

erosions. Functional outcomes have an irreversible component that is strongly related to the amount of structural damage. This needs to be considered when targeting functional outcomes in clinical practice.

#### References:

- [1] Kavanaugh A, van der Heijde D, McInnes IB, et al. Golimumab in psoriatic arthritis: one-year clinical efficacy, radiographic, and safety results from a phase III, randomized, placebo-controlled trial. *Arthritis Rheum* 2012; 64: 2504–2517.

#### Acknowledgements:

We thank Janssen for provision of an 80% random data cut of patients in the GO-REVEAL trial for our analyses.

**Disclosure of Interest:** None declared

**DOI:** 10.1136/annrheumdis-2017-eular.2835

### THU0702 ARE MRI-DETECTED EROSIONS SPECIFIC FOR RA? A LARGE EXPLORATIVE CROSS-SECTIONAL STUDY

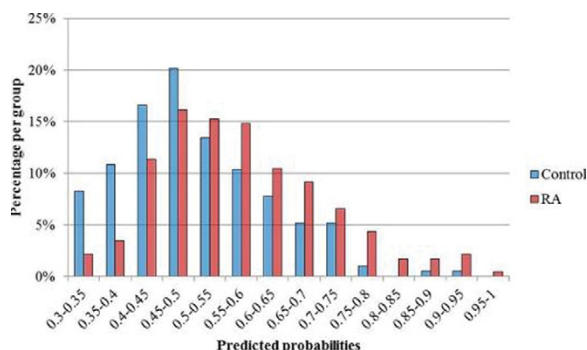
D. Boeters<sup>1</sup>, W. Nieuwenhuis<sup>1</sup>, H. van Steenbergen<sup>1</sup>, R. Landewé<sup>2</sup>, M. Reijnen<sup>3</sup>, A. van der Helm-van Mil<sup>1</sup>. <sup>1</sup>Department of Rheumatology, LUMC, Leiden; <sup>2</sup>Department of Clinical Rheumatology and Immunology, AMC and Atrium MC, Amsterdam and Heerlen; <sup>3</sup>Department of Radiology, LUMC, Leiden, Netherlands

**Background:** Magnetic resonance imaging (MRI) is recommended in the diagnostic process of rheumatoid arthritis (RA), as it can detect damage at an earlier time point than conventional radiographs. However, MRI-detected erosions as defined by EULAR and included in RAMRIS are also observed in symptom-free controls, especially at older age. It is unclear how RA-specific erosions on MRI can be distinguished from physiological erosions in symptom-free individuals. Therefore this study compared MRI-detected erosions between RA-patients and healthy controls, including evaluation of the effect of age.

**Objectives:** To compare characteristics of MRI-detected erosions (total erosion score, location and severity of erosions and simultaneous presence of MRI-detected inflammation) in metacarpophalangeal (MCP) and metatarsophalangeal (MTP) joints between RA-patients and healthy controls.

**Methods:** 422 subjects (229 newly presenting patients with a clinical diagnosis of RA and fulfilling the 2010-criteria and 193 symptom-free controls) underwent contrast enhanced 1.5T MRI of unilateral MCP and MTP joints. The readers were blind to the clinical information. Total erosion score according to the RAMRIS method (hence a combination of number and severity), location and severity of erosions and simultaneous presence of MRI-detected inflammation (synovitis and/or bone marrow edema) were compared between groups, also in relation to age.

**Results:** First total erosion scores were analyzed. Both in RA-patients and in controls this score was associated with age ( $p < 0.001$  in both groups). In addition, at all ages and on group level, RA-patients had 1.2 (95% CI 1.1–1.3) times higher erosion scores than controls. Despite this difference, total erosion scores could not differentiate RA-patients from controls on the individual level, as there was large overlap (Figure). Next different characteristics of erosions were explored within age groups (<40, 40–59, ≥60) to search for RA-specific features. With respect to location, erosions found in MTP5 were specific for RA (spec 90–98% for different age groups). Erosions found in MTP1 were specific for RA if subjects were aged <40 (spec 98%), but specificity decreased by increasing age (spec 86% if aged 40–59 and 63% if aged ≥60). Evaluating the severity revealed that “severe erosions” (scores ≥2) were infrequent in all subjects, but almost exclusively present in RA (spec 98–100%). Finally the simultaneous presence of erosions with inflammation was studied. In the age group <40 years, the simultaneous presence was exclusively observed in RA-patients (specificity 100%); but specificity decreased by age since the combined presence was also seen in symptom-free controls (spec 91% if aged 40–59 and 71% if aged ≥60 years).



**Conclusions:** Whilst the group of RA-patients at disease presentation had significantly higher erosion-scores than healthy controls, scores of individual subjects were largely overlapping. Some erosion characteristics were specific for RA, but these were present in only a minority of all RA-patients (22%).

**Disclosure of Interest:** None declared

**DOI:** 10.1136/annrheumdis-2017-eular.4026

### THU0703 SYSTEMATIC REVIEW OF RHEUMATOID ARTHRITIS CLINICAL STUDIES: SUBOPTIMAL STATISTICAL ANALYSIS OF RADIOLOGICAL DATA

S. Mahmood<sup>1,1</sup>, L. van Tuyl<sup>1</sup>, L. Schoonmade<sup>2</sup>, R. Landewé<sup>1</sup>, D. van der Heijde<sup>3</sup>, J. Twisk<sup>2</sup>, M. Boers<sup>1</sup>. <sup>1</sup>Amsterdam Rheumatology and immunology Center; <sup>2</sup>VUmc, Amsterdam; <sup>3</sup>LUMC, Leiden, Netherlands

**Background:** Radiography is an inexpensive, reliable and reproducible method to detect and quantify progression of damage, an important outcome in rheumatoid arthritis (RA) trials and observational studies. However, the distribution of progression scores is skewed with many low or zero scores. Analysis of such data is challenging, and the choice of analysis technique may influence the result. Current analysis practice is unknown.

**Objectives:** We systematically searched the literature to identify current practice for the analysis of radiographic progression in clinical trials and observational studies of RA.

**Methods:** PubMed Embase and Cochrane databases were searched (2006–2016) to identify studies that described analysis techniques to compare radiographic progression in at least two groups. Studies in animals, children as well as conference abstracts and studies not written in English were excluded. Titles and abstracts were screened by one researcher (SM); a second investigator (LvT) evaluated the included cases, doubtful cases and a random sample of the excluded cases.

Information on study design, sample size, assessment methods and analysis technique was extracted by one researcher (SM), in consultation with 3 others (LvT; MB and JT).

**Results:** Of 5980 identified papers, 252 were eligible. 226 of these reports were on a single study while 26 were on multiple studies in one paper.

Of the 226 studies, 75 studies used parametric techniques, such as t-tests, ANOVA or linear regression to analyze the data. Of these only 12% took the skewed distribution into account. In 78 studies, the continuous data was categorized into two or more groups and analyzed with binomial or ordinal methods, such as chi-square tests or logistic regression analyses. 4 studies treated the outcome as a “count” outcome variable (2 studies applied a Poisson regression, 1 a negative binomial regression and 1 a zero-inflated binomial regression).

43% compared more than two groups. Median (IQR) sample size was 351 (range 163–608). 30% had one reader, 57% two readers, and 2% more than two; in 10% the number of readers was not recorded. Order of reading was random in 43%, sequential in 31%, and unknown in 26%. Most applied the Sharp van der Heijde scoring method (75%); 9% the Genant modification, and 16% other methods.

**Conclusions:** There is large heterogeneity in the analysis strategy of radiographic progression in recent RA clinical trials and observational studies: a large number of studies apply simple, suboptimal or inappropriate methods. In addition, key information (i.e. number of readers and order of readings) is poorly documented.

**Disclosure of Interest:** S. Mahmood: None declared, L. van Tuyl: None declared, L. Schoonmade: None declared, R. Landewé Employee of: director of Rheumatology Consultancy BV, D. van der Heijde Employee of: director of Rheumatology Consultancy BV, J. Twisk: None declared, M. Boers: None declared

**DOI:** 10.1136/annrheumdis-2017-eular.1829

### THU0704 EVALUATION OF THE ACCURACY OF HAND AND FOOT MRI IN THE EARLY IDENTIFICATION OF RA: USING THE PREVALENCE OF LOW-GRADED INFLAMMATION IN THE SYMPTOM-FREE POPULATION AS REFERENCE REDUCES FALSE-POSITIVE MRI RESULTS

A.C. Boer<sup>1</sup>, L.E. Burgers<sup>1</sup>, L. Mangnus<sup>1</sup>, R.M. Ten Brinck<sup>1</sup>, W.P. Nieuwenhuis<sup>1</sup>, H.W. Van Steenbergen<sup>1</sup>, M. Reijnen<sup>2</sup>, T.W. Huizinga<sup>1</sup>, A.H. van der Helm van Mil<sup>1</sup>. <sup>1</sup>Rheumatology; <sup>2</sup>Radiology, LUMC, Leiden, Netherlands

**Background:** Early identification of rheumatoid arthritis (RA) is important, because it allows early treatment initiation and is associated with better disease outcomes. In this perspective, the use of hand and foot MRI in the diagnostic process of rheumatoid arthritis (RA) has been advocated. Recent studies showed that MRI is helpful in predicting progression from clinically suspect arthralgia (CSA) to clinical arthritis, and from undifferentiated arthritis (UA) to RA. However, the diagnostic value of MRI is still undetermined. Most studies focussed on the sensitivity rather than the specificity of inflammation detected on MRI. It is known that symptom-free persons can also show inflammation on MRI. Consequently, it has been questioned if MRI-findings in symptom-free volunteers are relevant to consider as a reference when defining a “positive MRI”.

**Objectives:** To determine the value of considering MRI-findings in a control group for the predictive accuracy of MRI when defining a positive MRI.

**Methods:** 225 patients with CSA and 201 patients with UA underwent MRI of MCP-, wrist- and MTP-joints at baseline and were followed for 1 year on progression to arthritis and RA respectively. MRI was considered positive either if ≥1 joint showed inflammation (called “uncorrected definition”), or if ≥1 joint had inflammation that was present in <5% of persons of the same age-category at the same location in a symptom free reference population (called “5% corrected definition”). MRI scans were scored according to RAMRIS method. Test characteristics were compared for both definitions, hence with and without the incorporation of a reference population when defining a “positive MRI”.

**Results:** By using MRI-data of symptom-free volunteers as reference, the

specificity of MRI-detected inflammation increased from 22% to 56% in CSA-patients, and from 10% to 36% in UA-patients. The sensitivity was not affected; it was 88% and 85% in CSA-patients and 93% and 93% in UA-patients. The accuracy also increased, from 32% to 60% in CSA-patients and 22% to 44% in UA-patients.

**Conclusions:** The use of a reference population resulted in a substantial reduction of false-positive results, without affecting the sensitivity. This is of high importance because of the potential risks of false-positive MRI-results, for example in the setting of UA as a positive MRI-result may influence the decision to initiate disease modifying medication. Although a reference population is generally used in medicine for other tests to derive a definition of a positive test result, this is the first study demonstrating the value of a reference population to define a "positive MRI".

**Disclosure of Interest:** None declared

**DOI:** 10.1136/annrheumdis-2017-eular.1559

THURSDAY, 15 JUNE 2017

## Rehabilitation

### THU0705 EXPERIMENTAL USE OF 3D PRINTING TECHNOLOGY FOR THE CONSTRUCTION OF DEVICES AS INTEGRATION OF OCCUPATIONAL THERAPY INTERVENTION WITH RHEUMATOID ARTHRITIS PATIENTS (RA)

G. Sandri<sup>1</sup>, A. Bottini<sup>2</sup>, F. Franchi<sup>3</sup>, M.T. Mascia<sup>2</sup>. <sup>1</sup>Department of Clinical, Diagnostic and Public Health, Service of Rheumatology; <sup>2</sup>Department of Clinical, Diagnostic and Public Health, Occupational Therapy Unit; <sup>3</sup>Orthopedic, Hand Rehabilitation, Modena, Italy

**Background:** RA is a chronic inflammatory disease that can interfere with the ability to perform activities of daily living. The adoption of aid devices allows to maintain and/or improve employment performance, reducing the pain preventing further joint damage. However, it is known that the abandonment rate of such devices is quite high, resulting in failure of the rehabilitation project, and waste of resources. The reasons people give for abandoning support technology are that they have not been involved in the process of provision, and that the devices do not have the intended effect (1).

**Objectives:** technology may allow customization of 3D printing devices agreed together with patients, utilizing materials which are cheap, fast and easily adjustable.

**Methods:** The study was organized into the following phases: recruitment of RA patients for the "joint protection laboratories"; sessions of the "joint protection laboratories"; recruitment of patients for the identification of needs for customized aid devices; co-design of customized aid devices; printing of customized aid devices; delivery of customized aid devices; detection using customized aid devices.

We have collected a list of needs to be able to develop such customized aid devices at the end of a course to educate on joint protection covering: ergonomic gestures, management of fatigue and pain, environmental adaptations and aid devices.

18 patients (17 women and 1 man), age between 30 and 75 years old, were organized into small groups for the "joint protection laboratories". 9 patients expressed their specific needs regarding the aid devices and therefore subsequent meetings were organized that have allowed us to produce and deliver customized objects.

Autodesk® Fusion360 for object modeling; Ultimaker Care for slicing; 3D printing DeltaWASP 20 40. For the collection of the design features we used the PA board (product analysis) of the USERfit tool. For the psycho-social impact assessment of the assistance, the PIADS (Psychosocial Impact of Assistive Devices Scale – scale -3+3) was used, and for the evaluation of the patient's satisfaction with respect to the aid device, QUEST (Quebec User Evaluation of Satisfaction with Technical Aids, scale 1–5) was used.

**Results:** 6 aid devices were customized: hand grip holder for chalk, toothbrush, ignition key, tablespoon, iron, as well as a handle to open the moka coffee machine.

The psychosocial assessment of 6 delivered aid devices, collected through PIADS, showed an overall positive outcome (mean competence +1.488; adaptability: +1.690; self-esteem: +1.375). The assessment of patient satisfaction through QUEST, was good overall (scale 1–5: satisfaction aid: 4.75; service satisfaction: 4.68).

**Conclusions:** This work also demonstrated, over a range of small numbers, that the path of co-design and production of customized aid devices via rapid manufacturing with 3D printing technology is feasible and fulfilling.

**References:**

[1] Tuntland H, Kjeker I, Nordheim L, Falzon L, Jamtvedt G, Hagen K. The Cochrane review of assistive technology for rheumatoid arthritis Eur J Phys Rehabil Med. 2010 Jun;46(2):261–8.

**Disclosure of Interest:** None declared

**DOI:** 10.1136/annrheumdis-2017-eular.2591

### THU0706 LOW DISEASE ACTIVITY AFTER A SHORT COURSE OF DRUG THERAPY AND REHABILITATION IS ASSOCIATED TO A GREATER IMPROVEMENT IN FUNCTIONAL CAPACITY IN RHEUMATOID ARTHRITIS

B. Cunha, B. Ferreira, L. Moreira, C. Barros, A. Gushikem, J. Kauer, T. Ferreira on behalf of SARAR 2 cohort. *Rheumatology, SARAH Network of Rehabilitation Hospitals, Brasília, Brazil*

**Background:** Patients with rheumatoid arthritis (RA) have lower functional capacity than general population (1). Studies have shown that patients are able to improve their functional capacity after adequate treatment with disease-modifying antirheumatic drugs (DMARDs) (1–2), but it is unclear which other factors are involved in rehabilitation settings.

**Objectives:** To investigate which clinical factors are associated to improvement in functional capacity in patients with RA in the context of DMARD therapy and rehabilitation.

**Methods:** It was a case-control study. Patients with RA admitted between June 2014 and July 2016 were included. Assessments were carried out just before and after completion of rehabilitation program. Functional capacity was assessed with Health Assessment Questionnaire-Disability Index (HAQ-DI). Disease activity was evaluated with Clinical Disease Activity Index (CDAI). It was allowed to change DMARD treatment or dose during the follow-up period. Interventions were carried out at the discretion of the rehabilitation team and could include joint injections, exercises, orthoses, insoles, educational interventions and assistive devices. Patients that were operated in the follow-up period were excluded.

An improvement in HAQ-DI was defined as a difference of  $-0.22$ . Patients that improved after treatment were compared with those who did not, regarding clinical characteristics and modalities of treatment that were employed. Chi-square or Fisher exact test analyses were employed.

**Results:** Forty-six women and two men were included, with average age of 56 (11) years old and 10,8 years of diagnosis, Rheumatoid factor was positive in 58% (mean titre 242,3 U/L); anti-CCP was positive in 48% (mean titre 283,8 U/L). Patients were followed for 6–12 months.

HAQ-DI improved 0,51 (0,3–0,71;  $p < 0,001$ ) and CDAI improved 12,8 (7,6–17,9). Patients who were able to improve HAQ-DI had a better average CDAI in the second assessment (16 vs. 7,  $p = 0,011$ ). There was no association between improvement of HAQ-DI and other clinical and laboratorial variables, including drug and rehabilitation modalities.

**Conclusions:** Low disease activity after a short course of drug therapy and rehabilitation is related to a greater improvement of functional capacity in patients with RA. Therefore, patients with RA may have better outcomes in rehabilitation if disease activity is controlled.

**References:**

[1] Mota LM, Laurindo IM, dos Santos Neto LL. Prospective evaluation of the quality of life in a cohort of patients with early rheumatoid arthritis. *Rev Bras Reumatol.* 2010 May-Jun;50(3):249–61.

[2] Norton S, Fu B, Scott DL, Deighton C, Symmons DP, Wailoo AJ, Tosh J, Lunt M, Davies R, Young A, Verstappen SM. Health Assessment Questionnaire disability progression in early rheumatoid arthritis: systematic review and analysis of two inception cohorts. *Semin Arthritis Rheum.* 2014 Oct;44(2):131–44.

**Disclosure of Interest:** None declared

**DOI:** 10.1136/annrheumdis-2017-eular.1670

### THU0707 RACE & REHABILITATION DESTINATION AFTER TOTAL HIP REPLACEMENT

E.R. Vina<sup>1</sup>, M. Kallan<sup>2</sup>, A. Collier<sup>2</sup>, C. Nelson<sup>2</sup>, S. Ibrahim<sup>2</sup>. <sup>1</sup>University of Arizona, Tucson; <sup>2</sup>University of Pennsylvania, Philadelphia, United States

**Background:** There are marked racial/ethnic disparities in the utilization of hip joint replacement in the US. Differences in post-surgical rehabilitation care may influence this disparity. There is relatively little research on racial variations in post-hip joint replacement surgery care processes.

**Objectives:** The main objective of this analysis was to examine racial differences in where patients go for post-acute care rehabilitation after elective hip replacement surgery. We also assessed whether or not where patients go for post-surgery rehabilitation care impacts quality of care markers such as 90-day hospital readmission.

**Methods:** A retrospective, large regional dataset analysis using the Pennsylvania Health Care Cost Containment Council database was performed. Patients who underwent elective hip replacement surgery and discharged from Pennsylvania hospitals between fiscal years 2008–2012 were selected. Post-surgery rehabilitation destinations options included: home with self-care, home with home health (HH) care; skilled nursing facility (SNF) and in-patient rehab facility (IRF).

We used multinomial logistic regression models to estimate unadjusted and adjusted relative risk ratios (aRRRs) of being discharged home with HH care, to a SNF or to an IRF (vs. home with self-care) after surgery, comparing African-American (AA) to white patients. Multivariable models adjusted for patient-level and facility-level variables associated ( $p < 0.10$ ) with post-surgical discharge destination based on bivariate analyses. Unadjusted and adjusted odds ratios (aORs) of 90-day hospital readmission were estimated using binary logistic regression models. Multivariable models adjusted for patient-level and facility-level variables associated