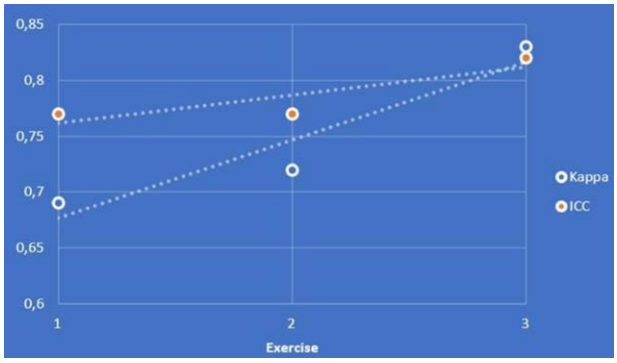


**Figure 1.** Reader agreement for all readers combined

**Acknowledgements: NIL.**
**Disclosure of Interests:** Anna E F Hadsbjerg Grant/research support from: Novartis., Mikkel Østergaard Speakers bureau: AbbVie/Abbott, Eli Lilly, Gilead, Novartis, Janssen, Pfizer, UCB, Grant/research support from: AbbVie/Abbott, Eli Lilly, Novartis, Janssen, UCB, Amgen, BMS, Celgene, Joel Paschke: None declared, Raphael Micheroli: None declared, Susanne Juhl Pedersen Speakers bureau: AbbVie/Abbott, Merck/MSD, Novartis, Pfizer, UCB, Grant/research support from: Merck/MSD, Novartis, Adrian Ciurea Speakers bureau: AbbVie, Merck/MSD, Novartis, Michael J Nissen Speakers bureau: Janssen, Amgen, Novartis, Consultant of: AbbVie/Abbott, Pfizer, Kristyna Bubova: None declared, Stephanie Wichuk: None declared, Manouk de Hooge: None declared, Simon Krabbe Grant/research support from: Novartis, Ashish Jacob Mathew: None declared, Monika Gregová: None declared, Marie Wetterslev: None declared, Karel Gorican: None declared, Karlo Pintaric: None declared, Ziga Snoj: None declared, Burkhard Moeller: None declared, Alexander Bernatschek: None declared, Maurice Donzallaz: None declared, Robert G Lambert Consultant of: Calyx, CARE Arthritis, Image Analysis Group, Walter P Maksymowych Speakers bureau: Novartis, Consultant of: AbbVie, Boehringer-Ingelheim, Celgene, Eli Lilly, Galapagos, Janssen, Novartis, Pfizer, UCB, Grant/research support from: AbbVie, Janssen, Pfizer, Employee of: CARE Arthritis Limited
**DOI:** 10.1136/annrheumdis-2023-eular.2116

## POS0919 [18F] POSITRON EMISSION COMPUTED TOMOGRAPHY ([18F] FDG PET/CT) IS ABLE TO PREDICT ULTRASOUND-DEFINED REMISSION IN RHEUMATOID ARTHRITIS

**Keywords:** Inflammatory arthritides

C. Rinkin[1], C. Florane[1], C. Gérard[1], L. Seidel[1], C. Lamaye[2], R. Hustinx[2], M. Malaise[1], C. Ribbens[1], O. Malaise[1]. *[1]University Hospital of Liège, Rheumatology Department, Liège, Belgium*; *[2]University Hospital of Liège, Nuclear Medicine Department, Liège, Belgium*

**Background:** Assessing joint inflammation in rheumatoid arthritis (RA) is of high importance because associated with structural damage. In addition to clinical examination and ultrasound (US), joint inflammation can also be quantified by [18F] positron emission computed tomography ([18F] FDG PET/CT). Nowadays, PET/CT is widely used for cancer evaluation and systemic inflammation work-up and it can be used for opportunistic joint evaluation in RA patients. In addition, PET/CT allows a whole-body articular evaluation in one examination. We, and others, have previously demonstrated that PET/CT is significantly correlated with US parameters, but with a weak correlation coefficient.
**Objectives:** We investigated the ability of PET/CT to predict US-defined remission at the joint level and at the patient level.
**Methods:** 61 RA patients were included and underwent [18F] FDG PET/CT and US evaluations. For PET/CT, standardized uptake value (SUV) was determined on 22 joints (wrists, PIP and MCP of both hands). At the patient level, the maximum SUV (SUVmax), the number of PET positive joints (SUV>0) and the sum of all SUVs (cumulative SUV) were evaluated. US evaluation included gray-scale and Power Doppler imaging, according to OMERACT.
**Results:** At the joint level, PET/CT activity (SUV) was significantly different when the joint was under US remission or not (OR 0.411, p<0.0001 with remission defined as "no synovitis grade ≥ 2 with no PDI "). ROC-curves identified SUV thresholds to define joint remission with a high predictive positive value (95.2; confidence interval (CI): 93.8-96.4), but with low negative predictive value (28.9; CI: 21.7-36.8). When wrists, MCP and PIP were evaluated separately, AUC was higher for wrists. Predictive positive value was high for each sub-type (93.4, 94.2, 96.3% respectively). Negative predictive value was low for MCP and PIP (34.0 and 22.2%) but better for wrist (71.4%). At the patient level, SUVmax was significantly different when the patient was under US remission or not (p=0.0023 with remission defined as "no synovitis grade ≥ 2, no PDI, no tenosynovitis"). Cumulative SUV was also different (p=0.045) while there was no difference for the number of PET-positive joints. SUVmax threshold was determined with ROC-curves and demonstrated a high negative predictive value for determining US remission (92.9, CI: 66.1-99.2), while the positive predictive value was lower (67.4, CI: 52.0-80.5). For cumulative SUV threshold, negative and predictive value for determining US-defined remission were 73.1 and 73.5 respectively.
**Conclusion:** PET/CT is able to predict US-defined remission in RA patients. In addition to its well-known role in cancer evaluation and systemic inflammation work-up, PET/CT is also a promising tool in RA metrology. When considering US remission at the joint level, the predictive positive value is high, while the predictive negative value is better when predicting US remission at the patient level. Among PET/CT parameters, the maximum SUV (SUVmax) and the cumulative SUV exhibit the highest performances to predict US remission.
**REFERENCES: NIL.**
**Acknowledgements: NIL.**
**Disclosure of Interests: None Declared.**
**DOI:** 10.1136/annrheumdis-2023-eular.2190

## POS0920 QUANTIFICATION OF TENOSYNOVITIS IN RA FROM WRIST MRIS, BASED ON DEEP LEARNING

**Keywords:** Artificial intelligence, Rheumatoid arthritis, Imaging

D. Shamonin[1], Y. LI[1], T. Hassanzadeh[1], M. E. Bakker[1], M. Reijnierse[2], A. Van der Helm – van Mil[3], B. Stoel[1]. *[1]Leiden University Medical Center, Division of Image Processing, Department of Radiology, Leiden, Netherlands*; *[2]Leiden University Medical Center, Department of Radiology, Leiden, Netherlands*; *[3]Leiden University Medical Center, Department of Rheumatology, Leiden, Netherlands*

**Background:** To assess tenosynovitis in wrist MRI scans from patients suspected of developing rheumatoid arthritis (RA), visual scoring (RAMRIS) is usually applied. As this time-consuming and requires rigorous training, we propose a method for the wrist that is based on Deep Learning (DL) combined with post-processing. This method detects all structures (a process called 'segmentation'), including all tendons, and measures inflammation around each tendon (group).
**Objectives:** To develop a method that automatically segments tendons together with all other anatomical structures of the wrist, and perform automatic tenosynovitis quantification as an alternative to the RAMRIS score.
**Methods:** Post-contrast axial MR scans of the wrist of 1216 patients with early-onset synovitis from the early arthritis clinic (EAC) cohort were used. From 28 EAC patients, ground truth manual segmentations were obtained as atlases. This dataset contains 33 labels: 14 flexor/extensor tendon groups; 10 carpal, 5 metacarpal bones; 1 label for all main vessels; 2 labels for skin and remaining tissue; and 1 air label. We normalized each input image using the Z-score. For segmentation of the wrist (see Figure 1a), our method utilizes a U-Net. For data augmentations we used intensity scaling (0.8-1.25) and added normally distributed noise ($\mu$= 0, $\sigma$=0.06). We used softmax cross-entropy as a loss function, Adam optimization for 200 epochs, with a constant learning rate of 0.001. After 1-fold cross-validation evaluation, we trained on all 28 atlases. For validation we compared the automated tenosynovitis score against the manual RAMRIS score for tenosynovitis. From 10 RAMRIS tenosynovitis scores defined by two clinicians, we computed the mean score (T$\mu$). To define starting and end MRI slices for the scoring area we followed the RAMRIS definition. Starting from the slice where radius and ulna are closest to each other, ending with the hook of the hamate. The scoring areas were computed 3 mm around tendons, using a Euclidean distance transform, while excluding bones and vessels. Subsequently we computed histograms of the image intensities in the blood vessels and used the 25$^{th}$ percentile point as threshold to define inflamed areas within the scoring area (see Figure 1b). The final tenosynovitis quantification (Tq) was defined as the ratio between the number of 'inflamed pixels' and the total scoring area.