

Authors: Dr Varvara Choida^{1,2,3}, Dr Anastasia Madenidou^{1,2}, Dr Debajit Sen², Prof Margaret Hall-Craggs^{3,4}, Dr Coziana Ciurtin^{1,2}

1. Centre for Adolescent Rheumatology Versus Arthritis at UCL, UCLH and GOSH
2. Rheumatology department, UCLH
3. Centre for Medical Imaging, UCL
4. Radiology department, UCLH

Title: A systematic review of the ability of Whole Body MRI to assess disease activity and treatment response in Inflammatory Arthritis

Background: Whole body MRI (WBMRI) is a novel imaging technique that allows the examination of the spine and peripheral joints in patients with inflammatory arthritis (IA) at one visit. Depending on the protocol, it can identify synovitis, enthesitis, spondyloarthritis and chronic structural changes.

Objectives: To evaluate the performance of WBMRI in detecting inflammation in comparison with clinical assessments as well as the change in imaging outcomes in response to treatment, in IA patients.

Methods: We conducted a systematic search of the electronic databases MEDLINE, EMBASE and Cochrane Library. Two authors selected independently the eligible studies, extracted the predefined data and assessed the quality using the QUADAS2 tool. Studies that reported a) disease activity scores, b) patient or physician reported outcomes or c) results from other imaging tests in IA patients who underwent WBMRI were included.

Results: Fourteen studies (out of n=471) met our inclusion criteria. The majority of the studies were performed in Spondyloarthritis [SpA] (n=9), followed by Rheumatoid Arthritis [RA] (n=4) and Psoriatic Arthritis [PsA] patients (n=3). Nine studies provided clinical and MRI outcome measures. There was great heterogeneity in the quality of studies, disease specific outcomes reported and methodology used to compare them with MRI findings. One study documented low correlation between 28 swollen/tender joint count and MRI bone marrow oedema (BME)/synovitis in RA patients, whereas another reported that 31% of MRI negative joints (other than hand joints) exhibited tenderness. In PsA, one study demonstrated correlation between 28 swollen joint count and BME ($r=0.54, p=0.03$). Superiority of WBMRI in the detection of synovitis and enthesitis over clinical examination was documented in two studies with SpA patients. A third study in SpA showed a ranging agreement of 49 to 100% between clinical and WBMRI enthesitis.

Treatment response to biologics was assessed by WBMRI in 7 studies (5 in SpA, 2 in RA). In RA, one study showed numerical (but not statistically significant) reduction of WBMRI joint count at week 16 and 52 of Adalimumab treatment. The other study demonstrated a reduction in WBMRI synovitis and bone oedema scores after 1 year of anti-TNF or Tocilizumab treatment. A multicentre open label study reported a reduction in the number of MRI enthesitis lesions, spinal and sacroiliac joint scores at week 48, year 2 and 3 of Etanercept treatment in SpA patients. Improvement in WBMRI scores in SpA was also documented in one Adalimumab and one further Etanercept study.

Conclusion: There was a variable level of correlation between clinical and WBMRI outcomes measures across the included studies. The clinical significance of inflammation detected by WBMRI in some studies remains unclear. Many of the devised WBMRI scores appear to decrease after biologic treatment. Further studies are needed to determine the accuracy of WBMRI in detecting inflammation and its potential utility for clinical practice.