Whole body multiple joint MRI of patients presenting with inflammatory arthritis.

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Introduction.

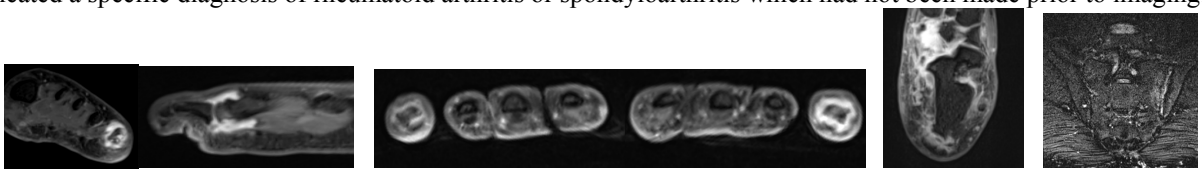
It is increasingly recognised that early treatment of inflammatory arthritis, particularly rheumatoid arthritis, prevents long term disability. However, diagnosis is often delayed. In some cases this may be due to the lack of sensitivity of clinical examination and plain radiographs for detecting early synovitis, osteitis, erosions and enthesitis. MRI is more sensitive, but in early disease it may be difficult to know which joints should be imaged, and targeted imaging of individual joints or groups of joints does not provide an assessment of the joints throughout the body. Recent developments in whole body scanning offer the potential to scan most of the joints in the body in a single session. Such techniques have been applied to psoriatic arthritis where they have revealed widespread, unsuspected disease[1]. The aim of this work was to demonstrate the feasibility of a protocol for scanning multiple joints throughout the axial and appendicular skeleton in patients presenting for the first time with arthritis. Specific aims were to compare MRI with clinical examination and clinical diagnosis.

Methods.

15 patients newly presenting to the Rheumatology Early Arthritis Clinic were studied. A clinical diagnosis was made using clinical (swollen joint count, Leeds enthesitis index[2]), laboratory (rheumatoid factor, anti-CCP antibody, CRP) and plain radiographic (hands and feet) assessments. Involvement of joints and entheses was determined clinically based on joint swelling and entheseal tenderness.
Whole body multiple joint MRI was performed using a 3T Siemens Verio scanner with multiple radiofrequency coils including spine array, large and small flex and peripheral angiography coils. T2-weighted fat suppressed (3000/100) images of the spine were acquired in 3 stages followed by T2-weighted fat suppressed images of the sacroiliac joints. After 0.1 mmol/kg intravenous Gd-DOTA, images of the joints and entheses were acquired using VIBE Dixon TR=6-12ms, TE=2.5&3.7ms, flip-angle=15-20º sequences with voxel size < 1mm^3. Multiple joints and entheses were imaged in 4 stages: (i) Shoulders, sternoclavicular and chostochodral joints; (ii) Hips, wrists, hands, pelvic entheses; (iii) Knees including entheses; (iv) Ankles and feet including Achilles tendon and plantar fascia.
Images were scored by a MSK radiologist blind to the clinical findings for presence of absence of the following features: (i) Spinal inflammatory change, sacroiliac oedema and erosion; (ii) Synovitis, osteites or erosion at the glenohumeral, sternoclavicular, wrist, MCP, PIP, hip, knee, ankle, mid/hind foot, MTP and interphalangeal joints; (iii) Enthesitis at the shoulder, ASIS, greater trochanter, knee, Achilles and plantar fascia. (ii)-(iv) were compared with the results of clinical examination. MRI findings were compared between groups of patients with different clinical diagnoses. The clinical diagnoses were reviewed in view of the MRI findings.

Results.

The clinical diagnosis at presentation was rheumatoid arthritis in 8 patients and undifferentiated arthritis in 7 patients. MRI revealed pathology at more sites than clinical examination ($p<0.05$, Wilcoxon matched pairs) and showed abnormalities at more sites in patients with rheumatoid arthritis than in patients with undifferentiated arthritis ($p<0.05$, Mann Whitney U). In 4/15 (27%) patients, MRI indicated a specific diagnosis of rheumatoid arthritis or spondyloarthritis which had not been made prior to imaging.



(a) (b) (c) (d)

Examples of whole body multiple joint imaging: (a) synovitis and erosion at 5th MTP joint (b) bilateral 5th MCP joint synovitis (c) Achilles enthesitis (d) sacroiliitis

Conclusions.

Whole body multiple joint MRI is feasible, more sensitive than clinical assessment and may help make a specific diagnosis. The combination of axial and peripheral imaging allows assessment of both spondyloarthritis and rheumatoid arthritis. Long-term follow-up will be required to confirm the accuracy of the MRI diagnoses. The number of sites of inflammation on whole body multiple joint MRI may provide a useful semi-quantitative assessment of disease load throughout the body.

References.

1. Weckback S et al. Eur J Radiol 2011;77:149
2. Healy PJ et al. Arthritis Care Res 2008;59:686