Commentary

Can magnetic resonance imaging differentiate undifferentiated arthritis?

Mikkel Østergaard[1,2], Anne Duer[1] and Kim Hørslev-Petersen[3]

[1]Department of Rheumatology, Copenhagen University Hospital at Hvidovre, Denmark
[2]Department of Rheumatology, Copenhagen University Hospital at Herlev, Denmark
[3]King Christian X's Hospital for Rheumatic Diseases at Graasten, University of Southern Denmark, Denmark

Corresponding author: Mikkel Østergaard, mo@dadlnet.dk

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Abstract

A high sensitivity for the detection of inflammatory and destructive changes in inflammatory joint diseases makes magnetic resonance imaging potentially useful for assigning specific diagnoses, such as rheumatoid arthritis and psoriatic arthritis in arthritides, that remain undifferentiated after conventional clinical, biochemical and radiographic examinations. With recent data as the starting point, the present paper describes the current knowledge on magnetic resonance imaging in the differential diagnosis of undifferentiated arthritis.

Introduction

The potential advantage of using magnetic resonance imaging (MRI) in the differential diagnosis of undifferentiated arthritis is evident. Earlier diagnosis and appropriate therapy have been recognized as essential factors for improved clinical outcomes in early rheumatoid arthritis (RA) [1]. MRI is known to be more sensitive than conventional clinical examination and radiography for the detection of inflammatory and destructive joint changes. But is there a scientific basis for the use of MRI in the differential diagnostic process?

Sensitive visualization of early changes

Numerous studies have shown that MRI allows the detection of RA bone erosions earlier than conventional radiography allows, and there is solid evidence that MRI bone oedema and bone erosions have predictive value with respect to subsequent radiographic progression [2]. Correspondingly, MRI is more sensitive than clinical examination for the detection of inflammatory soft tissue changes such as synovitis, tenosynovitis and enthesitis [2-6]. Comparisons with mini-arthroscopy and histopathological findings have documented that MRI synovitis, as determined by contrast-enhanced T1-weighted MRI, represents true synovial inflammation [7,8].

Different findings in different arthritides

Differences between MRI findings in peripheral joints of different arthritides, mainly RA and psoriatic arthritis, have been investigated. In a previous issue of *Arthritis Research and Therapy*, Cimmino and colleagues describe an interesting, although unsuccessful, approach to differentiate between psoriatic arthritis and RA using dynamic MRI [9]. The lack of success is probably not surprising because their method takes into account only enhancement rates after intravenous contrast injection and not the anatomical information provided by the location of the inflammatory changes on MRI. The well-known problems with reliability and reproducibility of measuring enhancement in small, visually selected, circular regions of interest [8,10], as in the study by Cimmino and colleagues, may also contribute.

Earlier attempts have incorporated anatomic information. Small studies have shown that MRI signs of inflammation in RA are more frequent in the synovial membrane than at the insertions of ligaments and tendons (enthesitis), while the opposite is true for seronegative spondyloarthritides such as psoriatic arthritis [3,4,11]. This is in accordance with the clinical experience that entheseal/capsular changes are more prominent in, but are not exclusively occurring in, sero-negative spondyloarthritides. Preliminary results from a recent MRI study by Boutry and colleagues of patients with RA, systemic lupus erythematosus and primary Sjogren's syndrome suffering from hand polyarthralgias found a frequency of metacarpophalangeal-joint bone oedema of 71% in RA patients versus 5% in non-RA patients, but no RA-specific findings were revealed [12].

A report from an early arthritis clinic [5] suggested that early MRI erosions only occurred in patients fulfilling the American

ACR = American College of Rheumatology; MRI = magnetic resonance imaging; RA = rheumatoid arthritis.

College of Rheumatology (ACR) 1987 revised criteria for RA at baseline or within the subsequent year. However, MRI bone erosions have also been found in other inflammatory arthritides [13].

Some types of pathology and their corresponding MRI findings are thus markedly more frequent in RA than in other arthritides, but are still not pathognomonic.

Interestingly, Cimmino and colleagues [9] used a low-field dedicated extremity MRI unit, and not a conventional high-field MRI unit as used in the majority of studies. Extremity MRI has, due to reduced costs and patient discomfort, a major potential for use in rheumatological clinical practice. However, more validation is needed.

Value in the differential diagnosis of undifferentiated arthritis

Definite answers concerning the differential diagnostic value of MRI should obviously be achieved through longitudinal studies of patients with undifferentiated arthritis. Studies of this kind are scarce.

In small studies it has been suggested that the incorporation of MRI signs of synovitis in the ACR criteria for RA would increase their accuracy, leading to an earlier diagnosis of some RA patients [6,14]. A retrospective study by Sugimoto and colleagues found that including "periarticular enhancement in at least one wrist or finger joint" as a third criterion in the classification tree format of the ACR 1987 criteria increased the sensitivity and accuracy of the diagnosis of RA. However, there were also false-positive cases [14]. In a subsequent study, early polyarthritis patients suspected for early RA were examined prospectively, with clinical follow-up diagnoses as the 'gold standard' reference [6]. Inclusion of the MRI criterion 'bilateral joint enhancement' increased the baseline sensitivity for RA from 77% to 96% and increased the diagnostic accuracy from 83% to 94%, but the inclusion decreased the specificity from 91% to 86% [6]. These findings have not been retested on other cohorts.

In a recent Danish study (Duer, Østergaard, Vallø, Hørslev-Petersen, unpublished data) the value of hand MRI and whole-body bone scintigraphy in the differential diagnosis of patients with unclassified polyarthritis was investigated in clinical practice. Forty-one patients with polyarthritis (≥2 swollen joints; >6 months' duration), which remained unclassifiable despite conventional clinical, biochemical and radiographic (hands and feet) examinations, were included. Patients who fulfilled the ACR criteria for RA or who had radiographic bone erosions were excluded. Contrast-enhanced MRI, using a 0.2-Tesla dedicated extremity MRI unit (Artoscan, Esaote, Italy), of the wrist and metacarpophalangeal joints of the most symptomatic hand and whole-body bone scintigraphy were performed. The patterns of joint involvement were noted. Patterns considered compatible with RA were as follows: for MRI erosion and MRI synovitis, joints other than the first carpometacarpal joints; and for scintigraphy, several joints but not the distal interphalangeal and first carpometacarpal joints. Subsequently, two rheumatologists agreed on the most probable diagnosis and patients were treated accordingly. A final diagnosis was made by another specialist review 2 years later.

Tentative diagnoses in this unpublished Danish study after MRI and bone scintigraphy were 13 patients with RA, eight patients with osteoarthritis, 11 patients with other inflammatory diseases and nine patients with arthralgias without inflammatory or degenerative origin. Two years later, 11 of 13 patients with an original tentative RA diagnosis had fulfilled the ACR criteria, while two patients were reclassified (one to psoriatic arthritis [erosive arthritis, rheumatoid factor-negative and psoriasis] and one to unspecific self-limiting arthritis). No patients classified as non-RA at baseline had fulfilled the ACR criteria after 2 years. The positive and negative predictive value of having MRI synovitis, MRI erosion and scintigraphic patterns compatible with RA were 1.00 and 0.87, respectively. Thus, in polyarthritis patients unclassified despite conventional clinical, biochemical and radiographic examinations, MRI and scintigraphy allowed correct classification as RA or non-RA in 39 of 41 patients, when fulfilment of ACR criteria 2 years later was considered the standard reference (Duer and colleagues, unpublished data).

In future studies of undifferentiated arthritis the value of MRI should be compared with the contributions of other potential diagnostic determinants, such as rheumatoid factor, anti-cyclic citrullinated peptide antibody, clinical/biochemical disease activity measures, radiographic erosions and promising biomarkers; for example, comparison by logistic regression analysis with the aim to develop the best possible prediction model, as previously done (without incorporating MRI) by Visser and colleagues [15].

Conclusion

MRI is more sensitive for the detection of early inflammatory and destructive changes in inflammatory arthritides than are conventional methods. MRI may be valuable for diagnosing specific arthritides, including early RA, in patients with undifferentiated arthritides, but the sensitivity and specificity, and so on, of MRI are not yet known. Even though MRI will probably only rarely be able to assign specific diagnoses alone, it can be a very useful addition to the differential diagnostic process. Our current knowledge strongly encourages further testing in patients with early suspected or unclassified arthritis.

Competing interests

The author(s) declare that they have no competing interests.

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