What the Rheumatologist Is Looking for and What the Radiologist Should Know in Imaging for Rheumatoid Arthritis

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KEYWORDS

• Rheumatoid • Arthritis • Inflammatory • Imaging • Ultrasound • MR Imaging • Rheumatologist • Radiologist

KEY POINTS

- The early diagnosis and treatment of patients with rheumatoid arthritis is the key to preventing irreversible joint damage.
- Plain radiographs are insensitive to early detection of synovitis and joint damage; in recent years, there has been an increasing reliance on ultrasound and MR imaging.
- A clear understanding between the rheumatologist and radiologist is essential to ensure that the patient is investigated efficiently and effectively.
- This article outlines what the rheumatologists is looking for and what the radiologist should know when imaging patients with inflammatory arthritis in the clinical setting.

INTRODUCTION

In recent years, the development of biologic disease-modifying antirheumatic drugs has greatly improved the treatment and prognosis of patients with inflammatory arthritis. Novel treatment regimes aim to suppress joint inflammation, minimize structural damage, and thus prevent disability.[1] The early implementation of treatment, and its optimal adjustment, requires early diagnosis and accurate monitoring of disease activity. In addition, accurate prognostic markers are required to select the appropriate treatment regime.

A good understanding between rheumatologists and radiologists is required to ensure that investigations are carried out in an efficient, cost-effective way, with careful attention to the patient's individual needs, using locally available equipment and expertise. This article outlines what the rheumatologist is looking for and what the radiologist should know in the clinical imaging of inflammatory arthritis.

DIAGNOSIS

Does the Patient Have Inflammatory Changes and/or Structural Changes?

In suspected inflammatory arthritis, the clinical question is usually whether or not there is synovitis, and if so is there structural change? In early rheumatoid arthritis, the spectrum of disease includes synovitis, tenosynovitis, bone marrow

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edema, bone erosions, and bursitis. To answer this question effectively, several supplemental questions should be answered, including: Which imaging modality should be used? Is there synovitis? Is there tenosynovitis? Are the findings in this patient indicative of structural damage in the future or functional decline? Is there bone marrow edema? Are there bone erosions? and Which regions should be imaged?

Which imaging modality should be used?

Radiographs Radiographs are inexpensive and easily available, allowing wide coverage of affected regions with a reasonable level of reproducibility. In addition, there are validated assessment methods and scoring systems allowing longitudinal comparisons.[2] The disadvantages of radiographs are that it uses ionizing radiation, and is insensitive for soft tissue inflammation and early bony change. Radiographs, therefore, have a limited role in the early diagnosis of rheumatoid arthritis. The earliest radiographic findings of disease are of periarticular soft tissue swelling and juxtaarticular osteopenia. Early erosions typically occur at the junction between the cartilage and periosteal synovial membrane insertion and the bone (the so-called bare area). The joint space may initially be widened owing to the presence of a joint effusion or synovitis, but as cartilage destruction occurs, the joint space may narrow. Eventually, the joint is destroyed and there is joint subluxation and in some cases bony fusion.

Although radiographs have a low sensitivity, they have a high specificity for making a diagnosis of rheumatoid arthritis if erosions are present. In clinical practice, radiographs of the hands are typically obtained at presentation, because, if erosions are seen, they immediately classify the patient as having aggressive disease (**Fig. 1**). Radiographs also serve as a useful baseline, and may reveal a pattern of disease that suggests an alternative diagnosis such as psoriasis. Radiographs can also depict chondrocalcinosis, which may suggest gout or calcium pyrophosphate disease.

MR imaging MR imaging is more sensitive than clinical examination and radiographs for the detection of inflammatory and destructive joint changes in early rheumatoid arthritis.[3] MR imaging can assess all the structures involved in arthritic disease, that is, synovial membrane, fluid collections, cartilage, bone, ligaments, tendons, and tendon sheaths. Its multiplanar capability and excellent soft tissue contrast resolution makes MR imaging a very sensitive examination for joint inflammation, allowing for the assessment of

Fig. 1. Plain radiograph demonstrating early erosions (*arrows*) at the metacarpophalangeal joints.

structural changes and disease activity.[4] It is, however, a relatively expensive modality, which is time consuming and sometimes not well-tolerated by patients.

In clinical practice, the use of MR imaging for the detection of early inflammation depends on many factors, including local practice, cost, ease of access, and the degree of uncertainty of diagnosis. Its use will therefore vary between institutions, but radiologists should be aware that this modality offers the most comprehensive assessment of inflammatory arthritis in any particular joint.

Ultrasound imaging Ultrasound (US) imaging, with its multiplanar capability and excellent soft tissue resolution, allows for the delineation of inflammatory and structural changes in inflammatory arthritis. The use of Doppler allows a real-time assessment of neovascularity in joints, which correlates with histopathological findings.[5] US imaging can assess several regions relatively quickly, and with comparative ease and less expense when compared with MR imaging. However, because US imaging cannot penetrate bone, certain areas are not assessable. Furthermore, US imaging is highly operator dependent, and differing results may be obtained according to the training and ability of the sonographer. Finally, the findings, and changes therein may be difficult to quantify.