

# Imaging of Inflammatory Arthritis in Adults



## Status and Perspectives on the Use of Radiographs, Ultrasound, and MRI

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### KEYWORDS

• Inflammatory arthritis • Imaging • Radiographs • Ultrasound • MRI

### KEY POINTS

- Inflammatory arthritis refers to a group of arthritides with similar, often overlapping, clinical and imaging characteristics.
- A variety of imaging modalities may be used for the evaluation of patients with inflammatory arthritis, with radiographs, ultrasound scan, and MRI having the widespread clinical use.
- These modalities tend to complement one another, each individual modality having its own set of strengths and weaknesses.
- Knowledge of the expected appearance of imaging findings associated with inflammatory arthritis for each of these modalities aids in the timely diagnosis and accurate monitoring of patients with these conditions.

### INTRODUCTION

The term *inflammatory arthritis* encompasses a variety of conditions, the common feature being synovial inflammation. Chronic joint inflammation results in synovial hyperplasia, which causes the average depth of blood vessels from the synovial surface to increase, increasing the distance over which nutrients must travel and thereby decreasing the efficiency of nutrient transport to the articular cartilage. This process may stimulate angiogenesis. Local tissue damage may occur as a result of progression of this process, with the enlarging synovial pannus invading nonsynovial

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tissues such as articular cartilage and bone. Vascularization of typically nonvascular tissues, such as articular cartilage, may lead to functional compromise, resulting in further tissue damage.<sup>1</sup>

Although numerous inflammatory arthropathies exist, they often share similar and overlapping basic imaging characteristics. Synovitis, cartilage wear, and osseous changes tend to be common and fairly universal imaging findings. Additional findings may include tenosynovitis, skin changes, and deposits. The individual arthropathies may often be distinguished by the pattern of joint involvement, the specific appearance of pathologic changes, and ancillary findings. Various complementary imaging modalities may be used to evaluate patients with inflammatory arthropathies.

### PREIMAGING PLANNING

Synovial joints comprise of a variety of tissues. These tissues include the highly vascular synovium and variably less vascular tissues such as articular cartilage, ligaments, menisci, tendons, muscles, bone, capsule, and bursae.<sup>1</sup>

Plain radiography is the conventional first-line imaging examination obtained in the evaluation of suspected inflammatory arthropathy, as it is accessible and relatively inexpensive and allows for the simultaneous evaluation of multiple joints. Radiographs provide valuable information regarding the bony manifestations of arthritis. These osseous abnormalities, however, represent the late sequelae of the disease, and, accordingly, radiographs do not allow for early detection and, consequently, treatment of these conditions. Additionally, conventional radiographs do not provide sensitive soft tissue assessment. Finally, radiography necessitates exposure to ionizing radiation and its potential stochastic effects, the risks of which increase with repeated imaging acquired to monitor for disease progression.<sup>2</sup>

Ultrasound scan (US) uses the acoustic properties of tissue to produce images. In the evaluation of inflammatory arthropathy, US can detect soft tissue abnormalities including synovial hypertrophy, joint effusion, and tenosynovitis. Doppler evaluation provides additional benefit, as it can detect hyperemia, thus, informing the user on the activity of inflammatory disease. Although US imaging of bone is limited because of its highly reflective properties, periarticular osseous erosions can be detected. The benefits of US include portability, ease of contralateral side imaging, and lack of ionizing radiation, particularly useful in young patients who are more susceptible to effects of repeated radiation. Additionally, US is relatively cost effective when compared with other imaging modalities.

MRI provides excellent tissue contrast and sensitivity for mobile water, offering superior evaluation of both the synovium and nonsynovial soft tissues and of periarticular marrow edema and osseous erosions. This, along with the lack of ionizing radiation, makes MRI a superb modality for evaluation of patients with inflammatory arthropathies; however, the cost makes it inappropriate as a first-line imaging test, and contraindications, such as claustrophobia and pacemakers, preclude the use of MRI in certain patients.<sup>2,3</sup>

### DIAGNOSTIC IMAGING TECHNIQUE

Radiographs of the symptomatic joints and the patient's hands, wrists, and feet are typically obtained at the outset of the disease to provide baseline information regarding joint integrity. Follow-up radiographs of the hands and feet, regardless of symptoms, should be considered in an effort to gauge disease progression or treatment efficacy,<sup>4</sup> as they often detect early erosions radiographically. No specific recommendations regarding the exact timeframe of serial follow-up radiographs exist.<sup>5</sup>

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