The septic versus nonseptic inflamed joint: MRI characteristics

Abstract  Objective. To differentiate the MR features of septic versus nonseptic inflamed joints. Design and patients. Thirty patients were referred for MRI with inflamed joints (19 were subsequently found to be septic and 11 nonseptic). At 1.5 T enhanced MRI five groups of signs related to joint space, synovium, cartilage, bone and peri-articular soft tissue respectively were assessed and compared between the septic and nonseptic groups. Results. The prevalence of MRI findings in septic versus nonseptic joints (respectively) was as follows: effusion (79% vs 82%), fluid outpouching (79% vs 73%), fluid heterogeneity (21% vs 27%), synovial thickening (68% vs 55%), synovial periedema (63% vs 55%), synovial enhancement (94% vs 88%), cartilage loss (53% vs 30%), bone erosions (79% vs 38%), bone erosions enhancement (77% vs 43%), bone marrow edema (74% vs 38%), bone marrow enhancement (67% vs 50%), soft tissue edema (63% vs 78%), soft tissue enhancement (67% vs 71%), periosteal edema (11% vs. 10%). The presence of bone erosions appeared to be an indicator for an infected joint ($P=0.072$); coexistence of bone marrow edema slightly improves the significance (0.068). A similar trend was obtained when combining bone erosions with either synovial thickening, synovial periedema, bone marrow enhancement or soft tissue edema ($P=0.075$). Conclusions. The combination of bone erosions with marrow edema is highly suggestive for a septic articulation; the additional coexistence of synovial thickening, synovial edema, soft tissue edema or bone marrow enhancement increases the above level of confidence. Similar to conventional radiography, the single sign that appeared to show a significant trend was the presence of bone erosions. However, no single sign or combination could either be considered pathognomonic or exclude the presence of a joint infection. Key words  Joint · MRI · Infectious arthritis · Septic joint · Inflammation

Introduction

In several small series the MRI findings in septic arthritis appear to be nonspecific, with overlap of findings seen in inflammatory arthropathies [1–5]. Consequently it is not known which are useful MR signs of a septic articulation. Therefore an investigation of multiple MRI findings was carried out in an attempt to determine characteristics which might distinguish septic arthritis from other causes of an acutely inflamed joint.

Material and methods

Thirty patients (17 women and 14 men; age 29–83 years, mean age 53 years) were referred for MRI to investigate possible joint infection. Septic arthritis was confirmed in 19 patients by positive
culture following joint aspiration or biopsy (n=15) or by follow-up of response to antibiotic treatment (n=4). In 11 patients the diagnosis of infected joint was excluded. In these cases the diagnosis of the non infected joints included: inflammatory synovitis/bursitis (n=9; rheumatoid in two, seronegative inflammatory in seven), cellulitis (n=1) and anasarca (n=1), both with inflamed joints.

Imaging was performed on a 1.5-T unit (Signa; GE Medical Systems, Milwaukee, Wis.). Pulse sequences included sagittal T1-weighted and STIR, coronal T2-weighted and axial T2- and T1-weighted sequences, the last with fat suppression before and after (n=26) the intravenous administration of gadopentate dimeglumine (Magnevist; Berlex, Wayne, N.J.). Imaging planes and field of view varied by body part.

Images were retrospectively reviewed separately and independently by two experienced musculoskeletal radiologists (D.D., M.E.S). Specific note was made of the following findings: (a) effusion, with or without distention of articular recesses and with or without homogeneous signal intensity; (b) synovial thickening, with or without synovial edema and with or without synovial enhancement; (c) cartilage loss; (d) bone erosions, with or without enhancement; (e) bone marrow edema, with or without enhancement; (f) soft tissue edema, with or without enhancement; and (g) periosteal edema. Prevalence of each of the above-mentioned findings and the percent of agreement of the variation between the observers was calculated.

As most groups were smaller than five cases, Fisher’s exact test was used for statistical analysis.

**Results**

Effusion was a common feature in both septic (79%) and nonseptic (82%) joints (Table 1). Fluid outpouching was a common finding also, in both septic (79%) and nonseptic inflamed joints (73%). Fluid heterogeneity was less common in both populations, but was almost equally distributed in septic (21%) and nonseptic joints (27%).

Synovial thickening was slightly more frequent in septic joints (68%) than nonseptic joints (55%). Edema around the synovium was also slightly more common (63% vs 55%) in septic joints (Fig. 1).

Cartilage loss was more suggestive of an infected joint (53% vs 30%), as were bone erosions (79% vs 38%) (Figs. 1, 2). Bone marrow edema showed some predilection for the septic joints (74% vs 38%). The involvement of both adjacent sides of the joint space was