



## Radiodiagnosis

## APPLICATION OF MAGNETIC RESONANCE IMAGING IN SEPTIC ARTHRITIS

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**ABSTRACT** Septic arthritis which is infection of various types of joints due to introduction of pathological organisms in joint space have many adverse outcomes. If not recognized and treated on time, irreversible joint damage and permanent disability can occur. Earliest radiographic changes are seen 7 to 10 days after onset of infection, however MRI changes can be detected within 3-5 days. We have attempted to characterize various MRI features in our study. Pulse sequences included coronal T1-weighted (early and late after contrast administration), coronal T2-weighted, and coronal STIR, sagittal T1-weighted, sagittal T2-weighted. Images were retrospectively reviewed for location of the joint involved, presence of joint effusion, synovial thickening, peri-synovial edematous changes and synovial enhancement. Presence of the bone marrow involvement and extent was evaluated by abnormal signal on T1-weighted images, T2-weighted images, STIR and contrast-enhanced images. Bone destruction was also evaluated using the images. Periarticular involvement in form of peri-synovial edematous changes, muscle and fascial plane involvement and collection were noted. The most commonly involved joints were small joints of foot (n=15). Most commonly isolated organism was staphylococcus aureus (60%, n=18). The bone destruction was noted 10 patients. The periarticular involvement showed perisynovial odema in 26 cases (87%), Muscle and fascial involvement in 14 cases (46%) and well defined collection in 10 cases (33%). Bone involvement showed Abnormal T1W signal in 21 cases (80%), Abnormal T2W signal in 27 cases (90%), Abnormal T1W and T2W signal in 21 cases (80%) and Post contrast enhancement in 25 cases (83%).

**KEYWORDS :****INTRODUCTION**

Septic arthritis can be explained as infection of the various types of joints due to introduction of pathological organisms in joint space. There are many adverse outcomes of the septic arthritis. It is a medical emergency having debilitating effects with long term adverse outcome if not recognized and treated on time. In neglected cases it causes irreversible joint damage and permanent disability. Early diagnosis and timely intervention can salvage the affected joint. Septic arthritis is considered a clinical diagnosis based on physical examination and diagnostic arthrocentesis.<sup>(1)</sup> However, the findings are often nonspecific at time of presentation. Clinical evaluation of joint effusion in deep joints, such as the shoulder or the hip, can be difficult, making the diagnosis even more challenging.<sup>(2)</sup> Earliest radiographic changes are seen 7 to 10 days after onset of infection in the form of soft tissue swelling. While on MRI the changes can be detected within 3-5 days. We have attempted to characterize various MRI features in our study.

**MATERIALS AND METHODS**

Imaging was performed on a 1.5-T unit standard MRI scanner. Imaging was always performed before joint aspiration or biopsy and before bone biopsy.

Pulse sequences included coronal T1-weighted (early and late after contrast administration), coronal T2-weighted, and coronal STIR, sagittal T1-weighted, sagittal T2-weighted.

Septic arthritis was confirmed in all 30 cases by positive results from culture after joint aspiration (n=26) or from post-surgical specimen (n=04). The presence of associated osteomyelitis was determined by bone biopsy

MRI imaging was performed on all the cases within 4 days of hospital admission. Demographic details of patients and associated history predisposing to septic arthritis were acquired.

Images were retrospectively reviewed for location of the joint involved, presence of joint effusion, synovial thickening, peri-synovial edematous changes and synovial enhancement. Presence of the bone marrow involvement and extent was evaluated by abnormal signal on T1-weighted images, T2-weighted images, STIR and contrast-enhanced images. Bone destruction was also evaluated using the images. The number cases showing each of these findings were

recorded. Periarticular involvement in form of peri-synovial edematous changes, muscle and fascial plane involvement and collection were noted.

**RESULTS**

Total number of cases in the study were 30 (n=30). There were 26 males and 4 females in the study.

Age range of the patients were from 10-60 years.

There was associated history of trauma in 2 cases, operative procedure in 2 and diabetes mellitus in 4 cases. 22 cases had no significant history. The most commonly involved joints were small joints of foot (n=15), followed by the ankle (n=2), the knee (n=4), the hip (n=6), the sacroiliac joint (n=1), the wrist (n=1) and the shoulder joint (n=1).

Most commonly isolated organism was staphylococcus aureus (60%, n=18), followed by Group A streptococcus in 20% of joints (n=6). Escherichia coli and Pseudomonas aeruginosa were present in 10% of joints (n=3) each.

The characteristics of synovium and joint space on MRI revealed synovial enhancement in 27 cases (90%), synovial thickening in 18 cases (60%) and joint effusion in 25 cases (83%).

The characteristics of bone involvement showed Abnormal T1W signal in 21 cases (80%), Abnormal T2W signal in 27 cases (90%), Abnormal T1W and T2W signal in 21 cases (80%) and Post contrast enhancement in 25 cases (83%).

The bone destruction was noted in just 10 patients out of 30 cases under study.

The periarticular involvement showed perisynovial odema in 26 cases (87%), Muscle and fascial involvement in 14 cases (46%) and well defined collection in 10 cases (33%).

**DISCUSSION**

Being common disease, delayed diagnosis increases morbidity and may lead to complications such as bone and cartilage destruction, osteonecrosis, secondary osteoarthritis, osteomyelitis, and eventually ankyloses. Some patients may present with subtle findings with

inconclusive findings on laboratory studies.<sup>(3)</sup> No single modality has shown comprehensive diagnostic accuracy.<sup>(4)</sup>

As bone marrow, soft tissues and joints can be well appreciated on MRI, it is increasingly used to evaluate musculoskeletal infections. MRI findings can be found within 24 hours of onset of infection.

The most commonly involved joints in our study were small joints of foot, followed by hip joint and then knee, ankle, shoulder, sacroiliac in decreasing frequency.

Culture studies established the role of staphylococcus aureus as most commonly associated organism for septic Healthy synovial joint show mild contrast enhancement. We found intense synovial enhancement in almost about 90% of cases likely indicates increased vascularity owing to vasodilation and angiogenesis which are classic manifestations of septic arthritis.

Synovium is faintly seen on MRI, however we found that it becomes thickened and becomes readily visible in septic arthritis in 60% of cases which is consistent with the microscopically noted permeation of synovial stroma by a dense perivascular inflammatory infiltrate.<sup>(5)</sup>

Effusions have been seen in most of the cases of septic arthritis. We found effusions to be present in 83.3 % of our cases.

Reactive bone marrow edema of septic arthritis is known manifestations. In our study, abnormal marrow signal on T1-weighted images were found in 80% cases and 90% cases on T2-weighted images. 80% cases showed both abnormal T1 and T2- weighted signals.<sup>(6)</sup>

The enhancement of proliferating synovium may be difficult to distinguish from enhancement of joint fluid. The rate of enhancement between synovial membrane and joint fluid differs, and dynamic contrast-enhanced MRI may separate the fast-enhancing synovium from the slower enhancing fluid. We acquired early and late contrast-enhanced images and found fluid enhancement in about 83% of joints.<sup>(7)</sup>

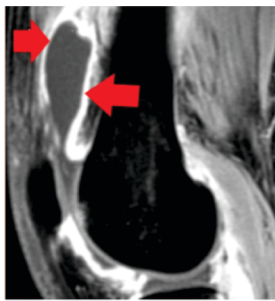
Inflammation causes increases capillary permeability causing peri-synovial edema also correlates with the diagnosis of a septic joint, being present in 87% of cases.

The involvement of muscles is not sine quo non for septic arthritis, however we found 46% cases had involvement of muscles and fascia.

Bone destruction was found out in only 33% cases of septic arthritis. In our study, bone destruction was found in only 10% of the joints.

This investigation had significant limitations, including the small sample size, variability in joint location studied, and lack of true MRI criteria for effusions and synovial thickening.

Accepting all these limitations, we conclude that synovial enhancement and joint effusions correlates with the clinical diagnosis of septic joint. However, these finding cannot be concluded on general population as we imaged patients with septic arthritis only.



Septic arthritis in knee joint demonstrating contrast enhancement on Fat suppressed T1W images.



Septic arthritis in ankle joint demonstrating collection

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