



RADIOLOGICAL EVALUATION OF SEPTIC ARTHRITIS IN PAEDIATRIC POPULATION

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ABSTRACT

Background and aims Septic arthritis is a dangerous medical condition associated with significant morbidity and mortality. This was a prospective study for radiological evaluation of septic arthritis in children presenting with fever, joint pain and restriction of joint movement. The aim of the study was to describe the soft tissue, synovial and osseous USG and MRI findings of septic arthritis and assess the severity and extend of the affected joints in those patients. **Materials and methods** In this cross-sectional study, 40 patients referred from various departments of Silchar Medical College and Hospital to the department of Radiology with fever, joint pain and restriction of joint movement were evaluated with X-ray, USG and MRI. X-ray was obtained using Allengers-525 X-ray Machine 300 kV, 700 mA. USG examination done by using SAMSUNG PRESTIGE RS-80A via high frequency probes. MRI evaluation was carried out on SIEMENS TIM AVANTO 1.5T Scanner. **Results:** Out of the 40 cases in the study, maximum cases in the present study were between the age 3months–1year (27.5%). A male preponderance (67.5%) was noted. The most common joint affected in septic arthritis was the hip(55%) joint followed by knee. Most common clinical manifestations observed was swelling followed by pain, fever, local rise of temperature and restriction of movement. X-ray (20%) showed poor sensitivity compared to MRI. USG was very sensitive in diagnosing joint effusions, synovial thickening and soft tissue changes. MRI was found to be very sensitive in diagnosing septic arthritis in our study with a sensitivity of 100%. **Conclusion:** Plain radiography is the basic first line of investigation that is still done for any case with clinically suspected septic arthritis. Ultrasound has an excellent sensitivity in diagnosing joint effusions, soft tissue changes and synovial thickening. MRI is the imaging modality of choice for arthropathies, showing

KEYWORDS : Septic arthritis, X-ray, Sonography, MRI.

INTRODUCTION

Septic arthritis (SA), also called infectious arthritis, is an inflammatory disease of the joints that is caused by an infectious agent⁽¹⁾. SA is a surgical emergency with a reported annual incidence between 4 and 12 per 100,000 children⁽²⁾. Septic arthritis owns a bimodal incidence, with peaks in both childhood and adults over the age of 55 years⁽³⁾.

Acute septic arthritis (SA) in children is most often a hematogenous infection.⁽⁴⁾ Staphylococcus aureus and respiratory pathogens are the most common causative agents.⁽⁵⁾

Symptoms of SA include acute onset of a decreased range of joint motion, localized pain, redness, tenderness, and swelling of the infected joint, commonly (though not always) associated with fever⁽⁶⁾. However, neonates (3 months old) may present with more subtle findings, e.g., irritability with passive joint movement or features of septicemia without fever⁽⁷⁾. The absence of fever in patients does not rule out a diagnosis of SA, with only 30 to 60% of cases of culture-confirmed native-joint SA having fever upon initial presentation⁽⁸⁾. SA of the knee and hip occurs more commonly in older children and adults, whereas hip and shoulder joints are more frequently affected in neonates⁽⁹⁾. Only one joint is affected (i.e., monoarticular) in most (80 to 90%) of the cases⁽¹⁰⁾.

The imaging workup for suspected septic arthritis includes plain radiography or ultrasound before surgical intervention⁽¹¹⁾.

Ultrasonography (USG) can be helpful in confirming the presence of a joint effusion and can, in turn, be used to guide joint washout or arthrocentesis⁽¹⁾. USG is the recommended imaging method for paediatric SA, but magnetic resonance imaging (MRI) may be warranted to rule out adjacent osteomyelitis⁽¹²⁾.

MATERIALS AND METHOD:

In this cross-sectional study, 40 patients were referred from various departments of Silchar Medical College and Hospital to the department of Radiology. After informed consent from the patient, involved joint X-ray, USG and MRI scan was performed. X-ray was obtained using Allengers-525 X-ray Machine 300 kV, 700 mA, USG was performed using SAMSUNG RS80A ultrasound machine with a linear array transducer. MRI evaluation was carried out on SIEMENS AVANTO FIT 1.5T SCANNER

The study was conducted from the time period of 1st of June 2021 to the 31st of May 2022 in the department of Radiology, Silchar Medical College and Hospital after taking approval from the ethical committee.

RESULTS

In our study out of 40 children, most of them belonged to the age group <1 year (27.50%). The mean age was found to be 4.8±4.1 years. Most of the subjects were males 27(67.5%). Hip was the most common joint involved followed by knee. In x-ray findings, joint effusion was found in (40)100% of the subjects; bone erosion was found in 10(25%) of the subjects; and joint space narrowing was found in 11(17.5%). USG findings showed that joint effusion was present in all 40(100%) subjects; synovial hyperemia in 31 (45%) subjects; synovial thickening in 40(100%) subjects and soft tissue extension in 4(10%) subjects. MRI findings showed that joint effusion, bone erosion, synovial thickening, bone marrow edema, and synovial thickening with enhancement was present in all 40(100%) subjects. Soft tissue involvement was present in 21(52.5%) subjects. The sensitivity of diagnosing septic arthritis by MRI was 100%, by USG was 77.5% and 20% by Radiography.

Table 1: Distribution of radiographic features in septic arthritis.

MRI		Frequency	Percentage (%)
JE	Joint Effusion	40	100
BE	Bone Erosion	40	100
BME	Bone marrow edema	40	100
STI	Soft Tissue Involvement	21	52.5
STW	Synovial thickening with enhancement	40	100

Table 2: Distribution of USG features in septic arthritis.

XRAY		Frequency	Percentage (%)
JE	Joint Effusion	40	100
BE	Bone Erosion	10	25
JSN	Joint Space Narrowing	11	17.5

Table 3: Distribution of MRI features in septic arthritis

USG		Frequency	Percentage (%)
JE	Joint Effusion	40	100
SH	Synovial Hyperemia	31	77.5
ST	Synovial thickening	40	100
STE	Soft tissue extension	4	10

Chart 1: Bar diagram showing sensitivity of imaging modalities in diagnosing septic arthritis.

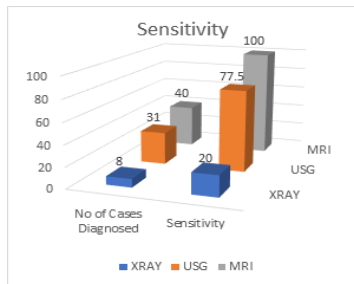


FIG 1: Septic arthritis of the left hip joint



(A) X-ray of the bilateral hip joint shows joint space narrowing involving the left hip joint with associated slipped capital femoral epiphysis. (B) USG of the hip joint shows synovial thickening with hyperemia on color doppler study. (C) T2 STIR axial section shows areas of joint effusion and associated bone edema involving the left hip joint. (D) T1 C+ axial section shows contrast enhancement of the synovium.

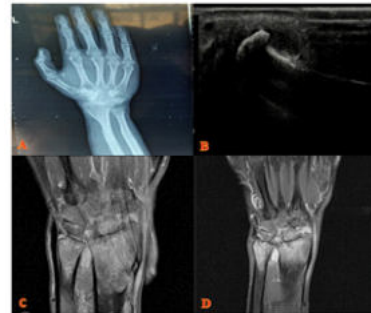
FIG 2: Septic arthritis of knee joint.



(A) Lateral view of knee joint shows soft tissue density in the suprapatellar recess suggestive of joint effusion, articular surface

erosions and surrounding soft tissue swelling, predominantly in the popliteal aspect. (B) USG transverse scan shows joint effusion with synovial thickening and floating debris involving the suprapatellar recess of the knee joint. (C) PDFS sagittal section shows areas of articular cartilage destruction, bone erosions, joint effusion and associated bone edema. (D) T1 C+ sagittal section shows contrast enhancement of the synovium and enhancing popliteal lymph nodes.

FIG 3: Septic arthritis of the wrist joint.



(A) X-ray of the wrist joint shows joint space narrowing involving the intercarpal and the radio-carpal joint with articular surface erosion. (B) USG longitudinal scan of the wrist joint shows joint effusion with synovial thickening. (C) PDFS coronal section shows hyperintensity involving the distal end of radius, ulna and the carpal bones, severe joint space reduction and articular surface destruction. (D) T1C+ coronal section shows moderate contrast enhancement with thickening of the synovium.

FIG 3: Septic arthritis of the metatarsophalangeal joint.



(A) X-ray of the foot shows joint space narrowing involving the metatarsophalangeal joint of the 5th toe with increased surrounding soft tissue density. (B) USG longitudinal scan around the 5th MTP joint shows synovial thickening with collection. (C) PDFS transverse section shows marrow oedema and joint space narrowing involving the metatarsophalangeal joint of the 5th toe. (D) T1 C+ transverse section shows synovial thickening and enhancement on post contrast study.

Discussion:

The sensitivity of X-ray in diagnosing septic arthritis in our study was 20% which showed result similar to prospective study by Zieger M M et al⁽¹³⁾ (1987). The common features in our study were the presence of joint effusion, bone erosions and joint space narrowing. The sensitivity of USG in diagnosing septic arthritis in our study was 77.5%. USG features of synovial thickening and joint effusion were seen in all patients with infective arthritis. On color Doppler study, increased vascularity was noted in the thickened synovium. Our findings correlated well with studies conducted by Al Saadi et al⁽¹⁴⁾ (2009) and Donana Gandini et al⁽¹⁵⁾ (2003). MRI features of synovial effusion and thickening, bone marrow edema, erosions and post-contrast enhancement of synovium were noted in all the cases (100%). Surrounding soft tissue enhancement were noted in (52.5%) of the cases. Our findings correlated well with the results of the study by Michael Karchevsky et al⁽¹⁶⁾ (2018) and Hopkins KL et al⁽¹⁷⁾ (2009) which demonstrated sensitivity of 100% by MRI in diagnosing septic arthritis.

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