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Magnetic resonance imaging findings in tubercular arthritis of elbow☆

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ABSTRACT

Objective: To evaluate magnetic resonance imaging (MRI) features of tubercular involvement of elbow joint.
Methods: Fourteen patients with tubercular arthritis of elbow were evaluated. The following findings were recorded on MRI ($n=12$): bones involved; erosions, intraosseous abscesses, synovial thickening, and effusion; hypointensity within the thickened synovium on T2-weighted images; and periarticular soft tissue changes.
Results: The common abnormalities on MRI were synovial thickening and bone erosions ($n=12$), soft tissue ($n=9$)/intraosseous ($n=5$) abscesses, and T2 hypointensity within the thickened synovium ($n=5$).
Conclusions: A diagnosis of elbow tuberculosis should be considered if there is a combination of findings involving bone and soft tissue.

1. Introduction

India is among the countries having highest burden of tuberculosis accounting for over one fifth of the total cases of tuberculosis worldwide [1]. Even in developed countries, there is resurgence in the incidence of tuberculosis [2]. An increase in osteoarticular tuberculosis is seen in conjunction with an overall increased incidence of tuberculosis. Several factors have led to this increase. Human immunodeficiency virus epidemic is the most important single factor besides increasing drug resistance.

Among the extrapulmonary tuberculosis, musculoskeletal tuberculosis contributes less than 3% [3]. Elbow joint involvement is relatively rare [4]. Clinical differentiation from other causes of monoarticular arthritides particularly inflammatory arthritis is challenging. Radiographs have a low sensitivity, particularly in the early stage of the disease.

Magnetic resonance imaging (MRI) has an excellent resolution for early detection of osseous and extraosseous abnormalities. MRI has been reported to be helpful in evaluation of tubercular arthritis at various sites in the body [5–9]. However, MRI characteristics of tubercular involvement of elbow joint have been reported only as isolated cases.

The current study was conducted to evaluate the specific findings of tubercular arthritis of elbow by retrospectively evaluating MRI over the past 6 years.

2. Materials and methods

A retrospective review of the radiology database for cases of tubercular arthritis of elbow over 6 years from January 2008 to March 2014 was conducted. Fourteen patients who underwent radiographs ($n=9$) or MRI ($n=12$) were included for analysis. Tuberculosis was diagnosed on the basis of aspiration or histopathological examination. In cases where aspiration/histopathological examination was not done or was negative, clinical response with resolution of radiological findings following antitubercular therapy (ATT) was considered for diagnosis.

Ethics committee approval was obtained and the need to obtain informed consent was waived. The MRI examinations were performed on a 3.0-T magnetic resonance (MR) scanner ($n=8$) (Magnetom Verio, Siemens) and a 1.5-T scanner ($n=4$) (Magnetom Aera, Siemens), a surface transmit–receive coil with the elbow in the neutral position. The following sequences were employed: T1-weighted turbo spin echo (TR/TE, 780–1070/10–20), proton density-weighted (TR/TE, 3000–4280/25–35), T2-weighted turbo spin echo (TR/TE, 3000–4500/80–95), and postgadolinium T1-weighted turbo spin echo (TR/TE, 850–1170/10–20). Images were acquired in multiple planes (axial and coronal for T1-weighted and coronal and sagittal for T2-weighted and proton density-weighted). Gadolinium-enhanced images were acquired in all the three orthogonal planes. The following parameters were employed: field of view, 180 mm; matrix size, 307×386; slice thickness, 3–5 mm; gap, 0.6–1 mm.

Evaluation of the MR images was done by two radiologists in consensus (experience of 3 years and 12 years). Bones involvement was defined by hypointensity on T1-weighted images and hyperintensity on T2-weighted images. Well-defined intraosseous lesions that were T1-weighted hypointense and T2-weighted hyperintense with peripheral ring enhancement on postgadolinium images were defined as intraosseous abscesses (Fig. 1).

☆ Conflict of interest: none.

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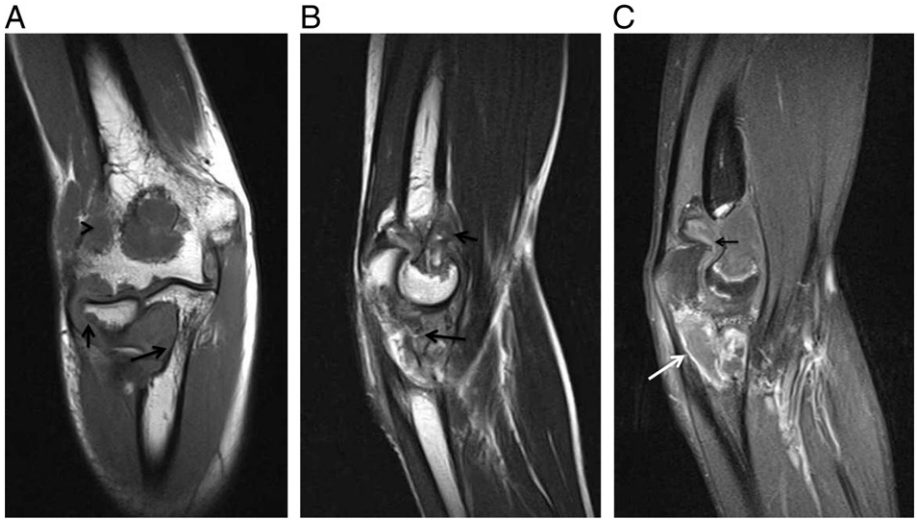

Fig. 1. Coronal T1-weighted MR image (TR/TE, 810/15) (A) shows large erosion involving radial aspect of proximal shaft of ulna (arrow) with associated marked synovial thickening (short arrow). Also note erosion on the radial aspect of the humerus (arrow head). Sagittal T2-weighted nonfat-suppressed MR image (TR/TE, 4000/85) (B) of the same patient as in (A) shows erosion of the proximal shaft of the ulna (arrow) with associated hypointense synovial thickening (short arrow). Sagittal T1-weighted gadolinium-enhanced MR image (TR/TE, 793/17) (C) shows peripheral enhancement of the intraosseous lesion in the proximal shaft of ulna (arrow) representing an intraosseous abscess. The thickened synovium shows mild ring enhancement (short arrow).

The findings evaluated in each MRI study were as follows: number and location of involved bones, articular erosions, intraosseous abscesses, synovial thickening with or without T2-weighted hypointensity on T2-weighted images (Fig. 2), joint effusion with or without T2-weighted hypointense foci, periarticular soft tissue inflammation or abscess (Fig. 3), lymph nodes around the elbow (Fig. 4), and abnormal signal intensity in the ulnar nerve. X-rays of the elbow were available in few patients. These were evaluated for radiological stage (as described by Martini et al. [10]), cystic lesions (Fig. 5), and periosteal reaction. Clinical findings viz. local swelling, sinus (Fig. 6), lymph nodes, and extraskeletal sites of tubercular involvement were recorded for all cases.

The diagnosis of tubercular arthritis was based on histopathology (aspiration or synovial biopsy) and/or clinical resolution following completion of ATT.

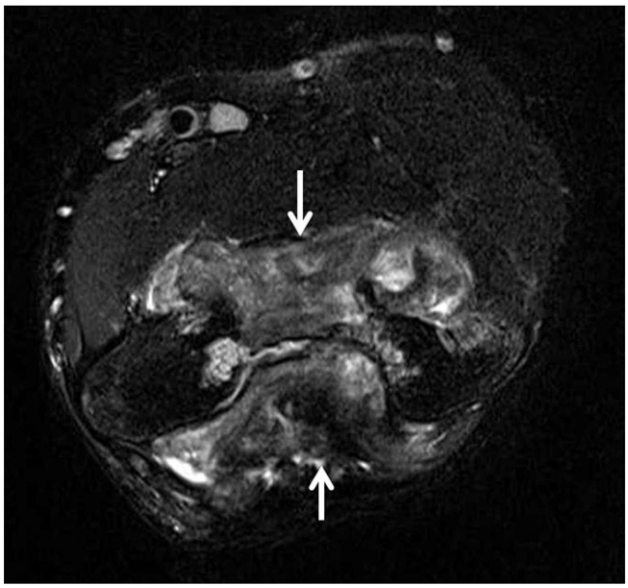

Fig. 2. Axial T2-weighted MR image (TR/TE, 4000/76) reveals extensive synovial thickening around the elbow joint with hypointense signal (arrow).

3. Results

Of the 14 patients, MRI data was available for 12 patients at the end of the evaluation. Histopathological confirmation was available for 8 cases. In the rest of the cases, diagnosis was established by clinical/imaging features and clinical resolution following ATT.

3.1. Clinical/demographic data

Mean age was 34.8 years (range, 13–60 years). There were equal number of males and females ($n=7$). Right elbow was involved in 8 patients and left elbow was involved in 6 patients. None of the patients had bilateral involvement. None of the patient had concomitant active pulmonary tuberculosis or tubercular arthritis of other joints. Pain was the most common presentation ($n=14$) followed by restricted range of motion ($n=13$) and local swelling ($n=10$). Sinuses were present in 4 patients. These were adherent to bones and not to lymph nodes suggesting their origin from the joint space. Five patients had palpable supratrochlear lymph nodes. Mean time from presentation to diagnosis was 5 months (range, 2–12 months). All patients were treated with ATT. None of the patients underwent surgery.

3.2. Imaging evaluation

X-rays of the elbow were available for evaluation in 9 (75%) patients. The most common radiological stage was stage III ($n=3$). Lytic lesions within bones were seen in 4 patients. Smooth lamellated periosteal reaction was seen in 1 patient.

All the MRI studies were diagnostically adequate. Bone involvement was seen in 9 (75%) cases. The mean number of sites involved was 2.5 (maximum, 6; range, 0–6). The most frequently affected site was the lateral epicondyle ($n=9$), followed by upper end of radius ($n=6$), medial epicondyle and upper shaft of ulna ($n=5$), and olecranon ($n=4$) (Table. 1). Extensive signal abnormality extending until the midshaft of humerus was seen in 2 patients. Erosions were noted in all the cases. Intraosseous abscesses were present in 5 (46%) cases.

Synovial thickening was noted in all patients with T2 hypointensity seen in 5 (46%) patients. The disease was restricted to synovium in 3 (25%) patients. Ten patients (83%) had joint effusion. None of the patients had hypointense foci within joint effusion on T2-weighted images Soft tissue changes inflammation was noted in all patients while soft