Various Spectrum of MRI Findings in Articular and Para-articular Tuberculosis: Pictorial Assay

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Abstract Tuberculosis continues to be a health-related issue in India. Musculoskeletal tuberculosis is noted to occur dramatically as isolates, primarily accounting for large numbers of extra-pulmonary tuberculosis since early diagnosis is always a priority; with good prognosis, it is a curable disease. Delayed treatment is associated with severe morbidity. Musculoskeletal tuberculosis accounts for a large number of extra-pulmonary tuberculosis. In this article, we describe various articular and para-articular MRI spectrum findings that are seen in patients with tuberculosis. MRI is the perfect modality to study the extent of involvement and its related complications

Keywords Magnetic resonance imaging (MRI) · Tuberculosis (TB) · Musculoskeleton (MSK) · Pott's (Koch's)

Introduction

Skeletal tuberculosis constitutes 35 % of extra-pulmonary disease, with 50–60 % of the spine affected at a time [1]. In the musculoskeletal system, 65 % of the cases show involvement of the axial skeleton, while only 35 % show involvement of the peripheral skeleton.

Musculoskeletal TB is usually hematogenous, secondary to primary focus elsewhere, and is more common in the lungs [2]. Radiological manifestations generally parallel the pathological

appearances. And hence, MRI is the ideal modality for imaging.

All Indian radiologists have come across the various typical and non-typical radiological appearances of tuberculosis as it is one of the most common infections occurring in our country. Here, in this review article, we describe varying presentations of tuberculosis of the musculoskeletal system.

Spine (Pott's Spine)

The spine is the most frequent site of tuberculosis osseous involvement, comprising about 50 % of cases in most series [3, 4]. The disease was first described by Sir Percival Pott in 1779, hence, the name Pott's disease [5].

Lower thoracic and lumbar spine is the most often affected, followed by the middle thoracic and cervical vertebrae [6]. The spread of tuberculosis to the spine is usually by hematogenous route; however, perivertebral or venus plexi is still on debate. The arterial route is generally considered more important.

The disease may originate anteriorly near the vertebral body near the anterior cortex, commonly near the endplate. Bone destruction and Gibbus short-segment kyphotic deformity are common sequelae of spine tuberculosis (Figs. 1 and 2). There are mainly four sites of infection in the vertebrae: (1) paradiscal (most common), (2) anterior, (3) subperiosteal, (4) central and appendiceal.

Joints

Classical Radiographic Findings The Phemister's triad is described on plain radiographs—(1) severe peri-articular osteoporosis, (2) peripherally located osseous erosions and (3)

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Fig. 1 T2-weighted sagittal image of the lumbar spine showing altered marrow signals involving D11–D12 vertebral bodies with intradiscal abscess formation extending into the bilateral psoas muscles and also spreading along the anterior longitudinal ligament

Fig. 2 Large pre-vertebral abscess formation with completely collapsed C3 vertebra with thin stripes on the anterior epidural collection. Axial T2-weighted image of lumbar spine reveals an extensive para-spinal soft tissue with nerve root encasement

Fig. 3 Sagittal and coronal PD images shows diffuse synovial thickening with juxtacortical erosion of the humerus head

Fig. 4 Elbow joint tuberculosis showing altered marrow signals with synovial thickening and effusion. Altered marrow changes were noted in the left inferior sacroiliac joint. Unilateral sacroiliitis is usually infectious

Fig. 5 Hip joint tuberculosis seen as an altered marrow signals and soft tissue

Fig. 6 Wrist joint MRI of two patients; the first image showed diffuse tenosynovitis of the flexor tendons while the second image showed compound palmar ganglion (bursal cyst formation with rice-bodied collection within it)

Fig. 7 Knee joint MRI showed intra-osseous abscess formation with extension into pre-patellar soft tissue region. Mild joint effusion was noted with synovial thickening

Fig. 8 Spina ventosa–fusiform swelling of the diaphysis of the short tubular bones of the hand

gradual narrowing of intraosseous space are radiographic findings of tubercular arthritis [7].

The slow insidious disease type or dry variety is known as caries sicca and is most common in the shoulder joint. MRI helps for early detection, as findings are obvious before they appear on plain radiographs. Various joints involvement is seen with radiological findings varying from bone effusion to destruction as mentioned in Figs. 3, 4, 5, 6, and 7. Joint involvements are commonly seen.

Small and Flat Bones

Tubercular bone involvement of the bone can be boldly divided into four stages: (1) pre-destructive stage, (2) necrosis

Fig. 9 Healed tubercular osteomyelitis of the iliac bone with a large organised abscess

and cavitation, (3) destruction and deformation and (4) healing and repair [7] (Figs. 8 and 9).

Periosteal reaction with reactive sclerosis is described. Large sequestration is not uncommon. Bone debris may present in fluid discharge of the sinus tracts [7].

Pott's puffy tumour is a localised soft tissue mass with osteolytic lesion in the skull. Cystic tuberculosis is common in multifocal osteolytic areas, which is common in paediatric age group.

Discussion

Tuberculosis is still widely prevalent in our country affecting all sections of the society, though it has been controlled to a great extent in the developed world. Most skeletal tuberculosis is now caused by bacilli of human types as opposed to bovine bacilli; para-osteoarticular tuberculosis is only second in frequency to tubercular infection of the spine.

As the routine mentality of all radiologist sets in, the present scenario is to think of one of the different cases they encounter in day-to-day practice. MRI detects lesions much earlier than the radiographs in the form of marrow involvement and is also

helpful to detect progression and lesion healing. It also helps on follow up assessment of complications.

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