

Lessons of the month 2: Tubercular osteomyelitis of the knee involving the growth plate in a young girl mimicking oligoarticular juvenile idiopathic arthritis

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ABSTRACT

Oligoarticular juvenile idiopathic arthritis (JIA) and tubercular arthritis in children can present in a similar way as monoarthritis. Patients with musculoskeletal tuberculosis may not have the classical constitutional symptoms. Moreover, microbiological evidence of infection may not be found in all patients. In such cases, features on imaging aid in the diagnosis. We present a case of an 8-year-old girl who had inflammation in the right knee. Investigations showed negative results for autoimmune markers. Synovial fluid examination did not reveal any evidence of tuberculosis. However, magnetic resonance imaging of the knee joint showed inflammation around the distal growth plate of the femur, away from the knee joint. The suspicion of tuberculosis was strengthened by the presence of left hilar lymphadenopathy on chest X-ray and positive result on tuberculin skin sensitivity test. The patient showed remarkable clinical and radiological recovery with anti-tubercular therapy. Peculiar features on imaging may help in differentiating infections from inflammatory arthritides, even in the absence of microbiological evidence of infection.

KEYWORDS: tuberculosis, juvenile idiopathic arthritis, MRI, epiphysis, metaphysis

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Introduction

Tuberculosis is a common cause of monoarticular arthritis in tropical countries, such as India. In children, oligoarticular juvenile idiopathic arthritis (JIA) can have a similar presentation. In the absence of constitutional symptoms, it may be difficult to distinguish tuberculosis from JIA. We present an unusual case of tuberculosis of the knee joint in an 8-year-old girl, where the diagnosis was established on the basis of imaging findings; microbiological evidence of tuberculosis was lacking.

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Case presentation

A young girl presented with pain and swelling of the right knee and intermittent fever (maximum 99.1°F (37.3°C)) for the previous 6 weeks. There was no history of weight loss or anorexia. Examination of the right knee showed tenderness and a suprapatellar effusion. All other joints and the spine were normal. Examination of the chest, abdomen, cardiovascular system, skin and eyes was unremarkable. There was no lymphadenopathy or bony tenderness.

The right knee effusion was aspirated, which showed leukocyte count 15,000/mm³ with 50% neutrophils and 50% lymphocytes. Gram stain, culture, stain for acid-fast bacilli, and culture and polymerase chain reaction for tuberculosis were negative. Blood investigations showed C-reactive protein of 28 mg/L, erythrocyte sedimentation rate of 96 mm in the first hour, haemoglobin of 125 g/L, total leukocyte count of 6.3 × 10⁹/L, platelet count of 480 × 10⁹/L, and normal peripheral smear examination. Antinuclear antibody (ANA), rheumatoid factor, anti-cyclic citrullinated peptide, human leukocyte antigen B27 and serology for brucellosis and Lyme disease were negative. Magnetic resonance imaging (MRI) of the right knee showed a suprapatellar effusion (bright signal on short tau inversion recovery sequence; Fig 1c). Hyperintense signals were noted in the distal epiphysis and metaphysis of the femur, suggestive of bone marrow oedema (BMO; Fig 1a and 1c). Interestingly, epiphyseal oedema was more intense along the growth plate than the subarticular area of the femur. In addition, there was no oedema in the subchondral area of tibia. Inflammatory arthritis typically causes predominant oedema in the subarticular area of the bones forming the joint. The features on MRI strengthened the suspicion of tuberculosis and further investigations were obtained. A chest X-ray showed left hilar prominence suggestive of lymphadenopathy (Fig 2a). Tuberculin skin sensitivity test (TSST) revealed an induration of 20×25 mm. Based on these results, the patient was started on anti-tubercular therapy with rifampicin, isoniazid, ethambutol, and pyrazinamide.

After 6 months of treatment, the patient was able to mobilise normally and no signs of inflammation were observed in the right knee joint. Repeat MRI of the right knee showed complete resolution of peri-epiphyseal bone marrow oedema and suprapatellar effusion (Fig 1b and 1d). Left hilar lymphadenopathy had also resolved (Fig 2b). Anti-tubercular therapy was continued for 18 months.



Fig 1. Magnetic resonance imaging (short-TI inversion recovery sequences) of the right knee. a) Coronal section before treatment. b) Coronal section after treatment. c) Sagittal section before treatment. d) Sagittal section after treatment. The images before treatment show hyperintensity in the distal epiphysis and metaphysis of the femur along the growth plate suggestive of bone marrow oedema (BMO; asterisks). BMO in the epiphysis is less intense in the subarticular area of the femur (white arrows) as compared with the area along the growth plate (asterisks). A suprapatellar effusion is shown (arrowhead). Hyperintensity of the peri-articular muscles (stars) is suggestive of inflammation before treatment. Complete resolution of these features is observed after 6 months of treatment.

Discussion

In the absence of trauma, JIA, infection and malignancy are the commonest causes of monoarticular arthritis in children. Monoarthritis of the knee joint is common in the oligoarticular variant of JIA. It is more frequently seen in girls and may be associated with asymptomatic uveitis and positive ANA.¹ Typical features of 'arthritis', ie inflammation of the joint, were lacking in the MRI of our patient's knee, which include synovitis, BMO of the subarticular area of bones, capsulitis etc. However, there was effusion in the suprapatellar fossa, which resulted from inflammation of the bone near the growth plate. As the disease aetiology was not present in the synovium, synovial biopsy was unlikely to reveal diagnostic information. Moreover, it is an invasive procedure.

Bacterial causes of arthritis like staphylococcal and *Brucella* arthritis cause marked systemic signs with neutrophilic

leukocytosis. Absence of these features made this possibility unlikely. Lyme disease is an important cause of monoarticular arthritis. However, it is exceedingly rare in India. There was no evidence of haematological or bony malignancy in blood examination and MRI, respectively.

Patients with musculoskeletal tuberculosis may not have the classical constitutional symptoms. Vaccination with Bacillus Calmette–Guérin can give rise to a false positive result on TSST. Therefore, additional features of active tuberculosis must be present for diagnosis. Our patient had hilar lymphadenopathy on chest X-ray, in addition to MRI findings described earlier. Demonstration of *Mycobacterium tuberculosis* in a biological specimen is the gold standard for confirmation of tuberculosis. However, obtaining microbiological evidence of the disease may not be possible in all patients. In such cases, characteristic features on imaging

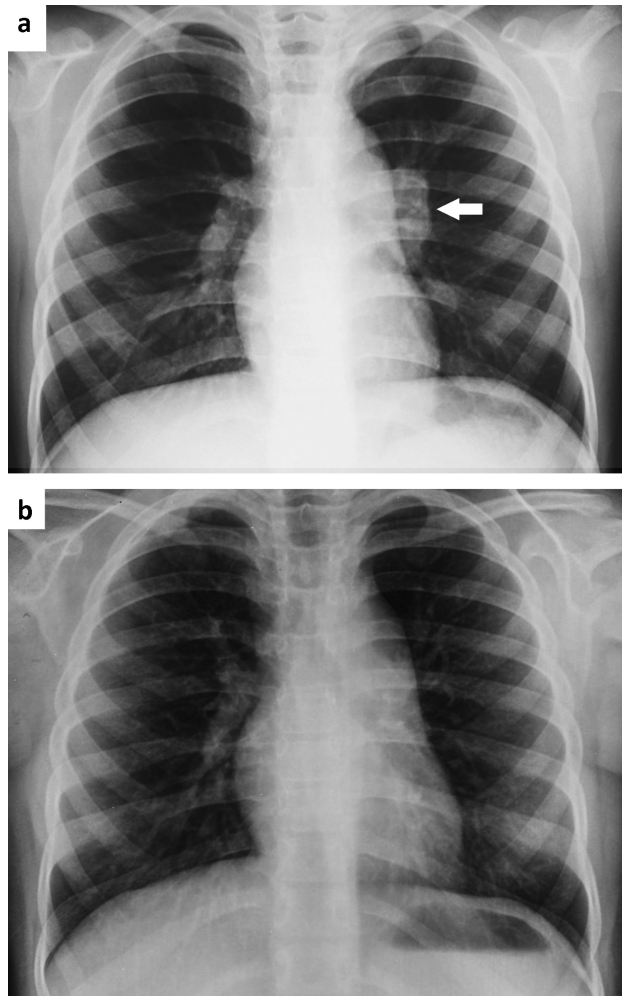


Fig 2. Chest X-ray. a) At presentation showing left hilar lymphadenopathy (arrow). b) Following resolution of left hilar prominence after 6 months of treatment.

and indirect evidence of the disease obtained from other investigations aid in the diagnosis.

The metaphysis is a favourable site for seeding of haematogenously spreading organisms. This is because of rich vascularity and reduced speed of blood flow in this area due to the presence of u-shaped vessels.² The growth plate acts as a mechanical barrier between metaphysis and epiphysis for the spread of infection. However, aggressive organisms like mycobacteria and fungi can cross the growth plate resulting in concomitant epiphysitis.³

Our patient had monoarticular effusion of the knee. Synovial fluid aspiration did not reveal evidence of tuberculosis. Oligoarticular JIA was the closest differential diagnosis. MRI of the knee joint showed BMO along the epiphyseal growth plate with relative sparing of the subarticular area. Significant inflammation of the peri-articular muscles was also observed (Fig 1a and 1c). These features are atypical for an inflammatory arthritis. Infection is more likely when the BMO extends beyond the anatomical boundaries of a joint.^{4,5} Based on imaging features (MRI of the knee and hilar lymphadenopathy on chest X-ray), a positive TSST and negative results for inflammatory arthritis, the patient was diagnosed with tubercular osteomyelitis of the distal epiphysis and metaphysis of femur and treated accordingly. To our knowledge, such a remarkable recovery of tubercular epiphysitis without surgical intervention has not been reported previously.

The aim of this report is to increase awareness among clinicians about the imaging features that may help in differentiating infections from inflammatory arthritides. Avoiding invasive investigations such as arthroscopy and synovial biopsy may be possible in certain patients. Surgical curettage and diagnostic biopsy of the tissue around the growth plate in children may result in injury leading to shortening of the limb.⁶ Moreover, the diagnostic dilemma regarding the possibility of tuberculosis may persist even after histopathological examination of tissue. ■

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