Case Report

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# Isolated Primary Tuberculous Osteomyelitis of the Distal Tibia in Early Childhood: A Case Report

Orthopaedics Section

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## ABSTRACT

Tuberculous osteomyelitis is an uncommon manifestation of extrapulmonary tuberculosis, accounting for 1-3% of all tuberculosis cases and 10-15% of musculoskeletal tuberculosis. Isolated involvement of the distal tibia in early childhood is rare and often mimics other chronic infective or neoplastic bone conditions, making diagnosis challenging. A two-year-old female child presented with a six-week history of swelling and dull, progressive pain over the distal left leg. Radiography and Magnetic Resonance Imaging (MRI) revealed a well-defined lytic lesion in the metaphyseal-diaphyseal region of the distal tibia suggestive of osteomyelitis. Surgical decompression and curettage were performed and histopathological examination showed epithelioid granulomas, Langhans-type giant cells and caseous necrosis, confirming tuberculous osteomyelitis. The patient was treated with a fixed-dose anti-tubercular drug regimen- two months of intensive phase followed by 12 months of continuation phase. Follow-up radiographs at four weeks and 12 months demonstrated progressive cavity healing and cortical remodelling, with the patient achieving full, pain-free mobility. Early diagnosis and prompt management of tuberculous osteomyelitis are crucial to prevent deformity and growth disturbances. Combined surgical curettage and Anti-Tubercular Therapy (ATT) provide excellent outcomes, as demonstrated in this rare case of distal tibial involvement in a young child.

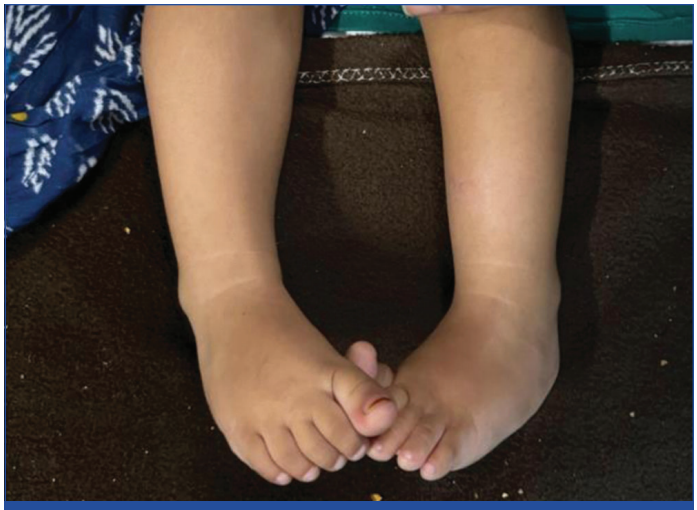
**Keywords:** Anti-tubercular therapy, Neoplastic bone disorders, Paediatric tuberculosis, Surgical curettage

## CASE REPORT

A two-year-old female child was brought to the Outpatient Department by her parents with complaints of swelling, pain and discomfort over the left distal leg, persisting for the past six weeks. The pain was described as insidious in onset, dull in nature, of moderate intensity and gradually progressive. It showed partial relief with medication (oral paracetamol (acetaminophen-SOS). There was no history of trauma, fever, weight loss, or constitutional symptoms.

### Clinical Examination

On inspection, a diffuse swelling of size 4×5 cm was noted over the distal third of the left leg. The overlying skin was normal [Table/Fig-1]. There was no limb length discrepancy. On palpation, tenderness was present over the distal tibia and thickening was appreciated on anteromedial aspect of lower third left tibia. The distal neurovascular status was preserved, with palpable Dorsalis Pedis Artery (DPA) and Posterior Tibial Artery (PTA). Active toe movements and distal sensations were intact with no signs of neurovascular compromise.



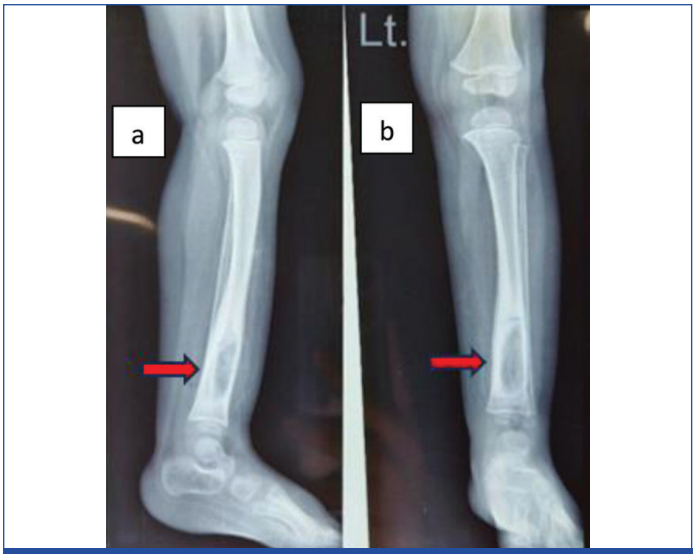
**[Table/Fig-1]:** Clinical image showing a diffuse, well-defined swelling measuring approximately 4×5 cm over the distal third of the left leg.

**Investigations:** An anteroposterior and lateral X-ray of the left leg revealed a well-defined lytic lesion involving the metaphyseal-diaphyseal region of the distal tibia. There was thickening of posteromedial cortex of tibia in lower third shaft [Table/Fig-2a,b].

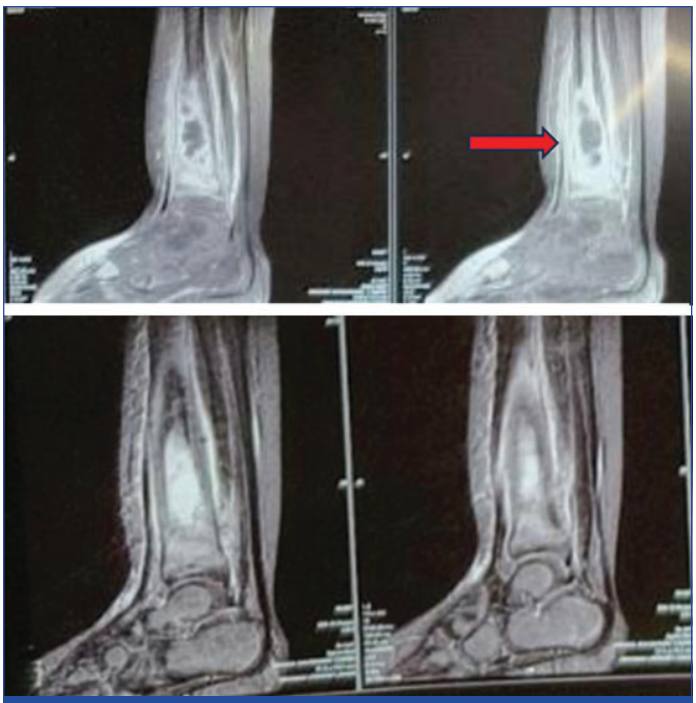
To further delineate the extent and nature of the lesion, an MRI contrast was performed, which demonstrated a 1.4×1.2×3.6 cm lytic area in the metadiaphyseal region of the lower tibia. Multiple small lytic foci were noted along the anterolateral cortex, with a mild periosteal reaction and perilesional oedema. The lesion was hyperintense on Proton Density (PD) fat-saturated sequences, hypointense on T1 and exhibited mild peripheral post-contrast enhancement. Notably, the lesion did not involve the physis [Table/Fig-3]. The radiological findings were suggestive of an infective aetiology, likely osteomyelitis.

Given the unique appearance and lack of pulmonary symptoms, a high level of suspicion for Tuberculosis (TB) was maintained. Microbiological and molecular examinations were conducted on tissue samples collected during surgical debridement. Ziehl-Neelsen staining for Acid-Fast Bacilli (AFB) was conducted on the tissue material; while this test has limited sensitivity in paucibacillary paediatric cases, it is nevertheless effective for rapid preliminary identification. The Cartridge-Based Nucleic Acid Amplification Test {CBNAAT/GeneXpert Mycobacterium tuberculosis (MTB)/Rifampicin (RIF)}. was performed on debrided tissue, detecting mycobacterium TB Deoxyribonucleic Acid (DNA) while also identifying rifampicin resistance, allowing for quick and highly precise tuberculosis diagnosis. Samples were submitted for mycobacterial culture on Lowenstein-Jensen (LJ) medium, which, despite the longer turnaround time, is still the gold standard for conclusive diagnosis and drug susceptibility testing. CBNAAT positive, together with supporting histological and culture results, established the diagnosis of isolated primary tuberculous osteomyelitis of the distal tibia.

Laboratory investigations revealed an elevated White Blood Cell count (WBC) with elevated Erythrocyte Sedimentation Rate (ESR)




**[Table/Fig-2]:** Anteroposterior and lateral radiographs of the left leg: b) The anteroposterior radiograph demonstrates a well-defined, eccentric radiolucent lesion in the distal tibial metaphysis with cortical thinning, intact joint surfaces and no deformity, suggestive of a chronic osteolytic process such as tuberculous osteomyelitis; a) The lateral radiograph shows a well-defined oval lytic lesion in the distal tibial metaphysis with cortical thinning and mild expansion, preserved ankle joint and no periosteal reaction or fracture, consistent with a chronic indolent pathology.



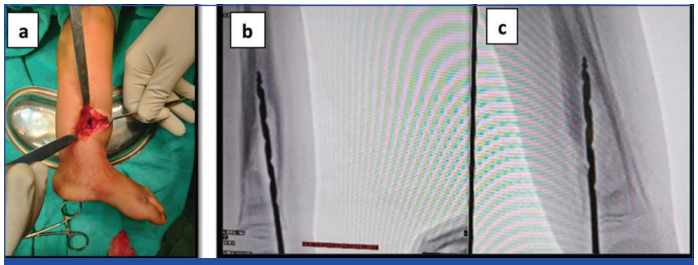
**[Table/Fig-3]:** Lateral and anteroposterior radiographs of the left leg: a) The lateral radiograph shows a well-defined oval lytic lesion in the distal tibial metaphysis with cortical thinning and mild expansion, preserved ankle joint, and no periosteal reaction or fracture, consistent with a chronic indolent pathology; b) The anteroposterior radiograph demonstrates a well-defined, eccentric radiolucent lesion in the distal tibial metaphysis with cortical thinning, intact joint surfaces, and no deformity, suggestive of a chronic osteolytic process such as tuberculous osteomyelitis.

at 45 mm/hour (Normal range is 0-10 mm/hour in children) and C-Reactive Protein (CRP) at 20 mg/L (<5 mg/L), further supporting the presence of an inflammatory or infective process.

## Surgical Management

In view of the infective pathology the patient was planned for surgical debridement in the form of decompression and curettage of the distal tibia. Under general anaesthesia, with the patient in the supine position and a tourniquet applied, a longitudinal incision was made over the anteromedial aspect of the distal tibia. The subcutaneous tissues and fascia were dissected to expose the lesion, followed by periosteal elevation.

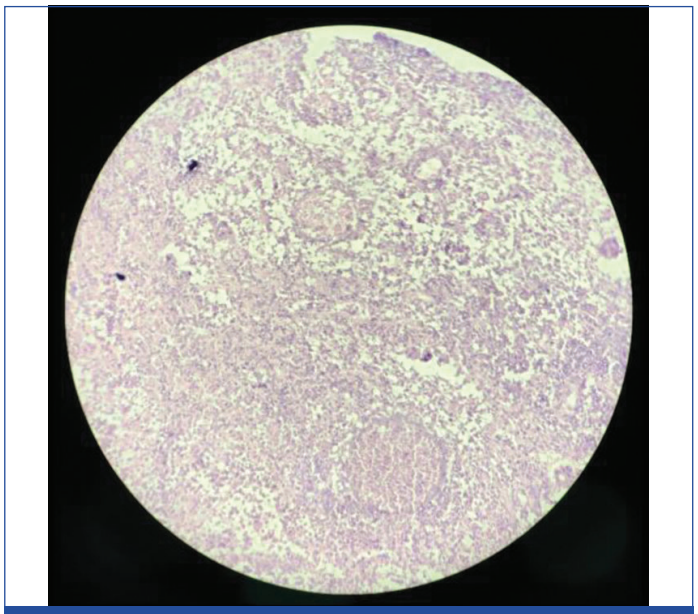
A cortical window was created by deroofing the outer cortical bone using an osteotome and burr, avoiding involvement of the growth plate. Upon accessing the lesion, thorough curettage was performed. Necrotic, caseous and granulation tissue was meticulously removed until healthy, bleeding bone margins were achieved. The cavity was irrigated copiously with normal saline. No bone grafting was done. The wound was closed in layers and a below-knee slab was applied for postoperative immobilisation [Table/Fig-4a-c].




**[Table/Fig-4]:** Intraoperative images: a) Decompression and curettage of the lytic lesion involving the distal tibia of the left leg under c arm guidance. The necrotic and caseous material was meticulously removed until healthy, bleeding bone margins were achieved; b,c) This radiographic image shows contrast outlining a linear tract within the distal tibia on two views, consistent with a sinus tract communicating with an intramedullary cavity, a feature commonly seen in chronic osteomyelitis such as tuberculous osteomyelitis.

## Histopathology and Diagnosis

Tissue samples sent for histopathological analysis revealed epithelioid granulomas, chronic inflammatory cells, Langhans-type giant cells, fibrosis, trabeculae of dead bone and microabscesses, consistent with the diagnosis of tuberculous osteomyelitis [Table/Fig-5].



**[Table/Fig-5]:** Histopathological section showing epithelioid granulomas composed of chronic inflammatory cells and Langhans-type giant cells, with areas of fibrosis and microabscess formation, findings consistent with tuberculous osteomyelitis (H&E, 10x).

## Postoperative Course and Follow-up

Postoperatively, the patient was kept non weight bearing and mobilised with slab support six weeks. A standard ATT regimen was initiated as per national guidelines with two months of initiation phase followed by 12 months of continuation phase [Table/Fig-6] [1].

Serial monitoring of ESR and CRP levels demonstrated a progressive decline, indicating clinical and biochemical resolution of infection [Table/Fig-7].

At the 4-week [Table/Fig-8a,b] and 8-week follow-up, the patient showed significant clinical improvement.

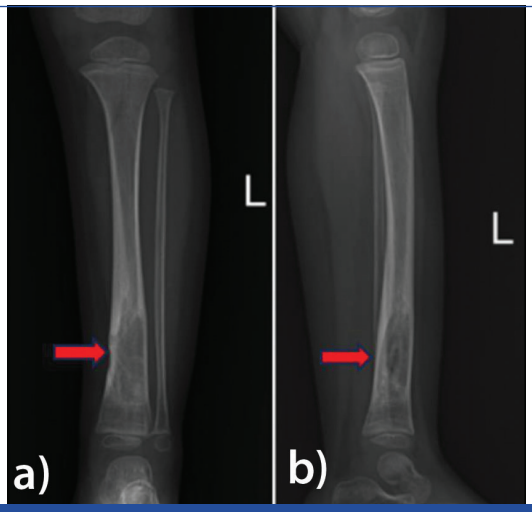
Radiographs at 12 months follow-up demonstrating progressive filling of the bone cavity and signs of healing. The patient had no residual pain or swelling and had regained full functional mobility, with no limb length discrepancy or deformity. The patient demonstrates full weight-bearing and normal walking pattern, indicating complete functional recovery [Table/Fig-9,10].

| Patient weight: 10.5 kg | HRZ (50/75/150 mg) | E (100 mg) |
|---|---|---|
| Intensive phase (2 months) | 2 tablets | 2 tablets |
| | HR (50/75 mg) | E (100 mg) |
| Continuation phase (12 months) | 2 tablets | 2 tablets |

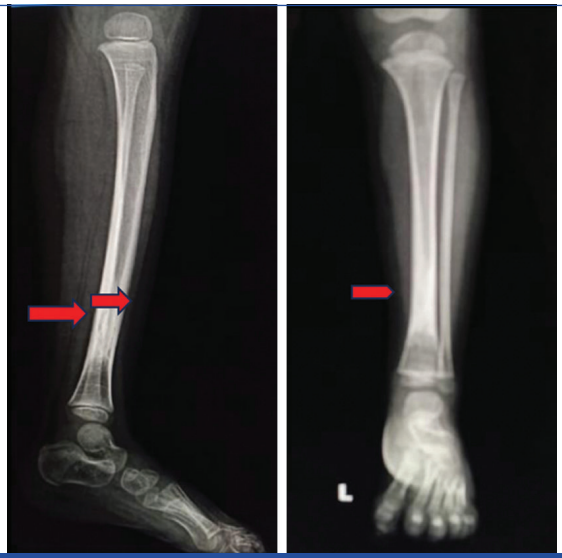
**[Table/Fig-6]:** Anti-tubercular Therapy (ATT) (Fixed Dose Combination (FDC) Regimen). Standard anti-tubercular regimen as per national tuberculosis guidelines. A Fixed Dose Combination (FDC) protocol was followed based on the child's body weight (10.5 kg). The intensive phase comprised two months of HRZE, followed by a 12-month continuation phase with Haematoxylin and Eosin (H&E) staining under low magnification (10x). Treatment adherence was ensured through regular followups and the patient tolerated therapy well without adverse effects [1].
H: Isoniazid R: Rifampicin Z: Pyrazinamide E: Ethambutol (HRZE)

| Variables | WBC (cells/mm³) | ESR (mm/hr) | CRP (mg/L) |
|---|---|---|---|
| Normal range | 4,000-11,000 | 0-10 | <5 |
| Pre-operative | 19100 | 45 | 20 |
| Postoperative (12 month follow-up) | 9200 | 21 | 14 |

**[Table/Fig-7]:** Postoperative laboratory parameters. postoperative follow-up at 12 months showed a progressive decline in WBC count, ESR and CRP levels, indicating satisfactory control of infection and good clinical recovery.



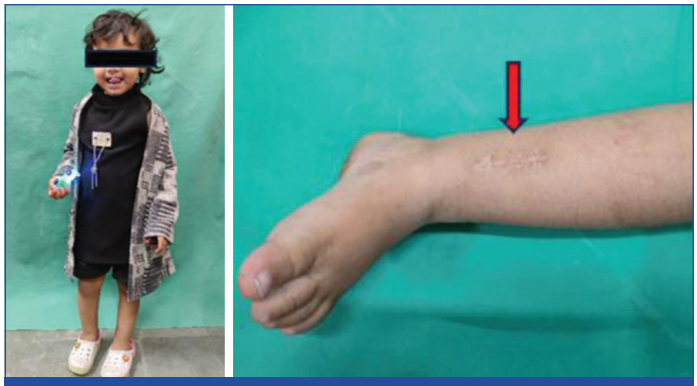

**[Table/Fig-8]:** a) Postoperative anteroposterior and b) Lateral radiographs of the left leg at four weeks follow-up showing progressive healing of the distal tibial lytic lesion (red arrow).




**[Table/Fig-9]:** Postoperative a) Lateral and b) Anteroposterior radiographs of the left leg at 12-month follow-up showing complete healing and remodelling of the distal tibial lesion with restoration of cortical continuity and no evidence of recurrence (Red arrow).

## DISCUSSION

A two-year-old female child presented with a painful swelling over the distal leg and initial radiographic evaluation demonstrated a well-defined lytic lesion involving the distal metaphyseal-diaphyseal region of the tibia. Subsequent MRI findings favoured an infective pathology, prompting surgical exploration and biopsy. Histopathological examination confirmed the diagnosis of tuberculous osteomyelitis.



**[Table/Fig-10]:** a) The patient demonstrates full weight-bearing and normal walking pattern, indicating complete functional recovery. b) Clinical image at 12-month follow-up showing a well-healed surgical scar (red arrow) over the distal left leg with no residual swelling, deformity, or limb length discrepancy.

Tuberculous osteomyelitis is an uncommon manifestation of extrapulmonary tuberculosis, accounting for approximately 1-3% of all tuberculosis cases and about 10-15% of musculoskeletal tuberculosis [2,3]. In children, skeletal tuberculosis typically affects the spine and large joints, while isolated involvement of the long bones, particularly in the diaphyseal or metaphyseal region, is relatively rare and diagnostically challenging [3-5]. Its presentation can mimic other subacute or chronic bone infections such as Brodie's abscess, osteoid osteoma, or neoplastic lesions, further complicating early diagnosis and management [6-8].

The metaphyseal-diaphyseal region of the tibia is an unusual location for tuberculous involvement, especially in very young children, where the diagnosis may be delayed due to the non specific nature of symptoms like localised pain swelling [4,6,7]. Radiological imaging often reveals lytic lesions; however, definitive diagnosis relies on histopathological confirmation and microbiological studies [7,8]. MRI can be instrumental in suggesting infective aetiology but may not differentiate tuberculous from pyogenic osteomyelitis [8].

Although skeletal tuberculosis is considered relatively uncommon in early childhood and isolated involvement of the distal tibia is rare in reported literature, such presentations are not infrequent in developing countries where tuberculosis remains endemic [9]. The diagnostic challenge in this case stemmed from its insidious onset, non specific clinical features and radiological resemblance to other chronic osteolytic conditions, which often leads to delayed diagnosis [10]. This case highlights the importance of maintaining a high-index of suspicion for tuberculosis in paediatric patients presenting with chronic bone lesions, especially in resource-limited settings and underscores the need for comprehensive clinical, radiological and histopathological correlation to ensure timely diagnosis and appropriate management.

In the paediatric population, skeletal tuberculosis more commonly affects the spine and weight-bearing joints such as the hips and knees, with isolated long bone involvement-particularly in the diaphyseal or metaphyseal region-being exceptionally rare [2,5,7].

The present case highlights a unique presentation of tuberculous osteomyelitis affecting the metaphyseal-diaphyseal region of the distal tibia in a two-year-old child, a location and age group where this diagnosis is seldom encountered. Such presentations pose significant diagnostic challenges due to their non specific symptoms which included insidious onset pain and swelling and their radiological resemblance to other lytic lesions seen in this age group, such as Brodie's abscess, acute pyogenic osteomyelitis, fibrous dysplasia, eosinophilic granuloma, or early neoplastic conditions [6-8,11].

The diagnosis in this case was suggested by radiography and MRI and confirmed by histopathological examination. MRI can reliably identify features of osteomyelitis such as marrow oedema, periosteal reaction and soft tissue changes, it often cannot differentiate between pyogenic and tuberculous aetiologies [11,12]. Therefore, histopathological examination remains the gold standard, as was evident in the present case, where epithelioid granulomas, Langhans-type giant cells and caseous necrosis confirmed the diagnosis of tuberculous osteomyelitis [13].

The surgical approach involving decompression and curettage is a widely accepted method for managing localised bone tuberculosis. It allows for complete removal of necrotic material and debridement of lytic area reducing the bacillary load and provides tissue for definitive diagnosis. Importantly, in children, the physis must be preserved to avoid potential growth disturbances, which was carefully considered and achieved in this case [3,12].

Several studies support the effectiveness of curettage without bone grafting in early, localised lesions, especially when followed by appropriate ATT. Olasinde AA et al., demonstrated that curettage and ATT can lead to excellent outcomes even in complex cases of Brodie's abscess [14]. Similarly, Vohra R et al., and Jain AK et al., emphasised that early surgical intervention combined with prolonged ATT results in high rates of infection control and functional recovery [3,13].

The radiological outcomes following curettage are generally favourable. As seen in this case, serial imaging over eight weeks demonstrated progressive cavity filling with reactive bone, suggesting satisfactory osseous remodelling. In paediatric patients, this bone regeneration is often more robust due to active remodelling potential [9,15].

Functional outcomes are also excellent if the lesion is confined and appropriately treated. Studies report minimal long-term complications such as joint stiffness or limb length discrepancy when the physis and adjacent joint are preserved [12,16]. In the present case, the child achieved full functional recovery, with no residual pain, deformity, or limb length discrepancy, and resumed normal activities. However, delayed diagnosis or incomplete debridement may lead to chronic infection, recurrence, or growth disturbances. Hence, close clinical and radiographic follow-up is essential.

## CONCLUSION(S)

Tuberculous osteomyelitis involving the distal tibia in a paediatric patient represents a diagnostically challenging manifestation of musculoskeletal tuberculosis. This case illustrates the critical importance of considering tubercular aetiology in the differential diagnosis of lytic lesions in young children, particularly in endemic regions, where early-stage presentation may mimic pyogenic infections or neoplastic processes. Advanced imaging modalities and histopathological evaluation aided in establishing a definitive diagnosis.

Surgical intervention and anti-tubercular chemotherapy resulted in favourable radiological and functional outcomes.

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