

Tuberculosis of the foot: An osteolytic variety

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ABSTRACT

Background: Foot involvement in osteoarticular tuberculosis is uncommon and isolated bony involvement of foot bones with an osteolytic defect is even more rare; diagnostic and therapeutic delays can occur, worsening the prognosis. We present a retrospective series of osteolytic variety of foot tuberculosis.

Materials and Methods: We present 24 osteolytic variety of foot tuberculosis (Eleven calcaneus, four cuboid, two cunieforms, one talus, three metatarsals, three phalanges) out of 92 foot TB cases collected over last 20 years. There were 16 adults and eight children. Tissue diagnosis was established in 23 of 24 cases based on PCR AFB staining, culture, and histopathology. Surgical intervention was reserved for patients with either a juxtaarticular focus threatening to involve a joint or an impending collapse of a midfoot bone with cystic destruction.

Results: Fifteen cases had an osteolytic lesion on the radiographs resembling a space-occupying lesion, five had patchy osteolysis, while four showed coke like sequestra; one patient had a lesion in two bones. Antitubercular chemotherapy after biopsy was sufficient to heal the lesion in 19 cases, while in five cases surgical debridement needed to be done. The lesions healed eventually. At an average followup of 8.3 years, (range 2-15 years) there were no recurrences and all patients were free from pain, with no restriction of movements. Six patients complained of occasional pain during walking on uneven ground.

Conclusion: When tuberculous pathology is limited to the bone, the prognosis is better than in articular disease, as there is less deformity, and hence, less residual pain and disability.

Key words: Calcaneus, foot, infection, osteolytic, tuberculosis

INTRODUCTION

Osteoarticular tuberculosis has remained a diagnostic enigma particularly when the disease affects unusual sites.¹⁻⁵ The morbidity and prognosis are thus significantly worsened due to the tendency of TB to mimic other known diseases, leading to diagnostic and therapeutic delays, resulting in inferior functional outcomes.^{1,3,4}

Osteoarticular tuberculosis makes up <3% of the cases of extra-pulmonary tuberculosis, of which about 10% involve the foot and ankle region.^{1,6-13} Foot TB may become

significantly debilitating if left untreated, and diagnostic delays have the potential to convert a purely osseous lesion into one involving a joint, with more local destruction and functional disability.⁴

Early diagnosis and subsequent institution of chemotherapy is dependent upon multiple factors; the awareness in the mind of the treating physician is important, and the representative clinical and radiological features make this easier to achieve. Moreover, the added specific tests for TB contribute to confirmation of the diagnosis.¹⁻⁴ However, many cases of foot TB do not have classical presentation.⁴ If radiological presentations are atypical, the diagnostic dilemma worsens, especially in a low incidence site like the foot.^{2,4} Some typical radiological features have been described; Mittal *et al.*,⁷ classified tuberculosis of foot into five radiological types: cystic, rheumatoid, subperiosteal, kissing, and spina ventosa. Of these the cystic variety is relatively uncommon; these may be purely intraosseous lesions with or without the soft tissue component, and as they have not yet invaded the adjacent joints, the prognosis after early initiation of therapy at this stage is good. Ironically these are the very lesions that are often diagnosed late, as other more common disease pathologies are thought of first. We present our long experience of treating osteolytic variety of foot TB.¹⁻⁴

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MATERIALS AND METHODS

Between 1989-2010, we treated 92 cases of proven foot TB, 24 of which presented as osteolytic bony lesions. Osteolytic lesions were seen in 16 adults and eight children, with a mean age of 27 years (range, six months to fifty-nine years). All relevant investigations, including sputum, urine examination, chest radiographs, and the Mantoux test were obtained. Hematological investigations included hemoglobin, erythrocyte sedimentation rate (ESR), and total and differential leukocyte counts. Enzyme-linked Immunosorbent assay (ELISA) for tuberculosis was done in 16 cases and polymerase chain reaction (PCR) was conducted on seven patients. Radiological evaluation included anteroposterior, lateral, and oblique radiographs, and additional magnetic resonance imaging (MRI)/computed tomography (CT) scans were obtained in 16 cases. All cases were subjected to either aspiration or needle biopsy (material was taken from surgical curettings when operated), and granulomatous tissue with or without a typical tubercle and caseating necrosis was considered diagnostic of tuberculosis. An attempt was also made to obtain cultures of the organisms.

All the patients began multi drug antitubercular therapy (ATT) on confirmation of the diagnosis; the ATT regimen in the initial 17 patients consisted of an initial intensive phase (three to four drugs given for three to four months), followed by two drugs (Isoniazid and Rifampicin) for the maintenance phase (given for 12–14 months).¹⁻³ In the later seven patients, ATT consisted of three phases: Intensive (four drugs), continuation (three drugs) and maintenance phase (two drugs), for a total of 12 months. The drugs used were: isoniazid (300–450 mg/day for adults; 10 mg/kg/day for children); rifampicin (450–600 mg/day for adults; 10 mg/kg/day for children); ethambutol (15–25 mg/kg/day for adults and children); and pyrazinamide (20–25 mg/kg per day). Surgical intervention was reserved for patients with either a juxtaarticular focus threatening to involve a joint or for an impending collapse of a midfoot bone with cystic destruction. The aim of all the treatment was to control disease activity and obtain a supple, painless, weight-bearing foot. The disease was considered to be healed when the local or systemic symptoms disappeared, along with radiological evidence of remineralization, obliteration of cavities, decrease in regional osteoporosis, and restoration of the trabeculae.¹

RESULTS

Fifteen males and nine females with a mean age of 27 years at presentation (range, six months to fifty-nine years) and an average followup of 8.3 years (range 2–15 years), were

included in this retrospective study. All the patients presented with persistent pain with or without mild swelling for an average of five months. Eight patients had been referred after being misdiagnosed and mistreated elsewhere, while the others were primarily seen at our institute [Table 1].

Only two patients had constitutional symptoms attributable to tuberculosis. Investigations revealed elevated ESR in all patients (25–90 mm/1st hr; most cases between 35 and 50 mm/1st hr), and positive Mantoux test in 21. ELISA was positive in nine of the 16 patients; PCR was done only in seven cases encountered after the year 2000, and was positive in six of the seven aspirates [Table 2]. Twenty-three patients were diagnosed on the basis of histopathology (n=23), ELISA (n = 9), PCR (n=6) or culture (n=2), while one patient did not reveal any positive finding in any of the mentioned tests and was given a therapeutic trial of antitubercular chemotherapy, to which he responded favorably within nine weeks. All cases were subjected to aspiration or needle biopsy, to obtain tissue diagnosis, except two instances, where operative treatment was undertaken, primarily due to the impending joint involvement and collapse of the bone. Open biopsy and curettage was generally reserved for cases returning with a negative result on aspiration or needle biopsy. The radiographs of the foot [Figures 1–6] revealed an osteolytic lesion resembling a space-occupying lesion in 15 patients, patchy osteolysis in five patients, and, flaky sequestra in four patients [Figure 2]; one patient had a lesion in two bones of foot [Figure 6]. Two patients had evidence of healed pulmonary tuberculosis and none had any evidence of active disease anywhere in the body. The most common bone involved was the calcaneus (11) followed by cuboid (four), metatarsals (three), phalanges (three), cuneiforms (two), and talus (one) [Table 1].

Table 1: Radiological distribution of lesion

Bone involved	Pure osteolysis	Patchy osteolysis	Flaky sequestra	Total
Calcaneus	7	2	2	11
Cuboid	2	1	1	4
Metatarsals	2	-	1	3
Phalanges	3	-	-	3
Cunieform	1	1	-	2
Talus	-	1	-	1

Table 2: Diagnostic tests

Diagnostic test	Positive	Negative
Mantoux test	21	-
ELISA	9	7
PCR	6	1
ZN staining	8	16
FNAC	17	5
Open biopsy	6	1
Culture	2	22

ELISA: Enzyme-linked Immunosorbent assay, PCR: Polymerase chain reaction, ZN: Zeil Nelson, FNAC: Fine needle aspiration cytology



Figure 1: (a) Plain X-ray (axial view) of the calcaneus showing a well defined osteolytic lesion, (b) Sagittal T2WI showing fluid and tissue inside the cavity, (c) T1WI of a 23-year-old male, showing hypointense destructive lesion of calcaneus, (d) T2WI of same patient showing a hyperintense cavitory lesion



Figure 3: X-ray of foot (oblique view) showing irregular osteolytic lesions of the lateral cuneiform threatening to invade the joint

Favorable response to antitubercular chemotherapy, defined as resolution or significant decrease of local symptoms of pain and swelling within four to six weeks of starting chemotherapy, was observed in all patients treated nonoperatively.⁷ Five cases underwent open biopsy and surgical debridement in order to obtain definitive tissue diagnosis. All five cases ultimately healed after chemotherapy. One patient with impending cuboid collapse [Figure 4] had curettage and fixation with an external fixator in distraction mode, until there was some evidence of remineralization; this was published elsewhere.² One patient with involvement of the calcaneus close to the posterior facet of the subtalar



Figure 2: (a) Lateral view ankle joint showing two osteolytic lesions in the calcaneus, with the proximal one threatening to invade the subtalar joint, (b) CT scan showing an osteolytic lesion with coke like sequestra, (c) Same case after seven months of ATT showing healing of lesions and no joint invasion (d) Radiograph at the conclusion of chemotherapy



Figure 4: X-ray of foot and ankle (oblique view) showing a well-defined osteolytic lesion of the cuboid, with peripheral sclerosis

joint underwent surgical debridement due to the imminent danger of joint involvement [Figure 2]. The lesions healed without joint involvement. Immobilization in a plaster cast was used only for noncompliant cases that could not follow a non-weight-bearing regimen (five children; one adult).

Serial resorption of sequestra was seen on radiographs with chemotherapy alone. At an average followup of 8.3 years (range 2-15 years), none of the patients had rest pain during walking on level ground, although six patients complained of occasional discomfort or mild pain when walking on uneven ground. No significant restriction of motion was seen in these cases with purely osteolytic lesions. None of our patients have shown signs of recurrence so far.



Figure 5: X-ray of fore foot (oblique view) showing osteolytic destructive lesion of the neck and distal fifth metatarsal



Figure 6: X-ray (L) foot anteroposterior view showing expansile lesions of the second and fifth metatarsals, so called 'spina ventosa'

DISCUSSION

Tuberculosis in the foot occurs in one of the four basic forms.^{1,3,5} The most common presentation is as a periarticular granuloma, which if not treated, eventually spreads to the adjacent joint.¹⁻³ This can significantly worsen the prognosis. The second type of presentation is that of a central granuloma, more commonly encountered in the phalanges or the metatarsals of children, and seen relatively infrequently.^{1,3,5} The two other types of tubercular infection in the foot are primary hematogenous synovitis in isolation, and tenosynovitis or bursal tuberculosis. When tuberculous pathology is limited to the bone the diagnostic enigmas arise, as this type of presentation is uncommon.^{3,4} Delays often lead to the inevitable progression of disease, with the adjacent joint being the first victim, and motion loss and deformity in the weight-bearing portions of the foot being the outcome.^{3,4}

The most common bone involved in the present series was the calcaneus, as has been noted in similar reports focused on the foot.^{1,7} The possible reasons for this could range from calcaneus being the largest bone (making it possible to detect lesions still limited to it, in contrast to smaller bones where articular penetration into the joints is early), to its increased vulnerability to direct trauma. The tuberosity of the calcaneus is most commonly involved in isolated osteomyelitis,³ and since it is far away from the articular surfaces, it is perhaps often picked up prior to joint involvement.

Our experience with the incidence of sequestrum has been a little different from that reported by Mittal *et al.*,⁷ who observed lack of sequestrum in the cystic lesions of the calcaneus. They however noted sequestrate in the smaller bones like the cuboid. We found that coke like sequestrates were of no consequence and got resorbed over time, with adequate ATT.

Mittal *et al.*,⁷ described five radiographic types with the cystic variety being most common (15 of 44 cases). In contrast to that, our experience revealed isolated cystic involvement of bone in 24 / 92 cases, with many more showing articular involvement at presentation; this was perhaps a later stage in the same pathological process, and could be a reflection of the delayed diagnosis that was the norm in our series. In many cases, the suspicion of bone tumor was entertained by the treating physician and the biopsy was done keeping that in mind; the true nature of the lesion was revealed only after tissue biopsy showed features suggestive of tuberculosis. As shown in our data, some form of tissue sampling was mandatory for all suspicious osteolytic lesions of the foot even in endemic regions [Table 2], as it could establish the diagnosis with relative certainty. This became doubly important when the radiographic presentation of the disease was that of a destructive lesion limited to the bone, and when the disease-affected population groups were routinely not affected by the disease.

In spite of a high index of suspicion for tuberculous infection, bony involvement in isolation can lead to some confusion, and diagnostic delays are common.⁴ The possible contributing factors include lack of constitutional symptoms so often related to osteoarticular tuberculosis elsewhere,^{3,4} confusion of radiographic features with bone tumors,^{1,2,4} and a relatively normal picture on laboratory investigations (including, at times, histopathology). Diagnosis of osteoarticular tuberculosis is often based on more than one test [Table 2]. Being a paucibacillary infection, culture from the infected tissue is seldom positive and the other ancillary evidence of infection then becomes important.^{4,7} Despite persistent efforts, a single diagnostic test for osteoarticular tuberculosis with high sensitivity and specificity has remained elusive, and chemotherapy is often instituted on clinical suspicion in endemic areas.⁷ Nevertheless, a full battery of diagnostic tests must be exhausted before adopting such an approach,

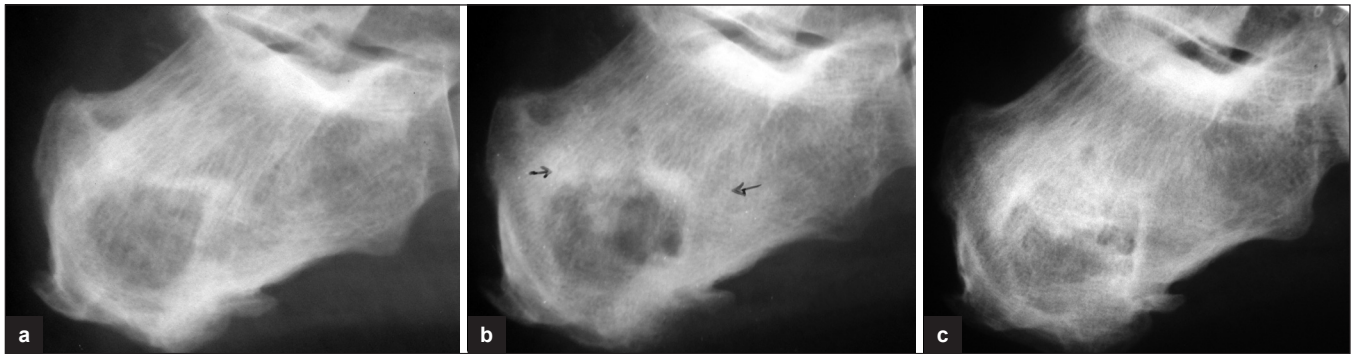


Figure 7: X-ray of calcaneum/ankle (lateral view) showing (a) Pre-treatment radiograph of a 47-year-old male, (b) Radiograph at conclusion of chemotherapy, (c) Persistence of cavities after a followup of nine years

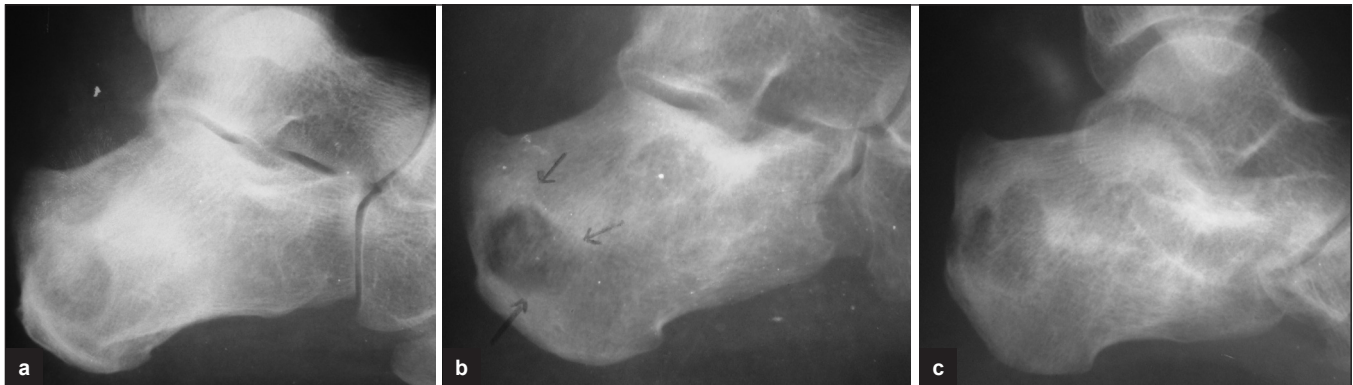


Figure 8: X-ray of calcaneum/ankle (lateral view) showing (a) Pre-treatment radiograph of a 32-year-old female, (b) Radiographs at conclusion of chemotherapy, (c) Persistence of cavities at the final followup of six years

especially in cases presenting at atypical locations, with unusual presentation, as is the case with osteolytic lesions in the foot.^{1,2,4} Adopting this principle we were able to find evidence supporting tuberculosis of foot in 23 of 24 cases.

The outlook of patients suffering from tuberculosis has improved dramatically after the introduction of modern multi drug chemotherapy; however, the best regime for osteoarticular disease still remains a matter of debate.¹⁴ We recommend a minimum of 12 months of chemotherapy due to the higher incidence of recurrences with shorter courses.¹⁵ This prolonged treatment in osteoarticular tuberculosis is justified by the fact that it is a paucibacillary infection with many organisms being in a dormant state, making them resistant to chemotherapy.¹⁵ None of our patients have shown signs of recurrence so far.

The observation that the radiographic picture does change after treatment has been well documented⁴ [Figures 2, 7 and 8]. Resolution of cavities typically takes a long time and small residual cavities may be visible even years after treatment, and are of no great clinical significance.⁴

With the success of antitubercular chemotherapy, use of operative procedures has become limited. Except for the neurological involvement in Pott's spine, surgery in

tubercular osteoarticular disease is seldom warranted.¹⁵ At some sites, surgery is reserved for corrections of deformities, arthodesis of painful joints with fibrous ankylosis, or lesions not responding to chemotherapy.^{1,4,15} An important lesion worth considering for debridement is that which is close to the articular surface, as surgical debridement might halt progression and joint invasion, avoiding worsening of the prognosis.¹⁻³ This may also become relevant for some osteolytic foot lesions, which are easy to operate, being superficial, and the disability after surgery is minimal.²

CONCLUSION

The isolated osteomyelitis seen in the early stages, without joint involvement, early diagnosis and therapy is imperative for good long term results. If diagnosed late threatens to cause joint involvement and gives compromised results.

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