International Journal of Research in Orthopaedics
Kumar S et al. Int J Res Orthop. 2025 Mar;11(2):441-447
http://www.ijoro.org

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20250471

Review Article

Calcaneum tuberculosis-an uncommon phenomenon: narrative review

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Received: 17 October 2024
Revised: 02 December 2024
Accepted: 04 January 2025

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ABSTRACT

The *Mycobacterium tuberculosis* is the cause of tuberculosis (TB), a dangerous and highly contagious infection that is a major source of morbidity and mortality. One to three percent of cases have osteoarticular TB, and 10% of these cases involve foot and ankle involvement. The bone in the foot most frequently attacked by TB is the calcaneus. There are currently relatively few case series studies and case Report available that describe this uncommon phenomenon. The aim of this narrative review is to find information on the calcaneum tuberculosis-An uncommon phenomenon. We evaluated the medical records of some patients with 4 to 68 years, who had isolated calcaneal tuberculous osteomyelitis. As part of the systematic search, the phrase "calcaneal tuberculosis-an uncommon phenomenon" was created in relation to integrative, along with its synonyms, and the search database was used. The Google search engine was used to manually search PubMed and Google Scholar. The database did not include any further articles. According to the study's conclusions, *Mycobacterium tuberculosis* is the main cause of TB, a dangerous and communicable infectious illness. Calcaneal tuberculosis is uncommon. A high degree of clinical suspicion, in addition to positive imaging data, GeneXpert findings, and Gram stains, can aid in the diagnosis of TB calcaneus because it is an uncommon illness. To stop the illness from spreading to other bones and joints, early identification is crucial. Patient was treated with antitubercular medication and had a successful operation to correct the abnormalities.

Keywords: Contagious, Calcaneum, Tuberculosis

INTRODUCTION

Mycobacterium tuberculosis is the pathogen that causes tuberculosis, a disease that mostly affects the lungs. 2022 marks a milestone year for tuberculosis (TB) surveillance efforts in India, with a record high notification of 24.2 Lakh cases; an increase of over 13% as compared to 2021. This translates to a case notification rate of approximately 172 cases per lakh population.[1-5] About 10% of cases of tuberculosis are osteoarticular, and 10% of those instances involve the foot and ankle.[6] Tuberculosis of foot and ankle is difficult to diagnose because of lack of awareness among treating surgeons. Early diagnosis and treatment are important for better clinical outcome. Here we report the case of isolated TB of right calcaneus treated conservatively with antitubercular medication and immobilization of the ankle joint with protected weight-bearing leading to a good functional outcome.[7]

Very few studies, including case reports and case studies, describe the presentation of foot and ankle TB and its management are present. In most cases of foot and ankle TB, medical management has a key role, whereas surgery is required in cases not responding to anti-Koch treatment (AKT) for tissue collection, deformity correction, pain relief, and reconstruction of the joint.[8]

We performed a literature review to study the involvement of calcaneum in foot and ankle TB, as well as the different treatment modalities.

CASE DETAILS

Kadu et al was done on the 8-year old girl presented to OPD with swelling and dull aching pain over left heel. Radiograph of calcaneum showed small lytic pectate lesions in the calcaneum. Further investigations showed presence of multiple tuberculous bacilli. Anti-Kochs treatment was started immediately and patient was treated conservatively. Four drugs (HRZE) were prescribed for a period of 12 months. Radiographs at 2 years follow-up showed a healed lesion. The concluded that rare and unusual locations of osteoarticular TB often pose a problem of differential diagnosis. Meticulous history and clinical examination help in reaching the diagnosis. Start of AKT drugs as soon as reports show presence of tubercular bacilli plays a vital role in treatment as well as functional outcome of the patient.[6]

Tiwari et al was done to review the cases of isolated tuberculous osteomyelitis of calcaneum in terms of clinical features, radiological features, treatment and outcome. Methods: medical records of 9 patients (7 males and 2 females) aged 4 to 45 years (mean 21.33 years) who presented with isolated calcaneal tuberculous osteomyelitis were reviewed. Clinical features, laboratory tests result, findings of imaging modalities, and histopathological examination were noted. The location of involvement of tuberculosis and treatment offered were noted. Multifocal tuberculosis and articular involvement were excluded. The result showed that all patients presented with pain and swelling around the heel; three of them presented with a discharging sinus. Patients had involvement of calcaneal body (n=5), tuberosity (n=2), and anterior process (n=2). The erythrocyte sedimentation rate of all patients was elevated. All the patients were treated conservatively with immobilization and chemotherapy. Conclusions: Isolated calcaneal tuberculosis is rare and the prognosis with non-operative treatment is good.[9]

Carvallo et al was done a clinical case of a 68-year-old male patient, with systemic arterial hypertension and chronic kidney disease, who presented with pain in the left hindfoot of one year of evolution, that has evolved slowly, worsening after infiltration with steroids, presenting volume increase, functional limitation, and an ulcerative lesion with purulent exudate on the medial side. It is evaluated clinically and with imaging studies by various physicians and surgeons. An open biopsy and bone culture were performed, reporting as diagnosis: Bone tuberculosis, superinfected, in the left calcaneus. Surgical treatment was performed, and antituberculosis treatment was started, the patient evolved satisfactorily in the immediate postoperative period, recovering joint mobility, without pain, and decreased hindfoot volume.[10]

Yadav et al was done a case of 21-year-old male presented with pain, swelling in the right heel for 5 months and difficulty in walking for 2 months. Plain X-ray (axial) view of calcaneus showed a lytic lesion in calcaneus. Biopsy was done under local anaesthesia and histologic examination revealed a characteristic granuloma, caseous necrosis, and Langhans giant cells which confirmed our diagnosis. The patient was treated with anti-TB chemotherapy for 12 months. Radiographs at 18 months follow-up showed a healed lesion. At present, the patient is comfortable with no complaints calcaneus is rare condition and a high index of clinical suspicion along with imaging studies helps in diagnosis. Conservative management with anti-TB chemotherapy for adequate duration helps in complete resolution of the infection with good functional results.[11]

Gadge et al was done a rare case of 9-month-old boy who presented with gradually increasing inflammatory swelling over the lateral aspect of the right ankle which may be an indication of tuberculosis of calcaneus is reported. The diagnosis was confirmed by culture sensitivity and cytology for acid-fast bacilli. The patient was managed with incision and drainage with debridement, followed by treatment with anti-tubercular drugs for nine months with a very good evolution. On follow up X-ray even after eighteen months, there were no radiological signs of any remnant disease.[12]

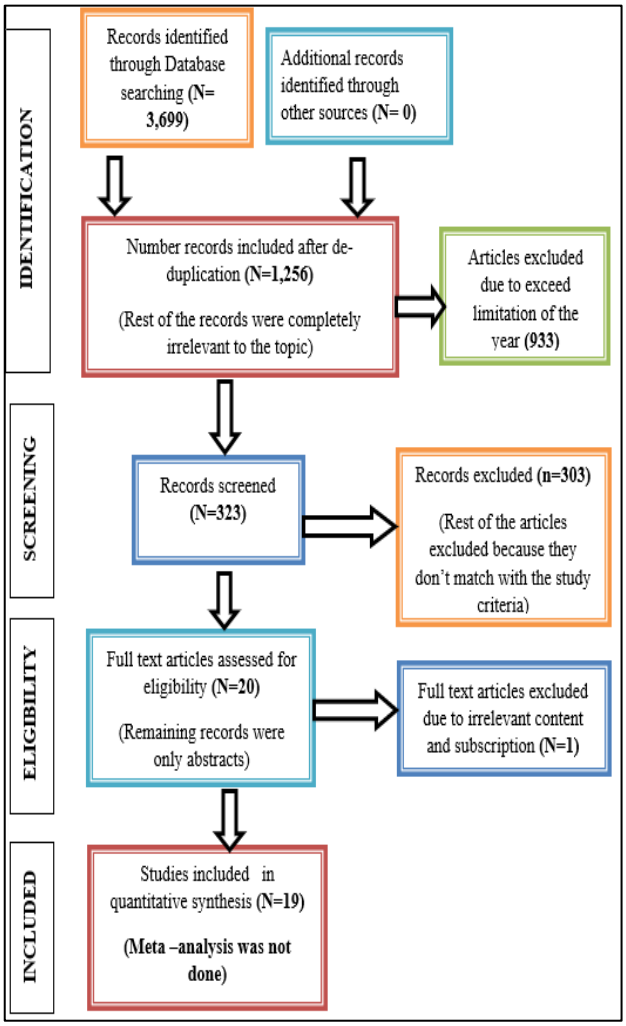

Figure 1: Prisma flow diagram of narrative review.

FINDINGS

The systematic search involved formulating the term 'calcaneal tuberculosis-a rare occurrence' in connection to integrative along with its synonyms, as well as using the search database. A manual search was carried out on PUBMED and Google Scholar using the Google search engine. There were no extra articles discovered in the database. The first search resulted in 3,699 articles, with 933 being excluded for being irrelevant. 323 selected manually and 303 articles were rejected as a result of replication in the database. Replication was removed and reviewed 20 articles for acceptability. 1 more studies were rejected because of unreachable of the full text. Hence 19 articles were screened.

DISCUSSION

In countries like India that are still developing, diseases like TB remain significant issue for public health, causing illness and death. TB mostly affects lungs, but it can also impact other parts of body. In cases of skeletal TB, spine involvement is frequently observed, while foot and ankle joint involvement is uncommon.[13] A timely diagnosis of infections such as tuberculosis that impact bones and joints is crucial because it can extensively damage, leading to disabilities that hinder everyday tasks.

TB impacting the skeletal system manifests as a paucibacillary type, and when it presents uncommonly in the foot, it results in delayed diagnosis and treatment.[14] The illness typically originates in the spongy section of the bone via direct introduction or through the bloodstream.[15] The sequence of skeletal TB involvement begins with the dorsal spine, then moves to the pelvic bones, femur and hip joint, tibia and knee, and finally the ribs. The elbow, ankle, and foot each make up 2% of the total, with only 3% involving multiple sites.[16]

The PubMed and Google scholar data were searched for TB around the foot and ankle by two authors with key words-"tuberculosis", "calcaneum" (Table 1). We included the search results for the past 12 years (2012-2024) and included all type of studies. Out of the result searched, we found 18 relevant studies with the involvement of calcaneum (Table 2).

The literature review of the past 12 years shows that male:female is 3:1. The disease duration varied from 1 to 24 months. The side involvement does not show much difference in involvement with left: right; 1.27:1. All the studies tabulated above show the involvement of the anterior process (three patient) and tuberosity (seven patient). The most common symptoms noted were pain with weight bearing and swelling.

Table 1: Search strategy used for the systematic review in PubMed.

Data base	Result
("tuberculosis" or "calcaneum" [all fields]	66
Search strategy used for the systematic review in Google scholar	
("tuberculosis" or "calcaneum" [all fields]	3640
Total	3699

Table 2: Reported cases of tuberculosis of calcaneus.

Authors	Year	No. of patient	No. of calcaneus TB	Diagnostic delay	Treatment	Outcome
Dhillon et al[17]	2012	74 patients, out of 75 cases, 23 was included from prev study	11	2 months to 1.9 years	Medical management and surgical in selected cases	No recurrence in any of the patients.
Rafiqi et al[18]	2013	12	2	32 months	Medical management and surgical in selected cases	7 showed good clinical evolution with complete remission, while 4 had sequelae at mean follow-up of 37.5 months.
Gillott et al[19]	2013	1	1	7 months	AKT for 18 months (6+12 months) and immobilized with an air cast boot	18 months, on final follow-up radiograph suggestive of new bone formation on calcaneum
Hayat et al[20]	2014	1	1	9 months	Surgical curettage and AKT for 9 months	Fully mobile and pain free and no recurrence.
Charter et al[21]	2014	1	1	9 months	Surgical curettage and AKT for 9 months	18 months and resolution of radiological signs

Continued.

Authors	Year	No. of patient	No. of calcaneus TB	Diagnostic delay	Treatment	Outcome
Nayak et al[22]	2014	20	11	6 months to 5 years	Medical management	None of the patients have shown signs of recurrence.
Agarwal et al[15]	2015	10	11	Yes	AKT for 12 months, foot orthosis for 6 weeks, partial weight- bearing in the next 6 weeks, and full weight-bearing in 10th week	Healed and no patient recurrence mean follow up to 17 months
Khan et al[23]	2015	1	1	2 months	Surgical debridement/ curettage/ medical management	Patient was followed for 18 months after completing therapy and remains well and radiographs shows evidence of healing.
Kadu et al[24]	2016	1	1	4 months	AKT was given for 12 months. A below-knee cast was given for 6 weeks, followed by partial weight bearing after 6 weeks and at 10th week, full weight bearing started	Pain and swelling subsided and radiographs at 2 years follow-up showed healed lesion.
Takhar et al[25]	2016	1	1	2 months	Medical management	No pain
Muhammad et al[26]	2016	1	1	5 months	Medical management	At final follow-up of 18 months, pain free and able to perform her routine daily activities.
Alizayagam et al[27]	2017	1	1	6 months	Surgical curettage	No pain and difficulty in walking
Kumar et al[28]	2019	1	1	2 months	AKT for 18 months	36 months, radiograph and CT-scan showed on recurrence.
Ramanathan et al[5]	2020	6	4	Yes	AKT for 12-18 months in all 4 patients with additional surgery in out of 4 cases	Mean follow-up 14 months, no recurrence.
Jeyaraman et al[29]	2021	1	1	8 months	Medical management and surgical intervention in selected cases	No pain, normal range of motion and patient was still under follow-up.
Bikoroti et al[30]	2021	1	1	Yes	AKT for 12 months	21 months follow-up, healed sinus, weight gain, and limb length discrepancy of around 1 cm.
Yadav et al[7]	2020	1	1	5 months	Conservative management with anti-TB chemotherapy	Complete resolution of the infection with good functional results
Choudhary et al[8]	2023	1	1	3 months	Conservative management and Anti-kotch treatment	Within 2 months of treatment both clinically and radiologically improved
Jadawala et al[31]	2024	1	1	Yes	Conservative treatment, sand anti-tubercular therapy	No pain

Of all the bones of the foot, the calcaneum is the most commonly affected by TB as seen in the literature, also supported by the conducted by Kumar et al.[28] Which showed that out of 312 cases of foot TB, 88 cases had calcaneum involvement. A possible explanation is the larger bone size and the fact that is it the commonly injured foot bone by trauma.[17] Tubercular infections of the foot can present with pain, swelling, discharging sinus, difficulty in weight bearing, heel-up signs and symptoms like evening rise of temperature, night sweats, and weight and appetite loss.[18]

Dhillon et al subsequently presented 11 cases of calcaneal TB in a series of 74 patients of foot TB, with bilateral involvement of the calcaneus in one case.[14] In a later series, they reported one case of multifocal involvement in a patient with lesions in second and fifth metatarsals of the same foot. Two patients had evidence of pulmonary involvement.

In the cases reported by Rafiqi et al a second focus of infection was seen in 3 out of a total of 12 patients of TB foot.[18] These patients had separate lesions involving the dorsal spine, the lumbar spine and skin, respectively, probably due to hematogenous spread.

Nayak et al reported involvement of 2 or more bones in 7 out of 20 cases of foot and ankle TB.[22] Agarwal et al reported a 10-year-old patient who had bilateral involvement of calcaneus along with lesions in phalanges, lumbar spine and ulna.[15]

Agarwal et al records of 12 girls and 9 boys aged 3 to 14 (mean, 7) years with tuberculosis of the foot and ankle was reviewed. The mean delay in presentation was 4.7 (range, 0.5-14) months. All the patients had local swelling, tenderness, and antalgic gait; 16 were limping; 5 had an antecedent trauma; 11 had an abscess; and 6 had a discharging sinus. The diagnosis was based on a smear positive for acid-fast bacilli (n=2), histopathology (n=15), or clinic radiological findings (n=4). Nine patients had osteoarticular tuberculosis in other parts of the body. none of our patients had any residual tenderness or foot deformity at the final follow-up.[32]

Karkhur et al done a 20-year-old male diagnosed with isolated tuberculosis of right talus without the radiological involvement of the distal tibia, fibula or calcaneum. The diagnosis was made with the help of magnetic resonance imaging and confirmed through core biopsy of the talus. He was treated with multi-drug antitubercular chemotherapy and ankle immobilization with protected weight bearing with good results.[33,34]

The rare occurrence of TB in the foot and ankle and lack of associated symptoms such as evening temperature rise, appetite and weight loss, night sweats and radiographic appearance make a definitive diagnosis difficult.[17,35] TB is of a paucibacillary nature when bone and joints are involved; therefore, more than one diagnostic modality is required for diagnosis. To date, many diagnostic tests are available. Still, none of them is highly sensitive and specific for diagnosing skeletal TB, as stated by Dhillon et al.[14]

Thorough debridement of the lesion along with chemotherapy for adequate duration helps in the complete resolution of infection with good functional results as stated by Poudel et al.[36]

The current protocol of treatment of osteoarticular TB has been a prolonged duration of 9-18 months.[22] Prolonged treatment in osteoarticular TB is justified by the fact that it is a paucibacillary infection with many organisms being in a dormant state, making them resistant to chemotherapy.[17,28] This protocol is also followed at our institute for the simple cases that are diagnosed early. But in the cases which present at unusual locations or with discharging sinuses or with multi-focal involvement, maintenance medical therapy is continued under supervision for an additional few months. One reason for this is that these patients are then involved in better follow-up; the biggest issue in our country is that patients are lost to follow-up or have inadequate therapy unless supervised, with high chances of relapse or recurrence.

Complications

Complications are described in 3-5% of cases, including fistulae, abscess formation and the need for further surgical intervention. Relapses have been described in 2% of cases.[11] No definite association between duration, drug regimen and complication rate has been determined.[37]

CONCLUSION

This study concluded that Tuberculosis is an infectious disease that is both serious and contagious and is brought on by *Mycobacterium tuberculosis* calcaneus is rare so a high index of clinical suspicion with positive imaging findings, histopathological examination, and staining for acid-fast bacilli could help us in diagnosis. Early diagnosis is crucial to prevent disease progression to the adjacent bones and joints. Conservative management with adequate anti-TB chemotherapy along with immobilization helped in the complete resolution of the infection with good functional results. Surgery is indicated for obtaining tissue diagnosis, debridement of abscess, cases resistant to chemotherapy, deformity correction, or joint reconstruction.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Kumar S, Kumar R, Jayant N, Gautam C, Aggarwal V. Calcaneum tuberculosis-an uncommon phenomenon: narrative review. Int J Res Orthop 2025;11:441-7.