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Original article

Two-stage operation to treat destructive midfoot tuberculosis: 14 cases experience

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ABSTRACT

Introduction: Tuberculosis (TB) in midfoot is often secondary to tuberculosis elsewhere in the body. The experience and literatures to treat midfoot tuberculosis are rare. Up until now, no successful method is reported to treat midfoot tuberculosis.

Hypothesis: Stage surgery is an effective method to treat midfoot bone TB.

Material and methods: Between January 2008 to January 2011, 14 patients who were diagnosed midfoot tuberculosis and suffered stage operation were enrolled. All the patients had been diagnosed definitely relying on imaging examination and laboratory tests preoperatively. Two-stage operation was performed to all patients. At the first stage, TB tissue and infective tissue were completely removed and replaced by antibiotic bone cement. Normal foot length and arch would be restored and maintained by K-wires and external fixators. At the second stage, autologous iliac and allogeneic bone graft were used to replace bone cement and by fixed by locking plates. American Orthopaedic Foot and Ankle Society (AOFAS), SF-36 and visual analogue scale (VAS) pain score were recorded at the last follow-up.

Results: The average bone union time was 3.8 (range 3–6) months. There is no case of local recurrence or skin sinus. Neither implant broken nor screw loosen was present in this study. The AOFAS score was increased from 51.7 ± 6.8 (range 43–61) preoperatively to 82.9 ± 3.9 (range 76–90) postoperatively ($P < 0.001$). The SF-36 score increased from 46.1 ± 6.1 preoperatively to 83.1 ± 5.4 postoperatively ($P < 0.001$). The VAS score decreased from 6.1 ± 1.1 preoperatively to 1.4 ± 0.9 points postoperatively ($P < 0.001$).

Discussion: Stage operation is an effective treatment to stage III, IV midfoot tuberculosis.

Levels of evidence: Level IV, retrospective.

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1. Introduction

Despite tuberculosis (TB) had been controlled effectively for a short period of time, in the late 1990s, the rise of tuberculosis has become a threat to public health in the world [1,2]. According to Fifth National Tuberculosis epidemiological survey in China in March 2011, it was published that the incidence of tuberculosis in China is about 130 million, accounting for 14.3% of global incidence, and is second place among the world [3]. Although the incidence of TB in the foot and ankle is less than 1% of TB in bone and joint, the incidence of TB in midfoot is about 20% of that in foot and ankle [4–6]. TB in midfoot is one kind of chronic disease and

is often secondary to tuberculosis elsewhere in the body, which always combines with synovial inflammation, granulation and bone destruction at Chopart joint. Tuberculosis, which develops gradually, is characterized by worsening joint pain with mild fever, inflammation of the joint, and cold abscesses with sinus tracts. Patients with TB in foot and ankle often complained of pain, swelling, and movement limitation of involved joints. There is sometimes sinus around involved joints. Fever, weight loss and other body symptoms are rarely [7,8].

Because of atypical symptoms and non-specific imaging findings in bone and joint TB, the diagnosis of bone and joint TB is difficulty [9–12]. Imaging findings include osteoporosis, soft tissue swelling, joint space narrowing and bone invasion [11,13]. Even there are radiographic abnormalities, it maybe misdiagnosed as other infection diseases [14]. Looking for TB granulation by biopsy is the definitive diagnosis of TB. Anyway, patients with TB are often missed or misdiagnosed as osteomyelitis, bone tumor or other inflammatory diseases [5,7].

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The basic treatment of foot and ankle TB is reasonable and long-term anti-tuberculosis. Operative treatment includes biopsy in cases that were not diagnosis clearly, debridement and arthrodesis. If there were obvious destruction and pain persists around foot and ankle joints, arthrodesis including triple arthrodesis and Lisfranc joint arthrodesis can be used to achieve a stable and painless foot. Operative treatment can be used to shorten anti-TB drug usage period and improve prognosis as well [15–17].

There is low incidence of TB in developed countries [14,18], so the literature about foot and ankle TB are rare. These articles are mostly case reports of ankle TB. There is no detailed introduction or guideline of operative method or procedure in literature. According to past experience to treat foot and ankle TB, debridement of infective tissue and arthrodesis were performed in one same stage. After arthrodesis, cast immobilization was used to stabilize the fracture site without internal fixation but K-wire. This kind of fixation was not stable enough that failure of arthrodesis and joint stiffness could occur. On the contrary, arthrodesis with rigid internal fixation can be performed after infection was controlled and cleaned in staging operation.

From January 2008 to January 2011, 14 cases with TB in midfoot were treated by stage operation in our department. The authors hypothesized that infection could be eliminated completely without secondary infection by implant, and rigid internal fixation could also improve bone union rates by stage operation.

2. Materials and methods

2.1. General information

Between January 2008 to January 2011, 14 patients who were diagnosed with midfoot tuberculosis were enrolled in this study. Nine patients were male and five were females. The average age of was 29.7 (range, 20–41) years. This study was conducted with approval from the Ethics Committee of Jiaotong University. Written informed consent was obtained from all participants. There were

8 patients of left side and 6 patients of right side. The patients suffered from 8 months to 6 years. All patients complained of pain and dysfunction in midfoot. There was sinus on the surface of skin in five patients. All patients denied there was tuberculosis in the remaining parts of body, such as lungs or stomach. All the patients accepted chest X-ray examination, there were the presence of lung tuberculosis in five patients. Old tuberculin tests (OT tests) were positive in 10 patients. Before the first stage surgery, biopsy had been performed in all cases. If the histologic appearance consisted of multifocal aggregates of epithelioid and foamy, infected macrophages, with scattered multinucleated giant cells, lymphocytes, and plasma cells flooding alveoli, with significant lymphoplasmacytic perivascular cuffing, the diagnosis of TB was definite. The results showed all cases were TB. The culture of *Mycobacterium tuberculosis* is not performed routinely. All the patients had been diagnosed definitely relying on imaging examination and laboratory tests preoperatively. Plain film, computed tomography (CT) and magnetic resonance imaging (MRI) of foot and ankle were regularly taken preoperatively (Fig. 1A and B). Eight patients were in stage IV and 6 patients were in stage III. ESR and CRP were both increased in all patients without HIV infection (Table 1). Because of pain, dysfunction of feet and destruction of Chopart joint, all patients were selected to surgical treatment.

2.2. Operative methods

Two-stage operation was performed to all patients. At the first stage, medial incision, lateral incision and combined incision were used to expose Chopart joint and eliminate TB tissue. All the articular surface involved TB tissue should be completely removed until normal bone tissue were exposed. Infective and TB tissue were sent to pathological examination. Then, the defected bone tissue was filled with antibiotic bone cement. An amount of 1.0 g vancomycin and 2 million unit streptomycin were mixed to 40 g cement. Normal longitudinal arch height should be restored and fixed by multiple K-wires in the cases of arch collapsing. At the same time, external fixator was used on the lateral side to maintain the length of foot

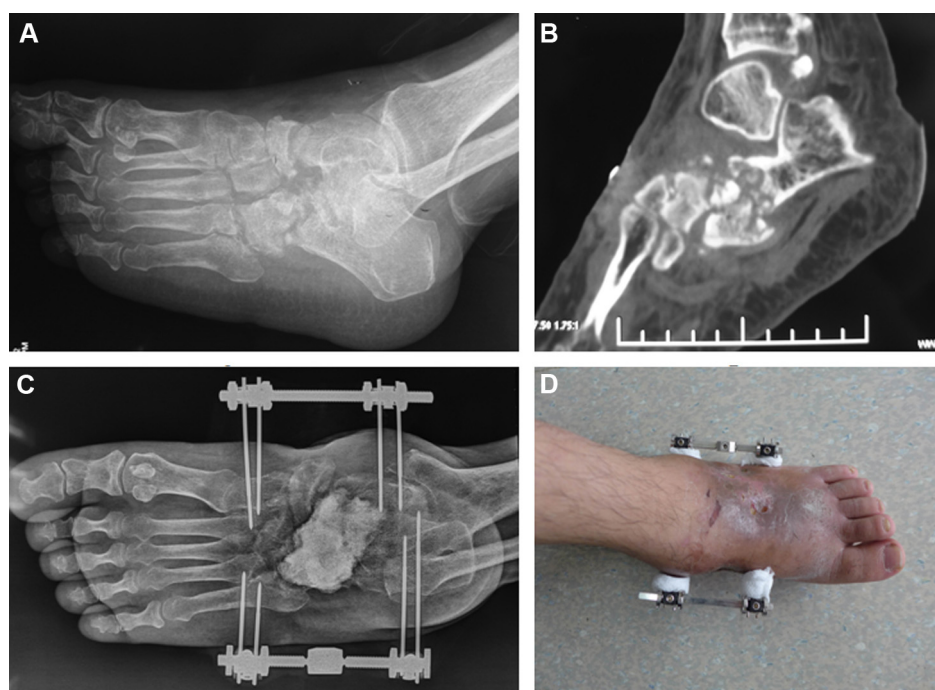


Fig. 1. A 34-year-old man was diagnosed TB in left midfoot. A. Plain film showed destruction in Chopart joint and TMT joints, as well as osteoporosis in whole foot. B. CT showed destruction in calcaneocuboid joint. C. After first operation, two mini external fixators were used at both sides to maintain the length of foot. Bone cement was used to fill into the bone deflection. D. The appearance of left foot after first operation.

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