

# Tibiototalcaneal arthrodesis using a supracondylar femoral nail for advanced tuberculous arthritis of the ankle

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## ABSTRACT

**Purpose.** To review 7 patients with advanced osteoarticular tuberculous arthritis of the ankle who underwent arthrodesis using a supracondylar femoral nail.

**Methods.** All patients showed gross destruction of the articular cartilage of the tibiotalar joint with severe periarticular rarefaction on radiographs. Their pre- and one-year post-operative Foot and Ankle Outcome Scores (FAOS) were compared. All patients underwent joint debridement, complete synovial excision, and arthrodesis using a supracondylar femoral nail, followed by multidrug chemotherapy for 12 months (isoniazid, rifampicin, pyrazinamide, and ethambutol for 3 months, and isoniazid and rifampicin for 9 months).

**Results.** All patients achieved fusion in a mean of 13 weeks and regained their preoperative level of independence. No patient had a relapse, major

complications, or hardware failure. At postoperative year one, the mean FAOS for pain improved to 85 from 26, whereas the mean FAOS for quality of life improved to 60 from 5.

**Conclusion.** Tibiototalcaneal arthrodesis using a supracondylar femoral nail, combined with debridement and multidrug therapy, enabled a reliable one-stage solution for advanced osteoarticular tuberculosis and early return to function.

**Key words:** ankle joint; arthrodesis; bone nails; tuberculosis, osteoarticular

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## INTRODUCTION

Tuberculosis of the ankle is rare and accounts for less than 5% of all osteoarticular tuberculosis.<sup>1</sup> The ankle joint plays an important role in locomotion and weight bearing; when afflicted it can cause serious functional impairment. Early mobilisation and multi-drug chemotherapy can achieve good

results in patients with early stages of tuberculous arthritis. Severely destroyed ankles usually require arthrodesis for pain relief and function optimisation. Tibiotalocalcaneal arthrodesis using modified short retrograde nails inserted from the calcaneum has been described.<sup>2-6</sup> We retrospectively reviewed 7 patients with advanced osteoarticular tuberculous arthritis of the ankle who underwent arthrodesis using a supracondylar femoral nail.

## MATERIALS AND METHODS

Records of 5 men and 2 women aged 31 to 54 (mean, 40) years with advanced (grades 3 or 4) osteoarticular tuberculous arthritis of the ankle who underwent tibiotalocalcaneal arthrodesis using a short supracondylar femur nail between August 2005 and December 2007 were retrospectively reviewed.

All patients presented with a history of a painful swollen ankle starting 6 months to 2 years earlier. Five patients complained of severe pain during walking, whereas 2 were unable to bear weight and used crutches for ambulation. Two patients had a posterior sinus and one had a medial sinus. The ankle was unstable in 2 patients. All patients showed gross destruction of the articular cartilage of the tibiotalar joint with severe periarticular rarefaction on radiographs. Their pre- and one-year post-operative Foot and Ankle Outcome Scores (FAOS)<sup>7</sup> were compared. The erythrocyte sedimentation rate (ESR) ranged from 55 to 130 mm per one hour. Four patients yielded positive Mantoux tests using purified protein derivative.

Arthroscopy-guided synovial biopsy confirmed the diagnosis of tuberculosis in 6 patients. They were started on 4-drug chemotherapy consisting of isoniazid, rifampicin, pyrazinamide, and ethambutol. In one patient with an inconclusive biopsy, anti-tuberculosis drug therapy was started based on clinicoradiological features.

All patients were operated on under spinal anaesthesia and tourniquet control. The ankle joint was approached anterolaterally. Every joint was severely destroyed and the synovium was infiltrated with yellowish caseous and granular tissue. The articulating surfaces were debrided and shaped for maximal contact. The synovium was removed piecemeal circumferentially from the ankle and subtalar joints.

A guide pin was passed from the non-weight-bearing region of the plantar aspect of the heel in line with the medullary cavity of tibia. The lateral plantar neurovascular bundle was protected using

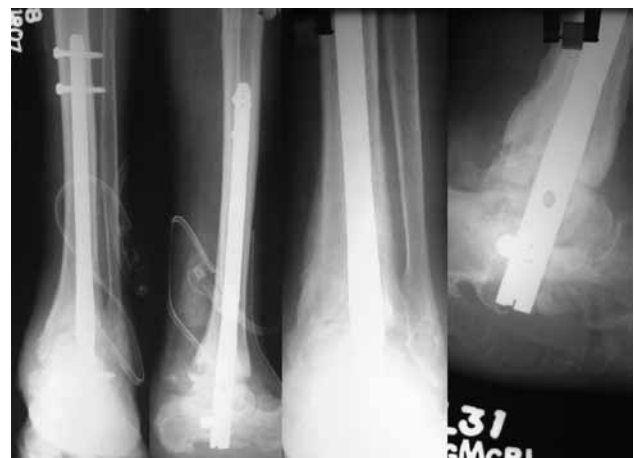
Langenback retractors after careful blunt dissection. The guide pin passage in 2 planes was checked under the C-arm and was reamed for the supracondylar femoral nail (IMSC nail; Sharma Surgicals, India). The nail was 20 or 25 cm long and 10 to 12 mm in diameter. Care was taken to bury the nail well into the calcaneum. The nail was distally locked in the tibia with 2 screws and proximally locked with one screw inserted in a mediolateral direction through the calcaneum (Fig.). The tourniquet was released and haemostasis achieved. A bulky compression dressing was applied after skin closure.

Patients were allowed non-weight-bearing mobilisation after drain removal at postoperative day 2. Full weight bearing was allowed only after radiological signs of solid fusion. Multidrug chemotherapy was continued for 12 months (isoniazid, rifampicin, pyrazinamide, and ethambutol for 3 months, and isoniazid and rifampicin for 9 months).

## RESULTS

The mean operating time was 65 (range, 50–85) minutes. The mean estimated blood loss was 250 (range, 200–350) ml. The mean time to bone fusion was 13 (10–18) weeks. No patient had a relapse, major complication, or hardware failure; 2 had superficial skin infections. All patients returned to their normal activities/work; 2 had mild pain but were not taking analgesics regularly.

Patient comfort levels increased and pain and



**Figure** Postoperative radiograph of a 50-year-old woman showing solid fusion at 6 months using a retrograde supracondylar nail.

**Table**  
**Pre- and one-year post-operative Foot and Ankle Outcome Scores (FAOS)**

Patient no.	FAOS for pain		FAOS for quality of life	
	Preop	Postop	Preop	Postop
1	25	73	0	75
2	14	84	13	75
3	39	78	7	57
4	23	84	0	50
5	45	98	7	53
6	14	81	7	57
7	25	95	0	53

constitutional symptoms decreased by the end of week 3. Serial ESRs returned to normal by the end of month 3. Complete bone mineralisation was achieved at months 9 to 12, even though fusion occurred earlier. At postoperative year one, the mean FAOS for pain improved to 85 (standard deviation [SD], 9) from 26 (SD, 12), whereas the mean FAOS for quality of life improved to 60 (SD, 11) from 5 (SD, 5) [Table].

## DISCUSSION

Advanced osteoarticular tuberculosis is characterised by severe joint destruction, deformity, instability and sometimes an unstable painful fibrous ankylosis.<sup>8,9</sup> The diagnosis of osteoarticular tuberculosis can be made based on clinical, serological, and radiological grounds, especially in countries where the disease is very common.<sup>10</sup> The treatment goal is to arrest the disease process and achieve stable painless bony fusion. Debridement helps clear the necrotic, avascular debris and opens up new vascular channels to promote fusion. It also facilitates disease eradication by enabling better penetration of anti-tuberculous drugs.

The ideal duration of drug therapy for osteoarticular tuberculosis is controversial. Chemotherapy for more than 12 months is advised, but short-course chemotherapy (such as that advocated in the revised national tuberculosis control programme of India<sup>11</sup>) is also as effective. The radiological process of healing lags behind actual disease healing and should not be used as a criterion for duration of therapy. Haematological parameters including ESR and C-reactive protein should be measured serially to monitor the response to treatment. In our patients, the ESR returned to normal levels at the end of month 3. Large-scale studies are required to confirm the efficacy of short-course chemotherapy in

osteoarticular tuberculosis.

Ankle arthrodesis using external fixators has been the traditional treatment. Charnley's clamp is versatile and achieves satisfactory outcome.<sup>12</sup> Stability can be increased with the triangular configuration.<sup>13,14</sup> Nonetheless, the external fixator has to be retained for a long period of time hindering social activities, and pin tract infection is almost inevitable.<sup>15</sup>

Ankle arthrodesis using multiple screws in different configurations achieves good compression across the fusion surfaces in normal bone, but in advanced osteoarticular tuberculosis the bone is osteoporotic, which may compromise fixation.<sup>16-18</sup> Patients may need an additional plaster cast to prevent fixation failure.

Ankle arthrodesis using an intramedullary nail is rare and thus its availability is limited. Custom-made nails with additional locking holes in anteroposterior direction and other compression devices have been used to compress the fusion sites.<sup>2-6</sup> The use of intramedullary interlocking nails is specifically indicated in patients with concomitant subtalar arthritis or with severe osteopenia such as those ensuing in rheumatoid arthritis and neuropathic arthritis,<sup>19</sup> or for arthrodesis of a tuberculous ankle.<sup>20</sup> When a nail is used for arthrodesis, it is important to maintain more than 60% of the compression at the fusion site.<sup>21</sup> We used a widely available straight supracondylar femoral nail, although it may not achieve optimal compression owing to the lack of a compression device. In our series, the fusion surfaces were held by the assistant while the nail was being locked to optimise compression. Reaming provides adequate graft material to improve fusion rates and avoids recourse to additional grafts, thereby preventing donor-site morbidity. Application of cancellous grafts may increase the volume of the surgical site and cause wound problems.

Arthroscopy-assisted ankle arthrodesis for end-stage tuberculosis enables visualisation of joint surfaces, decreases blood loss and morbidity, preserves the mortise, and thus facilitates early functional recovery. Arthroscopy-assisted debridement and ankle arthrodesis using a retrograde nail attained good fusion and cosmesis.<sup>22</sup>

## CONCLUSION

Tibiototalcaneal arthrodesis using a supracondylar femoral nail enables a reliable one-stage solution for advanced osteoarticular tuberculosis and early return to function. Radical debridement facilitates

disease eradication and bone fusion. It enables chemotherapy to be more effective in clearing the

disease. Intramedullary reaming generates healthy bone grafts and avoids donor-site morbidity.

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