



Tibiocalcaneal Arthrodesis in the High-Risk Foot

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ABSTRACT

The present case series outlines the history and surgical treatment of 6 patients who underwent tibiocalcaneal arthrodesis from April 2002 to May 2012, all with external fixation as the primary or secondary fixation. Surgical intervention was performed by the same surgeon at the same facility. The indication for surgery was a nonbraceable Charcot deformity in 5 (83.3%) patients and bone and soft tissue infection complicating previous intramedullary hindfoot fusion in 1 (16.7%) patient. Talectomy was performed in 2 (33.3%) patients secondary to widespread osteomyelitis of the talus and in 4 (66.7%) patients secondary to avascular necrosis and/or disintegration and fragmentation of the remaining talus. The postoperative complications have been discussed in detail and their management outlined. At the most recent follow-up visit, all patients were independently ambulating on a braceable limb with or without the use of an assistive device. In conclusion, tibiocalcaneal arthrodesis is a reasonable option for limb salvage to produce community ambulators in the high-risk population. We emphasize that although multiple fixation options are available for tibiocalcaneal arthrodesis, a combination of internal and external fixation is vital to its success.

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Limb salvage using lower extremity arthrodesis in the high-risk patient population poses a challenge for the lower extremity surgeon. The high-risk limb salvage patient has had previous surgical attempts to a braceable limb fail and will have concomitant osteomyelitis or wounds. Also, the case can be complicated by comorbidities such as obesity and diabetes, patient noncompliance, and poor home support for wound care and postoperative management. Patients with Charcot arthropathy are prone to delayed wound healing, infection, and poor bone healing, with increased morbidity owing to gross instability, recurrent ulcerations, or amputation, limiting traditional methods of internal fixation (1–3). Extensive surgical planning is paramount and must be multifactorial, taking into consideration, not only the radiographic examination findings, but also patient expectations, preoperative patient quality of life, and patient comorbidities. Multiple fixation options exist for hindfoot arthrodesis, and the surgeon must choose carefully which option or combination of fixation options would most benefit the patient.

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Surgical stabilization in the neuropathic patient is aimed at creating a stable, plantigrade, braceable foot to allow the limb to continue to be functional and preventing amputation (3–9). Although the published data have shown that amputation has the shortest rehabilitation time and a good functional result with modern prostheses, it is unacceptable to most patients (10). The risk of contralateral Charcot arthropathy with amputation is greatly increased in patients with a history of lower extremity amputation (5,11). Limb preservation surgery has come into greater favor, because surgeons are now avoiding primary amputation as the first-line treatment (6).

Tibial-pedal arthrodesis as a limb salvage option for the unstable, unbraceable hindfoot deformity includes ankle, tibiotalar, and tibiocalcaneal arthrodesis. In the patient with segmental bone defects, tibiotalar and/or tibiocalcaneal arthrodesis provide a viable option. The presence or absence of soft tissue and/or bone infection will alter the sequence of fixation placement. Also, when osteomyelitis or avascular necrosis of the talus (with collapse) has complicated the neuropathic hindfoot deformity, talectomy with tibiocalcaneal arthrodesis is specifically indicated for surgical stabilization and limb salvage. In cases necessitating talectomy, the surgeon is left with the option of acute shortening of the limb, an interpositional structural graft, or concomitant lengthening.

The tenants of successful fusion originally described for the Charcot knee apply and must be adhered to in tibiotalar and

Table
Summary of study cohort (n = 6)

Patient No.	DM	TC Fusion Indication	Wound Present at Surgery	Osteomyelitis of Talus	External Fixation Type	Definitive Internal Fixation	Bone Graft Used
1	No	Infected IM nail	Yes	Yes	Ilizarov	None	Demineralized bone matrix, cancellous allograft, platelet-rich plasma Autograft (resected fibula)
2	Yes	Hindfoot Charcot	Yes	Yes	First: Ilizarov Second: circular monoclonal compression	IM nail	
3	Yes	Hindfoot Charcot	Yes	No	Ilizarov	Tripod	Autograft (resected fibula) and femoral head allograft
4	Yes	Hindfoot Charcot	No	No; osteomyelitis of tibia 13 wk postoperatively treated with debridement and IV antibiotics	Delta configuration	Tripod	Demineralized bone matrix and femoral head allograft
5	Yes	Hindfoot Charcot	First: no Second: yes	No	First: Ilizarov Second: delta configuration	First: IM nail Second: tripod (modified)	First: autograft (resected fibula and tibia), demineralized bone matrix, platelet-rich plasma Second: none
6	Yes	Hindfoot Charcot	No	No; superficial infection just before stage 2 at pin site treated with debridement and antibiotic beads Stage 2 initially postponed.	First: triplanar (Butt construct) Second: Ilizarov	First: None Second: IM screw and staple	First: none Second: autograft (resected fibula) and cancellous allograft

Abbreviations: DM, diabetes mellitus; IM, intramedullary; IV, intravenous; TC, tibiocalcaneal.

tibiocalcaneal arthrodesis (12). These include careful removal of all cartilage and debris; removal of sclerotic bone down to bleeding, well-vascularized bone; fashioning of congruent bone surfaces; firm fixation using an intramedullary (IM) rod or other fixation; and careful debridement of all synovial tissue and scarred capsule.

The use of external fixation in the surgical treatment of Charcot arthropathy has been well documented in published studies. Internal

fixation alone carries a risk of failure secondary to osteopenic bone's inability to support the screw threads. The postoperative course after internal fixation alone requires an extensive period of non-weightbearing. Internal fixation combined with external fixation is a viable option for arthrodesis, because the external fixator will mechanically bridge the arthrodesis site and neutralize stress within the tarsus, allowing greater stability and earlier weightbearing (7).



Fig. 1. Preoperative radiographs of patient 1 demonstrating retained intramedullary nail with diffuse osteolysis.

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