Concomitant Osteomyelitis and Avascular Necrosis of the Talus Treated with Talectomy and Tibiocalcaneal Arthrodesis

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Published In/Presented At

Stapleton, J., & Zgonis, T. (2013). Concomitant osteomyelitis and avascular necrosis of the talus treated with talectomy and tibiocalcaneal arthrodesis. *Clinics In Podiatric Medicine And Surgery*, *30*(2), 251-256. doi:10.1016/j.cpm.2013.01.001

Concomitant Osteomyelitis and Avascular Necrosis of the Talus Treated with Talectomy and Tibiocalcaneal Arthrodesis

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KEYWORDS

• Avascular necrosis • Osteomyelitis • Charcot foot • Neuropathy • Talus
• External fixation

KEY POINTS

- The incidence of avascular necrosis from a complex talus fracture is high.
- External fixation use for talectomy and tibiocalcaneal arthrodesis can provide successful outcomes in the presence of soft tissue and/or defects.
- Single or staged talectomy with a tibiocalcaneal arthrodesis depends on but is not limited to the patient's history, medical optimization, clinical presentation, laboratory findings, and medical imaging.
- A multidisciplinary team approach is crucial for the patient's overall successful outcome.

INTRODUCTION

The use of external fixation to perform lower extremity salvage arthrodesis in the presence of osseous and/or soft-tissue infection is a valuable tool that allows adequate osseous realignment and stability while avoiding the insertion of retained implants that can act as a nidus for latent or recurrent infection. Permanent cemented antibiotic-impregnated hindfoot intramedullary nails have also been used to achieve arthrodesis of the hindfoot/ankle in the presence of talar osteomyelitis and avascular necrosis (AVN).[1–4]

In this article, the following clinical case scenarios demonstrate the use of circular external fixation to treat complex talar fractures complicated with AVN, structural

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Clin Podiatr Med Surg 30 (2013) 251–256
http://dx.doi.org/10.1016/j.cpm.2013.01.001 **podiatric.theclinics.com**
0891-8422/13/$ – see front matter

collapse, and infection with a single-stage talectomy and tibiocalcaneal arthrodesis and how staged procedures are more commonly used in the management of diabetic Charcot neuroarthropathy. The dilemma arises as to whether a single or staged procedure is required when performing a septic tibiocalcaneal arthrodesis. The first clinical case scenario demonstrates a single-stage talectomy and tibiocalcaneal arthrodesis for the management of posttraumatic talar AVN and concomitant osteomyelitis. However, diabetic patients with Charcot neuroarthropathy and concomitant talar osteomyelitis are typically treated with a staged talectomy and tibiocalcaneal arthrodesis. The clinical presentation of infected ulcerations, active drainage, and the presence of purulence when managing the diabetic patient with Charcot neuroarthropathy is surgically approached with a multiple-staged reconstruction to achieve a successful tibiocalcaneal arthrodesis.

CLINICAL CASE SCENARIOS

In the first clinical case scenario, the patient presented with a history of severe pain in the right ankle after developing AVN of the talus that led to a collapse and posttraumatic deformity. The patient's past medical history was significant for pulmonary embolism 20 years prior, a history of alcohol abuse, and a 30-pack-year history of smoking tobacco. The patient reported a sustained complex talus neck and body fracture with a concomitant ankle fracture to the ipsilateral extremity after a fall from a roof. An open reduction and internal fixation of the talus, lateral malleolus, and syndesmosis was performed at the time of injury. In the initial postoperative period, the patient reported difficulty with healing of the medial surgical incision secondary to wound dehiscence. Treatment at that time consisted of local wound care and oral antibiotics until the surgical wound was healed. Six months from the initial surgery the patient had internal fixation hardware removal from the lateral malleolus and syndesmosis injury. The patient was permitted to increased weight-bearing status and eventually developed posttraumatic collapse of the avascular talus and nonunion of the ankle that led to severe valgus deformity.

The neurovascular status of the affected lower extremity was intact. The surgical incisions were also healed in the presence of moderate edema and surrounding postinflammatory hyperpigmentation and scar contractures. There was no open wound or evidence of a draining sinus. A fixed hindfoot and ankle valgus deformity was evident, and the patient was unable to ambulate for activities of daily living. A chronic infectious process was suspected but not confirmed by laboratory or nuclear imaging studies. The results of all laboratory tests were within normal limits, and a white blood cell labeled bone scan with a 24-hour delay could not confirm deep infection or osteomyelitis.

Surgical treatment options discussed with the patient included a single and/or staged talectomy with a tibiocalcaneal arthrodesis versus a lower extremity amputation. Based on the preoperative laboratory and medical imaging testing, a single-stage talectomy and tibiocalcaneal arthrodesis with a circular external fixator was performed. Intraoperatively, 2 bone cultures from the talus were obtained along with 1 bone culture from the lateral malleolus. All bone that was resected was also sent for histopathologic analysis. The 2 bone cultures from the talus identified methicillin-sensitive *Staphylococcus aureus*, whereas the histopathologic analysis from the talus was positive for osteomyelitis. Infectious disease consultation was initiated, and medical management consisted of a 10-week course of oral minocycline, 100 mg, twice daily. Postoperatively, the patient was kept non–weight bearing with the circular external fixator for approximately 6 weeks. At that time, all wounds were healed and

the provisional Steinmann pins were removed, whereas the external fixator was modified by attaching a postoperative shoe that allowed the patient to begin partial weight bearing as tolerated. The external fixator was removed at 12 weeks postoperation. The patient first had a walking cast for an additional 4 weeks and then progressed to wearing a shoe with a lift to accommodate for the 3.5-cm limb length discrepancy. At 1-year follow-up, the patient demonstrated successful arthrodesis with no evidence of recurrent infection (**Fig. 1**).

Similarly, in cases with a severe fracture dislocation of the diabetic Charcot neuroarthropathy hindfoot and ankle with or without concomitant osteomyelitis, a 1-stage versus staged talectomy and tibiocalcaneal arthrodesis is performed for osseous and soft-tissue reconstruction. In the presence of large soft-tissue defects with or without osteomyelitis, circular external fixation becomes ideal for lower extremity limb salvage. As described earlier, necessary preoperative and intraoperative laboratory and medical imaging becomes crucial to the surgeon's decision between salvage arthrodesis and lower extremity amputation.

In the diabetic patient with Charcot neuroarthropathy, confirmed osteomyelitis of the talus is most commonly treated with serial surgical debridements, cemented antibiotic impregnated spacers, beads, and staged talectomy with tibiocalcaneal arthrodesis. Internal fixation is usually avoided but may be used when clean surgical osseous and soft-tissue margins are obtained after serial surgical debridements and the patient has completed a prolonged course of antibiotic therapy as directed and monitored by an infectious disease specialist with an interest in diabetic lower extremity pathology and reconstruction. A 1-stage talectomy and tibiocalcaneal arthrodesis is also indicated in the diabetic patient with Charcot neuroarthropathy when there is no history of open wounds or infections in the lower extremity or when the patient presents with a soft-tissue defect but without any evidence of a talar osteomyelitis. Adjunctive therapies including but not limited to negative pressure wound therapy, bone grafting, biologic dressings, and hyperbaric oxygen therapy may also be used in the diabetic patient with Charcot neuroarthropathy (**Fig. 2**).

In both clinical case scenarios, it is important to emphasize the role of the multidisciplinary team approach for the patient's overall successful outcome. Obtaining a detailed and extensive past medical history, laboratory testing, medical imaging, and vascular evaluation and testing in addition to the patient's medical optimization are all important factors in the final diagnosis and surgical treatment of these complex injuries. Intraoperative soft-tissue and osseous cultures, bone biopsy, and histopathologic analysis may later reveal an infectious process as presented with the first clinical case scenario described earlier. A high index of suspicion is paramount with a history of talar AVN related to complicated traumatic wounds or in cases of Charcot neuroarthropathy of the hindfoot/ankle.

DISCUSSION

In the first clinical case scenario, circular external fixation was chosen for the 1-stage talectomy with tibiocalcaneal arthrodesis for several reasons. First, despite a negative preoperative infectious workup with necessary testing, chronic deep infection was still clinically suspected according to the patient's history and clinical presentation. Second, lower extremity deformity correction and postoperative adjustments could have been made with an external fixation device to achieve the desired alignment and successful arthrodesis, and last, circular external fixation could have allowed for earlier weight-bearing status and closer monitoring of the surgical incisions.

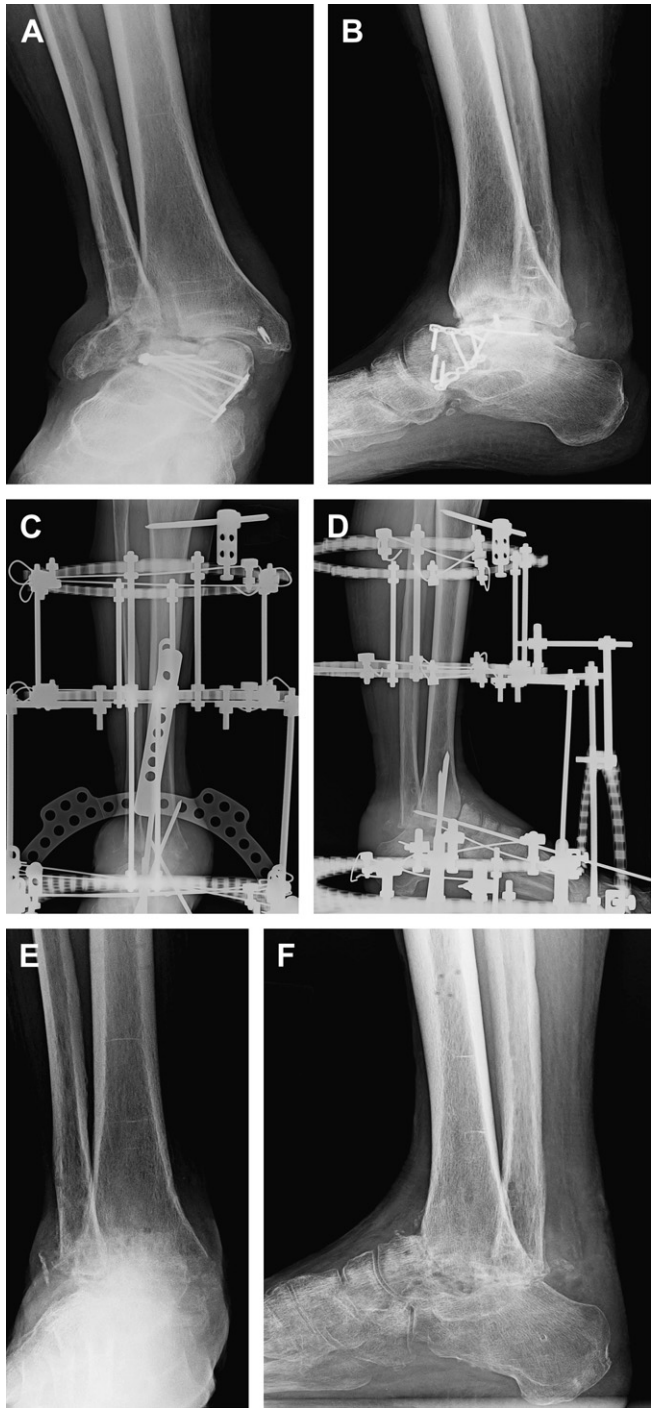

Fig. 1. Preoperative anteroposterior and lateral ankle radiographs (*A, B*) showing the avascular necrosis of the talus with collapse and nonunion of the lateral malleolus with significant valgus deformity and loss of talar height after an open reduction and internal fixation. Postoperative anteroposterior and lateral ankle radiographs (*C, D*) at 2 weeks showing the tibiocalcaneal arthrodesis alignment in 1-stage talectomy with circular external fixation. Postoperative anteroposterior and lateral ankle radiographs (*E, F*) at 1-year follow-up demonstrating successful alignment and union of the tibiocalcaneal arthrodesis.

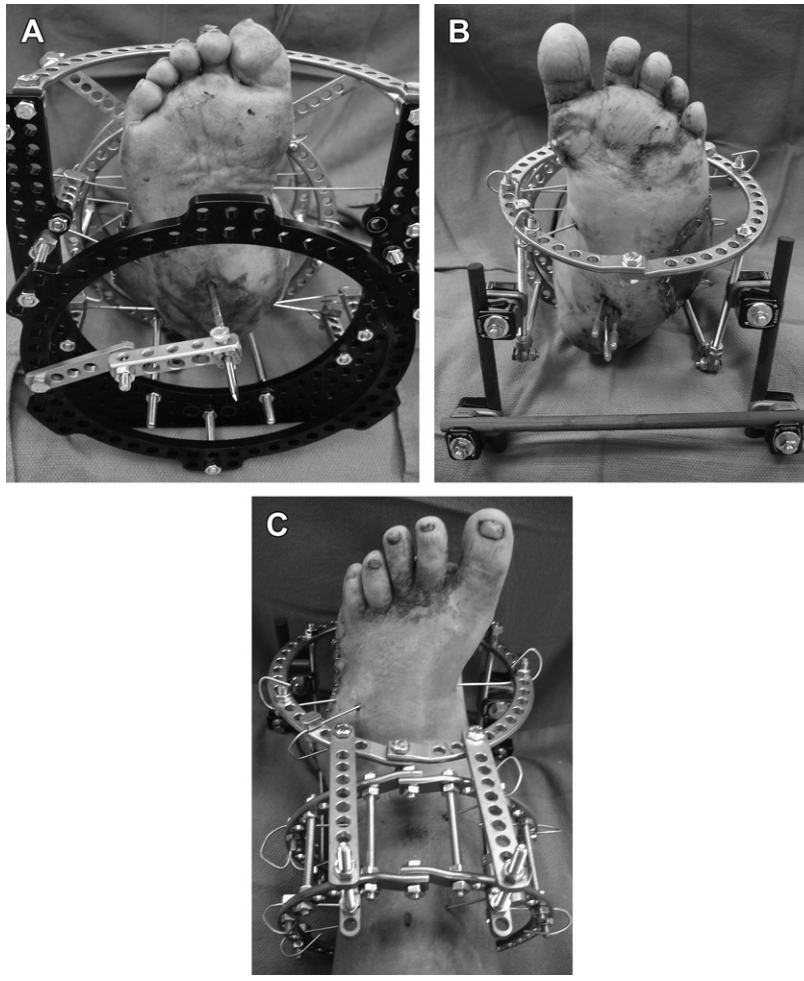

Fig. 2. Clinical case examples using circular external fixation for staged talectomy with tibiocalcaneal arthrodesis procedures in the diabetic patient with Charcot neuroarthropathy. Note the 2 different circular external fixation devices with incorporated Steinmann pin fixation to the external fixation plate (*A*) and locked ankle hinged devices with a forefoot circular ring (*B, C*).

The surgical decision in the diabetic patient with Charcot neuroarthropathy is multifactorial and depends on the patient's overall medical condition, associated comorbidities, presence of soft-tissue infection or osteomyelitis, severity of fracture, dislocation and AVN of the talus, ambulatory status, peripheral vascular disease, body mass index, patient's compliance with medical and surgical treatments, and social support.

Surgical experience for these complex conditions becomes paramount, as latent infections, nonunions, and wound healing complications can lead to lower extremity amputation. The use of circular external fixation among these difficult-to-treat clinical case scenarios may allow for a single or staged reconstruction with a talectomy and tibiocalcaneal arthrodesis. Further studies comparing single versus staged talectomy and tibiocalcaneal arthrodesis among these clinical scenarios is required.

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