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Case Report

Infected talar malunion treated with fresh tibiotalar allograft: A case report

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Abstract

Talus fractures are rare injuries, with an incidence ranging from 0.1% to 0.85% of all fractures. Due to their complex anatomy and specific irrigation patterns, they pose a significant therapeutic challenge for orthopedic surgeons. The talus lacks muscle attachments, receives most of its irrigation through small terminal branches, and bears much of the hindfoot's loads, making it especially vulnerable to avascular necrosis, malunion, and other complications. We present a patient managed with a fresh tibiotalar autograft, with favorable short- and long-term outcomes.

Level of evidence: IV.

Keywords: Talus; Avascular necrosis; Allograft; Reconstruction; Malunion.

Introduction

Talus fractures are rare injuries, accounting for less than 1% of skeletal fractures. They are most often seen in young patients, predominantly men, after high-energy trauma mechanisms, such as traffic accidents or falls from heights[1]. The particular anatomical talus configuration, which articulates with the tibia, fibula, calcaneus, and scaphoid, together with its extensive cartilaginous coverage and the scarcity of muscle insertions, contributes to its delicate vascular supply[1].

The Hawkins classification, established in 1970, remains the reference for assessing vascular compromise. This author described four grades: type I (non-displaced fracture), type II (associated with subtalar joint subluxation), type III (displaced fracture with tibiofibular dislocation), and type IV (additional talonavicular joint dislocation)[2]. As the degree of displacement increases, the risk of avascular necrosis rises, reaching up to 90% in type III[2].

Complications following these fractures are common and include avascular necrosis, pseudoarthrosis, malunion, post-traumatic osteoarthritis, and varus or valgus deformities[3]. Talus avascular necrosis is the most feared, as it can trigger bone collapse and secondary osteoarthritis. Malunion, by contrast, is associated with alterations in joint congruence, progressive deformities, and significant functional deterioration. Its management involves complex reconstructive procedures aimed at restoring joint congruence and limb functionality[4].

Case presentation

A 23-year-old male patient with no significant pathological history, with a recent history of motorcycle vs. car traffic accident, as a motorcycle driver on 12/30/2022, with multiple fractures in the left lower limb; he presented a luxo-open fracture of the left talus, Hawkins classification type III, and an open fracture of the medial and lateral malleolus, Weber classification B. Upon admission, he presented with an analog pain scale (VAS) pain 10/10 with inability to walk due to pain in the left ankle region in bilateral malleoli associated with perimaleolar edema and functional limitation, inability to plantarflexion and dorsiflexion of the foot due to pain, and purulent secretion.

Study performed at Pontificia Universidad Javeriana, Bogota, Colombia.

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Management included open reduction and internal fixation of the tibia and left distal fibula, and repair of the deltoid ligament, performed on 01/10/2023 (Figure 1). This showed partial improvement in pain and secondary stability of the fracture focus.

The patient presented for postoperative follow-up with clinical suspicion of infected talar malunion (pain, local warmth, erythema, edema). Therefore, irrigation and debridement of the left ankle and removal of the osteosynthesis material placed on 02/28/2023 were indicated due to malunion of presumed infectious origin (Figure 2).

Subsequently, definitive treatment of the infected talar malunion was attempted; however, based on intraoperative findings, partial talectomy was performed due to varus collapse, infection, and necrosis of the talar body and neck. An antibiotic-impregnated cement spacer was temporarily placed.

Definitive management was performed with a fresh tibiotalar allograft, with evidence of infection control and concomitant ankle ligament reconstruction. Intraoperatively, a substantial defect was identified in the anterior, medial, and distal tibia; therefore, despite ligament reconstruction, the patient was left with residual varus ankle alignment (Figure 3). The patient was able to ambulate despite these findings.

During outpatient follow-up, the patient reported significant ankle pain associated with ankle osteoarthritis and varus ankle alignment. Therefore, ankle arthrodesis was performed, with intraoperative confirmation that the subtalar joint was healthy, well aligned, and stable. He currently demonstrates a solid fusion, without residual ankle malalignment, and a painless, stable subtalar joint without osteoarthritis (Figure 4).

Discussion

Talus fractures, although uncommon, are associated with high morbidity and a substantial risk of functional impairment. The talar blood supply relies on a complex anastomotic network derived mainly from branches of the posterior and anterior tibial and peroneal arteries. Disruption of this vascular inflow—particularly in displaced or dislocated fracture patterns—may result in avascular necrosis (AVN), with incidence increasing in proportion to fracture displacement as described by the Hawkins classification[2].

The Hawkins sign remains a useful radiographic marker during follow-up to infer talar viability: subchondral resorption is consistent with revascularization, whereas its absence is associated with a higher risk of AVN. When the sign is absent, magnetic resonance imaging is valuable for assessing talar perfusion and guiding timely management decisions[2].

Malunion may occur after inadequate reduction, comminution, or ineffective management of open injuries. Varus deformity is the most common pattern and is associated with altered joint mechanics, soft-tissue contracture, and early development of tibiotalar and subtalar osteoarthritis[2]. Reconstructive strategies should prioritize the restoration of limb length, axial alignment, and joint congruence[2,5,6].

Figura 1. Postoperative radiographs of open reduction and internal fixation of the left tibia and distal fibula.

Fresh total tibiotalar allograft has emerged as a therapeutic option for extensive talar bone loss[3]. A key advantage is the ability to replace the affected segment while preserving hindfoot alignment and height, potentially avoiding the marked shortening and rigidity that may accompany isolated arthrodesis. Fresh allografts may better preserve biomechanical and structural properties, thereby supporting incorporation and osseointegration[3].

In the present case, the allograft facilitated infection control, anatomic restoration, and limb preservation. Nevertheless, progression to post-traumatic osteoarthritis ultimately required tibiotalar arthrodesis, which remains the reference standard for pain relief and stabilization in advanced degenerative disease. Fixation with a locking anatomic plate provides rigid stability, promotes uniform load sharing, and has been associated with nonunion rates below 10%[4].

Figure 2. Radiograph after removal of osteosynthesis material in the ankle with subsequent varus collapse of the left ankle.

Figure 3. Fresh tibiotalar allograft of the left ankle.

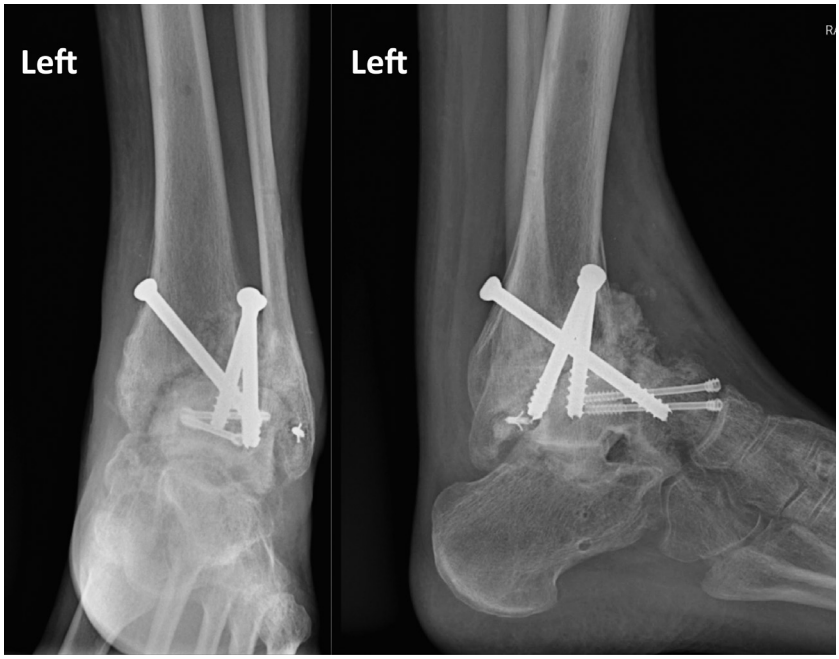

Figure 4. Radiograph after tibiotalar arthrodesis with fresh tibiotalar allograft of the left ankle.

The anterior approach used in this case provides adequate exposure of the talus and ankle joint, enabling correction of alignment and achievement of interfragmentary compression. Recent studies suggest that locking anatomic plates can improve construct stability and may reduce complications in patients with osteopenic bone or relevant metabolic comorbidities[7,8].

Successful outcomes depend on appropriate patient selection, complete eradication of infection, sufficient mechanical stability, and structured rehabilitation. Factors associated with impaired fusion include smoking, diabetes mellitus, obesity, and prolonged corticosteroid use[9]. Optimization of metabolic status and smoking cessation before reconstructive procedures is therefore recommended[9,10].

Functional prognosis after complex talar reconstruction is variable. Although ankle motion is typically reduced, preservation of limb length and stability may allow near-normal gait and improved quality of life[8,11]. Long-term clinical and radiographic follow-up is essential to identify late complications, including graft resorption and secondary osteoarthritis[8,12].

This case highlights the importance of multidisciplinary management for complex talar fractures, in which surgical decision-making must balance eradication of infection with anatomic restoration and functional preservation. Fresh allograft reconstruction is a valuable option in the reconstructive armamentarium, particularly in younger patients, in whom limb salvage and restoration of ambulation are prioritized[5,10].

Conclusions

Talus fractures remain a therapeutic challenge because of their high complication rates, with avascular necrosis and malunion being among the most frequent and functionally consequential. Optimal management requires a detailed understanding of hindfoot anatomy, vascular supply, and biomechanics. In the setting of infection with associated bone loss, a fresh total tibiotalar allograft can serve as an effective option for structural reconstruction.

This case demonstrates that infection control, anatomic restoration, and limb preservation can be achieved using advanced reconstructive techniques. When post-traumatic degeneration or residual deformity persists, tibiotalar arthrodesis remains a reliable adjunct to restore stability and relieve pain. Appropriate patient selection, meticulous surgical planning, confirmation of infection eradication, and structured rehabilitation are key determinants of success.

In young, active patients, limb-salvage strategies such as fresh total tibiotalar allografts may maintain limb length and help avoid amputation, offering a feasible alternative in complex scenarios involving infection and extensive talar bone loss. Although technically demanding, this approach is a valid option in the comprehensive management of complex talar fractures.

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