

TOTAL TALAR EXTRUSION: A Case Report

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INTRODUCTION

Open total talar extrusion is an extremely rare injury with few reported cases in the literature.¹⁻⁸ The limited research is divided between recommendations for talar reimplantation and talar body removal. A number of case reports have described infection and avascular necrosis (AVN) as the leading complication associated with talar reimplantation. Several reports have advocated talectomy with tibiocalcaneal fusion or the use of a talar prosthesis.^{5,7,9} Because the injury is so rare, there is no consensus on the appropriate treatment protocol for a total talar extrusion. Limited follow-up has also been reported in literature. We report our experience with a talus completely extruded out of the skin with no occult fractures and the results of reimplantation.

CASE REPORT.

A 44-year-old obese woman fell off of the third step of a ladder and sustained an open total extrusion of the talus through a 12 cm wound on the anterior lateral aspect of her right ankle (Figure 1). The talus was completely extruded through the skin with a single strand of soft tissue attached to the dorsal aspect of the talar neck. There were no associated fractures of the talus and the neurovascular status of the extremity was not compromised.

Radiographs of the right ankle and foot (Figure 2)



Figure 1. Photograph of the ankle and the extruded talus.



Figure 2A. Preoperative anteroposterior radiograph of the right ankle.



Figure 2B. Preoperative lateral radiograph of the right ankle.



Figure 3. Intraoperative photograph of the extruded talus.



Figure 4B. Immediate postoperative lateral radiographs of the right ankle.



Figure 4A. Immediate postoperative anteroposterior radiographs of the right ankle.



Figure 5. Anteroposterior radiographs of the right ankle at the 12 week follow up exam.

revealed the extruded talus anterior and lateral to the ankle mortise. There was complete dislocation of the talus from the tibiotalar, subtalar, and talonavicular joints. A computed tomography scan of the right ankle was performed to confirm the absence of any fractures.

Upon arrival in the emergency room, the patient was administered 2 grams of Cefazolin and 80 milligrams of Gentamycin intravenously. She was also given a tetanus toxoid booster. Bedside irrigation was performed and the talus was wrapped in saline soaked gauze. The patient was taken to the operating room within 3 hours of the injury.

Under general anesthesia, the wound was irrigated with a pulsatile lavage with 9 liters of sterile normal saline. The talus was irrigated and gently scrubbed with a Bacitracin/saline solution (Figure 3). The single strand of

soft tissue attached to the talar neck was left intact. The talus was placed back in its anatomic position without difficulty. An external fixator was placed in a delta configuration across the right ankle with two pins in the proximal tibia and a transosseous pin through the calcaneus. The ankle was stabilized in a neutral position. Polymethylmethacrylate beads mixed with 1 gram of Vancomycin and 80 milligrams of Tobramycin were placed in the wound bed and the wound was reapproximated with retention sutures (Figure 4).



Figure 6A. Weight-bearing photograph of the right ankle at the 4 month follow up exam.



Figure 6B. Weight-bearing photograph of the right ankle at the 4 month follow up exam.

Intravenous administration of Cefazolin 1 gram was continued every 8 hours for 72 hours. Gentamycin 80 milligrams was started preoperatively and administered intravenously every 12 hours for a total of 3 dosages. The patient was kept nonweight bearing and placed in a posterior splint.

Forty-eight hours after the injury, the patient returned to the operating room for repeat irrigation with a pulsatile lavage and 9 liters of sterile normal saline. The antibiotic impregnated beads were removed and the wound underwent delayed primary closure.

The external fixator was left in place for 6 weeks and the wound healed without complication. After removal of the external fixator, the patient was placed in a below the knee cast and kept nonweight bearing for an additional 6 weeks. At 12 weeks, radiographs (Figure 5) showed no signs of AVN and the patient was allowed to begin progressive weight bearing.

No intraoperative or postoperative complications occurred. At the 4 month follow up, the patient was full weight bearing without the use of an assistive device (Figure 6). The patient was very satisfied with the results obtained. At the most recent follow up, the patient reported no pain with weight bearing and painless range of motion about the right ankle. Physical examination revealed greater than 5 degree of dorsiflexion of the right ankle, which was markedly better than the unaffected extremity. The patient had unrestricted subtalar joint motion. Radiographs demonstrated mild tibiotalar joint spaces narrowing and there were no signs of AVN.

DISCUSSION

The total extrusion of the talus is an extremely rare injury that results from a high-energy trauma. Early literature describes talectomy with tibio-calcaneal arthrodesis as the treatment of choice for an open total talar dislocation.⁹ In recent years, talar reimplantation has been advocated.^{1-4,6} When choosing a treatment plan, the physician must be aware of the common complications associated with this high-energy injury. Infection and AVN are of chief concern when treating an open talar extrusion.

Sixty percent of the talus is articular cartilage and it has no muscular attachments. The anatomy of the talus makes it vulnerable to injury. Extreme supination and plantarflexion forces cause dislocation of the talus out of the ankle mortise, disrupting its strong ligamentous attachments, often resulting in open injury. As in our case, most reports in literature describe an anterior lateral ankle wound with the talus extruded laterally.¹

The blood supply to the talus has been well described.¹⁰ It is an intricate arrangement of vessels highly vulnerable to injury. The anterior tibial, posterior tibial, and perforating peroneal arteries serve as the vascular supply to the talus. The artery of the tarsal canal is a branch off of the posterior tibial artery and it supplies most of the talar body, the medial talar wall, and the undersurface of the talar neck. The artery of the tarsal canal anastomoses with the artery of the sinus tarsi, which is a branch off of the perforating peroneal artery, to supply the inferior talar body and neck.¹¹ As the talus dislocates from the ankle mortise, there is a sequential failure of the talar blood supply. With total talar dislocation

and extrusion, there is a total disruption of the talar blood supply and an increased risk of vascular crisis. Hiraizumi¹ concluded that the risk of AVN was higher in cases in which no soft tissues were attached.

In the early postoperative phase, the development of AVN is very difficult to predict. It can be observed anywhere between 6 months and 2 years post-injury. The Hawkins sign is the only early predictive sign that can be seen on conventional radiography. It is characterized by subchondral radiolucency in the talar dome, which is visible 6-8 weeks post-injury.¹² The Hawkins sign is prognostically favorable and it almost exclusively rules out the presence of AVN.¹³ In the case that AVN develops, there is a dichotomy in the recommended treatment protocol. Historically, many authors have advocated nonweight bearing or protected weight bearing until the AVN resolves.¹⁻² However, there is no definitive evidence to suggest that full weight bearing in the presence of AVN leads to secondary complications such as collapse of the talar dome and tibiotalar arthritis.¹⁴⁻¹⁵ Smith¹⁶ suggests that even in the face of talar collapse, talar reimplantation imparts the advantage of retained height and bone stock. Tibiocalcaneal fusion can be performed as a salvage procedure.

Soft tissue infection and the potential for acute and chronic osteomyelitis must be considered. Marsh¹⁷ reported on 18 open injuries of the talus, 12 of which were partial or total talar extrusions. Their overall infection rate was reported as 38%. The authors were able to directly correlate the degree of soft tissue injury with the degree of infection. Smith¹⁶ treated 27 open talar extrusions over a 9-year period and identified only 1 infection that occurred in the initial hospitalization period. They contributed their low infection rate to staged procedures, multiple debridements, early soft-tissue closure, and rigid fixation. Recent recommendations include preservation of the talus except in the case of gross contamination.¹ Stevens⁷ reported on a pediatric total talar extrusion that was initially treated with talar reimplantation. The reimplantation failed due to infection and a custom talar prosthesis was made for the patient. If infection occurs after reimplantation, a secondary talectomy and tibiocalcaneal fusion can be performed as a salvage procedure.³

A review of literature has presented multiple case studies where talar reimplantation after a total talar extrusion has led to a favorable outcome.^{2-4,6,7} If the talus can be anatomically reduced, AVN and talar collapse are not inevitable.^{2,4} The incidence of infection can be decreased with proper open fracture protocol and careful soft tissue handling.^{4,6,16} In the case of severe contamination and/or delayed time to re-implantation, talectomy and tibiocalcaneal arthrodesis must be considered.¹

In conclusion, patients with a totally extruded talus represent an extremely high risk population. However, these patients can function normally again if the proper treatment protocol is selected. Our clinical experience is in line with other recent case reports. The timely administration of antibiotics, staged open fracture protocol, early stabilization, and close follow up led to a favorable outcome for our patient. We recommend that talar reimplantation be performed whenever possible. Restoration of the talus in the ankle mortise allows the surgeon to maintain normal hindfoot anatomy. The risk of AVN and infection are not inevitable. Primary talectomy and tibiocalcaneal fusion should be saved as a salvage procedure.

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