Reconstructive Surgery for Complete Talus Extrusion Using the Sandwich Block Arthrodesis: A Report of 2 Cases

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Total extrusion of the talus is a rare and severe injury of the foot. If the talus is viable and can be repositioned, the outcome is unpredictable and mainly depends on whether infection and/or avascular necrosis ensues. If the talus is actually missing, the surgeon is faced with extensive bone loss and destruction of the ankle. In this report, we present 2 cases of total talus extrusion treated with the sandwich block tibiocalcaneal arthrodesis with structural autografts harvested from iliac crest. The surgical technique is reviewed in detail, and its application in 2 male patients who had a complete talus fracture-dislocation and a dislocation, respectively, is described. Follow-up after 18 years and 1 year, respectively, showed favorable clinical outcomes and only minor restrictions in daily activities. In light of these case reports, we believe that the sandwich block arthrodesis offers a useful alternative for the treatment of these serious lower extremity injuries. (The Journal of Foot & Ankle Surgery 46(6):493–498, 2007)

Key words: ankle fusion, arthrodesis, dislocations, open fracture, peritalar arthrodesis, talus

Total extrusion of the talus is a rare injury, even by the standards of a busy trauma center (1). For this reason, total extrusion of the talus remains primarily an issue for case reports and literature reviews (2, 3). A better understanding of the long-term outcome after surgical treatment of these injuries continues to be of interest to foot and ankle surgeons. The injury, specifically, entails total extrusion of the talus and represents an open, triarticular dislocation with dislocation of the ankle, subtalar, and talonavicular joints. This complete dislocation has been described as "luxatio tali totalis" (4). Incomplete extrusion of the talus consists of open fracture dislocations wherein the talus retains residual soft tissue attachments to the limb. Complete talus extrusion represents the worst case scenario for these injuries and involves disruption of all of the soft tissues that attach to the talus. The proposed mechanism of injury is a combination of tibiotalar (ankle) plantarflexion, rather than dorsiflexion (extension), coupled with either excessive subtalar supination or pronation (5, 6). The most common cause of this injury is a motor vehicle accident, and most of the victims are highly active patients aged 20 to 40 years (2–8). As a result of the violent forces required to extrude the talus from the body, the surgeon caring for patients with this injury faces a number of serious challenges, including malleolar fractures (2, 5), grossly contaminated tibiocalcaneonavicular voids, avascular necrosis (AVN) of the talus, and contaminated and severely damaged talar fragments found outside the body. In addition, at times, the entire talus is, or substantial fragments of the talus are, lost and not retrievable (2, 3, 5, 8). After a thorough review of the literature, we identified 8 cases of total extrusion of the talus and, in 5 of these cases, the talus was missing at the time of admission (2, 3, 5, 6, 8, 9). Because of the rarity of total extrusion of the talus, there is a lack of experience with this injury. Consequently, treatment options for this severe injury are scarce. In 1990, in a technical description and report of the outcome after ankle arthrodesis, the senior author (U. H.) described a sandwich block technique for tibiocalcaneal arthrodesis for the severely damaged talus (10). In this report, we describe the long-term outcome of 2 patients who had talar extrusion injuries that were treated with tibiocalcaneal sandwich block arthrodesis using bicortical iliac crest autografts and lag-screw compression osteosynthesis.

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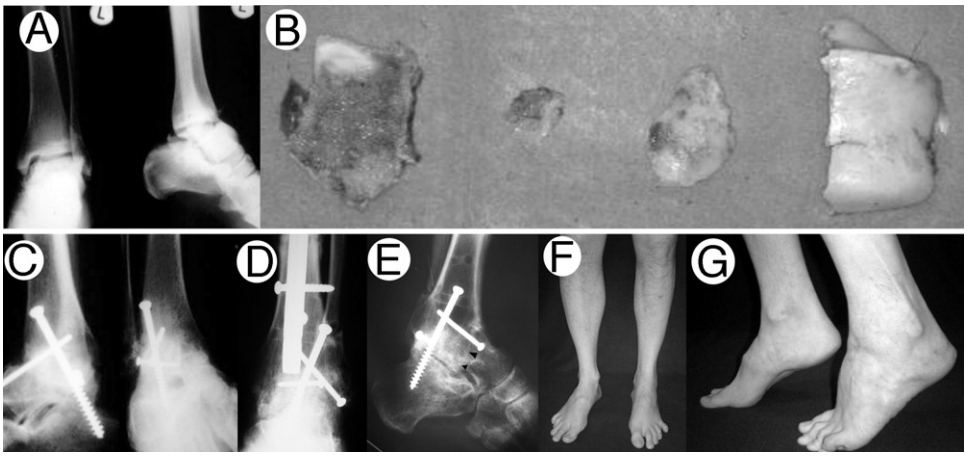

FIGURE 1 Case 1. (*A*) Complete fracture-dislocation of the talus following reduction. (*B*) Four weeks after index procedure avascular fragments resembling the talus corpus and neck were removed. (*C*) Tibiocalcaneal sandwich block arthrodesis performed. (*D*) Patient suffered a closed tibial shaft fracture, which was successfully treated elsewhere with the Ilizarov technique and antegrade nailing 17 years after the index procedure. The nail was removed 3 months prior to final follow-up. (*E*) After 18 years, follow-up radiographs depict solid tibiocalcaneal arthrodesis as well as fusion of the cubic sandwich block with the remainder of the talus head (arrow heads). (*F* and *G*) The patient shows good functional outcome with full strengths at the left calf and a balanced gait.

Case Reports

Case 1

In 1987, a 23-year-old man fell of a cliff, which resulted in a closed right-sided Lisfranc dislocation injury with an avulsion fracture of the base of the fifth metatarsal bone, as well as a left-sided, combined, complete open anterior talus fracture dislocation. Initial treatment in a referral hospital entailed cleansing and replacing the retrieved, totally extruded talus, followed by temporary bracing and initiation of antibiotic therapy. After transfer to our clinic in the Department for Traumatology and Reconstructive Surgery, at Katharinenhospital, in Stuttgart, Germany, the patient underwent tension band wiring of the right fifth metatarsal base as well as open reduction of the Lisfranc injury with temporary Kirschner wire (K-wire) fixation, and resection of the already avascular fragments of the left talus via the open wound created by the original injury (Figure 1). Surgical inspection of the wound revealed the persistence of the head of the talus, fragments of the lateral talar process, anterolateral and anteromedial fragments of the posterior facet of the body of the talus, and vitalized shreds of capsule and periosteum. Residual cartilage was resected, and the margins and surfaces of the residual viable bones were freshened. Afterward, sandwich block arthrodesis of the tibia, calcaneus, and head of the talus was performed with the use of 2 bicortical iliac crest autografts that were lagged together to form a bony cube to fill the void created by extrusion of the majority of the talus. The sandwich block graft was then fixated to the surrounding, viable bones with long lag screws. The wound was closed in layers over 2 closed-suction drains, and the patient was immobilized for 8 weeks in a plaster-of-Paris cast and allowed to bear weight only on the right lower extremity, which was also immobilized in a plaster cast. He was referred to a hospital in his hometown for ongoing care after suture removal, and he underwent an unremarkable course of surgical wound healing without developing a wound infection or AVN. After 1 year, follow-up radiographs showed bony union throughout the arthrodesis.

Eighteen years after the injury, the patient was invited for a follow-up consultation, at which time he reported that he had undergone successful treatment of a left tibial shaft fracture with the Ilizarov technique followed by antegrade intramedullary nailing and subsequent removal of the nail. Despite having sustained the tibial shaft fracture and subsequent operative treatment, he reported experiencing only slight pain at the site of the left ankle sandwich block arthrodesis. He denied any restrictions related to the activities of daily living and was able to walk on all types of surfaces for any distance. In stance and gait, he displayed no evidence of a limp, and he denied any regular use of analgesic or antiinflammatory medication. He noted that he experienced slight imbalance while standing on the left foot because of lack of motion, and he related a vague soreness in the distal leg in association with increased barometric pressure (wet weather). Finally, he denied ever experiencing morbidity in relation to harvesting autograft from the iliac crest. The patient's clinical appearance and radiographs, 18 years after sandwich block arthrodesis, are shown in Figure 1.