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Total Talar Prosthesis Replacement after Talar Extrusion

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ABSTRACT

Dislocation of the talus is a serious and extremely rare injury, with 86 cases reported in the published data in 20 years. The reference standard for case management involves replacement of the dislocated talus to restore the height and function of the tibiotalar joint. The risk of avascular necrosis remains very high, and the standard treatment in such cases is tibiotalar arthrodesis. We report the case of total dislocation of the talus, which was treated with the insertion of a custom total talar prosthesis affixed directly to the tibial cartilage at 6 months after injury. At the 2-year follow-up point, the preliminary results were rather encouraging, with well-functioning activity and an improved American Orthopaedic Foot and Ankle Society foot function scale score increasing from 11 to 77 of 100 and a Short-Form 36-item Health Survey score increasing from 17 to 82. Much longer follow-up periods are necessary to evaluate longer term trends.

Although a peritalar dislocation is an uncommon injury, total dislocation (or luxation) of the talus is an exceptionally severe trauma (1–6). Weston et al (1) found only 86 cases referenced in 39 published studies during a 20-year period. A totally dislocated talus is exposed to a grave risk of avascular necrosis and infection (1–6). Emergency care aims at conserving the dislocated talus, such that the stability and the integrity of the joint can be restored. The intent is also to maintain the structure of the mid- and back-foot to keep functional sequelae to a minimum (1–6). This approach has been rather promising, with 72% of patients having fairly good to good subjective results (1). Whenever osteoarthritis or necrosis develops, the current reference standard is total arthrodesis (1). In contrast to this, a study from Thailand (7) described the surgical insertion of a prosthesis replacing the talus.

We report the preliminary results of the first European case of a prosthesis replacing the talus in the aftermath of severe talocrural trauma.

Case Report

A 51-year-old patient experienced a climbing accident that resulted in forced varus trauma of the tibiotalar joint. This severe ankle sprain caused an open skin wound and resulted in a tear in the lateral collateral ligament and total extrusion of the talus. The patient was secondarily transferred to us from the first hospital for treatment of this complex injury.

The computed tomography scans taken on arrival at the first hospital revealed a clear space in the tibiotalar interval, corresponding to the missing talus (Figs. 1 and 2). The wound was situated transversely below the lateral malleolus. Clinically, no distal neurovascular injury was detected.

Emergency surgery was performed, which consisted of abundant cleansing of the joint and trimming and excision of the contused subcutaneous tissues. An antibiotic cement spacer was positioned to stabilize the clear space and avoid capsular ligament retraction and was molded to fit against the adjacent joint surfaces (Fig. 3).

The immediate follow-up examination was uneventful, with optimal healing of the skin and absence of potential infection from the opening of the joint or the delay in the secondary transfer to our institution. In the initial postoperative days, the option of total arthrodesis (tibiotalar, subtalar, and talonavicular joints) was raised. The patient was immediately adverse to a “panarthrodesis,” because it would compromise, both medium and long term, the possibility of

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Fig. 1. Preoperative radiograph showing the talus completely missing.

returning to his previous level of sporting activities. He was especially adverse because he was a very active sportsman, intensely participating in climbing, cycling, and hiking in the mountains.

After our research of studies performed in Asia, we proposed, in collaboration with the patient and Wright Medical-Tornier (Montbonnot, France), a project we developed to replace the talus with a custom total talar implant made of cobalt-chromium alloy and directly affixed against the tibial cartilage and navicular bone, both completely undamaged after the initial injury. Once this project was accepted, the patient was allowed to walk with a special cast to applied relieve the mid- and back-foot and fully preserve the distal tibial cartilage, which would not be worn down by contact with the cement spacer. The patient provided informed consent, and several meetings were held with the surgeon and the engineering team that designed the implant.

To create the total talus prosthesis, we first performed a computed tomography scan of the contralateral talus that allowed us to form 3-dimensional images of a model of the missing talus and replicate an intact talus. Starting with this model, we decided that to stabilize the implant, we would fix it into the calcaneus by performing a subtalar arthrodesis bonded with a hydroxyapatite coating on the caudal face of the implant and reinforced with two 6.5-mm diameter screws. This would ensure that the prosthesis remain compressed against the calcaneus. To facilitate insertion of the implant into the space left by the resection, we reduced the dimensions of the prosthesis by 3% of the actual size of the talus. Finally, we produced a 3-dimensional image of a prototype for use as the basis to create the final custom-made cobalt-chromium implant coated with hydroxyapatite on its caudal face (Figs. 4 and 5).

The patient underwent surgery 6 months after the initial injury. We removed the cement spacer using a direct anterior approach and installed the prosthesis after abrading the cartilage of the calcaneus. The implant was attached with two cancellous 6.5-mm screws to transfix the anterior and posterior subtalar joint. We decided intraoperatively not to perform internal or external ligamentoplasty owing to the severe stiffness of the ankle. Also, we preferred not to overconstrict the joint to preclude the onset of pain from excessive tightness.

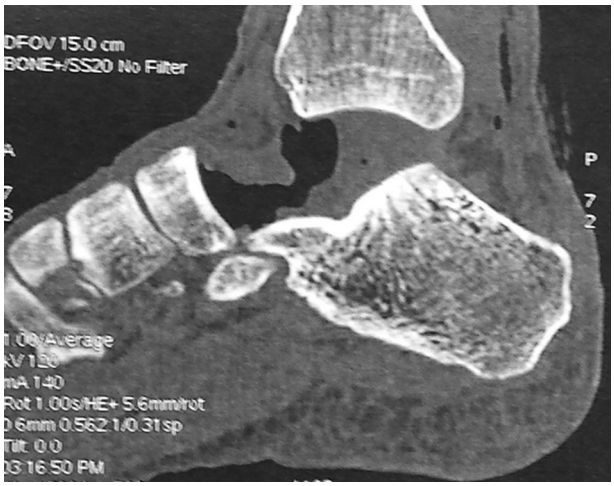

Fig. 2. Computed tomography scan, sagittal view, showing the talus completely missing.

Fig. 3. Postoperative follow-up radiograph showing the spacer positioned in the tibiotalar space.