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Case report

Treatment and outcome of open dislocation of the ankle with complete talar extrusion: A case report

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ABSTRACT

Background: Open total talar extrusion is a severe, disabling ankle injuries. The most appropriate treatment (reimplantation versus talar body removal and tibiocalcaneal arthrodesis) is still a controversial challenge; outcomes and fearful potential complications are not predictable.

Objective: To report the case of an open ankle dislocation with talar extrusion, focusing on treatment modality and outcomes.

Method: Immediate reduction, surgical debridement and external fixation were performed under antibiotic coverage. Wound closure was achieved with accurate debridement, postoperative strict clinical surveillance and meticulous handling of medications. The patient maintained external fixator for three weeks, then kept non-weight bearing with a cast for an additional four weeks.

Results: The patient's wound healed with no complications. Full weight-bearing was gained at 12 weeks postoperation. At 18 months postoperatively, the patient did not develop any infection or avascular necrosis, which are the major complications associated to talar extrusion.

Conclusions: Good treatment procedure for a such severe open trauma, based on accurate debridement, wound care and stable temporary immobilization with external fixation allow reduction of infection risk and made preservation of extruded talus a successful option to preserve function and normal hindfoot anatomy at first instance. Talcotomy should be considered as a salvage procedure.

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1. Introduction

Open total talar extrusion is rare but it is one of the most severe, disabling ankle injuries. It requires a high-energy trauma and it is often accompanied by severe soft-tissue damage, wound contamination and fractures of the malleoli, talar body or neck [1]. Complete dislocation of the talus without a concomitant fracture is extremely rare, estimated at 0.06% of all dislocations and 2% of all talar injuries [2,3]. It was first reported by the German surgeon Fabricius Hildanus in 1680 and treated by talcotomy [4]. Given the rarity of this type of injury, current literature describes only few case reports and small series with limited follow-up [1,5–9]. Since indications for talar reimplantation versus talar body removal are still controversial, there is no established treatment protocol

yet [8,10]. It is well demonstrated that disruption of the vascular supply and contamination lead to major complications, such as infection, osteomyelitis and avascular necrosis (AVN). The high risk of these complications is associated both with the traumatic ankle injury itself and subsequent talar reimplantation into the mortise [6,11–13]. On the other hand, early talcotomy with tibiocalcaneal arthrodesis have not demonstrated satisfactory results [8,11,13]. We report the case of an open, complete dislocation and extrusion of the talus, focusing on outcomes of talar reimplantation and the importance of prompt reduction, debridement and external fixation for a favorable prognosis.

2. Case report

A 17-year-old man injured his left foot in a motorcycle accident on February 2012. The patient was brought to the Emergency Department of our level-II Trauma Center 30 min after the accident. The vital findings of the patient were stable; clinical examination revealed a 15-cm transverse skin cut on the anterolateral side of the ankle and the tibio-fibular mortise was exposed with the talus completely enucleated laterally; soft tissues of the ankle were

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Fig. 1. Clinical picture. Clinical presentation of the injured ankle with total talar extrusion.



Fig. 2. Post-injury presentation. Photograph of the ankle after talar reduction and reimplantation.

contaminated and seriously damaged (Fig. 1). There were no associated malleolar fractures, or grossly apparent fracture of the talus nor articular cartilage damage. The dorsalis pedis and posterior tibial arterial pulses were absent. Thus, after a quick irrigation with saline solution and povidone iodine, an immediate manual traction was applied to the calcaneus and pressure was exerted in posteromedial direction holding the foot in extremely supination, thus placing back the talus in its physiological position (Fig. 2). The talus was loosely held by a few remaining capsule-ligamentous strands, which were left intact and reapproximated anatomically upon reduction. Standard radiographs were not obtained because of the urgency to treat the open injury. Arterial pulses got back to being palpable after reduction of talar dislocation. Broad-spectrum intravenous antibiotics were administered. The patient was brought to the operating room within 1 h from the injury to complete

the surgical procedure. Intraoperatively, the soft tissues of the anterolateral side of the ankle were severely crushed and grossly contaminated with grass and asphalt. Under general anesthesia, the wound was irrigated with saline solution, chlorhexidine, povidone iodine and hydrogen peroxide; repeated irrigations were then performed by using 5 L of normal saline solution and gentamicin. After irrigating and debridement, the wound was explored to ensure that neurovascular structures, tendons, and bones were intact. After a fluoroscopic control of the left foot and ankle, a temporary stabilization of the ankle was obtained by using an external fixator Hoffmann® II System (Stryker Trauma AG, Selzach, Switzerland) in a delta-frame construct across the left ankle with two pins in the tibial diaphysis, two transosseous pins through the calcaneus and one through medial cuneiform, and the ankle was stabilized in a

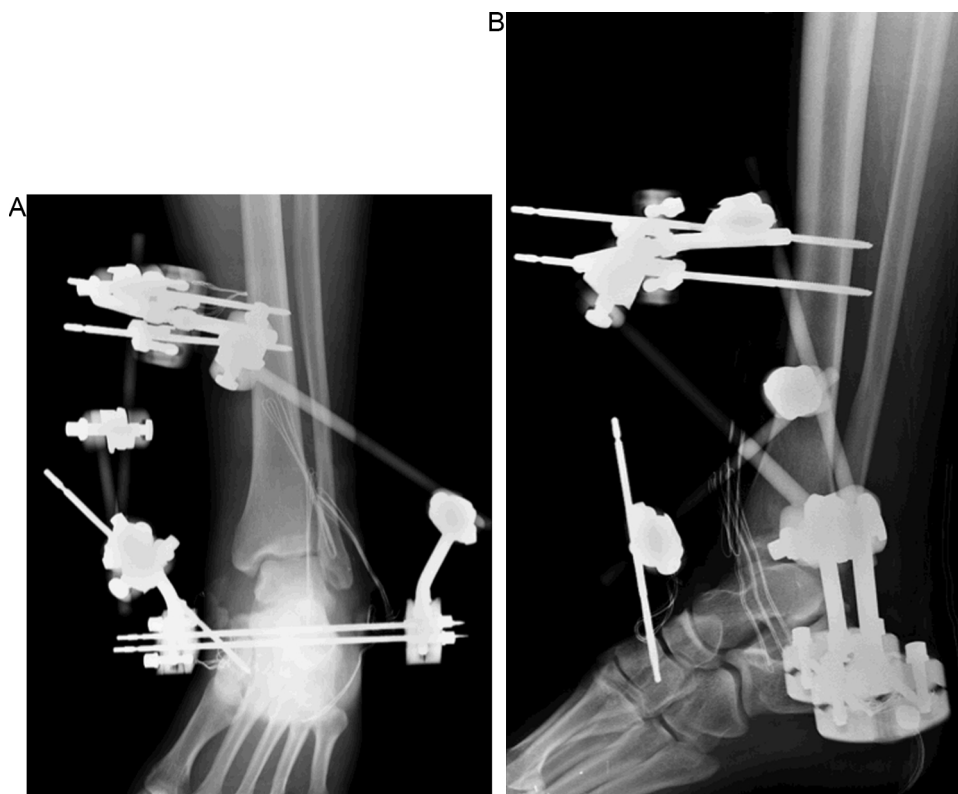


Fig. 3. External fixator positioning. (A) Postoperative anteroposterior radiographs showing external fixator positioning (B) lateral radiographs of the operated ankle.

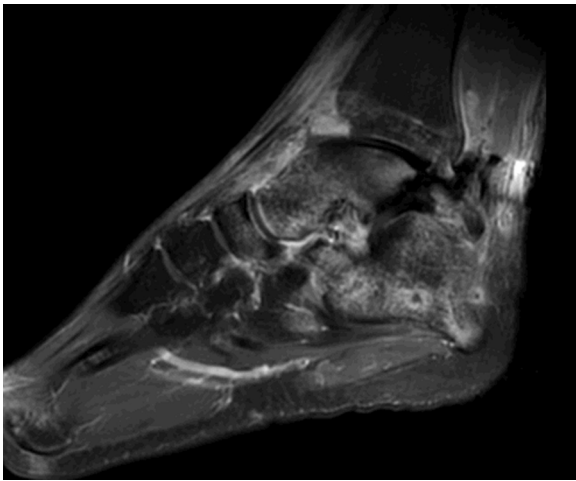


Fig. 4. MR image follow-up. Six weeks postoperative MR image documented post-traumatic sequelae of the ankle trauma with no early signs of avascular necrosis of talus.

neutral position (Fig. 3A and B). The wound was primarily closed with few non-absorbable monofilament nylon sutures. Following the operation, the patient was admitted to the Orthopedic and Traumatology Department of our hospital: the wound was managed with daily medication favoring promptly appearance of granulation tissue with no clinical evidence of local infection; intravenous



Fig. 5. Three months post-operative radiographs. Three months postoperative anteroposterior radiographs of the left ankle.



Fig. 6. Clinical follow-up. Range of motion of the left ankle at 18-month follow-up exam.

antibiotic therapy was maintained for seven days until fever remission. Low-molecular-weight heparin was given subcutaneously daily until the patient was mobilized. Doppler examination of the pulses did not show any vascular deficits and postoperative radiographs showed anatomical contours of the foot and ankle with restored joint anatomy. The patient was discharged after two weeks from trauma in good clinical conditions and was kept non-weight bearing on the affected foot; walking on two crutches, medication of the wound and fitches of the external fixator every three days and oral antibiotic therapy for additional 10 days were prescribed. The external fixator was left in place for three weeks; then it was removed and the wound was inspected and overhauled with escharectomy. The patient was placed in a below-the-knee cast with the ankle fixed at 90° dorsiflexion and kept non-weight bearing for an additional four weeks. The wound healed without complication. At six weeks postoperative, X-rays showed only mild tibiotalar joint spaces narrowing with no signs of post-traumatic arthritis; MR image documented small post-traumatic chondral defects on the articular surface of the talar head and the anterior articular apophysis of calcaneus and cuboid, with calcaneal bone bruise (Fig. 4). At 12 weeks postoperative on May 2012, radiographs (Fig. 5) showed no signs of avascular necrosis of the talus, and the patient was allowed to begin progressive weight bearing in a removable cast boot. By four postoperative months, the patient was full weight bearing without the use of an assistive device. At 18 months (September 2013) after operation, the patient reported no pain with weight bearing and painless range of motion of the left ankle. Range of motion of the left ankle joint was greater than 10° of



Fig. 7. Follow-up at 18 post-operative months. (A) Anteroposterior and lateral radiographs of the ankle at 18-month follow-up (B) MR image at 18-month follow-up. No signs of avascular necrosis or tibio-talar arthritis are found.

dorsiflexion and 40° of plantarflexion, similarly to the right ankle; the subtalar joint showed a limited range of motion as if for stiffness (Fig. 6). Imaging examinations showed mild tibiotalar joint spaces narrowing with no signs of arthritic changes nor avascular necrosis (Fig. 7A and B).

3. Discussion

Talar dislocation is open and anterolateral in most than 50% of all reported cases [1,14,15]. Even if the lack of muscular attachments theoretically makes the talus vulnerable to dislocation, this event occurs rarely because of its deep position in to the tibio-peroneal mortise [5,14]. Leitner [2] described a 3-stage mechanism of antero-lateral dislocation: talar extrusion can be considered as the final endpoint of a combined movement of maximum subtalar supination and tibiotalar plantarflexion that pull the talus out of the ankle mortise. A high-energy trauma is usually responsible, such as a fall from a height or a motor vehicle accident, and tibiotalar or subtalar dislocations can be eventually associated with malleolar fractures until complete lateral extrusion of talus [1,6]. In case of extrusion, the talus can remain attached to the body by capsular attachments, as in our patient, or expelled through the skin and missing at the time of initial presentation [6,14].

Such injuries are potentially catastrophic; besides poor functional outcomes, they are associated with gross wound contamination, severe soft-tissue damage, disruption to the talar dome blood supply, leading to AVN and infection that are the most common complications [1,10].

Anterior tibial, posterior tibial and perforating peroneal arteries with their anastomoses serve as the vascular supply to the talus. The occurrence of AVN is determined by the injury of these anastomoses and the amount of soft tissue damage [8,14]. If strands of the superior talonavicular ligament remain attached, AVN may be avoided [1]. In the early postoperative phase, the development of AVN is very difficult to predict [8]. MR imaging remains the most specific and sensitive exam to detect early development of AVN [1]; it can be observed from six months to two years post injury although posttraumatic arthritis may develop after more than 10 years [5,8,9]. Our patient had no evidence of AVN after 18 months after surgery.

Open talar dislocation is frequently complicated by soft tissue infection with potential acute or chronic osteomyelitis: infection rate actually ranges from 25% to 38% of cases [9,12] versus 88.9% initially reported by Detenbeck and Kelly [11]. Throughout the years, infection risk has been minimized through improvement of staged procedures for wound care and soft-tissue handling and appropriate antibiotic therapy [5,8,9].

Treatment options vary from primary talectomy with early tibio-calcaneal arthrodesis [11] to more recently suggested talar reimplantation after thorough debridement [5,7–10]. Many authors [5,7,8] suggest that, despite the high risk of infection or post-AVN talar collapse, talar reimplantation gives the advantage of retained height and bone stock. In some recent case reports and little case series, satisfying short- and long-term clinical outcomes have been reported after preservation and reduction of the talus as the first method of choice [1,9,10]. Conversely, in case of severe

contamination, complete extrusion and/or delayed time to reimplantation, primary talectomy and tibiocalcaneal arthrodesis are advised [13,14]. Risk of osteomyelitis and AVN increases with time that elapses between talar exposure and reimplantation: many cases reported in the literature differ from immediate (30 min) up to eight days-delayed treatment [1,6,8,9,13,14]. On the whole, prognosis is favorable if reimplantation is performed within 3 h, whereas patients treated after 24 h show to be doomed to failure and secondary tibiocalcaneal arthrodesis.

In spite of potential and not predictable sequelae, at the last follow-up (18 months), the patient experienced none of the major complications associated with total talar dislocation. In our opinion, these successful outcomes can be attributed to a combination of patient's local and systemic conditions along with the immediate proper intervention on bone and soft tissue injuries. The patient was young, healthy, with no other injuries nor particular risk factors for infection or AVN, which can affect more adult patients (diabetes, vascular diseases, etc.). The adequacy of soft tissue envelope for wound closure and the proper treatment of wound contamination led the Authors to attempt an immediate primary closure; however, the contamination was judged too much severe for wire transfixation or any other internal devices, thus a tibiocalcaneal external fixator was preferred. External fixation demonstrated to be a valuable tool for the management of such major trauma as a total talar dislocation; it was an effective mechanical solution for ankle immobilization and contemporary a handy option for management of daily wound medication. However, AVN and arthritis are not inevitable [5,8,13]; considering the young age of our patient, long-term postoperative follow-up is warranted. If infection or AVN would occur at distance after reimplantation, a secondary talectomy and tibiocalcaneal fusion shall be considered as a salvage procedure [10,13].

In conclusion, open total talar dislocation is a fearful injury and the treatment is challenging: immediate reimplantation of the talus is a valuable procedure to avoid talectomy and tibio-calcaneal arthrodesis at first instance. The latter entails severe functional loss and should be considered only as secondary option in case of talar salvage failure. Obviously, tibio-talar reduction must be correctly performed, preserving all viable soft tissues, and combined to serial irrigation and multiple debridements, early soft tissue closure and rigid fixation with lasting soft-tissue care and timely administration of antibiotics. In our opinion, the presence of remnants of

capsular attachments along with the young age are favorable factors concerning the AVN prognosis. All patients should be informed of the uncertain long-term prognosis and the possibility of further reconstructive procedures.

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None.

Conflict of interest statement

The authors state they have no conflicts of interest.

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