CASE REPORT

Management of exposed talar body fracture-dislocation with bone extrusion: A case report

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ABSTRACT

Talus fractures are often related to high-energy trauma and are associated with exposed lesions in 20-25% of cases. Open fracture dislocations are rare but with potentially devastating consequences, often unsatisfactory outcomes and a high rate of complications. For this reason, the treatment of these injuries is challenging. We report a case of a 24-year-old man who sustained an exposed fracture-dislocation of the ankle with subtotal extrusion of the talus. Joint stabilization and application of the external fixator were performed immediately. The bone gap was filled with hand-moulded antibiotic-treated cement due to the comminution and contamination of the extruded fragment. Twenty months after injury arthrodesis of the hindfoot was performed with autologous bone graft from the distal fibula. The finding of dehiscence and contamination in the area of the previous exposure required a surgical debridement, and targeted antibiotic therapy. The dehiscence area was covered by transposition of a fasciocutaneous flap from gastrocnemius 2 months after arthrodesis. The patient started weight-bearing 1 month later. One year after surgery, the arthrodesis healed in a good position without any signs of infection of the surrounding tissues, and the patient reported no pain with full weight bearing. Management of the exposed dislocation fractures of the talus is very complex; the choice of the most appropriate treatment remains controversial and the outcomes are unpredictable. Different treatments have been reported, but early wound debridement, anatomical reduction, and adequate fixation are key components for treating exposed talus lesions. (www.actabiomedica.it)

Key words: avascular necrosis, bone extrusion, foot, infection, open injury, talus

Received: 15 January 2025 | Accepted: 31 October 2025

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Introduction

Talar fractures or dislocations are rare injuries, accounting for approximately 1% of all fractures (1,2).

The high-energy nature of these injuries produces fracture displacement, comminution, and acute soft tissue damage, which commonly correlate with open lesions (3). These account for 20% to 25% of all talus fractures (4).

Management of these injuries is difficult owing to the unique osseous and vascular anatomy of the talus, resulting in historically poor outcomes and a high incidence of complications such as infections, avascular necrosis (AVN) and post-traumatic arthritis (5-7).

There are few studies on open talar extrusion (8-22). It is a rare injury in which the talus lies completely outside the ankle mortis, devoid of all soft tissue attachments. It is associated with severe soft tissue damage, contamination, and disruption of the talar blood supply. Its treatment remains controversial, as no definitive guidelines exist (10,23,24). Treatment can be either reimplantation of the extruded talus (with a greater risk of infection, osteomyelitis, and avascular necrosis) or tibia-calcaneal arthrodesis with the talus discarded (leading to deformed anatomy, decreased heel height, and inadequate bone stock for future reconstructive procedures) (11,13,25).

This report aims to describe a rare case of subtotal talar extrusion in which bone fragments of talar body were extruded and to discuss treatment implications, highlighting the value of emergency operative treatment.

Case report

A 24-years-old man injured his left ankle in a motorcycle accident. The patient was admitted to the emergency department 60 minutes after the accident. The vital signs of the patient were stable; clinical examination revealed a 10 cm. longitudinal skin wound on the lateral side of the ankle and the tibio-fibular mortise was exposed with great fragment of talus enucleated laterally without any residual capsule-ligamentous strands. Soft tissues of the ankle and talus fragment were contaminated with blades of grass, asphalt grains, and seriously damaged (Figure 1A). Neurovascular integrity was not compromised. Radiographs revealed a talar body fracture with talonavicular and subtalar dislocation with an associated calcaneal fracture (Figure 1B).

The patient also reported a thoracic trauma and fractures of right humerus, left tibial plateau and iliac bone. Broad-spectrum intravenous antibiotics (amoxicillin-clavulanic acid 2.2 g, gentamicin 240 mg and metronidazole 500 mg) were immediately administered, and the patient was taken to the operating room within 2 hours from the admission to perform the debridement and the stabilization of the joint. 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 avascular soft tissues were removed (Figure 2A). Surgical exploration revealed complete lesions of peroneal tendons, partial lesion of Achilles tendon but neurovascular bundles were intact. The bone gap following the talar extrusion and debridement procedure has been filled with hand-moulded antibiotate cement in order to mantain the length of the limb and the right strain of the residual muscle, tendon and neurovascular structures (Figure 2B).

Under fluoroscopic control, reduction of dislocations and temporary stabilization of the talonavicular, subtalar and tibiotalar joints were obtained by using k-wires and external fixator Hoffmann®III system (Stryker trauma AG, Selzach, Switzerland) (Figure 3).

Skin flaps of the wound were approached using metal staples and vessel loops. Following this operation, the patient continued treatment at the orthopedic and traumatology department of our hospital and removal of the external fixator was performed respectively 28 days after the injury. The wound was managed with daily medications and using vacuum-assisted closed (VAC) therapy for 2 weeks. Intravenous antibiotic therapy with amoxicillin-clavulanic acid (1 g, three times a day) and levofloxacin (500 mg once daily) was maintained for 1 month and oral administration continued until inflammation index normalization. Low-molecular-weight heparin was given subcutaneously daily until the patient started partial weight bearing. The patient was discharged 43 days

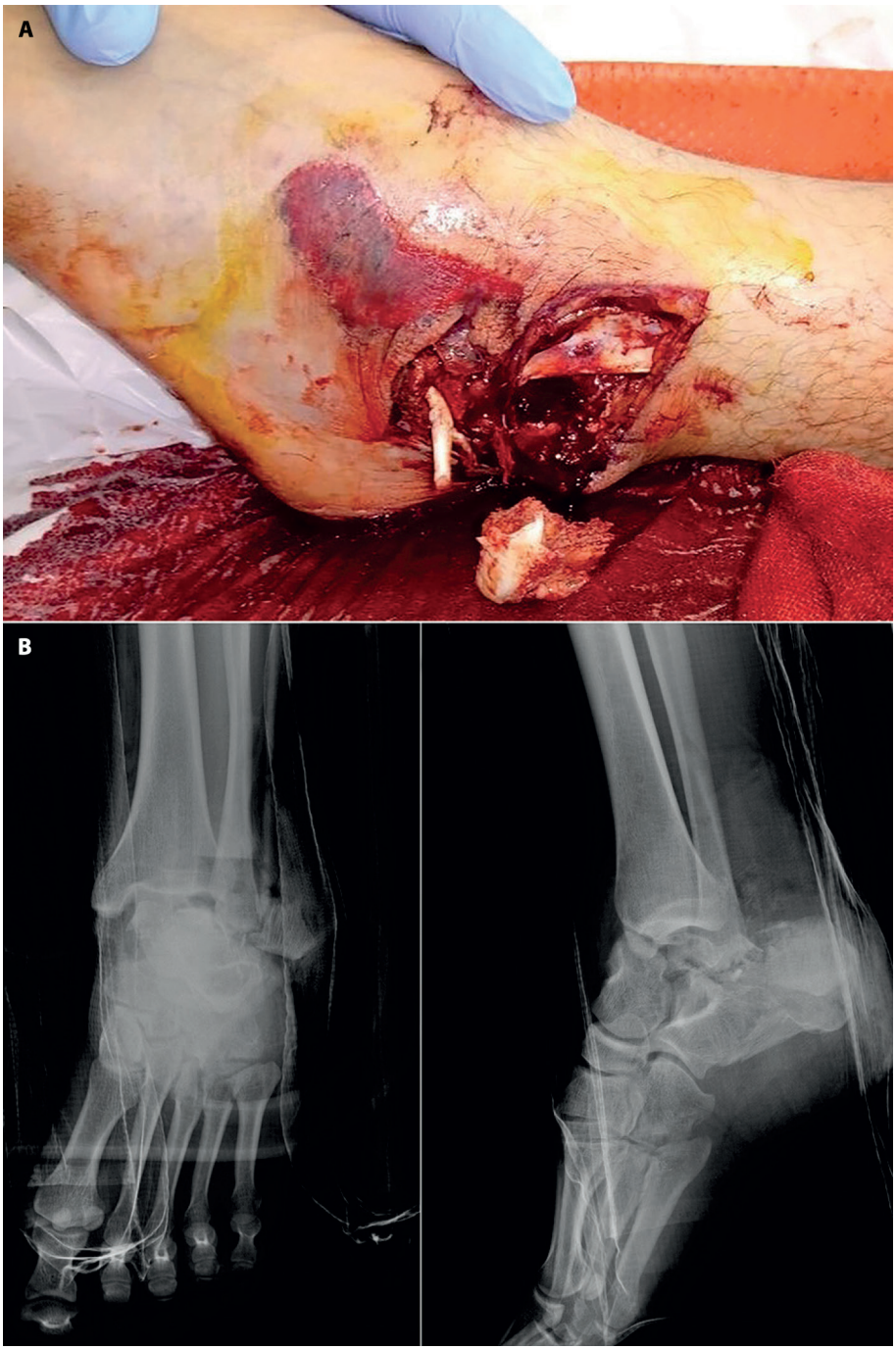

Figure 1. (A) Clinical presentation of the injured ankle with extruded talar fragment retrieved from the accident site. (B) Preoperative anteroposterior and lateral radiograph of the left ankle.

after the trauma in good clinical conditions and weight bearing was not allowed on the affected foot. The limb was restrained with a plaster cast for 90 days. The patient could walk on two crutches; frequent wound medications and outpatient checkups were prescribed. Finally, the wound healed by secondary intention two months after the accident. The removal of k-wires was performed at this time. Monthly X-rays images

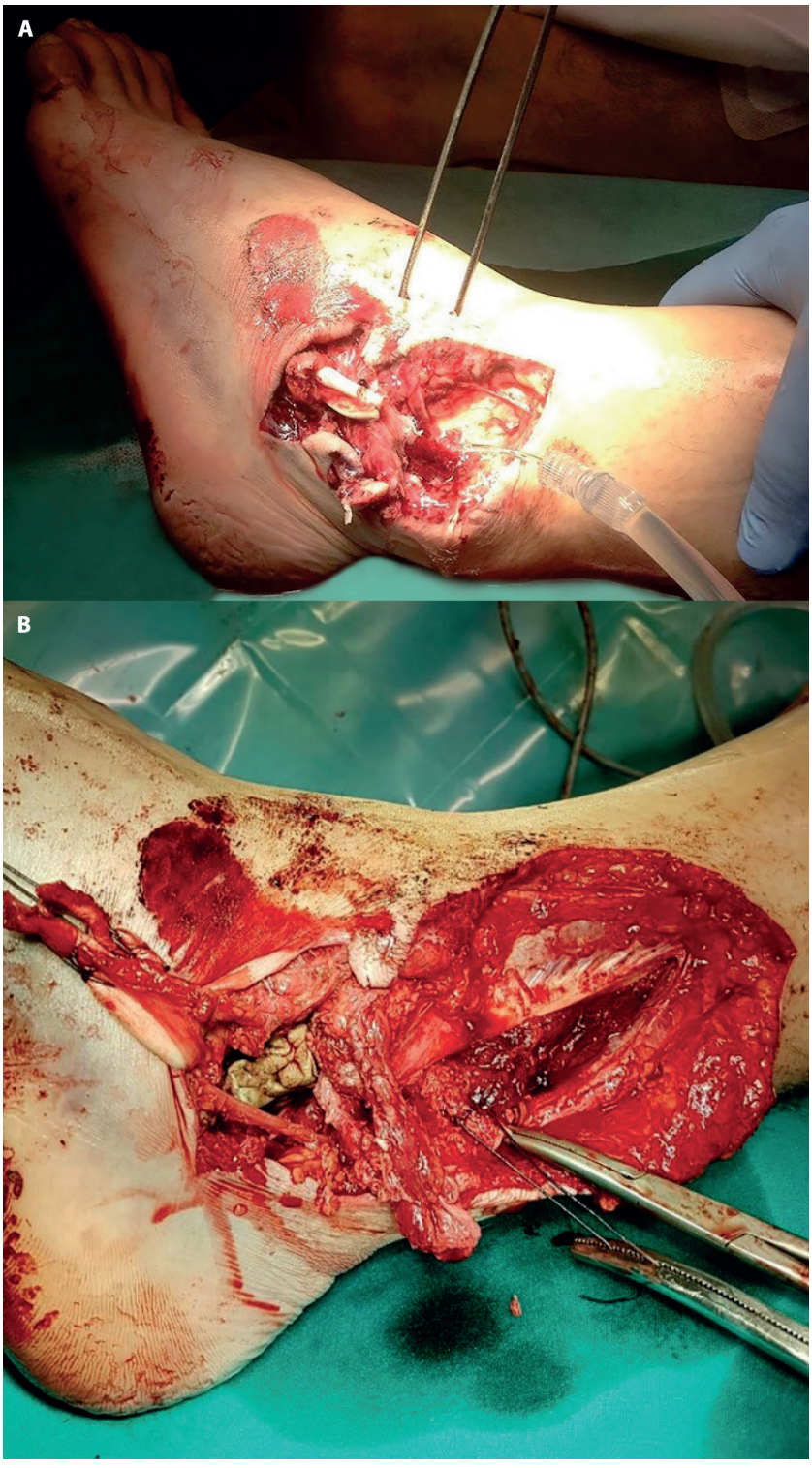

Figure 2. Intraoperative images. (A) Wound irrigation with normal saline solution. (B) Bone gap filling with hand-moulded antibiotate cement.

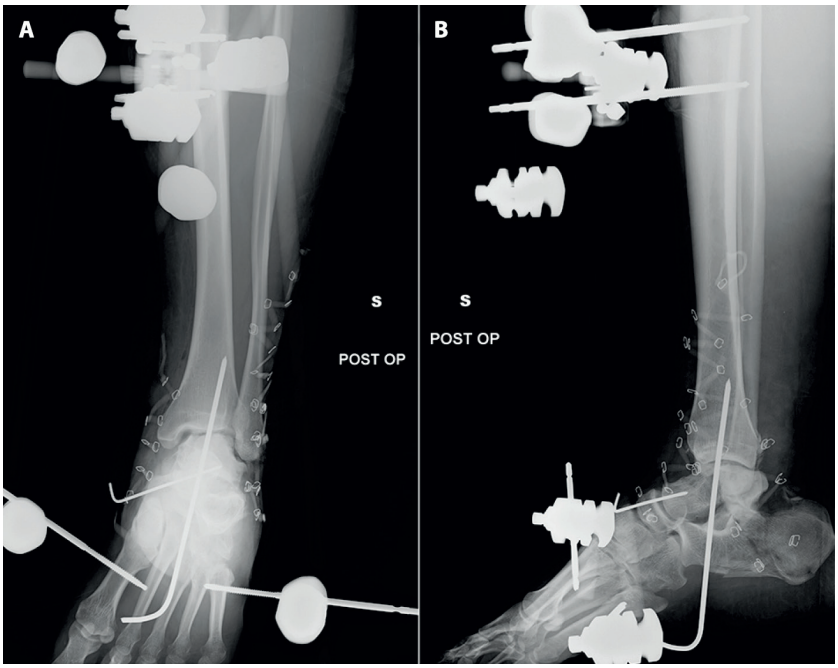

Figure 3. Joint's stabilization and external fixator positioning. (A) Postoperative anteroposterior and (B) lateral radiographs.

showed good evolution with no signs of avascular necrosis or infection. The patient was allowed to begin the progressive weight-bearing in a removable cast boot 4 months after the operation. Twenty months after the accident the patient underwent arthrodesis of the hindfoot under spinal anesthesia. After removal of the moulded antibiotate cement, the gap was filled with autologous fibular bone graft and joint stabilization with cannulated screws and k-wire was finally performed (Figure 4).

The patient was placed in a below-the-knee cast with no weight-bearing for the other four weeks. However, after the removal of the plaster, the skin revealed an important dehiscence at the same level as the previous exposure wound. Therefore soft-tissue and bone debridement was performed and a VAC therapy was placed and maintained for 2 weeks. Samples were collected for microscopy and culture. These revealed the growth of four different bacterial types (Escherichia Coli, Morganella Morganii, Peptostreptococcus Harei and StenotrophomonasMaltophilia). The patient was then prescribed a new course of intravenous and oral antibiotic therapy with ceftriaxone and trimethoprim-sulfamethoxazole on the advice of the microbiology team. One month after the debridement the plastic surgeons of our hospital covered the wound with a transposition of musculocutaneous flap taken from gastrocnemius. The patient was discharged some days later with no fever, and he was followed for 12 months. During this period the traumatic wound healed without complications. Three months after arthrodesis, the patient started partial weight bearing by the use of one crutch without pain. The occurrence of the wound dehiscence and the consequent management of the musculocutaneous flap inevitably delayed the rehabilitation program. One month later, since the wound showed no signs of infection, the antibiotic therapy was definitively stopped. Twelve months after arthrodesis, the patient reported no pain with full weight bearing. Imaging and clinical examinations showed that arthrodesis was healed in a good position

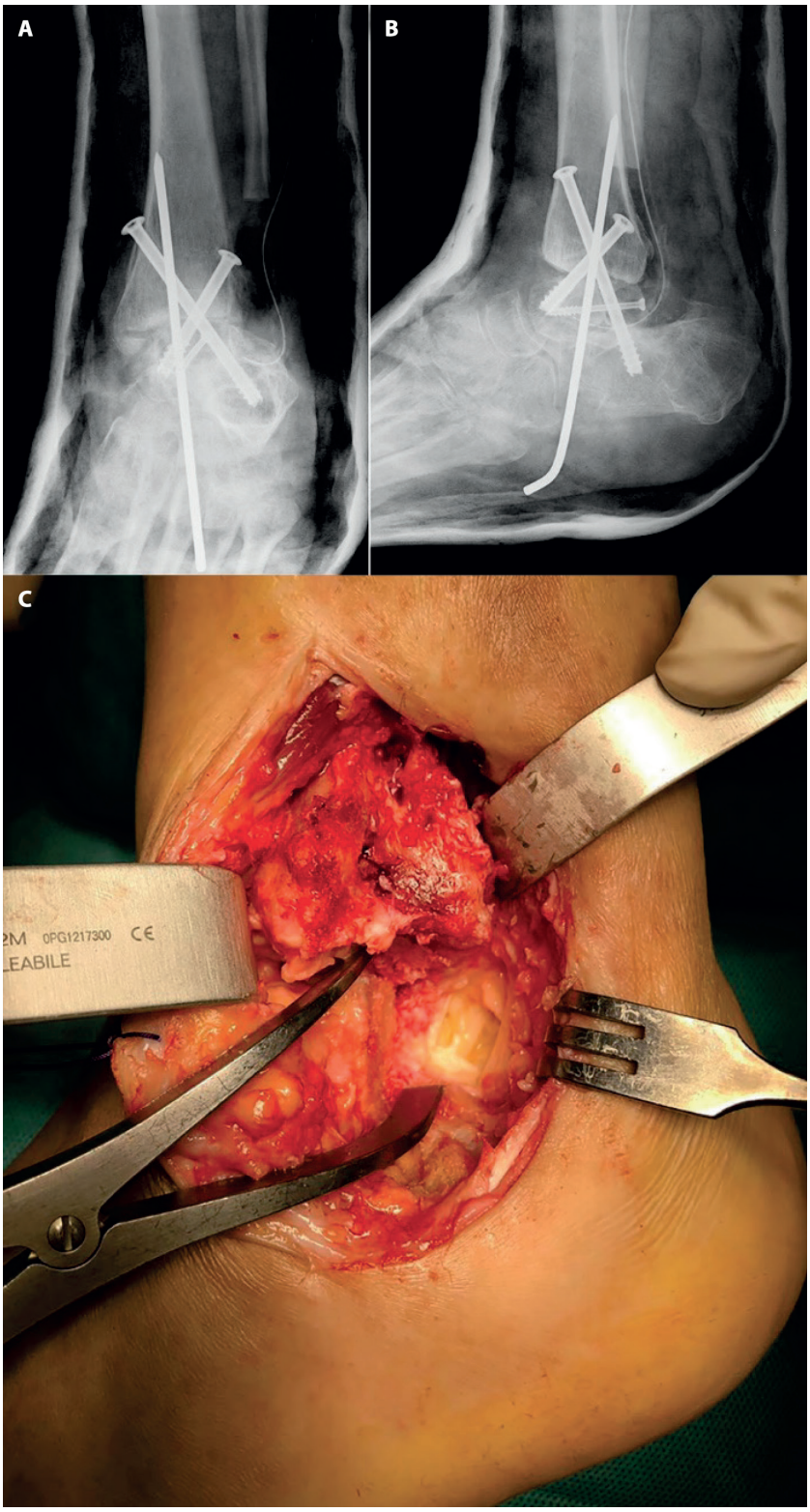

Figure 4. Postoperative X-rays after arthrodesis of the hindfoot. (A) Anteroposterior and (B) lateral radiographs. (C) The bone gap of the tibial-talar joint before filling with the graft.

Figure 5. (A) Weight-bearing clinical pictures of the left ankle at the 8-months follow-up examination. (B) Radiographs at 12 months follow-up. Arthrodesis healed in a good position.

without any signs of infection of the surrounding tissues (Figure 5)

Discussion

Open fractures-dislocations of the talus are challenging injuries for the orthopaedic surgeon. Talar dislocation is usually the result of high-energy trauma, and it is open anterolaterally in most of 50% of all reported cases (7,26,27). It is caused by extreme supination forces causing lateral subtalar dislocation or extreme pronation forces causing medial subtalar dislocation. Tibiotalar or subtalar dislocations may be eventually associated with malleolar fractures up to complete lateral extrusion of the talus (7,9). In case of extrusion, the talus could remain attached to the body due to capsular attachments. Otherwise, it might be expelled through the skin (9,26). Such injuries are potentially catastrophic. Besides poor functional outcomes, they are associated with gross wound contamination, severe soft-tissue damage, disruption to the talar domeblood supply, thus leading frequently to AVN and infection (7,17). Soft tissue infection with potential acute or chronic osteomyelitis often complicates open talar dislocation. The infection rate currently ranges from 25% to 38% (19,23) versus 88.9% initially reported by Detenbeck and Kelly (28). Indeed, over the years infection risk has been minimized due to the improvement of staged procedures for wound care, soft-tissue handling, and appropriate antibiotic therapy (16,19,29). Treatment options vary from primary talectomy with early tibiocalcaneal arthrodesis (28) to more recently suggested talar reimplantation

after careful debridement (16-19,29,30). Many authors (16,29,30) suggest that, despite the high risk of infection or avascular collapse, talar reimplantation gives the advantage of maintaining the height and bone stock. In some recent case reports, satisfying short and long-term clinical outcomes have been reported after preservation and reduction of the talus as the first method of treatment (7,17,19). Conversely, in case of severe contamination or complete extrusion and/or delayed time to reimplantation of the extruded fragment, primary talectomy and tibiocalcaneal arthrodesis are advised (25,26). Risk of osteomyelitis and AVN increase over time elapsing between talar exposure and reimplantation: many cases reported in literature differ from immediate (30 minutes) up to eight days-delayed treatment (7,9,16,19,25,26). External fixation was 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 a contemporary handy option for the management of daily wound medication. However, AVN and arthritis are unavoidable (16,25,29). If infection or AVN occur at distance after reimplantation, a secondary talectomy and tibiocalcaneal fusion shall be considered as a salvage procedure (17,25). In conclusion, open talar dislocation is a fearful injury and the treatment is challenging and controversial, as there are no definitive guidelines (10,23,24): immediate reimplantation is a valuable procedure to avoid talectomy and tibiocalcaneal arthrodesis at first choice of treatment. The latter entails severe functional loss and should be considered as a second option in case of talar salvage procedure failure. Tibiotalar reduction should be correctly performed, preserving all available soft tissues, combined to serial irrigations and multiple repeated debridements. Besides, early soft tissue closure and rigid fixation with lasting soft-tissue care and timely administration of antibiotics should be mandatory.

All patients should be informed of the uncertain long-term prognosis and the possibility of further reconstructive procedures.

The most appropriate treatment of open talus fractures and dislocations is still a topic of debate and the clinical outcomes are unpredictable. As these injuries are rare, the final treatment decision should be at the surgeon's discretion, taking into account the degree of contamination, the amount of soft tissue attachment to the talar body, the size, the availability of the talar fragments and the integrity of the articular cartilage (31). Several surgical techniques are reported in the literature, but early wound debridement, anatomical reduction, and stable fixation are certainly the keys to the appropriate treatment of open astragalus lesions.

Acknowledgements: The authors are grateful to Aurora Stifano for language editing of this manuscript.

Statement of ethics: This case report is complied with the guidelines for human studies and was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Authors contribution: PB: Study design; writing manuscript; FC: Performed the first surgery; editing manuscript; AC: Performed the second and third surgery; data collection; CG: Data collection; took part in first surgery; FC: Performed the second surgery; manuscript supervision.

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