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Traumatic Complex Hawkins Type IV Talar Fracture: A Case Report

Jessica L. Herzog, DPM, FACFAS [1], Kevin J. Blue, DPM, AACFAS [1], David B. Hahn, MD [2], Matthew H. Paden, DPM, FACFAS [3], Paul A. Stone, DPM, FACFAS [4]

[1] Third-Year Resident, Highlands Presbyterian St. Luke's Podiatric Medicine and Surgery Residency Program, Denver, CO
[2] Surgeon, Department of Orthopedic Surgery, Presbyterian/St. Luke's Denver Medical Center, Denver, CO
[3] Director of Residency Education, Highlands Presbyterian St. Luke's Podiatric Medicine and Surgery Residency Program, Denver, CO
[4] Director of Research, Highlands Presbyterian St. Luke's Podiatric Medicine and Surgery Residency Program, Denver, CO

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ABSTRACT

Fracture-dislocations of the talus are one of the most complex injuries involving the foot and ankle. These injuries are often accompanied by additional traumatic orthopedic injuries, avascular necrosis, and infection. When approaching limb reconstruction and salvage, the overall prognosis and functionality of the limb are key factors to consider. In the present report, we draw attention to the importance of a multidisciplinary team approach for formulating a treatment plan that incorporates the talar injury and associated injuries or pathologic features. We also reviewed the published data related to avascular necrosis of the talus, open talar fracture management, and treatment outcomes.

Talar fractures should be treated urgently because of possible circulation compromise and the potential for posttraumatic osteonecrosis (1). It is of paramount importance to understand the blood supply to the talus, attributed to 3 major arteries: the posterior tibial artery, dorsalis pedis artery, and peroneal artery. In addition, the soft tissue in this region is tenuous, especially in an open fracture, making wound complications and infection common. Despite this, the precarious blood supply of the talus makes avascularity the major concern in any talar injury. In the classic study by Hawkins (2), a series of 57 talar neck fractures was retrospectively used to develop a classification scheme that prognosticated the incidence of posttraumatic osteonecrosis. Hawkins type I, a nondisplaced vertical fracture of the talar neck, injures only 1 of the 3 main sources of blood supply to the talar body, with a 0% to 12% incidence of osteonecrosis. Hawkins type II, a vertical fracture of the talar neck with subtalar joint subluxation/dislocation, injures 2 of the main 3 arteries, with a 41% incidence of osteonecrosis. Hawkins type III, a vertical fracture of the talar neck with subtalar and tibiotalar joint subluxation or dislocation, injures all 3 main arteries, with a 91% incidence of osteonecrosis (2). Canale and Kelly (3) added an additional type, Hawkins type IV, a vertical fracture of the talar neck with subtalar, tibiotalar, and talonavicular joint subluxation or dislocation, which also injures all 3 main vessels, with a nearly 100% rate of osteonecrosis. Subsequently, treatment has been determined according to the described fracture type and likelihood of osteonecrosis. In the absence of osteonecrosis, fusion will not likely be required, and the injury should heal in time (1). In the patient with osteonecrosis, fusion or another limb salvage procedure could be necessary. Also, the deltoid ligament can act as a tether for the medial one half of the talar body in Hawkins type III and IV injuries and must be considered in the surgical planning for such cases.

The Hawkins IV fracture type is extremely difficult to manage in a healthy patient with few comorbidities and an isolated injury. It is decidedly more complicated in a patient involved in an extensive accident that has resulted in multiple traumatic injuries. In addition, if the fracture is an open fracture-dislocation, the level of urgency increases to a much greater extent. Before approaching the patient surgically, one must carefully determine whether the extremity is salvageable, and if so, will the reconstruction be functional. In the present report, we describe the case of an adult female who had sustained an open fracture-dislocation of her talar neck and body in a multitrauma motor vehicle accident. We emphasize the importance of considering all of the patient's injuries when determining the treatment management of high-risk limb salvage cases.

Case Report

A 44-year-old female was brought into the emergency department (ED) of an outside hospital after being involved in a single-car motor vehicle accident. The patient, an unrestrained driver, was found under

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Address correspondence to: Paul A. Stone, DPM, FACFAS, Highlands Presbyterian St. Luke's Podiatric Medicine and Surgery Residency Program, 1719 East 19th Avenue, Denver, CO 80218.
E-mail address: Pstonehighlandspslresidency@comcast.net (P.A. Stone).

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the dashboard. On arrival to the ED, the patient was awake, intermittently conversant, and speaking in broken sentences. The initial assessment revealed that the patient had multiple injuries, including head contusion, prevertebral hemorrhage, bilateral hip fracture-dislocations, right acetabular fracture, pubic symphysis fracture, right lung contusion, bilateral rib fractures, left knee laceration, and left hand metacarpal fractures. In the distal right lower extremity, the patient had the following injuries: intraarticular knee laceration, tibial pilon fracture, open Hawkins type IV with severe comminuted talar body fracture, and a fourth metatarsal fracture. The patient was taken to the operating room urgently from the ED. Initial attempts were made to close reduce the right hip; however, the femoral neck and head were fractured, making reduction difficult. At the lateral and medial right knee, >10-cm lacerations extending into the knee joint were copiously irrigated. In the distal right lower extremity, the dorsalis pedis was palpable, although it was difficult to palpate the posterior tibial pulse. A large lateral malleolar laceration, full thickness, with an exposed fibula and lateral talus, was appreciated but lacked signs of occult neurovascular injury. On further examination, a large, unattached lateral talar body fragment, with a significant portion of the articular surface, was visualized in the soft tissues of the lateral malleolar wound and removed. Multiple comminuted fragments of the talus were visualized. Components of the patient's sock and other foreign material were noted in the site. An A-frame external fixator was then applied to hold the ankle in the most adequately reduced position. The large talar body fragment, initially removed, was then packed into the articular space, in the hopes of potentially using it as a bone graft in subsequent treatment. The operative site was then dressed with a sterile bulky dressing, and intravenous antibiotics were started.

Two weeks after the initial treatment, the patient returned to the operating room for surgical management of her complex ankle fracture. After exsanguination via gravity and thigh tourniquet inflation, the extruded talus was removed and placed on the back table. An incision was made over the medial aspect of the ankle, allowing exposure of the pilon fracture. The talar body's main portion was then reintroduced into the wound and provisionally pinned with Kirschner wire fixation. Multiple attempts at screw fixation found that anatomic reduction of the talar portion via screws was impossible. The distal tibia was then fixated with multiple titanium partially threaded cannulated 4.5-mm screws with washers to allow for a buttress-type effect in the talar reduction. A large piece of the distal tibia was found to be missing during this reduction. Multiple attempts were then made to reduce and fixate the talar body with screws and Kirschner wires for provisional fixation, followed by adjustment of the external fixator. Intraoperative fluoroscan demonstrated significant talar body collapse and a missing portion of the distal tibia. Throughout the patient's remaining stay at the outside hospital, she underwent many additional procedures, including tracheostomy, percutaneous endoscopic gastrostomy tube placement, right hip hemiarthroplasty to address the subcapital fracture of the femoral neck and associated fracture of the femoral head, repeated irrigation and debridement with antibiotic bead placement of the right knee and ankle, and open reduction of the left fifth metacarpal neck fracture.

The patient was discharged from the outside hospital to an extended rehabilitation program at the lead author's (D.B.H.) institution 24 days after her initial admission through the ED. Ten days after transfer to our hospital, the orthopedic team (D.B.H.) was consulted to address the continuing complex issues regarding the lower extremities. In conjunction, the internal medicine team addressed her medical issues throughout the hospitalization, including respiratory failure, anemia, bacteremia managed by intravenous vancomycin, hyperglycemia, depression, and a history of alcohol abuse. A thorough neurology consultation revealed that the patient had encephalopathy, with no radiologic evidence of intracranial lesions, and an overall good neurologic prognosis. Radiographic studies were ordered to visualize the initial postoperative hardware fixation and assess the extent of trauma in the right foot and ankle. We attempted to visualize a Hawkins sign on the radiographs, because that would assist us in assessing the vascularity to the talar body. We did not expect to see this prognostic indicator owing to the extent of her injuries and that it was only 5 weeks after the accident, because Hawkins sign is usually visualized approximately 8 weeks after injury (Figs. 1–4). A right lower extremity computed tomography (CT) scan was also ordered to

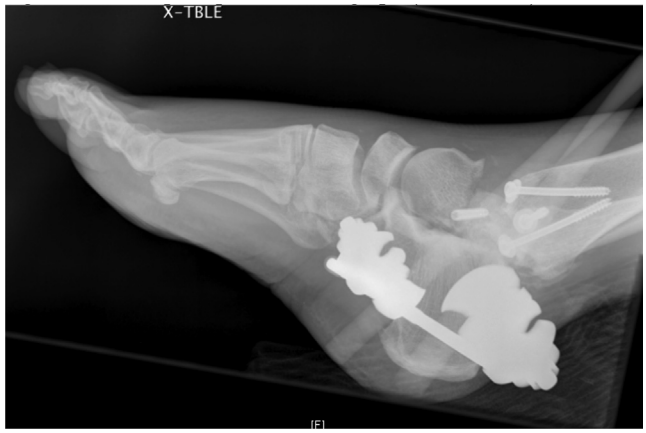

Fig. 1. Initial postoperative lateral radiograph.

Fig. 2. Initial postoperative anteroposterior radiograph.