Open reduction and internal fixation for concomitant talar neck, talar body, and medial malleolar fractures: a case report

J Isaacs,1,2 B Courtenay,2 A Cooke,2 M Gupta3
1 Royal North Shore Hospital, Sydney, NSW, Australia
2 The St George Hospital, Sydney, NSW, Australia
3 St Vincent’s Hospital, Sydney, NSW, Australia

ABSTRACT

Fractures of the talus are rare and generally associated with severe trauma. The mechanism of injury is usually forced dorsiflexion or a fall from a height. Severe talar fractures pose a challenge for surgeons as they are often associated with complications such as avascular necrosis, collapse, malunion, secondary osteoarthritis and pain. This has led some institutions to advocate primary arthrodesis for these injuries. We report an unusual complex fracture of the talus that was successfully managed with open reduction and internal fixation. By restoring a near-normal range of motion and function to a fit, young male, the severely limiting effects of arthrodesis were avoided or at least delayed. We use this case to highlight that primary arthrodesis should only be reserved for cases that fail to respond to open reduction and internal fixation or deteriorate to the point where it is the only reasonable and justifiable alternative.

INTRODUCTION

Fractures of the talar neck and body are rare and usually associated with severe trauma and poor outcomes. The incidence of talar fractures is <0.85%; the talar neck is involved in approximately 50% of cases and the talar body in <20%. Talar neck fractures are extra-articular, involving only the middle facet of the subtalar joint, whereas talar body fractures are intra-articular and involve the surfaces of both the tibiotalar and subtalar joints. Each fracture in isolation is associated with high complication rates, including avascular necrosis (AVN), collapse, malunion, secondary osteoarthritis, and pain. The common injury mechanisms are a fall from a height or a forced dorsiflexion injury to the ankle. Fractures of the medial malleolus, however, particularly vertical shear fractures, are common.
The fracture mechanism is usually a forced inversion injury with or without plantarflexion. We report an unusual case of concomitant talar neck, talar body, and medial malleolar fractures successfully managed with open reduction and internal fixation.

CASE REPORT

In May 2007, a 42-year-old man presented with an injury to his left foot after falling 1 m from a ladder. The injury mechanism was dorsiflexion plus inversion with axial loading. Physical examination revealed diffuse ankle and hindfoot swelling with marked medial tenderness. Plain radiographs and computed tomographic (CT) scans demonstrated a sagittal fracture of the lateral half of the talar body (shear fracture), a comminuted fracture of the talar neck (Hawkins type I), and a vertical shear fracture of the medial malleolus (Fig. 1). The fracture pattern was unusual for low-energy trauma in a young, fit man.

Open reduction and internal fixation was selected instead of arthrodesis. The talar neck and body were exposed through medial and lateral approaches, respectively. The lateral talar body fragment extruding to the sub-lateral malleolar position and the extensive comminution of the talar neck required meticulous reduction. Small osteochondral fragments were removed, and thorough irrigation performed. The talar body fracture was fixed with 2 4-mm Asnis cannulated screws, the talar neck fracture with one screw, and the medial malleolar fracture with 2 screws using a percutaneous approach. Immediate postoperative radiographs demonstrated a satisfactory anatomic reduction (Fig. 2). Immobilisation and non-weight-bearing were prescribed for 6 weeks. Partial weight bearing via a walking boot was started from week 7 and full weight bearing with range of motion exercises from week 13.

At 6 weeks, plain radiographs showed no signs of progressive sclerosis or collapse suggestive of AVN, but the absence of the Hawkins sign indicated an increased risk of AVN (Fig. 3a). Hawkins sign is a prognostic indicator of re-establishment of the vascular supply to the talar body. The preserved blood supply resorbs the subchondral bone of the talar dome, creating a disuse osteopenia, which appears as a radiolucency of the talar dome and indicates preserved vascularity of the talus. A positive sign is strongly predictive of the absence of AVN and a negative sign is moderately predictive of the presence of AVN.

At 3 months, the patient complained of moderate-to-severe pain during mobilisation and had not yet returned to work. He had an antalgic gait, 20° of plantarflexion, 5° of dorsiflexion, and 10° of subtalar movement. Plain radiographs revealed satisfactory

Figure 1 Preoperative radiographs and computed tomographic scans showing comminuted talar neck fracture, displaced lateral talar body fracture, and undisplaced vertical shear fracture of the medial malleolus. Note the displaced lateral talar body segment occupying the sub-malleolar position.

Figure 2 Immediate postoperative radiographs showing satisfactory open reduction and internal fixation.
fracture healing with talar body sclerosis and medial translation through the subtalar joint complex suggestive of attenuation or disruption of the interosseous ligament (Fig. 3b).

At 12 months, his level of pain and function had improved considerably. The patient complained of mild pain when walking on uneven surfaces but was able to climb a ladder with minimal difficulty. The range of motion was almost fully recovered, with only a 5° loss of both dorsiflexion and plantarflexion. Plain radiographs showed satisfactory bone union with no signs of collapse or AVN. Mild secondary osteoarthritis of the subtalar joint was observed, consistent with the location and severity of the fracture (Fig. 3c). He did not require analgesia for his pain and had returned to work.

**DISCUSSION**

The blood supply to the talus is complex and precarious. As the talus articulates with the tibia superiorly, the calcaneus inferiorly, the navicular anteriorly, and the malleoli medially and laterally, nearly 70% of the surface of the talus is covered by articular cartilage. This enables only a small surface area for penetration of extra-osseous blood vessels. The talus receives both extra- and intra-osseous supplies from the 3 main arteries to the foot (posterior tibial, anterior tibial, and peroneal) and an extensive anastomotic network. The latter are present throughout the talus and are responsible for its survival in severe injuries. Any fracture or dislocation of the talus makes it particularly vulnerable to vascular compromise. Complications such as AVN, collapse, malunion, post-traumatic arthritis, and pain have been widely reported.

Talar neck fractures can be associated with medial malleolar and talar body fractures. 10 out of 71 (14%) and 15 out of 57 (26%) patients with talar neck fractures had additional medial malleolus fractures. Two out of 19 (11%) and 23 out of 56 (41%) patients with talar body fractures had concomitant talar neck fractures. Two out of 18 (11%) and 23 out of 102 (23%) patients with talar neck fractures had coexistent talar body fractures.

The most common injury mechanism for talar body fractures is forced dorsiflexion with axial loading, such as a fall from a height. For the talar neck, the mechanism is similar but it can occur from forced dorsiflexion alone. When there is concomitant medial malleolar fracture, rotational forces such as inversion or supination are involved.

Prior to the 1980s, most patients with talar neck and body fractures were treated nonoperatively and outcomes were poor owing to AVN and post-traumatic arthritis. Open reduction and internal fixation reduced the rates of such complications. For severe fractures, salvage procedures including arthroscopically assisted internal fixation, talectomy, or arthrodesis of the ankle, subtalar or talonavicular joints should be used.

Many severe fractures involving the talar neck and body eventually require arthrodesis due...
to AVN or arthrosis. Primary arthrodesis is therefore advocated, in particular for comminuted or Hawkins type-IV talar neck fractures. Early subtalar arthrodesis preserves tibiotalar motion and prevents subtalar arthritis and malpositioned subtalar ankylosis, but carries risks of malposition, malunion, and nonunion of the subtalar joint, talar dome collapse, pseudarthrosis, and premature arthrosis of adjacent joints. Function is also impaired, owing to the loss of range of movement. Hence, primary arthrodesis is indicated only for severe comminuted fractures that are likely to respond poorly to open reduction and internal fixation or when the patient is unlikely to gain functionally.

Our patient’s vocation depended on a near full range of movement at the ankle. We decided against primary arthrodesis because of its negative effects on function. Despite severe comminution of the talar neck, our patient had an excellent outcome 12 months after open reduction and internal fixation, highlighting the importance of delaying arthrodesis. Nonetheless, our case does not negate the value of primary arthrodesis in severely comminuted talar fractures. When indicated, primary arthrodesis greatly lessens pain and improves function, and obviates the need for a second operation.

REFERENCES