CASE REPORTS

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Ipsilateral Ankle, Talus, and Calcaneus Fracture Dislocation: A Case Report

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Summary: Foot and ankle injuries can present with multiple fractures after high-energy trauma. The goal for complex combined injuries remains anatomic restoration of articular surfaces and overall alignment. Operative fixation may require a variety of plate and screw sizes for an optimal construct. Below is a case report of a combined injury involving fractures of the ankle, talus, and calcaneus, where an assortment of mini-fragment implants were used.

Key Words: ankle, calcaneus, talus, fracture, mini fragment

INTRODUCTION

High-energy trauma to the foot and ankle presents a challenge to the treating orthopaedic surgeon. Soft-tissue, ligamentous, and osseous components can form a constellation of complex injuries. Axial load, twisting, or combined mechanisms of injury can cause fractures from the ankle to the forefoot. Temporization with closed reduction and splinting, percutaneous pinning, or external fixation may be required before definitive fixation. Once soft-tissue swelling and fracture blisters subside, one can safely proceed with surgical incisions. Preoperative planning for fixation may require a myriad of approaches, implant sizes, and designs. Because of the variation in the bone size and complex articular architecture, a surgeon may ideally use mini, small, or rarely large fragment plates and screws for a well-implemented fixation construct. We present a case report of a rare combination of injuries including an ipsilateral ankle, talus, and calcaneus fracture dislocations that required strategic planning and treatment with open reduction internal fixation.

PATIENT INFORMATION

Patient 1 is a 28-year-old woman with a medical history significant for intravenous drug abuse, hepatitis C, and opioid abuse who was a restrained driver in a motor vehicle accident. She sustained isolated left lower extremity injuries. No other associated injuries occurred. She was evaluated in the trauma bay and found to have a closed gross deformity of the foot and ankle with superficial abrasions. Her examination showed intact neurovascular status of the limb. Radiographs and computed tomography (CT) revealed a complex pattern of injuries including a left bimalleolar ankle fracture [supination adduction (SA) pattern], with an associated medial subtalar fracture dislocation plus a talar body fracture and an intra-articular calcaneus fracture (Figs. 1–3). In the emergency department, the ankle and subtalar joints were reduced and splinted. She was admitted and scheduled for temporizing versus definitive fixation depending on soft tissue status in the operating room the following day.

SURGICAL TECHNIQUE

At the time of surgery, the skin wrinkled with gentle pressure, so definitive fixation was undertaken (Fig. 4). The patient was supine with a tourniquet and bump under the left hip on the operative side. Medial and lateral curvilinear approaches were made to the ankle, with care to avoid damage to neurovascular structures. Starting on the lateral side, working through the sinus tarsi, and around the peroneal tendons, the calcaneus fracture was visualized (Fig. 5). There was a large posterior facet fracture, which was reduced and provisionally pinned. There were also an anterior process and lateral wall fractures. The calcaneal fracture lines were anatomically reduced and provisionally pinned. The calcaneus was stabilized with a mini-fragment 2.7 mm Y-shaped plate and screws. After this,
attention was directed medially. The medial malleolus fracture was rotated distally on its soft tissue attachments for visualization of the posteromedial talar body fracture. There were some comminuted osteochondral fragments that were nonreconstructable and therefore excised. The major talar body fracture was reduced and then fixed with 2 countersunk mini-fragment lag screws. The medial and lateral malleoli were then reduced anatomically and provisionally pinned on the medial and lateral sides. The fibula fracture was a transverse

FIGURE 1. Left ankle anteroposterior and lateral radiographs of the injury.

FIGURE 2. Left ankle after closed reduction and splinting in the emergency department.
fracture and therefore was fixed with an intramedullary lag screw. The medial malleolus fracture was vertically oriented and therefore fixed with a buttress plate and multiple interfragmentary screws. Verification with direct visualization and multiplanar C-arm fluoroscopic imaging was performed to ensure that all articular reductions were anatomic and that all implants were well positioned. Both medially and laterally, the ankle joint capsule was repaired. The superficial deltoid was repaired medially, and the anterior talofibular ligament was repaired laterally. Medially, the posterior neurovascular bundle and the posterior tibialis tendon had been retracted to protect the structures throughout the case; however, at conclusion, they were placed back into their anatomic location, and the posterior tibialis tendon sheath and pulley were repaired. The deep tissues were also reapproximated with 0 Vicryl, and all skin was closed with 2-0 Vicryl and 3-0 nylon under no tension. A well-padded short leg splint was placed. The patient was instructed to remain nonweight-bearing for 12 weeks.

The patient began range of motion exercises at 3 weeks postoperatively once her splint and sutures were removed, and she was transitioned to a removable fracture brace. She remained

FIGURE 3. Axial, coronal, and sagittal CT images of the injury after closed reduction and splinting.
compliant with nonweightbearing for the recommended 12 weeks and then was transitioned to a walking boot and then a normal shoe. Her wounds healed without complication. The patient went onto uneventful union.

DISCUSSION
KS’s case presents several concomitant complex injuries. A review of the literature identified several previously published case reports of combined injuries at 2 of the 3 locations (ankle, talus, or calcaneus).1–5 One report does describe a similar case involving a medial malleolar, talar, calcaneal, and cuboid fractures.6 Fortunately, all injuries to our patient were safely managed in one operation. The soft tissues allowed early definitive fixation the day after injury. Often swelling precludes early open reduction internal fixation and requires temporizing fixation and elevation for days or weeks. The utility of each incision was maximized by addressing more than one fracture through each approach. Because of the size differences at each anatomic location and with articular comminution, fixation may demand 2.0 mm, 2.4 mm, and 2.7 mm screws and plates. The benefit of a set that contained a variety of screws, plates, and instruments of all 3 sizes facilitated care in this case.

Our patient’s ankle fracture fits the classification of a SA mechanism of the Laugé–Hansen system.7 SA fractures require close evaluation for medial plafond articular impaction and potential need for reduction and fixation.8 Up to 61% of these injuries sustain marginal impaction of the medial tibial plafond, according to a recent CT study of 120 ankles injuries.9 Operative techniques for fixation of medial malleolus fractures abound, ranging from interfragmentary screws alone to plate fixation or tension band with K-wires.10,11 Biomechanically for SA ankle fractures, surgeons commonly use an antiglide plating technique. At least 2 biomechanical reports have demonstrated that an antiglide plate with

**FIGURE 4.** Intraoperative fluoroscopy of the final fixation construct.

**FIGURE 5.** Three months postoperative left ankle mortise, lateral, and calcaneal axial views.
an additional screw in the distal fragment is stronger under axial load. However, mini-fragment plating has been shown to be as strong under tension and even stronger under axial load than lag screws or tension band.

The talar body fracture in our patient included a primary fracture line and comminution. Talar body fractures occur as 3%-6% of all fractures in the foot, and 40% of all talus fractures involve the body. A large level 1 trauma center series the incidence of operative talar bone fractures relative to all operative fractures is 0.62%. Talus fractures may present up to 23% of the time with an associated adjacent fracture, with a calcaneus fracture in 6%-11% of cases, or an ankle fracture in 15%-44%. Talar body fractures can lead to variable clinical and radiographic outcomes. Vallier et al reported osteonecrosis in 26% of talar bone fractures, with 22% sustaining collapse. The same authors reported that 83% of talar body fractures led to one or more adjacent joint developing radiographic posttraumatic arthritis, with subtalar arthritis in 57% and tibiotalar arthritis in 61%. Depending on the severity of injury, poor clinical outcomes can result, requiring salvage fusion or even amputation. In a series of 45 patients with high-energy ipsilateral talus and calcaneus fractures, 5 went onto early below-the-knee amputation and another 5 primary subtalar arthrodesis. Calcaneus fractures typically occur from a high-energy mechanism of injury, with an estimated incidence of 2% of all fractures and 60% of tarsal fractures. Severity and outcome of displaced intra-articular calcaneus fractures varies widely depending on the amount of energy and injury imparted through the calcaneus and subtalar joints. The most prognostic classification system to date incorporates the number of displaced posterior facet fragments based on CT of the injury in the coronal plane (the Sanders Classification). Sanders II–IV fractures have worse functional outcome scores and higher incidence of late subtalar fusion for symptomatic posttraumatic arthritis. Associated injuries occur often, with at least 10% sustaining a spinal compression fracture, 10% bilateral calcaneal fractures, and doubling the length of hospital stay. Numerous authors have investigated which variables affect patient-reported outcomes. One group found significantly worse health-related quality of life with increasing age, female sex, psychiatric history, and higher Aspirin, but not with associated injuries, socioeconomic status, or interestingly severity of injury.

Operative technique for displaced intra-articular calcaneus fractures has evolved over time as well. For severe articular comminution and step-off, the extensile lateral approach offers broad exposure to the subtalar joint and lateral calcaneus. Through this approach, one can visualize and fixate articular and body fractures. Articular reduction in a series of 108 fractures treated with an extensile lateral approach allowed for 103 anatomic reductions. However, postoperative wound healing remains the primary concern with an extensile lateral approach, even with attention to detail, retractor placement, and “no touch” techniques. An alternative surgical approach is through the sinus tarsi, with lower rates of wound complications. In a series of 25 patients treated through a sinus tarsi approach, only 2 required open debridement for surgical site infection. A meta-analysis of extensile lateral versus sinus tarsi approaches, including 2 randomized control trials and 5 cohort studies, found fewer wound complications in the sinus tarsi patients, with similar clinical and radiographic outcomes.

CONCLUSION

High-energy trauma can inflict significant injury to the foot and ankle and subsequent morbidity to the patient. Close clinical and radiographic evaluation will determine the extent of injury and guide treatment. Once soft-tissue swelling allows, one can consider definitive fixation of multiple fractures and injuries in a single setting through carefully planned surgical approaches and fixation strategy. Because of the osseous dimensions of the foot and ankle, especially with articular involvement, optimal fixation may be facilitated by mini-fragment screws and plates of different shapes and sizes.

REFERENCES

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