CHAPTER **47**

SUPINATION-ADDUCTION FRACTURES

George Gumann, DPM

Supination-adduction fractures are a less common fracture pattern. They are consistent with the Danis-Weber Type A fracture.[1-3] Stage I presents as a transverse fracture of the fibula below the level of the syndesmosis and represents a pull-off type fracture as the foot inverts. With the Stage II fracture the lateral injury can also present as rupture of the fibular collateral ligaments without fibula fracture. Stage II presents as a vertically oriented fracture of the medial malleolus and presents a push-off type fracture.

Supination-adduction or Type A fractures represent 10-20% of all ankle fractures.[1-3] The injury occurs with the foot supinated, placing the lateral structures under tension. Stage I presents as a transverse fracture of the fibula below the level of the syndesmosis or as a rupture of the fibular collateral ligaments. This location usually spares the syndesmotic ligaments from injury. Occasionally, the fracture can occur more proximally at the level of the superior aspect of the ankle joint and rupture the anterior and posterior syndesmotic ligaments. If there is enough force the injury can proceed to Stage II, which is a vertically oriented fracture of the medial malleolus.

Yde reported that supination-adduction fractures represented 20.1% of 488 ankle fractures.[4] Stage I fractures occurred in 80.6% of the patients. The fracture was tranverse in configuration and located below the level of the syndesmosis 70.5% of the time. Liestal reported supination-adduction injuries represented 14.8% of 108 fractures.[5] In those fractures managed conservatively, the results were 56.2% very good, 18.8% good, and 25% poor. In the operatively treated group, the results were 82.7% good to excellent and 25% poor.

Figure 1. Non-displaced stage I fracture that can be managed by cast immobilization.

Most stage I fractures are nondisplaced and can be managed in a short leg cast for 6 to 8 weeks (Figure 1). The fracture is stable. However, radiographic evaluation 12 to 14 days post-injury is recommended to rule out loss of position. A displaced stage I fracture may have an attempted closed reduction and cast immobilization. The fracture can be reduced by first inverting the foot then everting it, while applying direct pressure to the distal lateral malleolar fragment. Check the reduction with radiographs after application of the short leg case. Obviously, the smaller and the more distal the fracture, the easier it is to justify small degrees of displacement. However, assuming that the patient is a good surgical candidate, a displaced stage I fracture should be treated with open reduction and internal fixation .

The surgical approach is easy as the lateral malleolus is quite superficial in location.[6,7] The surgical incision can be anterolaterally, midline, or posterolaterally to the lateral malleolus. The fracture is exposed, debrided, and anatomically reduced, and provisionally stabilized. Check the ankle joint for any osteochondral fragments that need to be excised. Internal fixation, can be accomplished with an oblique/intramedullary screw, tension band wire, or plate (Figures 2 and 3). The easiest means of internal fixation is the oblique or intramedullary screw. This technique can allow for an arthroscopically assisted percutaneous reduction and internal fixation of the fibular fracture. The tension band wire is best utilized for osteoporotic bone, a comminuted fracture, or as a fail-safe technique for failure of screw purchase. Sometimes, the fibular fracture is at the level of the superior aspect of the ankle joint or syndesmosis and a plate can be applied.

The patient is immobilized in a short leg cast or fracture boot for 7 to 8 weeks. Weight bearing generally can be initiated fairly early in 1 to 2 weeks. A stage II fracture involves a vertically oriented fracture of the medial malleolus along with the stage I injury, which in my

Figure 2A. Anteroposterior view of a displaced stage I injury with transverse fracture of the lateral malleolus below the syndesmosis.

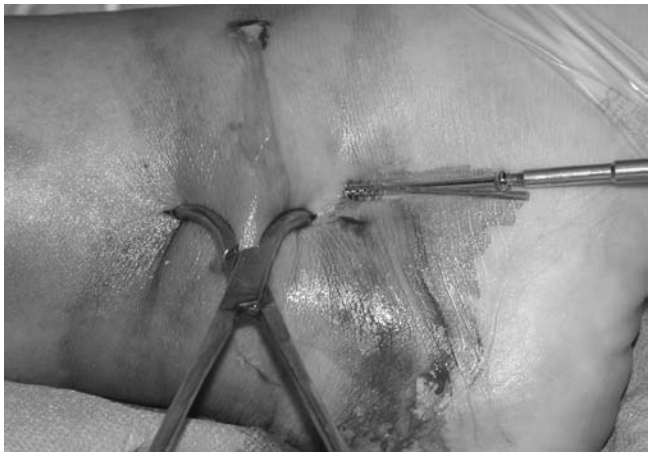

Figure 2B. Photograph of an arthroscopically assisted percutaneous reduction and internal fixation.

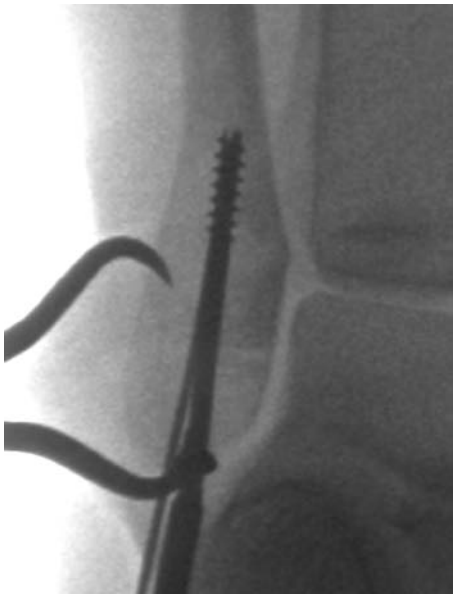

Figure 2C. Image-intensifier view of percutaneous reduction and internal fixation.

Figure 2D. Mortise view of final reduction and internal fixation with intramedullary screw.

experience usually is the transverse lateral malleolar fracture (Figure 4). It is uncommon for this fracture to be nondisplaced. However, it if is, then cast treatment is appropriate. The difference would be, an initial long cast nonweight bearing for 4 to 6 weeks followed by a weight bearing short leg cast for 2-4 weeks.

Displaced stage II fractures are normally treated surgically. The incision approach can be anteromedially, over the mid-tibia, or posteromedially. The fracture is exposed, debrided, anatomically reduced, and provisionally stabilized. It is critical to explore the ankle joint, because many times, there are osteochondral fragments off the inferior aspect of the tibia at the medial bend. The fracture is usually internally fixated with multiple cancellous lag screws directed perpendicular to the fracture. Washers may need to be used with the lag screws especially with osteoporotic bone so that the screws will not penetrate through the thin medial cortex. Sometimes, an anti-glide screw with washer is placed at the apex of the fracture to help prevent proximal migration of the fracture. One can also use a 2-hole plate as a larger washer.

It is also important in this fracture configuration to

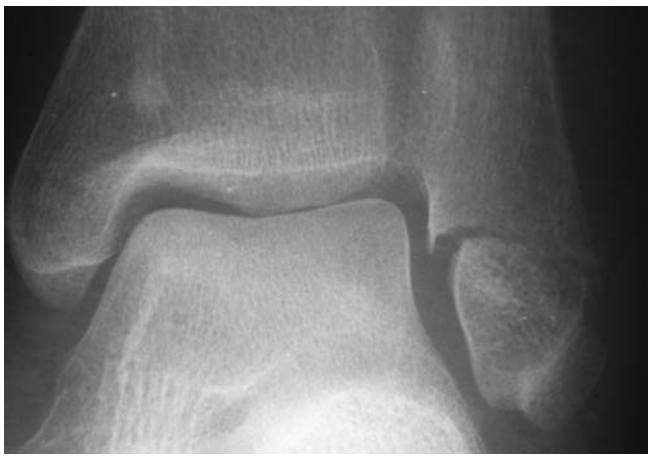

Figure 3A. Mortise view of stage I fracture.

Figure 3B. Anteroposterior view of ORIF with tension band wire technique.

Figure 4A. Mortise view of supination-adduction stage II fracture. The fibular fracture is an interesting variation that is a short curved fracture more like a supination-external rotation fracture.

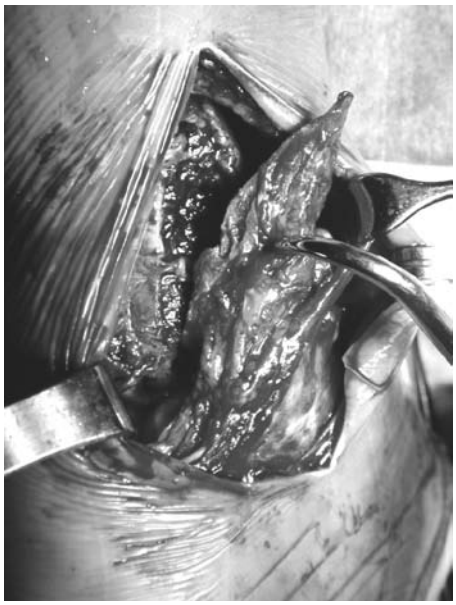

Figure 4B. Photograph of displaced medial malleolus fracture.

evaluate for the possibility of an impacted and superiorly displaced medial aspect of the tibia plafond. This situation is normally associated with fracture-dislocations. An impacted tibial plafond needs to be disimpacted utilizing a tibial osteotomy and levered inferiorly to restore congruity of the inferior tibia articular surface.[8] Local cancellous bone graft can be taken from the exposed medial tibial metaphysis and packed into the osteotomy site to prevent collapse. Fixation should be more aggressive with the application of a buttress plate along with cancellous lag screws across the fracture.

Postoperative management should include 6 to 8 weeks of nonweight bearing immobilization in a short leg cast followed by progressive weight bearing in a fracture brace for 4 to 6 weeks depending on osseous consolidation. As with all ankle fractures, physical therapy is extremely important for the rehabilitation of the patient.

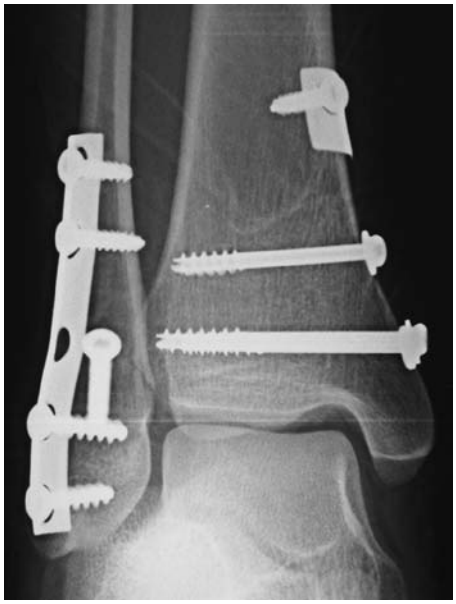

Figure 4C. Mortise view of final reduction and internal fixation. The fibular fracture was fixated with a lag screw and neutralization plate. The tibial fracture was fixated with multiple cancellous lag screws adding an anti-glide screw at the apex of the fracture.

Figure 4D. Lateral view.

REFERRENCES

1. Lauge-Hansen N. Fractures of the ankle: analytic historic survey as the basis of new experimental, roentgenologic, and clinical investigations. *Arch Surg* 1948;56:259.
2. Lauge-Hansen N. Fractures of the ankle. IV. Clinical use of genetic roentgen diagnosis and genetic reduction. *Arch Surg* 1952;64:488.
3. Lindsjo U. Classification of ankle fractures: the Lauge-Hansen or AO system? *Clin Orthop* 1985;199:12-6.
4. Yde J. The Lauge-Hansen Classification of ankle fractures, *Acta Orthop Scand* 1980;51:181.
5. Hughes JL, Weber H, Willenegger H, et al. Evaluation of ankle fractures non-operative and operative treatment *Clin Orthop* 1979;138:111.
6. Mast JW, Teipner WA. A reproducible approach to the internal fixation of adult ankle fractures: rationale, technique, and early results. *Orthop Clin North Am* 1980;11:661.
7. Michelson JD: Current concepts review fractures of the ankle. *J Bone Joint Surg Am* 1990;77:142.
8. Trafton DG, Bray TJ, Simpson LA. Fractures and soft tissue injuries of the ankle: In: Browner BD, Jupiter JB, Levine am, et al, eds.: *Skeletal trauma*. Philadelphia; WB Saunders;1992.