CHAPTER 32

Management of Ankle Fractures in High Risk Patients: A Case Report

Mario Cala, DPM
Jodee Brown, DPM
Abdulaziz Kimawi, MD, DPM
Thomas Merrill, DPM

INTRODUCTION

Diabetes mellitus is a serious pandemic that continues to plague public health officials on a global level. This disease, combined with other comorbidities such as obesity, has shown to have a deleterious effect on many clinical outcomes (1). The literature supports a strong correlation between obesity and failure of hardware following ankle fracture repair; stating that obese patients are 12 times as likely to exhibit postoperative loss of reduction compared with their nonobese counterparts (2). Research studies also show an association between diabetes and a delay in fracture and wound healing, owing in part to effects on cellular proliferation, vascular ingrowth, mineralization of fracture callus, and remodeling (3, 4).

Biplanar external fixation devices are gaining popularity for their use as primary or secondary fixation following ankle fractures and a variety of other lower extremity disorders. These devices provide the unique ability to stabilize fracture fragments and soft tissue damage away from the injured area (5). They are also commended for their ease of application, minimal blood loss, adjustability following surgery and access for wound management. Disadvantages to the use of biplanar fixators are largely centered on the learning curve involved in applying the device and manipulation necessary to achieve the desired outcome. This barrier can be overcome through surgeon education and training. Other major disadvantages of the system include the cost of the equipment together with the tools required for application and removal, and the potential for pin site infections and neurovascular injury. Many of these problems can also be resolved through training and experience as well as early detection and swift action on the part of the surgeon (6).

The authors present a case of a modern surgical approach to an old problem; combining open reduction internal fixation (ORIF) with syndesmotic rope and biplanar external fixation for an ankle fracture with syndesmotic rupture in a morbidly obese, diabetic patient. Implementing this technique can afford surgeons options not previously available when treating this high-risk group.

CASE REPORT

A 33-year-old woman presented to the emergency department with pain and swelling in the right ankle and an inability to bear weight. The patient reported a trip and fall just prior to arrival, which injured the right lower extremity.

The patient's medical history was significant for Type I diabetes mellitus. She was also noted to be obese, with a body mass index of 52. Examination revealed a well nourished, normocephalic individual, in mild distress secondary to pain; however her vital signs were observed to be stable. The lower extremity examination was remarkable for a right ankle deformity with ecchymosis, edema, limited ankle range of motion, and pain on palpation to both the medial and lateral malleoli. Radiographic evaluation revealed minimally displaced, angulated distal tibia and fibula fractures with disruption of the distal tibia fibula syndesmosis (Figure 1). Laboratory findings indicated hyperglycemia with a blood glucose of 331 mg/dl. The patient was subsequently admitted to the hospital with the following diagnoses: right ankle fracture, diabetes mellitus with long standing use of insulin, morbid obesity, and hyperglycemia.

On hospital day 2, the patient underwent an ORIF of the right ankle with application of an external fixator. Hardware applied included a fibular plate, medial malleolar screw, and syndesmotic rope. External fixation utilized consisted of biplanar delta fixators with three 4.5 mm threaded intraosseous rods through the tibia, calcaneus, and talus (Figure 2).

After surgery, the patient was discharged home with a walker and bariatric wheelchair. She was also instructed to remain non-weightbearing on the right lower extremity, and to complete all antibiotic and antithrombotic medications as prescribed. The first postoperative clinic visit occurred 2 weeks after surgery. Radiographs were taken during this visit in order to establish a baseline for healing (Figure 3). The patient reported intermittent pain to the right lower extremity (a grade 5 of 10 on the pain scale), which was well managed with pain medication. The patient was gait trained at the conclusion of this visit for partial weightbearing on the right lower extremity as tolerated.

Figure 1A. Mortise non-weightbearing radiograph of the right ankle. An oblique distal fibula fracture, transverse medial malleolar fracture, malalignment of the ankle mortise and disruption of the distal tibia fibula syndesmosis can be seen.

Figure 1B. Lateral non-weightbearing radiograph.

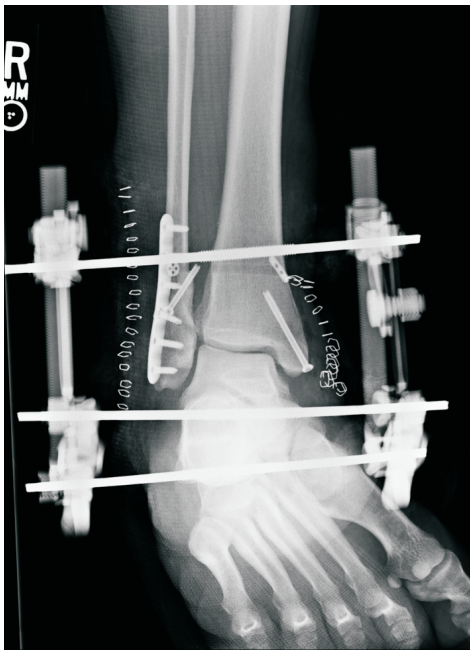

Figure 2A. Mortise postoperative radiograph. Realignment of all fracture fragments to anatomical position can be seen with restoration of ankle mortise. All operative hardware including fibular plate and screws, medial malleolar screw, syndesmotic rope, skin staples and biplanar external fixator can also be appreciated.

Figure 2B. Lateral postoperative radiograph.

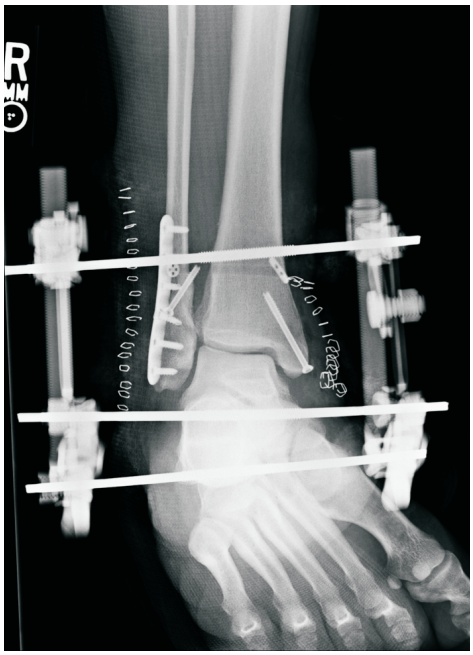

Figure 3A. Mortise radiograph taken in office. Fracture reduction and restoration of alignment continue to be appreciated.

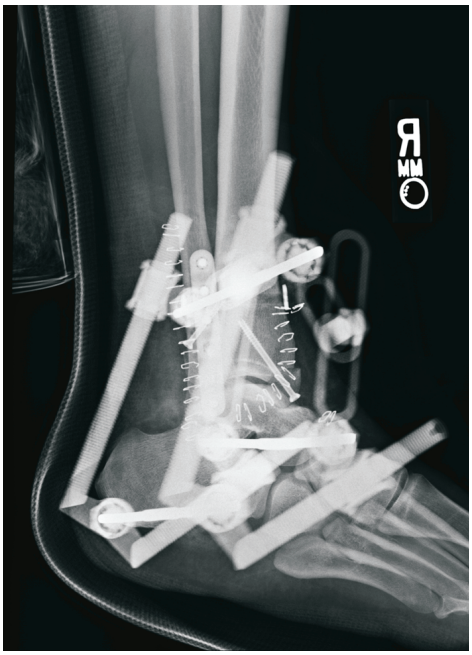

Figure 3B. Lateral postoperative radiograph.

Figure 4A. Anterior-posterior view showing delta frame intact and in place during the first postoperative visit.

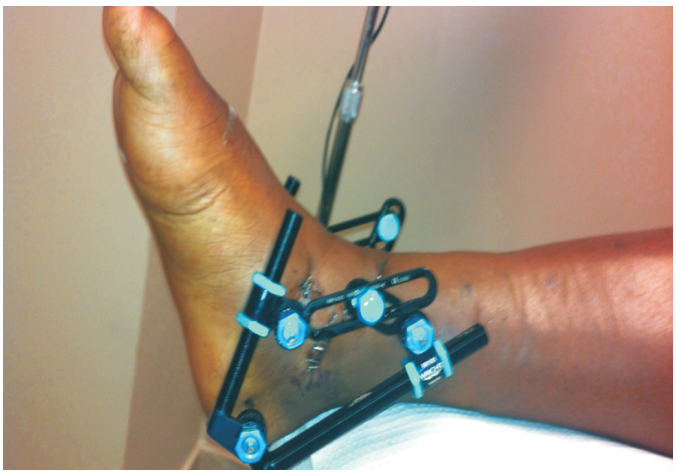

Figure 4B. Lateral postoperative view.

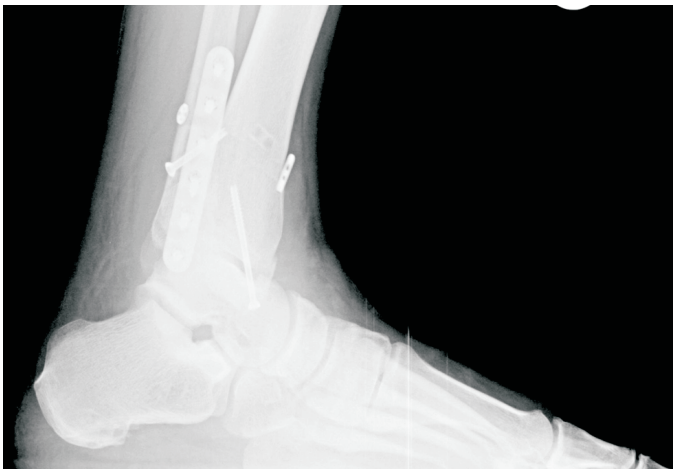

Figure 5. Lateral postoperative radiograph after removal of external fixator. Alignment of fracture fragments and visible transosseous pin sites can be appreciated.

At postoperative week 7, radiographs confirmed healing of both the tibial and fibular fractures (Figure 5). The patient was taken back to the operating room where the external fixator and the skin staples were removed. The patient was placed in an Unna boot dressing with a posterior splint for 2 weeks, followed by a long leg fracture boot, with 3 weeks of physical therapy.

The patient transitioned from partial- to full-weight bearing as tolerated during postoperative week 12. Radiographs taken at this time show almost complete healing of pin sites in bone (Figure 6). At this time she had no reports of pain or instability to the right lower extremity.

DISCUSSION

The use of external fixators as a primary or secondary treatment protocol has increased in recent years, due to its minimally invasive technique, the amount of stability achieved, and its versatility in treating a multitude of conditions (6). High risk patients, such as the one described above, have seen much success with the use of external fixation devices to achieve maximum stability at fracture sites coupled with offloading of incision sites. The result is earlier postoperative weightbearing and satisfactory wound healing in this population, compared with ORIF alone (5, 7).

We present the case of a 33-year-old, diabetic, morbidly obese female, who underwent ORIF of a bimalleolar fracture with syndesmotic rupture, supplemented by a biplanar external fixation device. The external fixator was left in place for 7 weeks, with the patient transitioning from partial-weightbearing at 2 weeks to full, nonassisted weight bearing at 12 weeks postoperatively. External fixators are ideally suited for morbidly obese patients, providing great stability of bone fragments with minimal soft tissue compromise. They are also capable of maintaining fracture reduction while allowing the patient to weight bear postoperatively (5). The use of this technique has shown to improve patient compliance and overall satisfaction in this group, as they are able to ambulate earlier with a more swift return to normal daily activities. Patient complaints, while minimal, are usually centered on large dressings and uncomfortable/unsightly postoperative footwear (6).

The findings of this report suggest that the use of external fixation devices combined with ORIF in the management of ankle fractures is a viable treatment protocol for high-risk patients compared with ORIF alone. It is proposed that this adjunct procedure be considered prior to surgical intervention in this group due to the reduced risks and higher benefits, namely early ambulation and protection of surgical sites; however, more studies are needed to confirm this.

Figure 6. Final anterior-posterior radiograph showing complete bone healing without loss of reduction. The absence of transosseous pin sites can be appreciated.

REFERENCES

1. Dodson NB, Ross AJ, Mendicino RW, Catanzariti AR. Factors affecting healing of ankle fractures. J Foot Ankle Surg 2013;52:2-5.
2. Mendelsohn ES, Hoshino CM, Harris TG, Zinar DM. The effect of obesity on early failure after operative syndesmosis injuries. J Orthop Trauma 2013;27:201-6.
3. Dellenbaugh S, DiPreta J, Uhl R. Treatment of ankle fractures in patients with diabetes. Orthopedics 2011;34:383-8.
4. Facaros Z, Ramanujam CL, Stapleton JJ. Combined circular external fixation and open reduction internal fixation with pro-syndesmotic screws for repair of a diabetic ankle fracture. Diabet Foot Ankle. E-pub ahead of print.
5. Seybold D, Gebmann J, Ozokyay L, Frangen T, Muhr G, Graf M. Custom made Ilizarov ring fixator for fracture care in morbidly obese patients. Langenbecks Arch Surg 2009;394:393-8.
6. Merrill T, Cala M, Herrera V, Sotelo AE. 15 diagnoses, 9 surgical procedures, 1 device – multiple applications of the MiniRail. Foot Ankle J 2012;5:2.
7. Clark J, Mills J, Armstrong DG. A method of external fixation to offload and protect the foot following reconstruction in high-risk patients: The SALSAstand. Eplasty 2009;9:185-97.