CHAPTER **26**

ANKLE MALUNIONS

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The goal in managing displaced ankle fractures is obtaining an anatomic reduction to provide the best chance for optimal long term function. Although closed reduction techniques can occasionally produce satisfactory alignment, most displaced ankle fractures require surgical intervention. However, failure to produce an anatomic reduction results in malunion with significant sequelae from post-traumatic arthritis.

The first question is what constitutes an anatomic position? On a gross evaluation, Joy et al reported that on the AP view, a line drawn down the center of the tibia should pass through the center of the talus. On the lateral view, a vertical line down the center of the tibia will pass through the upper most part of the talus.[1] Trafton and colleagues reported that on the AP radiograph, the tibia-fibula overlap should be 10 mm or greater. On the mortise view, the tibia-fibular clear space should be 5 mm or less.[2] However, these numbers should be considered only as guides for the position, as Ostrum et al indicate that they are unreliable.[3] I agree with their assessment. The unreliability of these numbers is based on sex, anatomic variation, and the radiographic positioning. Hamilton reports that the medial joint space should be 4 mm or less.[4] It has been stated that the joint spaces about the ankle should vary by less than 2 mm.[5]

Ankle malunions can arbitrarily be divided into being either acute or chronic. An acute malunion is one that is within several weeks of the injury/surgery. It can be opened and managed by manipulating the fracture fragments and applying internal fixation. The chronic malunion has healed, and requires a reconstructive procedure. This may require osteotomy of the fibula or tibia as well as addressing the ligamentous structures or it may involve only ligamentous structures (late diastasis).

In an acute malunion that was initially treated closed, the fracture should be addressed as a routine ORIF. The fracture is exposed through a standard surgical approach, the fracture reduced, and fixated according to AO technique.[6,7] If the acute malunion is the result of inadequate surgical reduction, then a decision needs to be made about the feasibility of re-operation. This needs to take into account the expectations of the patient, the condition of the soft tissue, the healing of the incisions, the degree of malreduction, the likelihood of being able to obtain an anatomic reduction, the exchange of internal fixation, the increased potential for postoperative complications, and any legal implications. Problems can arise from poorly placed incisions, poorly placed or inappropriate internal fixation, the need to modify the osteosynthesis construct, and comminution of the fracture that makes obtaining alignment difficult.

In a chronic malunion, it is necessary to decide if it is essentially an osseous or ligamentous malposition. If there is an osseous malunion, then osteotomy is required. It is most likely to involve the fibula. Reconstruction through a fibular osteotomy has been well described by Weber.[8] If the fracture was a Weber Type C, then the fibular nonunion can be anywhere along the fibula from above the syndesmosis to the neck of the fibula. It is necessary to debride any soft tissue entrapment from the medial joint space and also the syndesmosis. If there had been an attempted ORIF, then old internal fixation may need to be removed. The osteotomy is normally transverse and performed through the malunion or below it in the distal one-fourth or one-third of the fibula (Figure 1).

The transverse configuration allows for correction of both length and rotation. A stout plate, (usually small fragment limited contact dynamic compression plate) is applied and fixated distally with 2 screws. The plate should be applied on the posterolateral aspect of the fibula to allow for internal rotation of the distal segment as it is lengthened. Remember the initial displacement of the distal fracture segment involves shortening and external rotation. Apply an articulated tension device proximal to the plate and then distract. A less-desirable alternative for distraction is to use a laminar spreader or a small external fixator. Distract until the appropriate correction has been achieved. This is difficult to determine clinically, but a good sign is reduction of the syndesmosis but especially

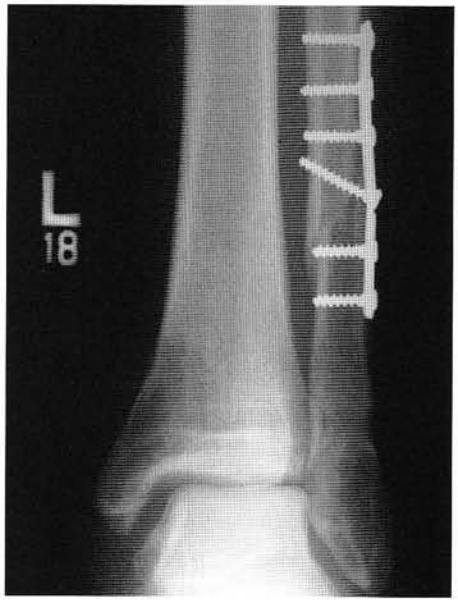

Figure 1A. Malunion of the fibula with a "sprung" ankle mortise following ORIF.

Figure 1B. A transverse fibular osteotomy above the syndesmosis with an articulated tension device applied to distract the fibula to the appropriate length. The gap is filled with a composite cortical-cancellous graft taken from the distal tibia.

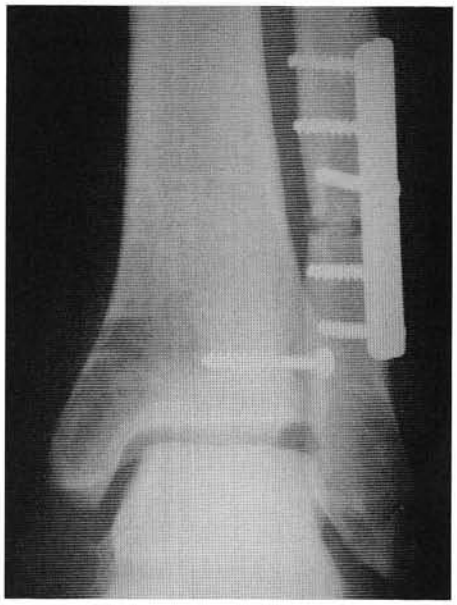

Figure 1C. Restoration of the fibular length and rotation producing an anatomic ankle mortise and the application of new internal fixation.

the medial joint space. If the lateral aspect of the ankle joint is exposed, it is sometimes possible to evaluate if the superior aspect of the articular facet on the fibula is in line with the articular cartilage on the inferior tibia. However, radiographic evaluation will be the absolute determinant to whether an anatomic restoration has been achieved.

With restoration of an anatomic ankle, then the distraction defect is filled with a cortical-cancellous graft taken from the tibia and the proximal portion of the plate secured with screws. Evaluate for the distinct possibility that transyndesmotic fixation may be required. Less commonly, the malunited fibula may be rotated or angulated without loss of length. In this case, the fibular osteotomy can be performed percutaneously and left unfixated, but stabilized with multiple transyndesmotic screws distally.

If the fracture was a Weber Type B, then the fibular malunion will be at the level of the syndesmosis. At this location, the fibular osteotomy needs to recreate the spiral configuration of the original fracture. The rest of the reconstruction is the same as described above except the syndesmosis should not need debridement or stabilization. If the medial and/or posterior malleolus are also malunited, then osteotomy will be required. However, the ability to anatomically reduce either of these malunions is extremely problematic.

If the malunion is strictly ligamentous, then the key to reconstruction is to debride the medial joint space and the syndesmosis followed by transydesmotic stabilization (Figure 2). This can be done either through open arthrotomy or arthroscopic (preferred) techniques. Arthroscopically, the condition

Figure 2A. A malpositioned ankle after ORIF. Both the medial malleous and fibular fractures appear to be anatomically reduced and well consolidated with retained internal fixation but with a widened medial joint space.

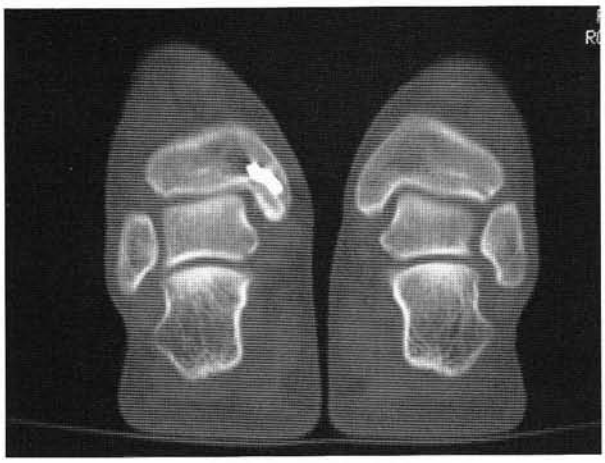

Figure 2B. CT scan confirms malposition of the fibula in the syndesmosis as well as widened medial joint space.

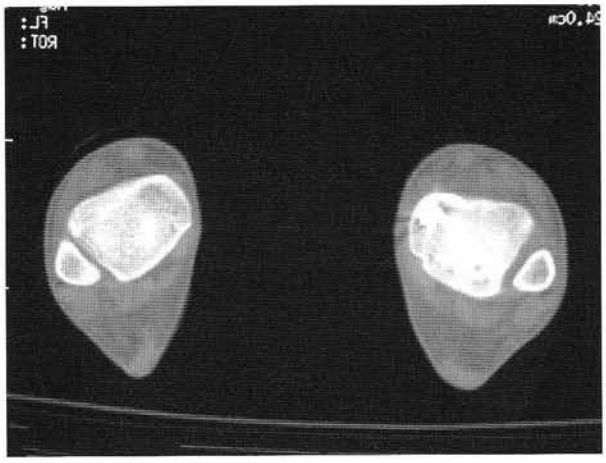

Figure 2C. Demonstrates widening of the syndesmotic interval.

Figure 2D. Image of debridement of the syndesmosis with an arthroscopic abrader. Note the internal fixation has been removed.

Figure 2E. Lateral image demonstrating arthroscopic assisted debridement of the syndesmosis and noting how far posterior one can reach.

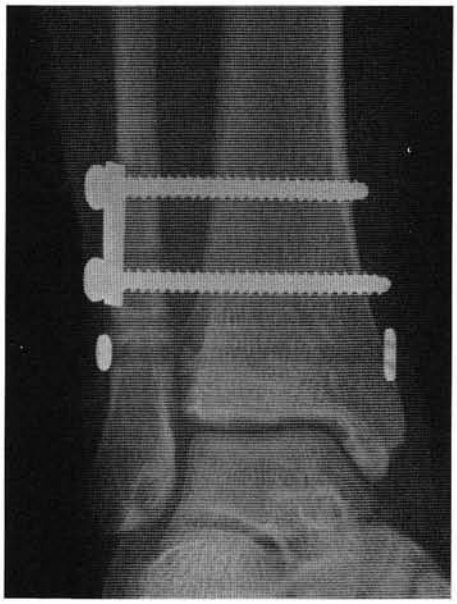

Figure 2F. Anatomically reduced ankle mortise with stabilization utilizing two 4.5 mm cortical transyndesmotic screws and a tight-rope device.

of the articular cartilage is evaluated. Then the syndesmosis is debrided with power instrumentation to remove scar tissue and the adjacent surfaces of the tibia and fibula are abraded to facilitate fibrosis without necessarily creating a synostosis. The syndesmosis is provisionally stabilized with reduction forceps and fixated, usually percutaneously. Fixation takes the form of multiple 4.5 mm transyndesmotic screws placed as positional screws engaging four cortices. Additional stabilization is obtained occasionally with a button/suture device. The entire procedure is guided with image intensification and the final reduction with fixation is confirmed with regular radiographic evaluation.

Postoperative management involves immobilization in a cast or fracture brace for approximately 2-3 months. The fracture brace is preferred so the patient can undergo active rehabilitation with range of motion exercises. The initial 5-6 weeks is non-weightbearing followed by weightbearing to tolerance. Transyndesmotic screws are normally removed at 3 months. However, in cases of malunion repair, they are left in for approximately 5-6 months. A case can be made for allowing them to remain permanently.

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