CHAPTER **26**

ANTERIOR APPROACH FOR ANKLE ARTHRODESIS

Michael C. McGlamry, DPM

As the debate on the merits of total ankle arthroplasty (TAR) versus ankle arthrodesis continues, surgeons in both camps strive for better implants, better techniques, and new methods to enhance surgical outcomes. Current approaches to ankle arthrodesis have included anterior medial and anterior lateral arthrotomy (or mini arthrotomy), the transfibular approach, medial malleolar osteotomy, and the posterior approach primarily for use in salvage cases with a fragile anterior soft tissue envelope. The author's training and primary experience were with anterior medial and lateral arthrotomies with or without fibular osteotomy. Exposure and training in TAR as well as the development of new designs of contoured plating, however have caused a critical look at the value of the anterior approach.

There have been numerous publications looking at the anterior approach with primary screw fixation, screw fixation augmented with anterior plating, and even a biomechanical analysis comparing single anterior to anterior medial/anterior lateral double plating techniques. Considerations for choosing the incisional approach to be utilized would include osseous angular deformities that need to be addressed such as varus or valgus malunion from previous fracture, and a desire to access the subtalar joint through the primary incision. Most importantly perhaps in severe post traumatic situations, is the quality of the soft tissue envelope, scarring, and previous skin grafting or flap coverage. Regardless of the incisional approach, all principles of successful arthrodesis must still be honored for a successful outcome.

FIXATION CONSTRUCT

Two and three screw crossed large fragment constructs have been relatively standard for fixation of primary ankle arthrodesis over the last 20 years. In an effort to achieve additional multiplanar stability Ruch advocated the addition of anteriorly-placed large staples. The anteriorly-placed plate combined with one or two large compression screws takes the Ruch model and increases the stiffness and resistance to failure.

The author has used this method over the last 2 years in high-risk patients whose behaviors included early weight bearing against medical advice and resuming tobacco abuse in the postoperative period. In spite of these behaviors, the author has observed a high level of successful bony union. Careful retraction and limited exposure times, however, still need to be respected, as wound problems, especially in high-risk patients continue to seem to present more of a challenge than successful osseous union.

ANATOMIC APPROACH

The anterior approach to the ankle for TAR or ankle arthrodesis is navigated by placing the incision between the tibialis anterior and the extensor hallucis longus. It is our practice to mark the course of these structures in the preoperative holding area having the patient actively fire the tibialis anterior and EHL. Additionally, marking the course of the anterior tibial/dorsalis pedis and intermediate dorsal cutaneous nerve can be helpful as well. In larger patients the use of handheld Doppler may facilitate identification.

TECHNIQUE

Utilizing anatomic dissection principles, the incision is carried out along the course described above, from several centimeters proximal to the ankle down to the talonavicular joint distally.

After reflection of the subcutaneous tissues, the tibialis anterior can be clearly visualized and palpated through the deep fascia and extensor retinaculum (Figure 1). The deep fascia is then carefully penetrated and unzipped utilizing a Metzenbaum scissor. The surgeon should stay slightly more lateral and make all attempts to preserve the tibialis anterior within its sheath to minimize wound complications (Figure 2).

The dissection plane is then bluntly and carefully extended between the tibialis anterior and EHL. The EHL, neurovascular bundle and the remaining contents of the compartment are then retracted laterally providing safe and unobstructed passage to the anterior talocrural joint. The anterior joint capsule is released with minimal stripping of the periosteocapsular attachments and the joint is exposed.

Mechanical distraction devices such as the AO mini distractor or Hintermann distractors are then utilized to complete access to the joint while minimizing stripping of

Figure 1. Following reflection of the subcutaneous tissue, the extensors are visualized through the deep fascial layer.

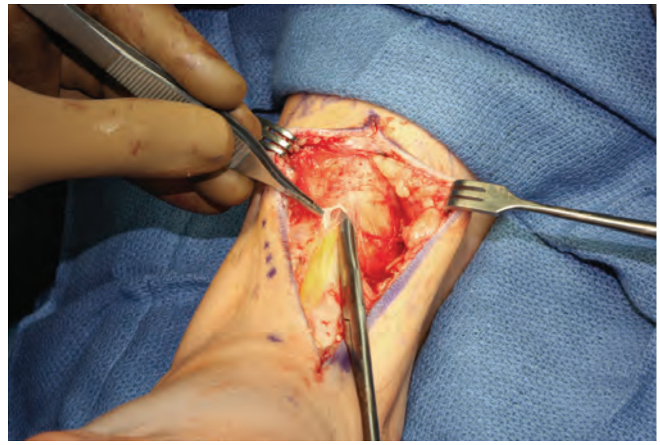

Figure 2. The deep fascia and extensor retinaculum are opened, taking care to stay slightly lateral and making all efforts to maintain the tibialis anterior within its extensor sheath.

the vascular soft tissue attachments (Figure 3). The joint surfaces are then prepared using primarily hand instrumentation including osteotomes and a series of straight and angled curettes. Power instrumentation is limited in most cases to a burr and/or a small drill to assure complete fenestration of the often schlerotic subchondral bone plate. Once the surface is thoroughly prepared, the site is ready for fixation (Figure 4).

Distraction is released and the talus is returned to its anatomic relationship, which is centered under the tibial plafond in the anterior posterior position, neutral in the frontal plane and neutral to slightly abducted in the transverse plane. Temporary fixation is then achieved with Steinmann pins or cannulated guide pins under fluoroscopic guidance. Bone graft may be utilized to fill any defects at this point interpositionally or prior to closure for any gutter gapping (Figure 5).

Once appropriate position is confirmed, it is recommended that a secondary point of fixation be added to maintain position as the compression fixation is applied. The direction of fixation of the initial screw is of surgeon preference, however for mechanical construct reasons, regardless of the direction of application, I recommend a primary screw running from slightly posterior medial in the concavity of the tibial metaphyseal flair into the anterior lateral talar process. Alternatively, I have retrograded the guidepin for this screw in the opposite direction. Another good option is the "home run" screw from the posterior lateral distal tibia into the talar neck (Figure 6). These screw directions offer the advantage of crossing the anterior-posterior midline axis of the joint and helping to resist additional dorsiflexion of the ankle with application of the locking compression plate.

Once initial compression fixation is achieved, the desired size of plate is selected and positioned. The plate utilized in this case sits slightly laterally obviating the need for notching of the anterior tibial cortex. This also places the plate, when properly positioned, in line with the axis of progression of the talus (Figure 7). The plate shown in this case fans 4 screws out into the body of the talus. These are applied initially under fluoroscopic guidance to assure protection of the subtalar joint (Figure 8).

Once compression has been achieved and the talar body secured to the plate, the compression screw is applied proximally into the compression slot in the plate. This secures the final compression of the construct, which is then locked in place with the remaining locking screws as needed based on the surgeon's discretion (Figure 9).

Postoperative aftercare is in line with other approaches with non-weightbearing for approximately 8 weeks followed by progressive partial weightbearing over the following month. Return to shoes is typically allowed around 12 weeks, based on clinical and radiographic findings.

The author has shown an overview of the anterior approach to ankle joint arthrodesis. This is a technique that allows direct access to the joint with minimal periosteal stripping and allows application of the newer anterior locked plating, which when combined with a traditional compression screw allows for enhanced stability without compromising the fusion mass interface in ankle arthrodesis.

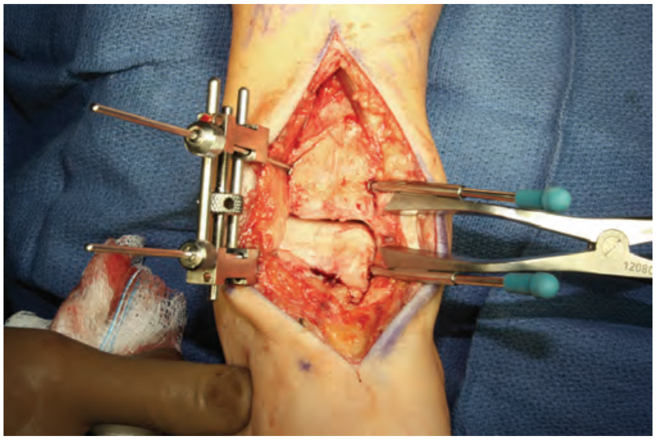

Figure 3. Application of distraction devices allow for symmetrical distraction for site preparation while minimizing additional soft tissue release, which might cause additional vascular compromise.

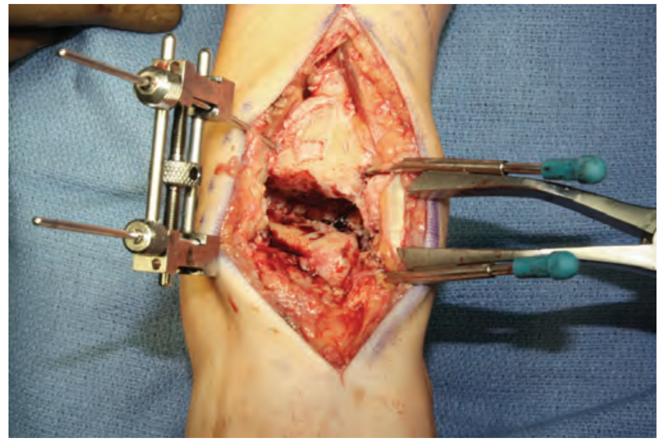

Figure 4. Following completion of site preparation, healthy bleeding surfaces are noted that should readily support successful arthrodesis.

Figure 5A. Intraoperative lateral C-arm view showing reduction of the talar body and temporary fixation with 2.8 mm guide pin for later placement of large fragment cannulated screw.

Figure 5B. Anterior-posterior C-arm view with placement of secondary fixation from the lateral talar process aiming superior medial.

Figure 6. Anterior-posterior view showing placement of initial compression fixation with 7.3 mm partially threaded screw for primary compression.

Figure 7. After placement of compression screw, the plate is selected and centered under fluoroscopic guidance. Once optimal placement is achieved temporary fixation can be performed with a fixation tack.

Figure 8. Plate is anchored into the talar body with 4 divergent 3.5 mm locking screws.

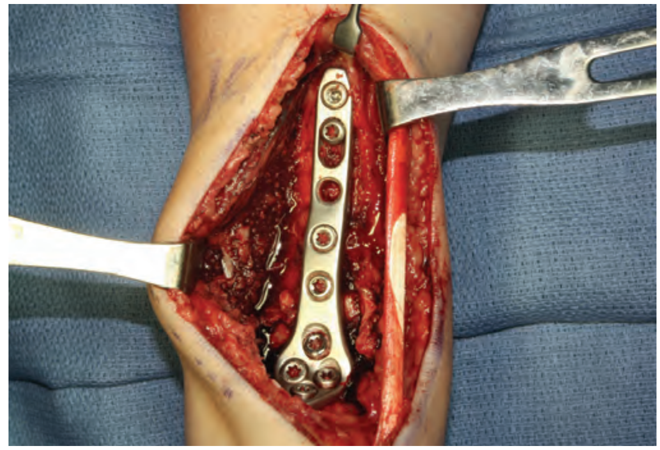

Figure 9A. Clinical and radiographic appearance after completion of fixation with placement of the tibial compression and locking screws.

Figure 9B. Radiographic appearance after completion of fixation.

Figure 9C. Radiographic appearance.