Fibula Osteotomy with Interpositional Bone Graft and Intramedullary Rod Fixation for Malunited Fibula

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Statement of Purpose

Due to the risk of malunion and subsequent post-traumatic arthritis, revisional surgery may be indicated after a malreduced ankle fracture. The purpose of this study is to provide a novel technique for addressing a malunited fibula utilizing an interpositional allograft and intramedullary fibular rod compared to the traditional plate and screw fixation.

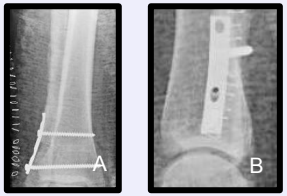

Figure 1.Preoperative (A) Anterior posterior (AP) view right ankle (B) Lateral view right ankle.

Literature Review

The effects of malreduced ankle fractures have been well described in the literature.[1-4] Ramsey et al reported a 42% decrease of articular contact of the ankle joint with one millimeter (mm) of lateral translation of the talus.[2] When addressing fibular malunion, fibrosis between the syndesmosis is excised to achieve reduction.[4] The osteotomy is made at the center of rotational angulation (CORA) to correct length, rotation and axial alignment. Offierski, Fogel and van Wensen et al. reported good to excellent outcomes after fibular osteotomy for ankle joint restoration.[1,3] Intramedullary fixation with interpositional bone graft for correcting a fibular malunion has not been described in the literature.

Case Study

A thirty-three year-old female presented to our clinic with complaints of right ankle pain and poor ambulatory tolerance. Past surgical history was significant for open reduction internal fixation (ORIF) of right ankle fracture approximately one year prior. Upon exam, a hypertrophic scar, syndesmotic instability, and fibular malunion was identified. A revisional surgery was performed to address syndesmotic instability; however, the patient still experienced moderate pain and poor ambulation (Figure 1 (A,B)). Advanced imaging revealed a widened ankle mortise and hardware failure of the syndesmotic screws (Figure 2(A,B)). It was our assessment that the failure of the hardware and continued pain was a result of fibular malposition. As a result of the previous procedures, the patient's lateral soft tissue envelope was deemed too tenuous for traditional fibular malunion revisional techniques. Therefore, a second revisional surgery was performed consisting of hardware removal, ankle arthroscopy, fibula osteotomy, interpositional bone graft with intramedullary fixation and syndesmotic repair. At twenty-two months postoperatively, patient is in regular shoe gear and ambulates without difficulty.

Surgical Technique

The patient was brought to the operating room and placed in the supine position. Under fluoroscopic guidance, the two broken screws were removed from the distal syndesmosis through two small stab incisions. Attention was directed to the anterior ankle joint where anteromedial and anterolateral portals were established for the ankle arthroscopy. There was a significant amount of fibrotic tissue within the medial gutter as well as syndesmosis. Upon debridement of the joint, the mortise was reduced. Under fluoroscopy, the ankle joint and syndesmosis was reevaluated, confirming a fibular malunion with significant shortening. A small (approximately two centimeter) longitudinal incision was made overlying CORA of the fibula deformity. A transverse fibular osteotomy was performed at the CORA, above the syndesmosis and distracted until the ankle mortise was aligned in a rectus position (Figure 2 (C, D)). A calcaneal cross-sectional graft was prepared (Figure 2 (F)) and inserted into the defect to maintain fibular length. Final fixation was achieved using a one hundred and fifty mm intramedullary fibular rod which was inserted through a small stab incision at the distal tip of the fibula. The syndesmosis was reduced with a clamp and fixated in appropriate positioning with two suture buttons. Intraoperative fluoroscopy was used to confirm adequate reduction and fixation of the ankle joint as well as the osteotomy and syndesmosis. The syndesmosis was stressed under fluoroscopy and was found to be stable. The incisions were closed and a posterior splint was applied.

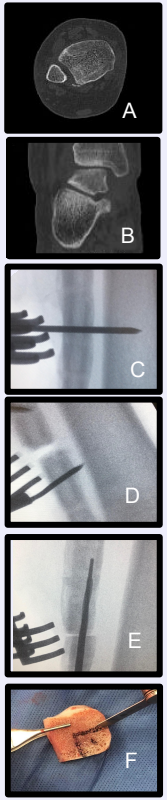

Figure 2. Intraoperative (A,B) CT imaging displaying widening of syndesmosis and medial clear space (C) CORA, site of osteotomy (D) Distraction of osteotomy site for fibula (E) Reaming fibula prior to graft insertion for easier intramedullary access (F) Preparation of calcaneal cross-sectional for interpositional graft.

Figure 3.Intraoperative AP view of the right ankle.

Figure 4.Postoperative lateral view of the right ankle.

Analysis and Discussion

Speed et al. was the first to describe the use of a fibula osteotomy for correction of a malunited ankle fracture in 1936.[3] When correcting an ankle malunion, the objective is to restore the anatomical alignment, congruency and stability of the joint.[3] Our approach is intended for revisional cases when soft tissue preservation is necessary and the patient is not a candidate for an end-stage salvage procedure. The goal of our procedure was to provide the patient pain relief and to prevent further progression of post-traumatic osteoarthritis.

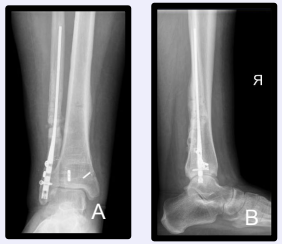

Figure 5. 5 months postoperative (A) AP view (B) lateral view of the right ankle.

References

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