Distraction Subtalar Arthrodesis

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KEYWORDS

• Arthritis • Arthrodesis • Calcaneus • Distraction • Fracture • Malunion • Osteotomy • Subtalar

KEY POINTS

- Patients with calcaneal malunion can have significant functional limitations. They need a focused history, physical and radiographic examination.
- Selective injections can be useful in both locating the source of patient's pain and in preoperative discussions with the patient about expectations of pain relief after surgery.
- Adequate preparation of the subtalar joint and correction of the hindfoot deformity are important for a successful outcome.

INTRODUCTION

The calcaneus is the most commonly fractured tarsal bone. Calcaneal fractures account for approximately 60% to 70% of tarsal fractures and roughly 2% of all fractures.[1] The mechanism of injury is typically high-energy axial loading of the calcaneus, such as from a motor vehicle accident or a fall from height. These injuries have an important socioeconomic impact because 90% of patients sustaining calcaneal fractures are young and of working age.[2] Cotton and Henderson understood this in 1921 when they said, "The man who breaks his heel bone is done, so far as his industrial future is concerned."[3] For many patients, a calcaneal fracture is life altering and can be highly disabling. Displaced intra-articular calcaneal fractures frequently result in decreased hindfoot motion, persistent foot pain, and angular deformity.[4]

PATHOANATOMY OF CALCANEAL FRACTURE

Most calcaneal fractures are a result of axial loading. The lateral talar process wedges the calcaneus and forces the subtalar joint into eversion. As explained

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by Böhler[5], this force causes a primary fracture line shearing the medial sustentaculum from the calcaneal tuberosity. It also leads to a secondary fracture line that occurs in the sagittal plane. These lines travel anteriorly and posteriorly, leading to posterior facet and anterior process comminution. The exit point of the secondary fracture lines varies and can exit the body of the calcaneus medially or laterally. Secondary fracture lines have been seen extending into the calcaneocuboid joint or splitting the anterior facet of the subtalar joint. Further impaction of the talus onto the calcaneus results in lateral displacement or blowout of the lateral calcaneal wall.[5]

The characteristic deformities seen in calcaneal fractures are a result of the primary and secondary fracture lines. Following fracture, the calcaneus is typically shortened and flattened as a result of the displacement through the primary fracture line. The sustentaculum tali usually remains with the talus, and the tuberosity displaces superolaterally. A recent study by Gitajn and colleagues[6] challenged the typical fracture pattern dogma because 44.3% of the calcaneus fractures they reviewed had sustentacular fractures. Only 11.7% were displaced but the investigators recommended evaluating the position of the sustentacular fragment to see whether this should be used as a landmark to anchor the fracture fixation. This short, flat appearance of the calcaneus is noted radiographically by a decrease in Böhler angle. It also causes the talus to rest in a more horizontal, dorsiflexed position that is seen radiographically as a decreased talar declination angle. The secondary fracture lines cause the additional deformities. The calcaneal tuberosity displaces into varus, leading to a varus heel position. In addition, the blowout of the lateral calcaneal wall results in a widened heel and subfibular impingement (**Fig. 1**). A recent study by Toussaint and colleagues[7] evaluated the rate of peroneal dislocation associated with 421 calcaneal fractures. A high rate (28.0%) of dislocated peroneals was noted and 89.8% of the dislocations were not noted on the radiology report. This study reaffirms the need for vigilance by surgeons treating these fractures to note the position of peroneal tendons on preoperative imaging.

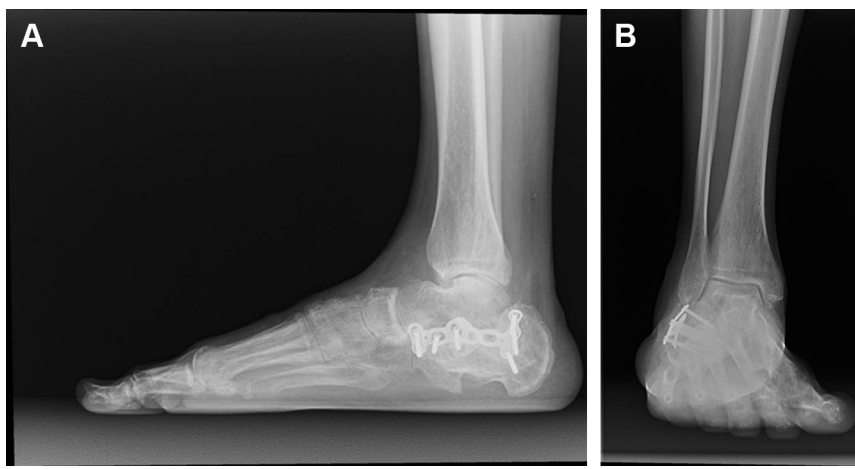

Fig. 1. (*A*) Preoperative weight-bearing lateral radiograph. (*B*) Preoperative weight-bearing mortise ankle radiograph. Note the overlap of the midfoot on the talus, indicating a flattened talus. This patient also has a widened heel and resultant subfibular impingement.