Corrective Osteotomies for Malunited Extra-Articular Calcaneal Fractures

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KEYWORDS

• Calcaneal malunion • Extra-articular correction • Joint preserving
• Chronic peroneals dislocation • Exostectomy

KEY POINTS

- Correction of calcaneal malunions is a technically difficult procedure that carries many risks for the patient.
- Joint-sparing extra-articular procedures for calcaneal malunions should be carefully evaluated, as few will be amenable to this approach.
- The presence of articular malunion or arthritic change to the subtalar joint is a contraindication for a joint-sparing approach.
- Simple exostectomy or osteotomy procedures can be effective at relieving localized pain caused by excessive pressure from plantar and posterior tuberosity protuberances.
- Associated soft tissue issues should be considered before proceeding with surgery, including skin and soft tissue quality, chronically dislocated peroneals tendons, and equinus contracture.

INTRODUCTION

Calcaneal fractures are the most common fracture of the hindfoot. These fractures often produce a high level of dysfunction.[1,2] Historically, most fractures were treated conservatively because of lack of knowledge concerning the injury.[3–5] However, as that method of treatment produced unacceptable results, alternative interventions were investigated. Currently, many surgical options exist for the treatment of calcaneal fractures, including external fixation, percutaneous techniques, and open reduction internal fixation either through a traditional extensile lateral or sinus tarsi approach.[6–10] Conservative or poor surgical techniques continue to produce calcaneal malunions. Calcaneal malunions present a difficult scenario for the treating orthopedic surgeon and can lead to deformity and rapid, progressive arthrosis of the subtalar joint.

The authors have nothing to disclose.

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PATHOLOGY AND DEFORMITY EVALUATION

Most calcaneal fractures involve the posterior facet and only approximately 25% are extra-articular fractures.[11] Many deformities are created as a result of the injury (Fig. 1). Despite the joint being preserved in these injuries, the deformities that arise can present issues for the patient in the future. An axial force can cause the talus to be driven into the calcaneus through the neutral triangle, which is an area of relative osteopenia. The bone collapses and pushes out the lateral wall of the calcaneus. The lateral wall displacement or *blow out* creates subfibular impingement. This displacement causes lateral pain most noted with uneven surfaces. With impaction of the talus into the calcaneus, there is decreased talar declination angle caused by the depression of the talar body into the fracture, creating anterior ankle impingement. Fractures through the body of the calcaneus can also create shortening of the calcaneus. The subsequent varus deformity of the posterior tuberosity causes patients to ambulate through the lateral border of the foot. It also creates stiffness as the medial column stiffens with hindfoot varus. Fractures of the posterior tuberosity of the calcaneus can create posterior prominence of the tuberosity leading to discomfort from direct pressure.

CLASSIFICATION

Currently, 2 classification systems for calcaneal malunions exist. The Stephens and Sanders classification system places the malunion into 3 categories.[12] Type I involves mild subtalar arthrosis with subfibular impingement, which can be treated with simple exostectomy. Type II malunions have advanced arthrosis with subfibular impingement. In addition to exostectomy, subtalar arthrodesis is advocated for these types of deformities. The type III deformity adds hindfoot varus to the previous deformities. This deformity requires corrective calcaneal osteotomy in addition to fusion and exostectomy. This classification system has merits in that it is prognostic and helps to guide the surgeon with treatment. However, this classification does not address anterior ankle impingement from talar body collapse.

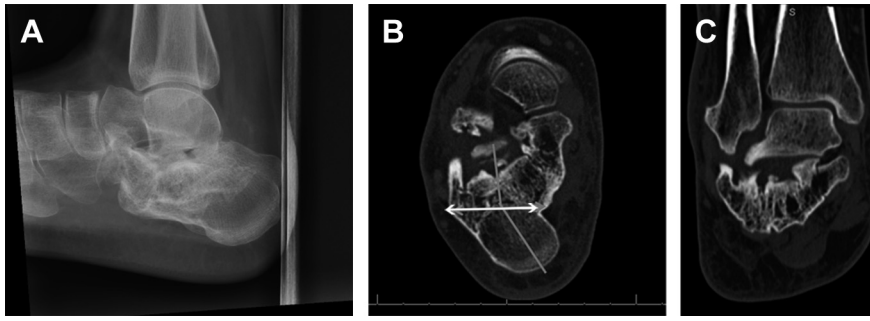

Fig. 1. (*A*) Lateral weight-bearing radiograph of a 23-year-old woman shows a calcaneal malunion with loss of height and Böhler's angle. Also, note the subsidence of the talus into the calcaneus creating anterior ankle impingement. (*B*) Axial view of the CT scan shows expansion of the lateral wall (*arrow*) and the severe varus angulation of the posterior tuberosity with shortening. (*C*) Semicoronal view of the CT scan shows subfibular impingement and subtalar arthrosis. Note the presence of the healed distal fibular avulsion fracture from injury to the superior peroneals retinaculum suggestive of chronic peroneal dislocation.