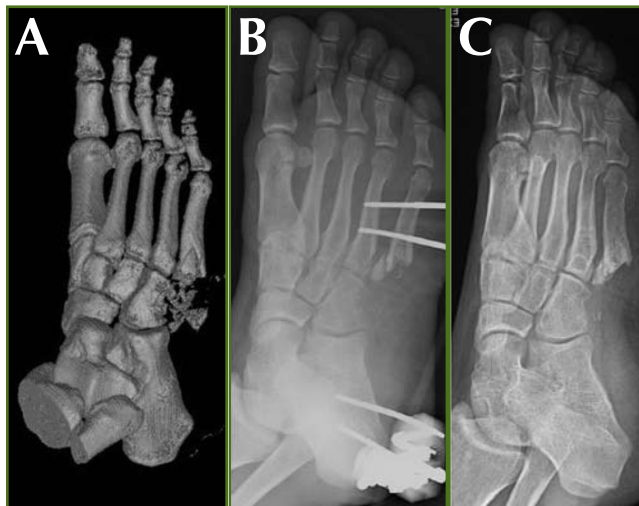


**Figure 26-4.** Blunt trauma causing tibial pilon fracture and midfoot fracture dislocation. (A) Foot fasciotomies performed in the lateral. (B) Radiograph demonstrating the midfoot fractures with lateral dislocation of the talar head through the fractured lateral navicular. (C) Placement of a mitre-type ringed external fixator, allowing reduction of the talar head utilizing an olive wire and re-establishing the length of the lateral column. (D) The external fixator does not cross the ankle joint, allowing immediate range of motion across the ankle.



**Figure 26-5.** High-velocity gunshot wound to the lateral foot. (A) 3-D computed tomography reconstruction of the foot demonstrating loss of the 5th metatarsal base and a portion of the cuboid. (B) External fixation to maintain the length of the lateral column of the foot. (C) Final follow-up demonstrating maintenance of the lateral column length after healing.

or amputation is the best option for the patient. Severe open injuries of the hindfoot are also associated with high rates of late infection and subsequent amputation despite ostensibly successful initial limb salvage.

Calcaneal alignment, as one part of the foot tripod, is critical to maintain appropriate length, width, and height to allow for near-normal shoe wear and gait. Bone loss in the calcaneus and subtalar joint destruction as a result of high-energy open trauma are often accompanied by critical soft tissue loss. Soft tissue reconstructions for the lateral and posterior aspects of the calcaneus have been described with moderate success, but there are no reliable reconstruction options for wounds of the plantar fat pad.<sup>41-43</sup> Plantar soft tis-

sue wounds are known predictors of poor outcomes with associated open calcaneus fractures.<sup>44,45</sup> It is unclear whether soft tissue transfers in the presence of open calcaneus fractures may reproduce the function of the plantar fat pad, and amputation should be considered in these cases.

Closed calcaneus fractures do occur and may be treated in the standard fashion, although following combat-related trauma, these tend to fall on the severe end of the spectrum. A recent biomechanical study comparing percutaneous screw fixation versus lateral plating of Sanders type IIB fractures in cadavers demonstrated similar mean-to-load failure and construct stiffness.<sup>46,47</sup> More research is needed, but percutaneous screws for definitive fixation may be an attractive alternative to plating with the traditional lateral exposure, possibly leading to decreased infection rates. Similarly, techniques combining limited incision and percutaneous screw fixation for closed type II and III fractures have been described with decreased rates of infection and equivalent accuracy and maintenance of reduction.<sup>47</sup> Unfortunately, percutaneous screw fixation is often not an option for definitive fixation in the war-related calcaneus fracture as most of these fractures are open and severely comminuted.

The treatment of open calcaneus fractures is burdened with increased rates of infection and complications compared with closed fractures. Sanders reviewed 43 open calcaneus fractures with medial wounds and concluded that Gustilo type I and II fractures can be treated with open reduction and internal fixation with closure of the medial wounds. Based on their review, type II and III calcaneus fractures with wounds in different locations (other than medial) were associated with high rates of infection when treated acutely. The authors concluded that open type II and III fractures with lateral, dorsal, or plantar soft