

Complex Hindfoot and Ankle Trauma: The Management Status in 2018

Modern day mechanization and higher velocity of injuries have lead to more complex and diverse presentation of trauma involving the ankle and hindfoot; even the accidents and falls are worse, and more crushing and newer combinations of injuries have added to the complexity. On the other hand, a better understanding of injury mechanisms, supported by improved diagnostic capabilities, have allowed the modern orthopedic surgeon to define injury patterns as well as plan reconstruction techniques, using better technology. Added to this is the increased specialization of many surgeons, with a special focus on the foot and ankle alone, and options of management are becoming more and more refined.

One of the biggest debates in modern orthopedics is the management of acute calcaneal fractures.^{1,2} The question whether surgery should or should not be done is addressed by Rammelt and Sangeorzan BJ³ emphasizes that the crucial question perhaps is not “*whether or not to operate*” but “*when and how to operate*” on calcaneal fractures. Case selection, surgeon experience as well as facilities available all dictate outcomes after surgery; as was published previously by various authors, treatment should be tailored to the individual fracture pathoanatomy, accompanying soft-tissue damage, associated injuries, functional demand, and comorbidities of the patient.

Approaches for calcaneal fracture fixation are another method for debate, as the wound complications are perhaps the biggest deterrent to the average surgeon to operate. Minimally invasive techniques are being propagated, and refined.^{4,5} Lakstein *et al.*⁶ have compared the extensile lateral approach with a posterolateral approach used by them, and have shown lesser wound complications in the latter. Prabhakar *et al.*⁷ have further developed a variant of the posterolateral approach, which they have labeled the “*open envelope approach*” with minimal insult to the soft-tissue sleeve around the fractured heel. The concept of minimally invasive surgery for the calcaneus has now taken root, and the multiple variations in surgical approaches that allow fracture exposure and direct reduction of fragments are allowing better visualization and more anatomic reductions of both the articular fragment, as well as the three-dimensional reconstruction of the hindfoot, which seems to be the determinant of best outcomes in these cases. The sinus tarsi approach and the percutaneous reductions still remain good options with proper indications, but the development of approaches like these that allow better fracture visualization but a limited insult to tissues, open a wide variety of options for the average surgeon.

Crush fractures of the anterior end of the calcaneus are perhaps not that well understood by the average orthoped;

it is important that the treating surgeons differentiate these from the other fractures of the calcaneus that occur by vertically directed forces, where the calcaneus is blown apart like an egg. Dhillon *et al.*⁸ have highlighted the mechanism of trauma, how the lateral foot column is shortened and the importance of reduction and column length restoration via distraction. These are unusual injuries and are often the result of complex midfoot abduction trauma, and the associated foot instability has to be appreciated and stabilized. Although discussed under the title of a fracture variant of the calcaneus, these are more complex distal injuries of the foot, with an entirely different injury mechanism, and a clear understanding is a key to management protocols that ensure a good outcome.

Even in 2018, fractures of the Talus are still considered the most difficult hindfoot injury to treat, and many surgeons are apprehensive about their management.⁹ This may be mainly due to the lower frequency of their presentation; however, a limited understanding of reduction and fixation methods by many, and the significant rate of complications which most surgeons dread make these challenging cases. Fractures of the talar neck and those of the body are different injuries, and management options are becoming more aggressive in both scenarios. Fracture reduction and stability, with minimal insult to the bone vascularity, are of paramount importance. The changing thought process toward fixing these by plates to achieve stability is well described by Swords *et al.*,¹⁰ and the indications and methods are well reviewed. The unusual posteromedial body fractures are also discussed in a separate article, and their association with subtalar dislocations is emphasized, along with the fact that some may be open injuries.

The associated complications may be significant despite the best measures employed, but modern techniques have developed enough to be able to manage most of them. The article in this symposium discussing the issues leading to, and causing, avascular necrosis of the talus defines options of early as well as late treatment based on a systematic review of the literature. This is the most dreaded complication of Talus fractures, but modern methods of management have reduced the sequelae, and outcomes actually are much better in 2018 than was reported in the last century. On the other hand, malunited talus fractures are more frequently seen, and some of them could be associated with varying degrees of nonunion.¹¹ This fairly frequent complication involving the talar body is addressed by Sakaki *et al.*¹² in this issue, who give their experience of reconstructing six such cases, where the articular cartilage was intact, and the bone was thus reconstructable. They identified three different patterns of talar nonunions and

malunions, and suggest adding a subtalar fusion to the reconstruction to improve the vascularity, which allowed them to successfully avoid avascular necrosis of the talus in all their cases.

Although cuboid injuries are rare, understanding that they are part of a complex abduction trauma involving the midfoot is important. The misconception that they are “*isolated fractures*” has been clarified previously;¹³ and Pountos *et al.*¹⁴ takes this further and emphasizes not only the importance of restoring articular congruity but also clarifies the concept of maintaining lateral column length. The editor tends to agree with these authors that the evidence to suggest specific management options is sparse, probably due to the limited experience of most surgeons as well as the inadequate literature on the subject.

Arthroscopic surgery has progressed by leaps and bounds, and hindfoot arthroscopy is now breaching new frontiers. Hindfoot stiffness is common after trauma, and the methodology of using arthroscopic surgery to treat such cases opens new avenues in the management. Although associated with a high learning curve and the need for specialized equipment, the techniques described by Lui TH¹⁵ in this symposium are in tune with modern management protocols, as the minimally invasive methods used allow for early and vigorous rehabilitation after surgery.

The importance of the posterior malleolus and its stability in complex ankle trauma is now more clearly understood.¹⁶ The changing strategies in ankle fractures are brought into focus by the article by Tosun *et al.*,¹⁷ who discusses the functional outcomes in trimalleolar fractures with and without posterior malleolus fixation. Although the study is retrospective, it nevertheless validates the increasingly realized concept that if the posterior malleolus is stabilized adequately, the need for fixing the syndesmosis reduces; this is not to say that the syndesmosis should not be stabilized, as all ankle fixations should be done with appropriate understanding of whether “*the ring*” at the ankle has been well stabilized. The importance of this article lies in the understanding that the ankle disruption is a complex instability, and all aspects of the injury have to be stabilized. Reconstruction for ankle instability, caused by chronic ligament deficiency, may not be in tune with the other manuscripts in this symposium discussing complex bony trauma; nevertheless, the editors felt that the article on chronic ankle instability treatment by Weng *et al.*¹⁸ rounds up the symposium. The discussion of a modified ankle ligament reconstruction technique for chronic instability, which according to the authors maybe a viable alternative to anatomic Broström-type reconstructions, seems appropriate here, and might be suitable for the general population too.¹⁸

One of the biggest issues that confront orthopedic surgeons in the underdeveloped world is delayed presentation of cases, which makes the management of hindfoot trauma even more complex.¹⁹ It is hoped that this comprehensive review of protocols and strategy of managing hindfoot trauma and its complications may allow the readers to make appropriate strategic decisions, as well as improve clinical management and dispel some doubts.

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