



Management of an open calcaneal fracture with use of antibiotic cement spacer and Reverse Sural Artery flap cover- A Salvage Procedure - A case report

Elvis Benjamin

Department of Orthopaedic Surgery, Christian Medical College

Abstract : Open fractures of the calcaneus are distinct injuries relative to closed fractures, and thus require different treatment. The reported complications rate after open calcaneal fractures lies between 7-37 percent, such as wound infection, osteomyelitis and amputation. The mainstay of management of open calcaneal fracture is early aggressive debridement and irrigation followed by fixation with percutaneous Kirschner wires or external fixator to provide a good bony alignment. The purpose of this paper is to report the outcome of removal of entire calcaneum, use of antibiotic spacer and reverse sural artery flap cover as a salvage procedure due to severely infected open fracture, non reconstructable fracture pattern and comorbidities. This had a relatively good outcome

Keyword : Open calcaneal fracture, Debridement, Antibiotic cement spacer, Reverse sural artery flap

Background

Open calcaneal fractures are high morbidity injuries and relatively have poor outcomes if not managed aggressively in the initial treatment phase. The reported complications rate after open calcaneal fractures lies between 7% – 37% such as wound infection, osteomyelitis and amputation. The mainstay of management of open calcaneal fracture is early aggressive debridement and irrigation followed by fixation with percutaneous Kirschner wires or external fixator to provide a good bony alignment. The purpose of this paper is to report the outcome of removal of entire calcaneum, use of antibiotic spacer and reverse sural artery flap cover as a salvage procedure due to severely infected open fracture, non reconstructable fracture pattern and comorbidities. This had a relatively good outcome.

Case Presentation

A 72-year-old male patient presented to our center following a fall from height. He had severe pain over the mid back, right trochanteric region, both heels and a wound over the medial aspect of the Left hind foot. His medical history included type 2 diabetes mellitus and hypertension for which he was on regular medications. On examination he had tenderness over the D12 spinous process, swelling and tenderness over the

right trochanteric region, right calcaneum and a 7 x 4 cm laceration over the medial aspect of the left hind foot. There was no distal neurovascular deficit.

Investigations

Plain radiographs taken at the time of presentation showed that he had sustained T12 stable wedge compression fracture, right intertrochanteric fracture (AO Type 31-A1) and bilateral calcaneal fractures (Essex-Lopresti classification - Joint Depression type) (Right closed calcaneal fracture & left open Gustilo type III B calcaneal fracture) (Figure 1 & 2)



Figure 1- Left open type III B calcaneum fracture



Figure 2- Right closed calcaneum fracture

Treatment

Immediate management involved irrigation of the wound with saline, sterile dressing and application of bilateral below knee plaster of paris back slab. He was started on broad spectrum intravenous antibiotics. He underwent right DHS fixation, left ankle wound debridement, ankle spanning external fixator and STSG under general anaesthesia. The right calcaneal fracture was managed non operatively on a below knee plaster of paris cast. He underwent another surgery after two weeks where the entire non viable calcaneum was removed due to severe infection and an antibiotic spacer was placed (Figure 3 & 4). The ankle was stabilized with an external fixator. A reverse sural artery flap was used to cover the composite soft tissue loss (Figure 5). Post operatively he received intravenous antibiotics as per intraoperative cultures for a period of two weeks. He was ambulated toe touch weight bearing for 6 weeks



Figure 3- Infected left open calcaneum fracture



Figure 4- Infected left open calcaneum fracture post debridement- intraoperative Image

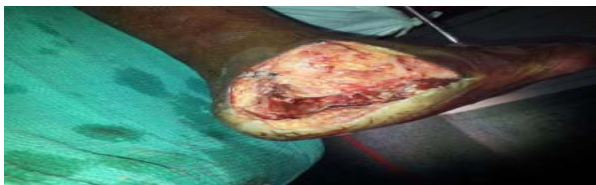


Figure 5- Infected Left open calcaneum fracture post antibiotic spacer and reverse sural artery flap-intraoperative image

Outcome and Follow up

At six weeks , the external fixator was removed and he was advised bone grafting. But he deferred the procedure due to high morbidity associated with recent myocardial infarction. He was later followed up every three months (Figure 6 & 7). He didn't have any complaints and was able to weight bear and walk. His AOFAS Ankle Hindfoot score was 73.

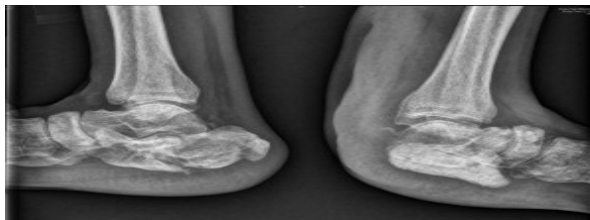


Figure 6-Xray showing follow up of bilateral calcaneum fractures at 3 months



Figure 7-Xray showing follow up of left calcaneum fractures at 6 months with antibiotic cement spacer in situ

Discussion

Open calcaneal fracture are associated with high complication rates ranging between 7% – 37% (1) such as wound infection, osteomyelitis and amputation. There are very few articles in the literature dedicated to the treatment and outcome of open calcaneal fractures. Whether to treat the open fractures with internal fixation or not is based on the nature of the injury. The greatest challenge lies in salvage and reconstruction of the soft tissue envelope. Open fractures of the calcaneus are distinct injuries relative to closed fractures, and thus require different treatment(1) . Between 7.7% and 17% of fractures to the calcaneus are open(2,3,4). They are generally associated with a higher complication rate than their closed counterparts, including deep infection, osteomyelitis, and need for amputation(5,6,7,8).Folk et al (9) reported wound complications in 13 of 18 open calcaneal fractures that were operatively treated (72%) and calculated that patients with an open fracture were 2.8 times more likely to develop a wound complication than those with a closed fracture. The incidence of these major complications also seems to increase with increasing severity of the soft tissue injury. Siebert et al (10) reviewed the results of 36 open intraarticular fractures treated with internal fixation with an average follow-up of 44 months. Of this group, 9 of 15 (60%) Type III open fractures developed osteomyelitis, resulting in five amputations. Aggressive surgical treatment of the soft tissue envelope and nonoperative management of the open fracture was recommended Heier et al (2), reported on the results of 43 open fractures in 42 patients managed according to a standard treatment protocol of immediate intravenous antibiotics, aggressive surgical debridement of the wound, and provisional limb stabilization. There were many injuries that defied classification because of the irregular shape and size of the wound. Definitive soft tissue coverage was completed at an average of 10.6 days; final fracture stabilization was delayed until the wound was clean and soft tissue swelling had dissipated. All Gustilo Type I open fractures, and Gustilo Type II open fractures with a medial wound, were treated with open reduction with internal fixation and a lateral incision after debridement and when tissue edema had resolved. Gustilo Type II fractures with lateral, posterior, or plantar wounds and Gustilo Type IIIA fractures had limited or no internal fixation. All Gustilo Type IIIB open fractures required vascularized free tissue transfer as soon as possible. The overall infection rate was 37%, and osteomyelitis developed in 19%, including 7 of 26 (27%) Type III open fractures. All six amputations occurred in patients with open Type IIIB fractures.

The authors concluded that the degree of soft tissue injury was the most important variable in predicting outcome; thus, all open Type I and those open Type II fractures with a medial wound could be treated by delayed open reduction with internal fixation once the soft tissues were suitable for surgery. They recommended either

external fixation or limited percutaneous fixation for those open Type II injuries with nonmedial wounds and all open Type IIIA wounds, and delayed or late reconstruction for all open Type IIIB wounds and for fractures resulting from penetrating trauma

Conclusion

In Open calcaneal fracture with severe infection and loss of soft tissue attachments to the bony fragments, its difficult to salvage the calcaneum. Antibiotic cement spacer can be used to fill the dead space. We feel that in patients with high risk for surgery and when the risks outweigh the benefits, the antibiotic cement spacer can be left alone.

Bibliography

1. Cotton FJ. Dislocations and Joint-Fractures. Philadelphia: WB Saunders; 1910
2. Heier KA, Infante AF, Walling AK, et al. Open fractures of the calcaneus: soft-tissue injury determines outcome. J Bone Joint Surg Am 2003;85:2276-2282.
3. Benirschke SK, Kramer PA. Wound healing complications in closed and open calcaneal fractures. J Orthop Trauma 2004;18:1-6.
4. Berry GK, Stevens DG, Kreder HJ, et al. Open fractures of the calcaneus: a review of treatment and outcome. J Orthop Trauma 2004;18:202-206.
5. Bezes H, Massart P, Delvaux D, et al. The operative treatment of intraarticular calcaneal fractures: indications, technique, and results in 257 cases. Clin Orthop 1993;290:55-59.
6. Levin LS, Nunley JA. The management of soft-tissue problems associated with calcaneal fractures. Clin Orthop 1993;290:151-156.
7. Myerson M, Manoli A. Compartment syndromes of the foot after calcaneal fractures. Clin Orthop 1993;290:142-150.
8. Paley D, Hall H. Intra-articular fractures of the calcaneus: a critical analysis of results and prognostic factors. J Bone Joint Surg Am 1993;75:342-354
9. Folk JW, Starr AJ, Early JS. Early wound complications of operative treatment of calcaneus fractures: analysis of 190 fractures. J Orthop Trauma 1999;13:369-372
10. Siebert CH, Hansen M, Wolter D. Follow-up evaluation of open intra-articular fractures of the calcaneus. Arch Orthop Trauma Surg 1998;117:442-447