

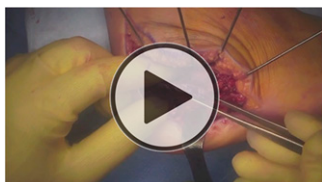
## KEY PROCEDURES

EXTENSILE LATERAL APPROACH FOR THE  
OPERATIVE MANAGEMENT OF A DISPLACED  
INTRA-ARTICULAR CALCANEUS FRACTURE

Dolfi Herscovici Jr., DO

Published outcomes of this procedure can be found at: *J Am Acad Orthop Surg.* 2015 Jul;23(7):399-407, *Foot Ankle Surg.* 2016 Mar;22(1):1-8, and *J Orthop Trauma.* 2016 Mar;30(3):e75-81

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## Abstract

Calcaneal fractures account for approximately 1.2% of all fractures and 60% of all tarsal bone fractures. Almost 75% present as displaced, intra-articular fractures. Because of the complex articular and osseous anatomy, the vulnerable soft-tissue envelope, and the technically challenging approach needed for fixation, these fractures are often treated nonoperatively, resulting in poor outcomes. These poor outcomes can include entrapment of the posterior tibial and sural nerves, impingement, dislocation or entrapment of peroneal tendons, a widened heel with a loss of height, hindfoot varus or valgus, formation of painful exostoses, development of posttraumatic arthritis of the subtalar and calcaneocuboid joints, and impingement of the ankle joint.

The current scientific literature supports fixation of displaced, intra-articular fractures. The principles of surgical fixation consist of reconstructing the height (obtained by improving the Böhler angle), narrowing the width, reconstructing the length, correcting any varus deformity of the tuberosity, and anatomically reducing the joint. However, at the time of initial presentation, there is often substantial swelling, with or without fracture blisters, that needs to be resolved prior to surgical fixation. During this waiting period, radiographic and computed tomography (CT) evaluations should be performed to assess the fracture pattern. Once re-epithelialization of the blisters and wrinkling of the skin are noted, open reduction and internal fixation (ORIF) can be performed.

The steps to an ORIF consist of (1) the use of an extensile lateral incision, with a subperiosteal dissection, that develops a full-thickness fasciocutaneous flap; (2) removal of the lateral wall, to allow visualization of the impacted joint; (3) removal of the lateral third or half of the joint to allow visualization of the medial two-thirds or half of the joint; (4) disimpaction of the medial half of the joint to its normal height, along with medialization of the tuberosity; (5) anatomic reduction of the posterior facet and fixation with lag screw(s); (6) possible use of a bone graft and replacement of the lateral wall; (7) spanning the calcaneus with a plate and screws; and (8) closure of the fasciocutaneous flap and skin over a drain.

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NOTE: The line drawing that appears in Video 1, 1:07, was reproduced, with modification, from: Carr JB. Mechanism and pathoanatomy of the intraarticular calcaneal fracture. *Clin Orthop Relat Res.* 1993 May;290:36-40. Reproduced with permission.

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## References

1. Benirschke SK, Sangeorzan BJ. Extensive intraarticular fractures of the foot. Surgical management of calcaneal fractures. *Clin Orthop Relat Res.* 1993 Jul; 292:128-34.
2. Borrelli J Jr, Lashgari C. Vascularity of the lateral calcaneal flap: a cadaveric injection study. *J Orthop Trauma.* 1999 Feb;13(2):73-7.
3. Buckley R, Tough S, McCormack R, Pate G, Leighton R, Petrie D, Galpin R. Operative compared with nonoperative treatment of displaced intra-articular calcaneal fractures: a prospective, randomized, controlled multicenter trial. *J Bone Joint Surg Am.* 2002 Oct;84(10):1733-44.
4. Carr JB. Mechanism and pathoanatomy of the intraarticular calcaneal fracture. *Clin Orthop Relat Res.* 1993 May;290:36-40.
5. Court-Brown CM, Caesar B. Epidemiology of adult fractures: A review. *Injury.* 2006 Aug;37(8):691-7. Epub 2006 Jun 30.
6. Csizy M, Buckley R, Tough S, Leighton R, Smith J, McCormack R, Pate G, Petrie D, Galpin R. Displaced intra-articular calcaneal fractures: variables predicting late subtalar fusion. *J Orthop Trauma.* 2003 Feb;17(2):106-12.
7. Giordano CP, Koval KJ. Treatment of fracture blisters: a prospective study of 53 cases. *J Orthop Trauma.* 1995 Apr;9(2):171-6.
8. Hsu AR, Anderson RB, Cohen BE. Advances in surgical management of intra-articular calcaneus fractures. *J Am Acad Orthop Surg.* 2015 Jul;23(7):399-407.
9. Koval KJ, Sanders R. The radiologic evaluation of calcaneal fractures. *Clin Orthop Relat Res.* 1993 May;290:41-6.
10. Maskill JD, Bohay DR, Anderson JG. Calcaneus fractures: a review article. *Foot Ankle Clin.* 2005 Sep;10(3):463-89.
11. Radnay CS, Clare MP, Sanders RW. Subtalar fusion after displaced intra-articular calcaneal fractures: does initial operative treatment matter? *J Bone Joint Surg Am.* 2009 Mar 1;91(3):541-6.
12. Sangeorzan BJ, Ananthkrishnan D, Tencer AF. Contact characteristics of the subtalar joint after a simulated calcaneus fracture. *J Orthop Trauma.* 1995 Jun;9(3):251-8.
13. Sharr PJ, Mangupli MM, Winson IG, Buckley RE. Current management options for displaced intra-articular calcaneal fractures: Non-operative, ORIF, minimally invasive reduction and fixation or primary ORIF and subtalar arthrodesis. A contemporary review. *Foot Ankle Surg.* 2016 Mar;22(1):1-8. Epub 2015 Nov 21.
14. Zhang W, Lin F, Chen E, Xue D, Pan Z. Operative versus nonoperative treatment of displaced intra-articular calcaneal fractures: A meta-analysis of randomized controlled trials. *J Orthop Trauma.* 2016 Mar;30(3):e75-81.