

Calcaneal fractures

Review of literature

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What do we want to know?

- Do the displaced # need fixation?
- Is Sander's classification prognostic?
- What is the outcome based on Sander's classification?
- Who will benefit from surgery?
- Is there a role for primary ST arthrodesis?
- ? Percutaneous fixation
- Summary

ORIF Vs Non-ORIF

- **Functional Outcome and Patient Satisfaction after Displaced Intra-articular Calcaneal Fractures: A Comparison Among Open, Percutaneous, and Nonoperative Treatment. De Boer AS, Van Lieshout EM, Den Hartog D, Weerts B, Verhofstad MH, Schepers T.**
- Retrospective cohort, Level I trauma centre, Rotterdam, Netherland
- 2002-2011
- 78 patients (18: non-operative, 27: ORIF, 33: PC fixation)
- Foot function index score
- Fixation group did better than Non-operative
- Disability more in non-operative group
- Late intervention more frequent in PC fixation group

ORIF Vs Non-ORIF

- **Factors Affecting Long-Term Treatment Results of Displaced Intra-Articular Calcaneal Fractures A Post-hoc Analysis of a Prospective, Randomized, Controlled Multicenter Trial. J Orthop Trauma. 2014 May 12.**
- Level II evidence
- Multicenter trial (RCT)
- Results divided into two groups, the superior 50% results (n=28) Vs inferior 50% results (n=28), regardless of the treatment
- **Operative treatment, better Böhler's angle and articular surface restoration, light labor/retirement and absence of injury insurance** were more common in the superior group

Prognostic outcome for Sander's classification

- **The Operative Treatment of Displaced Intra-articular Calcaneal Fractures (DIACFs): Long Term (10-20 years) Results in 108 Fractures using a Prognostic CT Classification. J Orthop Trauma. 2014 Jun 30. Sanders R1, Vaupel Z, Erdogan M, Downes K.**
- 108 fractures in 93 patients
- Average F/U: 15.22 years (10.5-21.2 years)
- 80 joint depression (J) ; 28 were tongue type (T) fractures.
- 70 Sanders Type II ; 38 Sanders Type III fractures
- **ST fusion in 47% of Type III (18/38) ; only 19% in Type II (13/70) fractures (p=0.002)**

Prognostic outcome for Sander's classification

- Sanders classification remains prognostic
- Type III: 4 times more likely to need a fusion than Type II
- Neither a locked plate, nor bone graft are required to maintain a reduction over time, as virtually no loss of reduction was seen in this series (3/108 = 0.9%)
- If severe post-traumatic subtalar arthritis does not occur, long term (10-20 years) functional results with mild pain, minimal alterations in ADLs work, and essentially normal shoe wear can be expected from a properly performed ORIF.

Patient selection & prognosis

- **Operative compared with nonoperative treatment of displaced intra-articular calcaneal fractures: a prospective, randomized, controlled multicenter trial. Buckley R1, Tough S, McCormack R, Pate G, Leighton R, Petrie D, Galpin R. J Bone Joint Surg Am. 2002 Oct;84-A(10):1733-44.**
- Multicentre RCT, 4 trauma centres
- Rigid ORIF Vs Non-op No reduction, RICE
- 471 fractures in 424 patients, 73% (309) followed up
- Minimum 2 years max 8 years
- **Surgical better in Women, Non Workers compensation, Younger than 29, Bohler angle >0, Comminution, Anatomical reduction <2mm**
- Anatomical reduction does much better
- Sanders II does much better with ORIF than non-op.
- **Sanders IV no difference**

Role of primary ST arthrodesis

- **Open Reduction and Internal Fixation Compared with ORIF and Primary Subtalar Arthrodesis for Treatment of Sanders Type IV Calcaneal Fractures: A Randomized Multicenter* Trial. J Orthop Trauma. 2014 Jun 30. Buckley R, Leighton R, Sanders D, Poon J, Coles CP.**
- Canadian Orthopaedic Trauma Society, Level II Evidence
- Sanders type IV fractures : ORIF versus ORIF plus primary subtalar arthrodesis (PSTA).
- 2004 to 2011, 26 patients , Minimum f/u two years (81% follow-up).
- No statistical difference b/w the two groups
- Advantageous for both patients and the health care system as ORIF + PSTA may prevent the need for late secondary subtalar fusion adding to increased costs and lost time from work.

Percutaneous fixation

- **Evidence-Based Rationale for Percutaneous Fixation Technique of Displaced Intra-articular Calcaneal Fractures: A Systematic Review of Clinical Outcomes. J Foot Ankle Surg. 2014 Apr 30. pii: S1067-2516(14)00133-1. Wallin KJ1, Cozzetto D2, Russell L3, Hallare DA4, Lee DK5.**
- Systemic reviews of all studies for PC fixation from 2000-2012
- Lower complication rates
- Favourable option in selected group

Approach

- **Anatomic Alignment and Integrity of the Sustentaculum Tali in Intra-Articular Calcaneal Fractures: Is the Sustentaculum Tali Truly Constant? J Bone Joint Surg Am. 2014 Jun 18;96(12):1000-1005. Gitajn IL, Abousayed M, Toussaint RJ, Ting B, Jin J, Kwon JY.**
- Level IV evidence
- Fixation by means of a lateral approach may be compromised when the sustentaculum tali is fractured or subluxated.
- A medial approach or combined medial and lateral approaches may be considered in such circumstances.
- Special attention should be paid to the integrity and alignment of the sustentacular fragment prior to surgical fixation

Summary

- **ORIF with good to excellent results in more than two thirds of patients in larger clinical series.**
- The **extended lateral approach** respects the neurovascular supply to the heel and allows a good exposition of the fractured lateral wall, the subtalar and calcaneocuboid joints, but wound healing problems cannot be completely avoided despite meticulous soft tissue handling.
- Percutaneous and less invasive procedures have successfully lowered the rates of wound complications but **exact anatomic reduction remains an important issue.**
- Care must be taken not to overlook atypical fractures like **sustentacular fractures and fracture-dislocations** of the calcaneus that are treated with a small **medial** or curved epimalleolar lateral approach, respectively.

Summary

- The use of bone grafting or bone substitutes for defect filling appears not necessary in most cases.
- Prognostic factors that can be influenced by the surgeon are **anatomical reduction of the overall shape of the calcaneus and congruity of the subtalar joint.**
- Treatment results are adversely affected by severity of injury, open fractures, bilateral fractures, a high body mass index and smoking.
- Calcaneal malunions and nonunions are disabling conditions resulting from either non-operative treatment or inadequate reduction and fixation of displaced fractures.