Calcaneus Fractures: My Small Incision Tricks

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Disclosures

• Smith & Nephew – Design surgeon, Royalties
• Extremity Medical - Design surgeon, Royalties

Calcaneus

• The Debate is about Sinus Tarsi Versus Extensile Lateral Approaches
• In Reality we should be aiming for the least invasive and most stable anatomic reduction
  • Less scaring and infections, and better function
Pearls - the Mini-incision Approaches?

• Medial – Bordeaux, no direct reduction of post facet
• Medial and limited lateral
• Percutaneous Fixation
  • No signif joint displacement

Percutaneous Fixation
Tornetta P 3rd, JOT 1998.
The Essex-Lopresti reduction for calcaneal fractures

Small Incision Surgery – Sinus Tarsi Approach
• A modification of standard fixation
• Joint surfaces must be visualized through adequate incisions
  • The concept = Less damage to the soft tissues
  • Must do before 14 days
Indications for Sinus Tarsi Approach

- Specific Fracture Patterns:
  - Sander’s 2 part (Easiest)
  - Sander’s 3 Part with an anterior central part (Difficult)
  - Sander’s 4 part (Fairly Straight forward) (If Fusing)
  - Need to reestablish articular anatomy grossly and then fuse
  - Excellent for open injuries in the correct setting

Contraindications

- Sander’s 3 part fractures with posterior fragments
- You do not think that you can achieve an anatomic reduction
- Small Incisions with a poor reduction achieve nothing!!!

Sinus Tarsi Incisions
Step 1 - Medial Ex-Fix Placement

- “Pull” the posterior tuberosity out of the way
- Easier
- Reconstruction of the posterior facet
- Correction of height and varus
- No need for a medial screw

Step 2 - Incision / Disimpaction

- Incision – Dorsal to the peroneals
- 1 cm onto the tip of the fibula (less soft tissue injury)
- Keep the peroneals in their sheath
- Compress Lateral wall
- Make path for the plate
- Disimpact the joint

Step 3 - Reduction and stabilization of posterior facet

- Lag – (2.0 to 3.0 mm screws)
- Aim towards sustentaculum
- Scope and fluor
Get postop CT to learn and get better!!!

Post-op Protocol

- Start Motion – 14 days
- Start 25% WB at 6 weeks and increase as healing progresses

The Sinus Tarsi Approach Works

- Adequate reduction
- Good functional outcomes
- Fewer wound issues / infections
- Fewer secondary surgeries

References:
- Acurate reduction leads to better results!
- Kikuchi C, et al. FAI 2013
- Nosewicz T, et al. FAI 2012
- Schepans T, Int Orthop, 2011
- Klíma J, et al. FAI 2013
- Femino J, et al. AO 2012
- Extended sinus tarsi approach with plate
- Do not dissect deep to SPR
Complications
• Delayed wound healing
• Infection
• Sural nerve injury
• Peroneal tendonitis
• Painful hardware

Direct Comparison Studies
• Fewer Wound complications / Infections
  • Yeo JH, et al. BMC Musculoskelet Disord. 2015
  • Kwon J, et al. FAI 2015 (odds ratio 5.3)
  • Yao H, et al., J Orthop Surg Res. 2017
  • Metaanalysis (Fewer secondary surgeries)
• Some studies show better functional outcomes
  • Kline AJ, et. Al. FAI 2013
  • Chen L, et. Al. FAI 2011

Sinus Tarsi Approach
Pearls
• Medial External fixator first
• Extend incision 1 cm up on fibula
• Dry arthroscope
• Lag screws – smaller, parallel to joint
• Plate – anterior to posterior

Pitfalls
• Fix later than 14 days
• Attempt for complex fractures
• Rough with the soft tissues
• Sural nerve injury

Thank you
Literature

- Arch Orthop Trauma Surg. 2017
  - The sinus tarsi approach in displaced intra-articular calcaneal fractures.
  - Park J1,2, Che JH3.
  - The mean one-year postoperative VAS and AOFAS scores were 0.54 (range 0‐3.0), and 94.0 (range 80‐100), respectively. The VAS and AOFAS scores were correlated with the degree of reduction of the posterior facet joint and the amount of Bohler angle restoration. Bony union was achieved in all cases. The mean time to union was 0.3 months (range 0‐12.5 months). There were no major soft tissue complications. Two cases of minor soft tissue complications healed with no need for surgical intervention. The posterior calcaneal tuberosity was the most common complication, which occurred in seven

- Sanders 2 and 3

  - Sinus tarsi approach versus extensile lateral approach for displaced intra‐articular calcaneal fracture: a meta‐analysis of current evidence.
  - Seven studies including two RCTs and five CSs were eligible for the meta‐analysis.
  - STA group had a lower incidence of wound complications than that in the ELA group and no significant difference was found in excellent and good rate and the recovery of Bohler’s angle between the two groups. The CSs also showed that the STA group had a lower incidence of secondary surgeries than that in the ELA group.

  - Review Article: Operative versus nonoperative treatment for displaced intraarticular calcaneal fracture: a meta‐analysis of randomised controlled trials.
  - Meena S1, Gangary SK2, Sharma P3.
  - We reviewed 8 randomised controlled trials that compared operative and nonoperative treatment for displaced intra‐articular calcaneal fractures. Patients with operative treatment were more likely to resume pre‐injury work (relative risk [RR]=0.60, p=0.04), had fewer problems when wearing shoes (RR=0.42, p=0.0004), and had a higher physical component summary score of SF‐36 (difference in means=6.75, p<0.0001) but a higher complication rate (RR=1.74, p=0.0005).

  - Percutaneous Reduction and Screw Fixation of Displaced Intra‐articular Fractures of the Calcaneus.
  - Tantavisut S1, Phisitkul P2, Westerlind BO2, Gao Y2, Karam MD2, Marsh JL2
  - At the 3‐month follow‐up, there were (percutaneous) superficial infections in one patient, two cases of subtalar osteoarthritis requiring subtalar fusion at a minimum of 1 year after the initial operation, and one case of deep infection. At the final follow‐up, 54.5% of the patients reported a residual pain level of 3 or lower.
• Value of 3D Reconstructions of CT Scans for Calcaneal Fracture Assessment.
• Roll C1, Schirmbeck J1, Müller F2, Neumann C1, Kinner B3.
  The benefit of 3D imaging was higher in inexperienced surgeons and complex fractures (Friedman test P < .001).

• Outcome of Minimally Invasive Open and Percutaneous Techniques for Repair of Calcaneal Fractures: A Systematic Review.
• van Hoeve S1, Poeze M2.
  minimally invasive open, percutaneous reduction and screw osteosynthesis, external fixation, and other. Forty-six studies were included, with 1776 patients and 2018 calcaneal fractures. Of the 2018 fractures, 924 (46%) were classified as Sanders II, 558 (28%) as Sanders III, and 245 (12%) as Sanders IV;
  The percutaneous reduction and screw osteosynthesis and minimal invasive open technique resulted in significantly better outcomes compared with external fixation and other techniques. In conclusion, percutaneous reduction and screw osteosynthesis and minimal invasive open techniques have the best outcomes for the minimal invasive open surgical treatment of calcaneal fractures.

• Radiographic and CT Assessment of Reduction of Calcaneus Fractures Using a Limited Sinus Tarsi Incision.
• Scott AT1, Pacholke DA2, Hamid KS3.
  Postoperative CT demonstrated that subtalar articular reduction was within 2 mm of anatomic in 91% of patients. There were 2 instances of superficial wound dehiscence (5.1%) and 1 deep infection (2.6%) that required debridement and complete hardware removal. Visual analog score (VAS) for pain averaged 3 of 10 in the 32 available patients (25%) reported no pain (0/10) at final follow-up.

• The STA group had a lower incidence of wound complications (p ≥ .05), the surgical procedure was faster, and the waiting time to surgery was shorter (p ≤ .05). Despite the limited number of patients and the short follow-up period, our results suggest that the STA is a useful method for the treatment of DIACFs, with a low incidence of complications and results comparable to those for patients treated using the extended lateral approach.
Technical Pearls - ELA

- Fractures of any complexity
- Operate at the right time
- Modified extensile lateral approach
- More posterior
- No touch technique
- Independent lag screw first
- Fix anterior to posterior
- Half pin to reduce posterior tuberosity

Similarities

- Must restore –
  - Articular alignment
  - Height
  - Axial alignment
  - Width

Complications of Extensile Lateral Approach

- Poor wound healing
- Risk of infection
- Significant scar tissue
  - 11% superficial
  - 14 % deep
- Folk JW, et. Al. JOT 1999 190 fx
  - 25% Wound problem
  - Diabetes, smoking, open fx
Case Study - What do you think?
Summary

• Both extensile and “percutaneous” approaches work well
• Fewer infections and wound healing complications with the sinus tarsi approach
• Excellent for Sanders 2 and 4 part fractures
• Some Sanders 3 fractures may be easier to fix with the extensile lateral approach

Thank You