Calcaneous Fractures

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Disclosures

Consultant: Stryker, Zimmer, Biomet

Problems Associated with Displaced Intra-articular Calcaneus Fractures

 Subtalar arthrosis/ arthritis

impingement due to

Anterior ankle

- C BOU
- horizontal
 Peroneal tendon impingement/ calcaneofibular impingement

Problems Associated with Displaced Intra-articular Calcaneus Fractures

- Widened heel/malleoli closer to ground with heel counter irritation
- Elevated Achilles tendon insertion weakening gastroc-soleus
- Shortened calcaneus with decreased lever arm for gastroc-soleus
- Limb length discrepancy

Displaced Intra-articular Calcaneus Fractures

- Therefore, good anatomic, orthopaedic reason for fixing fracture
- What approach?
- What type of fixation

Operative vs. Nonoperative Treatment

- Rick Buckley, et al, JBJS 84A: 1733-1744, 2002 Oct
 - 424 patients with 471 fractures
 - Minimum 2 year follow-up
 - Bottom line no difference between operative and nonoperative treatment

Differences in Outcome

- Worker's compensation patients fared worse in both groups
- Women fared better with surgery
- Younger patients, less decrease in Bohler's angle, light workload, comminuted fracture, anatomic reduction – all did better with surgery compared to non-operative treatment

Differences in Outcome

- Much higher rate of secondary surgery (fusion) in patients handled nonoperatively
- Higher cost of nonoperative management when disability costs are included

More Recently

- Agren et al. JBJS 2013;95:1351-7
- Level 2 study of op vs non op
- 82 patients (low #)
- 8-12 year f/u (wow!)

Differences in outcome

- 42% risk reduction of subtalar arthritis (long term)
- Better long term function and sf36 scores
- Short term no differences (operative group has higher complications)
- Couldn't differentiate sex, age, fracture types

Candidates for Surgery

- My bias is displaced fractures in medically fit patients without diabetes, especially non-smokers, generally offered surgery
 - Some will get primary fusion if joint surface significantly comminutedbeyond scope of present talk

Goals of Surgery

- Primary, uncomplicated wound healing
- Anatomic restoration of joint surface
- Anatomic or near anatomic overall calcaneal morphology to restore height, width, biomechanics of hindfoot

Soft Tissue Issues

- Preoperative
 - Await edema resolution
 - Positive wrinkle test
 - ? indication for operating less than six hours after injury
 - If minimally invasive approach to be used then earlier the better **within** reason

Lateral Extensile approach

• Best method for visualizing calcaneal fracture anatomy



Surgical Technique

- Place in lateral decubitus position for unilateral; prone position with external rotation for bilateral
- Appropriate placement of incision, lateral flap dependent upon 3 arteries

What you need

- Radiolucent table
- Schanz pin
- K wires
- Plates and screws
- ?bone graft substitute?

Surgical Technique

 Lateral calcaneal artery responsible for blood supply to corner of flap. Incision must be posterior and inferior at junction of dorsal and plantar skin



Surgical Technique

- Limit tourniquet time to 2 hours
- Wound closure and dressing/ splint applied before deflation
- 2 layer closure





- Note 3 retraction pins for no-touch technique

ORIF Techniques

 Dorsum of posterior tuberosity fragment wedge shaped/ translated precluding reduction articular fragments prior to its reduction



ORIF Techniques

- Either direct or indirect reduction
- Provisional K-wire placed up medial column to provisionally hold tuberosity reduction

ORIF Techniques

- Subchondral lag screws to compress articular fragments
 - Note: Medial articular surface of posterior facet curves inferiorly



ORIF Techniques

- Reconstitution of overall calcaneal morphology and contouring of appropriate low profile hardware
- Consider locked screws if highly comminuted









Postoperative Rehabilitation

- ROM exercises, ankle and more importantly, subtalar joint, begun when wound sealed
- If questionable flap tip viability or wound seal closure, then delay until certain
- Delay weight bearing 8+ weeks

Minimally invasive techniques

- Indications in decreasing order of ease
 - Sanders Type IIC tongue fracture easiest
 - Sanders Type IIA or IIB tongue fractures – not as easy
 - All other displaced, intra-articular calcaneus fractures

Minimally Invasive Techniques

Sanders tongue fracture/Sanders Type-IIC



Minimally Invasive Techniques

- Sanders tongue fracture/Sanders Type-IIC
 - Essex-Lopresti maneuver
 - Tongue fracture/Sanders IIC has entire posterior facet attached to posterior tuberosity fragment
 - Allows percutaneous reduction via Steinman pin in posterior tuberosity to lever posterior facet into alignment

Case Scenario

 Preoperative lateral and axial radiographs and coronal CT scans with good axial alignment on axial view



Technique

- Intraoperative lateral fluoro confirms reduction as does postop CT scan
- Prior to this fluoro shot pin was under posterior facet and levered
- Pin grabbed with lap pad



Technique

- Tornetta reported good to excellent results
 - 23/26 good reduction at 2.9 year follow up

Don't Drink & Stand on Barstool

• 4 days status post fall off of barstool from a height of approximately 4 feet





 Preoperative lateral and AP ankle radiographs





 Intraoperative fluoro demonstrating reduction Steinman pin and placement of cannulated guide pin



 Note placement of screws perpendicular to the fracture line with cancellous threads engaging inferior cortex









Closed Reduction and Percutaneous Pinning

- Personal preference Use combination of methods to reduce fragments
- Good understanding of fracture anatomy necessary in order to attempt percutaneous methods
 - Note-difficult to learn fracture anatomy with performing multiple open, extensile procedures
- Appropriate, minimal fixation to maintain reduction



Preop representative CT cuts demonstrating displacement



Technique-Photo shows skin incision over sinus tarsi Schanz pin in posterior tuberosity used to indirectly reduce tuberosity











Left image shows lateral corner of talus Right image shows joint surface reduction with Freer elevate in this case

















Summary

- Extremely complex fracture with high rate of wound complications
- Careful attention to technique, soft tissue and bone, can lead to improved result
- Uncomplicated operative results better than nonoperative results

Conclusion

- Percutaneous techniques have far less morbidity and postoperative pain, and probable earlier fracture healing
- Goals of surgery must be the same restoring normal anatomy and anatomic joint surface reduction