Open treatment of Calcaneus Fracture

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I. Classification

• Letournel (Judet), Rowe, Essex-Lopresti, Multiple CT classifications:
  • Based on number of posterior fragments (2-4)
  • Sustentaculum fragment often called the “constant” fragment held to talus by strong medial talo-calcaneal ligaments
  • Underestimates secondary fracture lines
  • None validated, reliable: only Essex Lopresti predicts treatment

II. Natural history of non-operative treatment

• Limited success, but low risk
• Decreased ankle (loss of Bohler’s angle -> tibio-talar impingement) and subtalar motion (arthrosis), widening and varus of hindfoot
• High incidence of chronic pain, shoe-wear difficulties, return to work problems

III. Decision making for operative treatment

Patient selection
• General health
• Fracture pattern (tuber under fibula can’t work)
• Compliance (etoh, psychiatric)
• Medical co-morbidities (diabetes, peripheral vascular disease)
• AGE generally not a factor in decision to operate

IV. Pre-Op Treatment

• Splint / Elevate
• Radiographs
  — Lateral, Axial (Harris), CT 2D- (sagittal / coronal)

V. Exposure

Medial (McReynolds)
Lateral (Palmer-Letournel)
minimalist
Medial Approach
Problems:
• Cannot assess subtalar joint  Can restore lateral wall
• Cannot Address lateral pathology

Lateral Approach
Can address entire Calcaneal Morphology
• Lateral wall blowout
• Tuberosity -> Anterior Process, incl. Calcaneo-cuboid joint
• Entire Subtalar Joint
• But it is a morbid incison

• Indirect reduction
  – Tuberosity -> Sustentacular Fragment at Medial Wall

VII. Surgical Exposure
A. Flap: Based on Peroneal Artery

B. Exposure
1. Full thickness periosteal cutaneous flap (preserve cutaneous circulation)
2. Maintain peroneals with flap (remove sheath from peroneal tubercle)
3. Avoid sural nerve (prox / distal extension of skin incision)

a. 1º (along angle of gissane- into middle and anterior facets)
b. 2º (antero-lateral process)
6. Place bolsters proximal to ankle to allow inversion of hindfoot for visualization of subtalar joint
VIII. Pathoanatomy

1. Primary fracture line:
   Shears tuberosity into lateral, varus, and shortened position

2. Secondary fracture lines:
   Extends distally into anterolateral process and proximal posterior facet
   o Variability in number of fragments

3. Lateral wall “blow-out”:
   Leads to:
   • wide hindfoot
   • peroneal tendon impingement / subluxation
   • sural nerve entrapment
   • tuberosity / posterior facet fragment can sublux lateral to talus causing subluxation of ankle joint

IX. Reduction
Steps:

1. Anterolateral process
   Reduction of sagittal plane fracture lines that enter calcaneo-cuboid jt
2. **Dis-impact posterior facet (if required)**
   Usually remove from site to allow primary fracture line visualization
   (tuberosity – sustentaculum junction)

3. **Reduce angle of gissane (1° fx line)**
   Region of middle facet – anterolateral process is reduced to sustenaculum

4. **Restore height (tuberosity)**
   Align tuberosity with sustentaculum – visualized by removal of posterior facet

5. **Reduce posterior facet**
   Requires ability to invert to allow joint surface visualization
   Dissection posterior to aid in reduction assessment

6. **Lateral wall blow-out is guide to height restoration**
   Always save lateral wall fragments for assessment

7. **Each step 1.25 -1.6 mm k-wires used for temporary fixation**

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A. Theoretical Advantages: of small incision
Diminished soft tissue morbidity?
Patients like the idea
Potentially shortens LOS
Reduces short term costs
Literature suggests that reducing Soft tissue morbidity enhances outcome

B. Possible disadvantages
   Cannot see the joints directly
   Incisions in the course of the sural nerve
   Tendency to accept an imperfect reduction

III. When?
   Tongue type with posterior facet intact
   Limited anterior process comminution
   Patients whose soft tissues are incompatible with the Benirschke extensile approach
   Patients who have other injuries which take priority over the calcaneus approach
   Can be done on day 1. Or as late as 3 weeks

IV. Who should do it?
   Someone with a good 3D brain
   Someone who has done at least 50 ORIF calcaneus fractures
   Someone with a good C-arm and a competent C-arm technologist

V. How is it done
   Patient in Lateral position
   C-arm at end of table

4 screws:
6. Post op management
   ROM PO day 1
   WB begins approx 6 weeks

XI. Closure
• Place all Subcutaneous Periosteal Sutures, THEN Gently Tie to reduce flap (2 or 3.0 undyed absorb) (? Monofilament)
• Horizontal, Donati Skin Sutures placed with Minimal Tension (3.0 nylon)

Conclusions
• IN some displaced calc fxs non-operative management often leads poor result
• ORIF can be beneficial (restore extra and intra-articular anatomy) in carefully selected cases
• NO one gets normal subtalar motion, BUT it does not equate to result
• Reconstruction (subtalar fusion) much more difficult for non-op patients with initial Bohler’s angle < 0°

BIBLIOGRAPHY: