Management of Calcaneal Malunions

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Key to treatment is understanding the complex pathoanatomy

Not just subtalar arthrosis

CT scan best demonstrates this pathoanatomy
Pathoanatomy

- Lateral Impingement
  - Subfibular
  - Peroneal tendons

- Subtalar Arthrosis

- Hindfoot Angulation

Pathoanatomy

- Weight-bearing lateral
  - Anterior Impingement secondary to loss of talar height and inclination

Calcaneal Malunions

- Stephens and Sanders, 1996
  - Developed classification system based on CT findings
  - 3 Types of malunions identified
Type I Malunion
- Lateral exostosis
- Lateral Impingement
- +/- Far lateral arthrosis

Type II Malunion
- Lateral exostosis
- Extensive subtalar arthrosis

Type III Malunion
- Lateral Exostosis
- Subtalar arthrosis
- Varus or valgus angulation
### Surgical Treatment

- **All 3 types have exostosis**
  - Lateral decubitus position
  - Extensile lateral incision
- Lateral wall exostectomy

<table>
<thead>
<tr>
<th>Type I</th>
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<tr>
<td><strong>May also need to remove the far lateral joint</strong></td>
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<td>ROM started as early as possible</td>
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<td>Check ROM</td>
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<table>
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<tr>
<th>Type II</th>
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<td><strong>In situ subtalar fusion also performed</strong></td>
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<td>Cannulated screws placed thru heel</td>
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Type II

- Supplemental bone graft
  - Local (exostosis)
  - ICBG
  - Allograft

- Screws are placed in talar neck and body

- Post-op
  - 10-12 weeks in cast
  - NWB 6 weeks
Type III
- Subtalar Fusion
- Osteotomy to correct angulation

Type III
- Varus deformity
  - Lateral closing wedge (Dwyer) osteotomy
- Valgus deformity
  - Medial slide

Osteotomy
Sanders Classification

- Does not address
  - loss of talar height
  - loss of talar inclination
  - indications for a bone block arthrodesis

Distraction Bone Block Arthrodesis

- Carr et al 1988
  - Subtalar bone block fusion
  - Restore height
  - Restore talar inclination
  - Relieve Anterior impingement

Distraction Arthrodesis

- Lateral decubitus position
- Posterolateral approach
  - Minimize wound problems
Ext. Lat. vs PL approach

Distraction Arthrodesis
- Lateral wall exostectomy
- Medial femoral distractor (prevent varus)
- Lamina spreader

Medial ex fix
Bone Block: allograft vs autograft

- Distraction
  - Tricortical posterior iliac crest graft
  - 2 screws
    - Fully threaded
    - Partially threaded

Bone Block Fusions

- Higher complication rate, malunion and nonunion with bone block fusions vs in situ fusions
  - Myerson & Quill, 1993
  - Flemister et al, 2000
  - Easley et al, 2000
- Bone blocks performed for more complicated malunions
Subtalar Arthrodesis

When is an bone block arthrodesis indicated versus an in situ arthrodesis?

Subtalar Fusion
Bone Block vs In-situ

Good results with in situ fusions regardless of talar height or talar inclination provided anterior impingement was not present (2 to 5 yr f/u)

Chandler et al., 1999
Flemister et al., 2000

Anterior Impingement

- Painful forced dorsiflexion < 10 degrees
- Anterior ankle tenderness
Subtalar Fusion

- In situ fusion if anterior impingement is not present clinically

Complications

- Nonunion
- Malunion (usually varus)
- Wound healing
- Persistent Pain

Union Rate

- >90% in nonsmokers
- 75% in smokers
- Structural allografts also risk factor for nonunion
Persistent Pain
- On uneven ground
- Sural and tibial neuritis
- Heel pad pain

Timing of Surgery
- 8 – 12 months after injury
- Sooner if significant lateral wall impingement

Post OP
- All fusions
- 6 wks NWB cast
- 4wks in wb cast
- Wean out of boot
75 y/o female, 6 mos post injury

CT SCAN

Question

- Treatment for this 75y/o with this calcaneal malunion? She has no anterior ankle pain, good dorsiflexion, and sub-fibular pain.

1. Osteotomy and repair without fusion.
2. Distraction bone block fusion with allograft.
3. Distraction bone block fusion with autograft.
4. In-situ fusion with lateral wall exostectomy.
Case 2

- 65 y/o male, healthy, active
- 6 month old calcaneal malunion
- Pain with ankle dorsiflexion, lateral pain
Case 2

Prevention of Malunion

- Adequate ORIF in appropriate patients
- Radney et al JBJS 2009
- Better results following subtalar fusion if they had initial ORIF

Summary

- Follow the Sanders protocol for Type 1,2,3 malunions (does not address talar height)
- Bone Block arthrodesis for anterior impingement