Evans Procedure

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Disclosure: Speaker for Orthofix and Biomet
What does the Evans Procedure accomplish?

• Lengthens the lateral column
  – Relocates TN joint
  – Preloads the plantar fascia
  – Improves Peroneus longus function

• Moves the effective STJ axis lateral
  – Medializes Achilles
  – Increases supination of TA
  – Enlarges the supinatory lever arm GRF
  – Reduces valgus heel
  – More effective MTJ locking
  – Increased calcaneal inclination
Why does the calcaneous invert and dorsiflex?

- Supination of the mid foot effectively moves the axis of the STJ lateral
- Lateral shift of the STJ axis increases the supination moment across the STJ from GRF
- GRF produces tri-plane movement of the STJ and MTJ (supination)
Indications

• Flexible Pes valgus
  – Progressive
  – Painful
• No DJD
• Younger patients
Technique: Non-Fixated

- Vertical incision
- Sub-periosteal retraction into sinus tarsi and below calcaneus
- No dissection of the CC joint
- Oblique osteotomy approximately proximal to CC joint and anterior to middle facet
- 1.5 cm
- Structural allograft is placed to lengthen
- Graft size tailored to foot size and deformity (8-10mm)
- Press fit of the graft produces stability at the osteotomy
Don’t Forget the Equinus!
Why Fixate the Osteotomy

• Loss of lateral column length (primary correction)
  – Graft collapse
  – Calcaneal collapse

• Shift of the anterior fragment
  – Dorsal, plantar, medial, lateral

• Stability
  – Early active ROM
    Improves rehabilitation
Does Locking Plate Prevent Length Loss and Displacement?

Dayton, Feilmeier, Prins, Smith JFAS 2013

• N= 35

• Without plate (12)
  • Average loss - 2.45 mm (0-9mm) @ 6 mo
  • Visible shift 5 = 23%

• With Plate (23)
  • Average loss - 1.0 mm (0-3mm) @ 6 mo
  • Visible shift 1 = 8%
Technique: Fixated

- Longitudinal incision from the cuboid to the lateral malleolus just dorsal and parallel to the peroneal tendons.
- Full thickness sub-periosteal flap raised with the peroneal tendons.
- Osteotomy vertical 1.5-2 cm from cc, parallel to joint
- Graft placed and fixated with locking plate
• Trapezoid
  – Linear advancement of the anterior calcaneus

• Wedge
  – Larger net medial shift of the midfoot
  – Cortical contact maintained medial-plantar
Locking Plate vs. Screw

- **Locking plate**
  - Load bearing bridge fixation provides the ideal mechanics for inter-positional bone graft
  - Multi-planar stability

- **Screw**
  - Does not neutralize angular or compressive forces on the graft
Allograft

- Healing is based on new bone formation around the graft and biologic replacement of the graft.
- Incorporation???
- Creeping substitution is replacement of the graft with host bone from the edges inward.
- This is a long process that takes many months to fully complete.
Bone Graft Biology

- **Osteoconduction**
  - Provides matrix or scaffold for bone growth

- **Osteoinduction**
  - Protein Growth factors recruit and encourage mesenchymal cells to differentiate into osteoblastic lineages
  - Complicated multistep process involving many known and unknown factors
  - We must recognize the body does this without graft materials

- **Osteogenesis**
  - Transplanted osteoblasts and periosteal cells directly produce bone

- **Osteostimulation**
  - Up regulation of local cells
Composite Grafts

• Why not combine components to take advantage of individual properties
  – B-Tricalcium Phosphate
    • Osteoconduction
    • Porous
    • High protein and cellular affinity
  – Autogenous Bone Marrow
    • Osteoinduction
    • Osteogenisis
  – Bioactive Glass
    • Osteostimulation
B-Tricalcium Phosphate

- Wet compressive strength slightly less than cancellous bone
- Excellent resorption and ingrowth characteristics
- Heals by direct bone formation not creeping substitution
- Excellent cell attachment and protein affinity
- Pore size 100-400 um
- Available as blocks, wedges, and granules
- Mechanically and biologically superior to DBM
Application Technique

• Harvest Marrow
  – Iliac Crest, Vertebral Body, Tibia, Calcaneous
  – Aspirate no more than 2cc per site
• Hydrate B-TCP with marrow (1:1 Ratio)
• Complete and fixate surgical site with stable / flexible bridge construct
• Apply composite graft to defect
• Close
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Fort Dodge Hot Tub