1\textsuperscript{st} MTPJ Arthrodesis

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Disclosures

- MTF: Consultant
- Talar Capital Partners: Director, Financial Investment
INDICATIONS

Arthritis

- Hallux Rigidus
- Inflammatory Arthritis
  - Rheumatoid Arthritis
INDICATIONS

- Severe Hallux Valgus
- Hallux Varus
- Neuromuscular Dx
  - Stroke
  - Cerebral Palsy
INDICATIONS

Salvage of Failed Surgery
  – Keller Arthroplasty
  – Implant Arthroplasty
  – Joint Preserving HAV
1st MTPJ Arthrodesis

Disadvantages

– Loss of Motion
– Shoe Limitation
– Risk of Adjacent Joint Arthritis
1\textsuperscript{st} MTPJ Arthrodesis

Advantages

– Pain Relief
– Deformity Correction
– Maintains 1\textsuperscript{st} Ray Weight-Bearing
– Durability
– Predictable Results
– Definitive Procedure
Surgical Technique
Incision and Exposure

- Incision
  - Dorsomedial
  - Medial

- Revisional Surgery:
  - Full thickness
    - Excess cicatrix
    - Minimize wound complications
Surgical Technique
Incision and Exposure

Lateral Release
- Adductor Hallucis
  - High IM Angle
Capsular incision
- Straight linear
- T or inverted L
  - Plantar exposure
  - Obstruction to positioning & fixation
Joint Preparation

- Remove exostosis prior to cartilage resection
- Recreate normal joint architecture
- Helps with positioning of hallux
Joint Preparation

- **Medial eminence**
  - Have no fear
  - Hallux varus should not live here
  - Preserve proximally for screw placement
Joint Resection

- Curettage
- Conical or Cup Reamer
- Planal Resection
- Interpositional Bone Graft

Less is Best
Joint Resection

- Curettage
  - Remove subchondral bone plate
  - Fenestration
  - Preserves length
  - Preserves joint contour
  - Easy positioning
  - Rigid Internal Fixation
**Joint Resection**

- **Conical or Cup Reamer**
  - Ball and socket configuration
  - Stable joint contour
  - Preserves length
  - Caution: Osteoporotic bone
Joint Resection

- Planal Resection
  - Accommodate severe angular deformities
  - Bone Grafting
  - Shortening
  - Positioning difficult
  - Non-Union/Mal-Union
Joint Resection

Significant bone loss

- Infection
- Failed implant/Keller
  - 1-2 cm. Defect - bone grafting
  - 2-3 cm. Defect – restoration of proximal segment (callus distraction/osteotomy)
Position

- Slight Valgus
  - Parallel to 2nd toe
- **NO** frontal plane rotation
- Dorsiflexion
  - 10-20° Relative to Floor
  - First Metatarsal Inclination
    - Angle Varies
      - 20-30° Relative to First
    - Hallux Tip Slightly off Foot Plate
Fixation Options

- **Recommended**
  - Crossed Screws
  - Dorsal Plate with Lag Screw or Offset screws

- **Others**
  - K-wires
  - Steinmann Pins
  - Staples
  - Ex-Fix

- Remember principles
Screw Fixation Options

- Non-cannulated screws
  - 2.7mm
  - 3.5mm
  - 4.0mm
- Cannulated screws
  - 3.0mm
  - 4.0mm
- Other
Crossed Screw Fixation

- Requires good bone stock
- Excellent compression – Bicortical
- Stable Construct
Screw Fixation Technique

- Screw #1
  - Proximal medial to distal lateral
  - *PLANTAR* distal exit

- Screw #2
  - Distal medial to proximal lateral
  - *DORSAL* proximal exit

**Avoid collision at screw intersection**
Avoid Screw Collision at Intersection

Dorsal Distal screw

Medial

Lateral

Plantar Proximal Screw
Screws and Plate Fixation
Fixation with Bone Grafting
Comparison of Fixation Techniques

  - Synthetic bone model, 4 fixation techniques
  - Best: cup/cone + 3.5 lag + 4 hole dorsal miniplate
  - 2 x stronger than oblique lag alone
  - Weakest: dorsal plate without lag or crossed K-wire fixation

  - Single compression screw vs. single screw with ¼ tubular plate
  - Overall fusion 97%
  - No significant associations between
    - Type of fixation and time to union
    - Patient satisfaction
    - Complications
Cost Comparison of Fixation

- Hyer et al. JFAS 47(1) 2008
- Crossed screw vs. plating
- Fusion rate 91.1%, no diff between groups
- $374 vs. $603
- Equal complications
  - Nonunion
  - Delayed union
  - Hardware
  - Revisions
“The precise operative technique is not important provided it maintains the position obtained at operation until the arthrodesis is sound.”

Remember the fundamentals!!

Fitzgerald, JAW. JBJS (Br) 51, 1969
POSTOP MANAGEMENT

- Protected WB is the universal standard
  - Quality of fusion
  - Stable fixation
- Bone Grafting - NWB Cast is essential

- Berlet et al, FA Spec, 2008
- Crossed screws vs. dorsal plate
- Fusion 92%
- Time 69 days
- Full WB in post-op shoe can be allowed with adequate fixation
COMPLICATIONS

- Poor Positioning
  - Difficult walking
  - Shoe gear problems
  - Skin lesions
  - Nail problems
  - Metatarsalgia
- HIPJ problems
  - Subluxation
  - Arthritis
COMPLICATIONS

- Bone Healing
  - Malunion
  - Delayed union
  - Nonunion
- Internal Fixation
  - Prominence
  - Loosening
  - Fracture
FINDINGS

- Literature > 90% Fusion Rate
  - Higher with Rigid Fixation
- 6-20% HIPJ Arthritis
- Near Normal Gait
  - Slight Earlier Toe Off
- Lateral Metatarsalgia
  - Usually Resolves
- Fusion Position Critical!
SUMMARY

- Proper patient selection
- *Position*
- Minimal joint resection
- *Position*
- Stable fixation
- *Position*
- Predictable results
- High patient satisfaction
POSITION ASSESSMENT
Screw Fixation Technique

- Requires good bone stock
- Excellent compression
- Stability
Pitfalls

- Excessive Dorsiflexion
  - Shoe gear
  - Nail problems
  - HIPJ arthritis
  - 1\textsuperscript{st} Metatarsalgia

- Lack of Dorsiflexion
  - distal hallux irritation
  - inability to roll over MTPJ during gait

- Varus alignment (straight)
  - abutment against medial shoe
  - Increased HIPJ DJD

- Excessive valgus
  - Impingement 2\textsuperscript{nd} toe
  - Callus between hallux and 2\textsuperscript{nd}
  - 2\textsuperscript{nd} toe crossover…MTPJ instability

- Malrotation
  - irritation of medial or lateral nail border

- Excessive shortening
  - lesser metatarsalgia