Tarsal-Metatarsal Joint

Primary & Revision Arthrodesis

Paul Dayton, DPM, MS, FACFAS

Disclosure: Speaker for Orthofix and Biomet
Trauma Patterns

• Classifications
  – Lots of them
  – Do they really help?

• Must Evaluate
  – Angulation & Translocation
  – Transverse & Sagittal displacement

• Spontaneous reduction may hide the “true deformity”
  – Does it match the other side?
  – Careful attention to the “key-stone”
The subtle ones are the toughest

- Often missed in the ED
- History and physical exam is key
- Alignment of the second metatarsal base medially is an important radiographic finding
Always take a picture of the other foot!!

Do CT and MRI Help?
Still Not Sure?
Stress It !!!
Small Shift Equals Big Deformity
Clinical Questions for Treatment of TMTJ Dislocation

Tradition vs. Evidence

- Reduction vs. No Reduction
- Closed vs. Open
- Wires vs. Screws
- ORIF vs. Fusion
Reduction vs. No Reduction

• There is no evidence to support closed casting without reduction in a reasonable surgical candidate

• Instability is well known to result in progressive collapse, biomechanical dysfunction and painful arthrosis

• All studies that compare accurate reduction to mal-position show better outcome for accurate reduction
  – 50-95% Favorable outcome with anatomic reduction
  – 17-30% Favorable outcome non anatomic
Positional changes from unstable Lisfranc’s causes severe progressive functional abnormalities
Biomechanics

• Elevated first ray
  • Reduced first ray weight-bearing
  • Hallux Limitus

• Midfoot over-pronation
  • Forefoot abduction
  • Internal leg rotation
  • STJ, MTJ and ankle compensatory changes
Percutaneous Fixation?

- Reduction is highly variable even with fluoroscopy
- Nearly all recent papers recommend open visualization of reduction regardless of fixation technique
  - ORIF for both pins and screws
Inadequate Reduction With Closed Pinning

• Wilson 1972
• Arntz 1988
• Myerson 1989
  – ORIF gave superior result to closed pinning
  – 100% of patients had DJD of tarsal-metatarsal joints regardless of reduction
ORIF
Kuo 2000, Coetzee 2008

- Incomplete stability after ORIF
- Late collapse
- High incidence of DJD
- High rate of revision surgery
Late Instability and DJD
**Arthrodesis vs. ORIF**

*Coetzee JBJS 2006*

- **ORIF**
  - 15 of 20 had loss of correction, arthrosis and or pain
  - 16 of 20 needed hardware removal (2\(^{nd}\) Surgery)
  - 7 needed revision within 4 year period (3\(^{rd}\) Surgery)
  - AOFAS score 57.1

- **Primary Arthrodesis of 1-2-3 TMTJ**
  - AOFAS score 86.9
  - No revision
  - Rare 2\(^{nd}\) surgery (hardware removal)
Primary Ligamentous Injury
Coetzee 2008

- Ligamentous injury
  - Dorsal Instability
    - Much more stable
    - ORIF acceptable
  - Medial second metatarsal base fracture
    - ORIF

- Plantar Instability
  - Less reliable
  - Arthrodesis

- Pure ligamentous instability
  - Arthrodesis
ORIF vs. Primary Arthrodesis for Lisfranc Injuries
Henning FAI 2009

• Prospective, randomized study of patients presenting with Lisfranc’s fracture dislocation
  – ORIF vs. primary arthrodesis 1-2-3 TMTJ
  – Follow-up to one year
  – Had 94% fusion rate in the arthrodesis group
  – Found similar short term functional results between groups however showed that Arthrodesis resulted in a statistically significant decrease in the number of follow-up surgeries
ORIF vs Complete TMTJ Arthrodesis

Mulier 2002

- ORIF did better functionally than complete TMTJ arthrodesis
- 94% of ORIF had arthrosis at 36 months
- Fuse only 1 – 2 - 3
Late or Revision Arthrodesis
Rammelt 2008

• “We can always fuse it later”
• Primary arthrodesis gave better functional result and less complicated recovery than secondary arthrodesis
• Medial column fusion gave better result than fusion of all five joints
**ORIF**

- High rate of second and third surgeries
- High rate of DJD in first 5 years
- No post operative advantages
- Progressive deformity and adjacent joint damage
- Not a more conservative operation

**Arthrodesis**

- One and done
- No more complicated than ORIF
- Better patient function
- Excellent union rates
- Superior to late arthrodesis
- Stability is the key to the TMTJ
- Most conservative option
• It is well documented that closed pinning and ORIF have high failure rates and high revision rates.

• We have to consider adjacent joint damage from years of walking on a progressively deformed foot.

• Lisfranc’s joint is a stability segment, not a mobility segment.

• There is no good functional or surgical argument against fusion.
Surgical Technique

• Incision
  – 2 or 3 incisions

• Bone preparation
  – Remove all subchondral bone
  – Correct the deformity

• Fixation
  – Has to be contourable to the anatomy
  – Low profile

• Post operative course
  – NWB for 4-6 weeks
Control The Variables for Consistent Healing

• Vascular Preservation
  • Periosteal, Endosteal, Surrounding soft tissues
  • Minimal soft tissue disruption
  • NO tissue plane separation
  • Limit heat generated with saws and burrs

• Mechanical stability
  • Directly affects cellular activity
  • Inappropriate motion interferes with healing
  • Absolute rigidity may also slow healing
  • Stable, non rigid fixation with controlled micro-motion can stimulate healing
Bridge Fixation “Internal Fixator”

- Plate and screws form a “single beam” load bearing construct
- Multi-planar stability
- Bone segments are stable but not compressed therefore low gap strain
- Controlled micro motion based on the mechanical characteristics of the fixator
  - Mono vs bi-planar construct
  - Stiff vs flexible plates
  - Number of screws per plate
- Stimulates callus healing and the callus strengthens the fixation construct
Expose joints directly
Resect all cartilage and SC bone
CORRECT DEFORMITY – Contralateral foot is the map
Drill surfaces with fluted bit
DO NOT IRRIGATE FRAGMENTS
Multi-Planar - Low Profile – Flexible - Locking Plate
TMTJ Fusion is Excellent for Deformity Correction
Key Points

• TMTJ stability and alignment is important for function
• Arthrodesis is the most stable option for repair with the lowest revision rate
• There is no good argument from a surgical or functional standpoint for “Joint Preservation” in the TMTJ
• Locking plates provide a stable, load bearing construct that tolerates external stresses better than traditional AO techniques
• Must prioritize deformity correction in both acute and late reconstructions
I have to admit I'm a little anxious to see what's going to be hanging from that sign.