Weightbearing after 1st MPJ Arthrodesis and Lapidus

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Why Should We Care About NWB vs WB???
• Prolonged NWB increases risk for VTE
• Less risk for falls
• Psychologic effects
• Improved ability to perform ADL’s
• Patient comfort
• Other orthopedic comorbidities
Common Pathology leading to 1st TMT Arthrodesis

- Instability
- Hallux-valgus
- Hallux limitus
- Deformity
- Arthritis (OA, post-traumatic, systemic, etc)
- Flatfoot

Surgical Approaches to 1st TMT Arthrodesis

- Incision:
  - Dorsal
  - Medial
  - Dorsal-medial
  - Plantar-medial
- Joint preparation:
  - Curette
  - Bur
  - Rongeur
  - Planal resection
  - Osteotome
  - “Rose pedal” or “Fish scale”
  - Fenestration with wire/drill
  - Templated cutting guides

Surgical tips: 1st TMT Arthrodesis

- Pin distractor (Hintermann)
- Use the dorsal lip of the cuneiform as bone void filler/graft.
- Dorsiflex and rotate the hallux at the MTP.
- Pointed large bone reduction clamp at the 1st metatarsal head to the 2nd metatarsal head.
Does the Evidence Support Early WB After 1st TMT Arthrodesis??

Union Rates in 1st TMTJ Arthrodesis with Crossed Screws

- 136 consecutive patients
- Crossed, solid screw fixation.
- Partial WB at 12.2 days
- Full WB at 34.4 days
- Average time to radiographic union was 65 days.
- 3 total Nonunions (2.2%)
  - 1 Symptomatic

Union Rates 1st TMTJ Arthrodesis

- Does early weightbearing change union rates?
- Early weightbearing is defined as full weightbearing at less than 21 days post-operative.
- 367 Consecutive patients
  - 24 total non-unions, 6.5% overall
  - 11 (7%) in the early weightbearing group
  - Median time to WB in the union group, 22 days.
  - Median time to WB in the non-union group, 26.5 days.
- 367 Consecutive patients
- 24 total non-unions, 6.5% overall
- 13 (7.1%) in the early weightbearing group
- 11 (6%) in the delayed weightbearing group
- Median time to WB in the union group, 22 days.
- Median time to WB in the non-union group, 26.5 days.
- 50% of the non-unions were 3 screw constructs.

Early WB with Lapidus

- 80Pts undergoing a Lapidus
- Protected WB starting at 2 weeks post-op
- 2 or 3 screw construction
- Either calcaneal bone graft or dorsal redundant medial cuneiform used as graft to the dorsal aspect of the arthrodesis site.
- 100% fusion rate

My Personal Protocol and Results

- 2-3 week NWB
- WBAT with tall CAM boot for additional 3 weeks
- Tennis shoes at 6 weeks post-op
- Non-union rate 4%
- 0 symptomatic non-unions
- 0 reoperation for non-union
Points to Remember

• Review of literature supports NWB for 2-3 weeks post-op
• Begin WB with CAM boot at 2-3 weeks with little to no effect on union rates or loss of reduction of IM 1-2.
• No general consensus on fixation.

Common Pathology Leading to 1st MPJ Arthrodesis

• Hallux rigidus
• Hallux valgus
• Hallux varus
• Failed implant

Surgical Approaches to 1st MPJ Arthrodesis

• Incisions:
  • Dorsal
  • Medial
  • Dorsal medial
• Joint preparation:
  • Curette
  • Rongeur
  • Bur
  • Osteotome
  • Planar resection
  • Reamers
  • Fenestration with drill/wire
  • "Fish scaling" or "Rose pedaling"
Joint Preparation, First MPJ

- 200 First MPJ arthrodesis with overall union rate of 93.5%
- 92.4% Flat preparation (saw)
- 95% Ball and socket
  - Rongeur only 100%
  - Rongeur and burr 96.3%
- Union rate is not influenced by preparation technique

Surgical tips: 1st MPJ Arthrodeis

- Penetrating towel clamp to the proximal phalanx for visualization of the joint.
- Lid to simulate the weightbearing surface.
- Save large osteophytes to debride and use as bone void filler/graft.
Hardware: 1st MPI Arthrodesis

- K-wires
- Lag/compression screw
- Dorsal plate
- Locking plate
- Combination
- External fixation
IMA 1-2 Reduction³

• 2014 Systematic review, 701 procedures included
  • Starting IMA of less than 15 reduced by 3.7
  • Starting IMA of greater than 15 reduced by 5.42

Overall results: starting IMA average of 13.74 reduced to 9.38, reduction of 4.36

Nonunion Rates of 1st MPJ Arthrodesis⁷

• Systematic review
  • 37 studies, 2656 arthrodesis included
  • Compression screws/Dorsal plate and screws/Staples
  • Severe hallux valgus 47.2%
  • Hallux rigidus 32%
  • Rheumatoid arthritis 11.5%
  • Revision surgery 9.3%
  • Hardware removal rate of 8.5%

  Total nonunion rate of 5.4%
  Symptomatic nonunion 1.8% overall

Union Rates 1st MPJ Arthrodesis²

Dorsal Non-Locking Plate (n=18)
  • Union <60 days = 55.6%
  • Fusion rate total = 77.8%

Dorsal NLP with Lag Screw (n=30)
  • Union <60 days = 83.3%
  • Fusion rate total = 100%

No difference in complications
Faster fusion with less non-union utilizing a lag screw
Does Pathology Effect Union rates

- Single surgeon study looking at 134 consecutive 1st MPJ arthrodesis.
  - Overall union rate of 91.8%
  - Hallux valgus 49 joints (36.6%)
  - Hallux rigidus 49 joints (34%)
  - Inflammatory arthropathy 34 joints (25.4%)
  - salvage surgery 5 joints (3.7%)
- Hallux valgus group had a 14.3% non-union rate, leading to possible stronger fixation needed with worsening deformities.


Fusion Rates With Early WB

- 21 Procedures
- Lag screw or K-wire with 2 hole plate dorsally
- Full WB by 2 weeks for all patients
- 95.24% Fusion rate
- Prevalence:
  - 1 asymptomatic and eventually fused
  - 1 asymptomatic requiring re-operation


Does Construct Effect Fusion Rates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Static Plate</th>
<th>Static Plate + Lag Screw</th>
<th>Locked Plate</th>
<th>Locked Plate + Lag Screw</th>
<th>G-Value</th>
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<tbody>
<tr>
<td>Pain (mm)</td>
<td>1.83 ± 2.32</td>
<td>1.97 ± 2.67</td>
<td>0.32 ± 2.68</td>
<td>0.46 ± 2.84</td>
<td>0.30</td>
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<td>Failure by 12 weeks (%)</td>
<td>41 (39.35)</td>
<td>12 (85.71)</td>
<td>32 (50.83)</td>
<td>43 (59.56)</td>
<td>0.04</td>
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<td>Nonunion Rate (%)</td>
<td>59 (59.01)</td>
<td>60 (57.74)</td>
<td>12 (19.61)</td>
<td>13 (18.84)</td>
<td>0.29</td>
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<td>Nonunion Rate by 12 weeks (%)</td>
<td>60 (60.02)</td>
<td>61 (58.84)</td>
<td>12 (19.61)</td>
<td>13 (18.84)</td>
<td>0.29</td>
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<td>Nonunion Rate by 24 weeks (%)</td>
<td>60 (60.02)</td>
<td>61 (58.84)</td>
<td>12 (19.61)</td>
<td>13 (18.84)</td>
<td>0.29</td>
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<td>Nonunion Rate by 36 weeks (%)</td>
<td>60 (60.02)</td>
<td>61 (58.84)</td>
<td>12 (19.61)</td>
<td>13 (18.84)</td>
<td>0.29</td>
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<td>Probability of the null hypothesis calculated using analysis of variance.</td>
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Fusion Rates With Immediate WB\textsuperscript{12}

- 37 Fusions with immediate weightbearing post-op
- Overall fusion rate of 91.1%
- Mean time to fusion 69 days
- Combination of crossed screws or plate and screws


My Personal Protocol and Results

- WBAT immediately post-op
  - Crutches/Scooter Rx’d for patient comfort if needed
  - WBAT with tall CAM boot for 6 weeks
  - WBAT with tennis shoes at 6 weeks post-op
  - Activities as tolerated at 12 weeks post-op
  - 3.1% non-union rate
  - 6 symptomatic non-unions
  - 0 re-operation for non-union

Case #1

- 64 y.o. male
- DM, HTN
- Hallux rigidus, 2\textsuperscript{nd} MPJ instability, 2\textsuperscript{nd} Hammer toe
- Surgical plan: 1\textsuperscript{st} MPJ arthrodesis, 2\textsuperscript{nd} Metatarsal osteotomy, 2\textsuperscript{nd} PIPJ arthroplasty
- Immediate WB post-op with tall CAM boot
  - K-wire to the 2\textsuperscript{nd} ray removed 6 weeks post-op when patient transitioned into tennis shoes.
Case #2
- 30 y.o. Active duty Air Force
- Multiple prior failed surgeries by the time he presented to our clinic.
- Healthy

Immediate WB post-op of 1st MPJ Arthrodesis. Returned to full active duty and passed fitness test 10 weeks post-op.

Case #3
- 75 y.o. male
- DM with neuropathy
- 45 pack year history
- 1st MPJ implant approx. 15 years ago
- Pain with any ambulation

Noncomplaint. Does not wear CAM boot. Wears slippers at all times.

Case #4
- 52 y.o. male
- Failure of prior cheilectomy
- Failure of attempted prior 1st MPJ arthrodesis with K-wires
- Presents to us with complaint of sub 2nd metatarsal head pain
- Under pain management

Undergoing interpositional calcaneal autograft. 1 cm of length was gained with the graft to restore the metatarsal parabola.

Due to interpositional graft, patient was placed NWB for 4 weeks. WBAT with CAM boot for additional 4 weeks.

Due to his work requirements, he returned to work as a restaurant manager in tennis shoes and rigid orthotic at 8 weeks post-op with no pain to the arthrodesis site or the 2nd metatarsal head.
Case #5

• 64 y.o. Female
• Severe RA
  • On chronic prednisone and methotrexate. All DMARDs have caused her severe side effects and been discontinued
• NWB for 1 week post-op
  Hardware removed due to potential infection (recurrent blister over the hallux)

Case #6

• 40 y.o. female
• Healthy
• Active tennis player
• NWB for 3 weeks, Full WB in CAM boot for additional 3 weeks.
• Returned to tennis at 10 weeks post-op

Thank you!
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<td>1. FAI.</td>
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