

## Weightbearing after 1<sup>st</sup> MPJ Arthrodesis and Lapidus

Thomas A. Fusco DPM, FACFAS



---

---

---

---

---

---

---

### Financial Disclosure

- Speaker for Mimedx
- No financial disclosures relevant to this presentation.



---

---

---

---

---

---

---

### 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 1<sup>st</sup> TMT Arthrodesis

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




---

---

---

---

---

---

---

### Surgical Approaches to 1<sup>st</sup> 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: 1<sup>st</sup> TMT Arthrodesis

- Pin distractor (Hintermann)
- Use the dorsal lip of the cuneiform as bone void filler/graft.
- Dorsiflex and rotate the hallux at the MPJ.
- Pointed large bone reduction clamp at the 1<sup>st</sup> metatarsal head to the 2<sup>nd</sup> metatarsal head.




---

---

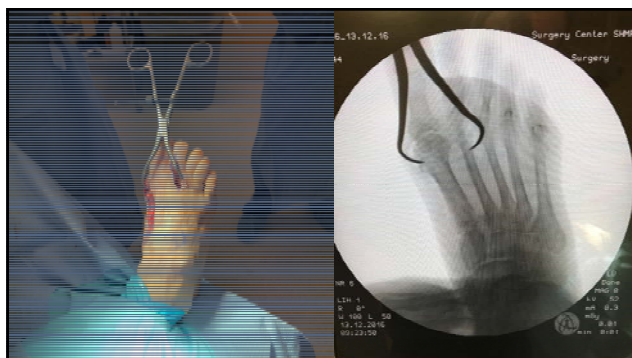
---

---

---

---

---



---

---

---

---

---

---

## Does the Evidence Support Early WB After 1<sup>st</sup> TMT Arthrodesis???



---

---

---

---

---

---

## Union Rates in 1<sup>st</sup> TMTJ Arthrodesis with Crossed Screws<sup>8</sup>

- 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



JFAS 2015 Jan-Feb 2015, Vol 54, Issue 1. 69-75. King et al. *Modified Lapidus Arthrodesis With Crossed Screw Fixation: Early Weightbearing in 136 Patients.*

[illegible]

## Union Rates 1<sup>st</sup> TMTJ Arthrodesis<sup>5</sup>

- 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
  - 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, 16.5 days
  - 50% of the non-unions were 3 screw constructs

JFAS March 2016, Vol 55, Issue 2, 226 – 229. Prissel et al. A Multicenter, Retrospective Study of Early Weightbearing for Modified Lapidus Arthrodesis




---

---

---

---

---

---

---

---

## Early WB with Lapidus<sup>13</sup>

- 80 Pts 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



JFAS 2010 July-Aug, Vol 49, Issue 4, 357-362. Blitz et al. Early Weight Bearing After Modified Lapidus Arthrodesis: A Multicenter Review of 80 Cases




---

---

---

---

---

---

---

---

## 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 1<sup>st</sup> MPJ Arthrodesis

- Hallux rigidus
- Hallux valgus
- Hallux varus
- Failed implant




---

---

---

---

---

---

---

---

## Surgical Approaches to 1<sup>st</sup> MPJ Arthrodesis

- Incisions:
  - Dorsal
  - Medial
  - Dorsal medial
- Joint preparation:
  - Curette
  - Rongeur
  - Bur
  - Osteotome
  - Planal resection
  - Reamers
  - Fenestration with drill/wire
  - "Fish scaling" or "Rose pedaling"




---

---

---

---

---

---

---

---

## Joint Preparation, First MPJ<sup>4</sup>

- 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%
    - Not statistically significant
- Union rate is not influenced by preparation technique

Mahadevan, D. et al. JFAS June 2015, Vol 21, Issue 2, 103 – 107. First metatarsophalangeal joint arthrodesis – Do joint configuration and preparation technique matter?




---

---

---

---

---

---

---

---

## Surgical tips: 1<sup>st</sup> MPJ Arthrodesis

- 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.




---

---

---

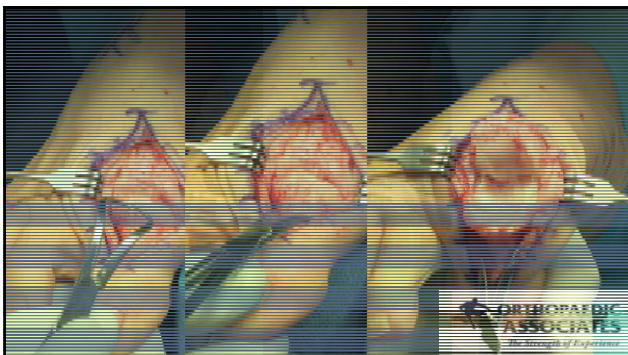
---

---

---

---

---




---

---

---

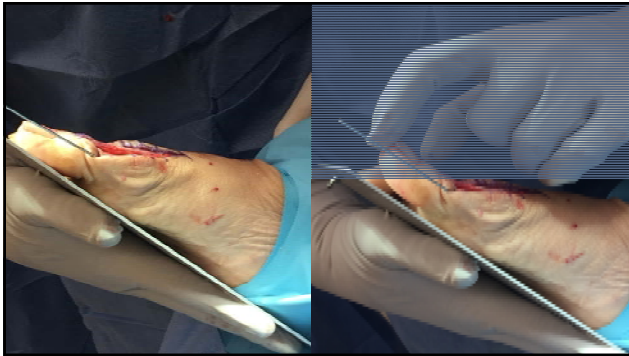
---

---

---

---

---



---

---

---

---

---

---

---

### Hardware: 1<sup>st</sup> MPJ Arthrodesis

- K-wires
- Lag/compression screw
- Dorsal plate
- Locking plate
- Combination
- External fixation



---

---

---

---

---

---

---



---

---

---

---

---

---

---

### IMA 1-2 Reduction<sup>3</sup>

- 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**

JFAS Sept-Oct 2014, Vol 53, Issue 5, 620-623. Dayton et al. *Reduction of the Intermetatarsal Angle after First Metatarsal Phalangeal Joint Arthrodesis: A Systematic Review*




---

---

---

---

---

---

---

---

### Nonunion Rates of 1<sup>st</sup> MPJ Arthrodesis<sup>7</sup>

- 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**



JFAS 2011 Nov-Dec;50(6):710-3. Roukis. *Nonunion after arthrodesis of the first metatarsal-phalangeal joint: a systematic review*




---

---

---

---

---

---

---

---

### Union Rates 1<sup>st</sup> MPJ Arthrodesis<sup>2</sup>

#### Dorsal Non-Locking Plate (n=18)    Dorsal NLP with Lag Screw(n=30)

- |                             |                            |
|-----------------------------|----------------------------|
| • Union <60 days = 55.6%    | • Union <60 days = 83.3%   |
| • Fusion rate total = 77.8% | • Fusion rate total = 100% |

**No difference in complications  
Faster fusion with less non-union  
utilizing a lag screw**

Open Orthop J. 2015; 9: 480-482. Rashid et al. *First Metatarsalphalangeal Joint Arthrodesis: A Retrospective Comparison of Two Methods of Fixation*




---

---

---

---

---

---

---

---



## Does Pathology Effect Union rates<sup>6</sup>

- Single surgeon study looking at 134 consecutive 1<sup>st</sup> MPJ arthrodesis.
  - Overall union rate of 91.8%
- Crossed screws (124) or dorsal plate (10)
- 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.**

FAJ 2015 Jan;36(1):51-4. Korim et al. Effect of pathology on union of first metatarsophalangeal joint arthrodesis.



## 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**
  - 2 nonunions.
  - 1 asymptomatic and eventually fused
  - 1 symptomatic requiring re-operation



JFAS 2013 July-Aug. Vol 52, Issue 4, 460-464. Mann et al. Low-profile Titanium Plate Construct for Early Weightbearing with First Metatarsophalangeal Joint Arthrodesis



## Does Construct Effect Fusion Rates<sup>10</sup>

Variable	Fixation Construct				P Value *
	Static Plate (n = 43)	Static Plate + Lag Screw (n = 14)	Locked Plate (n = 36)	Locked Plate + Lag Screw (n = 45)	
Age (years)	58.6 ± 9.21 (40, 78)	57.1 ± 13.97 (27, 82)	57.3 ± 7.81 (38, 72)	58.1 ± 10.06 (29, 80)	.92
Successful fusion (count (%))	41 (95.35)	12 (85.71)	33 (91.67)	43 (95.56)	.78
Days to radiographic fusion	59 ± 56 (13 to 320)	56 ± 18 (31 to 92)	66 ± 67 (17 to 400)	63 ± 22 (29 to 116)	.70
Days to full weight-bearing	54 ± 18 (30 to 128)	55 ± 13 (37 to 85)	59 ± 16 (37 to 103)	63.45 ± 19.67 (30 to 116)	.086
Duration of follow-up (months)	12.25 ± 15.1 (0.7 to 61)	12.2 ± 13.6 (1.8 to 36.5)	9.82 ± 8.43 (1.5 to 12.9)	4.59 ± 4.44 (0.05 to 5.91)	.0059

\* Probability of the null hypothesis calculated using analysis of variance.

JFAS 2012 May-June. Vol 51, Issue 3, 285-287. Hyer et al. A Retrospective Comparison of Four Plate Constructs for First Metatarsophalangeal Joint Fusion: Static Plate, Static Plate with Lag Screw, Locked Plate, and Locked Plate with Lag Screw



## Fusion Rates With Immediate WB<sup>12</sup>

- 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

Foot & Ankle Spec. Feb 2008; 1(1):24-8. Berlet et al. A retrospective review of immediate weightbearing after first metatarsalphalangeal joint arthrodesis.




---

---

---

---

---

---

---

---

## My Personal Protocol and Results

- WBAT immediately post-op
  - Crutches/Scooter Rx'ed 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**
  - **0 symptomatic non-unions**
  - **0 re-operation for non-union**




---

---

---

---

---

---

---

---

## Case #1

- 64 y.o. male
- DM, HTN
- Hallux rigidus, 2<sup>nd</sup> MPJ instability, 2<sup>nd</sup> Hammertoe
- Surgical plan: 1<sup>st</sup> MPJ arthrodesis, 2<sup>nd</sup> Metatarsal osteotomy, 2<sup>nd</sup> PIPJ arthroplasty
- Immediate WB post-op with tall CAM boot
  - K-wire to the 2<sup>nd</sup> 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 1<sup>st</sup> MPJ Arthrodesis**  
**-Returned to full active duty and passed fitness test 10 weeks post-op**

ORTHOPAEDIC ASSOCIATES  
The Strength of Experience

---

---

---

---

---

---

---

---

### Case #3

- 75 y.o. male
- DM with neuropathy
- 45 pack year history
- 1<sup>st</sup> MPJ implant approx 15 years ago
- Pain with any ambulation

**Attempted 1<sup>st</sup> MPJ arthrodesis**

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

Attempted bone growth stimulator 12 months later, non-union. He has 0 pain and maintains that he should have had this surgery 15 years ago.

ORTHOPAEDIC ASSOCIATES  
The Strength of Experience

---

---

---

---

---

---

---

---

### Case #4

**52 y.o. male**

- Failure of prior cheilectomy
- Failure of attempted prior 1<sup>st</sup> MPJ arthrodesis with K-wires
- Presents to me with complaints of sub 2<sup>nd</sup> metatarsal head pain.
- Under pain management
- On 1<sup>st</sup> MPJ arthrodesis with 1<sup>st</sup> MPJ arthrodesis with K-wires
- 1<sup>st</sup> MPJ arthrodesis with 1<sup>st</sup> MPJ arthrodesis with K-wires
- Due to interosseous graft patient was placed NWB for 4 weeks
- WB with CAM boot for additional 4 weeks.
- Due to his work requirements, he returned to work on a "restricted" assignment at his work site and rigid orthosis at 8 weeks post-op with no pain to the arthrodesis site or the 2<sup>nd</sup> metatarsal head.

ORTHOPAEDIC ASSOCIATES  
The Strength of Experience

---

---

---

---

---

---

---

---

### 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!




---

---

---

---

---

---

---

---

## References

1. *FAJ* 2003 Apr;24(4):210-7. **Pablo et al.** First metatarsophalangeal joint arthrodesis: a biomechanical assessment of stability.
2. *Open Orthop J*. 2015; 9: 480-482. **Kushit et al.** First Metatarsophalangeal Joint Arthrodesis: A Retrospective Comparison of Two Methods of Fusion.
3. *FAJ* June 2014, Vol 15, Issue 4, 523-525. **Swain et al.** Reduction of the Intermetatarsal Angle After First Metatarsal Phalangectomy and Arthrodesis: A Systematic Review.
4. *FAJ* June 2015, Vol 15, Issue 3, 181 - 187. **Mahabadi, S. H. et al.** First metatarsophalangeal joint arthrodesis - the joint configuration and preparation technique matter?
5. *FAJ* March 2016, Vol 16, Issue 2, 228 - 230. **Prasad et al.** A Multicenter, Retrospective Study of Early Weightbearing for Modified Lapidus Arthrodesis.
6. *FAJ* 2015; 16(4):215-18. **K. Swain et al.** Effect of pathologic an angle of first metatarsophalangeal joint arthrodesis.
7. *FAJ* 2011; 12(4):240-243. **J. Kuo, et al.** Arthrodesis of the first metatarsophalangeal joint: a systematic review.
8. *FAJ* 2015 Jan-Feb 2015, Vol 14, Issue 1, 68-75. **King et al.** Modified Lapidus Arthrodesis With Crossed Screw Fixation: Early Weightbearing in 130 Patients.
9. *FAJ* 2013 July-Aug, Vol 12, Issue 4, 460-464. **Mans et al.** Low-profile Titanium Plate Construct for Early Weightbearing with First Metatarsophalangeal Joint Arthrodesis.
10. *FAJ* 2013 July-Aug, Vol 12, Issue 4, 267-269. **Nguyen et al.** Retrospective Comparison of Three Plate Constructs for First Metatarsophalangeal Joint Fusion: Duck, Plate, Duck Plate with Lag Screw, Locked Plate, and Locked Plate with Lag Screw.
11. *Foot & Ankle*. 2012 February; 33(2): 179-182. **Swain et al.** Using the Thompson's Off-axis Screw Arthrodesis: The Role of 3D Computer-Aided Design.
12. *Foot & Ankle Spec*. 2015; 20(8): 523-524. **Swain et al.** A Retrospective Review of Immediate Weightbearing After First Metatarsophalangeal Joint Arthrodesis.
13. *FAJ* 2010 July-Aug, Vol 10, Issue 4, 317-322. **Swain et al.** Early Weightbearing After Modified Lapidus Arthrodesis: A Multicenter Review of 80 Cases.

