**1st Metatarsophalangeal Arthrodesis: Surgical Outcomes with Immediate Partial Weight Bearing**

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### Statement of Purpose

The purpose of this study is to evaluate the effects of immediate partial weight bearing on fusion rates in patients who undergo 1st Metatarsophalangeal Arthrodesis. This study will specifically evaluate the fusion rates of 1st Metatarsophalangeal Arthrodesis with a single interfragmentary compression screw with a dorsal locking plate construct to provide the stability needed to allow early weight bearing. Showing that immediate weight bearing following a 1st Metatarsophalangeal Arthrodesis does not affect fusion rates would allow surgeons to avoid the increase risks associated with non-weight bearing restrictions.

### Methodology & Hypothesis

This study is a retrospective review of all patients who underwent a 1st Metatarsophalangeal Arthrodesis under a single surgeon. Each arthrodesis procedure was performed using the same surgical technique and fixation construct. All patients were allowed to immediately partial weight bear to the ipsilateral heel while in a postoperative wooden soled shoe. The post medial and social history were all reviewed to identify any indirect risk factors that may lead to failed fusions or surgical complications. The rate of successful union as well as the time to union were determined. A successful union is considered arthrodesis sites with greater than 90% bone consolidation visible on radiograph. The fusion rates of the patients included in this study will be compared to the fusion rates commonly reported in the literature. Patient who underwent any additional procedures that would require any period of non-weight bearing postoperatively were excluded from the study.

**Hypothesis:** Immediate weight bearing in a wooden soled postoperative shoe following a 1st Metatarsophalangeal Arthrodesis does not affect union rates.

### Procedures

**Surgical Procedure:**

All patients underwent a 1st Metatarsophalangeal Arthrodesis under a single surgeon. Each procedure was completed using the same techniques. The 1st Metatarsophalangeal joint was exposed through a dorsal incision just medial to the extensor tendon. The 1st metatarsal head is released from the joint capsule and ligaments to allow for direct access to the articular surface. A guidewire is then placed in a retrograde fashion through the center of the articular surface. A convex reamer is then used to denude all the articular cartilage and subchondral plate from the metatarsal head. The guidewire is then placed in an antegrade fashion through the center of the proximal phalanx. A cortical reamer is then used to denude all cartilage and subchondral plate from the proximal phalanx. The 1st metatarsal and proximal phalanx are then held in proper position with approximately 6 degrees of varus/varus, 5 degrees of abduction and 10 degrees of dorsiflexion. A distal, medial to proximal, lateral compression cannulated screw is then placed across the arthrodesis site. A dorsal locking plate is then fixated across the joint to further stabilize the construct.

**Postoperative Weight Bearing Protocol:**

All patients underwent a postoperative weight bearing protocol. Each patient was allowed to immediate weight bear to the ipsilateral heel while wearing a wooden soled surgical shoe. All patients would remain partial weight bearing in the postop shoe until osseous consolidation of the arthrodesis site was confirmed on radiograph.

### Literature Review

1. Rammelt et al. reported a 6% nonunion/malunion rate and a success rate of 90% in 1st metatarsophalangeal arthrodesis.
2. Biss et al. had a 6.9% nonunion rate when comparing non-locking and locking plate constructs, with no significant difference between the two.
3. Kumar and colleagues reported a 98% fusion rate with a mean time to fusion of 3.1 months.
4. Ellington et al. reported an 87.9% fusion rate when including Rheumatoid patients and 93.1% when those patients are excluded.

### Results

A total of 14 patients underwent a 1st Metatarsophalangeal arthrodesis with immediate weight bearing in a surgical shoe postoperatively. All patients (14/14) went on to successful union however on patient did have a delayed union with fusion at 26 weeks. The mean time to fusion was 8.2 weeks ranging from 4 weeks to 26 weeks. There was one patient who had a surgical site infection that resolved with oral antibiotics. No other postoperative complications occurred. One patient was a current smoker and six patients were former smokers.

### Discussion

All patients following an immediate weight bearing protocol went on to successful fusion with a single delayed union. This study shows that allowing patient to weight bear in a surgical shoe postoperatively does not affect union rates. Historically, 1st Metatarsophalangeal Arthrodesis is known to have a nonunion rate around 6%. By allowing patients to weight bearing postoperatively while not compromising surgical outcome, risks and burdens of non-weight bearing on patients.

One flaw of this study is the small sample size. A larger, prospective study could be indicated to better evaluate any possible negative effects that immediate weight bearing has on 1st Metatarsophalangeal Arthrodesis. Another future study could evaluate the effects of immediate or early weight bearing on different fixation constructs.

### References

1. Rammelt, Stefan M., Kohler, H., Linge, P, van der Rest, M., van den Broek, J.: Comparison of the outcomes and gender differences between locking and non-locking plating systems. The Foot, 2013, article in press
2. Ellington L.H., Jones C.P., Cotton B.G. et al. Review of 1017 talar MTJ arthrodesis using dome head or domed head and a stainless steel cortical plate. Foot Ankle Int. 2010; 31: pp. 365-369
7. Lampe et al. reported no difference in union rates between patients allowed to weight bear at 2-4 days after surgery and patient who remained non-weight bearing.
8. Mann and colleagues performed 22 1st MTPJ Arthrodesis with wire and pin fixation. Immediate weight bearing was allowed in a padded surgical shoe. Two nonunions and one delayed union were reported.
9. Lampe et al. reported no difference in union rates between patients allowed to weight bear at 2-4 days after surgery and patient who remained non-weight bearing.
10. Wu and colleagues allowed weight bearing in a fixed ankle boot at 2 weeks postoperatively following a 1st MTPJ Arthrodesis using a plate construct. The reported fusion rate is 95.24% with one nonunion and one delayed union that went on to fusion at 12 months.