

FIRST METATARSOPHALANGEAL JOINT FUSION WITH LOCKING PLATE

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INTRODUCTION

Locking plate technology has advanced over the past few years. The stability that these devices provide allows for earlier weight-bearing activity after foot surgery. Newer designs have combined locking and standard plating holes to allow for axial compression. These plates provide both stability and compression. Plates with only locking holes have no compression capability. When these plates are combined with a compression screw inserted separate from the plate, the same compression/stability construct is achieved. One procedure where these compression plates have a great indication is fusion of the first metatarsophalangeal joint (MPJ).

SURGICAL TECHNIQUE

The procedure is performed through a dorsal midline incision through the skin and capsule. Only necessary periosteal/capsular dissection to expose the joint surfaces is performed in order to preserve vascularity to the bone segments. Resection of the cartilage below the subchondral plate is performed maintaining the “ball and cup” configuration of the opposing joint surfaces. Reamers are available with most of the locking plate sets designed for this procedure. Care should be taken with reamers as they can be aggressive in the amount of bone and cartilage they remove. Similar removal can be performed using a rongeur and bone curette.

The toe is positioned on the metatarsal and temporarily fixated with an intramedullary Kirschner wire driven from the proximal phalanx base out the tip of the toe and retrograded into the metatarsal head. The toe should be positioned parallel to the second toe in the transverse plane. When there is a transverse plane deformity of the second toe present, that deformity should be corrected prior to the first MPJ fusion. The toenail should be facing superior in the

frontal plane. The plantar condyles of the head of the proximal phalanx should be parallel to the weight-bearing surface of the ground as well. A lid to an instrument tray can be used to assess the sagittal plane position of the toe. There should be just a little space between the toe and the lid.

A cannulated compression screw guide wire is driven next from the medial aspect of the metaphyseal/diaphyseal junction of the proximal phalanx base across the joint exiting laterally at the metatarsal neck. The screw is inserted and the guide wire removed. The temporary fixation wire can also be removed at this time if it will interfere with the insertion of the plate screws. The plate is applied dorsally and the screws are inserted. A drill guide must be used to insure that the threaded screw head will engage the threads on the plate hole. At least 2 screws should be inserted on both sides of the joint. More may be inserted depending on plate design. Locking screws only need to purchase 1 cortex, but 2 cortices are recommended for weaker bone. Capsular and skin closure are performed after intraoperative images are taken to assess the position of the joint and fixation.

POSTOPERATIVE MANAGEMENT

Postoperative care with locking plates includes early weight bearing. In nonobese patients with healthy bone, immediate weight bearing in a walking cast boot is allowed for 4 weeks. The patients are then transitioned into a gym shoe for another 2 to 4 weeks depending on postoperative edema. Crutch assistance reduced forefoot loading for the first 2 weeks is recommended for obese patients or patients with weaker bone stock. Transition to shoes is delayed to postoperative week 6 to 8. In cases where interpositional bone grafting is used, nonweight bearing is recommended until week 6. Full weight-bearing is allowed at 3 months. Radiographs are taken at weeks 2, 4, 6, 8, and 12 to determine if healing has occurred to allow these transitions (Figures 1-4).



Figure 1. Preoperative dorsal plantar radiograph.

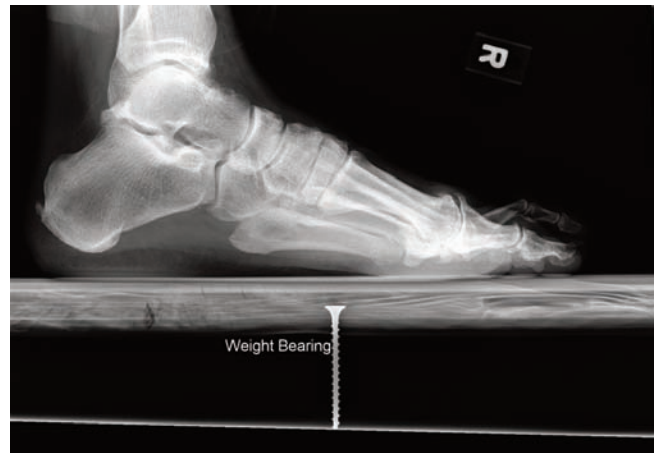


Figure 2. Preoperative lateral radiograph.



Figure 3. Six week postoperative dorsal plantar radiograph.



Figure 4. Six week postoperative lateral radiograph.

AUTHOR'S EXPERIENCE

The author has performed locking plate fixation for first MPJ fusion in 15 patients for a total of 15 feet. Four patients had severe hallux abducto valgus deformities, 10 had hallux rigidus, and 1 had hallux varus. One patient was a revision of a failed hemi implant and Keller procedure. One patient was a revision of 2 previous failed fusions. Three patients had rheumatoid arthritis, 3 had diabetes mellitus, and 1 had chronic renal failure. Four patients were considered obese. Three patients had osteopenia based on radiographs and intra-operative assessment. One patient was on long-term steroid therapy. All patients were nonsmokers. Interpositional autogenous calcaneal graft and external bone growth stimulation was used in both revision cases.

Of the 15 feet, 14 fused. The 1 non-union was an obese diabetic patient with chronic renal failure. A compression screw was not used in this patient. The nonunion was asymptomatic due to peripheral neuropathy. The 12 feet that were not revision surgery all went on to fuse clinically and radiographically within 6 weeks. The 2 revision cases both fused by 3 months. One patient showed up for his appointment 1 week after surgery walking in a boat shoe. He had no pain and minimal edema. Radiographs were

taken and showed no disruption of the fusion. The patient was informed of the possibility of his noncompliance causing failure of the surgery. He was instructed to only walk in the short-leg walking cast boot. He showed up for the second and fourth week postoperative appointments the same way as the first. He was clinically and radiographically fused at 4 weeks. This patient convinced the author that locking plates are an excellent choice of fixation for potentially noncompliant patients.

CONCLUSION

Locking plates offer advantages over standard plates when used for first MPJ fusions. The stability of locking plates make them an excellent choice for revision cases. Patients with weaker bone and obese patients are also good candidates for locking plates. The advantage of earlier weight bearing also makes locking plates more appealing. Locking plates should be used in patients who are poor candidates for nonweight-bearing fixations. The author's experience with a noncompliant patient who underwent fusion with a locking plate shows that locking plates should be considered in all patients undergoing first MPJ fusions.