

IMMEDIATE WEIGHTBEARING FOLLOWING FIRST MPJ FUSION WITH KIRSCHNER-WIRE FIXATION

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INTRODUCTION

First metatarsophalangeal joint fusion has been a successful form of treatment for a variety of disorders, including hallux limitus and rigidus, hallux varus, severe hallux abductovalgus, recurrent hallux valgus, and rheumatoid foot deformity.¹⁻⁶ A number of surgical techniques and types of fixation have been described to achieve arthrodesis.^{3,6-9} In addition, the postoperative weight-bearing status has varied from maintaining patients completely non-weightbearing in a below-knee cast, to full weightbearing with a rigid-soled shoe. Despite the variations in fixation and postoperative care, each technique has been described as successful.^{1,3,6,10-11}

However, most surgeons who have published their findings in patients undergoing this procedure have employed nonweightbearing as a routine part of the postoperative protocol. In actual practice one may encounter patients, particularly those who are older, where nonweightbearing might pose an additional hazard for falling or other injury. Primarily because of this consideration, the senior author began to perform first metatarsophalangeal fusions with Kirschner wire-stabilization and to allow patients to weight bear with a specially padded surgical shoe during the postoperative interval. A review of patients has been performed to determine if the technique provided for adequate arthrodesis and successful results.

MATERIALS AND METHODS

The medical records and radiographs of 20 patients (representing 22 feet) who underwent primary first MPJ fusion were retrospectively reviewed. Fixation in each case was provided by three 0.062 Kirschner-wires and weightbearing was instituted immediately postoperatively with a surgical shoe with felt or cork padding that extended from the heel to just distal to the digital sulcus. This

technique reduces direct bending forces against the hallux with weightbearing. The patients were allowed to ambulate as was comfortable as opposed to heel touch, or primarily placing weight on the lateral margin of the foot. The patients included in the study underwent surgery for problems associated with severe hallux valgus, hallux limitus, rheumatoid foot, and failed hallux valgus surgery. All procedures were performed by the senior author.

Surgical Technique

The surgical technique consisted of a dorsal medial incision along the first metatarsophalangeal joint. Once the joint was exposed, the cartilage and subchondral plate were removed from the first metatarsal head and base of the proximal phalanx with a combination of rongeur, curette, and rotatory burr. The ball and socket contour of the first metatarsal head and base of proximal phalanx was preserved in 17 of the patients. In 3 patients a planar resection of the joint was performed with a saw when shortening of the first metatarsal was necessary to balance the metatarsal parabola due to previous or concurrent resection of the lesser metatarsal heads.

Fixation was afforded by 3 individual 0.062-inch Kirschner wires. The exact method and orientation of these wires varied, but generally followed one of several patterns depending upon the surgical exposure, quality of bone, or other factors specific to the individual patient. One or two of the wires were often left percutaneous. Most commonly a linear central wire was directed from the distal hallux into the first metatarsal. Another percutaneous wire may be employed in an oblique orientation from the medial hallux into the metatarsal. A third wire was then inserted from the dorsal or medial aspect of the first metatarsal into the proximal phalanx. This wire was buried and a lock pin technique employed (Figure 1).¹² In other



Figure 1. The wire was buried and a lock pin technique employed.



Figure 2. The oblique wire from the phalanx into the metatarsal was buried and locked.

patients, the oblique wire from the phalanx into the metatarsal was buried and locked (Figure 2). A third variation included the use of a single percutaneous wire from the hallux directed to the metatarsal with 2 crossed wires from the metatarsal into the phalanx. The latter 2 wires are buried and locked against the metatarsal head (Figure 3). The position of the hallux was evaluated with intraoperative fluoroscopy after the insertion of the initial wire. Once the position was felt to be suitable the remaining 2 wires were inserted. Standard closure with absorbable suture was performed.

Following surgery, the patients were placed in a padded surgical shoe and allowed to immediately weight bear. Radiographs were employed to monitor the healing of each patient. At 6 weeks the percutaneous wires were removed. The padded surgical shoe was employed for an additional 2 weeks, after which patients were allowed to return to a tennis shoe or oxford type of shoe.

RESULTS

Twenty-two procedures were performed in 20 consecutive patients between 1999 and 2005. Interestingly, all of the patients were female. The average age in this series was 64.4 years. The surgical indications consisted of hallux limitus/



Figure 3. A single percutaneous wire from the hallux is directed to the metatarsal with 2 crossed wires from the metatarsal into the phalanx. The latter two wires are buried and locked against the metatarsal head.

rigidus (osteoarthritis) (n = 9 feet), hallux abductovalgus (n = 8 feet), rheumatoid arthritis (n = 4 feet), and nonunion (n = 1 foot). Five of the patients (representing 6 feet) had undergone previous surgery for their original condition without success. Successful fusion as assessed radiographically occurred in all but 2 patients.

In 1 patient a symptomatic disruption of the arthrodesis was appreciated 3 weeks following the removal of the percutaneous wire. Radiographs revealed that the 2 buried Kirschner-wires had fractured at the fusion site without displacement of the fixation or joint. The joint was immobilized with external splintage and the patient was placed into a Velcro cast for weight bearing. Six weeks later the joint was stable, the patient was asymptomatic, and radiographs appeared to demonstrate arthrodesis. However, within the next several weeks she developed recurrent pain and radiographic evidence of a disrupted arthrodesis. One patient with spastic diplegia and an altered gait pattern developed disruption of the fixation that required removal of all pins at 6 weeks postoperative. She developed an asymptomatic nonunion.

Another patient demonstrated a prolonged radiographic delayed union which was asymptomatic and only identified on routine followup evaluation. Initially the patient was felt to have sustained adequate healing for removal of the percutaneous wires. Radiographs were made as a routine measure 2 years later. These images demonstrated incomplete radiographic fusion, yet clinically the joint area was rigid and asymptomatic. However, at 4.5 years postoperatively her radiographs demonstrated complete fusion.

DISCUSSION

Arthrodesis has been used successfully in the treatment of a number of different deformities and conditions involving the first metatarsophalangeal joint. A number of different forms of fixation and postoperative protocols have been described. Fixation devices such as Kirschner-wires and Steinman pins provide stabilization across the fusion site without adding compression, yet have been successful in providing good results.^{3,13-15} With the development of screws and plates, surgeons have been able to employ fixation, which can be used to apply compression across the fusion site,

and again favorable rates of arthrodesis have been achieved.^{2,16-18} However, nonweightbearing would appear to be a standard protocol employed by most authors in the postoperative interval regardless as to the type of fixation employed. Nonweightbearing was recommended by Yu et al, for 4-6 weeks after surgery followed by a transition to protected weight bearing.¹⁹

However, there have been a number of surgeons who have allowed patients to weight bear in the initial stages of the postoperative interval following arthrodesis of the first metatarsophalangeal joint with good results. The use of pin or wire fixation has been noted as the most commonly employed form of fixation for arthrodesis of the first metatarsophalangeal joint.²⁰ In fact, the technique employed by the current authors is simply a modification of that previously described by Yu and Shook.¹⁹ However, there are only a few previous studies where patients were allowed to weight bear following the use of Kirschner-wires as fixation. Niskanen et al employed crossed Kirschner-wires in 19 patients with rheumatoid arthritis, and each was allowed to weight bear in a plaster splint.²¹ They reported 89% radiographic union. In one study 5 threaded 0.062 Kirschner-wires were employed for fixation and the patients were allowed to immediately ambulate in a short leg weight bearing cast which was employed for 2 months. A 97% fusion rate was noted.²⁰ More recently, Dayton et al reported 100% fusion rate with multiple external K-wires, but in only five cases. Patients were allowed to ambulate in a surgical shoe.²²

Although this study is a retrospective analysis, based upon the results, the use of multiple Kirschner wires and immediate weight bearing is a reasonable option for many patients undergoing this procedure. This fixation technique is simple and effective, and reduces inconvenience for patients who might otherwise be required to remain nonweightbearing. In older patients or those with impaired balance, this approach would also appear to reduce the risk of falling, and therefore, may be a more specific consideration.

Radiographic evidence of arthrodesis was achieved in 20 of 22 procedures, although with a significantly delayed radiographic union in one additional patient. This is comparable to the rates of fusion previously reported by many other authors regardless as to the type of fixation or weight

bearing protocol employed postoperatively. One potential complication that has previously been a concern for other authors when wires have been inserted across the hallux interphalangeal joint has been that of subsequent arthritis at this level.^{11,20} Relative to the patients in this study, office records fail to indicate that this has been a complaint registered by any the patient's evaluated thus far.

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