

Early Weightbearing After First Metatarsophalangeal Joint Arthrodesis: A Retrospective Observational Case Analysis

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A retrospective observational study was performed to determine if early ambulation compromised healing in patients who underwent primary first metatarsophalangeal joint arthrodesis. The records of 42 patients undergoing 47 fusions were evaluated to determine time to radiographic union, time to clinical union, and return to regular shoes. Results showed that patients achieved clinical healing at an average of 5.6 weeks, and showed distinct signs of radiographic union at an average 6.1 weeks. The mean time for return to athletic shoes was 6.23 weeks. The patient population reviewed had a 100% radiographic and clinical union rate. These results reinforce the idea that early ambulation is a viable option in patients undergoing primary first metatarsophalangeal joint arthrodesis. (The Journal of Foot & Ankle Surgery 43(3):156-159, 2004)

Key words: early ambulation, first metatarsophalangeal joint arthrodesis

First metatarsophalangeal joint (MPJ) arthrodesis is a time-honored procedure used to treat the painful first MPJ associated with degenerative joint disease, hallux abductovalgus, hallux rigidus, septic joint, rheumatoid arthritis, spastic contracture, or other derangement. Literature reports of rehabilitation after fusion vary from full weightbearing in a postoperative shoe to nonweightbearing in a short-leg cast (1–20). In addition, the timing of return to full weightbearing and return to shoes differs among surgeons.

Thompson and McElvenny (1) reported a period of nonweightbearing for 8 weeks after first MPJ arthrodesis. Rigid internal fixation was not used, therefore, nonweightbearing and casting were used to maintain correction. With the advent of rigid internal fixation, surgeons became more aggressive in their postoperative regimen. McKeever (2) advocated weightbearing in a cutout shoe on the third or fourth day postoperatively, with specific instructions against placing full weight on the hallux for 6 weeks.

Since that time, early ambulation in the postoperative period has ranged from weightbearing within 4 to 5 days postoperatively in a cast to immediate ambulation in a surgical shoe (Table 1). Zadik (3) permitted his patients to ambulate immediately in a short-leg plaster cast, and had a 95% union rate. Smith et al (11) and Johansson and Bar-

ington (13) advocated a short-leg weightbearing cast immediately after surgery and reported 97% and 96% union rates, respectively. Wu (14) applied a great-toe spica short-leg cast after resolution of initial pain and swelling, but did not report union rates. Lipscomb (8) allowed patients to begin weightbearing in a surgical shoe 4 to 5 days postoperatively. Similarly, weightbearing in a postoperative shoe on the second postoperative day was advocated by Mann (9) and Mann and Thompson (10) in 2 separate studies of this procedure, with union rates of 95% and 94%, respectively. Niskanen et al (15) preferred the use of a wedge-heel shoe and modified splint or plaster on the medial side of the foot. Patients were allowed to bear weight immediately, with an 82% union rate (15). Sage et al (18) allowed partial weightbearing with a walker or surgical shoe immediately, and transitioned patients into a conventional oxford shoe after 4 weeks. They reported a 100% union rate (18). Finally, Myerson (19) also described a technique that allowed patients to ambulate immediately in a postoperative shoe.

Despite success with early ambulation, some authors still prefer a cautious approach to the postoperative regimen. Harrison et al (4) attempted arthrodesis with external compression and nonweightbearing for 3 weeks. Despite the lengthened period of nonweightbearing, there was only a 74% union rate. Wilson (5) described the use of 24-gauge wire for fixation, allowing ambulation as early as 3 weeks postoperatively, and found a 96% union rate. Wilkinson (7) repeated Wilson's regimen, with a 97.6% union rate. Fitzgerald (6) kept his patients nonweightbearing for 2 weeks in a short-leg cast and reported a 97% union rate.

Yu and Shook (16) advocated a 6- to 10-week period of nonweightbearing in a short-leg cast followed by a gradual

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TABLE 1 Summary of various postoperative regimens and results

Date	Author (Reference)	Time to Ambulation	Type of Postoperative Footwear	Fixation	Union Rate (%)
1952	McKeever (2)	First week	Cutout shoe	Screw	NR
1960	Zadik (3)	First week	Short-leg Cast	Pidcock pin	95
1979	Lipscomb (3)	First week	Surgical shoe	Single screw	NR
1980	Mann (9)	First week	Surgical shoe	Steinman pins	95
1984	Mann et al (10)	First week	Surgical shoe	Steinman pins	94
1984	Johansson et al (11)	First week	Short-leg cast	Vitallium screw	96
1992	Smith et al (13)	First week	Short-leg cast	Kirschner wires	97
1993	Wu (14)	First week	Short-leg cast	Herbert screws	NR
1993	Niskanen et al (15)	First week	Wedge heel	Kirschner wires, biologic rods	82
1997	Sage et al (18)	First week	Surgical shoe, crutch/walker assistance	Various ^a	100
2000	Myerson (19)	First week	Surgical shoe	Various ^a	NR

Abbreviation: NR, not reported.

^aA combination of fixation that may include Kirschner wires, screws, plates, or any combination thereof.

progression to a walking cast, a surgical shoe, and, eventually, a regular shoe. Recovery took up to 8 weeks beyond the nonweightbearing period (16). Recently, this regimen has become more aggressive, with recommended nonweightbearing for 4 to 6 weeks and protected weightbearing thereafter (20). Gregory et al (12) recommended nonweightbearing for 6 to 8 weeks and reported an 88% union rate, which is lower than studies that advocated early ambulation. Bouche et al (17) also recommended a period of 6 to 8 weeks of nonweightbearing, but did not report their union rate.

This study was undertaken to further evaluate the healing of first MPJ arthrodesis when immediate full weightbearing was allowed in a postoperative shoe. It was performed to help clarify the appropriate course of postoperative care with this procedure.

Materials and Methods

Radiographic and medical records of 66 patients who underwent primary fusion of the first MPJ between 1995 and 2002 were retrospectively reviewed. Fusion was selected to treat the painful or dysfunctional first MPJ secondary to hallux abductovalgus, degenerative joint disease, or rheumatoid arthritis. Patients with long-standing diabetes, peripheral neuropathy, and peripheral arterial occlusive disease were excluded because of their high potential for delayed healing. Any patient who simultaneously underwent other procedures not amenable to early weightbearing was also excluded. A history of tobacco use or the use of any medications did not preclude inclusion in the study.

All patients were permitted to ambulate immediately postoperatively on the heel or the lateral aspect of their foot. Patients must have worn a standard surgical shoe to be included in the study. Postoperative evaluation was performed at weeks 1, 2, 4, 6, 9, and 12. The senior author

performed all procedures and all postoperative clinical and radiographic evaluations. No special consideration was given to the type of fixation or arthrodesis preparation used, but all patients had some form of internal fixation.

Charts were reviewed for each patient and the following information was obtained. 1) Time to clinical union: clinical union was deemed present if the arthrodesis site was solid with manual stress and the patient was free of pain during examination and standing. 2) Time to radiographic union: radiographic union was defined by close apposition of the fusion surfaces without gapping, visible trabeculation across the arthrodesis site and absence of lucency adjacent to the fixation. Anteroposterior, medial oblique, and lateral radiographs were used to assess healing. 3) Time to athletic shoes: noted as the earliest date at which the patient could comfortably wear lace-up athletic shoes.

Results

The records of 66 patients who underwent fusion of the first MPJ between 1995 and 2002 were reviewed. Twenty-four patients were excluded, according to the previously mentioned criteria or because of incomplete medical records. Therefore, the review group consisted of 42 patients (47 fusions). The age of the patients ranged from 36 to 83 years and included 7 men and 35 women. In 30 cases, 2 crossed screws were used, 12 cases had a combined single screw and a single .062-inch smooth wire, and 5 cases had 2 or more .062-inch smooth wires. External smooth wires were removed in all patients by 6 weeks. The average time to clinical union was 5.6 weeks (range, 4 to 8 weeks). The average time to radiographic union was 6.23 weeks (range, 5 to 8 weeks). The average time to return to athletic shoes was 6.24 weeks (range, 4 to 12.5 weeks). The overall union rate was 100%.

Discussion

The results observed in this patient population suggest that early ambulation after first MPJ fusion is a viable option and does not compromise healing after the procedure. These results were consistent across a wide age range and a varied patient population.

The authors believe the high rates of healing in this series and those of others can be explained by several factors (3, 9–11, 13, 15, 18). First, when internally fixated, this procedure represents a very stable construct. The site can be stabilized with a variety of internal fixation devices, such as screws and Kirschner wires. Stability of the site promotes primary bone healing. Second, direct access to the joint facilitates a minimal dissection technique, thereby preserving local blood supply. A dorsomedial incision of skin and the joint capsule avoids major vascular structures and allows intracapsular and subperiosteal dissection while preserving the perforating blood supply. Third, preparing the joint surfaces in a cup-and-cone fashion creates a relatively large surface area for fusion. This large surface area enhances stability and healing.

Most importantly, the authors believe the position of the fusion resists force transfer to the fusion site from the hallux if a flatfoot gait is maintained in the postoperative period. Typically, first MPJ arthrodesis is positioned with the hallux dorsiflexed 15° to 20° from the weightbearing surface. This position prevents the toe from purchasing the ground until heel lift and the initiation of propulsion. For the first 3 to 4 postoperative weeks, most patients avoid bearing weight on the hallux by rolling to the lateral side of the foot to avoid discomfort. Because the hallux does not bear weight during an appropulsive gait, minimal bending forces will occur at the fusion site to disrupt healing. If care is taken to train the patient to maintain a flatfooted gait, very little force will cross the first MPJ.

Return to regular shoe gear was consistent among patients in this study, with most patients returning to shoes within 6 weeks. It has been the author's experience that pain caused by pressure on the incisions and surgical site is the most common factor that prevents patients from returning to shoes. Early weightbearing and avoidance of immobilization may have a desensitization effect on the surgical foot. The authors have noted that patients return to shoes with greater comfort than if they were transitioning from non-weightbearing immobilization.

Neuropathic patients were excluded from this study because these patients are typically placed in a cast and kept nonweightbearing. The authors have not attempted early ambulation in these patients because they are at high risk of surgical-site disruption because of their inability to perceive pain and position. This altered perception would likely lead to excessive pressure on the surgical site and noncompliance with the postoperative regimen.

Osteopenia was not a consideration for the study, but a detailed review showed that several patients had a confirmed diagnosis of osteoporosis by bone densitometry and/or surgical findings of soft bone. However, the authors feel that osteopenia or osteoporosis is not a specific contraindication to the procedure and weightbearing regimen. A prospective study containing patients with proven osteopenia or osteoporosis would be of value.

Conclusion

Patients who underwent primary first MPJ arthrodesis were permitted to ambulate within the first week of recovery in a postoperative shoe. One hundred percent union was observed in this group, suggesting that early ambulation may be permitted when primary first MPJ arthrodesis with internal fixation is performed.

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