First Metatarsophalangeal Joint Arthrodesis in the Treatment of Hallux Valgus

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KEYWORDS

• Hallux valgus • Arthrodesis • First metatarsophalangeal joint • Fusion

KEY POINTS

- First metatarsal phalangeal joint (MPJ) arthrodesis has long been a reliable procedure in the armamentarium of the foot and ankle surgeon.
- The primary goal of first MPJ fusion should be to reduce/eliminate pain associated with the structural and functional changes related to the attendant pathology.
- Recent advances in fixation technique, coupled with early weight bearing and reliable, predictable, outcome make first MPJ an attractive alternative for the foot and ankle surgeon.

First metatarsal phalangeal joint (MPJ) arthrodesis has long been a reliable procedure in the armamentarium of the foot and ankle surgeon. First described over 100 years ago, the procedure has remained a go-to in salvage of first MPJ pathology.

End-stage degenerative disease has been the most common entity leading to arthrodesis of the first MPJ. Hallux varus, failed previous surgery (cheilectomy, implant arthroplasty), trauma, infection, rheumatoid arthritis, and neuromuscular disorders are but a few of the conditions amenable to first MPJ fusion. Moderate-to-severe hallux valgus with degenerative changes deemed contraindicated for a joint preservation procedure also falls into this category. When other procedures have previously failed or are simply not indicated, fusion can be an acceptable alternative for the surgeon in the treatment of hallux valgus with associated moderate-to-severe increase in first intermetatarsal angle.

In a study by Sung and colleagues,[1] it was shown that first MPJ arthrodesis could reduce a severe preoperative IM by an average of 6.7°. In moderate deformities, performing a first MPJ arthrodesis can reduce the preoperative inter-metatarsal angle (IM) by an average of 4.3°. Similarly, Cronin and colleagues[2] found mean change in intermetatarsal angle of 8.22°. In these studies, as the preoperative IM angle increased,

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so did the corresponding degree of reduction achieved with the fusion. Similarly, significant reduction was noted in the hallux abductus angle also. Dayton, LoPiccolo, and Kiley, based on similar findings in their study, came to the now accepted finding that osteotomy is generally not needed to address high IM angles when fusing the first MPJ.[3]

Severe IM and Hallux abductus (HA) angles as well as rotational deformities can be reduced and maintained with first MPJ fusion. This has led to better acceptance of first MPJ arthrodesis in treating this patient population.

The primary goal of first MPJ fusion should be to reduce/eliminate pain associated with the structural and functional changes related to the attendant pathology. As a result, there may be improvement in overall functional outcome also. Multiple authors have shown good-to-excellent results without significant restriction in activity. They attribute the excellent outcomes of arthrodesis to multiple factors:

1. Permanent correction with low likelihood of recurrence
2. Advantageous in patients with severe arthrosis, laxity and/or contracture
3. Preserves weight-bearing function better than resection arthroplasty or implant arthroplasty
4. Medial column stability is improved, leading to reduction of pain associated with lesser metatarsalgia[3,4]

In their recent article comparing hemi implant arthroplasty, total joint replacement and first MPJ arthrodesis, Erdil and colleagues[5] found that at final follow-up, functional assessment using the AOFAS-HMI (American Orthopedic Foot and Ankle Society-Hallux Metatarsophalangeal-Interphalangeal) scoring system was similar when comparing all 3 procedures. However, the visual analog scale (VAS) scores were much better with arthrodesis. In his review of the literature, Brewster found that arthrodesis achieved better functional outcomes than total joint replacement.[6]

Once the determination has been made to proceed with arthrodesis, there are critical components that are key in the successful outcome of the procedure. These are: joint preparation, position of arthrodesis, method of fixation, and postoperative management.

JOINT PREPARATION

Historically, the joint was often prepared by squaring off the opposing joint surfaces of the phalanx and metatarsal head to create a broad, flat, end-to-end fusion. Although shown to be a more stable construct, this technique is prone to excessive shortening of the first ray and inherently prevents the surgeon from being able to easily manipulate the fusion site in all 3 planes to achieve optimal positioning. Joint contour preservation techniques ameliorate these issues. In first MPJ arthrodesis, the result of joint preparation is a cone-and-cup (ball-and-socket) construct, in which the convexity of the first metatarsal head and the concavity of the base of the proximal phalanx are maintained.

A standard dorsomedial approach is used to gain access to the joint. Excessive stripping of soft tissue from the first metatarsal head and neck area is to be avoided (**Figs. 1** and **2**). Joint preparation begins by removing any surrounding periarticular bony abnormalities with a rongeur and bur. Soft tissue and the sesamoids are dealt with according to specific attendant pathology and surgeon preference. Attention is then directed to the opposing joint surfaces.

The goal in appropriate joint preparation is to remove any remaining diseased cartilage and its corresponding subchondral bone. Johnson and colleagues[7] showed that curettage technique alone often left a barrier of subchondral bone that could act as an impediment to successful fusion. Subchondral drilling has been advocated as