CHAPTER **15**

HEMI IMPLANT ARTHROPLASTY FOR THE SECOND METATARSOPHALANGEAL JOINT

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INTRODUCTION

Hemi-implant arthroplasty of the first metatarsophalangeal joint (MTPJ) has been well documented in the literature (1-5); however, a search for hemi-implant arthroplasty of the second MTPJ yields no results. However, in the authors' opinion, this is a viable alternative for second MTPJ arthrosis. Two implants, the Arthrosurface Hemi-Implant and the Vilex Hemi-Implant will be presented in this article and the authors' experience with each will be discussed (6, 7).

Second MTPJ arthrosis, most commonly associated with a history of Freiburg's infarction, has been addressed surgically in a number of ways. These include, chondroplasty or the Osteoarticular Transfer System (OATS) procedure, osteotomies to alter the parabola, arthrodesis, ostectomies or cheilectomies, silastic implants, and a Keller-like resection. Certainly all of these have been successful at times and do remain viable options. Indications for implant arthroplasty of the second MTPJ include joint pain, stiffness, swelling, limited motion, spur formation producing difficulty with shoes, and radiographic changes demonstrating joint deterioration.

Contraindications include osteoporotic or poor bone stock, history of bone infection, and unrealistic patient expectations. It must be emphasized to the patient preoperatively that this procedure is not a substitute for a natural joint. While the hope of the procedure is joint pain relief and improved motion, the hemi-implant arthroplasty will never be as good as a normal functioning natural joint.

One of the advantages of a metatarsal resurfacing hemi-implant arthroplasty is the preservation of muscle attachments, unlike a Keller where the proximal phalanx attachments are often sacrificed. The hemi-implant serves as a replacement for the defective or devoid cartilage of the metatarsal head with the use of cobalt chromium or titanium. The use of the two implants presented allows for some shortening of the metatarsal if that is necessary. By this virtue, the joint can be decompressed. And lastly, the use of the hemi-implant helps restore the range of motion of the lesser MTPJ.

The lesser hemi-implants have similar disadvantages and potential complications associated with hemi-implants used in the first MTPJ. Over time, the implant could loosen or shift. Due to its dense nature, it could erode the base of the proximal phalanx after a prolonged period. The implant itself can wear also. Other potential complications associated with aggressive activity on these implant arthroplasties are fracture of the metatarsal, and dislocation of the joint or implant. More rare complications include; infection, foreign body reaction, or allergic reaction to the metal. A surgical disadvantage with these lesser MTPJ implants, compared to the first MTPJ implants, is that they do not allow the surgeon to address any sagittal plane deformities that may be present. If the implant does fail, then it offers the surgeon few choices in a revisional surgery

SURGICAL TECHNIQUES

The first implant to be discussed is the Arthrosurface Hemi-Implant. This is a two-component system with a threaded base and a head that snaps on to the base. The process for insertion is as follows. Once the joint is exposed and the long extensor tendon is retracted, osteophytes around the metatarsal head can be removed (Figure 1). Utilizing intraoperative imaging, the guide wire is placed into the

Figure 1. Second metatarsophalangeal joint exposed. Note the advanced degenerative changes; loss of cartilage, surrounding osteophytes.

metatarsal making sure that it is specifically centered (Figure 2); this will insure that the implant is placed into the metatarsal in the proper orientation.

With the guide wire in place, a router is introduced over the guide wire and the metatarsal is prepared for the stem of the implant (Figure 3). The shaft is now tapped and the stem is inserted (Figures 4 and 5). The stem can be inserted so as not to allow any shortening of the second metatarsal thus preserving the parabola, or it can be inserted further to gain the desired amount of shortening. Once the stem is in place, an outer router is placed over the guide wire and the surface is prepared for the head of the implant. The stem limits the outer router so there is no concern with over aggressive removal of bone at this point (Figures 6 and 7). With the stem in place, the guide wire is removed, the surface routed, and the trial implant is placed. This will allow the surgeon to assess the pitch and size of the implant for final selection. This trial implant also serves as a guide for more aggressive removal of the surrounding osteophytes (Figure 8).

When the surgeon is satisfied with the size of the implant, and the metatarsal head has been prepared to his or her satisfaction, the implant cap can be placed (Figure 9). The cap is handled with a suction attachment to prevent any damage to the surface and placed on the stem with the underneath laser mark directly dorsal. With the impactor and a mallet, the cap is seated on the stem (Figure 10). At this point, the capsule and skin can be closed in the surgeon's preferred manner (Figure 11).

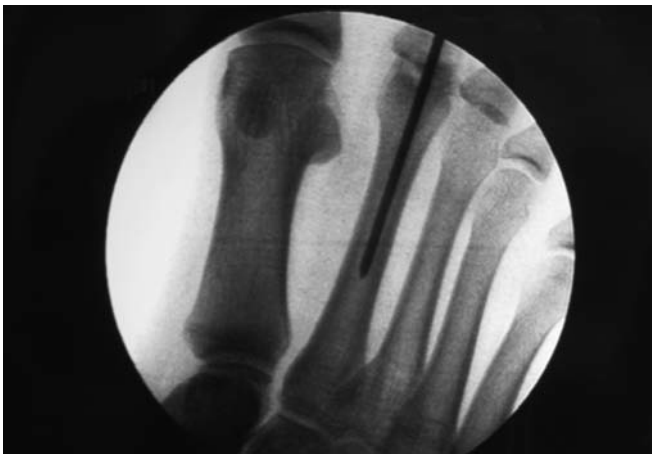

Figure 2. Intraoperative radiograph showing guide wire centered in the metatarsal.

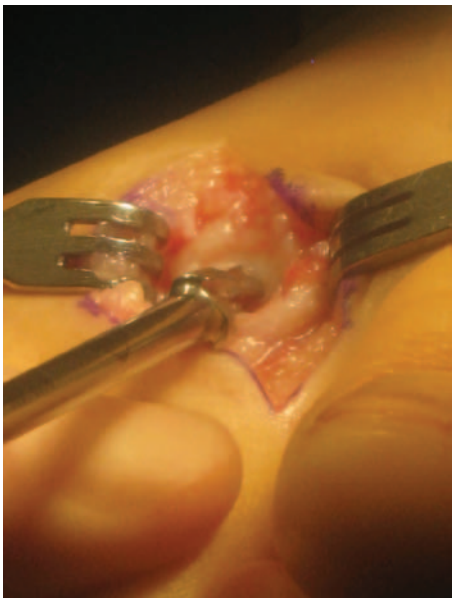

Figure 3. Intraoperative view of router preparing the metatarsal for the stem of the Arthrosurface implant.

Figure 4. The stem prior to insertion.

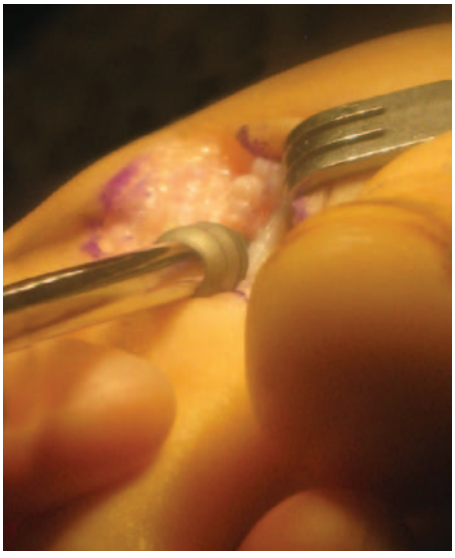

Figure 5. The stem being placed into the metatarsal.

The second implant is a cannulated self-drilling hemi-implant manufactured by Vilex. This implant is a one-piece design with a convex surface to replace the metatarsal head. The implants are available in cobalt chrome or titanium (Figure 12). For the lesser MTPJ, the implant is available in 9-mm to 13-mm sizes in 1-mm increments. Each implant is individually machined to create the mirror finish designed to minimize friction. Its cannulated design allows for precise positioning of the implant. The implant has two positioning holes that fit the special driver used for inserting the implant onto the resected metatarsal head over the guide wire (Figure 13). The positioning holes can also be used for suturing soft tissue to the implant, if so desired, while osseous integration to the implant proceeds naturally.

The joint preparation is the same as previously described. The typical amount of bone resected from the lesser metatarsal head is 2.0 to 2.5 mm. Once the bone has been resected, a trial sizer is used to just cover the exposed bone. After the appropriate sizer has been selected, the guide wire is placed through the trial sizer implant. Intraoperative imaging may be used. The trial sizer is removed and the hemi-implant is then simply screwed into the bone over the guide wire with the special driver. No other drilling is usually necessary. The guide wire is removed and closure is carried out as usual (Figures 14 and 15).

Postoperative care for both of these implants is usually protected weightbearing in a fracture boot with the skin healing in 7-10 days. Early range of motion is encouraged in these patients. In some cases, concomitant procedures may alter the postoperative care.

Figure 6. The external router used to prepare metatarsal head for the implant cap.

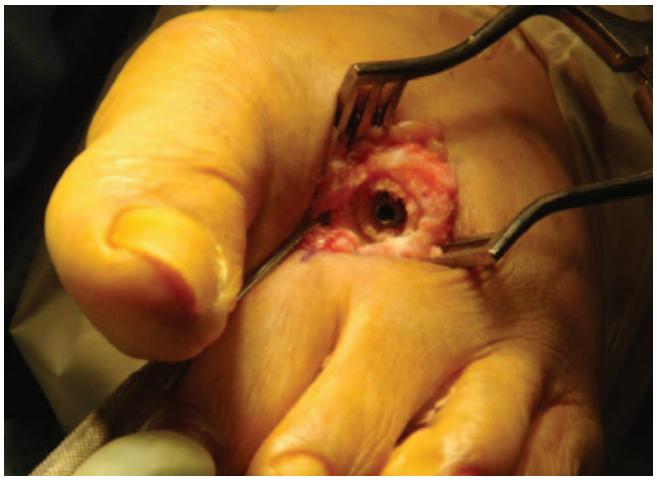

Figure 7. The metatarsal head has now been prepared for the sizer, then cap.

Figure 8. The sizer in place.

Figure 9. The cap has been seated onto the stem.

Figure 10. Postoperative radiograph showing the Arthrosurface in place.

Figure 11. View of skin after final closure.

Figure 12. The Vilex implant system.

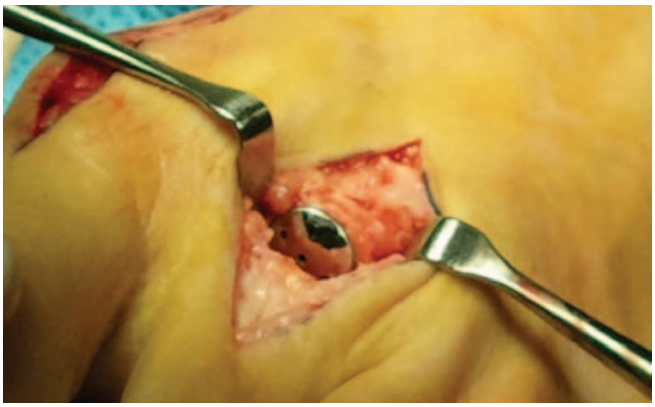

Figure 13. Vilex implant in place. Note the two positioning holes for the driver.

CONCLUSION

Second MTPJ arthrosis can be a challenge for the podiatric surgeon, and there are various options available. In the authors' experience, hemi-implant has shown to be a viable treatment in these patients. To date, the authors have performed a number of these procedures and plan to present these in a future paper with longer term follow-up.

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Figure 14. Preoperative radiograph of a patient with degenerative changes at the second metatarsophalangeal joint.

Figure 15. Postoperative radiograph with implant in place. Note this patient had an Austin osteotomy performed as well.