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Tips, Quips, and Pearls

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Techniques in Hemiarthroplasty of the First Metatarsophalangeal Joint

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ABSTRACT

Surgical intervention for hallux rigidus could be necessitated when conservative attempts fail to alleviate pain and dysfunction. Controversy exists as to which procedure is ideal and will provide lasting relief of hallux rigidus pain. Many arguments have been made for and against hemi-implant arthroplasty. We advocate the use of a low-profile hemimetallic endoprosthesis (Metasurg®) and present our technique of using a reamer to sculpt the articular surface of the metatarsal head when necessary. We further advocate for minimal resection of the phalangeal base when using a low-profile device to maintain the soft tissue periarticular intrinsics. We present a 2- to 3-position reamer decompression of the metatarsal and discuss the benefits of maintaining range of motion at the first metatarsophalangeal joint.

The etiologies of first metatarsophalangeal joint (MTPJ) pain are many. The most commonly encountered cause of pain is hallux rigidus or osteoarthritis of the great toe joint. Patients can report pain, swelling, or difficulty with certain shoe gear, along with pain in other areas of the foot, including lateral column pain secondary to gait compensation. Conservative treatment modalities should be attempted, consisting of physical therapy, ice, orthotics, injections, modification of shoe gear such as a rocker bottom, and alternation of activities.

When conservative treatments fail to provide lasting relief, surgical intervention should be considered. Many procedures are available for hallux rigidus correction, including arthrodesis, arthroplasty with a total or hemi-implant, cheilectomy, interpositional arthroplasty, arthrodiastasis, and several different phalangeal and metatarsal osteotomies (1–9).

Severe degeneration, such as can be seen in grade III or IV hallux rigidus, is often treated with arthrodesis (3) (Fig. 1). Complaints after an arthrodesis procedure can, of course, be related to stiffness of the first MTPJ, which can decrease patient satisfaction and alter the gait patterns (10,11). The fusion site position is another difficult aspect of the procedure that can influence the success of the procedure. An alternative to arthrodesis is joint arthroplasty, which is motion sparring. The ability to preserve motion is typically desirable to patients. Therefore, the hemi-implant arthroplasty procedure has evolved, and several companies provide hemi-implant devices for the first MTPJ (Table). Studies of patients after arthroplasty have demonstrated improvement in patient satisfaction scores postoperatively (7,12,13). Ideally, the goals of using hemi-implant arthroplasty should be to relieve pain, restore motion, improve function, and maintain joint stability; it should also be salvageable should it fail (13,14). To achieve these goals, we have identified some necessary steps that should be incorporated to achieve optimal results. These consist of first MTPJ decompression with proximal articular set angle (PASA) correction (when necessary), minimal shortening of the metatarsal and proximal phalanx, and creation of a smooth surface for the implant to glide on the first metatarsal head without restriction.

We describe a technique using a metatarsal reamer to consistently and precisely remodel the degenerate head of the first metatarsal, including PASA correction when required. This is particularly important in achieving the optimal position in hallux varus reconstructions. We also advocate minimal resection of the phalangeal base using a spin down rasp technique to ultimately preserve as much of the intrinsic attachments to the phalanx as possible (14).

Surgical Technique

The patient is placed on the operating room table in the supine position. A well-padded ankle tourniquet is used. We prefer to use local field block anesthesia with bupivacaine hydrochloride

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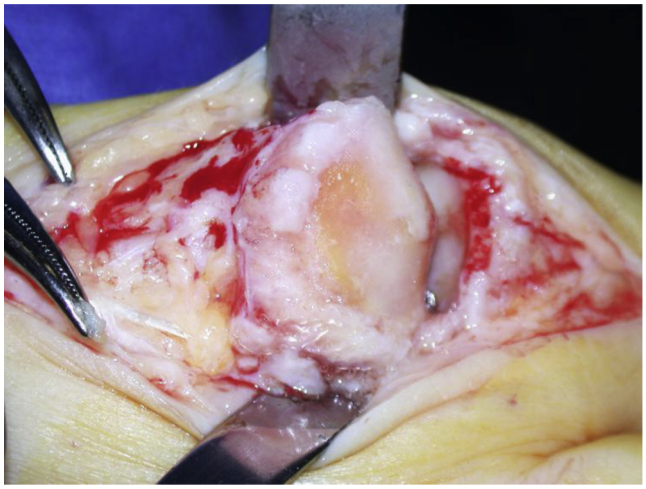

Fig. 1. Intraoperative photograph demonstrating periarticular osteophyte formation with articular erosions found in advanced arthrosis of the first metatarsophalangeal joint.

(Marcaine™ 0.25% plain). The surgical limb is draped in standard sterile fashion. A linear longitudinal midline incision is made medial to the extensor hallucis longus tendon. This incision is carried down through the capsule to expose any periarticular marginal osteophytes, which are debrided with a rongeur or osteotome and mallet. The joint is inspected, and the amount of degeneration is noted. The base of the proximal phalanx is resected in "silver dollar fashion," with very minimal resection. Alternatively, our preference is to "spin down" the phalangeal base with a special circular power rasp to create a flat interface surface for the implant. This removes very minimal bone length and should be preferred when possible. A guidewire is then placed into position 1 in the central aspect of the first metatarsal capital fragment (Fig. 2). A reamer is used to remodel the articular surface of the first metatarsal (Fig. 3). The guidewire is then repositioned into position 2, and the reamer is again used to resurface and sculpt the metatarsal head more dorsally (Fig. 4). Finally, the guidewire is repositioned into position 3 (when necessary), and the reamer is used again more dorsally for further dorsal decompression, as described, to create a very smooth surface for the implant to glide on (Fig. 5). The guidewire is then removed from the metatarsal and placed concentrically into the base of the proximal phalanx axially, allowing proper "sizing" and "positioning" of the implant. The flat resurfacing power circular reamer is then placed over the guidewire with minimal resection, creating a matched surface to the implant (Fig. 6). If desired, an "inside out" osteo-suture drill hole can be made on the inferior surface of the phalangeal base for anastomosis of the flexor hallucis longus tendon with suture.

If an osteotomy is necessary for intermetatarsal angle correction, we prefer to ream the metatarsal head beforehand to avoid disruption. Occasionally, it becomes necessary to fine tune the PASA with the reamer after metatarsal osteotomy. We have found this to be very helpful in hallux varus correction (Fig. 7). A cannulated broche is then used to prepare the phalanx for the implant stem, which might require impaction with a slap hammer. The appropriately sized implant is then placed over the guidewire with the flat side positioned inferiorly (Fig. 8). The stem is advanced into the base of the phalanx, and the slap hammer impactor is used to seat the implant flush against the bone (Fig. 9). The guidewire is then removed, and the implant is put through the range of motion. Other concomitant procedures can then be performed as needed. The wound is lavaged and closed in standard layered fashion.

Table
Available hemi-implant device companies who provided dimensions for their implant*

Brand	Thickness (mm)
Arthrex AnaToemic™	2.4
Vilex™	1.0 to 2.3
Wright LPT™	1.4 to 2.4
MediSurg™	1.75 to 2.75
BioPro™	2.5
OsteoMed™	2.0
Orthopro™	2.3 to 2.5

* Other devices exist; however, the dimensions could not be obtained.

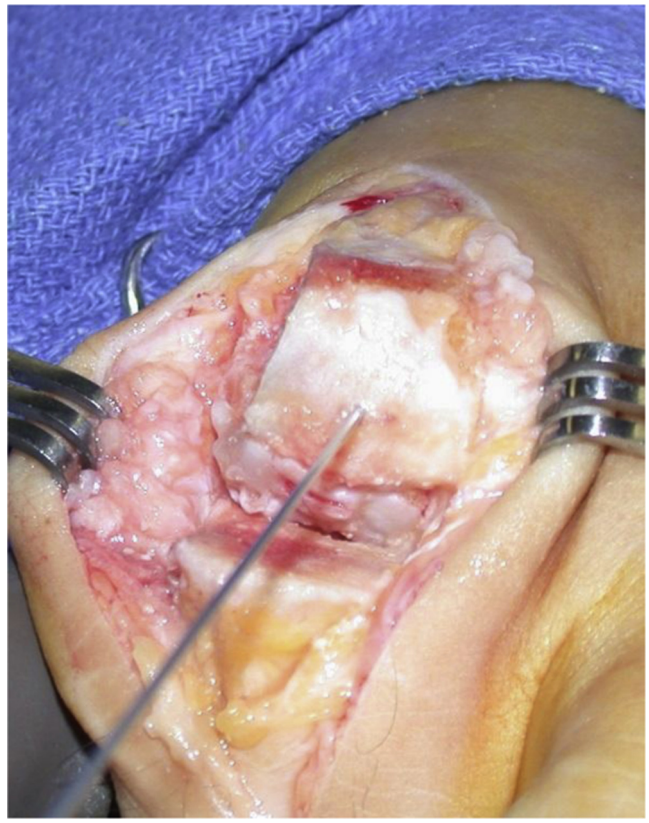

Fig. 2. Guidewire placement for position 1 placed concentrically to guide the reamer on the metatarsal head.

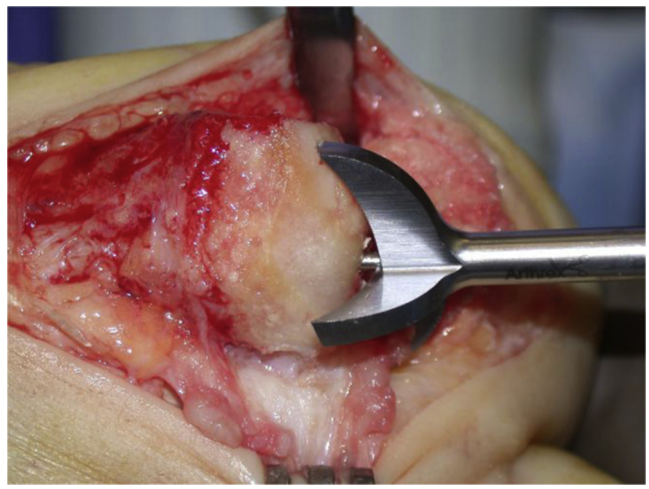

Fig. 3. Spherical reamer placed over the guidewire at position 1 to sculpt the capital fragment.