CHAPTER **22**

TREPHINE ARTHRODESIS: A VIABLE OPTION FOR FIRST METATARSOCUNEIFORM JOINT ARTHROSIS

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INTRODUCTION

Trephine fusions were first described by Arthur Michele in 1949 for doweling vertebral articular facets to facilitate arthrodesis (1). Since that time, trephines have been utilized not only for arthrodesis, but for tendon transplantation, bone biopsy, harvest of bone graft, and osteochondral defect repair (2). Trephine or dowel-graft technique has also been reported by many authors as a successful option for midfoot, rear foot and ankle fusion (2-9). In 2006, Banks et al described the advantages of this technique when compared to traditional joint resection. These include a decreased amount of tissue disruption, minimal shortening of the fusion segments, and increased stability of the joint complex (3). He also described the disadvantages as being difficult to accurately access postoperative radiographs for bony consolidation and an inability to reduce significant joint deformity or malalignment (3). Many authors have advocated trephine or dowel graft arthrodesis for treatment of isolated tarsometatarsal arthosis because the joints are relatively planar, they generally require minimal or no repositioning and can be performed simply with minimal dissection (3, 4, 9).

Trephine arthrodesis for the first metatarsocuniform joint is indicated for a patient who has painful degenerative arthritis isolated to this joint. The patient's symptoms are usually secondary to trauma or long standing hypermobility. Utilizing standard radiograph as well as clinical and biomechanical examinations, the surgeon should evaluate whether or not the ray needs significant realignment or shortening (Figures 1, 2). If realignment or shortening is desired, it is recommended that traditional joint resection be used for fusion and repositioning. However, if significant realignment is not needed, trephine fusion of the first metatarsocuniform joint is a simple and minimally invasive technique.

An invaluable surgical procedure is one that can be preformed by multiple surgeons with ease. The surgeon should be able to perform the operation with conviction and be confident of a reproducible and successful outcome. Few procedures for the foot and ankle fit so neatly into the above described parameters. When surgical correction is deemed necessary for isolated first MCJ arthrosis, trephine arthrodesis can be an invaluable surgical procedure.

Figure 1. Preoperative anterior posterior radiograph.

Figure 2. Preoperative lateral radiograph.

SURGICAL TECHNIQUE FOR TREPHINE FUSION OF THE FIRST METATARSOCUNEIFORM JOINT

This procedure is usually performed under general anesthesia in case autogenous graft needs to be harvested. However, it can be performed under local anesthesia and intravenous sedation. A dorsal-medial longitudinal incision is marked out overlying the first metatarsocuniform joint. The incision should also be medial to the extensor hallicus longus tendon and provide enough longitudinal length for desired fixation. A sharp controlled depth incision is made through the skin down to the level of the subcutaneous tissue. Sharp or blunt dissection is utilized to expose the deep fascia with care taken to maintain adequate surgical hemostasis and retract all vital neurovascular structures. The dorsal medial cutaneous nerve is regularly encountered at this level and is usually amenable to safe retraction without the need for sacrifice. Once down to the level of deep fascia, a deep fascial incision will be made medial to the extensor hallicus longus tendon and carried in-line with the skin incision. The deep fascial incision allows the extensor hallicus longus tendon to be retracted safely, which will provide exposure to the dorsal periosteum, capsule and ligaments of the first metatarsocuniform joint. If significant arthrosis or hypermobility is present along the medial column, intra-operative fluoroscopy can be used to verify accurate joint location.

Once the first metatarsocuniform joint is located, a stab incision is made into the dorsal capsule to expose the dorsal-medial and dorsal-lateral joint surfaces. When arthrosis/osteophytes obstruct the visualization of the joint a hand ronguer or rasp can be used to contour and remove excess bone to the dorsal joint. Complete exposure of the joint as with traditional joint resection is not necessary. By preserving the medial, lateral and plantar joint capsule/ligaments it provides stability to the fusion surfaces and minimizes periosteal stripping. Full visualization of the dorsal-medial and dorsal-lateral joint confines is important so that the appropriate trephine diameter can be chosen. The diameter of the trephine needs to be large enough to resect both the articular cartilage and subcondral bone plate from each articular surface while maintaing the outer confines of the joint. In some instances two trephine plugs can be utilized for resection. Once the trephine diameter is chosen the joint is ready to be trephined.

With the dorsal medial skin incision approach, as described, the joint is trephined from dorsal to plantar. A Freer elevator can be inserted into the joint prior to being trephined so that the direction of the joint from top to bottom can be identified. Even though powered trephines are available, hand trephines for tarsometatarsal joints provide a greater degree of tactile sense. This is important because the plantar cortex and ligaments should be preserved. By preserving these structures, it provides a plantar shelf so that inlay bone graft can be tightly packed. The plantar shelf also prevents the graft from subsiding. Once the joint has been resected it is ready to receive an inlay bone graft (Figure 3).

It is the surgeon's preference for inlay bone graft options. Autogenous and freeze dried allogenic bone grafts have been described in literature as a viable graft for foot and ankle trephine fusion. Banks et al reported a 94.7% fusion rate utilizing allogenic graft for 19 patients who underwent foot and ankle trephine arthodesis (3). If an autogenous graft is chosen, the calcaneus or the distal tibia should provide sufficient cancellous graft for midfoot fusions. Although, if multiple midfoot and rearfoot fusions are performed simultaneously, a larger graft may need to be harvested from the iliac crest. The author has used both freeze dried allogenic chips and autogenous calcaneal grafts without complications. Currently, the author's preferred inlay bone graft is Trinity Evolution from Orthofix, which is a cell-based bone allograft (Figure 4).

Even though the fusion site is inherently stable through the preservation of the joint confines and tightly packed graft, fixation is still recommended. Since the first metatarsocuniform joint is relatively small, the fixation should span the fusion site without violating the joint complex or graft (Figure 5). Staples or plate fixation are sufficient for stabilization, however screws and k-wires crossing the fusion site have also been used with success. Once the fixation is in, the deep fascial layer is closed over the EHLT and fixation with 3-0 Vicryl. The subcutaneous tissue is reapproximated with 4-0 Vicryl in a running fashion and the skin is closed with 5-0 Vicryl in a subcuticular running stitch. The patient is then placed in a posterior splint to protect the fusion site.

POSTOPERATIVE CARE

For a healthy patient who underwent this procedure, it is recommended the patient remain nonweight bearing to the surgical limb for 4-6 weeks so bony fusion can occur. Pending on the surgeon's method of fixation and comfort level, postoperative weight bearing can be managed in the same fashion as a traditional first metatarsocuniform joint fusion. As mentioned above, since the confines of the joint are largely preserved, assessment of radiographic fusion may be difficult to observe (Figure 6). Return to normal shoe gear should be based on the patient's postoperative radiographs, clinical evaluation, and symptoms.

Figure 3. Joint resected with a trephine.

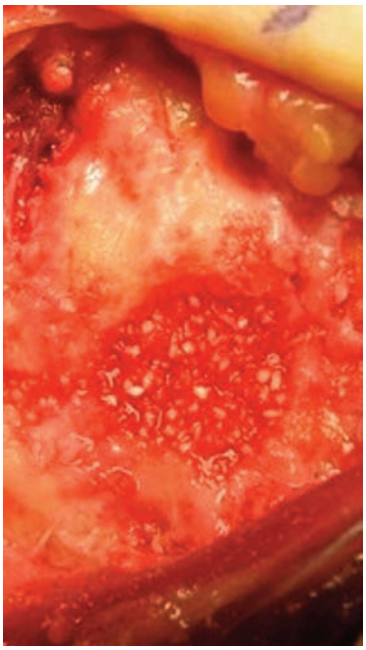

Figure 4. Inlay bone graft.

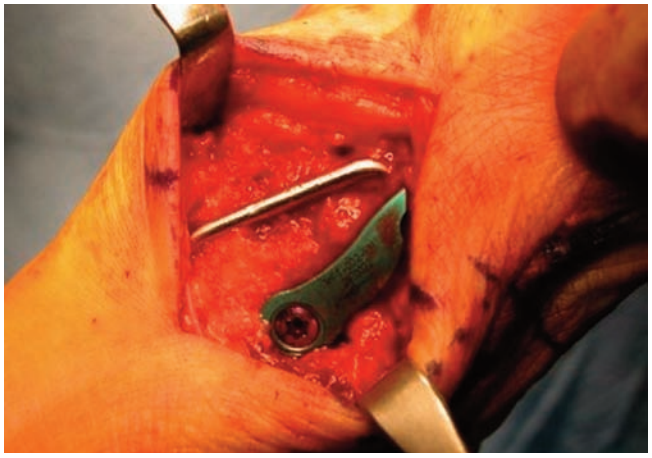

Figure 5. Fixation of first metatarsocuniform joint.

Figure 6. Postoperative anterior posterior radiograph.

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