

FIRST MTPJ ARTHRODESIS FOR SALVAGE OF FAILED HAV SURGERY

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A multitude of surgical procedures have been espoused for the correction of the deformity of hallux abducto valgus (HAV). Over the years, many of the procedures have been refined and more strict criteria for the use of particular procedures have been developed. Unfortunately, many procedures are still performed without adherence to the established criteria. In other cases, procedures are performed with poor technique. In still more cases, even with a properly selected and performed procedure, the procedure fails. These failures can be due to a variety of reasons including a postoperative complication or patient non-compliance.

In many cases of failed HAV surgery, regardless of the reason for failure, the joint will be left in poor condition with varying combinations of intra-articular arthrosis and fibrosis, soft tissue scarring, joint instability, and structural osseous deformity. In many such instances, a joint reconstructive procedure cannot reasonably be expected to improve the joint's function and/or architecture, and a joint destructive procedure should be considered if further surgery becomes necessary. When the need for a joint destructive approach arises, the surgeon will generally have to choose between an interpositional resectional arthroplasty (i.e. Keller procedure), implant arthroplasty (either hemi-implant or total implant), or first metatarsophalangeal joint (MTPJ) arthrodesis. In this paper, the author will review the advantages and disadvantages of each of these joint destructive approaches and discuss the rationale and approach for first MTPJ arthrodesis as a salvage technique for failed HAV surgery.

PREOPERATIVE CONSIDERATIONS AND PROCEDURAL SELECTION

In selecting a salvage joint destructive procedure in a patient with failed HAV surgery, several criteria should be considered. The patient's age, activity level, and desired shoe type must be determined.

Clinically, the length and position of the first metatarsal and hallux, the presence or absence of lesser metatarsalgia, and the structural integrity and viability of the first metatarsal head and proximal phalangeal base must be assessed. The quality and quantity of first MTPJ motion are less of a concern, as it is presumed that the quantity of motion is limited and the quality of motion is poor if a joint destructive procedure is being contemplated.

The joint resection or interpositional arthroplasty, including the Keller arthroplasty and its variations and modifications, is one possible salvage procedural approach. Generally, these procedures offer the advantage of being technically easier to perform, maintain a varying range of motion of the first MTPJ, and have a faster postoperative recovery. However, several disadvantages also exist with these procedures. Documented disadvantages include decreased first metatarsal weight bearing, decreased first MTPJ propulsion, shortening of the hallux, and a higher potential for recurrent HAV deformity. Henry and Waugh¹ found reduced weight bearing on the first toe and the development of lesser metatarsalgia following Keller arthroplasty, and concluded that the clinical results and function were less satisfactory following Keller arthroplasty than with first MTPJ arthrodesis. Certainly, the Keller procedure should be used cautiously in patients with a short first metatarsal, an elevated first metatarsal, or lesser metatarsalgia, whether these problems are congenital, acquired, traumatic or iatrogenic (i.e., from the prior bunion surgery) in origin.

Implant arthroplasty also offers a similar but distinct set of advantages and disadvantages. The main advantages of implant arthroplasty include the maintenance of joint motion at the first MTPJ level, the maintenance of some propulsion of the first MTPJ, and a comparatively short postoperative recovery period. The primary concern or criticism of implant arthroplasty techniques center around the insertion of foreign material into the foot and its long-term durability. Mechanical failure of an implant can create numerous problems and further

salvage surgery can be quite difficult. Other disadvantages include the potential for diminished first metatarsal weight bearing and the potential for recurrent deformity.

First MTPJ arthrodesis offers advantages and disadvantages which often make it a unique choice as a salvage procedure for the patient with a failed HAV surgery. Advantages of first MTPJ arthrodesis include easier restoration or maintenance of first metatarsal weight bearing, less potential for recurrence of deformity, a painless joint site, and generally good cosmetic appearance. As Ouzounian² recently stated, first MTPJ arthrodesis offers "the advantages of cosmetic improvement, stabilization of the medial ray, reduction of lateral metatarsalgia, and long-term durability." Disadvantages include the loss of first MTPJ motion, the limitation of shoe style and heel height, increased technical difficulty when performing the procedure, and a longer post-operative recovery period than interpositional arthroplasty or implant arthroplasty. Many authors have advocated first MTPJ arthrodesis for the salvage of failed HAV surgery.³⁻¹⁴

It is the author's opinion that the first MTPJ arthrodesis procedure is uniquely indicated for failed HAV surgeries associated with severe functional restriction and dysfunction of the first MTPJ, a poor joint "platform" (i.e., staked first metatarsal head or loss of structural integrity of the first metatarsal head or base of the proximal phalanx of the hallux), loss of first metatarsal weight bearing or lesser metatarsalgia, or uncontrollable HAV deformity. In some situations, first MTPJ arthrodesis or any of the joint destructive procedures will need to be combined with other procedures to achieve full structural correction. For example, an unstable first metatarsocuneiform joint may have to be fused along with the first MTPJ procedure chosen. In selecting the best procedure for a particular situation, the long-term function and goals should be considered carefully and be fully discussed with the patient preoperatively.

SURGICAL CONSIDERATIONS AND OPERATIVE TECHNIQUE

The long-term reliability of first MTPJ arthrodesis makes it a viable approach for the salvage of previously failed HAV surgery (Figs. 1A-1F). The particular operative technique chosen for first MTPJ arthrodesis often varies depending upon the

patient's symptom complex and the underlying structural deformity. It should be emphasized that the final position of fusion is far more important than the method or technique by which it is achieved. Too many authors advocate a specific technique or single fixation method to accomplish a first MTPJ arthrodesis. When a first MTPJ arthrodesis is performed as a salvage for failed HAV surgery, the surgeon needs to remain flexible as to the technique and fixation utilized. In some situations, simple removal of the remaining articular surfaces will be sufficient. In other situations, creating a cone arthrodesis or a table-top (i.e., end-to-end) arthrodesis will be necessary. Fixation methods will vary from simple Kirschner wires (K-wires) to screws, to plates and screws, or even mini-external fixators.

The ideal position of fusion varies from patient to patient and is based on several factors including the nature and severity of the deformity, the patient's expectations and shoe preferences, gait observations, and radiographic assessment. The consensus of fusion position leaves the hallux dorsiflexed upon the first metatarsal in the sagittal plane, in slight abduction in the transverse plane, and in a neutral position or slight valgus position in the frontal plane. In the sagittal plane, the position of fusion typically is 15° to 25° of dorsiflexion. Lower degrees of dorsiflexion are considered in a propulsive patients, such as in patients undergoing rheumatoid salvage reconstructions, or in patients wearing flat shoes. In most individuals though, fusion positions of less than 10° to 15° should be avoided, as the hallux will be subjected to increased pressure during propulsion, and may develop a lesion under the hallux or a hyperextension deformity or arthritis at the hallux interphalangeal joint. Higher degrees of fusion are considered in patients who must wear high-heeled shoes. In the transverse plane, 15° to 20° of abduction is most common. Fusion in lesser degrees of abduction is only done when the patient might develop irritation to the second toe with the standard fusion position. Caution should be exercised in such cases, as medial irritation to the distal hallux may occur in closed shoes. In the frontal plane, fusion in a position as close to neutral as possible is preferred. Extremes of valgus or varus rotation should be avoided.



Figure 1A. Preoperative dorsoplantar radiographic view. The patient had a previous Silver-Akin bunionectomy with obvious staking of the medial aspect of the first metatarsal head.



Figure 1B. Immediate postoperative radiograph following first MTPJ arthrodesis with crossed K-wire fixation.

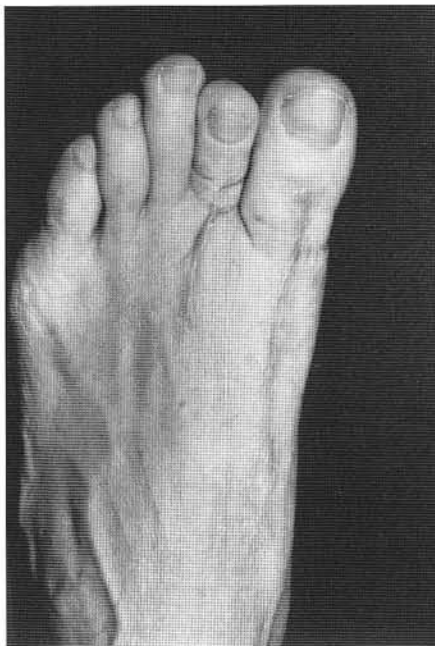


Figure 1C. One year follow-up dorsoplantar clinical view.



Figure 1D. Radiographic view, one-year follow-up.

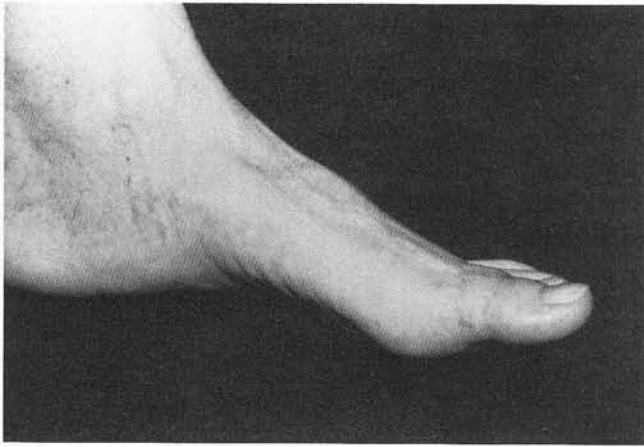


Figure 1E. One year follow-up lateral clinical view.

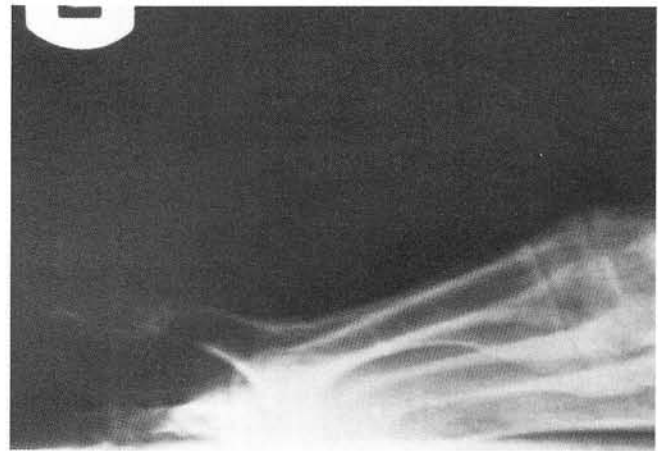


Figure 1F. One-year follow-up radiographic view.

When the fusion is performed, the surgeon must first remove all fibrous tissue intervening between the remaining joint surfaces. In some cases, where a previous implant arthroplasty or Keller procedure has been performed, a bone graft may be necessary to maintain or restore length to the hallux and/or first metatarsal. An autogenous cortico-cancellous graft, such as an iliac crest bone graft, is preferred if possible. The hallux is then placed in the preferred position of fusion and the joint surfaces are resected in the surgeon's preferred manner. Fixation is then accomplished. The author prefers K-wires or cannulated screws for most cases, with a plate and screws for an arthrodesis where a bone graft is used.

Postoperatively, the patient undergoing salvage arthrodesis is typically maintained in a short-leg, non-weight-bearing cast for 6 to 8 weeks. If a bone graft is inserted, the non-weight-bearing period may need to be extended for an additional 4 to 6 weeks. Serial radiographs and the clinical examination are both evaluated to determine when weight bearing should be started. Any external fixation devices or K-wires are typically removed at the time weight bearing is initiated, but may be continued during the initial weight-bearing period if desired. After cast removal, appropriate supportive shoes and functional orthoses are utilized.

SUMMARY

First MTPJ arthrodesis has proven to be a valuable procedure in the patient necessitating a joint destructive approach to salvage a previously failed HAV surgery. The surgeon considering a first MTPJ

arthrodesis, in such cases, should carefully weigh the advantages and disadvantages of the first MTPJ arthrodesis versus a Keller procedure or implant arthroplasty. In a well-informed patient with realistic expectations, the first MTPJ arthrodesis can be an excellent surgical option.

REFERENCES

- Henry APJ, Waugh W: The use of footprints in assessing the results of operations for hallux valgus: a comparison of Keller's operation and arthrodesis. *J Bone Joint Surg* 57B:478-481, 1975.
- Ouzounian T: Metatarsophalangeal arthrodesis for salvage of failed hallux valgus surgery. *Foot Ankle Clinics* 2:741-752, 1997.
- Coughlin MJ, Mann RA: Arthrodesis of the first metatarsophalangeal joint as a salvage for a failed Keller procedure. *J Bone Joint Surg* 69A:68-75, 1987.
- Coughlin MJ: Etiology and treatment of hallux valgus: arthrodesis of the first metatarsophalangeal joint with mini-fragment plate fixation. *Orthopaedics* 13:1037-1044, 1990.
- Georgousis H, Patsalis T, Bertram R: Salvage of the failed Keller-Brandes operation by metatarsophalangeal fusion. *Foot Ankle* 2:3-11, 1996.
- Gregory JL, Childers R, Higgins KR, et al.: Arthrodesis of the first metatarsophalangeal joint: a review of the literature and long-term retrospective analysis. *J Foot Surg* 29:369-374, 1990.
- Johansson JE, Barrington TW: Cone arthrodesis of the first metatarsophalangeal joint. *Foot Ankle* 4:244-248, 1984.
- Mann RA, Chou LB: Surgical management for intractable metatarsalgia. *Foot Ankle Int* 16:322-327, 1995.
- Mann RA, Oates JC: Arthrodesis of the first metatarsophalangeal joint. *Foot Ankle* 1:159-166, 1980.
- Myerson MS, Miller SD, Henderson MR, et al.: Staged arthrodesis for salvage of septic hallux metatarsophalangeal joint. *Clin Orthop* 307:174-181, 1994.
- Sage RA, Lam AT, Taylor DT: Retrospective analysis of first metatarsal phalangeal arthrodesis. *J Foot Ankle Surg* 36:425-429, 1997.
- Skalley TC, Myerson MS: The operative treatment of acquired hallux varus. *Clin Orthop* 306:183-191, 1994.
- Turan I, Lindgren U: Compression-screw arthrodesis of the first metatarsophalangeal joint of the foot. *Clin Orthop* 221:292-295, 1987.
- Yu GV: First metatarsophalangeal joint arthrodesis. In McGlamry ED, Banks AS, Downey MS, eds. *Comprehensive Textbook of Foot Surgery*, 2nd ed., Baltimore, Md; Williams & Wilkins: 1992;545-565.