

CONVERSION OF A FUSION OF THE FIRST METATARSOPHALANGEAL JOINT TO A HEMI-IMPLANT ARTHROPLASTY

Thomas J. Merrill, DPM

Martha Herrera, DPM

Barbara Buckley, DPM

INTRODUCTION

We present an unusual case of a first metatarsophalangeal (MTP) joint fusion converted to a hemi-implant. The purpose was to evaluate the effectiveness of a hemi-implant used for revision of a failed first MTP fusion. The reverse is often performed and seen in the literature, which is what makes this case unique.

LITERATURE REVIEW

Hallux rigidus is a progressive disorder of the first MTP joint, characterized by a diminished range of motion (ROM) and degenerative alterations of the joint. Because some degree of movement is generally available, the term hallux limitus has been used to describe the condition although the pathologic process is one of progressive degenerative joint disease secondary to biomechanical disturbance or local pathology. Generally, a cyclic deterioration of the articulation and the reduction of motion occur, and ultimately, ankylosis with virtual absence of the joint.

The hallmark of hallux rigidus is the typical dorsal bunion caused by both the proliferative disease and the flexion at the first MTP joint. Dorsiflexion is generally limited because of abutment of the articular surfaces of the phalanx and metatarsal head, and motion is painful with or without crepitus. Gait requirements for extension at this joint result in compensatory hyperextension at the hallux interphalangeal joint.

Hallux rigidus is often categorized or divided into stages predominantly based on the progression of the osteoarthritis. Regnauld proposed a 3-stage classification from developing arthrosis, established arthrosis, to ankylosis describing the end-stage joint disease. Later, a fourth stage was included to address the biomechanical imbalance without radiographic joint changes.

Multiple orthopedic and podiatric surgical procedures

have been described in the literature to address hallux rigidus including joint preservation techniques, and joint destructive procedures.

Although the literature addressing treatments for conditions that affect the hallux often focus on surgical interventions, the use of conservative therapies is emphasized before surgery is considered. Conservative treatments include exercise, physiotherapy, supportive shoes worn alone or with soft/semi-rigid orthoses, nonsteroidal anti-inflammatory drugs, and steroid injections. Many surgical procedures have been described for the treatment of hallux rigidus. They include arthrodesis (fusion of the joint), arthroplasty, cheilectomy (trimming of the joint), the Keller procedure (simple excision of the joint), osteotomy, and plantar release. MTP arthrodesis remains the gold standard for arthritis and salvage of a painful first MPJ. The typical age for surgical intervention in patients with hallux rigidus is between 50 and 60 years, with a slightly higher proportion being female patients. Before any intervention, every patient's age, activity level, expectations, and previous treatments should be considered, along with a radiographic and clinical grading and probable future treatment requirements to provide an appropriate treatment plan. Two common interventions for first MTPJ pathology are arthrodesis and arthroplasty. Arthrodesis of the first MTPJ was first described by Broca in 1852, and still appears to be the most successful and reproducible option in the management of severe hallux rigidus.

First MTP joint implant arthroplasty was first developed in the 1950s, as an alternative solution for patients in whom a joint arthrodesis, metatarsal osteotomy, or excisional type arthroplasty was not the ideal choice. Implant arthroplasty aims to replace the first MTPJ while maintaining stability and function. Arthrodesis fuses the first MTPJ, and provides pain relief but does not restore a normal pressure pattern, denying the theoretical and clinical principles of energy efficient gait.

There are certainly many choices available to the surgeon when considering joint replacement. These include the total hinged silastic implant with grommets, a hemi-silastic implant, a total, two-piece, cobalt chrome implant as well as many variations of a hemi-cobalt chrome implant. The hemi-implant although originally a very popular design, was introduced in 1967.

CASE REPORT

The patient is a 58-year-old woman who presented with a chief symptom of constant pain in her left foot, especially upon ambulation and weight bearing. The patient relates having had bilateral bunionectomies in 1968, followed by a failed first MPJ fusion and second metatarsal cuneiform fusion of the left foot in February of 2009. The patient had no significant medical conditions (Figures 1, 2).

Upon physical examination, hypertrophic scars were noted over bilateral first MTPJs. There were no open lesions in the lower extremity. The patient had pain on palpation of the first MTPJ and limited range of motion of the left first MTPJ. She also had pain over the dorsum of the left foot over the second metatarsal base and cuneiform joint. The pedal pulses were palpable in both lower extremities, and the patient had a cavus foot type with metadductus.

At that time all options were discussed with the patient in detail and she opted for surgical intervention involving removal of the hardware from the left foot and a Vilex

hemi-implant at the first MTPJ of the left foot. The surgery was performed in March of 2010 (Figures 3, 4).

No postoperative complications were noted. Part of the postoperative course included physical therapy, three times a week for three weeks. At six months postoperative, she was completely pain free, stated that she had an adequate amount of first MTPJ motion for her activity level. On clinic examination patient had a 2:1 ratio of dorsiflexion to plantarflexion and smooth, pain free range of motion of the left first MTPJ. Postoperative radiographs show good alignment and the hemi-implant is well seated (Figure 5).

ANALYSIS AND DISCUSSION

At present, the primary indication for a hemi-implant is arthritis of the base of the proximal phalanx, without concomitant arthritis of the first metatarsal head or limited range of motion. In addition, the phalanx should be stable and without deforming soft tissue or bony structural stresses. Proximal and distal osseous segments must be properly aligned to prevent excessive stresses to the implant and contiguous bone.

The primary objective when considering implantation for arthritic conditions or hallux limitus is the return of function and the relief of chronic pain. Our patient had chronic pain following the fusion and also desired motion of her first MTPJ which is why this was the optimal choice in this case.



Figure 1. Preoperative radiograph shows MPJ fusion and displaced proximal screw.



Figure 2. Preoperative radiograph shows fusion in too much plantarflexion position.



Figure 3. Vilex hemi – implant first MTPJ.

Implant arthroplasty for first MTPJ end stage degenerative joint disease appears to be effective in improving patient satisfaction but implant longevity and long-term functionality remain a concern. At 6 months postoperative, our patient has not experienced any problems to date and is content with results of the hemi-implant. Although the postoperative period is too short in this case to conclude that this is an optimal procedure for painful MTPJ fusion, it does open the door for future studies.

BIBLIOGRAPHY

- Brewster M. Does total joint replacement or arthrodesis of the first metatarsophalangeal yield better functional results? A systematic review of the literature. *Foot Ankle Surg* 2010;49:546-52.
- Carpenter B. Surgical treatment of hallux rigidus using a metatarsal head resurfacing implant: mid-term follow up. *Foot Ankle Surg* 2010;49:321-5.
- Cook E. Meta-analysis of first metatarsophalangeal joint implant arthroplasty. *Foot Ankle Surg* 2009;48:180-90.
- Coughlin MJ, Shurnas PS. Hallux rigidus grading and long term results of operative treatment. *J Bone Joint Surg Am* 2003;85:2072-88.
- Davidson D. The Vilex hemi-implant: a retrospective analysis of 30 patients in the treatment of hallux rigidus. *Foot Ankle Online* 2009;2:3.



Figure 4. Vilex hemi – implant first MTPJ.



Figure 5. Dorsiflexion motion available with hemi-implant.

- Giannini S, Ceccarelli F, Faldini C, et al. What's new in surgical option for hallux rigidus? *J Bone Joint Surg Am* 2004;86 Suppl 2:72-83.
- Hasselmann C, Shield N. Resurfacing of the first metatarsal head in the treatment of hallux rigidus. *Tech Foot Ankle Surg* 2008;7:31-40.
- Kelikian AS. Technical consideration in hallux metatarsal phalangeal arthrodesis. *Foot Ankle Clin* 2005;10:167-90.
- Maffulli N. Quantitative Review of Operative management of Hallux Rigidus. *British Medical Bulletin* 2011; 1-24
- Oloff LM. First metatarsophalangeal implant. *Hallux Valgus and Forefoot Surgery*; 1994. p.327-46.
- Randall M. What's new in foot and ankle surgery. *J Bone Joint Surg Am* 2008;90:928-42.
- Regnauld B. Hallux Rigidus. In: *The Foot*. Springer-Verlag, Berlin; 1986. p. 345-59.
- Sammarco VJ, Nichols R. Orthotic Management for disorders of the hallux. *Foot Ankle Clin* 2005;10:191-209.
- Vanore JV. Diagnosis and treatment of first metatarsophalangeal joint disorders. *Foot Ankle Surg* 2003;42:124-36.
- Weinfeld SB, Schon LC. Hallux metatarsophalangeal arthritis. *Clin Orthop Relat Res* 1998;349:9-19.