



## Metallic Hemiarthroplasty Resurfacing Prosthesis For The First Metatarsophalangeal Joint

Design:

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### **Giza E, Sullivan MR. First Metatarsophalangeal Hemiarthroplasty for Grade III and IV Hallux Rigidus**

*Techniques in Foot and Ankle Surgery 4(1):10-17,2005*

**Abstract** - The BioPro® first metatarsophalangeal hemiarthroplasty is a reliable alternative to fusion of the first metatarsophalangeal for patients with grade III or IV hallux rigidus. The implant was introduced in 1952, and Townley reported 93% good or excellent results on 279 implants with an 8-month to 33-year follow-up. One hundred three first metatarsophalangeal hemiarthroplasties have been performed at our center over 4 years, and we report no cases of deep infection or loosening. Post-operative arthrofibrosis is the most common complication and is addressed with manipulation, which restores functional dorsiflexion. A structured postoperative physical therapy program is important to maintain range of motion and favorable outcomes. A prospective, long-term follow-up study is currently underway.

### **Mosheyev A, Malone K, Shipley J, Lewis M, Granger D. Biomechanical Efficacy of the BIOPRO Cobalt-Chrome Hemi-Arthroplasty Resurfacing Prosthesis for the Treatment of Osteoarthritis in the First Metatarsophalangeal Joint**

*Gait Study Center, Temple University School of Podiatric Medicine, Philadelphia, PA*

**Abstract** - Osteoarthritis (OA) of the first metatarsophalangeal joint (MTPJ) is a common, progressive, and debilitating disorder affecting many individuals. There are a limited number of surgical procedures that could be used for a severe form of 1st MTPJ OA (Hallux Rigidus), which typically do not restore anatomical function. The goal of this investigation is to determine the biomechanical efficacy of the BioPro cobalt-chrome hemi-arthroplasty resurfacing prosthesis for the treatment of 1st MTPJ OA. Significant controversy exists within the literature concerning the reliability and longevity of the 1st MTPJ implant device.

One foot from one patient with painful end stage Hallux Rigidus (OA of the 1st MTPJ) was evaluated pre- and post operatively with a lower extremity biomechanical exam, weight bearing radiographs, 1st MTPJ flexibility measurements, and gait analysis. The quantitative gait analysis included plantar pressure measurements (Musgrave Footprint™) and temporal and distance foot fall parameters (GaitMat II™).

The results of this study demonstrated and increase in the center of pressure excursion index (CPEI), a reduction in peak plantar pressure at the 1st MTPJ and hallux, an increase in stride length and walking speed, and an equalization of the swing and stance times between left and right feet post-operatively.

Assessment of 1st MTPJ load-displacement properties resulted in increased laxity of the joint and decreased early and late flexibilities post-operatively.

Post-operatively, the patient exhibited minimal pain upon performing the activities of daily living (ADL's) while demonstrating significant improvements in objective biomechanical foot function.

**Conclusions** - The BioPro implant has provided improved clinical and biomechanical function to the patient under study. Plantar pressures, footfall parameters, and joint laxity were all enhanced as a result of this surgery.

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**Roukis TS, Townley CO. BIOPRO resurfacing endoprosthesis versus periarticular osteotomy for hallux rigidus: short-term follow-up and analysis.**

*Journal of Foot & Ankle Surgery 2003;42(6):350-8*

**Abstract** - Forty-four patients (47 feet) were enrolled in a prospective hallux rigidus study. A subjective evaluation, physical examination, and radiographic analysis were performed preoperatively and at a 1-year follow-up. Twenty patients (20 feet) underwent a periarticular osteotomy, with 16 patients (16 feet) returning. Seven patients (9 feet) underwent a BIOPRO resurfacing endoprosthesis, with all patients returning. The subjective evaluation was based on a modified American Orthopaedic Foot and Ankle Society Hallux Metatarsophalangeal-Interphalangeal 100-Point scale. The physical examination included first metatarsophalangeal joint range of motion. Radiographic analysis included the metatarsal protrusion distance, transverse plane angulation of the second digit, lateral talo-first metatarsal angle, sagittal plane relationship of the first and second metatarsals, and hallux equinus angle. Statistically significant differences between preoperative and postoperative values were found for the periarticular osteotomy group for the metatarsal protrusion distance ( $P = .000$ ), transverse plane angulation of the second digit ( $P = .000$ ), and lateral talo-first metatarsal angle ( $P = .015$ ). No other statistically significant differences between the pre-operative and post-operative values for either procedure group were found to exist. For this specific patient population the short-term results of surgical intervention for hallux rigidus, whether through a periarticular osteotomy or resurfacing endoprosthesis, provided subjective patient improvement and satisfaction, as well as, minimal increase in first metatarsophalangeal joint range of motion.

**Goez JC. An Update on the Metallic Hemiarthroplasty Resurfacing Prosthesis for the Hallux**

*Presented at the 56th Annual Meeting and Scientific Seminar of the American College of Foot and Ankle Surgeons, Orlando, FL February 1998*

**Introduction** - Restoration of Hallux Metatarsophalangeal Joint (HMP) function is essential in preventing disabilities associated with advanced arthritic changes such as loss of foot propulsion, gait alteration, and transfer lesser metatarsalgia. Given an average patient age of 55 years, this functional HMP restoration must also remain stable for many years.

HMP function restoration has been attempted with many surgical procedures (Keller resection, cheilectomy, arthrodesis, and silastic). Although early satisfactory results were reported, long term results are inconsistent. A recent article by Townley reports excellent long-term clinical results (in 279 patients) with the use of a non-constrained, metallic resurfacing implant for arthroplasty of the HMP. The purpose of this report is to communicate an update on the metallic hemiarthroplasty resurfacing prosthesis with a 5-year increase in the time in service and increased patient population.

**Conclusion** - This particular method of hallux metatarsophalangeal joint resurfacing continues to prove its effectiveness through time. Biomechanics of the first metatarsophalangeal joint remain unaffected and prosthetic wear or mechanical failures were not encountered.

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**Taranow WS, Townley CO. Metallic proximal phalangeal hemiarthroplasty for hallux rigidus.**

*Operative Techniques in Orthopaedics 1999;9(1):33-6*

**Abstract** - Discouraging results after the use of silicone implants and/or total joint replacements in the great toe have caused many surgeons to avoid implant arthroplasty in the forefoot. An appropriately designed metallic hemiarthroplasty of the proximal phalanx avoids the pitfalls of other joint replacement procedures by using a durable material and restoring the normal biomechanical function of the hallux metatarsophalangeal joint. This resurfacing procedure has been shown to provide excellent long-term results in a high percentage of patients. It is viewed as a sensible alternative to cheilectomy and fusion in cases of moderate to severe arthrosis.

**Summary** - A properly designed metallic proximal phalangeal resurfacing hemiarthroplasty is a reliable alternative to cheilectomy and arthrodesis. The procedure is technically uncomplicated, and successful results are predictable and enduring.

**Townley CO, Taranow WS. A metallic hemiarthroplasty resurfacing prosthesis for the hallux metatarsophalangeal joint.**

*Foot & Ankle International 1994;15(11):575-80*

**Abstract** - Two-hundred seventy-nine arthritic hallux metatarsophalangeal joints treated surgically with a metallic resurfacing hemiarthroplasty over a 40-year period were reviewed. The implant, which is made available in three evenly graded sizes, is designed to replace only the articular surface of the proximal phalanx, with minimal resection of bone stock. The pathologic indications for surgery included classical hallux rigidus, rheumatoid arthritis, and degenerative changes associated with hallux valgus and bunion deformity. Follow-up at 8 months to 33 years after surgery revealed good or excellent clinical results in 95%. The time to follow-up was in excess of 5 years in 101 (36%) of the procedures, beyond 10 years in 62 (22%), and longer than 20 years in 23 (8%). Unlike other available surgical options for this debilitating condition, biomechanics of the hallux metatarsophalangeal joint remained unaffected and problems associated with prosthetic wear or mechanical failure were not encountered.

**Conclusion** - This long-term retrospective study provides radiographic and clinical evidence to support the use of a low friction phalangeal hemiarthroplasty as an alternative to existing surgical techniques available for the treatment of severe arthrosis of the hallux metatarsophalangeal joint. The procedure is technically uncomplicated and successful results are predictable and enduring.

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