BioPoly® Great Toe Case Report

Resurfacing of the 1st Metatarsal Head with the BioPoly Great Toe Hemiarthroplasty Implant: A 2-Year Case Report

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Case Report

Patient demographics

A 62-year-old female presented for consultation with right foot pain. The pain was described as aching, dull, throbbing, and located in the right great toe. The symptoms were partially relieved by pain medications. The symptoms were aggravated by walking. The symptoms resulted in limping and swelling in the region of the right great toe.

Prior medical history

Patient had a history of asthma, hypothyroidism secondary to thyroidectomy, and migraine headaches. She had a BMI of 32. Her medical conditions were well-controlled.

Treatment

Diagnostic Imaging revealed a Grade 4 hallux rigidus condition (Figure 1). The patient was initially managed with shoe wear modifications and an intra-articular corticosteroid injection. The patient was able to tolerate symptoms with over-the-counter medications for approximately three years after the initial consultation. She then presented back to the Clinic with worsening symptoms and a desire to proceed surgically.

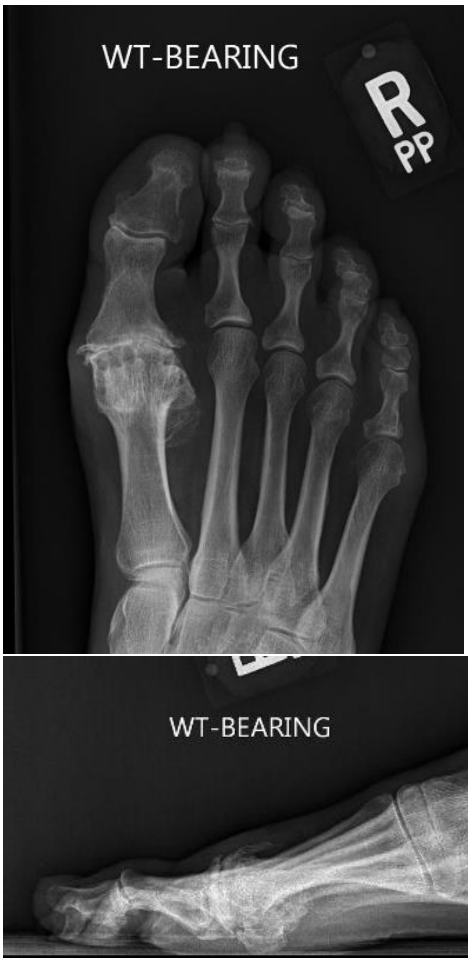

Figure 1: Pre-Operative Xray

A detailed surgical discussion was completed. She was offered hallux mtp arthrodesis or a BioPoly hallux MTP implant (Figure 2). The BioPoly Great Toe is a hemiarthroplasty implant that contains a unique material (BioPoly) that combines a common plastic for implants

(UHMWPE), with a lubricating molecule (Hyaluronic Acid) native to the joint. This material is compression molded to a porous titanium stem.

Figure 2: BioPoly Hallux MTP implant

Surgery

The patient chose to proceed with the BioPoly Great Toe. The surgery was performed under a popliteal/saphenous block with minimal sedation with an ankle-level tourniquet at 250mm Hg.

The joint was opened with a standard dorsal arthrotomy (Figure 3).

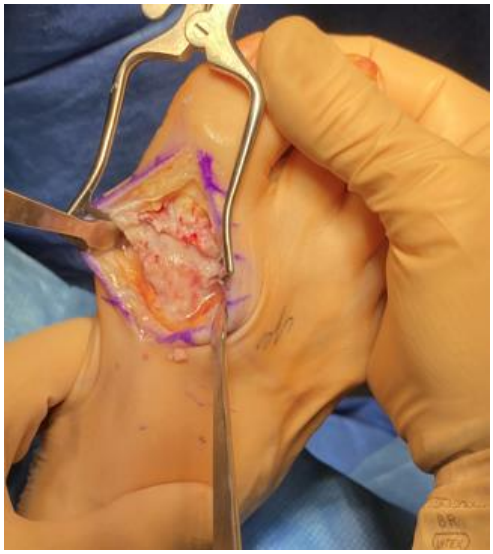

Figure 3: Initial Joint Exposure

The EHL was identified and protected. The capsule was released sharply off of the joint dorsally medially and laterally. There were Grade 4 changes to both sides of the joint with significant osteophyte formation.

To expose the joint fully, osteophyte off of the metatarsal head and proximal phalanx was removed. The MTP joint was hyper plantar flexed. A 6 mm resection of the metatarsal head perpendicular to the long axis of the first metatarsal was completed. The sizing instruments revealed a size 18 to be the best fit for the metatarsal. The sizing paddle was then used to place a guide pin centrally within the longitudinal aspect of the metatarsal. The reamer was utilized over the guide pin and the trial implant was placed. The trial fit well and was replaced with the final implant. The implant had an excellent press fit.

Additional osteophyte was resected (Figure 4). Fluoroscan images were obtained (Figure 5). Intraoperative range of motion was 10 degrees of plantar flexion and 60 degrees of dorsiflexion. the capsule was closed with 3-0 Vicryl, subcutaneous tissues with 3-0 vicryl, and skin with staples.

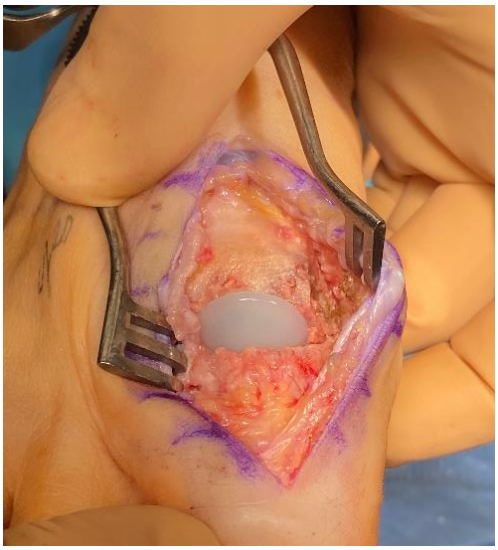

Figure 4: Press fit implant after osteophyte resection.

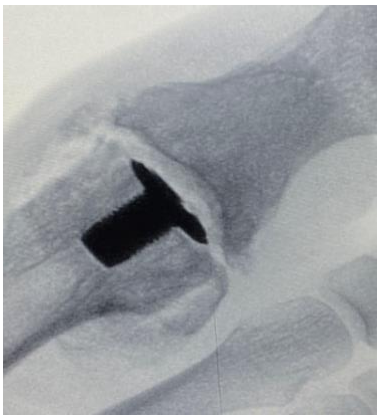

Figure 5: Intraoperative Fluoroscan Image

Outcome

Postoperatively, she was managed in a short walking boot with heel weight-bearing. At 2 weeks, her surgical staples were removed. X-rays were obtained in the clinic. She was instructed on range of motion exercises and allowed to be weight-bearing as tolerated. She was weaned out of her surgical boot at 6 weeks post-op and into a regular shoe.

She was seen in the office again 3.5 months post-op. She reported no pain, she had mild swelling and range of motion of 10 degrees of dorsiflexion and 25 degrees of plantar flexion. Images revealed a stable implant (Figure 6). She had returned to all desired activities without limitations. She acknowledged that she would both do the procedure again and recommend to a friend.

Additional follow-up at 23.5 months was done with x-ray and phone call. Radiographs are shown in Figure 7. Patient denied swelling or pain. She has no limitations with activity and would both undergo the procedure again and recommend it to a friend.

Discussion

Hallux MTP arthrodesis has long been a "Gold Standard" for treatment of moderate to advanced hallux rigidus. It has been predictable and provides long-lasting pain relief. However, functional limitations exist with this procedure. Specifically, those that require dorsiflexion of the hallux. There are also increased stresses put on the adjacent joints proximal and distal to the arthrodesis.

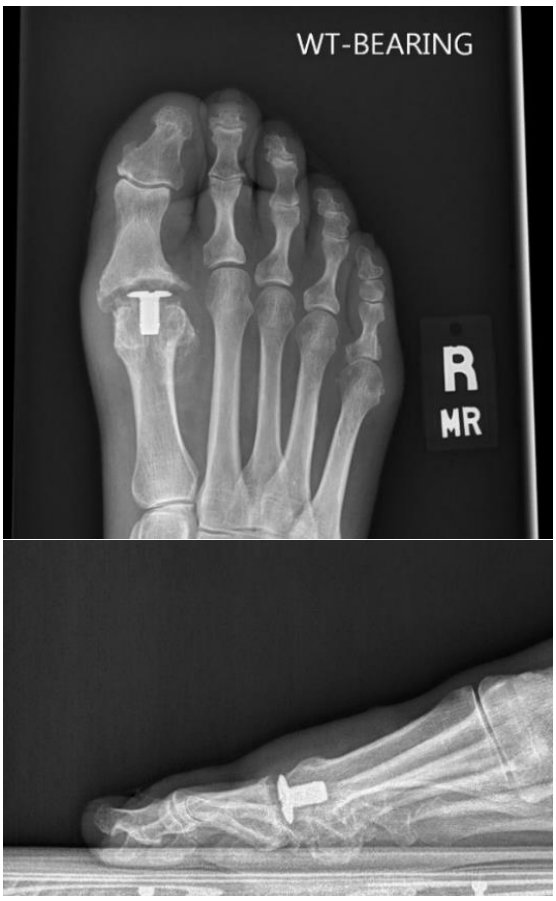

Figure 6: 3.5-month post-op images

Various metal and silicone total toe and hemiarthroplasty implants have been available for many years. These implants have been reported to have high rates of loosening and subsidence. Pain scores and revision rates have prevented them from becoming a procedure of choice.

Cartiva SCI (Synthetic Cartilage Implant) made from Poly Vinyl Alcohol (PVA) has been available as a more recently developed implant material. The rates of conversion to arthrodesis and persistent pain continue to be troublesome. MRI studies have shown that the implant in some patients subsides or possibly "dessicates". Revision rates as high as 20% have been reported.

The Biopoly implant was designed with three main principles in mind.

1. Minimal bone resection to allow for salvage procedures to be easily performed.
2. Incorporate Biopoly material into the implant in order to decrease rates of revision surgery compared to metallic implants. In vitro analysis shows a decrease in coefficient of friction and wear rates compared to metal implants.
3. Eliminate incidence of subsidence and desiccation seen in current synthetic cartilage replacement

The implant used to treat this patient incorporates the joint lubricant hyaluronan into compression-molded UHMWPE. The hyaluronic acid incorporated in the implant results in a very biocompatible and cartilage-friendly material that allows surrounding and opposing cartilage to be preserved. That combined with the minimal bone resection and an available porous titanium stem allow for stable implantation minimizing risks of subsidence and loosening.

At 23.5 month follow-up of the patient described in this case study is very encouraging. Additional studies are needed to evaluate the long-term effectiveness of this implant.

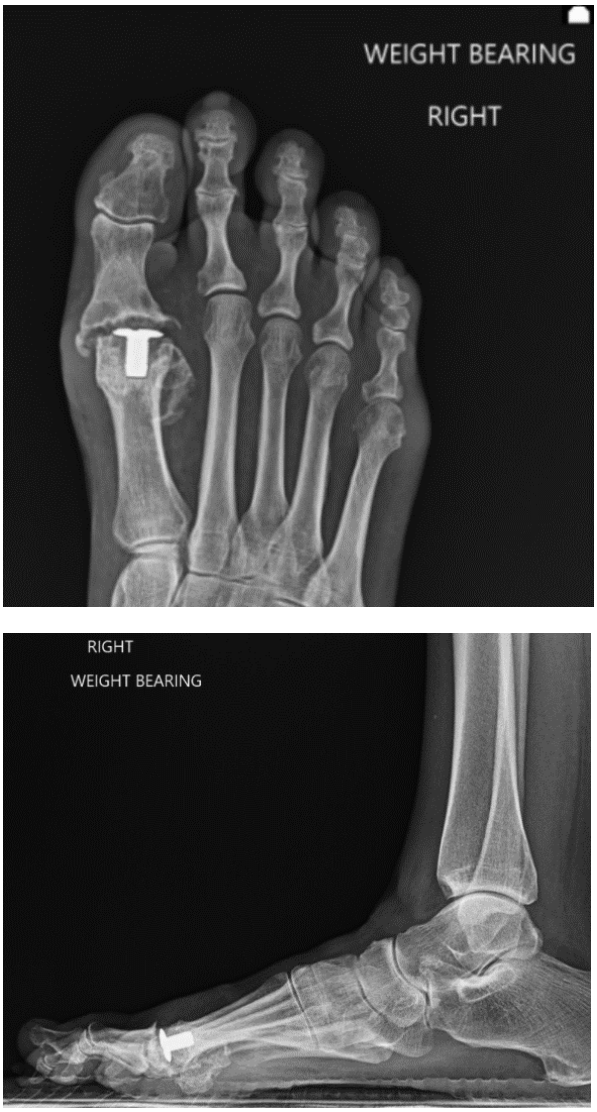

Figure 7: 23.5-month follow-up.