First Metatarsophalangeal Arthrodesis Malunion Revision to Silicone Implant Arthroplasty

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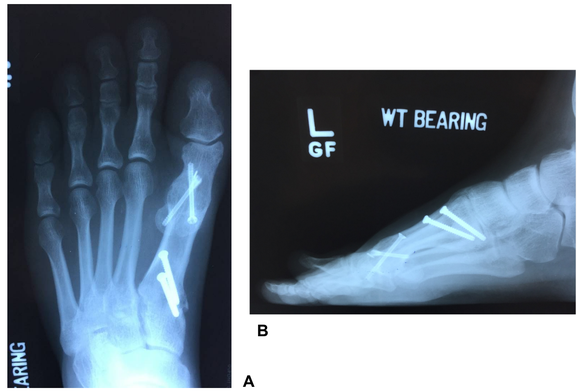
Purpose & Literature Review

First metatarsophangeal joint (MTPJ) arthritis has been reported in approximately 2.5 to 7.8% of people in the US (1,2). If conservative treatment fails, surgeons have the option of performing either a joint salvage procedure, or fusion for treatment of arthritis. First MTPJ fusion is currently the most common surgical treatment option for arthritis of the first MTPJ. If a first MTPJ fusion is performed, complications can arise if excess bone is resected. This may lead to a shortened MTPJ fusion. A shortened MTPJ fusion a can be a debilitating complication of an arthrodesis. It often results in the transfer pain to the lesser metatarsals, which can cause stress fractures and cortical thickening. Current recommended treatment of this complication, is re-establishing length of the first MTPJ (3). It is most commonly performed with a bone graft, however, callus distraction has been described in the literature. In the setting of a first metatarsal cuneiform fusion, re-establishing length of the fusion may not be the most optimal option. The purpose of this paper is to present a case of patient who underwent a two-staged procedure for a shortened first MTPJ malunion. The procedure included re-establishing length as well as motion of the joint with a silicone implant. To our knowledge this has not been reported in the literature.

Case Presentation

A 32-year-old male was seen by the senior author (JJS) for a burning, tingling and pain in his left foot. The patient is an active member of the military, in 2006 he underwent a first MTPJ fusion for a stiff joint. Following the procedure, he had continued pain and had loss of hallux purchase. In 2013, he underwent a first metatarsal cuneiform fusion for continued pain. However, this procedure did not provide him with relief. Becoming increasing frustrated, because the pain is restricting his duties, he is seen in our office (JJS). Upon initial evaluation, it was noted that there was diminished vibratory sensation of nerve distribution of L-5, S-1, the remaining neurological exam was unremarkable. The first ray was shortened and rigid with loss of hallux purchase. Calluses were noted plantar to metatarsal heads two through five on the left foot. Electromyography and nerve conduction studies were ordered, results from the studies were negative for any neurological abnormalities. It was discussed with patient at this time that his pathology was caused by the first MTPJ malunion. The patient elected for surgical takedown of the malunion for a distraction arthroplasty.
The patient was placed supine on the operating room table with an ipsilateral hip bump. A pneumatic calf tourniquet was applied for hemostasis.

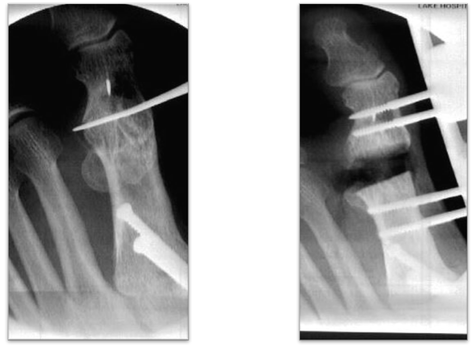
Pre-op Xray



A B

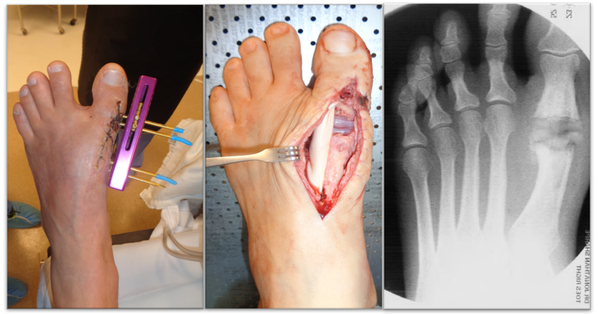
Figures A-B: Frist MTPJ malunion with screw fixation of both MTPJ and metatarsal-cuneiform joint fusion

Intra-op



C D

Figures C-D: Intraoperative osteotomy through the previous first MPTJ fusion



E F G

H

Figures E-H: Joint distraction with external fixator. Silicone implant with graftjacket. Final radiographic and clinical images.

Case Presentation

After sterile preparation and exsanguination, approximently an eight centimeter linear incision was made or the dorsal aspect of the first metatarsal crossing the first MTPJ. Sharpe dissection was continued reflecting the periosteum and capsule from the first MTPJ. All previous first MTPJ hardware was removed. An osteotomy was made through the first MTPJ fusion. Four threaded pins were placed, two in the proximal phalanx, two in the metatarsal, and a monorail fixator was applied. The joint was distracted one centimeter. The incision was irrigated and a layered closure was performed. The patient remained non-weight bearing following the procedure. Over the next month the patient distracted the newly created joint by 0.25 millimeters daily. The patient returned to the operating room one month following the initial procedure. The patient was positioned in a similar manor as to the previous surgery. The external fixator was removed non-sterilely. The extremity was then sterilely prepped.

Case Presentation

Utilizing the prior incision a full thickness incision was made. Full thickness flaps were created. The fibrocartilage was debrided from the joint. A silastic silicone implant was place in the recreated first MTPJ. The joint was irrigated, a graftjacket allograft was wrapped around the implant to create joint capsule. The incision was irrigated a second time and a layered closure was performed. During the recovery period underwent aggressive physical therapy. He was fitted for orthotics three months after surgery and has reported an improvement in his level of pain. Fifteen months following the procedure the patient's pain has improved. He is able to return to his duties in the military while wearing an orthotic.

Discussion

We present a unique case of a first MTPJ malunion corrected with a distraction arthroplasty with a silicone implant. Most published literature discusses the distraction of a first metatarsal in setting of a failed arthroplasty. Our case is unique due to converting a fusion malunion to a distraction arthroplasty. Currently, the gold standard for correction a shortened first MTPJ malunion is distraction arthrodesis. Myerson et al. reported a 79.1% fusion in 24 patients undergoing distraction arthrodesis of the first MTPJ (3). On average the first ray was lengthened by 13mm. In the setting of a first MTPJ with a first metatarsal-cuneiform joint fusion, a distraction arthrodesis may not provide adequate pain relief. Silicone implants have been discussed in the literature since 1967 by Swanson. In a retrospective study of silastic implants by Bonnet et al. he found a 63% of patients were completely satisfied eight years after surgery (4). He also reported 78% patients had pain relief following the procedure. In the setting of a first MTPJ malunion with a fused metatarsal-cuneiform joint we recommend a distraction arthroplasty as a viable alternative to distraction fusion.

References

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