Revision of a Failed Synthetic Cartilage Implant Using a Novel Motion Sparing Technique

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Statement of Purpose

Synthetic, cartilage hemiarthroplasty using a hydrogel implant has been described and shown to be equivalent to the gold standard treatment for hallux rigidus, arthrodesis. In our experience this procedure has a higher than reported failure rate, leaving the surgeon with limited options for revision. Conversion to fusion has been described, however, many patients view loss of motion as an unacceptable option for revision. We present a novel, biological, motion sparing technique for revision of a failed synthetic cartilage implant.

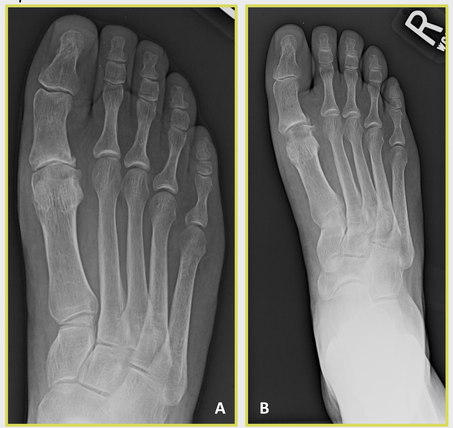
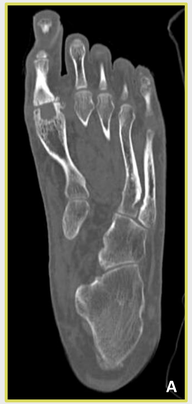


Figure 1A. Preoperative radiograph demonstrating grade II hallux rigidus according to Coughlin and Shurnas Classification. **Figure 1B.** Three month follow up radiograph after implantation of synthetic, hydrogel implant. Note minimal maintenance of joint space.

Literature Review

Hallux rigidus is the most common arthritis affecting the foot and ankle[1]. Almost 50% of patients over the age of 40 will have some radiographic findings consistent with degeneration of the first metatarsophalangeal joint (MTPJ)[1]. Despite some studies reporting a high success rate with conservative management[1], close to 50% of the time this does not provide long-term, symptomatic relief and many patients require surgical intervention. Despite arthrodesis being the gold standard treatment for hallux rigidus[2,3], many patients wish to maintain motion of the 1st MTPJ. This has given rise to many motion sparing options. Multiple studies have shown good to excellent results with Cheilectomy in patients with low grade arthritis[1]. Many different types of implants have been described for 1st MTPJ arthroplasty[4], however, reported issues include: bone loss, detritic synovitis, instability of the implant, continued pain and need for further surgery[5]. In a recent clinical trial, a synthetic, hydrogel implant was compared to 1st MTPJ fusion and showed equivalent pain relief and functional outcomes[5]. At 2 year follow up, 10% of patients required conversion to fusion[5]. In a subsequent study, the authors showed that conversion to fusion from a synthetic, hydrogel, implant had similar success rates without a higher complication rate[6]. To our knowledge, no one has described the presented, novel, motion sparing technique for salvaging a failed synthetic, hydrogel implant.

Literature Review



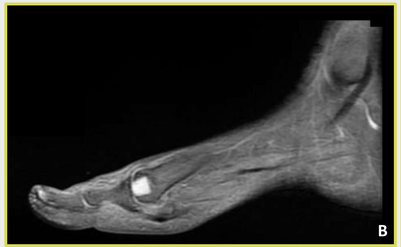
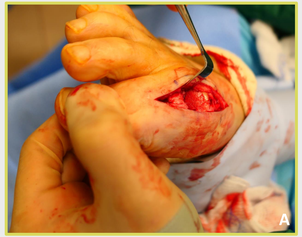


Figure 2A. CT scan and **Figure 2B** MRI, 3 months after implantation of a synthetic cartilage, hydrogel implant demonstrating minimal joint space and slight subsidence of the implant. The significant water content of the implant is appreciated on the T2 MRI slice.

Case Study

A single patient presented to the senior author for surgical consultation regarding hallux rigidus of his right foot. Radiographic and clinical exam revealed Coughlin and Shurnas grade 2 hallux rigidus. He underwent implant arthroplasty with a synthetic cartilage hydrogel implant. At 6 month follow up, he was still having significant pain and stiffness in the joint. An MRI and CT scan were obtained which revealed limited joint space and slight subsidence of the implant. Conversion to fusion was offered to the patient but he wished to maintain motion of the joint. Approximately one year after his index procedure, he underwent removal of the synthetic, hydrogel implant, grafting on the boney void with a combination of autograft and allograft, and interpositional arthroplasty utilizing a dermal, collagen allograft. At 3 month follow up, radiographs revealed increased joint space and he had pain free range of motion. At final follow up the patient was ambulating pain free without the need for custom inserts or shoe gear. His visual analog scale (VAS) numeric score was 3/10 and his American Orthopedic Foot and Ankle Society (AOFAS) hallux score was 82.

Case Study



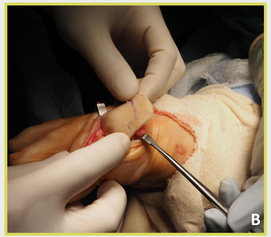
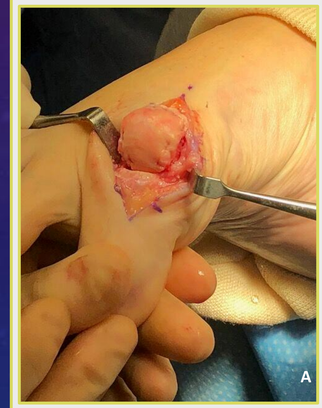


Figure 3A. Intraoperative picture showing the bone void packed with allograft. **Figure 3B.** Following bone grafting, the metatarsal head was remodeled and resurfaced with a dermal collagen allograft.

Analysis & Discussion

The most common arthritis affecting the foot is hallux rigidus. Despite arthrodesis being the gold standard treatment, many patients desire motion at the joint. In recent years, a synthetic cartilage, hydrogel implant has been touted as a successful alternative to fusion. When these implants fail, there are limited options for joint salvage and a conversion to fusion has been well described. To our knowledge, conversion of a failed synthetic cartilage, hydrogel implant to a biologic, motion, sparing arthroplasty has not been described. The present study highlights a patient successfully underwent conversion from a failed synthetic cartilage, hydrogel implant to a biologic arthroplasty. At final follow up the patient was ambulating unassisted with a pain free joint. The patient's VAS numeric rating was 3/10 and his AOFAS hallux score was 82. The patient stated that he would undergo the same procedure again. This novel method of revision also has the advantage of being bone sparing. This is a crucial benefit, if one would ever need to convert this patient to a fusion. Future studies should explore this novel, motion sparing, biologic technique's long-term results, and if necessary, conversion to fusion. This will reveal if there is a higher complication rate compared to primary arthrodesis.

Analysis & Discussion



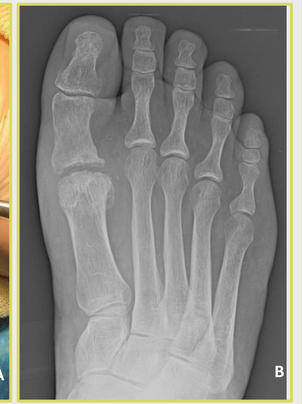


Figure 4A. Intraoperative picture showing final resurfacing. **Figure 4B** Radiographic follow up at 2 months postop reveals excellent maintenance of joint space and an anatomic metatarsal contour.

References

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Financial Disclosures:
None