CHAPTER 7

Interpositional Arthroplasty With Graftjacket for Midfoot Arthritis: A Report Of Seven Cases

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INTRODUCTION

If left untreated, midfoot arthritis can be a very painful and insufferable disease. It may present as a primary disease, as in osteoarthritis and rheumatoid arthritis, or as a secondary process from trauma. Patients often present with localized pain and stiffness, which is exacerbated by any activity, especially walking on uneven surfaces. Radiographs are ordered to evaluate foot and joint alignment, visualize the symptomatic area, and rule out fractures. Joint space narrowing, sclerosis, and osteophyte formation are characteristic findings of an arthritic joint.

Anti-inflammatory medications and steroid injections may be beneficial for temporary pain relief. Orthotics, braces, and shoe modifications can be used to help take the pressure off of the affected joints. These modalities may temporarily reduce pain and even slow progression of arthritic changes, but will not treat the underlying disease process. When conservative treatment options have failed, surgical options are then considered.

Arthrodesis of painful arthritic joints in the foot and ankle has always been the gold standard procedure. Fusion, whether performed with plates or screws, has shown good predictable patient outcomes. Recently, however, interpositional joint arthroplasty has become a popular treatment option for painful arthritis in any joint of the body. Diverse materials have been implemented including tendon, fascia, silicone, ceramics, and Pryocarbon.

To our knowledge, there is currently no published literature describing interpositional joint arthroplasty using Graftjacket for midfoot arthritis, specifically medial and middle columns. Here, we introduce an additional surgical approach to treating painful arthritis of various midfoot joints and detail results of a retrospective review of 7 cases.

MATERIALS AND METHODS

Institutional review board approval was obtained at Sharp Rees-Stealy for all patients who underwent surgical correction by a single surgeon for painful midfoot arthritis with interpositional arthroplasty using Graftjacket. All patients were included for clinical evaluation, regardless of any concomitant procedures. Clinical evaluation included postoperative course, device removal rate, and any noted postoperative complications. Radiographic evaluation involved comparing pre- and postoperative anterioposterior (AP), lateral, and medial oblique radiographic films.

Lastly, all patients were sent a follow-up patient satisfaction survey, which included pain evaluation, physical limitations, and satisfaction with the procedure. All questionnaires were sent through the mail and were kept confidential.

Description of Procedure

After proper sterile preparation of the lower extremity under general anesthesia and tourniquet control, the joint in question was identified under fluoroscopy and a linear incision was made over that joint. The joint was identified and distracted. The joint surfaces were prepared using electrical rasp until there was enough space made available to accommodate the implant. A piece of GraftJacket was folded over with smooth “non incorporating” sides facing each other and fashioned to fit inside the articular surface area. Two plantar folds of the graft were tagged with 0-Vicryl suture and pulled plantarly through the bottom of the foot using 2 straight Keith needles in order to slide the graft into the prepared joint. The GraftJacket was inserted with “incorporating” side against the raw bone to allow incorporation and adherence. The smooth “non-incorporating” sides slide against each other mimicking the gliding motion of the joint (Figure 1).

The suture was secured plantarly through the bottom of the foot over a sterile 4x4 inch gauze. The remaining dorsal graft overhang was then either resected flush with the bone, tagged down to the surrounding periosteal tissue using 2.0-Vicryl suture, or fixated using 2 absorbable micro bone anchors. The joint was then covered with remaining periosteum, muscle, tendon and subcutaneous tissues. Finally the skin was approximated and closed (Figure 2).

Postoperatively, the patient was placed in a non-weightbearing compression Jones splint for 3 weeks. The plantar sutures were resected at week 3 and the patient was allowed to ambulate in a walking boot for 3 more weeks. Physical therapy started at week 4. The patient was allowed to transfer into a sneaker with an arch support at week 6 and started weightbearing as tolerated.

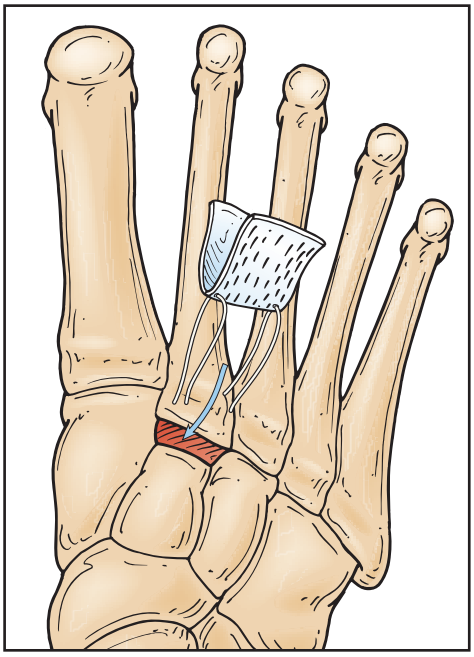

Figure 1.

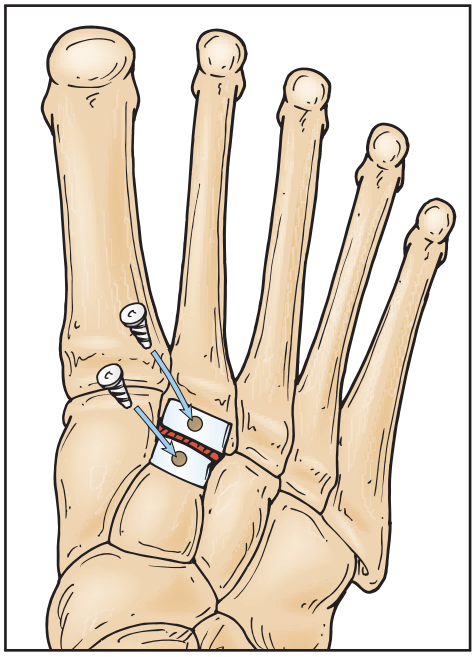

Figure 2.

Figure 3.

Figure 4.

RESULTS

All postoperative radiographs were reviewed and surgical changes at the affected joints were evaluated. Given Graftjacket's radiolucent nature, attention was directed at appreciating joint space widening, which indicated graft stability and incorporation into host tissue.

Preoperative and postoperative radiographs of each patient involved in the study are presented. Patient 1 had a painful nonunion of the fourth metatarsocuboid joint, which was revised with Graftjacket arthroplasty (Figure 3).

Patient 2 had painful retained hardware from a previously failed fusion of the navicular-cuneiform joint, which was repaired using Graftjacket interpositional arthroplasty (Figure 4).

Patient 3 had osteoarthritis of the second metatarsal-cuneiform joint as shown by the absent joint space. This was repaired using Graftjacket interpositional arthroplasty which can been seen in the immediate and 2 month follow-up radiographs (Figure 5). Patient 4 had a painful fifth metatarsocuboid joint osteoarthritis with previous peroneus brevis tendon interposition, which was repaired using

Figure 5.

Figure 6.

Figure 7.

Figure 8.

Graftjacket interpositional arthroplasty (Figure 6). Note the presence of the joint space in the postoperative radiographs.

Patient 5 had osteoarthritis of the midfoot and had failed cortisone injections. The patient underwent interpositional arthroplasty using Graftjacket in the second and third metatarsocuneiform joints (Figure 7).

Patient 6 had arthritis of the fourth and fifth metatarsocuboid joints, which was repaired using Graftjacket interpositional arthroplasty (Figure 8).

Patient 7 had arthritis of the second and third metatarsal cuneiform joints, which was repaired using Graftjacket interpositional arthroplasty (Figure 9).

This cohort of patients was comprised of 7 females with average age of 60.4 years at the time of surgery. The average length of follow-up was 24 months. All patients had pain for at least 1 year prior to surgery. All patients were asked to rank their pain in the affected foot pre- and postoperatively on a scale of 0-10 (with 0 being no pain and 10 extreme pain.) All, but 1 patient answered the patient satisfaction survey. On average, preoperatively patients ranked their pain at 7.7 ± 1.4

Figure 9.

and postoperatively at 1.7 ± 1.6. Only 1 patient continued to have pain and immobility due to preoperatively diagnosed chronic pain in the nonoperated joints.

Based on clinical examination and subjective interview there were no postoperative infections, inflammatory reactions, prolonged edema, or wound healing complications. There were no reported cases of loss of inherent stability at the midfoot joint and no transfer lesions. Overall, all patients were pleased with the surgery and its outcomes.

DISCUSSION

Graftjacket is an acellular tissue matrix allograft obtained from donated human skin. During aseptic preparation process, the epidemis and dermal cells are removed. The graft is then freezedried to preserve vascular channels. This processing allows the graft to serve as a scaffold for host cell repopulation, which will eventually covert to host tissue. The graft has two sides: reticular surface versus base membrane. The reticular surface is rough and serves as the incorporating side of the graft. The base membrane is smooth and functions as the nonincorporating side allowing gliding and decreasing adherence to neighboring tissue. The Graftjacket is a very durable material with excellent tensile strength, as well as suture retention. Because of these properties Graftjacket has been successfully used to assist in the repair of Achilles tendon ruptures, serve as an interpositional graft in the shoulder and hand joints, and aid in the closure of lower extremity wounds, including chronic diabetic foot ulcers. Graftjacket has also been documented for treatment of hallux rigidus. In 2006, Kennedy et al reported on 18 patients with 21 successful interpositional arthroplasty cases for treatment of severe first metatarsophalangeal joint arthritis with a mean follow-up of 38 months. More recently, Khoury et al in 2012 reported a case of salvage procedure using Graftjacket for an infected first metatarsophalangeal joint implant. At 1 year, the authors noted the patient to be pain-free with satisfactory function of the joint.

Midfoot arthritis is a debilitating condition characterized by pain, stiffness, loss of stability, and functional impairment. It has multiple etiologies, including inflammatory disorders, post-traumatic causes, gout, osteoarthritis, neuropathic degeneration, and structural abnormalities from advanced adult acquired flatfoot. The symptoms can be managed with nonsurgical options, but surgical intervention can offer long-term stability and reduction in pain. Arthrodesis is a popular way to manage arthritic joints in the foot because it provides a permanent solution. However, arthrodesis is not a proper solution for all patients. Many foot and ankle surgeons will also argue that after fusion, weightbearing forces must be taken up by near-by joints resulting in their potential long term arthritis. Therefore, the goals of performing arthroplasty in any joint in the foot are to relieve painful range of motion, preserve inherent motion and help prevent degeneration of nearby joints.

Our study has successfully shown its ability to effectively eliminate painful range of motion. Our patient's pain scores have decreased from 7.7 ± 1.4 preoperatively to just 1.7 ± 1.6 postoperatively. This procedure was also able to preserve sagittal motion of the fourth and fifth metatarsocuboid joints, which is required for proper biomechanics of the foot. It is important to mention that none of our patients experienced transfer lesions. This demonstrated that the procedure did not disturb inherent stability of the midfoot and did not increase pressure loading on neighboring joints. Besides the decrease in pain, the second most significant outcome of our procedure was elimination of prolonged weightbearing. Our patients were able to weight bear pan-free in as little as 3 weeks. This is half the time required for most fusion surgeries. Patients were able to quickly return to their previous activities of daily living without requiring assistance.

An advantage of the study over using other interpositional modalities is our surgical technique, which does not violate the patient's innate anatomy. Our surgical joint preparation did not require significant bone resection and therefore does not limit opportunity for further surgery if it is ever required. There is also no obstructing hardware, which can complicate revision surgeries. Another benefit to our study is absence of donor site morbidity when using Graftjacket allograft. Our study avoids using commonly harvested peroneus tertius or long extensor tendons.

Weakness of the current study include the retrospective study design, small sample size, relatively short follow up, and inclusion of all midfoot joints in the analysis. Medial, central, and lateral columns of the midfoot have unique and specialized requirements in the function of the foot. In the future, a larger prospective randomized study focusing on individual joints of the midfoot needs to be performed. A much longer follow-up interval is needed to assess the long-term efficacy of such procedures. In conclusion, from our preliminary pilot study, interpositional arthroplasty of the midfoot using Graftjacket appears to be an effective and safe alternative procedure for patients who have painful midfoot arthritis.

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