

Statement of Purpose

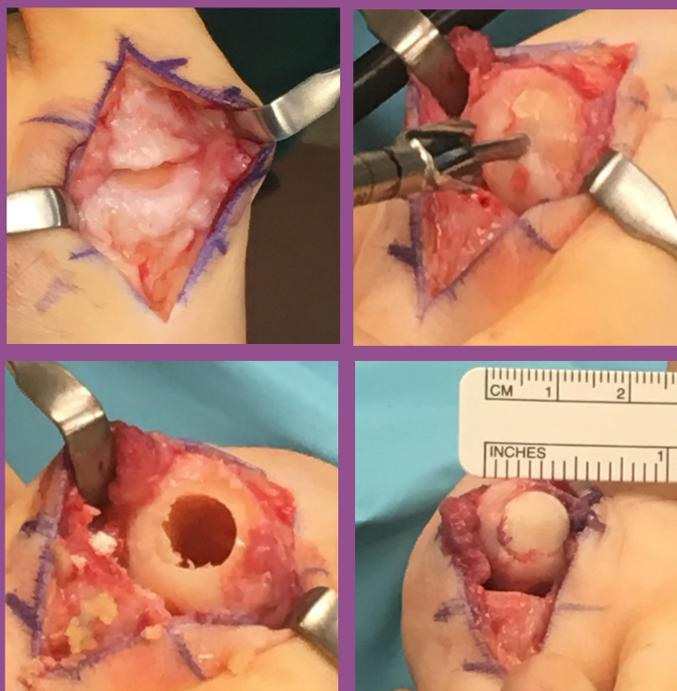
Osteochondral defects (OCD) at the 1st metatarsal head have perplexed foot surgeons over the years regarding surgical treatments. The condition can be attributed to trauma, metatarsal length or various arthritic conditions. Over time pain and restrictive range of motion at the 1st metatarsal phalangeal joint (MTPJ) occur. Numerous surgical procedures have been advocated for this condition. We present a novel surgical treatment of an osteochondral allograft transplant for 1st metatarsal head osteochondral pathology.

Literature Review

Chondral injury to the 1st metatarsal head is often described as a sequela to hallux limitus which is degenerative joint disease of the 1st MTPJ that presents with decreased and painful range of motion. The 1st MPJ is the most common joint in the foot for development of DJD and the second most common pathology of the hallux⁽¹⁾. Surgical options include cheilectomy, excisional arthroplasty, interposition arthroplasty, implant arthroplasty, phalangeal osteotomy, first metatarsal osteotomy, micro-fracturing, and arthrodesis^(2,5,6). For hallux limitus with focal osteochondral defects most surgeons treat with subchondral drilling or micro-fracture procedure⁽³⁾. We found published results of 1st MTPJ osteochondral transfers using autograft with successful results but not allograft⁽⁷⁻⁸⁾. Juvenile articulated cartilage has also been described with excellent clinical results⁽⁹⁾. With lesions larger than 50mm² another study found poorer results with subchondral drilling compared to autograft plug transfer⁽¹⁰⁾.

Materials and Methods

The implant used is an osteoarticular cartilage capped plug which comes in custom widths and a constant depth of 15mm. The plugs have been serologically tested, washed to remove blood elements, and gamma irradiated. The process does not compromise the biomechanical or biochemical properties of the implant.



Case Study

A 55-year-old Caucasian female presented with mild stage 2 hallux rigidus to her 1st MTPJ which had failed conservative therapy. She presented with dull, achy pain to her right 1st MTPJ with mild, palpable osteophytes and increased pain at full dorsiflexion which was limited to 45°. On XR there was mild dorsal spurring along with mild subchondral sclerosis. After discussion of surgical and conservative measures, the patient elected to undergo osteochondral allograft transplant to her 1st metatarsal head.

Case Study Cont.

A standard dorsal incision was used and dissection was carried down to the capsule which was linearly incised and reflected about the metatarsal head. Osteophytes were removed. The defect was measured as 10mm. A guidewire was advanced into the metatarsal to serve as a reaming guide.

Pre-Op



Post-Op



The metatarsal head was reamed in a step-wise fashion from 8mm to 10mm and a depth of 15mm. A 10mm frozen allograft plug was inserted into the defect and tamped into place. The toe was then axially loaded and ranged until there was no crepitus felt. The 1st MTPJ demonstrated increased dorsiflexion compared to pre-operative exam. The operative site was then closed in normal fashion. Post-operatively she was weight bearing as tolerated with passive ROM encouraged immediately. At 12 months post surgery she had painless range of motion, painless ambulation, and increased passive range of motion.

Analysis and Discussion

Review of literature found no report of osteochondral allograft transplant for a 1st metatarsal head OCD. The procedure is reproducible with readily available materials at a relatively low cost. Our procedure eliminates autograft harvesting and donor site morbidity. This procedure also doesn't prevent conversion to implant or fusion if necessary. Since our initial patient, 8 additional limbs have undergone the same procedure without complication. To date, our patients' satisfaction, range of motion, and pain have improved. We believe this to be a valid treatment option for OCD of the 1st metatarsal head.

References

1. Bussewitz BW, Dymont MM, Hyer CF. Intermediate-term results following first metatarsal cheilectomy. *Foot Ankle Spec.* 2013;6(3):191-195.
2. Coughlin MJ, Shurnas PS. Hallux rigidus. Grading and long-term results of operative treatment. *J Bone Joint Surg Am.* 2003;85(11):2072-2088
3. Beiser, I. H., Kanat, I. O. Subchondral bone drilling: a treatment for cartilage defects. *J. Foot Surg.* 29:595-601, 1990.
4. Hannon CP, Smyth NA, Murawski CD, et al. Osteochondral lesions of the talus: aspects of current management. *Bone Joint J.* 2014;96(2):164-171.
5. Geldwert JJ, Rock GD, Mancuso JE. Cheilectomy: Still a Useful Technique for Grade I and Grade II Hallux Limitus/Rigidus. *JFAS* 31(2): 154-159, 1992.
6. Mann, R. A., Clanton, T. O. Hallux rigidus: treatment by cheilectomy. *J. Bone Joint Surg.* 70(A):400-406, 1988.
7. Zelent, M.E. Neese, D. J. Osteochondral Autograft Transfer of the 1st Met Head: A Case Report. *JFAS* 44(5) 406-411.
8. Hopson, M. Stone, A. Paden, M. First Met Head Osteoarticular Transfer System for Salvage of a Failed Hemicap-Implant: A Case Report. *JFAS* 48(4), 483-487.
9. Dyke B. Berlet, G et al. First Metatarsal Head Osteochondral Defect Treatment with Particulated Juvenile Cartilage Allograft Transplantation: A Case Series. *FAI* 39(2) 236-241
10. Kim, Y. et al. Clinical Comparison of the OAT system and Subchondral Drilling in Osteochondral Defects of the 1st Met Head. *The Amer Jou of Sports Med.* 40(8). 2012