Microfracture with synthetic extracellular matrix application as a viable treatment option for first metatarsophalangeal joint osteochondritis dissecans

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Statement of Purpose
Subchondral drilling with application of a synthetic extracellular cartilage matrix for the treatment of traumatic osteochondral defects are routinely performed on other joints, however reported less commonly in the first metatarsal phalangeal joint (1 MTPJ). To determine if this is a viable treatment option - preventing the advancement of osteoarthritis (OA) and return patients back to pre-injury activity and pain levels.

Methodology and Procedure Continued
Each patient underwent subchondral drilling along with the application of an extracellular cartilage matrix. Calcaneus bone mineral aspirate (BMA) was harvested and mixed with the extracellular matrix. Four of the six patients had additional debridement of osteochondritis or osteocartilaginous excision.

Surgical Technique
Patients were placed in the Supine position. Prior to incision of the tourniquet BMA was harvested from the calcaneus, see figure 2.

Figure 2. Harvesting BMA from calcaneus with Jarndyce Needle

Next, the 1st metatarsal head was accessed through standard dorsal technique. The joint was then inspected and the lesion was identified (figure 3). Next using a curette the lesion was prepared by removing the loose cartilage and currying to obtain 90 degree angles at all borders (figure 4). Next, subchondral drilling was performed using a 0.55 mm wire. The primary surgeon then determined the need for a debridement osteotomy or osteochondrolysis based on biomechanical joint structure or extent of the lesion. Finally, use of a standard percutaneous curette to remove an osteochondral lesion. Patient had no pain with any other activities.

Figure 3. Identification of the lesion

Figure 4. Preparation of the lesion

Surgical technique continued
Follow the procedure patients were recommended a non weight bearing period of 4 weeks.

Results
Patient 1 who was a 66 year old male who fell from a height of 4 feet sustaining injury to his right great toe 1 month prior while playing golf. Patient had no pain with any other activities. Patient continued to have pain across his first metatarsal head through range of motion. It was determined to obtain application of fibrin glue over the lesion for 5 minutes until the glue was dry. Patient was instructed to bear weight on the toe for the first 4 weeks post surgery. Patient had no pain with any other activities.

Figure 5. Application of BMA with extracellular matrix into defect with application of fibrin glue

Following the procedure patients were recommended a non weight bearing period of 4 weeks.

Figure 6. MRI follow up on patient 1, 7 months from original surgery

Patient 3 was a 36 year old female who had a remote MTPJ surgery 16 years prior who injured her great toe 3 months prior when falling. An MRI was also obtained prior to surgery (figure 7). Patient continued to have pain with his MTPJ and was thought to originate from trauma. However lesions of the 1 MTPJ, usually leads to hallux limitus with subchondral drilling, curettage, microabrasion, microfracturing, and radiographic or MRI confirmed osteochondral defect (OCD). Osteochondral lesions of the knee and ankle are well documented in the literature lesions of the knee and ankle are well documented in the literature. A large population of patients with a longer follow up is needed to determine if this is a viable option to help decrease the need of a 1st metatarsal phalangeal fusion following an osteochondral lesion of the 1 MTPJ. However current data results are promising.

Figure 7. The operative MRI of patient 3 showing a 0.5 cm x 0.9 cm osteochondral defect of the 1st MTPJ

Patient underwent the procedure outlined along with a chelistry. Intraoperative images are shown in figure 8. Patient was back to normal shoe gear at 5 weeks and had returned to pre injury activity level.

Figure 8. Patient 3 intraoperative lesion in central metatarsal head after extracellular matrix application

Analysis and Discussion:
The goals of this procedure were to reduce pain, to increase function, and to prevent further joint destruction. This case series shows that microfracture with biocartilage application with BMA could be a viable treatment option for osteochondral defects of the first metatarsal head.

Current data shows that 5/6 have returned to pre injury activity level with minimal pain to his operative side while golfing. One patient who continues to have pain following surgery has returned to regular shoe gear but not to full activity. Patient is likely to need a 1st metatarsal head osteotomy and fusion, but at this time patient does not want to proceed with any further surgery. A larger population of patients with a longer follow up is needed to determine if this is a viable option to help decrease the need of a 1st metatarsal phalangeal fusion following an osteochondral lesion of the 1MTPJ. However current data results are promising.

References