CASE REPORT

October 14, 2007

LESS INVASIVE OSTEOCHONDRAL DEFECT REPAIR OF THE TALUS USING PERCUTANEOUS DELIVERY OF CONCENTRATEED AUTOLOGOUS ADULT STEM CELLS

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CASE HISTORY:

A 17 YO healthy male athlete sustained an inversion injury to the foot while competing at varsity level basketball. A physical evaluation by palpation determined tenderness and swelling around the joint, reduced range of motion and pain. X-rays (Figure 1) suggested a Stage 3 medial chondral injury to the talus that was confirmed by MRI (Figures 2 and 3). Diagnostic arthroscopy confirmed an intact dome of articular cartilage.

TREATMENT OPTIONS:

- Conservative care involving 2 to 3 months of non-weight bearing followed by another 2 to 3 months of abstention from impact exercise/contact sports. Subsequent prognosis of non-operative treatment greatly uncertain, with high likelihood of need for surgical management in the future[5]
- Surgical treatment with anterograde drilling (microfracture) of the medial talor dome
- OATS procedure (OsteoArticular Transfer System) with medial malleolus tibial osteotomy
- Surgical treatment with retrograde drilling of the medial talor dome with or without grafting
- Surgical treatment as above but with adjunct use of concentrated autologous adult stem cells derived from the patient's bone marrow harvested from the hip[1,2,3,4]

TREATMENT PLAN:

Since the patient was approaching the collegiate athletic recruiting season, he was seeking a treatment plan which could expedite his return to competitive play. With the hopes for a faster surgical recovery, the patient enthusiastically embraced the latter surgical option.

MATERIALS AND METHODS:

Following the manufacturer's instructions, 60 milliliters of bone marrow was aspirated percutaneously from the anterior superior iliac spine of the pelvis and processed in the SmartPReP 2 BMAC System (Harvest Technologies, Corp) into 10 mL of Bone Marrow Aspirate Concentrate.

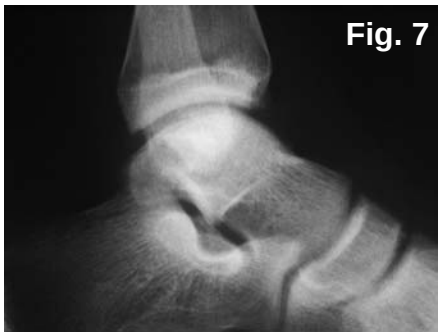
Diagnostic arthroscopy was performed to ensure that the dome of articular cartilage was intact. Subsequently, retrograde drilling of the medial talor dome was performed using a 4.0 mm cannulated drill under direct fluoroscopic guidance. Further debridement of lesion was performed with a spinal curette, followed by a staged delivery of first approximately 3 mL of concentrated stem cells into the cavity of the osteochondral defect (OCD) using a jamshidi needle; this was immediately followed by a graft mix consisting

of beta-Tricalcium Phosphate (TCP) and concentrated stem cells placed below the surface of the articular margin. A final AP x-ray showed good consolidation of the lesion consistent with a successful grafting.

The patient tolerated the bone marrow aspiration and surgical repair procedure well. Post operative instructions were strict non-weight bearing for 6 weeks with range of motion exercises beginning at 2 weeks and partial weight bearing at 6 weeks post-operative.

RESULTS:

The patient was compliant with the 6 weeks of post-operative non-weight bearing. At 8 weeks, x-rays (Figures 4 and 5) showed subchondral lucency consistent with revascularization. Full weight bearing and low impact exercise was initiated at 8 weeks. X-rays at 12 weeks (Figures 6 and 7) showed trabecular filling of the lesion indicative of healing. Patient was able to return to pain-free running at 12 weeks and competitive basketball at 16 weeks.



DISCUSSION:

Because of the high likelihood of failure with non-operative treatment of an OCD of the talus, and given the protracted recovery associated with the standard of care surgical options to date, there exists a need for an alternative approach that is less invasive, requires a shorter recovery period, and is associated with a high probability of return to pre-injury level of play. Such a modality has been reported in the orthopedic literature for a number of years but has yet [1]to be applied for use in the treatment of osteochondral lesions.

After approximately 20 procedures, this author has found that 60 milliliters of bone marrow can be safely and easily harvested percutaneously from the iliac spine in less than 60 seconds. The adjunctive use of concentrated bone marrow stem cell injection carries tremendous promise and the potential for widespread application in the realm of orthopedic trauma surgery and bone healing technology.

CONCLUSION:

With consideration for the Standard of Care approach to treating an OCD of the Talus, this new approach is less invasive, requires less surgical time (avoidance of harvesting autograft), is well tolerated and introduces an enhanced biologic response to healing that may return the patient to normal pain-free activities sooner.

1. Hernigou, P, et al, Percutaneous Autologous Bone-Marrow Grafting for Nonunions: Surgical Technique, *Journal of Bone and Joint Surgery*, 2006; 88;322-327
2. Hernigou, P, et al, Percutaneous Autologous Bone-Marrow Grafting for Nonuions: Influence of the Number and Concentration of Progenitor Cells, *Journal of Bone and Joint Surgery,* 2005; 87-A;1430-1437
3. Lieberman JR, Commentary & Perspective on "Percutaneous Autologous Bone Marrow Grafting for Nonunions" by Hernigou P et al, *Journal of Bone and Joint Surgery,* 2005; 87-A; 1430-1437; e*JBJS, July 2005;*
4. Connolly, JF, et al, Development of an Osteogenic Bone-Marrow Preparation, *Journal of Bone and Joint Surgery*, June 1989; 684-691
5. Schuman L; J Bone Joint Surg (Br) 2002;84-B:364-8 Arthroscopic treatment for osteochondral defects of the talus: Results at follow-up at 2 to 11 years