First Metatarsal Head Osteochondral Defect Treatment with Particulated Juvenile Cartilage Allograft Transplantation

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Disclosures

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Our disclosures are in the final AOFAS Mobile App. There is a potential conflict with this presentation due to: Consultant, Zimmer Biomet (GCB)
Introduction

- Osteochondral Defect (OCD): “pothole”
  - Focal area articular damage
  - Pain, decreased motion
  - Can progress to more generalized arthritis

- Cartilage Restoring Procedures: “filling in the pothole”
  - Microfracture
    - Forms fibrocartilage
  - Osteochondral Autograft
    - Require harvest from other site
  - Autologous Chondrocyte Implantation
    - Two stage procedure
  - Particulated Juvenile Cartilage Allograft
Particulated Juvenile Cartilage Allograft

- Particulated
  - “minced” cartilage pieces
- Juvenile
  - greater healing potential
    - more metabolically active
    - denser concentration of chondrocytes
    - less immune response
- Single stage procedure
- Produces hyaline cartilage
Methodology

• Limited consecutive case series
  – three foot and ankle surgeons
• Identified nine patients
  – 2010 to 2014.
• Reviewed patients charts
• F/u office visit and XR
• AOFAS questionnaire
• FFI questionnaire
• VAS pain level
• patient satisfaction survey
Participants

• Patient Demographics
  – 9 patients underwent procedure
  – Age 41 (21-65)
  – 5 females, 4 males
  – Preoperative VAS Score
    **5.75** (3-8) out of 10

• OCD Characteristics
  – Location: 4 central, 2 plantar, 1 dorsal
  – Mean Size: 30 mm$^2$ (16-49)
Follow Up Exam

- Mean **3.3 years** (1.4 – 5.6)
- XR showed mild to moderate joint degeneration
- No patients had first MTP joint tenderness, swelling, clicking, locking, or crepitus on exam
- Mean DF 41.8º (6-70)
- Mean PF 19.9º (10-30)
Patient Outcomes

- No postoperative infections or revision surgery.
- No patients reported any limitations with activities of daily living (ADLs)
- 7 of 9 patients felt no recreational activity limitations
- 8 of 9 patients would repeat procedure
- 7 of 9 “very satisfied”
Outcome Scores

- **Foot Function Index (FFI)**
  - mean score 8.0 (0-30.6) out of 100. Zero is best score.

- **AOFAS Scores**
  - Perfect 100 point scale broken down into:
    - Pain (40), Function (45), and Alignment (15)
    - Pain Score 35.6
    - Function 40.1
    - Alignment 12.3
    - Overall 88 out of 100

- **VAS** decreased
  - 5.75 to 1.2

![VAS Pain Scores Graph](image)
Discussion

• No prior published data on first MTP OCDs treated with particulated juvenile cartilage allograft

• 2012, Kim et al retrospectively compared microfracture with OATS for first metatarsal OCDs
  – Group A: 14 pts, microfx
    • VAS from 6.9 to 3.9, post op AOFAS 73.2
  – Group B: 10 pts, OATS,
    • VAS from 7.4 to 3.4, post op AOFAS 81.5
  – Large defect size >50mm² and subchondral cyst were significant predictors of poor outcomes with microfracture group

• Our average postop VAS score was 1.2 and AOFAS Score was 88. None of our lesions were over 50mm².
Conclusion

• OCDs of metatarsal head
  – Focal articular defect
  – Early detection ideal
  – Prevent progression

• Particulated juvenile cartilage allograft transplantation
  – Viable treatment option with promising patient results
  – At three year follow up, patients satisfied with little pain or activity limitation
  – No clinical or radiographic evidence of disease progression
References

- Shurnas PS. Hallux Rigidus: Etiology, Biomechanics, and Nonoperative Treatment. 2009;14:1-8
- Safran et al. Evidence for Surgical Repair Articular Cartilage in the Knee. JAAOS. 2010;18:259-266
- Easley et al. Osteochondral Lesions of the Talus. JAAOS. 2010;18:616-630
- McNeil DS, Baumhauer JF, Glazebrook MA. Evidence-Based Analysis of the Efficacy for Operative Treatment of Hallux Rigidus. Foot Ankle Int. 2013;34:15
- Bussewitz BW, Macaira MD, Hyer CF. Intermediate-Term Results Following First Metatarsal Cheilectomy. Foot Ankle Spec. 2013;6:191
- IMAGES: Medscape, STAR Physical Therapy, Northwood Foot and Ankle, brucelashleyDPM.com, democratandchonicle.com, Choose Home Now, Ski Caraibes, VAS Pain Scale, yoursightmatters.com, South Florida Sports Medicine, Oni Design, My Foot Clinic