Cryopreserved viable osteochondral allograft for OCD of the capitellum: A case report

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Introduction

- Osteochondritis dissecans (OCD) of the capitellum is a well-known disabling condition of the elbow
- Mechanism of injury
  - Overuse with poor mechanics in overhead sports
  - Acute trauma, although less common
- Lesions can classified as stable or unstable
  - **Stable lesions** can often be managed nonoperatively and are characterized by:
    - open capitellar growth plate
    - localized flattening or radiolucency of the subchondral bone
    - and good elbow ROM at the time of diagnosis
  - **Unstable lesions** often require surgery and are characterized by:
    - closed capitellar growth plate
    - fragmentation seen on imaging
    - and restriction of elbow ROM greater than 20 degrees at the time of presentation
- Operative techniques are determined by size and depth of the lesion.
  - Smaller lesions measuring less than 50% of the capitellar width may benefit from simple arthroscopic debridement, drilling or microfracture.
  - Larger lesions or those with attached subchondral bone, the fragment can be fixed in situ with or without bone graft.
  - Osteochondral autograft transplant has been popularized particularly for large laterally localized lesions higher contact pressures compared to smaller more centrally located lesions.
    - While these grafts have shown to provide benefit, the autografts come along with the risk of donor site morbidity
  - Cryopreserved viable osteochondral allografts (CVOCA) recently became available with a major advantage of being available off-the-shelf without the risk of donor site or harvest complications.
  - CVOCA has been described for articular cartilage repair in the knee, shoulder, and talus however, no prior reports have discussed the use of CVOCA for OCD lesions of the capitellum.
  - Here is a case study of the use of CVOCA (Cartiform - Arthrex Naples, FL) for OCD of the elbow.

Case Study

- Patient is a 15 year RHD male who presented with right elbow pain and decreased range of motion 3 months after crash while BMX racing.
- He reports having immediate pain in the elbow but denied any swelling.
- Over the following months leading up to his initial evaluation the patient states that his pain and range of motion had progressively been getting worse despite conservative treatment including rest, ice, compression and TheraBand exercises.

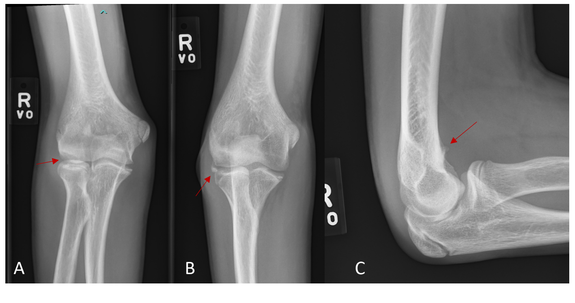

Figure 1: Pre-operative images of the right elbow. (A) AP of the right elbow demonstrating lucency of lateral aspect of capitellum. (B) Oblique of the right elbow showing intra-articular loose body. (C) Lateral of the right elbow demonstrating ossification of anterior aspect of humerus

Operation

- Patient was placed in to the lateral decubitus position
- On arthroscopic evaluation a large boney protuberance on the humerus blocking terminal flexion contacting the coronoid. An osteoplasty was performed to this area and full elbow flexion was re-established.
- Posteriorly, large fragmented loose bodies were found in the posterolateral radiocapitellar area as well as mild gouging of the radial head, likely where the radial head was hitting the lesion during motion.
- The loose fragments were excised and the bed of the lesion was provisionally prepared using a curette to remove poor quality scar tissue.
- The lesion extended laterally beyond the edge of the native cartilage, so it was felt that microfracture or biocartilage type procedures would have poor results. For this reason decision was made to use a cryopreserved viable osteochondral allograft (Cartiform - Arthrex Naples, FL).
- The posterior portals were extended to convert to an open procedure.
- A knotless suture tack and 2 push locks where placed into the bed to secure the implant to the base of the lesion. The elbow was then ranged to ensure stability and no blocks to motion were noted.
- Once stability was confirmed the joint was irrigated to remove any remaining debris and the wound was closed in a layered fashion
- Prior to being taken to postoperative recovery the elbow was placed into a hinged elbow brace.

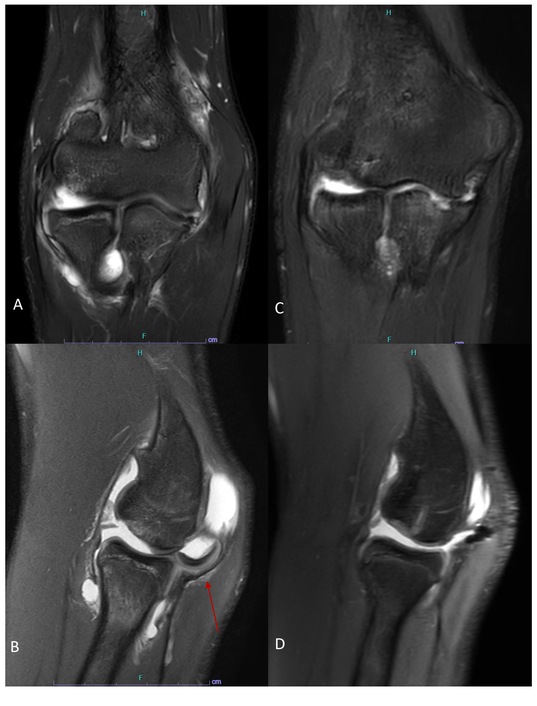

Figure 2: Preoperative operative MRI images of right elbow. (A) pre-operative coronal image demonstrating OCD lesion of capitellum with mild subchondral edema. (B) Pre-operative sagittal image of right elbow demonstrating large OCD lesion with loose body in posterior aspect of elbow. (C) Post-operative coronal image demonstrating improved coverage of capitellum with anchor placement. (D) Post-operative sagittal image demonstrating incorporation of Cartiform graft.

Follow-up

- Patient tolerated the procedure well and started PT immediately post op. He was allowed to begin ROM exercises as tolerated. His post-operative course was uneventful.
- MRI was obtained at 3 months post operatively (figure 2) which demonstrated evidence of incorporation of Cartiform graft to underlying subchondral bone with mild flattening but improved compared to preoperative MRI.
- Six month post-operatively, the patient is pain free with physical therapy and elbow range of motion has improved to 125 degrees of flexion and 5 degrees short of terminal extension.

Discussion

- This case highlights the novel use of a viable off-the-shelf implant for OCD of the capitellum (Cartiform - Arthrex, Naples FL).
- At 6 months post-operatively the patient is pain free with significantly improved range of motion.
- Fresh osteoarticular autograft procedures have been used for the treatment of OCDs with good results however, this comes with the risk of donor site morbidity.
  - Knee donor site morbidity up to 8% with symptoms including knee effusions and knee pain with climbing stairs or heavy lifting
  - Donor site morbidity with rib osteochondral autograft procedures which was around 1.6% however, this comes with the risk of entering chest cavity
- In addition to no donor site or harvest compilations the CVOCA provides several advantages:
  - Two year shelf life, where as a fresh frozen osteoarticular allograft must be used within 14 days
  - More cost effective
- While the cost is similar to particulated juvenile allograft cartilage (DeNovo NT Graft, Zimmer Biomet) the CVOCA has several advantages including:
  - Graft includes a layer of subchondral bone
  - The structural integrity distinct superficial, translational, and radial zones on histological analysis which is felt to provide better long term outcomes.

Conclusion

- This case study demonstrates good short term outcomes of a cryopreserved osteochondral allograft for osteochondral lesion of the capitellum.
- Advantages of this graft include off-the shelf availability, no donor site morbidity, and better cost effectiveness for smaller lesions when compared to osteochondral allografts.
- However, our study is limited to a single case. Future research should include larger cohorts with adequate short, middle, and long term outcomes to assess the viability of these novel grafts for OCD of the capitellum.

References

- Takahara M et al. *J Bone Joint Surg Am* 2007
- Schenck RC et al. *Clin Orthop Relat Res* 1994
- Vangsness CT et al. *J Knee Surg* 2018
- Bexkens R et al. *Knee Surg Sports Traumatol arthrosc.* 2017
- Iwasaki N et al.. A*m J Sports Med*. 2007