Common Complications in Knee Cartilage Surgery

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12th Annual CU Sports Medicine Fall Symposium
September 22, 2017
Objectives

- Brief case-based review to highlight common complications associated with common surgical techniques (MicroFx, ACI, OATs, OCA) treating focal articular cartilage defects of the knee
  - look at how these complications were recognized
  - how they were addressed
  - pearls on how they can be avoided
- Categorization of Complications
  - Technical Factors
  - Patient-Specific Factors
  - Coexisting Pathology
Microfracture Case

- 44 yo female presented to clinic with left knee pain after being involved in an airplane crash
- MRI obtained which demonstrated a 1.9 cm² full-thickness chondral lesion in the lateral aspect of the medial femoral condyle
- Failed 3 month course of physical therapy
Microfracture Case

- Patient underwent arthroscopic microfracture of her left medial femoral condyle with no other pathology noted during her surgical intervention.

- Postoperatively – NWB x 6 wks, with utilization of a CPM, early PT and a medial unloader brace starting at 6 weeks through 6 months.

- At her 6-month post-operative visit she continued to have anteromedial knee pain and a “pinching” sensation with extension.
Microfracture Case

- MRI was obtained at that time which revealed the area of microfracture had failed to reconstitute with fibrocartilage.

- Given her continued symptoms, a discussion was had about further interventions including continued rehab, viscosupplementation, ACI, or getting a second opinion.
## Microfracture Complications

<table>
<thead>
<tr>
<th>Common Complications</th>
<th>Methods of Prevention</th>
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<tbody>
<tr>
<td>Poor defect filling</td>
<td>Ensure appropriate spacing and depth of microfracture holes</td>
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<tr>
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<td>Consider use of adjuvants to help form and maintain a stable clot</td>
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<td>Consider patient age (older have &gt; risk)</td>
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<td>Osseous overgrowth</td>
<td>Avoid errant subchondral bone removal</td>
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<td>Consider increased risk in younger patient</td>
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<tr>
<td>Subchondral fracture</td>
<td>Increased BMI</td>
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<td>Place microfracture holes no closer than 3 mm apart</td>
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Autologous Chondrocyte Implantation Case

- Microfracture patient continued
  - 6 months out from microfracture surgery with continued knee pain
- Repeat MRI with full thickness cartilage defect
PT fail to improve symptoms and ACI performed at 18 months out from index surgery
At 1 year f/u able to perform her normal activities of daily living, but her recreational activities remained somewhat limited

Post-operative MRI showed decent infill but was not full thickness in the most medial aspect

The patient was counseled on continued non-operative and operative measures; she chose to proceed without further intervention
# ACI Complications

<table>
<thead>
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<th>Common Complications</th>
<th>Methods of Prevention</th>
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<tbody>
<tr>
<td>Insufficient regenerative cartilage</td>
<td>Consider patient age (older patients at higher risk)</td>
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<tr>
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<td>Consider membrane used with fixation (periosteal patch carries higher risk)</td>
</tr>
<tr>
<td>Graft hypertrophy</td>
<td>Consider patient age (younger patients have higher risk)</td>
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<tr>
<td></td>
<td>Consider membrane used with fixation (periosteal patch carries higher risk)</td>
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<tr>
<td></td>
<td>Consider location of defect (patellar defects associated with increased chance)</td>
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<tr>
<td>Disturbed/inadequate fusion</td>
<td>Consider fixation technique of cells (matrix carries highest risk)</td>
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<td>Utilization of microfracture concomitantly</td>
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<tr>
<td>Delamination</td>
<td>Use biodegradable bone anchors or limited suture fixation if lesion is uncontained</td>
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<td>Limit weight bearing for at least 8 to 12 weeks</td>
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Osteochondral Autograft Transplant

- 24 yo female with 1 yr of superolateral right knee pain
- Previously a Division I collegiate gymnast who sustained an anterior horn lateral meniscus tear and small, focal lateral femoral cartilage defect from a dismounting injury at the age of 19
- Underwent an arthroscopic surgery by her team surgeon who did a partial lateral meniscectomy and microfracture of her 1.5 cm² cartilage defect
- Cartilage defect did not fill in over the proceeding months and she continued to have persisting lateral knee pain with weight bearing
OAT/Mosaicplasty Case

- 2nd treating surgeon performed an OAT procedure 14 months later; taking two 10 mm diameter donor plugs from her lateral trochlea
- She recovered from this surgery and was able to continue as a competitive collegiate gymnast
- 2 years later due to crepitance and pain in the superolateral aspect of her knee with walking downhill, squatting, and prolonged periods of sitting
- Examination revealed crepitus with range of motion and tenderness to palpation over the superolateral aspect of her trochlea, near her previous donor sites
OAT/Mosaicplasty Case

- MRI was performed:
  - Showed incongruity and hypertrophy of the cartilage surface from her donor sites with a small amount of cystic change in the subchondral bone
  - OAT grafts in the lateral femoral condyle appeared to have incorporated well into the surrounding bone with congruent cartilage surfaces
Presenting symptoms due to donor site morbidity and she was offered an arthroscopic debridement of this area versus a trial of physical therapy; she opted for the former.

Postoperatively the patient’s symptoms improved and she was able to return running, hiking and skiing.
# OAT/Mosaicplasty Complications

<table>
<thead>
<tr>
<th>Common Complications</th>
<th>Methods of Prevention</th>
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<tr>
<td>Donor site morbidity</td>
<td>Minimize size of graft taken as able</td>
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<td>Take as few grafts as possible</td>
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<tr>
<td></td>
<td>Take graft from far lateral, far medial aspects of trochlea versus lateral aspect of</td>
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<tr>
<td></td>
<td>intercondylar notch</td>
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<tr>
<td>Donor-to-receipient mismatch</td>
<td>Ensure harvester is perpendicular to the donor site to achieve congruency at the</td>
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<tr>
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<td>donor-plug interface</td>
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<td>Make sure the defect site is prepared to the appropriate depth to prevent subsidence</td>
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<td>or an 'unbottomed' graft</td>
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<td>Impact the graft until it is flush with the surrounding cartilage surface; do not</td>
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<td>leave it proud</td>
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<tr>
<td>Graft fracture/Chondral injury</td>
<td>To avoid graft fracture do not toggle the harvester. Once the appropriate depth has</td>
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<td>been reached during graft acquisition rotate the harvester 180 degrees to cut and</td>
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<td>disengage the graft.</td>
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<td>During seating of the graft into the defect, employ a greater number of impacts with</td>
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<td>a tamp with low force to reduce chondrocyte damage and cell death.</td>
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<td>Hemarthrosis</td>
<td>Take the smallest size and number of grafts as possible</td>
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<td>Consider placing the recipient bone plug into the donor site defect or fill with</td>
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<td>cancellous allograft chips or other biocompatible material</td>
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29 yo male rugby player presented to clinic with a history of 3 right knee surgeries including microfracture, partial medial menisectomy, and OCA to the medial femoral condyle over a 6 year time period.

Approximately 10 months after his OCA surgery he developed an abrupt deterioration of his knee function with significant pain and recurrent effusions.
This failed OCA of the medial femoral condyle was felt to be secondary to varus malalignment of the lower extremity.

An opening wedge, valgus producing high tibial osteotomy (HTO) was conducted with revision of the medial femoral condyle cartilage defect using OCA.
He progressed well in the post-operative period and at most recent follow-up had returned to running without pain.
## OCA Complications

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<tbody>
<tr>
<td><strong>Graft Overload</strong></td>
<td>Obtain long-alignment x-rays and address malalignment of the lower extremity prior to cartilage restoration procedure</td>
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<td>Harvest graft from allograft condyle in a location corresponding to defect in native knee</td>
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<td>Maintain orientation of graft and trim edges as needed to match depths of native recipient site</td>
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<td><strong>Allograft Fragmentation</strong></td>
<td>Taper edges of graft</td>
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<td>Dilate recipient site</td>
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<td>Avoid use of mallet or excessive force</td>
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<td>Use fresh allograft</td>
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<td><strong>Early Loosening</strong></td>
<td>Utilize press-fit technique</td>
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<td>Develop adequate visualization</td>
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<td>Maintain perpendicular orientation to articular surface, during prep and graft harvest</td>
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<tr>
<td><strong>Subchondral Collapse/Non-union</strong></td>
<td>Drill 'healing holes' into the recipient bone bed</td>
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<td>Consider use of biologics to stimulate incorporation, healing, and bony ingrowth</td>
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<td>Bone graft subchondral cysts prior to insertion of OCA</td>
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<td>Restrict patient from high-impact activities for up to one year following procedure</td>
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Conclusions

- No single best surgical strategy exists to treat cartilage defects
- Important to know the Common Complications associated with each surgical technique, as these too can play a role in patient education and decision making

Clinical Work-Up:
- Hx – recurrent/persisting pain, +/- mechanical symptoms, +/- effusions.
  - Know prior surgical history
- Imaging – MRI & Long alignment films

Reasons for Complications Varied:
- Technical Factors – choice of procedures, choice of product, excessive force
- Coexisting pathologies - malalignment, ligamentous, meniscal injury
- Patient-Specific Factors – comorbidities, compliance
Thank You!
References


References

47. LaPrade RF, Botker JC. Donor-site morbidity after osteochondral autograft transfer procedures. Arthroscopy 2004;20:69-73.
References