Evaluation & Treatment of the Injured Athlete
Autograft OATS versus Osteochondral Allograft Technique: Indications, Problems, Outcomes

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DISCLOSURES

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- Vericel: Consultant
- Samumed: Consultant
- Cartiheal: Consultant
- Flexion: Consultant

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Board member:
- International Cartilage Repair Society (Treasurer)
- German Arthroscopy Society (AGA) Chair: Research Committee
Current treatment algorithm for the treatment of osteochondral lesions in the knee

Focal Chondral Defect

Femoral Condyle
- Malalignment
- Meniscal Deficiency
- Ligament Insufficiency

Patellofemoral
- Rehabilitation
- Patellofemoral Alignment

< 2-3cm²

Primary Treatment
- Microfracture ++
- ACI +/-
- OC Autograft n.a.
- OC Allograft ++

Secondary Treatment
- ACI +
- OC Autograft +
- OC Allograft+

> 2-3cm²

Primary Treatment
- Microfracture +/–
- ACI +/–
- OC Autograft n.a.
- OC Allograft n.a.

Secondary Treatment
- ACI +
- OC Autograft +
- OC Allograft +

Lattermann, Cole et al. Orthopaedics 2006

< 2cm²

> 2cm²
Indication for osteochondral grafts:

First or second line treatment for deep osteochondral defects or OCD lesions

Second line treatment for failed chondral defect treatment such as microfracture, ACI, DeNOVO, Trufit, biocartilage etc.

AVN

Posttraumatic defects

Limited role in PF joint
OCD lesion
AVN lesion
Posttraumatic defects
Failed primary or secondary procedures
Considerations Allo vs Auto:

<table>
<thead>
<tr>
<th><strong>Initial Arthroscopy is important:</strong></th>
<th><strong>Patient discussion about allografts:</strong></th>
<th><strong>Availability:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>● Verify lesion size and location:</td>
<td>● Current risk of disease transmission:</td>
<td>○ Can my patient wait? Allo vs Auto!</td>
</tr>
<tr>
<td>● Bigger than 2cm²</td>
<td>● e.g. Hepatitis C ~ 1/1750.000</td>
<td>○ What is my personal wait time for allografts</td>
</tr>
<tr>
<td>● Deep lesions (ie. AVN or deep OCD)</td>
<td>● HIV ~ 1/1.5 million</td>
<td></td>
</tr>
<tr>
<td>● Verify technical barriers:</td>
<td>● bacterial infection (non confirmed through CDC to date)</td>
<td></td>
</tr>
<tr>
<td>● Assess compartment (UKA needed?)</td>
<td>● Donor tissue is <strong>fresh tissue</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Insurance</strong></td>
</tr>
</tbody>
</table>
Indication for osteochondral grafts:

**Autograft:**
- First line treatment for small deep osteochondral defects or shallow OCD lesions (1-22cm)
- Second line treatment for small failed chondral defect treatment (microfracture)
- Limited role in PF joint

**Allograft:**
- Chondral or osteochondral condylar defects
- OCD lesions (any size)
- AVN
- Posttraumatic defects
- Failed primary or secondary cartilage procedures
- Currently just experimental in PF joint
Autograft - Technique:

**Usually Arthroscopic Technique:**
- **Advantage:**
  - Minimally invasive
  - “Same day technique”
  - Very benign technique for one plug
- **Disadvantage:**
  - “A lot harder than it looks”
  - Multiple plugs becomes very tricky due to curvature and anchoring
  - Harvest on lateral or medial trochlea is very difficult arthroscopically, often requires small incision
  - Size limitations

**Problem with the anchor**

**Problem with the surface**
## Technique and Instrumentation:

<table>
<thead>
<tr>
<th>Defect preparation:</th>
<th>Graft preparation:</th>
<th>Grafting:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify defect area and check for accessibility</td>
<td>1. Identify donor area and check for accessibility</td>
<td>1. Insertion of the donor plug into graft delivery tube</td>
</tr>
<tr>
<td>2. Position portal to allow for perpendicular access</td>
<td>2. Position portal or make small arthrotomy</td>
<td>2. Placement of graft delivery tube into defect</td>
</tr>
<tr>
<td>3. Insert graft harvester</td>
<td>3. Insert graft harvester</td>
<td>3. Carefully tapping of graft into defect</td>
</tr>
<tr>
<td>4. Carefully tap the recipient harvester to 10mm depth checking for perpendicular alignment</td>
<td>4. Carefully tap the donor harvester to 10mm depth checking for perpendicular alignment</td>
<td></td>
</tr>
<tr>
<td>5. Remove recipient plug</td>
<td>5. Remove donor plug with 180 degree twist</td>
<td></td>
</tr>
</tbody>
</table>
## Clinical Outcomes:

<table>
<thead>
<tr>
<th>Study</th>
<th>Characteristics</th>
<th>Pertinent findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krych AJ et al. JBJS. 2012</td>
<td>n=48; 5 years f/u</td>
<td>30+ point improvement in IKDC Equal to MF but better than MF in Marx at 5 years</td>
</tr>
<tr>
<td>Nho SJ et al., AJSM 2008</td>
<td>n=22; 2.5 years f/u</td>
<td>Patellar lesions: ~30 point improvement on IKDC No sig. differences if combined with realignment(?)</td>
</tr>
<tr>
<td>Ma HL et al, Injury 2004</td>
<td>n=18; 3.5 years f/u</td>
<td>89% success rate Lysholm 47=&gt; 92 Tegner 2.2 =&gt; 6.1</td>
</tr>
<tr>
<td>Gudas et al, Arthroscopy 2013</td>
<td>n=102; 3 years f/u</td>
<td>ACL alone&gt; ACL + OAT &gt;ACL+ MF=AC+Debridement</td>
</tr>
<tr>
<td>Gudas et al, AJSM 2012</td>
<td>n= 60; 10 years f/u</td>
<td>14% failures of OAT patients vs 38% in MF patients 75% of OAT group maintained activity level</td>
</tr>
<tr>
<td>Ollat D, Orthop Traumatol Surg Res 2011</td>
<td>n=142; 8 years f/u</td>
<td>81 % satisfied Overall IKDC and Hughston score still improved</td>
</tr>
<tr>
<td>Gudas, J Pediatric O 2009</td>
<td>n=50 children; 4 years f/u</td>
<td>No failures in Oat group 41% failures in MF group</td>
</tr>
<tr>
<td>Gudas et al, KSSTA 2006</td>
<td>n=57; 36 mos f/u</td>
<td>OAT &gt; MF; 52% rtp for OAT HSS score: 78 =&gt; 91</td>
</tr>
</tbody>
</table>
Allograft Technique:

**Single-OAT Press-fit Technique:**
- **Advantage:**
  - quick
  - 2.5-4 inch incisions
  - Lack of hardware
- **Disadvantage:**
  - Goes from easy to very difficult if lesion oblong or larger than 30mm
  - One attempt to insert the graft

**“Snow man-Technique”**
- **Advantage:**
  - Can cover large oblong defects
  - Possible press fit
  - More precise than free hand
- **Disadvantage:**
  - Technically challenging
  - Danger of destroying graft
Allograft Technique (cont.):

“Free hand” shell Allograft:

- **Advantage:**
  - Can cover all sizes and shapes of defects

- **Disadvantage:**
  - Usually requires hardware

*Courtesy: William Bugbee*
Sizing

Sizing films (or MRI/CT scan)

Size it yourself or trust someone who you have supervised or double checked

Sizing technique:

- subchondral width of tibial plateau
- width of femoral condyle (OCD)  
- Consider sizing the opposite side
Instrumentation:

1. Assess location of defect on knee
2. Mark defect area on graft
3. Orient graft in lunar module
4. Hollow drill graft (irrigate!)
5. Cut subchondral bone as thin as possible (6-8mm)
6. Irrigate with:
   1. Saline for articular cartilage
   2. Bacitracin for subchondral bone

Available Instrumentation

Lunar module (Arthrex)

“Allograft Chondral Transplant” (MTF)
## Clinical Outcomes:

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</tr>
</thead>
<tbody>
<tr>
<td>Garrett JC, CORR 1994</td>
<td>n=17; 2-9 years f/u</td>
<td>16/17 grafts survived at 2-9 years</td>
</tr>
<tr>
<td>Flynn JM, CORR 1994</td>
<td>n=17; 4.2 years f/u</td>
<td>12/17 “survived”</td>
</tr>
</tbody>
</table>
| Ghazavi MT, JBJS 1997        | n=126; 7.5 years f/u | 85% success rate (HSS score)  
KM Curve: 95% at 5, 71% at 10; 66% at 20 |
| Chu et al CORR 1999          | n=55; 75mos fu   | 84% unipolar g/e  
50% bipolar g/e |
| Emmerson BC, AJSM 2007       | n=66; 7.7 years f/u | 72% g/e, subjective fx: 3.4/10 => 8.4/10 |
| Williams RJ, JBJS 2007       | n=19; 48 mos f/u | ADL scale 50 => 70  
SF-36: 51 => 66  
inl MRI at 25 mos 18/19 grafts |
| McCullough PC, AJSM 2007     | n=25; 35 mos f/u | Lysholm 39=>67; IKDC 29 =>58  
84% satisfied, 88% radiographically incorporated |
| Laprade RF, JBJS 2009        | n=23; 3 year f/u | IKDC 52 => 68.5  
22/23 radiographically incorporated |
| Goertz S, CORR 2010          | n=28; 25 mos f/u | AVN lesions 89% survival  
IKDC fx 60 => 87 |
Clinical Outcomes

• Allografts Femoral Condyle:
  – 60-80% g/e (lower in bipolar cases)
  – Clinically meaningful improvements of subjective outcomes (Chahal J, Arthroscopy 2013)
  – Survival:

• Success in:
  – AVN
  – OCD
  – OA
  – Tibial plateau fractures

• Patella:
  – Questionable / experimental
Tips and tricks:

**General tips:**
- **Measure your defect size carefully:**
  - if at all under-measure by 1mm
  - Pay attention to orientation
- **Protect the graft!!!**
  - Irrigate
  - use extra blue basins
  - drop barriers
- **Do not pound the graft in!**
  - Thumb pressure
  - very gentle taps with the oversized tap at most
- **Cut subchondral bone as thin as possible**

**Tricks:**
- **Drill deep enough to get to healthy bone**
- **Fill cyst and deep bony lesions with autograft**
- **How to get the graft back out?**
  - Get some dental picks
  - Try to make a small hole on the lateral or medial condyle and tamp it out.
  - Do not try to pry it out using an osteotome
- **Smaller lesions in smaller condyles can accommodate grafts that are oversized better than larger condyles or larger lesions**
- **Never discard any of the Allograft before the defect is successfully filled!**

Kang RW, AJSM 2010
Tips: Location / Approach:

Mini-Arthroscopy:
- **Advantage:**
  - Low morbidity
  - 2.5-4 inch incisions
  - Excellent access with Z-retractors
- **Disadvantage:**
  - LFC (far medial) or MFC (far lateral) lesions are difficult to visualize
  - May require 1-2 mm patella edge resection
  - Access to posterior condyle

Extensive Approach (TKA):
- **Advantage:**
  - Excellent visualization
  - Patella out of way
- **Disadvantage:**
  - Morbidity
  - Access to posterior condyle

Collateral ligament or meniscus take down:
- **Advantage:**
  - Excellent visualization of posterior condyle
  - Useful for shell allografts
  - Access to tibia
- **Disadvantage:**
  - Ligament take down, meniscus take down