The Athlete and Cartilage Repair: Decision-Making

Brian J. Cole, MD, MBA
Professor, Vice-Chairman, and Managing Partner
Department of Orthopedics
Chairman of Surgery, Rush OPH
Section Head, Rush Cartilage Restoration Center
Team Physician, Chicago White Sox and Bulls

I (and/or my co-authors) have something to disclose.

Detailed disclosure information is available via:

The course syllabus, or

AAOS Disclosure Program on the AAOS website at http://www.aaos.org/disclosure

Think before you treat…..

Excellent results w/o treatment at 15 years and no different than C/L knee

Impact of Co-morbidities

Will sports participation make it worse?

Average of 76 Marathons over 19 years

Non operative
- Acute onset
- Performance maintained
- Performance compromised but last contract/academic yr

Operative
- Performance impaired
- Failed non-op
- Early “long money”
- Red shirt remaining

Scholarship? Contracts? $$$$$

So…who gets what?
Things to consider...

- The least amount one can do to make them better
- Fastest recovery
- Endure anticipated sport and loads
- Avoid revision and not burn bridges
- Extra articular option

Manage Expectations

MCID? Well enough to RTS?

Treatment Options

How I Decide

Debridement
- 1st line In-Season Athlete
- Lower demand-level
- New onset mechanical sx’s

MST
- 1-2 cm² 1st line Tx without SC change

Biocartilage
- 2-4 cm² 1st line Tx

OATS
- 1-2 cm² 1st line high demand

ACI
- PF larger (> 2 cm² primary tx)

OAG/MAT/Prochondrix
- PF Joint…other… > 2 cm²

What really happens….

Debridement
Microfracture +
OAG/MAT
Osteotomy
The Fate of Patients who Do Not Undergo Implantation Following Biopsy for Future ACI
Campbell KA, Cvetanovich G, Tilton A, Smith M, Scalise N, Riboh J, Cole BJ, Yanke A

<table>
<thead>
<tr>
<th>Year</th>
<th>Patients Biopsied</th>
<th>Implanted</th>
<th>Met Inclusion</th>
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<tbody>
<tr>
<td>2008-2012</td>
<td>264</td>
<td>90</td>
<td>54</td>
</tr>
<tr>
<td>44</td>
<td>Not Implanted</td>
<td>174</td>
<td>44 met inclusion</td>
</tr>
<tr>
<td>61%</td>
<td>Met Inclusion</td>
<td>90</td>
<td>54 met inclusion</td>
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</tbody>
</table>

2008-2012

- 44% Not Implanted with 61% reporting symptom relief
- Younger (<20), Short Duration (<20 Mo), Smaller <2.7 cm

Case Example
FCD in NBA Player

**History**
- 31 yrs Old NBA
- Able to play, but swelling compromises performance
- Injections helped initially
- In-season and has 1 year left until free-agency

**What was done…**

- RTP in 3 weeks
- 3 years out
- Veteran contract

Case Example
Female D1 Basketball

**History**
- 21 yo D1 Senior 1st round draft pick in 5 mo WNBA
- R lateral WB pain/swelling
- Failed 4 wks rest and IA injection
- Cannot play

**Microfracture**

- 83% RTS at 9 months
- 75% RTP equal to all ortho procedure RTP
- 66% RTS at 8 months

Case Example
Female D1 Basketball

**History**
- 21 yo D1 Senior 1st round draft pick in 5 mo WNBA
- R lateral WB pain/swelling
- Failed 4 wks rest and IA injection
- Cannot play
What was done....

- Lateral Meniscectomy
- Defect Debridement
- Loose Body

What was done....

- Microfracture

How she did....

- 8 mo before felt well enough to RTP
- 1 year contract in Europe
- 3rd year WNBA

Autologous Chondrocyte Implantation

- 73% RTS
- Stop-start sports difficult

RTP > 75%

Osteochondral Allograft “My Go-To”

Knee
- Talus
- Shoulder
- Elbow
- Hip
- Other

AJSM, 2015

Activity-Related Outcomes of Articular Cartilage Surgery: A Systematic Review

Peter G. Callahan, MD, lslt Vianen, J., R. K. Cher, J., N. D. Hailes, R. G. T., and Brias J. Col, M. H. M. A.

Cartilage, 2015

AJSM, 2011

Osteochondral Allograft Study of Long-Term 11% Knee Outcome After Microfracture Versus OATS in Knee Articular Cartilage Defects 2017

How she did....

- OATS 96% vs Microfracture 52%
- OATS 12 mo vs MFx 7 mo
- ACI > MFx PROs
- ACI deteriorated after 2 yrs

AJSM, 2017

RTP > 75%

OATs, 2012

AJSM, 2012

OATs
**Case Example NBA Forward**

**History**
- 28 yo 6’9” NBA player
- Prior ACL, Lmy, Micrfx
- Continued pain/swelling
- Known trochlea/MFC FCD
- Cannot play

**2.5 Years Later**

**What was done....**

**OAG TF Joint**
- 29% return to full duty
- 42% could not return due to knee
- 2 (7.4%) RTS at pre-injury level

**Allograft Frenzy**
- BioCartilage (Arthrex)
- DeNovo NT
- Cartiform - Cryopreserved (Arthrex)
- Prochondrix-Fresh (AlloSource)
- Pre-shaped OCA/"BioUni"

**Case Example Olympic Wrestler**
- 29 yo 130 lb wrestler
- 1 year knee pain
- Prior debridement
- Unable to compete
Case Example
Olympic Wrestler

- MST Lateral Tibia
- DeNovo LFC
- 1 year recovery time

Case Example
2012 Olympic Alternate

Case Example

- 24 yo NFL lineman in contract year
- Years of medial pain
- Unable to continue

Defect Evaluation

What was done....
Drill/Biocartilage/BMAC

One year later
Clinical Reality

- Alignment
- TTO/DFO/HTO
- Instability
- Articular/Meniscal Deficiency

Post-Mensiscetomy Demise
Uncommon but not rare

- Intra op Index R MM tear
- Intra op 6 mo s/p MMy

What she got....

- Ran her 1st marathon at 12 months
- Avoiding tennis
- No pain
- Feels “achy” on occasion

OAG & MAT

- OCA @ 5 yrs 86% SR
- OCA + MAT @ 3 yrs 86% SR

How she did....

- Ran her 1st marathon at 12 months
- Avoiding tennis
- No pain
- Feels “achy” on occasion

Return to Sport

- 3 Level IV studies, 39 athletes
- HS, collegiate and professional
- Cumulative RTS = 75-85%

OAG & MAT

- Outcomes of Osteochondral Allograft Transplantation With and Without Concomitant Meniscus Allograft Transplantation
  - A Comparative Matched Group Analysis

Return to High-Level Sport After Meniscal Allograft Transplantation

Arthroscopy 2013

Knee Surg Sports Traum 2015
MENISCAL TRANSPLANTATION WITH A HIGH TIBIAL OSTEOOTOMY: A BIOMECHANICAL ANALYSIS
Geoffrey S. Van Thiel, MD/MBA, Rachel M. Frank, BS, Arman Gupta, MD, Neel Ghodadra, MD, Elizabeth Sherman, PhD, Bernard R. Bach, MD, Nikhil N. Verma, MD, Matthew T. Provancher, MD, Brian J. Cole, MD/MBA

**Graph:**
- Medial Compartment Peak Contact Pressures
  - Intact
  - Transplant
  - Meniscectomy
  - 6º varus
  - 3º varus
  - Neutral
  - 3º valgus
  - 6º valgus
  - 8º valgus

**Observations:**
- HTO with MAT better than either in isolation
- Correction to 3º of Mech Valgus Maximal Benefit
- HTO valuable with neutral to valgus

**Table:**

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<th>Condition</th>
<th>Peak Contact Pressure (kg/cm²)</th>
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<tbody>
<tr>
<td>Intact</td>
<td>40</td>
</tr>
<tr>
<td>Transplant</td>
<td>50</td>
</tr>
<tr>
<td>Meniscectomy</td>
<td>30</td>
</tr>
<tr>
<td>6º varus</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>3º varus</td>
<td>P &gt; 0.05</td>
</tr>
<tr>
<td>Neutral</td>
<td>P &gt; 0.05</td>
</tr>
<tr>
<td>3º valgus</td>
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**24 y.o. MLS Forward**

**24 y.o. MLS Forward**

** RTS after Osteotomy**
- Mean F/U 65.4 mo
- 78.6% RTS equal or higher level
- 90% RTS within 1-year

**PF Overview**
- Correct Diagnosis
- Maximize non-op tx
- Debridement first
- TTO (respect TT-TG/PCL)
  - Patella
  - Central/Lateral Trochlea
- Restore
  - Small: Microfracture/Surface Allograft
  - Large: ACI and OAG
  - Revise: OA Graft

**Clinical Outcomes of Patellofemoral Osteochondral Allograft Transplantation: A Prospective Analysis**
Cotter EJ, Wischmier D, Frank RM, Farr JB, Cole BJ
- 14 patients
- 32.8 ± 7.5 years
- F/U: 3.6 ± 1.8 years
- # of prior surgeries 4.1 ± 3.5
- 8 T; 6P; 2 BP
- 2/14 failures
- All others met PRO MCIDs
Post Op Care

- Chondrosis is often incidental
- Observe (inject?) for those who can tolerate
- S-T solutions (i.e. debridement) for those who cannot tolerate
- L-T solution if fail S-T solution (OAG!)

Summary

- Younger, smaller, shorter duration of symptoms

1st Annual AOSSM OLC Biologics/US Course
October 13-13, 2018
Chicago, IL

1st Annual AANA Practice Management Course
November 8-9, 2018
Chicago, IL

20th Annual AANA/AOSSM/AAO Ski Course
January 30-February 3, 2019
Park City, Utah