OCD: Beyond Microfracture

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OCD Talus: My Approach

Dictated by:

• Symptoms of the patient
• Mechanism of injury
• Size of the lesion
• Containment of the lesion
• Previous treatment of the lesion
• Corresponding damage to the tibia
Outcomes: Microfracture OLT

Tol JL et al. 2000
– Meta-analysis 32 studies; 1966-1998
– Success of OLT surgeries:
  • Excision, curettage, drilling: 85%
  • Excision, curettage: 78%
  • Excision alone: 38%

Results: OFAC

• Retrospective review of 189 patients
• Arthroscopy + Microfracture
• MRI used to determine size
• Review of clinical outcomes (37 mo avg)

Results: OFAC

• Direct correlation of size to outcome
• Linear relationship of size of lesion to outcome
• MRI changes may persist longer than expected
Results: OFAC vs Tol

- Average lesion size in Tol = 7 mm
- OFAC results deteriorated after > 1 cm
- Maybe size does matter
- Strategy has to be size dependent
- CRITICAL SIZE DEFECT

Critical Defect Size

Choi et al:
- 120 ankles with talus microfracture
- Failure defined as:
  - Repeat surgery
  - AOFAS < 80 (fair or poor result)
- Defect size > 150 mm² (7 mm)
  - 80% failure rate (p < .001)

They call it medical practice for a reason ....

1 year post microfracture of 1 x 1.5 cm OCD
Scope, Drilling OCD Talus

10 x 15 mm lesion

One Year Later With our Patient ...
Disappointment

• Pain initially was better but now has come back
• Swelling
• Does not feel ‘right’
• Complication: Failure to achieve long term clinical success for our patient

Why did it fail?

• Size of the lesion - maybe
• Access to lesion
  – Don’t think so
• Bone support
  – Don’t think so but ...
• Limitation of microfracture
I Believe That ....

Quality of Repair Matters:
- Quality of the cartilage repair is at least part of the reason that size matters
- I focus on critical size defects for my advanced cartilage restoration
- Lesions between 1.0 – 2.0:
  - Particulated cartilage grafting
- Lesions > 2.0
  - Osteoarticular reconstruction

Juvenile Cartilaginous Allograft Tissue

- Particulated cartilage with viable cells
- Secured into chondral defects with fibrin
DeNovo NT Graft Talus Study

Purpose:
• Evaluate mid-term outcomes of DeNovo NT Graft for the treatment cartilage lesions in the talus

Hypothesis:
• DeNovo NT Graft provides good clinical outcomes in a challenging patient population

Study Design
• Retrospective and prospective
  — All cases of ankle DeNovo NT Graft included
• Single-arm, multi-center

5 study centers
• 24 patients
• FAAM, AOFAS, VAS Pain (100mm), SF-12, Pt Satisfaction
Large Lesions

<table>
<thead>
<tr>
<th>Containment</th>
<th>Full</th>
<th>6 (27%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 to 99%</td>
<td>11 (50%)</td>
<td></td>
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<tr>
<td>50 to 74%</td>
<td>5 (23%)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Bone Removal</th>
<th>None</th>
<th>4 (17%)</th>
</tr>
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<tbody>
<tr>
<td>Osteotomy</td>
<td>12 (50%)</td>
<td></td>
</tr>
<tr>
<td>Plafondplasty</td>
<td>8 (33%)</td>
<td></td>
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<table>
<thead>
<tr>
<th>Lesion Size (mm²)</th>
<th>125 ± 75 (range, 50 to 300)</th>
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<tbody>
<tr>
<td>Lesion Depth (mm)</td>
<td>7 ± 5 (range, 3 to 20)</td>
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Coetzee et al. FAI 34(9), 2013

Results at ≥ 12 months

Average Outcome Scores @ Final F/U

- 78% of ankles demonstrating good to excellent scores (AOFAS ≥ 80)

Coetzee et al. FAI 34(9), 2013

Results at ≥ 12 months

<table>
<thead>
<tr>
<th>Re-Operation Reason</th>
<th># Re-Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of symptomatic or failed osteotomy hardware</td>
<td>5</td>
</tr>
<tr>
<td>Anterior Impingement</td>
<td>1</td>
</tr>
<tr>
<td>Partial Graft Delamination (full revision) (~25% of graft)</td>
<td>1</td>
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Coetzee et al. FAI 34(9), 2013
Juvenile Articular Cartilage
Saltzman et al (2017):
• Systematic review
  – Total of 32 patients
  – Level IV and V evidence
  – Mean OCD size 117.8 mm²
• Substantial clinical improvement
• No implant related adverse events
• Only one conversion to bulk allograft

Autologous Chondrocyte Implantation (ACI)
• First clinical use 1994 (knee)
• Implantation of in vitro cultured autologous chondrocytes
• Expansion of chondrocytes
• Re-implanted using a periosteal tissue cover

Cell Preparation
• Scope or open harvest of donor chondrocytes
• Processed to remove interstitial matrix and expand chondrocytes in the millions
• Reimplantation
Results ACI

- 29 OCD talus treated with ACI
  - 23 medial: 6 lateral failed micro#
  - Mean size of 18 x 11 mm
  - Average follow up 70 months
  - 86% had second look scope
- Improvement in all parameters tested:
  - Tegner, Finsen, AOFAS

ACI for Talus Defect

Case: 33 year old male
- Large lateral lesion
- Microfracture in 2007
- Repeat MRI in 2009
- Edema improved but still symptomatic
- Arthroscopy, biopsy and plan for ACI

One Year: ACI for Talus OCD
I Believe That ....

Subchondral Injury is Important:
- We have not focused enough on this side of the problem
- Micro# does not treat this part

Correlation of MRI Edema and Outcomes after Micro#

Cuttica, Berlet et al (2011):
- 30 patients at an avg of 9 mo post op
- Talus edema classified as none, mild, moderate or severe on MRI
- Those with moderate or severe edema had poorer clinical outcome

Subchondral Bone and Micro#

Reilingh ML et al (2016):
- Dimensional changes and bony healing of talar OCD after microfracture
- 58 patients with OCD talus / micro#
- CT scans obtained at:
  - Baseline, 2 weeks, 1 year
- 3 dimensional changes / bone healing
Bone Healing is Poor
Reilingh ML et al (2016):
• OCD increased in size in all directions at 2 week evaluation
• Only dimension to decrease significantly at 1 year was depth
• 14/58 were ‘well’ healed
• No difference in AOFAS / NRS pain found between well and poorly healed

Can We Avoid Microfracture?
Chu et al (2018):
• Hypothesis: BMC without microfracture improves cartilage repair compared to microfracture alone
• Equine model
• Paired chondral defects were randomly assigned:
  ➢ BMC without microfracture
  ➢ Microfracture alone

BMA vs BMC
• Culture expanded cells from BMA underwent cartilage differentiation in vitro
• Freshly isolated cells from BMA did not undergo cartilage differentiation
  ➢ This questions the role of BMA aspiration and immediate injection into articular environment
**1 Year: BMA vs Microfracture**

- Cartilage repairs in both groups were fibrous to fibrocartilaginous with no differences seen between groups
- Morphological MRI showed:
  - Detrimental subchondral bone changes with microfracture
  - Improved overall outcomes for BMA group without subchondral damage

Chu CR, Fortier LA et al: JBJS 100-A(2), 2018

**Unanswered Questions**

- Can we treat the cartilage deficiency without treating the bone?
- Does BME matter?
- Can we treat BME without treating the cartilage deficiency?

**Cartilage Resurfacing: 2018**

- < 1.0 cm = Microfracture is still the gold standard
- Gap Strategy
  - 1.0 – 2.0 cm = Particulated cartilage
  - > 2.0 cm = Osteoarticular options
- Evolving evidence to watch: BMA and treatment without compromising subchondral plate