Length of Symptoms and Smoking: Differences in Athletic and Non-athletic Candidates for Cartilage Surgery

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Disclosures

• David Flanigan, MD
  – consultant for and receives research support from Vericel, Zimmer, and Smith and Nephew
  – consultant for ConMed-MTF and DePuy Mitek
  – receives research support from MTF, Histogenics, Aesculap, Cartiheal, Anika Therapeutics, and Moximed

• Robert Magnussen, MD receives grant support from Biomet
Background

• Athletes with symptomatic knee cartilage defects tend to have improved outcomes following cartilage restoration procedures compared to non-athletes.

• It has remained unclear whether there are intrinsic differences in lesion chronicity, size, grade, or location between these two populations that may also affect clinical outcomes.

• Similarly, though tobacco use has a likely negative effect on cartilage restoration outcomes, it is unclear whether tobacco use rates differ between athletes and non-athletes that meet cartilage restoration criteria.
Methods

- Age-matched athletes (n=186) and non-athletes (n=159) age 40 or less (mean 29.7 SD 6.6 years) with BMI 35 kg/m² or less (mean 26.8 SD 4.1) and <50% joint space narrowing on weight bearing x-rays were included
- All patients had a symptomatic Outerbridge grade 2 or higher cartilage defect visualized during knee arthroscopy
- The relationship between athletic status and chronicity of knee symptoms prior to surgery as well as tobacco use status, cartilage defect Outerbridge grade, size, and location at time of surgery were characterized

Inclusion Criteria

- Age less than 40 years and body mass index 35 or less
- Patient underwent knee arthroscopic surgery between 2007-2013
- Concomitant ligament and/or meniscus injuries permitted
- Symptomatic Outerbridge grade 2 or higher focal cartilage defect on diagnostic arthroscopy
- Kellgren-Lawrence grade 2 or less and less than 50% joint space narrowing on weight bearing flexion posterior-anterior knee radiographs
- Athletes and non-athletes permitted. Athletic status defined as regular participation in sporting activities 3 or more days per week
- Non-athletes age-matched to athletes
Results: Smoking, BMI, and Symptoms

- Compared to athletes, non-athletes were more likely to:
  - *Smoke tobacco* (31% versus 12%, p<0.001)
  - *Have a higher BMI* (27.6 kg/m\(^2\) SD 4.4 versus 26.2 SD 3.6; p=0.005)

- Duration of symptoms prior to surgery was shorter among athletes (median 104 days versus 282 days for non-athletes, p<0.001)

<table>
<thead>
<tr>
<th></th>
<th>Athletes (n=186)</th>
<th>Non-athletes (n=159)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>29.4 SD 6.1</td>
<td>29.9 SD 7.1</td>
<td>0.45</td>
</tr>
<tr>
<td>Male</td>
<td>63%</td>
<td>51%</td>
<td>0.03</td>
</tr>
<tr>
<td>Female</td>
<td>37%</td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>Body mass index (BMI), kg/m(^2)</td>
<td>26.2 SD 3.6</td>
<td>27.6 SD 4.4</td>
<td>0.005</td>
</tr>
<tr>
<td>Current smoker</td>
<td>12%</td>
<td>31%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Previous ipsilateral knee surgery</td>
<td>26%</td>
<td>42%</td>
<td>0.002</td>
</tr>
<tr>
<td>Time from symptom onset until day of surgery</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>25% percentile</td>
<td>39 days</td>
<td>88 days</td>
<td></td>
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<tr>
<td>Median</td>
<td>104.5 days</td>
<td>282.5 days</td>
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<tr>
<td>75% percentile</td>
<td>305 days</td>
<td>1007 days</td>
<td></td>
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<tr>
<td>Concurrent partial meniscectomy</td>
<td>57%</td>
<td>50%</td>
<td>0.25</td>
</tr>
<tr>
<td>Concurrent meniscus repair</td>
<td>20%</td>
<td>11%</td>
<td>0.02</td>
</tr>
<tr>
<td>Concurrent ACLR</td>
<td>37%</td>
<td>21%</td>
<td>0.002</td>
</tr>
<tr>
<td>Concurrent meniscus repair or ACLR</td>
<td>42%</td>
<td>31%</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Results: Chondral Defects

- Grade 4 defects were equally prevalent (p=0.96) as were multi-compartment grade 3-4 lesions (p=0.12)
- Mean grade 3-4 defect size was similar in the lateral and medial compartments
Results: Athletes and Anterior Compartment Defects

After adjusting for symptom duration and history of ipsilateral knee surgery, non-athletes had a trend toward larger anterior compartment grade 3-4 defects when present.

- Adjusted mean size 4.7 cm² non-athletes
- Adjusted mean size 2.6 cm² Athletes
Results: Adjusted Risk of Multi-compartment Grade 3-4 Chondral Defects

- After adjusting for surgical history and symptom duration, there was no increased odds of multi-compartment high grade (grade 3-4) defect present among non-athletes compared to athletes (p=0.48)

- Increased symptom duration was independently associated with a higher likelihood of high grade defects in multiple compartments (p=0.01)

<table>
<thead>
<tr>
<th></th>
<th>Adjusted odds ratio, 95% confidence interval</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>Athlete</td>
<td>1.0 (referent)</td>
<td>0.48</td>
</tr>
<tr>
<td>Non-Athlete</td>
<td>1.32 CI 0.61, 2.89</td>
<td></td>
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<tr>
<td>Prior ipsilateral knee surgery</td>
<td>2.07 CI 0.97, 4.44</td>
<td>0.06</td>
</tr>
<tr>
<td>Symptom duration*</td>
<td>0.54 SE 0.22</td>
<td>0.01</td>
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</table>
Conclusions

- Non-athletes were more likely to smoke tobacco and have a significantly longer duration of symptoms prior to treatment.

- High grade anterior defects may be larger in non-athletes though defect size, grade, and likelihood of multi-compartment defects are otherwise similar between groups.

- These differences may in part explain the discrepancy in outcomes noted between athletic and non-athletic populations following cartilage procedure.
References


References


27. 2011-2016 State Tobacco Activities Tracking and Evaluation (STATE) System BRFSS Survey Data.: Centers for Disease Control and Prevention (CDC); 2016.


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