Origin of the Medial Ulnar Collateral Ligament on the Pediatric Elbow

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We have no potential conflicts with this presentation
Ulnar Collateral Ligament Injuries

• The anterior bundle of the UCL (aUCL) serves as the primary stabilizer of the elbow against valgus stress during the late-cocking and early acceleration phases of the overhead throwing or striking motion.\(^2,3\)

• aUCL injuries are most commonly seen in the context of overhead athletes (baseball, football, volleyball, etc.) and acute upper extremity trauma.\(^3\)

• In the adult population, surgical repair of the aUCL is a common and established treatment that yields satisfactory results.
Ulnar Collateral Ligament Injuries in the Pediatric Population

- Child athletes are at particular risk to unique chronic repetitive stress injuries of the aUCL related to two specific factors: 1) open growth plates, and 2) the evolution of youth sports from seasonal activities to year-round training.²

- Surgical reconstruction of the aUCL is becoming more popular for the adolescent athlete and is complicated by the attachment of the aUCL near the developing medial epicondyle apophysis.⁵,⁷,⁸
The purpose of this study was to determine the gender-specific anatomic origins of the aUCL in relation to the medial epicondyle apophysis based on different skeletally immature age groups.
Materials & Methods

- A retrospective comparative analysis of 90 pediatric patients (68 boys, 22 girls) receiving elbow MRI between 2009 and 2012, grouped by age and gender.
  
  - Mean age 12.8 years (range 6-18 years)

<table>
<thead>
<tr>
<th>Age @ date of imaging</th>
<th>All Patients</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10</td>
<td>15</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>11 to 13</td>
<td>34</td>
<td>27</td>
<td>7</td>
</tr>
<tr>
<td>Above 14</td>
<td>41</td>
<td>36</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>68</td>
<td>22</td>
</tr>
<tr>
<td>Mean age</td>
<td>12.8</td>
<td>13.3</td>
<td>11.2</td>
</tr>
</tbody>
</table>
Radiographic Assessment

Figure 1: Coronal T1 Fat Saturated MRI image demonstrating the sublime tubercle of the ulna (A), the apophysis of the medial epicondyle (arrowheads), and the UCL (B).

Figure 2: Coronal T1 Fat Saturated MRI image demonstrating (A) width of the UCL origin along the medial epicondyle, and the (B) distance from the medial epicondyle apophysis to the midpoint of the UCL origin.
Results

• Comparing genders across age groups, boys were found to have a wider aUCL than girls.

<table>
<thead>
<tr>
<th></th>
<th>All Ages</th>
<th>&lt; 11</th>
<th>11 to 13</th>
<th>&gt;13</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>4.1 ± 0.7</td>
<td>3.8 ± 0.4</td>
<td>4.1 ± 0.6</td>
<td>4.1 ± 0.7</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Girls</td>
<td>3.7 ± 0.5</td>
<td>3.7 ± 0.5</td>
<td>3.8 ± 0.5</td>
<td>3.6 ± 0.5</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>p value</td>
<td>0.03</td>
<td>0.77</td>
<td>0.21</td>
<td>0.23</td>
<td></td>
</tr>
</tbody>
</table>
Results

• No difference in the origin of the UCL relative to the medial epicondyle apophysis between gender, between gender age-matched groups, or within gender age-matched groups.

• However, the origin of the UCL always remained medial to the non-ossified lateral margin of the apophysis (denoted by negative value below).

<table>
<thead>
<tr>
<th></th>
<th>All Ages</th>
<th>&lt; 11</th>
<th>11 to 13</th>
<th>&gt;13</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>-3.1 ± 2.3</td>
<td>-2.5 ± 0.9</td>
<td>-3.5 ± 2.5</td>
<td>-2.9 ± 2.2</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Girls</td>
<td>-2.8 ± 1.5</td>
<td>-3.1 ± 2.3</td>
<td>-3.1 ± 2.3</td>
<td>-3.1 ± 2.3</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>p value</td>
<td>0.52</td>
<td>0.18</td>
<td>0.58</td>
<td>0.21</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

• Recent systematic review of aUCL reconstruction in adults demonstrates excellent outcomes, defined as the ability to return to the same or higher level of competition within one year, in >80% of patients.\textsuperscript{10}

• Surgical indications and guidelines for aUCL reconstruction in the pediatric and adolescent population include consideration of the developing anatomy of the elbow.

• Reconstruction of this ligament, in this age group, places the apophysis at risk for injury and possible partial arrest.

• The clinical significance of a complete or partial apophyseal arrest at the medial epicondyle is unknown.
Discussion

• This study demonstrates that the anatomic origin of the aUCL is relatively consistent across age and gender for children with an open medial epicondyle apophysis centered approximately 3 mm medial to the lateral edge of the apophysis.

• This location may be important when considering childhood medial epicondyle fractures and future stability to the ulnohumeral joint.
Conclusions

• Increasingly, youth athletes are engaging in overuse throwing habits, resulting in injury to the aUCL.

• Should a surgical reconstruction be indicated, operative techniques should be chosen in consideration of the risk it poses to the development of the elbow.

• Our study suggests that the origin for the reconstructed ligament in relation to the medial epicondyle apophysis does not require specific consideration of either age or gender; but rather, an understanding that anatomic repair of the aUCL will violate the apophyseal cartilage.
References

Thank you