Descriptive Anatomy of the Pediatric Quadriceps Tendon: Implications for ACL Autograft Repair

Jessica F. Burlilie, BA, BS1, Connor G. Richmond, BS2, Stockton C. Troyer3, Henry B. Ellis, MD4, Phil Wilson, MD4, Peter Fabricant, MD5, Stephanie W. Mayer, MD6, Ted Ganley, MD7, Tyler Stavinoha, MD5, Kevin G. Shea, MD2

1 Georgetown University School of Medicine, Washington, DC. 2 St. Luke’s Hospital System, Boise, ID. 3 Williams College, Williamstown, MA. 4 Texas Scottish Rite Hospital for Children, Dallas, TX. 5 Hospital for Special Surgery, New York, NY. 6 Department of Orthopaedics, University of Colorado Denver, Denver, CO. 7 Children’s Hospital of Philadelphia, Philadelphia, PA. 8 Louisiana State University Health, Shreveport, LA.

OBJECTIVES & BACKGROUND

- ACL Autograft choice that avoids physeal injury is essential for skeletally immature patients.
- Like the Hamstring Tendon, the quadriceps tendon (QT) may be considered for reconstruction of the ACL in the skeletally immature as it avoids direct physeal injury.
- But, the potential for quadriceps injury leading to delayed rupture is a concern.

The purpose of this study was to describe the anatomy of the pediatric quadriceps tendon to better inform QT graft harvest techniques.

METHODS

- Nine skeletally immature cadaveric knees were dissected, age 4-11.
- Digital calipers (measurement error ±0.005mm) were used to record measurements of:
  - Patella length, width, and depth
  - Quadriceps tendon width (anteriorly and posteriorly) and depth
  - Superior patella pole to QT splay
- These measurements were made proximal to the superior pole of the patella at distances 0.0, 0.5, 1.0, and 1.5 times the length of the patella, to control for specimen size.
- Spearman’s correlation was used to identify correlations between measurements.

RESULTS

<table>
<thead>
<tr>
<th>QT Width at interval:</th>
<th>Anterior</th>
<th>Posterior</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>25.99mm</td>
<td>22.00mm</td>
<td>5.88mm</td>
</tr>
<tr>
<td>0.5</td>
<td>19.18mm</td>
<td>16.15mm</td>
<td>5.18mm</td>
</tr>
<tr>
<td>1.0</td>
<td>13.05mm</td>
<td>14.87mm</td>
<td>4.42mm</td>
</tr>
<tr>
<td>1.5</td>
<td>9.93mm</td>
<td>20.74mm</td>
<td>4.04mm</td>
</tr>
<tr>
<td>Patella Width</td>
<td>31.74mm</td>
<td>18.33mm</td>
<td>46.11mm</td>
</tr>
<tr>
<td>Patella Width</td>
<td>17.41mm</td>
<td>7.90mm</td>
<td>23.52mm</td>
</tr>
<tr>
<td>Patella Depth</td>
<td>32.40mm</td>
<td>18.14mm</td>
<td>46.89mm</td>
</tr>
<tr>
<td>Distance to Splay</td>
<td>38.15mm</td>
<td>(1.15x patella length)</td>
<td>25.87mm</td>
</tr>
</tbody>
</table>

DISCUSSION

- Awareness of the tapering aspects of the anterior QT proximally can guide surgeons during harvest, to avoid significant separation of the muscle bellies from the central region of the QT.
- Surgeons should perform careful closure of the harvest site in order to prevent retraction and weakness of the separate muscle bellies.
- This knowledge may inform surgical technique when harvesting the QT for allograft reconstructions.

CONCLUSIONS

This study demonstrated that the posterior aspect of the QT begins to widen just proximal to the separation of the rectus from the quadriceps tendon; at a length 1.15 times the patella length above the superior pole of the patella.

The anterior aspect of the QT continues to narrow in a linear fashion.

References:

Acknowledgements: Allosource, Centennial, CO.
Correspondence: Shea, K. G. – St Luke’s’s Sports Medicine: kgshea@aol.com