Increased Risk of Graft Failure after ACL Reconstruction in Young Female Athletes with Hamstring Grafts

Paterno MV,1 Thomas S,1 Hewett TE,2 Magnussen RA,3 Schmitt, LC1,3
1 Cincinnati Children’s Hospital, Cincinnati, OH, 2Mayo Clinic, Rochester, MN 3The Ohio State University, Columbus, OH

Introduction

The incidence of second anterior cruciate ligament (ACL) injury after ACL reconstruction (ACLR) and return to sport (RTS) in a young, active population is between 25-33% with the greatest risk in the first 12 months after RTS.1,2 Although the use of allograft tissue in young athletes has been reported to result in increased risk of graft failure, differences in graft and contralateral ACL injury risk between patients who receive a hamstring (HS) autograft and bone-patellar tendon- bone (BTB) autograft has yet to be reported in a young, athletic population.

Objectives:

The tested hypothesis was that the relative risk (RR) of ipsilateral graft failure would be higher in young, active patients who receive an ACLR with a hamstring graft, while the RR of contralateral ACL injury would be higher in patients who receive and ACLR with a BTB autograft.

Methods:

One hundred thirty-nine subjects (99 female/40 male) with a mean age of 16.9±2.0 years old (range: 13-25 y/o) underwent ACLR with either a HS autograft (n=79) or a BTB autograft (n=60) and were medically cleared to return to pivoting/cutting sport by their physician and rehabilitation professional. These patients were enrolled in the ACL REconstruction Long-term outcomes in Adolescents and Young Adults (ACL RELAY) Study. This prospective, observational cohort study tracked for incidence of 2nd ACL after ACLR for a median of 73 months. Thirty-four (24.5%) suffered a 2nd ACL injury. Fisher’s exact tests were used to determine whether graft choice (HS vs. BTB) was associated with risk of either ipsilateral graft failure or contralateral ACL injury. Sub-group analyses by sex were also conducted.

Results

Demographic analysis comparing patients who underwent ACLR with HS autograft versus BTB autograft revealed the patients who elected to undergo ACLR with HS autograft were an average of 9.6 months younger and 5 kg lighter than those with BTB autograft tendon. (Table 1) The BTB group was also tracked for an average of 21 months longer than the patients who received a HS graft.

Table 1: Demographic Data

<table>
<thead>
<tr>
<th></th>
<th>Total (n=139)</th>
<th>Hamstring (n=79)</th>
<th>Bone-patellar tendon-bone (n=60)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years (SD)</td>
<td>16.9(2.0)</td>
<td>16.6(1.5)</td>
<td>17.4(2.1)</td>
<td>0.012</td>
</tr>
<tr>
<td>Height in cm (SD)</td>
<td>169.7(6.4)</td>
<td>167(6.3)</td>
<td>170.2(8.6)</td>
<td>0.110</td>
</tr>
<tr>
<td>Weight in kg (SD)</td>
<td>69.5(14.4)</td>
<td>66.7(12.1)</td>
<td>71.7(16.0)</td>
<td>0.039</td>
</tr>
<tr>
<td>Tracking Months (SD)</td>
<td>70.2(35.1)</td>
<td>61.1(35.1)</td>
<td>82.1(27.0)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

- 34/139 patients (24.5%) sustained a 2nd ACL injury. 18/139 (12.9%) patients sustained a contralateral ACL injury and 16/139 (11.5%) suffered an ipsilateral graft failure
- Patients who underwent ACLR with HS graft (n=79) sustained 14 (17.7%) ipsilateral tears and 6 (7.6%) contralateral ACL injuries
- Patients who received an ACLR with BTB (n=60) sustained 2 (3.4%) ipsilateral tears and 12 (20%) contralateral ACL injuries (Table 2)
- Patients who received an ACLR with HS graft were 3 times less likely (RR=0.33; 95%CI: 0.12-0.935) to suffer an ipsilateral graft failure compared to the BTB group. (Figure 1)
- In the first 12 months after RTS, the HS graft patients were nearly 10 times (RR=9.5; 95% CI: 1.2-76.1) more likely to suffer an ipsilateral graft failure. (Figure 1)

Results (cont)

- Patients with a HS graft were 3 times less likely (RR=0.33; 95%CI: 0.12-0.935) to suffer a contralateral ACL injury overall and nearly 7 times less likely (RR=0.15, 95%CI: 0.031-0.709) to suffer a contralateral ACL injury in the first 12 months after RTS compared to the BTB group. (Figure 1)
- When the cohort was divided by sex, females with HS grafts were significantly more likely to sustain a graft failure in the first 12 months after RTS (p=0.008) and by final follow-up (p=0.002) compared to females with BTB graft.

Clinical Significance

- Young, female athletes considering an ACLR with a HS graft after ACL injury should consider the elevated risk of graft failure and potentially pursue a more conservative post-operative course of care
- Young female athletes who elect to undergo ACLR with a BTB autograft are at elevated risk of contralateral ACL injury and should address modifiable risk factors, predictive of contralateral ACL injury prior to RTS

Acknowledgements

This work was funded by support from the National Institutes of Health grant F32-AR055844, and the National Football League Charities Medical Research Grants 2007, 2008, 2009, 2011.

References