INFLUENCE OF HIP ABDUCTOR FATIGUE ON ACL LOADING DURING SINGLE-LEG LANDING

Namwoong Kim¹, Brian A. Knarr¹
¹Department of Biomechanics, University of Nebraska at Omaha, Omaha, NE, USA

According to recent studies, weakness of hip abductors may contribute to greater hip adduction or internal rotation during dynamic activities such as landing or jumping [1]. These abnormal hip joint mechanics may lead to knee valgus collapse and it is considered the most common mechanism for ACL injury. Conversely, only a weak association was reported between hip abductor weakness or fatigue and knee joint mechanics.

To understand the cause and effect relationship between hip abductor weakness and ACL loading during single-leg landing, we need an experimental study. However, an internal force such as ACL loading cannot be easily studied in vivo during movements. Computer models of the musculoskeletal system offer a promising means to estimate ACL loading.

The purpose of this study was to identify the effects of hip abductor fatigue on ACL loading during single-leg landing. We hypothesized that hip induced hip abductor weakness through fatigue protocol would alter lower extremity kinematics, and would increase ACL loading during single-leg landing.

RESULTS

Median frequency of EMG activity of gluteus medius was decreased after hip abductor fatigue. No differences between conditions were found in peak ACL loading, knee flexion, knee abduction, and knee internal rotation angle (Table 1). The mean peak ACL loading (12.52 N/kg) was well aligned with a previous study [5] in a low-risk group (13.04 N/kg).

Figure 3. Average mean frequency prefatigue and postfatigue

Figure 4. Mean and SD of time-normalized ACL loading

Table 1. Peak ACL loading and knee kinematics pre and postfatigue

<table>
<thead>
<tr>
<th>Variable</th>
<th>Prefatigue</th>
<th>Postfatigue</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL loading (N)</td>
<td>884.15 ± 124.8</td>
<td>896.40 ± 110.3</td>
<td>0.414</td>
</tr>
<tr>
<td>Knee Flexion</td>
<td>65.54 ± 7.87</td>
<td>66.74 ± 7.21</td>
<td>0.584</td>
</tr>
<tr>
<td>Knee Abduction</td>
<td>5.81 ± 6.18</td>
<td>5.87 ± 5.42</td>
<td>0.923</td>
</tr>
<tr>
<td>Knee IR</td>
<td>8.98 ± 6.93</td>
<td>8.15 ± 8.04</td>
<td>0.230</td>
</tr>
</tbody>
</table>

DISCUSSION

We only used successful trials, where subjects maintained balance without falling over or touching the ground with their non-dominant leg, which may mask the effect of hip abductor fatigue on ACL loading during single-leg landing. Comparing successful trials with unsuccessful trials may be necessary to identify the effect of hip abductor fatigue on ACL loading during single-leg landing. Future studies will focus on determining what extent weakness of hip abductors start to alter ACL loading during single-leg landings, and explore compensation in other joints during single-leg landings after hip abductor fatigue.

REFERENCES


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