Y- Balance Testing in Anterior Cruciate Injuries and Following Reconstruction

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Disclosures

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Introduction

• ACL injuries are common
• ACL-deficient (D) knee leads to instability
• Instability related to balance ---> postural control and functional performance
• Balance testing may be able to assess functional deficits in ACL-D knees and recovery after reconstruction

P50 ACL Study

• Prospective Study of 50 patients with ACL injury
• Study to investigate changes in cartilage health using quantitative imaging, knee kinematics using quantitative MR imaging and kinetic testing using motion analysis and functional evaluations
• Longitudinal ACL observational study at baseline (after injury), then 6 months, 1 year, 2 years, and 3 years (after reconstruction)
• Goal is to understand the natural history of post-traumatic arthritis following ACL injury and reconstruction and identifying ways to recognize patients earlier in the time course
Introduction

- Static Balance testing has been criticized as not sufficiently challenging enough for physically active patients
- Star Excursion Balance Testing (SEBT) is a dynamic test that requires strength, flexibility, and proprioception
  - Shown to be reliable measure that sufficiently challenges active patients
  - Used identify chronic ankle instability, assess physical performance, and identify athletes at greater risk of lower extremity injury

Purpose & Hypothesis

- Star Excursion Balance Test uses 8 different positions for each leg

Methods

- Y-Balance testing:
  - 3 of 8 Positions
  - Equally Effective
  - Improved efficiency and repeatability
  - Intrarater reliability 0.85-0.91
  - Interrater reliability 0.99-1.0

Results

Discussion

Purpose and Hypothesis

Baseline (after ACL injury and prior to reconstruction)

- **Purpose**: To evaluate balance in ACL-D knees, contralateral knees, and healthy controls
- **Hypothesis**: ACL-D patients will have less balance compared to contralateral knees and healthy controls

6 Months (after ACL reconstruction)

- **Purpose**: To evaluate affect of ACL reconstruction on balance and relationship of Y-balance with other functional tests
- **Hypothesis**: ACL reconstruction will improve balance and Y-balance will correlate with other functional testing
**Methods**

<table>
<thead>
<tr>
<th></th>
<th>Baseline ACL-D</th>
<th>6 Months ACL-R</th>
<th>Healthy Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>45</td>
<td>31</td>
<td>14</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>29.2 +/- 8.7</td>
<td>29 +/- 8.6</td>
<td>30.3 +/- 5.1</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>23.7 +/- 2.8</td>
<td>23.9 +/- 2.8</td>
<td>23.4 +/- 1.9</td>
</tr>
<tr>
<td>Male/Female</td>
<td>24/21</td>
<td>17/14</td>
<td>8/6</td>
</tr>
<tr>
<td>Time from injury to baseline evaluation (days)</td>
<td>53.65 +/- 35.2 days</td>
<td>189.16 +/- 30.38 days</td>
<td></td>
</tr>
</tbody>
</table>

*Exclusion Criteria:* Other ligamentous injuries, meniscal injury requiring repair, previous history of arthritis, knee trauma, or surgery.

1) All patients underwent Y-balance testing- 3 trials (Max)
2) Max Recorded value taken and normalized by leg length
3) Trials done for each leg
4) At 6 months Single Leg Jump (distance) and 6-meter Timed Hop (time) was performed

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**Introduction Purpose & Hypothesis**

**Methods**

**Results Discussion**

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### Baseline ACL-D Knee vs Contralateral Knee vs Healthy Control Knee

* Indicates p < 0.05

ACL-D knee and Contralateral Knee have similar reach and have less reach in Posterior Medial and Posterior Lateral direction compared to Healthy Controls

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### 6 Months ACL-R Knee vs Contralateral Knee vs Healthy Control Knee

* Indicates p < 0.05

6 months following ACL reconstruction and rehabilitation reach for ACL-R knee and Contralateral knee are similar and match Healthy Controls

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### ACL-Injured Knee Longitudinal Baseline to 6 Months Following Reconstruction

* Indicates p < 0.05

Posterior-Medial Reach significantly improved and meet Smallest Detectable Difference
Contralateral knee Longitudinal Baseline to 6 Months Following Reconstruction

**Introduction**

Purpose & Hypothesis

Methods

Results

Discussion

**Results**

Posterior-Medial Reach significantly improved and meet Smallest Detectable Difference

* Indicates p < 0.05

<table>
<thead>
<tr>
<th>Reach Distance (% leg length)</th>
<th>Baseline</th>
<th>6 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smallest Detectable Difference:</td>
<td>Anterior= 6.87</td>
<td>PM= 8.15</td>
</tr>
</tbody>
</table>

**Discussion**

- Herrington et al demonstrated with Y-balance testing that ACL deficient and Contralateral knees had similar reach and less than healthy controls at mean 11 months after injury.
- Our study is unique as it follows patients before and after ACL Reconstruction and demonstrates return of balance function at mean 8 months after injury (6 months after reconstruction) and we demonstrate that Y-balance testing correlates with other functional tests.
- Y-Balance testing may be a safe and cost effective way to assess functional deficits and recovery for ACL injuries.

**References**

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