Radiographic Evaluation of Plantar Plate Injury: An In Vitro Biomechanical Study

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My disclosure is in the Final AOFAS Program Book. I have no potential conflicts with this presentation.
Turf Toe: Introduction

- Debilitating condition with a broad spectrum of symptoms

- Prior studies have demonstrated a qualitative relationship between the movement of the sesamoid bones and turf toe injuries

- No effort has been made to quantify the changes in movement of the sesamoids with respect to the extent of injury
Hypothesis

◆ A quantitative evaluation of turf toe injury is possible via radiographic analysis by measuring the relationship between capsuloligamentous injury and sesamoid movement.
Methods

◆ 24 Fresh Frozen Specimens

◆ The four structures of the plantar plate capsuloligamentous complex were cut in four different orders

◆ Lateral fluoroscopic images taken with each cut
Methods

- Standardized dorsiflexion stress with 15 N at 45° to floor
- Surgeon performed manual dorsiflexion stress test
- Statistical testing performed was a repeated measures ANOVA with Tukey post hoc
Results

- No differences between the four groups for each cut

- The third ligament cut was statistically significant compared to the intact state

<table>
<thead>
<tr>
<th>N: 24 Specimens</th>
<th>Cut 1</th>
<th>Cut 2</th>
<th>Cut 3</th>
<th>Cut 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgeon</td>
<td>0.08</td>
<td>1.20</td>
<td>3.04*</td>
<td>6.96*</td>
</tr>
<tr>
<td>Standard</td>
<td>0.68</td>
<td>1.53</td>
<td>3.37*</td>
<td>7.89*</td>
</tr>
</tbody>
</table>

Measurements in millimeters (mm) Δ from intact state

* Statistically significant  p≤0.05

Intraobserver intraclass correlation between Surgeon and Standardized groups for each observer was 0.95

Interobserver intraclass correlation for radiographic measurements of the phalangeal sesamoid distances for surgeon group and the standardized group was 0.94 and 0.88, respectively.
Discussion

- A 3mm difference in movement of the sesamoids compared to the intact state after turf toe injury is highly predictive of a three ligament injury.

- Study identifies more severe injuries that could lead to instability of the joint.
Conclusion

- First study to quantify change in excursion based on the extent of ligamentous injury
- Study aids in identifying those patients who need more advanced imaging, i.e. MRI
- Aids in diagnosing more severe turf toe injuries
- Guide the clinician in treatment decisions
References