PERONEAL TENDON DISLOCATION ASSOCIATED WITH INTRA-ARTICULAR CALCANEUS FRACTURES: AN UNDER-APPRECIATED PROBLEM

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My disclosure is in the Final AOFAS Program Book.
I have no potential conflicts with this presentation.
Background

• Peroneal tendon subluxations or dislocations (PTD) are undetected and under-treated consequences of intra-articular calcaneus fractures

• True incidence of PTD in setting of calcaneus fractures is unknown

Existing studies:
  • Limited by small sample sizes
  • Do not correlate fracture class with PTD therefore offering little diagnostic or prognostic value

**Purpose** of study is to determine

• incidence of PTD associated with intra-articular calcaneus fractures;
• correlation of PTD with fracture classification;
• association of PTD and heel width; and
• rate of missed radiographic diagnosis and lack of treatment of PTD
Materials and Methods

• Retrospective review of intra-articular calcaneus fractures presenting from 6/30/06 - 6/30/11 at three institutions
• Classified by Essex-Lopresti and Sanders classification systems
• PTD identified on CT scans using technique described by Ho et al.
• Plain films also evaluated for signs of PTD (i.e. “fleck sign”)
• Maximum heel width obtained from axial CT images using PACS (Picture Archiving and Communication System) measuring tool
• Radiology reports were reviewed to determine if radiologists identified PTD. Operative notes were reviewed to determine if surgeons addressed the displaced peroneal tendons
Results

- Incidence of PTD found to be 28% among intra-articular calcaneus fractures

  A: Axial CT image, soft tissue window
  B: Coronal CT image, soft tissue window

- Short arrows designate fibular avulsion fracture or “fleck” sign
- Long arrows designate dislocated peroneal tendons
Results

- The "fleck" sign and joint depression fractures were significantly associated with PTD
- Increasing severity of fractures, based on Sanders classification, was significantly associated with an increased risk of PTD

<table>
<thead>
<tr>
<th>Essex Lopresti Classification</th>
<th>Number of cases</th>
<th>% with evidence of PTD on CT scan</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint Depression</td>
<td>321</td>
<td>30.8%</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Tongue Type</td>
<td>100</td>
<td>19.0%</td>
<td></td>
</tr>
<tr>
<td>Unclassifiable (gun shot wound)</td>
<td>1</td>
<td>0.0%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sanders Classification</th>
<th>Number of cases</th>
<th>% with evidence of PTD on CT scan</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>44</td>
<td>4.5%</td>
<td></td>
</tr>
<tr>
<td>Type II</td>
<td>169</td>
<td>16.0%</td>
<td></td>
</tr>
<tr>
<td>Type III</td>
<td>138</td>
<td>34.8%</td>
<td></td>
</tr>
<tr>
<td>Type IV</td>
<td>60</td>
<td>58.3%</td>
<td>Bonferroni p &lt; 0.002</td>
</tr>
<tr>
<td>Unclassifiable (no coronal reformats available)</td>
<td>11</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
Results

- Among PTD cases, mean heel width was significantly ($p = 0.003$) greater than cases without PTD.
- PTD is significantly associated with joint depression fractures ($p < 0.001$) and increased severity of intra-articular fractures as indicated Sanders ($p < 0.002$) classification system.
Results

- Radiologists recognized only 10.2% of PTD cases
- Surgeons only corrected 10.8% of PTD cases during open reduction and fixation of calcaneus fractures

<table>
<thead>
<tr>
<th>Description</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcaneus fractures with evidence of PTD per CT</td>
<td>118</td>
<td></td>
</tr>
<tr>
<td>Calcaneus fractures with PTD recognized by radiologist</td>
<td>12</td>
<td>10.2%</td>
</tr>
<tr>
<td>Calcaneus fractures with PTD taken to operating room for ORIF</td>
<td>65</td>
<td>55.1%</td>
</tr>
<tr>
<td>Number of cases in which surgeon addressed PTD</td>
<td>7</td>
<td>10.8%</td>
</tr>
<tr>
<td>Average heel width of cases with PTD (millimeters)</td>
<td>41.5 ± 7.3</td>
<td>(*)</td>
</tr>
<tr>
<td>Average heel width of cases without PTD (millimeters)</td>
<td>48.9 ± 7.4</td>
<td>p = 0.003 (*)</td>
</tr>
</tbody>
</table>

Note: Average heel width listed in millimeters ± standard deviation. (*) Among cases with peroneal tendon dislocations, the mean heel width on CT scan was statistically significantly (p = 0.003) greater than cases without peroneal tendon dislocations.

PTD = peroneal tendon subluxation or dislocation. ORIF = open reduction, internal fixation.
Conclusions

PTD has relatively high incidence among intra-articular calcaneus fractures.

This injury is often overlooked by radiologists and orthopedists alike.

Close inspection of the axial CT with soft-tissue window should be used to evaluate for peroneal pathology.

- Further research will determine resultant morbidity of untreated peroneal tendon dislocation in the setting of intra-articular calcaneus fractures.
References


van Tetering EA, Buckley RE. Functional outcome (SF-36) of patients with displaced calcaneal fractures compared to SF-36 normative data. Foot Ankle Int. 25(10):733-8, 2004 Oct.


