Anatomic Assessment of the Optimal Starting Position for Fifth Metatarsal Intramedullary Screw Fixation: A Cadaveric Study

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Disclosures

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MaCalus V. Hogan, MD

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

- 5\textsuperscript{th} metatarsal (MT) fractures among the most commonly diagnosed foot fractures
- Proximal 5\textsuperscript{th} MT fractures common in the athletic population
  - Stress fractures
  - Jones fractures
- Surgical Indications:
  - High performance athletes [Quill, Ortho Clin NA, 1995; Mologne et al, AJSM 2005]
  - Symptomatic delayed/nonunion
- Often achieved with Intramedullary (IM) screw fixation
Treatment

Not a home run:
- Intricate anatomy
- Delayed healing
- Nonunion
- Refracture

Screw placement can be difficult
- Recommended “High and inside” position
  not always easy

**PROBLEM:** Straight screw \(\rightarrow\) Curved Bone!!!!!
Study Objectives

1. To examine the relevant anatomy and morphology of the 5th metatarsal
2. Define relationship of “IDEAL” starting position for IM screw fixation to the relevant anatomy
Study Design

- 10 cadaveric specimens
- 5th MT neck cut transversely cut w/ microsagittal saw
- Flexible reamer passed retrograde, exiting proximally
- Lateral aspect of foot over proximal 5th MT dissected
  - Proximity of reamer at exit point in relation to anatomy measured

Pertinent Anatomy
- Peroneus longus
- Peroneus brevis
- Main branch of sural nerve [Fansa et al, AJSM 2012]
- Inferior branch of sural nerve
- Sural vein
- 4th MT base
- Cuboid
Study Design

Reamer tip exiting 5th MT and hitting cuboid
## Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Std_Dev</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peroneus Longus (mm)</td>
<td>10</td>
<td>5.7</td>
<td>2.83</td>
<td>6.5</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Peroneus Brevis (mm)</td>
<td>10</td>
<td>5.1</td>
<td>2.23</td>
<td>4.5</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Sural_Nerve_Main (mm)</td>
<td>10</td>
<td>15.1</td>
<td>5.86</td>
<td>14</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Sural_Nerve_Inf (mm)</td>
<td>6</td>
<td>7.5</td>
<td>2.66</td>
<td>7</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Sural Vein (mm)</td>
<td>10</td>
<td>8.9</td>
<td>3.57</td>
<td>9.5</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Cuboid (mm) [negative value = reamer hit cuboid]</td>
<td>10</td>
<td>-0.7</td>
<td>2.06</td>
<td>-1</td>
<td>-5</td>
<td>2</td>
</tr>
<tr>
<td>4th Metatarsal (mm)</td>
<td>10</td>
<td>9.4</td>
<td>2.37</td>
<td>10</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

Interestingly, the flexible reamer hit the cuboid in 6/10 specimens studied!
Discussion/Conclusion

- Provides additional information regarding pertinent regional anatomy
- Findings highlight the potential difficulty in achieving the suggested “IDEAL” starting position for medullary canal preparation and screw placement.
- Morphology of 5th metatarsal needs to be more clearly defined

