Comparison of the posterior Achilles tendon-splitting approach and intramedullary nailing versus lateral transfibular approach with fixed-angle plating for tibiotalocalcaneal arthrodesis

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Disclosures

• None
Tibiotalocalcaneal (TTC) Arthrodesis

- Complex operation; salvage procedure for many indications
- Post-traumatic arthritis
- Inflammatory arthropathy
- Charcot neuroarthropathy
- Acquired or neuromuscular deformity
- Talus AVN
- Nonunion of prior arthrodosis
- Failed TAA
TTC Arthrodesis Operative Techniques

• **Approaches**
  - Lateral, transfibular
  - Posterior, Achilles tendon splitting
  - Anterior + sinus tarsi
  - Medial
  - Posterolateral
  - Posteromedial

• **Primary Fixation**
  - Intramedullary nail
  - Locking plate
    - Anatomic
  - Blade plate
  - Screws
  - External fixator
Purpose

• Many case series reporting outcomes...no comparative studies

• Compare the results of TTC arthrodesis between the PATS and IM nailing versus the LTF approach and lateral, fixed-angle plating
  – Union
  – Symptomatic union with revision
  – Complications
Methods

• Retrospective review, 2005 – 2013
• Minimum 1 year clinical/radiographic follow-up
• PATS/IM nail and LTF/fixed-angle plate only
• Union defined radiographically
  – XR: Bridging bone in three of four cortices on orthogonal images
  – CT (44%): Bridging trabecular bone on more than fifty percent of surface at arthrodesis site
## Results

66 patients; 38 PATS/IM nail, 28 LTF/fixed-angle plate

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>PATS / IM nail (38)</th>
<th>LTF / Fixed-angle plating (28)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>58.9 (30 - 86)</td>
<td>58.8 (30 - 86)</td>
<td>59.2 (41 - 78)</td>
<td>0.89</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>33.6 (20 - 68.4)</td>
<td>31.5</td>
<td>36.4</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Follow-up (months)</strong></td>
<td>73.4 (12 - 123)</td>
<td>62.1 (12-72)</td>
<td>88.4 (12 - 123)</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>29 M / 37 L</td>
<td>16 M / 22 F</td>
<td>13 M / 15 F</td>
<td>0.80</td>
</tr>
<tr>
<td><strong>Laterality</strong></td>
<td>40 R / 26 L</td>
<td>22 R / 16 L</td>
<td>18 R / 10 L</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>Diabetes mellitus</strong></td>
<td>16 (24%)</td>
<td>5 (13%)</td>
<td>11 (39%)</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Tobacco use</strong></td>
<td>10 (15%)</td>
<td>6 (16%)</td>
<td>4 (14%)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Peripheral vascular disease</strong></td>
<td>7 (11%)</td>
<td>4 (11%)</td>
<td>3 (11%)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Chronic corticosteroid use</strong></td>
<td>9 (14%)</td>
<td>3 (8%)</td>
<td>6 (21%)</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Presence of ulcer</strong></td>
<td>4 (6%)</td>
<td>1 (3%)</td>
<td>3 (11%)</td>
<td>0.30</td>
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<tr>
<td><strong>Supplementary fixation (any)</strong></td>
<td>46 (70%)</td>
<td>20 (53%)</td>
<td>26 (93%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Screws</strong></td>
<td>42 (64%)</td>
<td>16 (42%)</td>
<td>26 (93%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Plates</strong></td>
<td>9 (14%)</td>
<td>4 (11%)</td>
<td>5 (18%)</td>
<td>0.48</td>
</tr>
<tr>
<td><strong>Supplementary graft material (any)</strong></td>
<td>64 (97%)</td>
<td>37 (97%)</td>
<td>27 (96%)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Allograft</strong></td>
<td>55 (83%)</td>
<td>34 (89%)</td>
<td>21 (75%)</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Femoral head</strong></td>
<td>20 (30%)</td>
<td>18 (47%)</td>
<td>2 (7%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Orthobiologics</strong></td>
<td>49 (74%)</td>
<td>28 (74%)</td>
<td>21 (75%)</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Results

- **71% union rate**
  - **76%** PATS/IM nail, **64%** LTF/fixed-angle plate (p = .41)
  - PATS/IM nail nonunion: 7 TT, 2 TT/ST
  - LTF/fixed-angle plate nonunion: 6 TT, 1 ST, 3 TC

- **12% revision rate for symptomatic nonunion**
  - 16% PATS/IM nail, 7% LTF/fixed-angle plate (p = .45)
Results

- **PATS/IM nail**
  - 4 superficial wound complications
  - No nerve injury
  - 2 stress fractures (non-op)
  - 3 elective HWR
  - 1 amputation

- **LTF/fixed-angle plate**
  - 4 superficial wound complications
  - 1 sural nerve irritation
  - 2 stress fractures (non-op)
  - 5 elective HWR
  - 1 amputation

- No significant difference with any complication
Conclusion

• Acceptable union rates and similar complication rates with either technique in a complex patient population

• Prior incisions, preexisting hardware or deformity may preclude techniques, but other strategies can be executed with similar success rates

• Future studies should evaluate coronal deformity correction, functional outcomes, and cost
References


Ahmad J, Pour AE, Raikin SM. The modified use of a proximal humeral locking plate for tibiotalocalcaneal arthrodesis. Foot Ankle Int. 2007 Sep;28(9):977-83.


