Instability of the Medial Column following Triple Arthrodesis for Stage III Adult Acquired Flatfoot Deformity

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Disclosure

No Conflict To Disclose

Our disclosures are in the Final AOFAS Mobile App.

We have no potential conflicts with this presentation.
Background

• Triple arthrodesis remains a common and successful procedure performed for Stage III Adult acquired flatfoot disease (AAFD).

• However, investigators also noted the development of adjacent joints degenerative arthritis after triple arthrodesis.
The aim of this study was to examine the effect of the triple arthrodesis on the stability and alignment, specifically of the tarsometatarsal and naviculocuneiform joints of the medial column.

Hypothesis: Minimal change in the alignment or stability of the medial column joints following triple arthrodesis.
Study Methodology

• Retrospective review of all consecutive triple arthrodesis for AAFD Stage III between 2002-2013.
  – Total of 202 patients and 212 feet included in the study.

• Weight bearing images obtained at pre operative, 6 weeks, 6 months, 1 year and 3 years following surgery.

• 5 radiological measurements were used to determine stability of the medial column.
  – medial cuneiform-calcaneal angle (CCA); medial cuneiform-navicular distance (NCD); 1\textsuperscript{st}/2\textsuperscript{nd} intermetatarsal angle (IMA); 1\textsuperscript{st} Metatarsal - medial cuneiform angle (MCA); Calcaneal pitch angle (CPA).
  – These measurements determined the presence of instability in the sagittal plane (CCA and MCA) and coronal plane (NCD and IMA) of the medial cuneonavicular (NC) joint, and the 1\textsuperscript{st} tarsometatarsal (TMT) joint.
For the purpose of the study, x-rays over 3 fixed time points were used for analysis:

RO: 1st non weight bearing X-ray performed after the surgery.
RW1: First weight bearing X-ray performed after the surgery.
RW2: Final weight bearing X-ray performed during the final follow-up.
The medial cuneiform-calcaneal angle is the angle subtended by a line drawn along the inferior border of the calcaneus, and a perpendicular line to the anterior joint surface of the medial cuneiform. Changes in the CCA suggest movement in the sagittal plane of the CN joint.
Results

<table>
<thead>
<tr>
<th></th>
<th>R0</th>
<th>RW1</th>
<th>P</th>
<th></th>
<th>RW1</th>
<th>RW2</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCA(°)</td>
<td>39.75</td>
<td>35.21</td>
<td>&lt;0.001</td>
<td>CCA(°)</td>
<td>36.00</td>
<td>32.39</td>
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<tr>
<td>NCD(mm)</td>
<td>5.89</td>
<td>5.81</td>
<td>0.729</td>
<td>NCD(mm)</td>
<td>6.05</td>
<td>6.13</td>
<td>0.704</td>
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<td>IMA(°)</td>
<td>7.94</td>
<td>8.51</td>
<td>0.002</td>
<td>IMA(°)</td>
<td>8.48</td>
<td>7.90</td>
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<tr>
<td>MCA(°)</td>
<td>-1.54</td>
<td>-1.31</td>
<td>0.464</td>
<td>MCA(°)</td>
<td>6.24</td>
<td>5.98</td>
<td>0.173</td>
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<tr>
<td>CP(°)</td>
<td>19.77</td>
<td>17.78</td>
<td>&lt;0.001</td>
<td>CP(°)</td>
<td>17.98</td>
<td>15.40</td>
<td>&lt;0.001</td>
</tr>
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</table>
Effect of Triple Arthrodesis on Adjacent joints

- Flattening of the arch, loss of correction
  - ↓ Calcaneal pitch

- Evidence of instability in the sagittal plane of NC joint
  - ↓ CCA

- Slight decrease in the 1st – 2nd intermetatarsal angle over time indicating slight abduction of forefoot
  - ↓ IMA
Naviculocuneiform Joint Anatomy

- NC joint is not a rigid joint, helps with plantarflexion of the 1\textsuperscript{st} ray.
- NC instability leading to pes planus deformity has been described.
- Rigid hindfoot lead to stress transfer in the midfoot, possibly leading to deformity and arthroses.
Conclusions

There is ongoing instability of the medial column after triple arthrodesis

- Occurred in the sagittal plane of NC joint.
- Occurred in the coronal plane of TMT joint.
- Possibly related to a non-functioning PTT with adjacent stress transfer.

Long term consequences of instability unknown

- Possible loss of deformity correction.
- Adjacent joint arthrosis that may require additional medial column fusion.
- Insufficient justification for extending the triple arthrodesis distally.
References


