Evaluation of Lisfranc Joint Reduction Using Motion Tracking Software with Varying Clamp Positions

AUTHORS:
AMANDA FANTRY, MD
HEATHER GOTHA, MD
SARATH KORUPROLU, PHD
CRAIG LAREAU, MD
NO CONFLICT TO DISCLOSE

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Amanda Fantry, MD
Heather Gotha, MD
Sarath Koruprolo, PhD
Craig Lareau, MD

My disclosure is in the Final AOFAS Mobile App.

I have no potential conflicts with this presentation.
Purpose

- Unstable Lisfranc injuries require open reduction to restore the anatomic relationship between the second metatarsal base and medial cuneiform
- No study has identified the ideal clamp position in ligamentous Lisfranc injuries
Purpose

- To evaluate the clamp position and force vector that would most accurately restore the normal anatomy
- To determine if fluoroscopic evaluation and clinical assessment of the reduction was adequate
Methods

- Computer navigation system used to evaluate reduction of Lisfranc joint
- 9 fresh frozen cadaveric feet
- Markers placed in 2nd metatarsal and medial cuneiform
Methods

- Ligaments between 2\textsuperscript{nd} metatarsal base and medial/middle cuneiforms sectioned
- 1\textsuperscript{st} tarsometatarsal and intercuneiform ligaments preserved
- Lisfranc joint reduced using pointed reduction clamp in 6 formations
  - 2\textsuperscript{nd} or 3\textsuperscript{rd} metatarsal base
  - Dorsal, midpoint, or plantar medial cuneiform
Statistical Analysis

- Reduction evaluated clinically by assessment of dorsal surface
- Navigation software used to measure the rotation and translation of 2\textsuperscript{nd} MT to medial cuneiform
- One way ANOVA used to compare magnitude of translation
Results

- No statistically significant difference in rotation or translation of 2\textsuperscript{nd} metatarsal to medial cuneiform
- Clamp configuration between 2\textsuperscript{nd} or 3\textsuperscript{rd} metatarsal and plantar cuneiform with less gross translation compared to mid and dorsal cuneiform, although not significant (p=0.491)
Magnitude of Translation (mm) with Clamp Position on the Medial Cuneiform

- Dorsal clamp
- Mid clamp
- Plantar clamp
Comparison of Clamp Positions

<table>
<thead>
<tr>
<th></th>
<th>Rz (internal rotation)</th>
<th>Ry (pronation)</th>
<th>Rx (dorsiflexion)</th>
<th>X (lateral)</th>
<th>Y (anterior)</th>
<th>Z (superior)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intact vs. 2nd Dorsal</td>
<td>0.636</td>
<td>0.904</td>
<td>0.574</td>
<td>0.249</td>
<td>0.395</td>
<td>0.935</td>
</tr>
<tr>
<td>Intact vs. 3rd Plantar</td>
<td>0.672</td>
<td>0.52</td>
<td>0.782</td>
<td>0.957</td>
<td>0.758</td>
<td>0.217</td>
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<tr>
<td>Intact vs. 3rd Dorsal</td>
<td>0.71</td>
<td>0.817</td>
<td>0.867</td>
<td>0.249</td>
<td>0.373</td>
<td>0.563</td>
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<tr>
<td>Intact vs. 2nd Mid</td>
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<td>0.904</td>
<td>0.812</td>
<td>0.561</td>
<td>0.609</td>
<td>0.959</td>
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<tr>
<td>Intact vs. 2nd Plantar</td>
<td>0.795</td>
<td>0.533</td>
<td>0.82</td>
<td>0.847</td>
<td>0.719</td>
<td>0.457</td>
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<tr>
<td>Intact vs. 3rd Mid</td>
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<td>0.899</td>
<td>0.985</td>
<td>0.172</td>
<td>0.889</td>
<td>0.374</td>
</tr>
</tbody>
</table>

- p-values for comparisons in clamp position in all rotations and translations demonstrate no statistically significant difference between groups
Discussion

- Accuracy of Lisfranc reduction not affected by clamp position on the medial cuneiform
- However, global translation was lowest with 2\textsuperscript{nd} metatarsal and plantar cuneiform positioning
- Gross inspection of dorsal TMT joint and intraoperative fluoro are sufficient for evaluating reduction
References