Clinical and Biomechanical Results of Suture Button Fixation for Treatment of Ligamentous Lisfranc Injury: A Systematic Review and Meta-Analysis

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Disclosures

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Purpose

• Ligamentous Lisfranc injury has serious implications if treated inappropriately

• Optimal fixation strategy remains unclear

• To investigate the biomechanical, clinical, radiographic results and meta-analysis of post op outcomes for flexible ligamentous Lisfranc fixation
Materials & Methods

- Literature review conducted according to PRISMA search guidelines
- Primary outcome measures: return to activities
- Secondary outcome measures: AOFAS, VAS, patient satisfaction, radiographic alignment, revisions/failures, complications
Materials & Methods

PRISMA search

- Records identified through database searching (N=34) → Records excluded after screening for duplicates (N=5)
- Records screened (titles and abstracts) (N=29) → Records excluded after title/abstract screen (N=11)
- Full-text articles or abstracts assessed for eligibility (N=18) → 4 full-text articles excluded for strictly technical paper (no clinical outcomes data)
- Studies included in qualitative and quantitative synthesis (N=14) → Clinical articles (N=11) Biomechanical study (N=3)
- Studies included in quantitative synthesis (meta-analysis) (N=11)
Results

- 14 studies included
  - 11 clinical studies (n=216; mean age 36.7 yrs; mean f/u 25.4 months)

- Excellent clinical outcomes; no complications or subsequent hardware removals

- 100% maintained radiographic alignment at final follow up (n=62; 6 studies)

<table>
<thead>
<tr>
<th>Result</th>
<th>AOFAS</th>
<th>VAS</th>
<th>Return to Activity</th>
<th>Radiographic Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>150</td>
<td>137</td>
<td>35</td>
<td>62</td>
</tr>
<tr>
<td>Mean Age (years)</td>
<td>37.7</td>
<td>38.5</td>
<td>29.1</td>
<td>34.2</td>
</tr>
<tr>
<td>Time of survey (months)</td>
<td>30.7</td>
<td>30.8</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Number of Studies</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Results

- Biomechanical studies (n=3; 27 feet) yielded mixed results when comparing diastasis in cadaver models

<table>
<thead>
<tr>
<th>Publication</th>
<th>Number of Feet</th>
<th>Comparison</th>
<th>Measurements</th>
<th>Load</th>
<th>Results</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahmed 2010</td>
<td>8</td>
<td>Suture button vs 4.0 mm partially threaded cannulated screw C1-MT2</td>
<td>M1-M2 distance</td>
<td>Axial: 600N Load to failure: 50 mm/minute</td>
<td>*Fixed vs Intact Loaded: Screw Mean Diastasis: -0.1 mm Suture Mean Diastasis: +1.1 mm</td>
<td>Screw results in less displacement than suture button in isolated Lisfranc ligament injuries</td>
</tr>
<tr>
<td>Pancioli et al. 2009</td>
<td>14</td>
<td>Suture button vs 3.5 mm cannulated lag screw C1-MT2</td>
<td>C1-MT2 Lisfranc ligament attenuation at waist displacement</td>
<td>Axial: 840 N</td>
<td>*Cut fixed +1.2 mm difference from screw fixation *Cut fixed +1.0 mm difference from suture button fixation Screw vs suture button difference not significant (Screw 0.2 mm less)</td>
<td>Screw button and screw do not differ significantly in displacement in isolated Lisfranc ligament injuries</td>
</tr>
<tr>
<td>Pelh 2011</td>
<td>5</td>
<td>Suture button C1-MT2 with K-wire MT2-C2 vs 3.5 mm full threaded cortical screw C2 – C1-MT2, MT2-C2</td>
<td>C1-MT2 distance</td>
<td>Axial: 222.4 N Abduction: 50 N 1000 cycles, then retested</td>
<td>*Abduction load yields greater displacement than axial after injury (6.8 vs 2.0 mm)</td>
<td>Abduction stress results in greater motion than axial</td>
</tr>
</tbody>
</table>

Limited focus on abduction stress testing
Conclusion

• Flexible fixation for ligamentous Lisfranc has significant potential as viable fixation option based on excellent clinical and radiographic results

• Biomechanical results remain inconclusive

• Prospective randomized clinical trial comparing flexible fixation to screw fixation would be beneficial