Distal Clavicle Fracture Repair: Clinical Outcomes of a Novel Surgical Technique

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Disclosure Information

Speaker’s Bureau
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Consultant
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- Charles Jordan - Advanced Orthopaedic Solutions

No further disclosures
• Distal clavicle fractures represent ¼ of all clavicle fractures\textsuperscript{1,2}

• 25% are unstable and demonstrate high symptomatic nonunion rate, particularly Neer Type II and V patterns\textsuperscript{1,2}
• Most techniques use rigid fixation with plate osteosynthesis for distal clavicle fracture repair
  - Not all fractures are amenable to plating
  - Prominent hardware → hardware removal
  - The use of locking plates has demonstrated a high complication rate in previous studies\(^3, 4, 5\)

• Newer techniques use low profile hardware that is fixed to the coracoid\(^6\)
  - The biomechanical performance of these techniques was previously assessed, with constructs including cortical button fixation +/- CC reconstruction outperforming locking plate fixation\(^7\)
To assess the clinical and radiographic outcomes of a *novel* surgical technique for unstable distal clavicle fractures using a combination of cortical button fixation and CC ligament reconstruction.
Methods

• 22 patients with Type II or V distal clavicle fractures treated with CC stabilization with cortical button fixation combined with CC ligament reconstruction

• Patients followed until radiographic union or until returned to their baseline activity level

• Minimum 1 year follow-up
Methods

Cortical button fixation and CC ligament reconstruction
Methods
Methods

Primary Outcome Measures
- Radiographic Union
- Shoulder Function (UCLA, ASES)

Secondary Outcome Measures
- Preoperative and Postoperative Complications, Time to Radiographic Union, CC Distance
- Quality of Life
  - 36-Item Short Form Health Survey (SF-36) scores
## Results

### Patient Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (95% CI) or n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, y</strong></td>
<td>55.5 (22-71)</td>
</tr>
<tr>
<td><strong>Mechanism of injury</strong></td>
<td></td>
</tr>
<tr>
<td>Bicycle accident</td>
<td>8 (35.36)</td>
</tr>
<tr>
<td>Mechanical fall</td>
<td>7 (31.82)</td>
</tr>
<tr>
<td>Motor vehicle collision</td>
<td>5 (22.73)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (9.10)</td>
</tr>
<tr>
<td><strong>Fracture Type</strong></td>
<td></td>
</tr>
<tr>
<td>IIB</td>
<td>18 (81.82)</td>
</tr>
<tr>
<td>V</td>
<td>4 (18.18)</td>
</tr>
<tr>
<td><strong>No. of lateral fragments</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>18 (81.82)</td>
</tr>
<tr>
<td>2</td>
<td>2 (9.09)</td>
</tr>
<tr>
<td>3</td>
<td>2 (9.09)</td>
</tr>
<tr>
<td><strong>Size of lateral fragments, mm</strong></td>
<td>24.95 (21.33-28.56)</td>
</tr>
<tr>
<td><strong>Time to surgery, d</strong></td>
<td>11.82 (7.40-16.23)</td>
</tr>
</tbody>
</table>
Results

- 100% achieved radiographic union
- Avg time to union was 37 days
- CC Distance decreased from 27.45 +/- 4.18 mm → 9.048 +/- 3.34 mm

Pre-Op and Post-Op Radiographs
## Results

### Shoulder Function Scores

<table>
<thead>
<tr>
<th>Survey Measure</th>
<th>Pre-Operative Mean (95% CI)</th>
<th>Post-Operative Mean (95% CI)</th>
<th>Mean Difference (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASES Score</td>
<td>16.23 (9.79-22.67)</td>
<td>88.11 (81.82-94.40)</td>
<td>81.81 (p&lt;0.001)</td>
</tr>
<tr>
<td>UCLA Score</td>
<td>5.36 (4.14-6.60)</td>
<td>32.52 (30.56-34.48)</td>
<td>27.14 (p&lt;0.001)</td>
</tr>
</tbody>
</table>
Results

- Intraoperative complications
  - None

- Postoperative complications
  - 1 hardware irritation
  - 1 adhesive capsulitis
  - 1 wound dehiscence
• **Unique features of this technique**
  
  • No bone tunnels through the coracoid, minimizing the risk of coracoid fractures
  
  • Normal soft tissue attachments between coracoid and clavicle reconstructed using an allograft to provide increased load sharing and second point of fixation

Discussion
• **Technique Advantages**
  
  • Low profile hardware greatly reduces risk of second procedure for hardware removal
  
  • Can be used in most distal clavicle fracture patterns
  
  • Robust construct that outperformed distal clavicle plate alone in cadaveric model

• **Technique Disadvantages**
  
  • Increased complexity, surgical time
  
  • Bone tunnel through the clavicle creates a potential stress riser
Novel surgical technique using a combination of CB fixation & CC ligament reconstruction resulted in 100% union rate, excellent clinical outcomes, and relatively few complications.

- Can be used for most fracture patterns

- Biomechanically strong construct with minimal risk of obligatory hardware removal


