Effect of Pre-Operative Coracoid Dimensions on Outcomes after Latarjet Surgery

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Once a patient experiences a primary anterior shoulder dislocation, 39% will continue to develop recurrent instability.\textsuperscript{23}

Burkhart and De Beer found that 67% of patients with glenoid deformity (inverted glenoid pear appearance) develop recurrent instability, while only 6.5% of patients without bony deformity experienced recurrent instability following arthroscopic stabilization.\textsuperscript{7}

The Latarjet procedure is now indicated for patients with $\geq 20\%$ of glenoid bone loss.

\textsuperscript{Lo et al. 2004}
Introduction

The use of a coracoid bone graft length of more than 25 mm has been recommended for the Latarjet procedure to enable safe insertion of two 4.5 mm screws. However, there are significant differences in the coracoid process dimensions based on age, sex, and ethnicity. Pre-operative coracoid dimensions may affect the size of the bone graft transferred to the glenoid rim and thus post-operative outcomes of Laterjet coracoid transfer.

Burkhart et al. 2002
Purpose/Hypothesis

To determine the effect of coracoid length and width as measured on pre-operative imaging (MRI) on outcomes following Latarjet treatment of anterior shoulder instability. We hypothesized that patients with longer and wider coracoid dimensions would have improved post-operative outcomes after Latarjet treatment.
Materials and Methods

Inclusion/Exclusion Criteria:
- **Inclusion**: Primary Latarjet surgery from 2010-2019, with an available pre-operative MRI.
- **Exclusion**: History of ipsilateral shoulder infection, no available pre-operative MRI imaging, or history of connective tissue disorder.

Data Collection:
- Pre-operative MRI evaluated by one investigator (D.D.) using the PICO method.
- Pre-operative MRI evaluated by three investigators for coracoid length and width.
  - Good inter-rater reliability for coracoid length (ICC=0.79) and coracoid width (ICC=0.76)
- Post-operative radiographs examined for number of screws placed.

Outcomes of interest:
- Post-operative complications, recurrent instability, and reoperations
- Post-operative American Shoulder and Elbow Surgeons (ASES) scores and RTP info collected via RedCap

PICO method: Saliken et al. 2015
Coracoclavicular (CC) ligament on axial T2 fat saturated MRI slice.

Width was measured at three locations: 5 mm anteriorly from the base, midpoint, and 5 mm posteriorly from the tip. Linear length was approximated from the base to tip (orange line).
Data Analysis

Patients were split into short vs long coracoid length (<22 mm vs. ≥22 mm), and also narrower vs wider coracoid width (<10 mm vs. ≥10 mm), with these cutoffs selected as the whole number nearest the averages of coracoid length and width in this patient cohort.

Demographic and post-operative outcomes were compared between shorter vs. longer coracoid length, narrower vs. wider coracoid width, and male vs. female coracoid dimensions.
Results

56 patients were included: 28.4 ± 10.1 years, 9 females and 47 males, 34 (60.7%) had a Bankart repair prior to Latarjet surgery.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Shorter Coracoid (n=30)</th>
<th>Longer Coracoid (n=26)</th>
<th>p-value</th>
<th>Narrower Coracoid (n=29)</th>
<th>Wider Coracoid (n=27)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>27.3 ± 10.3</td>
<td>29.7 ± 9.8</td>
<td>0.372</td>
<td>28.2 ± 10.2</td>
<td>28.7 ± 10.1</td>
<td>0.856</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>24 (80.0%)</td>
<td>23 (88.5%)</td>
<td>0.481</td>
<td>22 (75.9%)</td>
<td>25 (92.6%)</td>
<td>0.146</td>
</tr>
<tr>
<td>Surgery on Dominant Side</td>
<td>15 (50.0%)</td>
<td>11 (42.3%)</td>
<td>0.565</td>
<td>12 (41.4%)</td>
<td>14 (51.9%)</td>
<td>0.432</td>
</tr>
<tr>
<td>Participation in Contact Sport</td>
<td>17 (63.0%)</td>
<td>12 (50.0%)</td>
<td>0.516</td>
<td>14 (53.8%)</td>
<td>15 (60.0%)</td>
<td>0.872</td>
</tr>
<tr>
<td>Chronic Instability</td>
<td>28 (93.3%)</td>
<td>26 (100%)</td>
<td>0.494</td>
<td>28 (96.6%)</td>
<td>26 (96.3%)</td>
<td>1.000</td>
</tr>
<tr>
<td>Bankart Repair Prior to Latarjet</td>
<td>17 (56.7%)</td>
<td>17 (65.4%)</td>
<td>0.505</td>
<td>19 (65.5%)</td>
<td>15 (55.6%)</td>
<td>0.446</td>
</tr>
<tr>
<td>Glenoid Bone Loss</td>
<td>11.8% ± 7.7%</td>
<td>15.8% ± 8.5%</td>
<td>0.079</td>
<td>13.9% ± 10.0%</td>
<td>13.5% ± 6.1%</td>
<td>0.863</td>
</tr>
<tr>
<td>Concomitant Bankart Repair with Latarjet</td>
<td>8 (26.7%)</td>
<td>6 (23.1%)</td>
<td>0.757</td>
<td>6 (20.7%)</td>
<td>8 (29.6%)</td>
<td>0.440</td>
</tr>
</tbody>
</table>
Average coracoid length: **21.6 ± 2.4 mm** (range: 17-27 mm).

Average coracoid width: **10.0 ± 1.0 mm** (range: 8-13 mm).

No relationship was observed between coracoid length and coracoid width (R=0.16).

Green line=coracoid width group cut-off (10 mm), blue line=coracoid length group cut-off (22 mm), black dotted line=trendline.

Only one patient (circled red above) was limited to one screw, while all other patients successfully received 2 screws.
Post-Operative Outcomes

No significant differences in post-operative outcomes based on either coracoid length or coracoid width.

<table>
<thead>
<tr>
<th>Post-Operative Variable</th>
<th>Shorter Coracoid (n=30)</th>
<th>Longer Coracoid (n=26)</th>
<th>p-value</th>
<th>Narrower Coracoid (n=29)</th>
<th>Wider Coracoid (n=27)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Complications</td>
<td>3 (10.0%)</td>
<td>4 (15.4%)</td>
<td>0.543</td>
<td>5 (17.2%)</td>
<td>2 (7.4%)</td>
<td>0.266</td>
</tr>
<tr>
<td>Recurrent Instability</td>
<td>2 (6.7%)</td>
<td>1 (3.8%)</td>
<td>0.640</td>
<td>2 (6.9%)</td>
<td>1 (3.7%)</td>
<td>0.596</td>
</tr>
<tr>
<td>Re-operation</td>
<td>1 (3.3%)</td>
<td>2 (7.7%)</td>
<td>0.592</td>
<td>1 (3.5%)</td>
<td>2 (7.4%)</td>
<td>0.605</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-Operative Variable</th>
<th>Shorter Coracoid (n=18)</th>
<th>Longer Coracoid (n=18)</th>
<th>p-value</th>
<th>Narrower Coracoid (n=16)</th>
<th>Wider Coracoid (n=20)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASES score</td>
<td>85.0 ± 18.0</td>
<td>81.6 ± 21.5</td>
<td>0.612</td>
<td>87.1 ± 17.0</td>
<td>80.0 ± 21.5</td>
<td>0.286</td>
</tr>
<tr>
<td>RTP</td>
<td>13 (76.5%)</td>
<td>10 (58.8%)</td>
<td>0.298</td>
<td>10 (66.7%)</td>
<td>13 (68.4%)</td>
<td>1.000</td>
</tr>
<tr>
<td>Time until RTP (months)</td>
<td>6.9 ± 4.1</td>
<td>6.1 ± 3.9</td>
<td>0.626</td>
<td>7.1 ± 4.2</td>
<td>6.1 ± 3.9</td>
<td>0.562</td>
</tr>
</tbody>
</table>
Coracoid Dimensions: Male vs. Female

Pre-Operative Coracoid Dimensions - Male vs Female

Distance (mm)

- Female - Length
- Male - Length
- Female - Width
- Male - Width

p=0.001
The Latarjet procedure provides stabilization through other mechanisms as well, such as the sling effect of conjoint tendon and subscapularis, and reinforcement by capsular duplication with the released coracoacromial ligament.\textsuperscript{6,9}

Surgeons who are treating patients with significant glenoid bone loss may utilize this MRI protocol if they are concerned about the anatomy of the coracoid pre-operatively.
Limitations

1. Sample size limited our post-operative outcome analyses, as there were only 3 patients with recurrent instability in our cohort.

2. Details regarding graft orientation and indications for concomitant Bankart repair could not be standardized due to the retrospective design of this study.

3. The size of intra-operative bone grafts was not measured, so the exact size of utilized bone grafts was not determined.
Conclusion

Patients undergoing Latarjet coracoid transfer had similar post-operative outcomes regardless of pre-operative coracoid dimensions. This MRI protocol for measuring coracoid dimensions has good inter-rater reliability and closely accounts for the specific landmarks utilized during the Latarjet osteotomy by focusing on identification of the CC ligament insertion.


