How Much Glenoid Bone Loss Needs to be Restored with a Latarjet?

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INTRODUCTION:

Significant anterior glenoid bone loss in the setting of recurrent instability may warrant a coracoid transfer (Latarjet). However, the amount of glenoid width that must be restored with a Latarjet in order to reestablish glenohumeral stability has not been studied. The purpose of this study is to determine the percentage of glenoid width restoration necessary for glenohumeral stability after Latarjet by measuring anterior humeral head translation and force distribution on the coracoid graft.

Our hypothesis was that restoration of 100% of glenoid width with Latarjet will be necessary for glenohumeral stability. When 90% or less of the glenoid width is restored after Latarjet, there will be significant increases in anterior humeral head translation and force distribution on the coracoid graft will increase.

METHODS:

Nine cadaveric specimens were prepared and mounted on an established shoulder simulator, which loads shoulder tendons through a system of pulleys and weights. A motion tracking system on the scapula and humerus recorded glenohumeral translations and force distribution was recorded using a sensor secured to the glenoid face and coracoid graft transfer. (Figure 1)

Coracoid osteotomy was performed, and the coracoid graft was sized to a depth of 10mm. A lesser tuberosity osteotomy (LTO) was performed to allow accurate removal of glenoid bone. The amount of bone loss needed to reestablish 110%, 100%, 90%, and 80% of native glenoid width after Latarjet was calculated by directly measuring the widest point of the glenoid and confirming accuracy based on the CT scan. Bone loss was established using a burr and the coracoid graft transfer was secured with two screws. The conjoined tendon was passed through a subscapularis split and the LTO was repaired with multiple Kirshner wires prior to each testing condition (Figure 2). Additionally, the rotator interval was closed and the capsule was repaired prior to each testing condition.

The supraspinatus was loaded with 18N and the subscapularis, infraspinatus, and conjoined tendons were each loaded with 13N. Testing conditions included native glenohumeral joint, LTO, Bankart tear, and then 110%, 100%, 90%, and 80% of glenoid width restoration with Latarjet. Glenohumeral translations were recorded while applying an anteroinferior load of 44N at 90° of humerothoracic abduction and 0° or 45° of glenohumeral external rotation. Force distribution was recorded without an anteroinferior load.

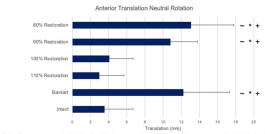
RESULTS:

Progressive increases in anterior humeral head translation occurred with an anteroinferior load as the amount of glenoid width restored decreased (Figure 3). An anteroinferior load created an average of 3.5mm (standard deviation +/- 3.2mm), 12.2mm (+/- 5.1mm), 3.0mm (+/- 2.7mm), 4.1mm (+/- 2.6mm), 10.8mm (+/- 3.0mm) and 13.1mm (+/-4.7mm) of anterior translation in the repaired LTO, Bankart, 110%, 100%, 90%, and 80% of glenoid restoration cohorts, respectively. There was no significant difference in translation between the intact glenohumeral joint and with a repaired LTO ($p=0.372$). There was a significant increase in anterior humeral head translation with 90% glenoid width restoration compared to 100% width restoration ($p<0.001$).

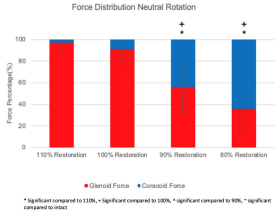
Greater glenoid bone loss also led to more force on the coracoid graft after Latarjet (Figure 4). 3.1%, 9.0%, 44%, 64% of the force distribution was on the coracoid graft relative to the native glenoid with glenoid width restoration to 110%, 100%, 90%, and 80%, respectively. There was a significant increase in force on the coracoid graft with 90% glenoid restoration compared to 100% width restoration ($p<0.001$).

DISCUSSION AND CONCLUSION:

There is a significant increase in anterior humeral head translation when only 90% of the native glenoid width is restored with Latarjet. There is also an increase in force distribution on the coracoid graft when 90% or less of native glenoid width can be restored by Latarjet. By determining the goals for glenoid width restoration after Latarjet, the findings of this study may provide guidance for patient-specific size requirements for the coracoid based on preoperative imaging. When 100% glenoid width cannot be restored with a Latarjet, surgeons may consider alternative graft sources.



* Significant compared to 110%, + Significant compared to 100%, ^ significant compared to 90%, ~ significant compared to intact



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