

## NORMALIZATION OF GLENOHUMERAL ARTICULAR CONTACT PRESSURES AFTER EITHER LATARJET OR ILIAC CREST BONE GRAFTING PROCEDURE

### IMPACT OF GRAFT TYPE, POSITION, AND CORACOID ORIENTATION

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#### Background

The articular conformity after bone augmentation procedures for glenoid deficiency remains poorly defined. We sought to investigate the alterations in glenohumeral articular contact pressures in a glenoid bone loss model to determine changes in pressure with proud, flush, and recessed Latarjet or iliac crest bone grafting (ICBG) procedures, and to determine the optimal orientation of the Latarjet graft.

#### Methods

Twelve fresh-frozen cadaveric shoulders were stripped of all tissues except the labrum. In static positions of scapular abduction (30 degree, 60 degree, and 60 degree with 90 degree external rotation) with a compressive load of 440 N, the glenohumeral contact area, contact pressure, and peak pressure were determined with a Tekscan sensor (Tekscan, South Boston, Massachusetts) for several conditions: (1) intact glenoid, (2) glenoid with clinical 15% and 30% defect from the 2 o'clock position to the 6 o'clock position, (3) 30% glenoid defect treated with Latarjet bone block placed 2 mm proud, flush, and 2 mm recessed to the glenoid, (4) 30% glenoid defect with ICBG placed 2 mm proud, flush, and 2 mm recessed to the glenoid, and (5) Latarjet bone block oriented with either the lateral (Latarjet-LAT) or inferior (Latarjet-INF) surface of the coracoid as the glenoid face.

#### Results

With a glenoid bone defect of 30% and 60-degree glenohumeral abduction with 90-degree external rotation, contact area decreased  $37 \pm 5\%$  ( $P < .04$ ), and mean contact pressure increased  $72 \pm 8\%$  ( $P < .01$ ), with mean contact pressure in the anteroinferior quadrant increasing  $294 \pm 35\%$  ( $P < .001$ ) compared to the intact state. Bone grafts in the flush position restored mean contact pressure to  $84 \pm 4\%$  (ICBG,  $P < .02$ ),  $79 \pm 5\%$  (Latarjet-INF,  $P < .02$ ), and  $62 \pm 4\%$  (Latarjet-LAT,  $P < .03$ ) of normal. Latarjet-LAT demonstrated statistically higher peak pressure than ICBG and Latarjet-INF at nearly all positions ( $P < .02$ ). With bone grafts placed in the proud position, mean contact pressure increased an additional  $44 \pm 6\%$  ( $P < .01$ ) in the anteroinferior quadrant, with a  $100 \pm 13\%$  ( $P < .01$ ) increase in the posterosuperior glenoid indicating a shift posteriorly.

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Mean contact pressures and forces of bone grafts placed in the recessed position were not significantly different from those of 30% glenoid defect, with high edge loading.

#### Conclusion

Due to the inherent congruity of the ICBG and the bony anatomy of the coracoid, contact pressures and edge loading were lower in glenoid defects reconstructed with ICBG and Latarjet-INF than in those reconstructed with the Latarjet-LAT method.

Grafts placed in the proud position not only increased the peak pressure in the anteroinferior quadrant but also shifted the articular contact forces to the posterosuperior quadrant. These findings may point toward the potential clinical advantages of an optimally placed ICBG and the Latarjet-INF graft orientation versus Latarjet-LAT for glenoid bone reconstruction.