# Effect of Glenosphere Lateralization With and without Coracoacromial Ligament Transection on Acromial and Scapular Spine Strain in Reverse Shoulder Arthroplasty

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INTRODUCTION:

Small changes in deltoid tension and moment arm due to glenosphere lateralization may be associated with an increase in acromion or scapular spine strain in reverse shoulder arthroplasty (RSA), which can lead to stress fracture. The coracoacromial ligament (CAL) may be protective and lower the strain seen on the acromion or scapular spine. This biomechanical study investigated the impact of glenosphere lateralization and CAL integrity on acromion and scapular spine strain after RSA.

METHODS:

Ten cadaveric specimens were tested on a custom dynamic shoulder frame. Acromial and scapular spine strain were measured at 0°, 30°, and 60° of abduction using strain rosettes fixed to the acromion (Levy Type 2) and the scapular spine (Levy Type 3). Specimens were first tested with a standard commercially available RSA implant with zero lateralization and then subsequently with the +3 and +6 lateralizing glenospheres for that implant. The CAL was then cut in each specimen and testing was repeated with the 0, +3, and +6 glenospheres. Maximal strain was recorded at both the acromion and scapular spine and analysis of variance compared strain across various abduction angles and glenospheres with and without CAL transection.

RESULTS:

In the intact CAL group, maximal strain decreased significantly at the acromion with abduction from $0^{\circ}$ to $30^{\circ}$and $0^{\circ}$ to $60^{\circ}$, however at the scapular spine abduction did not significantly impact strain. Maximal strain decreased significantly with increasing abduction from 0 to 30 and 0 to 60 at both the acromion and scapular spine in the cut CAL group. Average strain at the acromion was significantly higher in the cut group (844.7 με) versus the intact group (580.3 με), a difference of 31.3% (p=.0493). Average strain at the scapular spine, did not differ in the cut group (725 με) compared with the intact group (787 με) (p=.3666). There were no statistically significant differences in acromial or scapular spine strain between various levels of glenosphere lateralization in either the cut or intact state.

DISCUSSION AND CONCLUSION:

In this biomechanical study, arm abduction decreased acromial and scapular spine strain following RSA. Cutting the CAL significantly increased strain at the acromion, and did not significantly alter strain at the scapular spine for all angles of abduction, differing from prior literature. Glenosphere lateralization did not have a significant effect on strain at the levels studied regardless of CAL status. Continued study of the complexion relationship between surgical and implant factors on strain following RSA is needed.