Title: Effect of Reverse Shoulder Arthroplasty Humeral Component Retroversion on Acromial Stress.

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Introduction: Acromion and scapular spine stress fractures are catastrophic complications following reverse shoulder arthroplasty (RSA). A variety of host, implant, and technical factors have been identified that increase the risk of this complication. The glenoid component in particular has been closely evaluated for its impact on rates of stress fractures following RSA. The goal of this biomechanical study is to evaluate if humeral stem version has an impact on acromion and scapular spine strain after RSA.

Methods: Eight cadaveric specimens were tested on a custom dynamic shoulder frame. Commercially available RSA components were implanted with the humeral component inserted in 0 degrees of retroversion. Acromion and scapular spine strain were measured at 0, 30, and 60 degrees of abduction using strain rosettes secured to the acromion and scapular spine in the typical locations for Levy Type 2 and Type 3 stress fractures, respectively. The humeral stem was then removed and reimplanted in 30 degrees of retroversion and the measurements were repeated. Student t-test was performed to analyze the relationship between humeral stem version and acromion and scapular spine strain at various abduction angles.

Results: Strain at the both the acromion and scapular spine were found to have no significant difference at any abduction angle when comparing 0- and 30-degree version of the humeral stem. With 0-degree and 30-degree versions pooled together, there is significantly lower acromion and scapular spine strain at 60 degrees of abduction when compared to 0 degrees of abduction [Strain at 0 degrees abduction – strain at 60 degrees abduction: Acromion 313.1 με; $p = 0.0409$, Scapular spine 304.9 με; $p.= 0.0407$]. There was no significant difference in strain at either location when comparing 0 degrees of abduction to 30 degrees of abduction and when comparing 30 degrees of abduction to 60 degrees of abduction.

Conclusions: This biomechanical study found no significant difference in scapular spine and acromion strain after RSA when comparing variations in humeral stem version. There does appear to be lower strain at both the acromion and scapular spine at 60 degrees of abduction when compared to 0 degrees of abduction regardless of stem version. This may have implications on treatment for scapular spine or acromial stress fractures following RSA.