

Analysis of Subscapularis Integrity and Function After Lesser Tuberosity Osteotomy Vs. Subscapularis Tenotomy in Total Shoulder Arthroplasty Using Ultrasound and Validated Clinical Outcome Measures

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Summary:

The optimal method for take down of the subscapularis during total shoulder arthroplasty is controversial. Our analysis of 51 patients (60 shoulders) at a minimum 1 year follow-up demonstrates that lesser tuberosity osteotomy trends toward improved functional outcomes compared to subscapularis tenotomy.

Abstract:

Background:

The optimal method for take down of the subscapularis during total shoulder arthroplasty (TSA) is controversial. Some recent evidence suggests that lesser tuberosity osteotomy has a higher healing rate and improved functional outcomes compared to subscapularis tenotomy.

Methods:

Patients who underwent TSA or hemiarthroplasty for primary osteoarthritis or rheumatoid arthritis at a minimum one year of follow-up were eligible for inclusion. All study patients underwent physical examination by an examiner blinded to the procedure and ultrasound examination of the operative shoulder by an experienced ultrasonographer who was also blinded to the procedure performed. Radiographs were reviewed to evaluate for osteotomy healing. Finally, all patients completed three validated outcomes instruments: Western Ontario Osteoarthritis of the Shoulder (WOOS) index, Disability of the Arm, Shoulder, and Hand (DASH), and Constant Score. Statistical analyses were carried out using Fisher's exact test for proportions and Wilcoxon test for means.

Results:

Sixty shoulders in 53 patients who underwent a shoulder arthroplasty procedure at a minimum of one year follow-up were included. Tenotomy (n = 32) and osteotomy (n = 28) patients were similar in age, hand dominance, and gender. Follow-up duration for tenotomy and osteotomy patients differed (31.7 vs. 22.1 months, p = 0.002). WOOS score for all tenotomy patients was 82.1±18.9 vs. 91.5±10.2 in osteotomy patients (p = 0.13). DASH and Constant scores were not significantly different between the two groups (14.0±13.9 vs. 10.8±8.9, p = 0.70 for DASH and 80.8±9.9 vs. 81.8±9.4, p = 0.79 for Constant). Using ultrasound, four subscapularis tendons were abnormal in the tenotomy group (3 attenuated, 1 rupture) and all tendons were normal in the osteotomy group (p = 0.11). All radiographs showed union of lesser tuberosity, except one patient who had fibrous union. On physical examination, the tenotomy and osteotomy groups had similar forward elevation (151±16 vs. 145±14 degrees, p = 0.07) and abduction (132±21 vs. 128±23, p = 0.45) but the tenotomy group had significantly more external rotation (69±12 vs. 60±11, p = 0.005). Belly press resistance was 21.1±7.6lbs vs. 23.4±6.1lbs (p = 0.09) and bear hug resistance was 23.5±8.6lbs vs. 26.9±7.8lbs (p = 0.09) for the tenotomy and osteotomy groups.

When comparing normal (n = 56) and abnormal (n = 4) subscapularis tendons by ultrasound examination, the WOOS index was significantly different (88±15 vs. 65±18, p = 0.009) as was the DASH score (11.5±11.4 vs 25.9±11.2, p =

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0.02). The Constant score did not differ significantly (81.5 ± 9.6 vs 76.8 ± 9.7 , $p = 0.34$). Forward elevation and abduction did not differ between the groups but the abnormal tendons had increased external rotation (63.6 ± 12.1 vs. 76.3 ± 7.5 degrees, $p = 0.04$). Belly press resistance was significantly different (22.6 ± 6.9 lbs vs. 15.3 ± 5.0 lbs, $p = 0.04$) and bear hug resistance trended lower in the abnormal group (25.6 ± 8.2 lbs vs 17.3 ± 7.4 lbs, $p = 0.07$).

Conclusions:

Our results may indicate a trend towards improved functional outcomes in patients who underwent lesser tuberosity osteotomy compared to subscapularis tenotomy. Although the number of abnormal tendons identified in the study was small, an abnormal subscapularis tendon on ultrasound correlates with inferior functional outcomes based on WOOS and DASH scores, as well as decreased strength on quantitative belly press and bear hug testing.