Determining the Risk Factors for Acromial Stress Fracture After Reverse Total Shoulder Arthroplasty

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INTRODUCTION:

Reverse total shoulder arthroplasty (RTSA) predisposes patients to the development of acromial stress fractures by altering native joint biomechanics and causing increased tension and loading on the acromion process. Notwithstanding, very few studies to date have evaluated whether certain factors are associated with postoperative acromial stress fractures in this patient population. The purpose of this study was to identify risk factors for the development of acromial stress fractures in patients undergoing RTSA.

METHODS:

This retrospective study identified all patients that underwent RTSA from December 2010 to April 2024 at a large tertiary care center. All patients had a minimum of 1-year follow-up. Univariate and multivariate regression analyses were performed to determine whether patient demographics, body mass index (BMI), Charlson comorbidity index (CCI), smoking status, prior arthroscopic procedures, vitamin D supplementation, antiresorptive therapy, and preoperative T-scores were associated with the development of acromial stress fracture following RTSA. Receiver operator character (ROC) curve analyses and the Youden index were used identify the optimal cutoff points for age, BMI, CCI, and T-score in predicting postoperative acromial stress fractures.

RESULTS:

2,305 patients that underwent RTSA were included in the analysis. At a mean follow-up time of 4.6 ± 2.2 years, 96 (4.2%) patients were found to have experienced an acromial stress fracture. Of the 2,305 patients included, 758 (32.9%) had a diagnosis of osteoporosis. After controlling for co-variates, BMI ³ 37 kg/m^2 (OR, 1.7 [95% CI, 1.0 to 2.8]; p=0.033), smoking (OR, 1.8 [95% CI, 1.1 to 2.7]; p=0.012), antiresorptive therapy (OR, 1.7 [95% CI, 1.1 to 2.8]; p=0.029), and T-score £ -2.1 (OR, 2.3 [95% CI, 1.4 to 3.7]; p<0.001) were found to be independent predictors for the development of acromial stress fractures after RTSA (**Table 1**).

DISCUSSION AND CONCLUSION:

To our knowledge, this is the largest study to date to have evaluated the association between different factors and the development of acromial stress fractures in patients undergoing RTSA. We found that BMI ³ 37 kg/m^2, smoking, antiresorptive therapy, and T-score £ -2.1 were independent predictors of acromial stress fractures after RTSA. Future studies are necessary in order to develop scoring systems that can aid in the preoperative risk stratification of this patient population.

Univariate and multivariate regressions analyses to identify factors associated with the development of acromial stress fractures.

Variable	Univariate		Multivariate†	
	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value
Age ≥ 75 years	1.659 (1.099 – 2.500)	**0.016**	1.519 (0.982 – 2.344)	0.059
Sex, Female	1.777 (1.160 – 2.782)	**0.009**	1.089 (0.669 – 1.796)	0.733
Race, Other	1.136 (0.274 – 3.140)	0.832	–	–
BMI ≥ 37 kg/m^2	1.517 (0.926 – 2.402)	0.085	1.718 (1.028 – 2.788)	**0.033**
CCI ≥ 4	1.594 (1.052 – 2.450)	0.030	1.287 (0.835 – 2.008)	0.259
Smoking, Active or former	1.544 (1.001 – 2.355)	**0.047**	1.780 (1.129 – 2.771)	**0.012**
Prior arthroscopic procedure	1.113 (0.535 – 2.074)	0.755	–	–
Vitamin D Supplementation	2.175 (1.356 – 3.641)	**0.002**	1.555 (0.938 – 2.672)	0.096
Antiresorptive therapy	2.832 (1.843 – 4.305)	**<0.001**	1.734 (1.054 – 2.840)	**0.029**
T-score ≤ -2.1	3.195 (2.107 – 4.830)	**<0.001**	2.325 (1.442 – 3.745)	**<0.001**

†Only variables with a p-value < 0.250 in the univariate analyses were included in the multivariate regression model.

BMI, body mass index; *CCI*, Charlson comorbidity index.

Bold values indicate statistical significance (p<0.05).