Outcomes and Subscapularis Integrity Following Standard versus Augmented Anatomic Total Shoulder Arthroplasty: A Prospective Study

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INTRODUCTION: Glenoid augmentation is increasingly used for anatomic total shoulder arthroplasty patients with posterior glenoid wear and offers benefits such as preservation of bone stock and correction of retroversion. However, there is concern that glenoid augmentation may cause excessive lateralization and overstuffing of the joint space, thus increasing pain, reducing range of motion, and putting greater mechanical stress on the subscapularis. The purpose of this study is to compare patient-reported outcome measures (PROMs), range of motion (ROM), and subscapularis integrity using ultrasound in patients receiving standard versus augmented glenoid components at 12 months post-surgery.

METHODS: Sixty-five patients undergoing primary anatomic total shoulder arthroplasty (TSA) at a single institution were enrolled in this prospective study. Patients received either a standard glenoid component or an augmented component (15 or 25 degrees) based on glenoid morphology. ROM (forward elevation [FE], abduction, and external rotation [ER]) and PROMs (Visual Analogue Scale [VAS], American Shoulder and Elbow Surgeons Score [ASES], Simple Shoulder Test [SST], and Subjective Shoulder Value [SSV]) were obtained at baseline and again at 12 months post-surgery. Subscapularis integrity was assessed via ultrasound at the 12-month postoperative timepoint.

RESULTS:

Fifty-five patients (38 standard glenoid, 17 augmented glenoid) completed 12-month follow-up. There was no significant difference in age (63.8 vs. 67.1 in the standard and augmented groups, respectively, $p = 0.11$), BMI (32.4 vs. 30.3, $p = 0.25$), smoking status (5.3% vs. 0.0%, $p = 0.24$) or diabetic status (13.2% vs. 11.8%, $p = 1.0$) between groups. Patients in the augmented glenoid group were more often male (76.5% vs. 39.5%, $p = 0.02$) (Table 1).

At final follow-up, no patients experienced implant-related complications or underwent reoperation or revision surgery. There was no significant difference in VAS between groups (6.4 vs. 4.4 in the standard and augmented groups, respectively, $p = 0.53$), ASES (84.8 vs. 90.9, $p = 0.17$), or SSV (90.2 vs. 92.9, $p = 0.40$). SST score was significantly better in the augmented group than the standard group (94.3 vs. 82.6, $p < 0.01$). FE (158.8° vs. 160.0° in the standard and augmented groups, respectively), abduction (143.0° vs. 147.2°), and ER (53.5° vs. 51.9°) at 12 months were not significantly different between groups ($p = 0.63$, 0.67, and 0.56, respectively) (Table 2).

In the standard glenoid group, 75.8% of patients had an intact subscapularis at 12 months, versus 78.6% of patients in the augmented glenoid group ($p = 1.0$). Subscapularis tendon thickness was not different between the standard and augmented groups (0.404 cm vs. 0.450 cm, respectively, $p = 0.37$) (Table 2).

DISCUSSION AND CONCLUSION: Patients with augmented glenoid components experienced comparable outcomes to those with standard components and had better SST scores at 12 months post-surgery. Both groups had similar post-operative ROM, indicating that in this study, augmented glenoid components did not lead to shoulder stiffness due to overstuffing. The similarities in subscapularis status and thickness between groups suggest that augmented components do not predispose patients to subscapularis failure or deficiency in the early post-operative period.

Table 1. Baseline characteristics

	All (n = 55)	Standard glenoid (n = 38)	Augmented glenoid (n = 17)	*p* value*
Male (%)	50.9%	39.5%	76.5%	**0.019**
Age (years; mean ± SD)	64.8 ± 7.1	63.8 ± 7.3	67.1 ± 6.4	0.114
BMI (kg/m^2; mean ± SD)	31.7 ± 6.3	32.4 ± 6.5	30.3 ± 5.5	0.252
Smoking (%)	3.6%	5.3%	0.0%	0.239
Diabetes (%)	12.7%	13.2%	11.8%	1.000
VAS	57.7 ± 21.0	58.5 ± 18.2	55.8 ± 26.7	0.701
ASES	38.0 ± 14.1	37.3 ± 12.4	39.6 ± 17.5	0.580
SST	34.1 ± 23.1	30.6 ± 21.0	41.7 ± 26.4	0.104
SSV	42.4 ± 17.3	40.9 ± 16.2	45.9 ± 19.6	0.325
Forward Elevation (°)	133.5 ± 21.2	130.2 ± 21.4	140.6 ± 19.5	0.095
Abduction (°)	128.3 ± 19.0	126.1 ± 20.9	133.8 ± 12.6	0.177
External Rotation (°)	38.6 ± 12.6	38.0 ± 12.9	40.0 ± 12.2	0.596

Table 2. 12-month outcomes

	All (n = 55)	Standard glenoid (n = 38)	Augmented glenoid (n = 17)	*p* value*
VAS	5.8 ± 10.5	6.4 ± 11.7	4.4 ± 7.3	0.532
ASES	86.6 ± 14.9	84.8 ± 15.2	90.9 ± 13.8	0.170
SST	86.2 ± 17.6	82.6 ± 19.7	94.3 ± 7.3	**0.003**
SSV	91.0 ± 10.7	90.2 ± 11.4	92.9 ± 9.1	0.398
Subscapularis thickness (cm)	0.418 ± 0.16	0.404 ± 0.14	0.450 ± 0.20	0.367
Subscapularis intact (%)	76.6%	75.8%	78.6%	1.000
Forward Elevation (°)	159.2 ± 8.0	158.8 ± 8.3	160.0 ± 7.5	0.632
Abduction (°)	144.1 ± 24.9	143.0 ± 29.0	147.2 ± 4.4	0.670
External Rotation (°)	53.0 ± 9.3	53.5 ± 9.4	51.9 ± 9.1	0.561

* For continuous variables, an independent t-test was performed, while for nominal variables chi-square tests or Fisher's exact tests were used.