Treatment of B2 type glenoids with Anatomic vs Reverse Total Shoulder Arthroplasty: A retrospective review

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INTRODUCTION: Patients who have glenohumeral arthritis with severe posterior bone loss with a biconcave glenoid and posterior humeral head subluxation consistent with Walch B2 type glenoid morphology present a challenging case for shoulder arthroplasty surgeons. Results of anatomic shoulder arthroplasty in B2 glenoids are variable, with poor outcomes in patients with increased retroversion and subluxation. Reverse total shoulder arthroplasty (RSA) is an option for these patients, with good short-term results. There is limited literature directly comparing TSA and RSA for the management of B2 glenoid deformities. The purpose of the study was to compare the outcomes of TSA vs RSA for primary osteoarthritis with a B2 glenoid.

METHODS:

We performed a retrospective review of all patients who underwent total shoulder arthroplasty by a single surgeon from January 2014 to December 2020. Preoperative computed tomography (CT) was used to determine glenoid morphology based on the modified Walch classification, and patients with B2 type glenoid wear were included in the study. Patients with rotator cuff tears or less than two years of follow-up were excluded. The study population was divided into TSA and RSA groups. Patient reported outcome measures (PROMs), active range of motion, and any complications were compared between the groups. Radiographic analysis included pre-operative glenoid version, inclination, and posterior humeral head subluxation on CT scan. Post-operative radiographs were evaluated for glenoid version, inclination, humeral head subluxation, and component loosening.

RESULTS:

A total of 224 patients with Walch B2 type glenoid wear and an intact rotator cuff were included in the study. 162 of these patients underwent TSA, and 62 underwent RSA. The mean of follow-up (+/- standard deviation) was 32.8 +/- 2.27 months in the TSA group and 25.6 +/- 1.95 months in the RSA group ($p = 0.002$). The patients in the RSA group were older ($p < 0.001$) and had a higher proportion of females ($p = 0.019$) compared to those the TSA group. Patients in the TSA group had significantly better pre-operative forward flexion (FF) (110.2 +/- 36.5 vs 97.3 +/- 39; p=0.021), abduction (ABD) (101.5 +/- 34.5 vs 83.6 +/- 38.6; p=0.001), and external rotation (ER) (28.9 +/- 18.5 vs 23.4 +/- 17.6; $p = 0.045$) (Table 1). Post-operatively patients in the TSA group had significantly better external rotation (ER) compared to those who underwent RSA (53.28 +/- 12.26 degrees vs 39.22 +/- 18.18 degrees; $p < 0.001$). There were no significant differences in PROMs between the two groups pre-operatively or at final follow-up (Table 2). There was no difference between the two groups in glenoid version post-operatively (1.54 +/- 2.37 vs 1.81 +/- 2.66; $p = 0.561$). No patients in the TSA group demonstrated evidence of recurrent posterior humeral head subluxation postoperatively, and one patient in the TSA group had radiographic evidence of a loose glenoid component. Eight complications occurred, 4 in the RSA group and 4 in the TSA group. Three patients in the RSA group experienced instability requiring revision post-operatively, and one patient in the RSA group required revision for infection. Two patients in the TSA group required revision for infection, and 2 required revision for rotator cuff insufficiency with one having a grossly loose glenoid baseplate intra-operatively.

DISCUSSION AND CONCLUSION: Anatomic and reverse total shoulder arthroplasty can produce good results in patients with B2 type glenoid wear with low rates of revision. Anatomic total shoulder arthroplasty may result in improved range of motion that is not likely to be clinically relevant.

Pre and Post-operative Range of Motion

	Pre-op			Post-op (Final follow-up)		
	RSA	TSA	p-value	RSA	TSA	p-value
Forward Flexion (degrees)	97.26 +/- 38.96	110.19 +/- 36.51	0.021	155.25 +/- 29.52	161.11 +/- 25.16	0.145
Abduction (degrees)	83.63 +/-38.63	101.49 +/- 34.54	0.001	155.17 +/- 29.07	156.34 +/- 32.25	0.808
External Rotation (degrees)	23.36 +/- 17.60	28.92 +/- 18.50	0.045	39.22 +/- 18.18	53.28 +/- 12.26	< 0.001
Internal rotation (n)						
T12 and above	2	7	0.08	8	48	< 0.001
L1-L5	6	35		16	65	
Below L5	51	108		23	16	

Pre and Post-operative Patient Reported Outcome Measures

	Pre-op			Post-op (Final follow-up)		
	RSA	TSA	p-value	RSA	TSA	p-value
QuickDash	48.73 +/- 19.83	47.32 +/- 17.11	0.703	22.00 +/- 22.87	14.38 +/- 16.40	0.134
ASES	44.04 +/- 18.71	47.95 +/- 17.52	0.2	83.56 +/- 19.43	83.58 +/- 16.44	0.794
SANE	27.88 +/- 23.98	27.05 +/- 18.28	0.859	77.18 +/- 29.76	75.46 +/- 28.41	0.814
VAS Shoulder Pain	5.85 +/- 2.41	5.74 +/- 2.24	0.771	1.35 +/- 2.25	1.53 +/- 2.25	0.733
VAS Shoulder Physical Function	3.60 +/- 1.63	3.86 +/- 1.89	0.425	7.43 +/- 3.54	7.67 +/- 2.81	0.749

RSA = reverse total shoulder, TSA = anatomic total shoulder, QuickDASH = Quick disabilities of the arm, shoulder, and hand score,
ASES = American shoulder and elbow surgeon score, SANE = Single assessment numeric evaluation score, VAS = Visual analog scale