

Anatomic Total Shoulder Arthroplasty Following Healed Rotator Cuff Repair Leads to Worse Functional Outcomes Compared to Those Without Prior Rotator Cuff Repair: A Matched Analysis

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INTRODUCTION:

Rotator Cuff Repair (RCR) is a well-established procedure to restore shoulder function and alleviate pain in patients with rotator cuff tears. However, despite a healed rotator cuff, a small subset of these patients can progress to symptomatic glenohumeral osteoarthritis. While reverse total shoulder arthroplasty (rTSA) can reliably address rotator cuff dysfunction and provide pain relief, it carries potential downsides with reduced internal rotation, forward flexion, and concern for longevity in younger or more active patients. Therefore, in patients with a healed RCR, anatomic total shoulder arthroplasty (aTSA) may remain a viable option to preserve native shoulder kinematics and improve overall function.

Currently, there is limited data regarding the clinical outcomes for aTSA following a healed RCR (TSA-RCR). Therefore, the purpose of this study was to compare patient reported outcome measures, re-operation rate, and complications following TSA-RCR to a matched cohort of patients undergoing primary aTSA without prior RCR (TSA). We hypothesize that patients with a healed RCR will demonstrate a higher re-operation rate but maintain similar patient-reported outcome measures compared to those undergoing primary aTSA without RCR.

METHODS:

A retrospective cohort study was performed, with electronic medical records queried to identify all patients who underwent aTSA from 2008-2022 at a single institution. Patients were included if they underwent a primary aTSA following a previously healed arthroscopic RCR with a minimum 2 year follow up. These patients were then matched 3:1 based on age, sex, and BMI to a similar cohort who underwent primary aTSA without a prior history of RCR. Exclusion criteria included revision TSA, conversion from prior hemiarthroplasty, reverse total shoulder arthroplasty, open rotator cuff tear, or patients who lacked follow up or documentation. All patients had an intact ipsilateral rotator cuff, which was confirmed on physical examination, advanced imaging, and upon inspection intra-operatively. Chart review was conducted to obtain demographic information, range of motion (ROM), operative details of the index RCR (if applicable) and subsequent TSA, complications, and re-operations. All patients were contacted at least 2 years postoperatively to obtain patient reported outcome measures (PROMs), including American Shoulder and Elbow Surgeons (ASES), Single Assessment Numeric Evaluation (SANE), and SF-12 scores. Statistical analysis was performed by student t-test or Mann-Whitney U tests to compare groups of 2 and ANOVA or Kruskal-Wallis tests to compare groups of 3 or more. Fisher's Exact test was used to compare categorical data. A p-value of <0.05 was considered to be significant for the purpose of this study.

RESULTS:

A total of 84 patients (21 aTSA with healed RCR group (TSA-RCR), 63 aTSA without prior RCR group (TSA)) were included in the study. There was no significant difference in age, sex, BMI, comorbidities, or follow up between groups (Table 1). The tendon involvement (single versus multiple), tear characterization, and concomitant procedures at the index RCR for the TSA-RCR group were listed (Table 2). The average interval between RCR to TSA was 46.8 months +/- 35.7 months. Postoperative flexion and internal rotation were similar between groups, while external rotation trended higher in the TSA-RCR group (60.2 vs 46.2, p=0.067). Compared to the TSA group, the TSA-RCR group had significantly worse patient-reported outcomes, including lower ASES scores (55.0 vs 84.2, p<0.001), SANE scores (59.7 vs 82.9, p=0.001) and SF-12 mental health scores (48.0 vs 55.9, p=0.006). TSA-RCR also demonstrated a trend toward higher re-operation rates (9.52% vs 0.0%, p=0.060), with 2 patients requiring conversion to reverse TSA due to recurrent rotator cuff tear.

DISCUSSION AND CONCLUSION:

Anatomic total shoulder arthroplasty following healed rotator cuff repair demonstrated worse functional outcome measures with a trend toward higher re-operation rates compared to those without prior RCR. Despite the similar range of motion between groups postoperatively, there appears to be a disconnect between clinical performance and patient-perceived recovery. These findings highlight the importance of thorough pre-operative counseling and shared decision making when considering aTSA following a RCR, as they may be at higher risk of poor outcomes measures and subsequent failure.

Table 1. Demographics

	TSA with RCA (N=44)	TSA with RCA (N=11)	TSA with RCA (N=33)	Overall P Value
Age at TSA Register (Yr) - mean (SD)	41.2 (9.99)	41.7 (7.48)	41.2 (9.76)	0.90
Sex - n (%)				0.90
Female	42 (94.5%)	11 (100%)	53 (95.4%)	
Male	2 (4.5%)	0 (0%)	2 (3.6%)	
Equal Distance - n (%)				0.98
Left	11 (25%)	1 (9%)	12 (21.5%)	
Right	31 (70%)	10 (91%)	41 (73.5%)	
Laterality - n (%)				0.64
Left	38 (85.2%)	11 (100%)	49 (87.5%)	
Right	6 (13.8%)	0 (0%)	6 (10.6%)	
Follow-Up (Yr) - mean (SD)	4.45 (3.75)	4.45 (3.75)	4.45 (3.75)	0.99
Response Unavailable - n (%)				0.18
Consistent	10 (22.7%)	1 (9.1%)	11 (19.6%)	
Intermittent	1 (2.3%)	1 (9.1%)	2 (3.6%)	
Occasional	1 (2.3%)	0 (0%)	1 (1.8%)	
Never	1 (2.3%)	0 (0%)	1 (1.8%)	
Rotator Cuff Arthropathy	0 (0%)	0 (0%)	0 (0%)	
Chronic Comorbidity Index - mean (SD)	2.41 (3.52)	2.34 (3.48)	2.39 (3.51)	0.47
Edema Score - n (%)				0.90
No	16 (36%)	1 (9.1%)	17 (30.5%)	
Yes	28 (64%)	10 (91%)	38 (67.5%)	

Table 2. Rotator Cuff Characteristics

	TSA with RCA (N=44)	TSA with RCA (N=11)	Overall P Value
Age at RCA - mean (SD)	37.4 (7.76)	37.4 (7.76)	-
Months from TSA to TSA - mean (SD)	48.4 (20.7)	48.4 (20.7)	-
Tendon Rupture - n (%)			
Intact	12 (27.3%)	12 (100%)	0.048
Ruptured	32 (72.7%)	0 (0%)	
Repair Configuration - n (%)			0.64
Single Row	12 (27.3%)	12 (100%)	
Double Row	20 (45.5%)	0 (0%)	
Subscapularis - n (%)			0.99
Yes	16 (36.4%)	16 (14.5%)	
No	28 (63.6%)	28 (25.5%)	
Supraspinatus - n (%)			-
Yes	3 (6.8%)	3 (2.7%)	
No	41 (93.2%)	41 (37.3%)	
Suprascapular Tendon Thickness - n (%)			-
Intact	7 (16%)	7 (6.4%)	
Full	11 (25%)	11 (100%)	
Intermediate - n (%)			-
Yes	19 (43%)	19 (17.3%)	
No	25 (57%)	25 (22.7%)	
Consistent Pain - n (%)			-
Deep Tendons	1 (2.3%)	1 (9.1%)	
Subscapularis	2 (4.5%)	2 (18.2%)	
Supraspinatus and Lateral Body Rotator	4 (9.1%)	4 (36.4%)	
Intermediate Acromioclavicular	4 (9.1%)	4 (36.4%)	
Subscapularis Distal and Chondrolysis	4 (9.1%)	4 (36.4%)	
Lateral Body Rotator	1 (2.3%)	1 (9.1%)	

Table 3. Clinical Outcomes

	TSA with RCA (N=44)	TSA with RCA (N=11)	TSA with RCA (N=33)	Overall P Value
Postoperative Active Flexion (°) - mean (SD)	134 (28.3)	137 (23.6)	136 (26.7)	0.94
Postoperative External Rotation RCA - mean (SD)	12.1 (22.3)	12.1 (22.3)	12.1 (22.3)	0.94
Postoperative RCA - n (%)				0.76
0-10	11 (25%)	0 (0%)	11 (33%)	
11-15	20 (45%)	10 (91%)	30 (87.5%)	
16-20	14 (32%)	14 (127%)	28 (83.8%)	
21-25	1 (2.3%)	1 (9.1%)	2 (6.1%)	
26-30	1 (2.3%)	1 (9.1%)	2 (6.1%)	
31-35	1 (2.3%)	1 (9.1%)	2 (6.1%)	
36-40	1 (2.3%)	1 (9.1%)	2 (6.1%)	
41-45	1 (2.3%)	1 (9.1%)	2 (6.1%)	
46-50	1 (2.3%)	1 (9.1%)	2 (6.1%)	
51-55	1 (2.3%)	1 (9.1%)	2 (6.1%)	
56-60	1 (2.3%)	1 (9.1%)	2 (6.1%)	
61-65	1 (2.3%)	1 (9.1%)	2 (6.1%)	
66-70	1 (2.3%)	1 (9.1%)	2 (6.1%)	
71-75	1 (2.3%)	1 (9.1%)	2 (6.1%)	
76-80	1 (2.3%)	1 (9.1%)	2 (6.1%)	
81-85	1 (2.3%)	1 (9.1%)	2 (6.1%)	
86-90	1 (2.3%)	1 (9.1%)	2 (6.1%)	
91-95	1 (2.3%)	1 (9.1%)	2 (6.1%)	
96-100	1 (2.3%)	1 (9.1%)	2 (6.1%)	
Post-Operative Pain (VAS) - mean (SD)	12.1 (22.3)	12.1 (22.3)	12.1 (22.3)	0.94
Post-Operative Pain (VAS) - n (%)				0.29
0-10	11 (25%)	11 (100%)	22 (66.7%)	
11-20	14 (32%)	14 (127%)	28 (83.8%)	
21-30	14 (32%)	14 (127%)	28 (83.8%)	
31-40	1 (2.3%)	1 (9.1%)	2 (6.1%)	
41-50	1 (2.3%)	1 (9.1%)	2 (6.1%)	
51-60	1 (2.3%)	1 (9.1%)	2 (6.1%)	
61-70	1 (2.3%)	1 (9.1%)	2 (6.1%)	
71-80	1 (2.3%)	1 (9.1%)	2 (6.1%)	
81-90	1 (2.3%)	1 (9.1%)	2 (6.1%)	
91-100	1 (2.3%)	1 (9.1%)	2 (6.1%)	
Post-Operative Pain (VAS) - n (%)				0.94
0-10	11 (25%)	11 (100%)	22 (66.7%)	
11-20	14 (32%)	14 (127%)	28 (83.8%)	
21-30	14 (32%)	14 (127%)	28 (83.8%)	
31-40	1 (2.3%)	1 (9.1%)	2 (6.1%)	
41-50	1 (2.3%)	1 (9.1%)	2 (6.1%)	
51-60	1 (2.3%)	1 (9.1%)	2 (6.1%)	
61-70	1 (2.3%)	1 (9.1%)	2 (6.1%)	
71-80	1 (2.3%)	1 (9.1%)	2 (6.1%)	
81-90	1 (2.3%)	1 (9.1%)	2 (6.1%)	
91-100	1 (2.3%)	1 (9.1%)	2 (6.1%)	