Efficacy of Reverse Shoulder Arthroplasty Compared with Superior Capsular Reconstruction in Patients with Posterosuperior Irreparable Rotator Cuff Tears Without Arthritis: A Propensity Score Matching Study

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INTRODUCTION:
posterosuperior irreparable rotator cuff tears (PSIRCTs) may cause a loss of active range of motion (aROM) and strength in forward elevation (FE), abduction (ABD), and external rotation (ER) of the shoulder.[11] There are various surgical options; however, the management of PSIRCTs patients without arthritis controversial. In general, joint-preserving surgeries, including partial repair, biceps rerouting, subacromial balloon spacing, superior capsular reconstruction (SCR), and tendon transfer, are optimal in these cases. Among these treatments, SCR has recently been developed and has shown promising results. Moreover, reverse shoulder arthroplasty (RSA) has received attention as a possible treatment option for PSIRCTs patients without arthritis. Although SCR and RSA are viable treatment options for PSIRCTs patients without arthritis, few studies have compared the outcomes of SCR and RSA in patients with PSIRCTs. Moreover, these studies had limitation of difference in demographic data between two groups. The purpose of this study is to compare the clinical outcomes and recovery of muscle strength in PSIRCTs patients without arthritis who underwent either SCR or RSA.
METHODS:
We retrospectively performed a clinical comparative study of patients who underwent RSA or SCR for PSIRCTs between January 2017 and December 2021. The indications for RSA or SCR for PSIRCTs were as follows (Fig 1). Using propensity score matching based on demographic variables, 15 patients in each group were included (RSA and SCR groups) with a minimum 2-year follow-up (Fig 1). After Propensity score matching, there was no significant difference in age, sex, dominant hand and FI grade between two groups. In the surgical procedure, the SCR technique was performed with reference to Mihata et al.'s surgical methods. Following the confirmation of PSIRCTs, the medial-to-lateral dimension of the graft was determined by measuring the distance from the glenoid to the greater tuberosity footprint, while the anteroposterior dimension determined by measuring the distance of greater tuberosity footprint. Subsequently, a fascia lata autograft was harvested, including the intermuscular septum with the gluteus maximus to ensure sufficient graft thickness.[30] The harvested fascia lata autograft was prepared by folding three to four times, ensuring a minimum thickness of 6 mm. The bone surfaces of the superior glenoid rim and greater tuberosity footprint were prepared and decorticated. Two 4.5-mm polyether ether ketone (PEEK) Corkscrew anchors were inserted into the superior glenoid, and two additional 4.5-mm PEEK Corkscrew anchors were placed into the supraspinatus footprint. The medial edge of the graft was secured using a mattress suture technique, while the lateral edge was affixed using the double-row suture bridge technique with lateral anchors in the shoulder at a 30° abduction position. After securing the graft, a posterior side-to-side suture was placed to connect the graft with the remaining posterior cuff tissue. Clinical outcomes were compared using visual analogue scale (VAS) score, Constant shoulder score, American Shoulder and Elbow Surgeons (ASES) score, University of California Los Angeles (UCLA) shoulder score, activities of daily living requiring active ER (ADLER) and active range of motion (aROM). The strength of aROM was evaluated using a hand-held dynamometer. The acromiohumeral distance (AHD) and Hamada classification were assessed in the true AP view with the patient standing.
RESULTS:
Both groups showed significant improvement in postoperative clinical and functional outcomes; there was no significant difference between the groups. However, mean improvement in the Constant score, American Shoulder and Elbow Surgeons (ASES) score, University of California Los Angeles (UCLA) score, forward elevation, and abduction was significantly better in the RSA group Moreover, the achievement of MCID for ASES score and UCLA score was significantly better in the RSA group (p = 0.001 and 0.009, respectively) (Table II). Although the muscle strength was improved following SCR or RSA, it was not statistically significant (Table I). In the SCR group, five patients (30%) showed postoperative progression of arthritic change, and seven patients (46.7%) had graft re-tear (Table III).
DISCUSSION AND CONCLUSION:
Although both RSA and SCR showed improved clinical and functional outcomes, RSA showed significant improvement in clinical outcomes compared to SCR in PSIRCTs patients without arthritis. However, the limited recovery of muscle strength should be considered in RAS or SCR. Furthermore, graft re-tear and progression of arthritic changes should be considered when performing SCR.

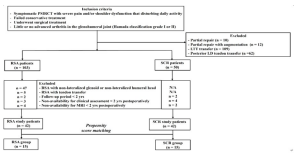

Figure 1. Flowchart of patient selection. PASIS/T, posterosuperior irreparable rotator cuff tear; LD, latissimus dorsi; LTT, lower trapezius tendon; RSA, reverse shoulder arthroplasty; SCR, superior capsular reconstruction; LDTM, latissimus dorsi and teres major; MRI, magnetic resonance image.

Table I. Comparisons in clinical and functional outcomes between the two surgical groups

Variables	RSA Group	SCR Group	*p*
VAS score			
Preoperative	4.8 ± 0.9	4.5 ± 1.4	0.247
Postoperative	1.4 ± 0.8	1.2 ± 0.4	0.011
p	0.001	0.001	
Constant score			
Preoperative	44.7 ± 4.2	47.7 ± 4.8	0.011
Postoperative	81.2 ± 6.0	57.9 ± 5.7	0.174
p	0.007	0.006	
ASES score			
Preoperative	46.9 ± 5.9	54.4 ± 9.6	0.023
Postoperative	69.7 ± 12.1	45.6 ± 7.5	0.102
p	0.001	0.001	
UCLA			
Preoperative	14.3 ± 4.7	16.6 ± 5.3	0.106
Postoperative	25.0 ± 3.9	22.5 ± 3.9	0.045
p	0.001	0.002	
ADLER			
Preoperative	13.9 ± 3.5	13.4 ± 2.3	0.312
Postoperative	20.3 ± 2.4	21.0 ± 2.3	0.412
p	0.001	0.001	
Active FE, °			
Preoperative	186.3 ± 16.4	110.0 ± 18.3	0.456
Postoperative	150.0 ± 13.4	141.3 ± 18.2	0.250
p	0.013	0.010	
ABD, °			
Preoperative	88.7 ± 32.2	94.4 ± 24.7	0.312
Postoperative	134.7 ± 22.8	124.0 ± 15.1	0.305
p	0.014	0.018	
ER at 0° of abduction, °			
Preoperative	25.0 ± 7.0	26.3 ± 6.9	0.212
Postoperative	57.3 ± 9.0	48.1 ± 15.8	0.345
p	0.004	0.001	
IR at body			
Preoperative	4.5 ± 1.0	8.1 ± 1.4	0.815
Postoperative	5.3 ± 2.0	5.9 ± 1.1	0.867
p	0.003	0.713	
Pseudoparalysis, n (%)			
Preoperative	2 (15.3)	3 (20.0)	0.583
Postoperative	0 (0.0)	1 (8.7)	0.492
p			
FE strength, N			
Preoperative	16.5 ± 4.1	18.7 ± 5.4	0.869
Postoperative	19.7 ± 2.9	21.4 ± 8.7	0.724
p	0.167	0.469	
ABD strength, N			
Preoperative	15.7 ± 3.0	17.1 ± 3.3	0.267
Postoperative	17.6 ± 3.5	18.4 ± 5.2	0.424
p	0.164	0.460	
IR at side strength, N			
Preoperative	16.4 ± 3.3	18.3 ± 5.7	0.148
Postoperative	21.0 ± 5.9	19.6 ± 7.3	0.302
p	0.009	0.649	
ER at side strength, N			
Preoperative	23.1 ± 4.0	21.2 ± 5.1	0.106
Postoperative	24.3 ± 4.5	23.7 ± 3.4	0.713
p	0.334	0.756	

Table II. Comparison of mean improvement of clinical and functional outcome between two groups

	RSA Group	SCR Group	*p*
MCID for Constant, n (%)			0.001
- Success	15 (100.0%)	6 (40.0%)	
- Failure	0 (0.0%)	9 (60.0%)	
MCID for ASES, n (%)			0.066
- Success	11 (73.3%)	5 (33.3%)	
- Failure	4 (26.7%)	10 (66.7%)	
MCID for UCLA, n (%)			0.009
- Success	11 (73.3%)	4 (26.7%)	
- Failure	4 (26.7%)	12 (73.3%)	

*Significant p-value is <0.05; RSA, reverse shoulder arthroplasty; SCR, superior capsular reconstruction; MCID, minimal clinically important difference; ASES, American Shoulder and Elbow Surgeons; UCLA, University of California, Los Angeles

Table III. Radiologic outcome of arthroscopic lower trapezius tendon transfer group

	RSA Group	SCR Group	*p*
AHD (mm)			
Preoperative	7.3 ± 2.9	8.1 ± 2.2	0.161
Postoperative		7.6 ± 2.7	
p		0.118	
Hamada grade			
Preoperative	1.6 ± 0.5	1.1 ± 0.3	0.011
Postoperative		1.8 ± 1.5	
p		0.040	

*Significant p-value is < 0.05; SD, standard deviation; AHD, acromiohumeral distance