

Research Article



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OBSERVATIONAL STUDY ON REVERSE TOTAL SHOULDER ARTHROPLASTY IN PATIENTS WITH CUFF-DEFICIENT SHOULDERS

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ABSTRACT

Background: Large rotator cuff tears or loss of function, complex proximal humerus trauma, glenohumeral arthritis, inflammatory pathology, and other pathologies that are not amenable to traditional shoulder arthroplasty are among the shoulder conditions for which RTSA (Reverse Total Shoulder Arthroplasty) is indicated.

Aim: The purpose of the current study was to assess the clinical results of patients with cuff-deficient shoulders following reverse total shoulder arthroplasty.

Methods: During the specified study period, 60 participants who were receiving RTSA at the Institute for various purposes were evaluated for this investigation. All of the subjects were kept in the beach chair position while the deltopectoral surgical technique was applied. To evaluate RTSA results, all participants were monitored for a full year following surgery.

Results: The study included a greater proportion of women and participants older than 60. The average weight of the research participants was 57.35±4.23 kg. The affected limbs were the right hand in 63.3% (n=38) of the participants, the left hand in 33.3% (n=20), and the bilateral limb in 3.3% (n=2). All clinical outcomes, including pain alleviation following surgery, SST scores, SANE, ASES, and constant Murley scores with p<0.05, showed a substantial improvement at 12 months.

Conclusion: shoulder surgery significantly improves functional outcomes and pain alleviation. From preoperative to different postoperative dates until one year, the SST, SANE, ASES, and Constant Murley scores demonstrated a significant and consistent increase.

Keywords: Constant Murley, reverse total shoulder arthroplasty, RTSA, Shoulder Scores, shoulder surgery

INTRODUCTION

The scapula and clavicle, which join the proximal humerus in the upper limb, make up the shoulder girdle. The shoulder is made up of four joints: the scapulothoracic, acromioclavicular (AC), sternoclavicular (SC), and glenohumeral joints. The glenohumeral joint, which joins the scapula's glenoid fossa, is one of these highly dynamic, ball-and-socket joints. Together with the triceps and biceps brachii tendons, the rotator cuff muscle, which attaches to the joint capsule, provides joint stability. The labrum, a fibrocartilaginous ring that attaches to the outer rim of the glenoid fossa, deepens the relatively shallow glenoid fossa, which covers less than one-third of the humeral head. Several bursae, which are fluid-filled sacs, are also found surrounding joints. These include subcoracoid, subscapular, subdeltoid, and subacromial bursae, which aid in lowering movement and friction.¹

Large rotator cuff tears or loss of function, complex proximal humerus trauma, glenohumeral arthritis, inflammatory pathology, and other pathologies that are not amenable to traditional shoulder arthroplasty are among the shoulder conditions for which RTSA (Reverse Total Shoulder Arthroplasty) is indicated. For certain shoulder disorders, RTSA has

been recommended and shown to be effective.² With a variety of prosthesis designs, including more sophisticated instrumentation, better fixation techniques, and modular components targeted at better outcomes, functionalities, and implant stability, RTSA has advanced in technique and implant design since initial use.²

As its use has increased, numerous studies have compared its effectiveness and results, reporting that it is more effective in treating rotator cuff inadequacy and other shoulder disorders. In order to help the deltoid muscle compensate for the loss of rotator cuff function and enable active forward abduction and flexion movements of the shoulder, RTSA shifts the center of rotation inferiorly and medially.³

Although there are many signs that RTSA can be used to treat a variety of shoulder disorders, it has been used more frequently in patients with significant rotator cuff tears and related arthritis, a condition termed as cuff tear arthroplasty. The rotator cuff muscles in these patients become dysfunctional, and conventional shoulder replacements do not produce positive results. RTSA can help these patients feel less discomfort and regain shoulder function. The purpose of the current study was to assess the clinical results of patients with cuff-deficient shoulders following reverse total shoulder arthroplasty.

MATERIALS AND METHODS

The goal of the current prospective observational study was to assess the clinical results of patients with cuff-deficient shoulders following reverse total shoulder arthroplasty. The Institute's Department of Orthopedics provided the study subjects. Prior to their involvement in the study, all subjects gave their written and verbal informed consent. 60 participants who were receiving RTSA at the Institute for various purposes during the study period were evaluated in this study. Subjects who were willing to participate in the study and had one or more signs of RTSA met the study's inclusion requirements.

A comminuted 3- or 4-part proximal humerus fracture, a failed hemiarthroplasty or total shoulder replacement with cuff deficiency, a rheumatoid arthritis with cuff deficiency, a completely torn rotator cuff that cannot be repaired, osteoarthritis of the shoulder with severe pain and functional impairment, cuff tear arthropathy, and any other indication were among the indications. Known metal allergies (titanium/tantalum), mental health conditions that could affect the ability to give informed consent and adhere to the postoperative protocol, neurological conditions (Parkinson's disease, multiple sclerosis, or a prior stroke), non-functioning deltoid muscles, and active infections were the study's exclusion criteria. Along with clinical information such as comorbidities, a thorough examination of the affected shoulder, and preoperative data collected in pre-made organized proforma, demographic data was obtained for each participant.

Preoperative radiographs were obtained and evaluated for Hamada shoulder classification, glenoid erosion, and glenoid subluxation. After putting all individuals in the beach chair position, a deltopectoral surgical technique was employed. The humeral component was either cemented or uncemented, and the base plate was screwed onto the glenoid before being inserted into the glenosphere.

For a month, the subjects were maintained in shoulder slings and were only allowed to perform passive range-of-motion activities. In order to safeguard the subcapsularis tendon healing, passive external rotation was avoided throughout the early phase. The subjects were permitted to perform everyday tasks with their arms in slings. After a month, teres minor and closed-chain deltoid exercises were initiated, and the usage of slings was stopped. No additional steps were taken. During the recovery phase, subjects were instructed not to carry anything heavy.

After three months following surgery, the participants were evaluated clinically and radiographically. Dislocation, scapular notching, glenoid component loosening, and humeral component loosening were evaluated in postoperative radiographs. All radiological and clinical evaluations were completed by professionals with field experience. Range of motion, including forward flexion, internal and external rotation, lifting capacity, activities of daily life, and pain threshold were evaluated using the constant Murley score. The American Shoulder and Elbow Surgeons' (ASES) scores were used to assess sleep disturbance brought on by pain, the requirement for pain medication, and the difficulty performing daily tasks and athletic activities. A subjective Likert scale was used to gauge patient satisfaction, determining whether the patient was completely satisfied, slightly satisfied, or dissatisfied with the results following surgery.

On a scale of 0 to 10, where 0 represents no pain and 10 represents the worst agony, patient stated levels of pain were evaluated using the Visual Analog Scores for Pain (VAS-pain). The Simple Shoulder Test (SST) employs a 12-point questionnaire that assesses shoulder function in a yes-or-no manner. On a scale of 1 to 100, the normal and affected sides are rated using the SANE (Single Assessment Numerical Evaluation) score. ANOVA, the chi-square test, the student's t-test, Fisher's exact test, the Mann Whitney U test, and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) were used to statistically evaluate the data that was gathered. When the p-value was less than 0.05, the significance level was taken into account.

RESULTS

The goal of the current prospective observational study was to assess the clinical results of patients with cuff-deficient shoulders following reverse total shoulder arthroplasty. During the designated study period, 60 participants who were receiving RTSA at the Institute for various purposes were evaluated for this investigation. The majority of the study participants were between the ages of 60 and 69 and 70 and 79, comprising 46.7% (n=28) of the total, followed by 3.33% (n=2) of the individuals in the 80–89 and 90–99 age groups, respectively. The study included 70% (n=42) female participants and 30% (n=18) male participants. In the majority of individuals, the right side was implicated in 63.35% (n=38), followed by the left side in 33.3% (n=20) and bilateral in 3.3% (n=20) (Table 1).

It was observed that the study subjects' mean varus score for evaluating the injury-related data was 14.35 ± 5.80 . The research participants' average weight was 57.35 ± 4.23 kg, their average functional outcome was 25.98 ± 17.22 , their average fixed flexional deformity (FFD) was 9.75 ± 7.38 , and their average range of motion was 88.21 ± 24.18 . The study participants' mean VAS ratings were 7.18 ± 1.38 and their mean Likert scale scores were 3.65 ± 0.90 (Table 1). According to the study's findings, the average Constant Murley score of the participants was 38.01 ± 6.64 before surgery, rising to 47.18 ± 5.95 right after, and then to 64.35 ± 6.22 , 85.21 ± 9.00 , 91.95 ± 7.12 , and 96.6 ± 5.32 after one month, three months, six months, and a year after surgery, respectively. The findings showed a statistically significant improvement in mean Constant Murley scores ($p < 0.05$).

Prior to surgery, the study participants' mean ASES scores were 43.31 ± 13.17 , and they quickly rose to 55.71 ± 8.45 . At one month, three months, six months, and a year after surgery, the corresponding values were 55.71 ± 8.45 , 69.08 ± 4.78 , 79.85 ± 4.64 , 93.38 ± 3.99 , and 95.4 ± 3.21 . The mean ASES improvement after the surgery was statistically significant, with $p < 0.05$ (Table 2).

Additionally, the study participants' mean SANE scores were 38.55 ± 6.49 before surgery, 53.35 ± 3.75 right after, and 64.85 ± 5.48 , 81.51 ± 7.14 , 92.25 ± 6.47 , and 94.45 ± 4.3 after one month, three months, six months, and a year after surgery, respectively. In terms of mean SANE (Single Assessment Numeric Evaluation) improvement after operation, the results were statistically significant with $p < 0.05$ (Table 2).

DISCUSSION

During the designated study period, 60 participants undergoing RTSA at the Institute for various purposes were evaluated for this study. The majority of study participants were in the 60–69 and 70–79 age groups, with 46.7% (n=28) each, followed by 3.33% (n=2) in the 80–89 and 90–99 age groups, respectively. The study included 70% (n=42) female participants and 30% (n=18) male participants. The majority of participants—63.35% (n=38)—were involved in the right side, followed by the left side (33.3%) in 20 subjects and the bilateral side (3.3%; n=20) in 20 cases). These findings were similar to those of earlier research by Mansotra S. et al. and Choi S. et al, whose authors evaluated participants with demographic information similar to those of the current study.

According to the study's findings, the mean varus score for the injury data was 14.35 ± 5.80 . The research participants' average weight was 57.35 ± 4.23 kg, their average functional outcome was 25.98 ± 17.22 , their average fixed flexional deformity (FFD) was 9.75 ± 7.38 , and their average range of motion was 88.21 ± 24.18 . The study participants' mean VAS score was 7.18 ± 1.38 , and their mean Likert scale score was 3.65 ± 0.90 . These results were consistent with those of Chamberlain AM et al. and Chun YM et al, whose authors' reported mean VAS, FFD, and ROM values were similar to those of the current study.

Prior to surgery, the study subjects' mean Constant Murley score was 38.01 ± 6.64 , and it quickly increased after surgery to 47.18 ± 5.95 , at 1 month, 3 months, 6 months, and 1 year postoperatively to 64.35 ± 6.22 , 85.21 ± 9.00 , 91.95 ± 7.12 , and 96.6 ± 5.32 respectively. The findings showed a statistically significant improvement in mean Constant Murley scores ($p < 0.05$). Prior to surgery, the study participants' mean ASES scores were 43.31 ± 13.17 , and they quickly rose to 55.71 ± 8.45 . At one month, three months, six months, and a year after surgery, the corresponding values were 55.71 ± 8.45 , 69.08 ± 4.78 , 79.85 ± 4.64 , 93.38 ± 3.99 , and 95.4 ± 3.21 . When it came to the mean improvement in ASES after the surgery, the results were statistically significant ($p < 0.05$). These findings were in line with those of Vanhelmond TA et al. and Saltzman BA et al. (2014), whose authors likewise reported results for mean Constant Murley score and ASES scores similar to those of the current study.

After evaluating different grading methodologies, the study subjects' mean preoperative SANE scores were 38.55 ± 6.49 , which rose to 53.35 ± 3.75 right after surgery and to 64.85 ± 5.48 , 81.51 ± 7.14 , 92.25 ± 6.47 , and 94.45 ± 4.3 after one month, three months, six months, and a year after surgery, respectively. The mean SANE improvement after the operation was statistically significant ($p < 0.05$). These results were in line with those of Morris BJ et al. (2011) and Emmanouil MM et al. (2012), whose findings for different scoring systems were similar to those of the current study.

CONCLUSION

Taking into account its drawbacks, shoulder surgery significantly improves functional results and pain reduction. From preoperative to different postoperative dates up to one year, the SST, SANE, ASES, and Constant Murley scores shown a significant and consistent increase. A decrease in VAS values indicated a decrease in discomfort.

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Characteristics	Number	Percentage (%)
Age range (years)		
60-69	28	46.7
70-79	28	46.7
80-89	2	3.33
90-99	2	3.33
Gender		
Male	18	30
Female	42	70
Involvement		
Right	38	63.3
Left	20	33.3
Bilateral	2	3.3
Mean varus	14.35±5.80	
Mean weight	57.35±4.23	
Mean functional outcome	25.98±17.22	
Mean FFD	9.75±7.38	
Mean ROM	88.21±24.18	
Mean Liker scale	3.65±0.90	
Mean VAS score	7.18±1.38	

Table 1: Demographic data of study subjects at baseline

Outcome scores	Pre-op	Immediate post-op	1-month post-op	3 months post-op	6 months post-op	1-year post-op	p-value
SST score	43.31±13.17	55.71±8.46	69.08±4.78	79.75±4.49	93.38±3.99	95.68±4.99	0.001
SANE score	38.55±6.49	53.35±3.75	64.85±5.48	81.51±7.14	92.25±6.47	94.45±4.3	0.001
ASES score	43.31±13.17	55.71±8.45	69.08±4.78	79.85±4.64	95.4±3.21	95.4±3.21	0.001
Constant Murley score	38.01±6.64	47.18±5.95	64.35±6.22	85.21±9.00	96.6±5.32	96.6±5.32	0.001

Table 2: Mean functional and clinical outcome score in pre ad post-operative time