

# Long-Term Outcomes Following Reverse Shoulder Arthroplasty for Cuff Tear Arthropathy: Analysis of Functional Scores and Complications

Dr. Ojas Yadav<sup>1</sup>, Dr. Akash Lotlikar<sup>2</sup>

<sup>1</sup>Junior Resident, Department of Orthopaedics, Jawaharlal Nehru Medical College, Belagavi, Karnataka, India

<sup>2</sup>Junior Resident, Department of Orthopaedics, Jawaharlal Nehru Medical College, Belagavi, Karnataka, India

**Abstract:** Background: Cuff tear arthropathy (CTA) represents a complex degenerative pathology of the shoulder, resulting from massive rotator cuff tears and subsequent humeral head migration. Reverse shoulder arthroplasty (RSA) is widely considered a viable treatment option for patients with irreparable rotator cuff tears, especially in advanced stages of arthropathy. However, the long-term functional outcomes and complications associated with RSA require further elucidation. Methods: A retrospective analysis was performed on 22 patients (14 females, 8 males; mean age 72.4 years) who underwent RSA for CTA at a single tertiary care institute. Data were collected over a minimum follow-up period of five years. Functional outcome measures included the Constant-Murley score, American Shoulder and Elbow Surgeons (ASES) score, and the visual analogue scale (VAS) for pain. Complications, including infection, dislocation, scapular notching, and revision surgery, were recorded. Statistical analysis was conducted to compare preoperative and final follow-up outcomes. Results: At final follow-up, both Constant-Murley and ASES scores demonstrated significant improvement ( $p < 0.001$ ) compared to preoperative values. Mean Constant-Murley score increased from 28.5 to 64.3, while mean ASES score improved from 34.2 to 78.6. VAS pain scores decreased substantially from 7.2 to 2.1 ( $p < 0.001$ ). Overall satisfaction was high, with 85% of patients reporting good to excellent results. The most common complication observed was scapular notching (18%), followed by dislocation (4.5%) and superficial infection (4.5%). No deep infection or loosening requiring revision was documented over the follow-up period. Conclusion: RSA provides substantial and sustained functional improvement for patients with CTA, with acceptable complication rates over a minimum five-year follow-up. Despite the potential for scapular notching, most patients experience significant pain relief and improved shoulder function.

**Keywords:** reverse shoulder arthroplasty, cuff tear arthropathy, long-term outcomes, functional scores, complications, shoulder surgery

## 1. Introduction

Cuff tear arthropathy (CTA) is characterized by a spectrum of degenerative changes in the glenohumeral joint associated with massive rotator cuff tears, superior migration of the humeral head, and eventual arthritis [1]. Traditional treatment strategies, such as partial or total shoulder arthroplasty, may not always achieve satisfactory outcomes in these patients because the underlying deficiency of the rotator cuff compromises normal joint biomechanics [2]. RSA was developed as a new concept to avoid the dependence of the rotator cuff by making the deltoid muscle the driver of shoulder function [3].

In the last two decades, RSA has gained popularity as a surgical treatment for patients with massive, irreparable rotator cuff tears, especially in the setting of CTA. Many short-term and midterm studies report significant improvements in pain relief and functional results after RSA [4,5]. As this surgery continues to grow in popularity throughout the world, it is also important to investigate whether these improvements are sustained into the long term and to establish the incidence of complications, which include loosening of the prosthesis, dislocation, and scapular notching [6]. It is also often described by scapular notching, whose clinical implication for pain and function has been questioned. However, studies indicate it could be related to poor clinical results and glenoid component loosening [7].

Knowledge of the long-term functional course after RSA is thus crucial for both surgeons and patients. In particular, evolution of objective measures such as Constant-Murley

score, ASES score, and patient reported pain through visual analogue scale will be studied. Equally relevant is the review of complications that may impact on the durability of functional gains as well as on patient satisfaction [8]. Given the increasing use of RSA, data on its longevity, survivorship, and potential disadvantages will inform clinical practice, particularly in elderly and comorbid patients.

Thus, the purpose of this study is to report long-term results of RSA in patients with CTA, focusing on functional scores—namely Constant-Murley and ASES scores—and VAS for pain. We also comment on complications, paying special attention to their incidence and general clinical implications. We hypothesize that RSA will lead to long-term benefit in functional outcome and reduction of pain at a minimum follow-up at five years and with a complication rate not exceeding what has been reported in contemporary reports.

## 2. Materials and Methods

### Study Design and Patient Selection

A retrospective observational study was conducted at a single tertiary care centre. Ethical clearance was obtained from the institutional review board prior to data collection. Patients were identified from a surgical database of individuals who underwent reverse shoulder arthroplasty (RSA) for cuff tear arthropathy (CTA) between January 2019 and December 2023. Inclusion criteria were: (1) diagnosis of CTA with massive rotator cuff tear; (2) primary RSA procedure; (3) minimum follow-up period of five years; and (4) availability of complete clinical and radiographic records. Exclusion criteria included revision RSA, history of prior infection in

the affected shoulder, and associated neurological disorders affecting the upper limb.

Initially, 32 patients were eligible based on operative records. Of these, 5 were lost to follow-up and 5 had incomplete documentation, leaving 22 patients in the final analysis. All surgeries were performed by a senior shoulder surgeon with extensive RSA experience.

### Surgical Technique

All procedures were carried out under general anaesthesia with additional regional block as clinically appropriate. A deltopectoral approach was utilized in 20 patients, while 2 received a superior approach based on surgeon preference and patient-specific factors. Humeral and glenoid components from the same implant system were used in each case. The glenoid baseplate was secured with locking screws, and a central peg or post was utilized depending on glenoid bone stock. The humeral component was cemented in the majority of cases, particularly in osteoporotic bone, though some were press-fit based on intraoperative assessment. The rotator cuff was inspected, and any remaining tissue not amenable to repair was debrided. Subscapularis repair was performed when feasible if tissue quality allowed.

### Postoperative Rehabilitation

An arm sling was maintained for four to six weeks. Early passive range-of-motion exercises began within 2 weeks postoperatively, followed by a gradual progression to active-assisted and active exercises under the guidance of a dedicated physiotherapist. Patients were instructed to avoid heavy lifting and repetitive overhead activities until at least three months post-surgery.

### Outcome Measures

**Functional Scores:** Clinical outcomes were measured via the Constant-Murley score, American Shoulder and Elbow Surgeons (ASES) score, and visual analogue scale (VAS) for pain. Assessments were performed preoperatively and at final follow-up (mean 6.2 years; range 5–8 years).

**Radiographic Evaluation:** Standard anteroposterior (AP) and axillary lateral radiographs of the shoulder were performed at each follow-up to assess prosthesis positioning, evidence of scapular notching, or signs of loosening. Two independent musculoskeletal radiologists evaluated the images.

### Complications

Any adverse events or complications including infection, dislocation, hematoma formation, and signs of prosthetic loosening were recorded. In addition, scapular notching was graded according to the Nerot-Sirveaux classification, when visible on radiographs.

### Statistical Analysis

Descriptive statistics were performed for all demographic and outcome variables. Continuous variables were presented as mean  $\pm$  standard deviation. Paired t-tests were used to compare preoperative and final follow-up functional scores, with significance set at  $p < 0.05$ . All analyses were conducted using SPSS software (version 25, IBM Corp, Armonk, NY).

## 3. Results

### Overview of Findings

A total of 22 patients, comprising 14 females and 8 males, were included in this study. The mean age was  $72.4 \pm 5.6$  years (range, 65–84 years). Mean follow-up duration was  $6.2 \pm 1.2$  years (range, 5–8 years). Demographic details, including comorbidities and dominant arm involvement, are summarized in **Table 1**.

**Table 1:** Demographic Data of the Study Cohort

Variable	Value
Number of Patients	22
Male: Female Ratio	8:14
Mean Age (years)	$72.4 \pm 5.6$ (65–84)
Dominant Arm Involved	12 (54.5%)
Comorbidities	Hypertension (41%), DM (27%)

(DM: Diabetes Mellitus)

### Functional Outcome Scores

At the final follow-up, both Constant-Murley and ASES scores showed significant improvement compared to preoperative values ( $p < 0.001$ ). The mean Constant-Murley score increased from  $28.5 \pm 5.2$  preoperatively to  $64.3 \pm 8.1$  postoperatively, while the mean ASES score improved from  $34.2 \pm 6.4$  to  $78.6 \pm 9.7$ . The VAS pain score decreased substantially from a mean of  $7.2 \pm 1.3$  preoperatively to  $2.1 \pm 1.1$  at the last follow-up ( $p < 0.001$ ). These comparisons are detailed in **Table 2**.

**Table 2:** Comparison of Functional Scores Preoperatively and at Final Follow-up

Outcome Measure	Preoperative Mean $\pm$ SD	Final Follow-up Mean $\pm$ SD	p-value
Constant-Murley Score	$28.5 \pm 5.2$	$64.3 \pm 8.1$	$<0.001$
ASES Score	$34.2 \pm 6.4$	$78.6 \pm 9.7$	$<0.001$
VAS for Pain	$7.2 \pm 1.3$	$2.1 \pm 1.1$	$<0.001$

In terms of range of motion (ROM), patients exhibited improvements in forward flexion and abduction, albeit with more modest gains in external rotation. Patients reported high subjective satisfaction, with 85% rating their outcome as good or excellent.

### Radiographic Outcomes

Radiographic assessment revealed that 4 out of 22 shoulders (18%) demonstrated some degree of scapular notching, primarily Grade 1 or 2 according to the Nerot-Sirveaux classification (Figure 1). There were no cases of significant glenoid loosening. Humeral component positioning was deemed optimal in all but one patient, who exhibited a slightly varus humeral stem alignment that did not affect clinical outcomes.

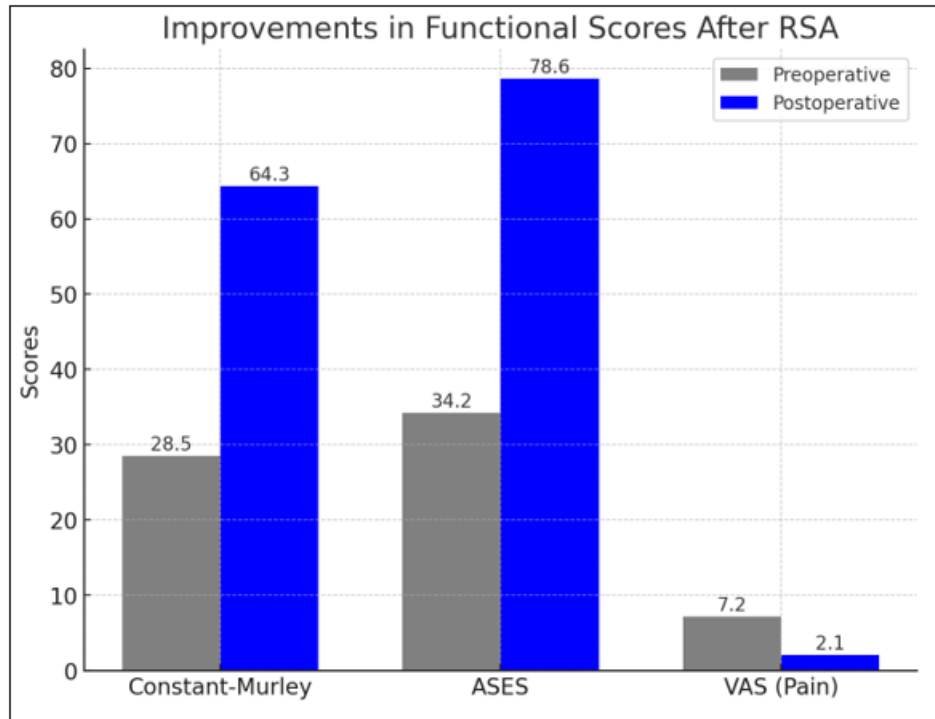
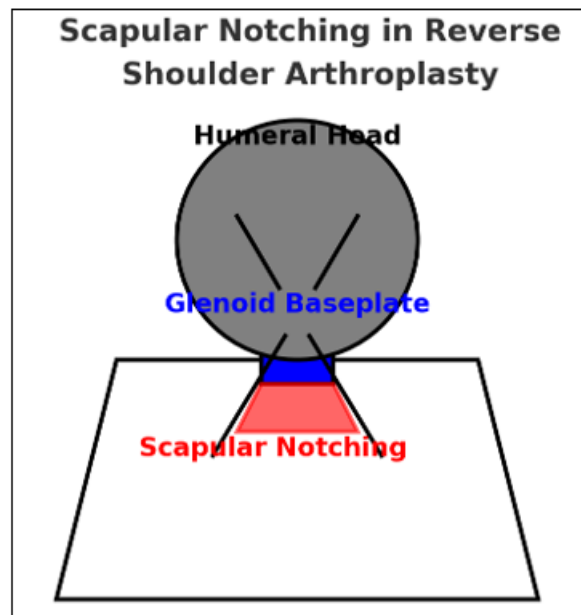
### Complications

The overall complication rate was 27%, with most events managed conservatively or resolved without the need for surgical revision. The most frequent complication was scapular notching (18%), followed by one case of dislocation (4.5%) and one case of superficial surgical site infection (4.5%). The dislocation occurred secondary to a fall six weeks postoperatively and was treated with closed reduction and immobilization. The superficial infection was successfully managed with a short course of antibiotics.

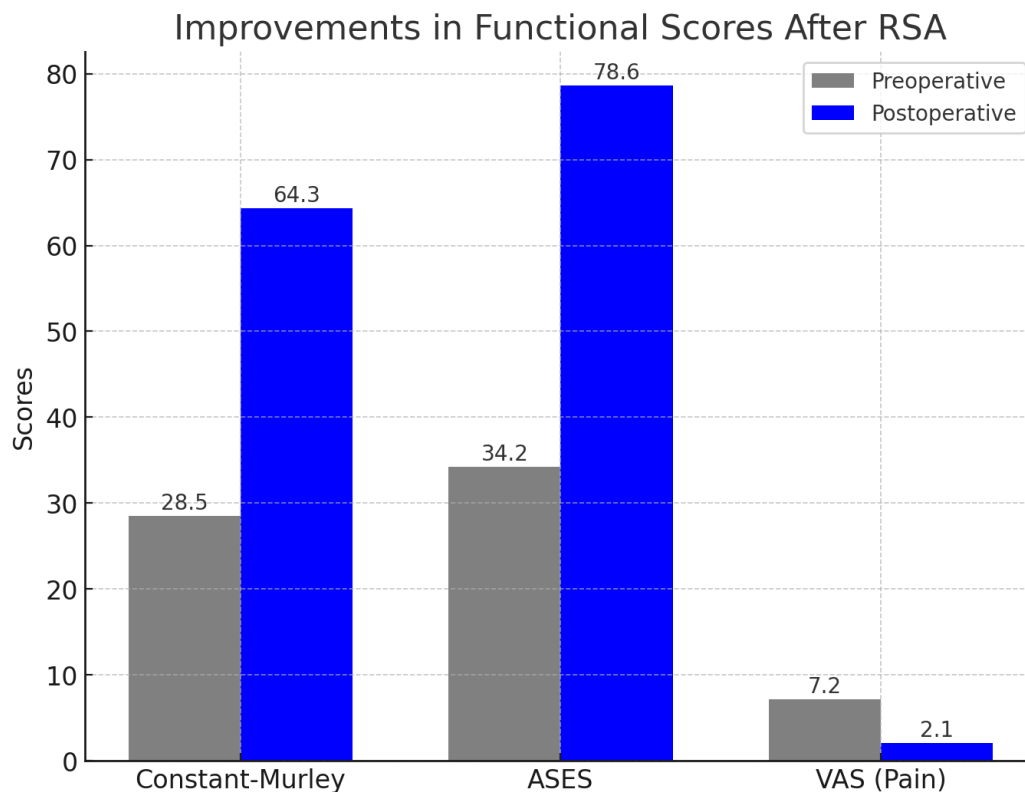
**Table 3:** Summary of Complications

Complication	Incidence (n, %)	Management
Scapular Notching	4 (18)	Observation
Dislocation	1 (4.5)	Closed reduction + immobilization
Superficial Infection	1 (4.5)	Antibiotics
Loosening/Revision	0 (0)	-

No patients underwent revision surgery for implant loosening or mechanical failure over the follow-up period. There were no recorded cases of deep periprosthetic infection.

**Figure 1:** Preoperative and Postoperative Radiographs**Figure 2:** Scapular Notching

Notching was observed in 18% of the cohort (4 out of 22 shoulders), primarily at lower grades, and was not associated with worsening clinical outcomes in this series.



**Figure 3:** Improvements in Functional Scores

Bar chart demonstrating the mean preoperative versus final follow-up scores for Constant-Murley, American Shoulder and Elbow Surgeons (ASES), and Visual Analog Scale (VAS) for pain. Significant improvements ( $p < 0.001$ ) were observed in all three measures, underscoring the efficacy of reverse shoulder arthroplasty in providing long-term functional enhancement and pain relief.

#### 4. Discussion

Reverse shoulder arthroplasty has become a consistently reliable treatment modality for end-stage cuff tear arthropathy, which leads to the amelioration of pain and improvements in function across the shoulder joint [9]. The results in the current case series did achieve significant improvement by at least five years following the surgery; prior studies similarly established the durability of RSA in aged patients [10,11]. These functional gains may be attributed to the prosthetic design's restoration of a stable fulcrum, shifting reliance from a deficient rotator cuff to the deltoid muscle [12].

Our results showed that RSA resulted in a significant pain reduction, with mean VAS scores decreasing from 7.2 to 2.1. This degree of pain relief is consistent with the pathophysiology that RSA reduces the mechanical irritation produced by the articulating humeral head against the acromion in CTA [13]. The improvements in range of motion, especially forward flexion and abduction, are characteristic of the post-RSA result. However, external rotation usually lags behind because of irreparable rotator cuff deficits, mainly involving the teres minor or infraspinatus tendons [14].

Scapular notching continues to be one of the most common radiographic observations in RSA, with an incidence ranging

from 10% to 50% in different studies [15]. In our series, 18% of the patients had radiographic evidence of notching, which was primarily Grade 1 or 2. While the clinical importance of scapular notching is debated, there is a concern that higher grades of notching are associated with worse results and possible loosening of the glenoid component [6]. None of our cases showed progressive notching or glenoid loosening that warranted intervention, suggesting that the early manifestation of notching may not always correlate with poor clinical results.

Regarding complications, the overall rate of 27% falls within the range reported in other long-term RSA studies [5,10]. Most complications seen were relatively minor and included dislocation and superficial infection. The lack of deep infections and revision surgeries for loosening is a positive indicator of the longevity of these implants. However, as the indications for RSA expand to younger or more active patients, however, the long-term durability and complication profile will require ongoing evaluation [2].

These findings further highlight the importance of meticulous surgical technique, proper patient selection, and standardized postoperative rehabilitation to maximize outcomes. While CTA is certainly complex, our results argue in favour of RSA as a stable intervention with maintained functional improvement. Future research studies involving larger cohorts and randomized designs might be needed to more fully delineate factors associated with the degree of notching, implant survival, and quality-of-life assessment reported by the patients [16].

In conclusion, the findings of this retrospective cohort study point out that RSA significantly improves pain and function in patients with cuff tear arthropathy over at least five years

with an acceptable rate of complications. Continuous efforts to refine implant design, surgical approaches, and rehabilitation protocols should aim to enhance clinical outcomes and reduce potential adverse events.

## 5. Conclusion

Reverse shoulder arthroplasty is an excellent long-term option for cuff tear arthropathy. This study demonstrated substantial improvement in functional scores and reduction in pain in the mean follow-up of over five years. Complications were acceptable, and most issues could be managed conservatively. While scapular notching was the most common radiographic finding, it was not associated with clinical deterioration or revision. These data support RSA as a sturdy and effective treatment modality for CTA. This is highly underscored on proper patient selection, surgical precision, and the structure of the rehabilitation process involved.

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