

Functional Outcome Analysis of the Latarjet Procedure in the Surgical Management of Recurrent Anterior Shoulder InstabilityNagaraju Honnegowda¹, Madhusudan B.², ShreeKrishna Nanda Sagar³¹Assistant Professor, Department of Orthopaedics, Sri Chamundeshwari Medical College Hospital & Research Institute, Channapatna, Ramanagar, Karnataka, India.²Department of Orthopedics, India.³Consultant Orthopaedic Surgeon, Government District Hospital, Udupi, Karnataka, India.

Received: 20-05-2026 / Revised: 19-06-2026 / Accepted: 17-07-2026

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Conflict of interest: Nil

Abstract:

Background: Recurrent anterior shoulder instability is a common orthopedic condition, particularly among young, active individuals, and is often associated with significant glenoid bone loss. Soft-tissue stabilization procedures have high recurrence rates in patients with substantial osseous defects. The Latarjet procedure restores shoulder stability through coracoid transfer and has become an effective surgical option for managing recurrent anterior shoulder instability. This study aimed to evaluate the functional outcome, recurrence, and complications following the open Latarjet procedure.

Methods: A prospective observational study was conducted in the Department of Orthopaedics, AJ Institute of Medical Sciences and Research Centre, Mangalore, between October 2019 and September 2021. Nineteen patients with recurrent anterior shoulder instability who fulfilled the inclusion criteria underwent the open Latarjet procedure. Patients were evaluated clinically and radiologically and followed up at 1–3, 4–9, 10–15, and 16–20 weeks. Functional outcome was assessed using the Rowe Shoulder Score and VAS (Visual Analogue Scale), along with assessment of pain relief, range of motion, shoulder stability, return to daily activities, complications, and recurrence. Statistical analysis was performed using SPSS 23.0 with a paired *t*-test, considering $p < 0.05$ as statistically significant.

Results: The mean age of patients was 28 years, with males constituting 89.5% of the study population and right shoulder involvement in 68.4%. Significant improvement was observed in functional outcomes, with the mean Rowe score increasing from 35.26 preoperatively to 85.26 postoperatively, while the mean VAS score decreased from 5.63 to 0.47. Abduction and external rotation improved progressively during follow-up. Excellent outcomes were achieved in 52.6% of patients, good outcomes in 36.8%, and fair outcomes in 10.5%. No patient experienced recurrent dislocation, and only one patient developed a superficial wound infection that resolved with antibiotics.

Conclusion: The open Latarjet procedure is a safe and dependable surgical option for recurrent anterior shoulder instability with significant glenoid bone loss. It provides excellent pain relief, restores shoulder stability, improves functional outcome and range of motion, facilitates early return to daily activities, and demonstrates a very low recurrence rate when combined with appropriate postoperative rehabilitation.

Keywords: Anterior Shoulder Instability; Recurrent Shoulder Dislocation; Latarjet Procedure; Glenoid Bone Loss; Rowe Score; Functional Outcome.

DOI: 10.25258/ijcpr.18.7.219

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Introduction

The shoulder joint is a ball-and-socket joint that provides the greatest range of motion among all joints in the human body, making it particularly susceptible to dislocation. Shoulder dislocations may occur due to traumatic or atraumatic causes, with traumatic anterior dislocation being the most common. Recurrent dislocation results in progressive damage to the humeral head, glenoid, capsule, labrum, and surrounding ligaments, leading to chronic instability and degenerative changes. It

occurs most frequently in individuals between 20 and 40 years of age. [1]

Anterior shoulder instability is a challenging clinical condition and can be managed using a variety of arthroscopic and open surgical techniques. Initial treatment following a primary dislocation generally involves immobilization of the shoulder using a sling for three weeks or longer, followed by a structured physiotherapy program focusing on

restoring the range of motion and strengthening the shoulder musculature. [2]

Bankart repair, a soft-tissue stabilization procedure, can be performed through either an open or arthroscopic approach. The procedure involves reattachment of the detached anterior labrum and capsule to the anterior glenoid rim using suture anchors. Overall success rates of approximately 88–90% have been reported following Bankart repair. [3-5] However, several studies have demonstrated inferior outcomes in patients with significant bony Bankart lesions or HAGL (Humeral Avulsion of the Glenohumeral Ligament) lesions treated with either open or arthroscopic Bankart repair. [6,7]

In patients with ligamentous insufficiency, significant glenoid bone loss, HAGL lesions, or failed previous Bankart repairs, the open Latarjet procedure is considered the preferred surgical option. The Latarjet procedure, first described by Latarjet in 1954, involves transfer of the coracoid process to the anterior glenoid rim to act as a bone block and prevent recurrent anterior shoulder dislocation. In this technique, the long axis of the coracoid graft is positioned in a superoinferior direction, with its inferior surface placed against the anterior surface of the glenoid. [8]

The open Latarjet reconstruction is a safe and reliable surgical procedure for restoring shoulder stability in patients with significant glenoid bone defects. It provides excellent stability and functional outcomes and is considered an effective treatment option in cases where soft-tissue reconstruction alone is insufficient or not feasible [9]

Aims and Objectives: The study aimed to evaluate the clinical outcomes, recurrence rate, and complications associated with the open Latarjet procedure in the management of recurrent anterior shoulder instability. The objectives are to assess postoperative relief from apprehension and pain, improvement in shoulder range of motion, return to routine daily activities and work, recurrence of shoulder instability following the procedure, and the overall functional outcome and complications associated with the open Latarjet procedure.

Materials and Methods

Study Design: This was a hospital-based, prospective observational clinical study conducted in the Department of Orthopaedics, A.J. Institute of Medical Sciences and Research Centre, Kuntikana, Mangalore, over a period of 24 months from 1st October 2019 to 30th September 2021.

Inclusion and Exclusion Criteria: Patients aged ≥ 17 years with recurrent anterior shoulder instability undergoing open Latarjet procedure were included. Indications included recurrent dislocation associated with a bony Bankart lesion, failed Bankart repair,

off-track or large Hill-Sachs lesion, glenoid bone loss $>15\%$, more than five episodes of anterior dislocation, recurrent instability following previous surgical repair, HAGL lesion, and epilepsy with recurrent shoulder dislocation. Patients with first-time traumatic dislocation, posterior instability, massive irreparable rotator cuff tear, unstable painful shoulder or microinstability, post-traumatic inferior subluxation, anterior dislocation with associated fracture, uncontrolled epilepsy, SLAP lesions, age <17 years, or those managed conservatively for other medical reasons were excluded.

Sample Size Calculation: Based on the study conducted by Dr. AN Sarath Babu, Dr. Naveen Kumar, Dr. Sathish Muthu and Dr. N Sukumar. Outcome analysis of management of recurrent shoulder dislocation by Latarjet procedure, International Journal of Orthopaedics Sciences 2018;4(3):82-86⁽¹⁾

It was observed that 95% of the patients had an improved outcome as excellent on follow up.

$n=4PQ/LxL$

Hence, assuming 95% confidence Interval, $P=95$ allowable error (L)= 10% sample size estimated for the study= 19

Data Collection Procedure: Data were collected prospectively from patients with recurrent anterior shoulder instability treated with the open Latarjet procedure at A.J. Institute of Medical Sciences, Mangalore. A detailed clinical history, physical examination, routine laboratory investigations, and radiological evaluation (X-ray and CT scan) were performed preoperatively. Intraoperative findings were documented, and all patients received standard postoperative antibiotics, analgesics, and rehabilitation. Postoperative assessment included wound healing, shoulder range of motion, mobilization, complications, infection, graft-related complications, need for secondary surgery, and duration of hospital stay. Patients were immobilized in a shoulder immobilizer for two weeks, with pendulum exercises initiated on the first postoperative day, and were followed up at 1–3, 4–9, 10–15, and 16–20 weeks. Functional outcomes were assessed based on pain relief, relief from apprehension, return to activities of daily living, patient satisfaction, and overall outcome using the Rowe Shoulder Score and VAS.

Statistical Analysis: Statistical analysis was performed using SPSS version 23.0. Baseline demographic and clinical characteristics were summarized using descriptive statistics, including frequency, percentage, mean, range, and standard deviation, and presented in tables and diagrams. Pre- and postoperative outcome measures were compared using the paired t-test. The chi-square test

was used to evaluate the association between functional outcomes and variables such as the number of dislocation episodes, recurrence, and postoperative stiffness with loss of external rotation.

A p-value of <0.05 was considered statistically significant.

Results

Table 1: Baseline Demographic and Clinical Characteristics of the Study Population (n=19)

Variable	Category	n (%) / Mean $\pm$ SD
Age (in years)	Mean $\pm$ SD	28.79 $\pm$ 6.59
	Range	18–38
Gender	Male	17 (89.5)
	Female	2 (10.5)
Affected side	Right	13 (68.4)
	Left	6 (31.6)
Number of previous dislocations	5–10	8 (42.1)
	11–20	7 (36.8)
	>20	4 (21.1)
Surgery interval	Interval 1	9 (47.4)
	Interval 2	7 (36.8)
	Interval 3	3 (15.8)

Table 1 illustrates the baseline demographic and clinical characteristics of the study participants. The mean age was 28.79 $\pm$ 6.59 years, with males constituting 89.5% of the cohort. The right shoulder

was more commonly affected (68.4%). Most patients experienced 5–10 previous dislocations (42.1%), and nearly half underwent surgery during interval 1 (47.4%).

Table 2. Clinical Outcome Following Open Latarjet Procedure

Variable	Category	n (%)
Postoperative Stability	No recurrence/subluxation/apprehension	16 (84.2)
	Apprehension only	3 (15.8)
	Subluxation	0
	Recurrent dislocation	0
Return to activities	No limitation	12 (63.2)
	Mild limitation	7 (36.8)
	Marked limitation	0
Rowe Outcome Grade	Excellent	10 (52.6)
	Good	7 (36.8)
	Fair	2 (10.5)

Table 2 demonstrates the postoperative functional outcome. Most patients (84.2%) achieved complete shoulder stability without recurrence. Approximately 63.2% resumed activities without

limitation, while 52.6% attained an excellent Rowe outcome, indicating favorable functional recovery after the Open Latarjet procedure.

Table 3. Comparison of Rowe and VAS Scores Before and After Surgery

Outcome	Preoperative Mean $\pm$ SD	Postoperative Mean $\pm$ SD	Mean Difference	p-value
Rowe Score	35.26 $\pm$ 10.73	85.26 $\pm$ 9.35	+50.00	<0.05
VAS Score	5.63 $\pm$ 1.77	0.47 $\pm$ 0.70	–5.16	<0.05

Table 3 compares the functional and pain outcomes before and after surgery. The mean Rowe score improved significantly from 35.26 to 85.26, while

the VAS score decreased from 5.63 to 0.47. Both improvements were statistically significant (p < 0.05).

Table 4. Progression of Shoulder Flexion and Extension during Follow-Up

Follow-up (weeks)	Flexion (Mean $\pm$ SD)	Extension (Mean $\pm$ SD)
1–3	65.79 $\pm$ 6.29	17.63 $\pm$ 6.51
4–9	98.42 $\pm$ 12.14	29.21 $\pm$ 5.86
10–15	134.74 $\pm$ 9.79	37.37 $\pm$ 4.51
16–20	170.53 $\pm$ 4.97	47.11 $\pm$ 5.37

Table 4 illustrates progressive improvement in shoulder flexion and extension across the follow-up period. Both movements demonstrated continuous

gains, reaching near-normal values by 16–20 weeks, with statistically significant improvement ($p < 0.05$).

Table 5. Progression of Shoulder Abduction and Adduction during Follow-Up

Follow-up (weeks)	Abduction (Mean $\pm$ SD)	Adduction (Mean $\pm$ SD)
1–3	33.42 $\pm$ 5.77	21.05 $\pm$ 3.57
4–9	95.00 $\pm$ 9.06	32.37 $\pm$ 5.86
10–15	141.05 $\pm$ 4.85	40.00 $\pm$ 4.71
16–20	169.74 $\pm$ 7.08	44.47 $\pm$ 2.84

Table 5 shows gradual recovery of shoulder abduction and adduction throughout rehabilitation. The greatest improvement occurred between the

early and intermediate follow-up periods, with both parameters approaching normal values by the final assessment ($p < 0.05$).

Table 6. Progression of Shoulder Internal and External Rotation during Follow-Up

Follow-up (weeks)	Internal Rotation (Mean $\pm$ SD)	External Rotation (Mean $\pm$ SD)
1–3	27.11 $\pm$ 3.84	7.63 $\pm$ 3.06
4–9	35.26 $\pm$ 3.90	16.58 $\pm$ 4.43
10–15	40.53 $\pm$ 2.84	23.42 $\pm$ 5.01
16–20	43.42 $\pm$ 2.39	30.79 $\pm$ 5.84

Table 6 presents postoperative recovery of rotational movements. Internal and external rotation improved steadily throughout follow-up, although a small

residual restriction remained compared with normal shoulder motion. The improvements were statistically significant ($p < 0.05$).

Table 7. Improvement in Shoulder Range of Motion

Movement	First Follow-up	Final Follow-up	Mean Improvement	Residual Loss from Normal
Flexion	65.79	170.53	104.74	5.26%
Extension	17.63	47.11	29.47	5.79%
Abduction	33.42	169.74	136.32	5.70%
Adduction	21.05	44.47	23.42	1.17%
Internal Rotation	27.11	43.42	16.32	21.05%
External Rotation	7.63	30.79	23.55	31.58%

Table 7 summarizes the overall recovery of shoulder range of motion. Flexion, extension, abduction, and adduction improved to near-normal values, whereas

mild residual deficits persisted in internal and external rotation. All improvements were statistically significant ($p < 0.05$).

Table 8. Postoperative Clinical Outcomes

Outcome	Result
Patients without recurrence	84.2%
Excellent Rowe outcome	52.6%
Good Rowe outcome	36.8%
Patients returning to activities without limitation	63.2%
Mean Rowe score improvement	35.26 $\rightarrow$ 85.26
Mean VAS reduction	5.63 $\rightarrow$ 0.47
Overall statistical significance	$p < 0.05$

Table 8 summarizes the key postoperative outcomes of the study. The Open Latarjet procedure resulted in excellent shoulder stability, significant pain relief, marked improvement in functional scores, and

satisfactory restoration of shoulder motion, supporting the effectiveness of the procedure in managing recurrent anterior shoulder dislocation.



Figure 1: Delto-Pectoral approach Incision mark

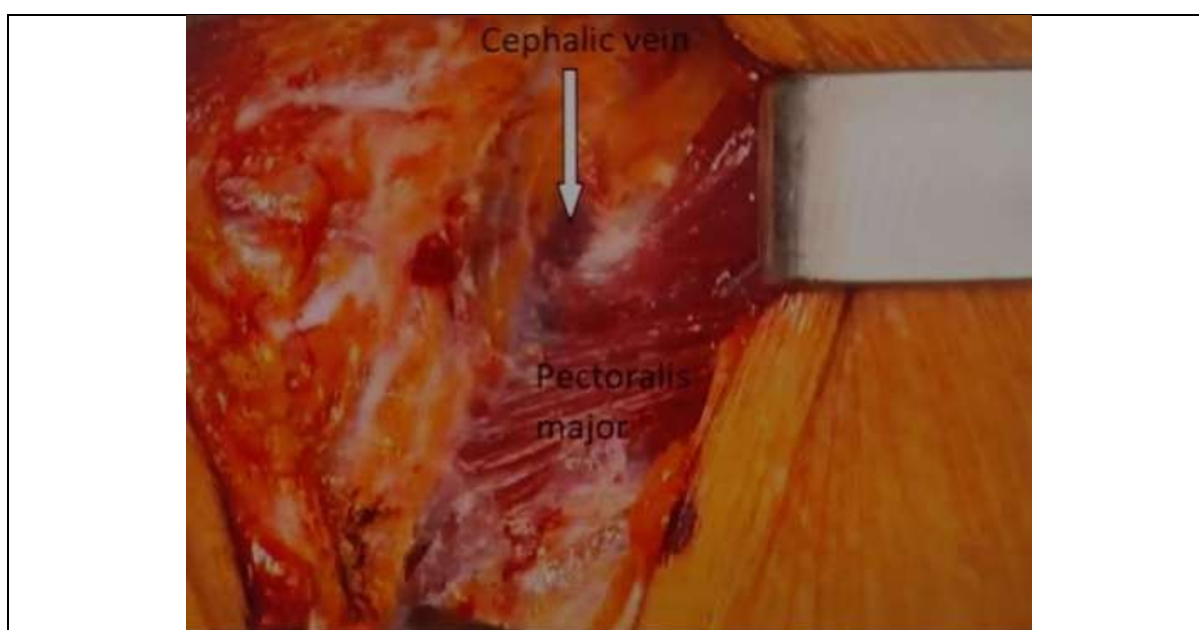


Figure 2: Delto-Pectoral approach

**Figure 3: Harvesting Coracoid Process****Figure 4: Preparation of Coracoid base**

Discussion

In the present study, the mean age of the patients was 28.7 years, with the age ranging from 18 to 38 years. All the patients had recurrent anterior shoulder instability. This finding is consistent with the literature, which states that anterior shoulder instability most commonly affects individuals between 20 and 40 years of age. [1]

The present study included predominantly male patients, with 89.5% being males and 10.5% females, indicating that recurrent anterior shoulder instability is more common among young active males, which is consistent with previous reports.

In the present study, 13 patients (68.4%) had right-sided instability, left-sided instability. Apprehension was the most common presenting complaint and

significantly affected the patients' routine daily activities. Prior to surgery, 42.1% of patients had experienced 5–10 episodes of dislocation, 36.8% had 11–20 episodes, and 21.1% had experienced more than 20 episodes of recurrent dislocations, demonstrating the chronic nature of instability before surgical intervention.

The principal aim of the Latarjet procedure is to prevent recurrent instability. In the present study, none of the 19 patients developed recurrent dislocation during the follow-up period. These findings compare favorably with the study by Bessière et al. [10], who conducted a retrospective study on 186 patients comparing arthroscopic Bankart repair with the Latarjet procedure over a mean follow-up of six years. They concluded that patients treated with the Latarjet procedure had

significantly lower rates of recurrent instability and better Rowe scores than those treated with arthroscopic Bankart repair.

Functional outcome in the present study was assessed using the Rowe scoring system. At the final follow-up, 52.6% of patients had excellent results, 36.8% had good results, 10.5% had fair results, and none had poor results. Overall, 17 of the 19 patients achieved excellent or good functional outcomes, while only 2 patients had fair outcomes. These findings are comparable with those reported by Rowe et al. [11], who evaluated 56 patients (58 shoulders) and reported excellent or good results in 51 shoulders, fair results in 5 shoulders, and poor results in 2 shoulders.

The mean Rowe score in the present study was 85.26 (n = 19) at the final follow-up. Eoghan T. Hurley et al.,¹² reviewed six studies utilizing the Rowe score and reported a mean final Rowe score of 88.5 (n = 353). Although the mean Rowe score in the present study was slightly lower, the functional outcome was comparable and demonstrates satisfactory postoperative shoulder function following the Latarjet procedure.

Patient satisfaction following surgery was high in the present study. Seventeen patients (89.5%) were satisfied with the outcome, while 2 patients (10.5%) were hesitant, and none were dissatisfied. Furthermore, no patient developed recurrent dislocation or postoperative subluxation. In comparison, the study conducted at the Chirurgie Orthopédique et Reconstructrice, CHU Hospital [13] on 74 patients with a minimum follow-up of 24 months reported 85% patient satisfaction, 6% hesitant patients, and 9% dissatisfied patients. They also reported four cases of recurrent dislocation and two cases of subluxation. Their Rowe score distribution showed 18.8% excellent, 49.9% good, 20.2% fair, and 10.1% poor outcomes. The findings of the present study demonstrate a comparatively higher proportion of excellent outcomes, greater patient satisfaction, and the absence of recurrent instability.

Persistent apprehension following surgery is another important indicator of functional recovery. In the present study, 3 patients (15.8%) demonstrated apprehension at 90° of abduction and external rotation. Metais P., Calvert P., Barth J., et al. [14], in a prospective multicentric study involving 390 patients, reported persistent apprehension in 11% of patients. Although the present study demonstrated a slightly higher incidence of postoperative apprehension, the results are comparable considering the smaller sample size.

Return to daily activities is an important functional outcome. In the present study, 12 patients (63.2%) returned to their routine activities without any

limitation, whereas 7 patients (36.8%) experienced only mild limitations. These findings indicate that the Latarjet procedure provides satisfactory functional recovery and enables patients to resume their normal daily activities.

Loss of external rotation is a well-recognized consequence following the Latarjet procedure. In the present study, the mean loss of external rotation was 15°. Similar findings were reported by Shah AA, et al., [15] and Allain J. et al. [16], who observed a postoperative loss of 5° to 15° of external rotation. Thus, the findings of the present study are in agreement with previously published literature.

Neurovascular injury is one of the recognized complications of the open Latarjet procedure. Previous studies have reported neurovascular complication rates of approximately 20%, emphasizing the importance of careful dissection around the coracoid process. In the present study, no patient developed neurovascular complications, reflecting meticulous surgical technique and adequate intraoperative protection of neurovascular structures.

Postoperative infection following the Latarjet procedure is uncommon but may compromise the outcome if not managed appropriately. Infection can result in failure of the bone block and recurrence of instability if left untreated. In the present study, only one patient (5%) developed a superficial surgical site infection, which resolved completely with appropriate antibiotic therapy. No further complications or recurrence of instability occurred in this patient.

The findings of the present study demonstrate that the Open Latarjet procedure provides excellent shoulder stability, satisfactory functional recovery, a high rate of patient satisfaction, minimal complications, and no recurrence of instability during the follow-up period. The outcomes observed in the present study are comparable with those reported in previous national and international studies, supporting the effectiveness of the Latarjet procedure in the management of recurrent anterior shoulder instability.

Conclusion

The present study demonstrated that the Latarjet procedure is a safe and effective surgical option for the management of recurrent anterior shoulder instability, particularly in patients with significant glenoid bone loss (>15%) and high-risk contact athletes. It provided excellent shoulder stability with significant relief from pain and apprehension, along with marked improvement in range of motion, activities of daily living, and return to sports by the end of 20 weeks of follow-up. The study also observed that anterior shoulder instability predominantly affected young males with a mean

age of 28 years, with the right shoulder being more commonly involved. Adherence to a structured postoperative physiotherapy protocol played a crucial role in achieving optimal functional recovery and satisfactory clinical outcomes.

Authors Contributions

Dr. Nagaraju Honnegowda- Conceptualization, Investigation, Case Management, Supervision, Writing – Review & Editing.

Dr. Madhusudan B.- Data Collection, Patient Management, Literature Review, Writing – Original Draft Preparation.

Dr. ShreeKrishna Nanda Sagar- Data Collection, Patient Management, Project Administration, Writing – Original Draft Preparation.

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