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Original Article

Orthopaedics Section

Midterm Clinical Outcome of Minimally Invasive Latarjet Procedure for Recurrent Anterior Shoulder Instability- A Prospective Cohort Study

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ABSTRACT

Introduction: Latarjet coracoid bone block is an effective treatment for the management of recurrent anterior shoulder instability. Minimally invasive technique modified by Saragaglia helps in preservation of subscapularis, leaves a minimal scar and helps in early rehabilitation and recovery.

Aim: To assess the midterm clinical outcome of minimally invasive Latarjet procedure for recurrent anterior shoulder instability.

Materials and Methods: This was a prospective cohort study conducted from April 2013 to March 2019 at a tertiary care Orthopaedic and Trauma Hospital in patients above 20 years of age of either sex with instability severity score index of >6 were included. A detailed history and clinical examination was done with special reference to hand dominance and number of episodes. Special tests like shift and load test, sulcus test, anterior apprehension test shoulder anterior drawer test and Jobe's relocation test were done and found to be positive. Preoperative Rowe score was assessed in all the patients. Mean follow-up in present study was 60±18 months. Quantitative variables were analysed using Student's t-test and qualitative variables using Fisher's-exact test or Chi-square test. A p-value of <0.05 was considered as significant.

Results: There were 40 men and seven female patients (49 shoulders, two patients with bilateral pathology) with an average age of 33.5±9 years. No recurrent dislocation was reported in the study. None of the patients had a positive apprehension test at final follow-up. Rowe score at final follow-up was excellent in 39 (79.6%) patients, good in 7 (14.3%) patients, fair in 3 (6.1%) patients and no patient reported poor result (score below 50). All special tests like shift and load test, sulcus test, anterior apprehension test, shoulder anterior drawer test and Jobe's relocation test became negative at final follow-up. Three patients developed superficial infection and one patient developed pseudoarthrosis of the graft.

Conclusion: Minimally invasive Latarjet procedure is simple, easy and reproducible method of treating anterior shoulder instability. It provides good cosmesis and functional results with low recurrence rate at a midterm follow-up.

Keywords: Bony glenoid loss, Coracoid bone block, Recurrent dislocation

INTRODUCTION

Anterior shoulder is the most common shoulder dislocation and accounts for 11% of shoulder injuries [1]. Recurrence rate varies and depends on age and number of dislocations, hyperlaxity, method of treatment and involvement of either glenoid and humeral head or both. There are more than 150 operations with their modifications devised for the treatment and there is no single best procedure [2]. Ideal surgical procedure should be able to maintain shoulder mobility with a low recurrence and a complication rate. Transfer of coracoid process through the subscapularis tendon is one of them. Coracoid block procedure was first described by Latarjet M in 1953 [3].

Helfet AF in 1958 defined the Bristow procedure in which the coracoid process was just sutured to the anterior part of the scapular neck through a transversally sectioned subscapularis muscle [4]. These techniques are now commonly known as the Bristow-Latarjet. A minimally invasive technique has been described. This technique aims at providing a small aesthetic scar and a preservation of subscapularis tendon [1]. Our hypothesis was that overall results of minimally invasive are comparable to that of conventional open technique in terms of recurrence but allows rapid rehabilitation and recovery. It appears to be an attractive alternative to arthroscopic stabilisation. It is less time consuming, rapid learning curve and less number of complications [5]. The primary aim of present study was to assess the recurrence rate and secondary objective was to evaluate the incidence of complications and overall functional outcome at midterm follow-up.

MATERIALS AND METHODS

This was a prospective cohort study conducted from April 2013 to March 2019 at a tertiary care Orthopaedic and Trauma Hospital. All patients were reviewed and provided consent for participation in the study. The study was approved by Institutional Ethical Committee (IEC) and was conducted inline with Principle of the Declaration of Helsinki.

Inclusion criteria: Patients above 20 years of age of either sex with instability severity score index of >6 were included in the study [6].

Exclusion criteria: Patients with instability associated with fractures around shoulder, single episode of shoulder instability, instability score less than 6 and those with co-morbid conditions contra-indicating surgery or anaesthesia were excluded from the study.

Fifty two patients (54 shoulders) were included in the study, out of them five patients lost to follow-up and were finally excluded. Hence, 47 patients (49 shoulders and two patients with bilateral pathology) were included in final analysis. A detailed history and clinical examination was done with special reference to hand dominance and number of episodes. Special tests like shift and load test, sulcus test, anterior apprehension test shoulder anterior drawer test and Jobe's relocation test were done and noted. This was followed by radiographic and Magnetic Resonance Imaging (MRI) evaluation to know the degree of capsular and labral damage. The instability severity score was calculated in every patient to determine the degree of instability [Table/Fig-1,2] [6].

Opérative Technique

After proper evaluation and written informed consent, patients were taken for surgery under general anaesthesia. Patients were placed in supine position on the operating table in our practice and not in a beach chair position. A small towel roll was placed under the scapula of the involved side and limited deltopectoral approach

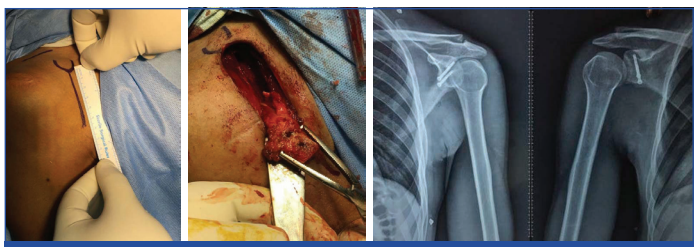
Prognostic factors		Points
1.	Age at surgery (in years)	
	≤20	2
	>20	0
2.	Degree of sport participation (preoperative)	
	Competitive	2
	Recreational or none	0
3.	Type of sport (preoperative)	
	Contact or forced overhead	1
	Other	0
4.	Shoulder hyperlaxity	
	Shoulder hyperlaxity anterior or inferior	1
	Normal laxity	0
5.	Hill sachs on AP* radiograph	
	Visible in external rotation	2
	Not visible in external rotation	0
6.	Glenoid loss of contour on AP radiograph	
	Loss of contour	2
	No lesion	0
7.	Total score (points)	10

[Table/Fig-1]: Instability severity index score is based on preoperative questionnaire, clinical examination and radiographs.
*AP: Anterioposterior

S. No.	SISS	No. of patients
1.	6	29
2	7	17
3	8	2
4	>8	1/2
	Total	49

[Table/Fig-2]: Preoperative shoulder instability score.
Mean Shoulder Instability Severity Score (SISS) was around 6.8±1.8

was used [Table/Fig-3]. An osteotome or an angulated saw was used to osteotomise the coracoid process from medial to lateral at the junction of horizontal and vertical parts. The coracoid graft was prepared and its deep surface was decorticated with cutting rongeur or saw. With 3.2 mm drill bit two drill holes were drilled in the deep surface of the graft [Table/Fig-4]. After preparation of the bed for the coracoid graft, the coracoid bone block was placed at the anteroinferior part of the glenoid after raising the subscapular muscle without cutting it or opening it. Bone block was flushed to the anteroinferior margin of the glenoid. Position of the graft was checked to avoid any lateral overhanging. A slight medial position was considered to be acceptable. A 3.2 mm drill hole was inserted through the inferior hole in the graft and into the glenoid neck in an anterior, posterior and superior direction. After proper positioning, two screws were inserted usually first inferior and then superior and tightened firmly with two finger tightening [Table/Fig-5]. Skin closure was done. Patients were immobilised in a sling or shoulder immobiliser for two weeks after surgery. Forward flexion was started at two weeks and external rotation at six weeks. Strengthening exercises were started at eight weeks after surgery.



[Table/Fig-3]: Skin markings for limited deltopectoral approach.
[Table/Fig-4]: Coracoid graft with two screw holes. **[Table/Fig-5]:** AP X-ray of shoulder showing screw fixation of a coracoid graft with the anteroinferior glenoid. (Images from left to right)

Patients were followed-up at 2nd week, 4th week and two weekly till three months and two monthly till one year and then yearly follow-up was advised. Final radiographs were done at six months and at final follow-up. At the time of clinical review, Visual Analogue Score (VAS) was recorded at rest and with activity, range of motion of abduction, flexion and external rotation, any kind of apprehension (apprehension test) was noted. Shoulder specific scores were also recorded: Constant score (100-90; excellent, 89-75; good, 74-51; average, below 50; Poor), Western Ontario Shoulder Instability Index (WOSI) and Rowe Score (≥90: Excellent, 75-89: Good, 51-74: Fair, ≤50: Poor) [7-10].

STATISTICAL ANALYSIS

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) software. Quantitative variables were analysed using Student's t-test and qualitative variables using Fisher's-exact test or Chi-square test. A p-value of <0.05 was considered as significant.

RESULTS

Mean Shoulder Instability Severity Score (SISS) in present study was 6.8. Patient demographics and other clinical details are summarised in [Table/Fig-6,7].

Variable	Mean±Standard deviation	Minimum	Maximum
Number of patients/shoulders (47/49)			
Age at review (years)	33.5±9	21	56
Age at first shoulder dislocation (years)	30±11	21	58
Time from first shoulder dislocation to surgery (months)	62 ±24	12	188
Total number of dislocations before surgery	6.6±4.8	2	14
Hyperlaxity (number of patients)	5		
Shoulder osteoarthritis (number of patients)	0		
Hill sachs lesion (number of patients)	42		
Glenoid lesion (number of patients)	21		
Mean Shoulder Instability Severity Score (SISS)	6.8±1.8		

[Table/Fig-6]: Preoperative characteristics and demographics.

Variable	Number (%)	p-value
Gender		
Male	40/47 (85.1)	<0.05
Female	7 (14.9)	
Aetiology		
Motor vehicle accident	22 (44.9)	-
Fall from height	7 (14.3)	
Fall in sport	17 (34.7)	
Others	3 (6.1)	
Affected side		
Right	44 (89.8)	<0.005
Left	5 (10.2)	
Dominant side		
Right	42 (85.7)	<0.005
Left	7 (14.3)	

[Table/Fig-7]: Comparison of preoperative variables.
Chi-square test was used; p-value <0.05 considered significant

A total of 49 shoulders were available for review at mean follow-up of 60±18 months representing a follow-up rate of around 90%. No

recurrent dislocation was reported in present study. None of the patients had a positive apprehension test at final follow-up. Rowe score at final follow-up was excellent in 39 (79.6%) patients, good in 7 (14.3%) patients, fair in 3 (6.1%) patients and no patient reported poor result (score below 50). No statistical significant differences were seen between operated and non operated shoulders in terms of Rowe score, Constant score, WOSI score and VAS at rest and at activity. Clinical and functional outcome scores are described in [Table/Fig-8]. All special tests like shift and load test, sulcus test, anterior apprehension test, shoulder anterior drawer test and Jobe's relocation test became negative at final follow-up.

Variable	Operated side	Non operated side	p-value
	Mean value±SD	Mean value±SD	
Range of motion external rotation°	80.8±10.5	83.9±9.2	0.45
Range of motion antepulsion°	177.2±5.3	175±3.8	0.30
Range of motion abduction°	177.4±8.2	179.5±9.1	0.53
Constant score	95.9±8.2	100±10.5	0.98
WOSI	40.02±3.2	0	0.12
VAS at rest	0	0	1
VAS at activity	0.62±0.2	0	0.2
Mean Rowe score	93±6	100±8	0.79

[Table/Fig-8]: Clinical results and functional score of the series.
Students t-test was used, VAS: Visual analogue score; WOSI: Western ontario shoulder instability index

Four patients had complications in present study (8%). Three patients had superficial infection which subsided with wound care and antibiotics and did not affect the final outcome. One patient developed pseudoarthosis with evidence of metal backing out which resulted in a Rowe score of 64 in this patient. Comparison of preoperative and postoperative Rowe score is shown in [Table/Fig-9].

Rowe score	Preoperative, n (%)	Final follow-up, n (%)
≥90	0	39 (79.6)
75-89	14 (28.6)	7 (14.3)
51-74	27 (55.1)	3 (6.1)
≤50	8 (16.3)	0
Total	49	49

[Table/Fig-9]: Rowe Score: Comparison of preoperative and postoperative scores.

DISCUSSION

The Latarjet procedure has been shown to restore glenohumeral instability consistently when both glenoid and humeral osseous deficiency leads to glenohumeral instability. Three distinct mechanisms have been described that contribute to the stability after Latarjet procedure [11]. The primary stabilising effect provided by the sling effect of conjoint tendon reinforcement. It provides more than 75% resistance to glenohumeral dislocation at the extremes of apprehension. The capsular repair with augmentation from coracoacromial ligament is the second stabilising mechanism. The third and final mechanism is that provided by the coracoids graft transfer to the glenoid cavity which contributes to glenohumeral instability in the midranges of motion [11,12].

The results of present study at a minimum follow-up of 48 months were excellent in 79.6%, good in 14.3% and fair in 6.1%. A recent systemic review and meta-analysis on outcome of Latarjet procedure supports and confirms the efficacy and safety of this procedure in presence of a glenoid bony loss [13]. Di Giacomo G et al., evaluated results of of Bristow Latarjet procedure in 26 patients with recurrent shoulder instability with mean follow-up of 17 months, 69% patients had excellent results, 23% had good score, 8% of patients had fair score and none of the patients had poor score as per the Rowe score [14]. Hovelius L et al., evaluated 118 patients with a mean follow-up of 15 years [15]. Excellent score was seen in 71% patients, good in 15% patients, 11% had poor and 13% fair score. Matthes G et al., evaluated 29 patients and had excellent results in 59% patients, good in 24%, fair in 10% and poor in 7% [16].

Although Latarjet procedure has been shown to restore glenohumeral stability in a number of clinical outcome studies, the procedure has been shown to have complication rate upto 25% [17]. Reported complications in the form of haematoma, infection, intraoperative fracture, graft malposition, non union, hardware complications, recurrence and neurovascular injuries have been documented after the Latarjet procedure. Allain J et al., at a minimum follow-up of 14 years reported no recurrence [18]. Mizuno N et al., in a series with an average 20 year follow-up reported a 5.9% recurrence rate [19]. Hovelius L et al., with a minimum 15 year follow-up in 118 cases reported a recurrence rate of 2.54% [15]. In Burkhart SS et al., series similarly a 2.2% recurrence was reported. French Trauma and Orthopedic Society (SOFCOT) in a multicentric study reported a recurrence rate of 6% at 12 year follow-up [20]. No recurrent dislocation was reported in present study.

In present study, the average operative time was 35 minutes with fewer complications and no patient with persistent apprehension was reported in present study. Lateur G et al., reported 3.1% persistent apprehension in their series (related to pseudoarthrosis of the bone block which was reported in 7.5 % of their patients) [5].

Arthroscopic procedures to perform bone block represent a less invasive evolution of this technique and was first described in 2003. Metais P et al., in a prospective series of 390 patients comparing open bone block technique against arthroscopic bone block reported persistent apprehension in external rotation in 90% abduction in 11% of cases and at 140° abduction in 4% of cases [21]. This was statistically significant in favour of open surgery when comparing external rotation at 90° abduction and in internal rotation with the elbow against the body. The combined recurrence rate for both techniques was 3.3%. Casabianca L et al., in their series of 19 arthroscopic Latarjets reported an average operative time of 161±34 minutes, a healing rate of bone block in 78% and two complications (one case of fracture of bone block and one case of osteolysis [22]. Cunningham G et al., reported an extended learning curve with conversion to open in their first 10 procedures and further 20 procedures before their operative times reduced [9]. Moreover, Randelli P et al., reported a literature review that the costs of arthroscopic surgery were more than double the costs of open surgery without any evidence of superior outcomes [23]. Zhu Y et al., in a prospective comparative study found that both arthroscopic and open Latarjet are effective treatment in presence of a glenoid bone loss however the graft position in a superior inferior direction was better in open Latarjet group and notably less resorption of the graft was seen in arthroscopic group [24].

Preservation of subscapularis is a major advantage of this technique. Although, authors did not compare with the results of conventional technique but it has been described in the literature that vertical or weaver incision results in decreased strength of internal rotation in contrast to present study findings [25]. However, it would be interesting to conduct a randomised study comparing the results of minimally invasive Latarjet with the conventional one using splitting approach of the subscapularis.

Limitation(s)

No comparison was done with arthroscopic procedure regarding overall functional outcome of the procedure. Moreover, no data was assessed regarding the impact of other lesions on shoulder outcome after Latarjet procedure. In addition, no reliable data was taken regarding shoulder arthritis as follow-up was midterm only, so authors recommend long term assessment of these patients as far as arthritis and other long term complications are concerned.

CONCLUSION(S)

The treatment of recurrent anterior shoulder dislocation using a minimally invasive Latarjet and coracoids bone block is a reliable and reproducible technique that gives good to excellent midterm clinical and functional results.

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