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Evaluation of Outcome after Open Latarjet Procedure for Recurrent Dislocation of Shoulder with Significant Glenoid Bone Loss

[1]Dr Rajesh Maji, [2]Dr Md Emdad Hossain, [3]Professor (Dr) Kaushik Banerjee, [4]Dr Ranjit Kumar Shaw
[1]Senior Resident, [2,4]Associate Professor, [3]Professor
[1]Khatra S D Hospital,Bankura,West Bengal ,India
[2]Rampurhat Government Medical College, Rampurhat, Birbhum, West Bengal, India
[3]R G Kar Medical College, Kolkata, West Bengal, India
[4]Midnapore Medical College, Midnapore, West Bengal, India

***Corresponding Author:**
Dr Md Emdad Hossain
Rampurhat Government Medical College, Rampurhat, Birbhum, West Bengal, India

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ABSTRACT

Background: Mobile nature of the glenohumeral joint makes it prone to dislocation, most commonly in anterior direction, when in extreme abduction, external rotation and extension along with anteriorly directed force against the humerus. A glenoid bone defect of substantial amount causes concavity loss thus affecting shoulder stability. Latarjet procedure involves transfer of coracoid to create a bony augment and is recommended for 20-30% bone loss where Bankart repair alone has high recurrence rate.

Aims and objectives: We evaluated functional outcome of Latarjet procedure for recurrent anterior glenohumeral dislocation with bone loss of>25% of glenoid width.

Materials and Methods: This was a prospective interventional study conducted at the department of orthopaedics, R.G. Kar Medical College, Kolkata between February 2018 to Feb 2020. 31 patients (21 male and 10 female) with>25% glenoid bone loss on CT scan were operated with open Latarjet procedure. Patients were assessed for ROWE score, ROM, recurrence and complications up-to 2 years post operatively.

Results: Mean age of the patients was 29±7.8 years with 93.6% having dominant side affected. Patients had suffered median of 15 dislocations (mean dislocation rate5/year). Average glenoid bone defect was 28.5±2.4%. All had apprehension preoperatively and 32.3% had pain. Mean preoperative ROM was 166˚±5.8˚ flexion and 73.4˚±13.3˚ external rotation compared to 179.7˚±1.2˚ flexion and 69.7˚±16.6˚ external rotation in 90˚ abduction post operatively at 2 years. Mean Rowe score improved significantly from 38.9±11.7 pre-operatively to 92.7±14.3 post-op at 2 year. We had 24(77.4%) excellent, 6(19.4%) good and 1(3.2%) poor result. There moderate limitation of activity in 1 patient. 1 patient had post op apprehension and 12.9% showed evidence of glenohumeral arthritis at 2 years.

Conclusion: Open Latarjet procedure effectively restores joint stability in patients with >25% glenoid deficiency.

Keywords: Recurrent shoulder dislocation, Open Latarjet procedure

INTRODUCTION

Dislocations involving the glenohumeral joint are very common due to its highly mobile nature. 95% shoulder dislocations are anterior[1]. The typical mechanism is extreme abduction, external rotation and extension along with anteriorly directed force against the humerus[2,3].Bony injuries like Hill Sachs, Reverse Hill Sachs, Bony Bankart and soft tissue injuries like Bankart, reverse Bankart,

ALPSA(Anterior labral periosteal sleeve avulsion), GLAD (glenolabral articular disruption), HAGL(humeral avulsion of inferior glenohumeral ligament), SLAP(superior labral tear from anterior to posterior) are found in shoulder dislocation cases[4] Glenoid bone loss predisposes to recurrent shoulder instability with estimates of significant bone loss being 20-30% glenoid width and >21% glenoid length[5,6,7]. A bony defect exists in around 22% of patients after initial dislocation and in around 88% of patients with recurrent instability[8-10]. Glenoid bone deficiency leads to recurrent instability by altering its function as static restraint thereby decreasing the glenoid stability angle. It is generally accepted that patients with bone loss of 20-30% have a high recurrence rate after Bankart repair and that a bone grafting procedure is required in these patients to restore osseous and shoulder stability[5,11-14].

Several strategies for the surgical management of glenoid bone loss exist including autologous coracoid transfer, tricortical iliac crest, frozen glenoid allograft, or fresh osteochondral distal tibial allograft[8,15-17]. Biomechanical studies have shown that inferior coracoid and osteochondral allograft of the lateral distal tibia are best fit for recreation of glenoid curvature[18]. The Latarjet procedure involves transfer of a larger portion of the coracoid than used with the Bristow procedure along with the conjoined tendon to anteroinferior scapular neck[19]. Fixation with two screws, increases the stability and chance of successful union of the bony augment[16,20]. Several studies have reported good outcomes with the Latarjet procedure, with low rates of recurrent instability, high patient satisfaction and return to sports[21-29].

AIMS AND OBJECTIVES:

To evaluate the clinical and functional outcome and complications after open Latarjet procedure for recurrent anterior glenohumeral dislocation with bone loss of>25% glenoid width.

MATERIALS AND METHODS:

This was a prospective interventional study conducted at the Department of Orthopaedics, R.G Kar Medical College and Hospital, Kolkata between February 2018 to Feb 2020. The study protocol was submitted to the Institutional Ethics Committee of R.G. Kar Medical College and after approval the study was started. All Patients visiting the Orthopaedics outpatient department and emergency room with recurrent shoulder dislocation were informed of the study and after getting informed consent for participation, data collection and pre-operative investigations were done. Pre-operative assessment included history, clinical ad laboratory evaluation, X-Ray of both shoulder AP and Stryker Notch view and 3D CT scan of both shoulders.

Inclusion criteria:

a) Recurrent anterior dislocation

b) Age 18-40 years

c) Significant glenoid bone loss (>25% width) in 3DCT

Exclusion criteria:

a) Presence of other significant injury or previous major surgery in the same limb

b) Large Hill-Sachs lesion (Rowe criteria-4cm width by 1cm depth)

c) Generalised ligamentous laxity or multidirectional instability.

Sample size was calculated by applying the formula $N=[(Z_{1-a}/2)*p*q]/l2$ (N= sample size, $Z_{1-a}/2$ = 1.96 considering 95% confidence level, P=expected proportion of cases with recurrent shoulder dislocation undergoing Open Latarjet procedure found with instability, q= 100-p and

l= precision in absolute it is being considered as 12).Based on previous literatures we have selected the sample size of 31[30].

Pre-operatively ROM of shoulder, apprehension, pain, function, duration of disability and Rowe score[31] were assessed. Percentage of Glenoid loss was assessed on enface CT image using glenoid index method along the perpendicular to long axis of glenoid (Saller line)[32,33].

Surgical technique: Patient was placed in beach chair position with arm draped free and a small towel placed under ipsilateral scapula. The surgical procedure was done as described by Walch and Boileau[22]. We harvested 2-2.5 cm coracoid graft and made 2 drill holes 1cm apart with 2.7 mm drill bit. The inferior coracoid surface was made raw and opposed to the freshened anteroinferior glenoid neck

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avoiding overhang and fixed with two 4 mm cancellous screws which were typically 35mm in size (usual range 30-40mm). Both screws were tightened using a "2-finger" technique. We attached the coracoacromial ligament to the capsule with nonabsorbable suture and subscapularis split was repaired with absorbable suture was done.

Post-operatively arm was immobilised in sling for 3weeks allowing active wrist and forearm movement, pendular shoulder movement and passive elbow flexion. From 3 weeks intermittent use of sling was advised and discontinued at 6 weeks. Passive shoulder movement up to 90˚ flexion and 90˚ abduction was allowed. After 6 weeks active shoulder movement up to 160˚ flexion, 120˚abduction, 40˚ extension and 65˚internal and 35˚ external rotation was allowed. Rotator strengthening and scapular isometrics were started at 6 weeks. Patient was allowed to return to full activity after 9 weeks.

Patients were followed up at 6 weeks, 3-month, 6-month, 1 year and 2 years post operatively. Return to activity, ROM, pain, apprehension, Rowe score and any complication were assessed.

All data were tabulated in a Microsoft Excel 2016 worksheet and statistical analysis was done using IBM SPSS version 25. Continuous variables were tested for normality using Shapiro-Wilk test and summarised with mean and standard deviation. Pre and post-operative data were compared by repeated measures using ANOVA. Rates and proportions were compared by Pearson chi-square test. Correlated proportions were compared using McNemar test. All tests were two-sided and statistical significance was defined at $p<.05$.

Results

The study group comprised of 31 patients (10 female and 21 male) with mean age of 29±7.8 years and dominant side affected in 29(93.6%) cases. Most patients had sports injury (17, 54.8%) while RTA and fall was initial injury mechanism in 7 cases each. Mean duration of disability was 3.1±1.1 years with 14.5±4.8 no of dislocations (average 4.8 dislocation/year). The average size of glenoid defect was 28.5±2.4%. The clinical assessment, ROM, function and Rowe score was compared pre and post operatively as summarised in Table1 and Table 2.

Table 1: Summary of pre and postoperative patient data (apprehension, pain and ADL)

Parameter		No of Pre-op patients(%)	No of post-op patients at 2 year(%)	p-value
Apprehension	Present	31(100%)	1(3.2%)	<0.001(McNemar test)
	Absent	0	30(96.8%)	
Pain	Present	10(32.3%)	6(19.4%)	0.1(McNemar test)
	Absent	21(67.7%)	25(80.7%)	
Activity of daily living	Normal	0	24(77.4%)	<0.001(Pearson chi-square test)
	Minimal limitation	14(45.2%)	6(19.4%)	
	Moderate limitation	15(48.4%)	1(3.2%)	
	Marked	2(6.5%)	0	

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	limitation			

Table 2: Comparison of preoperative and postoperative ROM and Rowe score

Parameter		**Preoperative**	**Postoperative 3 months**	**Postoperative 6 months**	**Postoperative 1 year**	**Postoperative 2 years**	**p-value (repeated measure ANOVA)**
ROM(Mean ± SD)	**External rotation at 90° abduction**	**73.4°± 13.3°**	**50°±11.5°**	**61.1°±13.6°**	**68.5°±14.6°**	**69.7°±16.6°**	**<0.001**
	Forward flexion	**166.6°± 5.8°**	**174°±5.3°**	**179°±2.4°**	**179°±2°**	**179.7°±1.2°**	**<0.001**
Rowe score(Mean±SD)		**38.9°± 11.7°**	**54.7°±9.7°**	**87.1°±15.7°**	**93.2°±8.5°**	**92.7°±14.3°**	**<0.001**

There was pain present in 19.4% patients post operatively at 2 years and moderate limitation of activity in 1 patient. 1 patient had post-operative apprehension and 12.9% showed evidence of glenohumeral arthritis at 2 years. The occurrence of glenohumeral arthritis was not associated with age difference but positively correlated with duration of disability, glenoid loss and decrease of external rotation. No patient had recurrence of dislocation. There were also no neurovascular or wound related complication.

Discussion

Large glenoid defect is a surgically challenging case to manage in the setting of instability. Our study confirms that the Latarjet procedure effectively restored glenohumeral stability. Mean age of patients in our study was 29±7.8 years which is comparable to that in study by Allain et al[25](27.5 years) and Mizuno et al[34](29.4 years). Hovelius et al[35] found that risk of re-dislocation varied inversely with age at primary dislocation. Both age<20 years and athletic activity were shown to be important risk factors for recurrence. There were more male patients in our study as in previous studies by Schmid et al[36](24% female, 76% male) due to involvement in risky sports activities. Dominant side was most commonly involved during sports activity. The study by Babu et al[24] had 56.6% sports injury while study by Burkhart et al[37] had 56% athletic injury. There was high number of previous dislocations in our patients, possibly because they were more motivated for surgery. Average glenoid defect of 28.5% was present comparable to 26.3% in study by Babu et al[24] . Previous clinical and biomechanical studies have

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recommended coracoid transfer in patients with defect >25% width[38].There was no significant difference in proportion of patients with pain pre and post operatively. Schmid et al[36] found that number of previous operations(OR=2.6), level of preoperative pain(OR=21.4) and the percentage with postoperative complications(OR=3.7) were significantly related to pain at follow up. Pain was not related to radiographic evidence of arthritis. There was some loss of external rotation in operated side. Previous studies have shown[25] that such loss is more with overlap suture compared to edge to edge suture. There was no re-dislocation in any of our patients, though one patient had apprehension. Previous studies have found 0-4% re-dislocation rate[25,34,37].The sling effect of conjoint tendon helps in additional stabilisation[15].Furthermore, the transfer of coracoid over top of lower subscapularis increases inferior fibre tension. 77% of our patients were able to achieve normal activity level. In studies by Allain et al[25] and Edward et al[39] there was 80% and 83% return to sport at preinjury level respectively. We evaluated Rowe score in all patients at 3 months, 6 months, and 1 year and 2 years. The mean Rowe score at final follow up in our study was 92.7 which was significantly different from preoperative average of 38.9. In the study by Allain et al[25] they found Rowe score of 90 in shoulders not having any arthrosis and it was less for grade 3 and 4 osteoarthrosis. Schroder et al[31] studied patients undergoing surgical correction of anterior instability(mean follow up 26.4 years). They found 70% rate of good to excellent results, but noted recurrent instability in 15% of the shoulders. Riederer et al[28], found Rowe score to be improved significantly from preoperative 31.7 to post-operative 98.1 at mean 14.6 months follow up. The high prevalence of postoperative arthritis after Latarjet procedure is concerning in spite of satisfactory results. Mizuno et al found development of arthritis postoperatively and progression of arthritis in 23.5 cases. It was lower than that reported by Allain et al (36% severe arthritis). The development and progression of arthritis is possibly influenced by surgical technique to a large extent. Maynou et al[40] described enhanced functional outcome and more preservation of external rotation in patients in whom subscapularis split rather than tenotomy was done.

Conclusion

Open Latarjet procedure effectively restores joint stability in patients with anterior Glenohumeral Instability having > 25% Glenoid deficiency. Meticulous attention should be paid for exact placement of the graft. Open Latarjet procedure is a technically demanding surgery but when properly done gives excellent results with some amount of restriction of external rotation finally.

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