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Dr. Aravindan Karunakaran
Assistant Professor, Department
of Orthopaedics, Chengalpattu
Medical College Hospital,
Chengalpattu, Tamil Nadu,
India

Dr. Samuel Gnanam Rajamani
Associate Professor, Department
of Orthopaedics, Chengalpattu
Medical College Hospital,
Chengalpattu, Tamil Nadu,
India

Analysis of Bristow-Later jet procedure in the treatment of recurrent traumatic anterior dislocation of shoulder

Dr. Aravindan Karunakaran and Dr. Samuel Gnanam Rajamani

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Abstract

The shoulder by virtue of its anatomy and biomechanics is one of the most unstable and frequently dislocated joints in the body, accounting for nearly 50% of all dislocations. Since the beginning of century more than 150 surgical procedures were described in treating recurrent dislocation of the shoulder with varying results and success. Most of the operative techniques described for the treatment of recurrent anterior dislocation or subluxation of the shoulder have 2 distinct disadvantages; need to immobilize the shoulder for several weeks and Loss of external rotation. These can be overcome by Bristow-Laterjet procedure.

We analysed Bristow-Laterjet procedure in the treatment of recurrent traumatic anterior dislocation of shoulder at the Department of Orthopaedics, Chengalpattu Medical College Hospital, Chengalpattu, Tamilnadu, India. We came across 20 patients (1 patient had bilateral dislocation) during February 2015 to February 2017. All the patients were followed up periodically both clinically and radiologically till their shoulder regained full range of movements and radiological bony union of the coracoid graft. All the patients were thoroughly examined and evaluated subjectively and objectively and outcome was assessed by Rowe's scoring system. We found all the patients were satisfied with surgery and were able to return to their pre dislocation level activity and none had further episodes of shoulder instability. Radiologically there was good bony union of the coracoid graft and there was no screw loosening.

Keywords: Bristow-Laterjet procedure, recurrent anterior dislocation, shoulder instability, hill sachs lesion, coracoid graft

1. Introduction

Materials and Methods

We in the Department of orthopaedics came across 20 patients (1 patient had bilateral dislocation) during February 2015 to February 2017 out of which 18 were Male and 2 were female.

Inclusion Criteria

- All traumatic recurrent anterior dislocation.
- Pre-op Stryker Notch view showing mild degree of Hill Sachs
- (Moderate to severe degrees are excluded from the study)
- All patients without any fracture of the proximal humerus.
- All patients without any ligamentous laxity

Based on the inclusion criteria, 2 patients who had generalized ligamentous laxity were excluded from the study thus leaving 18 patients in our study.

All the patients were in the age group of 20 to 25 years with mean age of 22.5 years, average age at the time of index dislocation being 19.8yrs. In two patients the index dislocation occurred above the age of 20 (in one who had bilateral dislocation, on the right side at the age of 23 and another person sustained the index dislocation at the age of 22). All the patients were evaluated clinically and radiologically. Clinically all the patients had positive apprehension sign, full ROM, no associated posterior instability and no previous surgery for shoulder instability. Radiologically all the patients were evaluated by taking AP view of the shoulder, True AP view of the shoulder, True lateral view of the shoulder, internal rotation (45 deg) AP

Correspondence

Dr. Aravindan Karunakaran
Assistant Professor, Department
of Orthopaedics, Chengalpattu
Medical College Hospital,
Chengalpattu, Tamil Nadu,
India

view of the shoulder, Stryker Notch view of the shoulder. 17 shoulders had mild degree of Hill Sachs lesion and 2 shoulders had no Hill Sachs lesion. All the patients underwent Bristow-Laterjet procedure

Operative Technique

Under GA, with a sand bag under the scapula, through a deltopectoral approach, cephalic vein is identified and retracted medially with a cuff of muscle. Then going through the interval between the deltoid and pectoralis major, coracobrachialis and short head of biceps. In some cases musculocutaneous nerve was seen and in other cases it was palpated and in none of the cases the musculocutaneous nerve was affected. The upper and lower limits of subscapularis muscle were identified. The lower border of the muscle was identified by the plexus of the anterior humeral circumflex vessels. Split the subscapularis muscle in line with its fibre from lateral to medial at approximately the junction of middle and lower third of the muscle. Once the subscapularis muscle was split, periosteal elevator was used to reflect it from the outer surface of the shoulder capsule to expose the anterior capsule. The anterior capsule was split in a manner to the split made in the subscapularis muscle. The joint is explored for intra-articular pathology.

Medial exposure of the anterior scapular neck is necessary for proper placement of the transferred coracoids. The anterior scapular neck was exposed by subperiosteal dissection. It is important that this transfer site be inferior to the equator of the glenoid and if possible less than 1 cm from its rim. At this position on the anteroinferior portion of the scapular neck, drill a 3.2 mm hole through the posterior cortex of the scapular neck. The surface of scapular neck where the screw has to be fixed was roughened with an osteotome. Position the transferred coracoid tip with its muscle attachment through the horizontal slit in the subscapularis onto the neck of scapula. Then fix the coracoids tip with a 4.5 mm malleolar screw with washer to avoid fragmentation of the coracoids. Then close the subscapular, longitudinal split. Then after attaining the hemostasis, wound closed in layers. All the patients were given I. V. Antibiotics for 3 days and oral antibiotics for 5 days.

Post-Operative Protocol

1st Week

Shoulder immobilization

1 to 3 week

Shoulder in arm sling

- Circumduction exercises (Pendulum exercises) started.
- It is aimed to achieve shoulder flexion, adduction and external rotation of 60deg each.
- Shoulder extension is not allowed
- Elbow flexion is allowed but neither active nor passive elbow extension is allowed.

3 to 6 weeks

Sling discarded

- Increasing range of movements at the shoulder
- Isometric strengthening of shoulder muscles (especially of the rotator cuff).
- It is aimed to achieve 90 degrees each of shoulder flexion, external rotation and abduction

6 to 12 weeks

- Gradual weight bearing is allowed in the shoulder.

- Elbow extension is allowed.
- Patient should be able to get full ROM in the shoulder

3 to 6 months

- Normal day to day activities allowed.
- Non-contact sports are allowed

Complications

The complications that are cited in the literature were Neurovascular complications [27, 28] (Brachial plexus injury, musculocutaneous nerve injury), screw penetration into the joint, screw loosening, glenohumeral arthritis. In our series till the latest follow up none of the patients had neurovascular complications, screw loosening, screw penetration or glenohumeral arthritis. None of the patients had recurrence of dislocation or subluxation. We have not encountered any complication such as nonunion of coracoid or problem with the screw.

Results

All the patients were followed up periodically both clinically and radiologically till their shoulder regained full range of movements and radiological bony union of the coracoid graft. All the patients were thoroughly examined and evaluated subjectively and objectively and outcome was assessed by Rowe's scoring system.

Subjective Evaluation

Based on the ability return to work to their pre-dislocation level, satisfaction, any shoulder instability or pain. All the patients were satisfied with the surgery. They were able to return to their pre-dislocation level activity. None of the patients had pam or episodes of shoulder instability.

Objective evaluation (by clinical examination and Rowe's scoring system)

In all the patients apprehension sign was negative. All the patients had regained full shoulder flexion, abduction, internal rotation. Although patients were not aware the terminal 5 to 20 deg of external rotation (average) was uniformly restricted in all the patients.

Radiological Evaluation

All the patients were evaluated by True AP view and True lateral view of the shoulder to assess the bony union of the transferred coracoid graft and to assess any screw loosening or screw breakage. In all the patients there was bony union and there is no evidence of any screw loosening.

Outcome assessment by Rowe's scoring system

It includes a maximum potential score of 100 points which were subdivided into stability (50 points), motion (20 points) and function (30 points). The rating scale is heavily weighed to the recurrence of instability (50 points). Results according to this system were excellent in 14 shoulders and good in 5 shoulders.

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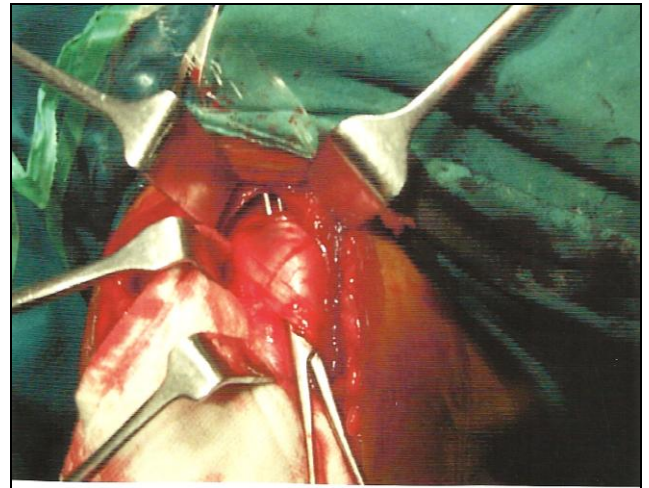
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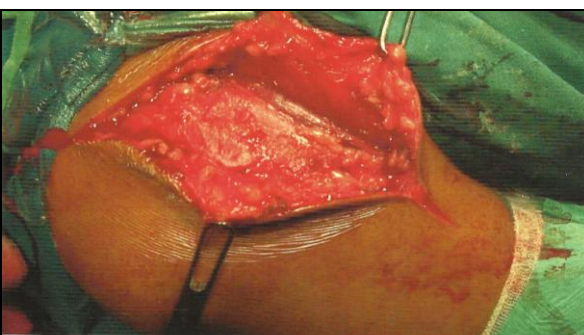
Showing coracoid process with its attached conjoined muscles



Showing coracoid process being osteotomised with its attached muscles – coracobrachialis and short head of biceps



Skin incision - deltopectoral approach

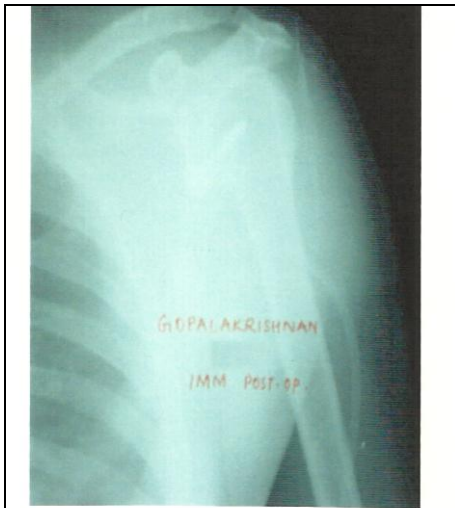


Showing cephalic vein on the deltopectoral groove

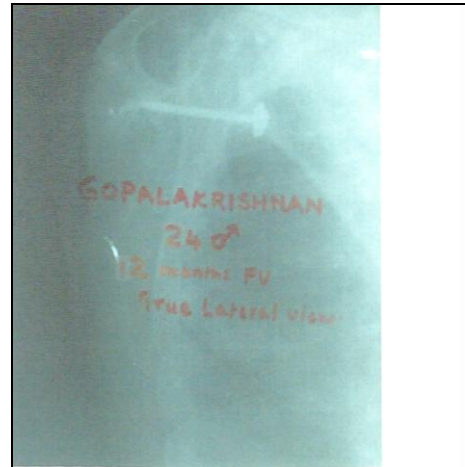


Coracoid fragment fixed in the anterior inferior quadrant within 1 cm from the rim just below the equator through the split in the subscapularis muscle (M 1/3 – L1/3 junction)

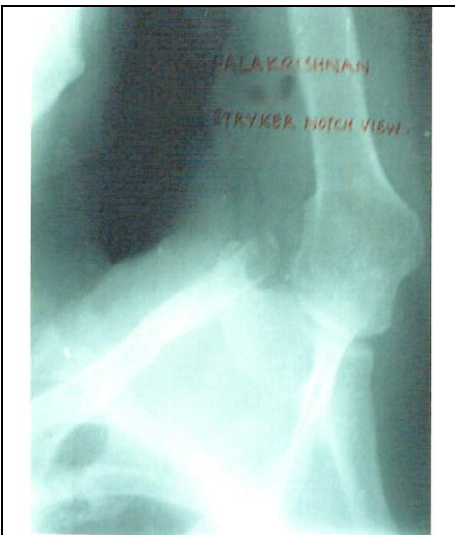
Cases Illustration Case 1



AP view right side Imm. Post. Op. showing screw in the Anteroinferior quadrant of the glenoid within 1 cm from the rim just below the equator



True lateral view Right side 12 months Post Op. follow up screw in situ with bicortical screw purchase without any loosening



Pre. Op. Stryker notch view showing mild defect in the posterolateral aspect of humeral head



3 years Post Op. follow up Left side - shoulder Abduction



True AP view right side - 12 months Post Op. follow up - screw in situ with good bony union



3 years post op follow up left side and 12 months follow up on right side - shoulder flexion



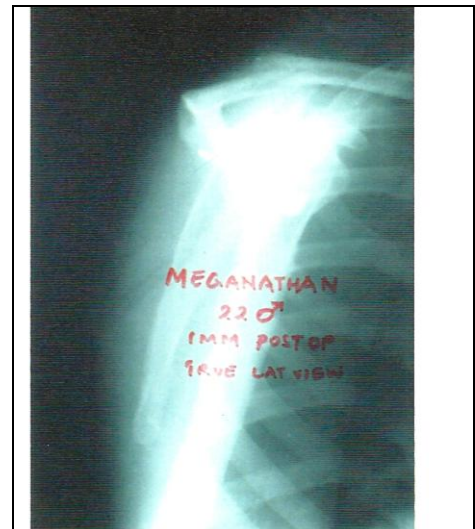
3 year post op follow up left side and 12 months follow up on right side – shoulder internal rotation



AP view Imm. Post. Op. showing the screw in the Anteroinferior quadrant of the glenoid within 1 cm from the rim just below the equator



3 year post op follow up left side and 12 months follow up on right side – shoulder external rotation

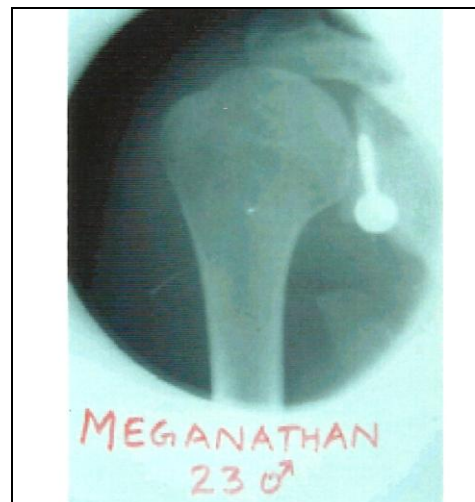


True lateral view Imm. Post. Op. showing Bicortical screw fixation

CASE 2



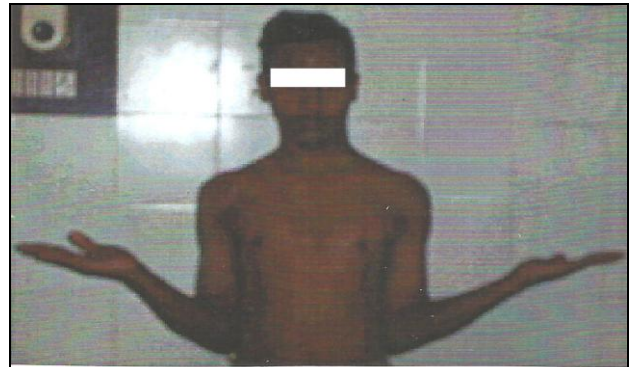
Pre-op Stryker notch view showing mild defect in the posterolateral aspect of the humeral head



True AP view – 12 months Post Op. follow up showing screw in situ without any loosening



12 months Post Op. follow up showing full Abduction

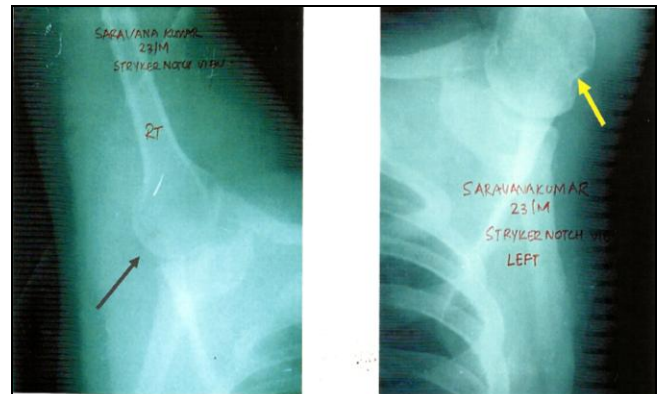


12 months Post Op. follow up showing both shoulders in external rotation

CASE 3



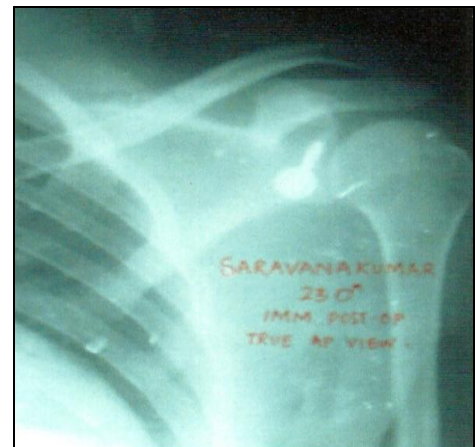
12 months Post Op. follow up showing Abduction and external rotation



Stryker notch view of both shoulder showing mild posterolateral defect in the left humeral head when compared to the right



12 months Post Op. follow up showing both shoulders in internal rotation



True AP view Imm. Post. Op. showing screw in the Anteroinferior quadrant of the glenoid within 1 cm from the rim just below the equator



True lateral view Imm. Post. Op. showing bicortical screw fixation with washer



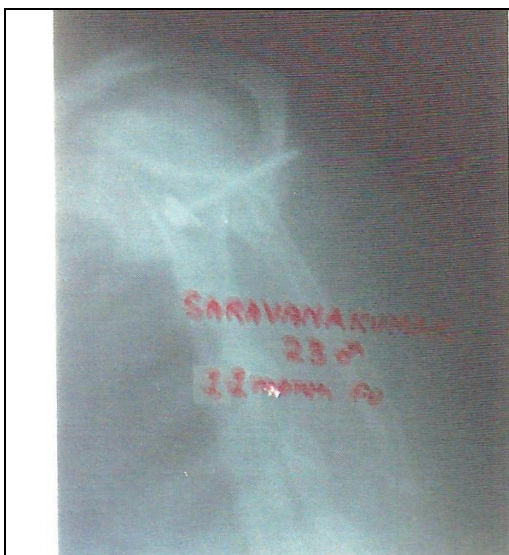
11 months Post Op. follow up – shoulder internal rotation



True AP view 11 months Post. Op. follow up showing insitu with good bony union without any loosening of screw



11 months Post Op. follow up – shoulder Abduction

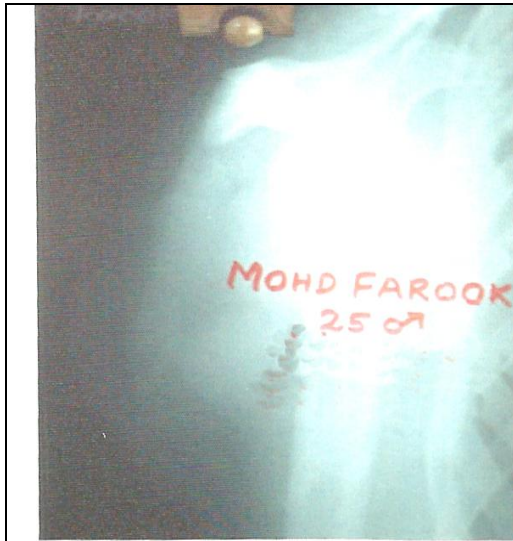


True lateral view – 11 months Post. Op. follow up

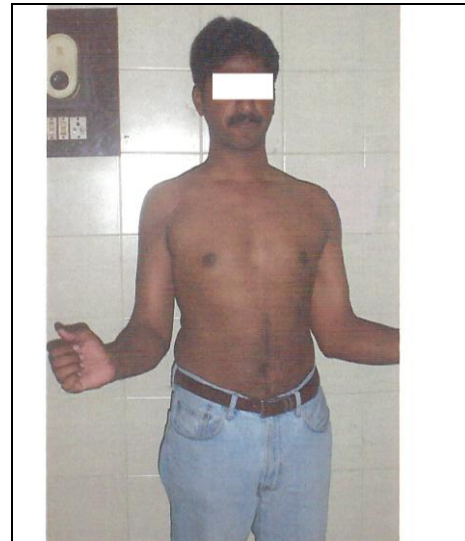
CASE 4



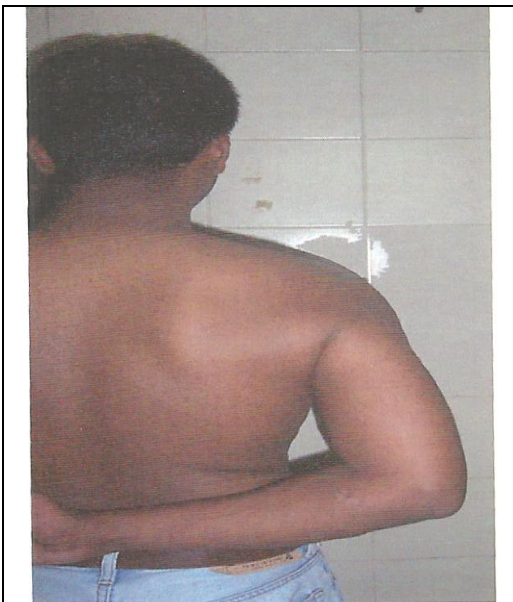
14 months follow up True AP view showing good bony union with screws insitu in the anteroinferior quadrant of the glenoid within 1 cm from the rim just below the equator, without any loosening



14 months follow up True lateral view showing bicortical screw fixation with good bony union



14 months Post. Op. follow up – shoulder external rotation



14 months Post. Op. follow up – shoulder internal rotation



14 months Post. Op. follow up – shoulder abduction

Discussion

In our series all the patients were in the age group of 20 to 25 years. In all but two patients, the index dislocations occurred at the age of 20 years (in one patient who had bilateral dislocation, the right side dislocation occurred at the age of 23 years and in another patient the index dislocation occurred at the age of 22). This is in concurrence with the study of Rowe [20] *et al*, Mclaughtin [32] *et al*. Hovelius *et al*.

In all of the patients, the index dislocation was due to fall on the outstretched hand (low-velocity injury). This is in comparison with the study of Rowe 19, 20, 21, 26 that lesser the trauma needed to produce the index dislocation, more is the chance of recurrent dislocation.

In our series, 16 out of 18 patients were male (88.89%) which also agrees with study of Rowe [20], Hovelius *et al* [19] that male dominates in the scenario of recurrence of shoulder dislocation.

In our series 14 out of 18 patients (72.22%), underwent proper treatment in our institution in the during their index dislocation and subsequently with closed manipulation and reduction and immobilization for 3 to 4 weeks (average 3.5 weeks). The remaining 4 patients underwent native treatment with 3 to 6 weeks of immobilization (average of 4.5 weeks). In all the patients, although they were immobilized for a sufficient time following their index dislocation, the dislocation recurred which is in comparable with the study that the initial mode of treatment and duration of immobilization does not alter the recurrence rate. 19, 20, 26, 30 In 16 out of 19 shoulders, Hill Sachs lesion-mild defect in the posterolateral aspect of humeral head was found in the Stryker Notch view i. e. in 84.21% of the shoulder had mild Hill Sachs lesion [33].

In our series on clinical examination in all the patients apprehension sign was negative and in all the patients, the shoulder flexion, abduction and internal rotation were full. There was uniform restriction of the external rotation-terminal 5 to 20 degrees of external rotation is restricted (average 12.5 degrees) in 5 patients there is restriction of terminal 15 degrees of external rotation. The patients were unaware of this as they had rarely experienced any difficulty with this restriction [30-42].

In follow-up, it was found in all the patients the transferred coracoids graft is well united and none had screw loosening.

Although bony union was not necessary (even fibrous union is enough to hold the graft in situ) [34, 35], we achieved bony union in all the cases. Complications cited in the literatures were screw loosening, screw cut through, non-union of the graft, neurovascular complication. We rarely encountered these complications.

Result analysis as per function, all were excellent Rowe's Scoring 14 out of 19 shoulders (73.68%) showed excellent results and the remaining 5 had good results (26.32%)

There are as many as 150 surgical procedures being described for the treatment of recurrent dislocation of shoulder which includes both soft tissue procedures and bony procedures. We chose Bristow-Laterjet procedure for the following reasons. The Principles of Bristow-Laterjet procedure is by Dynamic Musculotendinous sling.

1. The transferred coracoids graft with the conjoined tendon of short head of biceps and coracobrachialis muscles are placed so as to produce a strong dynamic buttress across the anterior and inferior aspects of the joint when the shoulder is in the vulnerable position of abducted and externally rotated position.

2. The transfer when passed through a split in the subscapularis muscle, also functions to hold the lower half of the subscapularis muscle in position and prevent it from slipping superiorly over the humeral head when the shoulder is abducted, and also it provides a new dynamic musculotendinous sling to hold humeral head posteriorly.

3. The transferred coracoids fragment used for reconstruction of the glenoid cavity is very effective at the end of throwing movement as well as with low abduction of the arm.

Putti-Platt procedure is intended to shorten the subscapularis muscle and according to Osmond Clarke [34], results in permanent limitation of external rotation in most case and has a high recurrence rate in younger patients, Glenohumeral Osteoarthritis is also a late complication with this procedure.

The Bankart procedure repair of the detached capsule from the glenoid-not only has technical difficulty, but also results in restriction of lateral rotation by approximately 20 deg [37, 38]. Magnuson and Stack [39] are of the opinion that the shoulder muscles are the only structures that maintain the head of humerus in contact with the glenoid and in proper position. In their operation, the insertion of the subscapularis tendon into the lesser tuberosity of the humerus is transferred laterally to the greater tuberosity. This overcomes the weakness of the subscapularis due to it overstretching. Magnuson and Stack's operation diminishes the range of outward rotation to a considerable extent.

Plain (50%), postoperative instability (22%) and loosening or migration of the staple (12%) were reported after staple capsulorrhaphy in a study conducted by Driscoil *et al.* [40]

In Boytchev's [41] technique the coracoids tip was osteotomised with conjoint tendons of coracobrachialis and short head of biceps and pectorals minor and was re-routed under the subscapularis muscle and was re-attached to its original anatomical position with a screw. Even though no restriction to its original anatomical position with a screw. Even though no restriction of movement was reported with this procedure, injury to the musculocutaneous nerve was an important complication with this procedure [42].

Table 1: Comparison of Rate of Redislocation in various procedures

Series	Year	Procedure	No of Cases	Rat of % redislocation
Hel fet	1958	Bristow	30	
Torg <i>et al.</i>	1987	Bristow	212	3.8
Miller <i>et al.</i>	1984	Magnusan stack	43	17
Hoveliuss <i>et al.</i>	1979	Putti piatt	68	19
Murrey and Jones	1976	Bankart	47	4.1
Our series	2012	Bristow-Later jet	18	

In our small series none of the patients had recurrence of subluxation or dislocation. Although there was restriction of external rotation 5 to 20 degrees, functionally all the patients had no/mild limitation which did not interfered with their daily activities. Our results are comparable to the result of various authorities in Bristow-Laterjet procedure.

Conclusion

An ideal surgical procedure for recurrent anterior shoulder dislocation should, Obliterate the anterior glenohumeral rent and Act as a glenoid block to force the humeral head into glenoid cavity in the vulnerable position of abduction and external rotation. These objectives are achieved by Bristow-Laterjet procedure through its dynamic musculotendinous sling mechanism.

The success of the procedure depends upon the correct positioning of the transferred coracoids process (Hoveliuss *et al.*) [29, 42]. The coracoid process should be less than one cm medial to the glenoid rim. The coracoid is positioned inferior to the transverse equator of the glenoid. There should be bicortical screw purchase, screw should not penetrate the articular surface, bony union develops between the coracoid graft and scapula (anterior aspect of the neck). When the above said technical points are clearly followed, excellent results can be achieved by this procedure.

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