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A modification of Bristow Latarjet procedure and results at 2 years follow-up

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Abstract
Background: Recurrent instability and deficits of shoulder function are common after a primary traumatic anterior shoulder dislocation. The possibility of recurrent dislocation decreases with increasing age at primary dislocation. Open surgeries have been traditionally used for treatment of anterior glenohumeral instability of which coracoid bone transfer have stood the test of time ever since. Though Bristow-Latarjet procedure is a time tested and well-practiced procedure, it is not free of complications.
Aims: To describe the surgical technique performed by us and highlight on the advantages with the modifications in the standard Bristow Latarjet procedure.
Methods: A prospective study was performed on 24 patients suffering from recurrent anterior shoulder instability with anteroinferior glenoid loss, who were treated with the technique described by us over a three year period. A modified Bristow Latarjet procedure was used to treat our patients. The modifications included using congruent arc coracoid bone block, and addition of supero-inferior capsular plication with reattachment of coraco-acromial ligament to superomedial capsule. Balg and Boileau index was used for selecting our patient group. All patients were followed for a minimum of 24 months and had a regular radiological evaluation. Results – there were 20 male and 4 female patients with all patients having the dominant extremity involved. The average number of pre-operative dislocations was 5 (range 3 to 10). No patient had recurrent instability after the procedure. Walch-Duplay scores at last follow-ups are as follows; excellent 75%, good 25%. 4 patients had mildly reduced external rotation at 90° abduction (average 5°).
Conclusion: Recurrent instability due to bone loss is a difficult problem that is not amenable to traditional soft tissue stabilization procedures. The modifications described by us in the traditional Bristow Latarjet procedure give excellent stability without compromising the range of movements and may theoretically, prevent delayed osteoarthritis. However, further clinical trials involving larger case group followed over a greater time period is necessary to confirm these preliminary results.

Keywords: Recurrent instability, shoulder, coracoid bone transfer, Bristow Latarjet procedure, coracoacromial ligament repair

Introduction
The shoulder is the most commonly dislocated joint, the possibility of recurrent dislocation decreases with increasing age at primary dislocation [1]. Recurrent instability not only results in pain and apprehension but also leads to low self-esteem resulting in decreased quality of life [2]. Latarjet procedure after being described in 1954 has been adapted by a vast majority of surgeons due to its promising results [3], in spite of this, it is not free of complications such as external rotation restriction & arthritis [4].

Patients and Methods
The procedure was performed at a tertiary care hospital in 24 consecutive patients fitting into our criteria between January 2012 and December 2015. Balg and Boileau index [5] was used to isolate our patients, all our patients had glenoid bone defect. Of our patient group 20 were male and 4 were females all between the age of 25 to 40 years and having a history of minimum 3 dislocations. A pre-operative MRI was done in all our cases to evaluate soft tissue and bony pathology pre-operatively.
Patient data including age of patient on first dis-location, injury mechanism, and events of recurring dislocations before surgical repair, time of surgery and complications were recorded. All patients were followed up for a minimum period of 24 months. Walch-Duplay score [6] was used to evaluate the results because of its wide acceptability.

Ethical committee approval was not required as study was observational in nature and informed consents from the patients were obtained for this study.

Technique

The principle of our method is to extend the glenoid articular surface by using coracoid bone inferior surface with similar radius of curvature and also obtain additional restraint against superior translation of humeral head by coracoacromial ligament reattachment to supero-medial capsule.

Patient positioning: The patient is placed in supine position with folded towel just medial to ipsilateral scapula and the lateral most aspect of the acromion level with the edge of the operating table (fig 1). The arm is draped free to allow intraoperative abduction and external rotation.

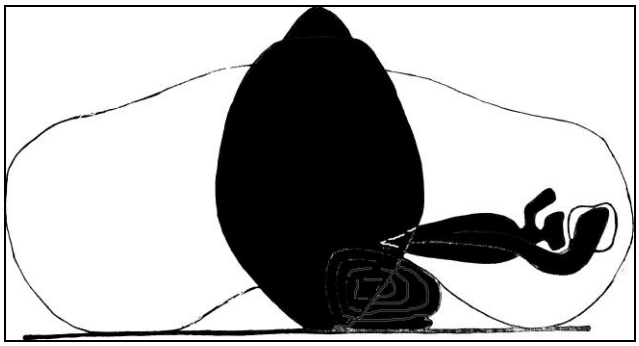

Fig 1: patient positioning

Incision: The skin incision extends vertically downward from the coracoid tip. A limited deltopectoral approach is used (fig 2).

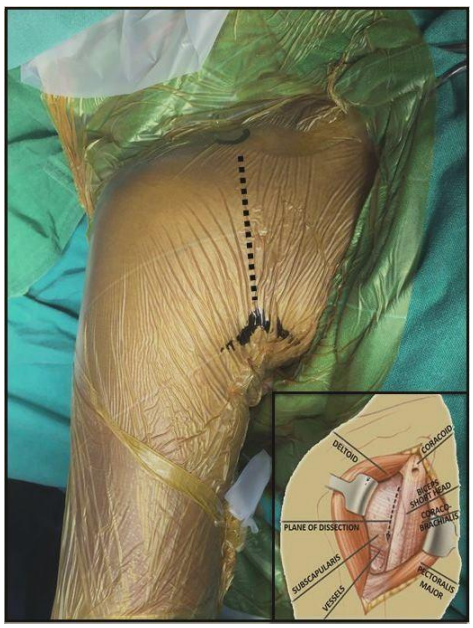

Fig 2: Incision

Coracoid harvesting and preparation: The coracoacromial ligament and pectoralis minor tendon are released from the coracoid. Osteotomy is done at the angle of the coracoid with a graft length not less than 25mm length. Care must be taken not to damage the coracoclavicular ligaments.

Two central drill holes are made in the coracoid about 1 cm apart running medio-laterally and medial part of coracoid is decorticated (fig 3).

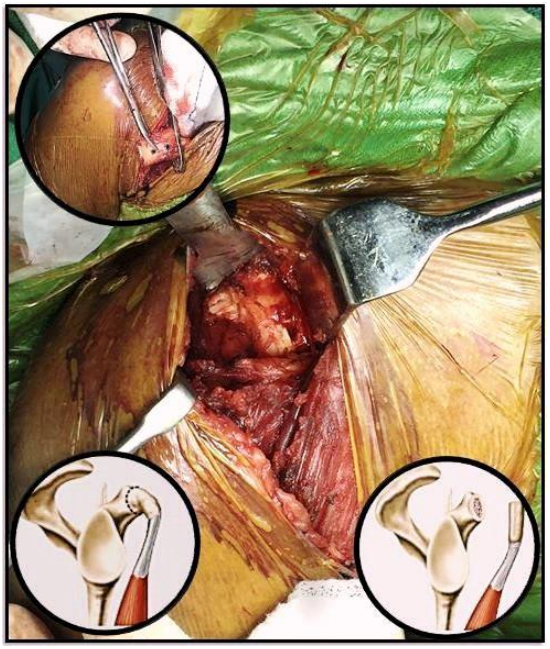

Fig 3: Coracoid detachment and drilling

Glenoid exposure and graft bed preparation: The subscapularis is split at the junction of its superior two-thirds and inferior one third unlike the traditional Latarjet technique involving subscapularis tenotomy.

Our capsular opening varies from the standard vertical opening so as to obliterate the inferior capsular laxity on closure of the incision. The underlying capsule is exposed and a wedge of capsule is excised from the antero-inferior aspect of the shoulder joint. The base of the wedge is taken medially over the glenoid neck so as to match the coracoid length. A burr is used to decorticate the anterior glenoid surface with the aim of creating a flat surface of bleeding cancellous bone. The inferior hole in the glenoid is drilled at a position between 4 and 5 o'clock in the right shoulder or 7 and 8 o'clock in the left shoulder (fig 4). The hole must be sufficiently medial to avoid lateral coracoid overhang from the glenoid. The holes should ideally be drilled parallel to the glenoid articular surface and pass through the posterior glenoid cortex.

Fig 4: wedge resection of capsule and glenoid holes

Graft fixation: The coracoid graft is fixed with a 30 to 35-mm-long 4.5-mm partially threaded cannulated cancellous screw. The screw is fully inserted into the inferior hole of the graft (ie, the conjoint tendon end). Although this is typically the correct length, it can later be exchanged after placement of the superior screw. The screw is placed in the already drilled hole in the glenoid and tightened after graft rotation is corrected to ensure the lateral margin of the coracoid is in flush with the glenoid articular margin (fig 5).

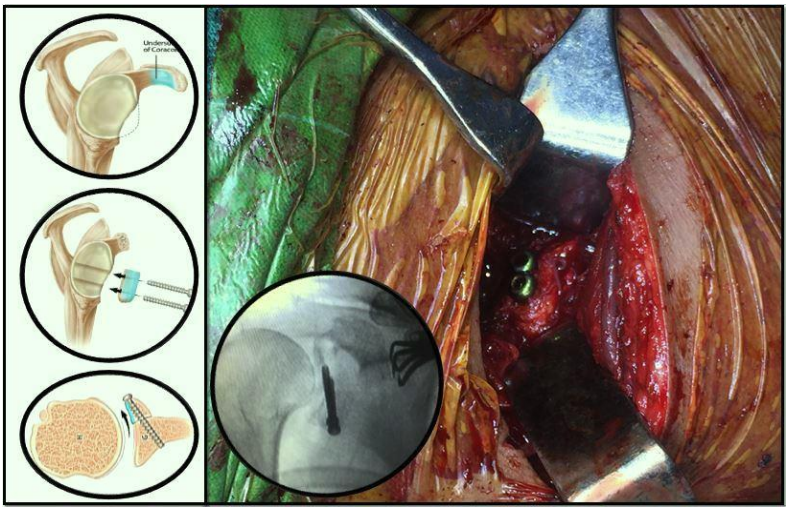

Fig 5: final position of coracoid

The second hole in the glenoid is drilled through the superior hole in the graft and graft is secured with a cannulated cancellous screw parallel to initial screw after optimal screw position is confirmed under image intensifier, a post-op x-ray is done for documentation (fig 6).

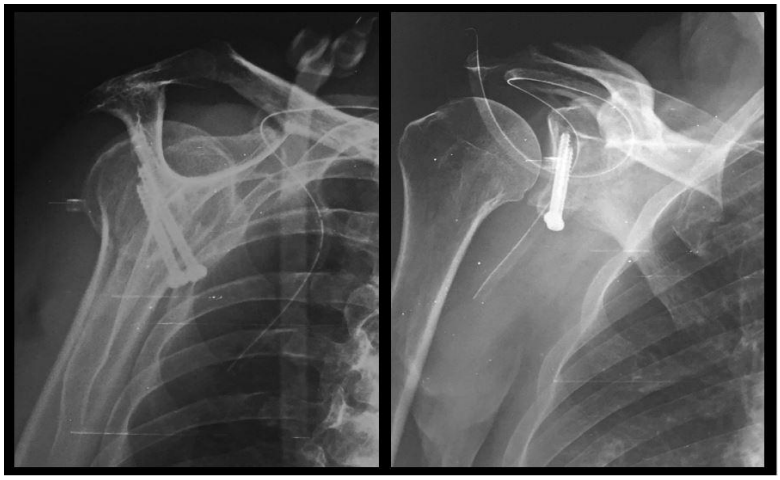

Fig 6: post-operative radiograph

Finally, capsule is closed (obliterating the inferior capsular recess) with the shoulder in full external rotation, with reattachment of coracoacromial ligament to superio-medial capsule near glenoid margin, to enable postoperative full range of motion and prevent tightness in external rotation. The authors do not repair the split in the subscapularis muscle. Patients wear a simple shoulder immobilizer for 15 days to encourage rest and reduce the risk of a postoperative hematoma.

Results

Our cohort consisted of 20 male and 4 female patients with only 3 male patients of all were involved in sports activites. The dominant extremity was involved in all of the patients,except 3. The average number of pre-operative dislocations was 5 (range 3 to 10). No patient had recurrent instability after the procedure. All patients were followed for a minimum of 24 months and their Walch-Duplay scores were as follows; excellent 75%, good 25% (table1). 6 patients had mildly limited external rotation at 90° abduction (average 5°).

Table 1: Cases summary details.

Cases	Age/ sex	Side	Previous dislocations	Cause of primary dislocation	App. test	B &B index	MRI findings	W D Score
Case 1	25/M	Right	5	Fall in bathroom	+	6	Early arthritic changes Hill sach's lesion, Bankart"s lesion & glenoid bone loss	100
Case 2	26/M	Right	4	Playing cricket (fall while bowling)	+	8	Hill sach's lesion, Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	100
Case 3	38/M	Right	4	Road traffic accident	+	6	Hill sach's lesion, Bankart"s lesion glenoid bone loss	100
Case 4	30/F	Right	4	Fall from a stair case	+	6	Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	100
Case 5	33/M	Right	7	Fall from a tree	+	6	Hill sach's lesion, Bankart"s lesion & glenoid bone loss	90
Case 6	31/M	Right	5	Road traffic accident	+	6	Early arthritic changes Hill sach's lesion, Bankart"s lesion glenoid bone loss	90
Case 7	25/M	Left	3	Road traffic accident	+	7	Hill sach's lesion,Bankart"s lesion glenoid bone loss	100
Case 8	27/M	Right	4	Road traffic accident	+	6	Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	100
Case 9	32/M	Right	3	Playing cricket (fall while catching a ball)	+	7	Hill sach's lesion, Bankart"s lesion & glenoid bone loss	100
Case 10	26/F	Right	3	Fall in bathroom	+	6	Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	100
Case 11	40/M	Right	10	Fall while working in the fields	+	6	Early arthritic changes Hill sach's lesion, Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	90
Case 12	35/M	Right	8	Fall from a ladder	+	6	Hill sach's lesion, Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	90
Case 13	36/M	Left	4	Fall from height	+	6	Hill sach's lesion, Bankart"s lesion,glenoid bone loss	100
Case 14	28/F	Right	5	Fall at home	+	6	Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	100
Case 15	30/M	Right	4	Road traffic accident	+	6	Hill sach's lesion, Bankart"s lesion,glenoid bone loss	100
Case 16	32/M	Right	7	Fall from height	+	7	Hill sach's lesion, Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	100
Case 17	26/M	Right	4	Road traffic accident	+	6	Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	90
Case 18	30/M	Left	3	Fall from roof	+	7	Hill sach's lesion, Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	100
Case 19	34/M	Right	6	Fall at home	+	6	Hill sach's lesion, Bankart"s lesion,glenoid bone loss	100
Case 20	32/F	Right	5	Fall at home	+	6	Bankart"s lesion & bony Bankart's lesion, glenoid bone loss	100
Case 21	28/M	Right	4	Road traffic accident	+	6	Hill sach's lesion, Bankart"s lesion,glenoid bone loss	100
Case 22	25/M	Right	4	Road traffic accident	+	6	Bankart"s lesion & glenoid bone loss	100
Case 23	36/M	Right	8	Fall at home	+	6	Hill sach's lesion, Bankart"s lesion & bony Bankart's lesion, glenoid bone loss, early arthritis	100
Case 24	39/M	Right	6	Fall from height	+	6	Early arthritic changes Hill sach's lesion, Bankart"s lesion glenoid bone loss	90

App. Test– apprehension test. B & B index - Balg and Boileau.
W D Score- Walch-Duplay score.

None of our patients had an infection, graft osteolysis or implant breakage. No patient showed progressive osteoarthritis in our follow-up period. Suprascapular nerve palsy was seen in one patient which recovered spontaneously in the 8th post-operative week.

Discussion

The shoulder is the most commonly dislocated joint accounting to 50% of all major joint dislocations, the reason being its wide range of motion and weak bony support [1]. The possibility of recurrent dislocation decreases with increasing age at primary dislocation [7].

The common pathologies behind recurrences is Bankart lesion in 87% & Hill-Sachs lesions 82% of cases [8]. Recurrent instability not only results in pain and secondary arthritis but also has a psychological impact decreasing the quality of life [2].

Open surgeries have been traditionally used for treatment of anterior glenohumeral instability. Michel Latarjet in 1954 proposed a successful technique of coracoid transfer to anterio-inferior glenoid neck in such a manner that the inferior aspect of the coracoid abuts the glenoid [3]. In 1958, Helfet published the results of a similar procedure using only terminal half-inch of the coracoid attributed to his mentor Rowley Bristow [9]. Of all the procedures attempting to reconstruct the glenoid bone loss coracoid bone transfer have stood the test of time ever since. Balg and Boileau [5] have provided a useful index to further clarify the decision-making process as to who would most likely benefit from a Latarjet procedure. If a patient has a moderate Hill-Sachs with small glenoid bone loss but the Hill-Sachs engages, then a Latarjet is more appropriate than a soft tissue arthroscopic reconstruction. Since the original description of Bristow-Latarjet procedure there have been a number of modifications in the conventional coracoid bone transfer, based on coracoid size, orientation for anchorage, incision of subscapularis, capsular opening and repair in order to minimize described complications such as shoulder arthritis and restriction of external rotation.

Of the various modifications Latarjet-Patte procedure has an additional blocking effect of capsule achieved by coraco-acromial ligament stump repair to anterior capsule popularly known as triple blocking effect [10, 11]. Most recently described congruent arc method uses natural curve of coracoid as the radius of curvature of the inferior surface of the coracoid is an excellent match for the radius of curvature of the glenoid, therefore it is possible by rotating the coracoid through 90 degrees and about the axis to match both surfaces prior to anchoring. Rotation of the coracoid in this modification has been shown to optimize these contact forces and therefore probably minimize rate of late-onset arthropathy [12]. Standard Latarjet and modifications do not address the potential problem of superior translation of humeral head caused by detachment of coraco-acromial ligament.

The most common complications noticed in patients undergoing coracoid transfer is shoulder arthritis and movement restriction [4]. Both these complications were technically minimised in our procedure. Arthritis was taken care of by large graft that acts similar to the congruent arc technique by increasing area of articular contact, optimizes the glenohumeral contact forces and problem of restriction of motion was taken care of by following the subscapularis splitting approach instead of tenotomy method. In addition to this we performed an obliteration of inferior capsular recess by removing a medial based wedge of capsule and closed the capsule. Coracoacromial ligament medial end was reattached to superio-medial portion of the closed capsule near to glenoid margin so as to provide a restraint against superior translation of humeral head.

Conclusions

The modification in the standard Bristow Latarjet procedure, that we adapted, has theoretical advantage in reducing complication rate over earlier described techniques although larger studies with long follow-up periods are required to demonstrate the clinical advantage. It successfully restores shoulder stability in joints even with a significant glenoid bony defect without significantly compromising the range of motion thus improving quality of life in short-term with probable reduction of arthritis in long-term.

To conclude the modification in standard Bristow Latarjet procedure is not a panacea and when done as a standalone procedure, is not an answer for significant humeral head defects, multidirectional instability and instability in voluntary dislocators.

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