Recurrent shoulder dislocation due to anterior instability managed by open Neer's Capsuloraphy and simultaneous Bankart lesion repair a therapeutic study

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Abstract

Background:

Recurrent shoulder dislocations mainly result from anterior shoulder instability when untreated, chronic subluxation and dislocation eventually leads to pain and functional disability. As the technology is evolving Bankart repair techniques have improved significantly over the last century since Bankart initially described the lesion. Open Bankart lesion repair with simultaneous capsulolabral complex repair remains the gold standard in chronic recurrent shoulder dislocation due to anterior instability and has been hypothesized in our study for joint stability and has driven for better results than previously reported methods.

Methods:

The study was carried out at the Department of Orthopaedics, Navodaya Medical College. The study consists of 14 patients with recurrent shoulder dislocation due to anterior instability who underwent open capsulolabral complex repair after an average delay of 19 ±7.61 weeks from injury. Early motion was allowed the day after surgery in the safe position and the clinical and functional results were analyzed for an average follow-up of 12 months with graded physiotherapy protocol.

Results:

All patients were able to perform their daily activities with mild or no pain. The average Rowe and Zarin's score was 77.14±1.64 points. 3 of 14 had excellent outcome while 7 of 14 and 4of 14 had good and fair outcomes respectively.

Conclusion:

The results from our study with concomitant open capsulolabral complex repair for the treatment of recurrent anterior shoulder dislocation due to anterior instability showed that the overall prognosis is more favorable than the previously reported methods. The procedure is relatively easy, safe and requires less surgical learning curve and can be done best in the rural setup hence we recommend.

Level of Evidence:

Therapeutic study, Level IV (case series- no control or historical group is considered)

Key words:

Recurrent shoulder dislocation, open Bankart lesion repair, Neer's Capsuloraphy

Introduction

Shoulder, the glenohumeral joint is structurally a ball and socket variety of synovial joint functionally as Diarthrodial and Multiaxial joint. Stability of the shoulder is established by the glenohumeral articulation, labrum, glenohumeral ligaments, rotator cuff, and deltoid muscle, all together contributing into range of movements at the cost of stability. The shoulder is the most commonly dislocated joint with anterior dislocation being the most common form with prevalent Injury to the anterior glenoid labrum, even after increasing the stability by deepening the glenoid cavity by 50%.[(1)]

The stability of shoulder is by the fibro-cartilaginous ring attached circumferentially to the glenoid rim, [(2)] which increases the glenoid surface vertically by 75% and horizontally by 57%, according to Saha et al. [(3)] Recurrent dislocation leads to injury to the glenoid labrum which in turn leads to joint instability, creating a vicious cycle. An anterior dislocation of shoulder is associated with Bankart lesion in 87 to 100%, a Hill-Sachs lesion in 90%, a bony Bankart lesion in 73%, a rotator cuff injury in 13%, and a SLAP (Superior Labral lesion Anterior to Posterior) in 10%.[(4,5,6)]

In 1938 Bankart's lesion was first described, which represents an anterior and inferior labral detachment from the glenoid with an associated capsuloligamentous injury below the equator of the glenoid. [(7)] A Hill-Sachs lesion is an osseous defect or "dent" of the postero-supero-lateral humeral head that occurs in association with anterior instability or dislocation of the glenohumeral joint. [(8)] In variable recurrent dislocation with anterior descent from a first episode of trauma and which was improperly treated making them prone for repetitive injury. With the patient's increasing age, weakness and degeneration of the soft tissue around the shoulder joint increases. [(9)] In younger individuals unreduced shoulder dislocations often occur in those with alcoholism, seizures, or multiple traumas. [(10)]

Usually the problems of dislocation like Hillsach and Bankart's lesions are increased along with the chronic subluxation leading to functional disability. Open capsulolabral repair with suture anchor fixation being the gold standard and has been suggested for most of the shoulders. Different fixation methods have been used to prevent redislocation at the cost of additional trauma to the articular surfaces of the glenoid and humeral head due to prolonged immobilization. [(11,12,13)]

Early shoulder mobilization minimizes injury to the articular surfaces by improving the cartilage nutrition but at the cost of redislocation. [(14,15)] The successful documentation of Bankart lesion repair in recurrent shoulder dislocation, [(16)] we hypothesized for open Bankart lesion repair and simultaneous Neer's Capsuloraphy in recurrent anterior shoulder dislocation with the benefit of safe early mobilization, with reduced chances of redislocation and increased stability of the shoulder.

Aim of the study

To study the functional outcome of recurrent shoulder dislocations treated with open Bankart's repair with suture anchors and Capsuloraphy.

Materials and methods

The study was carried out at the Department of Orthopaedics, Navodaya Medical College, Raichur between February 2021 and March 2023, over a period of 2 years.

Clinical examination

Clinical examination is crucial in understanding the mechanism of recurrent dislocations; always comparative evaluation of both the shoulders was performed. Any visible deformity and/or muscle atrophy with respect to the contralateral shoulder, or any scar tissue related to the past trauma or surgery are most important and can be recognizable just by a simple careful inspection. Active and passive range of range of movements in all planes was measured and noted for both the shoulders in every patient. Generalized ligamentous laxity was kept in mind and checked in every patient. Axillary nerve examination was always considered as it is critically important during clinical assessment. Apprehension test and relocation test on provocative examination are the fundamentals of clinical evaluation of any patient with a medical history of recurrent instability.

Inclusion criteria:

- Patients in the age group of 16 to 60 years
- Both male and female
- Patients with traumatic recurrent anterior shoulder dislocations

Exclusion criteria:

- Age less than 16 years
- Posterior shoulder dislocation
- Arthritis of shoulder
- Bony Bankarts lesion
- Multidirectional instability
- Generalized ligamentous laxity

In this study of 14 patients with unilateral recurrent, chronic anterior shoulder dislocation were considered and treated by Open Bankart lesion repair with simultaneous capsulolabral complex repair. The study was conducted after obtaining proper informed and written consent and once the patient signed, was enrolled for the study. The injuries were diagnosed based on clinical examination, radiographs and MRI. The radiographs included anteroposterior, axillary lateral and scapular Y-view images are the primary routine radiographic evaluation. The Apical oblique view, West point axillary view or Stryker notch view of the shoulder can also be valuable to detect particular pathologies related to patient's complaint. MRI of the affected shoulder was taken for soft tissue pathologies. Most of the shoulder dislocations were associated with concomitant injuries. In the study all the cases had Bankart injury with most of them associated with Hill Sachs lesion, the amount of involvement was less than 35% of the humeral head and were non engaging – off track lesions. 4 cases had associated greater tuberosity avulsion fracture, 3 cases of rotator cuff injury.

Figure: AP Radiograph of the shoulder with recurrent dislocation.

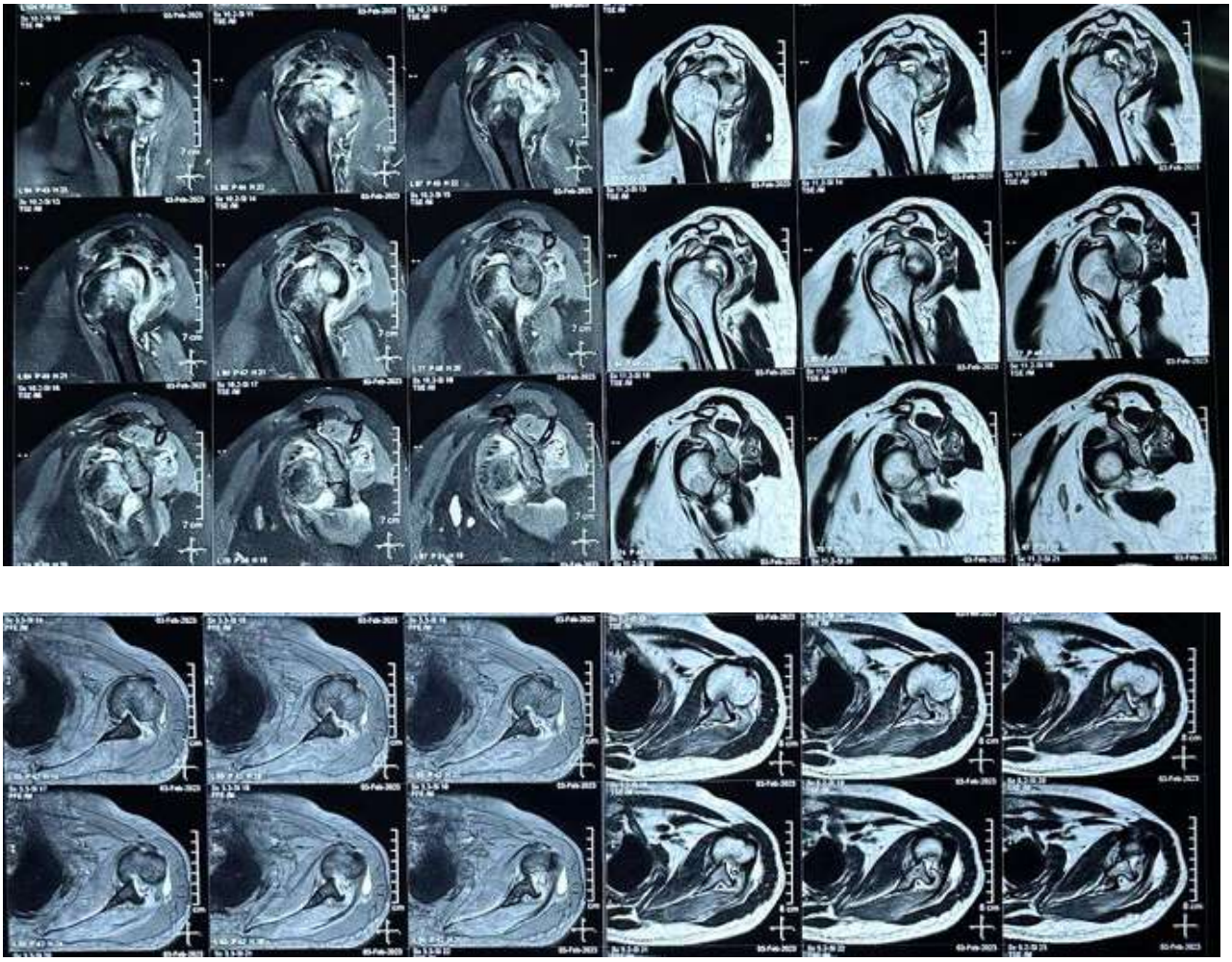

Figure: MRI of shoulder of a patient with recurrent shoulder dislocation

Operative procedure

Anaesthesia:

General Anaesthesia

Position of the patient:

Beach Chair position, shoulder at the edge of the table or with a sand bag under medial border of scapula.

Procedure:

Once the Position is confirmed under fluoroscopy parts were scrubbed painted and draped, the affected limb is kept free for easy manipulation, bony landmarks were marked. Deltopectoral approach was selected, an incision of 6-8 cm was taken, the deltopectoral internal was identified and the interval is bluntly developed, the cephalic vein is than mobilized laterally to minimize damage to the deltoid muscles and veins, clavipectoral fascia is incised and conjoint tendon is exposed. With the help of Hohmann retractors in the glenoid, the subscapular area was visualized and capsule was incised in the ratio of upper 2/3rd and lower 1/3rd ratio. Humeral head was retracted with the help of Fukuda retractor and soft tissue was detached and elevated with blunt Cobb elevator, the extent of the Bankart lesion was assessed. The anterior rim and glenoid are superficially abraded with high power micro burr, 2.5mm suture anchors were placed on the glenoid rim adjacent to the margins and the detachment was corrected with suture bridge technique, capsulolabral complex repair was done by double breasting technique, retractors were removed and the intraoperative stability was checked, a thorough wash was given, hemostasis was maintained throughout the procedure, wound was closed in layers by placing number 12 suction drain. No bone graft was used in the anterior glenoid and the humeral head and no joint fixation method was followed after operative reduction.

The upper limb was secured postoperatively with shoulder immobilizer; the arms were kept anterior to the coronal plane of the body by means of sling and swath. Three times a day, the supports were loosened to allow early shoulder motion up to 90 degrees of flexion and limiting external rotation and with full elbow motion.

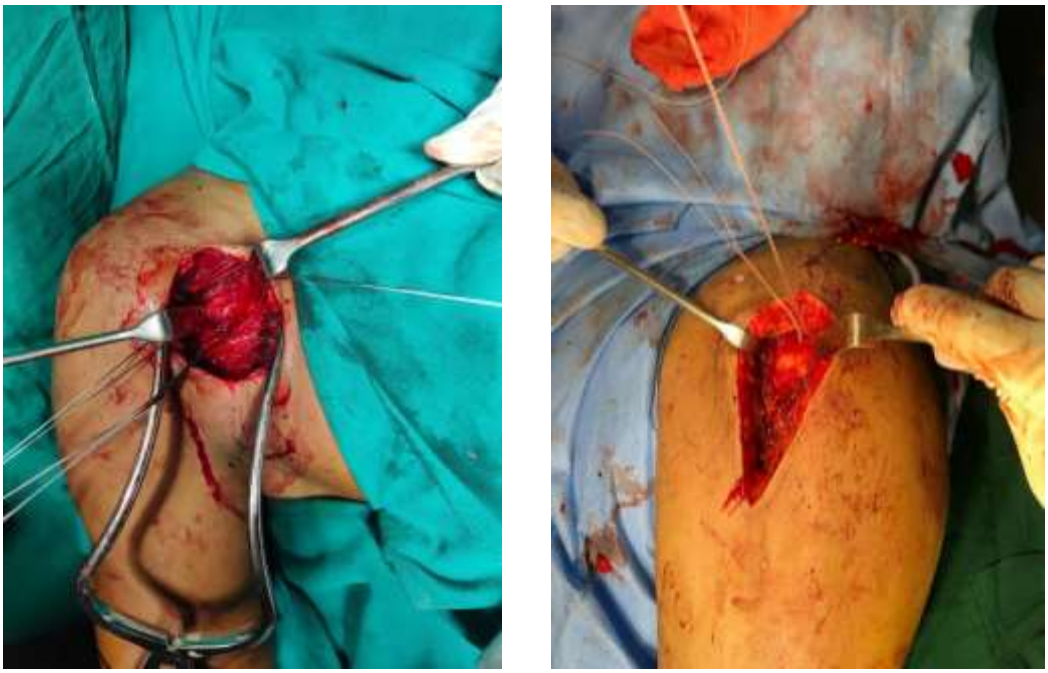

Figure: Intraoperative drapped setup and intraoperative placement of the suture anchors.

After care:

Regular dressing was done; drain was removed on postoperative 2-5 days once the drain volume was less than 20ml. Each dressing the condition of the skin, wound, discharge was considered and suture removal was done between 12-15 days postop, contemporary range of movements were started.

POST OP PROTOCOL:

0-2 weeks

Arm sling pouch at all time, Pendulum exercise, Elbow and wrist mobilization exercises.

3-4 weeks-

Flexion $<160^0$; External rotation $<30^0$;Internal rotation $<45^0$; Scapular mobilization exercise.

5-6 weeks-

Flexion $<170^0$;External rotation $<45^0$;Internal rotation $<45^0$;Abduction $<45^0$. Use arm sling pouch during sleep.

7-8 weeks-

Flexion to within normal limits; Abduction $<90^0$; Avoid terminal external rotation and abduction.

9-10 weeks-

External rotation to 90 degree; Rotator cuff strengthening exercise; Proprioceptive training; Weight bearing exercise.

Evaluation

During the study period all the patients were available for the follow-up. Regular follow up at 2 weeks once for first 2 months and monthly once for next 4 months and was followed up for 6 to 18 months with an average of 12 months postoperatively and the outcome was assessed clinically and the functional outcome by Rowe and Zarling's scoring system.[17]

The final functional results were rated at the time of the last follow up by the system. The scoring system ranges from 0-100 taking consideration of shoulder stability, motion and function. Score of 90-100 points indicating an excellent outcome; 75-89 points indicating a good outcome; 51-74 points indicating a fair outcome and 0-50 points indicating a poor outcome.

RESULTS

The study included 14 patients of which 10 male and 4 female patients (Table 1) with age ranging from 17 to 68 years with an average age of 44.42 ± 15.1 years. In most of the cases the mechanism of injury was trivial fall, affecting the dominant side right shoulder in 8 cases and involving left shoulder in 6 cases (Table 3). The time interval between the injury and the treatment modality ranged from 8 weeks to 34 weeks with an average of 19 ±7.61 weeks. The count of recurrent dislocations ranged from 4 to 8 (Table 5) with average being 5 ± 1.3 dislocations. The number of suture anchors which used in the surgery was 2 in majority of cases

which account for 71.43% and 3 in 28.57% (Table 6) which was mainly based on the extent of Bankart lesion. The time taken for the open surgical repair ranged from 85 to 150 minutes, when tabulated in 57.14% cases the duration was between 91 to 120 minutes while in 21.43% patients the duration was 60 to 90 minutes as well as 21.43% patients the duration was between 121 to 150 minutes (Table 7). The functional outcome was assessed with Rowe and Zarin's score which was excellent in 21.43% patients while it good and fair in 50.00% and 28.57% cases respectively (Table 8).

All the patients were able to do their daily activities with mild or no pain. Mild degenerative changes were present in one patient at 6 months follow up radiographs. Two patients had head migration proximal in their follow-up radiographs, of them one had surgically documented massive rotator cuff tear which was irreparable.

Table 1: Gender distribution

Gender	No. of patients	Percentage
Male	10	71.43%
Female	4	28.57%
Total	14	100%

Table 2: Age distribution

Age group	No. of patients	Percentage
<20 years	1	7.14%
20-40 years	5	35.71%
>40 years	8	57.14%
Total	14	100%

Table 3: Laterality

Laterality	No. of patients	Percentage
Right	8	57.14%
Left	6	42.86%
Total	14	100%

Table 4: Age of problem in weeks

Age of problem in weeks	No. of patients	Percentage
<10 weeks	2	14.28%
10-20 weeks	5	35.71%
21-30 weeks	6	42.86%
31-40 weeks	1	7.14%
Total	14	100%

Table 5: Number of dislocations

Number of dislocations	No. of patients	Percentage
3	2	14.28%
4	3	21.43%
5	4	28.57%
6	4	28.57%
7	-	-
8	1	7.14%
Total	14	100%

Table 6: Number of suture anchors used

Number of suture anchors used	No. of patients	Percentage
2	10	71.43%
3	4	28.57%
Total	14	100%

Table 7: Time taken for surgery in minutes

Time taken for surgery in minutes	No. of patients	Percentage
60-90 minutes	3	21.43%
91-120 minutes	8	57.14%
121-150 minutes	3	21.43%
Total	14	100%

Table 8: Rowe and Zarin's score

Rowe score	No. of patients	Percentage	Outcome
90-100	3	21.43%	Excellent
75-89	7	50.00%	Good
51-74	4	28.57%	Fair
Total	14	100%	

Discussion

In reviewing this literature there are only a few studies about the results of operative treatment of recurrent anterior shoulder dislocation. In recurrent shoulder dislocation most authors have recommended allograft reconstruction or arthroplasty in large head defects.

Gavriilidis in 2010 has stated that, the shoulder arthroplasty resulted in good midterm results for 12 patients with severe head involvement with benefits for range of motion, pain and patient satisfaction. [(18)] The average duration of dislocation was 14 months in this report, which corresponds to 19 weeks in our study.

Diklic with his coworkers reported good results with allograft reconstruction in 13 patients with locked chronic posterior dislocation of shoulder and defect of 25-50% of humeral head was noted. [19] In our series Hill-Sach's defect was less than 35% and all were nonengaging-off track.

Reinforcement of the anterior shoulder complex by Gosset technique [20] which places a rib graft between the coracoid and the glenoid rim after reduction of neglected anterior dislocation of the shoulder was described by Perniceni and Augereau in three patients. [21]

Most reports have recommended for shoulder joint transfixation to prevent redislocation following open reduction. Rockwood and Green have suggested of using smooth pins through the humeral head into the glenoid for ten to fourteen days. [13] Neviaser has reported that transfixing the shoulder joint with a Swiss screw for three to four weeks reduces the redislocation. [22] But as in our study the repair of the subscapularis tendon, the capsulolabral complex appears to be more favorable than previously reported studies which have used metallic fixation methods.

Goga have reported three excellent, five good and two fair results in ten operatively reduced anterior shoulder dislocation[23] which comply with our study but they used acromiohumeral -wire fixation for 4 week, they used Rowe and Zarins system. Rowe and Zarins in 1982 first stated that supporting the arm at the side, is the safe position.[24] They recommended simply maintaining the arm at the side anterior to the coronal plane of the body for anterior dislocations and posterior to the coronal plane for posterior dislocations reduces the risk of redislocation.

Capsulolabral complex repair allows early mobilization in a safe range without the fear of redislocation. We began up to 90 degrees of flexion and 0 degree of external rotation immediately in our patients. Although the average duration of dislocation have not pointed in Goga's study and it is difficult to compare his results with the present study. Even though the average Rowe score in our study corresponds to 77.14 ±10.64 as compared to Goga's average of 82 ± 14.17 but it seems that our patients had much better range of motion at the end of follow up period, as it should be mentioned that acromiohumeral fixation method had been used in Goga's study.

Our review of literature corresponded to one study, Mansat et al where they reported five patients with old anterior shoulder dislocation with average duration of 14 months, which were treated with open reduction and capsulolabral insertion. At the end of follow up the average Rowe score was 75 points which is corresponding to our study. [25] Mild degenerative joint changes were noted in only one patient, degenerative arthropathy in the shoulder joint is generally the final result of chronic instability. [26] Although in the literature there is no report for the true incidence of osteoarthritis after operative reduction of old dislocations, it appears that early osteoarthritis rate is reasonable in our study and we conclude that the reason may be early mobilization and not using transfixing implants.

Limitations

The present study is confined to only 14 patients, a small sample size, which was conducted at a tertiary care center by professional surgeons which lack multi-centric results. Another potential source of uncertainty is the duration of follow up period, longer follow up period is needed for the detection of the true incidence of degenerative changes following open reduction and repair of recurrent shoulder dislocations.

Conclusion

Recurrent shoulder dislocation due to anterior instability is a complex disorder which mainly affects the younger population and generally requires surgical intervention to restore joint stability. In conclusion we recommend concomitant open reduction and capsulolabral complex repair, when possible, in the treatment of recurrent anterior shoulder dislocations.

References

1. Howell SM, Galinat BJ. The glenoid-labral socket. A constrained articular surface. *Clin Orthop Relat Res* 1989; 243: 122-125
2. Chang LR, Anand P, Varacallo M. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Aug 8, 2022. Anatomy, Shoulder and Upper Limb, Glenohumeral Joint.)
3. Saha AK. Dynamic stability of the glenohumeral joint. Acta Orthop Scand. 1971;42(6):491-505.
4. Di Giacomo G, Itoi E, Burkhart SS. Evolving concept of bipolar bone loss and the Hill-Sachs lesion: from "engaging/non-engaging" lesion to "on-track/off-track" lesion. Arthroscopy. 2014 Jan;30(1):90-8.
5. Gill TJ, Zarins B. Open repairs for the treatment of anterior shoulder instability. Am J Sports Med. 2003 Jan-Feb;31(1):142-53.
6. Gill TJ, Micheli LJ, Gebhard F, Binder C. Bankart repair for anterior instability of the shoulder. Long-term outcome. J Bone Joint Surg Am. 1997 Jun;79(6):850-7.
7. Clavert P. Glenoid labrum pathology. Orthop Traumatol Surg Res. 2015 Feb;101(1 Suppl):S19-24.
8. Provencher MT, Frank RM, LeClere LE, Metzger PD, Ryu JJ, Bernhardson A, Romeo AA. The Hill-Sachs lesion: diagnosis, classification, and management. Journal of the American Academy of Orthopaedic Surgeons 2012;20(4):242-52.
9. Bennett GE: Old dislocations of the shoulder. *J Bone Joint Surg* 1936,18:594-606. Mirick MJ, Clinton JE, Ruiz E: External rotation method of shoulderdislocation reduction. *J Am Coll Emerg Physisicians* 1979, 8:528-31.
10. Engel T, Lill H, Korner J, Josten C: Bilatera fracture dislocation of shoulder caused by an epileptic seizure -diagnostic, treatment and result. *Unfallchirurg* 1999, 102(11):897-901.
11. Neviaser JS: Treatment of old unreduced dislocations of the shoulder. *Surg Clinic North America* 1963, 43:1671-1678.
12. Wilson JC, McKeever FN: Traumatic posterior (retroglenoid) dislocation of the humerus. *J Bone Joint Surg* 1949, 31(A):160-72.

13. Rockwood C, Green DP: *Fracture* Philadelphia:J.B Lippincott; 1975:710-8.
14. O'Hara BP, Urban JP: Influence of cyclic loading on the nutrition of articular cartilage. *A MaroudasAnn Rheum Dis* 1990, 49:536-539.
15. Rubak Jens M, Poussa Mikko, Ritsilá Veijo: Effects of Joint Motion on the Repair of Articular Cartilage with Free Periosteal Grafts. 1982,53(2):187-191.
16. Bankart ASB: Recurrent or habitual dislocation of the shoulder joint. *Br Med J* 1923:1132-1133
17. Rowe, C. Retal, Dinesh Patel, and W. W. Southmayd. "The Bankart procedure: a long-term end-result study." The Journal of bone and joint surgery. American volume 60.1 (1978): 1-16.
18. Gavriilidis I, Magosch P, Lichtenberg S, Habermeyer P, Kircher J: Chronic locked posterior shoulder dislocation with severe head involvement. *Int Orthop* 2010, 34(1):79-84.
19. Diklic ID, Ganic ZD, Blagojevic ZD, Nho SJ, Romeo AA: Treatment of locked chronic posterior dislocation of the shoulder by reconstruction of the defect in the humeral head with an allograft. *J Bone Joint Surg Br* 2010, 92(1):71-6.
20. Gosset J: Une technique de greffe coraco-glenordienne dans le traitement des luxations recidivantes de l'epoule. *Mem Acad Chir* 1960, 86:445-7.
21. Per niceni B, Augereau A: Treatment of old unreduced anterior dislocations of the shoulder by open reduction and reinforced rib graft: discussion of 3 cases. *Ann Chir* 1983, 36:235-9.
22. Neviaser JS: Treatment of old unreduced dislocations of the shoulder. *Surg Clinic North America* 1963, 43:1671-1678.
23. Goga IE: Chronic shoulder dislocation. *J shoulder Elbow Surg* 2003, 12(5):446_50.
24. Rowe CR, Zarins B: Chronic unreduced dislocation of the shoulder. *J Bone Joint Surg* 1982, 64(4):494-505.
25. Mansat P, Guity MR, Mansat M, Bellumore Y, Rongieres M, Bonnevialle P: Chronic anterior shoulder dislocation treated by open reduction sparing the humeral head. *Rev Chir Orthop Reparatrice Appar Mot* 2003, 89(1):19-26.
26. Hovelius L, Saeboe M. Neer Award 2008: Arthropathy after primary anterior shoulder dislocation--223 shoulders prospectively followed up for twenty-five years. *J Shoulder Elbow Surg* 2009; 18: 339-347.

Master Chart

SL NO	AGE	GENDER	LATERALITY	AGE OF PROBLEM IN WEEKS	NO. OF DISLOCATIONS	NO OF SUTURE ANCHORS USED	TIME TAKEN FOR SURGERY IN MINS	ROWE SCORE	OUTCOME
1	35	M	L	8	4	2	90	80	GOOD
2	17	M	R	25	6	3	110	90	EXCELLENT
3	44	F	R	16	5	2	150	55	FAIR
4	22	M	L	12	3	2	100	80	GOOD
5	65	M	R	22	6	2	140	75	GOOD
6	59	F	L	14	5	2	100	80	GOOD

7	28	M	R	29	6	3	105	80	GOOD
8	38	M	R	10	5	2	95	90	EXCELLENT
9	49	M	L	27	4	2	75	70	FAIR
10	57	M	L	20	6	3	130	60	FAIR
11	68	F	R	34	8	3	120	80	GOOD
12	55	M	R	14	4	2	85	75	GOOD
13	37	F	R	23	5	2	95	95	EXCELLENT
14	48	M	L	12	3	2	120	70	FAIR