

ARTHROSCOPIC BANKART REPAIR BY MATTRESS SUTURES WITH KNOTLESS ANCHORS FOR ANTERIOR SHOULDER INSTABILITY

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Abstract

Background: Shoulder instability may be treated in a variety of ways, one of which is by arthroscopic stabilisation, also known as arthroscopic Bankart repair (ABR). While it is important to keep the capsulolabral tissue attached to the glenoid, tying a firm knot is a time-consuming and technically challenging process that might result in a premature locked tie or a failure to attain the necessary tension. On the other hand, a low-profile anchor may produce a great capsular shift while avoiding the time-consuming knot-tying process using a knotless suture anchor. Knotless anchors are often utilised presently because they provide a quick and stable method of labral fixation with good long-term results for patients suffering from shoulder instability.

Aim: To study the functional results and possible complications of Arthroscopic bankart repair by mattress sutures with knotless anchors for anterior shoulder instability.

Methods: Through the duration from (January) 2019 to (April) 2021, a prospective case series study was done, thirty patients were followed for a year after arthroscopic Bankart repair utilising mattress sutures with knotless anchors for traumatic repeated anterior shoulder instability in the absence of a substantial glenoid bone defect.

Results: There was statistically significant improvement in the patients' constant shoulder score which before surgery ranged from 52–68 with (mean 60.97±6.01), compared to after 1 year ranged from 82–98 with (mean 90.10±5.38), this indicates a clear improvement of cases through constant shoulder score. Also, statistically significant improvement of the patients visual analogue score of pain which improved from 3–6 with (mean 4.30±1.21) to after 1 year ranged from 0–2 with (mean 0.93±0.58) this indicates a clear reduction of pain in cases through VAS score. The patients American Shoulder and Elbow Surgeons Score improved from 31–55 with (mean 45.30±9.56) before surgery to after 1 year ranged from 87–99 with (mean 93.47±4.08) this indicates a clear improvement of cases. In our study there was statistically insignificant decrease in External rotation which reduced by 6° at adduction and by 5° at 90° of abduction.

Conclusion: Arthroscopic bankart repair by mattress sutures with knotless anchors is a promising field for further studies that should have larger sample size and long term follow up of the patients. The principle is valid and may allow us of better bankart repair with reduced operative time which benefits the patient and surgeon

Keywords: Arthroscopic Bankart Repair, Knotless Anchors, Anterior Shoulder Instability

Introduction

The most often displaced joints in the human body is the glenohumeral joint, with up to 23.9 cases per 100,000 individuals each year. Most cases occur in young, active males (78%) in the United States, and redislocation rates are substantial after initial traumatic dislocations. **Error! Reference source not found..**

The glenohumeral joint is prone to instability and dislocations because it has a wide range of motion (ROM) but limited bone support. Stabilization is achieved by both dynamic and static techniques. Among the components that make up the static mechanisms are the bone geometries of the humerus and the glenoid, the joint capsule, the glenoid labrum, and the glenohumeral ligaments. The muscles that make up the rotator cuff, as well as, to a lesser degree, the deltoid and the long head of the biceps muscles make up the dynamic mechanisms. A glenohumeral dislocation often causes labral injury and may cause soft tissue damage in addition to a fracture of the glenoid rim's anteroinferior part. This injury may be a factor in the shoulder's repeated anterior instability. Young athletes' initial dislocations have been linked to glenoid rim injuries up to 97% and 90% with the associated glenoid rim and Hill-Sachs impaction humeral head fracture, respectively. **Error! Reference source not found..**

The operator must be knowledgeable about the many anatomical variations, typical anatomy, and the potential abnormalities to provide the best possible results. **Error! Reference source not found..**

A variety of pathological diseases affecting the bony constraints of the glenohumeral joint and the soft tissue may develop as a consequence of shoulder dislocation. Although the "Bankart" lesion, a labral separation from the glenoid rim, is the most frequent soft tissue lesion, it is also known that some stretching of the capsular constraints may take place. The capsule may sometimes become detached from its humeral connection (Humeral avulsion of glenohumeral ligament, or "HAGL" disease). In elderly people with shoulder instability, rotator cuff injuries are not uncommon. There are a variety of bone injuries that may occur, such as a fractured glenoid rim (also known as a "bony Bankart") or an impaction of the humeral head (also known as a "Hill-Sachs' lesion") (HSL). Recurrent shoulder instability may be brought on by severe bone loss, an anterior labroligamentous complex lesion (also known as a "ALPSA" lesion), or a failure of the original soft tissue injury to heal. **Error! Reference source not found..**

One of the possibilities for treating shoulder instability is arthroscopic stabilisation, often known as arthroscopic Bankart repair (ABR). It provides superb glenohumeral joint visualisation, enabling thorough evaluation of the disease and associated pathologies. Open Bankart repairs (OBR) compromise the subscapularis' ability to function, while ABR benefits from reduced postoperative pain, discomfort, and loss of mobility. Fixation using an anchor has historically been accomplished by the use of knots. Despite having a simple premise, tying knots may be difficult and have conflicting quality. **Error! Reference source not found..**

There are certain issues with the traditional knot-tying suture anchor. While it is important to keep the capsulolabral tissue attached to the glenoid, tying a firm knot is a time-consuming and technically challenging process that might result in a premature locked tie or a failure to attain the necessary tension. On the other hand, a low-profile anchor may produce a great capsular shift while avoiding the time-consuming knot-tying process using a knotless suture anchor. **Error! Reference source not found..**

We aimed at this study to study the functional results and possible complications of Arthroscopic bankart repair by mattress sutures with knotless anchors for anterior shoulder instability.

Patients and Methods:

Through the duration from (January) 2019 to (April) 2021, a prospective case series study was done for ARTHROSCOPIC BANKART REPAIR BY MATTRESS SUTURES WITH KNOTLESS ANCHORS FOR ANTERIOR SHOULDER INSTABILITY without glenoid or humeral bone loss. All patients were operated in Kasr Al-Ainy hospital and EL-haram Hospital (Giza). The follow up period of the cases 1 year, thirty patients met the following inclusion and exclusion criteria.

Patients:

Thirty patients with recurrent anterior shoulder dislocations will undergo arthroscopic repair of Bankart lesion using mattress sutures with knotless anchors after doing the necessary preoperative clinical and radiological assessment according to the following techniques.

Inclusion criteria included:

1. 20-30 years old.
2. Athletic and non-athletic.
3. MRI revealed that a traumatic anterior shoulder displacement produced the Bankart lesion.
4. Recurrent shoulder dislocation with humeral bony defect less than 10 %.

Exclusion criteria included:

1. Failed Bankart repair.
2. Associated rotator tear, HAGL and GLAD lesions.
3. Arthritic shoulder.
4. Associated SLAP tear.
5. Recurrent shoulder dislocation with glenoid bony defect > 20%.
6. Ligamentous hyper laxity.
7. Bony bankart.
8. Epileptics and tramadol addict patients.

All patients were subjected to the following:**A- Preoperative evaluation**

1. History, and complaint analysis.
2. Clinical examination and instability severity score (ISIS).
3. Constant shoulder score (CSS).
4. American shoulder and elbow Surgeon score (ASES Score)
5. Visual Analogue Scale Score for pain (VAS score)
6. Imaging investigations.

B-operative procedure.**C- Postoperative care.****D-postoperative protocol.**

1. Arm sling for 4 weeks.
2. Range of shoulder motion exercises.
3. Pendular exercises.

E- Follow-up evaluation at 12 months postoperatively:

1. ROM.
2. CSS.
3. ASES Score.
4. VAS Score for pain.
5. Return to previous level of activity and work.

(A) Pre-operative evaluation

1. History and complaint analysis:

Careful history taking was done for all patients. Special care was given to the mode of first dislocation, number of dislocations, mode of subsequent dislocations, how the shoulder was reduced each time, need for general anesthesia for reduction, epileptic fits and tramadol addiction. The answers to these questions may depict the amount of bone loss and the quality of capsulo-labral tissues available for repair.

2. Examination:

General Examination:

Examination of the neck, whole upper limb as well as the opposite shoulder were carried out, before examining the affected shoulder.

Evidence of generalized ligamentous laxity was looked for by using Beighton score including hyperextension in the elbows and knees, the ability to touch the volar aspect of the forearm with the thumb. None of the patients showed evidence of generalized laxity

Scoring Systems

To collect information on patient outcomes both before and after shoulder surgery, a number of clinical rating systems and questionnaires have been developed **Error! Reference source not found..**

(I) The Society of the American Shoulder and Elbow Surgeons (ASES) rating scale:

This grading system assesses the patient's level of pain, strength, stability, and function in everyday activities, jobs, and sports. In contrast to the Rowe score, this grading system gives greater weight to function in daily life activities than to stability **Error! Reference source not found..**

(II) ISIS:

Is based on radiographs, a clinical examination, and a preoperative questionnaire. If a Hill-Sachs lesion was seen during external rotation and there was a loss of the typical inferior glenoid contour, two points were given to the AP radiograph **Error! Reference source not found..**

(III) The CSS:

It is a simple to use, verified measure of patient function. The scoring tool estimates shoulder function by combining subjective and objective testing. The introduction of electronic dynamometers, such as Isobex, has made objective strength assessment procedures easier and more precise than they were in the past **Error! Reference source not found..**

Hayes and Patterson utilised the VAS as the first pain assessment measure in 1921. Scores are derived from self-reported evaluations of complaints that are documented with a single handwritten mark at one location along a 10-cm line that shows a continuity between the opposite edges of the scale—"no pain" on the left end (0 cm) of

the scale and "greatest pain" on the right end (10 cm). From the left edge of the scale, where the scale starts, to the patient's marks, centimetre measurements are taken and converted into pain levels. The data may be used to track a patient's pain progression or to assess pain in others with similar diseases. The VAS is still widely employed in clinical and domestic contexts despite contradictory information about its benefit over alternative techniques for recording pain⁵.

3. Imaging investigations

All patients had plain X-rays, CT scan and MRI.

Plain X-rays:

In our health center, standard shoulder imaging consists of the true anteroposterior and West point views for glenoid rim assessment and the Stryker notch images for Hill Sachs lesion identification.

CT scan

Used in cases when plain radiographs show severe glenoid rim erosion or in individuals with a history of numerous dislocations (>4) occurring with little force. Axial, sagittal, coronal, 3D reconstruction and 3D reconstruction with subtraction of humeral head with an 'en face' view of the glenoid. Size of Hill-Sachs defect was calculated as a percentage of articular arc loss on axial CT. Glenoid rim fractures and substantial glenoid bone loss were excluded in the 'en face' view of the 3D CT.

MRI

MRI accurately shows anterior capsulo-labral lesions (Bankart lesion, anterior labral periosteal sleeve avulsion 'ALPSA' and perthes lesion). It was also used to exclude other soft tissue injuries, which can occur with recurrent anterior instability like rotator cuff injury, subscapularis rupture, and biceps tendon pathology.

(B) Operative procedure:

- **Anesthesia:**

All patients (100%) received general anesthesia with an endotracheal intubation. The mean arterial pressure should be kept between 70 and 90 mm Hg (systolic blood pressure of 100 mm Hg) all-through the procedure.

. Positioning of the patients:

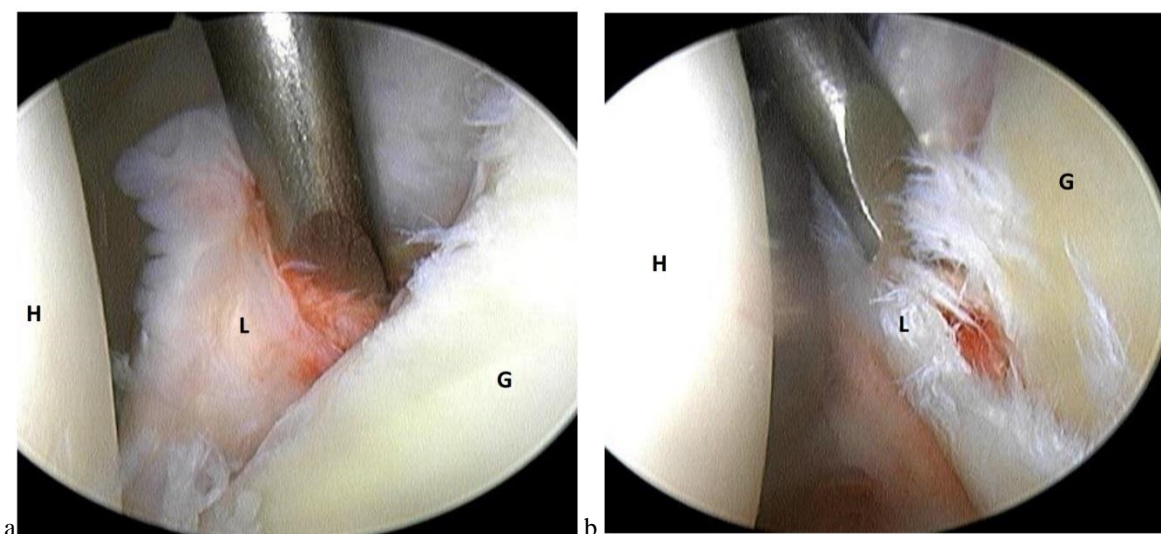
All patients were placed in the beach chair position with the patient sitting 70o with the horizontal. The scapula was completely out of the table and the arm hanging freely to allow its manipulation in all direction. After that, a load-and-shift test is used in an examination while the patient is anesthetized to determine the level and direction of instability.

Portal Placement

The region of the posterior portal, which is created 2 cm below and 1 cm medial to the postero-lateral corner of the acromion, is where additional local anaesthetic is administered. An evaluation of the anterior labral complex and any associated pathology is done during a diagnostic arthroscopy to determine if there is any evidence of an ALPSA lesion.

In the superolateral part of the rotator interval, a second portal is formed just under the biceps tendon. Just above the superior edge of the subscapularis tendon, a third portal is created. This portal's approach angle must be considered carefully. In order to reach the 5:30 point on the glenoid, the direction must be inferior, and it must also be lateral, so that anchors may be placed on the glenoid's face.

Figure (1): (a,b) The anterior glenoid neck being prepared with a dissector and anterior labrum mobilized in LT shoulder.



G: glenoid; L: labrum; H: humerus

A curve Suture Lasso is inserted into the joint via the working threaded cannula. It is pass through the capsulolabral tissue inferior to the intended position of the anchor at 6 clock to accomplish superior shift. Next, a prolene suture (nitinol wire loop can also be used) is advanced into the joint and the Suture Lasso is withdrawn from the cannula. An arthroscopic grasper is used to retrieve the prolene suture (nitinol wire loop) from the same cannula and followed by the passage of the #2 Maxbraid through the labral complex using the prolene as a shuttling device

This same step is repeated to facilitate the passage of the second limb of the Maxbraid into the capsulolabral complex about 1 cm above the first limb in a horizontal mattress fashion. Both limbs are retrieved through the anterolateral working cannula.

The optimal location for the initial anchor on the glenoid is at position five (in a right shoulder). This may be positioned utilising the low portal right above the subscapularis if the angle permits. To prevent slippage, the drill guide may be softly impacted with a mallet at the 5 position on the glenoid face, approximately 2 mm from the edge of the glenoid cartilage. With anchors equally placed more superiorly at the 4 and then 3-o'clock positions, these stages are often performed twice more. This knotless method offers good fixation while reducing the risk of gleno humeral joint irritation.

(C) Follow-up evaluation

At 12 months patients were assessed according to the following parameters:

1.ROM.

Examination of the ROM included forward flexion, external rotation at side and external rotation at 90° abduction.

2. CSS.

3. ASES Score.

4. VAS Score for pain.

5. Return to previous level of activity and work.

Statistical analysis:

Version 20.0 of the SPSS was used to evaluate the data collected. The mean and standard deviation were used to convey quantitative data (SD). Frequency and percentage were used to convey qualitative data.

The following tests were done:

The paired sample t-test for significance was employed when contrasting samples from the same category.

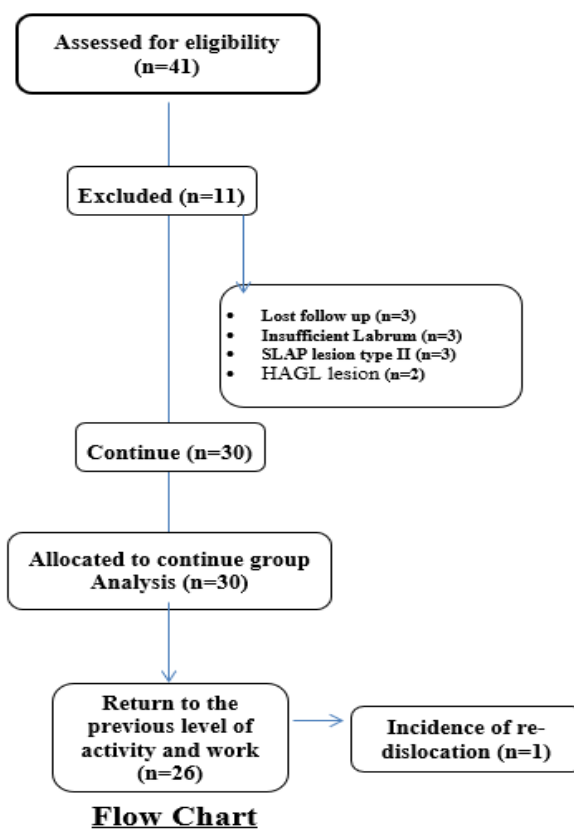
When the predicted count is less than Five in more than 20% of the cells, Fisher's exact test was employed to analyse the association between two qualitative variables. When the expected numbers are small, Fisher's exact test is much more accurate than that of the chi-squared test.

The allowable margin of error was set at 5%, while the confidence interval was set at 95%. The p-value was thus deemed significant as follows:

- P-values that were less than 0.05 were deemed significant.
- P-values below 0.001 were deemed to be very significant.
- P-values greater than 0.05 were deemed insignificant.

Results:

from (january) 2019to (april) 2021, prospective case series study at Kasr Al-ainy and El-haram hospital on patients with recurrent anterior shoulder dislocations, arthroscopic repair of bankart lesion using mattress sutures with knotless anchors was done. 30 patients were included in this study that met inclusion criteria and 11 patients was excluded due to lost follow up in 3 cases, insufficient labrum in 3 cases, SLAP lesion type II in 3 cases and HAGL lesion in 2 cases.



The study was conducted on age group ranging from 20 to 30 years, (mean age of 25.67 ± 2.93 years). There was male predominance with male to female ratio about 14:1, as shown in table (1).

There were 24 patients (80%) were dominant and 6 patients (20%) were non-dominant among dominant hand, while there were 26 patients (86.7%) were right side and 4 patients (13.3%) were left side, as shown in table (1).

As for the time between instability and surgery (months) it was ranged 4–15 with mean 9.63 ± 3.60 , while No. of dislocations before surgery it was ranged 2–6 with mean 3.50 ± 1.46 , as shown in table (1).

Additionally, there were 18 patients (60%) had injury due to working accident, 7 patients (23.3%) were due to sport and 5 patients (16.7%) were due to road accident among initial trauma cause dislocation. All cases in patients groups were showing a clear history of dislocation regarding degree of instability, as shown in table (1).

Table (1): Baseline characteristics distribution among study group (n=30).

Baseline characteristics	Total (n=30)
Age (years)	
Range	20–30
Mean±SD	25.67±2.93
Sex	
Female	2 (6.7%)
Male	28 (93.3%)

Dominant hand	
Dominant	24 (80.0%)
Non-Dominant	6 (20.0%)
Side	
Right	26 (86.7%)
Left	4 (13.3%)
Time between instability and surgery (months)	
<i>Range</i>	4–15
<i>Mean±SD</i>	9.63±3.60
No. of dislocations before surgery	
<i>Range</i>	2–6
<i>Mean±SD</i>	3.50±1.46
Initial trauma cause dislocation	
Working accident	18 (60.0%)
Sport	7 (23.3%)
Road accident	5 (16.7%)
Degree of instability	
Clear history of dislocation	30 (100.0%)

Values are expressed as mean±SD & Number and (%)

There was 14 patients (46.7%) had “Score 0”; 4 patients (13.3%) had “Score 1”; 4 patients (13.3%) had “Score 2”; 2 patients (6.7%) had “Score 3”; 4 patients (13.3%) had “Score 4” and 2 patients (6.7%) had “Score 5” among ISIS for all patients as shown in table (2) and Fig(43).

Table (2): Instability Severity Index Score distribution among study group (n=30).

Instability Severity Index Score	Total (n=30)
Score 0	14 (46.7%)
Score 1	4 (13.3%)
Score 2	4 (13.3%)
Score 3	2 (6.7%)
Score 4	4 (13.3%)
Score 5	2 (6.7%)

The patients forward flexion was before surgery ranging from 85-180 with (mean 148.17±16.73), compared to after 1year ranged from 82-175 with (mean 144.30±16.52), it turns out that there mean slightly reduction after 1year compared to before surgery, there is no statistically significant difference with p-value (p=0.371 NS), this indicates movement stability through forward flexion. The patients external rotation was before surgery ranging from 40-70 with (mean 55.03±13.38), compared to after 1year ranged from 36-62 with (mean 49.00±11.86), it turns out that there mean slightly reduction after 1year compared to before surgery, there is no statistically significant difference with p-value (p=0.070 NS), this indicates movement stability through external rotation at side.

The patients external rotation at 90° abduction was before surgery ranged from 57-86 with (mean 71.53±12.40), compared to after 1year ranging from 49-78 with (mean 66.30±9.95), it turns out that there mean slightly reduction after 1year compared to before surgery, there is no statistically significant difference with p-value (p=0.077 NS), this indicates movement stability through External rotation at 90° abduction as shown in table (3).

Table (3): Comparison between before surgery and after 1year according to their range of motion regarding “forward flexion, external rotation at side and external rotation at 90° abduction”.

Range of motion	Measurements	Range	Mean±SD	Paired Sample t-test			
				Mean Diff.	Change%	t-test	P-value
Forward flexion	Before surgery	85–180	148.17±16.73	-3.870	-2.6%	0.902	0.371
	After 1 year	82–175	144.30±16.52				
External rotation at side	Before surgery	40–70	55.03±13.38	-6.030	-11.0%	1.847	0.070
	After 1 year	36–62	49.00±11.86				
External rotation at 90° abduction	Before surgery	57–86	71.53±12.40	-5.230	-7.3%	1.802	0.077
	After 1 year	49–78	66.30±9.95				

p-value >0.05 Non-Significant

Apprehension test & Relocation test were positive before surgery for all the 30 patients(100%) compared to After 1year were 2 patients (6.7%) were positive, there was statistically significant difference between before surgery and after 1year with p-value (p<0.001), the results of the table indicates an improvement of cases through apprehension test & relocation test. as shown in table (4).

Table (4): Comparison between before surgery and after 1year according to apprehension test & relocation test.

Apprehension test & Relocation test	Before surgery	After 1 year	FE	p-value
Negative	0 (0%)	28 (93.3%)	48.817	<0.001**
Positive	30 (100.0%)	2 (6.7%)		
Total	30 (100%)	30 (100%)		

Fisher's exact test

The patients CSS was before surgery ranging from 52–68 with (mean 60.97 ± 6.01), compared to after 1 year ranged from 82–98 with (mean 90.10 ± 5.38), it turns out that there is a higher mean after 1 year compared to before surgery, there was highly statistically significant with p-value ($p < 0.001$), this indicates a clear improvement of cases through constant shoulder score. as shown in table (5)

Table (5): Comparison between before surgery and after 1 year according to constant shoulder score.

Constant Shoulder Score	Range	Mean±SD	Paired Sample t-test			
			Mean Diff.	Change%	t-test	p-value
Before surgery	52–68	60.97 ± 6.01	-29.133	-47.8%	-64.144	<0.001**
After 1 year	82–98	90.10 ± 5.38				

**p-value <0.001 highly significant

The patients visual analogue score of pain was before surgery ranging from 3–6 with (mean 4.30 ± 1.21), compared to after 1 year ranged from 0–2 with (mean 0.93 ± 0.58), it turns out that there lower mean after 1 year compared to before surgery, there was highly statistically significant difference with p-value ($p < 0.001$), this indicates a clear reduction of pain in cases through VAS score. as shown in table (6)

Table (6): Comparison between before surgery and after 1 year according to Visual analog scale score for pain.

Visual Analogue Scale Score for Pain	Range	Mean±SD	Paired Sample t-test			
			Mean Diff.	Change%	t-test	p-value
Before surgery	3–6	4.30 ± 1.21	3.367	78.3%	20.721	<0.001**
After 1 year	0–2	0.93 ± 0.58				

**p-value <0.001 highly significant

The patients ASES Score was before surgery ranging from 31–55 with (mean 45.30 ± 9.56), compared to after 1 year ranged from 87–99 with (mean 93.47 ± 4.08), it turns out that there is a higher mean after 1 year compared to before surgery, there was highly statistically significant with p-value ($p < 0.001$), this indicates a clear improvement of cases through ASES score. as shown in table (7).

Table (7): Comparison between before surgery and after 1 year according to American Shoulder and Elbow Surgeons Score.

American Shoulder and Elbow Surgeons Score	Range	Mean±SD	Paired Sample t-test			
			Mean Diff.	Change%	t-test	p-value
Before surgery	31–55	45.30 ± 9.56	-48.167	-106.3%	-45.754	<0.001**

After 1 year	87–99	93.47±4.08				
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***p-value <0.001 highly significant*

There were 26 patients (86.7%) returned to the previous level of activity and work and 4 patients (13.3%) were not returned to the previous level of activity and work among study group due to decreased ROM postoperative . as shown in table (8)

Table (8): Return to the previous level of activity and work distribution among study group (n=30).

Return to the previous level of activity and work	Total (n=30)
No	4 (13.3%)
Yes	26 (86.7%)
Total	30 (100%)

There was one patient (3.3%) had incidence of re-dislocation after 7 months from arthroscopic repair, the cause of re-dislocation was working accident and this case has been addressed through Latarjet Operation after Re-Dislocation. as shown in table (9)

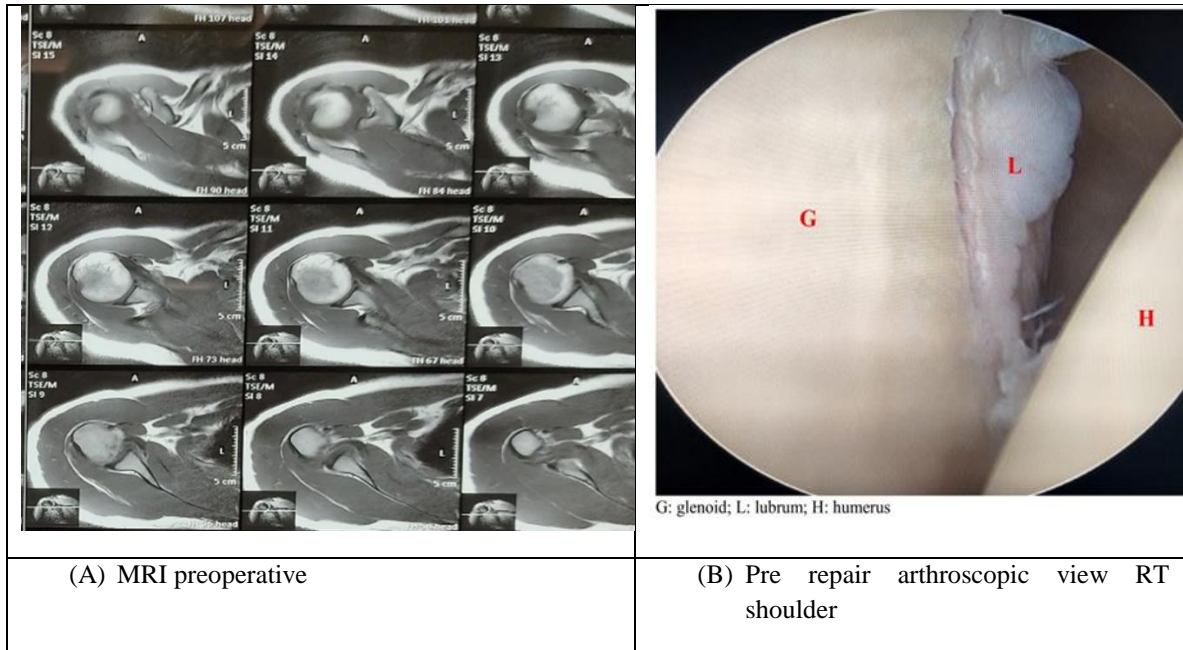
Table (1): Incidence of re-dislocation distribution among study group (n=30).

Incidence of re-dislocation	Total (n=30)
Yes	1 (3.3%)
No	29 (96.7%)
Total	30 (100%)

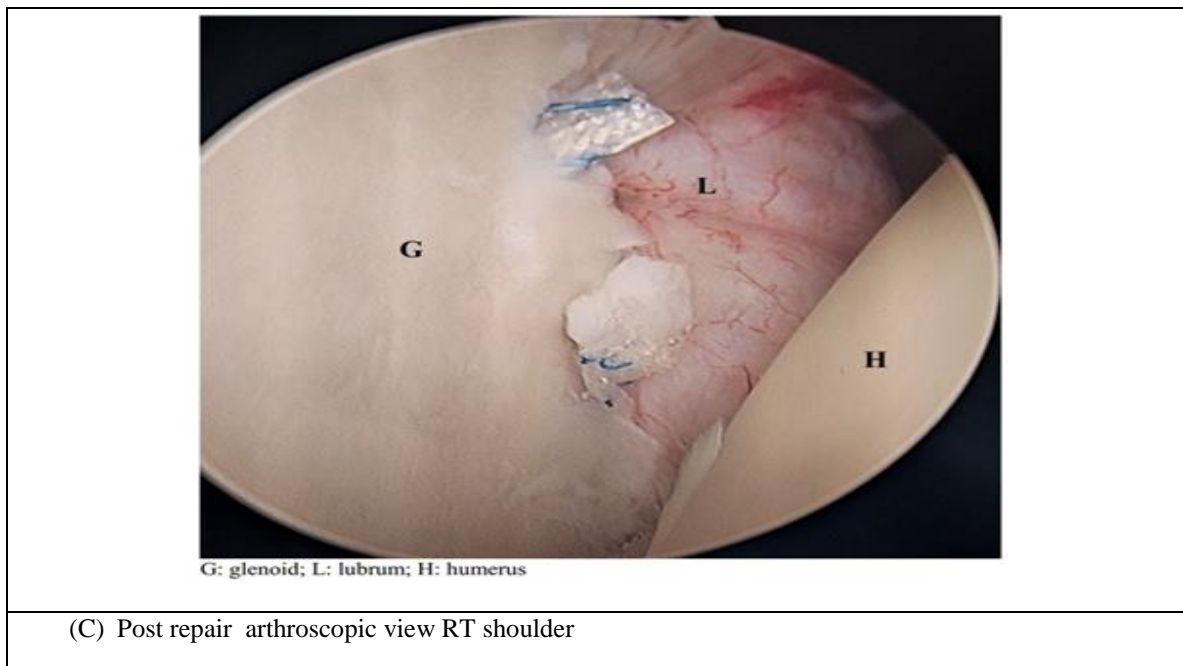
Complications:

Following a brief round of oral antibiotic treatment, a superficial portal site infection in one case was cleared completely. We experienced anchor-related trouble in 2 cases, Breakage of the anchor loop occurred during the procedure in one case and backwardness of the anchor during the procedure in another case. We removed these anchors and replace with another.

Figure 2: A 26 year old, right handed, male patient who is footballer. He complained of recurrent dislocation (five episodes) of his right shoulder. The initial trauma was falling while playing football. He had positive anterior drawer test and positive apprehension test.



Discussion



Preoperative ROM was 151 forward flexion, 57° external rotation at side and 73 external rotation at abduction. Pre-operative ISIS score was 3 point. MRI showed soft Bankart lesion and small Hill-Sach`s lesion. Arthroscopic examination confirmed the MRI findings.

Postoperative ROM was 146 forward flexion, 51° external rotation at side and 68° external rotation at abduction. After 12 months of follow up there was no recurrence with negative anterior drawer and negative anterior apprehension test.

The CSS was preoperative 60, and postoperative improved to 87.

The ASES score improved from 47 preoperative to 93 postoperative

Postoperative patient returned to previous level of activity

Discussion

In this study we performed 30 cases of recurrent anterior shoulder dislocation. All had Bankart lesion and all were operated by using mattress sutures with knotless anchors. Arthroscopic labral repair aims to retain ROM while regaining joint stability. Suture anchors are used as part of the usual procedure for arthroscopic labrum repair, and multiple studies have shown positive biomechanical and clinical outcomes¹⁰. Reference source not found..

There are certain issues with the traditional knot-tying suture anchor. While it is important to keep the capsulolabral tissue attached to the glenoid, tying a firm knot is a time-consuming and technically challenging process that might result in a premature locked tie or a failure to attain the necessary tension. According to a study, one such large knot caused injury to the articular cartilage in the shoulder joint. This is due to the bulky knot that an arthroscopic knot-tying suture anchor leaves behind¹¹. Reference source not found..

Theoretically, knotless constructions offer various benefits over knotted constructions. A knotless approach looks to provide more consistent strength when compared to a knotted technique since knot tying variability is avoided. Additionally, a knotless repair is quicker to complete and has a reduced profile, which should result in less interaction with the humeral head. Surgery that takes less time has advantages for the patient, the surgeon, and the healthcare system, including cheaper costs and a reduced risk of infection and other consequences¹¹.

In our study, a total of thirty patients were followed for a year after arthroscopic Bankart repair utilising mattress sutures with knotless anchors for traumatic repeated anterior shoulder instability in the absence of a substantial glenoid bone defect. In our study there was statistically significant improvement in the patients CSS which before surgery ranged from 52–68 with (mean 60.97 ± 6.01), compared to after 1 year ranged from 82–98 with (mean 90.10 ± 5.38), this indicates a clear improvement of cases through constant shoulder score. Also, statistically significant improvement of the patients visual analogue score of pain which improved from 3–6 with (mean 4.30 ± 1.21) to after 1 year ranged from 0–2 with (mean 0.93 ± 0.58) this indicates a clear reduction of pain in cases through VAS score. The patients ASES Score improved from 31–55 with (mean 45.30 ± 9.56) before surgery to after 1 year ranged from 87–99 with (mean 93.47 ± 4.08) this indicates a clear improvement of cases. In our study there was statistically insignificant decrease in External rotation which reduced by 6° at adduction and by 5° at 90° of abduction.

There were 26 patients (86.7%) resuming their prior level of activity and work and 4 patients (13.3%) were not resuming their prior level of activity and work among study group. There was one redislocation event (3.3%), this case has been addressed through Latarjet Operation after Re-Dislocation.

Twenty patients underwent with anterior unidirectional post-traumatic shoulder instability were managed with arthroscopic reconstruction employing knotless anchors, and the results were reported in 2005 by **Raffaele Garofalo** as part of a retrospective clinical trial examining the benefits of arthroscopic stabilisation of the shoulder. The patients were assessed after an average follow-up of 43 months. Results: Eighty percent of patients were able to resume athletic activity without restrictions, and 90% were pleased with the outcomes of the operation. One patient (5%) suffered recurring dislocations; in spite of medical advice, this patient continued playing contact sports. One patient (5%) reported experiencing shoulder discomfort during excessive external rotation and abduction; this individual had resumed sports participation with certain restrictions and was the only one who was not entirely happy with the surgical outcomes. The Rowe and Constant scores revealed no discernible difference between the surgically treated shoulder and the non-operated shoulder. The average exterior rotational loss was 3° . The radiographs showed no evidence of degenerative osteoarthritis in the shoulders, and there were no reports of anchor loosening¹².

The clinical outcomes of arthroscopic Bankart repair using the knotless suture anchor for traumatic repeated anterior shoulder instability were examined in another research by **Kenji Hayashida, Minoru Yoneda, et al.** [13], published in (2006). The current research comprised a forty seven individuals with traumatic repeated anterior shoulder instability who had arthroscopic Bankart repair using knotless suture anchors for this study, and

they were all monitored for more than two years. These patients did not have substantial glenoid bone defects. With a range of 16 to 49 years, the average patient age at surgery was 26, and the average follow-up time was 28 months (range, 24 to 38 months)[13].

The outcomes showed that the Clinical score—as measured by the modified Rowe score—rose from 31 to 91 points. Overall, 35 patients received outstanding ratings, while six received acceptable ratings. The rate of success was 87% (41 of 47), while the recurrence rate was 6.4%. (3 of 47). At 90° of abduction and adduction, respectively, external rotation was decreased by 8° and 6°. Of the 12 patients, seven (58%) fully resumed contact sports at their pre-injury levels, and two (12%) resumed them at a lesser level. In three cases, we had trouble because of the anchor. One was the anchor's backwardness two months after it had been operated. In 2 instances, the anchor loop broke during the operations[13].

Thirty-seven individuals in another research by **Dr. Joo Han Oh** **Error! Reference source not found.** experienced traumatic anterior instability for the study's Clinical and Radiologic Effects of Arthroscopic Glenoid Labrum Repair. The Western Ontario Shoulder Instability Index and Rowe score increased from 53.2 to 85.9 and 68.7 to 92.7, respectively, with the use of the BioKnotless Suture Anchor. Thirty patients (81.1%) were able to resume regular sports and recreation; the mean satisfaction VAS was nine. There was one surgical dislocation, and one instance tested positive for apprehension. There was no difference in the postoperative range of motion, including external rotation. In postoperative CT arthrography, it was discovered that all labra had successfully repaired to the bony glenoid rim without anchor-related osteolysis **Error! Reference source not found.**

To examine the clinical result between the use of knotless sutures and knot-tying sutures in arthroscopic Bankart repairs, **Dennis Zhaowen Ng, et al.** conducted a further prospective comparison research[15]. The evaluation of patients who had arthroscopic Bankart repair using knot-tying suture anchors or knotless suture anchors included 42 patients and 45 patients, respectively. Patients were divided into two groups: the knot-tying suture arm received the odd-numbered patients, while the knotless suture arm received the even-numbered patients. Constant score, VAS and patient satisfaction scores, and range of movement in forward flexion and external rotation with the arm in adduction were among the outcomes. The 2 procedures' effects on redislocations or subluxations were also investigated. The findings demonstrated that there was a statistically significant increase in both groups' preoperative, postoperative, and constant ratings. The VAS score decreased in the knot-tying suture group from 2.5 ± 2.3 to 0.7 ± 0.5 ($P < .05$), and the Constant score increased from 64 ± 7 to 92 ± 10 ($P < .05$). The VAS score decreased from 2.8 ± 0.9 to 2.5 ± 0.6 ($P < .05$) and the Constant score increased from 62 ± 6 to 89 ± 9 ($P < .05$) in the knotless group. The patient satisfaction ratings were 6.9 and 7.1, respectively, for the knot-tying and knotless groups. Comparing the results between the two groups revealed no statistically significant differences. In addition, there were no significant differences between the two groups in the range of forward flexion and external rotation. The rates of recurrence or redislocation were likewise the same[15].

In conclusion, when comparing knot-tying versus knotless anchors, we found that the former resulted in equal rates of re-dislocation and revision surgery, whereas the latter resulted in reduced rates of recurrent subluxation. Patients had acceptable to excellent functional results. This demonstrates the effectiveness of knotless anchors as opposed to knot-tied anchors for arthroscopic anterior labral repair of recurrent anterior shoulder dislocation[16].

Our research had significant limitations, including the small sample size (30 cases) and the brief average follow-up (12 months). The value of the knotless anchor should be clarified by more research using adequate controls and extended follow-up.

Conclusion

Many stabilisation procedures have been documented, with the capsulolabral glenoid bone anchor repair being the most common. Arthroscopic Bankart repair is the stabilisation method of choice in patients who have a significant probability of recurrent instability or who have failed non-operative therapy. There are several different anchors available for this procedure, each loaded with a different kind of suture. Fixation using an anchor has historically been accomplished by the use of knots. Despite having a simple premise, tying knots may be difficult

and have conflicting quality. Because acceptable knot making needs a lot of experience with particular gear made for knot tying, high-quality arthroscopic suture anchor repair is challenging to do. There is disagreement about the best knot, and some surgeons have commented that there is a steep learning curve involved.

These days, there are several knotless anchor choices available for arthroscopic Bankart repairs. Numerous research have looked at the outcomes of using these anchors to treat shoulder instability since the invention of the knotless anchor. Different researchers have reported receiving satisfactory outcomes during short-term follow-up.

As the variation in knot tying is minimised, knotless constructions tend to give greater predictable strength than knotted constructions. Additionally, a knotless repair takes less time to complete and has a reduced profile, which should result in less contact with the humeral head. Reduced operating time helps the patient, surgeon, and healthcare system by lowering the risk of infection and other problems. In comparison to conventional anchors, knotless anchors may provide better capsulolabral healing by compressing the healed tissue more tightly against the bone, resulting in a more stable fixation.

Mattress sutures with knotless anchors positioned beneath the labrum can be used to repair the labrum anatomically by reducing the chance of suture contact with the humeral head, allowing the suture to pass through multiple labral tissue planes, covering the anchor holes with labral tissue, and lowering the likelihood of suture contact with the humeral head.

Recommendations

Arthroscopic bankart repair by mattress sutures with knotless anchors for anterior shoulder instability in absence of significant Glenoid bone loss (20%) and absence of large engaging hill sach's lesion looks to be clinically and economically beneficial so long as its outcomes are equivalent to or superior than those of a knotted approach.

References

1. **Zacchilli MA, Owens BD.** Epidemiology of shoulder dislocations presenting to emergency departments in the United States. *J Bone Joint Surg Am.* 2010;92(3):542-549.
2. **Taylor DC, Arciero RA.** Pathologic changes associated with shoulder dislocations: arthroscopic and physical examination findings in firsttime, traumatic anterior dislocations. *Am J Sports Med.* 1997;25(3): 306-311.
3. **Tischer T, Vogt S, Kreuz PC, Imhoff AB.** Arthroscopic anatomy, variants, and pathologic findings in shoulder instability. *Arthroscopy.* 2011;27(10):1434-1443.
4. **Shortt CP, Morrison WB, Shah SH, Zoga AC, Carrino JA.** Association of glenoid morphology and anterosuperior labral variation. *J Comput Assist Tomogr* 2009;33:584-586.
5. **Couper M, Tourangeau R, Conrad F, et al.** Evaluating the effectiveness of visual analog scales: A web experiment. *Soc Sci Comput Rev* 2006;24:227-245.
6. **Gowd AK, Charles MD, Liu JN, Lalehzarian SP, Cabarcas BC, Manderle BJ, Nicholson GP, Romeo AA, Verma NN.** Single Assessment Numeric Evaluation (SANE) is a reliable metric to measure clinically significant improvements following shoulder arthroplasty. *Journal of Shoulder and Elbow Surgery.* 2019; 28(11):2238-46.
7. **Strother CR, McLaughlin RJ, Krych AJ, Sanchez-Sotelo J, Camp CL.** Open shoulder stabilization for instability: anterior labral repair with capsular shift. *Arthroscopy techniques.* 2019; 8(7):e749-54.
8. **Ziegler P, Kühle L, Stöckle U, Wintermeyer E, Stollhof LE, Ihle C, Bahrs C.** Evaluation of the Constant score: which is the method to assess the objective strength?. *BMC musculoskeletal disorders.* 2019; 20(1):1-6.
9. **Hantes M, Raouls V.** Suppl-1, 6: Arthroscopic Findings in Anterior Shoulder Instability. *The open orthopaedics journal.* 2017;11:119.
10. **Rhee YG, Ha JH.** Knot-induced glenoid erosion after arthroscopic fixation for unstable superior labrum anterior-posterior lesion: case report. *J Shoulder Elbow Surg.* 2016;15(3):391-393.
11. **Sileo MJ, Lee SJ, Kremenec IJ, et al.** Biomechanical comparison of a knotless suture anchor with standard suture anchor in the repair of type II SLAP tears. *Arthroscopy.* 2009;25(4):348-354.

12. **Raffaele Garofalo, M.D., Andrea Mocci, M.D.,** Arthroscopic Treatment of Anterior Shoulder Instability Using Knotless Suture Anchors: *The Journal of Arthroscopic and Related Surgery*, Vol 21, No 11 (November), 2005: pp 1283-1289.
13. **Kenji Hayashida, Minoru Yoneda, et al.** Arthroscopic Bankart Repair With Knotless Suture Anchor for Traumatic Anterior Shoulder Instability: Results of Short-Term Follow-Up. *The Journal of Arthroscopic and Related Surgery*, Vol 22, No 6 (June), 2006: pp 620-626.
14. **Joo Han Oh, MD, PhD, Ho Kyoo Lee, MD et al.** Clinical and Radiologic Outcomes of Arthroscopic Glenoid Labrum Repair With the BioKnotless Suture Anchor: *The American Journal of Sports Medicine*, Vol. 37, No. 12.
15. **Dennis Zhaowen Ng, V. Prem Kumar.** Arthroscopic Bankart Repair Using Knot-Tying Versus Knotless Suture Anchors: Is There a Difference? *Arthroscopy: The Journal of Arthroscopic and Related Surgery*, Vol 30, No 4 (April), 2014: pp 422-427.
16. **Isabella T. Wu · Vishal S. Desai et al.** : Comparable clinical outcomes using knotless and knot-tying anchors for arthroscopic capsulolabral repair in recurrent anterior glenohumeral instability at mean 5-year follow-up : *Knee Surgery Sports Traumatology Arthroscopy* · May 2020.