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RESEARCH ARTICLE
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INTERWEAVING OR RE-ROUTING OF THE CONJOINT TENDON THROUGH THE SUBSCAPULARIS IS A RELIABLE METHOD FOR ANTERIOR SHOULDER INSTABILITY WITHOUT LABRAL TEAR OR BONE LOSS

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ABSTRACT

Background

Recurrent anterior instability has diverse aetiologies and multiple treatment options. Bankart lesion and Hill Sachs lesion are two main recognized causes but in many cases, neither of these can be found. When Bankart lesion is found, arthroscopic Bankart repair has been accepted as treatment of choice, but instability or apprehension persisted or recurred in nearly 40 % cases. Some imitation of motion is almost invariable after the Laterjet procedure due to fixed mechanical blockage. An acceptable alternative should also be there. Interweaving or re-routing of the conjoint tendon through the Subscapularis is relatively simple operation where reinforcement is dynamic, i.e. maximum in abducted position when it is really needed.

Method

In this procedure, shoulder is exposed through the anterior approach, conjoint tendon is separated and detached along with 1 cm of coracoid process which is predrilled, the conjoint tendon is passed posteriorly first and then bought back anteriorly through the Subscapularis i.e., interwoven through it, and finally, the tip of the coracoid process is re-attached to its original position with a cancellous screw.

Results

I have used this method in 11 cases of recurrent anterior instability who did not have obvious glenoid labrum tear or bone loss and have found satisfactory results without complications for two years in 10 patents; one patients was lost in follow-up.

Conclusion

If no specific aetiology is found on MRI or the facility of shoulder arthroscopy is lacking, re-routing of conjoint tendon can be a good alternative.

Keywords: Anterior Shoulder Instability, Re-Routing of Subscapularis, Dynamic Reinforcement.

INTRODUCTION

Sach lesion, but in many cases, neither of these two can be found, even on MRI. As no single type of lesion is seen in all cases of anterior shoulder instability, no single type of operation will be suitable for every patient. Soft tissue procedures are indicated for patients without major osseous defect,[1] but open or arthroscopic is still a matter of debate. Open operative treatment is preferred particularly when there is bone and soft tissue loss, and in revision settings.[2] In cases of MRI-revealed Bankart lesion, arthro-scopic repair has generally been accepted as the treatment of choice. The higher failure rates reported with arthroscopic stabilization compared with open stabilization remain a concern.[3]

Retrospective analysis by Stefan M. Zimmermann et al[4] has reported 41.7% instability or apprehension after arthroscopic Bankart procedure. The study concluded that the arthroscopic Bankart procedure was inferior to the open Latarjet procedure for anterior shoulder instability.
A randomized clinical trial by Nicholus G.H. Mohtadi et al[5] comparing open and arthroscopic stabilization has also reported a higher (23%) recurrence rate in the arthroscopic group in comparison to the open group (11%). The study by Tim R. Lenters[6] has also shown that arthroscopic approaches are not as effective as open approaches in preventing recurrent instability. The higher failure rates reported with arthroscopic stabilization of recurrent anterior shoulder instability compared with open stabilization remain a concern.
Anterior instability with glenoid or humeral bone loss may be primarily treated via coracoid transfer, e.g., Bristow or Latarjet procedure.[7] In the study by David M. Privitera et al, 8% of patients experienced re-dislocation, and an additional 14% experienced a perception of instability or apprehension without a dislocation after the Latarjet procedure.[8]
Anup A. Shah et al[9] have reported a complication rate of 25% after the Latarjet procedure. Some restriction of motion is almost invariable after the Latarjet procedure. The situation becomes even more tricky or confusing when Bankart lesion or glenoid/humeral bone loss is not seen on radiology. It becomes difficult to decide which operation should be done when there is no or minimal lesion on MRI. The purpose of this study was to search for an easy, logical, and reliable method for the treatment of anterior shoulder instability which does not impair the range of motion unlike other coracoid transfer operations, and has a lower chance of recurrence unlike arthroscopic operations.

MATERIAL & METHODS

After screening of 14 patients and excluding those with Bankart lesion or bony defects on MRI, 11 patients were operated between 2008 and 2018. All were male with a median age of 29 years and an age range of 18 to 35 years. None of them was playing contact sports. With the patient in a supine position under general anaesthesia, the shoulder was elevated by placing a sandbag beneath it, and the arm was kept adducted during the procedure. An anterior approach was used, and the coracoid process along with the conjoint tendon was exposed. The upper 5 cm of the conjoint tendon and the terminal 1.5 cm of the coracoid process were carefully separated (see Pic-1). The coracoid process was pre-drilled centrally using a 2.5 mm drill bit. The terminal 1.5 cm of the coracoid was cut and separated along with the conjoint tendon attached to its tip (see Pic-2). A curved artery forceps was passed posteriorly through the lower fourth of the subscapularis and brought anteriorly through the upper fourth of the subscapularis.
A wet bandage was grasped by the artery forceps and passed downward through the track just created (see Pic-3). The cut coracoid process was wrapped at the end of the bandage, temporarily tied with a suture, and pulled superiorly through the track using the bandage (see Pic-4).
The bandage and sutures were removed, and the coracoid process was re-attached to its original position using a 4 mm cancellous screw (see Pic-5). The wound was closed in layers, and the shoulder was immobilized in an adducted position for 3 weeks. Exercises were initiated after 3 weeks, and patients were advised to avoid throwing and working with the hand in overhead positions for 3 months.
Patients were examined at 3 months, 6 months, one year, and two years for pain, range of motion, and apprehension. The anterior apprehension test was conducted with the shoulder abducted to 90 degrees and the elbow flexed at 90 degrees. It was observed whether external rotation of the arm induced any apprehension while continuous anterior stress was applied to the humerus.

RESULTS

All the patients were examined at 3 months, 6 months, 1 year and 2 years after operation for pain, range of motion i.e. abduction and internal rotation & apprehension. Overall shoulder functions were also assessed by Oxford shoulder score (OSS). Abduction was measured in degree while internal rotation was noted as complete or incomplete according to the ability or inability of the patient to

touch the back of opposite shoulder by internally rotating the arm at shoulder joint. One patient i.e. No-8 was lost to follow-up after one year. Rest of the patient were satisfied with nearly full range of motion. Two patients had mild grade-1 pain without any restriction of motion. One of the patients developed apprehension and none of them suffered re-dislocation after two years of follow-up. There were significant improvement in OSS after the operation. The median OSS was 34 before operation which improved to 91 after the operation. Results are summarized in the following tables.

Patient	Pain	Abduction in Degree	Internal Rotation	Apprehension
1	No	120	Complete	No
2	No	125	Complete	No
3	No	110	Complete	No
4	Gr 1	120	Complete	No
5	No	120	Complete	No
6	No	120	Complete	No
7	No	130	Complete	No
8	No	125	Complete	No
9	Grl	120	Incomplete	No
10	No	125	Complete	No
11	No	125	Complete	No

Table 1: Post-operative results at 3 months

Patient	Pain	Abduction in Degree	Internal Rotation	Apprehension
1	No	170	Complete	No
2	No	170	Complete	No
3	Gr 1	155	Complete	No
4	No	165	Complete	No
5	No	170	Complete	No
6	No	170	Complete	No
7	No	170	Complete	No
8	No	170	Complete	No
9	Gr 1	160	Incomplete	No
10	No	170	Complete	No
11	No	165	Complete	No

Table 2: Post-operative results at 6 months

Patient	Pain	Abduction in Degree	Internal Rotation	Apprehension
1	No	170	Complete	No
2	No	170	Complete	No
3	No	160	Complete	No
4	Gr 1	170	Complete	No
5	No	170	Complete	No
6	No	170	Complete	No
7	No	170	Complete	No
8	**	**	**	**
9	No	160	Incomplete	No
10	No	170	Complete	No
11	No	170	Complete	No

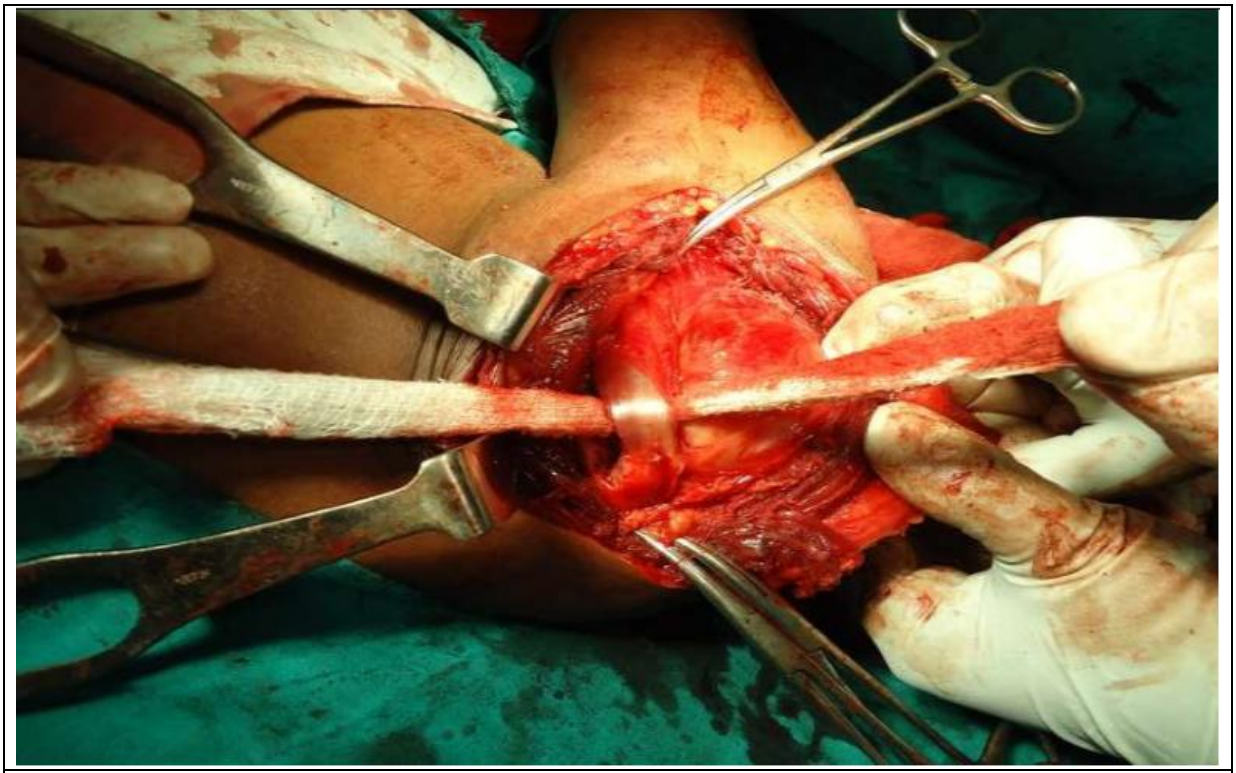
Table 3: Post-operative results at 1 year

Patient	Pain	Abduction in Degree	Internal Rotation	Apprehension
1	No	170	Complete	No
2	No	175	Complete	Yes
3	No	160	Complete	No
4	Gr 1	170	Complete	No
5	No	170	Complete	No
6	No	170	Complete	No
7	No	170	Complete	No
8	**	**	**	**
9	Gr 1	155	Incomplete	No
10	No	170	Complete	No
11	No	170	Complete	No

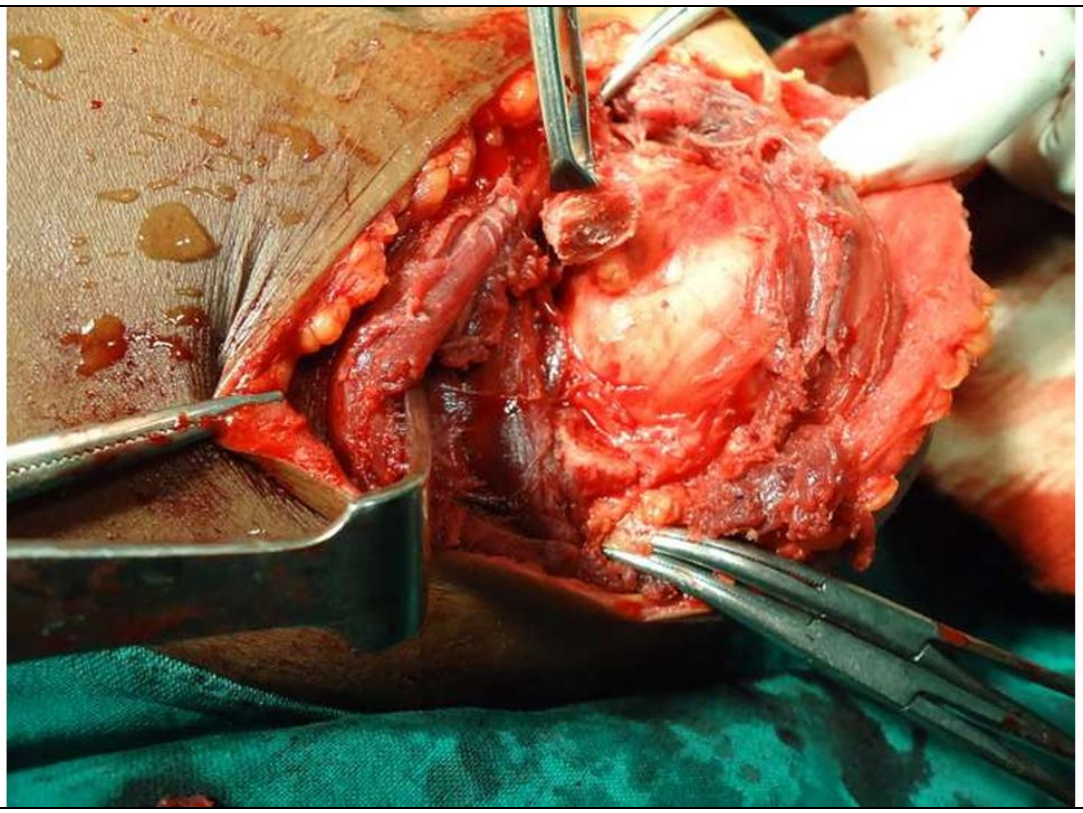
Table 4: Post-operative results at 2 years

Patient	Pre-operative	3 month post-op	6 month post-op	1 year post-op	2 year post-op
1	37	92	90	91	92
2	34	91	92	90	91
3	34	94	91	91	92
4	30	80	88	91	88
5	30	88	91	88	91
6	34	90	92	84	85
7	31	91	92	90	88
8	32	88	90	**	**
9	33	90	91	91	92
10	32	85	90	90	91
11	35	88	91	92	92

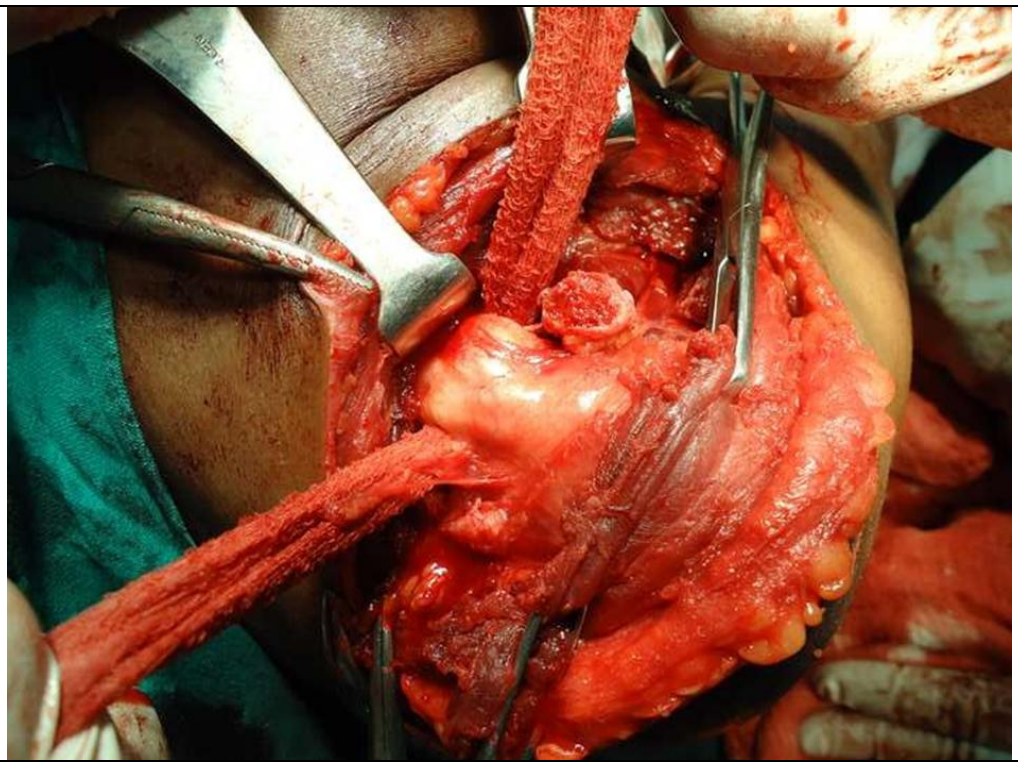
Table 5: Pre-operative and post-operative Oxford Shoulder Scores



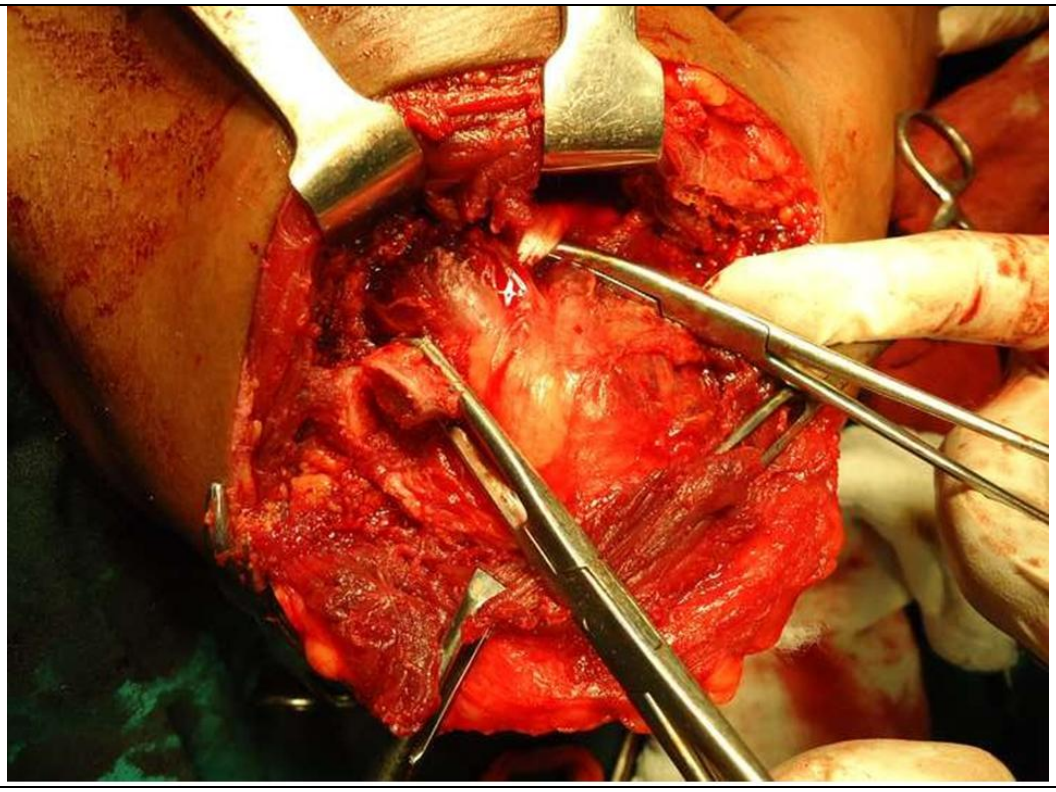
Picture 1: conjoint tendon exposed



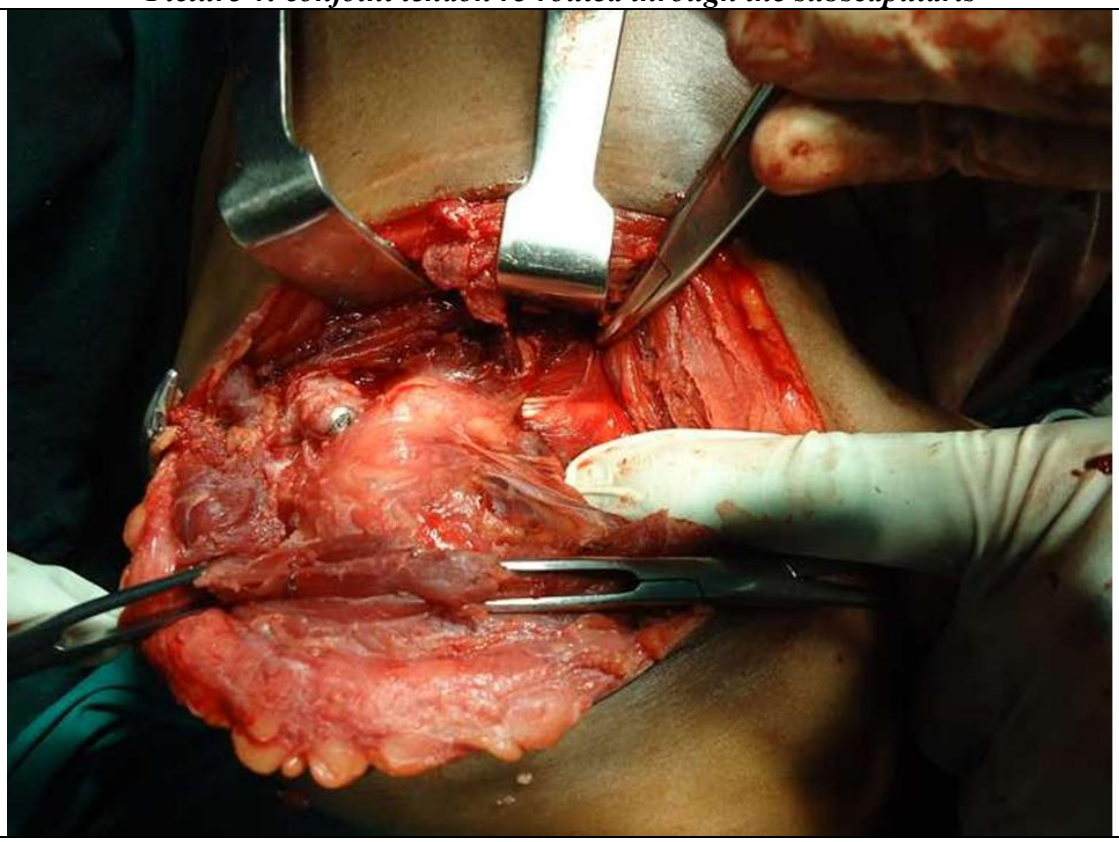
Picture 2: Tip of the coracoid with attached conjoint tendon cut



Picture 3: Track made for conjoint tendon



Picture 4: conjoint tendon re-routed through the subscapularis



Picture 5: Cut coracoid process re-attached to it's original position

Picture 6

Picture 7

DISCUSSION

The high success rate of this operation with a low rate of complications and less stiffness may be attributed to its unique biomechanics. Unlike the Latarjet and other bony block procedures, where the bony block is fixed and present at all times, the reinforcement brought by this procedure is dynamic, i.e., maximum when needed while the arm is abducted. When the arm is adducted, the biceps remains nearly vertical and the sub-scapularis nearly horizontal (see Pic-6). In this situation, shoulder dislocation does not occur even when some aetiology is present. When the arm is abducted to 90

degrees, the subscapularis becomes nearly vertical and the conjoint tendon nearly horizontal (seePic-7).

As the conjoint tendon is interwoven or re-routed through the subscapularis, both these structures are interlocked and become tight, supporting each other at 90 degrees of abduction. This prevents antero-inferior movement of the humeral head and thus prevents its dislocation.

It is a well-known fact that anterior dislocation occurs only when the arm is abducted. Therefore, producing a permanent mechanical block that is present at all times is not as justified, especially if no visible or significant bone loss is seen on radiography.

This operation is relatively simple to perform. As less tissue dissection is needed in comparison to nearly all types of open procedures, operative time, blood loss, and other related complications are less likely at least theoretically. Given that the long-term failure rate of open Bankart repair remains high despite the exclusion of substantial glenoid defects,[10] this procedure may be a better alternative to the open Bankart procedure. This procedure can be an excellent option in under-developed regions of the world where good quality MRI and/or competent arthroscopic surgeons and equipment are not available. This method seems to have potential for use in cases of failed arthroscopic procedures.

CONCLUSION

In cases where there is no obvious Bankart lesion or Hill Sach lesion seen in MRI to decide the appropriate procedure for anterior shoulder instability, or the infrastructure & skills are lacking for arthroscopic repair e.g., in remote places, re-routing of conjoint tendon may be a good alternative operation.

Conflict of Interest

The research has been done solely by me & I have done all the financial expenditure myself. No financial support of any type has been taken from anybody or organization by me or any of my known persons.

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