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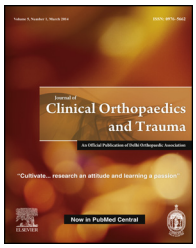

Original Article

Functional evaluation of patient after arthroscopic repair of rotator cuff tear

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ABSTRACT

Background: Rotator cuff tear is a common problem either after trauma or after degenerative tear in old age group. Arthroscopic repair is the current concept of rotator cuff repair. Here, we are trying to evaluate the functional outcome after arthroscopic repair of full thickness rotator cuff tear (single row) in Indian population.

Materials and methods: Twenty five patients (14 males and 11 females) who underwent arthroscopic repair of full thickness rotator cuff tear at a single institution were included in the study. Postoperatively patient's shoulder was rated according to UCLA score, pain was graded according to the visual analog score. The range of motion was analysed and documented.

Results: The mean age of the patients were 50.48 years. The preoperative VAS score mode was 7 and post operative VAS was 1 (p value <0.001). The UCLA grading was good in 80% ($n = 20$), fair in 12% ($n = 3$), excellent in 8% ($n = 2$) and poor results were seen in none of the patients.

The mean UCLA improved from a score of 15.84 to 30.28 with a p value <0.001. Mean postoperative forward flexion was 161.6°, mean abduction was 147.6° and mean external rotation was 45.4°.

Conclusion: Arthroscopic repair is a good procedure for full thickness rotator cuff tear with minimal complications. The newer double row repair claims to be biomechanically superior with faster healing rates without functional advantages, hence we used a single row repair considering the Indian population and the cost effectiveness of the surgery with good to excellent results.

1. Introduction

Rotator cuff tears are among the most common conditions affecting the shoulder. Tears of the rotator cuff tendon are described as partial thickness, full thickness, full thickness with complete detachment of the tendons from bone and massive tears. There is an age-dependent increase in rotator cuff tearing. The prevalence of full thickness rotator cuff tears range from 7 to 40%.

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Repair of rotator cuff aims to provide high initial fixation strength, minimal gap formation, stability without loss of mobility and strength with early pain relief. The repair is based on attachment of the torn tendon by suture anchor placement either in single row or double row. Surgery can be performed either open, mini open or all arthroscopic.

Although the current concept emphasises on arthroscopic double row repair but study by Iagulli et al[1] have shown that both methods are comparable in terms of functional outcome. The purpose of this study was to assess the "Functional evaluation of patient after arthroscopic repair of full thickness rotator cuff tear" after single row repair and evaluated on the basis of pain, range of motion, VAS score, UCLA score in the pre and post-operative period.

2. Materials and methods

In between March 2012 and Dec 2013 many patients with degenerative rotator cuff tear were treated by shoulder arthroscopy. Twenty five patients with full thickness rotator cuff tear confirmed by MRI or on diagnostic arthroscopy were enrolled in this study. Fifteen patients were studied retrospectively and 10 prospectively. Patients with partial tear, with ligamentous laxity syndrome or who did not turn for follow up were excluded from this study. All the patients after a diagnostic arthroscopy were treated with a single row repair using 5 mm TWINFIX suture anchor double loaded ultra braid. All patients were evaluated by university of California at Los Angeles (UCLA) and pain was graded using visual analog score (VAS).[2]

The concerned permission from the ethical committee was taken.

Operative method: After giving general anaesthesia patient was placed in lateral decubitus position with arm in 70° of abduction using single lever traction suspension system tied with 4 inch sling and 15° of forward flexion. The patient was rotated slightly towards the back to allow good use of instruments through the anterior portal. Parts were painted and draped. The bony anatomical landmarks were identified and outlined with a pen.

First a Diagnostic arthroscopy was done followed by the repair.

2.1. *Glenohumeral arthroscopy*

Posterior portal, the preferred approach for diagnostic glenohumeral arthroscopy, was used i.e. approximately 1.5 cm inferior and slightly medial to the posterolateral tip of the acromion. As the suspended arm was internally and externally rotated, the humeral head was palpated beneath the thumb and the exact location of the glenohumeral joint was confirmed. An 18 or 20 gauge spinal needle was inserted through this posterior soft spot and directed anteriorly toward the coracoid process. 40–50 ml of saline solution was then injected to distend the joint. The presence of free backflow confirmed the correct placement of the needle.

After the removal of spinal needle, a 5 mm skin incision was made at the point of the needle's insertion. The cannula and trocar were inserted anteriorly toward the coracoid process. Then trocar was replaced by an arthroscope.

A second, anterior portal was required for improved inflow or for additional instruments. This second portal was located one-half the distance between the coracoid process and the anterolateral edge of the acromion. The joint was entered in the same manner as through the posterior portal. The spinal needle entered the capsule just medial to the tendon of the long head of the biceps (here after referred to as biceps tendon). Correct placement was aided by direct intraarticular visualization provided by the arthroscope. A third portal was established directly adjacent to the initial anterior portal. Through this portal, the spinal needle entered the capsule just lateral to the biceps tendon. The instruments were exchanged between the posterior and anterior portals to improve access to the posterior quadrants of the shoulder joint.

2.2. *Subacromial arthroscopy*

A mid lateral portal 3–4 cm lateral to the acromion was established and then a posterolateral portal at the posterolateral edge of the acromion for complete inspection of sub acromial area i.e. type of acromion, sub-acromial bursitis etc. After identification of the tear with its location, depth, whether degenerated or not was recorded. The tendon was grasped with a surgical instrument, and the reparability of the tendon (the ability of the tissue to hold sutures) was determined [Fig. 1]. Occasionally there were adhesions which were removed with a motorized shaver or electrocautery until full excursion was possible

The purpose of the acromioplasty was to create adequate space for the rotator cuff tendons [Fig. 2]. As the thickness and shape of the acromion varied, the amount of bone removed during the acromioplasty also varied. The goal was to achieve a flat acromial under surface. All patients in the present study had a chronic tear of the rotator cuff. Impingement was considered to be part of the pathological process regardless of whether or not it was the cause of the tear. Osteophytes in the

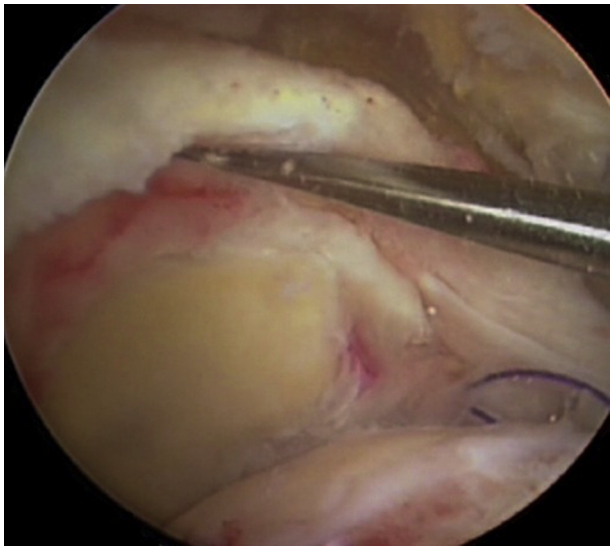


Fig. 1 – Intra-operative image showing torn rotator cuff.

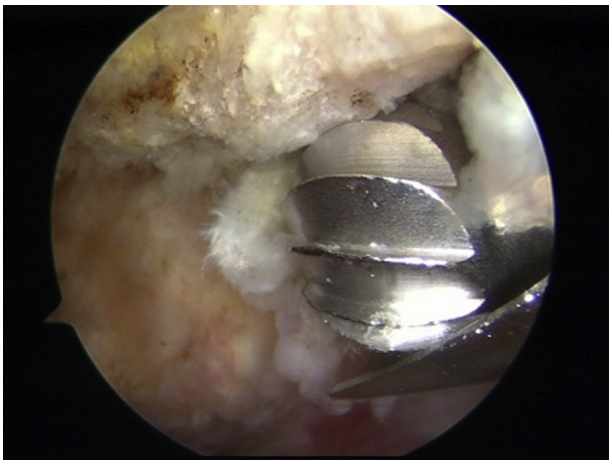


Fig. 2 – Intra-operative image showing the acromioplasty.

inferior part of the acromioclavicular joint were removed on the basis of pre operative radiographs or by inspection at the time of surgery. A cancellous bed was prepared at the site of the repair by removal of a thin layer of cortical bone with a power burr [Fig. 3]. A suture anchor was inserted lateral to the cartilage of the humeral head in the cancellous surface of the dense metaphyseal bone. A braided, non absorbable suture was placed approximately seven mm from the margin of the tendon. The number of suture anchors varied with the length of the tear (posterior to anterior). After all sutures were inserted, traction was applied to reduce the tendon to its repair site and allowed the suture to be tied without tension. The sutures were tied so that the knot was on the bursal surface of the tendon [Fig. 4]. Longitudinal tears were repaired with simple monofilament sutures, as dictated by the geometry of the tear. As per the requirement acromioplasty or AC joint decompression was done. Suturing of the portal site was done and sterile dressing was given with shoulder bag for immobilization.

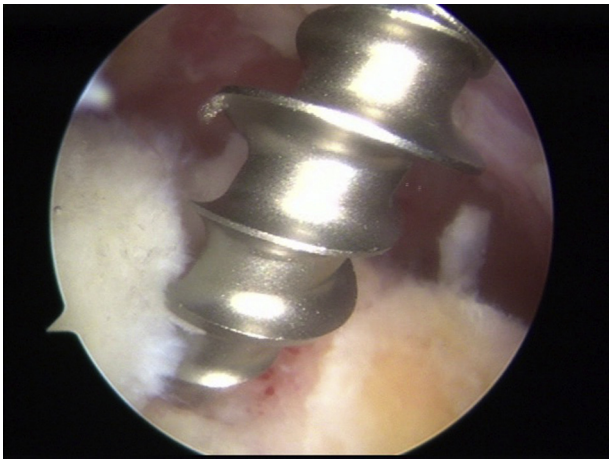


Fig. 3 – Intra-operative image showing the placement of suture anchor on the cancellous bed of humerus.

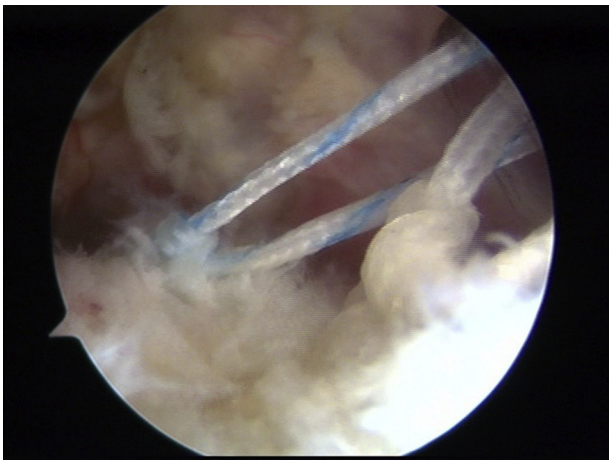


Fig. 4 – Intra-operative image showing the repaired cuff with no gap at tear site.

2.3. *Post-operative rehabilitation*

Post-operatively the arm was held in a shoulder bag and the patients were discharged in 3–4 days. Suture removal was done on 10th postoperative day. The physiotherapy regime was divided into three phases:[3]

2.4. *Phase I – rest*

Initiated between post operative week 2 and week 4. Scapular setting exercises with hand, wrist and elbow range of motion. No forceful stretching or mobilization was performed. Abduction and external rotation was not done to avoid stressing the repair.

2.5. *Phase II – movement*

Initiated between postoperative weeks 4 and week 12. Along with active assisted, passive range of motion were encouraged in all planes. Forced stretching in external rotation with abduction of arm in 90 deg was not done.

2.6. *Phase III – Strengthening period*

Strengthening exercises were initiated at postoperative week 12 to week 16. Normal activities were encouraged.

Statistical analysis: The descriptive analysis consisted of frequency and percentage for discrete data and mean for continuous data. Statistical analysis was done using paired *t* test and non parametric study using wilcoxon signed rank test. *P* values were calculated ($p < 0.001$) was considered significant. In cases where pre and post operative assessment was not available *p* value was not calculated but descriptive statistics have been provided for comparison with other studies in the literature.

3. Results

Functional outcome after the repair was evaluated on the basis of university of California at Los Angeles (UCLA) and

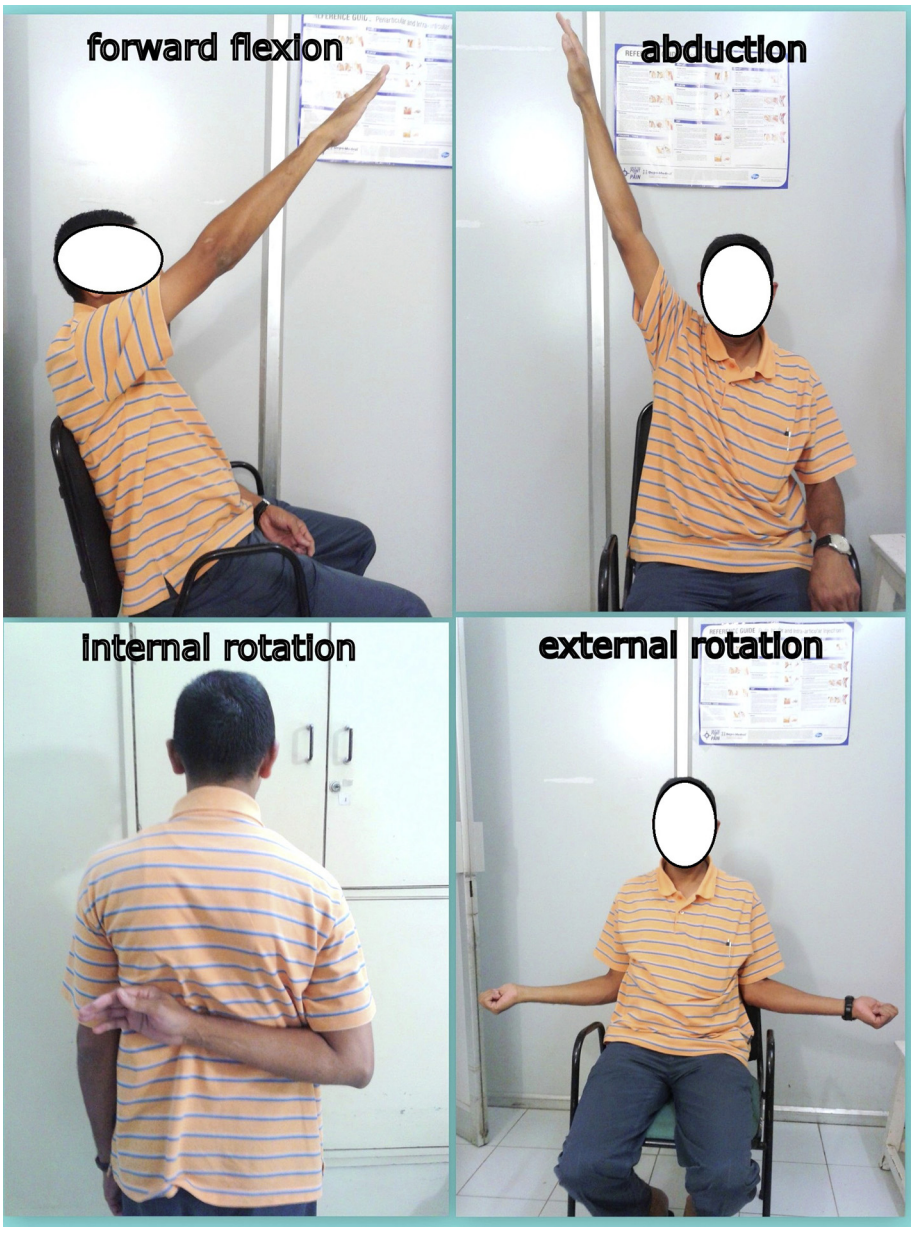


Fig. 5 – Clinical photograph of patient after 12 months follow up with right supraspinatus repair with good results (ucla-33, vas-1).

pain was graded using visual analog score (VAS).[2] Mean number of suture anchors used was two. The UCLA grading was categorized as good in 80% ($n = 20$), fair in 12% ($n = 3$), excellent in 8% ($n = 2$) and poor results were seen in none of the patients. The mean UCLA improved from preoperative score of 15.84 (SD = 3.30) to postoperative score of 30.28 (SD = 2.26) with a p value <0.001 with paired t test and was considered significant. The preoperative VAS score mode was 7 and post operative VAS was 1 with wilcoxon sign rank test (p value <0.001) which was significant. Range of motion of shoulder was measured. The mean postoperative forward flexion was 161.6°, mean abduction was 147.6° and mean external rotation was 45.4° [Fig. 5]. The internal rotation at final follow up was up to the level of D8 vertebra in 68% ($n = 17$) and up to D10 vertebra in 32% ($n = 8$).

4. Discussion

Rotator cuff is a dynamic stabilizer of the glenohumeral joint and its repair in full thickness tear is a necessity,[4] earlier open and mini open repairs was considered as a part of the treatment but in the last few decades the arthroscopic repair has taken its place.[5]

The open repair had five fundamentals: (1) meticulous repair of the deltoid origin, (2) subacromial decompression, (3) surgical releases as necessary to obtain freely mobile muscle-tendon units, (4) secure transosseus fixation of the tendon to the tuberosity and (5) closely supervised rehabilitation with early passive motion.[6] Despite reports of high satisfaction rates with open cuff repair, it was associated with several disadvantages

related to deltoid dysfunction and postoperative pain. Loss of the anterior deltoid was a devastating complication of open cuff repair, as there were no reasonable fixation alternatives and the patient lost anterior deltoid function.[6] Moreover, deltoid take-down and repair required a postoperative period of protection of at least 4 weeks, which precluded accelerated postoperative rehabilitation (no active motions).[7]

With the mini open approach, rotator cuff preparations, including debridement of tendon edges, releases, mobilization and in some cases, single row anchor placement were all performed arthroscopically. As most of the procedure was done arthroscopically, both the time requirement and exposure for the deltoid splitting approach was limited, potentially minimizing deltoid injury.[7] In a study of 29 patients who were treated with mini-open cuff repair, Severud et al[8] noted that patients had good to excellent results at 44-month follow up.

As orthopaedists have performed the mini-open repair, they have gained familiarity with the arthroscopic appearance of full-thickness tears of the rotator cuff. By performing arthroscopic operations for glenohumeral instability, orthopaedic surgeons have also developed expertise in other applicable techniques, such as preparing bone for soft-tissue attachment. These developments have allowed the open portion of the mini-open technique to be eliminated and the repair to be performed exclusively with the arthroscopic technique.[9]

Arthroscopic repair of rotator cuff led to decreased immediate post operative pain, decreased surgical insult to the deltoid and decreased post operative stiffness. These effects translate to quicker return to functionality and work with increased patient satisfaction.[10] Arthroscopic repairs of cuff tears of shoulder is an established method of treatment with reproducible results,[4,11,12] considering that the post operative rehabilitation is as important as the repair itself.[3,12,13]

In our study twenty five patients, underwent the procedure of all arthroscopic rotator cuff repair of full thickness tear. We used 5 mm twin fix double loaded suture anchor – ultrabraid in the repair of rotator cuff.

The mean age of the patients were 50.48 years, range 23–70 years. In the study by Gartsman et al[9] the average age of the patients at the time of the operation were 60.7 years (range, 31–82 years). Ten patients (40%) required additional procedure other than rotator cuff repair in which acromioplasty was done in 16% ($n = 4$), biceps tenotomy in 12% ($n = 3$) and sub acromial decompression in 12% ($n = 3$). In all twenty five patients two suture anchors were used. We noted no case of re tear with the use of two suture anchors in the given follow up period.

The preoperative VAS score mode was 7 and post operative VAS was 1 and (P value <0.001). In the study by Gartsman et al,[9] fifty seven (78%) of the seventy three patients rated the relief of pain as good or excellent on the visual analog scale and (p value = 0.0015). Buess et al[5] showed pain relief on the VAS score (P value <0.05) in a study of 66 patients with arthroscopic repair. Gerber et al[11] in his study said that pain decreased and performance of activities of daily living improved significantly ($P < 0.05$).

In our study the UCLA grading[14,15] was categorized as good in 80% ($n = 20$), fair in 12% ($n = 3$), excellent in 8% ($n = 2$) and poor results were seen in none of the patients. The mean improved from preoperative score of 15.84 (SD = 3.30) to postoperative score of 30.28 (SD = 2.26) with a P value <.001 with paired t test and was considered significant. Gartsman et al[9] noted in study of seventy three patients, the average total score according to the rating scale of the UCLA improved from 12.4 to 31.1 points. Iagulli et al[1] in a study of 45 patients with full thickness tear achieved a mean UCLA score of 29.64, yielding significant improvement in complete repair group ($P = .0001$) compared with preoperative UCLA scores. In 2013 Ji et al [16] on a study of 22 patients by single row repair, he observed the mean UCLA score increased from the preoperative 12.23 to 30.82.

We had a postoperative mean forward flexion of 161.6°, mean abduction of 147.6° and mean external rotation of 45.4°. The internal rotation at final follow up, was up to the level of D8 vertebra in 68% ($n = 17$) and up to D10 vertebra in 32% ($n = 8$).

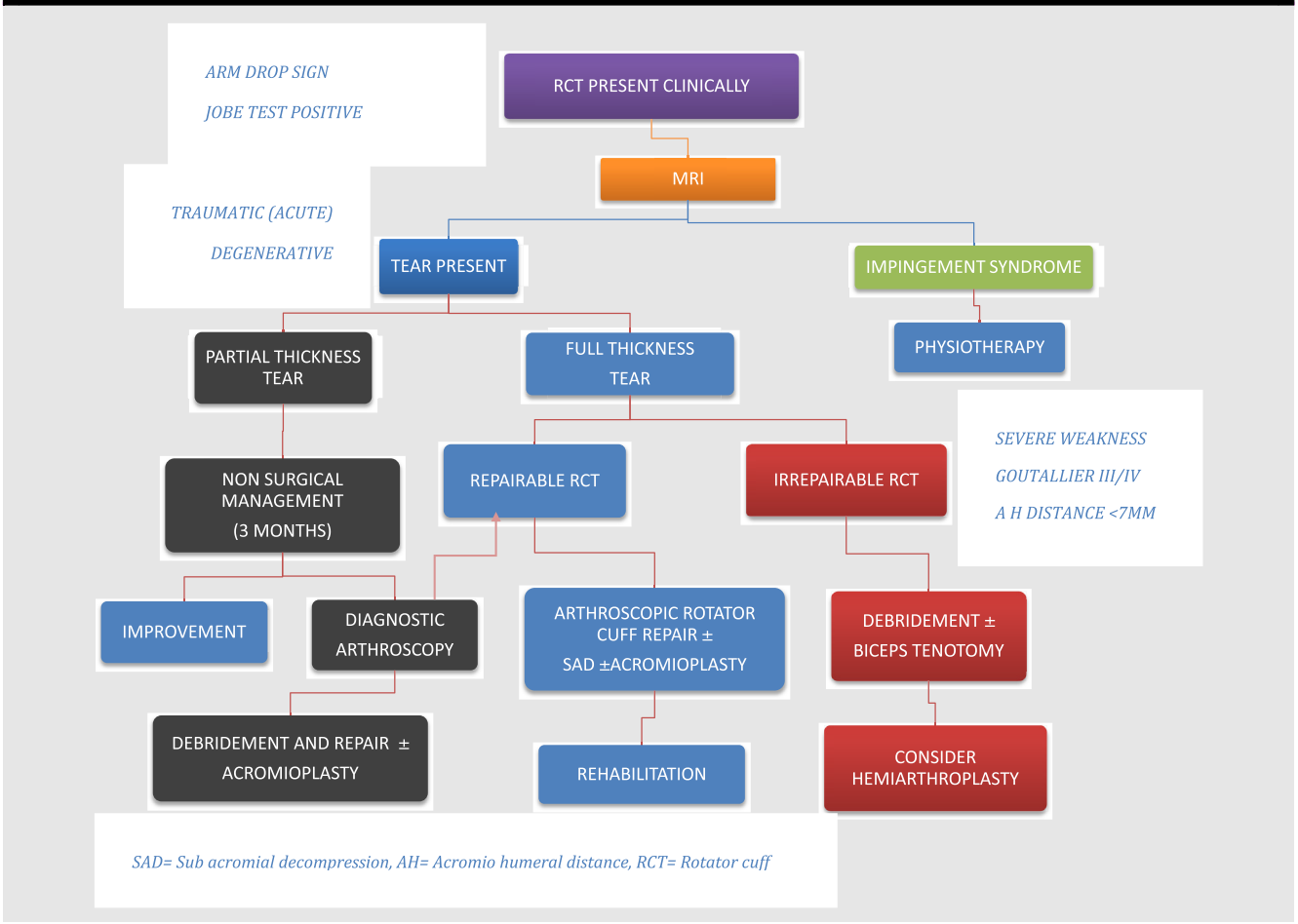
According to Gerber et al,[11] pain free forward flexion was on an average of 142° and abduction on an average of 137° postoperatively. Lee et al[17] showed forward flexion of 160.2 and abduction of 146.5 [Table 1]. Our mean duration of follow up was 11.72 months, range from 6 months to 18 months. In the study by Gartsman et al,[9] the average duration of follow up was 30 months range from 24 to 40 months. In the study by Buess et al[5] follow up evaluation was in the range of 15–40 months after surgery. Iagulli et al[1] showed an average follow up of 24 months (10–40 months).

Table 1 – Present study comparison.

Study/Particulars	Present study	Lee et al[17] Clin Ortho Surg, 2014	Iagulli et al[1] J Sports Med, May 2012	Ji et al[16] Indian J Orthop, 2010
Descriptive				
Mean AGE (in years)	50.48	56.1	-	58
No. of patients	25	196	45	22
Follow-up (months)	11.72	27.4	-	24
Outcome				
UCLA				
Pre Op	15.84	18.8	-	12.23
Post Op	30.28	27.8	29.64	30.82
P value	$P < 0.001$	$P < 0.01$	$P = 0.0001$	$P = 0.237$
Post op ROM				
F. Flexion/ABD	161.6/147.6	160.2/146.5	-	-
Ext/Int rotation	45.4/upto D8	71.5/56.4	-	-

UCLA – University of California at Los Angeles.

Table 2 – Management algorithm.



We did not encounter any case of infection or re tear as the duration of follow-up was constrained. The most important limitation of our study was the retrospective study design in fifteen of the patients and the fact that we evaluated the clinical results at the last follow up in these cases. Long-term follow-up was not done due to time limit of this study. With the evolution of advanced arthroscopic techniques, there no longer exists a gold standard method for rotator cuff repair [Table 2]. The advantages of arthroscopic as compared with mini-open repair include the ability to mobilize and release the rotator cuff, decreased surgical insult to the deltoid muscle, improved ability to evaluate and treat pathology of the glenohumeral joint, improved visualization, decreased immediate postoperative pain, decreased postoperative stiffness and no limitation in the size of the tear that can be addressed.[6]

5. Conclusion

Arthroscopic repair is a good procedure for full thickness rotator cuff tear with minimal complication rates. Although the newer double row repair claims to be biomechanically superior with faster healing rates without functional advantages over single row repair,[7,16] hence we used a single row repair considering the Indian population, cost effectiveness of the surgery and our results were comparable with other studies in literature.

Conflicts of interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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