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Functional Outcome in Patients Undergoing Arthroscopic Single Row Repair of Rotator Cuff Tears

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Abstract

Introduction: Rotator cuff tears is a severely debilitating condition widely prevelant amongst the elderly age group. Timely adequate repair is of utmost importance. **Aims and Objectives:** To study the functional outcome of arthroscopic single row repair for rotator cuff tears. **Materials and Methodology:** We enrolled 30 patients of rotator cuff tears. Each patient underwent arthrosocpic single row repair in the lateral position with concomitant sub acromial decompression. Post operative protocol included immobilisation for 6 weeks followed by active assisted range of motion at 6 weeks and strengthening exercises at 3 months. We assessed the patient pre operatively and post operatively at 6 weeks, 3 months and 6 months using Constant Score and Visual analog scale for pain. **Results**: There was significant improvement at every follow up with mean Constant Score increasing from pre operative to post operative stage at 6 months. According to individual relative Constant Score patients went from a mean of poor to good outcome. Visual analog scale for pain changed from a meanscore of severe to mild at 6 months post operatively. Conclusion: Arthroscopic single row repair is a simple, minimally invasive, cost effective procedure with good functional outcomes and pain relief.

Keywords: Arthroscopic, Outcome, Rotator Cuff, Single Row

1. Introduction

A painful shoulder is a very common affliction and of all its etiologies, rotator cuff disease is the most common pathology estimated at affecting around 30% of the population[1]. There is a significant relationship between increasing age and frequency of rotator cuff tendon injuries[2]. Lehman found an overall incidence of full thickness rotator cuff tears in cadaveric dissection as high as 30% in age group of 60 years[3].

Rotator cuff refers to the tendons of supraspinatus, infraspinatus, subscapularis and teres minor which give stability to the shoulder joint. Tears of the rotator cuff are a major cause of morbidity in the elderly. The tendons are known to undergo fatty infiltration and degeneration with time leading to poorer outcomes in chronic cases. Hence, timely surgical management is crucial to primarily reduce pain and further to improve function.

Rotator cuff tendons are usually treated with repair of the tendon to the greater tuberosity using sutures through the bone or the more recent anchor sutures. Conventionally, open repair or the mini open repair was practiced. Disadvantages of open repair include bigger scar, increased chances of bleeding, injury to axillary nerve and deltoid dehiscence. Since the advent of arthroscopy, arthroscopic repair is now the treatment

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of choice for these cases. Various techniques of tendon repair like single row, double row and trans-osseous repair have been described and used. Each technique has its advantages and disadvantages. Most commonly, the single row and double row technique are being used. Several meta analyses have reported no difference in functional outcomes between single row and double row repairs[4]. Single row repair refers to the use of a single row of anchors at the medial end of the footprint for attaching the rotator cuff tendon to the bone. It is technically less challenging, requires little hardware, is cost effective and simple to perform.

Single row repair has been used widely and it is the aim of this study to assess the functional outcome of single row repair.

2. Aims and Objectives

To study the functional outcome of arthroscopic single row repair of rotator cuff tears.

3. Materials and Methodology

3.1 Methodology

The study was conducted on a minimum of 30 patients enlisting in the casualty or inpatient department of orthopaedics at a medical college and tertiary health care centre. Only those patients satisfying the inclusion and exclusion criteria were included in the study. All patients were explained about the surgical procedure, the purpose of the study and informed consent was taken.

The detailed clinical history, complete general, systemic and local examination and pre-operative investigation findings were noted in a predesigned proforma. Each patient was evaluated with preoperative X-ray (antero-posterior view) of the shoulder. Detailed MRI study of the involved shoulder was also done to assess the condition of the rotator cuff and the amount of retraction.

Arthroscopic repair was accomplished with the patient lying in the lateral decubitus position, with lateral traction achieved with the help of anchors (titanium/ peek/biodegradable and double/ triple loaded) from a single company with concomitant sub acromion decompression.

3.2 Eligibility Criteria

3.2.1 Inclusion Criteria

1. Age group - >45 and <75 years.
2. Primary cuff repair.
3. Goutallier stage 1 or 2.

3.2.2 Exclusion Criteria

1. Rotator cuff arthropathy.
2. Prior surgeries, fracture, nerve injuries around the shoulder joint.
3. Poor deltoid function.
4. No local signs of infection.
5. Bilateral shoulder involvement.

3.3 Post Op Protocol

Till 6 weeks: Shoulder abduction sling.

6 weeks – 3 months: Active assisted shoulder range of motion.

3 months – 6 months: Active shoulder range of motion and gentle cuff strengthening exercises using thera bands.

>6 months – Gym protocol including pendulum, cross over arm stretch, sleeper stretch, standing row, internal rotation, external rotation, external rotation with abduction 90 degrees, elbow flexion and extension, trapezius strengthening, scapula setting/protraction/ retraction, bent over horizontal abduction exercises.

All patients were assessed using the Constant Shoulder Score pre-operatively, 6 weeks, 3 months and 6 months.

3.4 Surgical Procedure

- Patient in lateral decubitus position with arm attached to the lateral traction unit so that the arm is in 30-40 degrees of abduction.

- Painting, draping done.

- Posterior viewing portal to visualize and localize the rotator cuff tear.

- Lateral and anterior portals established.

- With scope shifted to sub-acromial space, then acromioplasty and sub-acromial decompression done.

- Tear pattern is then recognized e.g. U-shaped, L-shaped, etc. and the cuff is then mobilized.

- Foot print of the torn rotator cuff visualized and prepared.

- Double/triple loaded anchors then placed in such a way that they cover all of the tear area footprint.

- The anchors are placed from anterior to posterior. Using suture passers, suture anchors threads are then passed through the cuff and then the arthroscopic knots are tied from posterior to anterior.

- Perfect repair is confirmed through the lateral portal visualization.

- Portals are then closed with 3-0 Ethilon suture and post operatively the arm is held in a shoulder abduction brace.

3.5 Constant Score

The Constant Score was used to evaluate function of the patient. It is a score to determine functionality with a scale of up to 100. The test is divided into four subscales: pain (15 points), activities of daily living (20 points), strength (25 points) and range of motion: Forward elevation, external rotation, abduction and internal rotation of the shoulder (40 points). The higher the score, the higher the quality of the function. This is an absolute value and should be compared with age and sex adjusted scores as described by Constant[5]. However it was found that comparing the Constant Score with the opposite normal side was of more statistical value than the actual score as it ruled out the need of age and sex related factors. Hence in this study, in addition to the constant score, a modification of the score[6,7] was used, wherein the Constant Scores of the two sides were compared and the difference noted down and graded accordingly.

Thus, we have only included cases with unilateral involvement. This modification is the individual relative constant score[6,7].

Grading of individual relative Constant Score was done as below:

>30 – Poor.

21-30 – Fair.

11-20 – Good.

<11 – Excellent.

Note: Lesser the difference from opposite normal shoulder, better it is.

We also assessed pain as per the Visual Analog Scale at each visit 6

4. Observation and Results

The patients were evaluated pre-operatively, at 6 weeks, at 3 months and at 6 months. At each visit pain was assessed using the Visual Analog Scale and function assessed by the Constant Score. We recruited 30 patients with a mean age of 58.9, the oldest being 71 and the youngest being 46. We had 16 males and 14 females with 17 right sided tears and 13 left sided tears. The mean Constant Score preoperatively was 32.23. This gradually improved to a mean Constant Score of 75.33 at 6 months post operatively. There was significant statistical difference between the mean preoperatively and at 6 months. Further the mean Constant Score at 6 weeks was 47.8 and the mean Constant Score at 3 months was 65.53. The score at each visit was statistically different from the previous score. Hence to summarise the Constant Score

Table 1. Mean Constant Shoulder Score, individual relative constant score, Visual analog scale for pain at each evaluation visit

	CS (Mean ± SD)	(irel) CS (Mean ± SD)	VAS (Mean ± SD)
Pre-op	32.23 ± 8.05	54.33 ± 8.00	8.83 ± 1.02
6 weeks post-op	47.80 ± 6.49	38.37 ± 6.29	3.87 ± 1.01
3 months post-op	65.53 ± 4.95	21.03 ± 4.63	2.27 ± 0.87
6 months post-op	75.33 ± 5.12	11.23 ± 4.55	1.57 ± 0.86

continued to significantly improve at each follow up visit till 6 months post operatively [Tables 1, 2].

The mean function preoperatively as per individual relative Constant Score was in the poor category. This improved statistically at 6 weeks post operatively even though the mean score was still in the poor category. Further statistical improvement was noted at 3 months post operatively with the mean individual relative Constant Score now being in the fair category. At 6 months we found a further statistical improvement in the score with the mean individual relative Constant Score now in the good category [Tables 1, 3].

The pain grading as per the visual analog scale went from a mean of 8.83 preoperatively to a mean of 3.87 at 6 weeks denoting immediate pain relief. Hence within 6 weeks the mean VAS went from severe pain to mild pain[8]. There was further statistically significant difference in pain at both 3 months and 6 months with continued improvement at each setting [Tables 1, 4].

Table 2. p-value and level of significance between Constant scores at each individual visit using Post hoc test (Analysis Between Individual groups) for CS

Bonferroni corrected α value = 0.0083

Between Groups	p-value	Significance
Pre-op and 6 weeks post-op	$p < 0.005$	Highly Significant
Pre-op and 3 months post-op	$p < 0.005$	Highly Significant
Pre-op and 6 months post-op	$p < 0.005$	Highly Significant
6 weeks and 3 months post-op	$p < 0.005$	Highly Significant
6 weeks and 6 months post-op	$p < 0.005$	Highly Significant
3 months and 6 months post-op	$p < 0.005$	Highly Significant

Table 3. p-value and level of significance between individual relative Constant Scores at each individual visit using Post hoc test (Analysis Between Individual groups) for CS

Bonferroni corrected α value = 0.0083

Between Groups	p-value	Significance
Pre-op and 6 weeks post-op	$p<0.005$	Highly Significant
Pre-op and 3 months post-op	$p<0.005$	Highly Significant
Pre-op and 6 months post-op	$p<0.005$	Highly Significant
6 weeks and 3 months post-op	$p<0.005$	Highly Significant
6 weeks and 6 months post-op	$p<0.005$	Highly Significant
3 months and 6 months post-op	$p<0.005$	Highly Significant

Table 4. p-value and level of significance between Visual Analog scales at each individual visit using Post hoc test (Analysis Between Individual groups) for VAS

Bonferroni corrected α value = 0.0083

Between Groups	p-value	Significance
Pre-op and 6 weeks post-op	p<0.005	Highly Significant
Pre-op and 3 months post-op	p<0.005	Highly Significant
Pre-op and 6 months post-op	p<0.005	Highly Significant
6 weeks and 3 months post-op	p<0.005	Highly Significant
6 weeks and 6 months post-op	p<0.005	Highly Significant
3 months and 6 months post-op	p<0.005	Highly Significant

4.1 Complications

One case of suture anchor migration due to poor bone quality requiring revision. The anchor suture was removed and same procedure performed again with different position and direction of anchor suture.

One case of superficial infection treated by oral antibiotics.

5. Discussion

Rotator cuff tears are a severely debilitating condition affecting a large population today. Effective management with timely repair and adequate rehabilitation is important for a successful outcome.

Many surgical procedures have been explained for rotator cuff tears. Initially, open repairs were performed involving extensive soft tissue damage and chances of damage to axillary nerve. Later, the mini open approach was used to repair rotator cuff tears. With the recent advent of arthroscopy, arthrosocopic repair is the current method of surgical treatment being used widely. It gives the advantages of a minimally open procedure, less tissue damage and appropriate access to retracted rotator cuff tendon. Along with the approach to repair, the technique of repair too has evolved. Initially, a transosseous repair was the repair of choice.

However, with the advent of newer implants a single row technique of repair using suture anchors was developed giving good results. Further, a double row technique involving more usage of hardware was developed. These techniques have the disadvantage of being technically demanding, costlier, more usage of hardware and increased chances of compromise to the vascularity of the tendon.

The main two debates currently seen in rotator cuff tears are:

- Arthroscopic vs. mini open.
- Single row vs. double row repair.

Mini open repair involves significant tissue damage. Arthrosocopic repair involves lesser tissue damage with a more cosmetic scar. Functional results, pain scores and patient satisfaction have shown comparative results between the two procedures as reported by Sauerbrey et al and Verma et al.[9,10]. Thus with its advantages, the arthroscopic technique is continued to be preferred currently.

The main aim of rotator cuff repair is to achieve a pain free functional shoulder. Functionality of the shoulder is relevant as different patients have different demands. The outcome of arthroscopic repair has gradually improved. However despite newer repair techniques, a high rate of re-tear has been observed. Gazielly *et al.*[11] found 24% recurrent tears in their series of 100 full thickness rotator cuff repairs. Various factors like fatty degeneration, muscle atrophy and osteoarthritis are responsible for failure to heal and retear[12,13].

Current point of debate is between the single row and double row technique. Studies have reported that double row technique has better strength biomechanically as

reported by Lorbach et al who studied the cyclic loading of rotator cuff reconstructions,[14] Caiqi Xu et al.[15] reported lesser re-tears with double row repairs.

However clinical superiority of double row is still debatable, as explained by Dahm[16]. In fact, various meta-analytical studies have shown that single row repair is clinically equivalent to double row repair technique. Chen et al[17] and Prasathaporn et al.[18] have shown that though double row repair provided higher rate of intact tendon healing, this benefit did not translate into clinically confirmed functional improvement. They also suggest that double row technique be used only in carefully selected patients. Millet et al.[19] have discussed that double row repair may be superior in large tears but for when all size tears are included, there is no difference between the two techniques. At the same time, single row repair is technically less demanding, shorter procedure, less costly and easier to perform. Chances of damage to vascularity is less in these patients. Sheibani et al.[20] concluded that there was no statistical difference between single row and double row techniques with regard to clinical outcome scores. Hence single row repair is often the preferred procedure in rotator cuff repair.

In our study, we looked at 30 patients with a mean age of 58.9 highest being 71 and youngest being 46. We had 16 males and 14 females with 17 right sided tears and 13 left sided tears.

The mean pre-operative Constant Score was 32.23 and that at 6 months post operatively was 75.33 with a p value of less than 0.005. This was comparable to a study by Jin-Young Park et al.[21] where the pre-operative Constant Score mean was 41.63 which improved to a post operative mean of 76.68 with a p value of less than 0.005. We also found that the shoulder function improved from a poor grade preoperatively [(irel) CS mean of 54.33] to a good grade post operatively at 6 months. [(irel) CS mean of 11.23].

In our study the Visual Analog Scale for pain improved from a preoperative mean of 8.83 to a post operative mean of 1.57 at 6 months giving significant pain relief to the patients.

We found very few complications in the study group at 6 months. One case of superficial infection was seen which was treated successfully with antibiotics. One case of suture migration was seen which was successfully reoperated by changing direction and entry point for suture insertion. This is comparable to the finding by Robertson et al. who found a complication rate of 9 % in the group of arthroscopic single row repair[22].

We could infer that arthroscopic single row repair is quick to produce adequate pain relief. Functionality improves at 6 weeks though the grade improvement was initially seen at 3 months. We attribute this to the fact that for the first 6 weeks, patients were kept immoblised. Hence function takes longer to improve but there is definite constant improvement from day of surgery. Patients continue to improve till 6 months postoperatively.

Arthroscopic single row repair thus gives good functional outcome with improved pain scores at 6 months leading to satisfactory patient outcomes.

6. Limitation

We have observed that the patients continued to improve until 6 months and we would have liked to follow them up for a longer period of time to see if they improved further or developed any late complications.

7. Conclusion

We concluded from this study that single row repair of rotator cuff tears provided good pain relief and functional outcome, with patient satisfaction. In addition, single row repair was found to be a simple technique, quicker to perform, required less hardware, and was cost effective. It also had a low complication rate.

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