

## Functional outcome following arthroscopic single row repair in degenerative rotator cuff tear

Dr. Pradeep E<sup>1</sup>, Dr. Arun Kumar KV<sup>1\*</sup>, Dr. Manu Ampalaya<sup>2</sup>, Dr. Shah Shaival Kalpesh<sup>3</sup>

<sup>1</sup>Associate Professor, <sup>3</sup>Junior Resident, Department Of Orthopaedics, Chettinad Hospital and Research Institute

<sup>2</sup>Dr. Manu Ampalaya, Senior Resident, Sukh Sagar Medical College, Jabalpur

**Corresponding Author:** Dr. Arun Kumar KV

**Email:** [arun5684@gmail.com](mailto:arun5684@gmail.com)



### Abstract

**Background:** Rotator cuff disease encompasses a wide range of pathology from minimal bursal or articular side irritation and tendonitis to severe degenerative rotator cuff arthropathy. Rotator cuff pathology affects adults of all ages and other shoulder afflictions must be ruled out by careful history and physical examination. Arthroscopic surgery allows for a shorter recovery time and predictably less pain following procedure than any open surgery. **Materials and methods:** We did a prospective study on 32 patients of age more than 40 years of age with degenerative rotator cuff tear, who met the inclusion criteria and were operated using single row technique of arthroscopic rotator cuff repair and were followed up at 1 month, 3 months and 6 months and pain, function, muscle power and range of movements were assessed by ASES and UCLA scoring system. **Results:** The mean age of the patients was found to be 54.94 years. The Male: Female ratio in our study was found to be 3:1. The average ASES score in the pre-operative and post-operative period was found to be 22.66 and 89.53 respectively. The average UCLA score in the pre-operative and post-operative period was found to be 8.97 and 29.13 respectively. **Conclusion:** Arthroscopic rotator cuff repair with single row repair provides early pain relief and improves mobility, strength as well as patient satisfaction post operatively.

**Key words:** Single row repair, Arthroscopic rotator cuff repair, UCLA scoring, ASES shoulder score index.

### Introduction

The Rotator Cuff (RC) is a combination of muscles and their tendinous part which comprises of 4 muscles, namely-Supraspinatus, Infraspinatus, Teres Minor and Subscapularis. RC tears can affect the quality of life and cause difficulties in carrying out basic daily living activities in adult population. The incidence of RC tear increases with advancing age. The prevalence of RC tears in individuals above 60 years of age is around 20 to 30 percent, whereas, it raises even more to around 62 percent in patients above 80 years of age, regardless of any symptoms in patients.<sup>1,2,3,4</sup> The progression of the RC tear is most importantly dependent on the initial tear presentation. Patients having partial RC tear have 10 percent chances of healing and around 10 percent chances of becoming smaller, however, there is a 53 percent probability of it progressing in size and around 28 percent chances of turning into full thickness RC tear.<sup>5</sup> Besides, patients with more than 50 percent RC tear at the time of initial presentation have more than 55 percent chances of RC tear progression.<sup>6</sup>

There is no sex predilection for the development of RC tears.<sup>7,8</sup> Although, there are reports suggesting increased prevalence of asymptomatic RC tears in post-menopausal women.<sup>9</sup> Individuals who have been previously surgically treated for partial or full thickness RC tears, have a increased risk of developing the same problem on the contra-lateral shoulder joint.<sup>10</sup> There is nearly a 50 percent possibility of bilateral RC tear in individuals over 60 years of age. There are other significant predisposing factors of RC tears, which include - history of trauma, smoking,<sup>11</sup> positive family history of RC tears,<sup>12</sup> hypercholesterolemia and the individuals with flat back or sway-back postures.<sup>13,14</sup>

Surgical management of RC tears is recommended after conservative treatment failure. Restoration of the footprint contact area, along with adequate compression of the tendon on it and good quality rotator cuff muscles, tendons and bone are the essential anatomical factors responsible for the success of the surgical reconstruction of the RC tear.<sup>15,16</sup> Even though various techniques have been used in the past for the repair of RC tears like open reconstruction and minimally open reconstruction, the use of arthroscopy assisted repair techniques have become more popularized with the orthopaedic surgeons, especially after the development of suture anchors.<sup>17</sup> Studies in the past, have shown that there is no significant amount of difference in re-tear rates, pain scores and functional outcomes between the patients who have undergone minimally open surgery and arthroscopic assisted reconstruction of RC tears, however, the individuals who underwent arthroscopic repair of RC tear encountered fewer post operative complications like recurrent shoulder pain, shoulder joint stiffness and surgical site infection and also were able to resume their daily routine activities earlier as compared to those who had underwent minimally open surgery.<sup>18,19</sup> Two different techniques of arthroscopy assisted RC tears are mentioned in the literature.<sup>20</sup> Single row repair and double row repair are the types of arthroscopic repair suture configurations which were used worldwide.

### **Materials and Method**

The main objective of our study was to check the functional outcome in patients, who were treated with arthroscopic repair for RC tears using single row technique using ASES (American Shoulder and Elbow Surgeons) Shoulder Score and UCLA (University of California Los Angeles) Shoulder Score.

The study is a prospective analysis of patients treated using arthroscopy assisted single row repair for RC tears in Chettinad Hospital and Research Institute, Kelambakkam. We have included patients who have atleast 6 weeks of conservative management from onset of symptoms and atleast 6 months follow up after the surgery. 32 patients above 40 years of age, of the sexes, who were diagnosed to have RC tears on MRI were included in the study after obtaining the Ethical Committee Certificate and Written Informed consent from the patients. The protocol included evaluation of patients according to their symptoms and their functional ability to do their daily living activities. The range of motion of the shoulder joint and muscle strength are assessed by the surgeon and documented. For this study purpose we have employed UCLA (University of California Los Angeles) shoulder scoring and ASES (American Shoulder and Elbow Surgeons) shoulder score index for evaluating the functional outcome. UCLA and ASES scores were taken and analyzed pre-operatively and post-operatively at 1 month, 3 months and 6 months. Preoperatively, we routinely obtained AP view radiographs of shoulder joint in all patients. Patients with rotator cuff tears typically demonstrate sclerosis of the undersurface of the acromion, sclerosis and cystic changes in the region of the greater tuberosity, and a type II or III acromion.

In massive tears, patients may demonstrate chronic proximal migration of the humerus, with a decrease in the acromio-humeral distance. We did not consider chronic proximal migration of the humerus as a contraindication for RC repair and in some cases, the proximal migration may be reversed following repair. We routinely obtained a magnetic resonance imaging (MRI) scan in all pre-operative shoulder patients. MRI can provide information on tear size, tear configuration, and tendon involvement, as well as suggest whether a massive rotator cuff tear is potentially repairable. Careful evaluation of the axial views is necessary to identify subscapularis tendon involvement. Following the procedure, the operated arm is placed at the side in a shoulder immobilizer. The immobilizer is worn continuously for 6 weeks, except during bathing and exercises. The standard postoperative rehabilitation program is followed. However, if a subscapularis repair is performed, passive external rotation is limited to 0 degrees for the first 6 weeks. In addition, terminal extension of the elbow is restricted if a biceps tenodesis was performed.

### **Results**

Study Design: Prospective study functional outcome with total 32 subjects have been conducted to study the functional outcome and evaluation of UCLA and ASES score.

The mean age in our study is 54.94 years, in the range of 51-60 years.

**Table 1: Distribution of age of patients studied**

Age	No.	%
<40	0	0.00%
41-50	12	37.49%
51-60	16	50.00%
61-70	3	9.38%
>70	1	3.13%
TOTAL	32	100.00%

Mean  $\pm$  SD = 54.94  $\pm$  6.5

**Table 2: Evaluation of UCLA score**

UCLA				
	Pre-OP	Post-OP 1 month	Post-OP 3 months	Post-OP 6 months
Min-Max	5-12	13-21	19-27	23-32
Mean $\pm$ SD	8.97 $\pm$ 1.84	17.28 $\pm$ 1.99	24.09 $\pm$ 2.37	29.13 $\pm$ 2.62
95% CI	5.29 - 12.65	13.30 - 21.26	19.35 - 28.83	23.89 - 34.37

**Table 3 : Evaluation of ASES score**

Ases				
	Pre-OP	Post-OP 1 month	Post-OP 3 months	Post-OP 6 months
Min-Max	18-35	55-72	72-88	90-98
Mean $\pm$ SD	22.66 $\pm$ 4.00	59.69 $\pm$ 3.14	77.72 $\pm$ 3.62	89.53 $\pm$ 3.65
95% CI	14.66 - 30.66	53.41 - 65.97	70.48 - 84.96	82.23 - 96.83

**Table 4: Complications**

Complications	Frequency	Percentage
Recurrent Pain	2	6%
Stiffness	3	9%

After the surgery, 6% patients had recurrent pain and 9% had stiffness on follow-up.

## Discussion

Numerous surgical techniques and approaches have been described and established for the treatment of RC tears of the shoulder. In the past, only small tears were treated using arthroscopic repair, while larger tears would require an open repair procedure. Advances in the field of arthroscopic surgeries, now allow arthroscopic repair of even largest tears and they also help to mobilize many of the retracted tears.<sup>2,4</sup> In addition to that, clinical outcomes in patients following arthroscopic repair for RC tear, now match open surgical techniques and also allow for more thorough evaluation of the bony and soft tissues structures around the shoulder joint at the time of surgery, thus increasing diagnostic value of procedure. Arthroscopic repair also allows for a shorter recovery time and predictably less pain in the initial post-operative period than does any open surgery.<sup>15</sup> Our study was taken up to evaluate the functional outcome in patients with degenerative RC tear treated with arthroscopic repair using single row technique. The functional outcome was assessed by using ASES and UCLA shoulder scoring system. The pre-operative and post-operative values of both the scores were obtained and were compared to those of previous similar studies.

Henn RF et al<sup>16</sup> reported that patient's pre-operative expectations have a dramatic positive association with their self-assessed outcome after rotator cuff repair. Therefore, counselling patients prior to rotator cuff repair can affect their expectations and thus the outcome of surgery. All the patients in our study were counselled about the pros and cons of the procedure, other treatment options, and expected complications. Francesco Franceschi et al<sup>7</sup> conducted a study in 2007, on the clinical results of arthroscopic single row suture anchor repair for Rotator cuff tears in 30 patients with a follow-up of 2 years. The study showed that, there was a significant improvement in the mean UCLA score post-operatively. The pre-operative mean UCLA score was found to be 11.5 and post-operatively, the mean UCLA score was found to be 32.9 showing an excellent clinical outcome in patients undergoing single row repair. They evaluated all the patients with MR Arthrography at the end of 2 years to evaluate the anatomical appearance after operative rotator cuff repair and single row repair was found to have good functional outcomes in terms of load to failure, cyclic displacement, and gap formation. However, 2 patients out of the 30 patients included in the study, at the end of 2 year follow-up was found to have recurrent pain and had to be evaluated further. Burks, Crim J. et. al<sup>18</sup> in 2009, reported a randomized controlled trial study on Clinical Trial Comparing Arthroscopic Single and Double Row Rotator Cuff Repair in 40 patients with RC tear with a follow-up of 1 year. They compared single row with double row technique in terms of post-operative clinical outcomes, post-operative follow-up MRI, patient satisfaction and patients ability to resume daily activities. The mean ASES score pre-operatively in the individuals undergoing single row repair and the individuals undergoing double row repair were 41.0 and 37.6 respectively. There was compelling evidence showing improvement in the post-operative mean ASES score, which was found to be 85.9 in single row repair and 85.5 in double row repair. Similarly, the UCLA scores also showed similar trend, where the pre-operative mean value in single row repair was 12.1, which was improved to 28.6; and the pre-operative mean value in double row repair was 13.6 and was found to be 29.5 at 1 year follow-up. The post-operative MRI was done to check the repaired rotator cuff status. They further concluded that, MRI studies in the post-operative period showed no significant difference between the 2 groups in tendon thickness, abnormal signal in the tendon, or footprint size. They study stated that single-row repair when compared with double-row rotator cuff fixation did not show a significant difference in outcome in terms of clinical results or MRI results.

Andrea Grasso et. al<sup>19</sup> in the year 2009, conducted a Level 1 randomized controlled trial comparing the functional outcomes of arthroscopic single row vs double row repair in 80 patients with full thickness rotator cuff repair. The mean age was 56.8 years. Comparison between both the groups did not show significant differences between them with regards to functional outcome. Hence they concluded that, both single row as well as double row are known to show equivalent clinical outcomes post-operatively in the long run. Similarly, Paul Saridakis and Grant Jones in 2011 reported a meta-analysis which included 3 RCT's and 2 Controlled clinical cohorts on comparison of single row repair vs double row repair in rotator cuff tears and checked the clinical outcomes and the structural integrity of the repair. They finally concluded that, double row repair may potentially result in a more anatomic and structurally sound restoration of the rotator cuff footprint on the basis of radiographic studies. However, this does not seem to show a superior clinical outcomes for the double row repair when evaluating all different sizes of rotator cuff tears as a whole.

In 2011, Kyoung Hwan Koh et. al<sup>2</sup> did a randomized control trial, where he compared single row repair vs double row repair in patients with rotator cuff tears which included a total of 62 patients, in which 37 patients underwent single row repair and 25 patients underwent double row repair with a follow-up of 31 months. The mean age of the patients involved in the study was 61.3 years. The study included 20 male and 42 female patients. Out of 62 shoulders assessed in this study, 43 were right sided and the remaining 19 were left sided. The functional outcomes following the surgery were measured with the help of ASES and UCLA scoring systems in all the patients. The study showed prominent improvements in both the scoring systems in the post-operative period. The mean pre-operative ASES scores in the patients undergoing single row repair and double row repair were 38.8 and 38.1 respectively. The post-operative mean ASES scores in the patients undergoing single row repair and double row repair improved to 85.9 and 83.4 respectively. The mean UCLA scores in the patients undergoing single row repair in the pre-operative and post-operative period were 17.8 and 29.5 respectively; whereas the mean UCLA scores in the patients undergoing double row repair in the pre-operative and post-operative period were found to

be 17.7 and 29.8 respectively. They concluded that, there was found to be no difference in terms of clinical outcome or re-tear rate, when double row repair was compared with single row repair for medium to large (2 to 4 cm) rotator cuff tears. In 2013, Shahin Sheibani Rad et. al<sup>12</sup> conducted a Level 1 meta-analysis of 5 randomized controlled trials on the functional outcome of single row repair vs double row repair in rotator cuff tears which involved 349 patients with a mean age of 59.6 years. They stated that, the potential drawbacks of the double row fixation are longer surgical time hence making it a technically more demanding procedure and increased cost of anchors compared to the single row technique. They further added that, a risk-reward analysis of cost, functional demands, and other quality of life issues should be considered before deciding which surgical method to use. However, they found no significant difference between the 2 techniques in terms of clinical outcomes and patient satisfaction in the post-operative follow-up period. Luis F. Senna et. al. in the year 2018 conducted a study in patients with rotator cuff tears managed with single row repair with a mean follow-up period of 37.8 months. The study included 29 patients, out of which 13 were males and 16 were females. The mean age of the patients involved in the study was found to be 57.5 years. At the follow-up of 3 years, the patients showed remarkable improvements in the UCLA and ASES scores. The mean ASES score was found to be 82.3, whereas, the mean UCLA score was found to be 30.8 at the 3 years follow-up.

#### Comparison with respect to ASES score in our series

In our present study, the average pre-operative ASES score was 22.66, which significantly improved to 89.53 in the post-operative period. This was in comparison with the values concluded by Burks et. al; Kyoung Koh et. al<sup>9</sup> and Luis Filipe Senna et. al.<sup>13</sup> Hence, the range of ASES score after 6 months follow-up of our series in comparison to other studies was  $89.53 \pm 3.65$ .

**Table 5 : Comparison of Pre-op and Post-op ASES Score of our study with other studies**

Sr. No.	Study	No. Of patients	Pre-op score	Post-op score
1	Burks et. al	20	41.0	85.9
2	Kyoung Koh et. al	37	38.8	85.9
3	Luis Filipe Senna et. al	29	-	82.3
4	Our Study	32	22.66	89.53

#### Comparison with respect to UCLA score in our series:

In our present study, the average pre-operative UCLA score was 8.97, which improved to 29.13 in the post-operative period. This was in comparison with the values concluded by Franceschi et. al,<sup>17</sup> Burks et. al,<sup>18</sup> Kyoung Koh et. al<sup>20</sup> and Luis Filipe Senna et. al.<sup>13</sup> Hence, the range of UCLA score after 6 months follow-up of our series in comparison to other studies was  $29.13 \pm 2.62$

**Table 6: Comparison of Pre-op and Post-op UCLA Score of our study with other studies**

Sr. No.	Study	No. Of patients	Pre-OP score	Post-OP score
1	Franceschi et. al	30	11.5	32.9
2	Burks et. al	20	12.1	28.6
3	Kyoung Koh et. al	37	17.8	29.5
4	Luis Filipe Senna et. al	29		30.8
5	Our Study	32	8.97	29.13

#### Conclusion

The increasing probability of rotator cuff tears in advancing age population, makes adequate rotator cuff repair a very arduous job due to the severe pain and activity restriction. It was concluded in the present study that single row repair in rotator cuff tears gives good functional outcome.

The results of our study are nearly same as the published studies. It has already been proven that, there is no significant difference in clinical outcomes following single row and double row repair. Hence, we suggest the single row repair technique for the surgical management of rotator cuff tears.

**References**

1. Yamaguchi K, Ditsios K, Middleton WD, Hildebolt CF, Galatz LM, Teefey SA. The demographic and morphological features of rotator cuff disease. A comparison of asymptomatic and symptomatic shoulders. *The Journal of Bone and Joint Surgery. American Volume.* 2006;88:1699-1704. PMID: 16882890
2. Teunis T, Lubberts B, Reilly BT, Ring D. A systematic review and pooled analysis of the prevalence of rotator cuff disease with increasing age. *Journal of Shoulder and Elbow Surgery.* 2014;23:1913-1921. PMID: 25441568
3. Fehring EV, Sun J, VanOeveren LS, Keller BK, Matsen FA. Full-thickness rotator cuff tear prevalence and correlation with function and co-morbidities in patients sixty-five years and older. *Journal of Shoulder and Elbow Surgery.* 2008; 17:881-885
4. Moosmayer S, Smith HJ, Tariq R, Larmo A. Prevalence and characteristics of asymptomatic tears of the rotator cuff: An ultrasonographic and clinical study. *Journal of Bone and Joint Surgery. British Volume (London).* 2009; 91 :196-200
5. Millett PJ, Warth RJ, Dornan GJ. Clinical and structural outcomes after arthroscopic single-row versus double-row rotator cuff repair: A systematic review and meta-analysis of level I randomized clinical trials. *Journal of Shoulder and Elbow Surgery.* 2014;23:586-597
6. Mall NA, Kim HM, Keener JD, et al. Symptomatic progression of asymptomatic rotator cuff tears: A prospective study of clinical and sonographic variables. *The Journal of Bone and Joint Surgery.* 2010;92(16):2623 -2633
7. Keener JD, Galatz LM, Teefey S A, et al. A prospective evaluation of survivorship of asymptomatic degenerative rotator cuff tears. *The Journal of Bone and Joint Surgery.* 2015; 97(2):89 -98. DOI: 10.2106/JBJS.N.00099. PMID: 25609434
8. Pauly S, Stahnke K, Klatte-Schulz F, Wildemann B, Scheibe l M, Greiner S. Do patient age and sex influence tendon cell biology and clinical/radiographic outcomes after rotator cuff repair? *The American Journal of Sports Medicine.* 2015 ; 43:549-556
9. Milgrom C, Schaffler M, Gilbert S, van Holsbeeck M. Rotator -cuff changes in asymptomatic adults. The effect of age, hand dominance and gender. *Journal of Bone and Joint Surgery. British Volume (London).* 1995; 77:296-298
10. Abate M, Schiavone C, Di Carlo L, Salini V. Prevalence of and risk factors for asymptomatic rotator cuff tears in postmenopausal women. *Menopause.* 2014; 21:275-280
11. Yamamoto A, Takagishi K, Osawa T, Yanagawa T, Nakajima D, Shitara H, et al. Prevalence and risk factors of a rotator cuff tear in the general population. *Journal of Shoulder and Elbow Surgery.* 2010;19:116-120
12. Kim KC, Shin HD, Cha SM, Park JY. Repair integrity and functional outcome after arthroscopic conversion to a full -thickness rotator cuff tear: Articular- versus bursal-side partial tears. *The American Journal of Sports Medicine.* 2014 ;42:451-456
13. Lee TQ. Current biomechanical concepts for rotator cuff repair. *Clinics in Orthopedic Surgery.* 2013 ; 5(2):89-97
14. Lindley K, Jones GL. Outcomes of arthroscopic versus open rotator cuff repair: A systematic review of the literature. *American Journal of Orthopedics (Belle Mead, N.J.).* 2010; 39: 592 -600
15. Roth KM, Warth RJ, Lee JT, Millett PJ, ElAttrache NS. Arthroscopic single-row versus double-row repair for full thickness posterosuperior rotator cuff tears: A critical analysis review. *JBJS Reviews.* 22 Jul 2014; 2(7). DOI: 10.2106/JBJS.RVW.M.00081
16. Park MC, Cadet ER, Levine WN, Bigliani LU, Ahmad CS. Tendon-to-bone pressure distributions at a repaired rotator cuff footprint using transosseous suture and suture anchor fixation techniques. *The American Journal of Sports Medicine.* 2005;33(8):1154 -1159
17. Colvin AC, Egorova N, Harrison AK, Moskowitz A, Flatow EL. National trends in rotator cuff repair. *The Journal of Bone and Joint Surgery. American Volume.* 2012 ; 94(3 ):227 -233
18. Saha AK. Dynamic stability of the glenohumeral joint. *Acta Orthopaedica Scandinavica.* 1972 ; 42:476-483
19. Agrawal V, Stinson M. Ability and length of time to return to work after RCR in workers' compensation patient. *Indiana Orthopaedic Journal.* 2008; 2:49
20. Ma CB, Comerford L, Wilson J, Puttlitz CM: Biomechanical evaluation of arthroscopic rotator cuff repairs: double -row compared with single-row fixation. *J Bone Joint Surg Am* 2006, 88:403-10.