ORIGINAL ARTICLE

OUTCOME OF ARTHROSCOPIC NON-ANATOMIC REPAIR OF MASSIVE ROTATOR CUFF TEAR: A RETROSPECTIVE ANALYSIS

Muhammad Usama [1], Bilal Uddin[2], Muhammad Umer Faheem[2]✉, Asad Amin[2], Mubashar Ahmed Bajwa[2], Ayesha Sohail[2], Shaheryar Ahmad Khan[2].

[1]Ayub Medical College, Abbottabad, [2]Ghurki Trust Teaching Hospital Lahore,

Background: The aim was to assess the clinical outcome of non-anatomic rotator-cuff repair in large tears not amenable to anatomic repair and to assess the preoperative factors that affect the result of such repairs. A retrospective case-series at Ghurki Trust Teaching Hospital, Lahore. Twenty-seven cases that underwent non-anatomic rotator-cuff repair at GTTH over the last 5 years and met inclusion criteria were assessed over a three-month study period (from 01/10/2023 to 31/12/2023). **Methods:** Outcome was assessed in terms of improvement in pain as per visual-analog-scale (VAS), UCLA, as well as Constant score. Furthermore, patients' satisfaction was also assessed to measure subjective efficacy of the procedure. **Results:** Most commonly cases of rotator cuff tear present with pain, weakness, and restriction of shoulder range of motion. Pain improved significantly **(*p*<0.001)** from preoperative score of 3.68 to 1.45. Analysis of the objective assessment showed statistically significant **(*p*=001)** improvement in Constant score from a preoperative average score of 63.63 to a postoperative average of 77.27, with significant improvement **(*p*=0.05)** in each individual scoring criteria as well. The other scoring studied: UCLA also improved significantly **(*p*=0.001**) from 25.36 to 30.18. Despite this, on subjective assessment 40.9% of the sample was very satisfied and 27.3% were satisfied with the outcome. **Conclusion:** Non-anatomic repair is very effective at treating the presenting complaints of the rotator cuff tear patients. Thus, alongside good clinical outcome, patient satisfaction can be predicted after the procedure.

Keywords: Rotator cuff tear; Anatomic repair; Constant score; University of California at Los shoulder score

Citation: Usama M, Uddin B, Faheem MU, Amin A, Bajwa MA, Sohail A, Khan SA. Outcome of arthroscopic non-anatomic repair of massive rotator cuff tear: a retrospective analysis. J Ayub Med Coll Abbottabad 2024;36(4):734–7.

DOI: 10.55519/JAMC-04-13574

INTRODUCTION

One of the frequent complaints for which patients present to orthopedic OPD are shoulder issues.[1] Among elderly population rotator cuff tears affect up to 50% of patients [1] making it roughly up to 23% of the visits to a shoulder surgeon.[2] The rotator cuff consists of four muscle supraspinatus, infraspinatus, teres minor & subscapularis, their main function is to stabilize the humeral head inside the glenoid cavity and rotate the humerus in relation to the scapula. The s first 10° to 15° degree of elevation is initiated by supraspinatous muscle together with the infraspinatus, teres minor and subscapularis muscles. Injury to one of these muscle result in chronic pain, loss of functional capacity & weakness.[3]

Rotator cuff lesions are clinically challenging .[4] Rotator cuff injuries have incidence among female between age group 55-60 years are considered to be one of the commonest diseases of the shoulder.[1] The underlying pathology is either traumatic or degenerative origin.[5] The treatment plan may vary depending upon the age of patient & functional status, choice of procedure for young active patient is bit complex. As per literature in patients less than 65 years age surgical repair of rotator cuff injury with post operative rehabilitation provides better chance of tendon healing & functional status.[6] Patients with cuff deficiency suffer from severe functional disability resulting in loss of active elevation also known as pseudo-paralysis. Pseudo-paralysis is defined as inability to perform active elevation of arm above 90, with normal passive mobility of shoulder. This is generally the result of Cuff-tear arthropathy, which is an irreparable cuff rupture associated with osteoarthrosis of the shoulder .[7]This inability to perform active elevation secondary to rotator cuff injuries that are mainly large or extensive. Though the data suggest that the repair of these extensive injuries has good outcome [8] Active range of motion deficit is one of the alleged negative influencing factors of rotator cuff repair. Thus, with the recent popularity of reverse total shoulder arthroplasty (RTSA), there is a tendency toward performing RTSA in cases of nonarthritic large-to-massive tears with pseudo paralysis.[9]

Rotator cuff tears are of two types, complete or incomplete. Complete tears also referred as full thickness tear, tendon is completely separated from bone[13], complete repair of massive cuff tear is heralded by tendon retraction & poor quality of tissue .[10] On the other end, partial tears also referred as incomplete tears, the tendon

is not completely separated from bone. Incomplete tears are generally managed conservatively with physical therapy, NSAIDs and subacromial injections. In complete tears treatment of choice is anatomic or complete repair. For massive rotator cuff tears not amenable for total repair, partial repair with aim of creating biomechanically functional cuff without the need of full anatomic coverage is considered ideal treatment plan. Partial repair is also referred as non-anatomic repair is the one in which when tendon cannot be reduced to its anatomic origin, it is fixed at a non-anatomical site that is usually medial to its origin .[12] Where possible, complete anatomic repair should be performed.[14] In scenarios where tear is so massive that non-anatomic repair is also not possible, tendon transfer (pectoralis major or latissimus dorsi) is done if shoulder joint is not arthritis and RTSA is done if the joint is arthritic.[10,11] A research done by Shon MS *et al.* inferred that the good clinical improvement was noted in patients undergoing partial rotator cuff repair of massive rotator cuff repair.[13] Similar findings were presented in the publication of Malavolta EA.[2]

Thus, it was hypothesized that non-anatomic or partial repair has been shown to have promising results in terms of functional and radiologic improvement. Thus, aim of the study was to evaluate the clinical outcome of non-anatomic rotator cuff repair and to assess the preoperative factors that influence the outcome in such repairs.

MATERIAL AND METHODS

A retrospective cross-sectional analysis was performed at Ghurki trust teaching hospital Lahore, after getting ethical approval from Institutional Review Board of the hospital. All those that met sample inclusion criteria and had arthroscopic partial or non-anatomical repair of rotator cuff tear after 1st January 2017 were enrolled. Patients of both genders, aging greater than 18 years and having complete surgical and follow-up assessment record were included. The cases that had concomitant injury of the shoulder girdle as fracture of humerus, scapula or clavicle were excluded. Similarly, the cases in which the data was incomplete in any aspect were excluded, to avoid potential bias. Duration of the study was 3 months. Data collection was done using records present in hospital databases/HMIS and follow-up visits. It was done by using a pre-designed performa. The information collected included the patient's demographic details and other associated variables including pain, constant score and UCLA score. Constant score assesses function of the shoulder in terms of pain experienced, daily life function, power and range of motion (ROM) at the shoulder; where higher score represents better function. UCLA score assesses pain, ROM, strength, function and satisfaction: here too, higher score represents better function. The patients were reviewed at postoperative 3-week, 6-weeks, 12-week (3 months) and 6-month at the out-door unit; and thorough clinical and radiological assessment alongside physical rehabilitation (in collaboration with a fully equipped physiotherapy department) was done. Patient's satisfaction level with the results of non-anatomic repair was assessed on the last follow-up. All the data was processed through Statistical Package for the Social Sciences software (SPSS) version 23.0. Descriptive analysis was performed in terms of measures of central tendencies i-e mean and standard deviation (SD) and proportions. Pain and clinical scores were compared with pre-operatively recorded values via use of chi-square / fisher's exact test and student's t-test.

RESULTS

In this project, we examined the demographic as well as clinical data of 22 patients undergoing non-anatomic rotator cuff repair. The Demographic analysis showed a predominant presence of male participants 68.2% (15), with most sustaining injury of their right side 86.4% (19). A notable percentage 77.3% (17) reported the involvement of their dominant arm, while 54.5% (12) had diabetes, and 36.4% (8) had a history of smoking. Quantitative variables indicated that the mean age was 63.5 years, with a SD of 7.95, and the mean duration of symptoms was 43.68 months, with a SD of 9.06. The mean follow-up period was 14.27 months, with a SD of 3.43.

The inferential analysis showed significant improvements post-procedure in pain, constant score, and UCLA score (Table-1), all with *p*-values less than 0.001. Pain improved significantly ($p<0.001$) from preoperative values of 3.68 to 1.45. Results of objective assessment showed statistically significant ($p=001$) improvement in Constant score from a preop mean of 63.63 to a postop mean of 77.27. Furthermore, significant improvement ($p=0.05$) in each individual scoring criteria of Constant score was noted as well. This signified that the patients' pain was affectively reduced which led to significant improvement in mobility, strength and activities of daily life (ADL). The other studied score: UCLA, also improved significantly ($p=0.001$) from 25.36 to 30.18. On subjective assessment 40.9% of the sample was very satisfied and 27.3% were satisfied with the outcome. Patients' satisfaction levels are illustrated in Figure-1.

Table-1: Inferential analysis of clinical improvement following the procedure

Variable	Preoperative mean (SD)	Postoperative mean (SD)	t-value	*p*-value (at df of 21)
Pain (VAS)	3.68 (91.49)	1.45 (0.8)	5.72	**<0.001**
Constant score	63.63(11.35)	77.27 (11.31)	-3.79	**0.001**
UCLA score	25.36 (4.5)	30.18 (3.45)	-3.91	**0.001**

bold (*p*-values) stand for statistically significant results at confidence interval of 95%

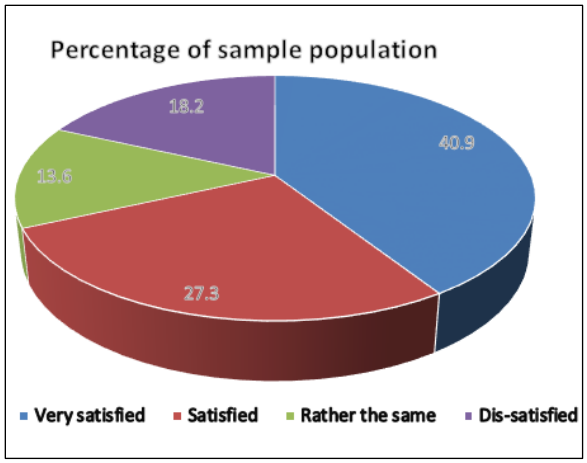

Figure 1: Patients' satisfaction level

Associations of gender, side affected, smoking, diabetes, and dominant arm involvement with patients' satisfaction were not statistically significant. Age showed a borderline statistically insignificant association (p=0.06), similarly duration of symptoms and follow-up period did not exhibit significant associations. These findings provide valuable insights into the clinical outcomes of the procedure and its impact on patient satisfaction. **(Table-2)**

Table-2: Association of studied variables with patients' satisfaction

Variable	*p*-value
Gender	0.35¥
Side affected	0.52¥
Smoking	0.19¥
Diabetes	1.00¥
Dominant arm involvement	1.00¥
Age	0.06
Duration of symptoms (months)	0.30
Follow-up period (months)	0.10

¥Fisher's Exact test applied

DISCUSSION

The current study favors arthroscopic partial repair, as it has shown better result in terms of pain improvement for patients with rotator cuff injuries. One of the studies published in The American Journal of sports medicine in which patients were followed for 1 year & 2 year minimum, when results serially compared it showed less satisfactory outcome, as one half of patients despite initial improvement reported symptoms deterioration over the time. On the contrary our study showed that 40.9% of the patients had significant improvement, with 27.3% being satisfied in general.[13] Presence of multiple factors such as involvement of dominant arm & comorbidity like diabetes mellitus influenced outcomes & patient satisfaction. Kim *et al*. had a mean follow up period of 41.3 month in their study ,reported that patients who did not have fatty degeneration in entire supraspinatous , infraspinatus ,or teres minor & that did not have severe atrophy in either of these three muscles , arthroscopic partial repair and margin convergence in irreparable large-to-massive tear were effective in reducing pain and improving functional outcomes .[15] However, in study exclusion criteria included patients with subscapularis tears requiring repair ,those with substantial fatty degeneration of the infraspinatus or supraspinatus muscles .

Mobilization of tissue to reduce the torned cuff tendon back to original anatomical point is challenging for surgeon in large massive tears. In cases where a torn tendon needs to be repositioned to anatomical point, stretch on fibers result in excessive tension, even if the fibers of the affected area have to be repositioned to the footprint's initial position, tension is often excessive. To overcome this tension, medicalization of insertion site of tendon of rotator cuff has been suggested. The repositioning of the anatomic insertion of the rotator cuff to the medial side of the cartilage of the humeral head, the medialization procedure allows the repair of the retracted tendons. However, this medialization alters shoulder range of motion & results in diminished moment arm, especially at the cuff tendon, and a smaller articular surface area of the humeral head.[16]

Results of our study are aligned with the literature. Lee *et al.* [17] conducted a similar study; the male-to-female ratio was 22:20 with a mean age of 61.2±9.1 years. The average follow-up duration was 35.4±7.3 months. At the final follow-up, significant improvement was observed in the average pain score of 1.9±1.2, UCLA score of 30.9 ± 2.3, and constant score of 88.8±7.9, i.e., p<.001, while the failure rate was 23.8% based on the radiological outcomes. In another study, 27 patients were included, and the constant score improved from 43.6±7.9 to 74.1±10.6 (P < .001). The pain level improved from preoperative 2.6±2.5 to postoperatively 9.6±2.4 (p<.001).[16] In a similar study with postoperative follow-up of 11.5±1.0 years, significant improvement in functional score was observed as 21.0±3.59 and 32.7±3.11, respectively.[18]

In our study all of the clinical parameters assessed showed significant improvement postoperatively. Literature suggests that it is the postoperative recovery of force couple mechanism of shoulder joint that offsets force and improves strength in a final common pathway. This indicates that in management of large massive rotator cuff injuries arthoscopic partial repair offers a better alternative treatment compared to complete repair even with high rate of retears. Thus, the implementation of non-anatomic repair is massive rotator cuff tears will help improve the clinical outcome in elderly patients sustaining these massive tears. Hence, this will abolish the need of major procedures including tendon transfers or RTSA in such cases.

One of the main strengths of our study is the comprehensive assessment of clinical outcomes using multiple validated scoring systems, including pain on VAS, Constant score, and UCLA score. This shows a effectiveness of partial repair in improving various aspect of shoulder function.

Study limitations: The study was performed in a single center with a limited number of cases. Thus, a multi-centric study with a larger sample size is required to present more generalized inferences. Furthermore, randomized control trials and systematic reviews are needed to formulate best practice guidelines for the management of massive rotator cuff tears with non-anatomic repair techniques.

Furthermore, future research should address the issue of the duration of efficacy and the sustainability of the obtained clinical changes and patients' satisfaction. Further research should also consider the conditions under which some characteristics, including tear size, muscle atrophy, and fatty degeneration, affect the results of partial repair.

CONCLUSION

On the basis of the inferential analysis stated above, it is obvious that incomplete or non-anatomic repair is very effective at treating the two most common presenting complaints of the patient. Thus, alongside good clinical outcome, patient satisfaction can be predicted after the procedure. Therefore, in massive rotator-cuff tears it should be considered as an effective repair technique.

REFERENCES

1. van der Windt DA, Koes BW, de Jong BA, Bouter LM. Shoulder disorders in general practice: incidence, patient characteristics, and management. Ann Rheum Dis 1995;54(12):959–64.
2. Malavolta EA, Martinez L, Gracitelli MEC, Assunção JH, Andrade-Silva FB, Ferreira Neto AA. Clinical Outcome of Partial Repair of IrreparableRotator Cuff Tears. Rev Bras Ortop (Sao Paulo) 2020;57(1):136–43.
3. Jain NB, Higgins LD, Losina E, Collins J, Blazar PE, Katz JN. Epidemiology of musculoskeletal upper extremity ambulatory surgery in the United States. BMC Musculoskelet Disord 2014;15:4.
4. Miyazaki AN, Santos PD, da Silva LA, do Val Sella G, Checchia SL, Yonamine AM. Are the good functional results from arthroscopic repair of massive rotator cuff injuries maintained over the long term? Rev Bras Ortop 2015;51(1):40–4.
5. DeOrio JK, Cofield RH. Results of a second attempt at surgical repair of a failed initial rotator-cuff repair. J Bone Joint Surg Am 1984;66(4):563–7.
6. Miyazaki AN, Fregoneze M, Santos PD, da Silva LA, do Val Sella G, Neto DL, *et al.* Functional evaluation of arthroscopic repair of rotator cuff injuries in patients with pseudoparalysis. Rev Bras Ortop 2014;49(2):178–82.
7. Berhouet J, Collin P, Benkalfate T, Le Du C, Duparc F, Courage O, *et al*. Massive rotator cuff tears in patients younger than 65 years. Epidemiology and characteristics. Orthop Traumatol Surg Res 2009;95(4 Suppl 1):S13–8.
8. Iagulli ND, Field LD, Hobgood ER, Ramsey JR, Savoie FH 3rd. Comparison of partial versus complete arthroscopic repair of massive rotator cuff tears. Am J Sports Med 2012;40(5):1022–6.
9. Oh JH, Kim SH, Shin SH, Chung SW, Kim JY, Kim SH, *et al*. Outcome of rotator cuff repair in large-to-massive tear with pseudoparalysis: a comparative study with propensity score matching. Am J Sports Med 2011;39(7):1413–20.
10. Boileau P, Chuinard C, Roussanne Y, Bicknell RT, Rochet N, Trojani C. Reverse shoulder arthroplasty combined with a modified latissimus dorsi and teres major tendon transfer for shoulder pseudoparalysis associated with dropping arm. Clin Orthop Relat Res 2008;466(3):584–93.
11. Hurschler C, Wülker N, Windhagen H, Hellmers N, Plumhoff P. Evaluation of the lag sign tests for external rotator function of the shoulder. J Shoulder Elbow Surg 2004;13(3):298–304.
12. Farazdaghi A, Paschos NK, Kelly JD. Comparison between partial and full coverage repair in massive rotator cuff tears. A minimum five year follow-up. Orthop Traumatol Surg Res 2021;107(4):102911.
13. Shon MS, Koh KH, Lim TK, Kim WJ, Kim KC, Yoo JC. Arthroscopic Partial Repair of Irreparable Rotator Cuff Tears: Preoperative Factors Associated With Outcome Deterioration Over 2 Years. Am J Sports Med 2015;43(8):1965–75.
14. Di Benedetto P, Mancuso F, Tosolini L, Buttironi MM, Beltrame A, Causero A. Treatment options for massive rotator cuff tears: a narrative review. Acta Biomed 2021;92(S3):e2021026.
15. Kim SJ, Kim YH, Chun YM. Arthroscopic partial repair of massive contracted rotator cuff tears. Clin Shoulder Elbow 2014;17:44–7.
16. Lee KW, Lee GS, Yang DS, Park SH, Chun YS, Choy WS. Clinical outcome of arthroscopic partial repair of large to massive posterosuperior rotator cuff tears: medialization of the attachment site of the rotator cuff tendon. Clin Orthop Surg 2020;12(3):353.
17. Kim SJ, Lee IS, Kim SH, Lee WY, Chun YM. Arthroscopic partial repair of irreparable large to massive rotator cuff tears. Arthroscopy 2012;28(6):761–8.
18. Ishigaki N, Hata Y, Matsuba T, Hino M, Murakami N, Kobayashi H. Long-term results of partial repair for irreparable rotator cuff tear. JSES Int 2021;5(4):642–8.

Submitted: July 10, 2024	*Revised: October 17, 2024*	*Accepted: November 21, 2024*

Address for Correspondence:

Dr. Muhammad Umer Faheem, Ghurki Trust & Teaching Hospital, Lahore-Pakistan.
Cell: +92 333 380 0005
Email: umer.fahim@gmail.com