

Functional Outcome of Management of Isolated Supraspinatus Tendon Tear by Mini-open Repair Technique- A Prospective Interventional Study

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ABSTRACT

Introduction: Rotator Cuff Injuries (RCIs) are common shoulder injuries, and the supraspinatus muscle, which is part of the rotator cuff, plays a crucial role in shoulder abduction. The mini-open repair technique offers several advantages, including being less invasive, leading to reduced postoperative morbidity, and shorter operative times.

Aim: The aim of this prospective interventional study was to assess the functional consequences of open microscopic repair and the functional implications of supraspinatus tendon repair following the procedure and during the postoperative healing period.

Materials and Methods: The study was conducted at the Department of Orthopaedics at Great Eastern Medical School and Hospital in Srikakulam, Andhra Pradesh, India. The study duration was one year, from July 2020 to July 2022. A total of 120 patients aged between 20 and 60 years were included, and all surgeries were performed by the same surgeon. Patients

were followed-up for one year and evaluated with Constant-Murley Score (CMS) system. Patient data were analysed based on gender, age, degree of tears, clinical test results, and postoperative scores. Levene's test was used to determine variance homogeneity, and the Student's t-test (two-tailed, dependent) was used to determine the statistical significance of study parameters on a continuous scale within each group.

Results: The study included 120 patients (84 males and 36 females), and the majority of them had traumatic tears. When data was analysed based on patient age, the majority were between 46 and 50 years (33 patients, 27%), followed by the age group of 41-45 years. At the end of one year, the outcomes were excellent in 68 patients, good in 24 patients, satisfactory in 16 patients, and poor in 12 patients.

Conclusion: Based on the results of the mini-open technique, the authors concluded that mini-open rotator cuff repair resulted in superior repair integrity and shoulder function.

Keywords: Functional outcome, Minimally invasive technique, Rotator cuff injuries, Short operative time

INTRODUCTION

The rotator cuff contains the supraspinatus, teres minor, subscapularis, and infraspinatus muscles. The supraspinatus muscle partially integrates with the infraspinatus muscle's tendon [1]. Rotator Cuff Injuries (RCIs) are usually observed in patients aged above 60 years and have an impact not only on shoulder function but also on the Quality of Life (QoL) of patients [2]. Epidemiological studies strongly support a link between age and the prevalence of rotator cuff tears [2,3]. The incidence of these tears increases from 13% in the youngest group (aged between 50-59 years) to 20% in the group aged between 60-69 years, and further increases to 31% in the group aged between 70-79 years, and finally reaches 51% in the oldest group (aged between 80-89 years) [1].

Supraspinatus tendinopathy is a debilitating disorder that becomes more common in middle age and is a frequent source of shoulder pain. Resistive overuse is a risk factor for this condition. The supraspinatus rotator cuff tendon is involved and impacted in the musculoskeletal system, and it deteriorates most typically as a result of repetitive pressures and overloading during sports or occupational activities [4]. This occurs due to increased stress that exceeds the healing capacity of the tendon cells (tenocytes), leading to improper tendon repair [4]. These degenerative processes begin with acute tendinitis, progress to tendinosis, and may eventually result in a full rupture [4]. Increased mechanical loads on the supraspinatus tendon insertion lead to more collagen synthesis and turnover, leading to tendon tears and ruptures [5]. An isolated supraspinatus tendon tear refers to a tear or rupture of the tendon of the supraspinatus muscle. The severity of the tear is determined by the number of tendons that are torn. According to

Ladermann et al., a rotator cuff tear occurs when at least two tendons are completely ruptured [6].

The supraspinatus is a part of the shoulder's rotator cuff and is often associated with other rotator cuff muscle tears. Since Codman and Akerson's initial description of rotator cuff pathology, rotator cuff repair has become a common surgical procedure for the shoulder [1,7]. With advancements in arthroscopic repair techniques, such as margin convergence techniques and improvements in suture anchor technology [8,9], the use of mini-open rotator cuff repair has become less common [10]. Arthroscopic results align with available surgical techniques and provide detailed evaluation of the disease, increasing its diagnostic value. The healing rate after rotator cuff repair ranges from 60% in massive tears treated arthroscopically to 96% in tears treated using a mini-open technique [11-15]. Mini-open repair with a lateral deltoid-split approach produces good postoperative outcomes as the deltoid muscle is not completely detached. There are advantages to using the mini-open technique, including shorter operating times and lower costs [16]. Arthroscopic surgery allows for a shorter recovery time and less pain compared to open surgery. The mini-open repair with a lateral deltoid-split approach is commonly used [17,18]. The satisfactory clinical outcomes of the mini-open technique are compared favourably to open or arthroscopic repair techniques. However, arthroscopy is not a substitute for diagnostic skills [19].

There have been few studies evaluating the mini-open microscopic repair technique in India [20,21], and none from South India. There are only a few studies exclusively studying the functional

outcomes of the mini-open repair technique, and none have been conducted in the last three years [16,20]. Most of these studies are comparative studies that compare the mini-open technique to arthroscopic repair [19,22]. Therefore, the present study aims to assess the functional consequences of open microscopic repair and the functional implications of supraspinatus tendon repair after the procedure and during the postoperative healing period.

MATERIALS AND METHODS

A prospective interventional study was conducted at the Department of Orthopaedics, Great Eastern Medical School and Hospital in Srikakulam, Andhra Pradesh, India. The study duration was one year, from July 2020 to July 2022. The study was conducted after obtaining Institutional Ethics Committee approval (GEMS & H/IEC/2020/041).

Inclusion criteria: The study included all patients diagnosed with a Rotator Cuff (RC) tear, aged over 20 years and under 60 years, who were willing to participate.

Exclusion criteria: Patients over 60 years of age, those with proximal humerus fractures, those unfit for anesthesia or unwilling to participate, and patients with bilateral RC tears were excluded from the study.

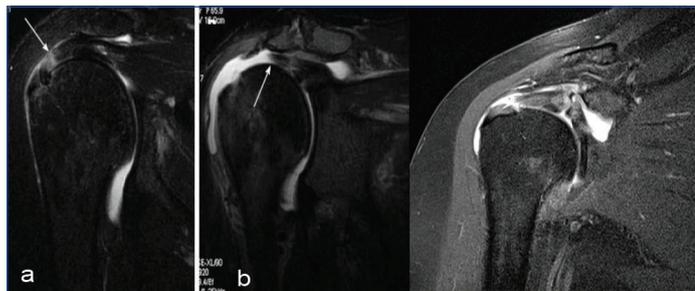
Sample size calculation: The sample size was calculated using the formula:

$$n = \frac{(Z\alpha/2)^2 PQ}{L^2}$$

Where $Z\alpha/2$ is the critical value of the normal distribution (1.96), P is the expected prevalence (50%), Q is the complementary probability (50%), and L is the margin of error (10%). When these values were substituted into the formula [23], the minimum sample size was calculated to be 95. However, during the study period, 120 patients were included in the study.

Study Procedure

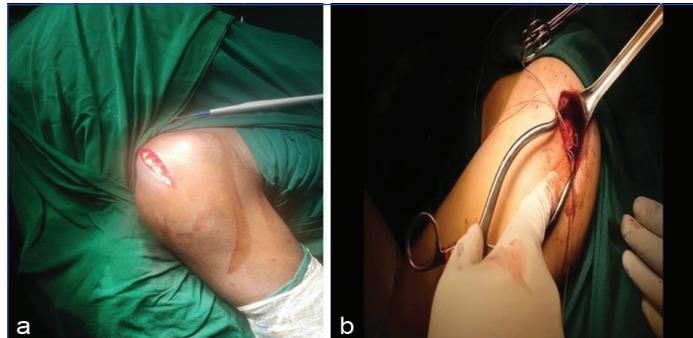
Patients were evaluated to exclude other Rotator Cuff (RC) injuries apart from the supraspinatus. A thorough history was taken, including history of smoking and alcoholism, which was documented. All patients underwent clinical evaluation to test the integrity of the RC using Jobe's empty can test (supraspinatus), belly press test (subscapularis), horn blowers sign (infraspinatus and teres minor), and drop arm test (massive and complete RC tear), and the results were documented [24]. Patients were informed about the study and participated voluntarily. A total of 120 patients were included in the study after clinical examination of the RC muscles using the drop arm test, horn blowers sign, empty can test, belly press test, Hawkins test, and confirmation of the RC tear by Magnetic Resonance Imaging (MRI) [Table/Fig-1a,b].



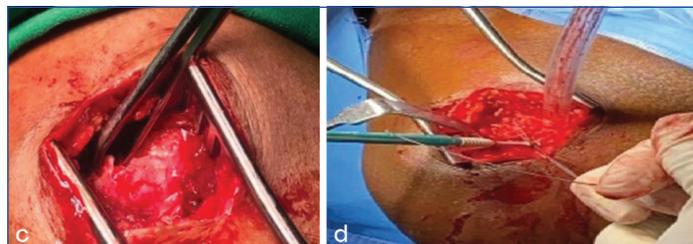
[Table/Fig-1a,b]: T2-weighted coronal Magnetic Resonance Imaging (MRI) of a right shoulder demonstrating a rotator cuff tear.

All patients underwent diagnostic arthroscopy to confirm the diagnosis, examine the tear thickness, and determine its cause, which was documented in the operative notes. Subacromial decompression and acromioplasty were performed to relieve pain

in cases where the humeral head was impinged by the acromion. The biceps tendon was evaluated for fraying, and biceps tenotomy was done in all patients aged 50 years and above. If there was no fraying, a mini-open supraspinatus repair was performed. Sutures were placed at the musculotendinous junction and tied to a medial suture anchor placed at the intersection of the articular surface with the greater tuberosity, with a 45° inclination [Table/Fig-2a-d]. The integrity and strength of the repair were evaluated prior to wound closure.



[Table/Fig-2a,b]: Incision and suture knot in mini-open repair technique.



[Table/Fig-2c,d]: Mini-open repair technique in supra spianus tear.

The commonly used suture anchor techniques are the Single Row (SR) and Double Row (DR). In the SR technique, two or more double-loaded suture anchors were placed in a single row at the lateral edge of the tendon's insertion footprint on the greater tuberosity. In the DR repair technique, two rows of anchors were placed, one medial and adjacent to the articular cartilage in the anatomical neck, and the other lateral in the greater tubercle, to provide better anatomical footprint restoration [25].

For the first two weeks, the limb was kept in abduction in a neutral or 10-15° degrees internal rotation (if possible). Afterward, the limb was switched to sling immobilisation for another four weeks. Active elbow Range of Motion (ROM), passive pendulum exercises, and scapular stabilising exercises were started while wearing the sling.

After six weeks, active assisted ROM, pulley exercises, pendulum exercises, scapular stabilising exercises, and rotator cuff strengthening exercises were initiated. Patients were evaluated at three, six, and 12 weeks, and at six and 12 months using the CMS system, and the scar was inspected for any signs of infection [26]. The CMS was developed to assess functional outcomes following shoulder injury treatment. This total score is divided into four subscales: pain (maximum 15 points), Activities of Daily Living (ADL) (maximum 20 points), ROM (maximum 40 points), and strength (maximum 25 points). A higher score indicates better function (minimum 0, maximum 100).

STATISTICAL ANALYSIS

Statistical analysis was performed descriptively and inferentially. Mean values were presented as percentages (%). The level of significance, indicating the significance of an event, was set at 5%. Metric parameters were assessed using Student's t-test (two-tailed, independent). The Levene's test was used to assess the homogeneity of variance, and the Student's t-test (two-tailed, dependent) was used to determine the statistical significance of study parameters on a continuous scale within each group.

RESULTS

Based on the age of the patients, the majority of patients were between 46 to 50 years old, with 33 (27%) being males and 36 (30%) being females [Table/Fig-3]. When asked about alcoholism and smoking habits, 96 (80%) patients reported no smoking habits, while 24 (20%) were known smokers, and 32 patients were alcoholics. When analysing the data for the type of tears, 68 (57%) had partial thickness tears and 52 (43%) had complete thickness tears. Among the patients, 112 had traumatic tears and only eight had degenerative tears. 67% of the patients presented with shoulder pain, while 33% were unable to lift their arm. Prior to consultation, 12 (10%) patients had received at least one intra-articular steroid injection.

Age (in years)	n (%)	Males	Females
26-30	17 (14)	10	7
31-35	19 (16)	13	6
36-40	23 (19)	15	8
41-45	28 (23)	21	7
46-50	33 (27)	25	8
Total	120 (100)	84	36

[Table/Fig-3]: Demographic data of patients.
n=Number of patients

Patients were clinically evaluated for the integrity of other RC muscles. The drop arm test was positive in 99 patients, the belly press test was positive in 44 patients, the Hawkins test was positive in 96 patients, Jobe's empty can test was positive in 84 patients, and the horn blower's sign was positive in 65 patients. Out of the 120 patients, 92 underwent surgery using the double-row technique with two anchors, and 28 patients underwent surgery using the single-row method. All patients were evaluated using the CMS score. Mild to moderate pain was reported up to three weeks post-surgery. Activities of Daily Living (ADL) showed improvement of 10 points from 12 weeks, and flexion and abduction improved over time. Strength also improved over time, with a score of 20 points from six months onwards [Table/Fig-4].

Variables	At three weeks	At six weeks	At 12 weeks	At six months	At one year
Pain	Mild-moderate pain	No pain	No pain	No pain	No pain
ADL	-	-	10 points	10 points	10 points
Movements flexion, abduction	-	-	91-120°/6 points	121-150°/8 points	>120°/6 points
Strength	-	-	15 points	20 points	20 points

[Table/Fig-4]: Evaluation of Constant-Murley score (CMS).
ADL: Activities of daily living

The average CMS score was 87 ± 2.5 . Before treatment, it was 33 ± 4.8 . There was a significant difference in CMS scores before and after mini-open repair [Table/Fig-5]. A paired t-test was performed, and the major difference was noted after 12 weeks post-surgery. The p-value was <0.0001 , indicating that mini-open repair significantly improved CMS scores among the study patients.

CMS score	Score
Preoperative	33 ± 4.8
Three weeks postoperative	45 ± 5.3
Six weeks	53 ± 6.7
12 weeks	57 ± 6.3
Six months	67 ± 6.2
One year	87 ± 2.5

[Table/Fig-5]: Constant-Murley Score (CMS) at different time periods.

The maximum improvement in the CMS score was noticed after six months, with a 20-point improvement. Outcomes were rated

as excellent in 68 patients, good in 24 patients, satisfactory in 16 patients, and poor in 12 patients at the end of one year [Table/Fig-6]. Among the 120 patients, five experienced mild infection at the surgical site, which was managed with antibiotics. No other postoperative complications were encountered.

CMS	Strength	No. of patients (n)
86-100	Excellent	68
71-85	Good	24
56-70	Satisfactory	16
0-55	Poor	12

[Table/Fig-6]: Outcome after one year follow-up.

CMS: Constant-Murley score

DISCUSSION

The results of the present study were similar to a study by Cho CH et al., who evaluated 128 cases repaired by mini-open technique with an anterolateral approach and reported excellent results [27]. Plachel F et al., (2020) studied 27 patients, with 16 undergoing single-row repair and 11 undergoing double-row repair, and followed them up for a mean \pm SD period of 12 ± 1 years (range, 11-14 years) [28]. Pearsall AW et al., studied 52 patients, with 27 undergoing arthroscopic repair and 25 undergoing mini-open repair, and found no significant difference in outcomes between the two techniques for RC tears [29]. Barnes LA et al., (2017) studied 22 mini-open and 128 arthroscopic RC repairs conducted from July 2007 to June 2011 and found higher American Shoulder and Elbow Surgeons Shoulder (ASES) scores in the mini-open group [30].

The mean CMS score at the end of the 12-month follow-up in our study was 87 ± 2.5 . ADL scores were not recorded in the first three and six weeks, respectively. However, it was observed that there was a 10-point improvement at six months and one year, respectively. When assessing movement flexion, the findings were not obtained at three and six weeks but rather at 12 weeks, with scores ranging from 1210 to 1500, and at six months, scores ranged from >1200 , indicating an improvement of six points or higher at one year.

In the present study, the average CMS score was 87 ± 2.5 at the end of one year. There were no recorded points for the first three and six weeks after performing the shoulder strength test. However, at the end of 12 weeks, there was a 15-point improvement, followed by 20 points after six months and one year, indicating that the mini-open surgery procedure yielded more than satisfactory results. The present study also collected the follow-up outcomes of previously published studies [Table/Fig-7] [31-33].

Studies	Year of study	Sample size	Study place	CMS (preoperative)
Liu J et al., [31]	2017	50	China	74.7 ± 6.8
Van der Zwaal P et al., [32]	2013	95	Netherland	76 ± 13.7
Kasten P et al., [33]	2011	17	Germany	77.5 ± 12.4
Present study	2022	120	India	87 ± 2.5

[Table/Fig-7]: Constant-Murley Score (CMS) of different studies [31-33].

This strongly indicates that the mini-open repair surgical technique can effectively check and replace damaged tendons in the shoulder's rotator cuff as part of the shoulder reconstruction process. Most of the patients (68 out of 120) achieved excellent strength. After one year, a full range of shoulder function was observed, which was statistically significant when compared to preoperative values. According to the findings of the present study, patients can regain the ability to carry out daily activities such as sweeping and washing their face within six weeks, while activities such as reaching for a shelf and washing their own back may take a year.

Adherence to strict postoperative physiotherapy has been critical for achieving full range of motion and pain-free Activities of Daily Living (ADL). The study on "Mini-open repair of isolated

supraspinatus tendon tears” necessarily requires a longer follow-up period to arrive at specific guidelines and make comparable comparisons. Studies can be conducted on patients aged below 20 and above 80 years, and there should be multicenter studies including various tertiary care hospitals and specialised clinics to involve patient populations from different backgrounds. Studies can also be conducted to compare different scoring systems such as the Oxford Shoulder Score and Disabilities of the Arm, Shoulder, and Hand (DASH) score.

Limitation(s)

In the present study, the duration of tendon tears was not assessed, and patients were only followed-up for one year. Additionally, the sensitivity and specificity of the CMS score were not assessed.

CONCLUSION(S)

The results of the present study showed that there was a considerable improvement in pain, strength, and QoL, regardless of the type of tear. The patients experience early recovery, better rehabilitation compliance, and excellent outcomes with the mini-open repair technique.

REFERENCES

- [1] Rutten MJ, Jager GJ, Kiemeny LA. Ultrasound detection of rotator cuff tears: Observer agreement related to increasing experience. *Am J Roentgenol*. 2010;195(6):440-46.
- [2] Viswanath A, Monga P. Trends in rotator cuff surgery: Research through the decades. *J Clin Orthop Trauma*. 2021;(18)105-13.
- [3] Vaidyar JM, Kassim S, Shibli S, Safwan UH. Functional outcome of shoulder following mini open repair for rotator cuff injuries. *International Journal of Current Research and Review*. 2015;(7):40-44.
- [4] Spargoli G. Supraspinatus tendon pathomechanics: A current concepts review. *Int J Sports Phys Ther*. 2018;13(6):1083-94.
- [5] Smucny M, Shin EC, Zhang AL, Feeley BT, Gajju T, Hall SL, et al; MOON Shoulder Group. Poor agreement on classification and treatment of subscapularis tendon tears. *Journal of Arthroscopy*. 2016;32(2):246-51.
- [6] Lädermann A, Denard PJ, Collin P. Massive rotator cuff tears: Definition and treatment. *Int Orthop*. 2015;39(12):2403-14.
- [7] Vora P, Shah V, Patel N, Chudasama C, Shah M, Prabhakar M. Results of arthroscopic rotator cuff repair. *International Journal of Orthopaedics*. 2018;4(1):652-55.
- [8] Burkhart SS, Athanasios KA, Wirth MA. Margin convergence: A method of reducing strain in massive rotator cuff tears. *Arthroscopy*. 1996;12(3):335-38.
- [9] Park MC, Elattrache NS, Ahmad CS, Tibone JE. “Transosseous-equivalent” rotator cuff repair technique. *Arthroscopy*. 2006;22(12):1360.e1-5.
- [10] Colvin AC, Harrison AK, Flatow EL, Egorova N, Moskowitz A. National trends in rotator cuff repair. *Journal of Bone and Joint Surgery*. 2012;94(3):227-33.
- [11] Galatz LM, Ball CM, Teefey SA, Middleton WD, Yamaguchi K. The outcome and repair integrity of completely arthroscopically repaired large and massive rotator cuff tears. *J Bone Joint Surg Am*. 2004;86(2):219-24.
- [12] Gerber C, Fuchs B, Hodler J. The results of repair of massive tears of the rotator cuff. *J Bone Joint Surg Am*. 2000;82(4):505-15.

- [13] Lafosse L, Brozka R, Toussaint B, Gobezie R. The outcome and structural integrity of arthroscopic rotator cuff repair with use of the double-row suture anchor technique. *J Bone Joint Surg Am*. 2007;89(7):1533-41.
- [14] Lee E, Bishop JY, Braman JP, Langford J, Gelber J, Flatow EL. Outcomes after arthroscopic rotator cuff repairs. *J Shoulder Elbow Surg*. 2007;16(1):01-05.
- [15] Sugaya H, Maeda K, Matsuki K, Moriishi J. Repair integrity and functional outcome after arthroscopic double-row rotator cuff repair. A prospective outcome study. *J Bone Joint Surg Am*. 2007;89(5):953-60.
- [16] Churchill RS, Ghorai JK. Total cost and operating room time comparison of rotator cuff repair techniques at low, intermediate, and high volume centers: Mini-open versus all-arthroscopic. *J Shoulder Elbow Surg*. 2010;19(5):716-21.
- [17] Wagner ER, Elhassan BT. Surgical management of massive irreparable posterosuperior rotator cuff tears: Arthroscopic-assisted lower trapezius transfer. *Curr Rev Musculoskelet Med*. 2020;13(5):592-604.
- [18] Eid, Taher A, Hannout Y, El-Sayed A, El-Sayed M. Arthroscopically assisted repair of massive full-thickness rotator cuff tears: An analysis of 2-year postoperative follow-up. *The Egyptian Orthopaedic Journal*. 2018;53(1):77-82.
- [19] Morse K, Davis AD, Afra R, Kaye EK, Schepesis A, Voloshin I. Arthroscopic versus mini-open rotator cuff repair: A comprehensive review and meta-analysis. *Am J Sports Med*. 2008;36(9):1824-28.
- [20] Chebbi PK, Manik R, Muthu M. A prospective comparative study of mini-open versus arthroscopic repair of supraspinatus tear. *International Journal of Research in Orthopaedics*. 2020;(6):777-84.
- [21] Bashir A, Seth S, Wani IH, Farooq M, UI Gani N, Naqshi BF. Mini-open rotator cuff tear repair: An institutional experience with a midterm follow-up. *Ortop Traumatol Rehabil*. 2018;20(5):383-87. Doi: 10.5604/01.3001.0012.8274. PMID: 30648663.
- [22] Karakoc Y, Atalay İB. Comparison of mini-open versus all-arthroscopic rotator cuff repair: Retrospective analysis of a single center. *Pan Afr Med J*. 2020;(37):132.
- [23] Simarjeet K. Sample size determination. *International Journal of Current Research*. 2021;09(03):48365-67.
- [24] Jain NB, Luz J, Higgins LD, Dong Y, Warner JJ, Matzkin E, et al. The diagnostic accuracy of special tests for rotator cuff tear: The ROW cohort study. *Am J Phys Med Rehabil*. 2017;96(3):176-83.
- [25] Lo KYI, Burkhart SS. Double-row arthroscopic rotator cuff repair: Re-establishing the footprint of the rotator cuff. *Arthroscopy*. 2003;19(9):1035-42.
- [26] Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res*. 1987;(214):160-64.
- [27] Cho CH, Song KS, Min BW, Jung GH, Lee YK, Sin HK. Anterolateral approach for mini-open rotator cuff repair. *Int Orthop*. 2012;36(1):95-100.
- [28] Plachel F, Siebert P, Rüttershoff K, Thiele K, Akgün D, Moroder P, et al. Long-term results of arthroscopic rotator cuff repair: A follow-up study comparing single-row versus double-row fixation techniques. *Am J Sports Med*. 2020;48(7):1568-74.
- [29] Pearsall AW, Ibrahim KA, Madanagopal SG. The results of arthroscopic versus mini-open repair for rotator cuff tears at mid-term follow-up. *J Orthop Surg Res*. 2007;24(2):1749-99.
- [30] Barnes LA, Kim HM, Caldwell JM, Buza J, Ahmad CS, Bigliani LU, et al. Satisfaction, function and repair integrity after arthroscopic versus mini-open rotator cuff repair. *Bone Joint J*. 2017;99(2):245-49.
- [31] Liu J, Fan L, Zhu Y, Yu H, Xu T, Li G. Comparison of clinical outcomes in all-arthroscopic versus mini-open repair of rotator cuff tears: A randomized clinical trial. *Medicine (Baltimore)*. 2017;96(11):6322-25.
- [32] Van der Zwaal P, Thomassen BJ, Nieuwenhuijse MJ, Lindenburg R, Swen JWA, van Arkel ERA. Clinical outcome in all-arthroscopic versus mini-open rotator cuff repair in small to medium-sized tears: A randomized controlled trial in 100 patients with 1-year follow-up. *Journal of Arthroscopy*. 2013;29(2):266-73.
- [33] Kasten P, Keil C, Grieser T, Raiss P, Streich N, Loew M. Prospective randomised comparison of arthroscopic versus mini-open rotator cuff repair of the supraspinatus tendon. *Int Orthop*. 2011;35(2):1663-70.

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PLAGIARISM CHECKING METHODS: (Lain H et al.)

- Plagiarism X-checker: Jan 07, 2023
- Manual Googling: May 17, 2023
- iThenticate Software: Jun 05, 2023 (11%)

ETYMOLOGY: Author Origin

EMENDATIONS: 9

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: Jan 05, 2023

Date of Peer Review: Feb 11, 2023

Date of Acceptance: Jun 06, 2023

Date of Publishing: Aug 01, 2023