To analyze the clinical and functional outcome in patients undergoing an arthroscopically assisted 'mini open repair' of rotator cuff tear

Alok Gupta¹, Rajendra Kumar Beniwal², Saumya Agarwal², Shivank Prakash¹

Abstract

Background: A rotator cuff tear is one of the most frequent shoulder lesions that require surgical treatment.

Methods: 30 patients within the span of 2 years underwent mini open repair for the rotator cuff tear diagnosed with the help of noninvasive imaging. Pre-operative evaluation of shoulder function was done using the University of California Los Angeles (UCLA) scale.

Results: There was sequential improvement in pain, which was significant at 9 to 18 weeks and 18 to 24 weeks interval. There was sequential improvement in the range of motion. The mean score for function was pre-operatively was 5.86. Post-operatively, the mean score was 6.13 at 9 weeks, 7.20 at 18 weeks and 9.60 at 24 weeks. After final UCLA score at 24 weeks sixteen patients (53.33%) were rated as having excellent result, twelve patients (40%) as having good result, and two (6.66%) as having poor result. 28 out of the 30 patients were satisfied with the overall result.

Conclusion: Thus, when comparing mini-open and traditional open methods of rotator cuff repair, it appears that outcomes do not significantly differ. However, the advantages of mini-open repair, which include preservation of the deltoid origin, lower peri-operative morbidity, enhanced cosmesis, shortened rehabilitation, and arthroscopic evaluation of the glenohumeral joint for additional pathology, make it an overall superior method.

Keywords: Rotator cuff tear, Arthroscopy, Shoulder mini open repair

Introduction

The shoulder is essential for placing the hand in functional positions and requires mobility, strength & stability. The rotator cuff provides stability and is important in maintaining the shoulder joint in apposition when it is taken into a very wide range of motion by the other muscles. The most common mechanisms of a rotator cuff tear are divided into 'repetitive use' wherein over a period, the tendons wear thin and a rotator cuff tear can develop within the tendons and 'traumatic injuries' like falling on to an outstretched hand. Rotator cuff tear is characterized by pain referred to the lateral aspect of the upper arm in the region of the deltoid muscle and its insertion. A painful arc [1] between 60° and 120° of abduction indicates some disorder of the subacromial region and the pathology lies in subacromial region which comprises a functional joint between the acromioclavicular and the coracoacromial arch above and the tendinous cuff and the tuberosities of the humerus below. Codman [2] was first to describe intrinsic disease of the rotator cuff and Neer3 concluded that anterolateral inferior portion of the acromion and the coraco acromial ligament as principle sites of rotator cuff impingement. The Neer’s acromioplasty became the standard procedure for pain relief and functional improvement in recalcitrant cases [4] but morbidity and duration of rehabilitation were considerable, partly due to deltoid release and reinsertion [5]. Arthroscopic open repair has been reported to compare favourably with Neer’s technique, giving considerably less postoperative morbidity, but it is a technically difficult procedure [6]. The aim of the study is to analyze the clinical and functional outcome in patients undergoing an arthroscopically assisted ‘mini open repair’ of small, medium or large size rotator cuff tear.

Material and Methods

The study was conducted in the Department of Orthopaedics at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. The study comprised of a group of 30 patients and the study period was from 1st February 2016 to 1st February 2018. The study was conducted in the Department of Orthopaedics at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. The study comprised of a group of 30 patients and the study period was from 1st February 2016 to 1st February 2018. The study design was hospital based retrospective and prospective serial follow-up study. The ethical clearance was obtained from ethical clearance committee. Patients with small, medium or large sized rotator cuff tears as determined by clinical examination and diagnostic imaging prior to surgery, patients with symptoms of impingement syndrome like rest pain at shoulder referred to insertion

© 2020 by Journal of Bone and Joint Diseases | Available on www.jbjdonline.com | doi: 10.13107/jbjd.2020.v35i02.020

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/3.0) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.
of deltoid, night pain, painful arc of shoulder and with tenderness at greater tuberosity and weakness of rotator cuff muscles specially supraspinatus and patient not responding to adequate conservative treatment were included in the study. Patients who had any evidence of major trauma, infection, avascular necrosis, chronic dislocation, inflammatory or degenerative glenohumeral arthropathy, frozen shoulder, or previous surgery of the affected shoulder, patients who had significant cuff arthropathy with superior humeral translation and acromial erosion diagnosed by X-ray or other investigations, who had major medical illness (life expectancy less than 2 years), psychiatric illness that precludes informed consent, patients < 15 years of age and > 70 years of age, patients unwilling to be followed up were excluded from the study.

Intraoperatively, patients who had large, massive or irreparable cuff tears extending into the subscapularis or teres minor which cannot be mobilized to the articular margins or repaired using this technique, patients with teres minor or subscapularis tears, patients with inelastic & immobile tendon which cannot be advanced to the articular margin, patients with coexisting labral pathologies requiring repair with sutures, patients with bankart lesions requiring repair and patients with partial tear of biceps (more than 60% of thickness) requiring tenodesis or release were also excluded from the study. X-ray shoulder Anterior-Posterior (AP) view and supraspinatus outlet view were performed initially followed by Magnetic Resonance (MR) Arthography and ultrasonographic evaluation of the shoulder in all the cases. Preoperative evaluation of shoulder function was done using the University of California Los Angeles [UCLA] scale[7].

Surgical Technique

After taking a well informed consent, patient is placed in a lateral decubitus position and twin traction units were applied to provide optimal exposure for instrument placement and for distraction and internal rotation of the glenohumeral joint. After intubating and positioning the patient physical examination of the involved shoulder was performed to determine the direction and degree of instability. After physical examination, arthroscopic examination was performed. Shoulder was placed in 40° abduction and 15° flexion and arthroscope introduced through posterior portal. An antero-inferior portal was made by using the inside-out technique, it was used to view the intra-articular pathology in the antero-inferior aspect of shoulder and to view the abrasion of the glenoid rim and scapular neck. After this, scope was introduced in the subacromial space and subacromial decompression was performed. This was followed by arthroscopic debridement of the torn cuff margins. The arthroscope was removed and the standard mini open repair was performed. A transverse or vertical skin incision at the lateral border of the acromian was made. Exposure of the cuff was achieved by dissection of the deltoid fascia and split of deltoid from the level of the acromian distally for 4 cm. The edges of the tear were resected. The bone between the articular margins and the greater tuberosity was decorticated or a bone trough was prepared. A maximum of two suture anchors of 5 mm size each with two sutures (one tiger wire and one fibre wire) were used along with side to side sutures. The number of anchors were recorded. After the completion of suture anchor placement, braided sutures were passed through the torn tendon and tied by sige row technique. Side to side sutures at the apex of the tear were used as indicated. The wound was then copiously irrigated. One or two stitches were applied on the deltoid. Skin and subcutaneous tissue were closed with cosmetic subcuticular closure. Intra-operative surgical findings were correlated with the pre-operative ultrasonography and MRI/ MR arthrography findings.

Post-operative regime:

Shoulder was immobilized in a shoulder immobilizer post operatively. Patients were advised to wear an immobilizer for a period of about 4-6 weeks. Arm was supported and circled in both the directions and across the body. This was repeated about 10-15 times each way, 3-4 times a day. Active assisted overhead flexion was initiated after 4 weeks and physiotherapy was advised. Postoperative evaluation using UCLA scale was done at postop day, 9 week, 18 weeks and 24 weeks post-operatively. Final results were graded with UCLA Score: Excellent (34-35), good (28-33) and fair (21-27) results would be considered satisfactory, whereas poor results (UCLA score <20) would be considered unsatisfactory.

Results

In our study, 30 cases were included as per the inclusion criteria. The age of patient ranged from 30 years to 63 years, with an average age of 47 years. Majority of the patients belonged to the age group 30-39 years. The majority of the patients were males (69.24%). Of the 30 patients, 2 complained of bilateral involvement, 23 had pain on the dominant side and 5 had pain on the non-dominant side. 84.62% underwent surgery on their dominant extremity while 15.38% were operated on their non-dominant extremity. The onset of impingement pain was marked by a traumatic episode in 12 out of 30 patients of which 10 cases had insignificant trauma and 2 had significant trauma. 14 patients had sedentary lifestyle while 16 patients were involved in heavy manual work. Positive Neer’s impingement test, muscle weakness, painful arc test and greater tuberosity tenderness was found to be present in all the patients. 9 patients out of 30 had acromioclavicular tenderness. Hawkins’ sign was found to be positive in 76.66% while drop arm sign was positive in 70% of the patients. On radiography, greater tuberosity sclerosis was observed in 70%, acromioclavicular arthritis was observed in 46.66%, subacromial osteophytes were found in 6% and 30% of the patients had normal findings. Ultrasonographic examination of all the patients was done and it was revealed that 28 patients out of 30 had rotator cuff tear. Out of 30 patients, 26 had full thickness tear, 2 had partial thickness tear and remaining had no tear. On confirmation with MRI, all the patients were found to have full thickness tear. 2 patients had calcification. Duration of symptoms ranged from 2 months to 24 months, with average duration being 9.2 months. Intraoperatively, all the cases showed decreased subacromial space, and subacromial bursitis while rotator cuff tear was observed in 26 cases and acromioclavicular joint degeneration in 16 cases. The pre-operative MRI findings were correlated with the operative findings. All the patients who had rotator cuff tear underwent mini open repair. Post operatively all patients were treated with a closely monitored physical therapy program. The results of treatment were found out using the UCLA score at 9, 18 and 24 weeks. There was sequential improvement in pain, which was significant at 9 to 18 weeks and 18
to 24 weeks interval. (p<.001) [Table 1] The mean score for strength of forward flexion was statistically significant at 9 to 18 weeks and 18 to 24 weeks interval. (p<0.01) [Table 2] There was sequential improvement in the range of motion (Active Forward Flexion). The mean score for range of motion was statistically significant at each level, except at 0-9 weeks interval. (p<0.001) [Table 3] The mean score for function was pre-operatively was 5.86. Post-operatively, the mean score was 6.13 at 9 weeks, 7.20 at 18 weeks and 9.60 at 24 weeks. The improvement was statistically significant at each interval. (p < .001). The mean score for total UCLA score was statistically significant at each interval. (p < .001) [Table 4] Final UCLA score at 24 weeks was used for assigning the overall results. Sixteen patients (53.33%) were rated as having excellent result, twelve patients (40%) as having good result, and two (6.66%) as having poor result. 28 out of the 30 patients were satisfied with the overall result.

One patient, who had poor result according to UCLA score, was satisfied with pain relief. She had poor score because of poor range of motion gained post-operatively due to poor compliance to exercise regime. The other patient who had poor result had moderate improvement in all parameters but did not have clear failure area. The surgical findings were analysed with respect to patient’s etiology, lifestyle and occupation. There was little difference between those patients with a traumatic etiology compared with those who had an insidious onset of symptoms. No significant correlation was seen between heavy manual lifestyle or occupation and the surgical findings.

Discussion

The present study evaluates the efficacy of mini-open repair in the treatment of full thickness rotator cuff tear. In our study, rotator cuff tear was more common in male patients. Out of a total of 30 patients 21 (70%) were male and 9 (30%) were females. This may be explained by the fact that males are involved in heavy manual work than females thus justifying the wear and tear theory. This finding was in accordance with the findings of Nari Yamada et al [8] where out of a total of 40 cases, 33 (82.5%) were male and 7 (17.5%) were female. In our study the patients ranged from 30 to 63 years of age with an average age of 47 years. 10 (33.33%) patients were in the age group of 30 to 39 years, 8 (27%) were in the age group of 40 to 49 years, 6 (20%) in 50 to 59 years age group and another 6 (20%) in > 60 years of age group. This is in contrast with the study done by Galanopoulos et al [9] in which the respective percentage of patients was 17%, 14.63%, 24.39%, and 43.89%. This study shows that the rotator cuff tears are more common with aging. Rotator cuff tear in our study was more common in dominant shoulder (76.66%), again justifying wear and tear theory.

Non dominant shoulder was involved in 16.66% of the cases. Only 6.66% of our patients had bilateral tear, negating the hypothesis that there are an intrinsic predisposing factors for rotator cuff tear. This is comparable to the study by Nari Yamada et al8 in which dominant shoulder was involved in 85% of the cases and non dominant shoulder in 15% of the cases. In our study there was history of no trauma in 59.67% of the cases and insignificant trauma in 33.33% of the cases. There was history of significant trauma in only 7% of the cases in our study. These results correlate with the findings of Josh B. Moosikaswan et al [10]. This proves that trauma is less important as the etiological factor for rotator cuff tears.

Drop arm sign in our study was found to be most specific (100%) sign for full thickness rotator cuff tear though its sensitivity was found to be low. Sensitivity of Neer’s impingement test was found to be very high (100%). Also we found that the specificity of painful arc sign was very high. This is in contrast to the study done by Callis et al [11] in which the sensitivity of Neer’s impingement test was 88.7%, specificity of drop arm sign was 97.2% and that of painful arc sign was 80.2%. We found that though patients with full thickness rotator cuff tear were having restricted active range of abduction but passive abduction was full. So, we recommend a combination of painful arc sign, difference in passive and active range of motion, Neer’s impingement test and drop arm sign as major clinical tests for diagnosis of rotator cuff tear. X-rays (supraspinatus outlet view) in our study showed that 53.33% of patients had type II acromion while 46.66% had type III acromion. None of the patient in our study had type I acromion. This is in comparison to Bigliani [12] who had reported the incidence of type I, II and III acromion as 17%, 43% and 40% respectively in cadaveric study. Thus, our study indicates that shape of acromion has a
significant bearing on development of rotator cuff tear and thus further justifying wear and tear theory. Ultrasonography and MRI was done in all patients. In our study, the sensitivity of Ultrasound was found to be 88.4% though the specificity was 50%. These findings co-related with the result of study by Josh B. Moosikasuwan et al [10]. MRI in our study was found to be very sensitive method for detection of full thickness rotator cuff tear with 100.0% sensitivity. This value is very close to what is described in literature in which the sensitivity and accuracy of MR imaging [13] for full-thickness rotator cuff tears were 84% to 96% and 92% to 97%, respectively. Though in our study, USG was not found to be as sensitive and specific as MRI. In our study, almost all patients showed serial improvement in various parameters taken in UCLA score 7 though results at the end of 9 weeks were not very good because patients were kept in shoulder immobilizer for 6 weeks after surgery and only passive exercise were allowed thus, the patients had slight stiffness at the end of 9 weeks, resulting in not too good results as compare to the result at the end of 18 & 24 weeks. After a successful cuff repair, patients were advised against returning to heavy lifting, pushing, pulling or overhead work. This is due to the fact that though the tear has been repaired but the quality of the tendon tissue has not been restored. Hence there is fear of re-rupturing of abnormal tendon tissue if cuff is again subjected to major loads. Full thickness rotator cuff tear can also be treated by open repair. When comparing mini open repair with traditional open methods of rotator cuff repair, it appears that the outcomes do not differ significantly. However, the advantages of mini open repair, which include preservation of the deltoid origin, lower peri-operative morbidity, enhanced cosmesis, shortened rehabilitation and arthroscopic evaluation of the glenohumeral joint for additional pathology, make it an overall superior method. This is in accordance with the findings of Hersch et al [14], Weber and Schaefer et al [15] and Baker and Liu et al [16]. An additional advantage of mini-open repair is that it can be converted to the conventional open repair at any time during the procedure if the surgeon encounters a much larger tear than revealed by various radiological investigations. As compared to conventional open repair, mini open repair required substantially less parental narcotics and shorter hospital stays and is associated with less perioperative morbidity without compromising long term results [17].

Conclusion

The present study evaluates the efficacy of mini open repair in the treatment of full thickness rotator cuff tear. In our study, we found that rotator cuff tear was more common in dominant shoulder. These findings in our study suggest that degenerative theory of rotator cuff tear is more appropriate in suggesting pathogenesis of rotator cuff tear. We diagnosed rotator cuff tear on the basis of clinical features and diagnostic evaluation (X-ray/USG/MRI) mainly. We recommend combination of painful arc sign, difference between passive and active range of motion, Neer’s impingement test and drop arm sign as very sensitive and specific for diagnosis of full thickness rotator cuff tear. We used mini open repair for treating rotator cuff tear. We found that this technique is very good for treating all types of rotator cuff tears which are difficult to treat by traditional open technique. Post operatively, we started passive range of motion exercises immediately. We found this extremely effective in helping the patient in regaining range of motion. We also recommend that post-operative exercise regime should be under control of operating surgeon.

References

1. Kessel L and Watson M. The painful arc syndrome. Clinical classification as a guide to management. J Bone Joint Surg 59B: 166-172, 1977.
2. Codman, E.A. Clinical Orthopaedics and Related Research: May 1990 - Volume 254 - Issue - p 3-26.
3. Neer CS. Anterior acromioplasty for the chronic impingement syndrome in the shoulder. A preliminary report. J Bone Joint Surg Am. 1972; 54: 41-50.
4. Hawkins RJ, Brock RM, Abrams JS, Hobeika P. Acromioplasty for impingement with intact rotator cuff. J Bone Joint Surg 70B: 795-797, 1988.
5. Bjorkenheim JM, Paavolainen P, Ahovuo J, Slatis P. Subacromial impingement decompressed with anterior acromioplasty. Clin Orthop 252: 150-155, 1990.
6. Norlin R. Arthroscopic subacromial decompression versus open acromioplasty. Arthroscopy 5: 321-323, 1989.
7. Romeo Anthony A, Mazzocca Augustus, Hang David W, Shott Susan, Bach Bernard R Jr. Shoulder Scoring Scales for the Evaluation of Rotator Cuff Repair. Clinical Orthopaedics & Related Research 427:107-114, October 2004.
8. Nari Yamada et al. Comparison of conservative and open treatments of massive rotator cuff tears. Tokai J Exp Clin Med., No.4-6;151-163, 2000.
9. Galanopoulos, C,Yannakopoulas, E. Antonogiannakis. Arthroscopic repair of rotator cuff tears: mid term results. Jour of the Hellenic Assoc Ortho Traum. S7:4, 2006.
10. Josh B. Moosikasuwan et al. Rotator cuff tears: Clinical, Radiographic & USG findings. Radiographics: 25:1591-1607. 2005.
11. Callis M, Akgun K, Birtane M, Karacan I, Callis H and Tuzun F. Diagnostic values of clinical diagnostic tests in subacromial impingement syndrome. Ann Rheum Dis. 2000; 59: 44-7.
12. Bigliani LU, Morrison D and April EW. The morphology of
The acromion and its relationship to rotator cuff tears. Orthop Trans 10: 228, 1986.

13. Ara Kassarjian, Jenny T. Bencardino, William E. Palmer. MR Imaging of Rotator cuff. Radiol Clin N. Am 44 (2006) 503-23.

14. Hersch, JC; Sgaglione, NA. Arthroscopically assisted mini-open rotator cuff repairs. Functional outcome at 2- to 7-year follow-up. Am J Sports Med. 2000;28:301-311.

15. Weber, SC, et al. ‘Mini-open’ Versus Traditional Open Repair in the Management of small and Moderate Size Tears of the Rotator Cuff. Arthroscopy. 1993;9.

16. Baker CL, Liu SH. Comparison of Open and Arthroscopically Assisted Rotator Cuff Repair. American Journal of Sports Medicine, 1995;23.

17. Hata Y et al. A less invasive surgery for rotator cuff tear: Mini-open repair. J Shoulder Elbow Surg 2001; 10: 11-6.

How to Cite this Article
Gupta A, Beniwal R A, Agarwal S, Prakash S | To analyze the clinical and functional outcome in patients undergoing an arthroscopically assisted ‘mini open repair’ of rotator cuff tear. | Journal of Bone and Joint Diseases | May-Aug 2020; 35(2): 42-46.