Razavi Int J Med. 2018 September; 6(3):e60817 doi: 10.30483/RIJM.2018.22

Published online 2018 September 30 **Original Article**

A Comparative Study on the Clinical Results of Arthroscopic Rotator Cuff Repair and Open Repair Surgery

Maziar Nafisi[1,*], Mohamd Reza Guity[1], Nima Bagheri[2], and Saeed Khabiri[1]

[1] Joint Reconstruction Research Center, Tehran University of Medical Sciences, Tehran, Iran
[2] Joint Reconstruction Research Center, Imam Khomeini Hospital, Tehran University of Medical Sciences, Tehran, Iran

*** *Corresponding author:*** Maziar Nafisi, Joint Reconstruction Research Center, Tehran University of Medical Sciences, Tehran, Iran. Email: maziarnsfisi@gmail.com

Received 2017 August 24**; Accepted** 2018 July 13.

Abstract

Background: Despite the obvious advantages of arthroscopic rotator cuff repair, there are no definitive evidences regarding the superiority of this method over open surgery.

Objectives: The aim of this study is to compare the results of arthroscopic rotator cuff repair and open repair surgery.

Methods: A total of 52 patients referring to a general university hospital were included in the study and assigned to two groups of arthroscopic repair and open repair. Demographic information of patients and the presence of any underlying disease and the grade of rotator cuff tear were recorded. The pain scores of the patients were measured three times, before, 48 h after surgery and 6-month follow-up, using the VAS system. To evaluate the clinical performance of patients, UCLA scoring system (only 6 months after the surgery) and Constant (before and 6 months after surgery) were utilized.

Results: 32 patients were assigned to the open repair surgery and 20 to the arthroscopic repair group. The two groups were not significantly different in terms of pain variables, 48 hours after operation (p = 0.054) and 6 months after operation (p = 0.638), constant score 6 months after operation (p = 0.157) and UCLA shoulder rating scale 6 months after surgery (P = 0.167). Moreover, there was not any significant difference between the two groups with regard to these variables before surgery.

Conclusion: The results of this study showed that arthroscopic rotator cuff repair was a safe procedure which was as effective as open repair surgery. Also, reduced postoperative pain was one of the advantages of this method noted in the present study, although the long-term severity of pain in this method was not significantly different from the pain of patients undergoing open surgery.

Keywords: Arthroscopic repair, Open repair surgery, Rotator cuff tear

1. Background

Rotator cuff tear is the most prevalent musculoskeletal complaint after lumbar pain, and also the most common cause of referral to doctors after shoulder injury in adults (1). The rotator cuff tear usually results in shoulder pain, stiffness, weakness, and loss of the range of joint movement. The rotator cuff tear is of two types, full-thickness and partial-thickness (2). The age-related degeneration may result in manifestation of rotator cuff tear in different parts, sizes, and forms with varying severity. The severity of symptoms does not necessarily correlate with the severity of the tear, so a minor tear may cause more severe pain and symptoms (3).

Large tears may lead to secondary atrophy and muscle impairment with accumulation of fat inside the muscle, which may lead to irreversible loss of muscle function (4). In recent years, due to an increase in the elderly population and advances in diagnostic techniques, growing attention has been paid to rotator cuff tear repair. The main goal of the rotator cuff tear repair surgery is to alleviate pain, and the improvement of shoulder function is treated as a second priority. In 20 to 95% of patients, the repair of the rotator cuff may be unsuccessful, depending on factors such as tear size, time elapsed from the injury, fat atrophy and surgical technique (5).

Currently, there are three general procedures for rotator cuff tear repair including open surgery, mini-open and arthroscopic surgery (5).

Previous studies have shown the effectiveness of both open and mini-open surgical procedures (6,7). Arthroscopic repair is a standard treatment for rotator tear, which is currently applied for all types of small or large tears (8,9). Compared to the open surgery, this procedure is less invasive and imposes fewer damages to deltoid muscle, which may be beneficial to postoperative outcomes. In developing countries, high-cost of medical machine drives people to use open repair surgery. With recent advancements and innovations offered in general orthoscopic devices, and especially in the specialized orthoscopic instruments utilized for rotator cuff repair, there has been a growing interest in employment of orthoscopic rotator cuff tear repair.

The theoretical advantages of this method such as immediate postoperative pain alleviation, reduced damage to the deltoid muscle, and lower postoperative stiffness help expedient recovery and return of the patient to normal life. However, there are concerns about the use of full arthroscopic repair including the impossibility of complete repair and its subsequent loss of performance as well as the difficulty of performing this procedure (10).

Despite the obvious advantages of the

arthroscopic rotator cuff tear repair, there are not conclusive evidences about the superiority of this method over open surgery, with many non-randomized studies indicating similar effectiveness of these two techniques (5,8). Further studies are needed to make better comparisons and more reasonable decisions about the adoption of the best therapeutic procedure for patients. Therefore, we decided to compare the results of rotator cuff repair using deltopectoral with orthoscopic repair surgery in this study.

2. Methods

The present study is a quasi-experimental study and the study population consisted of patients with mild to moderate full-thickness rotator cuff tear (Confield 1 and 2) who had referred to university hospitals for repair surgery in 2015-16. The exclusion criteria were at least 18 years of age and a definitive diagnosis of rotator cuff tear based on clinical symptoms and imaging evidence. The inclusion criteria included conditions such as sub-scalpular tear, glenohumal joint instability and its degeneration, upper lacrimal tear, shoulder stiffness, previous surgery on rotator cuff and massive or partial tear.

A total of 52 patients with rotator cuff tear who had referred to the Shoulder Clinic of a University Hospital in Tehran and met the inclusion criteria were included in the study and divided to two groups of arthroscopic repair and open repair.

The sample size consisted of all patients who were complaining of rotator cuff tear in a 6-month interval after the injury. In all patients of the two groups, abduction pillow was used 6 weeks after the surgery and in the open repair group, active assisted motions in flexion and external rotation were performed regularly during the first 6 weeks to prevent muscle atrophy and stiffness of the shoulder. We used same analgesic drug in all of patients.

The isometric external rotation exercises were started after 6 weeks and active movements were begun after 12 weeks, and patients were recommended to refrain from any aggressive movement during this period to avoid tear. In arthroscopic group, abduction pillow was used for 4 to 6 weeks.

The shoulder pendulum motion, passive range of motion, active arm and wrist exercises were performed during this period. Active exercises were carried out briefly and active-assisted and full active exercises were started after 6 and 12 weeks respectively. The patients were advised against any aggressive motion during this period to avoid re-ear.

If patients were lost to follow-up or the post-operative rehabilitation protocols were not implemented, so that serious complications manifested, they were excluded from the study.

Patients' demographic data including gender, age, duration of preoperative clinical symptoms, and underlying conditions such as diabetes and the severity of preoperative tear were recorded. The severity of patients' pain before surgery was measured using VAS system. Patients' pain was assessed and recorded in both groups 48 h after surgery and in the 6-month follow-up.

The clinical evaluation of patient's function was made by UCLA Shoulder Rating Scale (11) and Constant score (12) before and 6 months after the surgery.

This study was approved by the Ethics Committee of Tehran University of Medical Sciences.

Data were analyzed by SPSS software. The descriptive statistics of the two groups were computed and the significance of variables in the two groups was assessed using Mann Whitney and chi square tests.

3. Results

52 patients were enrolled in the study, out of whom 32 underwent open repair surgery with an average age of 56.81 ± 9.19 years and 20 patients had arthroscopic repair with mean age of 80.86 ± 46.4 years.

40.6% of the patients in the open repair group were male and 31.3% of them had type 1 Connfield tear. In the arthroscopic group, 50% of patients were men and 25% of them had Type-1 Connfield tear.

Information on the variables of pain, Constant score and UCLA shoulder rating scale before and after surgery is reported in Table 1.

According to Table 2, the results of Mann-Whitney and chi-square test revealed that there was not any significant difference between the two groups in terms of pain score, constant score and the background information of the patients at the baseline.

Table 1. Pain Severity and Constant score before and after surgery in the two groups

Variables	Arthroscopic group	Open repair surgery	
Constant score	Preoperative	2.972±24.94	2.673±25.10
	6 months after surgery	11.314±740.6	8.792±70.65
UCLA Shoulder rating scale	Preoperative		
	6 months after surgery	3.74±27.5	3.748±28.55
Pain	Preoperative	1.135±747	1.252±7.9
	48 hours after surgery	1.464±4.72	1.673±3.8
	6 months after surgery	2.03±1.062	1.95±1.191

Table 2. Results of Mann-Whitney test of the two groups at the baseline

Variable	p-value
Age	0.096
Preoperative Constant score	0.784
Preoperative pain	0.219
Gender	0.508
Type of tear	0.628

As shown in Table 3, there was no significant difference between the two groups in variables of Constant score and UCLA Shoulder rating scale after surgery.

The variables of pain 48 hours and 6 months after surgery, UCLA Shoulder rating scale and constant score 6 months after the surgery were compared in patients of both groups. There was not any significant difference between the two groups in terms of the grade of tear.

However, the constant score 6 months after surgery was associated with the grade of tear, so that constant score dropped as the degree of tear was decreased (P = .002).

Table 3. Comparison of postoperative variables in two groups

Variable	p-value
Pain 48 h after surgery	0.054
Pain 6 months after surgery	0.638
UCLA Shoulder rating scale 6 months after surgery	0.167
Constant score 6 months after surgery	0.157

4. Discussion

As discussed earlier, the results of this study suggested that although the severity of postoperative pain in the arthroscopic restoration group was lower (which was statistically insignificant), the severity of pain 6 months after the rotator cuff repair was identical in both procedures. Also, the clinical outcome after surgery was almost identical in both groups.

The results of this study, in line with other previous studies, show similar effectiveness of both open surgery and full arthroscopic repair surgery (13,14). Many of these studies consider the size of the tear as the main variable predicting clinical function after repair. For example, Kim et al. reported that unsuccessful arthroscopic rotator cuff tear repair and the secondary mini-open surgery did not lead to deterioration of prognosis; rather, the size of tear was correlated with the outcome of the operation (14). Similarly, the study by Ide et al. revealed that the clinical results of arthroscopic surgery in patients with small to large tear was not significantly different from the group of patients who had open surgery, but in a group of patients with large to massive rotator cuff tear, regardless of the repair technique adopted, clinical outcomes were worse than patients with small to moderate tear (13).

As mentioned earlier, one of the major goals of rotator cuff tear repair is to relieve pain in the patients. Arthroscopic repair is said to be less painful as it is minimally invasiveness with less damage to the muscle. A number of studies have shown that postoperative pain in arthroscopic repair is lower than open repair surgery (15) however, most studies, such as the present one, have shown that the severity of pain is similar in both procedures (16,17). In 2011, Kasten et al. compared the severity of postoperative pain and the range of joint motion in two techniques of mini-open and arthroscopic repair. The results of this study suggested that although the intake of painkillers in arthroscopic repair group was lower in the first week after the surgery, the severity of pain and range of joint motion were similar in both groups 6 months after the surgery (17).

Limitations of the study

A small sample size and a short follow-up were some of the limitations of the present study. It is posited that the chance of re-tear is greater in arthroscopy, and open surgical procedure is preferred in patients with a higher chance of re-tear (10). Therefore, for more accurate comparison of postoperative complications and arthroscopic repair and its comparison with open surgical technique, more studies with larger sample size and longer follow-up are required.

In general, we recommend the arthroscopic surgery for rotator cuff tear repair in small to medium tears.

Acknowledgments

None.

Conflicts of interest

None.

References

1. Picavet HS, Schouten JS. Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups, the DMC(3)-study. *Pain*. 2003;**102**(1-2):167-78. [PubMed: 12620608].
2. Matthewson G, Beach CJ, Nelson AA, Woodmass JM, Ono Y, Boorman RS, et al. Partial thickness rotator cuff tears: current concepts. *Adv Orthop*. 2015;**2015**:458786. doi: 10.1155/2015/458786. [PubMed: 26171251].
3. Fukuda H. The management of partial-thickness tears of the rotator cuff. *J Bone Joint Surg Br*. 2003;**85**(1):3-11. [PubMed: 12585570].
4. Lamplot JD, Angeline M, Angeles J, Beederman M, Wagner E, Rastegar F, et al. Distinct effects of platelet-rich plasma and bmp13 on rotator cuff tendon injury healing in a rat model. *Am J Sports Med*. 2014;**42**(12):2877-87. doi: 10.1177/0363546514547171. [PubMed: 25193888].
5. Depres-Tremblay G, Chevrier A, Snow M, Hurtig MB, Rodeo S, Buschmann MD. Rotator cuff repair: a review of surgical techniques, animal models, and new technologies under development. *J Shoulder Elbow Surg*. 2016;**25**(12):2078-85. doi: 10.1016/j.jse.2016.06.009. [PubMed: 27554609].
6. Parada SA, Dilisio MF, Kennedy CD. Management of complications after rotator cuff surgery. *Curr Rev*

Musculoskelet Med. 2015;**8**(1):40-52. doi: 10.1007/s12178-014-9247-6. [PubMed: 25532916].
7. Guity MR, Eraghi AS. Open rotator cuff tear repair using deltopectoral approach. *Med Arch*. 2015;**69**(5):298-301. doi: 10.5455/medarh.2015.69.298-301. [PubMed: 26622080].
8. Zuke WA, Leroux TS, Gregory BP, Black A, Forsythe B, Romeo AA, et al. Establishing maximal medical improvement after arthroscopic rotator cuff repair. *Am J Sports Med.* 2017; **46**(4):1000-7. doi: 10.1177/0363546517707963. [PubMed: 28650679].
9. Burkhart SS, Lo IK. Arthroscopic rotator cuff repair. *J Am Acad Orthop Surg*. 2006;**14**(6):333-46. [PubMed: 16757673].
10. Bishop J, Klepps S, Lo IK, Bird J, Gladstone JN, Flatow EL. Cuff integrity after arthroscopic versus open rotator cuff repair: a prospective study. *J Shoulder Elbow Surg*. 2006;**15**(3):290-9. doi: 10.1016/j.jse.2005.09.017. [PubMed: 16679227].
11. Amstutz HC, Sew Hoy AL, Clarke IC. UCLA anatomic total shoulder arthroplasty. *Clin Orthop Relat Res*. 1981;**155**:7-20. [PubMed: 7226634].
12. Constant CR, Gerber C, Emery RJ, Søjbjerg JO, Gohlke F, Boileau P. A review of the Constant score: modifications and guidelines for its use. *J Shoulder Elbow Surg*. 2008;**17**(2):355-61. doi: 10.1016/j.jse.2007.06.022. [PubMed: 18218327].
13. Ide J, Maeda S, Takagi K. A comparison of arthroscopic and open rotator cuff repair. *Arthroscopy*. 2005;**21**(9):1090-8. doi: 10.1016/j.arthro.2005.05.010. [PubMed: 16171634].
14. Kim SH, Ha KI, Park JH, Kang JS, Oh SK, Oh I. Arthroscopic versus mini-open salvage repair of the rotator cuff tear: outcome analysis at 2 to 6 years' follow-up. *Arthroscopy*. 2003;**19**(7):746-54. [PubMed: 12966383].
15. Buess E, Steuber KU, Waibl B. Open versus arthroscopic rotator cuff repair: a comparative view of 96 cases. *Arthroscopy*. 2005;**21**(5):597-604. doi: 10.1016/j.arthro.2005.01.002. [PubMed: 15891728].
16. Millar NL, Wu X, Tantau R, Silverstone E, Murrell GA. Open versus two forms of arthroscopic rotator cuff repair. *Clin Orthop Relat Res*. 2009;**467**(4):966-78. doi: 10.1007/s11999-009-0706-0. [PubMed: 19184264].
17. 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**(11):1663-70. doi: 10.1007/s00264-011-1262-2. [PubMed: 21533643].