

ORTHOPAEDICS

ROTATOR CUFF TEAR: COMPARATIVE STUDY OF CLINICAL OUTCOMES IN ELDERLY AND YOUNG POPULATIONS AFTER ARTHROSCOPIC REPAIR

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Muhieddine HAMIE¹, Riad FAKIH^{1*}

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ABSTRACT • Background: Rotator cuff pathology is a major contributor to shoulder dysfunction, particularly in the elderly population. Elderly individuals have shown an increasing desire to remain physically active and have high expectations of treatment. The ideal method to provide pain relief and restore function is controversial, with some surgeons advocating conservative measures and others preferring surgical management. **Objectives:** The purpose of this study is to compare the outcomes of arthroscopically repaired rotator cuff tears in 92 patients aged 60 years and younger (group A: mean age 43 years) and in 63 patients older than 60 years (group B: mean age 67 years). **Methods:** The groups were similar in regard to surgical technique, and post-operative rehabilitation programs, but different in age. After careful arthroscopic evaluation of the full-thickness rotator cuff tear, rotator cuff repair was performed in all patients. Pre- and postoperatively, each patient was evaluated for range of motion, using UCLA, Constant and ASES (American Shoulder and Elbow Surgeons) shoulder scores. **Results:** Comparing pre- versus postoperative status at a minimum 6 months' follow-up, forward and lateral elevation, internal and external rotation, UCLA rating system score, Constant Shoulder Score and ASES improved significantly in both groups. **Conclusions:** In patients older than 60, arthroscopic rotator cuff repair can yield clinical and related quality of life outcomes comparable to those of patients younger than 60 years.

Keywords : shoulder; rotator cuff; age; treatment outcome

INTRODUCTION

Rotator cuff tears (RTC) are a common cause of shoulder pain and dysfunction [1,2], and may be traumatic or non-traumatic in origin [3-5]. According to Neer [6], the rotator cuff tears because the supraspinatus tendon impinges on the acromion [4,7,8] although more recent reports have emphasized the role of intrinsic tendon degeneration as the main cause of tears [9-11]. The prevalence of these tears is reported to be between 20% and 30% in those aged 60 to 80 years [12-14]. Surgery is often advocated as the treat-

Hamie M, Fakh R. Rupture de la coiffe des rotateurs. Comparaison des résultats cliniques après réparation arthroscopique entre 2 populations : (≤ 60 ans) et (> 60 ans). *J Med Liban* 2017 ; 65 (3) : 167-172.

RÉSUMÉ • Contexte: La pathologie de la coiffe des rotateurs est une cause principale du dysfonctionnement de l'épaule, surtout au-delà de 60 ans. Les personnes âgées souhaitent de plus en plus demeurer physiquement actives et recherchent un traitement efficace. La méthode idéale pour soulager la douleur et restaurer la fonction est controversée; certains chirurgiens recommandent des méthodes conservatrices, d'autres une solution chirurgicale. **Objectifs:** Cette étude vise à comparer les résultats de la réparation arthroscopique des déchirures de la coiffe des rotateurs chez 92 patients ≤ 60 ans (groupe A: âge moyen 43 ans) et chez 63 patients > 60 ans (groupe B: âge moyen 67 ans). **Méthodes:** Les groupes étaient similaires quant à la technique chirurgicale et aux programmes de réhabilitation postchirurgicale, mais différaient par l'âge. Après une évaluation arthroscopique approfondie de la déchirure de la coiffe des rotateurs une réparation a été effectuée chez tous les patients. Avant et après l'opération, l'amplitude de mouvement chez chaque patient a été évaluée à l'aide des bilans suivants: *UCLA Shoulder Score*, *Constant Shoulder Score* et *l'American Shoulder and Elbow Surgeons Shoulder Score (ASES)*. **Résultats:** En comparant l'état pré- versus postopératoire, à un minimum de six mois de suivi, l'élévation frontale et latérale, la rotation interne et externe, les scores UCLA, Constant et ASES ont été significativement améliorés dans les deux groupes. **Conclusion:** Chez les patients > 60 ans, la réparation arthroscopique des déchirures de la coiffe des rotateurs peut procurer des résultats cliniques et une qualité de vie améliorée comparables à ceux des patients < 60 ans.

ment of choice even in the elderly population, but there is a lack of robust evidence [15-17]. At least 250 000 rotator cuff repairs are performed each year in the United States, with estimated direct costs of \$3 billion [18].

Older individuals have a number of factors that work against obtaining good results after surgery. Patients older than 60 years are three times more likely to experience massive rotator cuff tears compared with younger patients [4]. Bone quality decreases with age and may complicate anchor suture fixation. Lamellar dissection and fatty infiltration are more common in elderly individuals [13]. Healing may be impaired by poor blood supply, as histologic examination of rotator cuff tendon tissue has shown decreased vascularity in older patients. Furthermore, comorbid conditions such as diabetes, rheumatoid arthritis, and renal disease are more prevalent in older individuals.

From Beirut, Lebanon, ¹Orthopaedic Surgery, Makassed General Hospital, ²Beirut Arab University & Orthopaedic Surgery, Clemenceau Medical Center.

*Corresponding author: *Riad Fakh, MD.*
e-mail: riadfakh@gmail.com

All the aforementioned factors can make rotator cuff repair more challenging and clinical outcomes less predictable in the elderly patients.

The purpose of this study was to evaluate and compare the clinical outcomes of rotator cuff repairs in patients older than 60 years and those younger than 60 years.

METHODS

This was a retrospective study, and final approval of exemption by the institutional review board at our institution was obtained.

Patient selection

All data were collected prospectively and entered into a research database – this was a secondary, retrospective analysis of prospectively collected data. Patient demographics including age, sex, and site of injury were recorded. A single senior surgeon evaluated each patient and made the decision to proceed with surgery.

Patients were excluded if they had stiffness of the glenohumeral joint, glenohumeral osteoarthritis with present osteophytes in radiographs, systemic corticosteroid or antimetabolite medication, significant malignant, hematological, endocrine, metabolic, rheumatoid or gastrointestinal disease, and previous surgery of same shoulder.

From January 2010 to December 2015, 79 consecutive shoulders underwent arthroscopic rotator cuff repair for the treatment of full-thickness rotator cuff tears. Physical examination was used to identify patients with a painful arc, positive impingement signs, and clinical evidence of rotator cuff weakness.

The diagnosis of full-thickness RCT was confirmed on preoperative MRI (1.5 T), (two coronal oblique acquisitions, two sagittal oblique acquisitions, and a single axial plane), and also confirmed by arthroscopic findings. The sizes of the rotator cuff tears were measured intraoperatively according to the classification of DeOrio and Cofield [19] by assessing the anteroposterior dimension with the use of a calibrated probe introduced through the posterior portal with a view from the lateral portal. The tear sizes were categorized into small to medium (1 to 3 cm), large (3 to 5 cm), and massive (> 5 cm).

Fifty-six patients were operated on for unilateral repairable cuff tears between January 2010 and December 2015 by a single fully trained orthopedic surgeon with a special interest in arthroscopic surgery; these patients met our inclusion criteria and were prospectively enrolled in our study. There were two groups, according to the age of the patients: under 60 rotator cuff repair (group A) and over 60 rotator cuff repair group (group B). Group A included 54 patients, 31 men and 23 women, with a mean age of 43. Group B included 25 patients, 6 men and 19 women, with a mean age of 67 years. The dominant arm was affected in 45 patients in group A and in 19 patients in group B and with no significant difference between the two groups.

Preoperative and postoperative evaluations

Patients were examined 1 day before operation and during the follow-up period. They were evaluated at admission for the procedure and at 3, 6, 9, and 12 months, and then yearly postoperatively. A single senior orthopedic surgeon examined the patients both before and after surgery. All the operative results were analyzed at the final follow-up. Preoperative and postoperative shoulder motions including active forward flexion (FF), external rotation (ER) at the side, and abduction (Abd) were measured by a goniometer. Internal rotation (IR) to the posterior was measured by the vertebral level of the hand. Constant shoulder score [20], University of California Los Angeles (UCLA) [21] scoring systems and the American Shoulder and Elbow Surgeons score [22] were used to assess progress and outcome.

Operative technique

All operations were performed by the senior surgeon with the patient in the lateral position. A posterior viewing portal and an anterior working portal were used to assess the glenohumeral joint. After diagnostic arthroscopy was performed through the posterior portal, the arthroscope was inserted through the posterior portal to the subacromial space, and a lateral portal was created. The tear was then measured in the anterior-posterior (AP) and medial-lateral (ML) dimensions with the use of a marked, graduated probe. The footprint was identified in the greater tuberosity and prepared, using the shaver to obtain a bleeding surface.

Depending on the tear morphology, a combination of margin convergence and double-loaded 4.5-mm suture anchors were used to obtain repair. The majority (2/3) of tears were treated with a single-row technique; the senior surgeon performed a double-row repair for medium tears with crescent-shaped pattern, occasionally for large tears with a crescent pattern and L-shaped tears with a long AP component and short ML dimension. Subacromial decompression was done if space was too narrow and coraco-acromial ligament was always preserved. Biceps tenodesis was done if there was degeneration of biceps tendon in group B.

Postoperative rehabilitation

All patients entered a standardized rehabilitation program, consisting of 6 weeks in a sling, with passive and limited active range of motion allowed. At 6 weeks, the sling was discontinued and patients were allowed to commence unrestricted active range of motion and light resistance exercises followed at 12 weeks by resistance and weight exercises, with return to full activity at 6 months.

Statistical analysis

Patients were categorized into two groups based on their age: the younger age group included patients \leq 60 years (group A), and the older age group patients > 60 years (group B). Data was analyzed using SPSS version 21 with a p -value < 0.05 considered statistically significant.

Categorical variables are presented as number and percent, whereas continuous variables presented as mean and standard deviation.

Bivariate analysis was carried out using the χ^2 test for comparing categorical variables, and the Student's t-test for comparing continuous variables.

Multivariate regression was used to control confounding variables.

RESULTS

Preoperative patient demographics

The mean age at surgery for patients in group A was 43.7 years and 67.6 years in group B ($p < 0.0001$). There were 92 patients in group A. Among them, 53 (57.6%) were male and 39 (42.4%) were female. There were 63 patients in group B. Among them, 15 (23.8%) were male and 48 (76.2%) were female. The follow-up period was 6 months for both groups.

The mean intraoperative tear size was 2.83 cm for group A and 3.68 cm for group B. There were 64 (69.6%) small to medium tears, 17 (18.5%) large tears, and 11 (11.9%) massive tears in group A compared with 13 (20.6%) small to medium tears, 35 (55.6%) large, and 15 (23.8%) massive tears in group B. Dominant-side involvement occurred in 80 (87%) cases in group A and in 48 (76.2%) cases in group B.

There were significant differences in sex distribution and tear size between the 2 groups ($p = 0.008$ and $p < 0.001$ respectively), but no significant difference in dominant side involvement ($p = 0.54$) (Table I).

Clinical outcomes

The mean UCLA score increased from 12.59 (± 2.38) preoperatively to 32.28 (± 2.18) at the final follow-up in group A ($p < .0001$). Similarly, it improved from 10.52 (± 2.00) preoperatively to 30.48 (± 2.04) at the final follow-up in group B ($p < .0001$).

The mean Constant score increased from 39.67 (± 6.71) preoperatively to 85.57 (± 9.328) at the final follow-up in group A ($p < .0001$) and also improved from 34.80 (± 7.89) preoperatively to 80.44 (± 4.21) at the final follow-up in group B ($p < .0001$).

The mean ASES score increased from 34.25 (± 7.19) preoperatively to 85.12 (± 5.71) at the final follow-up in group A ($p < .0001$) and also improved from 29.89 (± 6.47) to 81.53 (± 4.21) at the final follow-up ($p < .0001$).

	Group A N = 92	Group B N = 63	p-value
Mean age	43.70 (± 9.21)	67.60 (± 4.91)	< 0.0001
Male	53 (57.6%)	15 (23.8%)	0.008
Female	39 (42.4%)	48 (76.2%)	
Dominant side involvement	80 (87%)	48 (76.2%)	0.540
Mean tear size (cm)	2.83	3.68	
Small to medium	64 (69.6%)	17 (18.5%)	< 0.001
Large	11 (11.9%)	13 (20.6%)	
Massive	35 (55.6%)	15 (23.8%)	

However, there was no significant difference in the UCLA, ASES and Constant scores between the two groups preoperatively and at the final follow-up but no significant difference in improvement between the two groups (Table II).

Range of motion (Table III)

Forward flexion improved from a range of 91-120° to a range of 151-180° at final follow-up for patients in group A, and also improved from a range of 61-90° preoperatively to 121-150° at final follow-up in group B with significant difference ($p < 0.0001$) in improvement within each group but not between the 2 groups.

Lateral elevation improved from a range of 61-90° to a range of 121-180° in group A; similarly in group B improvement from a 31-60° range to a 121-150° range for patients in group B at final follow-up with significant difference ($p < 0.0001$) in improvement within each group but not between the two groups.

External rotation improved from < hands on top of head with elbow forward > to < full elevation > for patients in group A. Improvement was also noticed in group B where external rotation improved from < hand behind head, elbow back > to < hand top of head, elbow back > at final follow-up with significant difference ($p < 0.0001$) in improvement within each group but not between the two groups.

Internal rotation improved in group A reaching by hand the lumbosacral junction to the interscapular area; similarly in group B improvement from hand reaching buttock to T12 at final follow-up, with significant difference ($p < 0.0001$) in improvement within each but not between the two groups.

TABLE II CLINICAL OUTCOMES OF PATIENTS IN GROUP A & B

Variable	GROUP A			GROUP B			p*
	Preoperatively	Postoperatively	p	Preoperatively	Postoperatively	p	
UCLA	12.59 (± 2.38)	32.28 (± 2.18)	< 0.0001	10.52 (± 2.00)	30.48 (± 2.04)	< 0.0001	0.28
ASES	34.25 (± 7.19)	85.12 (± 5.71)	< 0.0001	29.89 (± 6.47)	81.53 (± 4.21)	< 0.0001	0.32
Constant Shoulder Score	39.67 (± 6.71)	85.57 (± 9.328)	< 0.0001	34.80 (± 7.89)	80.44 (± 4.21)	< 0.0001	0.25

UCLA: University of California Los Angeles scoring systems ASES: American Shoulder and Elbow Surgeons shoulder score
p*: Differences in postoperative range of motion between groups. Statistically significant ($p < 0.05$)

DISCUSSION

This study assessed rotator cuff rupture characteristics and compared the functional outcome after arthroscopic rotator cuff repair in two age groups: patients older than 60 years versus patients younger than 60 years. According to our results, rotator cuff tears in patients older than 60 years are characterized by greater size than in patients younger than 60 years. Shoulder function is improved in all patients after arthroscopic rotator cuff repair.

Many authors have reported improved clinical outcomes after rotator cuff repair in elderly patients. Grondel *et al.* [23] reported an improvement from a preoperative UCLA score of 12.9 to 32.4 postoperatively, with 87% good and excellent results in 92 of 97 shoulders in patients older than 62 years of age. Yel *et al.* [24] evaluated 51 shoulders in patients older than 65 years and reported satisfactory results in 94.1% of patients, a Constant score of 82 points.

The reported result of arthroscopic rotator cuff repair in younger patients may be better. Krishnan *et al.* [25] performed a retrospective review of 23 patients under 40 (mean age of 37) undergoing arthroscopic repair of RCT with a mean size of 2.4 cm – at minimum 2-year follow-up, the mean ASES had increased from 42 to 92. Lin *et al.* [26] reviewed 53 patients under 45 (mean age of 37.5) undergoing arthroscopic repair of full-thickness RCT – at a mean follow-up of 35.8 months, the mean ASES score was 84.6, with 91% (43/47) patients returning to work. Burns and Snyder [27] reported on 41 shoulders under 50 after arthroscopic repair at a minimum of 3-year follow-up using the UCLA score, 39 of 41 (85%) had a good or excellent outcome.

The principal findings of this study show that range of motion, and functional status were significantly improved after arthroscopic rotator cuff repair (ARCR) in patients aged 60 years or older. Previously published reports on rotator cuff repair in the elderly have reported good

TABLE III COMPARISON BETWEEN PRE- AND POSTOPERATIVE RANGE OF MOTION

		≤ 60 years			> 60 years			p*
		Preoperative N = 92	Postoperative (Follow-up) N = 92	p-value	Preoperative N = 63	Postoperative (Follow-up) N = 63	p-value	
Lateral elevation	31-60	7 (7.6%)	2 (2.2%)	< 0.0001	33 (52.4%)	0 (0.0%)	< 0.0001	0.2
	61-90	53 (57.6%)	0 (0.0%)		28 (44.4%)	0 (0.0%)		
	91-120	32 (34.8%)	0 (0.0%)		2 (3.2%)	20 (31.7%)		
	121-150	0 (0.0%)	51 (55.4%)		0 (0.0%)	21 (33.3%)		
	151-180	0 (0.0%)	39 (42.4%)		0 (0.0%)	22 (35%)		
Forward flexion	31-60	2 (2.2%)	0 (0.0%)	< 0.0001	8 (12.7%)	0 (0.0%)	< 0.0001	0.5
	61-90	15 (16.3%)	0 (0.0%)		43 (68.3%)	0 (0.0%)		
	91-120	60 (65.2%)	0 (0.0%)		10 (15.9%)	3 (4.8%)		
	121-150	15 (16.3%)	14 (15.2%)		2 (3.1%)	28 (44.4%)		
	151-180	0 (0.0%)	78 (84.8%)		0 (0.0%)	32 (50.8%)		
External rotation	Hand behind head	4 (4.3%)	0 (0.0%)	< 0.0001	25 (39.7%)	0 (0.0%)	< 0.0001	0.1
	Elbow forward							
	Hand behind head	28 (30.4%)	0 (0.0%)		30 (47.6%)	0 (0.0%)		
	Elbow back							
	Hand top of head	57 (62.0%)	0 (0.0%)		8 (12.7%)	13 (20.6%)		
	Elbow forward							
	Hand top of head	3 (3.3%)	32 (34.8%)		0 (0.0%)	30 (47.6%)		
Elbow back								
Full elevation	0 (0.0%)	60 (65.2%)	0 (0.0%)	20 (31.8%)				
Internal rotation	Lateral thigh	0 (0.0%)	0 (0.0%)	< 0.0001	4 (6.3%)	0 (0.0%)	< 0.0001	0.25
	Buttock	9 (9.8%)	0 (0.0%)		39 (61.9%)	0 (0.0%)		
	Lumbosacral junction	70 (76.1%)	0 (0.0%)		20 (31.8%)	0 (0.0%)		
	Waist	13 (14.1%)	0 (0.0%)		0 (0.0%)	6 (9.5%)		
	T12	0 (0.0%)	42 (45.7%)		0 (0.0%)	30 (47.6%)		
	Interscapular	0 (0.0%)	50 (54.3%)		0 (0.0%)	27 (42.9%)		

*Differences in postoperative range of motion between groups. Statistically significant ($p < 0.05$)

outcomes consistent with many findings in this article. Worland *et al.*, [28] in a retrospective review of 69 patients over the age of 70 years, showed good or excellent results after open rotator cuff repair in 78.2% of patients. Grondel *et al.* [23] reported good to excellent results in 87% of patients aged 62 years or older. In their study 105 consecutive patients were retrospectively reviewed, 92% of whom underwent repair with a mini open approach and 8% of whom underwent repair arthroscopically. Rebuzzi *et al.*, [29] investigating outcomes of ARCR in 64 patients aged over 60 years, showed good or excellent results in 81.4% of the cohort. Similar to the findings in this study, active forward flexion of those patients increased 30° after ARCR [30]. Flurin *et al.* [30] reported improvement from a preoperative Constant score of 44 to 76 postoperatively and an American Shoulder and Elbow Surgeons (ASES) score of 35 to 54 postoperatively at 1 year follow-up in patients ≥ 70 years of age. Robinson *et al.* [31] evaluated the arthroscopic rotator cuff repair of 68 patients ≥ 70 years of age. They reported an improved Constant score from 23 preoperatively to 58 at the final follow-up in patients ≥ 70 years of age. Verma *et al.* [32] evaluated 39 shoulders in patients ≥ 70 years undergoing arthroscopic repair of RCT. They reported that the ASES score improved from 45.8 to 87.5 at final follow-up. Worland *et al.* [28] studied 69 open rotator cuff repairs in patients aged ≥ 70 years. Finally, Lam and Mok, [33] investigating 74 consecutive patients aged 65 years or older who were treated with open rotator cuff repair, reported that the mean Constant score was 63, a figure slightly lower than the results in this study.

LIMITATIONS

The current study has a few limitations. First, our study could provide analysis of results with a minimum follow-up of 6 months only. Further, longer term follow-up studies with a larger group of patients would be needed. However, our study can provide valuable information on clinical outcomes after rotator cuff repair in patients older and younger than 60 years. Second, with regard to postoperative imaging evaluation, the postoperative repair integrity was not analyzed by arthrography and MRI at follow-up to demonstrate tendon integrity after repair. Furthermore, we have no data regarding return to work, return to sport, or satisfaction rates in this patient cohort – future studies should include such information. Nevertheless, there are also several strengths to the present study. First, all the surgery was performed by one senior surgeon. And currently, there are only a few published articles on the evaluation and comparison of clinical results in elderly and young patients.

CONCLUSIONS

Both group of patients showed significant improvement in clinical outcomes and range of motion after rotator cuff repair, and with no significant difference in improve-

ment between the two groups showing that clinical outcome and range of motion is similar after arthroscopic rotator cuff repair. Healing potential can be expected in elderly patients aged > 60 years who have RCT and in whom surgical repair can be attempted.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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