

## Clinical Outcome of Arthroscopic Rotator Cuff Repair in Patients Aged 70 Years and Older

Ashish Babhulkar<sup>1</sup>, FRCS; Ravikumar<sup>1</sup>, MS; Prateek Patil<sup>1</sup>, MS; Vimal Kumar<sup>1</sup>, MS

<sup>1</sup> Department of Shoulder & Sports injuries, Deenanath Mangeshkar Hospital, Pune, India

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**Correspondence to:** Ashish Babhulkar, Deenanath Mangeshkar Hospital, Pune, India  
Email: [docshoulder@gmail.com](mailto:docshoulder@gmail.com)  
Telephone: +91-20-49153122

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### ABSTRACT

**AIM:** The purpose of this study was to evaluate the outcome of arthroscopic rotator cuff repair in patients aged 70 years or older and report our results in terms of pain, range of motion, muscle strength, and functional outcome.

**MATERIALS AND METHODS:** We performed retrospective data review and identified 97 shoulders (94 patients) of our interest with minimum 24 months of follow-up. All patients were evaluated with Visual Analogue Scale (VAS), Range of motion (ROM), Manual Muscle Strength, and Oxford Shoulder Score (OSS) preoperatively and at final follow-up. Patient satisfaction was determined by asking patients whether they were satisfied (yes or no). Statistical analysis was performed using paired *t* test to compare pre and postoperative measures and Mann-Whitney U test to see the effect of age and gender on the final outcome.

**RESULTS:** Of 97 shoulders, 70 (67.9%) shoulders were available

for final evaluation with a mean age of 73.56 years (70 to 81) and mean follow-up of 57.52 months (24 to 122). Mean VAS for pain was improved from 8.4 (6 to 10) to 1.04 (0 to 5) ( $p < 0.001$ ) at final follow-up. Mean forward flexion, abduction, external rotation increased from 112.50° to 165.43° ( $p < 0.001$ ), 114.36° to 166.86° ( $p < 0.001$ ), 45.14° to 73.64° ( $p < 0.001$ ) respectively, as well as, Internal rotation also improved in 55 patients (78.5%,  $n = 70$ ) at final follow-up. Mean muscle strength of Supraspinatus (SSP) and Infraspinatus (ISP) according to MRC scale was significantly improved ( $p < 0.05$ ) from 2.84 (2 to 4) to 4.67 (4 to 5) and from 2.77 (2 to 4) to 4.64 (3 to 5) at the final follow-up respectively. Mean OSS was improved from 11.49 to 44.40 ( $p < 0.001$ ) and only three patients (4.28%,  $n = 70$ ) were subjectively less than satisfied at final follow-up.

**CONCLUSIONS:** There was a significant improvement in shoulder function with a low complication rate. Hence, we have no hesitation to recommend repair in this age group. Provided the rotator cuff is not grossly wasted, and patient is fit to undergo surgery, age should not be the criteria for determining repairability.

**Key words:** Rotator cuff repair; Above 70; Elderly Arthroscopic rotator cuff; Rotator cuff

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### INTRODUCTION

Incidence of rotator cuff tears in the general population is between 5% to 30%. However, in population over 65 years of age this incidence reaches up to 25%<sup>[1]</sup>. Prevalence rate of asymptomatic cuff tears has been reported to be 40.7%<sup>[2]</sup>. This prevalence can rise beyond 50% in individuals over age of 80 years<sup>[2,3]</sup>.

With the steady and sustained rise of life expectancy globally, prevalence of rotator cuff tears will inevitably increase<sup>[4]</sup> and clinicians are frequently confronted by elderly patients with symptomatic rotator cuff tears. Rotator cuff repair in the elderly can

be fraught with challenges and surgery has its limitations in this population for several reasons and also may not yield comparable results as in younger patients. The elderly are more likely to have osteoporosis of the proximal humerus which may significantly compromise suture anchor fixation. Poor tendon quality<sup>[5]</sup> and thereby likelihood of a larger tear size, could potentially increase the difficulty of repair<sup>[6]</sup>. Elderly rotator cuffs are associated with greater tendon degeneration, reduced cellular activity and poorer potential for healing<sup>[7-10]</sup>. Increasing age is also associated with a high rate of re-rupture following repair<sup>[10,11]</sup>. Moreover, elderly people are more likely to have serious comorbidities (diabetes mellitus, rheumatoid arthritis, and renal diseases), which may further challenge their surgical recovery<sup>[4,5]</sup>. Some surgeons have historically avoided operative management in this elderly group because of these concerns and there was lack of unanimity over repair versus conservative treatment in this age group.

Presently, it is well established that rotator cuff repair provides consistently better results than debridement alone<sup>[12-15]</sup>. With the advent of primary Reverse Shoulder Arthroplasty (RSA) in this age group, which perhaps may avoid the debatable task of healing of rotator cuff repair<sup>[16]</sup>, there is always a clinical predicament, in the elderly age group, over the choice between a primary rotator cuff repair versus primary RSA. Amid all confusion and controversies, there are surgeons who recommended repair for all symptomatic individuals, regardless of age<sup>[6]</sup>. However, there is a genuine paucity of literature recommending rotator cuff repair in patients aged 70 years and older<sup>[17,18]</sup> and only a few studies have published all arthroscopic rotator cuff repair (ARCR) in this particular age group<sup>[15,19]</sup>.

The purpose of this study was to evaluate the outcome of ARCR in patients aged 70 years or older and report our results in terms of pain, range of motion, muscle strength, and functional outcome. Our hypothesis iterates that the results of ARCR in patients 70 years and older are satisfactory and primary repair is indicated. Age should not be a criterion for determining the repairability.

## MATERIAL AND METHODS

We performed a retrospective data review from our consecutive ARCR patients above the age of 70. The database search identified our patient population of interest and provided patient age, gender, hand dominance, date of surgery and period of follow-up. Between December 2005 to August 2015, we identified 97 shoulders (94 patients) of our interest with a minimum of 24 months follow-up. Inclusion criteria consisted of patients with symptomatic full-thickness rotator cuff tears who underwent primary ARCR with suture anchors at age 70 years or older. We had excluded patients who were younger than 70 years at the time of ARCR and cases of revision repair and repair of partial rotator cuff tears. Patients with concomitant procedures such as Bankart repair with ARCR, Adhesiolysis with ARCR and Mumford with ARCR were excluded to maintain a uniform cohort.

Patients meeting the inclusion criteria were contacted to participate in this study, which was approved by our institutional review board. Apart from demographic information, social history, detailed medical history and surgical history, the preoperative objective assessment form also includes 4 assessment tools: pain on Visual Analog Scale (VAS)<sup>[20-22]</sup>, Manual Muscle Strength Testing using Medical Research Council scale (MRC scale)<sup>[23]</sup>, Range of Motion (ROM) and Oxford Shoulder Score for functional assessment (OSS). Operative records were reviewed to identify intra-operative factors of interest including

both diagnostic information and concomitant procedures performed at the time of surgery.

Operations were performed using standard anesthesia as well as standard techniques and portals. All operations were performed by the senior author. Subacromial decompression and mobilization of the cuff with spino-glenoid notch decompression was performed in all patients irrespective of tear size and retractability of the rotator cuff. Postoperatively arm was placed in elbow pouch sling intermittently however, patients were allowed leave the operated arm free without active ranges. Patients were allowed to do activities of daily living below shoulder level within their pain limits - like lifting a cup of tea, wiping a table etc. Active assisted movements are started at 3<sup>rd</sup> week though supervised rehab is started at sixth week. At six weeks after surgery, patients underwent supervised PSRP (Pune Shoulder Rehabilitation Program) which is standard post-operative rehabilitation at our center. This involves scapular stabilization, rotator cuff strengthening with elastic bands ad capsular stretches and core strengthening. Patients were reviewed at 3 weeks, 6 weeks, 12 weeks, 6 months and at 1 year, and thereafter followed up annually.

Failure of ARCR was defined in shoulders requiring additional revision rotator cuff repair or RSA. At final follow-up, all examinations were performed by a clinical fellow (as a third party research fellow) at the shoulder department and were evaluated for VAS, ROM, manual muscle Strength according to MRC scale and OSS. The subjective assessment was determined by asking patients whether they were satisfied (yes or no). ROM includes forward elevation, abduction in the scapular plane, external rotation and internal rotation. We further divided patients into two groups to observe the effect of age ( $\leq 75$  years and  $> 75$  years) and gender (male & female) on the final outcome.

Statistical analysis was performed using **paired t test** to compare preoperative VAS, ROM, Manual strength testing and OSS with corresponding measures at final follow-up and **Mann-Whitney U test** to see the effect of age and gender on the outcome. P value 0.05 was considered statistically significant.

## RESULTS

Out of 97 shoulders, 19 shoulders were lost to follow-up, Five patients expired (including 1 bilateral repair), two shoulders were unable to use their operated extremity because of subsequent stroke, One patient underwent revision with a RSA after three years of repair due to failure of repair. 70 (37 male and 33 female) shoulders were available for the final follow-up, and were further divided into two groups based on age and gender. The mean age was 73.56 years (70 to 81) with a mean follow-up of 57.52 months (24 to 122). 55 cases were in  $\leq 75$  years of age group and 15 cases were in  $> 75$  years of age group. 7 patients had hypertension, 6 patients had diabetes, 3 patients had hypothyroidism, one had rheumatoid arthritis and one had carcinoma breast that was treated recently. Few concomitant surgeries were also performed along with ARCR (Table 1).

At the final follow-up, pain was decreased significantly ( $p < 0.001$ ) and VAS score at final follow-up improved to 1.04 (0 to 5) from 8.4 (6 to 10) pre-operatively. Mean forward flexion increased by 52.9° ( $p < 0.001$ ) from 112.50° (45 to 180°) pre-operatively to 165.43° (90 to 180°) at final follow-up. Mean abduction and external rotation also improved significantly by 52.5° ( $p < 0.001$ ) from 114.36° (40 to 170°) pre-operatively to 166.86° (100° to 170°) at final follow-up and by 28.5° ( $p < 0.001$ ) from 45.14° (0 to 90°) pre-operatively to 73.64° (30 to 90°) at final follow-up respectively (Table 2). Internal rotation (IR) was improved in 55 patients and in 12 patients it remained at

the same level and actually deteriorated in 3 patients at final follow-up (Figure 1). Mean muscle strength of SSP and ISP was improved significantly ( $p < 0.05$ ) from 2.84 (2 to 4) to 4.67 (4 to 5) and from 2.77 (2 to 4) to 4.64 (3 to 5) at final follow-up respectively (Table 2). The mean OSS also improved significantly at final follow-up by 32.9 ( $p < 0.001$ ) from 11.49 (3 to 19) preoperatively to 44.40 (24 to 48) at final follow-up (Table 2). 67 (95.3%) patients were satisfied and only 3 (4.3%) were unsatisfied. Apart from the above, we also studied the effect of age and gender on outcome measures at final follow-up. We could not find any statistical difference between stratified age groups & sex differences (Figure 2 and 3).

The outcomes were also stratified between average, good and excellent groups between males & females and even then there was no statistically recordable change between the two groups (Table 3). Six (8.6%) patients presented with complication postoperatively. Three patients developed stiff shoulder, one patient developed urinary tract infection, one patient presented with a hematoma in the anterolateral portal which resolved spontaneously and one patient presented with stitch abscess which settled with oral antibiotics.

## DISCUSSION

As patients live longer and grow older the challenging question is at what age does the surgeon stop advising a rotator cuff repair. Seventy perhaps was an arbitrary age limit to test the success of a rotator cuff repair and there are only a few studies<sup>[15,17-19]</sup> which have highlighted successful repairs above 70 years of age. With the aging population, it is not unusual to have above 70-year individuals living independently, some even pursuing their sporting passion. In symptomatic patients with rotator cuff tear, a rotator cuff repair is pertinent, as they wish to have an optimal functional recovery to support their active lifestyle. We believe a formal repair is far superior to, merely offering an

**Table 1** Concomitant surgical procedures.

Surgical procedure	No. of shoulders (%)
Subacromial Decompression	70 (100)
Acromioplasty	14 (20)
Biceps Tenotomy	7 (10)
Subscapularis Repair with Tenodesis	24 (34.2)
Bony Bankart Repair	1 (1.4)
Calcification Removal	1 (1.4)
Suprascapular Nerve Decompression	1 (1.4)

**Table 2** Functional outcome of ARCR.

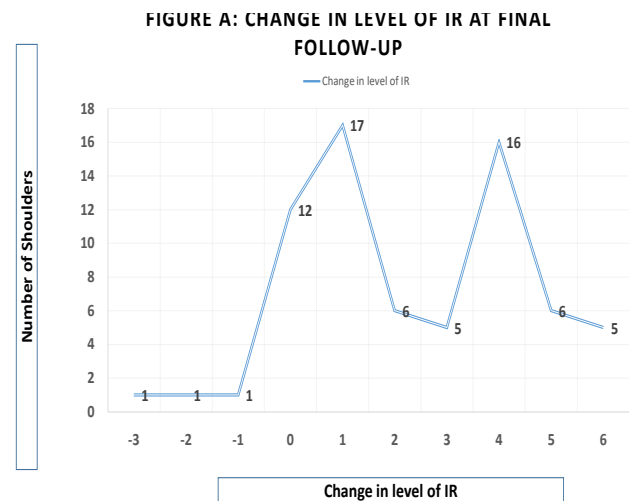
Outcome measure	Pre-op (mean ± sd)	At final f/up (mean ± sd)	P value
VAS (0-10)	8.4 ± 0.9	1.04 ± 1.45	< 0.001
Forward flexion (°)	112 ± 26.54	165.43 ± 19.54	< 0.001
Abduction (°)	114.36 ± 27.08	166.86 ± 18.22	< 0.001
External rotation (°)	45.14 ± 14.77	73.64 ± 17.98	< 0.001
SSP Strength (0-5)	2.84 ± 0.40	4.60 ± 0.47	<0.05
ISP Strength (0-5)	2.77 ± 0.49	4.64 ± 0.59	<0.05
OSS (0-48)	11.49 ± 4.38	44.40 ± 5.64	< 0.001

**Table 3** Genderwise OSS.

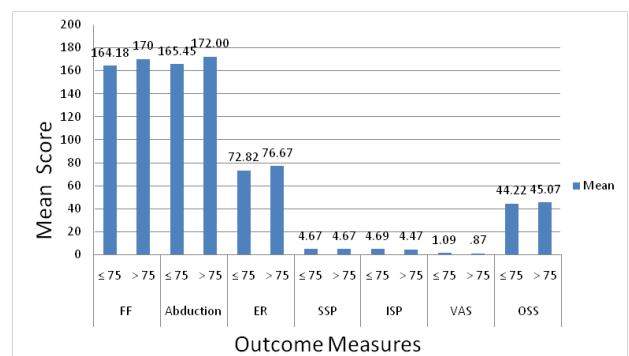
Sex	OSS Group			Total
	Average (20-29)	Good (30-39)	Excellent (40-48)	
Male	1	3	33	37
Female	1	4	28	33
Total	2	7	61	70

acromioplasty or debridement by itself.

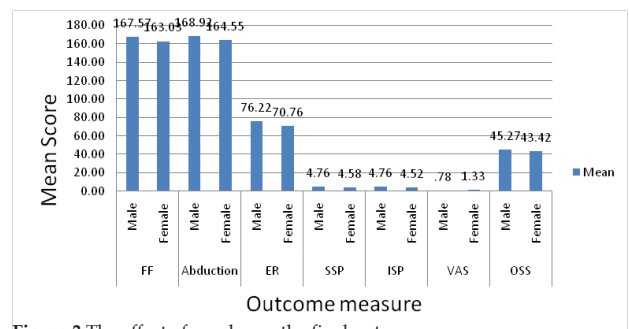
The findings of our study support our hypothesis and show that ROM, pain, functional status, and patient satisfaction were



**Figure 1** Change in level of IR at final follow-up.

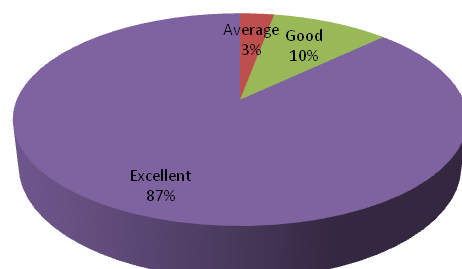


**Figure 2** Effect of Age - Between less than 75 years & more than 75 years on the final outcome.



**Figure 3** The effect of gender on the final outcome.

## Functional status according to OSS



**Figure 4** Functional status according to the Oxford Shoulder Score at the final follow up.

significantly improved after ARCR in patients aged 70 years or older with full-thickness cuff tears. This is the largest single surgeon series, till date, of “all-arthroscopic repair” in this age group, to the best of our knowledge. Findings in this article are comparable to previously published reports on rotator cuff repair in patients aged over 70. Worland *et al*<sup>[17]</sup> 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. Worland published his results in 1999 on patients who underwent Mini Open cuff repair with a clavicle osteotomy and used a bone trough without suture anchors to repair the torn rotator cuff. Carvalho *et al*<sup>[18]</sup> reported good to excellent results in 92.7% of patients aged 70 years or older. In their study, a retrospective review of 88 consecutive patients, all patients underwent repair with a mini-open approach. A confounder in Carvalho’s series was -- all patients who underwent mini-open rotator cuff repair also underwent an acromioplasty. Verma *et al*<sup>[19]</sup> retrospectively reviewed 39 patients aged 70 years and older and reported good to excellent results in 97.4% patients after all arthroscopic repair. Seven (18%) out of 39 patients had a large or massive tear. In our series of 70 patients, 17 (24%) of patients had a large to massive cuff tear. As per the Oxford Shoulder Score (OSS), we had 97.1% good to excellent results, 2.9% average results and no patients in the poor category (Figure 4) which are comparable to Verma *et al* series.

The incidence of subscapularis tear in our series is 34.2% (24/70) which is comparable to the existing literature<sup>[24-27]</sup>, which probably suggests that the incidence of subscapularis tear does not apparently increase with increasing age. One finding in our study is we had 15 cases in which internal rotation was not improved at final follow-up. Out of these 15 cases, 9 cases (60%) were found to be clustered in a follow-up period of 51 to 110 months.

We have also observed some complications in our patients like shoulder stiffness, Urinary Tract Infection (UTI), hematoma at portal site and stitch abscess. The post-operative complication of our series of 8.6% is comparable with the published literature<sup>[24]</sup>. Brislin *et al*<sup>[24]</sup> reviewed 263 patients undergoing primary ARCR and complications occurred in 10.6% of their series. Based on the current study, we can conclude that the complication rate has not increased in this elderly cohort.

The senior author does not approve of mere debridement or plain acromioplasty in elderly patients with rotator cuff tear. Hence, the study reflects the results of patients who had a repairable tear and in such cases, a successful result can be expected in a majority of the patients. Also, we recommend counseling of senior citizen who undergo ARCR, on compliance for rehab and possible prolonged duration of recovery prior to surgery.

The strength of our study is the population group, sample size and mean follow-up period. To our best knowledge, this study appears to have the largest sample size in the literature which looks specifically at all “arthroscopic rotator cuff repair” in patients aged 70 years and older. However, this study does not reflect the number of patients who were refused Arthroscopic repair due to poor health, severe wasting of rotator cuff muscles and irreparable status. This remains a weakness of our study. Also, the authors admit this is a retrospective study without a comparison group. Nevertheless, this remains the largest single surgeon Arthroscopic rotator cuff repair cohort and the results endorse the confidence we bear in offering arthroscopic repair to elderly group. There are some other limitations too, like postoperatively, we have not assessed the integrity of the cuff repair. Albeit the association of structural failure with clinical outcome is poorly defined, but it is known that there is a known incidence of recurrent defects after rotator cuff repair in all age groups<sup>[25-28]</sup>

and lastly, since we have included all consecutive patients with arthroscopic rotator cuff repair above 70 years we can claim to have eliminated compliance bias.

## CONCLUSIONS

There was 97.1% good to excellent rate among the patients in this study. The results of arthroscopic rotator cuff repair in a patient aged 70 years and older are satisfactory with a low complication rate and post op improvement was statistically significant. There was no statistically significant difference between age (< 75 & > 75) or male and female patients in our study. There was a significant improvement in shoulder function with a low complication rate. Hence, we have no hesitation to recommend repair in this age group. Provided the rotator cuff is not grossly wasted, and patient is fit to undergo surgery, age should not be the criteria for determining repairability. Age should not be the criteria for determining the repairability provided, the patient is fit and the rotator cuff is not grossly wasted and is a repairable tear.

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