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Do elderly patients gain as much benefit from arthroscopic rotator cuff repair as their younger peers?

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Background: This study was conducted to ascertain whether patients aged older than 75 years achieve outcomes after arthroscopic rotator cuff repair comparable to younger patients.

Methods: Arthroscopic cuff repair was performed in 60 shoulders of 59 patients aged older than 75 years. A control group of 60 younger patients, matched for sex, tear size, and American Society of Anesthesiology Functional Classification grade were included. Surgery occurred from 2006 to 2016. Prospective outcomes were the Constant score (CS), Subjective Shoulder Value, pain, satisfaction, and operative complications. Mean follow-up was 29 months.

Results: The elderly group was a mean age of 78 years compared with 59 years for controls. Tear sizes were 25 massive, 20 large, 12 medium, and 3 small. The CS improved by 25.1 points in elderly patients compared with 23.7 points for controls ($P = .742$). Pain improved by 7.5 of 15 in elderly patients vs. 6.2 of 15 in controls ($P = .055$). Fifty-five of 59 older patients were satisfied compared with 52 of 60 controls ($P = .378$). The overall complication rate did not differ between the groups ($P = .509$). Both groups had 1 infection and 1 stiffness. An acromioclavicular joint cyst developed in 1 younger patient, and a traumatic retear occurred in 1 patient. Subsequent reverse total shoulder arthroplasty was performed in 4 elderly patients at a mean of 28 months after cuff repair. Massive tears had higher risk for subsequent reverse total shoulder arthroplasty ($P = .026$).

Conclusion: Elderly patients benefit as much from arthroscopic rotator cuff repair as their younger counterparts. Similar improvements in CS, Subjective Shoulder Value, pain, and satisfaction occurred for both elderly and control patients. Arthroscopic repair was safe and effective in both groups. Even elderly patients with massive tears showed clinically significant improvements. Arthroscopic rotator cuff repair should be considered as a valuable treatment irrespective of age.

Level of evidence: Level III; Retrospective Case Control Design; Treatment Study

Keywords: Rotator cuff; tear; repair; arthroscopic; geriatric; elderly

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Rotator cuff (RC) tears are extremely common in the older population. Prevalence increases with age.[34,51] The prevalence of full-thickness RC tears has been reported at 22% for those older than 65 years, 31% to 41% in those older than 70, and 51% in those older than 80.[9,21,45] There is a 2.69-fold increase in the odds of a tear with a 10-year increase in age.[45] In addition, those aged older than 60 or 65 are more likely to have larger tears.[14,15] Patients older than 70 also have reduced tendon and bone quality.[2]

This combination of factors means that anchor fixation and tendon repair are expected to be more challenging in elderly individuals. Older patients are also more likely to have medical comorbidities that could interfere with healing and place the patient at increased risk of anesthetic and surgical complications. Such factors often result in conservative treatment being selected for elderly individuals. However, as our population grows increasingly old, there is a larger proportion of patients in their 70s and 80s who remain physically active. These patients have high functional demands and high expectations of treatment.

Despite this, little is known about the outcome of arthroscopic RC repair in patients aged older than 75 years. Optimal management remains controversial, and choosing the best treatment can be difficult. Previous studies have focused mainly on younger patients and smaller tear sizes. We hypothesized that elderly patients could benefit as much from cuff repair as younger patients. Consequently, the aim of this study was to ascertain whether arthroscopic RC repair (aRCR) is safe and effective for treating symptomatic RC tears in patients aged older than 75 years and whether elderly patients receive as much benefit as younger patients.

Materials and methods

Between 2006 and 2016, aRCR was performed in 60 consecutive shoulders in 59 patients aged older than 75 years. All tear sizes were included in the study. Inclusion criteria were age older than 75 years, fit for surgery (American Society of Anesthesiologists [ASA] Physical Status Classification ≤III), full-thickness RC tear, failure to improve with physiotherapy, and a minimum follow-up of 12 months. This length of follow-up was chosen as the minimum time frame because, as a result of financial restrictions, it is the stage at which some Clinical Commissioning Groups in the United Kingdom National Health Service no longer fund follow-up care.

Exclusions were patients who were medically unfit for surgery. For example, patients with unstable angina and uncontrolled chronic obstructive pulmonary disease were not considered to have an ASA score ≤III and were consequently excluded. In equivocal cases, we consulted the appropriate subspecialty physician for advice on whether the patient was fit for surgery. Patients with cuff tear arthropathy or advanced glenohumeral osteoarthritis were deemed more suitable for reverse total shoulder arthroplasty (rTSA) and were thus excluded. Also excluded were patients who were judged unable to comply with the postoperative rehabilitation program, for example, those with dementia.

The 60 shoulders were matched with a control group of younger patients by sex, tear size, and ASA grade, and 56 shoulders were also matched according to activity level. Four shoulders could not be matched because of a lack of sedentary younger patients with massive tears. Consequently, 4 of the older sedentary patients with massive tears were matched with controls who reported active hobbies. Where more than 1 potential control patient was identified, the patient with comorbidities most similar to the elderly patient was selected.

We decided not to characterize tears as degenerative or traumatic because we find it difficult to make this distinction. Many patients report a history of trauma, but this trauma is not necessarily the cause of their cuff tear. In our experience, patients commonly remember minor injuries, such as knocking their arm on a door, that occurred around the time that their symptoms deteriorated. In such cases, it is very difficult to believe that the minor injury could justify the label of "traumatic tear." Consequently, we believe that trying to categorize patients into traumatic or nontraumatic groups would not produce accurate or reliable results. Thus, in the interests of pragmatism, we included all patients, irrespective of their accompanying history.

The RC tears in all patients were diagnosed clinically and confirmed by ultrasound or magnetic resonance imaging. Operations were performed under General anesthesia and interscalene block with the patient in lateral decubitus with traction. The arthroscopic technique varied depending on the size and shape of the tear. Small and medium C-shaped tears were repaired using a single-row "parachute technique".[27] The technique creates a suture and knot configuration that looks like a parachute and increases the contact area between the tendon and the footprint (Fig. 1, *A*). The tear is débrided and the cuff is mobilized.

After preparation of the footprint, a double-loaded anchor is inserted into the footprint. One limb of each suture is passed through the tear anteriorly to create a horizontal mattress suture configuration. The remaining suture limbs are passed posteriorly to create another horizontal mattress suture. This brings the cuff toward the footprint. The ends of each mattress suture are tied to each other so that the contact area and pressure between tendon and bone is increased (Fig. 1, *B*).

Larger tears were repaired with a double-row technique. The medial row was repaired using the parachute technique and then supplemented with an additional lateral row ratchet-loop repair (Fig. 2). A second double-loaded suture anchor is positioned laterally. One suture is passed through the cuff anteriorly to create a loop of suture. Then the free end of the same suture is passed through the loop and tied to the suture limb that has not been passed through the cuff. The same procedure is repeated for the posterior cuff. U- and L-shaped tears were repaired according to their configuration, using the principle of the medial row parachute configuration, supplemented with a lateral row when required.

We routinely perform a subacromial decompression, and if required, an acromioclavicular joint resection at the same time as the cuff repair. If the biceps tendon was normal, it was left alone. In the case of an abnormal biceps associated with poor tendon quality, a tenotomy was usually performed. If the biceps tendon was subluxing but the tendon tissue quality was good, then tenodesis was performed. Tenodesis was also performed if the patient showed specific concern about the appearance of the biceps muscle.

Postoperatively, all patients were placed into a mild abduction and neutral rotation sling for 6 weeks. Gentle pendular exercises were started immediately for small tears, at 3 weeks for medium tears, and only at 6 weeks for large and massive tears. Passive exercises were commenced according to tear size and the surgeon's assessment of repair quality. Generally, this was at 3 weeks for small or medium tears and at 6 weeks for large or massive tears. Active movement and strengthening exercises were performed under

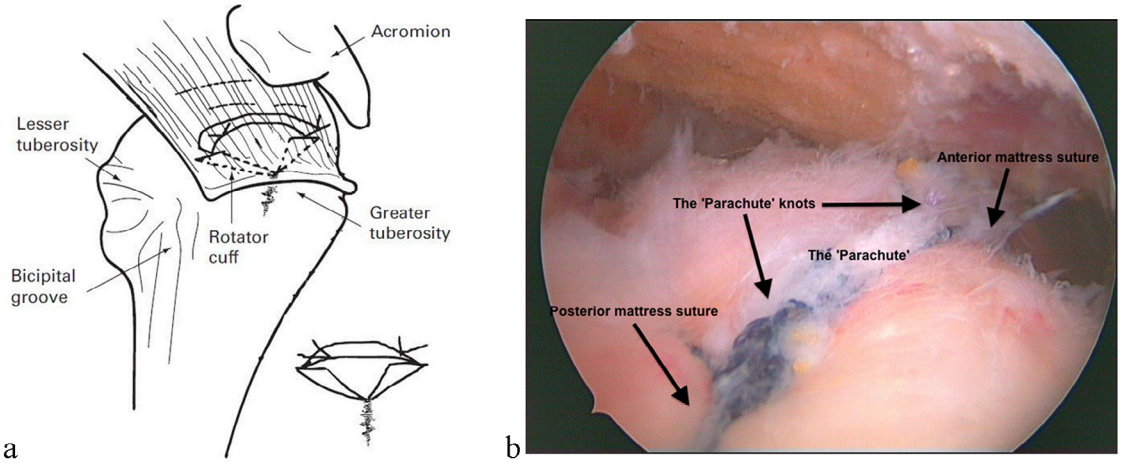

Figure 1 (**a**) The "parachute technique" for arthroscopic rotator cuff repair. The suture and knot configuration look like a parachute. **(b)** An arthroscopic photograph demonstrates the parachute repair.

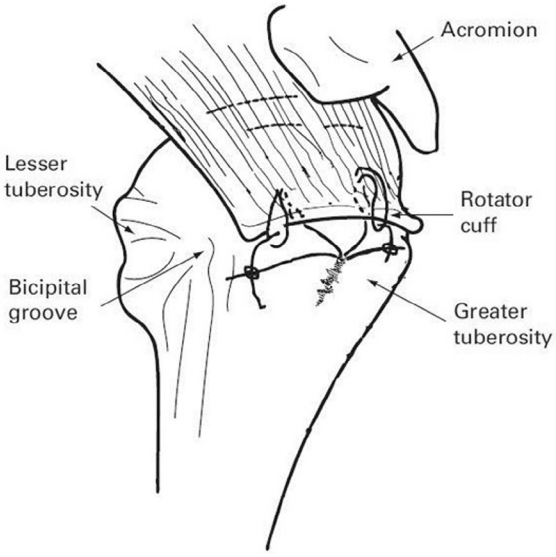

Figure 2 The ratchet-loop technique for lateral row repair.

physiotherapy supervision from 6 weeks postoperatively onward. In addition, all patients were given the deltoid rehabilitation regimen.[26]

Progression of exercises occurred under the supervision of a specialist shoulder physiotherapist and was tailored to the individual patient. For example, patients with sporting hobbies were given incremental strength exercises to help their return to play. Noncontact sport was generally allowed at 3 months, and contact sport was allowed from 6 months onward. Patients were reviewed in the outpatient clinic at 3 weeks, 3 months, 6 months, 1 year, and then every 6 months until discharge.

Outcome scores collected on a computerized database included the Constant score (CS), Subjective Shoulder Value (SSV; 0-10),[12] pain, and satisfaction. We use a 15-point visual analog scale (VAS) pain scale that correlates with the CS, where 15 points are available for pain. For guidance, the VAS scale states that 0 equates to no pain, 1 to 5 is mild pain, 6 to 10 moderate pain, 11 to 14 severe pain, and that 15 is unbearable pain.

Satisfied patients were defined as patients who stated that they were "better" or "much better" than before their operation and also reported that they had resumed all of their previous activities, including sport. Patients stating that they were "the same" or "worse" than preoperatively, or that they were unable to resume their previous activities, including sport, were classed as unsatisfied. Other data collected included operative complications, patient demographics, and information on the hobbies that patients participated in.

For the purposes of data interpretation, CSs adjusted for age and sex were also calculated. This was performed according to age- and sex-matched normal scores.[6] Age- and sex-adjusted scores allow for interpretation within the context of degenerative and pain-related changes that would be expected in the geriatric population. Statistical analysis was performed using the Student *t* test for continuous data, the Mann-Whitney *U* test for ordinal data, and the Fisher exact test for categorical variables. Differences were considered to be statistically significant when P was $<.05$.

Results

The elderly cohort included 31 men (1 bilateral) and 28 women. The mean age was 78 years and 4 months (range, 75-86 years). The matched control group was a mean age of 58 years and 8 months (range, 42-73 years). Because of a lack of sedentary controls with massive tears, 4 elderly sedentary patients were matched with controls who participated in active hobbies: a 50-year-old male cyclist, a 49-year-old male golfer, a 64-year-old female Pilates enthusiast, and a 49-year-old female netball player. By the DeOrio and Cofield classification[7] each group had 25 massive, 20 large, 12 medium, and 3 small tears. There were 19 isolated supraspinatus tears, 17 supraspinatus and infraspinatus tears, 15 supraspinatus, infraspinatus, and subscapularis tears, and 2 isolated subscapularis tears.

Three elderly patients had previous ipsilateral shoulder operations. These were a 76-year-old man who underwent open cuff repair 6 years before aRCR, a 75-year-old woman who underwent resurfacing arthroplasty 10 years before aRCR, and an 80-year-old woman who underwent subacromial decompression 9 years before aRCR. These patients were not excluded from the study because each patient had developed

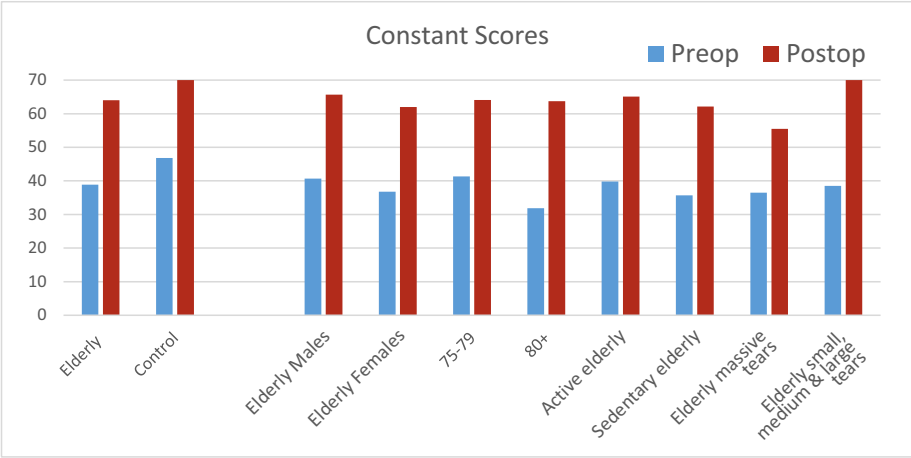

Figure 3 Constant scores preoperatively and postoperatively after arthroscopic rotator cuff repair. Significant improvements occurred for elderly patients, younger control patients, and all subgroups of elderly patients: men, women, aged 75 to 79, aged ≥80, active hobbies, sedentary hobbies, massive tears, and other sizes of tear.

new symptomatic RC tears that had not been present at the time of their first operation. None of the younger group had previous shoulder surgery.

In the elderly cohort, there were 32 single-row repairs and 28 double-row repairs. Concomitant long head of biceps tenotomy or tenodesis was performed in 30 elderly patients. The controls were treated with 34 single-row repairs and 26 double-row repairs, with 26 patients undergoing concomitant tenodesis or tenotomy. In both groups, a number of different suture anchors were used, including Spiralok (DePuy Mitek, Raynham, MA, USA) and Healix BR anchors (DePuy Mitek), both with Orthocord sutures (DePuy Mitek), and Twinfix anchors with Ultrabraid sutures (Smith & Nephew, Memphis, TN, USA).

Mean follow-up was 26 months (range, 1-7 years) for the elderly cohort compared with 31 months (range, 1-7.5 years) for the controls. Complete CS, pain, and satisfaction data were available for 51 of 60 elderly shoulders. Two patients had incomplete postoperative CS but had complete postoperative pain and satisfaction scores. The 7 remaining elderly patients had all attended follow-up clinics, and data on their postoperative progression, surgical complications, and satisfaction were available. However, attempts to contact them to obtain complete scores were unsuccessful because 4 moved without leaving updated contact details and were lost to follow-up, and 3 died of unrelated causes. In the control group, complete data, including outcome scores, was available for 59 of 60 shoulders. One diabetic 51-year-old man with a large tear did not complete the postoperative pain score. The rest of his outcome data was available.

In the elderly cohort, there were 34 patients (35 shoulders) with active hobbies and 25 with sedentary hobbies. The most common active activities were gardening (15 patients), walking (13 patients), golf (9 patients), tennis (5 patients), and swimming (5 patients). Other active hobbies were horse riding, skiing, and sailing. Sedentary hobbies comprised painting, reading, playing bridge, and knitting.

Fig. 3 shows the preoperative and postoperative CSs for different groups of patients. Statistically significant improvements occurred in all groups. Table I reports the postoperative CS and the age- and sex-adjusted postoperative CSs for different patient groups. Table II reports the mean preoperative, mean postoperative, and mean improvement in age- and sex-adjusted CSs. CSs improved by a mean of 25.1 points in the elderly cohort compared with 23.7 points for controls ($P = .742$). The only subgroup with a statistically significantly worse outcome was the smaller improvement in adjusted CS of 24.9 points seen for massive tears compared with 43.6 points for small, medium, and large tears ($P = .031$).

Mean postoperative rotator cuff strength was 2.95 kg for the elderly cohort compared with 4.67 kg for controls. However, the difference between preoperative and postoperative strength did not differ significantly between the 2 groups ($P = .504$).

Mean postoperative pain scores and mean postoperative SSV scores for different patient groups are summarized in Table III. Pain improved by 7.5 of 15 in the elderly cohort vs. 6.2 of 15 in younger controls ($P = .055$). SSV improved by 5.8 of 10 in elderly patients vs. 5.3 of 10 in the controls ($P = .165$). Table IV reports the mean preoperative, mean postoperative, and mean improvement in SSV for the different groups of patients. Once more, the only subgroup with a statistically significantly worse outcome was the smaller improvement in SSV of 4.3 points in massive tears compared with 7.0 points for small, medium, and large tears ($P = .002$).

In the control group, a subgroup analysis of the effect of activity level was performed. The age- and sex-adjusted CS improved by 28.5 points in active controls compared with 29.7 points in sedentary controls ($P = .689$). Improvement in SSV was 5.3 for active controls and 5.4 for sedentary controls ($P = .842$). Improvement in pain VAS was 6.0 for active controls and 6.7 for sedentary controls ($P = .418$). None of these differences achieved statistical significance.

Three elderly patients with massive tears had pseudoparalysis at presentation. These were patients with clearly

Table I Postoperative Constant scores and adjusted (for age and sex) scores for different groups of patients

Category	Postoperative CS	*P* value	Age- and sex-adjusted CS	*P* value
	Mean ± SD		Mean ± SD	
Control group	70.5 ± 13.9	**.05**	88.1 ± 19.3	.407
Elderly patients	63.4 ± 17.0		91.6 ± 25.5	
Men	65.7 ± 18.0		91.2 ± 27.3	
Women	62.0 ± 16.1	.280	92.0 ± 23.9	.928
With active hobbies	65.1 ± 16.4		93.7 ± 26.7	
With sedentary hobbies	62.1 ± 18.3	.490	88.0 ± 23.6	.503
Age 75-79 yrs	64.1 ± 16.6		89.1 ± 23.5	
Age ≥80 yrs	63.7 ± 18.8	.960	98.2 ± 30.0	.322
With massive tears	55.5 ± 17.6		77.5 ± 24.7	
With small, medium, and large tears	70.4 ± 13.7	**.003**	102.3 ± 20.7	**.001**

CS, Constant score; *SD*, standard deviation.
Statistically significant *P* values (*P* < .05) are in bold.

Table II Preoperative, postoperative, and improvement in age- and sex-adjusted Constant scores for different groups of patients

Category	Mean age- and sex-adjusted CS			*P* value
	Pre-op	Post-op	Improvement	
Control group	57.8	88.1	30.4	.259
Elderly patients	55.5	91.6	36.2	
Men	56.0	91.2	34.2	
Women	54.9	92.0	37.3	.741
With active hobbies	57.5	93.7	34.6	
With sedentary hobbies	52.3	88.0	37.4	.992
Age 75-79 yrs	57.7	89.1	31.1	
Age ≥80 yrs	48.3	98.2	47.6	.082
with massive tears	51.8	77.4	24.9	
With small, medium, and large tears	58.2	102.3	43.6	**.031**

CS, Constant score.
Statistically significant *P* values (*P* < .05) are in bold.

Table III Postoperative pain and Subjective Shoulder Value scores for different groups of patients

Category	Pain score (0-15)	*P* value	Subjective Shoulder Value (0-10)	*P* value
	Mean ± SD		Mean ± SD	
Control group	2.8 ± 2.9	.055	7.6 ± 2.1	.165
Elderly patients	2.3 ± 3.2		7.9 ± 2.2	
Men	2.5 ± 3.4		7.5 ± 2.5	
Women	2.0 ± 3.0	.596	8.4 ± 1.8	.180
With active hobbies	2.6 ± 3.6		7.7 ± 2.3	
With sedentary hobbies	1.9 ± 2.5	.889	8.2 ± 2.0	.465
Age 75-79 yrs	2.7 ± 3.5		7.9 ± 2.2	
Age ≥80 yrs	1.1 ± 1.7	.136	8.0 ± 2.2	.810
With massive tears	3.4 ± 3.4		6.8 ± 2.5	
With small, medium, and large tears	1.5 ± 2.8	**.007**	8.7 ± 1.6	**.002**

SD, standard deviation.
Statistically significant *P* values (*P* < .05) are in bold.

traumatic tears, because before the trauma they had good function that changed to pseudoparalysis immediately after the fall. These patients achieved outcomes that were on the better side of average.

The complication rate did not differ between the elderly cohort and the controls ($P = .509$). One patient in each group developed an infection and a stiff shoulder. Both infections were superficial portal wound infections that resolved with

Table IV Preoperative, postoperative, and improvement in Subjective Shoulder Value scores for different groups of patients

Category	Mean Subjective Shoulder Value			*P* value
	Pre-op	Post-op	Improvement	
Control group	2.3	7.6	5.3	.165
Elderly patients	2.1	7.9	5.8	
Men	2.3	7.5	5.3	
Women	1.8	8.4	6.4	.238
With active hobbies	2.0	7.7	5.7	
With sedentary hobbies	2.3	8.2	6.1	.810
Age 75-79 yrs	2.1	7.9	5.7	
Age ≥80 yrs	2.0	8.0	6.1	.689
With massive tears	2.6	6.8	4.3	
With small, medium, and large tears	1.7	8.7	7.0	**.002**

Statistically significant *P* values ($P < .05$) are in bold.

antibiotics. Both patients with stiff shoulders were successfully treated with arthroscopic capsular release: one 82-year-old woman 5 months postoperatively and one 53-year-old man 17 months postoperatively. An acromioclavicular joint cyst developed in 1 control, a 43-year-old man with a medium tear, that required surgical excision. A traumatic retear occurred 10 months postoperatively in another control, a 48-year-old diabetic woman with a massive tear, when she fell down the stairs. She was treated with revision aRCR. No other control patients required further surgery.

However, 4 elderly patients (16% of the elderly patients with massive tears) underwent subsequent reverse total shoulder arthroplasty (rTSA) at a mean of 28 months after aRCR. No elderly patients with small, medium, or large tears required subsequent rTSA. The increased risk of rTSA for elderly patients with massive tears was statistically significant ($P = .026$).

Overall, elderly patients reported satisfaction with 56 of 60 RC operations compared with 52 of 60 younger control patients ($P = .378$). Of the 8 unsatisfied younger patients, the tear sizes were 3 large, 4 medium, and 1 small. None required further treatment. Conversely, the 4 unsatisfied elderly patients all had massive tears, and 3 underwent subsequent rTSA. A fourth elderly patient also subsequently required rTSA. However, she reported that she was still satisfied with her cuff repair because it had provided her with a good result for 4 years before she needed the rTSA. The remaining dissatisfied elderly patient was a 76-year-old man who was unhappy because he could not play a full round of golf. He was able to play 9 holes of golf at the last follow-up and did not receive any further treatment.

Discussion

Full-thickness tears managed conservatively can result in symptomatic improvement for 75% of patients at 2 years of follow-up.[23] A recent Cochrane Review assessing treatment of cuff tears with physiotherapy compared with surgery reported that although surgery reduced pain, there was no difference in function.[40] However, all of our patients had failed to improve with physiotherapy and the deltoid rehabilitation regimen[26] before being considered for surgery.

Risk factors for progression include tear size, patient age, and tears involving the rotator cable.[31,33,40] Zingg et al[53] reported that approximately half of their patients with repairable massive tears progressed to the point where they were no longer repairable within 4 years. Most of our patients (45 of 60 shoulders in each group) had large or massive tears and were therefore at increased risk of tear progression. Maman et al[31] reported that 54% of symptomatic tears in patients older than 60 years increased in size compared with only 17% of tears in those younger than 60. The combination of symptomatic elderly patients and larger tears would likely have resulted in tear progression and poorer outcomes if these elderly patients had continued to receive further nonoperative management. Furthermore, the psychosocial effect of RC tears should not be underestimated. RC tears have been reported as a major cause of depression in the elderly population.[25]

Historically, débridement and acromioplasty have been suggested as an alternative to repair in elderly individuals. However, there is evidence that their results deteriorate over time and that repair provides a superior long-term improvement in pain and function.[11,32,35,44,48,54] Comparison of RC repair outcomes in the literature is difficult due to the heterogeneity of outcome scores and study populations. Although little is known on the outcome of cuff repair in those older than 75, a number of studies have demonstrated promising open and arthroscopic repair results for patients aged between 60 and 75. These studies are summarized in Table V.

Jung et al[18] performed open repair in 64 patients aged older than 75 years with large or massive tears. They achieved a mean postoperative CS of 76, with 80% of patients reporting that they were satisfied with surgery.

Worland et al[50] performed open repairs in 69 patients aged older than 70 with massive tears. Good to excellent results on the University of California Los Angeles Shoulder Rating Scale were seen in 78.2%. Similarly, Lam and Mok[24] performed open repairs on 74 patients aged older than 65 and reported that 92% of patients had reduced pain and achieved a mean postoperative CS of 63.

Table V A summary of studies in the literature compared with our study

Author, yr	Open or arthroscopic	Patients	Age	Tear characteristics	Outcome	Failures and complications	Mean follow-up
		No. (shoulders)	(yrs)				
Worland, 1999[50]	Open	69	>70	Massive	78.2% good-excellent UCLA	9 unsatisfied	3 yrs
Yel, 2001[52]	Open	47 (51)	>65	Not stated	Adjusted CS 82	10% unsatisfactory	9.2 yrs
Grondel, 2001[13]	98 open, 7 arthroscopic	105 (111)	>62	Not stated	87% good-excellent UCLA	5 retears, 2 infections, 1 transient brachial plexus injury	35 mo
Lam, 2004[24]	Open	74	>65	Massive	CS 63	11 unsatisfied, 8 deltoid wasting, 5 infection, 2 suture granulomas	48 mo
Rebuzzi, 2005[42]	Arthroscopic	54	>60 >70 = 12	30 large or massive	81.4% good-excellent UCLA	4 unsatisfied, had retears	27 mo
Verma, 2010[47]	Arthroscopic	39	>70	13 small, 19 medium, 7 large or massive	Men CS: 77.7 (adj 88); women: 66.4 (adj 81)	1 unsatisfied, 1 pneumonia, 1 infection, 1 wound haematoma	36 mo
Flurin, 2013[10,11]	Arthroscopic	145	>70	Small to medium supraspinatus	CS 76	15 retears	Minimum 1 yr in 135 patients
Jung, 2017[18]	Open	64	>75	35 large, 29 massive	CS 76	20% unsatisfied, 12 retears	30 mo
Our study	Arthroscopic	59 (60)	>75	25 massive, 20 large, 12 medium and 3 small tears	CS 64 (adj 91.6)	4 unsatisfied, 1 infection, 1 stiffness	29 mo

UCLA, University of California Los Angeles Shoulder Rating Scale; *CS*, Constant score.

Yel et al[52] performed open repair in 51 patients older than 65 and reported an average postoperative adjusted CS of 82. Grondel et al[13] performed repairs on 105 patients aged older than 62, with 7 of these repairs being arthroscopic. After repair, 87% of patients had good or excellent results.

Rebuzzi et al[42] reported a series of 54 patients aged older than 60 repaired arthroscopically, and 12 of their patients were aged older than 70. They achieved good or excellent University of California, Los Angeles Shoulder Rating Scale in 81.4% of patients. Verma et al[47] reported the outcome of arthroscopic repair in 39 patients aged older than 70. The postoperative mean CS was 77.7 in men and 66.4 in women (adjusted 88 and 81, respectively).

Interestingly, a recent study by Flurin et al[10] has called into question whether arthroscopic repair of tears in patients aged over 75 years is worthwhile. They reported 145 patients aged 70 or older. All patients had small to medium tears of supraspinatus with extension limited to the upper third of infraspinatus. All tears were reducible without tension, and 96% had fatty infiltration stages 0 to 2. Mean age was 73.9 years. Full-thickness retear occurred in 16 patients (12%). These retear patients were statistically significantly older, with a mean age of 76 years, and also had lower postoperative outcome scores.

All of our patients were treated arthroscopically. Although open and arthroscopic results have been shown to be equivalent,[3,8,28,36,39,43] there has been a recent trend toward arthroscopic surgery.[5] Some authors have reported that open repair is cheaper.[1,4] However, a recent study using data from the United Kingdom Rotator Cuff Study (UKUFF) found no difference in the use of resources or quality of life between open and arthroscopic surgery.[37] Arthroscopic advantages include smaller incisions, reduced damage to the deltoid muscle, reduced early postoperative pain, faster recovery, quicker return to exercise, and lower risk of postoperative stiffness.[8,19,41,42,46,47] Arthroscopic healing rates are reported to be 83% to 93% for small to large tears.[17,38] Massive tears are reported to have healing failure rates as high as 91%.[22]

However, tendon nonhealing does not reflect functional failure. In our series, we looked at the functional success or failure. We did not assess the cuff integrity (retear or nonhealing) rate. Our definition of failure was clinical/functional and considered to be dissatisfaction or revision to rTSA. There were no elderly failures in the small or medium tear size (0 of 15) compared with 5 of 15 (33%) failures in the controls. For large and massive tears, there were 5 of 45 failures in the elderly group and 3 of 45 failures in the controls. This gives an overall functional failure rate of 5 of 45 (11%) in the elderly cohort and 3 of 45 (7%) in the young control group for large and massive tears.

We consider that our lower rates of functional failure in the elderly cohort for the small and medium tears are likely to reflect difference in expectations and demand between the young and elderly patients. This difference may, as well, be a reflection of selection bias in the elderly group; only patients in whom conservative management had previously failed, who were fit for surgery (ASA ≤III) and able to comply with the postoperative regime were included.

Further surgery was required in 4 of 25 elderly patients in our elderly cohort who underwent aRCR for massive tears, and 4 of 5 symptomatic elderly patients went on to have rTSA. One elderly patient with a massive tear was unsatisfied but was not considered to be a candidate for rTSA, because although the patient was unsatisfied, his outcome was considered by the surgeon to be good: he could play 8 holes of golf, regained excellent movement, and had good outcome scores. In this situation, we were doubtful that further surgery would result in the patient being more satisfied.

Our indications for performing rTSA after failed cuff repair are painful shoulder with poor function and pseudoparalysis. Even in the absence of arthritis, we believe that rTSA is the only viable option for improving the outcomes for this group of patients. All 4 patients were satisfied after their rTSA surgery.

Although improvements in outcome were comparable between elderly and younger patients, it is interesting to note that elderly patients reported higher levels of satisfaction. Similarly, although none of the differences between the active and sedentary control patients achieved statistical significance, we observed that active patients received smaller improvements in age- and sex-adjusted CSs, smaller improvements in SSV, and smaller improvements in pain VAS. These findings could possibly reflect differences in expectations of treatment or differences in postoperative functional demands. For example, younger patients with manual labor jobs or those participating in high-demand physical recreation activities could be more affected by weakness and a lengthy rehabilitation program than elderly or sedentary patients with lower functional demands.

Limitations

The main limitation of our study is the potential for confounding factors to affect the results. We attempted to minimize this risk by matching for sex, tear size, ASA grade, and activity level, but matching for every single variable is impossible. Four sedentary elderly patients could not be matched with sedentary controls. It is also possible that factors we did not study, such as patient ethnicity and socioeconomic status, could have affected our results.

Previous physiotherapy had failed in all patients, and most had large or massive tears, thus placing them at higher risk of tear progression and poorer outcomes. The literature has little information on expected outcome after rotator cuff repair for patients aged over 75 years. Therefore, despite the limitations of this study, this study helps to inform this important area of clinical practice, and we believe that the results are relevant and applicable to other centers treating elderly individuals.

Some authors have reported a correlation between clinical outcomes and ultrasound healing with improved outcome scores and increased shoulder strength in healed repairs.[11,17,20,27,29,30,38] Double-row repairs have been reported to result in increased tendon healing and reduced retear rates.[8,43]

We performed a double row-repair in 28 elderly patients and in 26 control patients. One potential limitation of our study is the lack of routine postoperative imaging; therefore, it is possible that postoperative retear could have occurred unrecognized. However, tendon nonhealing does not reflect functional failure. In our series, we looked at the functional success or failure. We did not assess the cuff integrity (retear or nonhealing) rate.

In addition, although our mean follow-up is relatively long compared with other studies, it is possible that longer follow-up would result in more failures. Maximum recovery has been reported to occur at 6 to 9 months after cuff repair,[49] with no further improvements seen after 1 year.[16] We also know that most retears occur in the first 6 months after repair.[17] Our mean follow-up was 29 months, and all of our patients were monitored for an absolute minimum of 1 year. Consequently, we believe that we are likely to have identified our failures.

Advantages

To our knowledge, this is the first arthroscopic cuff repair study directly comparing patients aged older than 75 years with a control group of younger patients. In addition, we have a larger proportion of massive and large tears than many published series (Table V). Although this is the largest series of aRCR in patients aged older than 75 years, it is clear that a larger patient population would improve accuracy. Four of our elderly patients were lost to follow-up. We consider that compliance could be higher in patients who attended for follow-up, which might artificially improve the results. However, other published series would also have this bias.

Finally, it is important to remember that we have a selection bias in our patients, because patients considered unfit for surgery (ASA not ≤III) or unable to comply with the postoperative rehabilitation program were excluded. This could also artificially improve the results.

Conclusion

Symptomatic cuff tears in patients aged older than 75 years who are fit for surgery can be safely and effectively treated with aRCR. Outcomes for elderly patients are comparable to their younger peers, achieving similar improvements in CS, pain, and satisfaction. Clinically significant improvements occurred in all patient groups. We documented that 55 of 59 elderly patients were satisfied with surgery and resumed all of their previous activities, including sport. There was no difference between elderly men, elderly women, age older than 80, age 75 to 79, elderly patients with active hobbies, and elderly patients with sedentary hobbies. Even elderly patients with massive tears showed clinically significant improvements after repair. aRCR should be considered as a valuable treatment in patients aged older than 75 years.

Disclaimer

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