

Factors associated with patient satisfaction after arthroscopic rotator cuff repair: do they differ by age?

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Background: Several studies have investigated factors affecting patient satisfaction after arthroscopic rotator cuff repair (ARCR); however, it is unknown if these factors vary according to age. Therefore, this study aimed to evaluate the factors associated with satisfaction of ARCR in individuals 70 years and older versus younger patients.

Methods: Among 319 consecutive patients who underwent ARCR, 173 were included. Patients were divided into an old age group (≥ 70 years) and a young age group (< 70 years), and the two age groups were further divided into satisfied and unsatisfied subgroups. Patient satisfaction was evaluated at the final follow-up visit using a binary question (yes or no). Clinical outcomes were assessed preoperatively and at the final follow-up.

Results: Satisfaction rates in the older and younger age groups were 75.41% and 79.47%, respectively. Mean changes in Constant and American Shoulder and Elbow Surgeons scores were significantly different between the satisfied and unsatisfied subgroups ($P=0.031$ and $P=0.012$, respectively) in the young patients. In the old patients, there was a significant difference in the mean change in depression subscale of the Hospital Anxiety and Depression Scale ($P=0.031$) and anxiety subscale of the Hospital Anxiety and Depression Scale ($P=0.044$) scores between the satisfied and unsatisfied subgroups.

Conclusions: Factors affecting patient satisfaction after ARCR differed according to age. Psychological improvement was more important to elderly patients, whereas restoration of function was more important to younger patients. Pain relief was important for both age groups.

Level of evidence: III.

Keywords: Patient satisfaction; Arthroscopic surgery; Elderly; Age factors; Rotator cuff tears

INTRODUCTION

Patient satisfaction is widely used as an important indicator to assess the effectiveness of treatment. When evaluating outcomes after surgical intervention, satisfaction plays an important role as an outcome that reflects patient needs and expectations compared to physician-oriented outcomes based on numeric results [1-4].

Arthroscopic rotator cuff repair (ARCR) is one of the most common orthopedic surgeries used to relieve shoulder pain and

restore function. Several studies on patient satisfaction after ARCR have been conducted, and high satisfaction rates ranging from 92 to 100% have been reported [5-8]. With the global increase in life expectancy, ARCR is often performed in elderly patients, and high satisfaction rates have been reported for these patients [9-11].

However, elderly patients, especially those over 70 years of age, have different biological characteristics than younger patients. In the elderly, diminished cellularity and vascularity of the tendon tissue, inferior bone quality, and larger tear sizes have been re-

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ported, and comorbidities that can interfere with and exacerbate poor treatment responses are often present [12-16]. Despite these differences, the high satisfaction rate after ARCR in both elderly and young patients suggests that factors affecting satisfaction differ according to age. In addition, compared to younger patients, elderly patients have reduced activity levels and functional demands and increased psychological and social distress [10,17].

However, few studies on factors related to satisfaction after ARCR in elderly patients have been reported. Moreover, no studies have compared factors related to satisfaction between young and elderly patients. Thus, this study aimed to evaluate the factors associated with patient satisfaction after ARCR in patients 70 years and older and those younger than 70 years. We hypothesized that factors associated with patient satisfaction after ARCR would differ between these two age groups.

METHODS

This study was approved by the Institutional Review Board of Inje University Busan Paik Hospital (No. 2023-08-047). Requirement for informed consent was waived by the Institutional Review Board because of the study retrospective design.

Patient Selection

After approval from the Institutional Review Board of Inje University Busan Paik Hospital, we performed a retrospective comparative study of data of 319 patients who underwent ARCR for

rotator cuff tears between January 2017 and January 2020 in the hospital.

Inclusion criteria were as follows: (1) full-thickness rotator cuff tear based on preoperative magnetic resonance imaging, (2) underwent a postoperative shoulder computed tomography arthrogram (CTA) once within 6 months after surgery, and (3) at least 2 years of follow-up. Exclusion criteria were as follows: (1) irreparable rotator cuff tear, (2) traumatic rotator cuff tear, (3) revision surgery, (4) surgeries other than repair, such as augmentation, biceps rerouting, and superior capsular reconstruction, (5) cuff tear arthropathy, and (6) glenohumeral (GH) joint osteoarthritis.

Of 231 patients who met the inclusion criteria, 58 were excluded for the following reasons: irreparable rotator cuff tears (n = 22), traumatic rotator cuff tears (10), revision surgery (n = 6), and surgeries other than repair (n = 11; augmentation = 6, biceps rerouting = 2, superior capsular reconstruction, 3). In addition, 5 patients were excluded due to accompanying cuff tear arthropathy, and 4 patients were excluded due to GH joint osteoarthritis. A total of 173 patients was enrolled in this study (Fig. 1). The patients were divided into two groups according to age: <70 years old (younger group, n = 112) and ≥70 years old (elderly group, n = 61).

Satisfaction Assessment

To evaluate factors affecting satisfaction, the two age groups were further divided into satisfied and unsatisfied subgroups. At the last follow-up visit, a questionnaire assessed patient satisfaction

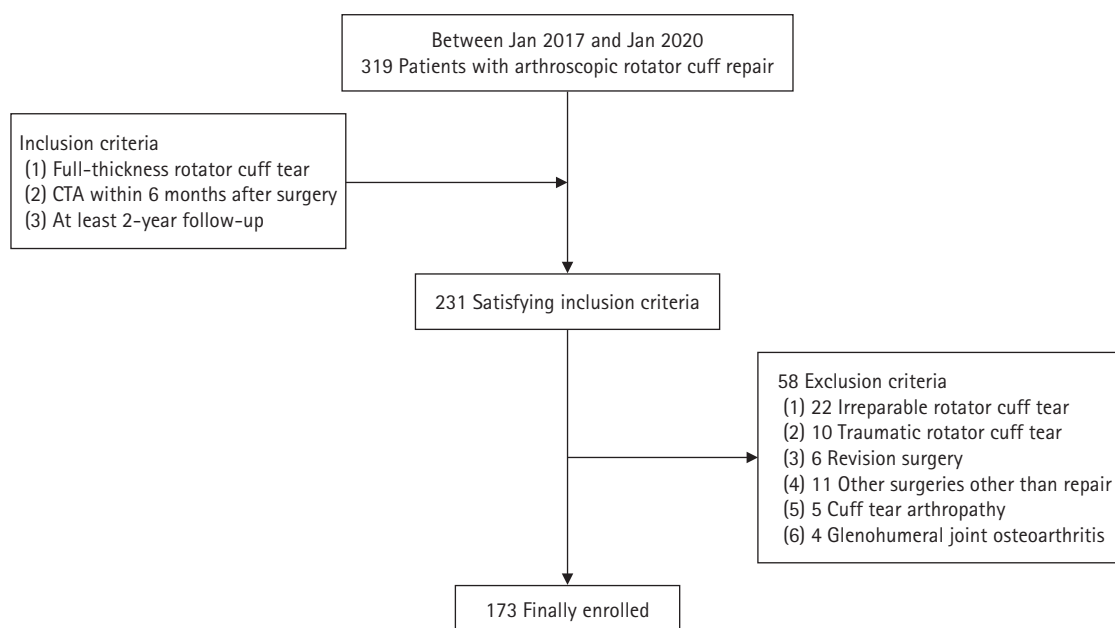


Fig. 1. Flowchart of patient inclusion and exclusion criteria. CTA: computed tomography arthrogram.

using the binary “yes” or “no” question: “Are you satisfied with your shoulder surgery?”. Patients who answered “yes” were classified into the satisfied subgroup, and patients who answered “no” were classified into the unsatisfied subgroup.

Factors Associated with Satisfaction Evaluations

Demographic (age and sex) data, clinical characteristics (body mass index, follow-up period, and comorbidities such as diabetes and cardiovascular disorders), rotator cuff tear size, and information about the presence or absence of fatty infiltration were extracted from medical records. Rotator cuff tear size was measured intraoperatively using a ruler after debridement of the degenerated tendon edges. Fatty infiltration of each rotator cuff muscle (supraspinatus and infraspinatus) was evaluated using the Goutallier classification.

Clinical outcomes were evaluated preoperatively and at the final follow-up visit by one examiner (JHK). Pain at rest was measured using a visual analog scale (VAS) score ranging from 0 to 10. Constant and American Shoulder and Elbow Surgeons (ASES) scores were used to assess progress and outcomes. Short-Form 12, physical health composite score (PCS), mental health composite score (MCS), and shoulder activity scale (SAS) were used to assess quality of life, general health status, and level of shoulder activity, respectively. Psychological distress (anxiety or depression) was evaluated using the Hospital Anxiety and Depression Scale (HADS), which is used to determine levels of anxiety and depression. The HADS is a 14-item scale, with 7 items relating to anxiety and 7 relating to depression.

To evaluate postoperative shoulder stiffness, shoulder range of motion including active forward flexion (FF), external rotation (ER) at the side, and internal rotation at the back (IR back) were measured using a goniometer. Shoulder stiffness was defined as forward elevation $< 120^\circ$ passively, ER with the arm at the side $< 30^\circ$ passively, and IR back lower than L-3 passively at final follow-up [18].

Repair integrity after rotator cuff repair was evaluated on the basis of a shoulder CTA obtained 6 months after surgery. An experienced musculoskeletal radiologist, who was blinded to the present study, performed and interpreted the shoulder CTA. Complete leakage of contrast medium through the footprint was regarded as a re-tear, but leakage with maintenance of cuff insertion in the footprint was not considered a re-tear [19]. Differences after surgery for each factor were compared to determine those affecting satisfaction, reflecting patient expectations and needs.

Statistical Analysis

IBM SPSS Statistics version 25.0 (IBM Corp.) was used for statistical analyses. Trained statisticians performed all statistical analyses. Continuous and nominal data are presented as means and standard deviations. Using the Shapiro-Wilks test, normality testing was performed on continuous data in each group. Continuous data were normally distributed. An independent t-test was used to compare VAS score, Constant score, ASES, PCS, mental health composite (MCS), and Hospital Anxiety and Depression Scale (HADS) scores between the satisfied and unsatisfied subgroups. Postoperative shoulder stiffness and tendon healing were analyzed using Fisher's exact test. Differences in pre- and postoperative clinical scores were analyzed using paired t-tests. The level of significance was set at $P < 0.05$.

RESULTS

Patient Demographics

Mean age of the patients was 76.84 ± 3.59 years (range, 70–89 years) in the old age group and 62.05 ± 2.69 years (range, 54–69 years) in the young age group. Mean follow-up period after surgery was 3.8 ± 2.23 years (range, 2.3–5.8 years) in the old age group and 4.1 ± 2.05 years (range, 2.2 to 6.3 years) in the young

Table 1. Demographics and baseline characteristics of old and young age groups

Variable	Age group		P-value
	Old age (n = 61)	Young age (n = 112)	
Age (yr)	76.84 \pm 3.59	62.05 \pm 2.69	0.001*
Sex			0.215
Male	17 (27.87)	35 (31.25)	
Female	44 (72.13)	77 (68.75)	
BMI (kg/m ²)	24.16 \pm 3.33	24.82 \pm 3.52	0.231
Follow-up (yr)	3.80 \pm 2.23	4.10 \pm 2.05	0.109
Comorbidity			
Hypertension	26 (42.62)	38 (33.93)	0.258
Diabetes mellitus	21 (34.43)	24 (21.43)	0.063
Dyslipidemia	16 (26.23)	19 (16.96)	0.147
Initial cuff tear size (cm)			
AP dimension	2.38 \pm 0.76	2.25 \pm 0.72	0.437
ML dimension	2.61 \pm 0.58	2.33 \pm 0.61	0.137
Goutallier grade			
SST	2.86 \pm 0.79	2.52 \pm 0.41	0.324
IST	2.21 \pm 0.89	2.17 \pm 0.56	0.729

Values are presented as mean \pm standard deviation or number (%). BMI: body mass index, AP: anteroposterior, ML: mediolateral, SST: supraspinatus, IST: infraspinatus.

*Statistically significant.

age group. There were no significant differences in sex, medical comorbidities, initial rotator cuff tear dimensions, or Goutallier grade between the two groups (all $P > 0.05$) (Table 1).

Patient Satisfaction

Satisfaction rates in the older and younger age groups were 75.41% ($n = 46$) and 79.47% ($n = 89$), respectively, and this difference was not significant ($P = 0.538$) (Table 2).

Differences in Changes of Factors

Significant improvements (preoperative vs. postoperative) were found in all parameters in both groups (all $P < 0.05$) (Table 3). Primary endpoints were mean changes in VAS, Constant, ASES, and HADS scores. Secondary endpoints were mean changes in SAS, PCS, and MCS scores as well as tendon healing and stiffness.

Mean change in VAS score was 3.94 ± 1.12 (satisfied) and 1.67 ± 1.22 (unsatisfied) ($P = 0.022$) in the old age group and 3.86 ± 1.12 (satisfied) and 1.42 ± 1.48 (unsatisfied) ($P = 0.019$) in the young age group. In the old age group, mean changes in Constant and ASES scores were not significant between the satisfied and unsatisfied subgroups (all $P > 0.05$). In contrast, in the younger age group, mean changes in Constant and ASES scores

were significantly different between the satisfied and unsatisfied subgroups ($P = 0.031$ and $P = 0.012$, respectively). With respect to psychological distress, mean change in depression subscale of the Hospital Anxiety and Depression Scale (HADS-D) score was 2.24 ± 1.12 (satisfied) and 1.07 ± 0.56 (unsatisfied) in the young age group, while mean change in anxiety subscale of the Hospital Anxiety and Depression Scale (HADS-A) score was 2.35 ± 1.33 (satisfied) and 1.32 ± 0.74 (unsatisfied) in the old age group. There was a significant difference in HADS-D and HADS-A scores between the satisfied and unsatisfied subgroups in the old age group ($P = 0.031$ and $P = 0.044$, respectively). However, in the young age group, there was no significant difference in either score between the satisfied and unsatisfied subgroups ($P = 0.542$ and $P = 0.313$, respectively). There was no significant difference in SAS, PCS, or MCS scores between the satisfied and unsatisfied groups within the two age groups (all $P > 0.05$) (Table 4).

Tendon Healing and Stiffness

Postoperative tendon healing and stiffness were not significantly different between the two age groups ($P > 0.05$) (Table 5). Tendon healing after rotator cuff repair was not significantly different between the satisfied and unsatisfied subgroups in the old ($P = 0.560$) or young age group ($P = 0.627$). Shoulder stiffness after surgery showed a significant difference at a young age between the satisfied and dissatisfied subgroups ($P = 0.043$), but no difference was observed in the older age group ($P = 0.055$) (Table 6).

Table 2. Patient satisfaction in old and young age groups

Variable	Age group		P-value
	Old age ($n = 61$)	Young age ($n = 112$)	
Satisfaction			0.538
Yes	46 (75.41)	89 (79.47)	
No	15 (24.59)	23 (20.53)	

Values are presented as number (%).

DISCUSSION

In this study, factors that differed between the satisfied and unsatisfied groups after ARCR were analyzed according to age.

Table 3. Pre- and postoperative clinical outcomes in old and young age groups

Variable	Old age			Young age		
	Preoperative	Postoperative	P-value	Preoperative	Postoperative	P-value
VAS	5.64 ± 2.12	1.18 ± 1.34	0.005*	5.58 ± 1.95	1.53 ± 1.39	0.006*
Constant	51.65 ± 10.66	70.17 ± 12.82	0.001*	49.85 ± 9.79	77.81 ± 13.75	0.001*
ASES	49.45 ± 10.18	81.89 ± 13.54	$< 0.001^*$	47.01 ± 12.63	84.35 ± 15.67	$< 0.001^*$
SAS	5.31 ± 2.14	11.38 ± 4.02	0.021*	7.11 ± 3.05	14.91 ± 4.43	0.003*
PCS	28.34 ± 7.11	40.15 ± 10.59	0.016*	33.16 ± 8.77	52.19 ± 13.65	$< 0.001^*$
MCS	52.46 ± 11.71	60.32 ± 14.19	0.037*	55.18 ± 12.33	61.85 ± 15.63	0.045*
HADS-D	9.22 ± 3.36	6.87 ± 0.96	0.013*	8.42 ± 2.71	7.37 ± 0.59	0.033*
HADS-A	9.64 ± 3.78	6.65 ± 0.77	0.006*	8.85 ± 3.05	7.48 ± 0.93	0.041*

Values are presented as mean \pm standard deviation.

VAS: visual analog scale, ASES: American Shoulder and Elbow Surgeons score, SAS: shoulder activity scale; PCS: physical health composite score, MCS: mental health composite score, HADS-D: depression subscale of the Hospital Anxiety and Depression Scale, HADS-A: anxiety subscale of the Hospital Anxiety and Depression Scale.

*Statistically significant.

There was no significant difference in satisfaction rate between the old and young age groups ($P=0.538$), but factors affecting patient satisfaction differed by age.

With regard to pain, there was a significant difference in mean VAS change between older satisfied and unsatisfied groups and younger satisfied and unsatisfied groups ($P=0.022$ and $P=0.019$, respectively). O'Holleran et al. [4] performed multivariate analysis using a multiple linear regression model to identify independent determinants of patient satisfaction with their outcomes in

311 patients who underwent rotator cuff surgery. In that study, decreased satisfaction was noted in patients who experienced pain, and there was a significant relationship between pain and satisfaction levels ($P<0.001$). In the present study, pain was influenced satisfaction regardless of age, similar to the findings of previous studies. The subjects in our study were patients with degenerative rotator cuff tears, their chief complaint was pain, and surgery was performed because conservative treatment for pain failed; therefore, change in pain had an effect regardless of age.

Table 4. Mean change Δ (postoperative–preoperative) of clinical outcomes in old age and young age group

Variable	Old age			Young age		
	Satisfied	Unsatisfied	P-value	Satisfied	Unsatisfied	P-value
Δ VAS	3.94 ± 1.12	1.67 ± 1.22	0.022*	3.86 ± 1.12	1.42 ± 1.48	0.019*
Δ Constant	23.59 ± 8.76	20.17 ± 10.82	0.073	26.36 ± 8.36	19.76 ± 8.98	0.031*
Δ ASES	32.15 ± 15.26	29.4 ± 16.51	0.706	31.06 ± 12.57	22.48 ± 12.53	0.012*
Δ SAS	6.61 ± 3.28	5.47 ± 3.85	0.266	8.17 ± 3.74	6.87 ± 3.89	0.141
Δ PCS	10.63 ± 9.23	8.93 ± 10.34	0.354	20.2 ± 9.42	15.57 ± 9.54	0.056
Δ MCS	7.78 ± 8.86	6.13 ± 9.49	0.881	3.55 ± 11.96	1.22 ± 12.77	0.652
Δ HADS-D	2.24 ± 1.12	1.07 ± 0.56	0.031*	1.64 ± 0.91	1.37 ± 0.79	0.542
Δ HADS-A	2.35 ± 1.33	1.32 ± 0.74	0.044*	1.87 ± 1.01	1.42 ± 0.86	0.313

Values are presented as mean ± standard deviation.

VAS: visual analog scale, ASES: American Shoulder and Elbow Surgeons score, SAS: shoulder activity scale; PCS: physical health composite score, MCS: mental health composite score, HADS-D: depression subscale of the Hospital Anxiety and Depression Scale, HADS-A: anxiety subscale of the Hospital Anxiety and Depression Scale.

*Statistically significant.

Table 5. Postoperative healing and stiffness in old and young age groups

Variable	Age group		P-value
	Old age (n = 61)	Young age (n = 112)	
Healing			0.878
Yes	48 (78.49)	87 (77.68)	
No	13 (21.31)	25 (22.32)	
Stiffness			0.399
Yes	7 (11.48)	8 (7.14)	
No	54 (88.52)	104 (92.86)	

Values are presented as number (%).

Table 6. Postoperative healing and stiffness in satisfied vs. unsatisfied individuals within each age group

Variable	Old age			Young age		
	Satisfied	Unsatisfied	P-value	Satisfied	Unsatisfied	P-value
Healing			0.560			0.627
Yes	37 (80.43)	11 (73.33)		70 (78.65)	17 (73.91)	
No	9 (19.57)	4 (26.67)		19 (21.35)	6 (26.09)	
Stiffness			0.055			0.043*
Yes	3 (6.52)	4 (26.67)		4 (4.49)	4 (17.39)	
No	43 (93.48)	11 (73.33)		85 (95.51)	19 (82.61)	

Values are presented as number (%).

*Statistically significant.

In terms of function, there was no difference between older satisfied and unsatisfied groups, but there was a significant difference in mean change in Constant ($P=0.031$) and ASES ($P=0.012$) scores at a young age. Razmjou et al. [20] analyzed the association between satisfaction and function using multivariable ordinal logistic regression of ASES, Western Ontario Rotator Cuff Index (WORC), and Quick-Disabilities of the Arm, Shoulder and Hand (Quick-DASH) scores in 170 patients who underwent rotator cuff surgery. They reported that greater limitations in range of motion and strength were correlated with lower satisfaction with surgery. O'Holleran et al. [4] in their multivariate analysis reported that patients with functional difficulties or work disabilities had decreased satisfaction with the surgery than patients without functional difficulties or work disabilities. They suggested that functional outcomes contributed to patient satisfaction. In our study, function affected satisfaction in young patients, similar to the findings of previous studies. However, findings were different for elderly patients. In previous studies [4,8,20], patients were not divided into young and old age groups, and the mean age of the patients was similar to that of our younger age group. This likely obscured the outcomes of truly elderly patients. In our study, improvement in function did not affect patient satisfaction in older patients. Although the cause of this is unclear, we speculate that, because activity level and functional demand decrease with increasing age [10,17], functional improvement might not have a significant effect on satisfaction in elderly patients compared to younger patients.

Concerning psychological distress, while there was a significant difference in mean change in HADS-D ($P=0.031$) and HADS-A ($P=0.044$) scores between satisfied and unsatisfied subgroups in the older age group, there was no difference between these scores in the younger age group. Several studies have noted that psychological scores contribute to the severity of symptoms; therefore, these might be major factors affecting patient satisfaction [21-24]. Cho et al. [21] analyzed the correlation between psychological status and outcome measurements using the HADS scale and reported that depression and anxiety negatively affected self-assessed outcomes. In their study, the HADS score was assessed only before surgery; however, we measured the score before and after surgery and compared the two. In addition, patients in their study were young, with a mean age of 58.5 ± 8.2 years, and no comparison was performed according to age. According to our results, psychological scores did not have a significant effect on satisfaction in young patients but did in elderly patients. No previous study has evaluated changes in HADS score before and after rotator cuff repair surgery; therefore, it is difficult to know why this difference depends on age. Schilling

and Diehl [25] noted that elderly patients tend to have greater emotional experience and to be more skilled at emotional self-regulation than younger patients and have greater resilience to stress. Thus, older patients may have more skillful emotional regulation after surgery and are more likely to be satisfied with their psychological recovery.

We found that postoperative shoulder stiffness affected satisfaction in young patients ($P=0.043$). This finding may be related to the importance of functional restoration in young patients. Chung et al. [15] reported that ASES scores deteriorated in patients with postoperative stiffness at the final follow-up. As mentioned above, because young patients expect improvement in function after surgery, if shoulder function decreases due to postoperative stiffness, satisfaction may also decrease. Thus, in young patients, higher satisfaction can be achieved by postoperative management targeting improvements in function and preventing stiffness.

Our study has several limitations. First, it has the inherent weakness of being a retrospective study, namely the possibility of bias. Second, there is no universally agreed-upon definition of old age. The United Nations defines a person over the age of 60 years as an older person, while other authors have defined older people as those over 65 or 70 years [10,26,27]. However, in several previous studies, a high rotator cuff tear rate and a low healing rate were reported in patients over 70 years of age, based on which several studies have compared results according to an age cutoff of 70 [28-31]. Similarly, our study also classified patients over 70 years of age as old. Third, patient satisfaction was measured using a binary question (yes or no). Using a 10-point ordinal scale or a 6-point Likert scale to evaluate satisfaction, it may be possible to analyze more precisely the correlations between degree of satisfaction and the factors found to affect satisfaction in this study [4,32]. However, binary questions have the advantage of being simple and clear; in elderly patients with reduced cognitive ability compared to younger patients, simple and clear questions may elicit more accurate responses. Fourth, preoperative patient social factors such as marital status, current employment, income, and level of education were not investigated, even though they have shown a negative impact on satisfaction [2]. However, the main focus of our study was comparisons based on age. Finally, we did not include long-term follow-up data in our study. Over time, young patients age, but it is currently unknown whether these factors have the same effect during the long-term follow-up period. Therefore, long-term follow-up studies are needed.

CONCLUSIONS

Factors affecting patient satisfaction after ARCR differ according to age. Pain relief has a significant effect on patient satisfaction regardless of age. Improvement in psychological scores plays an important role in patients aged ≥ 70 years, while functional score is more important in patients aged < 70 years.

NOTES

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Conflict of interest

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Data availability

Contact the corresponding author for data availability.

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REFERENCES

1. Chow A, Mayer EK, Darzi AW, Athanasiou T. Patient-reported outcome measures: the importance of patient satisfaction in surgery. *Surgery* 2009;146:435–43.
2. Frank L, Basch E, Selby JV; Patient-Centered Outcomes Research Institute. The PCORI perspective on patient-centered outcomes research. *JAMA* 2014;312:1513–4.
3. Graham B, Green A, James M, Katz J, Swiontkowski M. Measuring patient satisfaction in orthopaedic surgery. *J Bone Joint Surg Am* 2015;97:80–4.
4. O'Holleran JD, Kocher MS, Horan MP, Briggs KK, Hawkins RJ. Determinants of patient satisfaction with outcome after rotator cuff surgery. *J Bone Joint Surg Am* 2005;87:121–6.
5. Davey MS, Hurley ET, Scanlon JP, Gaafar M, Pauzenberger L, Mullett H. Excellent clinical outcomes and rates of return to play after arthroscopic rotator cuff repair for traumatic tears in athletes aged 30 years or less. *Arthrosc Sports Med Rehabil* 2021;3:e667–72.
6. Jones CK, Savoie FH 3rd. Arthroscopic repair of large and massive rotator cuff tears. *Arthroscopy* 2003;19:564–71.
7. Levy O, Venkateswaran B, Even T, Ravenscroft M, Copeland S. Mid-term clinical and sonographic outcome of arthroscopic repair of the rotator cuff. *J Bone Joint Surg Br* 2008;90:1341–7.
8. Tashjian RZ, Bradley MP, Tocci S, Rey J, Henn RE, Green A. Factors influencing patient satisfaction after rotator cuff repair. *J Shoulder Elbow Surg* 2007;16:752–8.
9. Bennett WF. Arthroscopic repair of full-thickness supraspinatus tears (small-to-medium): a prospective study with 2- to 4-year follow-up. *Arthroscopy* 2003;19:249–56.
10. Fossati C, Stoppani C, Menon A, Pierannunzi L, Compagnoni R, Randelli PS. Arthroscopic rotator cuff repair in patients over 70 years of age: a systematic review. *J Orthop Traumatol* 2021;22:3.
11. Nicholson JA, Searle HK, MacDonald D, McBirnie J. Cost-effectiveness and satisfaction following arthroscopic rotator cuff repair: does age matter? *Bone Joint J* 2019;101:860–6.
12. Adams K, O'Shea P, O'Shea KL. Aging: its effects on strength, power, flexibility, and bone density. *Strength Cond J* 1999;21:65.
13. Brewer BJ. Aging of the rotator cuff. *Am J Sports Med* 1979;7:102–10.
14. Buckwalter JA, Woo SL, Goldberg VM, et al. Soft-tissue aging and musculoskeletal function. *J Bone Joint Surg Am* 1993;75:1533–48.
15. Chung SW, Huong CB, Kim SH, Oh JH. Shoulder stiffness after rotator cuff repair: risk factors and influence on outcome. *Arthroscopy* 2013;29:290–300.
16. Frost HM. On our age-related bone loss: insights from a new paradigm. *J Bone Miner Res* 1997;12:1539–46.
17. Witney-Lagen C, Mazis G, Bruguera J, Atoun E, Sforza G, Levy O. Do elderly patients gain as much benefit from arthroscopic rotator cuff repair as their younger peers? *J Shoulder Elbow Surg* 2019;28:1056–65.
18. Oh JH, Kim SH, Lee HK, Jo KH, Bin SW, Gong HS. Moderate preoperative shoulder stiffness does not alter the clinical outcome of rotator cuff repair with arthroscopic release and manipulation. *Arthroscopy* 2008;24:983–91.
19. Oh JH, Kim SH, Ji HM, Jo KH, Bin SW, Gong HS. Prognostic

- factors affecting anatomic outcome of rotator cuff repair and correlation with functional outcome. *Arthroscopy* 2009;25:30–9.
20. Razmjou H, Davis AM, Jaglal SB, Holtby R, Richards RR. Disability and satisfaction after rotator cuff decompression or repair: a sex and gender analysis. *BMC Musculoskelet Disord* 2011;12:66.
 21. Cho CH, Seo HJ, Bae KC, Lee KJ, Hwang I, Warner JJ. The impact of depression and anxiety on self-assessed pain, disability, and quality of life in patients scheduled for rotator cuff repair. *J Shoulder Elbow Surg* 2013;22:1160–6.
 22. Fishbain DA, Cutler R, Rosomoff HL, Rosomoff RS. Chronic pain-associated depression: antecedent or consequence of chronic pain?: a review. *Clin J Pain* 1997;13:116–37.
 23. Johnson AH, York JJ, Lashgari CJ, Petre BM, Turcotte JJ, Redziniak DE. Effects of preexisting depression and anxiety on post-operative outcomes following arthroscopic rotator cuff repair. *JSES Int* 2022;6:984–8.
 24. Vranceanu AM, Barsky A, Ring D. Psychosocial aspects of disabling musculoskeletal pain. *J Bone Joint Surg Am* 2009;91:2014–8.
 25. Schilling OK, Diehl M. Psychological vulnerability to daily stressors in old age: results of short-term longitudinal studies. *Z Gerontol Geriatr* 2015;48:517–23.
 26. Gwark JY, Sung CM, Na JB, Park HB. Outcomes of arthroscopic rotator cuff repair in patients who are 70 years of age or older versus under 70 years of age: a sex- and tear size-matched case-control study. *Arthroscopy* 2018;34:2045–53.
 27. Verma NN, Bhatia S, Baker CL 3rd, et al. Outcomes of arthroscopic rotator cuff repair in patients aged 70 years or older. *Arthroscopy* 2010;26:1273–80.
 28. Diebold G, Lam P, Walton J, Murrell GA. Relationship between age and rotator cuff retear: a study of 1,600 consecutive rotator cuff repairs. *J Bone Joint Surg Am* 2017;99:1198–205.
 29. Geary MB, Elfar JC. Rotator cuff tears in the elderly patients. *Geriatr Orthop Surg Rehabil* 2015;6:220–4.
 30. Hatstrup SJ. Rotator cuff repair: relevance of patient age. *J Shoulder Elbow Surg* 1995;4:95–100.
 31. Shon MS, Koh KH, Lim TK, Kim WJ, Kim KC, Yoo JC. Arthroscopic partial repair of irreparable rotator cuff tears: preoperative factors associated with outcome deterioration over 2 years. *Am J Sports Med* 2015;43:1965–75.
 32. Xu S, Chen JY, Lie HM, Hao Y, Lie DT. Minimal clinically important difference of Oxford, Constant, and UCLA shoulder score for arthroscopic rotator cuff repair. *J Orthop* 2019;19:21–7.