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Preoperative factors affecting the quality of life after arthroscopic rotator cuff repair: a prospective study

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Background: Rotator cuff tears are well known to cause significant pain and disability, having a marked impact on an individual's quality of life. This prospective study aimed to analyze the various patient factors and their impact on health-related quality of life (HrQoL) post arthroscopic rotator cuff repair (RCR).

Material and Methods: We prospectively analyzed 95 patients at one year and 81 patients at two years, with complete rotator cuff tear, who underwent arthroscopic repair of the same. The 36-Item Short Form Survey (physical and mental component score), visual analog scale (pain, function), and QuickDASH questionnaires were administered to all the patients preoperatively and at one- and two-year follow-ups. Relationships between various patient factors (age, gender, side, duration of symptoms, pseudoparalysis, diabetes mellitus [DM], type, and size of tear) and outcome measures were analyzed.

Results: All outcome parameters showed significant improvement at one- and two-year follow-ups. Patient factors, such as gender, tear type (traumatic vs degenerative), and DM, affected all outcome parameters and were significant even in the regression analysis model at a 2-year follow-up. Factors such as age and symptoms duration were significant only at 1-year follow-up, with older age and patients with symptoms > 6 weeks showing more disability. Side (dominant or nondominant), tear size, and pseudoparalysis do not affect outcomes.

Conclusions: This study showed that arthroscopic RCR significantly improved HrQoL post arthroscopic RCRs. Factors independently affecting HrQoL were noted as gender, tear type, and DM. On the other hand, age, side involved, duration of symptoms, pseudoparalysis, and tear size had no independent effect on HrQoL at a two-year follow-up.

Rotator cuff tears are frequently recognized to cause excruciating discomfort and disability, including weakness and restricted shoulder mobility, significantly affecting a person's health-related quality of life (HrQoL).[33,34] As a result, arthroscopic rotator cuff repair (RCR) has gained popularity as a treatment option with positive functional outcomes.[1]

Assessment of these functional outcomes has been done using several shoulder-specific scores. However, these functional outcome tools cannot adequately assess the overall health state following arthroscopic rotator cuff surgery. It has been underlined by Chung et al and Baettig et al that quality of life should be emphasized when evaluating the results of RCR, and assessment of treatment should focus on the patient as a whole and include the patient's subjective perception and not be limited to improvement of a specific symptom alone.[2,12] It is also highlighted that the conclusions derived from the objective analysis may not always match the patient's subjective perceptions and that this mismatch calls for further study.[24]

In the scant research that is currently available that analyses patient satisfaction, a few authors suggested that factors such as age, gender, smoking, fatty infiltration, and worker compensation affect the HrQol negatively.[3,37,45,47] Nevertheless, most current literature relies upon changes in pain ratings, subjective shoulder values, or a mere straightforward yes/no questionnaire.[3,37] Also, these studies have constrained scope and validity and are typically retrospectively evaluated.

As a result, a thorough patient-based outcome evaluation that focuses on HrQoL following arthroscopic RCR is required. By identifying factors that affect the quality of life, preoperative prediction models can be developed to determine the likelihood of a desired

The Kasturba Medical College, Manipal Institutional Ethical Committee approved this study (Registration no- ECR/146/Inst/KA/2013/RR-13, Study no- IEC/860/2017). Clinical Trial Registry (India) approval CTRI/2018/06/014655.

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or undesired surgical outcome. This knowledge can help avoid unnecessary efforts that do not contribute to improving patient satisfaction. This study aimed to comprehensively analyze as many ostensibly significant factors as possible in one evaluation and assess how they actually affected patient satisfaction after arthroscopic RCR.

Materials and methods

This is an institutional ethical committee-approved (IEC/860/2017) single-center, prospective study. The study has also been registered with Clinical Trial Registry–India (CTRI/2018/06/014655). The inclusion criteria included (1) clinical diagnosis of complete rotator cuff tear confirmed by magnetic resonance imaging, who underwent arthroscopic RCR of a complete rotator cuff tear, (2) medium to massive size cuff tears, and (3) patients who underwent standard postoperative rehabilitation with a minimum follow-up of two years. The exclusion criteria were (1) Goutallier grade 4 fatty infiltration[22] and grade 3 muscle atrophy (occupation ratio <0.4), (2) small size supraspinatus tears, (3) partial/irreparable rotator cuff tears, (4) partially repaired cuff tears, (5) mini-open RCR, (6) Samilson-Prieto grade 2 and above glenohumeral arthritis,[39] (7) history of previous shoulder surgeries, (8) history of known psychiatric illness, (9) history of inflammatory disorders like rheumatoid arthritis, and (10) workers compensation group of patient.

Preoperative evaluation

All patients who were suspected of having rotator cuff tear underwent a detailed clinical evaluation by a single senior shoulder surgeon, and the data were recorded in a standardized shoulder proforma, which remains in the inpatient medical record and was accessed for the demographic and clinical details of the patient during the study. Following the clinical evaluation, every patient underwent radiographic analysis using plain radiographs and magnetic resonance imaging to confirm the diagnosis. Once the clinical and radiological diagnosis of rotator cuff tear was confirmed, patients were conservatively or operatively managed depending on their age, symptoms, signs, and demand. Among patients who were advised and planned for surgery, questionnaires evaluating shoulder pain, functional abilities, and general health status were administered one day before the surgery by an independent surgeon who was not involved in the clinical assessment and operating team.

The questionnaires administered to assess health-related QoL included

1. *36-Item Short Form Survey (SF-36)*: SF-36 was developed as part of the Medical Outcomes Study, a four-year, multisite study to explain variations in patient outcomes.[44] SF-36 consists of 36 questions and measures HrQoL in 8 domains.[28] Its validity and reliability have been established for use in India.[41] The 8 SF-36 scale scores were summarized into 2 component summary scores via the oblique method providing an assessment of the quality of life related to physical and mental health, respectively: the physical component summary (PCS) and mental component summary (MCS).[17,28,46]
2. *QuickDASH*: It is a shortened version of the DASH outcome measure.[5] It is scored in the disability/symptom section (11 items, scored 1-5) and the optional high-performance sport/music or work modules (four items, scored 1-5). In our study, we have taken only the disability/symptom section for evaluation. The index forms a number between 0 and 100, where a higher value means a more significant limitation in performing activities.
3. *Visual Analog Scale (VAS)*: VAS is an excellent single-question tool with validated psychometric properties to assess preoperative and postoperative pain and function after the RCR.[7] The questionnaire included VAS for shoulder pain and an overall rating of shoulder function. The patients were asked to choose a number 0 to 10, 0 to 10 representing "none" to "disabling" for pain, and "comfortable" to "cannot use it" for function, respectively.

All patients underwent the planned arthroscopic RCR the following day.

Preoperative factors and their categorization

The following eight clinical variables were analyzed—age, gender, side of involvement, symptom duration, pseudoparalysis, tear type (traumatic and degenerative tears), diabetes mellitus (DM), and tear size (medium, large, and massive). Furthermore, for comparison, several variables were divided into subgroups: age less than or equal to 55 years, between 55 and 65 years and more than 65 years, and symptom duration as less or more than six weeks. Regarding tear type, based on the patient's history, the tear was classified into traumatic and degenerative subgroups.[21,25,29,35] Patients with a history of fall over shoulder tip, outstretched hand, or road traffic accident without any previous history of shoulder pain and dysfunction were categorized into a traumatic tear. In contrast, patients without any history of significant trauma and those with a history of pain and dysfunction were classified as degenerative. Based on Werner et al, pseudoparalysis was defined as "active forward flexion less than 90° with full passive motion, and the inability to hold the arm at 90°".[48] Patients were divided into two subgroups, with and without pseudoparalysis, respectively. Based on De Orio and Cofield's classification, tears were classified into medium, large, and massive tears following intraoperative measurement.[15] We did not include small tears in our study as their outcomes are usually excellent, and we wanted to assess how larger sizes (medium and above) could affect the clinical outcome.[49]

Surgical technique

A single senior shoulder surgeon performed the surgical procedure under general anesthesia and scalene block. All surgeries were performed in a sloppy lateral position. After standard preparation and draping, diagnostic arthroscopy was done via a standard posterior portal. Lesions of biceps, synovium, and cartilage were treated in standard fashion. Lafosse type 1 subscapularis tears were debrided, while type 2-5 were repaired using suture anchors. Adequate subacromial bursectomy was done to visualize the rotator cuff. Acromioplasty was done in case of acromial spur or Bigliani's type 3 acromion. The rotator cuff tear was assessed on its shape, size, retraction, delamination, and reparability onto the footprint. The cuff tear size was classified according to DeOrio and Cofield's classification using a graduated probe.[15] Adequate releases and medialization of the footprint were performed if the rotator cuff did not reduce adequately onto the footprint. Necessary footprint preparation was done, followed by RCR, either with single or double row, according to the tear size, reducibility, tear configuration, and reparability.

Postoperative rehabilitation and clinical follow-up

All patients underwent structured shoulder rehabilitation protocol followed in our institute. After RCR, an arm sling was provided

Table I
Baseline characteristics of patients at one- and two-year follow-ups.

Variables	Data		*P* value
	At one-year follow-up (n = 95)	At two-year follow-up (n = 81)	
Age			
Mean	57.4 ± 7.7* (range, 41-75)	57.6 ± 7.9* (range, 41-75)	
<55 y	35 (36.8%)	31 (38.2%)	.910
55-65 y	44 (46.3%)	35 (43.2%)	
>65 y	16 (16.8%)	15 (18.5%)	
Gender			
Men	56	49	.834
Women	39	32	
Symptom duration			
< 6 week	41	35	.994
>6 week	54	46	
Time duration as per type of cuff tear			
Traumatic	92 d† (range, 2-730)	82 d† (range, 2-730)	.06
Degenerative	296 d† (range, 10-1826)	252 d† (range, 10-1826)	
Side			
Dominant	71	59	.775
Nondominant	24	22	
Diabetes mellitus			
Yes	22	19	.962
No	73	62	
Pseudoparalysis			
Yes	43	36	.913
No	52	45	
Tear type			
Traumatic	74	63	.985
Degenerative	21	18	
Tear size			
Medium	23	20	.969
Large	19	15	
Massive	53	46	
Fatty infiltration			
Traumatic	**N = 74**-Grade 0- 36; Grade 1- 27; Grade 2-09 ; Grade 3-02	**N = 63**–Grade 0- 35; Grade 1- 22; Grade 2-05; Grade 3- 01	.771
Degenerative	**N = 21**-Grade 0- 02; Grade 1- 10; Grade 2- 8; Grade 3-01	**N = 18**–Grade 0- 02; Grade 1- 8; Grade 2- 7; Grade 3- 01	.996

SD, standard deviation.
*Mean ± SD.
†Mean duration.

for four weeks. In patients with medium size cuff tear, passive, gentle shoulder mobilization was started from the next post-operative day, whereas it was started after four weeks in large and massive size tears. The active assisted mobilization was started at eight weeks, and the rotator cuff strengthening was started after 12 weeks. Return to all routine activities was permitted at the end of 5-6 months, whereas sports were allowed after 8-9 months, depending on function and strength. The patients were followed up at the end of one and two years, and questionnaires were readministered.

Statistical analysis

The statistical analysis was done using R Statistical Software v4.0.0 (R core Team (2021); R Foundation for Statistical Computing, Vienna, Austria). Nonparametric tests (Friedman test) were used to compare preoperative, one-, and two-year follow-up scores in all eight domains of the SF-36, PCS, MCS, QuickDASH, and VAS scores. Kruskal-Wallis test and one-way analysis of variance were performed to examine differences in all the outcome scores between subgroups of each patient factor. In addition, mixed effect linear regression model analysis was done incorporating all the elements over the three-time period; preoperative, one-, and two-year follow-up for PCS and MCS scores. The *P* value of <.05 was taken as significant.

Sample size

In our study, a global sampling technique was used, which involved enrolling every consecutive patient who met the inclusion and exclusion criteria. Post hoc power calculation was performed to ensure adequate power was achieved for PCS and MCS scores using G*Power Software v3.1 (Heinrich Heine Universität, Düsseldorf, Germany).[18] It was observed that a power of > 99% was achieved in the study with a sample size of 95.

Results

A total of 95 patients were included at the beginning of the study and were followed up for one year without any dropouts. However, two patients expired, and 12 patients could not be contacted for the final follow-up scores at two years. Therefore, only 81 of the 95 patients were available for the final follow-up at two years. The patients were evaluated at two time points postoperatively; one- and two-year follow-ups. The baseline characteristics are summarized in Table I.

Overall trends of SF-36, QuickDash, and VAS score

Overall, significant improvements were noted in all patients after arthroscopic RCR in 8 domains of the SF-36, including the two-component summary scores (PCS and MCS), VAS scores (pain and function), and QuickDASH. The improvement in scores of the patients, as seen at the 1-year follow-up (n = 95), was maintained till the final follow-up at two years (n = 81). Maximum clinical and statistically significant improvement was seen in SF-36 role limitation due to physical health [7.63 ± 15.50-67.89 ± 19.52], QuickDASH [38.76 ± 10.70-11.96 ± 6.21], VAS pain [7.31 ± 1.04-2.0 ± 0.89], and VAS function [7.25 ± 1.29-2.69 ± 1.21] at the end of 1-year follow-up. Table II summarizes the preoperative and postoperative one-year and two-year follow-up mean scores and respective *P* values.

Patient factors affecting HrQoL post arthroscopic RCR

Patient factors such as gender, tear type, and DM significantly affected all five outcome parameters (PCS, MCS, VAS pain, VAS function, and QuickDASH). Age was noted to affect only PCS and VAS function scores at only one-year follow-up, with the younger group (< 55 years) having better scores as compared to the older group (>65 years). Similarly, symptom duration affected PCS and MCS scores at only 1-year follow-up, with the <6 weeks group showing better scores than the >6 weeks group. Side of injury, pseudoparalysis, and tear size showed no significance in any outcome parameters in any period. These results are elaborated on in Tables III and IV.

However, to account for confounding factors and prevent false-positive associations, mixed effect linear regression model analysis incorporated all eight patient factors over the entire three timelines for PCS and MCS scores (Table V). The model showed that only age, gender, tear type (traumatic or degenerative), and DM were significant patient factors independently affecting PCS and MCS scores. The model has demonstrated a significant difference in PCS scores between ages > 65 and < 55 years, with older patients showing lower PCS scores (by 1.96 points) than the younger age group. Female

Table II
Overall trends in SF-36, QuickDASH, and VAS scores at preoperative, one- and two-year follow-up.

Outcome parameters	Preoperative -mean(SD)	1 y-mean(SD)	2 y-mean(SD)	*P* value
SF-36 PF	68.26 (11.96)	87.84 (8.43)	85.11 (11.58)	<.001*
SF-36 RP	7.63 (15.50)	67.89 (19.52)	81.48 (19.68)	<.001*
SF-36 BP	34.99 (13.47)	75.68 (12.08)	77.59 (10.62)	<.001*
SF-36 GH	47.53 (9.48)	49.47 (8.77)	55.06 (5.89)	<.001*
SF-36 VT	50.89 (6.76)	52.74 (7.81)	54.81 (6.40)	<.001*
SF-36 SF	69.56 (12.15)	78.63 (9.78)	86.58 (9.57)	<.001*
SF-36 RE	58.93 (30.34)	78.32 (27.85)	87.75 (17.73)	<.001*
SF-36 MH	56.55 (7.11)	60.29 (8.19)	64.40 (7.84)	<.001*
SF-36 PCS	30.07 (3.51)	39.87 (4.91)	42.43 (5.47)	<.001*
SF-36 MCS	33.18 (3.45)	37.08 (3.77)	40.00 (3.14)	<.001*
QuickDASH	38.76 (10.07)	11.96 (6.21)	9.68 (7.15)	<.001*
V.Pain	7.31 (1.04)	2.00 (0.89)	2.00 (1.02)	<.001*
V.Function	7.25 (1.29)	2.69 (1.21)	2.00 (1.26)	<.001*

PF, physical function; *RP*, role limitations due to physical health; *BP*, bodily pain; *GH*, general health perception; *VT*, vitality; *SF*, social functioning; *RE*, role limitations because of emotional problems; *MH*, mental health; *PCS*, physical component summary; *MCS*, mental component summary; *V.Pain*, VAS pain score; *V.Function*, VAS function score; *Quick DASH*, quick disabilities of the arm shoulder and hand score; *SD*, standard deviation.
*Statistically significant ($P < .05$).

patients had lower PCS and MCS than their male counterparts (1.48 points and 2.41 points, respectively). Similarly, the degenerative tear type has demonstrated lower PCS and MCS scores than the traumatic type of tear (3.15 points and 1.56 points, respectively). Likewise, people with diabetes had lower PCS and MCS scores than non-diabetics (3.8 points and 1.16 points, respectively).

Discussion

In the present study, there was a significant improvement in all eight domains of the SF-36, including PCS and MCS component summary scores, QuickDASH scores, VAS pain and function scores, demonstrating that there is a significant improvement in HrQoL in patients with rotator cuff tear after arthroscopic RCR, which is sustained at the end of two years. Among the various outcome scores, SF-36 role limitation due to physical health (RE), QuickDASH, and VAS scores (pain and function) were the lowest preoperatively and improved most markedly after surgery. This emphasizes that pain severity and the ability to perform routine daily physical activities are the essential factors in patient-perceived well-being and arthroscopic RCR results in considerable pain reduction and improved function. Furthermore, only age, gender, diabetes, and tear type affected the PCS and MCS scores. A significant strength of our study is that it is a prospective study with more than 85% follow-up of patients at the end of two years.

Overall, our results are similar to Chung et al, who showed marked improvement in all eight subscales of SF-36, including both the PCS and MCS scores, with maximum change in SF-36 BP and SF-36 RE scores.[12] Compared with them, our study shows similar improvement in PCS and MCS scores by 9.8 points and 4.1 points, respectively. We believe that at the end of a minimum period of 1 year, most patients can return to their previous pain-free lifestyle, which results in vastly improved HrQoL. This fact is also well supported by Baysal et al, who demonstrated that more than 78% of the working patient returned to their old routine unmodified by one year postoperatively.[4] Our study shows steep improvement in SF-36 BP and VAS pain scores between preoperative and 1-year follow-up periods, and we believe that this reduction in pain results in a better quality of sleep, thus contributing to improved HrQoL. This finding is well supported by Castro-Contreras et al, in their systematic review, who concluded that a reduction in night pains due to rotator cuff pathology leads to improved sleep quality and shoulder function.[11]

The mean age in the present study was 57 years, with the significant bulk of patients aged 56-65 years. This was similar to demographic observations made by Tashjian et al, with a mean age of 59 years, and Chung et al, with a mean age of 56 ± 11.5 years.[12,45] Our study found that younger patients had higher postoperative scores for PCS, QuickDASH, and VAS function at the end of one- and two-year follow-ups. However, we could only establish statistical significance for PCS and VAS function scores at the end of one year mark. Our regression analysis showed a similar trend, with PCS scores decreasing linearly as patient's age increased, with significantly lower scores among patients aged >65 yrs compared to those aged ≤ 55yrs. These results indicate a higher satisfaction among the younger patient, which is in accordance with Chung et al, where age was a negative determinant of the physical score in which older patients with age > 65 years showed lower PCS scores than younger patients with age <55 years (by 5.2 points at one year and by 4.76 points at the final follow-up).[12] They also suggest that this difference is caused by the older population's decreased muscle strength and range of motion and higher possibilities of developing various medical comorbidities. On the contrary, several other authors have shown older patients have higher satisfaction than younger ones.[2,13,47] This discrepancy can be explained by the fact that those authors evaluated patient satisfaction using brief questionnaires and VAS pain score values. A more thorough examination of the quality of life might have revealed a different conclusion.

In our study, gender was seen to independently affect nearly all the outcome parameters at one year and final follow-up. It was also noted to be a significant patient factor in the regression model, with the female gender having lower physical and mental component summary scores than males. These findings are similar to the observations by Chung et al, who demonstrated that the female gender had lower PCS and MCS scores at one year and final follow-up.[12] They also added that these lower scores could result from higher pain intensity experienced among the females. These findings correlate with our study, where we observed similar differences in VAS pain scores, with the female gender showing higher scores than the male gender. Razmjou et al showed that females with rotator cuff pathology suffer from higher levels of preoperative and postoperative disability, as seen by the Western Ontario Rotator Cuff Index, compared to the male counterpart.[36] Other studies also have confirmed that the female gender is associated with poorer patient-reported outcomes.[19] This finding is also similar to the observation made in our study, where all five outcome parameters show higher disability in the female gender across all three time periods. The possible explanation for poor scores could be the gender-relation difference in pain perception,[38,42] physiological and social/cultural upbringing, and more importance to specific activities like dressing and grooming than males.[36,37] Razmjou et al also propose that

Table III
Change in outcome parameters for age, gender, tear type, and diabetes after arthroscopic RCR.

Outcome parameters	Time period	Patient factors												
		Age			*P* value	Gender		*P* value	Tear type		*P* value	Diabetes		*P* value
		<55 y	55-65 y	>65 y		Male	Female		Traumatic	Degenerative		Yes	NO	
		Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
PCS	Preoperative	30.68 (3.49)	29.69 (3.88)	29.79 (2.24)	.543	30.95 (3.04)	28.80 (3.78)	.002*	30.09 (3.58)	29.99 (3.34)	.946	27.80 (3.11)	30.75 (3.35)	<.001*
	1 y	41.65 (4.65)	39.31 (4.86)	37.47 (4.44)	**.012***	40.98 (5.00)	38.26 (4.34)	**.009***	40.89 (4.85)	36.25 (3.10)	<.001*	35.82 (3.45)	41.08 (4.63)	<.001*
	2 y	43.26 (5.82)	42.46 (5.37)	40.67 (4.86)	.2	42.81 (5.45)	41.85 (5.54)	.363	43.77 (5.10)	37.75 (3.99)	**<.001***	38.12 (5.67)	43.76 (4.71)	**<.001***
MCS	Preoperative	33.30 (3.30)	33.27 (3.83)	32.66 (2.78)	.918	34.24 (3.52)	31.66 (2.75)	<.001*	33.58 (3.57)	31.78 (2.61)	.014*	31.50 (3.28)	33.69 (3.36)	.017*
	1 y	37.48 (2.99)	36.92 (4.04)	36.63 (4.65)	.499	38.15 (3.96)	35.55 (2.90)	<.001*	37.78 (3.84)	34.59 (2.17)	**<.001***	35.60 (3.67)	37.52 (3.71)	**.039***
	2 y	39.83 (2.77)	40.16 (3.29)	40.00 (3.65)	.843	41.00 (3.28)	38.48 (2.19)	**<.001***	40.30 (3.19)	38.97 (2.79)	.094	39.24 (3.25)	40.24 (3.09)	.214
QuickDASH	Preoperative	39.16 (10.66)	39.15 (10.34)	36.79 (8.14)	.8	36.40 (10.09)	42.13 (9.13)	.004	39.40 (10.62)	36.47 (7.62)	.176	41.22 (8.01)	38.01 (10.55)	.073
	1 y	10.52 (5.70)	12.24 (6.41)	14.35 (6.25)	.083	10.35 (5.55)	14.28 (6.45)	.003*	11.30 (6.43)	14.29 (4.83)	.02*	14.77 (6.61)	11.11 (5.88)	.016*
	2 y	8.87 (6.75)	10.06 (7.68)	10.45 (6.97)	.653	8.30 (7.12)	11.79 (6.77)	**.019***	8.33 (7.27)	14.39 (4.20)	**<.001***	13.40 (7.57)	8.54 (6.67)	**.012***
V.Pain	Preoperative	7.31 (1.11)	7.23 (1.05)	7.50 (0.89)	.932	7.16 (1.19)	7.51 (0.76)	.184	7.38 (1.12)	7.05 (0.67)	.02*	7.27 (1.16)	7.32 (1.01)	.944
	1 y	1.83 (0.82)	2.07 (0.93)	2.19 (0.91)	.317	1.79 (0.82)	2.31 (0.89)	.004*	1.80 (0.74)	2.71 (1.01)	<.001*	2.50 (0.80)	1.85 (0.86)	.001*
	2 y	2.00 (1.03)	2.00 (1.06)	2.00 (1.00)	.996	1.76 (1.09)	2.38 (0.79)	**.008***	1.76 (0.98)	2.83 (0.71)	**<.001***	2.84 (0.60)	1.74 (0.99)	**<.001***
V .Function	Preoperative	7.20 (1.18)	7.32 (1.38)	7.19 (1.33)	.742	7.12 (1.35)	7.44 (1.19)	.361	7.45 (1.33)	6.57 (0.87)	.02*	7.50 (1.44)	7.18 (1.24)	.293
	1 y	2.37 (1.11)	2.70 (1.25)	3.38 (1.09)	**.017***	2.55 (1.19)	2.90 (1.23)	.248	2.58 (1.16)	3.10 (1.34)	.107	3.41 (1.14)	2.48 (1.16)	**.001***
	2 y	1.94 (1.15)	1.91 (1.25)	2.33 (1.54)	.664	1.76 (1.41)	2.38 (0.91)	**.008***	1.71 (1.21)	3.00 (0.91)	**<.001***	2.58 (1.17)	1.82 (1.25)	.011

PCS, physical component summary; *MCS*, mental component summary; *V.Pain*, VAS pain score; *V.Function*, VAS function score; *RCR*, rotator cuff repair; *Quick DASH*, quick disabilities of the arm shoulder and hand score; *SD*, standard deviation.
Bold *P* value signifies last follow-up significance.
*Statistically significant ($P < .05$).

Table IV
Change in outcome parameters for side of injury, duration, pseudopalsy, and tear size after arthroscopic RCR.

Outcome parameters	Time period	Patient factors												*P* value
		Side of injury		*P* value	Duration		*P* value	Pseudopalsy		*P* value	Tear size			
		D	Non. D		<6 weeks	>6 weeks		Yes	No		Medium	Large	Massive	
		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	
PCS	Preoperative	30.29 (3.34)	29.42 (3.98)	.219	30.68 (3.76)	29.61 (3.27)	.228	29.57 (3.03)	30.48 (3.84)	.136	31.05 (3.66)	29.54 (3.07)	29.83 (3.58)	.316
	1 y	40.17 (4.62)	38.95 (5.68)	.216	41.06 (5.28)	38.96 (4.44)	**.041***	39.27 (5.14)	40.36 (4.70)	.384	39.91 (5.34)	40.37 (5.31)	39.67 (4.64)	.899
	2 y	42.17 (5.51)	43.16 (5.42)	.474	42.93 (5.44)	42.06 (5.52)	.434	42.32 (5.44)	42.53 (5.56)	.744	41.19 (5.89)	42.91 (5.59)	42.82 (5.28)	.577
MCS	Preoperative	33.38 (3.44)	32.60 (3.51)	.353	33.89 (3.52)	32.64 (3.33)	.084	33.10 (3.59)	33.24 (3.37)	.619	33.26 (2.24)	32.56 (4.30)	33.37 (3.59)	.684
	1 y	37.25 (3.66)	36.58 (4.13)	.49	38.44 (3.92)	36.04 (3.33)	.02*	36.98 (3.48)	37.16 (4.03)	.662	36.59 (3.39)	37.05 (4.51)	37.30 (3.70)	.758
	2 y	40.18 (3.03)	39.53 (3.45)	.439	40.28 (3.63)	39.79 (2.73)	.505	39.51 (3.10)	40.40 (3.14)	.153	40.46 (2.89)	40.09 (3.33)	39.78 (3.22)	.719
Quick DASH	Preoperative	38.76 (10.25)	38.73 (9.72)	.959	39.91 (10.92)	37.88 (9.38)	.444	42.12 (9.80)	35.97 (9.50)	.004*	34.39 (9.18)	41.03 (7.93)	39.84 (10.69)	.082
	1 y	11.84 (5.70)	12.31 (7.67)	.931	11.20 (6.59)	12.54 (5.90)	.278	13.05 (6.91)	11.06 (5.48)	.163	11.76 (5.59)	13.04 (7.72)	11.66 (5.95)	.799
	2 y	10.25 (7.09)	8.16 (7.24)	.222	8.96 (7.23)	10.23 (7.12)	.407	9.34 (7.41)	9.95 (7.01)	.629	11.14 (8.11)	8.94 (6.04)	9.29 (7.10)	.655
V.Pain	Preoperative	7.28 (1.03)	7.38 (1.10)	.877	7.51 (1.03)	7.15 (1.04)	.04*	7.60 (0.95)	7.06 (1.06)	.002*	6.70 (1.33)	7.42 (0.90)	7.53 (0.85)	.012*
	1 y	1.93 (0.85)	2.21 (0.98)	.194	1.83 (0.67)	2.13 (1.01)	.187	1.98 (0.71)	2.02 (1.02)	.827	2.13 (1.10)	2.00 (0.94)	1.94 (0.77)	.899
	2 y	2.03 (0.93)	1.91 (1.27)	.744	1.89 (1.13)	2.09 (0.94)	.452	2.06 (1.04)	1.96 (1.02)	.484	2.15 (1.18)	2.07 (0.88)	1.91 (1.01)	.644
V .Function	Preoperative	7.20 (1.24)	7.42 (1.44)	.437	7.44 (1.29)	7.11 (1.28)	.187	7.84 (1.23)	6.77 (1.13)	<.001*	6.35 (1.34)	7.47 (0.90)	7.57 (1.22)	.002*
	1 y	2.63 (1.21)	2.88 (1.23)	.362	2.49 (1.12)	2.85 (1.27)	.142	2.84 (1.29)	2.58 (1.14)	.352	2.43 (1.24)	2.47 (1.26)	2.89 (1.17)	.219
	2 y	2.08 (1.28)	1.77 (1.23)	.379	1.69 (1.32)	2.24 (1.18)	.063	1.97 (1.30)	2.02 (1.25)	.907	2.30 (1.34)	2.00 (1.13)	1.87 (1.28)	.406

PCS, physical component summary; *MCS*, mental component summary; *D*, dominant; *Non. D*, nondominant; *V.Pain*, VAS pain score; *V.Function*, VAS function score; *RCR*, rotator cuff repair; *Quick DASH*, quick disabilities of the arm shoulder and hand score; *SD*, standard deviation.
Bold *P* value signifies last follow-up significance.
*Statistically significant ($P < .05$).

Table V
Result of mixed effects linear regression model over factors affecting overall PCS and MCS.

Patient factors	PCS			MCS		
	Est	S.E	*P* value	Est	S.E	*P* value
Age						
<55 y	Ref.			Ref.		
56-65 y	−1.03	0.63	.1	0.04	0.51	.94
>65 y	−1.96	0.85	.02*	−0.71	0.69	.3
Gender						
Male	Ref.			Ref.		
Female	−1.48	0.6	.01*	−2.41	0.48	<.001*
Side of injury						
D	Ref.			Ref.		
Non. D	0.04	0.68	.95	−0.91	0.55	.1
Duration						
<6 weeks	Ref.			Ref.		
>6 weeks	−0.75	0.62	.23	−0.91	0.5	.08
Tear type						
Traumatic	Ref.			Ref.		
Degenerative	−3.15	0.77	<.001*	−1.56	0.63	.02*
Tear size						
Medium	Ref.			Ref.		
Large	0.32	0.88	.72	0.14	0.71	.84
Massive	−0.67	0.8	.41	−0.14	0.65	.83
DM						
Yes	Ref.			Ref.		
No	3.8	0.68	<.001*	1.16	0.56	.04*
Pseudopalsy						
Yes	Ref.			Ref.		
No	1	0.66	.13	0.5	0.53	.35

PCS, physical component summary; *MCS*, mental component summary; *Est*, estimate; *S.E*, standard of error; *D*, dominant side; *Non. D*, nondominant; *DM*, diabetes mellitus.
*Statistically significant ($P < .05$).

females as the principal caregivers in society and their participation in family/social activities significantly impact the perception of disability secondary to rotator cuff pathology both before and after surgery.[36] We believe this difference has to be noted by the surgeon and his team to offer more effective and gender-sensitive care.

In our study, the tear type variable was a significant factor affecting all the outcome measures, where patients with degenerative tears reported significantly more disability than patients with traumatic tears. Braune et al demonstrated that patients in the nontraumatic group had significantly lower postoperative Constants Sore (75.3) than the traumatic groups, emphasizing that the nontraumatic group had lower postoperative range of movement and function.[9] Godshaw et al recently reported significantly better subjective outcomes in a traumatic tear than in degenerative tears.[21] In contrast, Baettig et al showed that nontraumatic tears had greater satisfaction when compared with patients of traumatic origin.[2] We consider this difference in the series of Baettig et al because the assessment of patient satisfaction was done with a single question, unlike our study. A plausible explanation for why degenerative tears may have inferior outcomes is that there is always more fatty infiltration and atrophy in degenerative ones than in traumatic tears, which contributes to poorer outcome.[20,30] In our study also, there was more fatty infiltration in degenerative tendons than traumatic torn ones, which could have contributed for poor outcome.

Another important patient factor affecting HrQoL was found to be DM. People with diabetes had significantly higher PCS, QuickDASH, and VAS pain scores over all three periods. The regression model has also shown DM to be significant in mental and physical component summary scores. Many authors have confirmed a significantly negative correlation between patient satisfaction and diabetic patients.[8,12,16,45] It is also recommended that RCR be performed after reasonable glycemic control to achieve better outcomes, as perioperative hyperglycemia has a negative effect after RCR.[6,10,43]

We have noted that pseudoparalysis did not affect HrQoL at the end of 1- and 2-year follow-ups. Although patients with pseudoparalysis had substantially lower preoperative scores, particularly for QuickDASH and VAS function, the similar postoperative outcomes of the two groups demonstrate that arthroscopic RCR reverses the effects of pseudoparalysis. Other authors also showed that postoperative function and cuff healing were not different in the presence of pseudoparalysis.[14,32] To the best of our knowledge, this is the first study to demonstrate the relationship between pseudoparalysis and SF-36 scores and HrQoL post arthroscopic RCR, and further study is required to validate this point.

We also noted that patients with symptom duration > 6 weeks had significantly lower SF-36 PCS and MCS scores at 1-year follow-up. Nevertheless, a similar interpretation could not be drawn at a 2-year follow-up or from the regression analysis. We can conclude that symptom duration does not affect HrQoL on long-term follow-up, which is supported by Tashjian et al and Chung et al, who have reported no significant correlation between postoperative HrQoL and symptom duration.[12,45]

In the present study, we have noted that tear size and hand dominance have not been shown to affect the HrQoL post arthroscopic RCR. Many other authors demonstrate no correlation between tear size and patient satisfaction.[12,15,20,23,27,31,45] We think that good arthroscopic RCR may result in consistent improvement of HrQoL, regardless of the tear size. Similarly, others reported no effect of dominance on patient satisfaction, which was in accordance with our study.[2,12,26,40]

The current study has a few limitations. Firstly, the present study does not assess any objective outcomes; thus, the correlation between subjective and objective outcomes could not be assessed. Secondly, we did not evaluate other patient factors, such as hypercholesterolemia, body mass index, and smoking which might act as potential confounders. Thirdly, we did not correlate various outcomes concerning fatty infiltration and muscle atrophy due to fewer degenerative tear patients and lesser grade 3 fatty infiltration.

Conclusion

Arthroscopic RCR is a successful intervention that can restore physical and mental quality of life. Furthermore, key patient factors positively affecting HrQoL include younger age, male gender, tear type (traumatic tears), and absence of DM. On the other hand, tear size, duration of symptoms, hand dominance, and pseudoparalysis do not contribute to patient-perceived happiness and well-being postsurgery. One can say that knowing these factors and their influence on HrQoL allows for making preoperative prediction models that can be used to counsel the patients better.

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