

Patient Preference Before and After Arthroscopic Rotator Cuff Repair: Which Is More Important, Pain Relief or Strength Return?

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Abstract

Our understanding of patients' desired outcomes and expectations of arthroscopic rotator cuff repair (ARCR) is limited, particularly regarding the importance of pain relief and strength return relative to each other.

We conducted a study of patient's ratings of the importance of pain relief and strength return after ARCR. Before undergoing surgery, 60 patients completed a shoulder questionnaire on which they assessed severity of symptoms and rated, on a 10-point scale, the importance of postoperative improvements in pain relief and strength return. After surgery, they completed the same questionnaire, again rating the importance of pain relief and strength return.

About 50% of the patients valued pain relief and strength return equally before and after ARCR. How-

ever, overall patient ratings were higher for strength return over pain relief, both before surgery, mean (SD), 9.2 (2.1) vs 8.6 (2.3) ($P = .02$), and afterward, at a follow-up of 5.2 (0.2) years, 8.9 (1.9) vs 8.2 (3.1) ($P = .03$). This significant preference for strength return held irrespective of sex, age, active sports involvement, preoperative self-assessed pain score, and subjective shoulder weakness. Before surgery, increasing age was associated with a stronger preference for pain relief ($r = 0.33$, $P = .01$), and retirees preferred pain relief over strength return.

These results show the patterns of patient preference for pain relief and strength return after ARCR. Improved understanding of these patients' expectations will allow meaningful changes in patient satisfaction.

Take-Home Points

- Pain relief and return of strength are important satisfaction variables for patients undergoing ARCR.
- Pain relief and strength return are equally desirable in the majority (50%) of the patients before and after ARCR.
- Overall, patient preference for strength return dominates pain relief in long-term.
- Increasing age is associated with a stronger preference for pain relief.
- Improved understanding of patient expectations after ARCR will promote meaningful changes in patient satisfaction.

A rotator cuff tear (RCT) can cause significant pain, weakness, stiffness, and loss of function in the shoulder. In most patients, arthroscopic rotator cuff repair (ARCR) provides significant and reproducible pain relief and variable return of shoulder strength and function.¹⁻⁴ ARCR outcomes are well described and well represented by validated outcome measures.⁵⁻⁹ However, these outcomes do not always correlate with patient satisfaction. For example, after ARCR, 2 patients with similar outcome scores may have different satisfaction levels.

Patient satisfaction involves multiple factors and varies with the patient's preoperative expectations and the degree to which the surgery matches the

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patient's desired outcomes.¹⁰⁻¹⁵ In clinical studies, Tashjian and colleagues,¹⁰ Henn and colleagues,¹¹ and O'Holleran and colleagues¹² found patient satisfaction correlated most highly with postoperative shoulder pain, shoulder function, general health status, and outcome scores. However, our understanding of patients' desired outcomes and expectations of ARCR is limited, particularly regarding the importance of pain relief and strength return relative to each other. We believe patients' preoperative expectations are influenced by their self-assessments of symptom severity and by their understanding of the outcomes of surgical procedures and of the information they receive from their surgeons during preoperative evaluation.

We conducted an observational study to determine patients' preoperative preferences and the importance of post-ARCR pain relief and strength return relative to each other. After surgery, preferences and ratings of pain relief and strength return were reevaluated to determine if they were altered by outcomes. We also studied the influence of multiple factors, including severity of preoperative symptoms (pain, weakness), age, sex, occupation, and active sports involvement, on patients' preoperative ratings of the importance of post-ARCR improvements in pain relief and strength return. We hypothesized that patients would vary in how they preoperatively value and desire post-ARCR pain relief and strength return.

Materials and Methods

The simple shoulder questionnaire (**Figure**) designed for this study had 12 items. Patients subjectively assessed the severity of their symptoms (pain level, shoulder weakness) and rated the importance of both pain relief and strength return to their occupational and personal life. They quantified their perceived level of pain over the preceding 7 days by rating it 0 (no pain) to 10 (worst pain imaginable). Preoperative pain level was evaluated to determine if patients with the worst pain would rate the importance of pain relief and strength return differently. Patients also rated their painful shoulder's strength deficit as a percentage of the contralateral shoulder's strength. In addition, patients rated the importance of pain relief and strength return from 0 (not important) to 10 (very important). Strength-to-pain difference (SPD) was calculated by subtracting the pain relief preference from the strength return preference, with positive values indicating a preference for strength return and negative values indicating a preference for pain relief.

Before patients underwent surgery for symptomatic suspected RCTs, they were approached to participate in this prospective study. Sixty-five patients provided informed consent on forms approved by an Institutional Review Board. Inclusion criteria were suspected unilateral rotator cuff pathology and willingness to participate. Of the 65 patients, 60 underwent ARCR without another procedure, such as shoulder instability repair, SLAP (superior labrum anterior-to-posterior) repair, or distal clavicle excision; the other 5 patients elected nonoperative treatment and were excluded from review. At a mean (SD) follow-up of 5.2 (0.2) years, the 60 patients who had surgery completed the questionnaire again and rated the importance of pain relief and strength return relative to each other.

Patients with RCTs were divided according to age, sex, shoulder dominance, occupation type, and active sports involvement. Standard definitions for occupation types were used: blue-collar, manual labor jobs; white-collar, salaried/educated positions; and retired.

Matched-pairs *t* tests were used to compare preoperative and postoperative continuous variables (strength return preference, pain relief preference, SPD). One-way analysis of variance (ANOVA) was used to compare categorical variables (sex, shoulder dominance, active sports involvement) with continuous variables (SPD), and bivariate regression was used to compare groups with continuous data (age, SPD). In cases involving more than 2 groups (occupation types), the Tukey honestly significant difference (HSD) test was used to evaluate intergroup differences. $P < .05$ was used for statistical significance.

Results

ARCR Outcomes

After ARCR, there was significant improvement in patient-reported pain and subjective strength scores. Mean (SD) pain score improved from 5.9 (2.3) to 1.3 (2.3) after ARCR ($P < .001$), and mean (SD) strength improved from 46% (22%) of normal to 84% (17%) of normal ($P < .001$).

Importance of Post-ARCR Pain Relief and Strength Return

Analysis of preoperative questionnaire responses revealed that, of 60 patients, 29 (48.3%) considered pain relief and strength return equally important, 20 (33.3%) valued postoperative strength return as more important, and 11 patients

Table 1. Importance of Pain Relief and Strength Return After Arthroscopic Rotator Cuff Repair

	Mean ± SD		P ^a
	Preoperative	Postoperative	
Importance of strength return rating	9.2 ± 2.1	8.9 ± 1.9	.01
Importance of pain relief rating	8.6 ± 2.3	8.2 ± 3.1	.21
Strength return–pain relief rating difference	0.9 ± 2.6	0.8 ± 2.7	.73
P ^b	.02	.03	—

^aLevel of significance between preoperative and postoperative ratings.

^bLevel of significance between preoperative and postoperative strength-to-pain ratings.

Table 2. Subgroup Analysis of Preference for Pain Relief and Strength Return

	Preoperative SPD, Mean ± SD	P	Postoperative SPD, Mean ± SD	P	P ^a
Sex					
Male	1.0 ± 2.7	.61	0.4 ± 2.5	.04	.16
Female	0.7 ± 2.3		1.7 ± 3.0		.33
Shoulder					
Dominant	1.3 ± 2.3	.21	0.7 ± 2.6	.79	.14
Nondominant	0.5 ± 2.7		0.9 ± 2.8		.28
Active sports involvement					
Yes	1.4 ± 3.0	.09	0.6 ± 2.8	.53	.17
No	0.3 ± 1.7		1.0 ± 2.6		.26
Occupation type					
Blue-collar	2.8 ± 4.2	.19 (BC vs WC)	1.3 ± 2.7	.99 (BC vs WC)	.29
White-collar	1.2 ± 2.1	.06 (WC vs R)	1.2 ± 3.1	.13 (WC vs R)	.97
Retired	−0.4 ± 0.4	.004 (BC vs R)	−0.3 ± 1.6	.3 (BC vs R)	.76

Abbreviations: BC, blue-collar; R, retired; SPD, strength return–pain relief rating difference; WC, white-collar.

^aLevel of significance between preoperative and postoperative SPD for individual subgroups.

Overall patient ratings were significantly higher for strength return compared to pain relief before surgery, mean (SD), 9.2 (2.1) and 8.6 (2.3) ($P = .02$), and afterward, 8.9 (1.9) and 8.2 (3.1) ($P = .03$) (Table 1). Although SPD was lower after surgery (relative increase in importance of analgesia at postoperative time point), the value was not significant ($P = .73$). There was a weak positive correlation between patient-reported preoperative pain and importance of pain relief ratings ($r = 0.05$, $P < .001$), but there was no significant correlation between postoperative values ($r = 0.01$, $P = .73$).

Also, there was no significant correlation between importance of strength return rating and strength deficits reported before surgery ($r = 0.22$, $P = .09$) or afterward ($r = 0.21$, $P = .11$).

Subgroup Analyses

Sex and Age. Of the 60 patients, 43 were male and 17 female. Mean (SD) preoperative SPD was 1.0 (2.7) for males and 0.7 (2.3) females; the difference was not significant ($P = .61$). After surgery, females emphasized strength return over pain relief more than males did: Mean (SD) SPD was

significantly higher ($P = .04$) for females, 1.7 (3.0), than for males, 0.4 (2.5). There were no preoperative–postoperative differences ($P = .33$) for males or females (**Table 2**). Before surgery, increasing age was associated with lower SPD, indicating a stronger preference for pain relief over strength return ($r = 0.33$, $P = .01$). There was no association between age and SPD after surgery ($r = 0.2$, $P = .12$).

Hand Dominance. RCT was found in the dominant shoulder of 31 patients (52%). Shoulder dominance did not affect SPD: Mean (SD) preoperative SPD was 1.3 (2.3) for dominant shoulders and 0.5 (2.7) for nondominant shoulders ($P = .21$), and postoperative SPD was 0.7 (2.6) for dominant and 0.9 (2.8) for nondominant ($P = .79$). SPD did not change from before surgery to after surgery for dominant ($P = .14$) or nondominant ($P = .28$) shoulders (Table 2).

Active Sports Participation. Thirty-two patients (53%) reported preoperative involvement in sports; 35 (58%) reported postoperative involvement ($P = .37$). Mean (SD) preoperative SPD was 1.4 (3.0) for involved patients and 0.3 (1.7) for uninvolved patients ($P = .09$), and postoperative SPD was 0.6 (2.8) for involved patients and 1.0 (2.6) for uninvolved patients ($P = .53$). SPD did not change from before surgery to after surgery for involved ($P = .17$) or uninvolved ($P = .26$) patients (Table 2).

Occupation Type. There were 9 blue-collar workers (15%), 32 white-collar workers (53%), and 19 retirees (32%). Mean (SD) preoperative SPD was 2.8 (4.2) for blue-collar workers, 1.2 (2.1) for white-collar workers, and -0.4 (0.4) for retirees. There were no significant differences in preoperative SPD between blue-collar and white-collar workers ($P = .19$) or between white-collar workers and retirees ($P = .06$), but there was a significant difference between blue-collar workers and retirees ($P = .004$). Mean (SD) postoperative SPD was 1.3 (2.7) for blue-collar workers, 1.2 (3.1) for white-collar workers, and -0.3 (1.6) for retirees. There were no significant differences between blue-collar and white-collar workers ($P = .99$), white-collar workers and retirees ($P = .13$), or blue-collar workers and retirees ($P = .3$).

Discussion

In this study, we wanted to determine patients' pre- and postoperative preferences for pain relief and strength return after ARCR. Preoperative and postoperative preference analysis of the 60 patients who underwent ARCR revealed that the

majority valued pain relief and strength return equally. However, overall, there was higher ratings for strength return in long term after ARCR, irrespective of age, sex, preoperative levels of shoulder pain and weakness, and preoperative and postoperative sports involvement.

Patients' preoperative expectations are a function of their assessment of their symptoms, their perceptions of expected surgical outcomes, and their understanding of preoperative discussion with their surgeons. In this study, patients self-assessed their shoulder symptoms and their effect on their occupational and personal life. They also rated the importance of post-ARCR pain relief and strength return relative to each other. To assess whether surgical outcomes affected perceptions of pain relief and strength return, patients completed the questionnaire before and after surgery. Overall, patients rated postoperative strength return over pain relief on long-term (5 years).

Subgroup analysis revealed a weak positive correlation between patient-reported preoperative pain scores and ratings of the importance of pain relief after surgery, but there was no correlation between postoperative pain scores and ratings of the importance of pain relief after surgery. This finding was surprising because we thought pain relief would be more important than strength return for patients with higher pain scores.^{1-3,16-21} We would like to clarify a point about this study: That patients preferred strength return over pain relief does not mean they did not care about pain relief. A substantial subset of patients (~50%) valued pain relief and strength return equally. In rotator cuff pathology, pain and weakness are to an extent interrelated. Shoulder pain that limits a patient's ability to perform a strenuous task can be perceived as shoulder weakness, which may explain why, despite having higher pain scores, patients preferred strength return over pain relief. Increasing age showed a positive correlation with preference for pain relief, which explains the finding that retirees preferred pain relief over strength return. We used SPD to express the preference for strength return over pain relief before and after ARCR. Unfortunately, SPD may not be used to quantitatively define the preference for strength return over pain relief.

Patient satisfaction after RCR involves multiple factors and has been well studied. In a retrospective analysis of 112 patients, Tashjian and colleagues¹⁰ found that patient satisfaction was affected by preoperative expectations, marital status, disability status, preoperative pain func-

tion, and general health status after RCR. They also found a positive but weak correlation between patient satisfaction and functional outcome scores, including visual analog scale (VAS), Simple Shoulder Test (SST), and Disabilities of the Arm, Shoulder, and Hand (DASH) scores. Henn and colleagues¹¹ evaluated 125 patients who underwent primary RCR for a chronic RCT. Higher preoperative expectations correlated with better postoperative VAS, SST, DASH, and Short Form 36 performance, irrespective of worker compensation status, symptom duration, number of patient comorbidities, tear size, repair technique, and number of previous operations. In a prospective cohort analysis of 311 RCR patients, O'Holleran and colleagues¹² found that decreased patient satisfaction was associated with postoperative pain and dysfunction. Furthermore, willingness to recommend surgery to another person was significantly related to patient satisfaction. In the present study, we did not correlate preoperative expectations with postoperative outcome scores or evaluate the effect of other known factors on RCR outcomes. Our main goal was to understand ARCR patients' preoperative and postoperative evaluations of the importance of pain relief and strength return relative to each other. Improved understanding of patients' expectations will allow us to identify disparities between expectations and outcomes.

Our study had several limitations. First, our questionnaire was not validated. However, we used it only as an assessment tool, to collect data, and do not propose using it to assess ARCR outcomes. Second, objective strength measurements were not performed, before or after surgery, and therefore patients' perceptions of weakness were not tested. Third, we did not correlate preoperative or postoperative shoulder outcome scores with patients' expectations. Our intention was to understand how ARCR patients rate the importance of pain relief and strength return relative to each other. Fourth, we did not correlate patients' expectations of strength return and pain relief with preoperative tear size or postoperative retear status.

Our observational study results showed that, before undergoing ARCR, most patients valued postoperative pain relief and strength return equally. However, there was an overall preference for strength return over pain relief. Furthermore, this preference held up irrespective of age, sex, sports involvement, or preoperative symptom severity. These findings add to our understanding of patients' preoperative expectations of ARCR.

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