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## Impact of rotator cuff tendon reparability on patient satisfaction

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## ARTICLE INFO

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**Background:** The primary purpose of this study was to explore the relationship between patient satisfaction and rotator cuff tendon reparability.

**Materials and methods:** This was a secondary analysis of prospectively collected data of consecutive patients who underwent arthroscopic repair of full-thickness rotator cuff tear and were followed up for 2 years. The satisfaction level was rated on a 6-point Likert scale. Patient-oriented disability measures included the American Shoulder and Elbow Surgeons score, the short version of the Western Ontario Rotator Cuff index, the Constant-Murley score, and the Quick Disabilities of the Arm, Shoulder, and Hand. Partial repair was defined as repair with >1 cm residual gap.

**Results:** There were 145 patients (65 women, 80 men; mean age, 62 years) who met the inclusion criteria. There were 12 massive, 31 large, and 102 small or moderate rotator cuff tears. Of 43 large or massive tears, 23 had a partial repair. There was a statistically significant relationship between satisfaction and tendon reparability ( $P = .01$ ). Patients with work-related shoulder injury reported less satisfaction with surgery ( $P = .005$ ). Age, gender, or tear size did not affect satisfaction with surgery. Satisfaction was a predictor of all postoperative outcome scores after being adjusted for preoperative scores ( $P = .001$  to  $P < .0001$ ).

**Conclusion:** In this study, patients with partial repair and those with an active compensable injury were less satisfied with surgery than their counterparts were. Older age, female sex, or a larger tear was not a negative predictor of patient satisfaction.

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Patient satisfaction involves the patients' perspectives in the assessment of the treatment they have received.<sup>18</sup> Satisfaction with surgical outcome and improvement in symptoms and functional ability are expected to have a linear relationship. This, however, is not always true. Williams et al<sup>42</sup> reported that patients might express full satisfaction despite the negative outcome or failure of achieving cure. Carr-Hill<sup>10</sup> noted that human satisfaction is a complex concept related to lifestyle, past experiences, and expectations as well as both individual and societal values. To date, a limited number of studies have examined patient satisfaction after rotator cuff repair. Whereas most investigators have based the success of surgery on patient-reported disability measures, only a few have used specific questionnaires to document satisfaction with surgery.<sup>14,23,28,33,38,40</sup> Factors such as demographics, preoperative disability, tear size, preoperative fatty infiltration, and presence of an active compensation

claim have been noted to affect satisfaction after rotator cuff repair.<sup>14,28,33,38,40</sup> However, the role of tendon reparability in patient satisfaction with surgery has not been specifically explored. The primary purpose of this study was to explore the relationship between patient satisfaction with surgery and tendon reparability. The impact of other important factors, such as age, sex, rotator cuff tear size, and a compensable work injury, was also explored. The difference in disability scores was examined within and between satisfaction categories.

## Materials and methods

## Patient population

Prospectively collected data of consecutive patients who had undergone a rotator cuff repair and were followed up for an average of 2 years were reviewed. The inclusion criteria were age  $\geq 18$  years, failure of conservative treatment including a structured rehabilitation program, and diagnosis of full-thickness rotator cuff tear requiring a repair. Exclusion criteria were previous surgery of the affected shoulder, evidence of infection, underlying metabolic or inflammatory disease, avascular necrosis, adhesive capsulitis, isolated

This study received ethics approval from the Human Ethics Research Board of the Sunnybrook Health Sciences Centre, Toronto, Canada: REB project #462-2014.

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subscapularis tear, and superior labral anterior and posterior or Bankart lesions requiring a repair.

#### Satisfaction with surgery

Patient satisfaction was rated on a 6-point Likert scale: very satisfied, somewhat satisfied, a little bit satisfied, a little bit dissatisfied, somewhat dissatisfied, and very dissatisfied. All patients provided this information at 2 years after surgery. Categories with zero or small cell numbers (ie, <5) were collapsed together.

#### Disability outcome measures

The outcomes used to measure recovery within and between satisfaction categories were the American Shoulder and Elbow Surgeons (ASES) standardized shoulder assessment form,<sup>36</sup> short version of the Western Ontario Rotator Cuff (ShortWORC) index,<sup>34</sup> Constant-Murley score (CMS),<sup>12</sup> and Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH).<sup>2</sup> Active shoulder movements within pain-free range were measured in flexion, abduction, and external and internal rotation (with 0 being the most restricted and 40 being the full score).<sup>12</sup> Reliability and validity of all outcome measures have been established in patients with shoulder or rotator cuff disease.<sup>27,31,32,34,37</sup>

Range of motion and strength assessments were completed before surgery and 2 years after surgery. Strength was measured as the maximum force that the patient could resist for 5 seconds without significant pain and discomfort from approximately 60° to 90° of elevation and in the scapular plane with an unsecured tensiometer.

#### Surgical procedures

Standard portals were used to examine intra-articular structures of the shoulder joint with the patient in the beach chair or lateral position. We used a calibrated probe to measure the medial to lateral and anterior to posterior dimensions of the tear. The largest dimension of rotator cuff tear size was categorized as small (<1 cm), moderate (1–3 cm), large (>3–5 cm), and massive (5 cm and larger).<sup>15</sup>

Rotator cuff repair to the bone was achieved by single-row or double-row fixations and margin convergence or side-to-side techniques along with lateral suture anchors. Partial repair was documented when the tear had a residual defect of >1 cm. Complete repair was either an anatomic repair or a repair over the articular margin with <1 cm residual gap. Anterior acromioplasty was performed for subacromial impingement. Moderate or severe degenerative changes (grades 3 and 4 of the Collins system)<sup>11</sup> of the acromioclavicular joint were managed by resection of the lateral end of the clavicle.

#### Postoperative rehabilitation

An UltraSling (DJO Global, Vista, CA, USA) was used to immobilize the shoulder joint for 6 weeks. Patients were given a standardized rehabilitation protocol with active assisted forward flexion and pendulum motions starting at 4 weeks postoperatively and submaximal isometric exercises starting at 6 weeks. Strength exercises against resistance were delayed for 12 weeks.

#### Statistical analyses

The sample size was calculated on the basis of the limited available literature.<sup>38,40</sup> Tashjian et al<sup>40</sup> reported 95% satisfaction in patients after rotator cuff surgery. Shon et al<sup>38</sup> reported 52% satisfaction with surgery in patients who had a partial repair. With  $P_1 = .95$ ,  $P_2 = .52$ ,  $P$  (overall proportion) = .74, effect size (ES) = 0.98, and an appropriate

Z value for  $\alpha$  (1.96) and power of 0.80 (0.84), a minimum sample of 16 patients per group was required.<sup>17</sup>

$$ES = \frac{|p_1 - p_2|}{\sqrt{p(1-p)}} \quad n_i = 2 \left( \frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES} \right)^2$$

The relationship between satisfaction (dependent variable) and independent categorical data (reparability, sex, tear size, compensable injury) and continuous variables (age) was examined through  $\chi^2$  statistics and univariable ordinary least squares regressions as appropriate. Analyses of covariance were used to examine the impact of satisfaction on postoperative disability outcome measures while adjusting for preoperative scores (between-group analysis). Paired  $t$ -tests examined within-group change over time. As a post hoc analysis, we examined the impact of outcomes that worsened over time in relation to reparability. Statistical analysis was performed using SAS version 9.1.3 (SAS Institute, Cary, NC, USA). Statistical results are reported using 2-tailed  $P$  values with significance set at  $P < .05$ .

## Results

There were 145 patients who met the inclusion criteria (65 women and 80 men; mean age, 62 [9] years; minimum, 42 years; maximum, 81 years). Seven patients had small tears and 95 patients had moderate tears. Thirty-one had a large tear, with 12 having a massive tear. Of 43 large or massive tears, 23 had a partial repair. There were 107 (74%) patients who reported that they were very satisfied; 28 (19%) were somewhat satisfied, 6 (4%) were a bit satisfied, 1 was a little bit dissatisfied, 1 was somewhat dissatisfied, and 2 were very dissatisfied. Categories of a little bit satisfied and dissatisfied were collapsed together, leaving 3 categories (Table I).

#### Predictors of satisfaction

There was a statistically significant relationship between satisfaction and tendon reparability ( $P = .01$ ). Patients with work-related shoulder injury reported less satisfaction with surgery ( $P = .005$ ). Age, sex, or tear size did not have an impact on satisfaction with surgery.

**Table I**  
Group differences in demographics and surgical findings

Variable	Highly satisfied (n = 107)	Somewhat satisfied (n = 28)	A bit satisfied/ dissatisfied (n = 10)	Statistics FET, P value
<b>Sex</b>				
Female: 65	53 (82)	10 (15)	2 (3)	FET = 0.005
Male: 80	54 (68)	18 (23)	8 (10)	$P = .12$
<b>Age, mean (SD)</b>	62 (9)	60 (9)	59 (11)	$F(2) = 0.96$ $P = .38$
<b>Surgery on dominant side</b>				
Yes	65 (61)	22 (79)	6 (60)	FET = 0.01
No	42 (79)	6 (21)	4 (40)	$P = .19$
<b>Workers' compensation</b>				
Yes: 20	9 (45)	8 (40)	3 (15)	FET = 0.001
No: 125	98 (78)	20 (16)	7 (6)	$P = .005$
<b>Mechanism of injury</b>				
Traumatic: 98	69 (70)	22 (23)	7 (7)	FTE = 0.02
Nontraumatic: 47	38 (81)	6 (13)	3 (6)	$P = .39$
<b>Tear size</b>				
Massive: 12	6 (50)	4 (33)	2 (17)	FTE = 0.001
Large: 31	22 (71)	8 (26)	1 (3)	$P = .14$
Small/moderate: 102	79 (77)	16 (16)	7 (7)	
<b>Tendon reparability</b>				
Partial: 23	12 (52)	10 (44)	1 (4)	FTE = 0.001
Full: 122	95 (78)	18 (15)	9 (7)	$P = .01$

FET, Fisher exact test; SD, standard deviation.

Variables are presented as number (%) unless otherwise indicated.

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