



Original article

Effect of affective temperament on outcome of rotator cuff surgery

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ABSTRACT

Introduction: Although numerous risk factors have been described, the effects of temperament, which is defined as a risk factor for certain disorders, on the outcome of patients undergoing rotator cuff surgery have not been investigated.

Hypothesis: We investigated whether a relationship exists between affective temperament and the outcome of patients undergoing rotator cuff surgery.

Material and methods: The outcomes of 176 patients undergoing rotator cuff surgery were examined using the Oxford and Constant questionnaires as well as visual analog scale values preoperatively and postoperatively. Inclusion criteria were defined as 1) dissatisfaction with pain despite 6 months of non-operative treatment; 2) rotator cuff defects with full-thickness, small- to large-sized defects; 3) presence of a single dominant temperament or nondominant temperament; 4) no history of a diagnosed psychiatric disorder; and 5) a minimum of greater than 1 year of follow-up after surgery. Exclusion criteria were 1) other comorbid shoulder pathology; 2) irreparable or partial rotator cuff rupture; 3) grade 3 retractions; 4) grade 3–4 fatty infiltration; 5) other comorbid diseases such as diabetes, thyroid disorders, or inflammatory diseases; 6) history of shoulder surgery; 7) infection of the shoulder joint; 8) neurologic deficit in muscles around the shoulder; 9) two or more dominant temperaments; and 10) history of acromioclavicular joint resection and/or biceps tenodesis with cuff repair. All patient temperaments were evaluated according to the Temperament Evaluation of Memphis, Pisa, Paris and San Diego auto questionnaire version.

Results: The mean follow-up time was 45.5 months. The outcomes of patients with depressive temperament were worse than of patients with a nondominant temperament. This situation was observed both preoperatively and postoperatively. However, a similar relationship between nondominant and anxious temperament groups was observed only postoperatively.

Conclusion: We noticed that depressive and anxious temperaments had a negative effect on patient outcomes after rotator cuff surgery; however, nondominant temperaments had a positive effect on patient outcomes.

Level of evidence: Level III; Retrospective Comparative Study.

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1. Introduction

Arthroscopic surgery for rotator cuff repair has been increasingly performed over the past 30 years [1–3]. To improve patient outcomes, risk factors that may interfere with the outcomes of patients undergoing rotator cuff tendon repair should be well known and identified preoperatively [1–7] so that prevention can

be arranged preoperatively or postoperatively. There are only a limited number of studies in the literature that have demonstrated that a patient's affective temperament is one of the identifiable risk factors for disease progression or the initiation of certain diseases [8–16].

The idea of “temperament” dates back to the era of ancient Greece, the time of Hippocrates and Aristotle [17]. It was later revised by Galen, who described “temperament” as a healthy human reaction. Today, it is postulated that temperaments are predisposing factors with genetic switching that enable consistent humor. Moreover, experiences and learning during the life period may affect temperaments, and these factors can lead to the development of character; in individuals, this has been called a

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“distinctive” sign [18,19]. This may explain why individuals with the same temperaments behave differently. Moreover, temperaments are considered to be stable and consistent during the life span [15–20].

In the literature, the effect of temperament on patient outcomes after rotator cuff surgery has not been evaluated. We hypothesized that the outcomes of patients undergoing rotator cuff surgery are influenced by dominant affective temperaments, independently. We aimed to investigate the relationship between dominant temperament and patient outcome and to describe temperament as a risk factor that affects the outcome of patients undergoing rotator cuff surgery.

2. Materials and methods

After obtaining ethical approval from our institutional review board (No. 01-11-18), we enrolled patients retrospectively. All patients gave informed consent before both surgery and the research, separately. Many conditions affecting the outcomes of patients undergoing cuff surgery have been defined [2–23]. Therefore, to evaluate only the effect of temperament on outcome after rotator cuff surgery, other components influencing outcome should be standardized to avoid potential confounding factors. Thus, we defined the inclusion criteria as follows:

- dissatisfaction with pain despite 6 months of nonoperative treatment;
- rotator cuff defects with full-thickness, small-to-large defects diagnosed preoperatively by magnetic resonance imaging (MRI) and during arthroscopy according to the Cofield [24,25] classification;
- presence of single dominant temperament or nondominant temperament (present in at least 20 people);
- no history of a diagnosed psychiatric disorder;
- a minimum follow-up of greater than 1 year after surgery.

The exclusion criteria were as follows:

- other comorbid shoulder pathology such as instability or glenohumeral arthritis, as determined on X-ray or MRI;
- irreparable rotator cuff rupture (defined as remaining cuff tissue that cannot reach the tubercle of humerus, despite adequate release, due to fatty degeneration and atrophy of muscles [26]) or partial rotator cuff rupture, as determined on MRI and during arthroscopy;
- grade 3 retractions according to the Patte [27] classification;
- grade 3–4 fatty infiltration according to the Goutallier [28] classification;
- other comorbid diseases such as diabetes, thyroid disorders, or inflammatory diseases;
- history of shoulder surgery;
- infection of the shoulder joint;
- neurologic deficit in the muscles around the shoulder (except pseudoparalysis);
- two or more dominant temperaments;
- history of acromioclavicular joint resection and/or biceps tenodesis with cuff repair.

Thus, we ultimately enrolled 287 patients who underwent arthroscopic rotator cuff repair from January 2010 to November 2017. Eleven subjects opted not to participate in this study, 84 did not match our inclusion/exclusion criteria, and 16 had two dominant temperaments according to the Temperament Evaluation of Memphis, Pisa, Paris and San Diego-auto questionnaire Turkish

version (TEMPS-A) [29,30] scale; all were excluded. Consequently, we analyzed 176 patients' outcomes.

Patients were evaluated using clinical and radiologic parameters, and their demographic features were documented (Table 1). The Oxford and Constant questionnaires as well as visual analog scale (VAS) values were completed preoperatively and postoperatively for all patients. All patient temperaments were evaluated using the TEMPS-A [30] by an orthopedic surgeon at the last follow-up. According to this system, the temperaments of the patients were categorized into five groups: depressive temperament, cyclothymic temperament, hyperthymic temperament, irritable temperament, and anxious temperament. Depressive temperament was described as having withdrawn and self-blaming features and an absence of steadiness [10–31]. Cyclothymic temperament was characterized by instability of mood and energy. This instability, which negatively impairs an individual's social life, accrues quickly [17–32]. Hyperthymic temperament was associated with optimistic and exhilarated features and having a high energy level. An individual with this temperament is productive and has self-conceit. He or she communicates effectively with others [17–33]. Irritable temperament interferes with cyclothymic type. This temperament is characterized by a higher level of energy and a poor level of empathy. These individuals get angry quickly and can engage in violence [10–17]. Individuals with an anxious temperament tend to fantasize, be concerned, and also provoke somatic disease because of environmental stress [10–19]. The TEMPS-A auto questionnaire is composed of 110 (109 for men) questions with responses given as “yes” or “no.” An individual may be classified into two or three groups at the same time or even none of them. If a patient could not be classified into any of the five groups, they were categorized as having a nondominant temperament. Therefore, we used six temperament groups. However, we included patients who had only one distinct temperament to avoid confusion as to which temperament influenced the outcomes of patients after surgery. Patients undergoing an assessment of functional status and temperament were evaluated at last follow-up.

All patients were operated by the senior surgeon in a modified beach chair position. The applied technique for rotator cuff repair was decided according to defect size, retraction, and fatty degeneration. A single-row technique was preferred for small defects, and a modified suture bridge technique was preferred for medium-to large-sized defects. Following the rotator cuff repair, an additional procedure was completed if needed, such as acromioplasty or biceps tenotomy (Table 1).

All patients wore a Velpeau bandage for 4 weeks. Passive pendulum exercise was started on the first day following surgery. Patients were asked to perform these exercises five times a day for 10 minutes. Physiotherapy was started on week 4. Strengthening

Table 1
Demographic data of patients.

Variable	Data, n (min-max)
Age (years)	60.8 (37–80)
Follow-up ^a (months)	45.5 (17–92)
Gender (F/M)	124/52
Rotator cuff repair	176
Biceps tenotomy	109
Acromioplasty	160
Goutallier grade	
1	120
2	56
Patte grade	
1	79
2	97

^a The follow-up time represents the time between surgery and completing the questionnaires.

exercises were initiated between week 8 and week 12. Sportive activities were allowed after 6 months.

The values for skewness and kurtosis between -3 and $+3$ are adequate for a normal distribution. Therefore, effects of the scores (Oxford, Constant, and VAS) on the temperaments were performed using analysis of variance and t tests. Effects of independent variables (age, gender, temperament, grade of Goutallier and Patte, time between surgery and completing the questionnaires) on the dependent variables (Constant, Oxford, and VAS scores) were performed using backward elimination for multiple linear regression. If the B coefficient is positive, there is a positive effect between variables. If the B coefficient is negative, there is a negative effect between variables. Significance was set at $p < 0.05$. Analyses were performed using SPSS version 22 for Windows (SPSS Inc., Chicago, IL, USA).

3. Results

All patients were categorized into six groups, nondominant, depressive, cyclothymic, hyperthymic, irritable, anxious temperament groups, which included 114, 38, 1, 2, 1, and 20 patients, respectively (Table 2). The mean follow-up time was 45.5 months (Table 1). The follow-up time represented the time between surgery and completing the questionnaires. Preoperative and postoperative scores of patients are presented in Table 2.

We found some significant relationship between groups, but we could not evaluate the cyclothymic, hyperthymic, and irritable groups because of their low number of patients. Thus, a significant relationship was detected between nondominant, depressive, and anxious groups (Table 3). Preoperative Constant and VAS scores were 34.8 ± 13 and 29.2 ± 8.8 for the nondominant temperament group and 9.2 ± 0.9 and 9.7 ± 0.7 for the group with depressive temperament. The evaluation revealed significant differences between the nondominant and depressive temperament groups according to the preoperative Constant and VAS scores ($p < 0.05$). The relationship between the nondominant and depressive temperament groups according to the postoperative Constant (79 ± 9 and 68.4 ± 12.1), Oxford (41.5 ± 8.6 and 31.8 ± 9.1), and VAS (1.7 ± 1.2 and 4.7 ± 1.1) scores was significant ($p < 0.05$; Table 3). When the results were taken into consideration, it could be said that the patients with depressive temperament had poorer results than those with a nondominant temperament. This situation was valid not only preoperatively but also postoperatively

(Tables 2 and 3). However, these similar correlations were detected only postoperatively between the nondominant and anxious temperament groups. In addition, there was no relationship between the depressive and anxious temperament groups according to the Constant, Oxford, and VAS scores preoperatively and postoperatively (Table 3).

When we established multiple linear regression models, which had both dependent variables (Oxford, Constant, VAS) and independent variables (temperaments, age, gender, Goutallier and Patte grades, and the time between surgery and completing the questionnaires), nondominant temperament had a significant positive effect on preoperative Oxford and Constant scores as compared with other independent variables. In addition, Patte grade 2 had a significant negative effect on preoperative Oxford and Constant scores as compared with other independent variables. Apart from these effects, male gender had a significant negative effect on preoperative VAS scores as compared with other independent variables. Namely, male gender was associated with a lower VAS score than female gender (Table 4). When we evaluated postoperative scores in the regression models, we detected that nondominant temperament had a significant positive effect on postoperative Oxford and Constant scores and a significant negative effect on postoperative VAS scores as compared with other independent variables (Table 4).

4. Discussion

To our knowledge, this is the first study to evaluate the relationship between affective temperaments and the outcomes of patients with rotator cuff defects treated arthroscopically. In the literature, numerous risk factors for worse outcomes have been demonstrated in patients with rotator cuff defect who were treated either arthroscopically or via open approach [1–34]. In this study, we determined that the patients' affective temperament influenced their outcomes, independently.

According to this study, depressive and anxious temperament affected patients' outcomes poorly in the postoperative period. In addition, it seemed that nondominant temperament affected patients' outcomes more positively than depressive and anxious temperaments in the postoperative period. It was also detected that patients with nondominant temperament had lower VAS score than those with depressive and anxious temperaments in the postoperative period. These results showed that depressive and anxious temperament could be defined as additional risk factors for out-

Table 2
Temperaments and functional scores.

Temperaments, n (%)	Preop. Oxford Mean $\pm$ SD	Postop. Oxford Mean $\pm$ SD	Preop. Constant Mean $\pm$ SD	Postop. Constant Mean $\pm$ SD	Preop. VAS Mean $\pm$ SD	Postop. VAS Mean $\pm$ SD
Anxious, 20 (11.4)	17.6 ± 9.1	32.3 ± 10.2	32.6 ± 13	71.5 ± 10.3	9.3 ± 2.9	5.3 ± 2.9
Nondominant, 114 (64.8)	17.3 ± 8.6	41.5 ± 8.6	34.8 ± 13	79 ± 9	9.2 ± 0.9	1.7 ± 1.2
Depressive, 38 (21.6)	14.6 ± 5	31.8 ± 9.1	29.2 ± 8.8	68.4 ± 12.1	9.7 ± 0.7	4.7 ± 1.1
Cyclothymic, 1 (0.6)	8	36	8	67	9	8
Irritable, 1 (0.6)	13	13	19	53	9	10
Hyperthymic, 2 (1.1)	14.5	45.5	31	85	9.5	1

Table 3
Relationship between temperaments and functional scores.

Temperaments	Anxious-Depressive (p value)	Depressive-Nondominant (p value)	Anxious-Nondominant (p value)
Preop. Oxford	.389	.195	.987
Postop. Oxford	.979	.000*	.000*
Preop. Constant	.563	.036*	.728
Postop. Constant	.501	.000*	.006*
Preop. VAS	.313	.012*	.832
Postop. VAS	.319	.000*	.000*

* $p < 0.05$.

Table 4
Linear regression models: independent variables* (temperaments, age, gender, Goutallier and Patte grades, and time between surgery and completing the questionnaires) effects on dependent variables (Oxford, constant, VAS).

Dependent Variable	Independent Variable	B	p	R ²
Postop. Oxford	Nondominant temperament	9.765	.000*	.208
Postop. Constant	Nondominant temperament	9.349	.000*	.167
Postop. VAS	Nondominant temperament	– 3.222	.000*	.486
Preop. Oxford	Grade 2 Patte	– 2.498	.039*	.047
	Nondominant temperament	2.970	.039*	
Preop. Constant	Grade 2 Patte	– 4.688	.010*	.058
	Nondominant temperament	4.705	.013*	
Preop. VAS	Male	– .302	.036*	.093

* $p < 0.05$.

comes in the postoperative period. In the literature, similar risk factors for some diseases have been defined [10–37]. Taşkesen et al. [13] evaluated affective temperaments of 102 patients with boxer fractures, and they detected that irritable temperament was seen mostly in the boxer fracture group. Furthermore, Eory et al. [10] investigated temperaments of the 179 patients treated for primary hypertension with antihypertensive drugs. They found that cyclothymic affective temperament was an additional risk factor for cardiovascular morbidity. Consequently, the evaluation of a patient's temperament preoperatively may provide the advantage of arranging private protective care of patients. Thus, preventive interventions may be organized to increase patients' expectations and outcomes in the long term. We think that both temperament and biological features of patients should be taken into account together while treating rotator cuff defect.

In this study, results showed that temperaments affected both objective and subjective scores postoperatively. Constant and Oxford shoulder score are commonly used to measure patient outcomes after rotator cuff surgery [38,39]. The Constant scoring system takes the place of subjective measures that consist of the patient's sensation of pain and objective measures consisting of strength and range of motion. The Oxford scoring system consists of subjective measurement elements. The Constant scoring system is more complicated because of the need for a specialist. The Oxford scoring system is simpler, and it does not require any specialist, as patients are able to answer the questionnaire by themselves [38]. However, we cannot determine how the temperaments affect both the objective and subjective scores or which mechanism is responsible this interaction. However, we think that compliance in the physical therapy period may be affected by the features of temperaments. It is quite likely that in those with depressive and anxious temperaments, compliance with physical therapy decreases following surgery. Shamsi et al. [37] pointed out that temperament was an important factor in the compliance with type 2 diabetes mellitus treatment. They claimed that patients with irritable temperament need an additional special training program to improve their medication compliance. Similarly, Gois et al. [11] presented that depressive temperament in type 2 diabetes mellitus patients was associated with poor metabolic control, and these patients should be given psychoeducation by a specialist. At this moment, it may be recommended that patients with depressive or anxious temperaments should be followed up more closely than those with a nondominant temperament and given special education about their healing processes individually.

This study has some limitations. The sample size was too small to generalize our results to the whole society. In addition, some temperaments were not represented in our patient population. However the proportions of cyclothymic and hyperthymic temperaments were detected as 1.7% and 1.2%, respectively, in the Turkish population by Vahip et al. [30], and irritable, anxious, and depressive temperaments were detected as 3.7%, 3.7%, and 3.1%, respectively. Thus, we do not know whether cyclothymic, hyper-

thymic, and irritable temperaments were associated with patient outcomes. Furthermore, in the temperament groups, patients did not present a scattered homogenetic pattern, and we did not eliminate the effects of the other factors on the outcomes of patients undergoing rotator cuff surgery, such as age, gender, fatty degeneration, retraction, surgical technique, and so on. Also, we could not divide patients into subgroups according to rotator cuff defect size classification because of the lack of patients in the subgroups, which precluded determining statistical significance. Therefore, we could not eliminate an effect of the defect size and surgical technique on patients' outcomes. This conflict can result in a focus on patient temperament.

5. Conclusion

In this study, we aimed to show that temperaments should be considered additional risk factors for poor patient outcomes after rotator cuff surgery. We found that only depressive and anxious temperaments negatively affected patients' outcomes following shoulder surgery, whereas nondominant temperaments affected patients' outcomes positively. However, the exact pathophysiological mechanisms of temperaments are not a topic for orthopedists, and they may be investigated by a psychiatrist. However, further prospective randomized studies with larger patient samples between affective temperaments and outcomes of patients undergoing rotator cuff surgery could be designed to develop an algorithm for the postoperative and preoperative approach to patients undergoing rotator cuff surgery that can be used by both psychiatrists and orthopedists, collectively.

Ethical statement

We obtained ethical approval from review board of Ankara University Faculty of Medicine (No. 01-11-18).

Disclosure of interest

The authors declare that they have no competing interest.

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We do not have any financial biases.

Authors' contributions

H. Çağdaş Basat planned the study, wrote the manuscript, analysed the data.

Mehmet Armangil planned the study, discussed the results and contributed to the final manuscript.

Yener Yoğun collected the data, discussed the results.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.otsr.2019.09.019>.

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