



Impact of Functional and Aesthetic Factors on Patient Satisfaction in Septorhinoplasty

Original Investigation

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Abstract

Objective: This study aimed to differentiate the functional or aesthetic factors affecting the result of septorhinoplasty and to determine the most important factor related to patient satisfaction.

Methods: Rhinoplasty Outcome Evaluation (ROE) and Visual Analog Scale (VAS) for obstruction (VAS-O) and for appearance (VAS-A) were administered to fifty-five patients undergoing septorhinoplasty preoperatively and six months after the surgery. VAS scores were evaluated as follows: VAS-O (0: unblocked, 10: completely blocked) and VAS-A (0: worst appearance, 10: best appearance). ROE scores were calculated between 0 and 100. In order to examine the relationship between the measurements and determine the most powerful item that affects the overall ROE score, path analysis was performed, and the path coefficients were calculated.

Results: The mean VAS-O and VAS-A scores before and after surgery were 6.85 and 4.36, and 3.91 and 7.22, respectively ($p < 0.001$). The absolute value of mean difference was greater for VAS-A (-3.31) than VAS-O (-2.49), which also means appearance scores were more widely affected. The mean ROE score was increased from 46.36 ± 9.28 to 78.85 ± 11.70 . VAS-A score had a significant impact on the overall ROE score ($\beta = 0.782$, $p = 0.001$), while the VAS-O score had no impact. The least effective item on the overall ROE score was item 2 ($\beta = 0.445$), while the other items related to aesthetic outcome had higher Path coefficients.

Conclusion: Although septorhinoplasty provides satisfactory results in both functional and aesthetic aspects, patients are more satisfied with the cosmetic outcomes.

Keywords: Rhinoplasty, cosmetic surgery, patient-reported outcome measures, health-related quality of life, patient satisfaction, visual analog scale

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Introduction

Septorhinoplasty can be regarded as a challenging operation because both functional and aesthetic expectations must be considered. The impact of the

social and professional environment, nasal obstruction, and concerns about body image are among the reasons why patients request this surgery. Surgical success in septorhinoplasty previously focused on morbidity, complications,

nasal obstruction, and cosmetic outcomes (1). However, improvements in patient satisfaction and quality of life, in addition to surgical values, are important factors in determining surgeons' performance in cosmetic procedures. In other words, the parameter that measures the success of the surgeon in aesthetic operations is patient satisfaction. Different patient-reported outcome measures (PROM) can be used to evaluate the success of nasal surgery in a patient-oriented manner. Some of these PROMs were created to assess functional outcomes, while others were created to assess artistic outcomes or a combination of both (2, 3).

Alsarraf (4) developed a specific questionnaire, rhinoplasty outcome evaluation (ROE), which allowed us to measure health-related quality of life in social, emotional, and psychological aspects in patients undergoing rhinoplasty. This questionnaire was well adopted and is widely used among rhinoplasty surgeons.

Another well-known and easily applicable measurement reported by the patient is the visual analog scale (VAS). This simple numeric scale is a way to turn a subjective feeling into a number (3). The VAS can provide a simple expression of thoughts about appearance and obstruction after septorhinoplasty.

ROE mostly consists of six questions that measure aesthetic satisfaction. Understanding which problem has the greatest impact on the overall score can reveal what factors have the greatest impact on patient satisfaction with septorhinoplasty. The cosmetic result will be less valuable for a patient whose nasal congestion does not improve in the postoperative period.

The aim of this study is to determine whether the main factor affecting patient satisfaction after septorhinoplasty is the aesthetic or functional result.

Methods

Patient Selection

The current study included 58 patients who underwent primary open septorhinoplasty in a tertiary referral hospital between January 2017 and December 2018. The open septorhinoplasty approach was performed on all patients by the same surgeon. Three patients were excluded due to incomplete surveys and missing information. Patients requiring septorhinoplasty due to nasal trauma, congenital nasal abnormalities, or revision surgery were excluded, as were patients receiving closed method septorhinoplasty, patients with systemic disease, allergic rhinitis, or chronic rhinosinusitis, and smokers. Informed consent was obtained from all patients. Institutional ethics committee approval was obtained from Ondokuz Mayıs University School of Medicine Ethics Committee (decision number: OМУKAEK-2018/423).

Assessment of Septorhinoplasty Outcomes

The ROE questionnaire developed by Alsarraf (4) and validated in Turkish by Celik et al. (5) was completed preoperatively and six months after surgery. ROE is composed of six questions related to appearance and nasal breathing (Table 1). Each question is scored on a scale from zero to four, where "0" is the most negative and "4" the most positive answer. The total score is calculated by adding the scores of the individual questions and therefore ranges from 0 to 24. To facilitate interpretation of the results, the total score can be divided by 24 and multiplied by 100, yielding a calculated value between 0 and 100 where higher values denote greater levels of patient satisfaction. A calculated score was obtained for each of the six items by dividing the score by four and multiplying by 100, yielding a value between 0 and 100.

Additionally, all patients were asked to evaluate nasal obstruction and appearance according to VAS preoperatively and six months after surgery. The patients were asked to rate the nasal obstruction based on the VAS score from zero to 10 (VAS-O; 0: unblocked, 10: completely blocked). Also, they were asked to evaluate the appearance of their nose based on the VAS score from zero to 10 (VAS-A; 0: worst appearance, 10: best appearance).

Statistical Analysis

VAS and ROE scores were collected and registered electronically. Statistical data processing was performed using R-Studio software (6). Parametric tests were used when the variables were normally distributed according to

Table 1. Rhinoplasty Outcome Evaluation Questionnaire

Item
Item 1. Do you like the look of your nose? Absolutely not (0) A little (1) More or less (2) Very much (3) Absolutely yes (4)
Item 2. Can you breathe through your nose? Absolutely not (0) A little (1) More or less (2) Very much (3) Absolutely yes (4)
Item 3. Do you think your friends and the ones dear to you like your nose? Absolutely not (0) A little (1) More or less (2) Very much (3) Absolutely yes (4)
Item 4. Do you think the looks of your nose limit your social and professional activities? Absolutely not (0) A little (1) More or less (2) Very much (3) Absolutely yes (4)
Item 5. Is your nose closer to perfection? Absolutely not (0) A little (1) More or less (2) Very much (3) Absolutely yes (4)
Item 6. Would you like to surgically correct your nose's function or looks? Certainly yes (0) Very likely yes (1) Possibly yes (2) Probably no (3) Certainly no (4)

the Kolmogorov–Smirnov and Shapiro–Wilk tests. When exploring the preoperative and postoperative scores, paired-samples t was used.

The relationships between VAS-O, VAS-A, and ROE, as well as the impact of individual ROE items on the overall score, were analyzed using structural equation modeling, and path analysis results were presented. The constructed models were evaluated according to the six well-known goodness-of-fit measures such as chi-square (X^2) division degrees of freedom (df), goodness-of-fit index (GFI), comparative fit index (CFI), adjusted GFI (AGFI), normed fit index (NFI), and root mean square error of approximation (RMSEA) (7). Path analysis results were interpreted as the model fit indices were obtained within the required limits.

Path analysis is a statistical method that allows the investigation of the interactions between a set of variables. Path coefficients are standardized linear regression weights (β) that can be used to investigate the potential causal linkage between statistical variables in structural equation modeling. The statistical significance was set at the $p < 0.05$ level.

Results

In total, 55 questionnaires were collected. The study included 27 female and 28 male patients with a mean age of 29.5 years [standard deviation (SD): 9.10; minimum;18, maximum: 57].

When the relationship of the preoperative VAS-O, VAS-A, and ROE scores was investigated, it was discovered that both the VAS-O and VAS-A scores had no effect on the ROE. However, when the relationship between the postoperative VAS-O, VAS-A, and ROE scores were analyzed, it was discovered that the VAS-A had a major impact ($\beta = 0.782$, $p = 0.001$) on the overall ROE score, while the VAS-O score had no effect (Table 2). Aesthetic satisfaction explains 63.6% of patient satisfaction after septorhinoplasty ($R^2 = 0.636$). The interactions between preoperative (1A) and postoperative (1B) VAS-A, VAS-O, and ROE scores with standardized path coefficients are illustrated in Figure 1.

The mean ROE score was increased from 46.36 ± 9.28 to 78.85 ± 11.70 . The mean VAS-O score was 6.85 ± 1.52 and 4.36 ± 1.52 before and after surgery, respectively. The mean VAS-A score was 3.91 ± 1.71 and 7.22 ± 1.11 before and after surgery, respectively. The mean difference of VAS-O was -2.49 [confidence interval (CI): $-3.16, -1.82$], and the mean difference of VAS-A was -3.31 (CI: $-3.84, -2.77$). Appearance scores are more widely affected than obstruction scores after septorhinoplasty since the absolute value of the mean difference was greater for VAS-A ($p < 0.001$, paired-samples t-test). The decrease in VAS-O scores indicates a reduction in obstructive symptoms, while the rise in VAS-A scores indicates increased patient satisfaction due to the aesthetic result. Table 3 represents the mean values and mean differences of VAS-O, VAS-A, ROE, and overall, ROE scores before and after septorhinoplasty.

When the impact of each ROE question on the overall score was analyzed, it was discovered that all questions had a statistically significant impact on the overall ROE score. The most effective items on the overall ROE score were item 6 ($\beta = 0.874$), item 5 ($\beta = 0.740$) and item 4 ($\beta = 0.737$) respectively. The least effective question was item 2 ($\beta = 0.445$). Table 4 shows the impact of each item on the overall ROE score and their path coefficients. The Path diagram which illustrates the effect of the individual items on the overall ROE score can be examined in Figure 2.

Discussion

Septorhinoplasty is a common procedure performed by facial plastic surgeons and otolaryngologists (8). PROM measures are defined as “a report directly reported by subjects without commenting on the clinician’s study and results. In procedures conducted for cosmetic purposes, evaluating outcomes from the patient’s perspective is important (2, 9). The commonly used measures are Septorhinoplasty Outcome Evaluation (ROE), the Functional Septorhinoplasty Outcome Inventory-17 (FROI-17), the Utrecht Questionnaire for Outcome Assessment in Aesthetic Septorhinoplasty (OAR), FACE Questionnaire (FACE-Q), The 10-item Standardized

Table 2. Comparison of preoperative and postoperative VAS-O, VAS-A, ROE, and ROE scores

		Mean (\pm SD)	Mean difference	95% confidence interval		p-value*
				Lower	Upper	
VAS-O	preVAS-O	6.85 (± 1.52)	-2.49	-3.16	-1.82	< 0.001
	postVAS-O	4.36 (± 1.94)				
VAS-A	preVAS-A	3.91 (± 1.71)	-3.31	-3.84	-2.77	< 0.001
	postVAS-A	7.22 (± 1.11)				
ROE	preROE	46.36 (± 9.28)	-33.48	-38.84	-29.13	< 0.001
	postROE	79.85 (± 11.70)				

SD: Standard deviation, ROE: Septorhinoplasty outcome evaluation score, VAS: Visual Analogue Scale score; VAS-O: Visual analogue scale score for obstruction, VAS-A: Visual Analogue Scale score for appearance, p*: Paired samples t-test

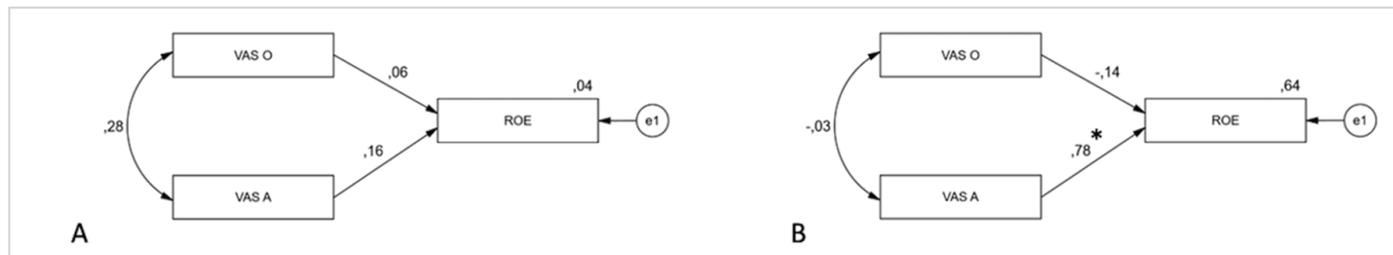


Figure 1.a. Preoperative path coefficients of ROE, VAS-O and VAS-A. b. Postoperative path coefficients of ROE, VAS-O and VAS-A
ROE: Rhinoplasty outcome evaluation, VAS-O: Visual Analog Scale for obstruction, VAS-A: Visual Analog Scale for appearance

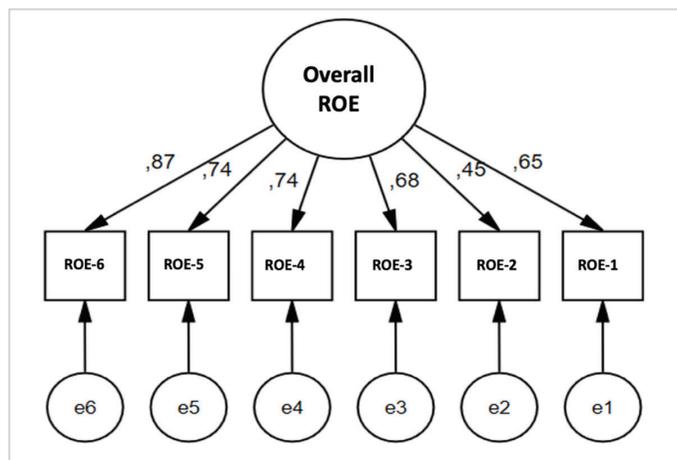


Figure 2. The Path analysis plot with standardized coefficients (β^1) of each item for the postoperative ROE model
ROE: Rhinoplasty outcome evaluation

Cosmesis and Health Nasal Outcomes Survey (SCHNOS), the Sinonasal Outcome Test (SNOT-22), and the Nasal Obstruction and Septoplasty Effectiveness Scale (NOSE) (8, 10, 11). ROE, FROI-17 and SCHNOS are focused on the subjective perception of cosmetic and functional results. OAR and FACE-Q are focused only cosmetic results, while the SNOT-22 and NOSE scales are only concerned with functional symptoms. Alsarraf (4) developed ROE, which has since been validated and translated into Turkish. It is a common PROM with six things that assess physical, social, and emotional factors (4, 5).

Despite the fact that measuring the quality of life after septorhinoplasty has become more common in recent years, the research designs and measurement instruments used in recent studies were remarkably diverse. This variety and heterogeneity create challenges in the literature review. Wahmann et al. (8) conducted a systematic review of 62 post-septorhinoplasty PROM studies published between 2002 and 2017. Only 17 of these met the requirements of being prospective, involving at least 50 participants, using at least one PROM, and collecting full preoperative and postoperative data. We conducted a prospective study with 55 patients using a widely accepted measure (ROE), that is comparable to other research in the literature.

In general, cosmetically unpleasant nasal deformities are associated with functional issues. In addition to reduced nasal breathing, a compromised nasal wall or a severely deviated septum may cause cosmetic deformities. According to our ROE, VAS-O, and VAS-A ratings, our patients had both cosmetic and obstructive symptoms prior to surgery. VAS-O scores decreased, while ROE and VAS-A scores dramatically improved, indicating relief of obstruction-related problems and pleasing aesthetic outcomes. Spiekermann et al. (10) conducted a study in which a VAS was scored between 0 (very ugly) and 10 (very nice). They showed that as the follow-up period increased, aesthetic satisfaction increased from the 1st to the 12th month. In our study, we used final survey scores at the end of the sixth month. Moubayed et al. (11) measured postoperative satisfaction using NOSE, ROE, and VAS in both functional and aesthetic aspects. They found no significant relationship between sex and scores, as in our findings.

The abovementioned studies clearly indicated that patients benefit from septorhinoplasty. However, only before and after surgery scores were compared in these studies. The causal relationship between aesthetics and functionality has not been investigated. Goal of septorhinoplasty is to improve patient satisfaction, it is important to identify the exact factor that has the greatest impact on patient satisfaction. It is obvious that patients benefit from septorhinoplasty both functionally and aesthetically. The question is which factor is more effective on overall satisfaction. Basic statistical work may be insufficient to answer this question. PROMs do not provide us with a measurable value like height or weight. They provide information about the extent of complaint of the patient. If variables related to this type of patient perception are evaluated with structural equation modeling or path analysis, which is a subtype of structural equation modeling, the causality relationship can be revealed more clearly. In our sample, there was no significant interaction between VAS-O, VAS-A, and ROE scores in the preoperative period. This finding may have been obtained during the preoperative phase because patients were dissatisfied with both the shape and function of their noses. While there was an important and strong relationship between VAS-A and ROE in the postoperative period ($\beta=0.782, p<0.001$). These findings can be interpreted as follows; The main factor affecting patient

Table 3. Preoperative and postoperative path analysis results belonging to ROE, VAS-O, and VAS-A

			β^1	β^2	SE	CR	p-value	r	R ²
Preoperative model									
PreROE	<---	PreVAS-O	0.063	0.387	0.849	0.456	0.648	0.062	0.037
PreROE	<---	PreVAS-A	0.165	0.893	0.754	1.185	0.236	0.159	
Postoperative model									
PostROE	<---	PostVAS- O	-0.138	-0.828	0.493	-1.678	0.093	-0.223	0.636
PostROE	<---	PostVAS- A	0.782	8.185	0.860	9.520	<0.001	0.792	

β^1 : Standardized coefficient (Path coefficient), β^2 : Unstandardized coefficient, SE: Standart error, CR: Critical ratio, r: Bivariate correlation coefficient, R²: Coefficient of determination, PreROE: Preoperative septorhinoplasty outcome evaluation, PreVAS-O: Preoperative visual analog scale related to obstruction, PreVAS-A: Preoperative visual analog scale related to appearance, PostROE: Postoperative septorhinoplasty outcome evaluation, PostVAS-O: Postoperative visual analog scale related to obstruction, PostVAS-A: Postoperative visual analog scale related to appearance.

<--- describes the effect of VAS-O and VAS-A scores on overall ROE scores

Table 4. Path analysis results of individual ROE items

			β^1	β^2	SE	CR	p-value
postROE1	<---	postROE	0.648	1.000	-	-	-
postROE2	<---	postROE	0.445	0.737	0.251	2.943	0.003
postROE3	<---	postROE	0.677	0.821	0.194	4.243	<0.001
postROE4	<---	postROE	0.737	0.814	0.179	4.537	<0.001
postROE5	<---	postROE	0.740	0.908	0.199	4.556	<0.001
postROE6	<---	postROE	0.874	1.309	0.258	5.078	<0.001

β^1 : Standardized coefficient (Path coefficient), β^2 : Unstandardized coefficient, SE: Standart error, CR: Critical ratio.

<--- describes the effect of individual item (e.g. postROE1) on postoperative overall ROE score

satisfaction in the postoperative period is the aesthetic result. Even if the patients' nasal congestion concerns resolve, if the aesthetic outcome is unsatisfactory, they are dissatisfied with the surgical outcome.

The postoperative VAS-O score was significantly lower than the preoperative VAS-O score (less obstruction). Patients are also functionally satisfied with the result, but VAS-A is more successful in affecting patient satisfaction. This situation was confirmed by examining ROE questions.

While item 2 (Do you breathe well through your nose?) had the least impact ($\beta=0.445$) on the overall ROE score, the items regarding aesthetic satisfaction were found to be more effective on the overall score. Evaluation of current questionnaires such as SCCHNOS, which evaluates both functional and cosmetic results similar to ROE and has been validated in Turkish (12), with similar statistical methods will clarify the effect of functional results on patient satisfaction after septorhinoplasty. According to our findings, 63.9% of patient satisfaction after septorhinoplasty can be explained by aesthetic factors. To clarify the remaining, additional demographic or psychosocial factors should be furtherly studied in larger patient series.

Path analysis, in addition to being thought of as a form of multiple regression based on causality, can be regarded as a subset of structural equation modeling (SEM). It examines the causality relationship between variables, and as the path coefficient increases, the strength of this causality relationship

increases (13). In order to perform a comprehensive analysis about factors affecting patient satisfaction, researchers should additionally perform further statistical analyses. The novelty of our paper is the use of this structural model to order the factors that affect ROE scores. No previous studies have constructed or verified a comprehensive structural model of the relationships among the various factors that may affect the quality of life of patients undergoing septorhinoplasty. Spiekerman et al. (10) published an innovative study about the development of a short and brief questionnaire to identify patients' motivations for septorhinoplasty. According to their study, the questions with the strongest loading on ROE were item 6 and item 1. We also found that item 6 had the highest Path coefficient ($\beta=0.874$), where the path coefficient of item 1 was 0.648. Question 6 covers both aesthetic and functional satisfaction. The fact that this is the most effective item on the total ROE score can be interpreted as ROE is successful in measuring both functional and aesthetic satisfaction. Nevertheless, the questions measuring only aesthetic satisfaction (items 1,3, and 5) were found to be more effective in measuring patient satisfaction than the question measuring only functionality (item 2).

One of the limitations of our study is the lack of additional PROMs about nasal obstruction such as NOSE that corroborate with the VAS-O scale. Further studies related to this subject should be enhanced with multiple PROMs. Accompanying factors such as age, sex, socioeconomic

status, and personality were not evaluated in our study. This can be accepted as a limitation; however, it was beyond the objective of this study. This study only presents the results from open septorhinoplasty and may only be applicable to such patients. Another study focusing on other techniques should be planned.

Conclusion

Septorhinoplasty significantly improves patient's quality of life and satisfaction predominantly on cosmetic aspects. More comprehensive analyses should be performed in order to deeply understand factors related to patient satisfaction. There is no universally accepted standardized outcome measure for septorhinoplasty. Further prospective studies should be performed using other validated questionnaires and various statistical analyses to support our study.

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Data Transparency

The data of the study can be shared on-demand, and it was uploaded to "Figshare"

Doi: 10.6084/m9.figshare.14575593.

Ethics Committee Approval: The study was conducted at and approved by Ondokuz Mayıs University School of Medicine Department of Otolaryngology with the number of OMUKAEK 2018/423.

Informed Consent: Written informed consent was obtained.

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Authorship Contributions

Surgical and Medical Practices: Ö.K., H.K., Concept: Ö.K., E.T., E.K., H.K., Design: Ö.K., E.T., E.K., H.K., Data Collection and/or Processing: Ö.K., E.T., E.K., H.K., Analysis and/or Interpretation: E.T., Literature Search: Ö.K., E.T., E.K., H.K., Writing: Ö.K., E.T., E.K., H.K.

Main Points

- The main factor affecting patient satisfaction after septorhinoplasty is the aesthetic result.
- Even if the patients' nasal congestion symptoms subside, if the aesthetic outcome is unsatisfactory, they are unsatisfied with the surgical outcome.
- Although ROE is successful in evaluating both functional and aesthetic satisfaction, the questions measuring only aesthetic satisfaction were more effective than the question measuring only functionality in patient satisfaction after septorhinoplasty.

Conflict of Interest: The authors declare there are no conflicts of interest.

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