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Evaluation of the effects of open and closed rhinoplasty on the psychosocial stress level and quality of life of rhinoplasty patients

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Summary *Aim:* To investigate patient-reported functional and aesthetic outcomes and psycho-social distress levels in patients undergoing rhinoplasty with regard to technique, type, and indications of surgery.
Methods: A total of 90 patients (mean(SD) age: 27.4(6.5) years, 64.4% females) undergoing rhinoplasty were included prospectively. Data of Nasal Symptom Obstruction Evaluation (NOSE) scale for the functional outcome, the rhinoplasty outcome evaluation (ROE) scale for the esthetic outcome, and the Derriford Appearance Scale (DAS-24) for psychosocial outcomes were recorded preoperatively and in the postoperative 1st, 3rd, and 6th month.
Results: No significant difference was noted in ROE or NOSE scores with regard to technique (open vs. closed), type (primary vs. secondary), and indication (functional vs. cosmetic) of rhinoplasty during study visits. Open vs. closed surgery, secondary vs. primary rhinoplasty, and cosmetic vs. functional indication for rhinoplasty were associated with significantly higher DAS-24 scores at the preoperative visit ($p < 0.001$ for each) and postoperative 1st ($p < 0.001$ for each) and 3rd month ($p < 0.001$, $p < 0.001$, and $p < 0.01$, respectively) visits. NOSE, ROE, and DAS-24 scores significantly decreased from the preoperative to the postoperative period and from 1st month to 3rd and 6th months of postoperative follow-up in all patients, regardless of the rhinoplasty subgroup ($p < 0.001$ for each).
Conclusion: In conclusion, our findings revealed favorable postoperative functional and esthetic outcome and improved psycho-social distress in patients undergoing rhinoplasty, with significantly improved NOSE, ROE, and DAS-24 scores after rhinoplasty during the entire 6-month follow-up, regardless of the technique (open vs. closed), type (primary vs. revision), and indication (cosmetic vs. functional) of rhinoplasty. Closed rhinoplasty may be a more preferable method because of less psycho-social distress.

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Introduction

Postoperative outcome in rhinoplasty is directly associated with patient satisfaction with his/her own image and self-esteem.[1,2] Objective measures of nasal function have been associated with well-documented limitations, while a significant discrepancy has been noted between objective and subjective measures of treatment efficacy and outcomes in rhinoplasty.[3,4] Given the growing number of rhinoplasty candidates admitting with demand for cosmetic purposes, patient satisfaction has become a critical indicator of postoperative outcome.[4,5] Accordingly, patient-reported outcome measures (PROMs), which assess the quality of care delivered from the patients' perspective through subjective quality of life (QOL) instruments, have become increasingly important to evaluate postoperative outcome in rhinoplasty.[3,4,6,7]

Psychosocial issues are also closely related to patient expectations in facial plastic surgery procedures, with likelihood of inadequate patient satisfaction with postoperative outcome as well as lack of improvement in psychological well-being, including their self-confidence and self-esteem after operation in patients with a history of depression, anxiety, or personality disorder.[8,9] Thus, evaluation of the willingness, compliance, and psychological status of patients is also considered critical to accomplish satisfactory postoperative outcome in nasal surgery.[8,9]

The Nasal Obstructive Symptom Evaluation (NOSE) scale and the Rhinoplasty Outcomes Evaluation (ROE) are the two most widely applied disease-specific QOL instruments that address patient-reported outcomes on nasal obstruction and multidimensional (physical, emotional, and social) aspects, respectively.[5,6,10] The Derriford Appearance Scale (DAS-24) is a valid and widely applicable instrument that assesses psychological distress related to disfigurements, deformities, and esthetic problems of physical appearance.[11]

Although patient satisfaction is the primary goal in esthetic surgery, most of the published rhinoplasty outcome studies have addressed surgical technique, complications, and sequelae with far less evidence on postoperative outcome from the patient's viewpoint by validated PROMs.[2,5,7]

This study was therefore designed to investigate patient-reported outcomes (using the instruments NOSE, ROE, and DAS-24) on functional and esthetic outcomes and psychosocial distress levels in patients undergoing rhinoplasty with regard to technique, type, and indications of surgery.

Patients and methods

Study population

A total of 90 patients (mean(SD) age: 27.4(6.5) years, 64.4% females) undergoing rhinoplasty were included in this single-center prospective 6-month follow-up study. Patients were randomized to receive either open rhinoplasty (45 patients) or closed rhinoplasty (45 patients). The patients who had started with the closed technique but then had to undergo the open technique were excluded from the study. Patients were informed of how the open and closed surgeries were performed, and the patients were also informed about the positive and negative aspects of these two different techniques. However, open technical septorhinoplasty was recommended for open roof deformities. The patient and the surgeon decided together whether the operation would be open or closed. We asked the patients whether they wanted to be operated on for cosmetic or functional concerns. We asked them to state which choice was the dominant.

Patients with chronic medical conditions and malignancy, previous nasal surgery, sinonasal inflammatory disease, chronic rhinosinusitis, craniofacial syndrome, and concha hypertrophy were excluded from the study.

Written informed consent was obtained from each subject following a detailed explanation of the objectives and protocol of the study, which was conducted in accordance with the ethical principles stated in the "Declaration of Helsinki" and approved by the institutional ethics committee.

Study parameters

Data were collected at four consecutive visits, including baseline (preoperative) visit and postoperative 1st, 3rd, and 6th month visits. Data of characteristics of rhinoplasty surgery (open vs. closed, primary vs. secondary, and functional vs. cosmetic rhinoplasty) were recorded at baseline, while postoperative data of functional, esthetic, and psychosocial distress outcomes were collected through NOSE scale, ROE scale, and DAS-24, respectively, at each visit and analyzed with regard to characteristics of rhinoplasty surgery.

NOSE scale

NOSE scale is a validated disease-specific instrument developed by Steward et al. (10) to provide an objective measure of nasal obstruction, and it is commonly used in otolaryngology practices. It is a brief questionnaire consisting of 5 self-rated items, each scored from 0 to 4. Total score ranges from 0 to 20, with higher scores indicating increase in the severity of the symptom.[10]

ROE scale

ROE scale is an easy-to-use questionnaire developed by Alsarraf (5,6) that allows comprehensive assessment of rhinoplasty-related patient satisfaction, on the basis of physical (nasal shape and function), emotional (degree of

Table 1 Patient demographics and characteristics of rhinoplasty surgery ($n = 90$).

Age (years), mean(SD)	27.4(6.5)
Gender, n(%)	
Male	32(35.6)
Female	58(64.4)
Technique of surgery, n(%)	
Open	45(50.0)
Closed	45(50.0)
Type of rhinoplasty, n(%)	
Primary	67(74.4)
Secondary	23(25.6)
Rhinoplasty indication, n(%)	
Functional	26(28.9)
Cosmetic	64(71.1)

confidence and desire to change appearances), and social (social, professional, and family acceptance) factors.[5,6] The ROE questionnaire comprises six questions, each scored from 0 to 4. The total score, which ranges between 0 and 24, is divided by 24 and multiplied by 100, which leads to a score varying between 0 and 100; the higher the score, the greater is the patient's satisfaction with the nose surgery. ROE is considered to have an excellent test-retest reliability and internal consistency scores following surgical interventions.[5,6]

DAS-24

DAS-24 is a 24-item questionnaire and a valid and widely applicable instrument to measure psychological distress related to disfigurements, deformities, and esthetic problems of physical appearance.[11] Each question is scored on a 4-point scale, and total score ranges from 10 to 96, with higher scores indicating higher levels of psychosocial distress related to physical appearance.[11] DAS-24 was shown to be psychometrically robust with the ability to discriminate between patient groups, between clinical and nonclinical populations, and within the general population between those concerned about their appearance and those not concerned.[11]

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows, version 17.0 (IBM Corp., Armonk, NY). A normal distribution of the quantitative data was checked using Kolmogorov-Smirnov test, and the homogeneity of the variances was checked using Levene test. Friedman test and Mann-Whiney *U* test with Bonferroni corrections were performed to compare psychometric survey scores between follow-up visits and rhinoplasty subgroups, respectively. Data were expressed as "mean (standard deviation; SD)," median (interquartile range, IQR), and percent (%), where appropriate. $p<0.05$ was considered statistically significant.

Results

Patient demographics and characteristics of rhinoplasty surgery ($n = 90$)

Open and closed types of surgery were performed in a similar percentage of patients (50% each), while most patients underwent primary rather than secondary rhinoplasty (74.4% vs. 25.6%) and received rhinoplasty surgery due to cosmetic rather than functional indications (71.1% vs. 28.9%) (Table 1).

Postoperative outcome on NOSE scores according to time from surgery and characteristics of rhinoplasty surgery

Overall, there was a significant decrease in NOSE scores from 75.0 (65.0-85.0) in the preoperative period to 10.0 (5.0-15.0) in the 6th month after rhinoplasty. No significant difference was noted in NOSE scores with regard to technique (open vs. closed), type (primary vs. secondary), and indication (functional vs. cosmetic) of rhinoplasty during study visits (Table 2).

NOSE scores significantly decreased from preoperative to postoperative period and from 1st month to 3rd and 6th months of postoperative follow-up in all patients, regardless of the rhinoplasty subgroup ($p < 0.001$ for each) (Table 2).

Postoperative outcome on ROE scores according to time from surgery and characteristics of rhinoplasty surgery

Overall, there was a significant increase in ROE scores from 31.2 (20.8-41.7) in the preoperative period to 85.4 (79.2-95.8) in the 6th month after the rhinoplasty. Apart from significantly higher median (IQR) ROE scores preoperatively in patients undergoing rhinoplasty with functional vs. cosmetic indication (41.7 (36.5-51.0) vs. 25.0 (16.7-33.3), $p < 0.001$), no significant difference was noted in ROE scores with regard to technique (open vs. closed), type (primary vs. secondary), and indication (functional vs. cosmetic) of rhinoplasty during study visits (Table 3).

ROE scores significantly increased from the preoperative to the postoperative period and from the 1st month to 3rd and 6th month of postoperative follow-up in all patients, regardless of the rhinoplasty subgroup ($p < 0.001$ for each) (Table 3).

Postoperative outcome on DAS-24 scores according to time from surgery and characteristics of rhinoplasty surgery

Overall, there was a significant decrease in DAS-24 scores from 55.0 (35.0-65.0) in the preoperative period to 20.0 (15.0-25.0) in the 6th month after the rhinoplasty. Open vs. closed surgery, secondary vs. primary rhinoplasty, and cosmetic vs. functional indication for rhinoplasty were

Table 2 Postoperative outcome on NOSE scores according to time from surgery and characteristics of rhinoplasty surgery.

	NOSE scores				
	Preoperative	Postoperative			*p* value[a]
		1st month	3rd month	6th month	
Overall (*n* = 90)	75.0 (65.0-85.0)	25.0 (20.0-30.0)*	15.0 (10.0-25.0) *,**	10.0 (5.0-15.0) *,**,***	**<0.001**
Technique of surgery					
Open (*n* = 45)	75.0 (67.5-85.0)	25.0 (20.0-30.0)*	15.0 (7.5-22.5)*,*	10.0 (5.0-12.5)*,**,***	**<0.001**
Closed (*n* = 45)	75.0 (65.0-85.0)	25.0 (20.0-30.0)*	15.0 (10.0-25.0)*,**	10.0 (5.0-15.0)*,**,***	**<0.001**
p-value[b]	0.720	0.669	0.630	0.914	
Type of rhinoplasty					
Primary (*n* = 67)	75.0 (65.0-80.0)	25.0 (15.0-25.0)*	15.0 (5.0-20.0) *,**	10.0 (5.0-15.0) *,**,***	**<0.001**
Secondary (*n* = 23)	80.0 (65.0-90.0)	25.0 (20.0-30.0)*	20.0 (10.0-25.0) *,**	10.0 (5.0-10.0) *,**,***	**<0.001**
p-value[b]	0.244	0.099	0.054	0.872	
Rhinoplasty indication					
Functional (*n* = 26)	75.0 (70.0-86.2)	25.0 (15.0-26.2)*	15.0 (8.7-21.2)*,**	5.0 (0.0-10.0) *,**,***	**<0.001**
Cosmetic (*n* = 64)	75.0 (61.2-83.7)	25.0 (20.0-30.0)*	15.0 (10.0-25.0) *,**	10.0 (5.0-15.0) *,**,***	**<0.001**
p-value[b]	0.118	0.587	0.773	0.014	

Data are expressed as median (interquartile range).
[a] Comparison between study visits; Friedman test with Bonferroni correction at $p < 0.025$.
[b] Comparison between rhinoplasty groups at the specific follow-up time; Mann-Whitney U test with Bonferroni Correction at a *p* value of <0.0125.
* $p < 0.001$ compared to preoperative scores.
** $p < 0.001$ compared to 1st month scores.
*** $p < 0.001$ compared to 3rd month scores.

Table 3 Postoperative outcome on ROE scores according to time from surgery and characteristics of rhinoplasty surgery.

	ROE scores				
	Preoperative	Postoperative			*p* value[a]
		1st month	3rd month	6th month	
Overall (*n* = 90)	31.2 (20.8-41.7)	77.1 (65.6-87.5)*	79.2 (70.8-91.7)*,**	85.4 (79.2-95.8)*,**,***	**<0.001**
Technique of surgery					
Open (*n* = 45)	29.2 (20.8-41.7)	75.0 (62.5-87.5)*	75.0 (70.8-89.6) *,**	83.3 (79.2-93.7) *,**,***	**<0.001**
Closed (*n* = 45)	33.3 (22.9-41.7)	79.2 (66.7-87.5)*	83.3 (70.8-91.7) *,**	87.5 (79.2-95.8)*,**,***	**<0.001**
p-value[b]	0.433	0.659	0.601	0.903	
Type of rhinoplasty					
Primary (*n* = 67)	33.3 (25.0-41.7)	79.2 (70.8-87.5)*	83.3 (70.8-91.7)*,**	87.5 (79.2-95.8)*,**,***	**<0.001**
Secondary (*n* = 23)	25.0 (16.7-33.3)	70.8 (62.5-83.3)*	75.0 (66.7-87.5) *,**	83.3 (75.0-91.7) *,**,***	**<0.001**
p-value[b]	0.028	0.053	0.057	0.153	
Rhinoplasty indication					
Functional (*n* = 26)	41.7 (36.5-51.0)	79.2 (69.8-87.5)*	81.2 (69.8-91.7)*,**	83.3 (74.0-92.7)*,**,***	**<0.001**
Cosmetic (*n* = 64)	25.0 (16.7-33.3)	75.0 (62.5-87.5)*	79.2 (70.8-91.7)*,**	87.5 (80.2-95.8)*,**,***	**<0.001**
p-value[b]	**<0.001**	0.538	0.964	0.122	

Data are expressed as median (interquartile range).
[a] Comparison between study visits; Friedman test with Bonferroni correction at $p < 0.025$.
[b] Comparison between rhinoplasty groups at the specific follow-up time; Mann-Whitney U test with Bonferroni Correction at a p value of <0.0125.
* $p < 0.001$ compared to preoperative scores.
** $p < 0.001$ compared to 1st month scores.
*** $p < 0.001$ compared to 3rd month scores.

associated with significantly higher DAS-24 scores at the preoperative visit ($p < 0.001$ for each) and the postoperative 1st ($p < 0.001$ for each) and 3rd month ($p < 0.001$, $p < 0.001$, and $p < 0.01$, respectively) visits, indicating higher psycho-social distress related to physical appearance. In the 6th postoperative month, DAS-24 scores were still significantly higher in patients with open vs. closed surgery ($p < 0.01$), whereas primary vs. secondary rhinoplasty and functional vs. cosmetic rhinoplasty indication groups had similar 6th month DAS-24 scores (Table 4).

DAS-24 scores significantly decreased from the preoperative to postoperative period and from the 1st month to 3rd

Table 4 Postoperative outcome on DAS-24 scores according to time from surgery and characteristics of rhinoplasty surgery.

	DAS-24 scores				
	Preoperative	Postoperative			*p* value[a]
		1st month	3rd month	6th month	
Overall (*n* = 90)	55.0 (35.0-65.0)	45.0 (28.7-55.0)*	25.0 (20.0-30.0)*,**	20.0 (15.0-25.0)*,**,***	**<0.001**
Technique of surgery					
Open (*n* = 45)	60.0 (47.5-65.0)	55.0 (47.5-60.0)*	25.0 (20.0-37.5)*,**	20.0 (20.0-25.0)*,**,***	**<0.001**
Closed (*n* = 45)	45.0 (30.0-55.0)	35.0 (20.0-45.0)*	20.0 (15.0-25.0)*,**	20.0 (15.0-20.0)*,**	**<0.001**
p-value[b]	**<0.001**	**<0.001**	**<0.001**	**0.004**	
Type of rhinoplasty					
Primary (*n* = 67)	50.0 (30.0-60.0)	40.0 (25.0-50.0)*	20.0 (15.0-25.0)*,**	20.0 (15.0-25.0)*,**,***	**<0.001**
Secondary (*n* = 23)	65.0 (55.0-70.0)	60.0 (55.0-70.0)	35.0 (25.0-40.0)*,**	20.0 (15.0-30.0)*,**,**	**<0.001**
p-value[b]	**<0.001**	**<0.001**	**<0.001**	0.257	
Rhinoplasty indication					
Functional (*n* = 26)	30.0 (25.0-35.0)	25.0 (20.0-36.2)	20.0 (15.0-25.0)*,**	20.0 (15.0-21.2)*,**	**<0.001**
Cosmetic (*n* = 64)	60.0 (50.0-65.0)	50.0 (40.0-55.0)*	25.0 (20.0-35.0)*,**	20.0 (15.0-25.0)*,**,***	**<0.001**
p-value[b]	**<0.001**	**<0.001**	**0.004**	0.384	

Data are expressed as median (interquartile range).
[a] Comparison between study visits; Friedman test with Bonferroni correction at $p < 0.025$.
[b] Comparison between rhinoplasty groups at the specific follow-up time; Mann-Whitney U test with Bonferroni Correction at a p value of <0.0125.
* $p < 0.001$ compared to preoperative scores.
** $p < 0.001$ compared to 1st month scores.
*** $p < 0.001$ compared to 3rd month scores.

and 6th month of postoperative follow-up in all patients, regardless of the rhinoplasty subgroup ($p < 0.001$ for each) (Table 4).

Discussion

Our findings revealed significantly improved NOSE, ROE, and DAS-24 scores in the 1st postoperative month after rhinoplasty, which further improved throughout the later periods of 6-month follow-up. DAS-24 scores remained significantly higher in open vs. close surgery, in secondary vs. primary rhinoplasty, and in cosmetic vs. functional rhinoplasty indication for at least 3 months after the operation, whereas neither NOSE nor ROE scores differed significantly with regard to rhinoplasty subgroups.

Our findings are in line with those reported in past studies that demonstrated association of rhinoplasty with significant improvement in NOSE scores,[5,10,12-17] with no significant difference in primary versus revision surgery[14] and between the functional and esthetic functional groups.[16]

Postoperative ROE scores in our cohort of patients who underwent rhinoplasty are well within the mean range (69.8-85.4 years) of postoperative scores reported in past studies addressing ROE-based patient outcomes after rhinoplasty.[5,7,13,17-24] This seems notable given that 25% of our patients had revision surgery, which has been considered to be associated with similar postoperative ROE scores as those of primary rhinoplasty. On the other hand, significantly lower ROE scores were found in the revision cases in different studies.[14,19]

Nonetheless, it should be noted that rhinoplasty was associated with significantly improved ROE scores in all patients during the entire postoperative period in our cohort, regardless of the technique (open vs. closed), type (primary vs. revision), or indication (cosmetic vs. functional) of rhinoplasty in our cohort.

Distress levels associated with self-consciousness of appearance are considered to be higher in rhinoplasty candidates than in the general population.[24] Accordingly, higher preoperative DAS-24 scores in candidates for open type surgery, secondary rhinoplasty, and rhinoplasty with cosmetic indications in our cohort seem to indicate higher psycho-social distress related to physical appearance in these patients before operation. Notably, given the maintenance of higher DAS-24 scores for at least 3 months after the operation despite achievement of favorable functional and esthetic outcome in these candidates, our findings emphasize the likelihood of postoperative maintenance of high psycho-social distress levels in patients undergoing rhinoplasty despite favorable postoperative outcome, depending on the type and indication of rhinoplasty.

Likewise, in a study on a combination of cosmetic and functional problems among patients undergoing rhinoplasty, lower preoperative DAS-24 scores were shown to be positively correlated, with more favorable postoperative outcome and greater patient satisfaction.[24]

Likelihood of maintenance of psycho-social distress related to physical appearance even after rhinoplasty in our patients with cosmetic indication despite their satisfaction with favorable postoperative functional and esthetic outcome seems also notable given the growing number of patients undergoing rhinoplasty admitting with demand for cosmetic purposes.[23] This seems to emphasize the consideration of psycho-social distress levels in evaluation of candidacy for rhinoplasty by the surgeon before surgery to be able to identify patients with a likely poor outcome in terms of psychological adjustment and psychosocial

functioning despite a technically satisfactory result.[25] Higher body and image dissatisfaction, which is associated with chronic depression, was reported in patients undergoing rhinoplasty.[26] In addition to this, patients who demanded rhinoplasty due to esthetic concerns had a dissatisfaction toward their body.[27] As a result, psycho-social stress levels should be analyzed well in patients undergoing cosmetic rhinoplasty, and we should keep in mind that we may face long-term dissatisfaction.

Notably, body dysmorphic disorder (BMD), defined as an excessive concern about one's physical appearance, especially regarding slight or imagined abnormalities of the body, has been reported among rhinoplasty candidates,[28] and comorbid BMD in patients undergoing rhinoplasty was associated with lower ROE scores and no significant QOL gains, postoperatively.[28]

While DAS-24 scores remained higher at least for 3 months in open, secondary, and cosmetic rhinoplasty subgroups in our cohort during postoperative follow-up, a significant decrease from preoperative scores was noted in all patients, regardless of the type of rhinoplasty during the entire follow-up. This seems consistent with a significant reduction reported in psychological distress (DAS-59 scores) levels of patients after cosmetic rhinoplasty.[29] Likewise, in a past study from Turkey on psychosocial distress and improvement in QOL of patients undergoing rhinoplasty, revision cases and patients with cosmetic indication were reported to have higher DAS-24 scores and emotional distress than primary cases with functional indication at the preoperative period, while distress levels were reported to be equalized with loss of discrepancy between rhinoplasty subgroups beyond 12 weeks of surgery.[17]

Preoperatively, the patients with cosmetic indication had lower ROE scores and higher DAS-24 scores than primary cases with functional indication in our study. There were lower preoperative ROE scores in patients undergoing secondary rhinoplasty than patients undergoing primary rhinoplasty, but the difference was not statistically significant. This seems to be important given that rhinoplasty is considered to be the esthetic surgery with the lowest satisfaction rate,[1,19,30] particularly in patients with already high ROE scores in the preoperative period.[13] Therefore, analysis of patient expectations before surgery is considered critical to accomplish the intended results.[31]

Hence, our findings support the role of considering psycho-social distress related to physical appearance alongside QOL assessment in better selection of suitable candidates for rhinoplasty surgery and in predicting more satisfactory postoperative outcome.[2,25,32,33]

In a past study that was related to functional septorhinoplasty, significantly improved ROE scores were reported at least 4 weeks after the operation, and no significant difference was observed with regard to age or follow-up duration.[22] However, in an analysis on ROE-based QOL outcome in patients undergoing rhinoplasty, cosmeto-functional rhinoplasty was associated with improved QOL, with maximum benefit among younger patients and during a follow-up period of 6–12 months.[34]

Our findings revealed significantly higher improvement in NOSE, ROE, and DAS-24 scores from postoperative 1st month–6th month in all patients, regardless of the rhinoplasty groups of primary vs. revision or functional vs. cosmetic indication. This seems to be consistent with consideration of improvement in self-esteem to begin in the 3rd postoperative month and to continue up to 2 years postoperatively and thus suggestion of assessment of patient satisfaction with postoperative outcome to be performed after the 3rd postoperative month of rhinoplasty surgery.[35]

The significantly improved NOSE, ROE, and DAS-24 scores after rhinoplasty as compared with preoperative scores in our cohort seems to indicate good responsiveness and sensitivity of each instrument for assessment of functional and/or esthetic outcome as well as psychosocial distress related to physical appearance in patients undergoing rhinoplasty.[36,37] Notably, in the open technique, patients undergoing septorhinoplasty, functional and esthetic visual analog scale (VAS) scores were reported to be correlated positively with ROE scores and negatively with NOSE scores alongside a negative correlation between ROE and NOSE scores.[38] In another study on outcomes of septorhinoplasty, patients with postoperative nasal obstruction was reported to have also a worse esthetic satisfaction, and functional correction was considered to be as important as esthetic correction.[39] In the literature, no study was found related to Turkish validation of the ROE and DAS-24 surveys. We obtained help from the rhinology experts and professional translators to validate the questions of these surveys in Turkish.

Accordingly, given that the outcome of functional rhinoplasty depends on different domains such as functional and esthetic improvement,[40] our findings indicate a need for developing a composite valid QOL instrument that addresses patient satisfaction without the segregation of functional and esthetic outcome and incorporation of psychosocial distress assessment.

Certain limitations to this study should be considered. First, the cross-sectional nature of the study and the relatively small sample size precluded the possibility of drawing extensive causal conclusions. Second, our subjects may not represent the general population because of the small sample size. Third, inter-individual variance and dependency of rhinoplasty outcome on different domains such as functional and esthetic improvement and lack of a comprehensive and valid QOL instrument to assess patient satisfaction without the segregation of functional and esthetic outcome are other significant limitations.

In conclusion, our findings revealed favorable postoperative functional and esthetic outcome and improved psycho-social distress in patients undergoing rhinoplasty with significantly improved NOSE, ROE, and DAS-24 scores after rhinoplasty during the entire 6-month follow-up, regardless of the technique (open vs. closed), type (primary vs. revision), and indication (cosmetic vs. functional) of rhinoplasty. Certain rhinoplasty subgroups such as open surgery, secondary, and cosmetic rhinoplasty seem to be associated with high level of psycho-social distress before and at least 3 months after the operation despite favorable postoperative functional and esthetic outcome. In addition to this, closed rhinoplasty may be a more preferable method because of less psycho-social distress. It can also be expressed that postoperative psycho-social distress scores were more favorable in patients who had functional expectations before surgery. If the surgeon is knowledgeable and

experienced in closed surgery and if the nasal deformity is suitable to perform closed surgery, closed surgery may provide more satisfying psycho-social outcomes. Accordingly, our findings emphasize consideration of psycho-social distress levels alongside QOL in the assessment of rhinoplasty candidates for better selection of suitable candidates and prediction of more satisfactory postoperative outcome. There is a need for developing a composite valid QOL instrument that assesses patient satisfaction without the segregation of functional and esthetic outcome and with incorporation of psychosocial distress levels.

Conflict of interest

The authors declare that they have no conflict of interest.

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References

1. Freiberg A, Giguère D, Ross DC, Taylor JR, Bell T, Kerluke LD. Are patients satisfied with results from residents performing aesthetic surgery? *Plast Reconstr Surg* 1997;**100**:1824–31.
2. Izu SC, Kosugi EM, Brandão KV, et al. Normal values for the rhinoplasty outcome evaluation (ROE) questionnaire. *Braz J Otorhinolaryngol* 2012;**78**:76–9.
3. Lam DJ, James KT, Weaver EM. Comparison of anatomic, physiological, and subjective measures of the nasal airway. *Am J Rhinol* 2006;**20**:463–70.
4. Lee MK, Most SP. A comprehensive quality-of-life instrument for aesthetic and functional rhinoplasty: The RHINO scale. *Plast Reconstr Surg Glob Open* 2016;**4**:e611.
5. Alsarraf R, Larrabee WF Jr, Anderson S, et al. Measuring cosmetic facial plastic surgery outcomes: a pilot study. *Arch Facial Plast Surg* 2001;**3**:198–201.
6. Alsarraf R. Outcomes research in facial plastic surgery: a review and new directions. *Aesthetic Plast Surg* 2000;**24**:192–7.
7. Biggs TC, Fraser LR, Ward MJ, Sunkaraneni VS, Harries PG, Salib RJ. Patient reported outcome measures in septorhinoplasty surgery. *Ann R Coll Surg Engl* 2015;**97**:63–5.
8. Andretto Amodeo C. The central role of the nose in the face and the psyche: review of the nose and the psyche. *Aesthetic Plast Surg* 2007;**31**:406–10.
9. Haraldsson P. Psychosocial impact of cosmetic rhinoplasty. *Aesthetic Plast Surg* 1999;**23**:170–4.
10. Stewart MG, Witsell DL, Smith TL, et al. Development and validation of the nasal obstruction symptom evaluation (NOSE) scale. *Otolaryngol Head Neck Surg* 2004;**130**:157–63.
11. Carr T, Moss T, Harris D. The DAS24: a short form of the Derriford appearance scale DAS59 to measure individual responses to living with problems of appearance. *Br J Health Psych* 2010;**10**:285–98.
12. Most SP. Analysis of outcomes after functional rhinoplasty using a disease-specific quality-of-life instrument. *Arch Facial Plast Surg* 2006;**8**:306–9.
13. Arima LM, Velasco LC, Tiago RSL. Crooked nose: outcome evaluations in rhinoplasty. *Braz J Otorhinolaryngol* 2011;**77**:510–15.
14. Riedel F, Wähmann M, Bran GM, Conder M, Bulut OC. Quality of life after functional aesthetic septorhinoplasty in primary surgery vs. revision surgery-a monocentric study. *HNO* 2018 [Epub ahead of print] [Article in German]. doi:10.1007/s00106-018-0554-x.
15. Zahedi FD, Husain S, Gendeh BS. Functional outcome evaluation of septorhinoplasty for nasal obstruction. *Indian J Otolaryngol Head Neck Surg* 2016;**68**:218–23.
16. Yeung A, Hassouneh B, Kim DW. Outcome of nasal valve obstruction after functional and aesthetic-functional rhinoplasty. *JAMA Facial Plast Surg* 2016;**18**:128–34.
17. Gunel C, Omurlu IK. The effect of rhinoplasty on psychosocial distress level and quality of life. *Eur Arch Otorhinolaryngol* 2015;**272**:1931–5.
18. Cingi C, Songu M, Bal C. Outcomes research in rhinoplasty: body image and quality of life. *Am J Rhinol Allergy* 2011;**25**:263–7.
19. Hellings PW, Nolst Trenité GJ. Long-term patient satisfaction after revision rhinoplasty. *Laryngoscope* 2007;**117**:985–9.
20. Baykal B, Erdim I, Kayhan FT, Oghan F. Comparative analysis of nasal deformities according to patient satisfaction. *J Oral Maxillofac Surg* 2014;**72**:603.
21. Saleh AM, Younes A, Friedman O. Cosmetics and function: quality-of-life changes after rhinoplasty surgery. *Laryngoscope* 2012;**122**:254–9.
22. Balikci HH, Gurdal MM. Satisfaction outcomes in open functional septorhinoplasty: prospective analysis. *J Craniofac Surg* 2014;**25**:377–9.
23. Yadav V, Kumar R, Chokkalingam VK, Chander Deka R, Hota A. Post-surgery outcome measurement of 30 patients with crooked nasal deformity using rhinoplasty outcome evaluation scale. *Clin Rhinol* 2015;**8**:5–7.
24. Herruer JM, Prins JB, van Heerbeek N, Verhage-Damen GWJA, Ingels KJAO. Does self-consciousness of appearance influence postoperative satisfaction in rhinoplasty? *J Plast Reconstr Aesthet Surg* 2018;**71**:79–84.
25. Honigman RJ, Phillips KA, Castle DJ. A review of psychosocial outcomes for patients seeking cosmetic surgery. *Plast Reconstr Surg* 2004;**113**:1229–37.
26. Rosenström T, Jokela M, Hintsanen M, et al. Body-image dissatisfaction is strongly associated with chronic dysphoria. *J Affect Disord* 2013;**150**:253–60.
27. Khajeddin N, Izadi MS. The relationship between body image and request and tendency toward rhinoplasty in female students. *Jundishapur Sci Med J* 2013;**11**:665–73.
28. Bulut OC, Wallner F, Oladokun D, Plinkert PK, Baumann I, Hohenberger R. Patients screening positive for body dysmorphic disorder show no significant health-related quality of life gain after functional septorhinoplasty at a tertiary referral center. *Facial Plast Surg* 2018;**34**:318–24.
29. Litner JA, Rotenberg BW, Dennis M, Adamson PA. Impact of cosmetic facial surgery on satisfaction with appearance and quality of life. *Arch Facial Plast Surg* 2008;**10**:79–83.
30. Yu K, Kim A, Pearlman SJ. Functional and aesthetic concerns of patients seeking revision rhinoplasty. *Arch Facial Plast Surg* 2010;**12**:291–7.
31. Rohrich RJ. Mirror, mirror on the wall: when the postoperative reflection does not meet patients' expectations. *Plast Reconstr Surg* 2001;**108**:507–9.
32. Kucur C, Kuduban O, Ozturk A, et al. Psychological evaluation of patients seeking rhinoplasty. *Eurasian J Med* 2016;**48**:102–6.
33. Koca CF. Health-related quality of life after rhınoplasty: a review article. *Med Res Arch* 2017;**5**:1–11.
34. Yang F, Liu Y, Xiao H, Li Y, Cun H, Zhao Y. Evaluation of preoperative and postoperative patient satisfaction and quality of life in patients undergoing rhinoplasty: a systematic review and meta-analysis. *Plast Reconstr Surg* 2018;**141**:603–11.
35. Sarwer DB, Infield AL, Baker JL, et al. Two-year results of a prospective, multi-site investigation of patient satisfaction and psychosocial status following cosmetic surgery. *Aesthet Surg J* 2008;**28**:245–50.
36. Guyatt GH, Kirshner B, Jaeschke R. Measuring health status: what are the necessary measurement properties? *J Clin Epidemiol* 1992;**45**:1341–5.

37. Spiekermann C, Savvas E, Rudack C, Stenner M. Adaption and validation of the nasal obstruction symptom evaluation scale in German language (D-NOSE). *Health Qual Life Outcomes* 2018;**16**:172.
38. Başer E, Kocagöz GD, Çalim ÖF, Verim A, Yilmaz F, Özturan O. Assessment of patient satisfaction with evaluation methods in open technique septorhinoplasty. *J Craniofac Surg* 2016;**27**:420–4.
39. Radulesco T, Penicaud M, Santini L, Thomassin JM, Dessi P, Michel J. Outcomes of septorhinoplasty: a new approach comparing functional and aesthetic results. *Int J Oral Maxillofac Surg* 2018;**47**:175–9.
40. Spiekermann C, Savvas E, Rudack C, Stenner M. Development and validation of a brief four-component questionnaire to identify patient's motivation to undergo functional rhinoplasty. *Facial Plast Surg* 2018;**34**:350–5.