

ORIGINAL ARTICLE

Medicine Science 2023;12(3):710-5

Are the sinonasal outcome test and nasal obstruction symptom evaluation scale questionnaires suitable for assessing the quality of life after septorhinoplasty? A prospective case-control study

Adem Bora¹, Kasim Durmus¹, Selim Cam², Emine Elif Altuntas¹¹Sivas Cumhuriyet University, Faculty of Medicine, Department of Otorhinolaryngology, Sivas, Türkiye²Sivas Cumhuriyet University, Cumhuriyet Vocational School of Social Sciences, Department of Office Services and Secretarial, Sivas, Türkiye

Received 31 May, 2023; Accepted 11 July, 2023

Available online 20.08.2023 with doi: 10.5455/medscience.2023.05.078

Copyright@Author(s) - Available online at www.medicinescience.org

Content of this journal is licensed under a Creative Commons Attribution-NonCommercial-NonDerivatives 4.0 International License.



Abstract

In the evaluation after septorhinoplasty (SRP), the surgeon's plan and the patient's expectations may not always be realised. Therefore, in our prospective case-control study, we aimed to investigate whether the Sinonasal Outcome Test (SNOT-22) and Nasal Obstruction Symptom Evaluation Scales (NOSE), which have been validated in different patient populations in Turkish, are appropriate for evaluating SRP cases and their relationship with each other. Preoperative and postoperative data of NOSE and SNOT-22 questionnaires of 125 cases diagnosed with traumatic septum deviation and external nasal deformity and decided to be operated were analyzed. It was calculated that the SNOT-22 score of those with high/low preoperative NOSE scores was also high/low with a 53.6% probability and that the SNOT-22 score of those with high/low postoperative NOSE scores was also high/low with a 69.9% probability, indicating a positive and high-level relationship between postoperative NOSE and SNOT-22 measurements. When the answers given to all questions in SNOT-22 were evaluated separately, it was observed that the most disturbing symptoms of the cases were nasal obstruction at 78.4% and the need to blow the nose at 46.4% in the preoperative period, and nasal obstruction with 64.8% and the need to blow nose with 37.6% in the postoperative period. The most dramatic changes in the answers to SNOT-22 questions were observed in the patient's feelings of frustrated/restless/irritable, sadness, and embarrassed. SNOT-22 and NOSE questionnaires can be used interchangeably to evaluate the functional status of patients undergoing SRP surgery.

Keywords: Septorhinoplasty, SNOT-22 questionnaire, NOSE questionnaire

Introduction

There are two main factors that determine patient satisfaction after septorhinoplasty (SRP): achieving a functionally unobstructed nose and obtaining a nose that meets cosmetic expectations. During SRP surgery, attention should be paid to both cosmetic expectations and the restoration of nasal function. Therefore, sometimes the results of SRP may be perceived differently by patients and surgeons. Quality of life surveys can be helpful in

resolving this confusion [1].

In recent years, various scoring systems have been developed to evaluate nasal function and the functional effects of treatment on the nose [2,3]. Specific scales have higher sensitivity than general scales, but these scales cannot be used to compare different diseases or patients [1]. When we review the literature on the scales commonly used to evaluate the quality of life of SRP patients, we see that the Utrecht Questionnaire, FACE-Q rhinoplasty module,

CITATION

Bora A, Durmus K, Cam S, Altuntas EE. Are the sinonasal outcome test and nasal obstruction symptom evaluation scale questionnaires suitable for assessing the quality of life after septorhinoplasty? A prospective case-control study. Med Science. 2023;12(3):710-5.



Corresponding Author: Adem Bora, Sivas Cumhuriyet University, Faculty of Medicine, Department of Otorhinolaryngology, Sivas, Türkiye
Email: adembora2016@gmail.com

Glasgow Benefit Inventory, Functional Rhinoplasty Outcome Scale 17, RHINO Scale, and Aesthetic Rhinoplasty Scale are frequently used for aesthetic self-assessment. For aesthetic and functional self-assessment, the Nasal Obstruction Symptom Evaluation (NOSE) Scale, Rhinoplasty Outcome Evaluation, and the Burden of Rhinologic Disease instrument are used. For functional self-assessment, the Nasal Surgery Questionnaire and the Nasal Obstruction Symptom Evaluation (NOSE) Scale are used [3,4].

The Sinonasal Outcome Test-22 (SNOT-22) is one of the commonly used questionnaires in clinical practice. It is designed to evaluate the impact of sinonasal pathologies on quality of life and to monitor patient perception following treatment, and is considered a reliable and sensitive outcome measure for functional endoscopic sinus surgery [5]. The SNOT-22 is an effective scoring questionnaire that measures nasal symptoms, ear/facial symptoms, sleep status, functionality, and emotional status [5,6].

The NOSE scale, on the other hand, is a specialized questionnaire consisting of 5 questions that clinicians can quickly and safely administer during the follow-up of patients who have undergone septoplasty and SRP to measure nasal obstruction [7-9]. However, the NOSE questionnaire does not contain questions aimed at measuring patients' aesthetic satisfaction.

The Turkish translation, cross-cultural adaptation, and validation of SNOT 22 for chronic rhinosinusitis cases and NOSE scale for septoplasty cases have been performed [10,11]. In our literature search, we found many studies using NOSE and SNOT 22 scales for evaluating the functional outcomes of SRP [1,12]. However, we could not find a study that shows the relationship between these two questionnaires used together for evaluating functional SRP cases. Therefore, we aimed to investigate whether the Turkish validated versions of SNOT-22 and NOSE scales, which were validated on different patient populations, are appropriate evaluation methods for functional SRP cases and their relationship with each other in our prospective case-control study.

Materials and Methods

Study group

The study was conducted with patients who presented to the Ear, Nose, and Throat (ENT) Clinic of Sivas Cumhuriyet University Hospital with symptoms such as nasal obstruction, open mouth breathing, and snoring lasting more than three months and were diagnosed with traumatic septal deviation and external nasal deformity based on physical examination, anterior rhinoscopy, endoscopic examination, and paranasal sinus tomography, and agreed to participate in the study. The SNOT-22 and NOSE questionnaires were administered to all patients in accordance with the principles of the Helsinki Declaration. All patients who agreed to participate in the study were informed by the researchers and written and verbal consent was obtained. This study was approved by the Sivas Cumhuriyet University Faculty

of Medicine Non-Interventional Ethics Committee (Date: 15.06.2017; Decision No: 2017-06/04).

Demographic data such as age and gender, smoking and alcohol habits, medications used, systemic diseases, and allergy history were recorded for all cases. Anterior rhinoscopic examinations and computerized tomography findings of all patients were also documented.

All cases underwent SRP under general anesthesia using the same technique by two separate surgeons. All patients were orally intubated and their heads were slightly elevated. In all cases, a bilateral alar marginal incision without a columellar reverse V incision was made using a no. 11 blade. The upper lateral cartilages and lateral crura were dissected while remaining beneath the superficial muscular aponeurotic system (SMAS) using elevators and curved scissors to reveal the middle vault. The cartilaginous septum, perpendicular plate of the ethmoid bone, vomer, and nasal spine of the maxilla were exposed with bilateral mucoperichondrial flaps. Spreader and strut grafts were obtained from the septal cartilage as autografts. After necessary bone and cartilage corrections were made, spreader and strut grafts were applied to all patients, and the incision was closed with 6/0 Prolene. The same type of silicone tampon and external nasal splint were used for all patients after surgery. Tampons were removed on the second postoperative day, and the external nasal splint was removed on the seventh day. All patients received nasal lavage and antibiotics in the postoperative period.

SNOT-22 and NOSE scales and assessments

Before filling out the questionnaire forms, all included cases were thoroughly explained how to fill out the scales. During both preoperative (preop) and postoperative (postop) periods, the patients were alone when they filled out the NOSE and SNOT-22 questionnaires, and they delivered their evaluation results in a standard envelope without any markings on them. Both questionnaires were applied to all patients one day before the surgery and six months after the surgery, and the preoperative and postoperative data were statistically compared for evaluation.

The validity of the SNOT-22 questionnaire in Turkish for chronic rhinosinusitis cases was evaluated by Hanci et al., and its reliability was evaluated in SRP cases in this study [10].

The adaptation of the NOSE scale to Turkish and the evaluation of its internal consistency, reliability, and validity were performed by Önerci et al. in septoplasty cases [11].

The SNOT-22 questionnaire includes 22 questions and patients respond to them using a 6-point scale ranging from 0 to 5. The total score is calculated between 0 and 110 with lower scores indicating better quality of life. The minimal clinically important difference is reported as 9 [1]. The NOSE questionnaire consists of 5 questions related to symptoms, and patients rate each question on a scale of 0 to 4. The raw scores obtained from the NOSE questionnaire range from 0 to 20, but can be multiplied by 5 to convert them to a range of 0 to 100 [13]. Higher scores indicate more severe nasal obstruction.

Statistical method

The statistics of the data were analyzed using the SPSS v23.0 software package. Since the NOSE averages were not normally distributed ($p_{\text{Shapiro-Wilk}} < 0.001$), Mann-Whitney U test was applied for categorical variables. Wilcoxon Rank test was applied to compare the preoperative and postoperative data of the participants. For the comparison of categorical data, Chi-square analysis was used, while Kappa test was used for the comparison of preoperative and postoperative categorical data. In addition, the magnitude of the relationship between the questionnaires was calculated using Spearman Correlation test. The significance level of the analyses was set at 0.05.

Results

In this prospective study, the study group was determined from patients ($n=197$) who underwent septorhinoplasty (SRP) operation with a diagnosis of traumatic nasal septal deviation and external nasal deformity at the Ear, Nose, and Throat (ENT) Clinic of Sivas Cumhuriyet University Hospital between January 1, 2017, and December 31, 2018. Cases with accompanying sinonasal diseases, active upper respiratory tract infections, allergic rhinitis, previous history of turbinate, septum, or other sinonasal surgeries, radiotherapy, asthma, craniofacial anomalies, pregnancy, as well as those who did not consent to participate or failed to attend follow-up visits, were excluded from the study ($n=72$). A total of 125 patients were included (Figure 1).

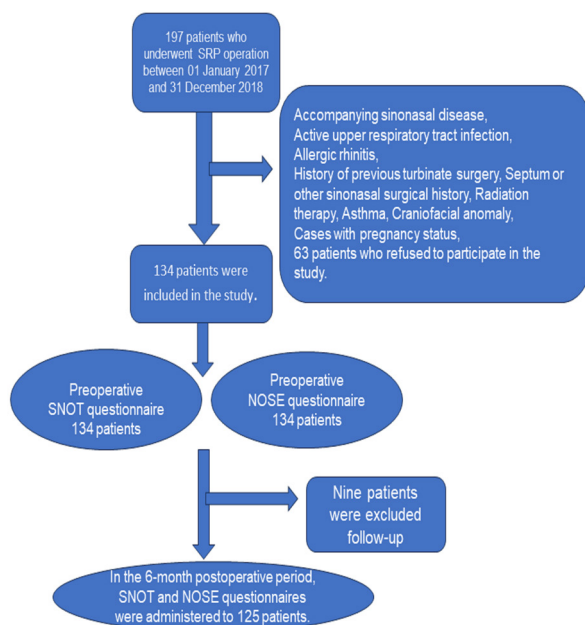


Figure 1. Study flowchart

Study group

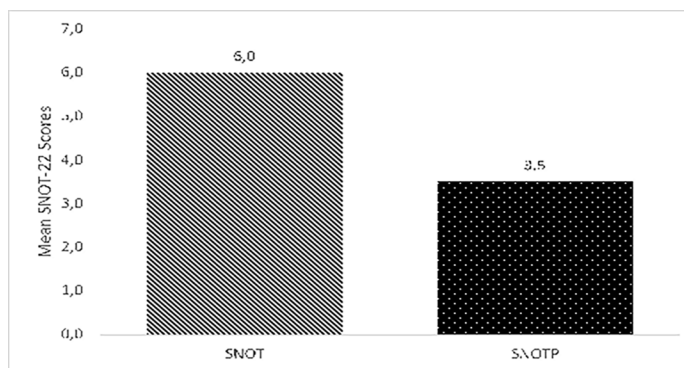
A total of 125 cases were included in the study [%40.8 ($n=51$) female, %59.2 ($n=74$) male]. The mean age of the cases was 26.8 ± 7.7 years (range: 17-55) [mean age of female cases: 27.3 ± 7.2 (range: 18-55) years, mean age of male cases: 26.4 ± 8.0 (range: 17-48) years].

General results of NOSE and SNOT-22

The preoperative and postoperative mean NOSE scores were 2.1 ± 0.75 (1-4) and 1.4 ± 0.62 (1-4), respectively. The decrease in the mean NOSE values was statistically significant ($p < 0.05$).

There was no significant difference between the preoperative and postoperative NOSE scores among genders ($p > 0.05$). In females, the preoperative and postoperative NOSE scores were 2.2 ± 0.82 and 1.5 ± 0.69 , respectively ($p < 0.05$). In males, the preoperative and postoperative NOSE scores were 2.1 ± 0.69 and 1.4 ± 0.56 , respectively ($p < 0.05$).

The preoperative and postoperative mean SNOT-22 scores of the cases were 6.0 ± 4.0 and 3.5 ± 2.0 , respectively, and this decrease was significant ($p < 0.05$) (Figure 2).



*SNOT:Preop;SNOTP:Postop

Figure 2. Mean distribution of pre-operative and post-operative SNOT-22 (Sinonasal Outcome Test-22) scores

The mean preoperative SNOT-22 scores were similar between genders ($p > 0.05$). However, postoperative SNOT-22 scores showed a more significant decrease in females ($p < 0.05$). When the answers given by the cases to all questions in SNOT-22 were evaluated individually, there was no significant difference in their responses to questions regarding nasal discharge, ear fullness, difficulty falling asleep, wake up at night, wake up tired, and dizziness ($p > 0.05$). However, there was a significant difference in responses to the remaining questions ($p < 0.05$) (Figure 3).

When the answers given to all the questions in SNOT-22 were evaluated individually, it was observed that the most bothersome symptoms for the patients in the preoperative period were nasal obstruction with 78.4% and the need to blow their nose with 46.4%. In the postoperative period, nasal obstruction with 64.8% and the need to blow their nose with 37.6% were still the most common symptoms. The most dramatic changes in the responses to SNOT-22 questions were observed in the patient's feelings of frustrated/restless/irritable, sadness, and embarrassed. All patients provided at least one answer to all the questions both pre- and postoperatively, but only one patient provided a response to the postoperative question about feeling sad. 22 people responded to the preop embarrassed question, 23 to the sad state, and 31 to the frustrated/restless/irritable question, and the number of people who answered post op to these questions is 3.1 and 7, respectively.

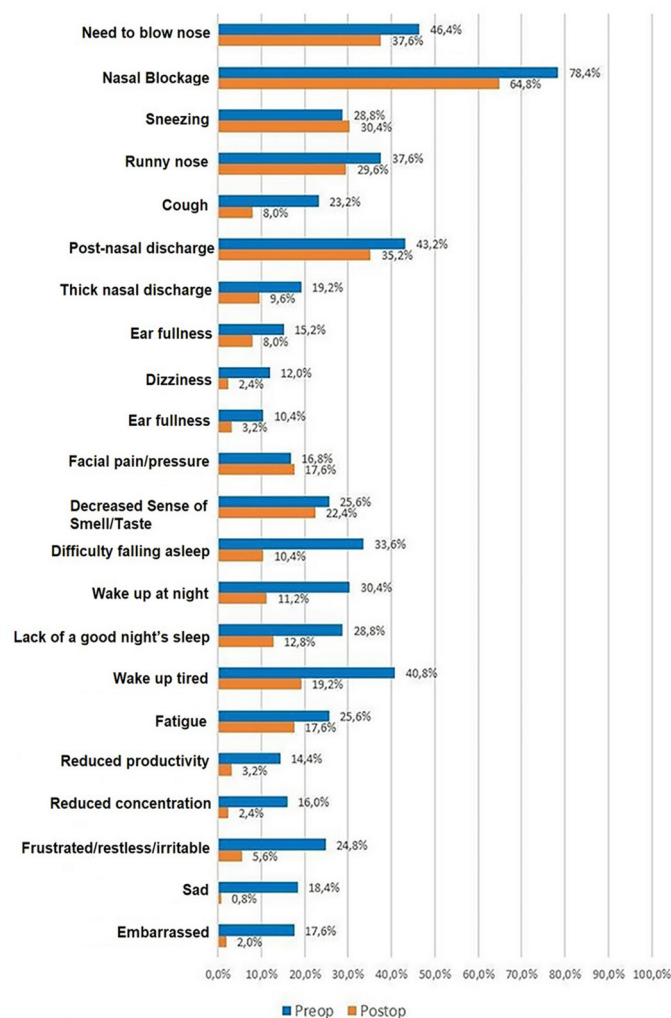


Figure 3. Distribution of pre-operative and post-operative responses given by cases for each item in the SNOT-22 (Sinonasal Outcome Test-22) scale

In the correlation analysis performed to evaluate the interchangeability of NOSE and SNOT scales, there was a positive correlation both pre- and postoperatively according to the Spearman correlation coefficient ($p < 0.05$). Postoperative NOSE scores were highly correlated with SNOT-22 scores ($r = 0.699$), suggesting that they can be used interchangeably in postoperative evaluations (Table 1).

Table 1. Results of the correlation analysis between NOSE (Nasal Obstruction Symptom Evaluation) and SNOT-22 (Sinus Nasal Outcome Test-22)

		NOSE preop	NOSE postop	SNOT 22 preop	SNOT 22 postop
NOSE preop	r		.289**	.536**	.307**
	p		0.001	0	0.001
NOSE postop	r	.289**		.235**	.699**
	p	0.001		0.009	0
SNOT 22 preop	r	.536**	.235**		.339**
	p	0	0.009		0
SNOT 22 postop	r	.307**	.699**	.339**	
	p	0.001	0	0	

Discussion

The most important finding of our study is the high correlation between both preoperative and postoperative SNOT and NOSE questionnaires. It has been reported that these two questionnaires are quite useful in the clinical evaluation and follow-up of patients [5,12]. However, the NOSE questionnaire does not include questions that measure the aesthetic satisfaction of SRP patients. In the SNOT-22 questionnaire, the last three questions are related to patients' emotional state and can provide an idea about their aesthetic satisfaction level. Therefore, in SRP patients where both the SNOT-22 and NOSE questionnaires are administered simultaneously, some mismatch between the two questionnaires can be expected. Due to the high correlation between the SNOT-22 and NOSE questionnaires as a whole and between the emotional state questions of SNOT-22 and NOSE, they can be considered interchangeable in SRP patients.

Although there is no similarity between the 21st question of SNOT(Sad) and the 2nd question of NOSE (nasal obstruction), a positive correlation was found. There can be two important interpretations of the result showing a high correlation between NOSE and SNOT-22 questionnaires. The first interpretation is that the SNOT-22 questionnaire is not successful in measuring the aesthetic concerns of SRP patients. The second interpretation is that good functional results and good aesthetic results are consistent in SRP patients. Recently, a study has shown that functional outcomes are consistent with aesthetic scores in SRP patients [9]. Since there is no question directly addressing aesthetic expectations in both questionnaires used in our study, aesthetic satisfaction cannot be evaluated. However, it is clear that we obtained positive results in terms of functionality in both questionnaires, and as Andrews et al. have emphasized, we are still lacking objective tests that can accurately measure nasal function in a clinical setting in patients undergoing surgery with nasal inspiratory peak flow (NIPF) [1].

When the SNOT-22 results were evaluated in terms of gender, they obtained lower SNOT-22 scores in the male gender in the study conducted by Gregório et al. In our study, there was no statistically significant difference between male and female patients in terms of mean SNOT-22 scores before surgery ($p > 0.05$), but there was a significant difference after surgery ($p < 0.05$). Therefore, it was observed that there was improvement in both genders after septorhinoplasty, as well as more effective improvement in men [13].

SNOT-22 includes questions that investigate general health problems, sleep disorders, psychological aspects, and daily productivity. Comorbidities such as depression, gender, ethnicity, age, and socio-cultural status can affect SNOT-22 results [14]. However, it has been shown that SNOT-22 questionnaire can be used in patient-approved outcome measurements in functional SRP patients [5,12]. In our study, when preoperative and postoperative SNOT-22 scores were examined, overall improvement in patients' SNOT-22 scores was observed.

Therefore, SRP provided effective improvement and significant improvement in quality of life in all age and gender groups. However, there was a slight increase in the number of patients sneezing in the postoperative period.

In the literature, it has been reported that questions related to emotional state (questions 20. 21. 22) in the SNOT-22 questionnaire are correlated with questions measuring sleep quality (questions 13. 14. 15. 16) [6]. These results are consistent with our study. In our study, a high correlation was found between questions measuring sleep quality and questions measuring a person's emotional state.

To our knowledge, our study is the first to investigate the relationship between NOSE and SNOT-22 questionnaires in SRP patients. When comparing the NOSE questionnaire with SNOT, significant correlations were found between NOSE questions 1. 2. 3 and 5 and SNOT questions related to emotional status (questions 20. 21. 22). Question 21 (feeling sad) showed a positive correlation with NOSE questions 2 and 3 (nasal blockage or obstruction, trouble breathing through your nose).

Another finding of our study is that both NOSE and SNOT-22 scores were lower in SRP patients before surgery. In the healthy population, the mean SNOT-22 score was found to be 9.3 and the median score was 7. A median score of 7 is considered a normal SNOT-22 score. It has been suggested that a score of 7 can serve as a guide for normalcy when evaluating patients in clinical settings, and that greater care should be taken when deciding on sinonasal surgery for those with scores below this level [15]. In our study, these values were found to be an average of 6.0 and a median of 4.0.

In the study by Shastri et al. in which the normative values of the NOSE questionnaire were examined, the mean NOSE score was found to be 1.1 in the asymptomatic population and 2.8 in the symptomatic population, and it was associated with an increase in score up to the age of 45 and a decrease in scores thereafter [16]. In our study, the average NOSE score after surgery was slightly higher, which may be related to the early postoperative timing of the questionnaire administration.

One strength of our study is that it is a prospective study. To our knowledge, this is the first study to examine the relationship between SNOT-22 and NOSE questionnaires in patients undergoing SRP. Previous studies have confirmed the usefulness of SNOT-22 and NOSE questionnaire scores in patients with nasal septal deviation, but no predictive and applicable model based on SNOT-22 and NOSE scores has been created for SRP patients [17,18].

Our study is limited by the fact that we could not use a specialized test to measure patients' aesthetic satisfaction. This is due to two reasons: first, the mismatch in the socio-cultural level of our patients made complex tests unfeasible, and second, using multiple tests in clinical practice can lengthen test duration, disrupt patients' compliance, and lead to deviation from objective

measurements. Additionally, our study was conducted in the early postoperative period of SRP patients. Long-term outcome studies are needed.

Conclusion

Our search for a single test that measures both the functional status and the aesthetic satisfaction level of SRP patients is not met by the SNOT-22 test. In solving this problem, tests that are created by adding questions to the SNOT-22 test can play a key role. SNOT-22 and NOSE scales can be used interchangeably to evaluate functional status in SRP surgeries.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

This study was approved by Sivas Cumhuriyet University Clinical Research Ethics Committee (Date: 15.06.2017; Decision No: 2017-06/04).

References

1. Andrews PJ, Choudhury N, Takhar A, et al. The need for an objective measure in septorhinoplasty surgery: are we any closer to finding an answer?. *Clin Otolaryngol.* 2015;40:698-703.
2. Bulut OC, Wallner F, Hohenberger R, et al. Quality of life after primary septorhinoplasty in deviated- and non-deviated nose measured with ROE, FROI-17 and SF-36. *Rhinology.* 2017;55:75-80.
3. Barone M, Cogliandro A, Di Stefano N, et al. A systematic review of patient-reported outcome measures after rhinoplasty. *Eur Arch Otorhinolaryngol.* 2017;274:1807-11.
4. Morley AD, Sharp HR. A review of sinonasal outcome scoring systems-which is best?. *Clin Otolaryngol.* 2006;31:103-9.
5. Poirrier AL, Ahluwalia S, Goodson A, et al. Is the Sino-Nasal Outcome Test-22 a suitable evaluation for septorhinoplasty?. *Laryngoscope.* 2013;123:76-81.
6. Khan AH, Reaney M, Guillemin I, et al. Development of Sinonasal Outcome Test (SNOT-22) domains in chronic rhinosinusitis with nasal polyps. *Laryngoscope.* 2022;132:933-41.
7. Most SP. Anterior septal reconstruction: outcomes after a modified extracorporeal septoplasty technique. *Arch Facial Plast Surg.* 2006;8:202-7.
8. 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.
9. Simsek T, Erdoğan MM, Özçetinkaya Erdoğan S, et al. Assessment of functional and aesthetic outcomes in septorhinoplasty. *Eur Arch Otorhinolaryngol.* 2021;278:1089-97.
10. Hancı D, Altun H, Şahin E, et al. Turkish translation, cross-cultural adaptation and validation of the SinoNasal Outcome Test (SNOT)-22. *ENT Updates.* 2015;5:51-7.
11. Onerci Celebi O, Araz Server E, Yigit O, Longur ES. Adaptation and validation of the Turkish version of the Nasal Obstruction Symptom Evaluation scale. *Int Forum Allergy Rhinol.* 2018;8:72-6.
12. Menger DJ, Richard W, Swart KM, Grolman W. Does functional septorhinoplasty provide improvement of the nasal passage in validated patient-reported outcome measures?. *ORL J Otorhinolaryngol Relat Spec.* 2015;77:123-31.

13. Gregório LL, Andrade JS, Caparroz FA, et al. Influence of age and gender in the normal values of Sino Nasal Outcome Test-22. *Clin Otolaryngol*. 2015;40:115-20.
14. DeConde AS, Mace JC, Bodner T, et al. SNOT-22 quality of life domains differentially predict treatment modality selection in chronic rhinosinusitis. *Int Forum Allergy Rhinol*. 2014;4:972-9.
15. Gillett S, Hopkins C, Slack R, Browne JP. A pilot study of the SNOT 22 score in adults with no sinonasal disease. *Clin Otolaryngol*. 2009;34:467-9.
16. Shastri K, Gao Y, Davis SJ, et al. Normative values of the nasal obstruction symptom evaluation scale. *Facial Plast Surg Aesthet Med*. 2023;25:35-9.
17. Pannu KK, Chadha S, Kaur IP. Evaluation of benefits of nasal septal surgery on nasal symptoms and general health. *Indian J Otolaryngol Head Neck Surg*. 2009;61:59-65.
18. Demirci S, Tuzuner A, Acikgöz C, et al. Evaluation of outcomes of septoplasty with NOSE and SNOT questionnaires. *Türkiye Klinikleri J Med Sci*. 2015;35:133-7.