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Revision rhinoplasty with free diced cartilage grafts: Outcome evaluations with the Nasal Obstruction Symptom Evaluation (NOSE) scale

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Abstract

Background/Aim: The Nasal Obstruction Symptom Evaluation (NOSE) scale is a validated, reliable, and feasible instrument used to evaluate nasal obstruction severity. We aimed to assess patient satisfaction using the NOSE score after revision rhinoplasty with free diced cartilage (fDC) grafts.

Methods: In this cross-sectional study, 36 patients who underwent a revision rhinoplasty procedure completed the Turkish version of the NOSE questionnaire before and six months after rhinoplasty. Pre- and postoperative NOSE scores were compared using the Mann Whitney U test.

Results: The pre- and postoperative total mean NOSE scores were 68.06 and 8.47, respectively. The NOSE score significantly decreased six months after rhinoplasty surgery (P<0.001). Adapting to exercise was the parameter with the highest improvement rate.

Conclusion: The outcome of the NOSE questionnaires in patients with nasal deformities shows that a revision rhinoplasty surgery with the placement of fDC grafts contributes to the improvement of nasal functions. The Turkish version of the NOSE scale is a useful tool to assess patient satisfaction among the Turkish population.

Keywords: revision rhinoplasty, diced cartilage grafts, NOSE scale

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Ethics Committee Approval
Ethical approval was obtained from the Atlas University institutional review board. Since this was a cross-sectional questionnaire study, written informed consent was obtained from the participants.
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

Conflict of Interest
No conflict of interest was declared by the authors.

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Introduction

Rhinoplasty is one of the most prevalent facial surgeries performed in an attempt to improve breathing difficulties or facial structure. Alongside the increasing number of primary procedures, the number of cases requiring secondary surgery has also risen [1,2]. Residual and iatrogenic aesthetic deformities following the procedures, which were not well organized or performed under emergency conditions, constitute a secondary surgical indication. Hence, secondary rhinoplasty, also called revision rhinoplasty, is performed to correct such complications and ameliorate the initial outcomes of primary surgery and patient dissatisfaction. Revision rhinoplasty has an incidence rate of 5-15% [3,4].

In addition to major complications, namely dysfunction, deformities due to grafts or implants used include skin and soft tissue disease and infection, the collapse of the nasal bridge, irregularities of the nasal bridge, and asymmetries, which also cause aesthetic problems [5]. In cases where the results of the primary surgery are not satisfactory to the patient, revision surgery might be mandatory. Revision rhinoplasty is a complicated and challenging operation because of the scar tissue and changes in nasal structure that occurred during the primary surgery. In cases where revision is required, a detailed preoperative evaluation is needed to identify deformities, and further surgical techniques should be well planned. It should be determined whether grafts are needed, and on which part of the nose the operation should take place [6]. Graft material selection among the autografts (bony, cartilage), homografts, and allografts is critical for successful aesthetic and functional results [7,8].

Rhinoplasty surgery should not compromise nasal functions and nasal physiology while providing aesthetic improvement. Patient satisfaction after rhinoplasty depends mainly on two factors. One is the patient's expectation regarding cosmetic aspects, and the other is nasal obstruction, which affects functional satisfaction [9]. While evaluating surgical outcomes, the opinions of the surgeon and the patient do not always coincide. For this reason, patient expectations and nasal airflow should be evaluated in addition to the preoperative and postoperative clinical analysis [10]. Furthermore, revision rhinoplasty is considered a complex procedure due to the traumatization and scarring of the tissues following the primary procedure.

There are several subjective and objective methods for the evaluation of functional and aesthetic outcomes. Acoustic rhinometry, measurement of nasal inspiratory flow, and computed tomography are among the objective methods. However, performing these procedures is not feasible under clinical conditions; thus, subjective methods may be more practical and informative [11].

The Nasal Obstruction Symptom Evaluation (NOSE) scale developed by Stewart et al. is a simple, easy to use, noninvasive, and durable quality of life questionnaire. It is available in different languages, including Spanish, Chinese, Italian, French, Greek, Portuguese, Dutch, and Turkish. The questionnaire consists of five questions to assess the status of nasal obstruction through patient feedback [12,13].

This study aims to evaluate patient satisfaction before and after revision rhinoplasty with free diced cartilage (fDC) autografts using the NOSE scale.

Materials and methods

The study was conducted in a private plastic surgery clinic from August 2021 to May 2022.

A power analysis revealed that a minimum of 26 participants was required to be able to evaluate the statistical significance with 80% power (alpha=0.05) Thirty-six individuals over the age of 18 with a history of previous rhinoplasty who had septal deviation, septal fracture, crooked or saddle nose deformities accompanied with chronic nasal blockage were enrolled. Ethical approval was obtained from the local board. Since this was a cross-sectional questionnaire study, written informed consent was obtained from the participants. The study was conducted in accordance with the Declaration of Helsinki.

Exclusion criteria included the presence of one or more of the following conditions: primary surgery, chronic sinusitis, allergic rhinitis, nasal polyp, acute nasal trauma, and asthma.

The Turkish NOSE (T-NOSE) scale validated by Karahatay et al. [13] was filled out by patients, both before and six months after the surgery. The English version of the scale is shown in Table 1.

Table 1: The English version of the T-NOSE scale; patient survey

	not a problem	very mild problem	moderate problem	fairly bad problem	Severe problem
1. Nasal congestion or stuffiness	0	1	2	3	4
2. Nasal blockage or obstruction	0	1	2	3	4
3. Trouble breathing through my nose	0	1	2	3	4
4. Trouble sleeping	0	1	2	3	4
5. Unable to get enough air through my nose during exercise or exertion	0	1	2	3	4

Over the past 1 month how much of a blend were the following conditions for you? Please circle the most correct response

The total NOSE score was calculated for each questionnaire by summing the scores of all questions and multiplying them by 5, with a total score ranging between 0-100.

According to the calculated total score, the severity of nasal obstruction was classified as mild (5-25), moderate (30-50), severe (55-75), and extreme (80-100).

All patients were operated on with an open rhinoplasty technique using conventional endotracheal intubation under general anesthesia.

fDC, harvested from the septum, rib, or ear cartilage was prepared and placed according to Kreutzer et al. [14].

Patients were hospitalized for one day after surgery. Cold compresses for 24 hours, oral antibiotics and analgesic treatments were applied. Sutures and splints were removed on the seventh day of the operation.

Statistical analysis

SPSS.v18 for Windows (IBM, New York, USA) was used for statistical analyses. Normality distribution of NOSE scores was tested by Kolmogorov–Smirnov test. The Mann Whitney U-test was applied to compare mean NOSE scores. A *P*-value of <0.05 was accepted for statistical significance.

Results

The baseline demographic and clinical characteristics of 36 patients have been summarized in Table 2. According to this table, saddle nose was a common condition among the patients. All patient underwent secondary surgery procedures.

Table 2: Baseline demographic and clinical characteristics of patients

Demographic data	
Total patients, n	36
Age (years), mean (SD)	33.64 (9.36)
Gender (n; male/female) - (%; male/female)	27/9 - 75/25
Deformity	
Saddle nose, n (%)	23 (63.88)
Deviated septum, n (%)	5 (13.88)
Septal fracture, n (%)	5 (13.88)
Crooked nose, n (%)	3 (8.33)

SD: standard deviation

The calculated means of pre-op and post-op NOSE scores, standard deviations, confidence intervals (95% CI) and p-value are given in Table 3. We observed a significant difference between the pre- and postoperative NOSE scores.

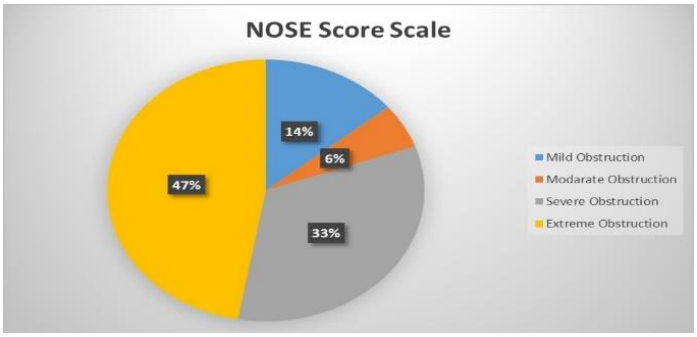
Table 3: Calculated means of pre-op and post-op NOSE scores, standard deviations, confidence intervals and the *P*-value

	Mean	**SD**	**95% CI**	***P*-value**
Pre-operative NOSE Score	68.06	26.44	60-80	<0.001
Post-operative NOSE Score	8.47	7.44	5-10	

SD: standard deviation, CI: confidence interval

Classification of patients according to their nasal obstruction status depending on pre-op NOSE scores is shown in Figure 1. The frequency of extreme obstruction was the highest with a frequency of 47%. This was followed by severe, mild, and moderate levels of obstruction (33%, 14%, and 6%, respectively).

Figure 1: Classification of patients according to their nasal obstruction status depending on pre-op NOSE scores



Mean values of the NOSE score of each question in the questionnaire are presented in Table 3. The mean score of air flow during exercise was higher than other conditions for the pre-operative status, and exhibited the highest improvement following the surgery.

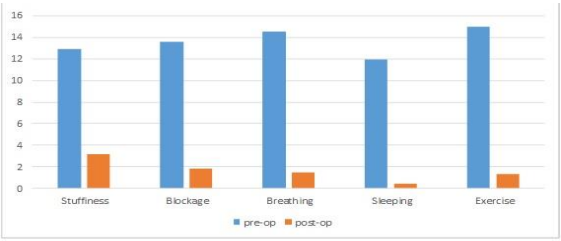
Table 1: Mean values, standard deviations and confidence intervals of NOSE score of each question in questionnaire

	Pre-op			**Post-op**			
	Mean	**SD**	**95% CI**	**Mean**	**SD**	**95% CI**	***P*-value**
Stuffiness	12.92	5.52	11.05-14.79	3.19	2.43	2.37-4.01	<0.001
Blockage	13.61	6.04	11.56-15.66	1.86	2.71	0.88-2.72	<0.001
Breathing	14.58	5.91	12.59-16.58	1.38	2.56	0.52-2.25	<0.001
Sleeping	11.94	6.57	9.71-14.17	0.44	1.44	0-0.94	<0.001
Exercise	15	5.85	13.02-16.98	1.28	2.24	0.52-2.04	<0.001

SD: standard deviation, CI: confidence interval

Patients' satisfaction six months after surgery on each situation in the questionnaire is depicted in Figure 2.

Figure 2: Improvement of patients' satisfaction six months after surgery according to NOSE scores



Discussion

Since rhinoplasty is a more demanding operation when compared to other facial aesthetic surgeries, patient satisfaction is an indicator of the performance and surgical approach [15,16]. Hence, in this study we aimed to evaluate the quality of life using the NOSE scale in patients who underwent revision rhinoplasty with fDC grafts. The use of fDC grafts is an efficient and easily applicable method in rhinoplasty surgery, with no cost. It is adequate for the personal tailoring and shaping of the nose regions, especially the dorsum. In addition, the autologous nature of these grafts is associated with lower complication rates, and higher chondrocyte viability, enabling the diffusion of supplementary chemicals inside the graft material [14].

In this study, we used fDC grafts in all patients in an attempt to reduce the patient burden from the initial surgery and provide a better-shaped and functioning nose, which would not require an additional rhinoplasty procedure in the future.

The NOSE scale is a practical instrument that has been used to evaluate the final outcomes of rhinoplasty surgery by several authors [17,18]. In a meta-analysis conducted by Rhee et al. [18], 19 study groups consisting of 725 patients reported an improvement of NOSE scores following the surgery, which is similar to our findings. They further reported a mean NOSE score of 15 for patients who were asymptomatic and had no history of nasal airway obstruction. This score could overlap with that of a healthy population with no complaints, concluding that, despite the concordancy of the published data, postoperative scores might be biased or placebo-influenced, as they had the similar mean NOSE score of the asymptomatic population.

On the other hand, Mondina et al. [19] reported that the NOSE scale was moderately correlated with patient satisfaction, with a significant difference between baseline days and six months after surgery for each variable of the questionnaire. In our study, we observed a similar improvement for each question and the total NOSE score, setting the duration between the two surveys at six months. Although Gerecci et al. [17] reported that one to three months was sufficient for the recovery of nasal airway blockage, they also mentioned that the recovery period could last up to ten months. Rhee et al. [18] reported a general follow-up period extending from one month to longer than three years to evaluate the NOSE score. While they subdivided the postoperative follow-up period into three different time ranges from one to six months after the operation, Kumar et al. [20] reported a significant amelioration of NOSE score baseline means, with a decreasing trend of the mean value from 71 to 19 within the first month, 10 on the third month, and 9.50 on the sixth month. Implementing similar time intervals, Saratziotis et al. [21] embraced a study duration of 18 months; however they obtained similar results. In our study, we did not construct the follow-up period into time intervals; however, despite this difference, we also observed that the mean value of the NOSE score significantly changed within the six months following the surgery.

The rate of revision rhinoplasty is increasing due to the unsatisfactory and inefficient results obtained from the initial surgery. Alsubeah et al. [22] conducted a prevalence study in Saudi Arabia involving 1,370 individuals, and reported that the prevalence of individuals who considered undergoing revision

rhinoplasty was 44.7% in the Saudi population. They also concluded that in half of these cases, the main reason for undergoing revision rhinoplasty was an aesthetic concern. In another study including 3,525 patients, Sibar et al. [4] reported that the revision rhinoplasty rate was 10.8% in their patient group. Unlike Sibar's study but similar to Alsubeah's, our revision rate was 63.88%, and we observed that the most common causes for revision surgery were saddle nose or a deviated septum.

Kotzampasakis et al. [23] conducted a study to assess the NOSE score of patients who underwent classical rhinoplasty for aesthetic concerns, and without functional interventions to the nasal cavity, septum or conchas. They observed a significant difference between pre-and post-operative NOSE scores, suggesting that an aesthetic rhinoplasty procedure could result in functional satisfaction. In their study, 59 out of 100 patients were smokers; hence, there was no difference between smokers and non-smokers. There were no smokers in our study, thus we could not achieve a comparison among this group.

Several authors have reported the finesse of the fDC grafts in rhinoplasty, with an emphasis on the low complication rate and donor site morbidity [24-26]. In our study, we did not observe graft-related complications, and graft survival was at its highest for all cases. We also suggest that, the use of fDC grafts is the primary source of the study findings, since the improvement rates in the NOSE scores were significantly higher after the surgery for the entire study population, regardless of the deformity.

Bezerra et al. [27] advised that it is essential to use the native language-adapted and validated version of the NOSE scale to compare the questionnaire responses with other studies. Therefore, one of the strengths of our study is the use of a native language adapted and validated questionnaire to ensure the consistency of the responses. The T-NOSE, adapted and validated by Karahatay et al. [13], was a reliable, valid, and responsive version, with Cronbach's alpha coefficient values of 0.938 and 0.942 for test and re-test, respectively. This indicated a robust internal reliability, showing the efficiency of T-NOSE in evaluating septal deviation and nasal obstruction.

Several studies reported that the best improvement after rhinoplasty was in spontaneous nasal breathing (Question 3), whereas in our report, it was the adaptation to exercise (Question 5) [20,28,29]. This variation could depend on the complaints and expectations of patients, age, profile, presence of concomitant diseases (diabetes, hypertension) or conditions as well as the surgical techniques used for rhinoplasty [29].

Limitations

Our study has two essential limitations to declare. Firstly, we had a small number of patients, indicating that the surgeon who performed the surgeries conducted the questionnaires in person with a face-to-face approach. Therefore, we limited the number of patients and the follow-up time in an attempt to keep a stable and qualified surgical practice and questionnaire. Secondly, we did not make a comparison with other available patient satisfaction questionnaires such as the Rhinoplasty Outcome Evaluation (ROE) or the FACE-Q rhinoplasty module. However, our reason for not performing the ROE questionnaire was to investigate functional recovery after rhinoplasty, whereas for the FACE-Q, it was due to the lack of a Turkish-validated version.

Conclusion

The T-NOSE scale is a useful and subjective tool for the evaluation of functional outcomes and patient satisfaction after revision rhinoplasty. The severity of nasal obstruction significantly decreased six months after the procedure. Despite the need for future studies from different parts of the globe with larger number of individuals and a longer follow-up period, a secondary rhinoplasty surgery with the use of fDC grafts contributes to the improvement of the quality of life by eliminating patient dissatisfaction following the primary surgery.

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