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Changes in Subjective Outcomes during the Early Period after Septoturbinoplasty

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Purpose: Septoturbinoplasty is frequently performed to correct nasal obstruction; however, there is still a lack of research on changes in nasal and nose-related symptoms early after septoturbinoplasty. Therefore, we aimed to investigate changes in subjective outcomes within 6 months after septoturbinoplasty.
Materials and Methods: The medical records of patients who underwent septoturbinoplasty at Gangnam Severance Hospital were retrospectively analyzed. Symptom scores were evaluated using the Sino-nasal Outcome Test (SNOT-22) and obstruction scores. The SNOT-22 and obstruction scores were investigated before surgery and at 1, 3, and 6 months after surgery.
Results: We noted significant decreases in both SNOT-22 and obstruction scores at 1 month after surgery, compared to those before surgery (p<0.001). However, there were no significant changes at 3 and 6 months after surgery, compared to scores at 1 month after surgery. Using multivariate logistic regression analysis, a larger difference between SNOT-22 scores preoperatively and 1 month after surgery was significantly associated with a significant improvement in symptoms at 3 or 6 months after septoturbinoplasty (p=0.029).
Conclusion: These results imply that subjective outcomes and degree of improvement in the first month after septoturbinoplasty can be used as a predictor of the results thereof and for counseling patients about its progress.

Key Words: Nasal obstruction, Sino-nasal Outcome Test, nasal septum

INTRODUCTION

Nasal obstruction is a common symptom that causes considerable discomfort and is closely related to quality of life.[1] Reversible factors, such as edema of the nasal mucosa, fixed factors, such as septal deformity, or both can cause nasal obstruction, and it can be difficult to assess the effect of each factor individually on nasal obstruction. Therefore, surgical treatment is generally performed in patients who do not respond to medical treatment.

Septal deviation is a common nasal finding, and the prevalence of a deviated nasal septum is up to 42.94% in South Korea.[2] Septoplasty involves the surgical correction of a deviated septum and is one of the most frequently performed otorhinolaryngology surgeries in adults.[3] Several studies have demonstrated the effectiveness of septoplasty for relieving symptoms of nasal obstruction, crusting, rhinorrhea, and postnasal drip.[4] Recently, an open, multicenter, pragmatic, randomized controlled trial showed that septoturbinoplasty is more effective than non-surgical management for nasal obstruction in adults with a deviated septum.[5] Also, recent studies have shown that correcting septal deviation by performing septal correction along with turbinoplasty is significantly helpful in improving the symptoms of nasal congestion.[6]

Until recently, evaluation of symptom improvement is generally evaluated at 6 months after surgery because the improvement of symptoms may not be sufficient due to edema or crusting in the early stages of surgery.[7-9] Moreover, there is still a lack of research on changes in nasal and nose-related symptoms during the early period after septoplasty with or without turbin-

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oplasty,[9-11] which makes it difficult to determine a follow-up plan and to offer counselling. Therefore, we aimed to investigate changes in subjective outcomes within 6 months after septoturbinoplasty.

MATERIALS AND METHODS

Patient selection

The medical records of patients who underwent septoturbinoplasty at Gangnam Severance Hospital between March 2019 and October 2021 were retrospectively reviewed. We excluded patients who underwent concomitant sinus surgery combined with septoturbinoplasty. In addition, patients who did not respond to the Sino-nasal Outcome Test (SNOT-22) and obstruction scores preoperatively or in the first month after septoturbinoplasty were excluded. This study was approved by the Institutional Review Board of Gangnam Severance Hospital, Yonsei University College of Medicine, in accordance with the Declaration of Helsinki (approval number : 3-2021-0157) and informed consent was waived.

Surgical techniques and progress

The patients enrolled in this study underwent septoturbinoplasty performed by a single surgeon (K.S.K.). Septoturbinoplasty was performed in a standard manner with a modified Killian or hemitransfixion incision under general anesthesia. Radiofrequency turbinoplasty using a coblator (Smith & Nephew, Andover, MA, USA) and outfracturing of the turbinate were conducted on the concave side. After surgery, a silicone splint was applied, and Merocel (Medtronic, Minneapolis, MN, USA) or Nasopore (Stryker, Kalamazoo, MI, USA) packing was used for hemostasis. The packing was removed 24 h to 48 h after surgery. Third-generation cephalosporin and analgesics were administered for 2 weeks. The patients were followed up at 1 week, 2 weeks, 1 month, 3 months, and 6 months after surgery, and intranasal dressing was performed as necessary during follow-up. Also, we recommended that nasal saline irrigation be performed if the patient felt uncomfortable with a stuffy nose.

Assessment of symptoms

SNOT-22 consists of 22 questions and a survey of symptoms associated with the general health of the nose. The patients rated every question on a scale of 0 to 5, and the total score was calculated. Although many studies have shown that patients with septal deviation have significantly different SNOT-22 values before and after surgery, it is not yet clear how many points of change ought to be set as criteria for significant improvement. However, a previous study suggested that a difference in SNOT-22 values of more than 9 points before and after surgery is clinically significant.[12] We defined significant improvement in symptoms after surgery when a patient showed symptom improvement of 9 points or higher in the 3-month or 6-month SNOT-22 questionnaire. We also compared the severity of nasal obstruction symptoms using a visual analogue scale of nasal obstruction (VAS-NO), which was based on a 5-point scale. The score was considered 0 when there was no nasal obstruction and 5 when the nasal obstruction was at its worst. A VAS-NO was also used to evaluate symptoms before surgery and at 1, 3, and 6 months after surgery.

Statistical analysis

Statistical analyses were performed using SPSS software (SPSS Inc. Released 2009. PASW Statistics for Windows, version 26.0; IBM Corp., Armonk, NY, USA). Differences in SNOT-22 scores at 1, 3, and 6 months post-surgery were analyzed using a paired t-test because the patient population was normally distributed. VAS-NO scores did not show normal distribution, and therefore, we analyzed differences of VAS-NO scores using the Wilcoxon rank test. Pearson's correlation test was used to analyze simple correlations between symptom scores at each time point. Multivariate logistic regression was used to determine whether factors of sex, age, allergy, body mass intex (BMI), and smoking history affected improvement in postoperative symptoms, and a receiver operating characteristic (ROC) curve was used to cross-analyze differences between preoperative and postoperative SNOT-22 scores that could predict significant improvement of symptoms.

RESULTS

Subject demographics

In total, 97 patients had SNOT-22 and obstruction scores at postoperative 1 month. Among 97 patients, 54 patients and 28 patients had SNOT-22 and obstruction scores at 3 months and 6 months after surgery, respectively. Twenty-one patients responded to the survey at both 3 and 6 months. Finally, 61 patients responded to at least one survey at 3 months or 6 months. Among 61 patients, 44 patients were classified into the group with significant improvement and 17 patients into the group without significant improvement according to a symptom improvement of 9 points or more. Comparing the characteristics of the two groups, there was no statistical difference between the two groups in terms of age, sex, allergic sensitization, BMI, and smoking history. However, preoperative SNOT-22 score and the degree of change in SNOT-22 scores at 1 month after surgery compared to that before surgery showed significant differences between the two groups (Table 1).

Changes in subjective outcomes

We analyzed simple correlations for SNOT-22 scores at each time point (preoperative vs. postoperative 1 month, postoperative 1 month vs. postoperative 3 months, postoperative 1 month vs. postoperative 6 months, and postoperative 3 months vs. postoperative 6 months). The slope of an overall fit regression

line was lower than that of the line of equality (same SNOT-22 value at each time point), which suggests an improvement in overall symptoms over time (Fig. 1A-C). However, the slope of an overall fit regression line between SNOT-22 scores at postoperative 3 months vs. postoperative 6 months was higher than the line of equality. This suggests that SNOT-22 scores at postoperative 6 months may have worsened, compared to SNOT-22 scores at postoperative 3 months (Fig. 1D).

Regarding the mean values of SNOT-22 scores according to each time point, there was a significant decrease in SNOT-22 scores at 1 month after surgery, compared to those preoperatively (37.9±1.96, 15.8±1.4, p<0.001, respectively). However, there was no significant difference in mean SNOT-22 scores between at 1 and 3 months postoperatively, 1 and 6 months postoperatively, and 3 and 6 months postoperatively (Fig. 2). Table 2 shows results from the Wilcoxon rank test for obstruction scores, which revealed similar results. VAS-NO scores at 1 month postoperatively were significantly lower than preoperative obstruction scores (p<0.001). However, VAS-NO scores at 3 and 6 months after surgery showed no difference than those at 1 month postoperatively (p=0.791 and p=0.265, respectively).

Table 1. Characteristics of Groups Classified by Symptom Improvement after Septoturbinoplasty

Variables	Significant improvement (n=44)	No significant improvement (n=17)	*p* value
Age (yr)*	39.5±2.4	36.6±3.2	0.503
Sex, male†	33 (75.0)	16 (94.1)	0.092
Preoperative SNOT-22*	41.4±2.6	20.2±3.6	<0.001
Postoperative change of SNOT-22	-32.2±2.3	+0.9±2.13	<0.001
Allergic sensitization (+)†	26 (59.1)	11 (64.7)	0.687
BMI (kg/m^2)*	24.1±3.5	26.1±0.9	0.057
Smoking history (+)†	11 (25.0)	2 (11.8)	0.258

SNOT-22, Sino-nasal Outcome Test; BMI, body mass intex.
Data are presented as mean±standard deviation or n (%). Postoperative changes in SNOT-22 scores were obtained by subtracting postoperative SNOT-22 scores at 1 month after surgery from preoperative SNOT-22 scores.
*t-test was used for the analysis; †chi-square test was used for analysis.

Analysis of variables associated significant symptom improvement

Finally, we analyzed the effect of individual variables on symptom improvement after septoturbinoplasty using multivariate logistic regression analysis. The results showed that larger differences in preoperative SNOT-22 scores and those at 1 month after surgery are significantly associated with a significant improvement in symptoms at 3 or 6 months after septoturbinoplasty (B=1.131, 95% confidence interval 1.013–1.264, p=0.029)

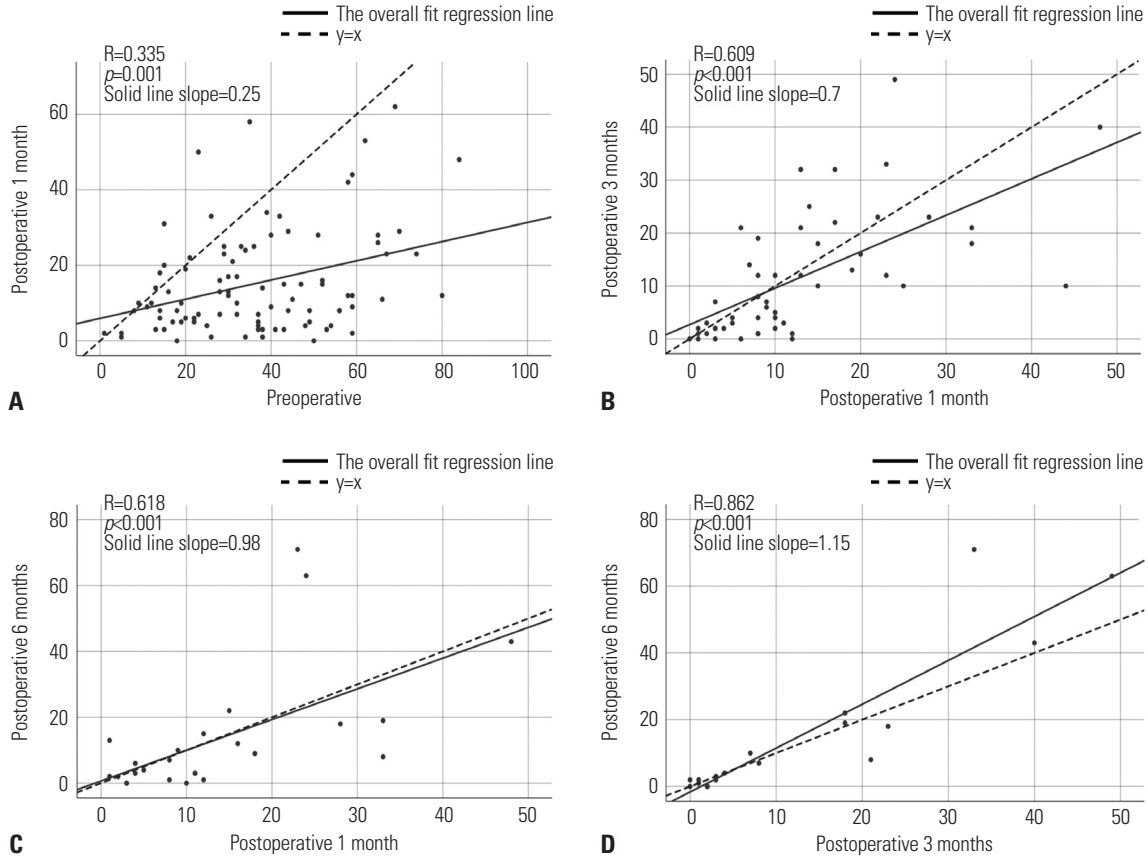

Fig. 1. Correlation analysis of SNOT-22 scores between individual time points (preoperative, postoperative 1 month, postoperative 3 months, and postoperative 6 months). (A) Preoperative vs. postoperative 1 month. (B) Postoperative 1 month vs. postoperative 3 months. (C) Postoperative 1 month vs. postoperative 6 months. (D) Postoperative 3 months vs. postoperative 6 months. SNOT-22, Sino-nasal Outcome Test.

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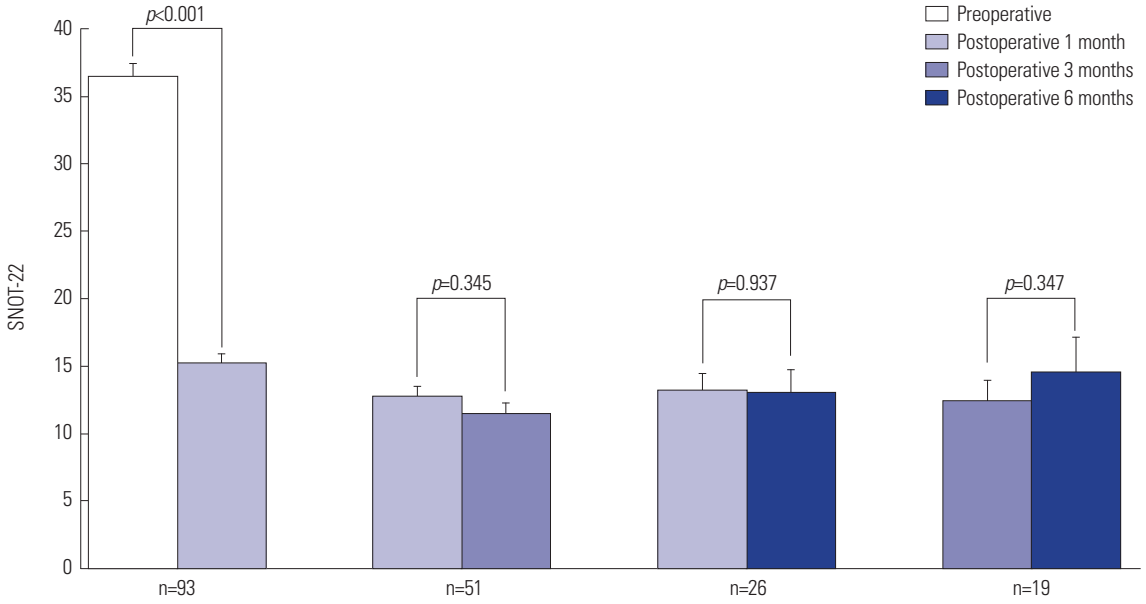

Fig. 2. Comparison of the mean values of SNOT-22 scores at individual time points. SNOT-22, Sino-nasal Outcome Test.

Table 2. Median Values of Obstruction Scores at Individual Time Points

	Negative ranks			Positive ranks			Test statistics	
	n	Mean rank	Sum of rank	n	Mean rank	Sum of rank	Z	*p* value
Preoperative and postoperative 1 month	78	41.29	3221.0	2	9.50	19.0	-7.727*	<0.001
Postoperative 1 month and postoperative 3 months	15	13.73	206.0	14	16.36	229.0	-0.265†	0.791
Postoperative 1 month and postoperative 6 months	5	5.00	25.0	7	7.57	53.0	-1.116†	0.265
Postoperative 3 months and postoperativep 6 months	2	2.00	4.0	4	4.25	17.0	-1.382†	0.167

Wilcoxon signed-rank test was used for analysis.
*Based on positive ranks; †Based on negative ranks.

(Table 3). In addition, using ROC curves, we calculated how many points or more of the difference in preoperative SNOT-22 scores and those at 1 month after surgery would show significant improvement. The cutoff value for a change in SNOT-22 scores at 1 month after septoturbinoplasty was 10.5 (sensitivity, 0.782; specificity, 0.789; area under curve, 0.871).

Table 3. Analysis of Variables Influencing SNOT-22 Scores

	B	95% CI	*p* value
Age	1.032	0.976–1.090	0.273
Sex			
Male		Reference	
Female	1.723	0.120–24.759	0.689
BMI	0.855	0.680–1.075	0.180
Allergic sensitization			
Negative		Reference	
Positive	0.747	0.116–4.830	0.759
Current smoking			
No		Reference	
Yes	2.704	0.281–26.031	0.389
Preoperative SNOT-22*	1.012	0.929–1.103	0.781
Postoperative change in SNOT-22	1.131	1.013–1.264	0.029

SNOT-22, Sino-nasal Outcome Test; BMI, body mass intex; B, coefficient; CI, confidence interval.
Postoperative change in SNOT-22 refers to the difference between SNOT-22 scores before surgery and those at the first month after surgery.
*Adjusted logistic regression analysis was conducted using significant improvement in SNOT-22 scores after septoturbinoplasty as a dependent variable.

DISCUSSION

Septoplasty is a commonly performed surgery in otorhinolaryngology and can improve nasal obstruction by correcting a deviated nasal septum. Many studies have reported that improvement in the nasal symptoms following septoplasty can improve a patient's quality of life.[5,10] Additional research has also indicated that septal deviation is not only related to quality of life but also to various diseases, such as cardiovascular diseases.[11,13] Thus, we thought that the SNOT-22 questionnaire could be better at evaluating improvement in nasal symptoms and nose-related symptoms after septoplasty over obstruction score.

Within 2–3 weeks after septoturbinoplasty, symptoms often do not improve satisfactorily for various reasons, such as crust formation, edema, and secretion. Until now, there has been a lack of studies on the duration required for these symptoms to stabilize, and few studies have compared the early postopera-

tive symptoms with those at long-term follow-up. Thus, we set the first follow-up for this study at 1 month after surgery.[14]

It is important to be aware of the correlation between an improvement in symptoms and long-term results of septoturbinoplasty for counseling patients. In this study, we investigated whether the final prognosis could be predicted within a relatively short period of observation after septoturbinoplasty. We found that SNOT-22 scores in the first month after surgery were significantly lower than preoperative scores. As reflected in SNOT-22 scores, symptoms continued to improve until the 3rd month after surgery and then got a little worse at 6 months. However, there was no statistically significant difference among SNOT-22 scores at 1, 3, and 6 months after surgery. VAS-NO scores also decreased significantly at 1 month after surgery, and there was no significant difference between VAS-NO scores at 1 month after surgery and obstruction scores at 3 or 6 months after surgery. These results suggest that we can predict long-term results of septoturbinoplasty as early as postoperative 1 month. As to worsening of SNOT-22 scores as time progresses, Stewart, et al.[15] showed significant symptom improvement at 3 months after septoturbinoplasty, but slightly worse symptoms at 6 months after surgery without statistical significance. We can postulate that the patients can experience an improvement in nasal obstruction in the early postoperative period with the correction of nasal structure, but they may feel uncomfortable again as the initial period after surgery passes and the patients become adapted to improved symptoms. However, some studies have reported that symptoms continue to improve for up to 12 months.[16-18]

Regarding factor analysis to predict improvement in symptoms after septoturbinoplasty, there was no significant correlation with sex, allergy, smoking history, and preoperative SNOT-22 score; however, the amount of improvement at the first month after septoturbinoplasty was significant in multivariate logistic regression analysis. Also, a larger difference in SNOT-22 scores between preoperative and 1 month after surgery was significantly associated with significant improvement of symptoms at 3 or 6 months after surgery; the cut-off value for this was 10.5 according to ROC curves. This result suggests that surgeons can explain the surgical results and prognosis to the patient using differences in SNOT-22 scores before and after surgery at 1 month. Meanwhile, some previous studies have also indicated that sex, allergy, and smoking history have no effect on improving symptoms after surgery.[15,19] Contrary to our results, worse preoperative symptoms were associated with better improvement of nasal symptoms in other studies.[15,19,20]

This study has several limitations. First, even though we set 1 month after septoturbinoplasty as the initial evaluation of surgery, we still do not exactly know when symptoms begin to stabilize. Thus, further studies on shorter time periods, such as 1, 2, and 4 weeks, may be required. Second, the number of patients who participated in the study was too small for a definitive conclusion. In addition, there were 97 patients who underwent septoturbinoplasty during the study period; however, follow-up was not completed in all patients. This may have affected the accuracy of our analysis. To reach a concrete conclusion, we need to study a larger number of subjects and complete follow-up in all of them. Third, we considered significant symptom improvement as a SNOT-22 score that improved 9 or more points based on the results of a previous study.[12] However, this is not a standard criterion. Therefore, results may differ when the criteria for symptom improvement are varied. Fourth, we could not consider the effect of patient compliance with medicine and/or nasal irrigation due to the limitations of retrospective studies. Fifth, our results are limited to subjective symptoms of patients. If objective results, such as endoscopic findings, rhinomanometry, and acoustic rhinometry, are included in a further study, more precise results will be obtained. Finally, changes in the quality of life in early after septoturbinoplasty could be affected by differences in culture, medical environment, and medical insurance between countries. Therefore, the results should be interpreted with caution.

In this study, we found that subjective symptoms in the first month after septoturbinoplasty improve significantly over those before septoturbinoplasty and that the degree of improvement at 1 month after surgery is significantly associated with a significant improvement in symptoms at 3 or 6 months after surgery. In conclusion, these results imply that subjective outcomes and the degree of improvement in the first month can be used as a predictor of the results of septoturbinoplasty and for counseling patients about its progress.

AUTHOR CONTRIBUTIONS

Conceptualization: Ju Wan Kang and Kyung-Su Kim. Data curation: Geun Cheol Shin, Ju Ha Park, and Han Cheol Lee. Formal analysis: Geun Cheol Shin and Ju Wan Kang. Funding acquisition: Kyung-Su Kim. Investigation: Geun Cheol Shin, Ju Wan Kang, and Kyung-Su Kim. Methodology: Ju Wan Kang and Kyung-Su Kim. Project administration: Kyung-Su Kim. Resources: Kyung-Su Kim. Software: Ju Wan Kang. Supervision: Kyung-Su Kim. Validation: Ju Wan Kang and Kyung-Su Kim. Visualization: Ju Wan Kang. Writing—original draft: Geun Cheol Shin and Ju Wan Kang. Writing—review & editing: Kyung-Su Kim. Approval of final manuscript: all authors.

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