Original article

Impact of septoplasty with high-frequency inferior turbinate reduction on quality of life

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Abstract

Background: Nasal obstruction due to septal deviation and inferior turbinate hypertrophy is a common clinical complaint that significantly impairs quality of life. Surgical intervention, specifically septoplasty combined with inferior turbinate reduction, is a frequently performed procedure to alleviate these symptoms. This study aims to prospectively evaluate the efficacy of septoplasty with high-frequency radio-ablation of the inferior turbinates by assessing subjective and objective outcomes in patients with nasal obstruction. **Methods:** This prospective cohort study enrolled 34 patients with symptomatic nasal obstruction due to septal deviation and compensatory inferior turbinate hypertrophy. Preoperative evaluation included a detailed clinical history, nasal endoscopy, and computed tomography (CT) of the paranasal sinuses. Subjective outcomes were measured using the Nasal Obstruction Symptom Evaluation (NOSE) scale and the Sino-Nasal Outcome Test-22 (SNOT-22). Objective anatomical parameters, including the type of septal deviation (Mladina classification), the degree of turbinate hypertrophy (Friedman classification), and the angle of septal deviation, were assessed. All patients underwent endoscopic septoplasty and high-frequency radio-ablation of the inferior turbinates. Postoperative outcomes were evaluated at one month. **Results:** The study cohort consisted of 73.5% male and 26.5% female patients, with a mean age of 32.91 ± 13.26 years. The most common presenting symptom was nasal obstruction (70.6%). Preoperatively, the mean NOSE score was 61.32 ± 21.79, and the mean total SNOT-22 score was 30.88 ± 15.58. Postoperatively, at one month, the mean NOSE score significantly improved to 18.68 ± 10.39 ($p < 0.01$). Similarly, the mean total SNOT-22 score decreased to 14.56 ± 10.05 ($p < 0.001$). A statistically significant correlation was found between the severity of nasal obstruction on the NOSE scale and the type of septal deformity ($p = 0.038$), as well as the degree of contralateral turbinate hypertrophy ($p = 0.010$). Post-surgical endoscopic evaluation at one month revealed a straight septum in 76.5% of patients and a significant reduction in the size of the inferior turbinates in 97.1% (left) and 94.1% (right) of cases. **Conclusion:** The combination of septoplasty with high-frequency inferior turbinate reduction is a highly effective and safe procedure for treating nasal obstruction caused by septal deviation and turbinate hypertrophy. This intervention leads to a statistically significant improvement in patient-reported quality of life, as measured by the NOSE and SNOT-22 scores. The correlation between the severity of symptoms and specific anatomical deformities underscores the importance of a thorough preoperative evaluation.

Keywords: *Septoplasty, Inferior Turbinate Hypertrophy, High-Frequency Ablation, Nasal Obstruction, NOSE Score, SNOT-22, Quality of Life.*

1. INTRODUCTION

Nasal obstruction is one of the most common complaints in otolaryngology practice, with a profound impact on a patient's quality of life, affecting sleep, daily activities, and overall well-being [1]. Anatomical abnormalities within the nasal cavity are a primary cause of chronic nasal obstruction, with deviation of the nasal septum and compensatory hypertrophy of the inferior turbinates being the most frequently identified etiologies. While medical management with intranasal corticosteroids and antihistamines can provide relief for some patients, surgical intervention is often necessary for those with significant structural deformities [2].

Septoplasty, the surgical correction of a deviated nasal septum, is a well-established and commonly performed procedure. Concurrently, addressing inferior turbinate hypertrophy is crucial for achieving optimal surgical outcomes, as persistent turbinate enlargement can lead to continued nasal obstruction despite a straightened septum [3]. A variety of techniques for inferior turbinate reduction have been

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developed, each with its own set of advantages and disadvantages. In recent years, minimally invasive techniques such as high-frequency radio-ablation have gained popularity due to their precision in tissue reduction, preservation of mucosal function, and favorable safety profile [4].

The evaluation of surgical success has evolved from relying solely on objective anatomical correction to incorporating patient-reported outcome measures (PROMs). Validated questionnaires, such as the Nasal Obstruction Symptom Evaluation (NOSE) scale and the Sino-Nasal Outcome Test-22 (SNOT-22), have become the gold standard for quantifying the subjective burden of nasal symptoms and the impact of interventions on quality of life. Several studies have demonstrated the utility of these instruments in assessing the effectiveness of septoplasty and turbinate surgery [5, 6].

While the benefits of septoplasty with turbinate reduction are generally accepted, there is ongoing research to refine patient selection, optimize surgical techniques, and better understand the correlation between specific anatomical deformities and the severity of symptoms. The use of standardized classification systems, such as the Mladina classification for septal deviations and the Friedman classification for turbinate hypertrophy, allows for more consistent and comparable research [7].

This study was designed to prospectively evaluate the efficacy of combined endoscopic septoplasty and high-frequency inferior turbinate reduction in a cohort of patients with symptomatic nasal obstruction. We hypothesized that this combined surgical approach would lead to a significant improvement in patient-reported quality of life, as measured by the NOSE and SNOT-22 scores, and that the degree of improvement would correlate with the preoperative anatomical findings.

2. METHODS

2.1. Study Design and Patient Population

This prospective cohort study was conducted on 34 patients who presented with chronic nasal obstruction refractory to medical management and were scheduled for septoplasty with bilateral high-frequency inferior turbinate reduction. The study was conducted in accordance with the principles of the Declaration of Helsinki, and all patients provided informed consent prior to their inclusion.

Patients were included if they were over 16 years of age and had a clinical and radiological diagnosis of nasal septal deviation with compensatory inferior turbinate hypertrophy. Patients with a history of previous nasal surgery, active sinonasal infection, sinonasal polyposis, or malignant tumors of the nasal cavity were excluded from the study.

2.2. Preoperative Evaluation

All patients underwent a comprehensive preoperative assessment which included:

Clinical History and Demographics: Patient demographics, including age, gender, occupation, and geographical location (rural vs. urban), were recorded. A detailed history of symptoms, including the duration of nasal obstruction, was also obtained.

Patient-Reported Outcome Measures (PROMs): The severity of nasal obstruction and its impact on quality of life were assessed using the Nasal Obstruction Symptom Evaluation (NOSE) scale and the Sino-Nasal Outcome Test-22 (SNOT-22).

Nasal Endoscopy: Diagnostic nasal endoscopy was performed on all patients to evaluate the anatomy of the nasal cavity, confirm the septal deviation, assess the degree of inferior turbinate hypertrophy, and rule out other pathologies. The morphology of the septal deviation and the location of inferior turbinate hypertrophy were documented.

Computed Tomography (CT): All patients underwent non-contrast CT scans of the paranasal sinuses. The CT scans were used to classify the septal deviation according to the Mladina classification, determine the angle of deviation, and assess the morphology of the inferior turbinate bones. The distance between the septum and the inferior turbinates was also measured.

2.3. Surgical Procedure

All patients were placed under general anesthesia. An endoscopic septoplasty was performed to correct the deviated nasal septum. Following the septoplasty, bilateral inferior turbinate reduction was performed using a high-frequency radio-ablation device. The radiofrequency probe was inserted into the submucosal tissue of the inferior turbinate at multiple points to achieve volume reduction while preserving the overlying mucosa.

2.4. Postoperative Evaluation and Follow-up

Patients were followed up at one and three months postoperatively. At each follow-up visit, the following assessments were performed:

Patient-Reported Outcome Measures: The NOSE and SNOT-22 questionnaires were re-administered to assess the change in symptoms and quality of life.

Nasal Endoscopy: Postoperative nasal endoscopy was performed to evaluate the position of the nasal septum, the size of the inferior turbinates, and the presence of any complications such as synechiae or crusting.

2.5. Statistical Analysis

The collected data were analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation (SD). Categorical variables were presented as frequencies and percentages. The paired t-test was used to compare preoperative and postoperative NOSE and SNOT-22 scores. A p-value of less than 0.05 was considered statistically significant.

2.6. Ethical Approval and Informed Consent

This study obtained ethical approval from the Ethics Committee in Biomedical Research of Hue University of Medicine and Pharmacy (Approval No. H2024/132).

3. RESULTS

3.1. Patient Demographics and Preoperative Characteristics

A total of 34 patients were included in this study, with a predominance of males (73.5%) over females (26.5%). The mean age of the patients was 32.91 ± 13.26 years, with the largest age group being 16-30 years (47.1%). The distribution of patients from urban and rural areas was nearly equal, at 55.9% and 44.1%, respectively.

The primary reason for seeking medical attention was nasal obstruction (70.6%), followed by rhinorrhea (20.6%) and headache (8.8%). The duration of nasal obstruction was greater than one year for the majority of patients, with 41.2% reporting symptoms for 1 - 5 years and 38.2% for more than 5 years. A history of allergic rhinitis was present in 58.8% of the patients.

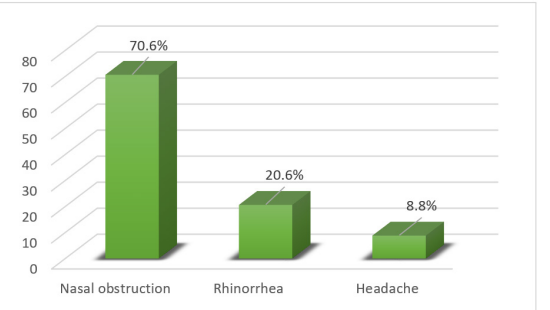


Chart 1. Main reasons for hospital admission (n = 34)

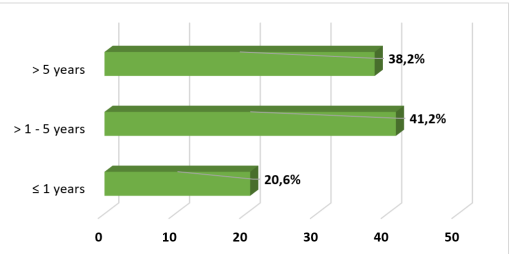


Chart 2. Duration of nasal obstruction (n = 34)

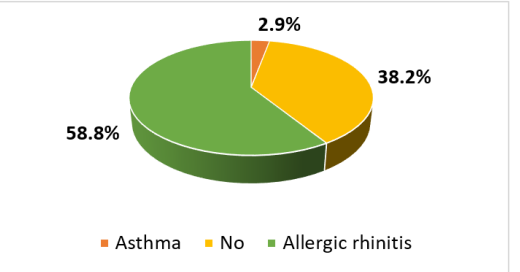


Chart 3. Characteristics of medical history (n = 34)

3.2. Preoperative Symptom Scores and Anatomical Findings

Prior to surgery, all patients (100%) reported nasal obstruction. Based on the NOSE scale, the obstruction was rated as very severe by 32.3% of patients, severe by 26.5%, moderate by 29.4%, and mild by 11.8%. The mean preoperative NOSE score was 61.32 ± 21.79. The mean total SNOT-22 score was 30.88 ± 15.58, with the highest scores in the domains of nasal symptoms (14.61 ± 6.40).

Table 1. Subjective symptom before surgery (n = 34)

Subjective symptom	Number of patients	Percentage
Nasal obstruction	34	100.0
Rhinorrhea	23	67.6
Sneezing	18	52.9
Headache	20	58.8
Olfactory disorder	9	26.5

Table 2. Degree of nasal obstruction according to NOSE scale before surgery (n = 34)

Degree of nasal obstruction	Number of patients	Percentage	Lowest	Highest
Mild	4	11.8		
Moderate	10	29.4		
Severe	9	26.5	15	85
Very severe	11	32.3		
Total	**34**	**100.0**		
X ± SD			61.32 ± 21.79	

Table 3. Symptom evaluation using SNOT-22 scale (n = 34)

Symptom group	X ± SD	Min - Max
Nasal symptoms	14.61 ± 6.40	4 - 32
Ear and facial symptoms	1.20 ± 1.38	0 - 5
Sleep-related symptoms	5.00 ± 3.87	0 - 15
Functional symptoms	5.67 ± 4.04	0 - 15
Psychological/emotional symptoms	2.94 ± 3.57	0 - 15
SNOT-22 total scores	30.88 ± 15.58	9 - 66

Endoscopic and CT evaluation revealed that the most common type of septal deformity was a C-shaped septal deviation (47.1%), followed by a septal crest (29.4%). The deviation was more frequently to the left (61.8%) than to the right (38.2%). On CT imaging, the most common type of deviation according to the Mladina classification was Type I (35.3%). The majority of patients (65%) had a mild angle of deviation (< 9 degrees).

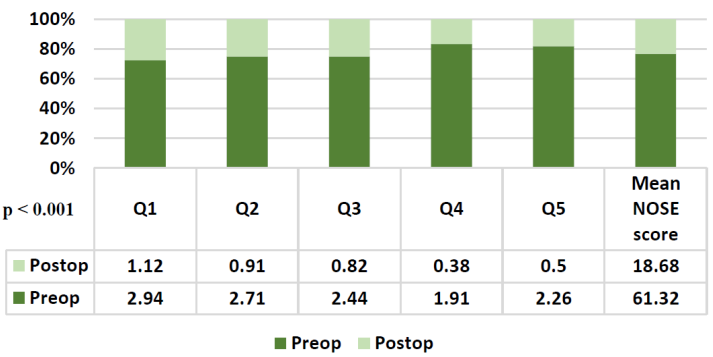


Table 4. Location of septal deformity (n = 34)

Location of septal deformity	Number of patients	Percentage
Left side	21	61.8
Right side	13	38.2
Total	**34**	**100.0**

Table 5. Classification of septal deviation on CT-scan (n = 34)

Type	Number of patients	Percentage
I	12	35.3
II	8	23.5
III	3	8.8
IV	2	5.9

V	4	11.8
VI	2	5.9
VII	3	8.8
Total	**34**	**100.0**

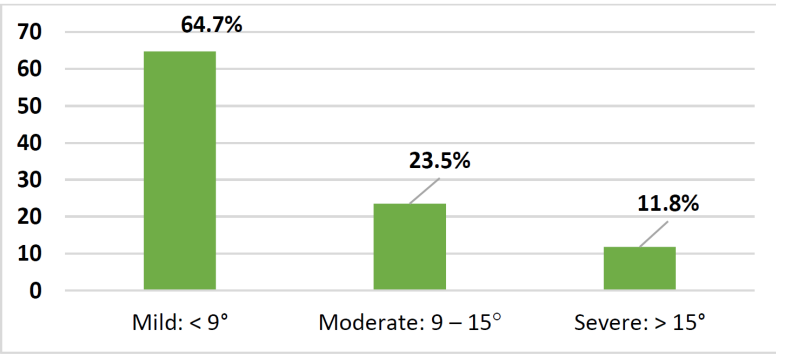


Chart 5. Classification of septal deviation severity on CT-scan (n = 34)

Inferior turbinate hypertrophy was observed bilaterally in 76.5% of patients. On the side contralateral to the septal deviation, the turbinate hypertrophy was classified as Friedman Grade III in 82.4% of cases. On the ipsilateral side, Grade III hypertrophy was present in 64.8% of patients.

Table 6. Location of inferior turbinate hypertrophy via endoscopy (n = 34)

Inferior turbinate morphology	Number of patients	Percentage
Left side	3	8.8
Right side	5	14.7
Bilateral	26	76.5
Total	**34**	**100.0**

Table 7. Friedman endoscopic grading of inferior turbinate hypertrophy on the contralateral side of septal deviation (n = 34)

Inferior turbinate hypertrophy on the opposite side of septal deviation	Number of patients	Percentage
Grade I	0	0.0
Grade II	6	17.6
Grade III	28	82.4
Total	**34**	**100.0**

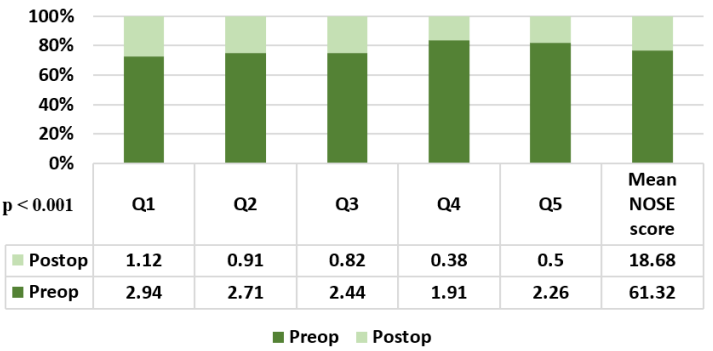
Table 8. Friedman endoscopic grading of inferior turbinate hypertrophy on the side of septal deviation (n = 34)

Inferior turbinate hypertrophy on the side of septal deviation	Number of patients	Percentage
Grade I	6	17.6
Grade II	6	17.6
Grade III	22	64.8
Total	**34**	**100.0**

3.3. Postoperative Outcomes

3.3.1. Improvement in NOSE and SNOT-22 Scores:

At the one-month postoperative follow-up, there was a highly significant improvement in the NOSE scores. The mean NOSE score decreased from a preoperative value of 61.32 to 18.68 postoperatively ($p < 0.001$). Before surgery, 58.9% of patients had severe or very severe obstruction, while after surgery, no patients remained in these categories, and 73.5% reported no or mild symptoms.



p < 0.001	Q1	Q2	Q3	Q4	Q5	Mean NOSE score
Postop	1.12	0.91	0.82	0.38	0.5	18.68
Preop	2.94	2.71	2.44	1.91	2.26	61.32

Chart 6. Improvement in degree of nasal obstruction according to NOSE scale (n=34)

Similarly, the total SNOT-22 score showed a significant reduction from 30.88 ± 15.58 to 14.56 ± 10.05 at one month ($p < 0.001$). Significant improvements were observed across all subdomains of the SNOT-22, including nasal symptoms, psychological symptoms, and sleep-related symptoms.

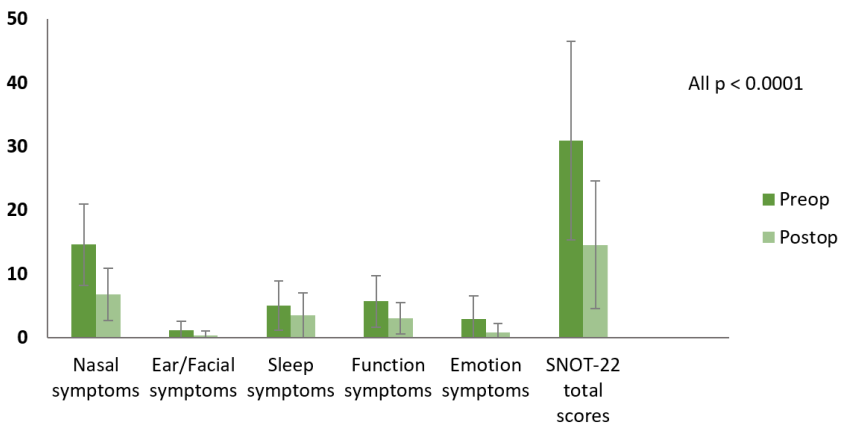


Chart 7. Comparison of SNOT-22 scores before and after surgery (n=34)

3.3. Postoperative Endoscopic Findings

One month after surgery, endoscopic examination revealed a straight septum in 76.5% of patients, with the remaining 23.5% having a mild residual deviation. There was a significant reduction in the size of the inferior turbinates, with 97.1% of left turbinates and 94.1% of right turbinates being smaller than their preoperative size. Abnormal findings in the nasal cavity, such as significant crusting or synechiae, were minimal, occurring in only 5.9% of patients.

Table 9. Endoscopic image of nasal septum after 1 month post-surgery (n = 34)

Septum image	Straight	Mild deviation	Unchanged	Total
n	26	8	0	34
%	76.5	23.5	0	100.0

Table 10. Endoscopic image of sinonasal cavity after 1 month post-surgery (n = 34)

Inferior turbinate image		Normal	Reduced	Unchanged	Total
Left	**n**	0	33	1	34
	%	0.0	97.1	2.9	100.0
Right	**n**	0	32	2	34
	%	0.0	94.1	5.9	100.0

3.4. Correlation Between Preoperative Findings and Symptom Severity

A statistically significant correlation was found between the preoperative NOSE score and the type of septal deformity (p = 0.038), with veering-type deviations being associated with higher NOSE scores. Furthermore, there was a significant correlation between the NOSE score and the degree of contralateral inferior turbinate hypertrophy according to the Friedman classification (p = 0.010), indicating that greater hypertrophy was associated with more severe symptoms of obstruction.

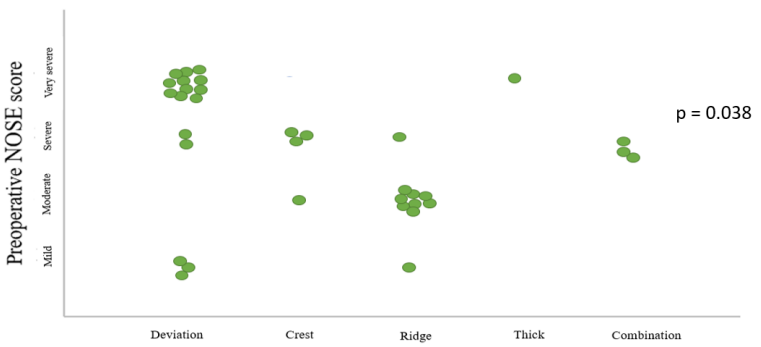


Chart 8. The preoperative NOSE score and the type of septal deformity (n=34)

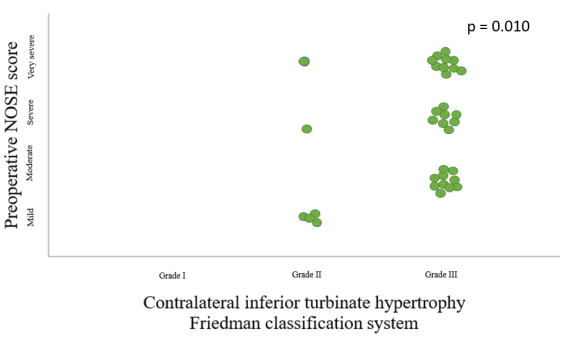


Chart 9. The preoperative NOSE score and the degree of contralateral inferior turbinate hypertrophy (n=34)

4. DISCUSSION

This prospective study demonstrates that combined endoscopic septoplasty and high-frequency inferior turbinate reduction is a highly effective treatment for patients with chronic nasal obstruction due to anatomical deformities. The primary finding of this study is the statistically significant and clinically meaningful improvement in patient-reported quality of life, as measured by the NOSE and SNOT-22 scores.

The demographic characteristics of our study cohort, with a male predominance and a mean age in the early thirties. Nasal obstruction was the main complaint, which aligns with the primary indication for this type of surgery. The results are consistent with other studies [8].

The improvement in the mean NOSE score from 61.32 to 18.68 is substantial and reflects a significant reduction in the subjective sensation of nasal blockage. This finding is in line with a growing body of literature that reports marked improvements in NOSE scores following septoturbinoplasty. Similarly, the significant reduction in the total SNOT-22 score from 30.88 to 14.56 underscores the broad impact

of this surgery on the overall well-being of the patient, extending beyond just the nasal symptoms to include improvements in sleep and psychological function. The observed improvements in our study are comparable to, and in some cases exceed, those reported in other studies using similar outcome measures [9].

A key strength of this study is the comprehensive preoperative evaluation, including the use of standardized classification systems for septal and turbinate deformities. The finding of a significant correlation between the severity of nasal obstruction (NOSE score) and both the type of septal deviation and the degree of contralateral turbinate hypertrophy provides valuable clinical information. This suggests that specific anatomical configurations may be more likely to cause significant symptoms and reinforces the importance of addressing both the septum and the turbinates during surgery. The predominance of Grade III contralateral turbinate hypertrophy (82.4%) highlights the compensatory nature of this condition in the setting of a deviated septum.

The postoperative endoscopic findings of a straight septum in the vast majority of patients (76.5%) and a significant reduction in turbinate size (over 94%) demonstrate the technical success of the surgical procedures. The low rate of postoperative complications (5.9%) further supports the safety of this combined approach, particularly with the use of high-frequency radio-ablation, which is known for its mucosal-sparing properties. The result nearly the same as that of Abdullah B. et al [10].

While this study provides strong evidence for the efficacy of the procedure, there are some limitations to consider. The follow-up period of one months is relatively short, and longer-term studies would be beneficial to assess the durability of the results. Additionally, while the study included objective anatomical measures, it did not incorporate objective functional measures such as acoustic rhinometry or rhinomanometry, which could have provided further insight into the changes in nasal airflow. The sample size of 34 patients, while sufficient to demonstrate statistical significance for the primary outcomes, is relatively small.

Future research should focus on long-term follow-up of patients undergoing this procedure, as well as randomized controlled trials comparing different techniques for turbinate reduction in combination with septoplasty. Further investigation into the correlation between specific anatomical subtypes and patient-reported outcomes could help for optimal results.

5. CONCLUSION

The findings of this prospective cohort study provide compelling evidence that endoscopic septoplasty combined with high-frequency inferior turbinate reduction is a safe and highly effective intervention for patients with chronic nasal obstruction secondary to septal deviation and turbinate hypertrophy. This procedure results in a dramatic improvement in patient-reported quality of life, as demonstrated by significant reductions in both NOSE and SNOT-22 scores. The correlation of symptom severity with specific anatomical deformities underscores the importance of a thorough preoperative assessment in guiding surgical planning. Based on these results, this combined surgical approach should be considered a standard of care for appropriately selected patients.

Acknowledgment

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