

Open Approach Septoplasty and Closed Endonasal Septoplasty: A Comparative Analysis of Surgical Outcomes, Postoperative Pain, and Quality of Life

Hasan Sami Bircan

hasansamibircan@gmail.com

İstanbul Eğitim ve Araştırma Hastanesi

Emre Baran

İstanbul Eğitim ve Araştırma Hastanesi

Yusuf Ozkan

İstanbul Eğitim ve Araştırma Hastanesi

Burak Arpacı

İstanbul Eğitim ve Araştırma Hastanesi

Ozan Ozdemir

İstanbul Eğitim ve Araştırma Hastanesi

Research Article

Keywords: Septoplasty, open technique septoplasty, closed endonasal septoplasty, NOSE score, SNOT-22, quality of life

Posted Date: July 7th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9469699/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

To compare the surgical outcomes, postoperative pain levels, operative time, and improvements in quality of life between open approach (OAS) and closed endonasal septoplasty (CES) techniques in patients with nasal septum deviation.

Methods

A prospective comparative study was conducted on 74 patients who underwent septoplasty between November 1, 2025, and February 28, 2026. Patients were divided into two groups according to the technique: OAS (n = 36) or CES (n = 38). Nasal Obstruction Symptom Evaluation (NOSE) scores, Sino-Nasal Outcome Test-22 (SNOT-22) scores, Visual Analog Scale (VAS) for pain, operative time, and complications were evaluated. Follow-up assessments were performed at the first postoperative month with endoscopic examination.

Results

The OAS group had a higher likelihood of caudal and high septal deviations ($p < 0.001$, $p = 0.004$), while the CES group had a higher likelihood of posterior and basal deviations ($p = 0.004$, $p = 0.001$). Both groups showed significant improvement in NOSE scores ($p < 0.001$) and SNOT-22 scores ($p < 0.001$) at the 1-month follow-up. The CES group demonstrated a significantly shorter operative time (32.2 ± 7.7 vs. 96.1 ± 16.1 minutes, $p < 0.001$) and lower postoperative pain scores (3.4 ± 1.1 vs. 5.5 ± 1.3 , $p < 0.001$). However, the OAS group achieved a greater improvement in SNOT-22 scores (decrease of 28.5 ± 18.9 vs. 17.6 ± 18.3 points, $p = 0.019$). At the first postoperative month, SNOT-22 scores were significantly lower in the OAS group (12.1 ± 12.3 vs. 20.5 ± 16.4 , $p = 0.006$). OAS showed statistically significantly fewer complications compared to the CES technique (8.3% vs. 26.3%, $p = 0.04$).

Conclusion

While CES offers advantages in terms of operative time and early postoperative pain, OAS provides superior quality of life outcomes at the 1-month follow-up, especially in complex septal deviations. The choice of surgical technique should be individualized based on the characteristics of the deviation and patient expectations.

BACKGROUND

Nasal septal deviation is observed with prevalence rates ranging from 20% to 80% in the general population [1, 2]. It is among the most common causes of nasal obstruction in adults. Septoplasty remains the gold standard surgical intervention for the treatment of symptomatic nasal obstruction due to septal deviation. It is also one of the most frequently performed rhinologic surgical procedures worldwide [3].

The primary objective of septoplasty is to restore adequate nasal airway patency while preserving the structural support of the nose and minimizing surgery-related complications. Various surgical approaches have been described to enhance surgical success in septoplasty [4, 5]. The closed endonasal technique involves a hemitransfixion or Killian incision made within the nasal vestibule, providing limited but sufficient exposure for most septal deviations [4]. In contrast, the open approach, which utilizes bilateral marginal incisions along with a transcolumellar incision, offers

superior visualization of the entire nasal cartilage framework and septum, being particularly advantageous in complex cases involving caudal septal and high dorsal deviations [5, 6]. Advantages of closed endonasal septoplasty include shorter operative times, less tissue trauma due to limited mucoperichondrial dissection, reduced intraoperative bleeding and postoperative morbidity (such as edema, pain, and ecchymosis), absence of visible scarring due to intranasal incisions, and a faster surgical recovery [7]. Additionally, it is suggested that the closed technique better preserves nasal functions. On the other hand, the open approach septoplasty technique is considered superior in that it allows three-dimensional assessment of the septum and nasal framework via transcolumellar and marginal incisions, enables more precise resection and reconstruction due to improved visualization of cartilage structures, offers safer procedures in cases requiring grafting, and achieves more effective surgical outcomes especially in complex deformities [5, 6, 8]. Recent studies and reviews in the literature generally report similar functional outcomes between the two surgical approaches. However, high-level evidence and direct comparative data regarding quality of life measures, postoperative pain, and long-term patient-reported outcomes remain limited [9, 10].

Patient-reported outcome measures (PROMs), including the Nasal Obstruction Symptom Evaluation (NOSE) scale and the Sino-Nasal Outcome Test-22 (SNOT-22), have become essential tools for objectively assessing surgical success not only in terms of anatomical correction but also based on patient-perceived symptom burden and quality of life [11–13]. The NOSE scale is a valid and reliable instrument for evaluating the severity of nasal obstruction and surgical outcomes of septoplasty [11, 12, 14]. SNOT-22, on the other hand, is a comprehensive and validated quality of life scale that assesses not only rhinological symptoms but also functional limitations and emotional impact [13].

Despite the widespread application of both surgical techniques, the number of studies directly comparing open approach and closed endonasal septoplasty techniques using standardized PROMs in the early postoperative period is limited [10, 15, 16]. Furthermore, clearly elucidating the relationship between surgical approach, operative time, postoperative pain, and improvement in quality of life is important for evidence-based surgical decision-making. The primary aim of this prospective study is to compare surgical outcomes, postoperative pain levels, operative time, and improvements in quality of life between open and closed septoplasty techniques using validated patient-reported outcome measures. Additionally, the study aims to evaluate the impact of different surgical techniques on the development of complications and the role of septal deviation location in the selection of surgical technique.

METHODS

Study Design and Patient Selection

This prospective comparative study was conducted at our clinic, a tertiary hospital, between November 1, 2025, and February 28, 2026. The study protocol was approved by the local ethics committee (Decision No: 284). All procedures were carried out in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants following a detailed explanation of the study protocol and surgical procedures.

Preoperative Evaluation and Surgical Technique Selection

All patients underwent a comprehensive preoperative evaluation including detailed medical history, anterior rhinoscopy, and rigid nasal endoscopy (0° and 30° endoscopes). Septal deviation characteristics were documented, including location (caudal, posterior, floor, dorsal/high septal), severity, and involvement of cartilaginous or bony septum. Nasopharyngeal examination confirmed normal anatomy without pathology. Preoperative internal and external nasal valve status was assessed in all patients, and only those with normal nasal valve function were included. Routine preoperative computed tomography was not performed for isolated septal deviation cases. Surgical

technique assignment was determined based on anatomical features: closed endonasal septoplasty was selected for posterior and floor septal deviations where adequate visualization could be achieved via an endonasal approach, while open technique septoplasty was reserved for cases involving caudal septal deviation, high dorsal deviations, or complex deformities requiring extensive cartilage reshaping and structural grafting.

Inclusion criteria:

1. Adult patients aged 18–60 years
2. Symptomatic nasal obstruction attributable to septal deviation
3. Willingness to comply with the postoperative follow-up protocol
4. Sufficient cognitive ability to complete the questionnaires

Exclusion criteria:

1. History of previous nasal or septal surgery
2. Acute or chronic rhinosinusitis requiring concurrent sinus surgery beyond septoplasty
3. Presence of nasal polyps
4. Systemic diseases affecting wound healing (uncontrolled diabetes, immunosuppressive conditions)
5. Coagulopathy or anticoagulant therapy
6. Pregnancy or lactation
7. External and/or internal nasal valve insufficiency
8. Previous septoplasty
9. Unwillingness to participate in the study

Patient-Reported Outcome Measures

Nasal Obstruction Symptom Evaluation (NOSE) Scale

The NOSE scale is a validated, disease-specific quality of life instrument consisting of 5 items that assess the severity of nasal obstruction. Each item is scored from 0 (no problem) to 4 (severe problem), with a total raw score ranging from 0 to 20. The calculated score is then multiplied by five to yield a final score out of 100. Higher scores indicate a greater impact of nasal obstruction.

Once the NOSE score is calculated, scores of 0–25 indicate mild symptoms, 30–50 indicate moderate symptoms, 55–75 indicate significant obstruction, and 80–100 indicate severe nasal obstruction. The NOSE scale has been demonstrated in numerous studies to be an effective tool for evaluating the surgical success of septoplasty [17]. Additionally, a correlation exists between the preoperative NOSE score and the degree of nasal obstruction caused by septal deviation.

Sinonasal Outcome Test-22 (SNOT-22)

The SNOT-22 is a comprehensive, validated 22-item questionnaire assessing rhinological and general quality of life domains. The items evaluate physical symptoms (nasal congestion, discharge, facial pain), functional limitations (reduced productivity, sleep disturbance), and emotional outcomes (frustration, embarrassment). Unlike the NOSE scale, the SNOT-22 also assesses functional and emotional status beyond nasal obstruction alone [18]. Each item is scored from 0 (no problem) to 5 (worst possible), with a total score ranging from 0 to 110. The SNOT-22 is one of the most widely used instruments for measuring the surgical success of septoplasty [19].

Visual Analog Scale (VAS) for Pain

Postoperative pain was assessed at postoperative hour 12 using a 10 cm VAS, where 0 represented "no pain" and 10 represented "the worst imaginable pain." Patients independently marked their pain level on the linear scale. The VAS questionnaire was completed by patients at postoperative hour 12 without physician assistance.

Surgical Technique

All procedures were performed under general anesthesia with the patient in the supine position and the head elevated 15 degrees, by two experienced surgeons (minimum 5 years of septoplasty experience). For local anesthesia, topical vasoconstriction was first achieved using adrenaline-soaked pledgets for 5 minutes, followed by infiltrative injection of 5 mL of lidocaine with adrenaline solution (20 mg/mL + 0.0125 mg/mL) diluted 1:1 with normal saline, administered submucoperichondrially and submucoperiostally on both sides of the septum.

Endonasal Conventional Septoplasty Technique

A left-sided hemitransfixion incision (Fig. 1) was made, followed by subperichondrial elevation to create four standard tunnels (bilateral mucoperichondrial and mucoperiosteal planes). Deviated cartilaginous and bony segments were conservatively resected while preserving a minimum 1.5 cm dorsal and caudal L-strut for structural support. The hemitransfixion incision was closed with 3 – 0 polyglactin sutures. Bilateral silicone nasal splints were placed and secured.

Open Approach Septoplasty Technique

Local anesthetic infiltration was extended beyond the septal infiltration to include the columella, medial and lateral crura, and nasal tip. A mid-columellar Godman incision was made along with bilateral marginal incisions. The medial and lateral crura were exposed and dissected in the subperichondrial plane. Dissection continued over the nasal dorsum to the osseocartilaginous junction, with bilateral exposure of the upper lateral cartilages in subperichondrial planes. (Fig. 2) Caudal septal dissection proceeded in standard subperichondrial planes, similar to the closed technique. Deviated cartilage and bone were resected and the septum was corrected intracorporeally with preservation of the L-strut. Spreader grafts were placed when addressing high dorsal deviations. All deviations were corrected in situ. Extracorporeal septoplasty was not required. Columellar and marginal incisions were closed with 5 – 0 rapidly absorbable polyglactin sutures. Bilateral silicone splints were placed and external nasal taping was applied.

Postoperative Care

In both groups, silicone splints were removed on postoperative day seven. Standard postoperative care included nasal saline irrigation, oral antibiotics (amoxicillin-clavulanate 1g BID for 7 days), and analgesics (paracetamol 1g QID as needed).

Outcome Measures and Follow-up

Primary outcomes:

Patient demographic data (gender, age), comorbidities, and smoking status were evaluated. The location and characteristics of septal deviation were recorded. Operation time and VAS score at postoperative 12th hour were

assessed. Patients underwent postoperative follow-up and were evaluated for complications at their first (day 7) and second (month 1) visits.

(1) Change in NOSE scores from preoperative to postoperative 1st month, (2) change in SNOT-22 scores from preoperative to postoperative 1st month, (3) operation time (from skin incision to final closure, in minutes), (4) VAS pain score at postoperative 12th hour, and (5) complication rate at 1st month follow-up.

Patients were evaluated at postoperative 1st week (splint removal) and first month. After confirming complete clearance of crusts, comprehensive nasal endoscopy was performed to assess healing and identify complications including synechia, septal perforation, residual deviation, persistent crusting, infection, or other adverse events. Patients were also evaluated using NOSE and SNOT-22 scores at this visit.

Statistical Analysis

Statistical analyses were performed using SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics included mean, standard deviation, median, minimum, maximum, frequency, and percentage. Normality of continuous variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. For comparisons between groups, the Mann-Whitney U test was used for continuous variables not following a normal distribution, and the chi-square test was used for categorical variables. Within-group changes between preoperative and postoperative measurements were analyzed using the Wilcoxon signed-rank test. Statistical significance was defined as $p < 0.05$ (two-tailed).

RESULTS

Patient Demographics and Baseline Characteristics

A total of 74 patients completed the study protocol; 36 patients were in the open technique septoplasty group and 38 patients were in the endonasal conventional septoplasty group. General cohort characteristics are presented in Table 1. The mean age was 33.5 ± 11.4 years (range 18–58), with a male predominance (67.6%). Baseline demographic characteristics, including age ($p = 0.689$) and gender distribution ($p = 0.872$), did not differ significantly between the surgical groups, confirming adequate randomization (Table 3).

Table-1: Demographic, preoperative, and operative data of patients							
Min-Max				Median	Avg.±ss/n-%		
Age	18.0	-	58.0	31.0	33.5	±	11.4
Gender	Female				24		32.4%
	Male				50		67.6%
VAS scores	2.0	-	8.0	4.0	4.4	±	1.6
NOSE scores	15.0	-	100.0	60.0	62.5	±	18.0
SNOT-22 scores	10.0	-	86.0	39.0	39.3	±	17.1
Operation type	Open approach septoplasty				36		48.6%
	Endonasal septoplasty				38		51.4%
Surgical time (min)	20.0	-	145.0	52.5	63.3	±	34.5
Complications	(-)				61		82.5%
	(+)				13		17.5%

The mean preoperative NOSE score was 62.5 ± 18.0 (15–100) and the mean preoperative SNOT-22 score was 39.3 ± 17.1 (10–86), indicating moderate to severe nasal obstruction and quality of life impairment. No significant difference was found between the groups in preoperative NOSE scores (63 ± 16 vs. 62 ± 19.5 , $p = 0.896$) or SNOT-22 scores (40.6 ± 16.8 vs. 38.1 ± 17.6 , $p = 0.634$), confirming comparable baseline symptom severity.

Septal Characteristics of Patient Groups

A total of 74 patients were included in the study: 36 patients who underwent open technique septoplasty and 38 patients who underwent closed endonasal septoplasty. The locations of septal deviations were classified as caudal, high septal, posterior, and floor regions, and a comparative analysis was performed between the two groups.(Table 2)

Table-2

Distribution of deviation location in open and closed technique septoplasty groups

Deviation localization	Open approach septoplasty	Endonasal septoplasty	Chi-Square(χ^2)	p
Caudal	26/36 (%72,2)	13/38 (%34,2)	$\chi^2=11,47$	$p < 0,001^{***}$
High	16/36 (%44,4)	5/38 (%13,2)	$\chi^2=8,46$	$p = 0,004^{**}$
Posterior	10/36 (%27,7)	28/38 (%73,7)	$\chi^2=12,63$	$p < 0,001^{***}$
Base	22/36 (%61,1)	37/38 (%97,4)	$\chi^2=10,78$	$p = 0,001^{**}$
:Statistically significant *:Highly statistically significant				

Caudal deviation was identified in 26 of 36 patients (72.2%) in the open approach septoplasty technique group, while it was observed in 13 of 38 patients (34.2%) in the endonasal septoplasty group. This difference was found to be highly statistically significant ($p < 0.001$). The prevalence of caudal deviation in patients who underwent open approach septoplasty was 2.2 times higher compared to the endonasal septoplasty group. (Table 2)

High septal deviation was observed in 44.3% (16/36) of the open approach septoplasty group, while it was detected in 13.2% (5/38) of the endonasal septoplasty group. The difference between the groups was statistically significant ($p = 0.004$). It is noteworthy that high septal deviations were 3.6 times more frequent in the open technique septoplasty approach. (Table 2)

In contrast, an inverse pattern was observed in the distribution of posterior deviation. Posterior deviation was identified in 73.7% (28/38) of the endonasal septoplasty group, while this rate was 27.7% (10/36) in the open technique septoplasty group. This difference was highly statistically significant ($p < 0.001$). Posterior deviations were observed 2.5 times more frequently in patients who underwent closed technique septoplasty.

Floor deviation showed a high prevalence in both groups; however, it was identified in 97.4% (37/38) of the endonasal septoplasty group and 61.1% (22/36) of the open technique septoplasty group. The difference between the groups was statistically significant ($p = 0.001$).

Table-3: Demographic and operative characteristics of patient groups.											
		Open approach septoplasty (n:36)				Endonasal septoplasty (n:38)				p	
		Mean ± SD /(n-%)			Median	Mean ± SD /(n-%)			Median		
Age		33.8	±	10.8	33.5	33.2	±	12.2	30.0	0.689	m
Gender	Female	12		33.3%		12		31.6%		0.872	x²
	Male	24		66.7%		26		68.4%			
VAS score		5.5	±	1.3	6.0	3.4	±	1.1	3.0	0.000	m
NOSE scores											
Preoperative		63	±	16	60.0	62	±	19.5	62.5	0.896	m
Postoperative 1st month		19.5	±	15.2	15.0	25	±	18	20	0.152	m
Preoperative/Postoperative 1st month change		-43.5	±	19.5	-40.0	-37.5	±	25,5	-42.5	0.388	m
Intragroup change p		0.000			w	0.000			w		
SNOT-22 scores											
Preoperative		40.6	±	16.8	38.0	38.1	±	17.6	40.5	0.634	m
Postoperative 1st month		12.1	±	12.3	8.0	20.5	±	16.4	15.0	0.006	m
Preoperative/Postoperative 1st month change		-28.5	±	18.9	-26.0	-17.6	±	18.3	-17.5	0.019	m
Intragroup change p		0.000			w	0.000			w		
Operation time (min)		96.1	±	16.1	96.5	32.2	±	7.7	30.0	0.000	m
Complications	(-)	33		91.7%		28		73.7%		0.04	x²
	(+)	3		8.3%		10		26.3%			
ᵐ Mann-whitney u test / ᵂ Wilcoxon test / x² Chi-square test											

Nasal Function Outcomes (NOSE Scores):

Both surgical techniques showed significant improvement in nasal obstruction symptoms at 1-month follow-up. In the open septoplasty group, NOSE scores decreased from 63 ± 16 preoperatively to 19.5 ± 15.5 postoperatively (p < 0.001), representing an average improvement of 43.5 ± 19.5 points. Similarly, the closed endonasal septoplasty group showed a decrease from 62 ± 19.5 to 25.0 ± 18 (p < 0.001), with an average improvement of 37.5 ± 25.5 points. (Fig. 3)

Although the average postoperative NOSE scores tended to be lower in the open approach septoplasty group (19.5 ± 15.5 vs. 25.0 ± 18.0), this difference did not reach statistical significance (p = 0.152). Furthermore, the magnitude of improvement in the NOSE score did not differ significantly between the groups (43.5 ± 19.5 vs. 37.5 ± 25.5 points, p = 0.388), indicating comparable efficacy in relieving nasal obstruction symptoms at 1 month postoperatively.

Quality of Life Outcomes (SNOT-22 Scores):

Quality of life assessment revealed significant differences between surgical approaches. Both techniques resulted in significant reductions in SNOT-22 scores: the open approach septoplasty group improved from 40.6 ± 16.8 to 12.1 ± 12.3 ($p < 0.001$), while endonasal septoplasty improved from 38.1 ± 17.6 to 20.5 ± 16.4 ($p < 0.001$). Critically, the open approach septoplasty group showed significantly lower absolute SNOT-22 scores at 6 weeks postoperatively compared to endonasal septoplasty (12.1 ± 12.3 vs. 20.5 ± 16.4 , $p = 0.006$), indicating better overall quality of life. (Fig. 4) Furthermore, the magnitude of SNOT-22 improvement was found to be significantly higher in the patient group undergoing open approach septoplasty (a decrease of 28.5 ± 18.9 points versus 17.6 ± 18.3 points, $p = 0.019$). This suggests increased comprehensive symptom resolution beyond isolated nasal obstruction.

Operation Time and Postoperative Pain:

When operation time was examined, the closed technique was statistically significantly shorter, with an average surgical time of 32.2 ± 7.7 minutes compared to 96.1 ± 16.1 minutes for open approach septoplasty ($p < 0.001$). This difference represents approximately a threefold reduction in time. This significant difference reflects the additional steps required for the external approach, including the columellar incision, soft tissue elevation, and closure of the modified Godman incision. Pain assessment at 12 hours postoperatively revealed significantly lower VAS scores in the closed endonasal septoplasty group (3.4 ± 1.1 vs. 5.5 ± 1.3 , $p < 0.001$). This 2.1-point difference represents a clinically significant reduction in pain, likely attributable to reduced tissue manipulation and the absence of external incisions in the closed endonasal technique.

Complications:

The overall complication rate was 13.5% (13/74 patients). Although the endonasal septoplasty group showed a numerically higher complication rate (26.3%, 10/38) compared to the open approach septoplasty group (8.3%, 3/36), this difference was not statistically significant ($p = 0.087$). (Table 4) Complications included synechiae formation ($n = 3$), persistent crusting requiring long-term care ($n = 3$), asymptomatic septal perforation ($< 5\text{mm}$) ($n = 2$). (Fig. 5) Saddle nose deformity, cerebrospinal fluid rhinorrhea, or other major complications were not observed in either group.

Residual septal deviation was not observed in the open technique septoplasty group. In the closed technique septoplasty group, residual septal deviation was observed in 2 patients.(Fig. 6)

Table 4
Analysis of differences in complications among patient groups.

Synechia	Open approach septoplasty(n = 38)	Closed endonasal septoplasty(n = 38)	p
	1/36	3/38	p = 0.615
Persistent crusting	1/36	3/38	p = 0.615
Septal perforation	0/36	2/38	p = 0.494
Superficial wound infection	1/36	0/38	p = 0.487
Residue deviation	0/36	2/38	p = 0.494
Total	3(%8.6)	10(%26.3)	p = 0.04**

**Statically significant

DISCUSSION

Septoplasty is one of the most frequently performed surgical operations worldwide [20]. Throughout history, many surgical approaches and techniques have been defined to improve the results of septoplasty. The choice of different surgical techniques is usually made based on the characteristics of the patient's septum and the surgeon's knowledge [21]. In our study, significant differences were found in terms of deviation location between patient groups who underwent open approach and endonasal technique septoplasty. These findings emphasize that deviation localization is an important determining factor in the choice of surgical technique. The significantly higher incidence of caudal and high septal deviations in the group that underwent septoplasty via open surgical approach suggests that complex deformities in these areas are anatomical features requiring an open surgical approach. The preference for open technique septoplasty in cases requiring direct visualization and manipulation of the structural features of the caudal region is consistent with the literature [5, 6, 8]. In contrast, the significantly higher incidence of posterior and base deviations in the endonasal technique group indicates that deviations in these locations can be effectively treated with an endonasal approach. The posterior and inferior septal region is a less traumatic area to access with the endonasal technique, and the findings in our study reflect this technical advantage. As a result of the study, a significant decrease in NOSE and SNOT-22 values was achieved within both groups. When comparing the two groups, no statistically significant difference was found in the reduction of NOSE values (69% reduction for open technique, 60% reduction for closed technique). These findings are consistent with previous studies showing comparable functional success rates between techniques for appropriately selected patients [15, 16]. The lack of significant differences indicates that both surgical approaches can effectively treat nasal obstruction when the technique selection is made appropriately according to the anatomical pathology.

When the studies in the literature are examined, patient groups are generally classified according to the severity of septal deviation and examinations are performed using different methods. Saxena et al. [18] classified septal deviation cases as mild, moderate, and severe in their study. Tian et al. [22] attempted to classify the degree of septal deviation using the NOSE score. In our study, although the location of septal deviations differed in the patient groups, preoperative NOSE and SNOT-22 values were found to be similar. With this examination result, the idea that septal deviation may be at similar severity levels can be predicted. Dutta et al. [17] suggested that the NOSE score can be used for monitoring purposes in measuring surgical success in patients undergoing septoplasty surgery. Although acoustic rhinometry and rhinomanometry tests are objective tests that measure nasal airway flow, they often may not reflect the subjective changes experienced by patients due to surgery. Kahveci et al. [20], in their study to evaluate septoplasty results, examined the relationship between NOSE scores and examination findings, acoustic rhinometry, and coronal computed tomography. Their study found that rhinometry could only show volume and area changes within the nose and that its clinical use was limited. They found a correlation between NOSE scores and examination and computed tomography findings. According to the results of these studies, NOSE and SNOT-22 questionnaires are reliable assessment methods that can be used to assess the severity of preoperative septal deviation and to monitor postoperative patients. In our study, tests such as rhinometry or rhinomanometry were not used for postoperative follow-up. Patient groups were followed up with endoscopy and questionnaire tests (NOSE, SNOT-22). However, studies in the literature have shown that questionnaire tests have sufficient reliability for follow-up purposes [17, 20].

The most important finding of our study is the significantly superior SNOT-22 results obtained with open technique septoplasty. The difference of 8.9 points in postoperative SNOT-22 scores (12.1 vs 20.5, $p = 0.006$) and the greater improvement of 10.9 points (28.5 vs 17.6, $p = 0.019$) greatly exceed the established minimal clinically significant difference (MCID) of 8.9 points for SNOT-22 and demonstrate a clinically significant improvement in quality of life [23]. Several mechanisms may explain this quality of life advantage. First, the high surgical visibility provided by the external approach allows for precise identification and correction of subtle anatomical abnormalities contributing to symptoms

beyond simple obstruction, including internal nasal valve insufficiency and caudal septal irregularities [5, 6, 8]. Second, it may be argued that a more comprehensive correction of the septum improves airflow dynamics and mucociliary clearance more effectively. In addition to these, since SNOT-22 is a questionnaire that also evaluates the functional outcomes of patients, changes other than nasal symptoms can also affect the outcome in patients who undergo open approach septoplasty. In particular, deviations that can cause curvatures in the nasal columella and the areas after the nasal K-point preoperatively can be corrected with open technique septoplasty surgery. For this reason, patients may have gains related to nasal shape in addition to nasal airway gains. This situation may have contributed to the more significant improvement of SNOT-22 scores in the open technique septoplasty group compared to the patient group using endonasal technique. In the study conducted by Philips et al. [24], it was shown that open technique septoplasty surgery made significant changes in aesthetic and functional aspects in patients.

Open approach septoplasty resulted in a three-fold longer operation time (96.1 vs. 32.2 minutes, $p < 0.001$), revealing a significant difference in surgical efficiency, anesthesia duration, and healthcare resource utilization. The clinical significance of the prolonged operation time is debatable. While prolonged anesthesia theoretically increases perioperative risk, our study population (healthy adults) did not experience any anesthesia-related complications. Postoperative pain assessment revealed significantly higher VAS scores after open septoplasty (5.5 vs. 3.4, $p < 0.001$). This may be related to a larger dissection area and external incisions during surgery. In the study by Awan et al. [25], patients with type 2 caudal deviation were divided into two groups; one group received endonasal septoplasty, and the other received open septoplasty. No difference was found between preoperative and postoperative NOSE and VAS scores in either group. The group treated with open septoplasty had a longer surgical time. Aesthetic satisfaction was found to be significantly better in the open technique septoplasty group. We have obtained similar results in our study. Even though the patients in our study were not evaluated separately in terms of aesthetic satisfaction, the reason for the more significant improvement in SNOT-22 values in the open technique septoplasty group may be this difference.

Our overall complication rate (17.5%) is within the reported range for septoplasty (5–20%) [26]. The numerically higher rate in endonasal septoplasty (26.3% vs 8.6%, $p = 0.04$) was statistically significant. This finding contradicts the traditional assumption that limited dissection in endonasal septoplasty reduces complications. The predominance of minor complications (synechia, persistent crusting) may reflect the limited visualization in the closed approach. Limited surgical vision can lead to more mucosal damage and increase the likelihood of minor postoperative complications. In the study by Garzaro et al. [10], it is suggested that the reason for the lower rate of postoperative complications is that the endoscopic approach offers better visualization. This study also found that better visualization reduced the likelihood of residual postoperative deviation. In their study, Saxena et al. [18] prospectively evaluated 120 patients and performed endoscopic and conventional septoplasty on patients with similar characteristics. They reported that the reason for the lower incidence of complications in the endoscopic septoplasty group was the higher visualization in the endoscopic septoplasty group. In addition, a more precise study was possible due to this visualization. These results are consistent with our study.

In their study, Migliavacca et al. [27] described a modified extracorporeal septoplasty technique and noted that classically performed open septoplasty operations could not adequately correct caudal deviations. The preoperative score of 65.2 decreased to 23.5 postoperatively. This decrease was similar to that in the patient group who underwent open septoplasty in our study. In our patients who underwent open septoplasty, we used spreader grafts to correct high deviations. We also used columellar strut grafts in patients with weak tip support. With the use of these grafts, we did not need extracorporeal septoplasty. All deviations could be corrected with open in situ septoplasty techniques.

Limitations:

Patient selection is based on anatomical features, therefore non-randomized selection may lead to bias. The short follow-up period (4 weeks) prevents long-term stability assessment. The single-center design limits generalizability. The lack of objective measurements (acoustic rhinometry) prevents the establishment of a correlation between subjective results and physiological recovery. The single-center design and small number of patients may reduce the generalizability of the study.

CONCLUSIONS

The choice of surgical technique is important depending on the location of the septal deviation. For posterior and/or base-related deviations without caudal involvement, endonasal septoplasty offers excellent functional results with advantages in efficiency and early postoperative comfort. In contrast, for complex deviations involving the caudal septum, high dorsal deformities, or cases requiring structural grafting, open septoplasty provided better quality of life improvement scores despite additional operation time and increased postoperative pain. However, no significant difference was found between postoperative NOSE scores when both techniques were chosen according to the appropriate patient.

Declarations

Ethical Approval and consent to participate

The study protocol was approved by the institutional ethics committee (Decision No: 284 All procedures were performed in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. Written informed consent was obtained from all participants following a detailed explanation of the study protocol and surgical procedures.

Consent for publication

Not applicable

Availability of data and material

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.(HSB)

Competing Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions (CRediT)

All authors meet the ICMJE authorship criteria.

Conceptualization: H.S.B, E.B, Y.O Methodology: H.S.B, E.B, Y.O. Formal Analysis: Y.O, B.A, O.O Investigation: H.S.B, E.B, Y.O, B.A, O.O .Data Curation: Y.O, E.B, B.A . Writing – Original Draft: H.S.B, E.B, Y.O . Writing – Review & Editing: H.S.B,

Y.O, B.A, O.O .Visualization: E.B, Y.O, B.A . Supervision: H.S.B, O.O. Project Administration: H.S.B, O.O, B.A . All authors reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Acknowledgements

None

References

1. Alghamdi FS, Albogami D, Alsurayhi AS, Alshibely AY, Alkaabi TH, Alqurashi LM et al Nasal Septal Deviation: A Comprehensive Narrative Review. Cureus [Internet]. 2022 Nov 10 [cited 2026 Feb 9]; Available from: <https://www.cureus.com/articles/123028-nasal-septal-deviation-a-comprehensive-narrative-review>
2. Mladina R, Čujić E, Šubarić M, Vuković K (2008) Nasal septal deformities in ear, nose, and throat patients. Am J Otolaryngol 29(2):75–82
3. Bhattacharyya N (2010) Ambulatory sinus and nasal surgery in the United States: Demographics and perioperative outcomes. Laryngoscope 120(3):635–638
4. Cottle MH (1960) Concepts of Nasal Physiology as Related to Corrective Nasal Surgery. Arch Otolaryngol - Head Neck Surg 72(1):11–20
5. Gubisch W (1995) The Extracorporeal Septum Plasty: A Technique to Correct Difficult Nasal Deformities. Plast Reconstr Surg 95(4):672–682
6. Most SP (2006) Anterior Septal Reconstruction: Outcomes After a Modified Extracorporeal Septoplasty Technique. Arch Facial Plast Surg 8(3):202–207
7. Fettman N, Sanford T, Sindwani R (2009) Surgical Management of the Deviated Septum: Techniques in Septoplasty. Otolaryngol Clin North Am 42(2):241–252
8. Most SP (2006) Analysis of Outcomes After Functional Rhinoplasty Using a Disease-Specific Quality-of-Life Instrument. Arch Facial Plast Surg 8(5):306–309
9. Rhee JS, Sullivan CD, Frank DO, Kimbell JS, Garcia GJM (2014) A Systematic Review of Patient-Reported Nasal Obstruction Scores: Defining Normative and Symptomatic Ranges in Surgical Patients. JAMA Facial Plast Surg 16(3):219–225
10. Garzaro M, Dell’Era V, Riva G, Raimondo L, Pecorari G, Aluffi Valletti P (2019) Endoscopic versus conventional septoplasty: objective/subjective data on 276 patients. Eur Arch Otorhinolaryngol 276(6):1707–1711
11. Stewart MG, Witsell DL, Smith TL, Weaver EM, Yueh B, Hannley MT (2004) Development and Validation of the Nasal Obstruction Symptom Evaluation (NOSE) Scale1. Otolaryngol Neck Surg 130(2):157–163
12. Stewart MG, Smith TL, Weaver EM, Witsell DL, Yueh B, Hannley MT et al (2004) Outcomes after Nasal Septoplasty: Results from the Nasal Obstruction Septoplasty Effectiveness (NOSE) Study. Otolaryngol Neck Surg 130(3):283–290
13. Hopkins C, Gillett S, Slack R, Lund VJ, Browne JP (2009) Psychometric validity of the 22-item Sinonasal Outcome Test. Clin Otolaryngol 34(5):447–454
14. Rhee JS, Book DT, Burzynski M, Smith TL (2003) Quality of Life Assessment in Nasal Airway Obstruction. Laryngoscope 113(7):1118–1122
15. Dinis PB, Haider H, Septoplasty (2002) Long-term evaluation of results. Am J Otolaryngol 23(2):85–90
16. Bugten V, Nilsen AH, Thorstensen WM, Moxness MHS, Amundsen MF, Nordgård S (2016) Quality of life and symptoms before and after nasal septoplasty compared with healthy individuals. BMC Ear Nose Throat Disord 16(1):13

17. Dutta A, Goyal L (2022) Can Nose Scale Be Used as a Predictor of Successful Surgery in Patients Undergoing Septoplasty. *Indian J Otolaryngol Head Neck Surg* 74(S2):785–791
18. Saxena A, Khan DA, Anas M (2025) Outcome Assessment of Conventional Vs. Endoscopic Nasal Septoplasty Using NOSE and SNOT-22 Questionnaires. *Indian J Otolaryngol Head Neck Surg* 77(6):2301–2308
19. Dizdar D, Bozan A, Dizdar SK, Göde S, Alpay HC (2019) Evaluation of nasal symptoms in septoplasty patients using SNOT-22. *Acta Otorhinolaryngol Ital* 39(2):98–102
20. Kahveci OK, Miman MC, Yucel A, Yucedag F, Okur E, Altuntas A (2012) The efficiency of Nose Obstruction Symptom Evaluation (NOSE) scale on patients with nasal septal deviation. *Auris Nasus Larynx* 39(3):275–279
21. Kim MJ, Jang YJ (2017) Selection of Surgical Technique and Treatment Outcome of Revision Septoplasty. *Korean J Otorhinolaryngol-Head Neck Surg* 60(12):640–645
22. Tian Q, Chu T, Sun H, Pang M (2021) Outcomes of Endonasal Septoplasty and Extracorporeal Septal Reconstruction in Anterocaudal Septal Deviation. *Ear Nose Throat J* 100(5suppl):645S–651S
23. Hopkins C, Slack R, Lund V, Brown P, Copley L, Browne J (2009) Long-term outcomes from the English national comparative audit of surgery for nasal polyposis and chronic rhinosinusitis. *Laryngoscope* 119(12):2459–2465
24. Phillips PS, Stow N, Timperley DG, Sacks R, Srubiski A, Harvey RJ et al (2011) Functional and Cosmetic Outcomes of External Approach Septoplasty. *Am J Rhinol Allergy* 25(5):351–357
25. Comparison of Endonasal (2021) and External Septoplasty for Treatment of Buckled Caudal Septal Deviation. *J Coll Physicians Surg Pak.* ;51–54
26. Dąbrowska-Bień J, Skarżyński PH, Gwizdalska I, Łazęcka K, Skarżyński H (2018) Complications in septoplasty based on a large group of 5639 patients. *Eur Arch Otorhinolaryngol* 275(7):1789–1794
27. Migliavacca RDO, Lavinsky M, De Souza OE, Friedrich EP, Cionek OAGD, Subda LF et al (2024) Modified extracorporeal septoplasty: prospective study. *Braz J Otorhinolaryngol* 90(3):101398

Figures

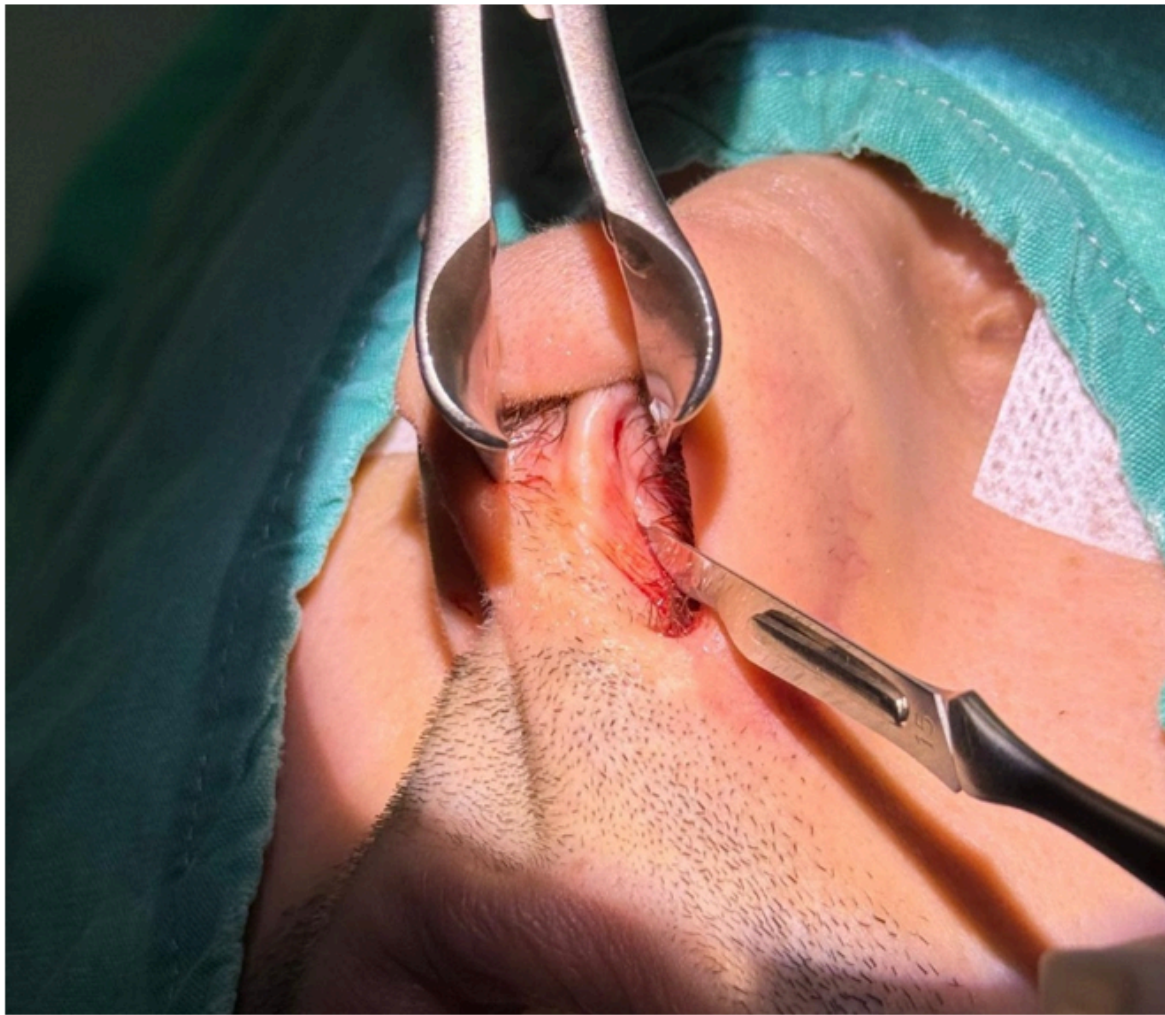


Figure 1

Endonasal septoplasty-left sided hemitransfixion incision

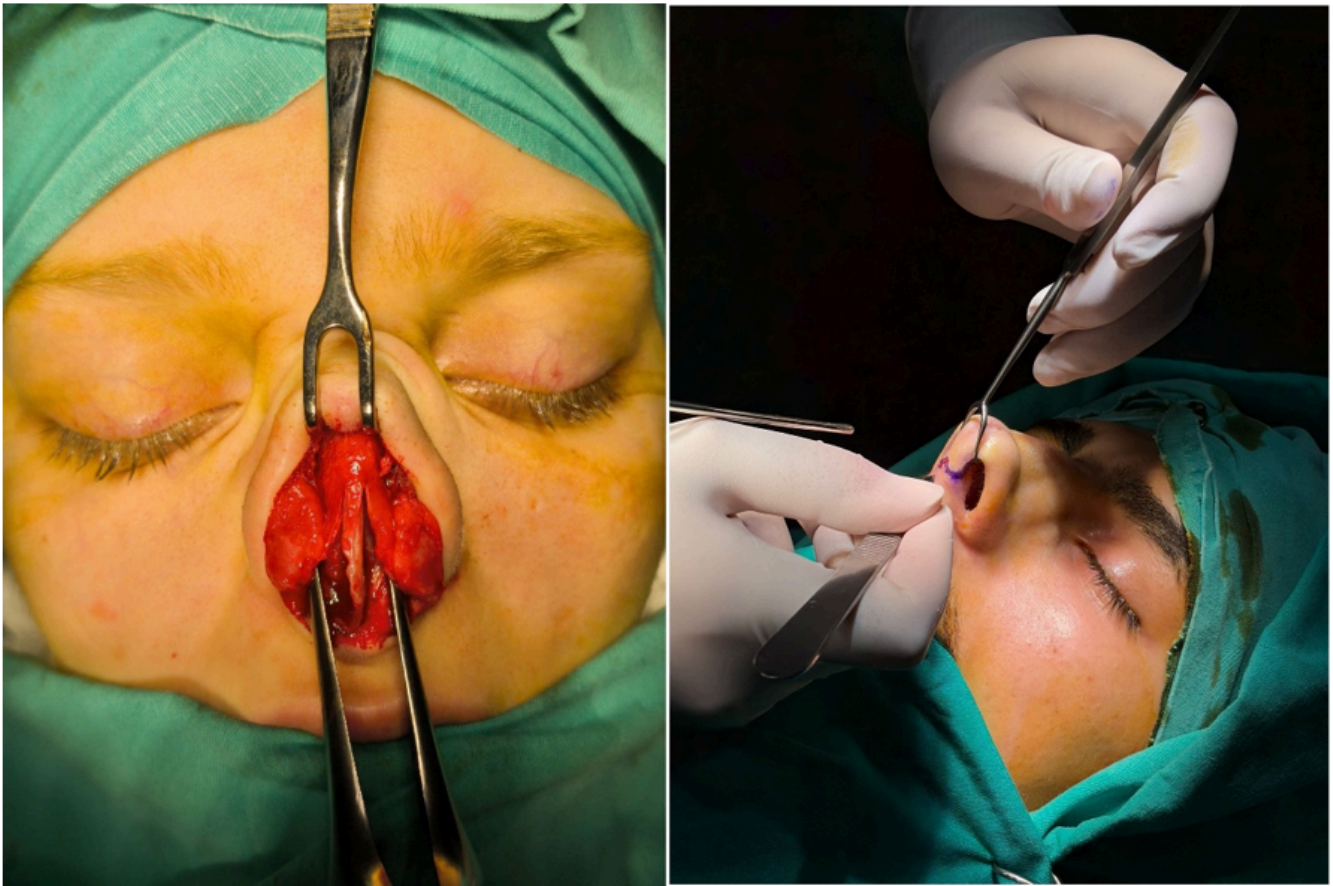


Figure 2

Open approach septoplasty incision design and surgical view

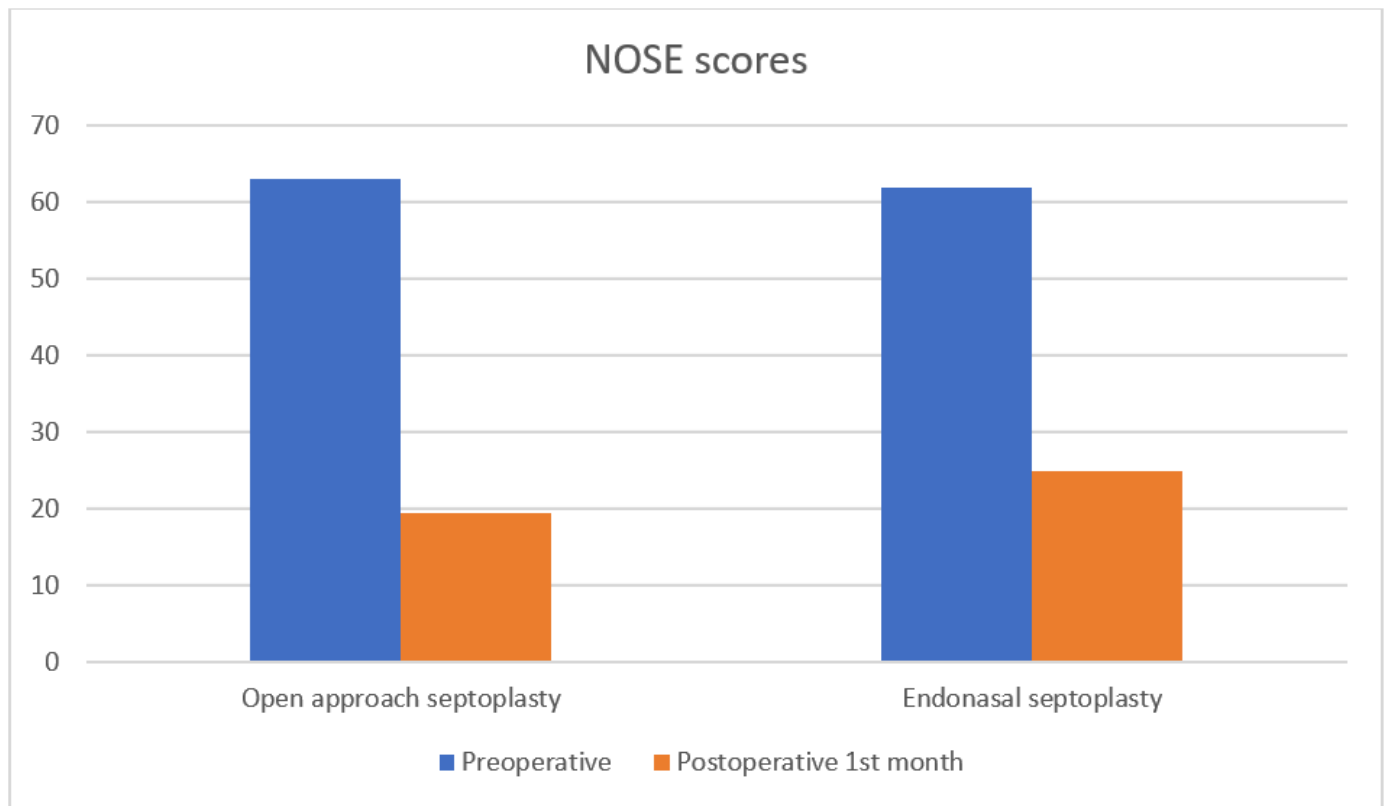


Figure 3

NOSE scores

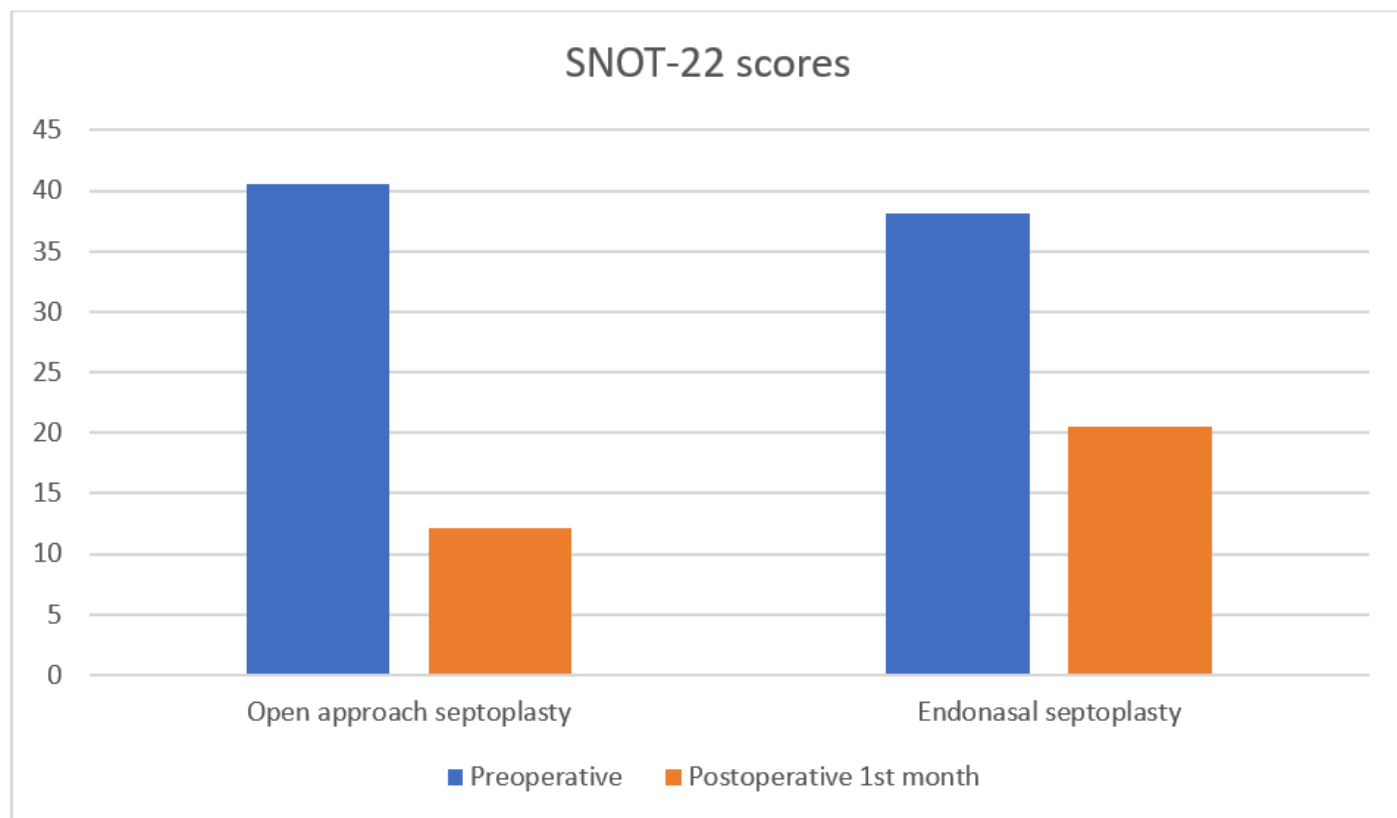


Figure 4

SNOT-22 scores

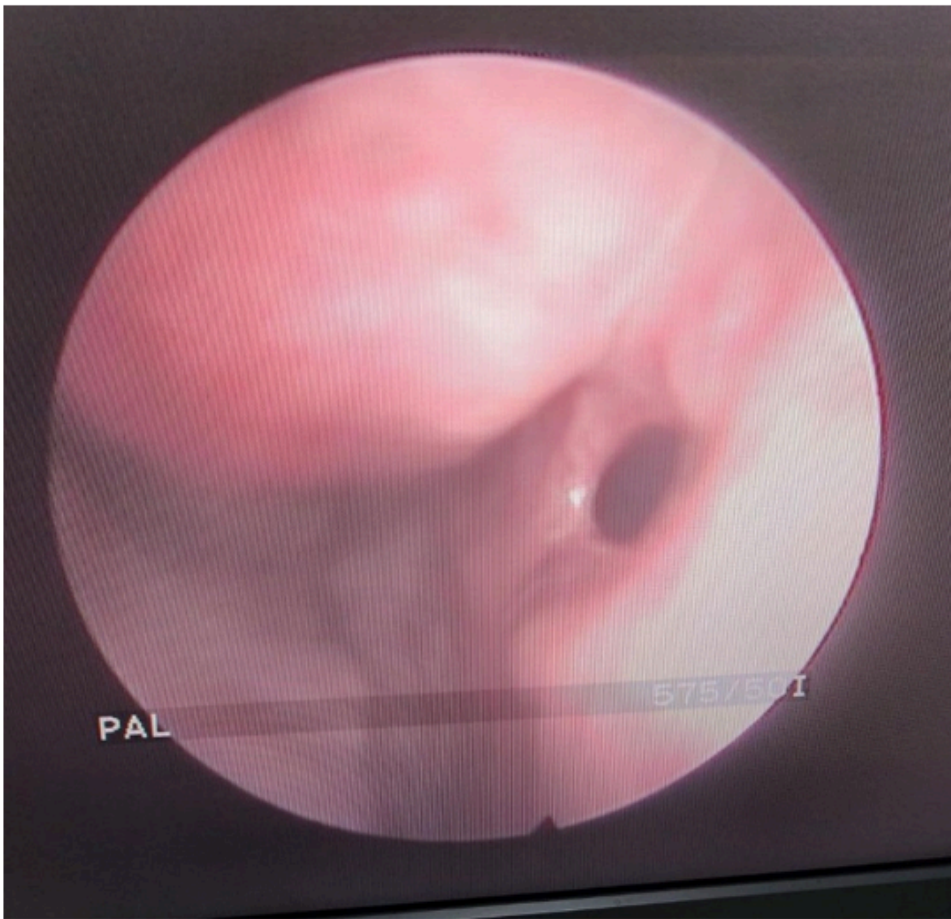


Figure 5

Septal perforation(< 5mm)



Figure 6

Right residue septal deviation