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CASE SERIES

COMBINED REPAIR OF LARGE NASAL SEPTAL PERFORATIONS AND REVISION OPEN RHINOPLASTY USING A SUBLABIAL APPROACH: A RETROSPECTIVE CASE SERIES

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ABSTRACT

Background: Repair of large nasal septal perforations in patients requiring revision rhinoplasty remains technically challenging. The procedure requires reliable mucosal coverage, adequate vascularity, tension-free closure, and restoration of nasal structural support. Combining septal perforation repair with revision open rhinoplasty may be appropriate when both the septum and the external nasal framework require reconstruction.
Objective: To describe a sublabial-assisted approach to the repair of large iatrogenic nasal septal perforations performed simultaneously with revision open rhinoplasty and to report anatomical outcomes, late recurrence, and patient-reported functional and aesthetic outcomes.
Materials and Methods: This retrospective case series included nine patients who underwent revision open rhinoplasty, costal cartilage autografting, and simultaneous repair of an iatrogenic nasal septal perforation between 2020 and 2026. The cohort comprised eight women and one man, aged 19–36 years. Operative duration ranged from 6 to 10 hours. In two procedures, endoscopic assistance was used primarily to improve visualization of the surgical anatomy and flap elevation. Anatomical outcomes were assessed endoscopically. Functional and aesthetic outcomes were evaluated using the Nasal Appearance and Function Evaluation Questionnaire (NAFEQ) at two years after surgery. Paired preoperative and postoperative scores were available for all nine patients.
Results: Complete perforation closure was observed in all nine patients during the first two postoperative years (100%; exact 95% confidence interval [CI], 66.4%–100.0%). At the fourth-year examination, two patients had small posterior partial recurrences measuring 3 and 5 mm, respectively. Both recurrences occurred in patients with initial perforations measuring 2.7 × 1.8 cm. No recurrence was observed among the seven patients with smaller perforations. Functional NAFEQ scores increased from 16.00 ± 4.24 to 31.78 ± 2.28, with a mean paired improvement of 15.78 points (95% CI, 11.84–19.71; exact Wilcoxon P = 0.0039). Aesthetic scores increased from 12.67 ± 3.46 to 30.67 ± 2.60, with a mean improvement of 18.00 points (95% CI, 14.50–21.50; exact Wilcoxon P = 0.0039). According to the authors' reported clinical records, no other postoperative complications were documented.
Conclusions: The described sublabial-assisted approach may be a useful reconstructive option for selected patients with large iatrogenic septal perforations who also require revision open rhinoplasty and restoration of nasal structural support. The late partial recurrences emphasize the importance of long-term surveillance.

Keywords: nasal septal perforation; revision rhinoplasty; septal reconstruction; sublabial appr Introduction

INTRODUCTION

Nasal septal perforation (NSP) is a defect involving the mucosal lining and the underlying cartilage or bone of the nasal septum. Previous septal surgery and septorhinoplasty remain among the most common causes of iatrogenic perforation. Consequently, most perforations associated with previous surgery are located in the anterior cartilaginous portion of the septum, where cartilage may be absent around the margins of the defect. Other recognized causes include cauterization, nasal packing, nasal trauma, granulomatosis with polyangiitis (formerly known as Wegener's granulomatosis), autoimmune diseases, intranasal cocaine use, prolonged or inappropriate use of topical nasal medications, tuberculosis, and other infectious or inflammatory conditions. Repeated self-traumatization of the nasal mucosa, prolonged intranasal instrumentation, and iatrogenic procedures may also result in septal perforation. Additional contributing factors include the use of nasal tubes, intranasal cryosurgery, cauterization, postoperative septal hematoma, and septal abscess [13,14,16,17].

The clinical presentation of NSP varies according to the size and location of the defect. Symptoms may include recurrent epistaxis originating from the perforation margins, excessive crust formation, dryness of the nasal mucosa, malodorous discharge, nasal obstruction, uncomfortable breathing, and whistling noises during nasal respiration. Whistling is particularly associated with smaller perforations. Larger anterior defects may be accompanied by structural deformities involving the anterior nose, caudal septum, columella, membranous septum, and nasal dorsum. In addition to physical symptoms, patients may experience psychological distress, anxiety, and concerns about the presence of a persistent defect inside the nose and its effects on nasal appearance and function [14,16,17].

A nasal septal perforation alters the normal pattern of inspiratory airflow. In patients with NSP, airflow may change from a predominantly laminar pattern to a more turbulent one. This alteration can increase the desiccating effect of inspired air, particularly in the anterior nasal cavity, leading to mucosal dryness, crusting, and recurrent bleeding. Small perforations may produce an audible whistle because of the passage of air through the defect. In contrast, posteriorly located perforations may generate less noticeable airflow disturbance and may therefore remain relatively asymptomatic, depending on their size and anatomical position[13,16]. Postoperative iatrogenic perforation may develop when septal dissection is performed in the submucosal plane rather than in the appropriate subperichondrial or subperichondrial–mucoperichondrial plane, or when mucosal tears are not adequately repaired. The risk is particularly important when mucosal tears occur on both sides of the septum directly opposite one another. Previous surgery may further compromise the available mucosal tissue through scarring, cartilage loss, and disruption of the normal vascular supply. These problems become especially challenging when a large septal perforation coexists with an external nasal deformity requiring revision rhinoplasty[16,42]. Several surgical approaches have been developed for NSP repair, including endonasal, endoscopic, and open techniques. The choice of approach depends on the size and location of the perforation, the condition and availability of the surrounding mucosa, the presence of associated nasal deformity, and the surgeon's experience. One previously reported distribution indicates that approximately 30% of repairs are performed using an open rhinoplasty approach and 70% using endonasal or endoscopic techniques, with an overall closure rate of approximately 91% and reported rates ranging from 68% to 100% [44]. These figures should be interpreted in the context of differences in patient selection, perforation dimensions, surgical techniques, and follow-up duration. The endoscopic approach to nasal septal perforation repair was first reported by Hier et al. in 2002 [45]. Successful repair generally depends on adequate mobilization of vascularized mucosal tissue, preservation of its blood supply, and tension-free closure of the defect. Multiple surgical methods have been described. However, many successful techniques have relied on bilateral, broad-based mucosal advancement flaps to achieve complete coverage of the perforation and separate the opposing suture lines. Fairbanks described surgical closure of nasal septal perforations in 1980 [7]. Other techniques have incorporated additional exposure to facilitate the repair of larger or more posteriorly located defects. Kridel et al. described closure using an external septorhinoplasty approach, which provides improved access to the septum and facilitates suturing of the mucosal flaps to the surrounding perforation margins [12]. Subsequent reconstructive approaches have included inferior turbinate flaps, bilateral intranasal flaps with nonopposing suture lines, bridge-flap techniques, three-layer repair, pericranial flaps, and other local or regional tissue options [18–26]. For selected extensive defects, more complex reconstructive procedures, including free-tissue transfer and midfacial degloving approaches, have also been reported [27,28]. Open rhinoplasty provides direct visualization of the septal structures and facilitates the mobilization and suturing of different mucosal flap designs around the margins of the perforation. It also permits simultaneous correction of associated deformities of the external nasal framework. Nevertheless, performing rhinoplasty at the same time as septal perforation repair is technically more demanding and generally requires more operative time than either procedure performed independently. The presence of scar tissue, reduced mucosal mobility, and insufficient cartilage may further increase the complexity of revision surgery.The feasibility and long-term outcomes of simultaneous septal perforation repair and septorhinoplasty have been described in the clinical experience reported by Kridel and Delaney[42]. The challenge becomes greater when the perforation measures 2 cm or more, particularly when previous surgery has reduced the amount of healthy septal mucosa available for advancement. In such cases, conventional local flaps may not provide sufficient tissue for tension-free closure. The nasal floor and inferior meatus may offer additional sources of vascularized tissue for reconstruction. Nasal floor and inferior meatus flaps have been described for septal perforation repair, and their application depends on the anatomical extent of the defect and the available mucosal tissue [35,39,40]. Other reports have described the use of pedicled nasal floor flaps in reconstructive procedures involving the nasal cavity and skull base [38,39]. These approaches may expand the available reconstructive options when local septal mucosa is insufficient. A sublabial approach can facilitate access to the anterior maxilla, pyriform aperture, and nasal floor,

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potentially allowing greater flap mobilization while avoiding an additional external incision for access to these structures. Sublabial and midfacial degloving approaches have previously been described for extensive nasal and sinonasal procedures [2–6,28]. Their relevance to complex nasal reconstruction lies in the possibility of obtaining broader surgical exposure while limiting visible external scarring. However, the selection of an approach must take into account the anatomical requirements of the reconstruction and the need to preserve the vascular supply of the mobilized tissue. The present technique combines open revision rhinoplasty, reconstruction of the nasal framework using costal cartilage autografts, and elevation of a posteriorly based nasal floor mucoperiosteal flap through a sublabial-assisted approach. The technique is intended to provide broad exposure of the nasal septum and nasal floor, improve mobilization of vascularized mucosal tissue, and permit simultaneous reconstruction of the external nasal framework. This combined approach was used in patients with large nasal septal perforations measuring 2 cm or more, in whom previous surgery and associated structural deformity presented additional reconstructive challenges. The purpose of this study was to describe the surgical approach and evaluate anatomical closure, long-term outcomes, and changes in patient-reported functional and aesthetic outcomes following combined septal perforation repair and revision open rhinoplasty.

MATERIALS AND METHODS

Study Design and Patient Population

Study Design and Patient Population

This retrospective case series included nine patients who underwent revision open rhinoplasty through a combined sublabial approach, costal cartilage autografting, and simultaneous repair of an iatrogenic nasal septal perforation. The cohort comprised eight women and one man. Patient age ranged from 19 to 36 years. Operative duration ranged from 6 to 10 hours. Two procedures were endoscopically assisted; the endoscope was used primarily for visualization and presentation of the operative technique. Clinical follow-up ranged from 3 to 5 years.

Outcome Measures

Functional and aesthetic patient-reported outcomes were assessed before and after surgery using the Nasal Appearance and Function Evaluation Questionnaire (NAFEQ) 2 years after surgery. Complete paired preoperative and postoperative functional and aesthetic scores were available for all nine patients.

Anatomical outcome was defined by endoscopic assessment of complete closure or partial recurrence. Perforation dimensions were recorded in the anteroposterior and vertical planes. Because direct planimetry was unavailable, area was estimated as length × width using a rectangular approximation.

Statistical Analysis

Continuous variables are presented as mean ± standard deviation (SD), median with interquartile range (IQR), range, and 95% confidence interval (CI) of the mean. Categorical variables are reported as number and percentage, with exact Clopper-Pearson 95% CIs for key proportions. Preoperative and postoperative NAFEQ scores were compared using the exact Wilcoxon signed-rank test as the primary paired analysis because the distributions of paired differences departed from normality.

Paired t tests are also reported as supplementary parametric analyses. Standardized paired effect size was calculated as Cohen's dz (mean paired change divided by the SD of the paired changes). The association between the largest perforation category (2.7 × 1.8 cm) and late partial recurrence was explored using a two-sided Fisher exact test.

All tests were two-sided, and $P<0.05$ was considered statistically significant. Because of the small sample and observational design, recurrence analyses are exploratory.

Patient Characteristics in Table 1.

Table 1. Demographic and operative characteristics

Variable	Value	Additional information
Patients	9	—
Women	8 (88.9%)	—
Men	1 (11.1%)	—
Age, years	24.9 ± 5.3	Median 25 [IQR 22–27]; range 19–36
Revision open rhinoplasty	9 (100%)	All with costal cartilage autografting
Iatrogenic septal perforation	9 (100%)	—
Operative duration	6–10 h	Individual durations unavailable
Endoscopic assistance	2 (22.2%)	Used primarily for visualization/presentation
Follow-up	3–5 y	Late recurrence assessed at year 4

The mean patient age was 24.9 ± 5.3 years (median, 25; IQR, 22–27; range, 19–36).

Perforation Dimensions inTable 2.

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Table 2. Initial perforation dimensions, estimated area, and late recurrence

Dimensions (cm)	Patients, n	Cohort (%)	Estimated area (cm²)	Late partial recurrence
2.2 × 1.0	2	22.2	2.20	0/2 (0.0%)
2.5 × 1.5	5	55.6	3.75	0/5 (0.0%)
2.7 × 1.8	2	22.2	4.86	2/2 (100.0%)

The mean estimated perforation area was 3.65 ± 0.95 cm² (median, 3.75; IQR, 3.75–3.75; range, 2.20–4.86 cm²).

Surgical Technique

The procedure was performed under general endotracheal anesthesia. The nose, septum, and floor of the inferior meatus were infiltrated with a solution prepared using 50 mL of 0.9% sodium chloride, 0.5 mL of 0.1% epinephrine solution (reported as a 1:100,000 dilution), and 1 mL of tranexamic acid at a concentration of 50 mg/mL. The exact concentrations and total administered doses should be confirmed from the operative protocol.

A conventional open rhinoplasty approach was initiated using a W-shaped transcolumellar incision. The columellar skin was elevated from the medial crura, and dissection continued superiorly in the supraperichondrial avascular plane. At the nasal bones, the periosteum was elevated using a periosteal elevator.

Dissection between the medial crura provided access to the caudal septal cartilage. Bilateral septal mucoperichondrial flaps were then elevated. Posterior dissection continued until healthy residual septal tissue was reached, which in some cases was located relatively far posteriorly. The upper lateral cartilages were separated from the septum on both sides.

Mucoperichondrial elevation was continued toward the margins of the perforation. In some regions, the two mucoperichondrial layers were adherent to one another, with no intervening cartilage. At the inferior margin of the defect, dissection was extended downward to elevate the mucosa from the maxillary crest (Figure 1).

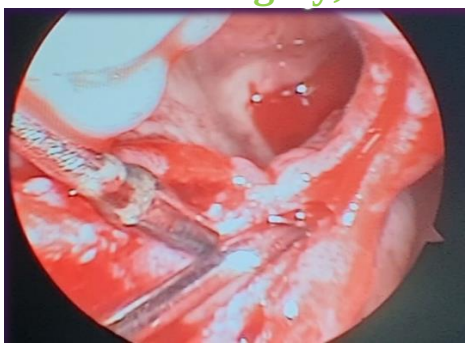


Figure 1. Mucoperiosteal dissection in the lower aspect of septal perforation toward to maxillary crest

At this stage, the nasal cavities were loosely packed with gauze moistened with tranexamic acid solution.

Sublabial Incision and Subperiosteal Exposure

An inverted V-shaped incision was marked in the upper labial vestibule, using the general concept of a Le Fort I vestibular approach but with a more limited incision. The angle of the V was approximately 45°–60°. The incision line was infiltrated using the same solution described above.

The inverted V-shaped incision was made with a Colorado needle through the mucosa and down to the bone overlying the roots of the central incisors (Figure 2). Limited subperiosteal elevation was then performed using a sharp instrument. The maxillary bone was exposed around the inferior portion of the pyriform aperture and the anterior nasal spine (ANS). The limited dissection was intended to preserve the surrounding soft-tissue attachments and vascular supply while providing sufficient access for elevation of the nasal floor mucoperiosteal flap (Figure 3).



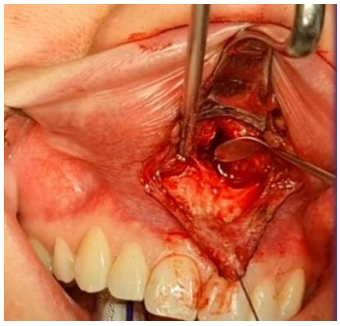


Figure 2. Inverted V type sublabial incision. **Figure 3.** A limited subperiosteal elevation was then performed with a sharp instrument degloving the maxillary bone around the lower part of the piriform aperture and around anterior nasal spine

The mucoperiosteal flap was elevated using sharp elevators designed for Le Fort I osteotomy procedures. Dissection proceeded posteriorly toward the choanae and laterally along the nasal floor and lateral nasal wall to the bony attachment of the inferior turbinate. When

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necessary, elevation could be extended along the lateral wall toward the region of Hasner's valve, with care taken to avoid injury to the nasolacrimal drainage pathway (Figure 4).

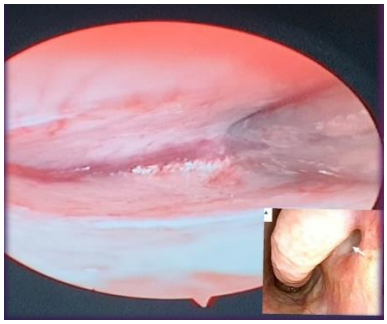


Figure 4. Mucoperiosteal flap elevation can be done under endoscopic control either under mucoperiosteal flap or above from inside the nasal cavity. White arrow direct to Hasner valve.

Flap elevation continued toward the maxillary crest and the margins of the septal perforation until the nasal floor mucoperiosteal flap could meet the previously elevated septal mucoperichondrial flaps (Figure 5a,b).

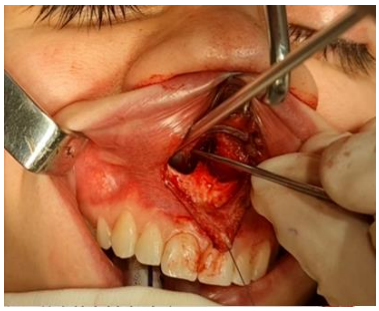


Figure 5. a-Mucoperiosteal flap elevation performed with sharp elevators (designed for Le Fort 1 osteotomy approach), elevation of the flap continues toward the choanae, b-lateral nasal wall up to the bony root of the inferior turbinate, along the lateral-most aspect of the nasal floor.

Flap Mobilization and Perforation Closure

Residual bony obstructions involving the septum or maxillary crest were corrected when indicated. The temporary nasal packing was removed.

Incisions were then made in the mucosa of the inferior meatus. The lateral incision began parallel to the inferior portion of the pyriform aperture and continued toward the lower level of the septal perforation. A medial incision was made from the anterior end of the inferior turbinate and extended posteriorly along the lateral nasal wall, parallel to the inferior border of the turbinate, toward the junction of the posterior and middle thirds of the inferior meatus. A 2–3 mm back-cut was made when required to improve flap mobility.

During elevation of the mucoperiosteal tissue around the junction of the vomer and maxillary crest, branches of the sphenopalatine arterial system supplying the anterior palate may be encountered. The authors reported identifying and cauterizing vessels that required division to permit flap mobilization. This step should be performed only after the relevant vascular anatomy has been identified and the intended flap pedicle has been protected. The mucoperiosteal flap was mobilized on each side and rotated medially and superiorly toward the septal perforation. The flap edges were sutured to the margins of the septal mucoperichondrium. Cartilaginous interposition material was used when indicated, according to the operative requirements. The precise suture material, suture configuration, and criteria for graft insertion should be specified from the operative records. The authors reported that the flap elevation and mobilization could be performed under endoscopic visualization, either from beneath the elevated flap or from within the nasal cavity (Figures 6 and 7).

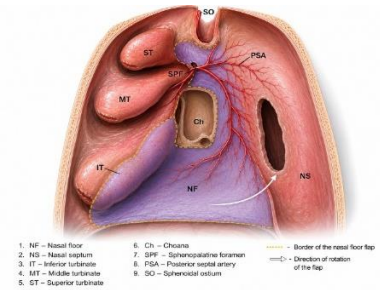


Figure 6. Flap design and blood supply from PSA

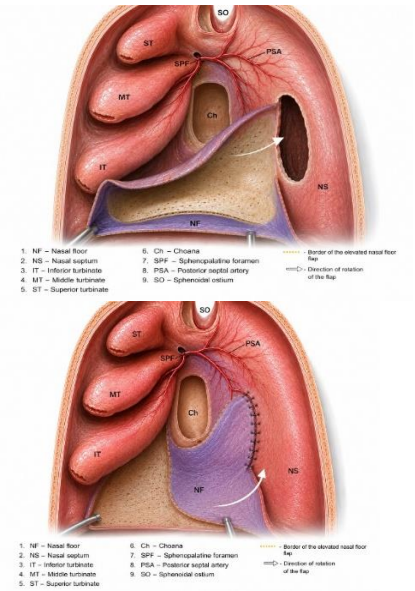


Figure 7. Elevation of the flap (left) and rotation of the flap towards to the septal perforation (right).

Nasal Framework Reconstruction

After completion of the septal perforation repair, the rhinoplasty procedure was continued. When stable fixation of the septum or a septal extension graft (SEG)

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was required, the still-open intraoral approach was used to expose the ANS and secure the supporting structures. This provided direct visualization of the anterior nasal spine and facilitated fixation of the reconstructed septum or SEG. The sublabial approach also permitted additional procedures when indicated, including widening of a constricted pyriform aperture, manipulation of the depressor septi nasi muscle, and a V–Y lip-lengthening procedure. These additional interventions should be identified for each patient if they were performed in the study cohort (Figure 8).

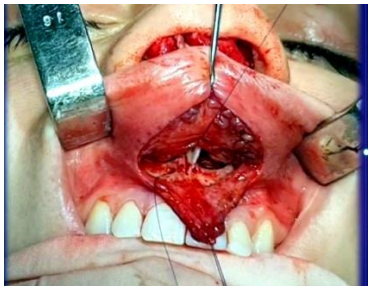


Figure 8. Fixation of the septum in combination with septal extension graft to the ANS

Inverted V - shape incision closed with continues running over an over suture. The design of V shape incision allow to prevent scar retraction in the transitional area between attached (keratinized) and mobile (not keratinized) mucosa. After finishing rhinoplasty stage and closing all the wounds we packed inferior nasal meatus, were now the exposed bone surface has formed, with surgical gloves “finger” with nasal expandable PVA sponge inside, moistened with tranexamic acid solution and wrapped around with xeroform gauze. We keep this insert 1 week in the nasal cavity.

Technical Features of the Sublabial-Assisted Approach

The principal technical features of the procedure are:

1. **Broad elevation of nasal floor mucoperiosteal flaps:** The approach permits initial elevation without immediately incising the nasal floor mucosa, allowing the surgeon to assess the available tissue and determine the final flap design before making the lateral release incisions.
2. **Exposure of the anterior nasal spine:** Direct access to the ANS facilitates stable fixation of the caudal septum and septal extension grafts during primary or revision rhinoplasty.
3. **Potential modification of the pyriform aperture:** In selected patients with a constricted bony nasal entrance, the approach provides access for pyriform aperture enlargement when clinically indicated.
4. **Combined exposure for septal repair and rhinoplasty:** The combination of open rhinoplasty and a limited sublabial approach may improve access to the septum and nasal floor, facilitate flap mobilization, and reduce tension during inset.
5. **Potential for endoscopic assistance:** Endoscopic visualization may be useful during flap elevation and identification of anatomical landmarks, including the region of Hasner's valve.

These technical advantages describe the intended benefits of the approach. They should not be interpreted as evidence of superiority over alternative techniques in the absence of a comparative study.

Outcome Measures

Individual NAFEQ Scores in Table 3.

Table 3. Individual paired NAFEQ scores and absolute changes

Patient	Function pre	Function post	Δ Function	Aesthetic pre	Aesthetic post	Δ Aesthetic
P1	22	30	8	10	30	20
P2	22	30	8	10	30	20
P3	18	35	17	10	30	20
P4	18	35	17	10	30	20
P5	12	32	20	10	30	20
P6	12	32	20	14	35	21
P7	12	32	20	14	35	21
P8	12	32	20	18	28	10
P9	16	28	12	18	28	10

NAFEQ Outcomes in Table 4.

Table 4. Paired analysis of functional and aesthetic NAFEQ outcomes

NAFEQ domain	Preoperative mean ± SD	Postoperative mean ± SD	Mean change ± SD	95% CI of change	Wilcoxon P	Paired t-test P	Cohen dz
Functional	16.00 ± 4.24	31.78 ± 2.28	15.78 ± 5.12	11.84–19.71	0.004	<0.001	3.08
Aesthetic	12.67 ± 3.46	30.67 ± 2.60	18.00 ± 4.56	14.50–21.50	0.004	<0.001	3.95

Functional NAFEQ scores increased from 16.00 ± 4.24 preoperatively to 31.78 ± 2.28 postoperatively. The mean

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improvement was 15.78 points (95% CI, 11.84–19.71). All nine patients improved. The exact Wilcoxon signed-rank test was significant (P=0.0039); the supplementary paired t test yielded t(8)=9.25, P<0.001. The standardized paired effect was very large (Cohen dz=3.08).

Aesthetic NAFEQ scores increased from 12.67 ± 3.46 to 30.67 ± 2.60. The mean improvement was 18.00 points (95% CI, 14.50–21.50). All nine patients improved. The exact Wilcoxon signed-rank test was significant (P=0.0039); the supplementary paired t test yielded t(8)=11.85, P<0.001. The standardized paired effect was very large (Cohen dz=3.95).

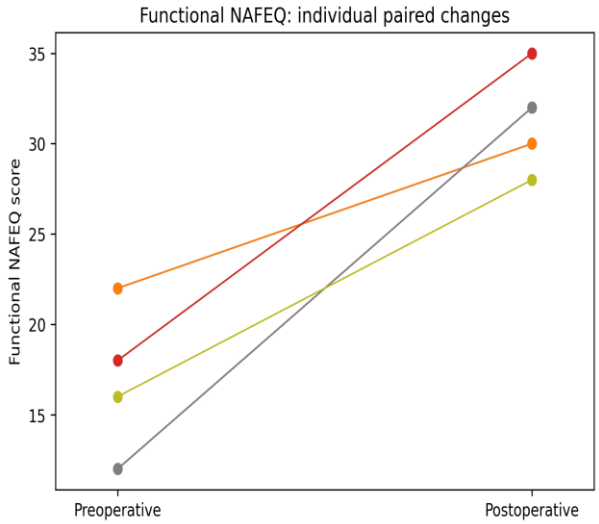


Figure 9. Individual paired changes in functional NAFEQ scores from preoperative to postoperative assessment.

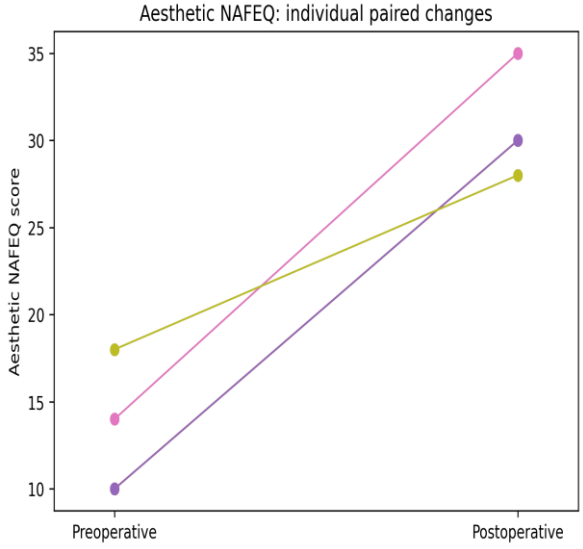


Figure 10. Individual paired changes in aesthetic NAFEQ scores from preoperative to postoperative assessment.

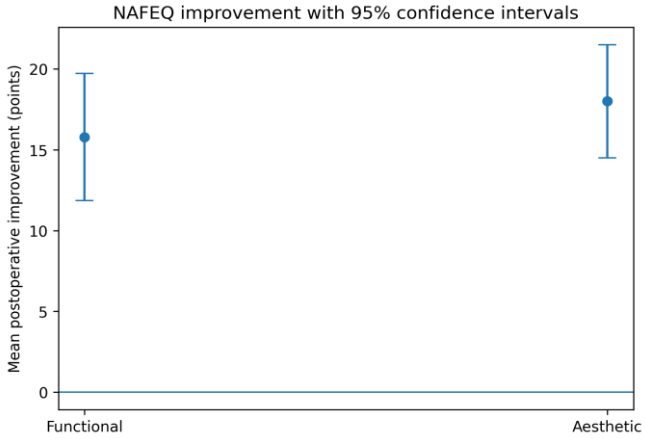


Figure 11. Mean improvement in functional and aesthetic NAFEQ scores. Error bars represent 95% confidence intervals of the mean paired change.

Anatomical Closure and Late Recurrence in Table 5.

Table 5. Anatomical outcomes

Outcome	n/N	%	Exact 95% CI (%)
Complete closure through 2 years	9/9	100.0	66.4–100.0
Maintained complete closure at 3–5 years	7/9	77.8	40.0–97.2
Late partial recurrence at year 4	2/9	22.2	2.8–60.0

Complete perforation closure was observed in all nine patients during the first 2 postoperative years (100%; exact 95% CI, 66.4%–100.0%). At the fourth-year examination, two patients had small posterior partial recurrences measuring 3 mm and 5 mm, respectively. Both recurrences occurred among the two patients whose original perforations measured 2.7 × 1.8 cm; no recurrence occurred among the seven patients with smaller perforations. The exploratory two-sided Fisher exact test was significant (P=0.0278). Because the cells included zero events and only two patients were in the largest-size category, the effect estimate is unstable and should not be interpreted as a definitive causal association.

Both patients attributed the late recurrence to nonadherence to postoperative recommendations, specifically mechanical intranasal trauma and failure to use prescribed moisturizing sprays. This explanation was based on patient report and cannot establish causation.

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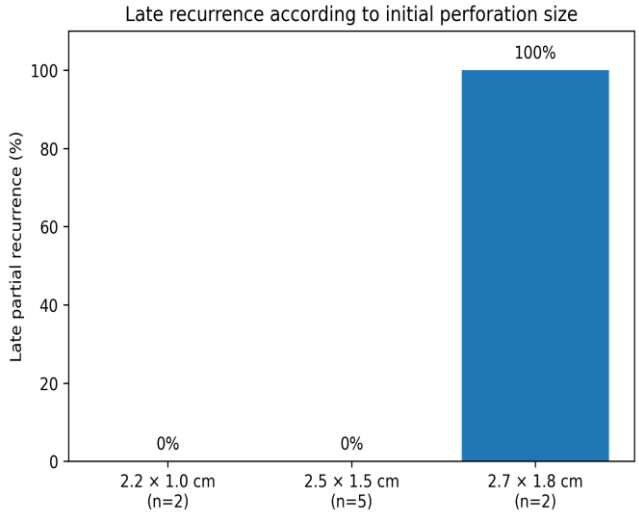


Figure 12. Late partial recurrence according to the initial perforation-size category. Both recurrences occurred in the 2.7 × 1.8 cm group.

RESULTS

Nine patients (eight women and one man) with a mean age of 24.9 ± 5.3 years underwent revision open rhinoplasty with costal cartilage autografting and simultaneous repair of an iatrogenic septal perforation. Two perforations measured 2.2 × 1.0 cm, five measured 2.5 × 1.5 cm, and two measured 2.7 × 1.8 cm.

The mean estimated perforation area was 3.65 ± 0.95 cm². Functional NAFEQ scores improved from 16.00 ± 4.24 to 31.78 ± 2.28, corresponding to a mean paired improvement of 15.78 points (95% CI, 11.84–19.71; exact Wilcoxon P=0.0039; Cohen dz=3.08).

Aesthetic NAFEQ scores improved from 12.67 ± 3.46 to 30.67 ± 2.60, with a mean improvement of 18.00 points (95% CI, 14.50–21.50; exact Wilcoxon P=0.0039; Cohen dz=3.95). Complete closure was achieved in all patients through 2 years. At year 4, two small posterior partial recurrences (3 and 5 mm) were identified, yielding a long-term complete-closure rate of 77.8% (7/9). Both recurrences occurred in the 2.7 × 1.8 cm group, whereas none occurred in the smaller-perforation groups (exploratory Fisher exact P=0.0278).

Endoscopic and Aesthetic Documentation

Nasal endoscopy was performed before surgery and during postoperative follow-up, reported as extending from approximately two months to five years. Representative images should show the preoperative perforation, the repaired site during follow-up, and the two late partial recurrences where relevant. Each image should be accompanied by a clear description of the time point and clinical finding.

Because septal perforation repair was performed together with revision rhinoplasty, aesthetic outcomes are also relevant. Representative preoperative and postoperative photographs may be presented to illustrate changes in nasal shape. These photographs should be obtained and published with appropriate patient consent and should not be presented as independently validated aesthetic outcome measurements. In addition to the NAFEQ score, assessed two years postoperatively, nasal endoscopy was performed to evaluate the condition of the mucosa at the septal perforation repair site before surgery and during follow-up visits between 2 month and 5 years after surgery (Fig. 13)

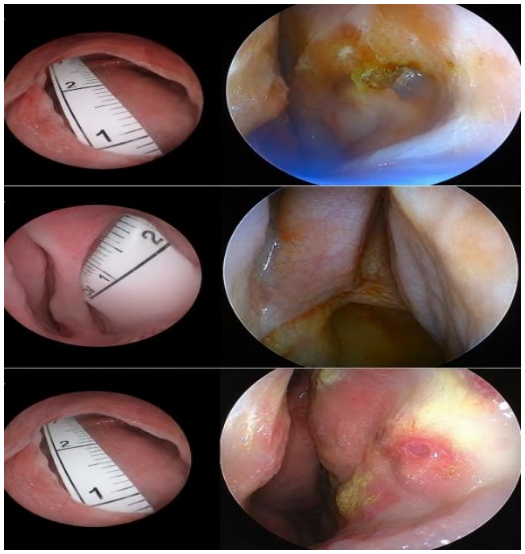


Figure 13. Endoscopic view of preoperative picture of perforation and after sptal perforation repair

Given that nasal septal perforation repairs in this study were performed in combination with revision rhinoplasty, we would like to present the aesthetic outcomes of these procedures (Fig. 14).

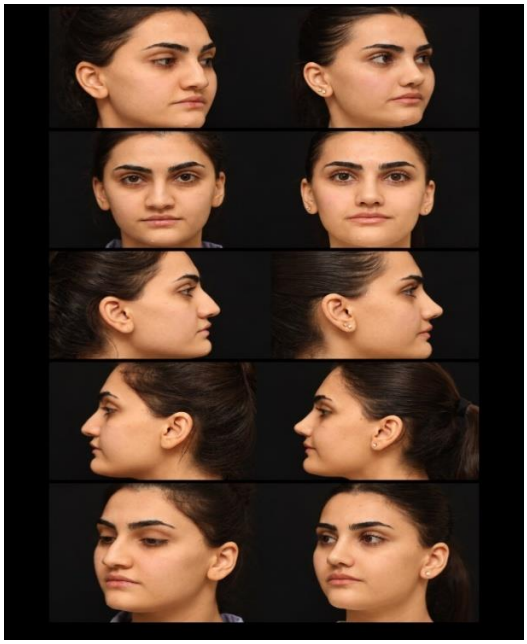


Figure 14. Aesthetic outcomes of these procedures

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Postoperative Complications

According to the authors' reported clinical records, no postoperative complications other than the two late partial recurrences described above were documented. This statement should be retained in the final manuscript only after confirmation against the complete operative and follow-up records.

The complication review should specifically address flap ischemia or necrosis, infection, hematoma, wound dehiscence, intranasal adhesions, inferior meatal or vestibular stenosis, nasolacrimal duct injury or postoperative epiphora, persistent obstruction, changes in olfaction, complications at the costal cartilage donor site, chest complications, and the need for unplanned revision surgery.

The absence of a documented complication should not be interpreted as proof that every possible complication was systematically assessed. If the records confirm that these outcomes were actively evaluated and none occurred, the authors may state that no such complications were observed during the documented follow-up period.

4. DISCUSSION

Surgical closure of a nasal septal perforation remains technically demanding because success depends not only on covering the defect but also on restoring a stable, well-vascularized mucosal lining without excessive tension, compromising the nasal airway, or worsening the external nasal framework. Defect size is an important determinant of outcome. Although several techniques have achieved favorable closure rates in small and medium perforations, results are less predictable as the defect becomes larger, particularly when the vertical dimension is substantial [3–5, 8, 12]. Large defects leave less residual mucosa for advancement, require greater flap excursion, and may place the final suture line under increased tension. These considerations are especially relevant to perforations measuring 2 cm or more, where exposure and flap design must be planned together.

A broad range of reconstructive options has been described, including septal advancement and rotation flaps, bridge flaps, inferior turbinate flaps, lateral nasal wall flaps, nasal floor and inferior meatus flaps, free mucosal or fascial grafts, and regional or free-tissue transfer for extensive defects [3, 5, 7–9, 11–16, 18, 23, 24, 29, 30, 32, 35, 36]. This variety reflects the absence of a universally superior technique. Reported closure rates are influenced by defect size and location, etiology, previous surgery, tissue quality, flap vascularity, surgeon experience, follow-up duration, and the definition of success [3, 35]. Direct comparisons between published series should therefore be made cautiously.

Purely endonasal techniques avoid an external incision and remain appropriate for selected defects. Bilateral mucosal flaps with nonopposing suture lines and three-layer closure can provide reliable healing by separating the repair lines and, when used, supporting an interposition graft [10,12]. The bridge-flap technique has also produced favorable results in experienced hands, although its feasibility may be limited when a large vertical defect consumes much of the available septal mucosa[8]. Inferior turbinate flaps provide vascularized tissue but may involve complex flap design and, in some techniques, a second procedure for pedicle division [7,11]. Endoscopic rotational flaps improve visualization and avoid external scars, although precise exposure and suturing of the posterosuperior margin may become more difficult as the defect enlarges[18, 30, 36].

The open septorhinoplasty approach addresses several of these limitations. Elevation of the nasal skin-soft tissue envelope provides broad access to the septum, facilitates circumferential preparation of the perforation margins, and permits direct visualization during suturing [14, 15, 31, 34]. This approach is particularly relevant when a septal perforation coexists with external nasal deformity, loss of structural support, nasal valve dysfunction, or the need for simultaneous functional and aesthetic rhinoplasty. A single operation can then combine mucosal reconstruction with correction of the osseocartilaginous framework [31,34]. The principal trade-off is the additional dissection and the potential for vascular compromise if septal flap elevation, perforation repair, and rhinoplasty maneuvers are not planned as a unified procedure.

For very large perforations or revision cases, midfacial degloving provides broad bilateral exposure without a visible facial scar. Romo and colleagues reported complete closure in 75% of defects larger than 3 cm using bilateral posteriorly based mucoperiosteal flaps, while also reporting small posterior reperforations and partial anterior vestibular stenosis[28]. Although this approach facilitates dissection and suturing of difficult posterior margins, it involves extensive sublabial and intranasal incisions and is more invasive than open septorhinoplasty[1, 2, 6, 17]. It may therefore be better reserved for selected extensive, posteriorly extended, or previously failed defects rather than used routinely for every perforation exceeding 2 cm. Pericranial and radial forearm free flaps provide alternatives when local mucosa is insufficient, but their complexity and donor-site burden restrict their use to selected reconstructive situations [13, 16].

Nasal floor and inferior meatus flaps are attractive because they recruit a broad area of respiratory mucosa while preserving septal tissue that may be required for

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structural reconstruction. Anatomical studies of modified nasal floor and inferior meatus flaps have shown that their reach can be increased by extending dissection onto the lateral nasal wall and inferior turbinate [23,24]. Nevertheless, anatomical reach demonstrated in cadaveric studies cannot automatically be equated with reliable clinical coverage. Flap contraction, scarring, tissue quality, and tension at the final inset can reduce the effective reconstructive area. Defect geometry must therefore be assessed in relation to the available donor mucosa in each patient.

The vascular basis of a posteriorly based nasal floor flap is important to its potential reliability. The sphenopalatine artery is a major source of arterial supply to the nasal mucosa and commonly divides into posterior septal and posterior lateral nasal branches [26, 27, 33]. Septal branches communicate with other arterial systems, including the greater palatine, superior labial, and ethmoidal arteries [26, 27, 33]. The nasal floor has a rich anastomotic network and may remain viable when elevated on an appropriate posterior vascular pedicle[28]. Clinical and imaging observations from posterior septal–nasal floor flaps used in skull-base reconstruction provide further anatomical support for vascularized tissue spanning the septum, nasal floor, and inferior meatus [25]. Although skull-base reconstruction differs from perforation closure, these observations support the anatomical rationale for using a vascularized flap rather than relying on a nonvascularized graft alone.

An important technical consideration is the possibility of extending the lateral incision toward the inferior meatus while protecting the nasolacrimal drainage pathway. Daraei and colleagues described extending the lateral border along the nasal floor and lateral wall toward the region of Hasner's valve without disrupting nasolacrimal outflow [28]. This boundary must be respected during flap elevation because injury or postoperative scarring around the distal nasolacrimal duct can cause epiphora. The same principle applies to sublabial exposure and pyriform aperture surgery, where careful identification and protection of adjacent structures are important [19, 21, 38]. Increased flap width should not be pursued at the expense of lacrimal function.

Access through the gingivobuccal sulcus can supplement intranasal or open rhinoplasty exposure by allowing subperiosteal elevation over the anterior maxilla and pyriform aperture [1, 4, 19–21, 39]. This corridor may facilitate mobilization of nasal floor and inferior meatal mucosa and reduce traction during final flap inset. However, extensive circumferential degloving may contribute to vestibular stenosis, sensory disturbance, or injury to adjacent structures[17]. Limited, purpose-directed sublabial dissection may therefore be preferable when it provides sufficient visualization and flap release without the morbidity of full midfacial degloving. Nasolabial soft-tissue attachments, including the depressor septi nasi muscle, should also be managed deliberately during combined rhinoplasty to avoid unwanted changes at the nose–lip junction [22].

The present technique occupies an intermediate position between limited endonasal repair and extensive midfacial degloving. Open rhinoplasty provides direct visualization and permits simultaneous correction of the external framework, whereas a posteriorly based nasal floor flap provides additional vascularized mucosa that may reach a large anterior defect. Protection of Hasner's valve and limitation of sublabial dissection are intended to retain the advantages of broader exposure while limiting morbidity. This strategy may be particularly useful when a perforation measuring 2 cm or more is accompanied by deformity requiring revision rhinoplasty, when local septal mucosa is insufficient for conventional bilateral advancement, or when previous surgery has altered the usual dissection planes.

Several principles remain essential regardless of the selected flap. The cause of the perforation should be identified and, where possible, controlled before surgery. Active inflammation, infection, smoking, misuse of topical vasoconstrictors, and systemic disease may jeopardize healing [1–5]. Scarred epithelium at the margins should be addressed while preserving as much healthy mucosa as possible. Flaps should be broad, atraumatically elevated, well perfused, and inset without tension. Bilateral closure with staggered suture lines is desirable when local tissue permits; a unilateral vascularized flap may be an alternative when contralateral dissection would threaten the remaining mucosa. Interposition material may reinforce the repair and separate opposing surfaces, but it cannot compensate for ischemic tissue or excessive tension [5, 9, 10, 12]. Appropriate internal support and postoperative humidification may help protect the repair during remucosalization.

In the present series, complete closure was observed in all nine patients through the first two postoperative years. At the fourth-year examination, two small posterior partial recurrences were identified. Both occurred in patients whose initial perforations measured 2.7 × 1.8 cm, whereas no recurrence was reported among the seven patients with smaller defects. The exploratory Fisher exact test yielded $P = 0.0278$. This finding may suggest that the largest defects are more difficult to maintain in the long term, but it cannot establish a causal relationship because the largest-size group included only two patients. The result should be considered hypothesis-generating and requires

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confirmation in a larger cohort.

Both patients with late recurrence attributed the outcome to mechanical intranasal trauma and failure to use prescribed moisturizing sprays. These explanations are clinically plausible, but they were based on patient report and cannot establish the cause of recurrence. The findings emphasize the importance of clear postoperative instructions, humidification, avoidance of intranasal trauma, and continued endoscopic follow-up. They do not establish that nonadherence was responsible for the observed outcomes.

Functional and aesthetic NAFEQ scores improved in all nine patients. The mean paired changes were 15.78 points for the functional domain and 18.00 points for the aesthetic domain. The exact Wilcoxon signed-rank tests were statistically significant for both outcomes. The magnitude of the reported standardized paired effect sizes was large. However, interpretation depends on confirmation of the NAFEQ instrument's validity, scoring range, and clinical meaning. The absence of a comparison group also means that the observed improvements cannot be attributed exclusively to the perforation repair or to any single component of the combined procedure. Revision rhinoplasty and costal cartilage reconstruction may independently influence patient-reported functional and aesthetic outcomes.

The absence of documented postoperative complications, if confirmed by systematic review of the clinical records, would be encouraging. Nevertheless, nine patients are insufficient to establish the overall safety of the technique or to exclude uncommon adverse events. The final manuscript should distinguish complications that were actively assessed from those that were not systematically recorded. The absence of an event in a small series should not be interpreted as proof that the procedure carries no risk.

Several limitations should be acknowledged. First, the study was retrospective and included only nine patients from a single clinical setting. Second, no comparison group was available, and the study cannot establish superiority over established endonasal, open, or midfacial degloving techniques. Third, the small number of patients, particularly in the largest-perforation category, limits the precision of recurrence estimates and makes subgroup comparisons exploratory. Fourth, the estimated defect areas were calculated using length multiplied by width rather than direct planimetry. Fifth, the interpretation of patient-reported outcomes depends on confirmation of the NAFEQ instrument's validation and scoring properties. Sixth, the combined nature of the operation prevents separation of the effects of septal perforation repair from those of revision rhinoplasty and structural reconstruction. Finally, the reported surgical dates and follow-up duration require reconciliation using the original records, and long-term outcomes should be interpreted according to each patient's verified follow-up interval.

Most published reports on septal perforation repair are retrospective case series or technical descriptions, and surgical techniques, defect classifications, and outcome definitions vary [3,35]. Cadaveric studies describe potential flap dimensions but cannot reproduce clinical perfusion, contraction, scarring, or postoperative nasal physiology[23,24]. Similarly, evidence of nasal floor flap viability in skull-base reconstruction supports the anatomical rationale but does not directly establish closure rates for septal perforations[25,28]. Prospective studies with standardized measurements, clear documentation of defect location and etiology, patient-reported symptoms, objective airflow assessment, rhinoplasty outcomes, complications, and long-term recurrence are needed.

In summary, successful repair of large nasal septal perforations requires matching surgical exposure to defect geometry and matching flap design to the available vascular supply. Endonasal techniques remain suitable for many small and medium defects, while open septorhinoplasty provides a practical option when perforation repair must be combined with correction of nasal deformity[14, 15, 31, 34]. A posteriorly based nasal floor flap offers a substantial source of vascularized respiratory mucosa[25–28,33]. When elevated with protection of the nasolacrimal drainage pathway and inset without tension, it may be a useful option for selected defects measuring 2 cm or more. Extensive midfacial degloving and regional or free flaps remain potential alternatives for the most extensive or recurrent defects [13, 16, 17].

CONCLUSION

The described sublabial-assisted technique combines nasal septal perforation repair with revision open rhinoplasty and costal cartilage reconstruction. Its principal technical features are broad mobilization of nasal floor mucoperiosteal tissue, use of a posteriorly based vascularized flap, and direct access to the anterior nasal spine for stable fixation of reconstructed nasal support structures.

Complete closure was observed in all nine patients during the first two postoperative years. Two small posterior partial recurrences were identified at the fourth-year examination, both in patients with the largest initial perforations. Functional and aesthetic patient-reported

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scores improved in all patients, although interpretation depends on confirmation of the NAFEQ instrument's validation and clinical meaning.

The technique may be considered for selected patients in whom a large septal perforation coexists with structural deformity requiring revision rhinoplasty. The present findings are preliminary and do not establish superiority over other reconstructive methods. Larger studies with verified long-term follow-up, systematic complication assessment, standardized outcome measures, and comparison with alternative techniques are needed.

DECLARATIONS

Ethical Approval

Not applicable.

Informed Consent

Written informed consent was obtained from all patients for the surgical procedures and the use of their clinical data for research purposes. In addition, written consent for publication of clinical photographs was obtained from the patients whose photographs are included in this article, where applicable.

Competing Interests

The authors declare no conflict of interest.

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