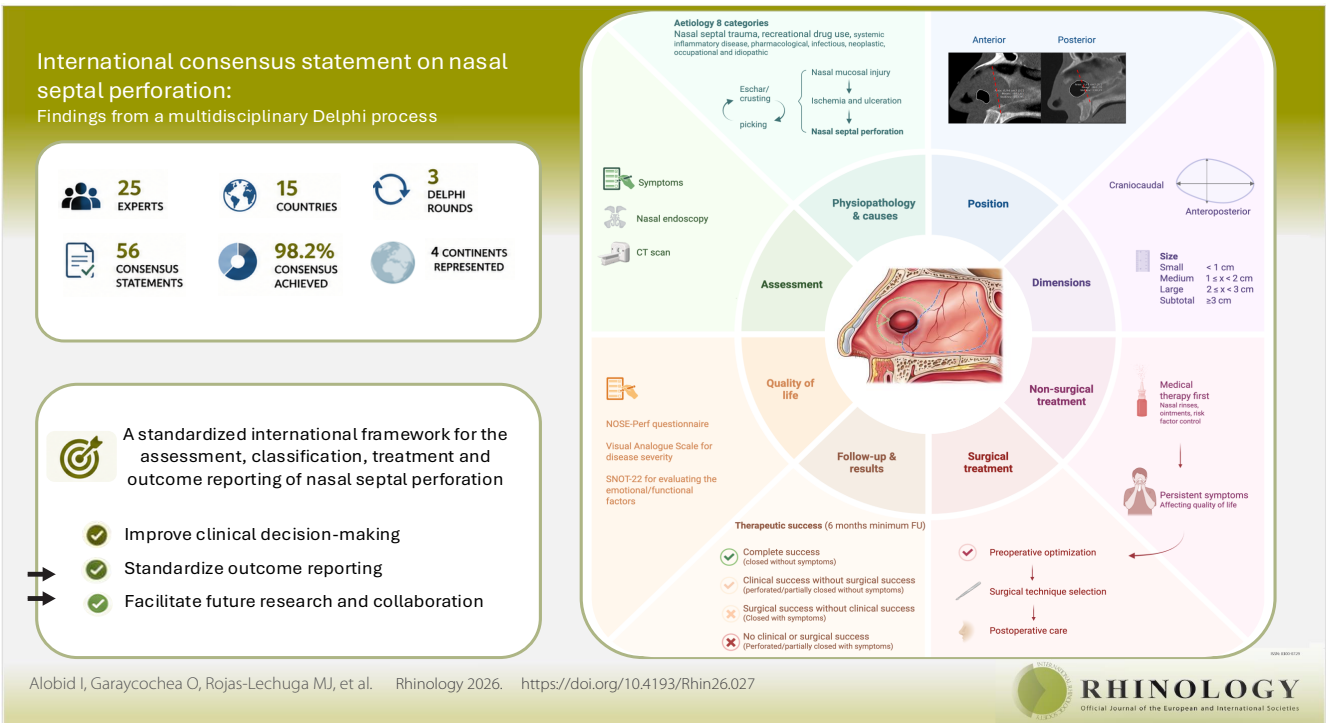
International consensus statement on nasal septal perforation

Isam Alobid[1,2,*], Octavio Garaycochea[3,*], Maria Jesus Rojas-Lechuga[1], Stephen Bansberg[4], Paolo Castelnuovo[5], John R. Craig[6], Sean Delaney[7], Deniz Hanci[8], Yong Ju Jang[9], Yuri Rusetsky[10], Abdulaziz Alqahtani[11], Saad Alsaleh[12], Juan David Bedoya[13], Claudio Callejas[14], Juan Carlos Ceballos[15], Arturo Cordero[16], Sercan Gode[17], Rohit Gohil[18], Franklin Mariño-Sánchez[19], Andrés Obando[20], Pablo Pegoraro[21], Alkis J. Psaltis[22], Miguel Tepedino[23], Richard Harvey[24, 25,#], Claire Hopkins[26,#]

Rhinology 64: 6, 0 - 0, 2026
https://doi.org/10.4193/Rhin26.027



Abstract

Background: Nasal septal perforation (NSP) is a multifactorial condition characterised by a full-thickness defect in the nasal septum, with clinical presentation ranging from asymptomatic cases to significant nasal obstruction, crusting, epistaxis, and impaired quality of life. A major challenge in NSP management is the absence of standardised diagnostic and therapeutic protocols, contributing to inconsistent outcomes. This study aimed to develop an international consensus on the assessment, classification, and management of NSP to standardise clinical decision-making and improve patient care.

Methodology: A modified Delphi process was conducted over three iterative rounds involving 25 panellists from 15 countries across four continents. Structured questionnaires addressing NSP diagnosis and management were developed, distributed, and refined. Statements covered eight categories: assessment; physiopathology and causes; position; dimensions; non-surgical treatment; surgical treatment, follow-up and results; and quality of life. Consensus was defined as ≥70% agreement, with no more than 10% disagreement.

Results: Consensus was reached for 98.2% of the proposed statements. Fifty-six agreements included validated symptom assessment tools, imaging protocols, classification systems based on size and location, preferred medical and surgical treatments, perioperative care standards, and outcome evaluation methods. Areas without full consensus included the clinical relevance of superior-inferior perforation location, prognostic significance of mucosal oedema, the optimal abstinence period from intranasal drug use, and the necessity of early postoperative debridement.

Conclusions: These expert consensus statements emphasise validated assessment tools, structured classification systems, and treatment approaches, providing a comprehensive framework to unify NSP management, guide future research, and improve patient outcomes.

Key words: Delphi, international consensus, nasal septal perforation, quality of life, reconstruction, surgery

Introduction

A nasal septal perforation (NSP) is a full-thickness defect of the nasal septum (NS) that communicates between the nasal cavities, resulting in altered intranasal airflow, which in some individuals leads to symptoms such as nasal obstruction, dryness, crusting, bleeding and reduced quality of life (QoL) [1–3]. NSP has an estimated prevalence of 0.9-2.05% in the general population [4,5]. The aetiology of NSP is diverse, with previous nasal surgery and intranasal drug use being the most common causes [6]. Surgical closure is recommended for symptomatic patients who fail conservative measures after the underlying aetiology has been addressed [6]. Although nasal reconstruction has been described since antiquity, it was not fully developed until the early 20th century, with the development of facial reconstruction surgery by Harold Gillies [7]. However, the limitations of NS reconstruction were not fully overcome until the late 20th century, with the introduction of bipedicled mucosal advancement flaps based on vascular anatomy and supporting nonvital grafts. These advances, together with the development of endoscopic sinus surgery (ESS), enabled reliable septal reconstruction with reported closure rates of up to 92% [8–15].

A robust and successful surgical closure is likely the main factor driving the increased interest in NSP over the past two decades, reflected in the growing literature. However, there are inconsistencies and discrepancies in the literature regarding certain definitions and terminologies, a lack of standardization in perforation evaluation, and a heterogeneous assessment of both closure and symptom outcomes which currently makes it difficult to compare results or data across different scientific groups [2]. Consequently, management strategies have varied significantly across institutions and regions, often relying heavily on individual clinician experience rather than evidence-based practice.

To address this issue an international multidisciplinary panel of rhinologists and nasal surgeons from 15 countries and 4 continents was convened. The aim was to develop consensus statements for NSP assessment, classification and management.

Materials and methods

This consensus statement comprised: 1) Recruitment of panelists selected for their expertise in NSP management; 2) Targeted literature review; 3) Qualitative survey and formulation of an initial set of statements; 4) Panel meeting to review and refine statements; 5) Administration of the first survey iteration; 6) Evaluation and refinement of ambiguous items, including adaptation or removal of statements; 7) Administration of a second survey iteration; 8) Further statement refinement; 9) Final data aggregation and analysis; 10) Panel meeting to discuss results; 11) Third survey iteration focusing on points reconsidered after panel discussion; 12) Finalization of consensus statements and manuscript drafting with open panel feedback. The survey process and manuscript development were led by the panel chair (IA), with designated panel members (OG and MJR-L) using the modified Delphi methodology.

Literature review

Clinical gaps were identified from guidelines and evidence-based reviews. A supplementary PubMed / Web of Science search (English or Spanish) using the terms "("nasal septal perforation"[tiab]) OR ("nasoseptal perforation"[tiab]) OR (("septal perforation"[tiab]) AND (nasal[tiab] OR nose[tiab]))" was performed, and the resulting gaps informed the Delphi framework.

Creation of initial set of statements

Following literature review and panel discussions, an initial set of 67 statements was produced and grouped into 8 areas: 1) Assessment, 2) Pathophysiology and Causes, 3) Position, 4) Dimensions, 5) Non-Surgical treatment, 6) Surgical treatment, 7) Follow up and Results and 8) Quality of life.

Delphi method

The Delphi method was employed to capture expert opinion, ensuring equal input while minimizing potential bias [19,20]. Panel members rated agreement on a 5-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = neutral; 4= agree; 5= strongly agree). Consensus was defined a priori as ≥70% agreement (agree/strongly agree) with ≤10% strongly disagree, or ≥70% disagreement (disagree/strongly disagree) with ≤10% strongly agree. Surveys were distributed via Google Forms (Google LLC, Mountain View, CA, USA). All items required mandatory completion, and included a free-text field for justification/ comments. Email addresses were collected for follow-up, and responses were anonymised. All panelists completed all rounds.

Our Delphi process comprised three rounds, with statement refinement between rounds based on panel feedback. Outcomes and statement flow are summarized in Figure 1. Statement

Table 1. Delphi results for statements on nasal septal perforation categorised by assessment; physiopathology and causes; position; dimensions; non-surgical treatment; surgical treatment, follow-up and results; and quality of life.

#	Statement	Mode	Median	Range	Agree (%)	Strongly agree (%)	Strongly disagree (%)
	ASSESSMENT						
1	It is important to determine whether a nasal septal perforation is symptomatic or asymptomatic	5	5	4-5	4	96	0
2	The NOSE-perf is a useful tool in the assessment of NSP symptomatology	5	4	2-5	41.7	45.8	0
3	The Visual Analogue Scale (VAS) is a valuable instrument for assessing the global severity of NSP, categorized as mild (<3), moderate (3–7), and severe (>7).	4	4	2-5	45.8	33.3	0
4	Crusting is a relevant finding in the nasal examination of NSP	5	5	4-5	33.3	66.7	0
5	Scarring/Squamous metaplasia is a relevant finding in the nasal examination of NSP	4	4	3-5	54.2	29.2	0
6	Granulation is a relevant finding in the nasal examination of NSP	4	4	2-5	45.8	37.5	0
7	Edema is a relevant finding in the management of nasal septal perforation	4 / 5	4	4-5	36	36	0
8	Nasal mucosa ulceration is a relevant finding in the physical exploration of NSP	5	5	2-5	24	72	0
9	It is important to assess saddle nose deformity in patients with nasal septal perforation	5	5	4-5	8	92	0
10	The presence of septal deformity is a relevant finding in the nasal examination of NSP	5	5	2-5	12.5	62.5	0
11	The assessment of osseocartilaginous support is an important part of the clinical examination	5	5	4-5	12.5	87.5	0
12	In the clinical assessment of NSP, vasoconstrictors can be used to improve visibility	5	5	3-5	29.2	58.3	0
13	Serology tests should be included in the clinical assessment of NSP when the history or clinical examination reveals suspicious findings or when the aetiology is idiopathic	5	5	2-5	16.7	75	0
14	In routine NSP evaluation, the initial clinical assessment does not typically include fungal, mycobacterial nor bacterial cultures unless there is a clinical suspicion based on symptoms or examination findings.	5	5	2-5	37.5	58.3	0
15	In the absence of clinical suspicion for neoplasia or inflammatory disorders, a biopsy is generally not necessary in the evaluation of NSP. However, it may be considered in cases with atypical features or uncertain aetiology.	5	5	2-5	33.3	62.5	0
16	In cases of suspicion of intranasal drug use, drug testing should be conducted before considering any surgical treatment	5	5	2-5	8.3	75	0
17	Computed tomography is part of the initial assessment of a NSP	5	4	1-5	33.3	45.8	4.2
18	Olfactory tests, including Threshold, Discrimination, and Identification assessments, are not routinely part of the initial evaluation of NSP. However, they may be considered in cases where patients report olfactory dysfunction.	4 / 5	4.5	4-5	50	50	0
19	Computational fluid dynamics (CFD) tests are not typically part of the initial assessment of NSP. However, they can be used for research purposes.	5	5	4-5	25	75	0
20	Trigeminal sensitivity tests are not typically part of the initial assessment of NSP. They may be considered if there are concerns about neurological involvement or nerve damage.	5	4	1-5	33.3	41.7	4.2
	PATHOPHYSIOLOGY AND CAUSES						
1	Excoriation, ischemia and ulceration of the mucosa, over time can result in a septal perforation	5	5	2-5	29.2	54.2	0

#	Statement	Mode	Median	Range	Agree (%)	Strongly agree (%)	Strongly disagree (%)
	ASSESSMENT						
2	Regardless of aetiology, nose picking, driven by nasal crusting, is a factor in the pathogenesis (between ulceration and perforation) of NSP.	5	4.5	2-5	25	50	0
3	Nose picking can be a factor in enlargement of NSP.	5	5	2-5	20.8	70.8	0
4	Nose picking alone may not explain why most NSP are in the anterior portion	4	4	2-5	45.8	37.5	0
5	Rhinotillexomania (compulsive nose picking) could be considered as a form of nasal septum trauma.	5	5	4-5	45.8	54.2	0
6	In addition to the seven groups, an additional group could be included for idiopathic NSP	5	4	1-5	33.3	41.7	4.2
7	Pathophysiology of NSP	4	4	2-5	45.8	33.3	0
8	Causes Chart	5	4	2-5	37.5	45.8	0
9	Pathophysiologic Progression from Nasal Septal Excoriation to Perforation	5	5	2-5	40	60	0
	POSITION						
1	Distinguishing between an anterior and posterior NSP is clinically important	5	5	3-5	20.8	70.8	0
2	Distinguishing between an anterior and posterior NSP is surgically important.	5	5	3-5	8.3	83.3	0
3	The exit of the incisive canal (nasopalatine canal) could serve as a helpful landmark for distinguishing between an anterior and posterior NSP from both clinical and radiological perspective	4	4	3-5	50	25	0
4	NSP position is considered anterior when its posterior border lies in front of an imaginary line drawn from the posterior border of the incisive canal to the nasion, as assessed radiologically	4	4	3-5	50	33.3	0
5	It is surgically relevant to differentiate between a superior and an inferior NSP	4	4	1-5	41.7	37.5	4.2
	DIMENSIONS						
1	The best way to measure the size of a NSP clinically is by using a surgical ruler under endoscopy	5	4	2-5	41.7	45.8	0
2	The anteroposterior diameter (cm) of the NSP is an important measurement during the radiological assessment	4	4	3-5	50	45.8	0
3	The craniocaudal diameter (cm) of the NSP is an important measurement during the radiological assessment	5	4.5	3-5	41.7	50	0
4	NSP area (cm^2) can be a useful measurement in the radiological assessment for research purposes; however, an approximate elliptic area may be easier to assess in clinical practice	4	4	2-5	54.2	33.3	0
5	It would be beneficial to have a single classification to help differentiate between small, medium, and large NSPs.	5	5	2-5	16.7	75	0
	NON-SURGICAL TREATMENT						
1	Medical treatment should be offered before considering surgical treatment	5	5	2-5	33.3	54.2	0
2	Nasal septal buttons are not a first line treatment; however, they can be considered in patients who are not candidates for surgery	4	4	2-5	50	29.2	0
	SURGICAL TREATMENT						
1	The patient's preferences should always take precedence when considering the surgical closure of a NSP	5	4	1-5	41.7	45.8	8.3
2	Providing mucosal coverage on both sides of the repair is advisable	5	4	2-5	29.2	45.8	0
3	Contralateral free mucosal grafts or interposition grafts can be utilized with pedicled flap repair in selected cases.	4	4	2-5	50	33.3	0
4	In patients with NSP associated with a valve defect or dorsal nasal deformity (saddle nose), it is recommended to address all issues surgically at the same time	4	4	1-5	41.7	29.2	4.2

#	Statement	Mode	Median	Range	Agree (%)	Strongly agree (%)	Strongly disagree (%)
	ASSESSMENT						
5	The use of oral antibiotics during the postoperative time is advisable.	4	4	3-5	70.8	25	0
6	Silicone splints should be placed on both sides of the nasal septum for at least two weeks following surgery.	5	5	2-5	25	54.2	0
7	Abstinence from intranasal drug use is necessary prior to attempting surgical closure of a nasal septal perforation	5	5	2-5	4	96	0
	FOLLOW UP AND RESULTS						
1	The minimum follow-up time after surgical closure to determine therapeutic success should be at least 6 months	4	4	3-5	50	37.5	0
2	The term ``reperforation´´ could be used if, after surgical success (closure for at least 3 or 6 months) a NSP reopens	4	4	2-5	62.5	29.2	0
3	Therapeutic success includes both clinical and surgical success. In this way, after 6 months of follow-up, the possible results could be grouped into:						
–	Complete success (Closed without symptoms)						
–	Clinical success without surgical success (Perforated/Partially closed without symptoms)						
–	Surgical success without clinical success (Closed with symptoms)						
–	No clinical or surgical success (Perforated/Partially closed with symptoms)	5	4.5	2-5	37.5	50	0
	QUALITY OF LIFE						
1	The NOSE-perf questionnaire is a useful tool in the assessment of the impact on quality of life in patients with NSP	4	4	3-5	50	37.5	0
2	A visual analogue scale (VAS) for disease severity is a useful tool in the assessment of the impact on quality of life in patients with NSP	4	4	3-5	58.3	20.8	0
3	Although SNOT-22 is not a specific questionnaire to assess quality of life in patients with NSP, it is a valuable instrument for evaluating the emotional/functional factors caused by the NSP	4	4	3-5	62.5	20.8	0

evolution is detailed in the Supplementary Material.

Results

A total of 56 statements, grouped into 8 categories: assessment, physiopathology & causes, position, dimensions, non-surgical and surgical treatment, follow-up & results and quality of life, reached final consensus (Table 1). Three statements were excluded because the concepts were already represented within other statements (Supplementary Material). Of the 56 final statements, 22 had a median response of 5 (strongly agree), while the remaining had 4 (agree). Strongly disagree responses were uncommon (<10%).

Discussion

The purpose of this consensus statement is to establish a structured framework for the study of NSP integrating the best available evidence with the collective expertise of the panel. This work aims to improve and standardize the evaluation and treatment outcomes of NSP, while also fostering opportunities for future research and international collaboration. The panel achieved consensus on the vast majority of statements (98.2%) reflecting the strength of recommendations and of overall agreement. Items without consensus warrant further research.

Assessment

Symptoms assessment

NSP can remain asymptomatic in approximately 20% of subjects [16,17], therefore, it is essential to first determine whether the condition is symptomatic. There was a consensus on the NOSE-perf scale [18] and VAS scale to assess disease severity related to NSP. However, a key limitation highlighted in both scales was the absence of an emotional domain, which is considered relevant to patient perception of the perforation and its associated symptoms. No consensus was reached on using the SNOT-22, primarily because it doesn't adequately capture the specific symptoms associated with NSP.

Physical examination

Nasal endoscopy provides important information for determining its aetiology and guiding therapeutic options [19]. Moreover,

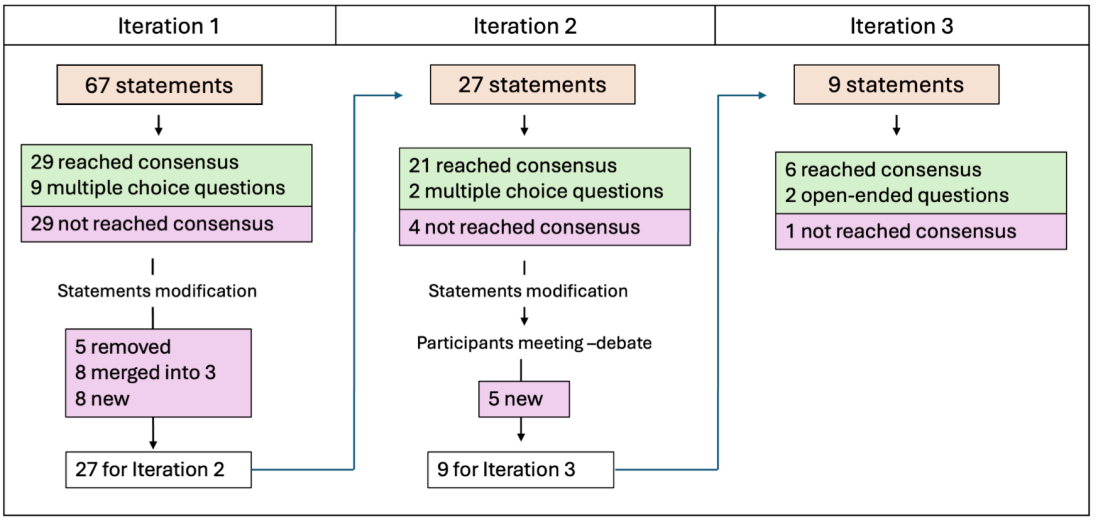


Figure 1. Delphi consensus process flow diagram summarising the number of items included, excluded, merged, or added across the three survey rounds.

NSP appearance has been reported to correlate moderately well with patient-reported symptoms [20]. Consensus was reached that the most relevant findings during the physical examination include crusting, scarring, granulation and septal deformity. Crusting, and its repeated removal, was the finding with the highest level of consensus [21]. Scarring and granulation were recognized as signs of chronic inflammation and parameters of the healing process [20], although their assessment and standardization may be challenging. The presence of oedema reached consensus only in the third iteration with greater controversy. Oedema was considered relevant primarily in the management of NSP, as it may influence donor tissue quality assessment, surgical complexity, and postoperative healing. In the third iteration, nasal mucosa ulceration – defined as full-thickness mucosal damage with exposure of septal cartilage- was also considered a relevant finding.

Septal deformity (deviation) associated with NSP was regarded as an inconsistent finding, relevant mainly in the surgical context. Migliani et al. proposed a clinical grading scale incorporating 5 examination findings - oedema, crusting, scarring, granulation and septal deviation - with acceptable interrater and intrarater reliability [20], scored on a 3-point scale (0-2). Although ulceration is not included, no other scale has been described to date. Assessment of osseocartilaginous remnants and saddle nose deformity was also considered important when evaluating septal involvement and surgical options. Vasoconstrictors were agreed to improve visibility, while no consensus was achieved regarding their use for patients' comfort and nasal swell body assessment.

Complementary testing

Laboratory workup of NSP should be guided by the clinical scenario. Serological testing was considered warranted when history or examination suggests suspicious findings, or when the aetiology is idiopathic. Routine fungal, mycobacterial, or bacterial cultures were not recommended unless clinical suspicion exists. Biopsies were considered often nonspecific and rarely useful for patient management [22]; therefore, in the absence of clinical suspicion for neoplasia or inflammatory disorders, biopsy was not recommended in routine NSP management. In cases of suspected intranasal drug use, drug testing should be conducted before considering surgery. In relation to how to rule out NSP secondary to drug use, the approach most frequently described by the panel was urine testing (79.2%), followed by direct patient questioning (70.8%), blood (25%), and hair testing (16.7%).

Sinus computed tomography (CT) was considered part of the initial assessment of NSP. Radiological evaluation can provide valuable information about the possible aetiology of NSP and/or help identify other concurrent conditions [23]. Moreover, CT allows for assessment of size and position, and may also be useful in evaluating the status of the osseocartilaginous remnant and the nasal swell body (NSB) [6]. The NSB is particularly relevant as persistent postoperative nasal obstruction has been reported in bipedicle flaps that include the NSB [24]. In patients with NSP, the NSB is generally smaller regardless of the perforation size or aetiology, and tends to be thinner on the ipsilateral side in cases of high septal deviation [25].

Loss of smell has been described in patients with NSP, typically as a mild to moderate problem. However, the panel agreed that olfactory tests should not routinely be part of the initial evaluation and should only be considered when patients report olfactory dysfunction. Computational fluid dynamics (CFD) [26] and trigeminal testing were also not considered as part of the clinical assessment of NSP.

Pathophysiology and Causes

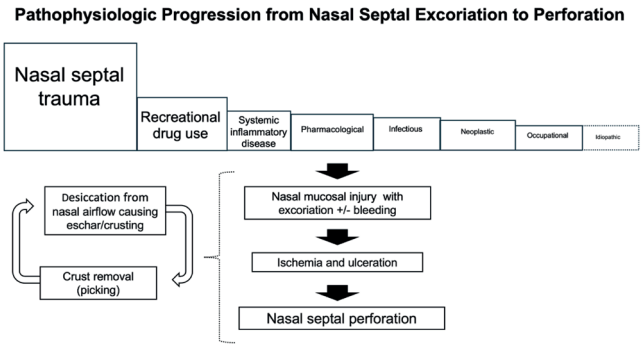


Figure 2. Pathophysiological progression of nasal septal perforation from mucosal excoriation to perforation, illustrating the sequential stages of injury: excoriation, ischaemia, ulceration, and perforation. Crust formation and desiccation contribute to impaired healing and enlargement of the defect. *Crust: Dried exudate (serum, blood, or pus) that forms on the skin surface after fluid from a lesion, blister, or wound dries. **Eschar: thick, dry, black or brown crust of dead tissue that forms on the surface of a wound. *** Desiccation: process of drying out or loss of moisture from tissues, cells, or wounds.

Pathophysiology

Lanier et al. described four pathogenic stages in the pathophysiology of NSP secondary to progressive cartilage inflammation and/or dissolution: excoriation, ischemia, ulceration and perforation [17]. The consensus on the pathophysiologic progression of nasal perforation is based on Lanier's NSP model (Figure 2). Throughout progression from ulceration to perforation, eschar and crust formation at the wound bed and/or perforation margins may impair mucosal healing through localized inflammation, bacterial colonization, and airflow-related desiccation [27]. In some patients, habitual or obstruction-related crust removal may further disrupt healing and perpetuate the ulceration. The progression from excoriation to perforation is variable and may be influenced by underlying aetiologies and patient behavioural factors. Nose picking was not included as an integral step of the disease progression, as it is not a consistent factor in all patients. However, there was agreement that when present, it may act as an external factor contributing to NSP enlargement.

A different pathophysiology can be considered for NSPs secondary to removal of cartilage and bilateral damage or tearing of the opposing mucosal surfaces on either side of the septum, as occurs in post-surgical perforations. These perforations with well-healed margins without exposed cartilage are often detected in the early postoperative period. Their size, mid to posterior affection, and mucosal margins are also related to this other pathophysiological mechanism [2].

Causes

Multiple causes of NSP have been described, with several classification systems proposed [17,19]. Based on this background, consensus was reached on an 8- category aetiology-based classification (Figure 3). Recently, House et al. proposed a three-category classification system based on the septal condition, distinguishing surgical, diseased and non-surgical/non-diseased perforations. The surgical category includes patients with previous surgery, characterized by septal scarring, obliteration of surgical planes, and attenuated, adherent bilateral mucosa that may negatively impact mucosal elevation [28]. The diseased category refers to perforations associated with active inflammatory mucosa, generalized crusting beyond the perforation margin, mucosal atrophy, history of sinonasal irradiation, or evidence of cartilage inflammation and/or dissolution. Finally, the non-surgical/non-diseased category includes perforations with intact cartilage or at the margin, and healthy surrounding mucosa [2]. As clinical history may not always allow identification of a single cause and multiple factors may coexist, classification based on septal condition provides practical guidance for treatment and expected surgical outcomes. Post-surgical and

Nasal Septum Trauma	Pharmacological	Recreational drug use	Systemic Inflammatory disease	Infectious	Neoplastic	Occupational	
• Nasal trauma (nose picking, blunt trauma9 • Nasal surgery • Rhinotillexomania • Foreign body • Septal hematoma • Hereditary Hemorrhagic Telangiectasia (treatment related) • Chemical cautery • Nasogastric tube • Prolonged nasal intubation.	• Topical Corticosteroids • Bevacizumab • Topical decongestants • Methotrexate	• Cocaine • Ampheta mines	• Granulomatosis with polyangiitis (GPA) • Eosinophilic granulomatosis with polyangiitis (EGPA) • Ulcerative coliti • Behçet disease • Takayasu's arteritis • Sarcoidosis • Lupus • Dermatomyositis • Rheumatoid arthritis • Celiac disease • Crohn's disease • Systemic juvenile idiopathic arthritis • Pyoderma gangrenosum	• Septal abscess • Tuberculosis • Mycobacterium kansasii • Syphilis • Histoplasmosis • Invasive fungal sinusitis • Acquired immune deficiency syndrome • Leprosy	• Squamous cell carcinoma • Lethal midline granuloma-nasal natural killer/T-cell lymphoma • Leukemia and B-cell lymphomas	• Sodium dichromate • Chromic acid • Nickel	Idiopathic

Figure 3. Consensus-based aetiological classification of nasal septal perforation integrating eight major categories.

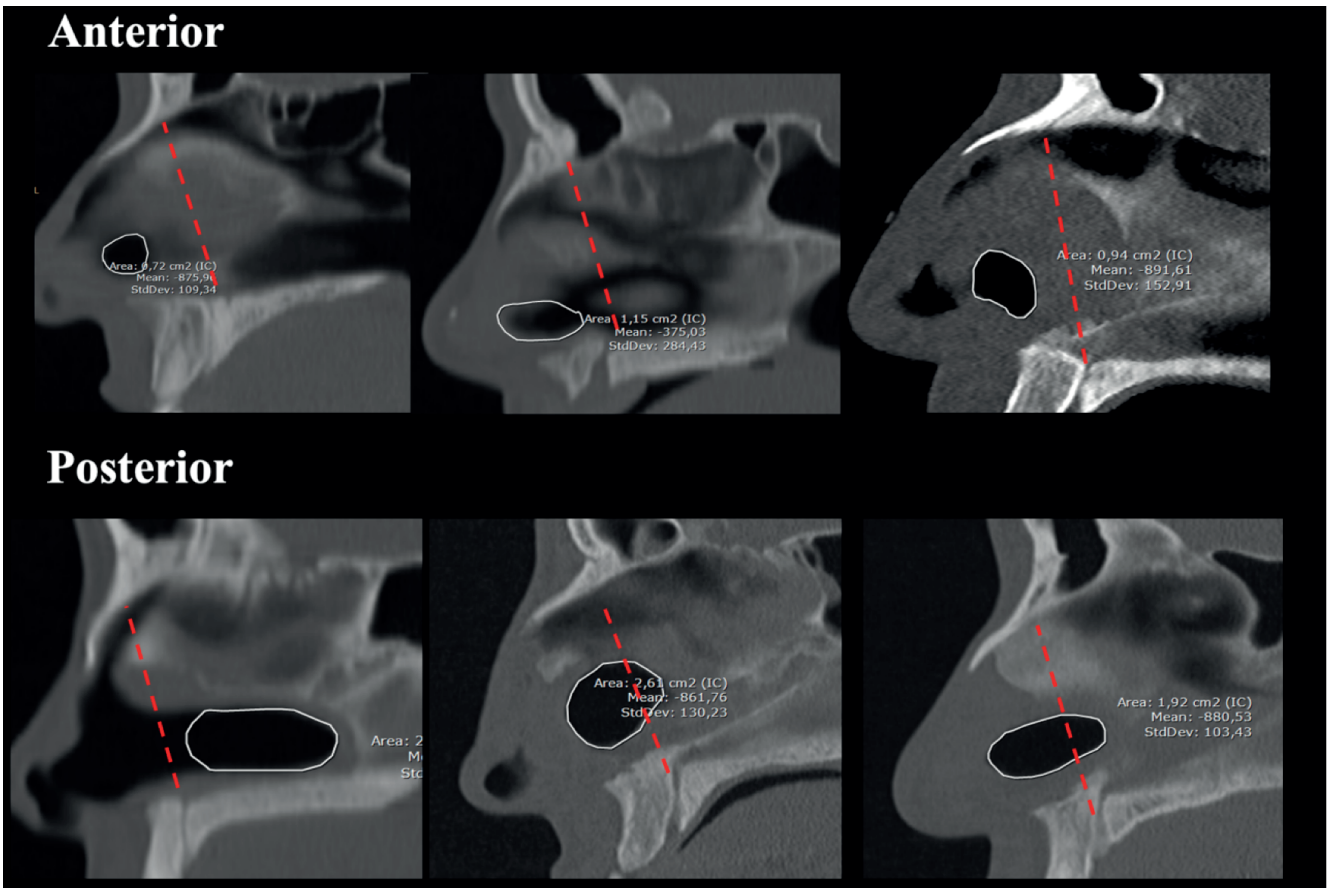


Figure 4. Radiological and anatomical definition of anterior nasal septal perforation. The perforation is considered anterior when its posterior margin lies in front of an imaginary line drawn from the posterior border of the nasopalatine (incisive) canal to the nasion.

diseased perforations are more challenging to repair, whereas non-surgical/non-diseased perforations generally show better healing outcomes. When applying 8-category system, pharmacological, recreational drug use, systemic inflammatory disease, infectious, neoplastic and occupational causes would be classified under the "diseased category" if abnormal or actively diseased mucosa were present at the time of treatment. Idiopathic, non-active disease perforations, and nasal septum trauma (excluding surgical causes) would be assigned to non-surgical/non-diseased category. Rhinotillexomania or compulsive nose picking is identified as a form of nasal septum trauma, different from occasional nose picking.

Position

From a surgical perspective, a distinction between anterior and posterior NSPs has long been recognised, with anterior perforations generally being more symptomatic [29,30]. Although, no unified definition exists, the panel agreed that this distinction is clinically and surgically important.

Consensus was reached that the exit of the nasopalatine canal (NPC) could serve as a helpful landmark for distinguishing between an anterior and posterior NSP, both clinically and radiologically. The NPC is a bony passage whose nasal opening (Stenson foramina) can be visualized endoscopically and is located approximately at 20 mm from the columella and 15 mm from the anterior nasal spine [31–33]. Jacob et al. identified the nasal opening in 94% of 221 nostrils [31]. Radiologically, the NPC can be easily assessed in the sagittal plane, and has also been described as a reference for evaluating the feasibility of a greater palatine artery flap [33]. There was a consensus that a NSP should be considered anterior when its posterior border lies in front of an imaginary line drawn from the posterior border of the NPC to the nasion, as assessed radiologically (Figure 4). This cut-off point coincides with the vascular division proposed by Ribeiro et al, and does not require the use of the lateral wall as a reference point, which may be less accurate [14]. This distinction may influence surgical technique selection.

In distinguishing superior from an inferior NSP, there was consensus regarding its surgical relevance, but not its clinical relevance. However, no agreement was reached on a definitive cutoff point. One third of the panel considered the superior aspect of the inferior turbinate as the reference for the superior margin of the perforation. Further research is needed to clarify whether such a distinction has clinical relevance and how it can

Therapeutic success of NSP surgical closure*
Complete success (Closed without symptoms)
Clinical success without surgical success (Perforated/Partially closed without symptoms)
Surgical success without clinical success (Closed with symptoms)
No clinical or surgical success (Perforated/Partially closed with symptoms)

Figure 5. Consensus-based framework for outcome classification after nasal septal perforation (NSP) repair, integrating both surgical closure and functional success.

be consistently defined.

Dimensions

Most of panel members (86.9%) assess NSP size clinically using the anteroposterior diameter, with measurement of the horizontal length under endoscopic view considered the most accurate method. Radiologically, both anteroposterior diameter and craniocaudal diameter were considered important parameters. The panel agreed that a unified size classification would be beneficial, with the system proposed by Davis et al. being the most widely referenced: Small (<1cm), Medium ($1 \leq x < 2$ cm), Large ($2 \leq x < 3$ cm) and Subtotal (≥ 3 cm) [34].

More recently, House et al. suggested that vertical height should be considered when classifying NSPs [2], given the predominantly elliptical shape of most perforations and the reliance of mucosal regeneration techniques on vertical height for complete coverage and repair success [35–37]. A vertical height of 1.5 cm or greater should be considered as large higher failure rates with bilateral advancement flaps have been described beyond this cut-off point [38]. Recently, Sapmaz et al. proposed a classification system according to the ratio of the vertical height of the perforation by the total vertical septal height [39]. The panel agreed that radiological NSP area (cm^2) can be useful for research; in clinical practice, an approximate elliptic area may be more practical and easier to apply [37].

Non-surgical treatment

There was a consensus that medical treatment should be offered before considering surgery, although it was acknowledged that medical therapy does not resolve the perforation and that many patients may ultimately prefer surgical management. The aim of medical therapy is to alleviate sinonasal symptoms caused by dryness, crusting and desiccation of the affected area [17,27]. Recommended measures include nasal saline irrigation, nasal ointments, ambient humidification, and avoidance of digital manipulation [19]. Antibiotic-based ointments may be considered in case of co-infection. Despite its role as first-line approach, surgery should be offered upfront in selected situations including younger patients, cartilage exposure, or whistling.

Septal buttons (SB) are temporary prosthetic devices that may provide symptomatic relief in selected patients. Placement can be performed in the office under topic or local anaesthesia, but requires meticulous nasal hygiene due to the risk of complications [40,41]. The panel agreed that SB should not be indicated as first-line treatment, and rather reserved for patients who are surgically adverse or not suitable candidates for surgery.

Surgical treatment

Surgical reconstruction of the nasal septum is considered the definitive treatment of NSPs. Although closure rates exceeding 90% are frequently reported [15,16], anonymous respondents reported lower rates (31-84%) [42], highlighting technical complexity and the potential for publication bias [43].

The panel identified several factors influencing the choice of surgical technique, included NSP location, size, surgeon experience, osseocartilaginous remnants, condition of the mucosal edges and underlying aetiology. Most panel members preferred an endoscopic approach (91.7%) followed by a combined approach (open external and endoscopic). The most common favoured repair techniques were bilateral intranasal mucosal advancement flaps (79%) and unilateral intranasal mucosal rotational or advancement flaps (60%). Most respondents (84%) incorporated an interposition graft and intranasal splints (89%) during repair. The most commonly selected interposition graft was acellular dermis (63%).

There was consensus that contralateral free mucosal grafts or interposition grafts may be utilized in combination with pedicled flap repair in selected cases, and that providing mucosal coverage on both sides of the repair is advisable. In a systematic review, Gravina et al. suggested that the benefit of this approach is related to increased surface area, improved coverage of exposed perichondrium, and reduced wound closure tension [44,45].

Beyond reconstructive approaches, some authors have described techniques aimed solely at improving symptoms without attempting perforation closure. Posterior septectomy [46] and septal perfoplasty [34] follow this principle by removing the posterior septum or slightly enlarging and fully mucosalising the perforation margins, with reported symptomatic benefit in selected patients.

In cases of NSP secondary to intranasal drug use, abstinence prior to surgical repair was considered essential. Regarding the minimum abstinence period, 36% of panellists recommended 6–12 months, while 52% recommended at least 12 months. Regarding postoperative care, there was consensus that oral

antibiotics are advisable during the postoperative period and that silicone splints should be placed on both sides of the nasal septum after surgery. Considerable variability was noted among panellists regarding the duration of splint placement after surgery. The minimum ranged from 4 to 6 days, while the maximum was up to one month. Most panellists (68%) reported leaving silastic sheets in place for 3 to 4 weeks.

Follow up and Results

Currently there is no consensus on the follow-up duration and the definition of surgical success after surgical closure [43]. Clear definitions are essential for standardised postoperative assessment and meaningful comparison across techniques. The panel agreed that a minimum follow-up of 6 months is required to determine therapeutic success, in line with the recommendation by Schultz-Coulon [45]. Persistent or recurrent perforation identified before 6 months postoperatively should be classified as a surgical failure, whereas perforations occurring after documented closure at 6 months should be considered reperforations. The panel agreed that both clinical and surgical outcomes should be considered when defining overall therapeutic success (Figure 5).

Quality of life

There was a consensus that the NOSE-Perf questionnaire [18,47,48] and a visual analogue scale (VAS) for disease severity are valuable tools in the assessment of QoL in patients with NSP. The NOSE-Perf specifically measures NSP-related symptoms, with a maximum score of 48, and has a minimal clinically important difference (MCID) of 4.85 following surgical repair [18]. Its main limitation is the lack of functional and emotional domains; therefore, although no consensus was reached on using the SNOT-22 for assessment, it was agreed to use it as an additional instrument to evaluate the emotional and functional impact of NSP on quality of life. In addition, the revised 15-item Glasgow Benefit Inventory (GBI-5F) has been used to assess postoperative changes in general quality of life after NSP repair [49].

Limitations

Potential bias is inherent to expert opinion methodologies, including selection bias, and regional variations in practice patterns may influence results. Panel size was partly dictated by logistical considerations; however, representation from 15 countries across 4 continents provided diverse perspectives and fostered constructive discussion.

The consensus threshold of at least 70% agreement with no more than 10% strong disagreement was defined a priori and aligns with commonly used Delphi, accounting for the methodological heterogeneity reported in the literature [50]. Although some authors regard 70% as a relatively modest benchmark, the concurrent limit on disagreement was intended to balance agreement level with response dispersion, reducing the risk of apparent consensus in the presence of polarisation. Several important definitions did not reach consensus including the clinical relevance and the definition of superior versus inferior perforations, the optimal period of abstinence from intranasal drug use prior to surgical intervention, the duration of splint placement after surgery, and the necessity and timing of postoperative debridement. These topics warrant further investigation and prospective studies.

Conclusion

The International Consensus on NSP represents a major step toward the standardization of NSP evaluation and management. Our findings underscore the importance of validated assessment tools, structured classification systems, and individualized treatment approaches. The high level of agreement achieved across a diverse international panel reflects the shared clinical experience and common challenges in NSP management, while areas of persistent debate highlight the complexity of the condition and the need for further research. Collectively, this consensus provides a robust framework for prospective studies, guideline refinement, and international collaboration to improve clinical decision-making and patient outcomes.

Abbreviations

ACT: Asthma Control Test; CRS: Chronic Rhinosinusitis; CRSwNP: Chronic Rhinosinusitis with Nasal Polyps; ENT: Ear, Nose, Throat; EPOS: European Position Paper on Rhinosinusitis and Nasal Polyps; EUFOREA: European Forum for Research and Education in Allergy and Airway Diseases; IL: Interleukin; IQR: Interquartile Range; AQLQ: Asthma Quality of Life Questionnaire; MCID : Minimal Clinically Important Difference; N-ERD: NSAID Exacerbated Respiratory Disease; NSAID: Non-Steroidal Anti-Inflammatory Drugs; QoL: Quality of Life; SD: Standard Deviation; SNOT-22: 22 Item Sino Nasal Outcome Test; Th: T-Helper Cell; TPS: Total Polyp Score; VAS: Visual Analogue Score.

Acknowledgments

The authors have no acknowledgments to declare.

Author contributions

The study was conceived by IA and MJR-L. The Delphi process and manuscript development were led by IA, with OG and MJR-L coordinating and executing the modified Delphi methodology. All authors participated as panel members, completed the Delphi rounds, critically reviewed the manuscript, and approved the final version. RH and CH acted as senior authors.

Conflict of interest

IA: reports grants, royalties or license, consulting fees, payment for lectures, participation to advisory board from AstraZeneca, Novartis, Sanofi, Salvat, Menarini, Roche, GSK, MSD, Galenus health, Viatris, Olympus, Storz, Metronic, payment for expert testimony from Teladoc. CH: reports payment for lectures, participation to advisory board from AstraZeneca, Sanofi, GSK, Medtronic. RH: is a consultant/advisory board with Medtronic, Sanofi, Novartis, GSK and Viatris. Research grant funding received from Glaxo-Smith-Kline, Sanofi and Stallergenes. He has been on the speakers' bureau for Proctor and Gamble, Glaxo-Smith-Kline, Astra-Zeneca, Viatris and Seqirus. SA: Received honoraria from Sanofi, GSK and AstraZeneca for lectures and advisory board activities. AJP: is consultant/advisory board with Medtronic, Sanofi, GSK, Astra-Zeneca. He has been on Speaker's Bureau for Medtronic, GSK, Sequiris, Stryker and Storz. He is a chairholder of Chitogel. The remaining authors declare no conflicts of interest.

Funding

No funding was received for this study.

References

1. Taylor CM, Marino MJ, Bansberg SF. Presenting Symptomatology for Patients With Nasal Septal Perforation: Application of the NOSE-Perf Scale. Laryngoscope. 2023;133(6):1315–20.
2. House T, Miglani A, Marino MJ, Bansberg SF. Nasal septal perforation surgical repair study methodology: A state of the art review. Otolaryngol Head Neck Surg. 2025;173(3):575–85.
3. Na Y, Kwon KW, Jang YJ. Impact of the location of nasal septal deviation on the nasal airflow and air conditioning characteristics. Facial Plast Surg. 2023;39(4):393–400.
4. Oberg D, Akerlund A, Johansson L, Bende M. Prevalence of nasal septal perforation: the Skövde population-based study. Rhinology. 2003;41(2):72–5.
5. Gold M, Boyack I, Caputo N, Pearlman A. Imaging prevalence of nasal septal perforation in an urban population. Clin Imaging. 2017;43:80–2.
6. Garaycochea O, Santamaría-Gadea A, Alobid I. State-of-the-art: septal perforation repair. Curr Opin Otolaryngol Head Neck Surg. 2023;31(1):11–6.
7. Meller C, Choroomi S. The history of facial plastic surgeons. Aust J Otolaryngol. 2024;7:0–0.
8. Alberti FB. Harold Gillies and the battleground of surgical innovation. Lancet. 2022;399(10341):2094–5.
9. Gollom J. Perforation of the nasal septum: The reverse flap technique. Arch Otolaryngol Head Neck Surg. 1968;88(5):518–22.
10. Fairbanks DNF. Closure of Nasal Septal Perforations. Arch Otolaryngol Head Neck Surg. 1980;106(8):509–13.
11. Kridel RW, Appling WD, Wright WK. Septal perforation closure utilizing the external septorhinoplasty approach. Arch Otolaryngol Head Neck Surg. 1986;112(2):168–72.
12. Schultz-Coulon HJ. Experiences with the bridge-flap technique for the repair of large nasal septal perforations. Rhinology. 1994;32(1):25–33.
13. Pedroza F, Patrocinio LG, Arevalo O. A review of 25-year experience of nasal septal perforation repair. Arch Facial Plast Surg. 2007;9(1):12–8.
14. Ribeiro JS, da Silva GS. Technical advances in the correction of septal perforation associated with closed rhinoplasty. Arch Facial Plast Surg. 2007;9(5):321–7.
15. Gravina A, Pai KK, Shave S, Eloy JA, Fang CH. Endoscopic Techniques for Nasal Septal Perforation Repair: A Systematic Review. Ann Otol Rhinol Laryngol. 2023;132(5):527–35.
16. Fermin JM, Bui R, McCoul E, et al. Surgical repair of nasal septal perforations: A systematic review and meta-analysis. Int Forum Allergy Rhinol. 2022;12(9):1104–19.
17. Lanier B, Kai G, Marple B, Wall GM. Pathophysiology and progression of nasal septal perforation. Ann Allergy Asthma Immunol. 2007;99(6):473–9; quiz 480–1, 521.
18. Taylor CM, Bansberg SF, Marino MJ. Validated Symptom Outcomes Following Septal Perforation Repair: Application of the NOSE-Perf Scale. Laryngoscope. 2024;134(7):3067–72.
19. Pereira C, Santamaría A, Langdon C, López-Chacón M, Hernández-Rodríguez J, Alobid I. Nasoseptal Perforation: from Etiology to Treatment. Curr Allergy Asthma Rep. 2018;18(1):5.
20. Miglani A, Rangel I, Smith C, Bansberg SF, Lal D, Marino MJ. Assessment of a novel tool for the clinical grading of nasal septal perforation. Laryngoscope. 2024;134(7):3049–53.
21. Lindemann J, Reichert M, Kröger R, Schuler P, Hoffmann T, Sommer F. Numerical simulation of humidification and heating during inspiration in nose models with three different located septal perforations. Eur Arch Otorhinolaryngol. 2016;273(7):1795–800.
22. Murray A, McGarry GW. The clinical value of septal perforation biopsy. Clin Otolaryngol Allied Sci. 2000;25(2):107–9.
23. Bhattacharyya N. Clinical symptomatology and paranasal sinus involvement with nasal septal perforation. Laryngoscope. 2007;117(4):691–4.
24. Ghorab S, Taylor CM, Bansberg SF. The nasal swell body and septal perforation repair. Laryngoscope. 2020;130(12):2795–801.
25. Brake DA, Snider S, Miglani A, Hamilton GS, Bansberg SF. Nasal Swell Body Characteristics in Patients With Septal Perforation. OTO Open. 2023;7(1):e43.
26. Na Y, Kwon KW, Jang YJ. Impact of nasal septal perforation on the airflow and air-conditioning characteristics of the nasal cavity. Sci Rep. 2024;14(1):2337.
27. Pless D, Keck T, Wiesmiller KM, Lamche R, Aschoff AJ, Lindemann J. Numerical simulation of airflow patterns and air temperature distribution during inspiration in a nose model with septal perforation. Am J Rhinol. 2004;18(6):357–62.
28. Rusetsky Y, Mokoyan Z, Elumeeva A. Repair of postoperative and recurrent nasal septal perforations using L-strut overlay flap. Eur Arch Otorhinolaryngol. 2022;279(5):2701–5.
29. Khong GC, Leong SC. Correlation of sinonasal symptoms with the size and position of nasal septal perforations. Laryngoscope. 2020;130(12):E715–20.
30. Lindemann J, Rettinger G, Kröger R, Sommer F. Numerical simulation of airflow patterns in nose models with differently localized septal perforations. Laryngoscope. 2013;123(9):2085–9.
31. Jacob S, Zelano B, Gungor A, Abbott D, Naclerio R, McClintock MK. Location and gross morphology of the nasopalatine duct in human adults. Arch Otolaryngol Head Neck Surg. 2000;126(6):741–8.
32. Lake S, Iwanaga J, Kikuta S, Oskouian RJ, Loukas M, Tubbs RS. The incisive canal: A comprehensive review. Cureus. 2018;10(7):e3069.
33. Santamaría-Gadea A, Vaca M, de Los Santos G, Alobid I, Mariño-Sánchez F. Greater palatine artery pedicled flap for nasal septal perforation repair: radiological study and case series. Eur Arch Otorhinolaryngol. 2021;278(6):2115–21.
34. Davis SJ, Morse JC, Kimura KS, et al. Septal perfoplasty for management of symptomatic nasal septal perforation: An alternative to surgical closure. Facial Plast Surg Aesthet Med. 2021;23(2):103–9.
35. Rusetsky Y, Mokoyan Z, Meytel I, Spiranskaya O, Malyavina U. Endoscopic repair of septal perforation in children. Int J Pediatr Otorhinolaryngol. 2020;130:109817.
36. Alobid I, Santamaría-Gadea A, Mariño-

Sánchez F. Endoscopic "Racket-on-Donut" Technique for Large Anterior Nasoseptal Perforations. Laryngoscope. 2024;134(1):143–7.
37. Bansberg SF, House T, Marino MJ, Taylor CM, Miglani A. Nasal septal perforation dimensional analysis. Otolaryngol Head Neck Surg. 2024;171(5):1362–9.
38. Kridel RWH, Delaney SW. Simultaneous septal perforation repair with septorhinoplasty: A 31-year experience. Facial Plast Surg. 2018;34(3):298–311.
39. Sapmaz E, Toplu Y, Somuk BT. A new classification for septal perforation and effects of treatment methods on quality of life. Braz J Otorhinolaryngol. 2019;85(6):716–23.
40. Døsen LK, Haye R. Silicone button in nasal septal perforation. Long term observations. Rhinology. 2008;46(4):324–7.
41. Luff DA, Kam A, Bruce IA, Willatt DJ. Nasal septum buttons: symptom scores and satisfaction. J Laryngol Otol. 2002;116(12):1001–4.
42. Delaney SW, Kridel RWH. Contemporary Trends in the Surgical Management of Nasal Septal Perforations: A Community Survey. Facial Plast Surg. 2019;35(1):78–84.
43. Lindemann J, Goldberg-Bockhorn E, Scheithauer MO, et al. A contemporary review of "realistic" success rates after surgical closure of nasal septal perforations. Auris Nasus Larynx. 2021;48(6):1039–46.
44. Kim S-W, Rhee C-S. Nasal septal perforation repair: predictive factors and systematic review of the literature. Curr Opin Otolaryngol Head Neck Surg. 2012;20(1):58–65.
45. Schultz-Coulon H-J. Three-layer repair of nasoseptal defects. Otolaryngol Head Neck Surg. 2005;132(2):213–8.
46. Otto BA, Li C, Farag AA, et al. Computational fluid dynamics evaluation of posterior septectomy as a viable treatment option for large septal perforations. Int Forum Allergy Rhinol. 2017;7(7):718–25.
47. Taylor CM, Bansberg SF, Marino MJ. Assessing Patient Symptoms Due to Nasal Septal Perforation: Development and Validation of the NOSE-Perf Scale. Otolaryngol Head Neck Surg. 2021;165(5):739–44.
48. Quer-Castells M, Alegre-Edo B, Rojas-Lechuga MJ, Alobid I. Adaptation and validation of the Spanish version of NOSE-Perf questionnaire for septal perforations. Acta Otorrinolaringol Esp. 2024;75(4):231–7.
49. Taylor CM, Marino MJ, Bansberg SF. Septal perforation repair quality of life outcomes using the revised 15-item Glasgow Benefit Inventory. Ann Otol Rhinol Laryngol. 2023;132(12):1550–6.
50. Diamond IR, Grant RC, Feldman BM, et al. Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. J Clin Epidemiol. 2014;67(4):401–9.

Maria Jesus Rojas-Lechuga
Otorhinolaryngology Department
Hospital Clínic de Barcelona
IDIBAPS, University of Barcelona
08036 Barcelona
Spain

Tel: +93 227 54 00 - Ext. 5442
E-mail: mrojas@clinic.cat

Isam Alobid[1,2,*], Octavio Garaycochea[3,*], Maria Jesus Rojas-Lechuga[1], Stephen Bansberg[4], Paolo Castelnuovo[5], John R. Craig[6], Sean Delaney[7], Deniz Hanci[8], Yong Ju Jang[9], Yuri Rusetsky[10], Abdulaziz Alqahtani[11], Saad Alsaleh[12], Juan David Bedoya[13], Claudio Callejas[14], Juan Carlos Ceballos[15], Arturo Cordero[16], Sercan Gode[17], Rohit Gohil[18], Franklin Mariño-Sánchez[19], Andrés Obando[20], Pablo Pegoraro[21], Alkis J. Psaltis[22], Miguel Tepedino[23], Richard Harvey[24, 25,#], Claire Hopkins[26,#]

[1] Rhinology and Skull Base Surgery Unit, ENT Department, Hospital Clinic, IDIBAPS, CIBERES, Universitat de Barcelona, Spain
[2] Centro Médico Teknon. Barcelona, Spain
[3] Department of Otorhinolaryngology, Clínica Universidad de Navarra, Pamplona, Spain
[4] Department of Otolaryngology-Head and Neck Surgery, Mayo Clinic, Phoenix, Arizona, USA
[5] Unit of Otorhinolaryngology, Department of Biotechnology and Life Sciences, University of Insubria, Ospedale di Circolo e Fondazione Macchi, Varese, Italy
[6] Department of Otolaryngology-Head and Neck Surgery, Henry Ford Health, Detroit, MI, USA
[7] Department of Otolaryngology-Head & Neck Surgery, University of Texas Medical Branch in Galveston, Texas, USA
[8] Department of Otorhinolaryngology, University of Health Sciences, Prof. Dr. Cemil Taşcıoğlu City Hospital, Istanbul, Turkey
[9] Department of Otorhinolaryngology-Head and Neck Surgery, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Republic of Korea
[10] Department of Otorhinolaryngology, Central State Medical Academy, Moscow, Russia
[11] Department of Otolaryngology-Head and Neck Surgery, King Fahad Medical City, Riyadh Second Health Cluster, Riyadh, Saudi Arabia

* contributed equally to this work
# contributed equally senior authors

Rhinology 64: 6, 0 - 0, 2026
https://doi.org/10.4193/Rhin26.027

Received for publication:
January 14, 2026
Accepted: July 9, 2026

Associate Editor:
Sietze Reitsma

[12] Security Forces Hospitals Program, General Directorate of Medical Services, Ministry of Interior, Riyadh, Saudi Arabia
[13] Department of Otolaryngology, Universidad de Antioquia, Medellin, Colombia
[14] Department of Otolaryngology, Head and Neck Surgery, The Queen Elizabeth Hospital, South Australia, Australia
[15] Department of Otolaryngology, Centro Médico ABC, Ciudad de México, México
[16] Centro Otorrino, Ciudad de Guatemala, Guatemala
[17] Department of Otolaryngology, Ege University School of Medicine, Izmir, Turkey
[18] Department of Otorhinolaryngology, Head and Neck Surgery, NHS Lothian, Edinburgh, UK
[19] Rhinology and Skull Base Surgery Unit. Otolaryngology Department. Ramon y Cajal University Hospital. Madrid, Spain
[20] Department of Otorhinolaryngology, Hospital México, San José, Costa Rica
[21] Instituto Superior de Otorrinolaringología y Fonoaudiologia, Córdoba, Argentina
[22] Department of Otolaryngology Head and Neck Surgery, Adelaide University and Central Adelaide Health Network, Adelaide, Australia
[23] Skull Base and Rhinology Department, Hospital Universitario Pedro Ernesto, Rio de Janeiro, Brazil
[24] Rhinology and Skull Base research group, Applied Medical Research Centre, University of New South Wales, Sydney, Australia
[25] Faculty of Medicine and Health Science, Macquarie University, Sydney, Australia
[26] Guy's and St Thomas' Hospital NHS Foundation Trust, London, UK

* contributed equally to this work
# contributed equally senior authors

This manuscript contains online supplementary material

The supplementary material provides additional details regarding the Delphi consensus process, including statement evolution across rounds, voting results, and supporting figures illustrating the development of the aetiological classification, pathophysiological models, and medical management strategies discussed by the expert panel.

SUPPLEMENTARY MATERIAL

Materials & Methods

Between Round 1 and Round 2, a total of five items without consensus were removed.

- Use of vasoconstrictors: Items referring to their use for patient comfort and for assessing the nasal swell body were excluded, as consensus was achieved only for their use to improve visibility.
- Definition of anterior NSP position: Three items proposing alternative anatomical reference points (middle turbinate, nasal spine, and anterior ethmoidal artery) were excluded because consensus had already been reached on the definition using the incisive canal as reference.

In addition, eight items were merged into three due to conceptual overlap:

- Quality-of-life assessment: Items on the role of the SNOT-22 for assessment and quality of life were combined.
- Microbiological testing: Items referring to fungal, mycobacterial, and bacterial cultures were consolidated.
- Inferior position of NSP: Items defining the inferior perforation margin by the middle turbinate, inferior turbinate, or nasal floor were merged and reworded.

Eight new items were subsequently added — six derived from panelist comments and two derived from revisions to the pathophysiological model and aetiological classification scheme.

The final number of items included in Round 2 was calculated as follows: 29 (initial non-consensus items) – 5 (removed) – 8 (merged items) + 3 (new merged versions) + 8 (new items) = 27.

Finally, three statements were excluded from the final synthesis because their concepts were already represented in other items:

1. NSP aetiology can be classified as: nasal septum trauma, pharmacological, recreational drug use, systemic inflammatory disease, infectious, neoplastic, and occupational.
2. An additional group could be included for idiopathic NSP.
3. Nasal septal buttons should be trialed before NSP surgery (>70% strongly disagree and disagree).

Table S1. Statements evaluated in the three rounds of the Delphi consensus process on nasal septal perforation (NSP). Each statement shows the mode, median, range, percentage of panelists selecting "agree" or "strongly agree" and the outcome of the item.

Item #	Round	Statement	Mode	Median	Range	Agree (%)	Strongly agree (%)	Strongly disagree (%)	Outcome
1	1	The SNOT-22 is a useful tool in the assessment of NSP symptomatology	4	3.5	1-5	33.3	16.7	4.2	Merged
2	1	The NOSE-perf is a useful tool in the assessment of NSP symptomatology	5	4	2-5	41.7	45.8	0	Consensus
3	1	A visual analogue scale (VAS) of disease severity is a useful tool in the assessment of NSP symptomatology	4	4	2-5	37.5	29.2	0	No consensus
4	1	Crusting is a relevant finding in the nasal examination of NSP	5	5	4-5	33.3	66.7	0	Consensus
5	1	Scarring/Squamous metaplasia is a relevant finding in the nasal examination of NSP	4	4	3-5	54.2	29.2	0	Consensus
6	1	Edema is a relevant finding in the nasal examination of NSP	3 / 4	3.5	2-5	41.7	8.3	0	No consensus
7	1	Granulation is a relevant finding in the nasal examination of NSP	4	4	2-5	45.8	37.5	0	Consensus
8	1	The presence of deviation of the nasal septum is a relevant finding in the nasal examination of NSP	5	5	2-5	12.5	62.5	0	Consensus

Table S1 *continued.*

Item #	Round	Statement	Mode	Median	Range	Agree (%)	Strongly agree (%)	Strongly disagree (%)	Outcome
9	1	Assessment of nasal septum osseocartilaginous support is an important part of the clinical examination	5	5	4-5	12.5	87.5	0	Consensus
10	1	In the clinical assessment of NSP, vasoconstrictors can be used to improve visibility	5	5	3-5	29.2	58.3	0	Consensus
11	1	In the clinical assessment of NSP, vasoconstrictors can be used for patient´s comfort	4	4	1-5	50	16.7	8.3	Excluded (redundant)
12	1	In the clinical assessment of NSP, vasoconstrictors can be used to assess the nasal swell body	4	4	2-5	41.7	25	0	Excluded (redundant)
13	1	Serology tests are part of the initial clinical assessment of NSP	5	4	1-5	25	33.3	4.2	No consensus
14	1	In cases of suspicion of intranasal drug use, drug testing should be conducted before considering any surgical treatment	5	5	2-5	8.3	75	0	Consensus
15	1	In routine NSP evaluation, the initial clinical assessment includes cultures for fungi, (without necessarily having a clinical suspicion)	2	2	1-4	8.3	0	16.7	Merged
16	1	In routine NSP evaluation, the initial clinical assessment includes cultures for mycobacteria, (without necessarily having a clinical suspicion)	2	2	1-4	16.7	0	33.3	Merged
17	1	In routine NSP evaluation, the initial clinical assessment includes cultures for bacteria, (without necessarily having a clinical suspicion)	2	2	1-4	20.8	0	20.8	Merged
18	1	In situations where there is no clinical suspicion of neoplasia or inflammatory disorder, it would be advisable to consider a biopsy	2	2	1-5	8.3	12.5	16.7	No consensus
19	1	Computed tomography is part of the initial assessment of a NSP	5	4	1-5	33.3	45.8	4.2	Consensus
20	1	Olfactory tests are part of the initial assessment of NSP (smell test: Threshold, Discrimination, and Identification)	3	3	1-5	20.8	8.3	4.2	No consensus
21	1	Computational fluid dynamics (CFD) tests are part of the initial assessment of NSP	2	2	1-4	8.3	0	12.5	No consensus
22	1	Trigeminal sensitivity tests are part of the initial assessment of NSP	3	3	1-5	8.3	8.3	4.2	No consensus
23	1	Excoriation, ischemia and ulceration of the mucosa, over time can result in a septal perforation	5	5	2-5	29.2	54.2	0	Consensus
24	1	Regardless of aetiology, nose picking, driven by nasal crusting, is a factor in the pathogenesis (between ulceration and perforation) of NSP.	5	4.5	2-5	25	50	0	Consensus
25	1	Nose picking can be a factor in enlargement of NSP.	5	5	2-5	20.8	70.8	0	Consensus
26	1	Nose picking may explain why most NSP are in the anterior portion	4	3.5	1-5	29.2	20.8	4.2	No consensus
27	1	Patho-aetiology can be classified as: nasal septum trauma, pharmacological, recreational drug use, systemic inflammatory disease, infectious, neoplastic and occupational?	5	5	2-5	33.3	58.3	0	Excluded (redundant with the figure)
28	1	Rhinotillexomania (compulsive nose picking) could be considered as a separate etiology rather than classified as a form of nasal septum trauma	5	4	1-5	29.2	37.5	4.2	No consensus
29	1	In addition to the seven groups, an additional group could be included for idiopathic NSP	5	4	1-5	33.3	41.7	4.2	Consensus
30	1	Distinguishing between an anterior and posterior NSP is clinically important	5	5	3-5	20.8	70.8	0	Consensus
31	1	Distinguishing between an anterior and posterior NSP is surgically important.	5	5	3-5	8.3	83.3	0	Consensus

Item #	Round	Statement	Mode	Median	Range	Agree (%)	Strongly agree (%)	Strongly disagree (%)	Outcome
32	1	The exit of the incisive canal (nasopalatine canal) could serve as a helpful landmark for distinguishing between an anterior and posterior NSP from both clinical and radiological perspective	4	4	3-5	50	25	0	Consensus
33	1	NSP position is considered anterior when its posterior border lies in front of an imaginary line drawn from the posterior border of the incisive canal to the nasion, as assessed radiologically	4	4	3-5	50	33.3	0	Consensus
34	1	NSP position is considered anterior when its posterior border lies in front the middle turbinates assessed radiologically.	3	3	1-5	25	12.5	4.2	Excluded (redundant)
35	1	NSP position is considered anterior when its posterior border lies in front of nasal spine, as assessed endoscopically.	2	2.5	1-5	16.7	8.3	12.5	Excluded (redundant)
36	1	NSP position is considered anterior when its posterior border lies in front of the AEA canal, as assessed radiologically	2	2	1-5	8.3	4.2	12.5	Excluded (redundant)
37	1	It is clinically relevant to differentiate between a superior and an inferior NSP	4	4	2-5	37.5	25	0	No consensus
38	1	It is surgically relevant to differentiate between a superior and an inferior NSP	4	4	1-5	41.7	37.5	4.2	Consensus
39	1	NSP position is considered inferior if part of its upper border is below the middle turbinate (or its projection)	4	4	2-5	37.5	16.7	0	Merged
40	1	NSP position is considered inferior if part of its upper border is below the inferior turbinate top edge	4	3.5	1-5	33.3	16.7	8.3	Merged
41	1	NSP position is considered inferior if any part involves the nasal floor	4	3.5	1-5	33.3	16.7	8.3	Merged
42	1	The best way to measure the size of a NSP clinically is by using a surgical ruler under endoscopy	5	4	2-5	41.7	45.8	0	Consensus
43	1	The anteroposterior diameter (cm) of the NSP is an important measurement during the radiological assessment	4	4	3-5	50	45.8	0	Consensus
44	1	The craniocaudal diameter (cm) of the NSP is an important measurement during the radiological assessment	5	4.5	3-5	41.7	50	0	Consensus
45	1	The area (cm2) of the NSP is an important measurement during the radiological assessment	4	4	2-5	45.8	16.7	0	No consensus
46	1	It would be beneficial to have a single classification to help differentiate between small, medium, and large NSPs.	5	5	2-5	16.7	75	0	Consensus
47	1	Medical treatment should be offered before considering surgical treatment	5	5	2-5	33.3	54.2	0	Consensus
48	1	Nasal Septal buttons could be offered as a treatment option for NSP	4	3	1-5	33.3	8.3	25	No consensus
49	1	Nasal Septal buttons should be trial before NSP surgery	1	2	1-5	4.2	4.2	41.7	No consensus
50	1	Providing mucosal coverage on both sides of the repair is required	2	3	1-5	20.8	20.8	4.2	No consensus
51	1	Contralateral free mucosal grafts can be utilized with pedicled flap repair	4	4	2-5	50	20.8	0	Reworded
52	1	Minimum follow-up time after surgical closure to determine therapeutic success should be at least 3 months?	5	3.5	1-5	20.8	29.2	12.5	No consensus
53	1	Minimum follow-up time after surgical closure to determine therapeutic success should be at least 6 months?	5	4	1-5	25	33.3	4.2	No consensus

Item #	Round	Statement	Mode	Median	Range	Agree (%)	Strongly agree (%)	Strongly disagree (%)	Outcome
54	1	Therapeutic success encompasses both clinical and surgical outcomes. Therefore, after 6 months of follow-up, the potential results could be categorized into: • Complete success (Closed without symptoms) • Clinical success without surgical success (Perforated/Partially closed without symptoms) • Surgical success without clinical success (Closed with symptoms) • No clinical or surgical success (Perforated/Partially closed with symptoms)	5	4.5	2-5	37.5	50	0	Consensus
55	1	The term ``reperforation´´ could be used if, after surgical success (closure for at least 3 or 6 months) a NSP reopens	4	4	2-5	62.5	29.2	0	Consensus
56	1	The SNOT-22 is a useful tool in the assessment of the impact on quality of life in patients with NSP	4	4	2-5	41.7	12.5	0	Merged
57	1	The NOSE-perf questionnaire is a useful tool in the assessment of the impact on quality of life in patients with NSP	4	4	3-5	50	37.5	0	Consensus
58	1	A visual analogue scale (VAS) for disease severity is a useful tool in the assessment of the impact on quality of life in patients with NSP	4	4	3-5	58.3	20.8	0	Consensus
59	2	The Visual Analogue Scale (VAS) is a valuable instrument for assessing the global severity of NSP, categorized as mild (<3), moderate (3–7), and severe (>7).	4	4	2-5	45.8	33.3	0	Consensus
60	2	Edema is not a clinically relevant finding in the nasal examination of NSP unless an underlying inflammatory or infectious component is present.	4	4	1-5	45.8	16.7	4.2	No consensus
61	2	Serology tests should be included in the clinical assessment of NSP when the history or clinical examination reveals suspicious findings or when the etiology is idiopathic	5	5	2-5	16.7	75	0	Consensus
62	2	In routine NSP evaluation, the initial clinical assessment does not typically include fungal, mycobacterial nor bacterial cultures unless there is a clinical suspicion based on symptoms or examination findings.	5	5	2-5	37.5	58.3	0	Consensus
63	2	In the absence of clinical suspicion for neoplasia or inflammatory disorders, a biopsy is generally not necessary in the evaluation of NSP. However, it may be considered in cases with atypical features or uncertain etiology.	5	5	2-5	33.3	62.5	0	Consensus
64	2	21. Olfactory tests, including Threshold, Discrimination, and Identification assessments, are not routinely part of the initial evaluation of NSP. However, they may be considered in cases where patients report olfactory dysfunction.	4 / 5	4.5	4-5	50	50	0	Consensus
65	2	Computational fluid dynamics (CFD) tests are not typically part of the initial assessment of NSP. However, they can be used for research purposes.	5	5	4-5	25	75	0	Consensus
66	2	Trigeminal sensitivity tests are not typically part of the initial assessment of NSP. They may be considered if there are concerns about neurological involvement or nerve damage.	5	4	1-5	33.3	41.7	4.2	Consensus
67	2	Physiopathology of NSP	4	4	2-5	45.8	33.3	0	Consensus
68	2	Causes Chart	5	4	2-5	37.5	45.8	0	Consensus
69	2	Nose picking alone may not explain why most NSP are in the anterior portion	4	4	2-5	45.8	37.5	0	Consensus
70	2	Rhinotillexomania (compulsive nose picking) could be considered as a form of nasal septum trauma.	5	5	4-5	45.8	54.2	0	Consensus

Item #	Round	Statement	Mode	Median	Range	Agree (%)	Strongly agree (%)	Strongly disagree (%)	Outcome
71	2	It is not clinically relevant to differentiate between a superior and an inferior NSP	4	3	1-5	33.3	8.3	12.5	No consensus
72	2	NSP area (cm^2) can be a useful measurement in the radiological assessment for research purposes; however, an approximate elliptic area may be easier to assess in clinical practice	4	4	2-5	54.2	33.3	0	Consensus
73	2	Nasal septal buttons are not a first line treatment; however, they can be considered in patients who are not candidates for surgery	4	4	2-5	50	29.2	0	Consensus
74	2	Providing mucosal coverage on both sides of the repair is advisable	5	4	2-5	29.2	45.8	0	Consensus
75	2	Contralateral free mucosal grafts or interposition grafts can be utilized with pedicled flap repair in selected cases.	4	4	2-5	50	33.3	0	Consensus
76	2	The minimum follow-up time after surgical closure to determine therapeutic success should be at least 6 months	4	4	3-5	50	37.5	0	Consensus
77	2	Although SNOT-22 is not a specific questionnaire to assess quality of life in patients with NSP, it is a valuable instrument for evaluating the emotional/functional factors caused by the NSP	4	4	3-5	62.5	20.8	0	Consensus
78	2	The patient's preferences should always take precedence when considering the surgical closure of a NSP	5	4	1-5	41.7	45.8	8.3	Consensus
79	2	In patients with NSP associated with a valve defect or dorsal nasal deformity (saddle nose), it is recommended to address all issues surgically at the same time	4	4	1-5	41.7	29.2	4.2	Consensus
80	2	A six-month period of abstinence is advised for patients with NSP due to intranasal drug use before considering surgical intervention.	4	4	1-5	41.7	25	4.2	No consensus
81	2	Silicone splints should be placed on both sides of the nasal septum for at least two weeks following surgery.	5	5	2-5	25	54.2	0	Consensus
82	2	The use of oral antibiotics during the postoperative time is advisable.	4	4	3-5	70.8	25	0	Consensus
83	2	At least one to two postoperative debridements should be performed within the first month following surgery.	4	4	2-5	37.5	20.8	0	No consensus
84	3	It is important to determine whether a nasal septal perforation is symptomatic or asymptomatic	5	5	4-5	4	96	0	Consensus
85	3	It is important to assess saddle nose deformity in patients with nasal septal perforation	5	5	4-5	8	92	0	Consensus
86	3	Edema is a relevant finding when evaluating the etiology of nasal septal perforation	4	4	2-5	40	28	0	No consensus
87	3	Edema is a relevant finding in the management of nasal septal perforation	4 / 5	4	4-5	36	36	0	Consensus
88	3	Nasal mucosa ulceration is a relevant finding in the physical exploration of NSP	5	5	2-5	24	72	0	Consensus
89	3	Pathophysiologic Progression from Nasal Septal Excoriation to Perforation (Chart)	5	5	2-5	40	60	0	Consensus
90	3	Abstinence from intranasal drug use is necessary prior to attempting surgical closure of a nasal septal perforation	5	5	2-5	4	96	0	Consensus

Abbreviations: NSP = nasal septal perforation; VAS = Visual Analogue Scale; SNOT-22 = Sino-Nasal Outcome Test-22; NOSE-Perf = Nasal Obstruction Symptom Evaluation–Perforation questionnaire; CFD = Computational Fluid Dynamics; AEA = Anterior Ethmoidal Artery.

Nasal Septum Trauma	Pharmacological	Recreational drug abuse	Systemic Inflammatory disease	Infectious	Neoplastic	Occupational
• Nasal surgery • Nasal trauma • Rhinotillexomania (compulsive nose picking) • Foreign body	• Bevacizumab • Methotrexate • Topical decongestants • Topical Corticoids	• Cocaine	• Wegener • Ulcerative coliti • Behçet disease • Takayasu's arteritis • Sarcoidosis • Lupus • Dermatomyositis • Rheumatoid arthritis • Celiac disease • Crohn's disease • Systemic juvenile idiopathic arthritis • Pyoderma gangrenosum	• Tuberculosis • Mycobacterium kansasii • Syphilis • Histoplasmosis • Invasive fungal sinusitis • Acquired immune deficiency syndrome • Leprosy	• Squamous cell carcinoma • Lethal midline granuloma-nasal natural killer/T-cell lymphoma • Leukemia and B-cell lymphomas	• Sodium dichromate • Chromic acid • Nickel

Figure S1. Proposed aetiological classification of nasal septal perforation evaluated during the first Delphi iteration. Panelists evaluated a proposed aetiological classification comprising seven major categories: nasal septum trauma, pharmacological causes, recreational drug use, systemic inflammatory disease, infectious causes, neoplastic causes, and occupational causes. An additional statement proposed the inclusion of an eighth category for idiopathic nasal septal perforation (NSP), acknowledging that some perforations remain without an identifiable cause despite comprehensive clinical investigation. Consensus was achieved for the inclusion of an idiopathic category in the final classification system.

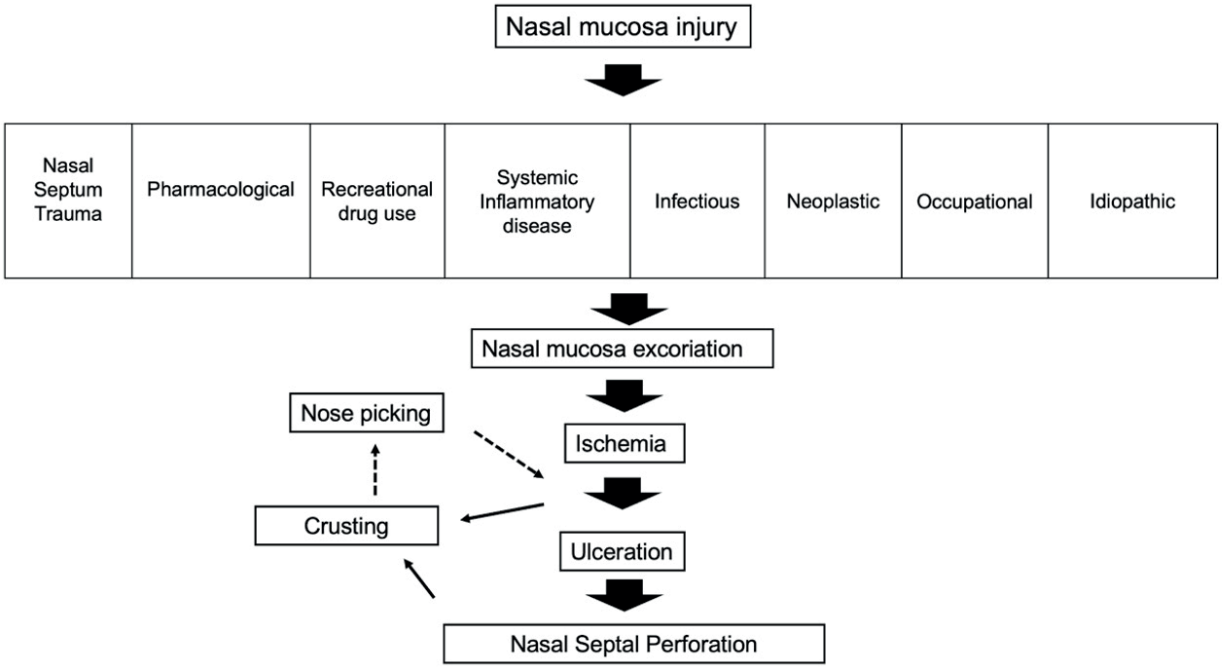


Figure S2. Proposed pathophysiological model of nasal septal perforation evaluated during the second Delphi iteration. Panelists evaluated a schematic representation of the proposed mechanisms involved in NSP development. The model illustrates how different aetiological factors may converge into a common pathway of mucosal injury, ulceration, and perforation.

Nasal Septum Trauma	Pharmacological	Recreational drug use	Systemic Inflammatory disease	Infectious	Neoplastic	Occupational
• Nasal surgery • Nasal trauma • Rhinotillexomania • Foreign body • Septal hematoma • Hereditary Hemorrhagic Telangiectasia • Chemical cautery • Nasogastric tube • Prolonged nasal intubation.	• Bevacizumab • Methotrexate • Topical decongestants • Topical Corticoids	• Cocaine • Amphetamines	• Granulomatosis with polyangiitis (GPA) • Eosinophilic granulomatosis with polyangiitis (EGPA) • Ulcerative coliti • Behçet disease • Takayasu's arteritis • Sarcoidosis • Lupus • Dermatomyositis • Rheumatoid arthritis • Celiac disease • Crohn's disease • Systemic juvenile idiopathic arthritis • Pyoderma gangrenosum	• Septal abscess • Tuberculosis • Mycobacterium kansasii • Syphilis • Histoplasmosis • Invasive fungal sinusitis • Acquired immune deficiency syndrome • Leprosy	• Squamous cell carcinoma • Lethal midline granuloma-nasal natural killer/T-cell lymphoma • Leukemia and B-cell lymphomas	• Sodium dichromate • Chromic acid • Nickel

Figure S3. Proposed causes chart of nasal septal perforation evaluated during the second Delphi iteration. This diagram summarises the aetiological categories considered during the Delphi process and the representative conditions included within each category. The chart was used to facilitate discussion and refinement of the proposed classification system.

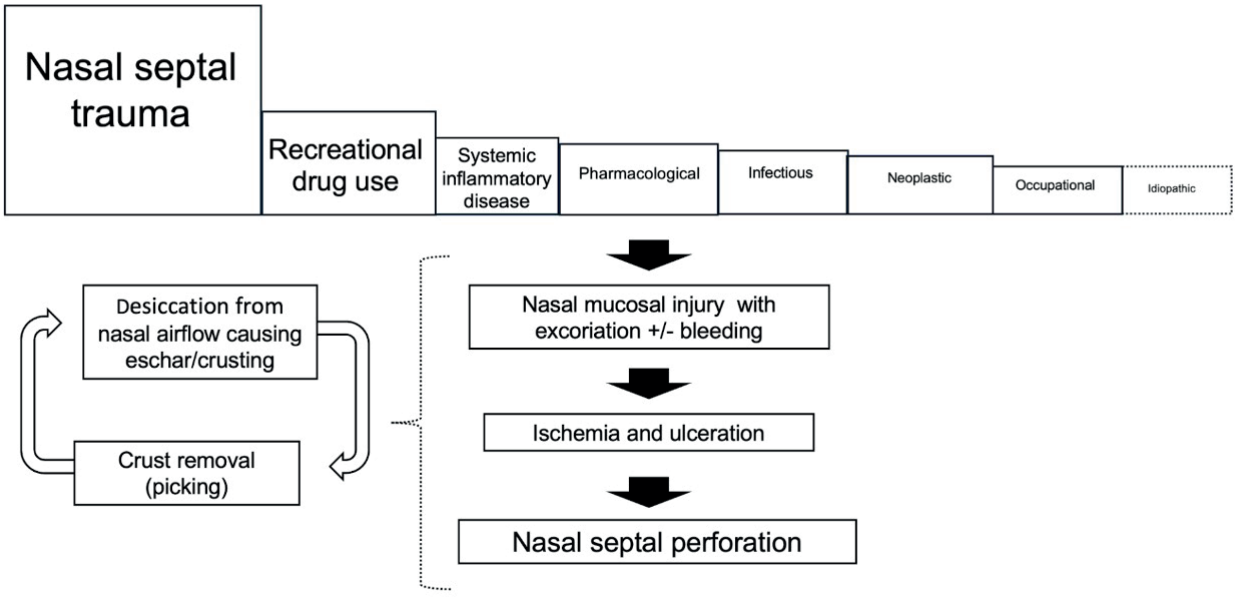


Figure S4. Pathophysiological progression from nasal septal excoriation to perforation evaluated during the third Delphi iteration. Following refinement of the initial framework, a revised schematic was presented during the third Delphi iteration. The model illustrates the progression from excoriation to ischaemia, ulceration, and perforation, while highlighting the potential contribution of crust formation, desiccation, and repetitive digital manipulation to disease progression and enlargement of established perforations.

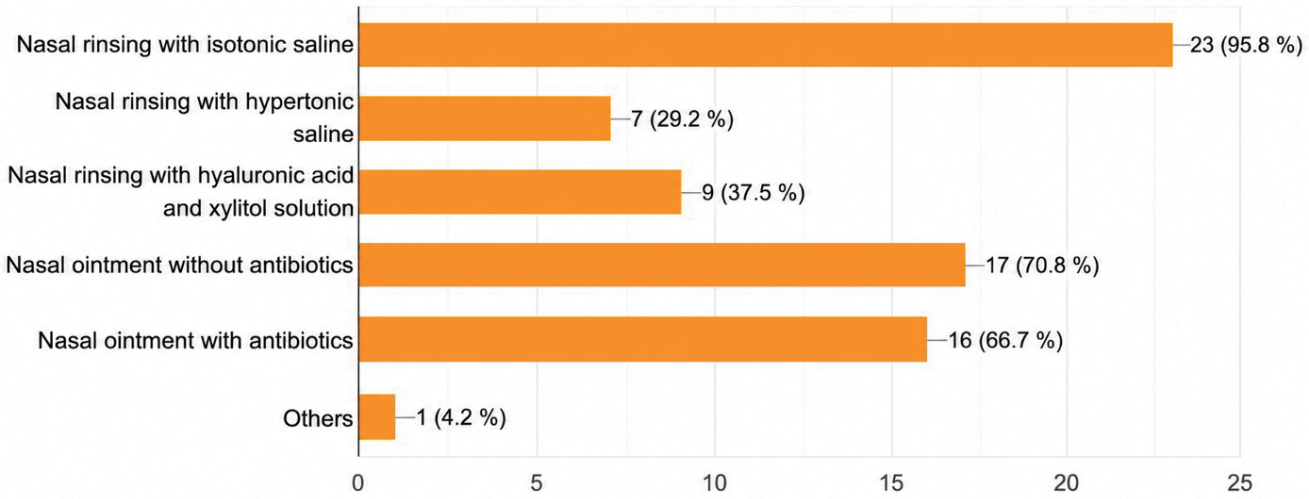


Figure S5. Medical therapies reported by Delphi panelists for the conservative management of nasal septal perforation. Distribution of medical therapies reported by Delphi panelists for the conservative management of nasal septal perforation (NSP). Values represent the number and percentage of experts selecting each treatment option. Multiple responses were permitted. Conservative management strategies varied among panelists. Isotonic saline irrigation was the most frequently reported treatment (95.8%), followed by non-antibiotic nasal ointments (70.8%) and antibiotic nasal ointments (66.7%). Hypertonic saline irrigation (29.2%) and solutions containing hyaluronic acid and xylitol (37.5%) were used less frequently. These data were collected as descriptive survey information to characterise current practice patterns and were not subjected to formal consensus voting.

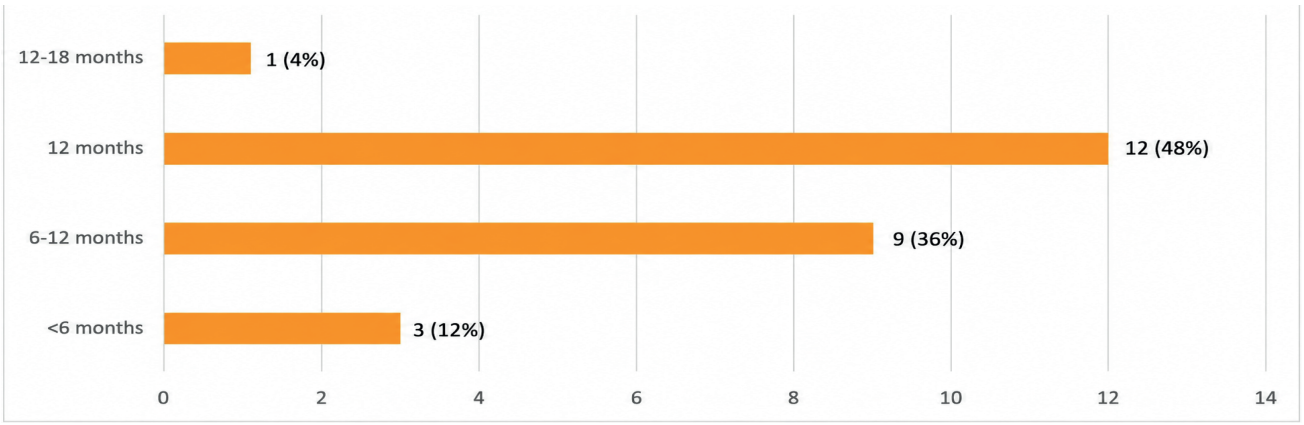


Figure S6. Minimum period of abstinence from intranasal drug use recommended by Delphi panelists before nasal septal perforation repair. Distribution of responses regarding the minimum period of abstinence from intranasal drug use considered necessary before proceeding with surgical repair of nasal septal perforation. Values represent the number of panelists selecting each time interval.