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Surgical Management of Non-Allergic Rhinitis—An EAACI Task Force Position Paper

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ABSTRACT

Non-allergic rhinitis is a frequent yet underdiagnosed cause of chronic nasal symptoms, including nasal congestion, rhinorrhoea, and upper airway hyperreactivity. Its pathophysiology involves neurogenic dysregulation, leading to excessive mucus production and vasodilation. While medical therapy remains first-line, some patients experience persistent symptoms requiring surgical intervention. This review outlines key surgical options for refractory non-allergic rhinitis: inferior turbinate (IT) reduction, vidian neurectomy, and posterior nasal nerve (PNN) ablation. IT reduction—performed using cold instruments, radiofrequency, laser, coblation, or microdebrider—remains the cornerstone treatment for nasal obstruction, offering durable symptom relief with low

Abbreviations: AR, allergic rhinitis; ARM, acoustic rhinometry; CAT, coblation-assisted turbinoplasty; CT, computed tomography; ENS, empty nose syndrome; FR, foramen rotundum; GA, general anesthesia; ICRF, impedance-controlled radiofrequency; IT, inferior turbinate; MAT, microdebrider-assisted turbinoplasty; NAR, non-allergic rhinitis; PNN, posterior nasal nerve; PPF, pterygopalatine fossa; PVC, palatovaginal canal; RFT, radiofrequency turbinoplasty; RMM, rhinomanometry; rTNSS, reflective Total Nasal Symptom Score; SPA, sphenopalatine artery; SPF, sphenopalatine foramen; SPP, sphenoid process of the palatine bone; TCRF, temperature-controlled radiofrequency; TRVP1, transient receptor potential vanilloid 1.

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complication rates. Vidian neurectomy effectively reduces rhinorrhoea but carries risks of ocular dryness and transient facial numbness, limiting its indication to severe, refractory cases. PNN interventions, including cryotherapy, cold-instrument techniques, and radiofrequency, provide a minimally invasive, outpatient alternative that selectively targets nasal parasympathetic and sensory fibers while sparing lacrimal innervation, yielding significant and lasting symptom improvement. Surgical management of non-allergic rhinitis is effective and safe when tailored to symptom profile, anatomy, and prior medical treatment response. Advances in endoscopic and minimally invasive approaches have reduced complications, establishing these procedures as integral options in comprehensive non-allergic rhinitis care.

1 | Introduction

Non-allergic rhinitis (NAR) is a common, underdiagnosed cause of persistent rhinitis symptoms including nasal obstruction, congestion, rhinorrhoea, and (post)nasal discharge [1, 2]. It should be differentiated from other forms of persistent rhinitis like allergic rhinitis (AR) or infectious rhinitis by thorough history, allergen tests, and clinical examination including nasal endoscopy [3]. Subtypes of NAR include hormonal, gustatory, occupational, and drug-induced rhinitis, or idiopathic rhinitis when no other trigger is identified [2, 4–7]. The pathophysiology of NAR is heterogeneous and differs between these subtypes, but overall, a neurogenic dysregulation is believed to be an important mechanistic pathway [8–10]. Nasal hyperreactivity is common. It is defined as the induction of nasal symptoms upon encounter with usual environmental stimuli like temperature or humidity changes. An estimated 50% of people suffering from persistent rhinitis have some subtype of NAR, highlighting the relevance and importance of research on this topic [11, 12].

Although the pathophysiology is different, treatment options for NAR overlap largely with those for AR reflecting a lack of specific treatment options for NAR. A course of trial and error with intranasal corticosteroids such as mometasone furoate and fluticasone propionate, ipratropium bromide sprays, and leukotriene antagonists is often considered in daily practice [13]. When monotherapy with corticosteroids proves insufficient, or as an alternative primary treatment, combination sprays merging a corticosteroid with a topical antihistamine—such as mometasone/olopatadine or fluticasone/azelastine—may offer additional benefit, with azelastine in particular providing a rationale for use in NAR through its modulation of transient receptor potential (TRP) channel activity and attenuation of nasal hyperreactivity. A more specific therapeutic approach is intranasal capsaicin, which induces functional desensitization of these transient receptor potential vanilloid 1 (TRPV1) channels, which are expressed on sensory afferent neurons of the nasal mucosa. The TRPV1 channels mediate neurogenic inflammation and are implicated in the pathophysiology of nasal hyperreactivity [14, 15]. In patients who remain symptomatic despite adequate medical therapy, with confirmed correct use and therapeutic adherence, surgical intervention constitutes a valid and widely accepted option to alleviate symptoms.

Prior to surgical intervention, it is essential to differentiate among the predominant symptom profiles (Figure 1). Nasal obstruction associated with inferior turbinate (IT) hypertrophy is best addressed with IT-reduction techniques. Predominant rhinorrhoea in NAR patients is often due to parasympathetic overactivity and may benefit more from nerve-targeting procedures.

Various surgical techniques are available for NAR patients, each with specific indications, benefits, and limitations. This paper provides a comprehensive overview for physicians and surgeons, covering indications, surgical methods, perioperative considerations, step-by-step guidance with illustrations and imaging, and discussion of risks and complications (Figure 2).

2 | Methodology of Task Force (TF)

This taskforce (#1606) was approved by the European Academy of Allergy and Clinical Immunology (EAACI). The members of the TF convened to review current evidence on the surgical management of NAR, develop expert recommendations, and identify key unmet needs. After defining the scope of the paper, the different surgical techniques were divided among the TF members, each of whom conducted an independent systematic literature search of relevant electronic databases, including PubMed and Embase, using search terms tailored to their assigned surgical domain. All identified evidence was critically reviewed for relevance and methodological quality. Consequently, the individual sections were merged into one manuscript and all recommendations were discussed collectively among TF members. Consensus was reached through iterative discussion during TF meetings, in which all recommendations, statements, and clinical guidance were reviewed by the full group. All items included in the final manuscript were unanimously agreed upon by all TF members prior to submission, with no unresolved disagreements. The manuscript therefore reflects expert opinion informed by the best available evidence and full consensus of the taskforce.

3 | Management of IT Hypertrophy

The IT, a key component of the nasal valve, forms the narrowest segment of the nasal airway and regulates airflow resistance, directs airflow, and maintains humidification and filtration, underscoring its critical role in nasal physiology and the impact of IT hypertrophy on symptoms [16, 17]. Differentiating congestion caused by mucosal hypertrophy from obstruction due to hyperostotic IT bone—or both—is essential to select the optimal surgical approach [18]. Diagnosis and surgical planning rely on nasal endoscopy, rhinomanometry (RMM), and/or acoustic rhinometry (ARM) before and after decongestion. Although

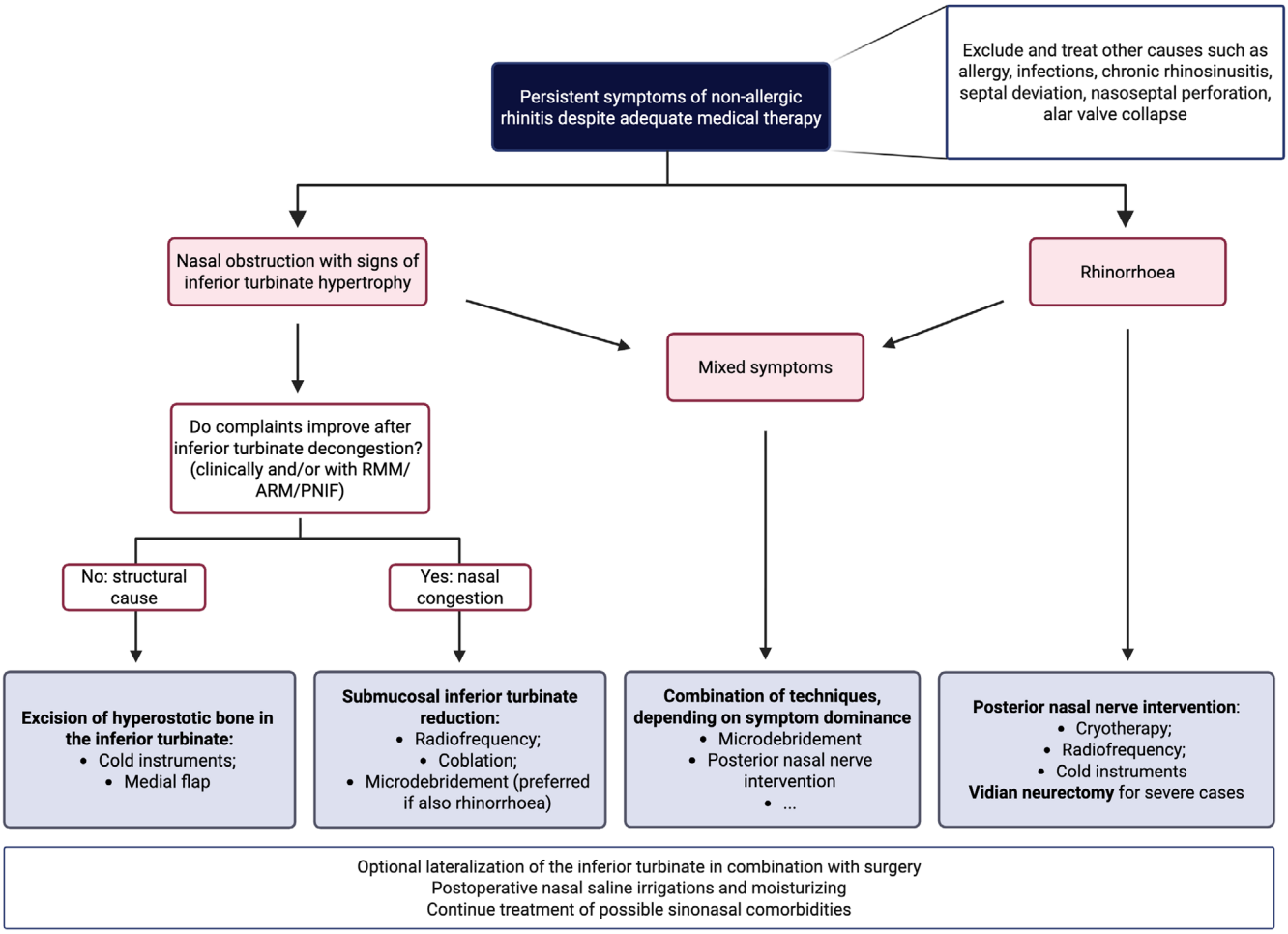

FIGURE 1 | Flowchart of decision-making of different techniques for surgical management of non-allergic rhinitis, based on symptomatology. For patients presenting with mixed symptoms, a combination of techniques should be considered based on the dominant symptom profile and individual patient characteristics. This pathway is intentionally non-prescriptive, reflecting the clinical complexity and heterogeneity of this subgroup. ARM, acoustic rhinometry; PNIF, peak nasal inspiratory flow; RMM, rhinomanometry.

computed tomography (CT) is not routinely indicated, Figure S1 illustrates a hypertrophic IT on imaging.

When medical therapy fails and the IT is bulky, the available surgical options are either non-mucosa-sparing techniques: IT reduction with cold instruments or laser, or mucosa-sparing techniques: medial flap turbinoplasty, radiofrequency turbinoplasty (RFT), coblation-assisted turbinoplasty (CAT), and microdebrider-assisted turbinoplasty (MAT) (Figure 3) [16, 19]. These techniques are used for nasal obstruction as the predominant symptom and have no proven effect on sneezing, itchy nose, or postnasal drip. Only for MAT, an additional beneficial effect on rhinorrhoea has been reported in a meta-analysis [20].

3.1 | General Surgical Considerations

For each technique, consider using endoscopic guidance. Anesthetic +/− decongestant solution can be applied with pledgets and/or by submucosal infiltration along the IT, with a 5-min wait for full effect. Every technique can be associated with lateralization of the IT to create additional space within the nasal cavity. This should be performed with a blunt instrument to avoid injury to the mucosa and nasolacrimal duct. However, it should be noted that lateralization alone is insufficient as a stand-alone definitive treatment, since most studies show no lasting duration of symptomatic improvement due to compensatory hypertrophy [21].

3.2 | Surgical Techniques

3.2.1 | IT Reduction With Cold Instruments/ Subtotal Resection

IT reduction with cold instruments is typically performed under general anesthesia (GA) for adequate pain control. This non-mucosa sparing, classic technique carries a considerable risk of intraoperative bleeding, which may require cauterization. Consequently, meticulous haemostatic control is important.

Surgical steps (Figure 4)

1. *Medialize the IT*: Luxate the IT medially using the Cottle instrument to create more space perioperatively. Be aware that the IT consists of a relatively hard bone, so luxation needs to be done with some force (Figure 4b).

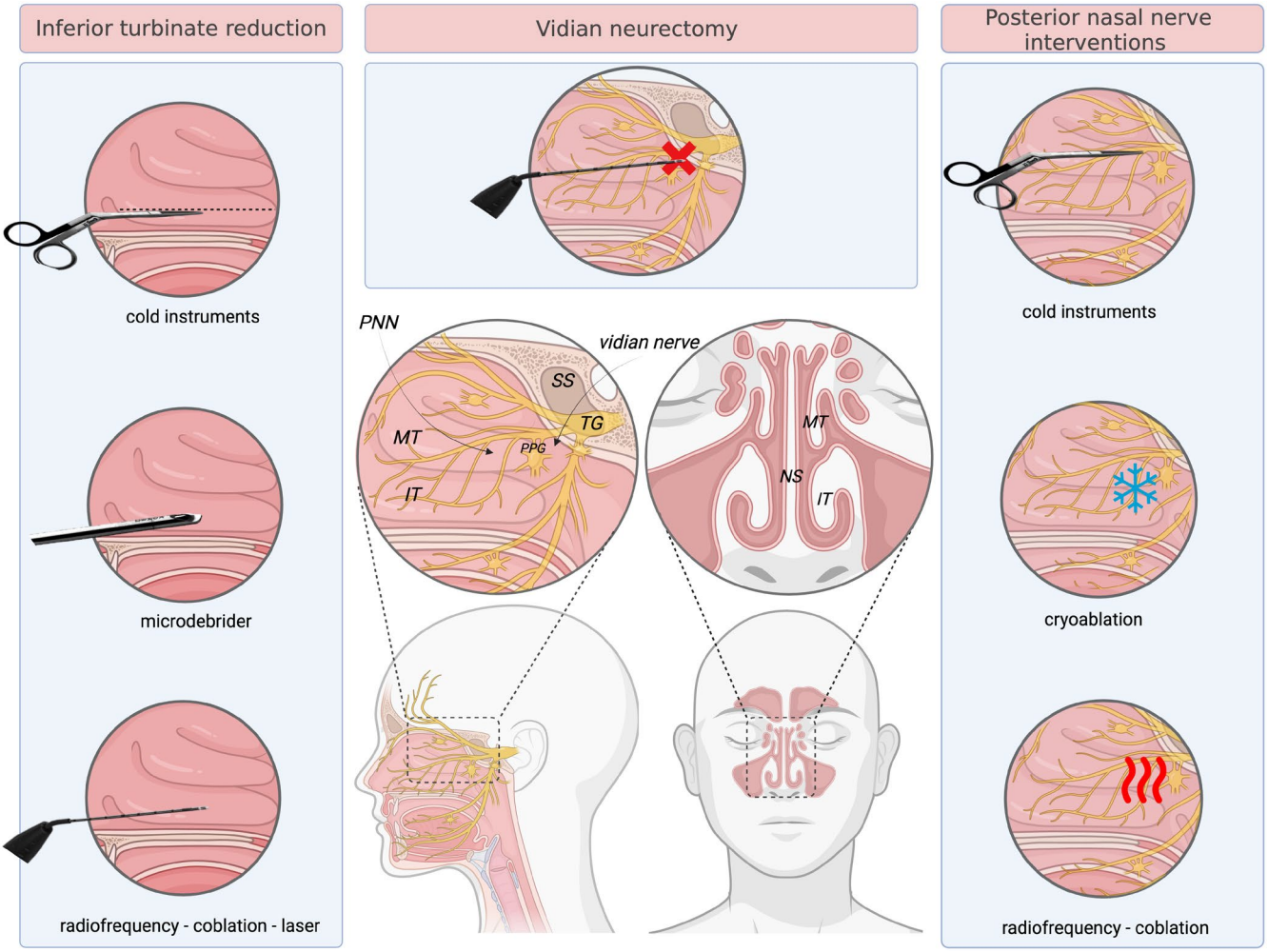

FIGURE 2 | Graphical overview of the surgical management options for non-allergic rhinitis. IT = inferior turbinate, MT = middle turbinate, NS = nasal septum, PPG = pterygopalatine ganglion, PPN = posterior nasal nerve, SS = sphenoid sinus, TG = trigeminal ganglion.

2. *Partially resect the inferior border of the IT*: Use angulated scissors to cut the inferior, lower third border of the IT. Be cautious to resect the total length of the inferior border without leaving the tail of the turbinate. Avoid contact between the tip of the scissors and (a) the nasal septum and (b) the medial wall of the maxillary sinus. For optimal visualization, position the 0° endoscope below your scissors (Figure 4c).
3. *Lateralize the IT*: Outfracture the IT to increase postoperative nasal airflow. At this point, it is advised to re-evaluate the completeness of the partial turbinectomy, paying particular attention to the tail of the IT. Perform additional resection if necessary (Figure 4d).
4. *Haemostatic control*: Use electrocautery. The vascular supply of the IT is mainly from the tail, where a branch of the posterior lateral nasal artery is located (Figure 4e).

3.2.2 | IT Reduction With Laser

There are six different kinds of lasers that have been used in the treatment of hyperplastic IT [22]. Diode and CO_2 lasers are the most common types used [22]. The diode laser emits infrared light in the 805–980 nm spectrum, allowing precise cutting of soft tissue with effective coagulation while the CO_2 laser has a shallower penetration depth, making bleeding more common [22].

Surgical steps:

1. *Introduce laser of choice*, usually under endoscopic view with settings based on the laser type. For example: diode laser with wavelength of 980 nm, output power of 6 W in continuous-wave mode, and laser delivery by a 600-mm fiber using contact mode.
2. *Make several long cuts*: Four parallel strips or a zig-zag pattern with the laser from posterior to the anterior along the IT. Maintain steady motion to ensure uniform tissue ablation and avoid excessive thermal injury.

3.2.3 | Other Non-Mucosa Sparing Techniques

Two other non-mucosa sparing techniques are electrocautery or cryosurgery. The former applies electrical current to the mucosa

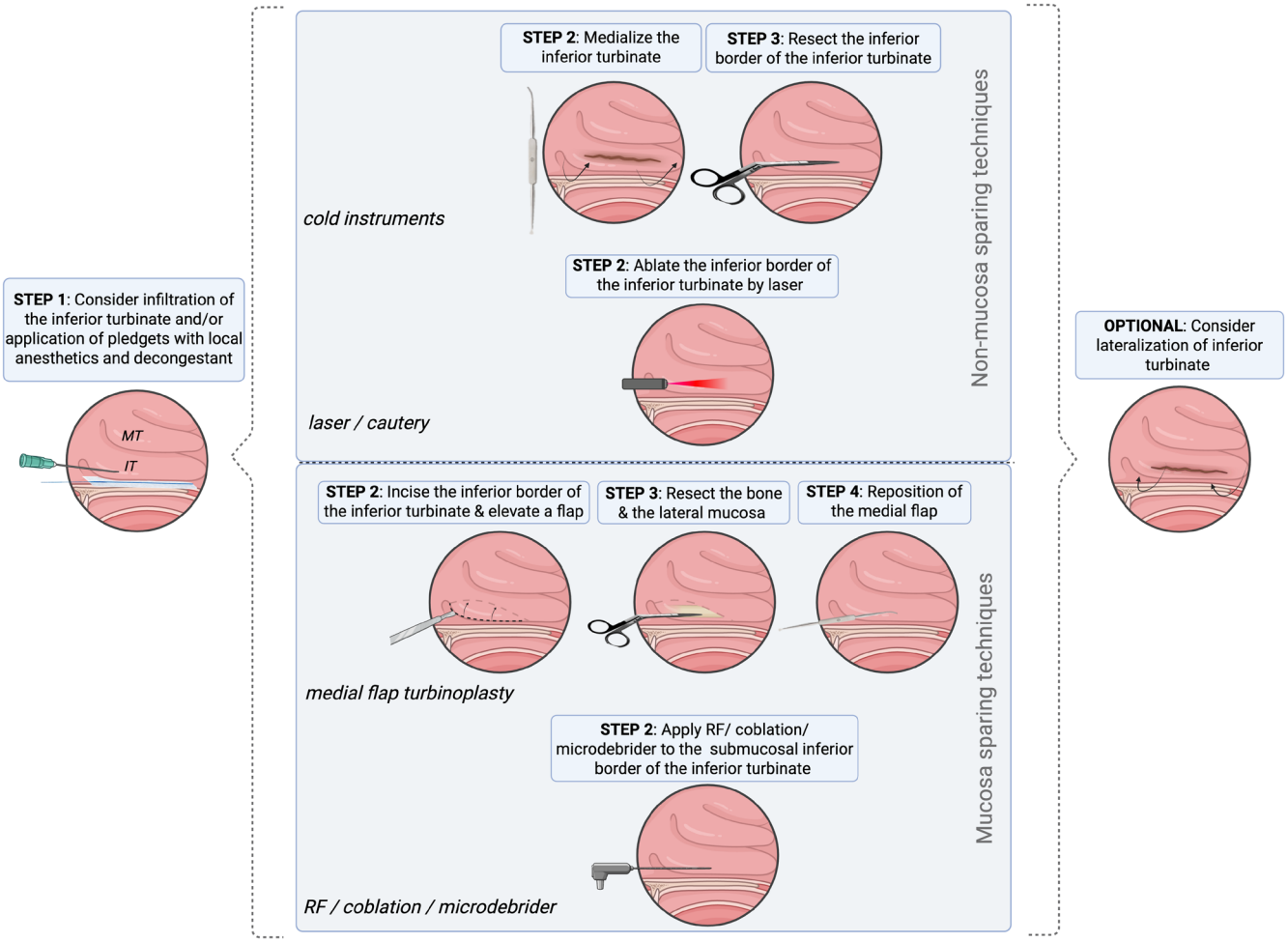

FIGURE 3 | Graphical overview of surgical techniques for inferior turbinate reduction. IT = inferior turbinate, MT = middle turbinate, RF = radiofrequency.

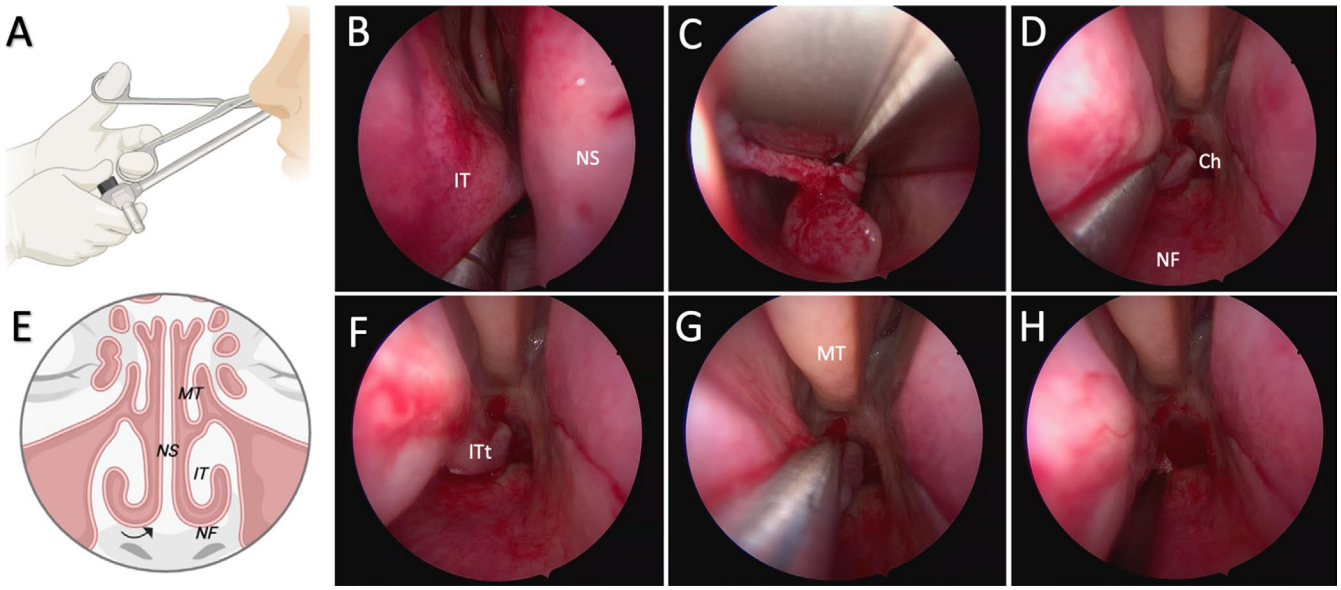

FIGURE 4 | IT reduction with cold instruments. (A) Position of endoscope and instruments when performing an inferior turbinate reduction. Endoscope is held beneath the instruments. (B–D, F–H) Endoscopic images (right nostril). (B) Medialization of the inferior turbinate with a Cottle instrument. (C) Resection of the inferior border with angulated scissors. (D–F) Lateralization of the inferior turbinate and re-evaluation of the resection. (G) Resection of residual mucosa at the tail of the inferior turbinate. (H) Hemostatic control using monopolar suction cautery. (E) Graphical overview of inferior and middle turbinates in the coronal plane as a reference to the endoscopic images. Arrow represents the medialization of inferior turbinate. Ch = choana, IT = inferior turbinate, ITt = inferior turbinate tail, MT = middle turbinate, NF = nasal floor, NS = nasal septum.

or in the submucosal plane of the IT. It has largely been abandoned due to its lower efficacy and high rates of postoperative crusting and synechiae. In cryosurgery, necrosis is induced by freezing the IT with nitrous oxide or liquid nitrogen. However, the amount of volume reduction is not predictable, and long-term results are not satisfactory [16].

3.2.4 | Medial Flap Turbinoplasty

The medial flap inferior turbinoplasty is a mucosa-sparing technique that includes removal of the IT bone. It needs to be noted that only the mucosa on the medial surface of the turbinate is spared, while the lateral mucosa is resected.

Surgical steps:

1. *Access*: Create a mucosal window at the anterior IT, allowing entry into the inferior meatus without destabilizing the IT. Identify the valve of Hasner to avoid injury.
2. *Excise* the posterior soft-tissue tail of the turbinate using a microdebrider to facilitate exposure.
3. *Prepare the medial flap*: Incise the inferior border of the IT and elevate a medial mucosal flap in a subperiosteal plane using a Cottle dissector.
4. *Resect bone and lateral mucosa*: Resect the bone and lateral mucosa of the IT to widen the inferior meatus, exposing the medial and lateral branches of the IT artery. Coagulate these arterial branches carefully with bipolar cautery under direct visualization to ensure complete hemostasis.
5. *Reposition the flap*: After sculpting the anterior IT head and undermining soft tissue to optimize nasal valve patency, reposition the medial flap inferolaterally over the resection site, leaving no exposed bone. A dressing or stent can be placed to support healing.

3.2.5 | Radiofrequency Turbinoplasty

Radiofrequency turbinoplasty (RFT) is based on the application of electromagnetic energy delivered at frequencies ranging from 100 to 4000 kHz, which increases tissue temperature to 60°C–90°C [23, 24]. This controlled thermal effect induces localized submucosal coagulative necrosis, while generally sparing the surface epithelium and the underlying bone [23]. The subsequent healing process leads to fibrosis and retraction, resulting in IT volume reduction and decreased submucosal venous congestion [23].

Surgical steps

1. *Use of the electrode*: Insert the electrode probe into the submucosal tissue of the IT through small punctures; usually, 2–3 application points are made (at the head, body, and tail of the IT). Activate the radiofrequency for 9–15 s per point, keeping the probe steady. Observe for slight mucosal blanching and avoid carbonization. Avoid mucosal perforation. Carefully withdraw the probe and proceed to the next application sites.

3.2.6 | Coblation-Assisted Turbinoplasty

CAT uses radiofrequency and saline solution to produce a plasma field by ionization. The principle is similar to the above-mentioned RFT technique, but the generated submucosal temperature is much lower and therefore even more conservative.

Surgical steps.

1. *Coblation treatment*: Make a small incision in the anterior head of IT using the ablation mode of the unit. If the IT is large, multiple channels can be considered. Reduce erectile submucosal tissue of the IT with a coblation wand under continuous endoscopic visualization, taking care to avoid mucosal perforation. It can optionally be done as extramucosal/non-preserving technique.
2. *Haemostatic control*: Coagulate the incision site with the tip of the coblation wand.

3.2.7 | Microdebrider-Assisted Turbinoplasty

Microdebrider-assisted turbinoplasty (MAT) enables submucosal tissue removal under endoscopic guidance. It preserves mucosal integrity while providing effective nasal airway improvement with minimal postoperative morbidity [25].

Surgical steps:

1. *Submucosal pocket creation*: Incise the mucosa of the anterior pole of the IT and elevate a submucosal pocket. The incision size may be tailored to the extent of planned IT resection, although a limited incision is sufficient in most cases.
2. *Insert the microdebrider*: debulk the soft tissue of the medial and inferior parts, while avoiding unintended transmucosal injury. Finally, reposition the mucosal flap laterally to close the surgical canal and restore a smooth mucosal surface.

3.3 | Effectiveness of IT Procedures

Cold-instrument IT reduction provides durable symptom relief but is associated with increased bleeding and crusting and carries a risk of empty nose syndrome (ENS) if excessive resection occurs [26]. Medial flap turbinoplasty preserves mucosal integrity and therefore induces less crusting, bleeding, limiting the risk of ENS while long-term obstruction relief is maintained [27].

RFT is a minimally invasive, office-based approach with strong long-term evidence (i.e., up to 2 years), minimal adverse effects, and superior preservation of mucociliary function [17, 23, 24, 28–31]. CAT effectively addresses soft tissue, and depending on wand type also bony hypertrophy, but usually requires GA [32–35]. MAT provides equal or superior long-term outcomes, including in pediatric patients, and remains a preferred option alongside RFT following medical therapy failure

TABLE 1 | Overview of IT reduction techniques: Long-term outcomes and risk profile.

Technique	Long-term symptom improvement	Risk of bleeding	Highest level of evidence	Relevant references
Partial turbinectomy	++	++	RCT/Meta-analysis	[26, 28, 31, 40, 53]
Electrocautery turbinectomy	−	−	RCT	[26, 27, 40]
Laser turbinectomy	−	+/−	RCT	[22, 26, 31, 50, 51]
Outfracture	−	−	RCT/Meta-analysis	[26, 36, 48]
Microdebrider turbinoplasty	+	+/−	RCT/Meta-analysis	[25, 36, 37, 38, 43–49]
Medial flap turbinoplasty	+	+/−	Cohort study/ Meta-analysis	[27, 36]
Radiofrequency	+	−	RCT/Meta-analysis	[19, 23, 24, 28–31, 36, 38, 43, 47, 50]
Coblation	+	−	RCT	[32–35, 44–46, 49]

Note: ++ Strong and consistent evidence of benefit/high risk. + Moderate evidence of benefit/moderate risk. +/− Conflicting results across studies. − Insufficient or no supporting evidence/minimal risk. Long-term defined as ≥12 months follow-up. Highest level of evidence reflects the best available study design identified in the literature for each technique: RCT = sham-controlled or active-controlled randomized trial; Meta-analysis = pooled analysis of RCTs and/or controlled studies; Cohort study = prospective or retrospective observational data without a control group.

[20, 25, 36–48]. Laser techniques provide sustained symptom improvement but are less favored due to longer procedure times and inferior recovery profiles [49, 50].

3.4 | Advantages of IT Reduction

IT reduction techniques are minimally invasive and time efficient, feasible in an outpatient or ambulatory setting [16, 17, 23]. There is a steep learning curve for surgeons to acquire the skills for these interventions [51], and there is a significant subjective and objective improvement of nasal patency postoperatively [23, 24, 26, 29, 52, 53]. In the case of symptom recurrence, many of the interventions can be repeated or switched to another type [53].

3.5 | Complications and Management

Complications of IT reduction are uncommon and generally mild (Table 1). Postoperative nasal congestion is universal and typically resolves within the first 10 days. Pain is limited and responds well to standard analgesics, while nasal crusting and dryness may persist for several weeks but can be alleviated with saline irrigations [24, 50]. Postoperative synechiae have been reported and can be surgically cut when causing discomfort or nasal obstruction [22].

Haemorrhagic complications are rare and usually self-limiting, responding to simple measures such as local compression or, in persistent cases, short-term nasal packing [24]. Non-mucosal preservation surgery, such as IT reduction with cold instruments, holds an increased risk of excessive bleeding and crusting [26, 28, 31]. Minor bleeding has been reported in 5%–8% of cases in laser turbinoplasty, but is uncommon as the laser provides coagulation with correct settings [22, 50]. When using CAT and RFT, coagulation of the bleeding occurs simultaneously, so very few complications are reported. Synechia formation and exceptional crusting are also rare [32, 33]. Infections are exceptional, although cases of postoperative rhinosinusitis have been reported and respond to antibiotic therapy. Extremely rare complications include olfactory disturbances and, anecdotally, vision loss after surgery [54]. For cases performed under GA, the anesthetic risk is comparable to other low complexity otolaryngological procedures [16].

ENS has received increasing attention in recent years and is generally considered a form of secondary atrophic rhinitis, most often reported after IT procedures, although cases following sinus surgery have also been described. Patients typically report a combination of nasal obstruction, paradoxical openness, dryness, crusting, burning sensations, and impaired perception of nasal airflow, despite either a widely patent nasal cavity or minimal abnormalities on examination [55]. Proposed mechanisms include altered nasal airflow dynamics and impaired trigeminal-mediated neurosensory perception of airflow-related temperature changes [56, 57].

Notably, ENS is rarely observed after extensive nasal surgeries such as oncologic resections, and multiple reviews consistently report high rates of anxiety and depression among affected patients [58]. This has led to growing recognition of ENS as a multifactorial condition with prominent neuropsychological and central sensory components rather than a purely anatomical complication of surgery. In their 2022 systematic review, Kanjanawasee et al. emphasized the complex interplay between altered airflow, mucosal and neurosensory dysfunction, and central neuropsychological processing in the ENS phenotype [59]. Importantly, in the absence of longitudinal pre-operative data, a causal relationship between IT surgery and subsequent psychological distress cannot be firmly established, and it remains possible that some symptoms attributed to ENS were

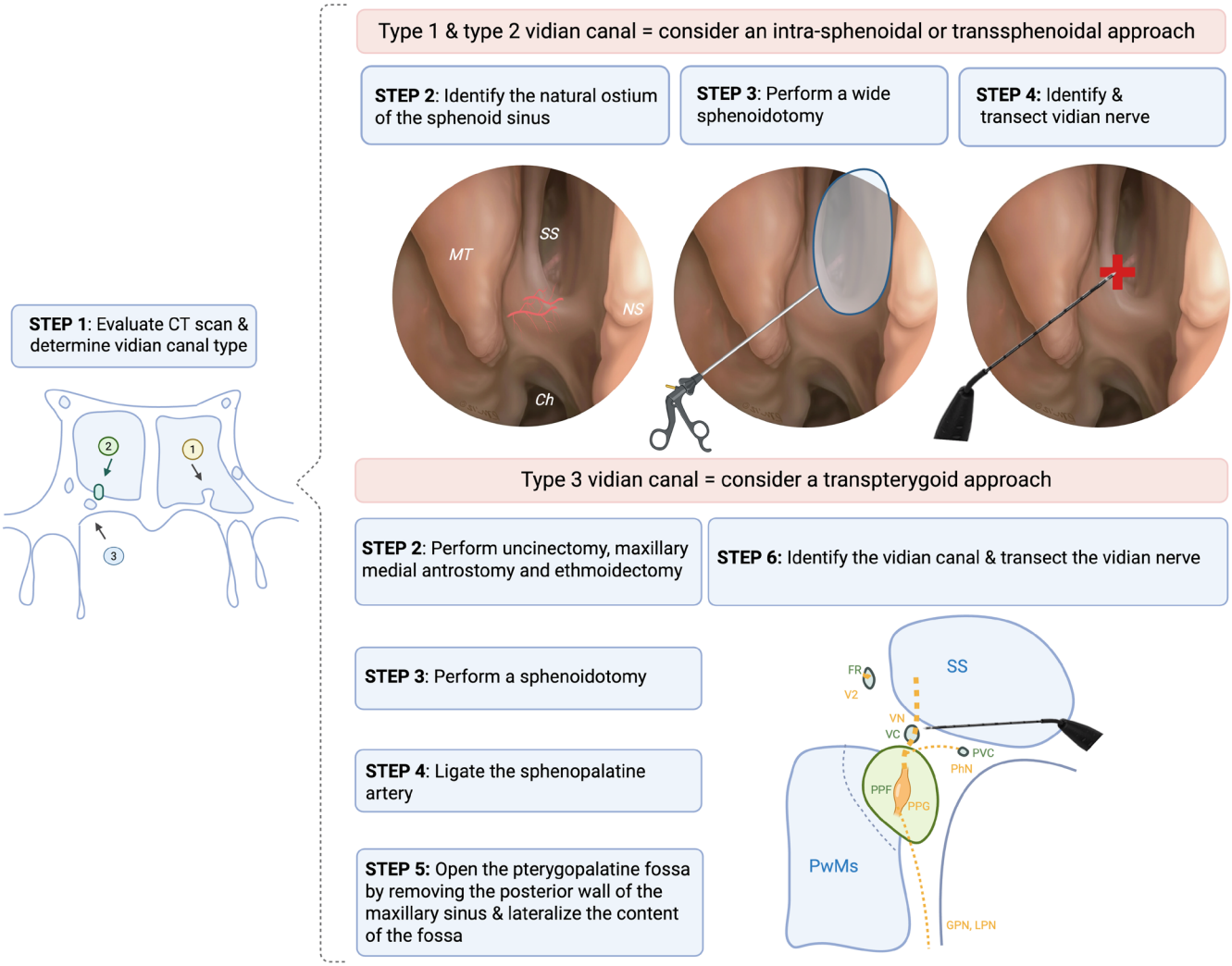

FIGURE 5 | Graphical overview of a vidian neurectomy. Right lower hand corner shows a schematic drawing of the perioperative view of the transpterygoid approach—right nostril. The removal of the posterior wall of the maxillary sinus allows exposure of the pterygopalatine fossa with its neurovascular content (blue dotted line). The pharyngeal nerve is the first nerve visualized and is the most medial nerve, entering the palatovaginal canal. The vidian nerve, branching off the pterygopalatine ganglion runs more lateral, in the vidian canal, from the pterygopalatine fossa to foramen lacerum (middle cranial fossa). The foramen rotundum with the maxillary nerve has the most lateral position at the floor/lateral wall of the sphenoid sinus. Ch = choana, FR = foramen rotundum, GPN = greater palatine nerve, LPN = lesser palatine nerve, MT = middle turbinate, NS = nasal septum, PhN = pharyngeal nerve, PPF = pterygopalatine fossa, PPG = pterygopalatine ganglion, PVC = palatovaginal canal, PwMs = posterior wall of the maxillary sinus, SS = sphenoid sinus, V2 = maxillary nerve, VC = vidian canal, VN = vidian nerve.

already present pre-operatively in patients previously labeled as having refractory NAR.

Given the rarity of ENS and the current uncertainties regarding causality and pathophysiology, management remains challenging and individualized. ENT surgeons are advised to carefully correlate complaints with clinical findings before recommending surgical intervention and to discuss ENS as a potential, albeit rare, complication in accordance with local guidelines and clinical judgment.

4 | Vidian Neurectomy

If rhinorrhoea—rather than nasal obstruction—is the dominant symptom and remains refractory to medical therapy, an intervention on the parasympathetic nerve system can be considered. The vidian nerve consists of the deep petrosal nerve and the greater petrosal nerves, innervating the nasal, palatine, and lacrimal glands by sympathetic and preganglionic parasympathetic fibers. By performing a vidian neurectomy, the parasympathetic function of these glands will be disrupted and symptoms alleviated [60]. A graphical overview is depicted in Figure 5.

In contrast to IT reduction, a thorough analysis of high-resolution preoperative CT imaging—with axial, coronal, and sagittal reconstructions—is essential when planning a vidian neurectomy. Evaluation of sphenoid sinus pneumatization and its anatomical variations is vital for safe endoscopic skull base surgery, aiding in the localization of the vidian canal (VC) and minimizing injury to adjacent structures [61, 62]. Sphenoid pneumatization is classified sagittally into conchal, presellar, sellar, and post-sellar types, based on extension relative to the sella turcica [63, 64].

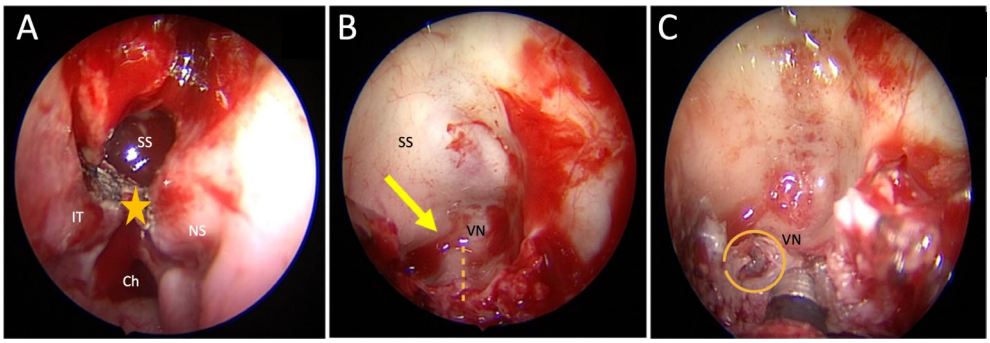

FIGURE 6 | Endoscopic images (right nostril) of vidian neurectomy by an intra-sphenoidal approach. (A) Wide sphenoidotomy (paraseptal approach) with the removal of the anterior wall of the sphenoid sinus to obtain good visualization and good accessibility of the sphenoid floor. Sometimes it is necessary to cauterize the posterior septal branch of the SPA (*). (B) Visualization of the VC (arrow, dotted line) on the floor of the sphenoid sinus with an angled endoscope. (C) After drilling the VC, visualization of the vidian nerve and artery (circle), which are transected by monopolar diathermy. Ch = choana, IT = inferior turbinate, NS = septum, SPA = sphenopalatine artery, SS = sphenoid sinus, VC = vidian canal, VN = vidian nerve.

Coronal assessment for lateral recess pneumatization is critical, as it affects the position of the VC and foramen rotundum (FR) [64]. The anatomical classification of the VC is the primary determinant in selecting the surgical approach for vidian neurectomy. It is required to determine the feasibility of a purely intra-sphenoidal approach, or whether a transpterygoid (extended) approach is necessary [62, 65]. The configurations of the VC are classified into 3 types based on the coronal CT findings: VC completely within the sphenoid sinus (type 1); VC on the floor of the sphenoid sinus or partially protruding into the sphenoid sinus (type 2); VC completely embedded in the sphenoid corpus (type 3) (Figure S2) [65]. In literature, the prevalence of VC protrusion into the sinus is 30%–70% [62, 66–68]. We advise the use of intra-operative navigation to double check the correct transection of the vidian nerve.

4.1 | Surgical Techniques

4.1.1 | Intra-Sphenoidal Approach

This approach is indicated when the VC protrudes into the sphenoid sinus lumen, so that the prominence of the VC in the floor of the sphenoid sinus can be unroofed and transected under direct endoscopic visualization (Type 1–2, Figure S3) [62, 65, 69]. It provides a straightforward and reliable method to perform a vidian neurectomy while avoiding entry into the pterygopalatine fossa (PPF). However, its success is largely dependent on a favorable anatomy.

Surgical steps (Figure 6)

1. *Preoperative decongestion*: Place pledgets soaked in cocaine 5% between the middle turbinate and the nasal septum.
2. *Wide sphenoidotomy* (0° endoscope): Paraseptally, identify the natural ostium of the sphenoid and perform a wide sphenoidotomy while preserving the posterior septal branch of the SPA running inferiorly from the sphenoid ostium (if this is not possible: cauterization). Sometimes it is necessary to partly remove the sphenoid rostrum and intersinus septa to improve visualization (Figure 6a).
3. *Identify the VC*: In type 1 and type 2 cases, the VC becomes visible along the floor of the sphenoid sinus, once the sinus floor is reached. It typically runs obliquely from anteromedial to posterolateral at the lateral aspect of the floor. Depending on the pneumatization, it may present as a bony prominence or within a mesentery. Visualization is optimized with an angled endoscope (30° or 70° endoscope), and image-guided navigation is recommended to confirm its position (Figure 6b).
4. *Exposure of the VC and vidian neurectomy*: If the VC is not clearly visualized, a gentle deroofing is performed using a probe or diamond burr to expose the vidian nerve. Under direct endoscopic visualization, and confirmation using the navigation, transect the vidian nerve using an angled ball probe or cautery. Afterwards, cauterize the remaining nerve stumps using monopolar diathermy (Figure 6c).
5. *Haemostatic control*: bleeding is expected because the vidian artery runs with the nerve. If necessary, achieve hemostasis with adrenaline-soaked swabs or cauterization.

4.1.2 | Transpterygoid Approach

This approach is used if [69–72] the prominence of the VC in the floor of the sphenoid sinus is absent or is situated laterally and is impeded by the sphenoid process of the palatine bone (SPP) (type 3) [69, 70, 73]. It requires a corridor that crosses the maxillary sinus, displaces the soft tissue contents of the PPF laterally, and removes (partially or completely) the pterygoid to reach the surgical field [71].

Surgical steps (Figure 7)

1. *Perform uncinectomy, maxillary antrostomy, anterior and posterior ethmoidectomy*: Create a wide maxillary antrostomy to expose the posterior maxillary wall.
2. *Ligate the sphenopalatine artery* (*SPA*): From the posterior margin of the maxillary antrostomy, perform a subperiosteal dissection to the posterior ethmoidal crest, which is an important landmark for the sphenopalatine foramen (SPF)

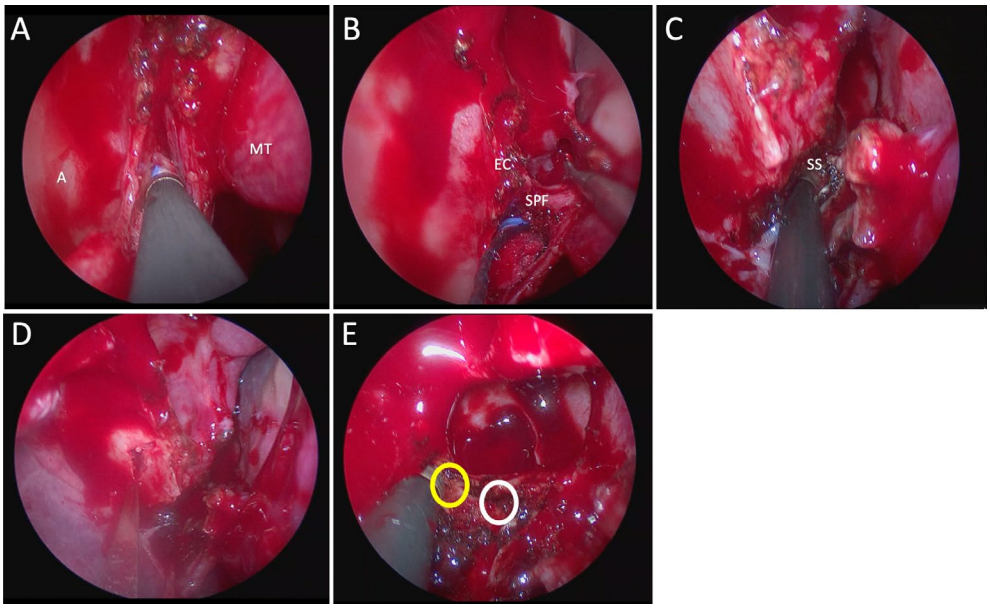

FIGURE 7 | Endoscopic images (right nostril) of vidian neurectomy by a transpterygoid approach. (A) Intraoperative view during posterior dissection from the maxillary antrostomy towards the sphenopalatine foramen. The sphenopalatine artery and its branches are cauterized and transected. (B) The ethmoidal crest is the most consistent landmark for identifying the sphenopalatine foramen with the sphenopalatine artery. (C) Perform a wide sphenoidotomy with resection of the anterior wall of the sphenoid. (D) Remove the sphenoidal process of the palatine bone and posterior maxillary wall to access the pterygopalatine fossa. This facilitates lateral displacement of its soft contents for identification of the vidian canal and palatovaginal structures. (E) Cauterize the structures of palatovaginal canal (white) and of the vidian canal laterally (yellow). A = antrostomy, EC = ethmoidal crest, MT = middle turbinate, SPF = sphenopalatine foramen, SS = sphenoid sinus.

and lies anteriorly/antero-inferiorly from this foramen. Expose the SPA, cauterize, and transect all the branches (Figure 7a,b).

3. *Sphenoidotomy*: Perform a transethmoidal sphenoidotomy [72]. Identify and open the natural sphenoid ostium inferomedially, then enlarge it by resection of the anterior wall of the sphenoid. Be aware of the posterior septal branch of the SPA running inferior to the ostium (Figure 7c).
4. *Opening of the PPF*: Remove the posteroinferior border of the SPF (sphenoidal process of the palatine bone) and the medial wall of the PPF. Gently displace the soft contents of the PPF (fat, nerves, and vessels) laterally to expose the VC. Identify and transect the pharyngeal artery and nerve in the palatovaginal canal (PVC), medial to the VC with monopolar cautery. The VC lies laterally from the PVC and has a funnel-shaped opening, with a course from anteromedial to posterolateral. The VC is found at the intersection of the medial pterygoid plate and the sphenoid sinus floor [72]. (Figure 7d).
5. *Vidian neurectomy*: Identify the opening of the VC at the anterior sphenoid wall, lateral to the PVC and inferomedial to the FR. Cauterize and transect the vidian nerve under direct endoscopic visualization using monopolar cautery (Figure 7e).
6. *Haemostatic control*: Apply a soluble haemostatic agent to the surgical field. Nasal packing is needed only in case of significant intraoperative bleeding.

4.2 | Effectiveness

Vidian neurectomy has demonstrated high success rates in treating symptoms of NAR, with some studies reporting complete symptom resolution in up to 82.2% of patients [60, 74, 75]. It appears to be particularly effective in alleviating rhinorrhoea [60]. The findings of Zhang et al. [76] further support long-term efficacy, with significant reductions in rhinorrhoea and nasal congestion after 2 years.

4.3 | Advantages of Vidian Neurectomy

Therapeutic benefits include immediate symptom relief and complete symptom resolution following the procedure. The intrasphenoidal approach for type 1 and type 2 configurations provides a straightforward approach to transect the VC under direct endoscopic vision, generally yielding favorable outcomes.

4.4 | Complications and Management

Despite the proven efficacy, vidian neurectomy has lost favor among many surgeons in recent years due to improved efficacy of topical therapies and concerns about complications arising from disruption of parasympathetic innervation [60]. Postoperative issues such as nasal dryness, crusting, or xerophthalmia due to reduced lacrimal secretion are relatively common. It is typically self-limiting, with spontaneous resolution within approximately

3 months, and can be managed conservatively with artificial tears. Another potential complication is facial numbness involving the cheek and palate, usually caused by inadvertent injury to adjacent branches of the maxillary nerve (V2) during dissection near the FR. In some cases, the V2 may sustain thermal injury during cauterization of the vidian nerve, as V2 and the vidian nerve are often separated by only a thin bony ridge [77]. Such sensory deficits are typically transient and self-limiting.

Anatomical variations of the VC, particularly type 3 configurations, can complicate nerve identification and increase the risk of incomplete sectioning or nerve misidentification when surgical exposure is insufficient. The close proximity of the VC to the medially located PVC—which transmits the pharyngeal nerve and pterygovaginal artery—further complicates dissection [65].

Postoperative epistaxis may also occur, most commonly due to incomplete cauterization of SPA branches. While most cases respond to conservative measures such as nasal packing, persistent or recurrent bleeding may necessitate revision surgery to identify and cauterize the responsible vessel.

To mitigate these risks, Kikawada et al. (2007) introduced PNN neurectomy as a safer alternative [78]. A systematic review by Niu et al. comparing the therapeutic outcomes of vidian neurectomy and PNN neurectomy concluded that both techniques are effective for treating NAR, although the former has a higher risk of complications [75].

5 | PNN Interventions

The PNN is a nerve that branches off the sphenopalatine ganglion and consists of postganglionic parasympathetic, sympathetic, and sensory fibers. It enters the nasal cavity via the SPF together with the SPA and supplies the nasal mucosa providing a secretomotor and vasodilatory stimulus as well as somatic sensory supply [79]. In most of the cases, there are two major branches: the anteroinferior branch towards the IT and the posterosuperior branch towards the middle meatus. Section of both of these branches specifically targets the nerve fibers destined to innervate the nose and spares the fibers that innervate the lacrimal gland, therefore reducing ocular side effects.

PNN neurectomy is indicated in patients with therapy-resistant chronic rhinitis in whom an imbalance exists between the sympathetic and parasympathetic nervous fibers, leading to invalidating symptoms of rhinorrhoea, sneezing, or nasal obstruction. It also targets the somatosensory fibers, which can aid in reducing nasal hyperreactivity. Both patients with AR as well as NAR have been shown to benefit from this treatment [79]. The fact that this technique specifically targets the nasal branches of the postganglionic parasympathetic, sympathetic, and sensory nerve fibers destined to innervate the nose allows us to spare the fibers that innervate the lacrimal gland and reduces the risk of ocular complications sometimes reported after vidian neurectomy [79]. PNN ablation with cryotherapy, RF, and cold instruments has been implemented in ENT practices (Figure 8).

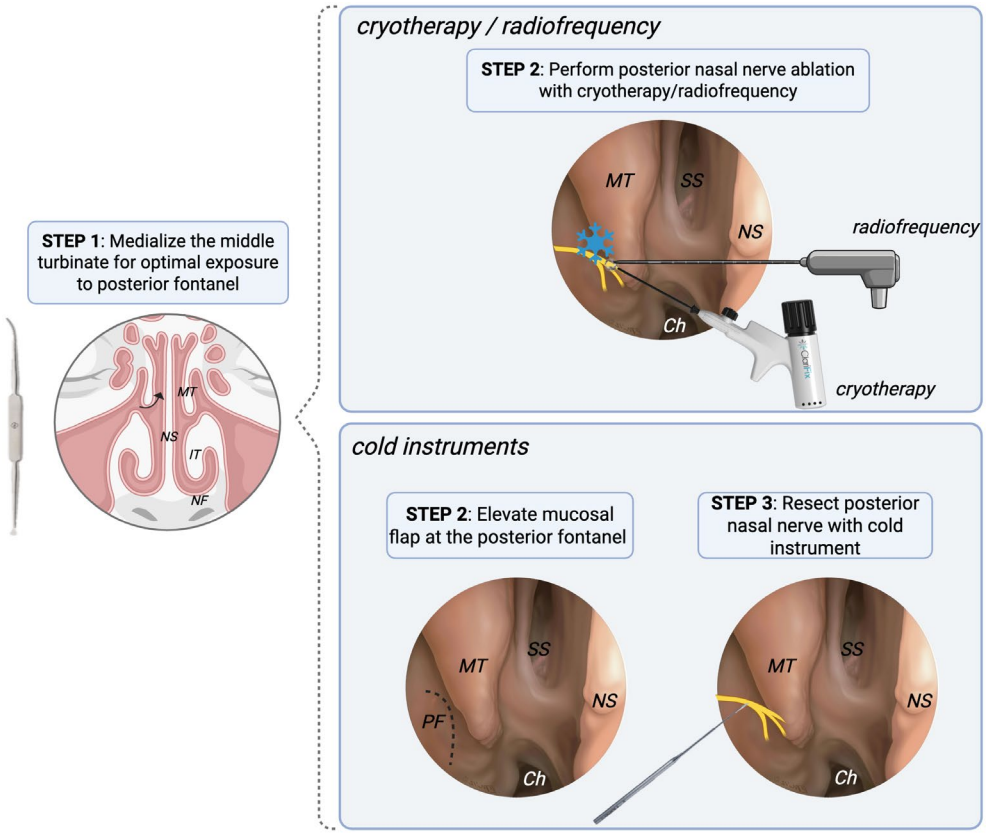

FIGURE 8 | Graphical coronal overview of posterior nasal nerve interventions. Ch = choanae, IT = inferior turbinate, MT = middle turbinate, NF = nasal floor, NS = nasal septum, PF = posterior fontanel, SS = sphenoid sinus.

5.1 | General Surgical Considerations

PNN ablation is performed using endoscopic guidance. To minimize bleeding and pain, place cotton pledgets soaked in a solution of anesthetic and decongestant of choice in the middle meatus, in proximity to the pterygopalatine ganglion. Additionally, for cold instrument surgery, it might be favorable to infiltrate local anesthetic and decongestant at the level of the posterior maxillary fontanel. Cryotherapy and radiofrequency ablation can be performed in an outpatient setting, while the cold instrument technique usually is performed in GA.

5.2 | Surgical Techniques

5.2.1 | PNN Ablation With Cryotherapy

Cryotherapy is a minimally invasive treatment targeting PNN. Cryoablation reduces PNN's activity without damaging surrounding tissue.

Surgical steps (Figure 9)

1. *Evaluation*: Investigate with an endoscope and Cottle elevator if the posterior axilla is accessible for cryotherapy; if not, consider lateralization of IT and gentle medialization of the middle turbinate. Palpate with Cottle elevator in the region of interest to assure local anesthesia was sufficient.
2. *Cryotherapy*: Insert a small probe of the single use cryotherapy device at the posterior part of the middle meatus. Pull valve on/off button until it clicks to activate cryogen. Apply cryotherapy for 30 s. Lift up on valve lock switch to stop cryogen flow. Hold cryoprobe in place until thawed (no less than 45 s) and can be detached with no effort (Figure 9a–c).

5.2.2 | PNN Ablation With Cold Instruments

PNN ablation with cold instruments is a surgical, invasive alternative that allows direct visualization and precise transection of the PNN branches.

Surgical steps [80]

1. *Perform dissection*: Make a vertical incision at the level of the posterior fontanel. Second, elevate a mucosal flap posteriorly up until the ethmoidal crest of the palatine bone. The neurovascular bundle exiting from the SPF is visualized and then uncovered by a suction elevator.
2. *Neurectomy*: Identify the PNN that runs parallel to the SPA and dissect the artery. The two branches that are present in most cases should be identified and dissected. A micro-, plasma-, or sickle knife is used to cut each of the nerve branches [81]. Caution is taken to preserve the SPA. Perform bipolar cauterization on the cut nerve endings to stop capillary bleeding and prevent reinnervation.
3. *Haemostatic control*: The mucosal flap is repositioned to cover the neurovascular bundle. An absorbable nasal pack can be positioned to support the mucosal flap if needed.

5.2.3 | PNN Ablation With Radiofrequency

Radiofrequency neurolysis of the PNN has emerged as a minimally invasive and effective treatment option for moderate to severe NAR. Two primary technologies are currently used in clinical practice: the temperature-controlled radiofrequency (TCRF) system device and the impedance-controlled radiofrequency (ICRF) device.

Surgical steps (Figure 10)

1. *Evaluation*: Nasal endoscopy is performed to assess satisfactory visualization of the posterior nasal cavity and the posterior aspects of the middle meatus, the middle turbinate and the IT (Figure 10a). To improve visualization, one can consider lateralization of IT and gentle medialization of middle turbinate once adequate anesthesia has been assured.
2. *Radiofrequency*: Place the device in the posterior nasal cavity adjacent to the lateral nasal wall (Figure 10b). Up to five nonoverlapping positions in the PNN area can be targeted, covering the areas of the posterior middle

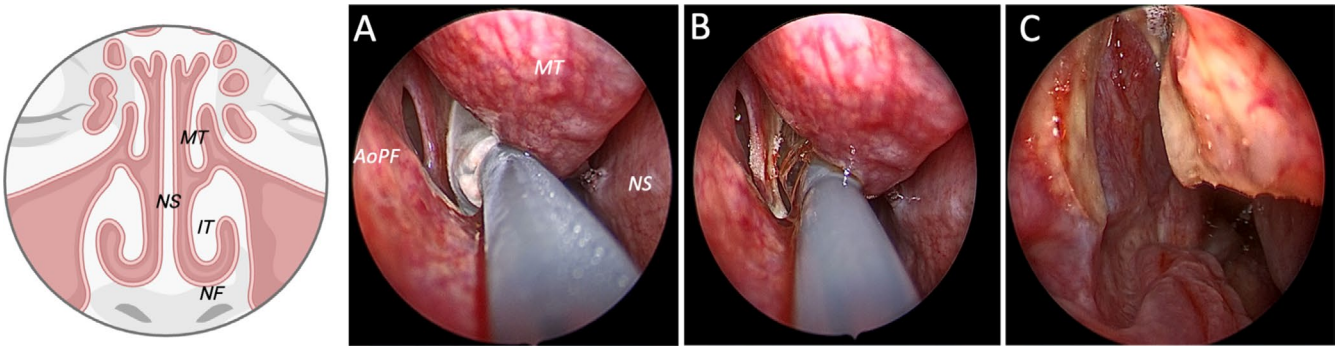

FIGURE 9 | Posterior nasal nerve cryoablation Left: Graphical coronal section of inferior and middle turbinate. Right: Endoscopic images (right nostril). (A) Insert the cryotherapy device in right middle meatus at the tail of the middle turbinate. Valve open, cryogen in ballon. (B) Valve closed, Cryogen exits ballon, frosting disappears. (C) After removal, white discoloring appears where ballon had contact with mucosa. AoPF = Accessory ostium at the level of the posterior fontanel; IT = inferior turbinate; MT = middle turbinate; NF = nasal floor; NS = nasal septum.

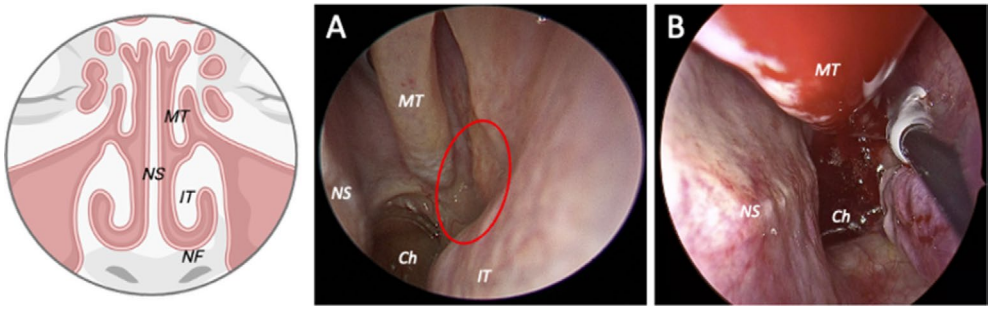

FIGURE 10 | Posterior nasal nerve ablation with radiofrequency Left: Graphical coronal section of inferior and middle turbinate. Right: Endoscopic images (left nostril). (A) Visualization of area to be targeted by radiofrequency devices for posterior nasal nerve (red circle). (B) Radiofrequency device in position in the area of the posterior nasal nerve (white tip). IT = inferior turbinate, MT = middle turbinate, NF = nasal floor; NS = nasal septum.

meatus and posterior portion of the IT. Additional areas on the IT and septal swell body may also be treated as indicated.

5.3 | Effectiveness

PNN cryoablation has been shown to significantly reduce nasal symptoms such as rhinorrhoea, congestion, and postnasal drip. Meta-analyses report mean reductions in reflective Total Nasal Symptom Score (rTNSS) of around 3.5 points at 1 and 3 months [82], with approximately 70% of patients achieving ≥30% symptom reduction across both AR and NAR [83]. Symptom relief starts within a few weeks and generally persists up to 6–12 months, though data beyond 1 year are limited and long-term durability remains uncertain [84]. NAR patients may experience more sustained benefits, but comparative data with other treatments are scarce [83].

PNN resection with cold instruments likewise demonstrates strong efficacy, as shown in a systematic review of 23 studies including 2882 patients [79]. Although many studies combined PNN with other nasal surgeries, isolated PNN interventions consistently improved patient-reported outcomes (SinuNasal Outcome Test-22 (SNOT-22), Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ)) over 6–12 months [79]. Two randomized trials found greater symptom improvement with PNN compared to medical therapy or IT reduction alone, supporting its role as an effective surgical option for refractory nasal obstruction and rhinorrhea [20, 85].

Initial randomized controlled trials of PNN ablation by TCRF demonstrated significantly higher responder rates and greater reductions in rTNSS compared with sham treatment, along with meaningful improvements in rhinorrhoea, congestion, and quality of life, without serious device-related adverse events [86]. Subsequent follow-up confirmed durability through 12 months, including similar benefits in sham patients who crossed over to active treatment [87]. A 2023 systematic review and meta-analysis of five studies (284 patients) reported pooled rTNSS reductions exceeding four points and responder rates above 77% at 3 months and 80% at 6 months, with concurrent improvements in postnasal drip, cough, and quality of life [88]. Long-term prospective data further support durability, with sustained and clinically significant symptom relief at 2 and 2 years and responder rates approaching 80%–87%, alongside persistent quality-of-life gains and no new safety concerns [89, 90]. ICRF systems offer an alternative approach using multi-site, impedance-guided ablation and have demonstrated comparable reductions in NAR symptoms with favorable tolerability and sustained benefit in early follow-up [91, 92]. Overall, both TCRF and ICRF PNN neurolysis show low adverse event rates. While post-market surveillance has identified rare cases of delayed epistaxis, no chronic or progressive complications have been reported [93]. Collectively, current evidence supports radiofrequency PNN neurolysis as a safe, effective, and minimally invasive treatment option for NAR.

5.4 | Advantages of PNN Interventions

PNN ablation is a time-efficient procedure performed in an outpatient or daycare setting, with fewer dry eye and nasal complications compared to vidian neurectomy and more effect on other symptoms than blockage compared to IT reduction. The learning curve is steep, and additionally, it has few side effects when performed properly and provides long-term relief [94].

5.5 | Complications and Management

Complications are generally mild and self-limiting. Patients may experience nasal discomfort or pain, described as pressure or soreness during or after the procedures, usually resolving within a few days, managed with pain medication. Nasal congestion can result from tissue swelling and is treated with saline rinses or decongestants. Crusting and dryness of the nose are rare and mild, reported in only 0.08% of cases, usually requiring no treatment or mere moisturizing [79, 94]. Oral or laryngopharyngeal dysesthesia is reported in about 1.7% of patients, with only 0.4% experiencing permanent symptoms [79].

Intraoperative bleeding may occur if the SPA is injured; this should be controlled with monopolar or bipolar cautery, or artery clips. Postoperative bleeding has been reported in about 1.5% of patients in meta-analyses, with surgical revision rates of 0.006%–2.4% [79]. Significant bleeding should be managed with non-resorbable nasal packing for 24–48 h, and persistent or heavy bleeding may require endoscopic exploration and SPA coagulation under GA.

6 | Discussion

The management of NAR remains challenging due to its heterogeneous pathophysiology and the limited availability of targeted medical therapies. Initial treatment should follow current guideline-based medical therapy. When symptoms persist despite adequate medical management, surgical intervention may be considered based on the symptom profile. Objective assessment of nasal function is an important complement to patient-reported symptoms in evaluating the underlying pathology and consequently the efficacy of surgical interventions. Rhinomanometry (RMM) quantifies nasal airway resistance and can objectively document improvements in nasal patency following IT reduction procedures. Acoustic rhinometry (ARM) provides cross-sectional area and volume measurements of the nasal cavity, allowing anatomical changes post-surgery to be captured with precision. Peak nasal inspiratory flow (PNIF) offers a simple, reproducible, and clinically accessible measure of nasal airflow that can be used both in the preoperative workup and postoperative follow-up [95, 96].

Figure 1 depicts an expert opinion-based management algorithm integrating symptom phenotyping, anatomical assessment, and treatment selection. Nasal obstruction in combination with IT hypertrophy favors IT reduction, whereas rhinorrhoea, sneezing, and nasal hyperreactivity suggest parasympathetic overactivity and support PNN-targeted approaches. The choice of intervention should be individualized, considering anatomy, prior treatments, patient preference, availability, and surgical expertise.

Consideration of long-term outcomes and potential sequelae is fundamental to informed surgical decision-making in NAR. For IT reduction, symptom recurrence due to re-hypertrophy of turbinate tissue is a recognized long-term concern, particularly with more mucosal-sparing techniques, and may necessitate maintenance of postoperative medical treatment and/or revision surgery. Regarding nerve-targeting procedures, PNN ablation carries a generally favorable long-term safety profile, but long-term durability (> 3 years) remains uncertain. Vidian neurectomy, while potentially more durable, is associated with a higher risk of complications including xerophthalmia due to disruption of lacrimal innervation and palatal numbness, which must be carefully weighed against its benefits.

It is important to note that surgical intervention in NAR is not always intended as a curative measure but rather aims to achieve meaningful and sustained symptomatic relief, and in some cases to enhance the responsiveness to subsequent medical therapy. Structural modifications following surgery—such as reduced turbinate volume after IT reduction or increased nasal airway patency—may improve the distribution, deposition, and mucosal contact time of intranasally administered medications, potentially augmenting their therapeutic efficacy. This interplay between surgical outcome and medical therapy underscores the importance of viewing surgery and pharmacotherapy as complementary rather than mutually exclusive strategies in the long-term management of NAR.

It must be emphasized that this algorithm (Figure 1) is based on expert consensus rather than high-level evidence. Robust, NAR-specific data are frequently lacking, and many therapeutic strategies are extrapolated from mixed rhinitis populations. Significant unmet needs remain, including improved patient phenotyping and endotyping, development of truly targeted treatment options, and standardized outcome measures to enable meaningful comparison across studies.

In practice, we would recommend doctors to select the appropriate surgical technique based on anatomical abnormalities, symptom pattern, clinical and technical examination, availability and cost of material, and preference of the patients. They should counsel patients about advantages and limitations of each technique, and referral notes should specify the dominant symptom (obstruction vs. rhinorrhoea), prior therapies and adherence, and any anatomic concerns such as septal deviation. Shared decision-making should compare mucosa-sparing and non-sparing strategies in terms of functional preservation, complication profile, cost and availability, setting (clinic vs. operating room), and patient preference. It should also be recognized that surgical treatment does not necessarily eliminate the need for postoperative therapy. In some patients, maintenance of medical treatment may be required to prevent symptom recurrence, particularly after submucosal IT reduction. The reintroduction of therapy should be tailored to the type of surgical procedure and the patient's postoperative clinical evolution.

In summary, the recommended pathway is the following: phenotype the complaint; ensure at least 3 months of optimized, adherent medical therapy; then select a procedure aligned with the symptom profile—IT reduction for nasal obstruction and PNN-targeted intervention for rhinorrhoea—reserving vidian neurectomy for carefully chosen cases. This approach balances efficacy with safety and preserves nasal physiology while addressing the symptoms patients find most disabling.

Author Contributions

All authors contributed equally to the conception and development of this taskforce paper. Specifically: M.L., J.V.W., M.M., P.G., V.H., S.R., and L.V.G. led the drafting of the manuscript and were responsible for the overall structure and argumentation. M.L., J.V.W., M.M., P.G., V.H., M.K., D.L., J.M.-S., J.W., S.R., and L.V.G. conducted the literature review and synthesized the evidence base underpinning the opinions presented. M.L., J.V.W., M.M., A.C., P.G., J.H., V.H., M.K., L.K., D.L., J.M.-S., O.P., F.S.R., M.S., D.S., S.T.-S., J.W., S.R., and L.V.G. provided critical review and revision of the manuscript for important intellectual content. All authors read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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Conflicts of Interest

M.L. has received honoraria for consultancy, scientific advisory boards and talks from AstraZeneca, Berlin-Chemie, GlaxoSmithKline, Sanofi, and Chordate. AMC reports grants, speaker honoraria, consultancy or advisory fees and/or research support and other, all via Technical University of Munich from Allergopharma, ALK Abello, AstraZeneca, Bencard/Allergen Therapeutics, GSK, Novartis, Hippo Dx, LETI, Roche, Zeller, Sanofi, Regeneron, Thermo Fisher Scientific, EIT Health, and Federal Ministery of Research and Education Germany. P.G. has received lecture fees and/or participation at expert board meetings from Amgen, Argenx, AstraZeneca, Eli Lilly, GlaxoSmithKline, Insmed, Novartis, Regeneron, Roche, Sanofi, and Stallergenes Greer. V.H. has received speaker and consultancy fees from ALK, Sanofi, GSK, Novartis, AstraZeneca, and Celltrion. J.H. received speaker honoraria and fees for advisory boards from HAL Allergy, Sanofi Genzyme D GmbH, GlaxoSmithKline (GSK) D GmbH, GSK Global, Novartis Pharma D GmbH, LETI Pharma, Stallergenes, Bencard, ALK, Dt. Fortbildungsgesellschaft für HNO, HNO-Berufsverband, Springer, Streamed Up, outside the here-submitted work. J.M.-S. has received honoraria for consultancy, research projects, advisory board participation, and speaker engagements from AstraZeneca, GlaxoSmithKline, MSD, Novartis, and Sanofi. O.P. reports grants and/or personal fees and/or travel support from AEDA, Alfried Krupp Krankenhaus, ALK-Abelló, Allergopharma, Almirall, Altamira Therapeutics, ASIT Biotech, AstraZeneca, Bencard Allergie GmbH/Allergy Therapeutics, Biologixpharma, Blueprint, Breazy Health, Cliantha, Deutsche AllergieLiga e.V., Deutsche Forschungsgemeinschaft, Dustri-Verlag, ECM Expro&Conference Management GmBH, Forum für Medizinische Fortbildung, Georg-Thieme-Verlag, GSK, HAL Allergy Holding B.V./HAL Allergie GmbH, Inmunotek, Ingress Health, Institut für Disease Management, IQVIA Commercial, Japanese Society of Allergology, Königlich Dänisches Generalkonsulat, Laboratorios LETI/LETI Pharma, Lilly, Lofarma, Medizinische Hochschule Hannover, med update europe GmbH, Meinhardt Congress GmbH, Novartis, Paul-Ehrlich-Institut, Paul-Martini-Stiftung, PneumoLive, Pohl-Boskamp, Procter & Gamble, Red Maple Trials Inc., Regeneron, RG Aerztefortbildung, ROXALL Medizin, Sanofi Aventis, Sanofi Genzyme, Springer Publisher, Stallergenes Greer, streamedup! GmbH, Technical University Dresden, John Wiley & sons publishers, Wort & Bild Verlag, Verlag ME; all outside the submitted work, O.P. is Vice President of the European Academy of Allergy and Clinical Immunology (EAACI), a member of EAACI Excom as well as a member of the external board of directors of the German Society of Allergy and Clinical Immunology (DGAKI); coordinator, main- or co-author of different position papers and guidelines in rhinology, allergology and allergen-immunotherapy; and he is Editor-in-Chief of Clinical Translational Allergy and Associate Editor of Allergy. D.S. reports grants and/or personal fees and/or travel support from Diater, Laboratorios LETI/LETI Pharma, Jaba Recordati, and Sanofi. S.R. reports speakers' fees, consultancy fees and advisory board fees, as well as research funding from AstraZeneca, GlaxoSmithKline, Novartis, and Sanofi-Regeneron. L.V.G. has received honoraria for consultancy, scientific advisory boards and talks from HippoDx, GlaxoSmithKline and Medtronic. All are outside of the submitted work. All other authors declare no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Figure S1:** Coronal CT image showing hypertrophy of inferior turbinates. **Figure S2:** Classification of the anatomical configurations of the VC on the CT of paranasal sinuses. Type 1: VC (yellow arrow) is totally protruding into the sphenoid sinus. Type 2: VC (blue arrow) is contacted or partially protruding into the sphenoid sinus. Type 3: VC (red arrow) is totally embedded in the sphenoid corpus. **Figure S3:**. CT showing the protrusion of the vidian canal into the sphenoid sinus on both sides (type 1 VC). Intraoperative endoscopic view (right nostril) confirming the exposure of the vidian canal on the floor, and the feasibility of transection under direct vision. SS = sphenoid sinus; VC = vidian canal; LR = lateral recess (of the sphenoid sinus).