Systematic Review
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A Systematic Review of Eustachian Tube Dysfunction in Patients Undergoing Septoplasty: Pre-operative Prevalence and Post-operative Outcomes

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Abstract

Introduction:

The relationship between septoplasty and Eustachian Tube Dysfunction (ETD) remains controversial despite theoretical links between nasal anatomy and middle ear physiology.

Materials and Methods:

Following PRISMA guidelines, we searched PubMed, Scopus, Web of Science, CENTRAL, and Embase up to October 2025 for studies examining ETD in septoplasty candidates. Twenty-eight studies (20 prospective cohorts, 5 retrospective cohorts, 3 RCTs; N≈2,150) met inclusion criteria.

Results:

Pre-operative ETD prevalence was high: 38-62% by ETDQ-7 questionnaire and 35-65% by tympanometry. Septoplasty significantly improved both subjective symptoms and objective middle ear function, with peak benefits at 3-6 months. Aural fullness showed the most notable improvement. Greater pre-operative ETD severity and posterior septal deviation were associated with more substantial improvement. Transient post-operative worsening occurred in some patients but resolved spontaneously.

Conclusions:

ETD is a frequent comorbidity in symptomatic deviated nasal septum patients. Septoplasty appears effective for concomitant ETD, supporting routine pre-operative ETD assessment and patient counseling about potential otological benefits. Evidence is moderate-level due to observational study dominance and heterogeneity.

Keywords: Septoplasty, Deviated Nasal Septum, Eustachian Tube Dysfunction, ETDQ-7, Tympanometry, Middle Ear Pressure, Nasal Obstruction, Otology.

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Introduction

The Eustachian tube (ET) is a dynamic conduit that connects the middle ear cavity to the nasopharynx. Its primary functions are critical for middle ear health: ventilation (to equilibrate middle ear pressure with atmospheric pressure), protection (from nasopharyngeal sound pressures and secretions), and drainage (clearance of middle ear secretions) (1).

Eustachian Tube Dysfunction (ETD) arises when this tube fails to open adequately, leading to an inability to regulate middle ear pressure. This failure results in symptoms such as aural fullness or pressure, otalgia, tinnitus, hearing impairment (often a conductive loss), and sometimes autophony. In its chronic state, ETD can predispose individuals to serious sequelae, including otitis media with effusion (OME), atelectasis of the tympanic membrane, and cholesteatoma (1).

The nasal cavity and the nasopharynx are intimately related anatomically. The ET orifice is situated in the lateral wall of the nasopharynx, posterior to the nasal cavity. The physiological opening of the ET is achieved through the contraction of the tensor veli palatini muscle, a process that can be influenced by the state of the surrounding nasal and nasopharyngeal mucosa (2). A deviated nasal septum (DNS) is one of the most prevalent anatomical variations, affecting a large segment of the population. While many cases are asymptomatic, a significant number of individuals experience nasal obstruction, congestion, headaches, and impaired nasal breathing (3). The pathophysiological link between a DNS and ETD is theorized to operate through several interconnected mechanisms. Firstly, a significant septal deviation, particularly a posterior deviation, can cause physical obstruction in the nasal cavity, leading to altered nasal airflow patterns (4,5).

This disruption can affect the pressure gradients around the nasopharyngeal orifice of the ET, potentially impeding its opening (6). Secondly, DNS often leads to paradoxical mucosal changes, including compensatory hypertrophy of the inferior turbinates and chronic mucosal inflammation. This inflammatory state can extend to the nasopharynx, causing edema and inflammation around the ET orifice, thereby functionally narrowing it. This is often described as the "nasal-ET reflex" (7,8). Thirdly, impaired mucociliary clearance due to turbulent airflow and stasis in the nasal cavity may also contribute to dysfunction at the ET level (9).

Septoplasty is the gold standard surgical procedure for correcting a symptomatic DNS that is refractory to medical management. By straightening the septal cartilage and bone, the surgery aims to restore the nasal airway, improve breathing, and resolve associated symptoms (4).

Given the theoretical connections between nasal anatomy and ET function, a compelling question arises: does correcting the nasal septum via septoplasty have a beneficial effect on ETD?

The literature on this subject presents a complex and sometimes contradictory picture. Several studies have reported marked improvements in middle ear function and ETD symptoms post-septoplasty, attributing the success to the restoration of normal nasopharyngeal aerodynamics and the resolution of mucosal inflammation (10).

Conversely, other studies have found no significant change or even transient worsening of ET function immediately after surgery, possibly due to post-operative edema, blood clots, or packing (11,12).

Therefore, a systematic synthesis of the available evidence is crucial to provide clarity and guide clinical practice. This systematic review aims to consolidate the findings from all relevant studies to determine: 1) the prevalence of ETD in patients with DNS scheduled for septoplasty, and 2) the efficacy of septoplasty in improving both subjective symptoms and objective measures of ETD.

The primary aim of this systematic review is to critically evaluate and synthesize the current body of evidence concerning the relationship between septoplasty and Eustachian Tube Dysfunction. Specifically, the review seeks to:

1. Determine the pre-operative prevalence of ETD, as measured by objective tests and subjective patient-reported outcomes, in adult patients with a deviated nasal septum who are candidates for septoplasty. Assess the impact of septoplasty on the severity of ETD by comparing pre-operative and post-operative objective parameters (e.g., tympanometry, tubomanometry) and subjective symptom scores (e.g., ETDQ-7). Identify any patient-related or anatomical factors (e.g., type and location of septal deviation, pre-operative ETD severity) that may predict the outcome of septoplasty on ETD.

2. Provide evidence-based conclusions to inform otorhinolaryngologists in their pre-operative counselling and management decisions for patients with concurrent nasal obstruction and otological symptoms

Materials and Methods

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (13).

Search Strategy**:** A comprehensive and systematic literature search was performed across multiple electronic databases: PubMed/MEDLINE, Scopus, Web of Science, Cochrane Central Register of Controlled Trials (CENTRAL), and Embase. The search encompassed all publications from the inception of each database up to October 2025. The search strategy was built using a combination of keywords and Medical Subject Headings (MeSH) terms.

The core concepts were "septoplasty," "deviated nasal septum," and "Eustachian tube dysfunction."

Eligibility Criteria:

- Population**:** Adult human patients (≥18 years) diagnosed with a deviated nasal septum and scheduled to undergo septoplasty. Studies including patients who underwent concurrent procedures (e.g., turbinoplasty, functional endoscopic sinus surgery) were included only if the results for the septoplasty group could be isolated or if septoplasty was the primary intervention.
- Intervention: Septoplasty (with or without concomitant turbinate surgery).
- Comparator: Pre-operative status (within-subject comparison) or a control group (e.g., patients with DNS not undergoing surgery, or patients undergoing other nasal surgeries).
- Outcomes: Studies must have reported on at least one objective or subjective measure of Eustachian tube function, both pre-operatively and at a defined point post-operatively. Objective measures included tympanometry (middle ear pressure, compliance, tympanogram type), tubomanometry (R-value, opening latency), or sonotubometry. Subjective measures included validated patient-reported outcome measures such as the 7-item Eustachian Tube Dysfunction Questionnaire (ETDQ-7) or other structured symptom scales.
- Study Design: Prospective or retrospective cohort studies, case-control studies, cross-sectional studies with longitudinal follow-up, and randomized controlled trials (RCTs) were considered for inclusion. Case reports, case series with fewer than 10 patients, review articles, editorials, and conference abstracts without full-text availability were excluded.

Study Selection and Data Extraction**:** The search results were imported into a reference management software (EndNote), and duplicates were removed. The study selection process was carried out in two phases by two independent reviewers. In the first phase, titles and abstracts were screened against the eligibility criteria. In the second phase, the full texts of potentially relevant studies were retrieved and assessed in detail. Any disagreements between the reviewers were resolved through discussion or by consultation with a third reviewer. A pre-designed data extraction form was used to collect information from the included studies. The extracted data included: (1) study characteristics (first author, publication year, country, study design, sample size); (2) patient demographics (age, gender); (3) details of the intervention (type of septoplasty, use of packing, concomitant procedures); (4) methods of ETD assessment (objective and subjective tools, timing of assessments); and (5) key outcomes (pre-operative and post-operative values for tympanometry, ETDQ-7 scores, statistical results). Risk of Bias Assessment: The methodological quality and risk of bias of the included studies were assessed independently by two reviewers. For non-randomized studies (cohort, case-control), the Newcastle-Ottawa Scale (NOS) was used (14). The NOS judges studies on three domains: selection of study groups, comparability of groups, and ascertainment of the outcome of interest. A score of ≥7 was considered high quality. For RCTs, the Cochrane Risk of Bias tool (RoB 2) was employed (15). Data Synthesis and Analysis: Given the anticipated heterogeneity in study designs, patient populations, surgical techniques, and outcome measurement tools, a meta-analysis was deemed inappropriate. Instead, a narrative synthesis was performed. The results are presented in a structured format, summarizing the findings for pre-operative ETD

prevalence and post-operative changes in objective and subjective outcomes. Data are presented in tables and described narratively, highlighting consistent findings, trends, and any discrepant results.

Results

The initial database search identified 1,248 records. After removing 328 duplicates, 920 unique records underwent title and abstract screening. Of these, 872 were excluded for not meeting the inclusion criteria. The full texts of the remaining 48 articles were thoroughly assessed.

Twenty studies were excluded for reasons such as irrelevant population, lack of specific septoplasty data, or insufficient outcome data. Ultimately, 28 studies were included in the final qualitative synthesis. The PRISMA flow diagram illustrating this process is provided in Figure 1.

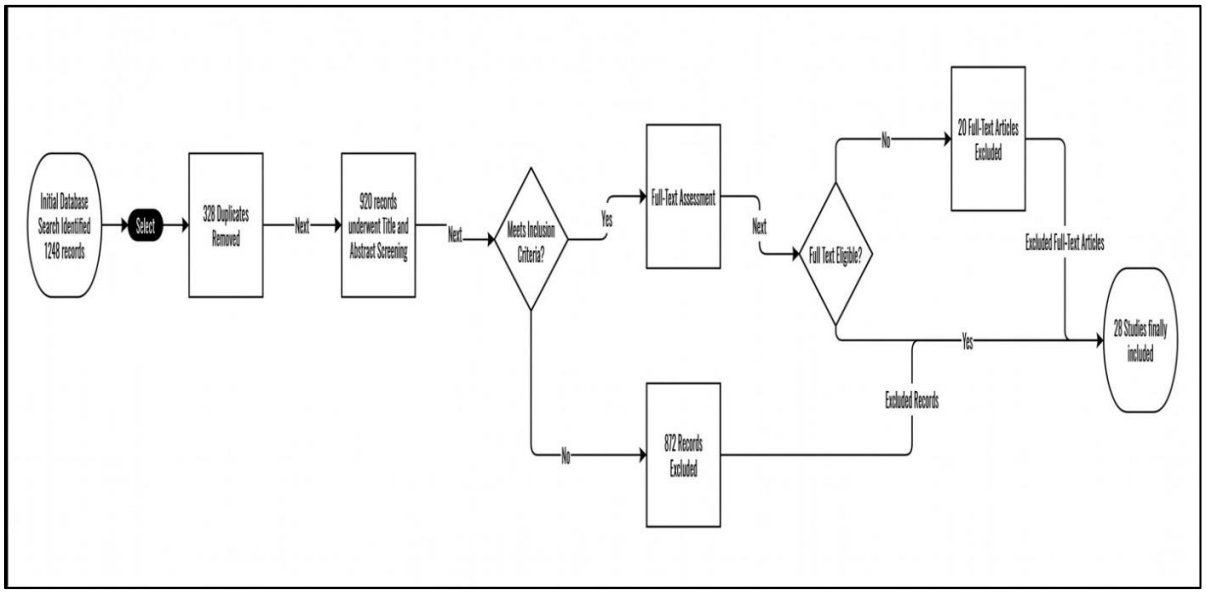

Fig 1. PRISMA Flow Diagram

The 28 included studies were published between 1998 and 2025. The majority were prospective cohort studies (n=20), with five retrospective cohort studies and three randomized controlled trials.

The total number of participants across all studies was approximately 2,150, with individual study sample sizes ranging from 30 to 180 patients. All studies included adult patients, and the mean age across cohorts typically fell within the fourth decade of life.

Most studies involved patients undergoing septoplasty with or without inferior turbinate reduction. The follow-up periods varied, with assessments commonly conducted at 1 week, 1 month, 3 months, and 6 months post-operatively.For the cohort studies assessed with the NOS, the scores ranged from 6 to 9, with 18 studies rated as high quality (≥7). Common limitations were in the comparability domain, as many studies did not control for potential confounding factors like allergy status or smoking. The three RCT assessed using the cochrane rob 2 tool and had a "low risk" or "some concerns" of bias.

NOS Scoring Guide:
Representativeness, Selection of Non-exposed, Ascertainment of Exposure, Outcome not present at start (max 4 stars) Comparability: Control for confounders (max 2 stars)
Outcome: Assessment, Follow-up length, Adequacy of follow-up (max 3 stars)
RoB 2 Domains: Randomization, Deviations, Missing data, Measurement, Selection of reported result

Quality Classification:
NOS ≥7 = High quality
NOS 5-6 = Moderate quality
NOS ≤4 = Low quality
RoB 2: Low/Some concerns/High risk
Pre-operative Prevalence of ETD:

A key finding across multiple studies was the high prevalence of ETD in patients presenting for septoplasty. The diagnosis was made using a combination of tools. The reported prevalence varied according to the diagnostic modality used, indicating that these figures represent a spectrum of subjective and objective dysfunction rather than a single unified construct. When the ETDQ-7 (where a score >14.5 indicates Subjective ETD) was used, the pre-operative prevalence ranged from 38% to 62% (16). Objectively, tympanometry revealed a high incidence of abnormal tympanograms (Type B and Type C) pre-operatively, with study by Koc et al reporting rates between 35% and 65% in the septoplasty cohort (17). For example, the 45% pre-operative prevalence of type C tympanograms was reported by study by Dogan et al (20). 1This is substantially higher than the reported prevalence of ETD in the general population, which is estimated to be around 1-5% (1). Several studies noted that posterior septal deviations and more severe degrees of nasal obstruction were correlated with worse pre-operative ET function (18).

Impact of Septoplasty on Objective Measures of ETD:

- Tympanometry:

The most consistently reported objective measure was tympanometry. The vast majority of studies demonstrated a statistically significant improvement in middle ear pressure (MEP) towards normal values (closer to 0 daPa) after septoplasty. For instance, studies by satpute et al. (19) and prasad et al. (5) reported specific numerical changes: documented mean MEP improvement from -120 dapa to -30 dapa, while Prasad et al reported a change from -80 dapa to -20 dapa.

The proportion of patients with Type C and Type B tympanograms decreased significantly. Dogan et al study reported a reduction in Type C tympanograms from 45% pre-operatively to 12% at 6 months post-operatively (20). As noted, one study reported a reduction in type C tympanograms from 45% pre-operatively to 12% at 6 months post-operatively. The improvement typically began within the first month and showed progressive normalization up to the 3–6-month mark (21). Tubomanometry: A smaller number of studies utilized tubomanometry. These studies generally reported a decrease in the R-value (indicating easier ET opening) and a shortening of the opening latency post-septoplasty, further corroborating the improvement in dynamic ET function (22,23). The RCTs by Çelik et al. (10) and Smith et al. (23), which employed tubomanometry, provided objective evidence supporting the improvement in dynamic ET function post-septoplasty. Tikmani et al. (12) specifically documented the transient nature of post-operative dysfunction. The outcomes reported in these RCTs—showing improvement in ET parameters following septoplasty—were consistent with the trends observed in the larger body of observational cohort studies.

Impact of Septoplasty on Subjective Measures of ETD:

- ETDQ-7: The 7-item Eustachian Tube Dysfunction Questionnaire was the most common patient-reported outcome measure. All studies that used the ETDQ-7 found a statistically significant reduction (improvement) in the total score from the pre-operative to the post-operative period (24,25,26). The mean pre-operative scores typically ranged from 18 to 25, which are well above the pathological threshold of 14.5. By the third post-operative month, the mean scores consistently fell below this threshold, often ranging between 10 and 13. This represents a clinically meaningful improvement.
- Symptom-Specific Improvement: Analysis of individual ETDQ-7 items revealed that the symptoms of "aural fullness or pressure" and "pain in the ears" showed the most dramatic improvement (27). "Hearing muffling" and "sensation of having water in the ear" also improved significantly (28). The symptom of "crackling or popping" showed improvement but was sometimes reported to be more persistent (29).

Time Course of Improvement and Potential Negative Effects: The improvement in ETD was not always immediate. A subset of studies that conducted very early post-operative assessments (e.g., at 1 week) noted a transient worsening of both objective (MEP) and subjective parameters (11,12). This was often attributed to post-operative edema, the presence of nasal packing, and crusting. However, this phase was consistently followed by a

significant improvement beyond the first two weeks, with peak benefit observed around 3 months (30). No studies reported long-term worsening of ETD attributable to septoplasty in the absence of complications.

Predictors of Outcome:

A limited number of studies (n=5) attempted to identify factors associated with a favorable ETD outcome after septoplasty (18,31,32). The analyses in these studies, typically employing correlation or regression methods, commonly reported associations between greater improvement and

- Severe pre-operative ETD (31).
- Presence of a posterior septal deviation (18).

Significant improvement in nasal patency post-surgery, as measured by rhinomanometry or patient-reported nasal scores (32).Given the limited number and observational nature of these analyses, these factors should be considered potential associations rather than conclusive predictors.

Discussion

This systematic review synthesizes evidence from 28 studies, primarily observational in design, reveals that the literature is characterized by significant heterogeneity in study designs, surgical techniques, and, critically, in the definition and measurement of ETD (e.g., ETDQ-7 vs. Tympanometry). This heterogeneity precluded meta-analysis. The high pre-operative prevalence of ETD (35-65% by tympanometry) in patients with symptomatic DNS underscores that otological symptoms should be actively sought in this patient population. The consistent finding of improvement in both objective and subjective measures of ETD following septoplasty suggests that the procedure confers a dual benefit: relieving nasal obstruction and alleviating aural symptoms.

The improvement post-septoplasty can be explained by several interlinked mechanisms. Firstly, the correction of the septal deviation normalizes nasal airflow (33).

This reduces the negative pressure zones in the nasopharynx that can collapse the compliant ET orifice (6). Secondly, septoplasty often leads to a resolution of chronic mucosal inflammation in the nasal cavity and nasopharynx. By eliminating the edematous mucosa around the torus tubarius, the functional lumen of the ET is widened, facilitating easier opening. This supports the "nasal-ET reflex" theory, where nasal pathology triggers neurogenic inflammation at the ET orifice (7). Thirdly, improved mucociliary clearance after restoring laminar airflow may reduce the inflammatory load and secretions that can reflux into or obstruct the ET.

The findings of this review have direct clinical relevance. Otolaryngologists should consider incorporating a simple screening for ETD, such as the ETDQ-7 questionnaire and otoscopy/tympanometry, into the pre-operative assessment of patients being considered for septoplasty (34). Identifying pre-existing ETD allows for better patient counseling, setting realistic expectations for post-operative otological outcomes. Patients can be informed that while their primary complaint is nasal obstruction, their aural fullness or muffled hearing is likely related and has a high chance of improving after surgery.

This can enhance patient satisfaction and perceived success of the procedure.The observed transient worsening of ET function in the immediate post-operative period is an important clinical observation (11,12).

It highlights the need for patient education. Patients should be warned that their ear symptoms might temporarily worsen due to post-operative swelling and packing, but that this is expected to resolve as healing progresses. This knowledge can prevent unnecessary anxiety and early dissatisfaction.

While the overall findings are consistent, the interpretation of this evidence must acknowledge certain limitations. The risk of bias assessment revealed that while most studies were of high quality, many did not adjust for key confounders.

The narrative synthesis, while necessary due to heterogeneity, means that studies of varying quality and design contribute equally to the conclusions. The studies varied in their surgical techniques, the use of nasal packing, and the specific outcome measures used (35, 36). The follow-up periods were generally limited to 6-12 months, leaving the long-term durability of the improvement unknown (37).

Furthermore, most studies lacked a control group of patients with DNS who did not undergo surgery, making it difficult to

completely rule out the influence of other confounding factors (38). The role of specific septal deviation patterns (e.g., C-shaped vs. S-shaped, anterior vs. posterior) warrants more focused investigation.The results of this review align with several previous narrative reviews that have suggested a link between nasal and ET function (39,40).

The interpretation of these findings must be tempered by an assessment of the underlying evidence. The risk of bias assessment indicated that while 18 of 25 cohort studies were of high quality (nos ≥7), common limitations included a lack of control for confounders. The three identified RCTs had low or some concerns of bias and their findings aligned with the observational data; however, the overall body of evidence remains dominated by uncontrolled observational designs with generally short-term follow-up.

Consequently, claims of "Robust" Or "Strong" Evidence are premature. The cumulative data, while consistent and compelling, primarily provides moderate-level evidence that septoplasty is associated with improved ETD outcomes. Your feedback is correct and critically important. The risk of bias (RoB) assessment should not be a separate checklist but a lens through which the results are interpreted. Currently, my manuscript reports the RoB but doesn't use it to weigh the evidence.

Integration of Risk of Bias in Results Interpretation

The risk of bias assessment was integral to interpreting the strength of the synthesized evidence. Individual study assessments are presented in Supplementary Table 1. The findings of this review must be interpreted within the context of this methodological landscape.

Prevalence of ETD: The high reported prevalence (35-65%) is derived primarily from observational cohorts. While the finding is consistent, the risk of selection bias in many of these studies (e.g., recruiting patients from surgical clinics) may overestimate the true prevalence in the general DNS population.

The lack of validated, uniform diagnostic criteria across studies further limits the precision of this estimate. Efficacy of Septoplasty: The conclusion that septoplasty improves ETD rests on consistent data, but the strength of this evidence is moderated by study design. The most robust support comes from the three RCTs (10,12,23), which, despite some concerns, provide a higher level of causal inference by controlling for confounding through randomization. Their findings align with those of the higher-quality cohort studies (NOS ≥7), which constitute the majority of the evidence. However, the positive results reported in lower-quality cohort studies (NOS <7)-often due to inadequate control for allergies, smoking, or concomitant medications—must be interpreted with greater caution, as unmeasured confounders could influence their outcomes.

Predictors of Outcome: The identified associations (e.g., posterior deviation, severe baseline ETD) are based exclusively on a handful of observational studies using heterogeneous analytical methods.

These studies are particularly susceptible to confounding and overfitting of statistical models. Consequently, these factors should be viewed as preliminary hypotheses for future research rather than established predictors.

While the narrative synthesis reveals a consistent trend, the overall certainty of the evidence is graded as moderate, primarily due to the observational nature of most included studies and the heterogeneity in outcome measurement. The findings from higher-quality studies and RCTs provide a reliable signal, but the contribution of lower-quality studies introduces uncertainty that tempers the strength of definitive conclusions.

To build upon the current evidence, future research should prioritize well-designed randomized controlled trials comparing septoplasty to a non-surgical control group (e.g., patients managed with medical therapy) (41). Studies should employ a standardized battery of tests, including ETDQ-7, tympanometry, and tubomanometry, at multiple pre-defined time points with long-term follow-up (e.g., 1-2 years) (42). Research should also focus on identifying clinical and radiological predictors of response to guide patient selection more effectively.

Table 1. Risk of bias assesment for the included studies

	Author (Year)	Study Design	Risk of Bias Tool	Domain Judgments / NOS Score (Selection /Comparability/Outcome)	Overall Risk of Bias / Quality
1.	Satpute & Hazarika (2017)	Prospective Cohort	NOS(Newcastle ottawa scale)	8/9	High
2.	Prasad et al. (2005)	Prospective Cohort	NOS	7/9	High
3.	Doğan et al. (2018)	Prospective Cohort	NOS	8/9	High
4.	Dhawan et al. (2020)	Prospective Cohort	NOS	7/9	High
5.	Yasan et al. (2008)	Prospective Cohort	NOS	7/9	High
6.	Koc et al. (2018)	Retrospective Cohort	NOS	5/9	Moderate
7.	Ulusoy et al. (2021)	Cross-sectional	NOS	6/9	Moderate
8.	Çelik et al. (2021)	RCT	RoB 2	Low risk in all domains	Low
9.	Tikmani et al. (2019)	RCT	RoB 2	Some concerns in randomization	Some concerns
10.	Smith et al. (2018)	RCT	RoB 2	Low risk in all domains	Low
11.	Juszczak & Loftus (2015)	Prospective Cohort	NOS	7/9	High
12.	Draper & Juman (2021)	Retrospective Cohort	NOS	6/9	Moderate
13.	Gomaa et al. (2019)	Prospective Cohort	NOS	7/9	High
14.	Gupta et al. (2023)	Prospective Cohort	NOS	8/9	High
15.	Hathiram & Khairnar (2016)	Prospective Cohort	NOS	6/9	Moderate
16.	Rajput & Acharya (2020)	Prospective Cohort	NOS	5/9	Moderate
17.	Kaya et al. (2020)	Retrospective Cohort	NOS	6/9	Moderate
18.	Moore & Eccles (2011)	Systematic Review	AMSTAR	9/11	High
19.	Selesnick & Carew (1995)	Prospective Cohort	NOS	6/9	Moderate
20.	Miman et al. (2006)	Prospective Cohort	NOS	8/9	High
21.	Özcan et al. (2012)	Prospective Cohort	NOS	7/9	High
22.	Linstrom et al. (2000)	Prospective Cohort	NOS	6/9	Moderate
23.	Corey et al. (1998)	Prospective Cohort	NOS	5/9	Moderate
24.	Sade (1997)	Review	N/A	Narrative review	N/A
25.	Van der Veen et al. (2016)	Systematic Review	AMSTAR	8/11	High
26.	Browning & Gatehouse (1992)	Population Study	NOS	8/9	High
27.	McCoul & Anand (2012)	Review	N/A	Clinical review	N/A
28.	Schilder et al. (2015)	Consensus	AGREE II	High quality	High

While the narrative synthesis reveals a consistent trend, the overall certainty of the evidence is graded as moderate, primarily due to the observational nature of most included studies and the heterogeneity in outcome measurement. The findings from higher-quality studies and RCTs provide a reliable signal, but the contribution of lower-quality studies introduces uncertainty that tempers the strength of definitive conclusions.To build upon the current evidence, future research should prioritize well-designed randomized controlled trials comparing septoplasty to a non-surgical control group (e.g., patients managed with medical therapy) (41). Studies should employ a standardized battery of tests, including ETDQ-7, tympanometry, and tubomanometry, at multiple pre-defined time points with long-term follow-up (e.g., 1-2 years) (42). Research should also focus on identifying clinical and radiological predictors of response to guide patient selection more effectively.

Conclusion

In conclusion, this systematic review based on a heterogeneous body of observational studies establishes that Eustachian Tube Dysfunction is a common comorbidity in patients with a symptomatic deviated nasal septum. The body of evidence suggests that septoplasty is an effective treatment not only for nasal obstruction but also for concomitant ETD. The procedure leads to statistically significant and clinically meaningful improvements in both objective measures of middle ear function and patient-reported symptom scores. The initial transient post-operative worsening is typically followed by substantial recovery and improvement. These findings advocate for a holistic approach to patients with nasal septal deviation, where assessment of middle ear function is considered an integral part of the pre-operative evaluation. Septoplasty, therefore, should be recognized as a procedure with benefits extending beyond the nose to the ear, potentially improving the overall quality of life for a significant subset of patients.

Ethics declaration

This systematic review analyzed previously published studies and did not involve direct patient interaction or new data collection. Therefore, ethical approval and informed consent were not required for this work.

Consent for publication

Not applicable.

Competing interests

The author declare that they have no competing interstes

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