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Role of Combining Various Adjunctive Surgical Procedures with Septoplasty in Improving Nasal Obstruction and Subjective Performance of Patients with symptomatic DNS and Allergic Rhinitis: An Interventional Prospective Study

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ABSTRACT

Background: Allergic Rhinitis (AR) (moderate to severe persistent) with severe symptomatic Deviated Nasal Septum (DNS) is a common entity seen in the otorhinolaryngology clinic with patients increasing proportionally to worsening air quality index (AQI) every year. Septoplasty has long been the only surgical treatment option in unresponsive patients. With the advent of nasal endoscopy techniques and CT PNS, it has become possible to tailor the surgical approach by combining adjunctive procedures with septoplasty for best post-surgical outcome.
Aims & Objective: To study the role of combining various surgical procedures with septoplasty in improving nasal obstruction and subjective performance of patients with symptomatic DNS and AR.
Methodology: This prospective study was done on 150 patients allocating them randomly into two groups; Group A patient's undergoing septoplasty with adjunctive procedures, while group B (control) undergoing septoplasty alone. The outcome was assessed using NOSE (nasal obstruction symptom evaluation) score, OSS (overall satisfaction score) and post-operative nasal endoscopy assessment.
Result: Pre-operative mean NOSE scores were comparable between Group A (11.45 ± 2.98) and Group B (11.21 ± 3.24). At 6 weeks post-operatively, NOSE scores significantly reduced in both groups; however, greater improvement was observed in Group A (0.60 ± 0.66) compared to Group B (1.35 ± 0.91) ($p < 0.001$). The mean OSS at 12 weeks was significantly higher in Group A (4.28 ± 0.73) than Group B (3.87 ± 0.79) ($p = 0.001$). Post-operative DNE at 12 weeks demonstrated adequate nasal cavity space in 100% of Group A patients compared to 53% in Group B.
Conclusion: A tailored surgical approach combining various surgical procedures with septoplasty is a quintessential, effective, long-lasting and safe treatment method to treat unresponsive chronic nasal obstruction attributed to DNS with AR.

Keywords: DNS, AR, NOSE score, OSS, DNE.

INTRODUCTION

Nasal obstruction (NO) is one of the commonest entities amongst patients presenting to the otorhinolaryngology clinic, with multiple etiological factors, deviated nasal septum (DNS) being the most common. However, multiple coexistent pathologies like allergic rhinitis (AR), inferior turbinate (IT) hypertrophy, sinonasal polyposis, concha bullosa (CB), might contribute and thereby aggravate the symptoms, the most prevalent one being allergic rhinitis (AR).[1] Sneezing, rhinorrhoea, nasal blockage, post nasal drip and/ or itching of the nose, irritation of the eyes are common presenting symptoms. It can be associated with bronchial asthma also. Chronic cough, ear itching, hyposmia, and post nasal drip may be additional symptoms of allergic rhinitis, which considerably affect the subjective performance and quality of life in a significant proportion of affected individuals.[2]

Typically, medical treatment is the most prevalent type of therapy (H1 antihistamines, leukotriene receptor antagonist, intranasal or systemic steroids, etc. [3] However, few patients become refractory to maximal medical management. Furthermore, social humiliation brought on by persistent rhinitis symptoms has a significant effect on patient's quality of life.[3]

Surgical option is reserved for such patients who show minimal or no improvement despite maximal medical management. Septoplasty is a common procedure which is done for deviated nasal septum causing nasal obstruction.[4] However, improvement in subjective performance has been found to be incomplete or unsatisfactory in some cases. The current study compares the outcome of septoplasty alone and septoplasty with adjunctive procedures (turbinoplasty, post nasal nerve neurectomy (PNNN), concha bullosa (CB) resection in improving the patient's subjective performance and thereby improving the quality of life.

MATERIALS & METHODS

This prospective study was conducted over a period of 2 years (January 2023 to December 2025) after well written informed consent on a total of 150 subjects divided randomly into two groups. Inclusion criteria of the study were patients above 18 years of age with chronic NO due to symptomatic DNS and allergic rhinitis (persistent, moderate to severe according to the allergic rhinitis and its impact on Asthma [ARIA] guidelines).[5] Exclusion criteria were patients below 18 years of age, pregnant, chronic rhinosinusitis, chronic adenoiditis, sinonasal polyposis, allergic fungal rhinosinusitis (AFRS), compensatory hypertrophy of contralateral inferior turbinate due to DNS, diabetic, hypertensive or coronary artery disease (CAD) patients on anti-platelet drugs, history of previous nasal surgery. All these patients were made to undergo a preliminary diagnostic nasal endoscopy (DNE) and computed tomography scan (CT) PNS.

Group A were treated with septoplasty along with other adjunctive procedures (inferior turbinoplasty, turbinoplasty for CB, PNNN while group B patients underwent septoplasty alone, surgery being tailored according to the nasal anatomy (assessed by DNE and CT PNS).

Endoscopic septoplasty was done for all under general anaesthesia. Inferior turbinoplasty procedures comprised partial resection (by Cold knife method, submucosal partial resection, endoscopic powered shaving using microdebrider and suction diathermy) tailored as per patient's structural anatomy.

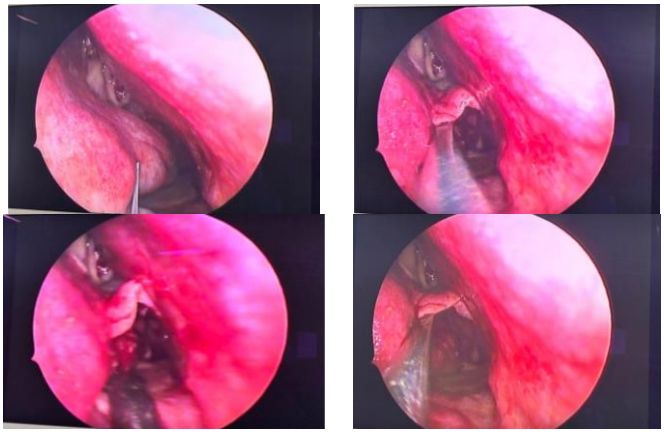

Fig 1: Turbinoplasty procedures for inferior turbinate hypertrophy

PNNN comprised severing the nerve branches using cautery or cottle elevator. After infiltrating injection lignocaine 2% ADR in the posterior attachment of middle turbinate, the mucoperiosteal flap was elevated from the lateral bony wall starting from the anterior part of the perpendicular plate of Palatine bone, reaching till the sphenopalatine foramen, after which the nerve branches were identified, and severed under direct endoscopic vision.

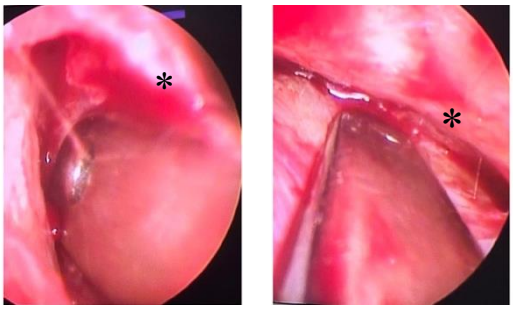

Fig 2: Posterior nasal nerve exposure for neurectomy

Concha bullosa (anterior 1/3 middle turbinate) resection was done in some while uncapping of concha (partial resection) was done in others tailored as per the patients structural nasal anatomy.

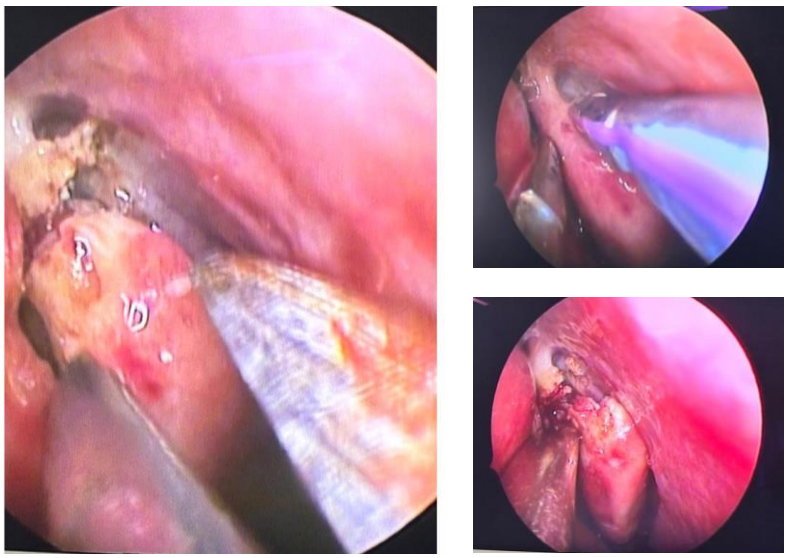

Fig 3: various methods of turbinoplasty for concha bullosa

Patients were followed at 1 week, 3 weeks and 6 weeks. The pre and post-operative improvement in NO was assessed and documented using NOSE score.[6] Subjective evaluation was also done post operatively using OSS at 12 weeks. [7] A DNE was also done post operatively at 12 weeks to assess the adequacy of the nasal cavities.

Statistical Analysis

- Statistical analysis was done using IBM statistical package for social sciences (SPSS) software version 25.
- Data display was performed by charts and tables.
- Comparison of NOSE scores across different time points and OSS at 12 weeks was performed using the Friedman test.
- Continuous variables were expressed as mean ± standard deviation
- Repeated measures were analysed using the Friedman test followed by pair wise comparison using the Wilcoxon signed rank test. A "p value" of less than 0.05 was considered statistically significant.
- Mann-Whitney U test was used for data analysis between the two groups.

RESULT

The study was conducted in MLB medical College, Jhansi, on a total of 150 patients of symptomatic DNS with AR attending the otorhinolaryngology clinic who were refractory to, or only partially relieved on maximal medical management.

After detailed verbal and written consent, patients were randomly distributed into two groups. Group A comprised patients who underwent endoscopic septoplasty with adjunctive procedures (bilateral (B/L) PNNN, and/or B/L inferior turbinoplasty (BIT), unilateral(U/L) inferior turbinoplasty (UIT) and/or CB resection/uncapping). Group B comprised of patients who underwent septoplasty alone.

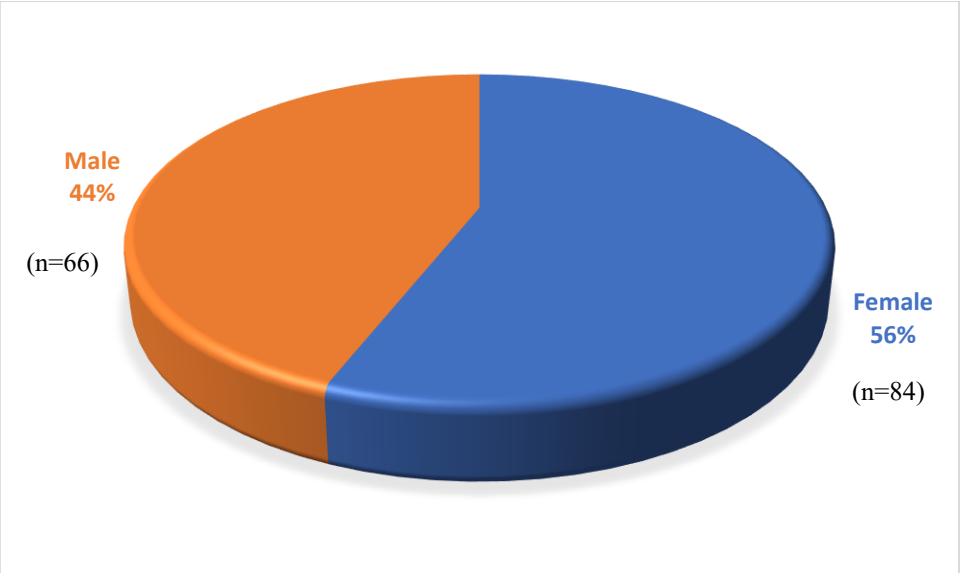

Fig 4: Gender wise patients' distribution

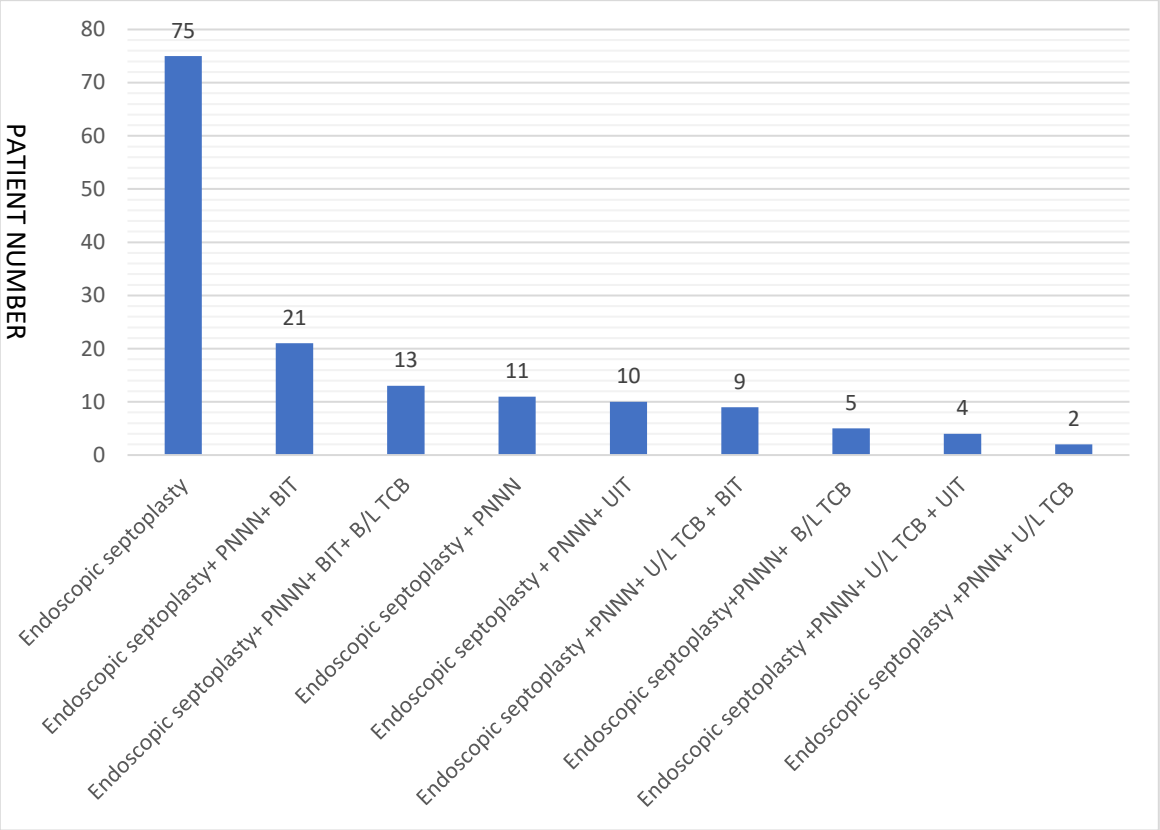

Fig 5: Graphical representation of patients undergoing various surgical procedures.

PNNN- post nasal nerve neurectomy
U/L TCB- turbinoplasty unilateral concha bulla
B/L TCB- turbinoplasty bilateral concha bulla
UIT- unilateral inferior turbinoplasty
BIT- bilateral inferior turbinoplasty

Table 1: NOSE score data analysis of Group A (Septoplasty++)

Level of assessment	Mean ± SD	Range	Median	χ^2	df	p value
Pre-operatively	11.45 ± 2.98	6-18	12			
Post-operatively at 1 week	3.03 ± 1.46	1-7	3			
Post-operatively at 3 weeks	1.35 ± 0.84	0-4	1			
Post-operatively at 6 weeks	0.6 ± 0.66	0-2	1	118.4	3	0.001

SD: Standard deviation

Table 2: Comparison of Group A NOSE score at different levels of assessment using Wilcoxon signed rank test (paired, two tailed)

Level of comparison	Z value	p-value
Pre-op - post-op 1 week	-7.52	<0.001
Pre-op - post-op 3 weeks	-7.52	<0.001
Pre-op - post-op 6 weeks	-7.52	<0.001
Post-op 1 week - post-op 3 weeks	-7.06	<0.001
Post-op 1 week - post-op 6 weeks	-7.37	<0.001
Post-op 3 week - post-op 6 weeks	-6.03	<0.001

Table 3: NOSE score data analysis of Group B (Septoplasty alone)

Level of assessment	Mean ± SD	Range	Median	χ^2	df	p-value
Pre-operatively	11.21 ± 3.24	4-17	11			
Post-operatively at 1 week	3.16 ± 1.23	2-7	3	210.44	3	<0.001
Post-operatively at 3 weeks	1.97 ± 0.73	1-3	2			
Post-operatively at 6 weeks	1.35 ± 0.91	0-4	2			

Table 4: Comparison of group B NOSE score at different levels of assessment using Wilcoxon signed rank test (paired, two tailed)

Level of comparison	Z value	p-value (two tailed)
Pre-op - post-op 1 week	-7.54	<0.001
Pre-op - post-op 3 weeks	-7.54	<0.001
Pre-op - post-op 6 weeks	-7.54	<0.001
Post-op 1 week - post-op 3 weeks	-7.30	<0.001
Post-op 1 week - post-op 6 weeks	-7.52	<0.001
Post-op 3 week - post-op 6 weeks	-5.54	<0.001

Table 5: Between-group comparison of NOSE score at different time points

Level of assessment	U-value	p-value	Interpretation
Pre-operatively	3011.0	0.455	Not significant
Post-operatively at 1 week	2531.5	0.272	Not significant
Post-operatively at 3 weeks	1656.5	<0.001	Significant
Post-operatively at 6 weeks	1496.0	<0.001	Highly significant

Test used: Mann-Whitney U test (two-tailed)

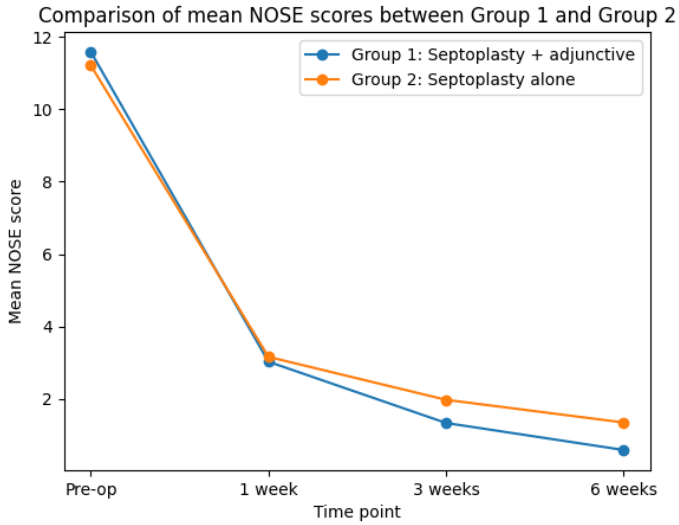

Figure 6: Comparison of mean NOSE score Between Group A (1) & Group B (2)

- Comparison of NOSE scores across different time points was performed using the Friedman test, which showed a statistically significant difference. ($\chi^2 = 118.4$, df = 3, $p < 0.001$).
- Statistically significant results were also demonstrated for group B (($\chi^2 = 210.44$, df =3, p<0.001)
- Although both groups demonstrated significant post-operative improvement, patients undergoing septoplasty with adjunctive procedure (group A) showed significantly greater reduction in NOSE scores at 3 weeks and 6 weeks post operatively compared to those with septoplasty being done alone (group B). However, early post-operative improvement at 1week is more or less similar in both groups.
- Although both groups improved postoperatively, but septoplasty with adjunctive procedures showed greater and sustained improvement from 3rd post operative week onwards. Superiority of septoplasty with adjunctive procedures is thus sustained.

Table 6: Descriptive statistics of overall satisfaction score (OSS) at 12 weeks

Group	Mean ± SD	Range	Median
Group A (Septoplasty+adjunctive procedure)	4.28 ± 0.73	2-5	4
Group B (Septoplasty alone)	3.87 ± 0.79	2-5	4

Table 7: Between group comparison of OSS

Outcome	U value	p-value	Interpretation
OSS at 12 weeks	3624.5	0.001	Statistically significant

OSS category	Group An (%)	Group Bn (%)
Poor- fair <3	Lower proportion	Higher proportion
Good excellent (4-5)	Higher proportion	Lower proportion

Test used: Mann-Whitney U test (two tailed)

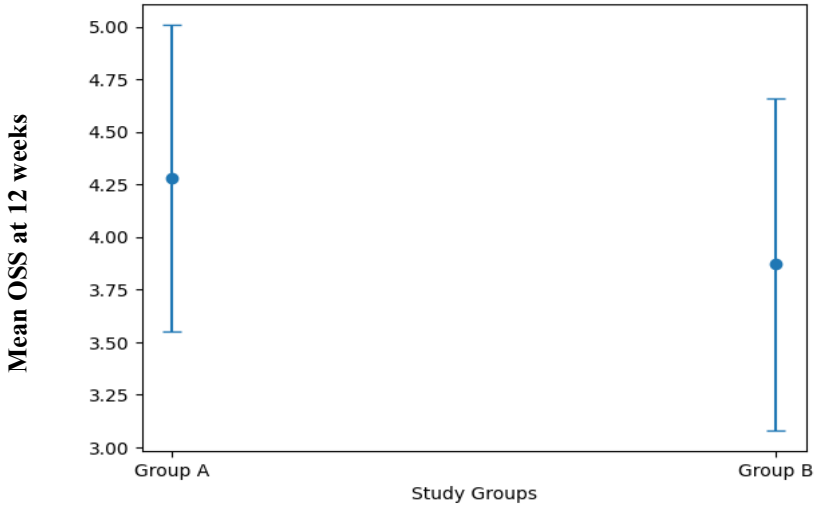

Figure 7: Dot plot of Mean OSS at 12 weeks

Thus, the data analysis OSS scores of both groups yet again were consistent with the superiority of septoplasty with adjunctive procedures reflecting the long-lasting benefits of surgery, when compared with septoplasty being done alone.

Table 8: Post operative diagnostic nasal endoscopy findings at 12 weeks

Diagnostic finding	Group A (n=75) (septoplasty+adjunctive procedures)	Group B (n=75) (Septoplasty alone)
Adequate space on both sides	75	40
Inadequate space on both sides	0	17
Inadequate space on right sides	0	10
Inadequate space on left sides	0	8

Group A patients had adequate nasal cavity space on both sites. However, this was not observed in group B patients. Hence, the objective performance of patients post operatively at 12 weeks was also found to be aligned with the better results of septoplasty with adjunctive procedures.

Table 9: Complications of surgery

Complication	Group A (septoplasty++)	Group B (septoplasty alone)
1. Intra operative bleeding	0	0
2. Duration of surgery >45 min	10	5
3. Prolonged hospital stay (>48 hrs)	0	10
4. Nasal synechia formation	0	7
5. Post op numbness (at 6 weeks)	1	0
6. Septal perforation	0	0
7. Recurrence of symptoms	1	22
8. Secondary Atrophic Rhinitis changes (including crusting)	0	0
9. Post op numbness (at 12 weeks)	0	0

DISCUSSION

Our study was conducted with the aim of comparing the results of septoplasty plus adjunctive procedures with septoplasty being done alone in improving NO and subjective performance with providing maximal benefit for patients of symptomatic DNS (chronic NO) with allergic rhinitis.

With worsening air quality index (AQI) especially in metropolitan cities, the incidence and prevalence of allergic disorders have been increasing.[8] This has caused a "butterfly effect" in the daily footfall of patients suffering with chronic NO due to symptomatic DNS with AR presenting to the otorhinolaryngology clinic.

The ARIA guidelines classify allergic rhinitis into two major groups, "intermittent" and "persistent" depending on the duration of symptoms.[5] These are further classified into "mild" and "moderate to severe" according to the degree of their symptoms. Treatment is often challenging in case of persistent, moderate to severe degree of AR. The mainstay of treatment in these cases generally includes topical steroid spray and systemic antihistamines. There are multiple changes in the Sino nasal mucosa, bilateral IT mucosal hypertrophy being one of the majors noticed one.[7] CB if present along (as seen on CT PNS) adds to the symptom severity in these patients. Despite maximal medical management being done, a good number of these cases have been found to be either refractory to treatment or only minimally relieved. The present study was thus conducted on such patients with the aim of providing maximal treatment benefit.

This results of data analysis of NOSE score, OSS and post-operative endoscopic assessment (at 12 weeks) signify a remarkably beneficial role of combining septoplasty with adjunctive procedures in alleviating the symptoms and improving subjective performance of these patients. Our study results corroborated with the results of similar studies done by Ahmad et al [3], Nayanna et al [4], Sanjoy Kumar Ghosh et al [7] Dinesh Kumar R et al. [9]

Inferior turbinectomy proves beneficial in attenuating symptoms by reducing the mucosal surface of IT [10]. PNNN reduces nasal mucosa hypersensitivity and decreases associated secretory activity [11]. Turbinoplasty for CB provided additive benefits to the study subjects for symptomatic improvement [12]. The long-lasting benefit of combining adjunctive procedures, as assessed post operatively at 12 weeks by OSS, further provided evidence in favour of the productivity of the procedure.

There are a few limitations which might be considered for our study. Firstly, the sample size could have been larger, along with the longer study duration and long-term follow-up of patients, especially relevant because the patient cohort in our study is highly selective and nasal tissues (septal and turbinate) take time for healing and remodelling, following corrective surgeries. Posterior nasal nerve branch regeneration to the pterygopalatine ganglion could still occur gradually after surgery. This might attribute to the recurrence of rhinitis symptom seen in some cases. Although not seen in our study, the possible complication of "empty nose syndrome" should always be borne in surgeon's mind, with emphasis on surgical corrective procedures to be done with precision. Other non-surgical factors like poor compliance to medical treatment post-operatively and follow-up checkup visits might affect the results of the study. Other extrinsic factors like low social economic status, poor general awareness, etc. could be considered to have the potential to modify the study design and results. Hence, these need to be dealt specifically as well.

CONCLUSION

The study findings proved more efficacy of combining septoplasty with adjunctive procedures compared to septoplasty being done alone in patients of chronic NO attributed to DNS, compounded by AR. The surgeon must tailor the surgical techniques according to the local anatomy and

physiology by a thorough pre-operative evaluation of patients.

To conclude combining adjunctive procedures with septoplasty can lead to a paradigm shift in the treatment protocol of AR patients with chronic NO due to DNS.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

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