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ENDOSCOPIC SEPTOPLASTY VERSUS OPEN SEPTOPLASTY IN SYMPTOMATIC DEVIATED NASAL SEPTUM: A PROSPECTIVE COMPARATIVE STUDY OF SURGICAL ACCESSIBILITY, CLINICAL OUTCOMES, AND QUALITY OF LIFE

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ABSTRACT

Objectives: Deviated nasal septum (DNS) is the leading structural cause of chronic nasal obstruction. Endoscopic and open septoplasty represent two distinct surgical paradigms with specific anatomical indications and outcome profiles.

Methods: A prospective observational comparative study was conducted at the Department of ORL-HNS, Kalinga Institute of Medical Sciences (KIMS), Bhubaneswar, from March 2024 to January 2026. One hundred patients with symptomatic DNS were enrolled: 50 underwent endoscopic septoplasty (Group A) and 50 underwent open septoplasty (Group B). Surgical accessibility was assessed by anatomical site of deviation and operative duration. Clinical outcomes were evaluated using Nasal Obstruction Symptom Evaluation (NOSE) scale preoperatively and at 3 and 6 months postoperatively, supplemented by documented complication profiles. Quality of life was assessed by a 4-point Likert satisfaction scale. Statistical significance was set at $p < 0.05$.**Results:** Open septoplasty demonstrated superior surgical accessibility for caudal septal deviation (28.0% vs. 6.0%; $p = 0.024$). Mean operative time was significantly longer for open septoplasty (119.50 ± 24.97 vs. 65.80 ± 19.62 minutes; $p = 0.025$). Both groups showed significant NOSE score improvement; however, endoscopic septoplasty demonstrated superior functional outcomes at 3 months (28.40 ± 8.89 vs. 39.10 ± 13.12; $p = 0.028$) and 6 months (20.10 ± 7.48 vs. 40.70; $p < 0.003$). Postoperative synechiae were significantly lower in the endoscopic group (22.0% vs. 46.0%; $p = 0.011$). Patient satisfaction was significantly higher following endoscopic septoplasty ($p = 0.049$), with 34.0% reporting excellent outcomes versus 16.0% in the open group.**Conclusions:** Endoscopic septoplasty offers superior functional recovery and fewer complications for anterior and posterior septal deviations. Open septoplasty remains indispensable for complex caudal deviations and internal nasal valve compromise requiring structural reconstruction. An anatomy-driven approach to surgical selection is essential for optimising outcomes in DNS management.

KEYWORDS : DNS, endoscopic septoplasty, open septoplasty, NOSE scale, nasal obstruction

INTRODUCTION

Deviated nasal septum (DNS) is among the most prevalent structural abnormalities encountered in otorhinolaryngological practice, affecting an estimated 20–80% of the population with a clinically significant subset requiring surgical correction.[1] Chronic nasal obstruction, snoring, mouth breathing, recurrent rhinosinusitis, sleep disturbance, and consequent quality-of-life impairment represent the functional burden of untreated symptomatic DNS. Surgical septoplasty remains the definitive treatment for patients whose symptoms are refractory to maximal medical management.[2]

Two principal surgical techniques have evolved for DNS correction: endoscopic septoplasty and open septoplasty. Endoscopic septoplasty provide magnified, illuminated, direct visualisation , enabling targeted correction of anterior, posterior, and isolated septal deviations with minimal mucosal trauma and preservation of healthy cartilage. The technique affords excellent visualisation of the posterior septum and sphenoethmoidal complex—regions beyond the reach of conventional headlight-assisted approaches.[3] Open septoplasty, performed through a transcolumellar incision with bilateral marginal extensions and elevation of the nasal skin envelope, provides wide-field exposure of the entire osteocartilaginous framework. This approach is uniquely suited to the correction of caudal septal dislocation, middle vault deformities, and internal nasal valve (INV) compromise through structural grafting—most critically the bilateral spreader graft placed between the dorsal septum and upper lateral cartilages.[4]

Despite widespread adoption of both techniques, comparative prospective data structured across specific, clinically meaningful outcome domains are limited. Most published series focus on individual techniques or provide only aggregate outcome metrics, without systematically analysing differences in surgical accessibility, functional recovery trajectories, and patient-reported quality of life. The present study addresses this gap through a prospective comparative design evaluating both techniques across three structured domains: (1) surgical accessibility, defined by anatomical complexity and operative parameters; (2) clinical outcomes, assessed by NOSE scale scoring and complication documentation; and (3) quality of life, measured by a 4-point Likert satisfaction scale. Together, these domains provide a comprehensive, multi-dimensional framework for evidence-based surgical decision-making in DNS management.[5]

MATERIALS AND METHODS

Study Design and Setting

A prospective observational comparative study was conducted at the Department of ORL-HNS, KIMS, Bhubaneswar, Odisha, India, from March 2024 to January 2026. Institutional ethics committee approval (KIMS/IEC/2024/XX) was obtained prior to commencement. Written informed consent was obtained from all participants.

Study Population and Eligibility

All consecutive patients attending the ENT Outpatient Department with symptomatic nasal obstruction attributable to DNS were screened for eligibility. Patients were allocated to surgical groups based on clinical and endoscopic anatomical assessment by the operating surgeon, guided by the site and morphology of septal deviation. Inclusion criteria encompassed patients aged 18–65 years with DNS of any morphological type—C-shaped, S-shaped, spur, caudal dislocation, or thickened septum—with or without nasal valve compromise, who provided written informed consent. Exclusion criteria included nasal polyps, vasomotor rhinitis requiring primary medical management, inferior turbinate hypertrophy as the sole cause of obstruction, concurrent requirement for FESS, obstructive or restrictive pulmonary disease, and patients requiring revision rhinoplasty.

Surgical Technique

Group A (Endoscopic Septoplasty, n=50): Performed under general anaesthesia using a 0° rigid nasal endoscope (4 mm diameter, 18 cm length). A hemitransfixion incision was made and subperichondrial and subperiosteal dissection performed under endoscopic vision. Deviated cartilaginous and bony segments were resected or repositioned as required. Osteotomy was performed where indicated for posterior bony spur correction. Bilateral anterior nasal packs were removed at 48 hours postoperatively.

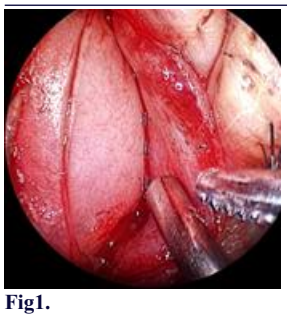

Fig1.

Fig2.

Figure1 and 2 represents Incision and Flap elevation respectively in Endoscopic Septoplasty

Group B (Open Septoplasty, n=50): Performed through an external approach via a transcolumellar inverted-V incision with bilateral marginal extensions under general anaesthesia. Full exposure of the osteocartilaginous framework was achieved following nasal skin-soft tissue elevation. Deviated septal cartilage was corrected under direct vision. Bilateral spreader grafts—harvested from resected septal cartilage or conchal bowl as appropriate—were placed between the dorsal septum and upper lateral cartilages to reconstruct the middle vault and widen the INV angle. Medial and lateral osteotomies were performed where indicated. Bilateral nasal packs were removed at 48 hours.

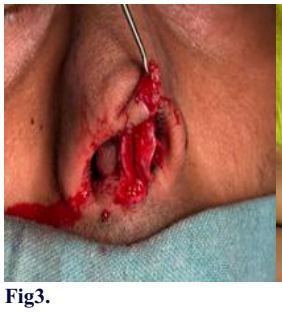

Fig3.

Fig4.

Figure 3 and 4 represents Incision and Spreader graft placement respectively in Open Septoplasty

Outcome Domains and Measurement Instruments

Domain 1 — Surgical Accessibility: Assessed by the site and morphology of septal deviation (anterior, posterior, caudal, combined) and mean operative duration in minutes. The distribution of caudal deviation between groups served as the primary measure of anatomical accessibility advantage.

Domain 2 — Clinical Outcomes: Assessed using the Nasal Obstruction Symptom Evaluation (NOSE) scale—a validated 5-item, 100-point patient-reported outcome measure (mild: 5–25; moderate: 30–50; severe: 55–75; extreme: 80–100)—administered at baseline, 3 months, and 6 months postoperatively. Postoperative complications including synechiae formation and residual septal deviation were documented at each visit. Synechiae were graded as present or absent on nasal endoscopy; residual deviation was documented on clinical examination with anterior rhinoscopy and endoscopy.

Domain 3 — Quality of Life: Assessed using a 4-point Likert satisfaction scale at 6-month postoperative follow-up (1 = poor satisfaction; 2 = moderate satisfaction; 3 = good satisfaction; 4 = excellent satisfaction).

Statistical Analysis

Data were entered in Microsoft Excel 2021 and analysed using SPSS version 26.0. Continuous variables are expressed as mean ± standard deviation (SD). Categorical variables are expressed as frequencies and percentages. Between-group comparisons of continuous variables were performed using the independent samples t-test. Categorical variables were compared using the chi-square test or Fisher's exact test as appropriate. Pre- and postoperative within-group NOSE score changes were evaluated by paired t-test. A two-tailed p-value of < 0.05 was considered statistically significant.

RESULTS

Demographic Profile

A total of 100 patients were enrolled—Group A (endoscopic septoplasty, n = 50) and Group B (open septoplasty, n = 50). The demographic profiles of both groups were comparable at baseline with no statistically significant differences in age distribution (p = 0.373) or sex (p = 0.280), ensuring that observed differences in outcomes were attributable to surgical technique rather than demographic confounding. The predominance of the 21–30 age group in both cohorts is consistent with the established epidemiology of symptomatic DNS in young adults. Males predominated in both groups (Group A: 64.0%; Group B: 74.0%), reflecting the known male preponderance in DNS surgical candidates across the Indian subcontinent. The side of nasal obstruction did not differ significantly between groups (p = 0.165). Baseline demographic data are summarised in Table 1.

Table 1. Baseline Demographic Comparison of Surgical Groups (n = 100)

Parameter	Group A – Endoscopic (n=50)	Group B – Open (n=50)	p-value
Age: 21–30 years (most common)	17 (34.0%)	16 (32.0%)	0.373
Age: 31–40 years	13 (26.0%)	20 (40.0%)	
Sex: Male	32 (64.0%)	37 (74.0%)	0.280
Sex: Female	18 (36.0%)	13 (26.0%)	
Side: Left obstruction	31 (62.0%)	22 (44.0%)	0.165
Side: Right obstruction	15 (30.0%)	24 (48.0%)	
Side: Bilateral	4 (8.0%)	4 (8.0%)	

Domain 1: Surgical Accessibility — Site of Deviation and Operative Duration

A statistically significant association was observed between the site of septal deviation and the choice of surgical procedure (p = 0.024). Anterior deviation was the most common indication for endoscopic septoplasty (46.0%), while caudal deviation was markedly more frequent in the open septoplasty group (28.0% vs. 6.0%). Posterior deviations were comparably distributed between both groups (38.0% vs. 34.0%). The mean operative time was significantly shorter for endoscopic septoplasty (65.80 ± 19.62 minutes) compared to open septoplasty (119.50 ± 24.97 minutes; p = 0.025). Table 2 presents the combined accessibility data. Figure 1 illustrates the distribution of septal deviation sites across both groups. Figure 2 provides a schematic comparison of operative durations.

Table 2. Site of Septal Deviation and Operative Duration by Surgical Group (Domain 1 — Surgical Accessibility)

Site of Deviation	Group A – Endoscopic (n=50)	Group B – Open (n=50)	Total	P-value
Anterior	23 (46.0%)	17 (34.0%)	40	**0.024***
Posterior	19 (38.0%)	17 (34.0%)	36	
Caudal	3 (6.0%)	14 (28.0%)	17	
Combined	5 (10.0%)	2 (4.0%)	7	
Mean Operative Duration (min ± SD)	**65.80 ± 19.62**	**119.50 ± 24.97**	—	**0.025***

*** Statistically significant (p < 0.05).**

Domain 2: Clinical Outcomes — NOSE Scale

Baseline NOSE scores were comparable between the two groups (Group A: 39.30 ± 10.64; Group B: 38.20 ± 10.29; p = 0.593), confirming equivalent severity of preoperative nasal obstruction. Both groups demonstrated significant postoperative improvement; however, endoscopic septoplasty showed a significantly greater and more rapid functional recovery. At 3 months, Group A achieved a mean NOSE score of 28.40 ± 8.89 versus 39.10 ± 13.12 in Group B (p = 0.028). At 6 months, the difference widened further, with Group A recording 20.10 ± 7.48 versus 40.70 in Group B (p < 0.003). The absolute reduction from baseline at 6 months was 19.20 points in Group A versus 2.50 points in Group B. NOSE score trajectories are presented in Table 3 and illustrated in Figure 3.

Table 3. Serial NOSE Scale Scores — Comparison Between Groups (Domain 2 — Clinical Outcomes)

Time Point	Group A – Endoscopic (Mean ± SD)	Group B – Open (Mean ± SD)	p-value
Preoperative	39.30 ± 10.64	38.20 ± 10.29	0.593 (NS)
3 Months Postoperative	28.40 ± 8.89	39.10 ± 13.12	0.028*
6 Months Postoperative	20.10 ± 7.48	40.70 ± —	<0.003*
Absolute change from baseline (6M)	**−19.20**	**−2.50**	

*** Statistically significant (p < 0.05). NOSE = Nasal Obstruction Symptom Evaluation.**

Domain 2: Clinical Outcomes — Postoperative Complications

Postoperative synechiae at 3–6 months were significantly lower in the endoscopic group (22.0%, n = 11) compared to the open septoplasty group (46.0%, n = 23; p = 0.011). This reflects the greater mucosal handling and wider dissection planes inherent in the open approach. Residual septal deviation at 3–6 months was observed in 30.0% of Group A and 40.0% of Group B; this difference did not reach statistical significance (p = 0.295), indicating comparable anatomical correction when appropriate case selection is applied. There were no septal perforations in either group. Complication data are summarised in Table 4. Figure 4 provides a graphical comparison of complication rates between groups.

Table 4. Postoperative Complications — Comparative Analysis (Domain 2 — Clinical Outcomes)

Complication	Group A – Endoscopic (n=50)	Group B – Open (n=50)	p-value
Postoperative synechiae (3–6 months)	11 (22.0%)	23 (46.0%)	0.011*
Residual septal deviation (3–6 months)	15 (30.0%)	20 (40.0%)	0.295 (NS)
Haemorrhage	0 (0.0%)	1 (2.0%)	>0.05
Septal perforation	0 (0.0%)	0 (0.0%)	—

*** Statistically significant (p < 0.05). NS = Not significant.**

Domain 3: Quality of Life — Likert Satisfaction Scale

The distribution of Likert satisfaction levels differed significantly between the two groups (p = 0.049). Excellent satisfaction (Score 4) was reported by 34.0% of patients in the endoscopic group versus 16.0% in the open group. Good satisfaction was the predominant response in both groups. Importantly, no patient in either group reported poor satisfaction, affirming that both procedures deliver clinical benefit. Satisfaction data are presented in Table 5 and illustrated in Figure 5.

Table 5. Patient Satisfaction — 4-Point Likert Scale (Domain 3 — Quality of Life)

Satisfaction Level	Group A – Endoscopic (n=50)	Group B – Open (n=50)	p-value
Excellent (Score 4)	17 (34.0%)	8 (16.0%)	0.049*
Good (Score 3)	23 (46.0%)	27 (54.0%)	
Moderate (Score 2)	10 (20.0%)	15 (30.0%)	
Poor (Score 1)	0 (0.0%)	0 (0.0%)	

*** Statistically significant (p < 0.05).**

DISCUSSION

This prospective comparative study is among the few to structure the comparison between endoscopic and open septoplasty across three explicit, clinically meaningful domains within a single institutional cohort and study period. This three-domain framework offers a more nuanced and surgically actionable basis for decision-making than aggregate outcome comparisons alone.

The most fundamental finding of the surgical accessibility domain is the statistically significant association between caudal septal deviation and the open surgical approach (p = 0.024). This association is anatomically determined rather than arbitrary. Caudal septal dislocation disrupts the internal nasal valve architecture, compromises the columellar support mechanism, and deforms the nasal tip — all of which require direct access for correction that the endoscopic route cannot provide. The transcolumellar approach of open septoplasty permits direct visualisation and repositioning of the caudal septum, bilateral spreader graft placement to reconstruct the middle vault and widen the INV angle, and osteotomies for nasal pyramid realignment. Kulkarni et al. similarly observed that endoscopic septoplasty provides superior results for anterior deviations, while cases involving the caudal septum and nasal valve demanded more extensive approaches. Sunnychan and Deshmukh specifically emphasised that INV compromise requires dedicated valve-addressing procedures, as isolated endonasal correction inadequately restores valve patency in this anatomical subset.[9]

The significantly longer operative duration of open septoplasty (119.50 vs. 65.80 minutes; p = 0.025) directly reflects the additional reconstructive steps — transcolumellar incision, nasal skin elevation, cartilage graft harvest, bilateral spreader preparation and placement, and osteotomy closure. Trimartani and Damara similarly noted that extended operative times in open septoplasty are an expected consequence of the structural reconstruction required.[5]

Endoscopic septoplasty produced a rapid and progressive reduction in NOSE scores at both 3 months (p = 0.028) and 6 months (p < 0.003), consistent with the direct and immediate correction of the obstructing segment with minimal collateral tissue disruption. The absolute 6-month reduction of 19.20 NOSE score points in Group A represents a clinically meaningful improvement, placing the mean score well within the mild-to-moderate obstruction range.

The open septoplasty group showed NOSE scores remaining relatively stable between 3 and 6 months. This pattern is well-recognised in the functional rhinoplasty literature and is attributable to prolonged postoperative oedema, progressive graft integration, and cartilage remodelling — processes that continue beyond the 6-month assessment window. Besharah et al. noted in their meta-analysis that open approach functional outcomes converge with endonasal results at 12 months, a follow-up period not captured in the present study.[1] Extended follow-up beyond 12 months would be expected to demonstrate continued NOSE score improvement in Group B.

The significantly lower synechiae rate following endoscopic septoplasty (22.0% vs. 46.0%; p = 0.011) is a direct consequence of the mucosal-sparing nature of the endoscopic technique. Ahmed et al. similarly reported lower synechiae rates with endoscopic approaches in their randomised controlled trial.[6]

The comparable residual deviation rates between both groups (p = 0.295) confirm that neither technique is inherently superior in achieving anatomical correction when appropriate case selection and surgical expertise are applied.

The significantly higher rate of excellent satisfaction in the endoscopic group (34.0% vs. 16.0%; p = 0.049) is coherent with its superior functional recovery trajectory and lower complication burden within the 6-month window.

Open septoplasty—through simultaneous spreader grafting, caudal septum repositioning, and osteotomies—addresses both the functional impairment and the visible external nasal deformity concurrently. This combined benefit is unavailable through the endoscopic route and is incompletely captured by the NOSE scale or Likert functional satisfaction score alone. Patients with longstanding aesthetic concerns in addition to nasal obstruction may derive disproportionate quality-of-life benefit from the open approach over longer follow-up periods. Ashwinirani et al. emphasised that patient-centred outcome assessment in septal surgery must account for both functional and aesthetic dimensions, particularly in patients with combined structural deformities. Future studies incorporating a dedicated rhinoplasty-specific outcome instrument alongside NOSE scoring — and employing follow-up periods of 12–24 months — would provide a more complete picture of quality-of-life benefit in open septoplasty candidates.

This study has several limitations. The follow-up period of 6 months may be insufficient to capture the complete functional recovery trajectory of open septoplasty. The absence of blinding in the Likert satisfaction assessment and the non-randomised allocation to surgical groups (determined by anatomical indication) are inherent to the observational design. Larger multicentre randomised trials with extended follow-up are warranted to corroborate these findings.

CONCLUSION

This prospective comparative study demonstrates that endoscopic

septoplasty and open septoplasty are complementary rather than competing surgical techniques, each occupying a distinct and evidence-based role in the management of symptomatic DNS.

Open septoplasty is uniquely mandated by the anatomical demands of caudal septal deviation and internal nasal valve compromise, delivering structural reconstruction of the middle nasal vault inaccessible to the endoscopic approach. Endoscopic septoplasty offers superior accessibility for anterior and posterior deviations with a significantly shorter operative time. In terms of functional outcomes, endoscopic septoplasty delivers superior NOSE scale improvement at 3 and 6 months, significantly fewer postoperative synechiae, and significantly higher rates of excellent patient satisfaction within the 6-month follow-up window. The overarching conclusion is that surgical selection in DNS management must be anatomy-driven: endoscopic septoplasty for uncomplicated anterior and posterior deviations; open septoplasty for complex caudal deviations, INV compromise, and cases requiring structural reconstruction. There is no universally superior technique — optimal outcomes arise from precisely matching the surgical approach to the anatomical problem.

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