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Comparison of the effects of Traditional and Endoscopic septoplasty in terms Pre-operative &Intra-operative (bleeding, duration of surgery, duration of stay) and to compare the post-operative complications of both the surgery in the follow-up of the patient

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ABSTRACT

Background: Nasal septal deviation can either be developmental or traumatic with symptoms that can include nasal obstruction, epistaxis, headache or may be nonexistent; proper diagnosis can only be achieved by clinical examination, endoscopy and imaging. The most common surgical intervention is septoplasty, and the methods of different techniques (traditional, endoscopic, grafting or extracorporeal reconstruction) are chosen based on the type of deviation, severity, and experience of a surgeon. Endoscopic septoplasty provides better visualization and allows more precise correction, although it requires a learning curve. Both traditional and endoscopic septoplasty are effective treatment options, but complications such as bleeding, septal perforation, adhesions, and residual deformity can occur with either technique.

Aims & Objectives: To compare the effects of Traditional and Endoscopic septoplasty in terms of pre-operative &intra-operative(bleeding,duration of surgery, duration of stay) and to compare the post-operative complications of both the surgery in the follow-up of the patient.

Materials and methods: The participants in this interventional research were 80 adult patients with deviated nasal septum symptoms chosen through a statistical formula of sample size. Conventional or endoscopic septoplasty depending on clinical indications was performed after informed consent, detailed clinical evaluation and diagnostic nasal endoscopy. Group A involved the endoscopic septoplasty group whereas Group B involved the traditional septoplasty group. Comparisons were made of intraoperative and postoperative complications and patients were followed-up three months and a repeat endoscopy conducted to measure surgical outcomes.

Results: The mean age of the patients in both groups was similar (young adults, 18-30 years old), and the prevalence of the baseline symptoms was similar, including headache, nasal discharge, epistaxis, and hyposmia, with the predominance of right-sided septal deviation. Endoscopic septoplasty was significantly shorter in the operation period, less bleeding during surgery, and the duration of stay in the hospital, and the nasal packing was consistently carried out in both groups. At 1 week, 2 weeks and 3 months postoperative, endoscopic group had lower rates of perioperative complications indicating a faster recovery and improved functional outcome with fewer residual deformities and latent sequelae.

Conclusion: Endoscopic septoplasty is linked with less operative time, less blood loss intraoperative, less hospitalization and less complications after the operation compared to with traditional septoplasty. Better visualization and reduced

invasiveness of dissection is probably associated with quicker recovery and positive after-effect. Therefore, endoscopic septoplasty can be deemed as a better type of surgery in the treatment of deviated nasal septum, especially when the more difficult or more posterior septal anomalies need to be addressed.

Keywords*: Endoscopic Septoplasty, Traditional Septoplasty, Deviated Nasal Septum (DNS), Nasal Obstruction, Postoperative Complications.*

INTRODUCTION

Nasal septal deviation (NSD) is one of the most common causes of nasal obstruction and represents a major indication for septoplasty in adults. Deviations may arise from developmental abnormalities, producing smooth C-shaped or S-shaped deformities, or from traumatic injuries that result in irregular displacement of the septum. Although many individuals remain asymptomatic, significant deviations can lead to nasal obstruction, recurrent epistaxis, rhinogenic headache, impaired airflow, and other nasal complaints. The choice of surgical correction depends on the site and severity of the deformity as well as surgeon expertise and patient-specific anatomical factors.[1, 2]

Septoplasty techniques have evolved considerably since the classical procedures described by Freer and Killian and later refined by Cottle. Traditional septoplasty, performed under direct visualization using a nasal speculum and headlight, has long been the standard treatment.[3] The introduction of nasal endoscopy led to the development of endoscopic septoplasty, which provides enhanced illumination and magnified visualization while maintaining the fundamental principles of septal correction. Both approaches have demonstrated effectiveness in managing septal deviations, particularly those involving the middle and posterior portions of the nasal septum.[4]

Selection of the surgical technique is largely determined by the pattern of deviation and surgeon preference. Traditional septoplasty remains useful for many routine cases, whereas endoscopic and extracorporeal techniques offer advantages in complex deformities, revision procedures, and severe anterior or caudal deviations. Endoscopic septoplasty facilitates precise identification of septal pathology, minimizes mucosal dissection, and improves visualization of difficult anatomical areas. However, it requires specialized training and is associated with a significant learning curve, especially when managing anterior deviations or operating within a restricted nasal cavity.[5- 7]

Both traditional and endoscopic septoplasty are associated with potential complications, including postoperative bleeding, septal hematoma, infection, sensory disturbances, septal perforation, synechiae formation, and residual or recurrent deviation. Endoscopic techniques may reduce mucosal trauma and postoperative adhesions, although objective functional outcomes are often comparable between the two methods.[8- 10] Given the ongoing debate regarding their relative advantages, the present study was undertaken to compare traditional septoplasty and endoscopic-assisted septoplasty with respect to intraoperative bleeding, adequacy of surgical exposure, operative duration, and postoperative complications, thereby providing evidence to guide optimal surgical management of nasal septal deviation.

MATERIALS & METHODS

The present prospective interventional study was carried out in the Department of Otorhinolaryngology after obtaining approval from the Institutional Ethics Committee. All participants were informed about the objectives and procedures of the study, and written informed consent was obtained before enrollment. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and Good Clinical Practice guidelines to ensure the protection of participants' rights, safety, and confidentiality. The study was conducted over a period extending from May 2024 to October 2025. A total of 80 patients clinically diagnosed with deviated nasal septum (DNS) and scheduled for primary surgical correction were included in the study. The sample size was determined using a standard statistical formula based on expected mean differences, standard deviation, confidence level, and study power, yielding a minimum requirement of approximately 80 participants. To ensure adequate representation, 80 eligible patients were recruited. Participants were randomly allocated into two equal groups comprising 40 patients each. Group A underwent endoscopic septoplasty, whereas Group B underwent traditional septoplasty. Patients aged between 18 and 60 years presenting with symptomatic nasal obstruction secondary to deviated nasal septum were considered eligible for inclusion. Patients with bilateral acute or chronic rhinosinusitis, nasal polyposis, inflammatory nasal disorders, or neoplastic lesions involving the nasal cavity were excluded from the study. Following enrollment, detailed clinical evaluation and preoperative assessment were performed for all participants. Random allocation was then undertaken to ensure unbiased distribution between the two surgical intervention groups.

Data collection focused on both intraoperative and postoperative outcomes. Intraoperative blood loss was estimated by recording the volume collected in the suction apparatus after subtracting the amount of saline used for irrigation during surgery. Operative duration was calculated from the time of incision until completion of the procedure and nasal packing. Additional parameters evaluated included duration of hospital stay and postoperative symptom improvement. Patients were monitored for complications associated with both surgical techniques. Postoperative follow-up assessments were

conducted at one week, two weeks, and three months after discharge to evaluate recovery, identify complications, and assess symptomatic outcomes. The primary study variables included operative time, intraoperative nasal bleeding, length of hospital stay, and postoperative symptom reduction. All collected data were systematically recorded and subjected to statistical analysis to compare outcomes between endoscopic and traditional septoplasty groups. Ethical approval for the study was obtained prior to commencement, and all research procedures adhered to established ethical standards governing clinical investigations.

RESULTS

The present study was conducted for comparing endoscopic septoplasty versus traditional septoplasty for treating deviated nasal septum. Group A included Endoscopic septoplasty group while Group B included Traditional septoplasty group. The mean age was comparable between both groups, being 26.55 ± 6.89 years in Group A and 27.28 ± 6.34 years in Group B. This indicates that the study population predominantly consisted of young adults, and both groups were age-matched. A male predominance was observed in both groups. In Group A, 33 patients (82.5%) were males and 7 patients (17.5%) were females. In Group B, 31 patients (77.5%) were males and 9 patients (22.5%) were females. Thus, males constituted the majority in both groups, indicating higher surgical presentation of DNS in male patients. At baseline, the most common presenting complaint in both groups was headache, reported by 24 patients (60%) in Group A and 25 patients (62.5%) in Group B. Nasal discharge was reported by 24 patients (60%) in Group A compared with 21 patients (52.5%) in Group B. Nasal bleeding was present in 23 patients (57.5%) of Group A and 20 patients (50%) of Group B. Hyposmia was noted in 18 patients (45%) in Group A and 16 patients (40%) in Group B. Post nasal drip was comparatively less frequent, being present in 14 patients (35%) in Group A and 16 patients (40%) in Group B. Overall, baseline symptoms were largely comparable between groups, suggesting similar preoperative symptom severity. Anterior rhinoscopy revealed that right-sided DNS was the most common pattern. Group A had 23 patients (57.5%) with right-sided DNS and 17 patients (42.5%) with left-sided DNS. Similarly, Group B had 21 patients (52.5%) with right-sided DNS and 19 patients (47.5%) with left-sided DNS. Hence, the distribution of laterality of septal deviation was comparable in both groups.

Table 1: Duration of surgery

Duration of surgery (mins)	Group A	Group B
Mean	35.33	52.6
SD	7.28	9.55
p-value	0.001 (Significant)	

The mean duration of surgery in Group A was 35.33 ± 7.28 minutes, while in Group B it was significantly higher (52.6 ± 9.55 minutes). The difference was statistically significant (p = 0.001). This shows that endoscopic septoplasty required significantly lesser operative time compared to the traditional procedure.

Table 2: Blood loss

Blood loss (ml)	Group A	Group B
Mean	45.65	68.93
SD	9.69	14.98
p-value	0.000 (Significant)	

The mean intraoperative blood loss in Group A was 45.65 ± 9.69 ml, whereas Group B showed substantially greater blood loss (68.93 ± 14.98 ml). This difference was statistically significant (p = 0.000). Thus, endoscopic septoplasty was associated with significantly reduced intraoperative bleeding.

Table 3: Distribution of patients according to duration of stay

Duration (hours)	Group A		GROUP B	
	Number	Percentage	Number	Percentage
<48 hours	37	92.5	14	35
48 to 72 hours	3	7.5	21	52.5
>72 hours	0	0	5	12.5
Total	40	100	40	100
p-value	0.001 (Significant)			

Intraoperative stay showed marked difference between groups. In Group A, 37 patients (92.5%) were discharged within <48 hours, and only 3 patients (7.5%) stayed for 48–72 hours. None stayed for more than 72 hours. In contrast, in Group B, only 14 patients (35%) were discharged within <48 hours. Majority of patients (21 patients; 52.5%) stayed for 48–72 hours, while 5 patients (12.5%) required Intraoperative stay of >72 hours. This difference was statistically significant (p = 0.001). Hence, endoscopic septoplasty resulted in significantly shorter Intraoperative stay

Table 4: Distribution of patients according to immediate follow-up (1st week)

1st week follow-up	Group A		Group B		p-value
	Number	Percentage	Number	Percentage	
Nasal bleeding	3	7.5	14	30	0.000345*
Nasal congestion	40	100	40	100	-
Nasal crusting	2	5	10	25	0.012*
Nasal discharge	2	5	12	30	0.006*
CSF rhinorrhoea	0	0	0	0	-
Septal tear	3	7.5	11	27.5	0.016*
Septal abscess	2	5	10	25	0.012*
Septal haematoma	1	2.5	9	22.5	0.007*

*: Significant

At the end of the 1st postoperative week, complications were observed in both groups; however, they were significantly more frequent in Group B (Traditional septoplasty) compared to Group A (Endoscopic septoplasty). Nasal bleeding was seen in 3 patients (7.5%) in Group A versus 14 patients (30%) in Group B, showing a statistically significant difference ($p = 0.000$). Nasal crusting was reported in 2 patients (5%) in Group A and 10 patients (25%) in Group B ($p = 0.012$). Similarly, nasal discharge occurred in 2 patients (5%) in Group A compared to 12 patients (30%) in Group B ($p = 0.006$). Septal complications were also more common in Group B, with septal tear present in 3 patients (7.5%) in Group A and 11 patients (27.5%) in Group B ($p = 0.016$), while septal abscess was observed in 2 patients (5%) in Group A versus 10 patients (25%) in Group B ($p = 0.012$). Septal haematoma was noted in only 1 patient (2.5%) in Group A but in 9 patients (22.5%) in Group B ($p = 0.007$). Nasal congestion was present in all patients (100%) in both groups, while CSF rhinorrhoea was not observed in any patient in either group (0%), hence statistical comparison for these variables was not applicable. Overall, early postoperative morbidity at 1 week was significantly lower in the endoscopic septoplasty group.

Table 5: Distribution of patients according to immediate follow-up (2nd week)

2nd week follow-up	Group A		Group B		p-value
	Number	Percentage	Number	Percentage	
Nasal bleeding	2	5	11	27.5	0.010*
Nasal congestion	2	5	11	27.5	0.010*
Nasal crusting	1	2.5	8	20	0.014*
Nasal discharge	1	2.5	7	17.5	0.026*
CSF rhinorrhoea	0	0	9	22.5	0.002*
Septal tear	1	2.5	9	22.5	0.007*
Septal abscess	1	2.5	7	17.5	0.026*
Septal haematoma	0	0	6	15	0.011*

*: Significant

At the 2nd postoperative week, a further reduction in postoperative symptoms was noted in Group A, whereas Group B continued to show comparatively higher complication rates, with statistically significant differences for most variables. Nasal bleeding persisted in 2 patients (5%) in Group A and 11 patients (27.5%) in Group B ($p = 0.010$). Nasal congestion, which was universal in the first week, decreased in Group A to 2 patients (5%), but remained high in Group B with 11 patients (27.5%), demonstrating significant difference ($p = 0.010$). Nasal crusting was present in 1 patient (2.5%) in Group A compared to 8 patients (20%) in Group B ($p = 0.014$). Nasal discharge was found in 1 patient (2.5%) in Group A and 7 patients (17.5%) in Group B ($p = 0.026$). Importantly, CSF rhinorrhoea was absent in Group A (0%) but occurred in 9 patients (22.5%) in Group B ($p = 0.002$), which was statistically significant. Septal complications also remained higher in Group B, including septal tear in 1 patient (2.5%) in Group A versus 9 patients (22.5%) in Group B ($p = 0.007$), septal abscess in 1 patient (2.5%) in Group A and 7 patients (17.5%) in Group B ($p = 0.026$), and septal haematoma, which was absent in Group A (0%) but seen in 6 patients (15%) in Group B ($p = 0.011$). These observations indicate that recovery was faster and complication burden was lower in Group A, while Group B continued to exhibit significantly higher postoperative symptoms and septal complications at 2 weeks.

Table 6: Distribution of patients according to Late follow-up (3rd month)

3rd month follow-up	Group A		Group B		p-value
	Number	Percentage	Number	Percentage	
Nasal obstruction	1	2.5	8	20	0.014*
Residual septal deviation	0	0	6	15	0.011*
Septal perforation	1	2.5	5	12.5	0.089
Saddle nose deformity	0	0	5	12.5	0.021*
Nasal tip depression	0	0	7	17.5	0.006*
Anosmia	0	0	7	17.5	0.006*
Synechiae	1	2.5	3	7.5	0.303

*: Significant

At 3 months follow-up, late postoperative sequelae were markedly more frequent among patients in Group B compared to Group A. Nasal obstruction was reported in 1 patient (2.5%) in Group A and 8 patients (20%) in Group B, showing significant difference (p = 0.014). Residual septal deviation was absent in Group A (0%), whereas it was observed in 6 patients (15%) in Group B (p = 0.011), indicating better long-term septal correction in the endoscopic technique. Septal perforation occurred in 1 patient (2.5%) in Group A and 5 patients (12.5%) in Group B; however, this difference was not statistically significant (p = 0.089). Structural deformities were more evident in Group B, where saddle nose deformity was absent in Group A but present in 5 patients (12.5%) in Group B (p = 0.021). Similarly, nasal tip depression and anosmia were not reported in Group A (0%), but were observed in 7 patients (17.5%) each in Group B, with statistically significant differences (p = 0.006 for both). Synechiae was noted in 1 patient (2.5%) in Group A and 3 patients (7.5%) in Group B; this difference was not statistically significant (p = 0.303). Overall, the late postoperative outcomes at 3 months strongly favored endoscopic septoplasty, which demonstrated significantly lower incidence of nasal obstruction, residual deviation, deformities, and anosmia.

DISCUSSION

Septoplasty is a long-established operation in restoring nasal septal deviation and relieving nasal airway obstruction, and it is still among the most common surgical operations performed in the procedure of otolaryngology-practice. In previous years, operative strategies of septal repair have been highly refined. The older methods were fairly radical and tended to deep dissection of tissues, but as the surgical insight improved the focus has been shifted towards preservation of mucosal integrity and support of cartilage which assists in providing both functional and structural stability.[11- 13]

The age of the sample in both groups was similar with the mean age of 26.55 years (SD 6.89) and 27.28 years (SD 6.34) in Group A and Group B respectively, which implies that the population under the study was composed of young adults and was age-balanced. Similar results have been achieved in previous studies.

Deshmukh et al. reported ages means of 28.6 years in endoscopic group and 28.2 years in traditional group.[14] A sharp male predomination was found in the two groups in the current investigation. Group A had 33 (82.5) and 7 (17.5) males and females respectively, whilst Group B had 31 (77.5) and 9 (22.5) males and females respectively. Kaushik et al. noted that 73.33% males and 26.67% females were observed in the endoscopic group and traditional group respectively.[15]

Group A in the current study recorded a mean operative time of 35.33 ± 7.28 minutes, and Group B registered a mean operative time of 52.6 ± 9.55 minutes and the difference between the two was significant (p = 0.001). These results suggest that endoscopic septoplasty took relatively shorter time to operate as compared to the traditional method of septoplasty. Similarly, Deshmukh et al. conducted a study where the endoscopic procedure needed a shorter surgical time than the traditional one (34.08 versus 39.20 minutes, respectively).[14] Bhardwaj et al.[16] conducted a study in which the shorter surgical time was observed in the endoscopic procedure compared to the traditional one (60.47 and 39.7 and 39.20 minutes, respectively).

The average blood loss suffered by the Group A during the operation was 45.65 ml. + -9.69 ml. and that of Group B was 68.93 ml. + -14.98 ml. that was significantly inferior (p = 0.000). The results of this study show that endoscopic septoplasty is linked to less intraoperative bleeding as compared to the traditional procedure. Similar results are also reported by Bhardwaj et al., they noted that endoscopic septoplasty had a much better visualization and minimal tissue dissection that leads to reduced intraoperative bleeding in comparison to traditional approach (p < 0.0001).[16]

There was also an evident difference in the hospital stay in the two groups in the current study. Group A (endoscopic septoplasty) had 37 patients (92.50) who were discharged in less than 48 hours and only 3 patients (7.5) were discharged in 48-72 hours and none of the patients was discharged later than 72 hours. Group B (traditional septoplasty), on the other hand, was associated with increased postoperative stay, only 14 (35) patient stayed less than 48 hours, 21 patients (52.5) stayed between 48-72 and 5 patients (12.5) stayed over 72 hours. This was statistically significant ($p = 0.001$) meaning that endoscopic septoplasty was also related with a reduced length of stay in the hospital. The same conclusions were made by Deshmukh et al. in which the average length of stay in the traditional group (Group I) was equal to 1.68 ± 0.41 days, and in the endoscopic group (Group II), the length of stay was equal to 1.41 ± 0.49 days. Their study results showed that in the traditional group 8 cases (32.0) remained 1 day and 17 cases (68.0) remained 2 days and the difference between the two is statistically significant ($p < 0.01$).[14]

There was also a report by Bothra R. that endured loner hospitalization (>2 days) by 25% of the traditional septoplasty patients, but only 4 out of 30 patients (13.33) in the endoscopic group.[17]

During the 1 st week of the postoperative period, there existed a definite higher occurrence of complications in the traditional septoplasty group than in the endoscopic group. The rates of nasal bleeding were found to be 30% and 7.5% in traditional and endoscopic cases, crusting 25 and 5, nose discharge 30 and 5 and septal haematoma 22.5 and 2.5, respectively. Symptoms also decreased significantly in endoscopic group by the 2nd postoperative week and more complications were still evident in traditional group (nasal bleeding and congestion 27.5 and 5 percent respectively vs 20 and 2.5 percent) as well as crusting (20% vs 2.5%), nasal discharge (17.5% vs 2.5%) and CSF rhinorrhoea (22.5% vs 0). At 3-month follow-up, the prevalence of late complications was still higher with traditional septoplasty, and nasal obstruction (20% vs. 2.5%), residual septal deviation (15% vs. 0), and saddle nose (12.5) and anosmia (17.5) were also seen only in the traditional group. These results, in general, support endoscopic septoplasty as a better method in terms of postoperative recovery and the number of complications. Past literature has indicated similar results. Maini M et al. showed more symptomatic relief and relief of nasal obstruction in 93.33% of endoscopic versus 70.69% traditional cases; headache relief in 93.33% versus 73.33%; nasal discharge improvement in 96.15% versus 92.85%; and total absence of nasal bleeding (100% vs 95.45%).[18]

On the same note, Kaushik et al. also found that nasal obstruction improved in 95.83% (23/24) patients using endoscopic versus 82.60% (19/23) in the traditional group. Headache of 92.85 and nasal discharge of 90.90 and nasal bleeding of 80 gave significantly better results with endoscopic versus 79, 81.81, and 100, respectively, and statistically significant results.[15]

Guindi et al. have also reported postoperative improvement of headache (9 vs 6 cases), postnasal discharge (16 vs 52 cases), and facial swelling (12 vs 36 cases) with a broadly similar outcome and slightly better headache relief in the endoscopic group.[19]

Also, higher patient satisfaction (87.5% and 71.4% endoscopic and classical, respectively) and less complication (0 and 14.3 endoscopic and classical, respectively) were reported by Park DH et al. and Nayak et al. using endoscopic procedures instead of a traditional septoplasty, respectively, and significant symptomatic improvement and better objective endoscopic evaluation in endoscopy patients (versus traditional surgery) were reported by both investigations, respectively.[20, 21]

CONCLUSIONS

Endoscopic septoplasty is a major improvement in the development of the septal surgery that is better in visualization, illuminations, and accuracy than the traditional method. The increased magnification of the endoscope facilitates proper detection of septal pathology, especially the posterior deviations, high septal defects and isolated spurs which in traditional methods are usually tricky to treat. It results in more specific correction and less superfluous dissection of tissues thereby preserving the integrity of the mucosa and minimizing the trauma of the operation. As a result, endoscopic septoplasty leads to a more favorable planning of the surgery, more accurate anatomical repair, and efficiency that is more efficient during operation. Septoplasty procedure using endoscopes is linked with decreased time of operation, less intraoperative blood loss, short hospital stay, and a decreased postoperative complication as compared to the traditional method of septoplasty. Enhanced imaging and less invasive dissection are likely to result in quicker recovery and improved postoperative outcome. Endoscopic septoplasty may therefore be considered as a better procedure in the treatment of DNS especially where the more exact repair of more complicated or posterior septal defects are needed.

REFERENCES

1. Alghamdi FS, Albogami D, Alsurayhi AS, Alshibely AY, Alkaabi TH, Alqurashi LM, et al. Nasal Septal Deviation: A Comprehensive Narrative Review. Cureus. 2022 Nov 10;14(11):e31317.
2. Watters C, Brar S, Yapa S. Septoplasty. [Updated 2022 Nov 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK567718/
3. Champagne C, Ballivet de Régloix S, Genestier L, Crambert A, Maurin O, Pons Y. Endoscopic vs. traditional septoplasty: A review of the literature. Eur Ann Otorhinolaryngol Head Neck Dis. 2016 Feb;133(1):43-6.

4. Most SP, Rudy SF. Septoplasty: Basic and Advanced Techniques. Facial Plast Surg Clin North Am. 2017 May;25(2):161-169
5. Kim DY, Nam SH, Alharethy SE, Jang YJ. Surgical outcomes of bony batten grafting to correct caudal septal deviation in septoplasty. JAMA Facial Plast Surg. 2017;19:470–475.
6. Teixeira J, Certal V, Chang ET, Camacho M. Nasal Septal Deviations: A Systematic Review of Classification Systems. Plast Surg Int. 2016;2016:7089123
7. Brescia G, Franz L, Frasconi S, Marciani S, Soldati L, Frigo AC, Marioni G. Traditional septoplasty complications: a systematic review and meta-analysis. Am J Otolaryngol. 2023 Jul–Aug;44(4):103811.
8. Shah J, Roxbury CR, Sindwani R. Techniques in Septoplasty: Traditional Versus Endoscopic Approaches. Otolaryngol Clin North Am. 2018 Oct;51(5):909-917.
9. Champagne C, Régloix SB, Genestier L, Crambert A, Maurin O, Pons Y. Endoscopic septoplasty: Learning curve. Eur Ann Otorhinolaryngol Head Neck Dis. 2016 Jun;133(3):167-70
10. Sobiesk JL, Munakomi S. Anatomy, Head and Neck, Nasal Cavity. [Updated 2023 Jul 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK544232/
11. Patel RG. Nasal Anatomy and Function. Facial Plast Surg. 2017 Feb;33(1):3-8. [PubMed]
12. Lafci Fahrioglu S, VanKampen N, Andaloro C. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Jan 30, 2023. Anatomy, Head and Neck, Sinus Function and Development. [PMC free article] [PubMed]
13. CONVERSE JM. The cartilaginous structures of the nose. Ann Otol Rhinol Laryngol. 1955 Mar;64(1):220-9. [PubMed]
14. Deshmukh KA, Ambiger RT.A comparative study of endoscopic septoplasty and traditional septoplasty. Int J Otorhinolaryngol Head Neck Surg2020;6:453-8.
15. Kaushik S, Vashistha S, Jain N. Endoscopic vs traditional septoplasty: a comparative study. Headache. 2013;14(46):14-46.
16. Bhardwaj H, Kalsotra G, Kalsotra P, Singh P, Saraf A. Surgical Outcomes of Endoscopic Versus Traditional Septoplasty. Indian J Otolaryngol Head Neck Surg. 2023 Sep;75(3):1724-1730
17. Bothra R, Mathur NN. Comparative evaluation of traditional versus endoscopic septoplasty for limited septal deviation and spur. J Laryngol Otol. 2009 Jul;123(7):737-41. doi:10.1017/S0022215108004192. Epub 2008 Dec 2. PMID:19046471.
18. Maini DS, Shrigharishi DM, Shukla DA. Competitive study of traditional septoplasty versus endoscopic septoplasty. Trop J Ophthalmol Otolaryngol. 2020;5:106-11.
19. Guindi SS, Mostafa HS, Fawzy TO. Endoscopic-assisted septoplasty versus traditional septoplasty: assessment by the NOSE scale. Egypt J Otolaryngol. 2016;32:26-31.
20. Park DH, Kim TM, Han DG, Ahn KY. Endoscopic assisted correction of the deviated nose. Aesthetic Plast Surg. 1998 22(8):190–195
21. Nayak DR, Balakrishnan R, Murthy KD. An endoscopic approach to the deviated nasal septum--a preliminary study. J Laryngol Otol 1998 Oct;112(10):934-999.