Endoscopic Septoplasty: A Retrospective Analysis of 415 Cases

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Abstract Nasal obstruction is the most common complaint in nasal and sinus disease. Deviated nasal septum is a very frequently encountered and common cause. Surgical correction of a deviated septum- nasal septoplasty- is the definite treatment for septal deviation. Over the last 2 decades, the applications for endoscopy in the field of rhinology have evolved beyond functional endoscopic sinus surgery (FESS). Septoplasty which is among the three most commonly performed procedures in otolaryngology is particularly well suited to endoscopic application. Endoscopic septoplasty as a minimally invasive technique can limit the dissection and minimize trauma to the nasal septal flap under excellent visualization whose primary advantage is to decrease morbidity and post operative swelling in isolated septal deviation by limiting the excision to the area of deviation. This was a retrospective study, conducted in a tertiary care medical college hospital over a period of 5 years. The study group comprised 415 patients in and around Nashik District; who visited our tertiary health centre and were subjected to endoscopic septoplasty. Complete data records from 415 patients were available for statistical analysis. Maximum numbers of patients were in age group 20–39. The youngest patient was 7 years old and oldest was 75 years. Mean age was 32 years. The 7 years old was operated for DCR for congenital NLD block and septoplasty was adjunct procedure.

Even the 75 years was operated for DCR. In the present study out of 415 cases, 256 (67.5 %) cases were male and 115 (32.5 %) cases were female. There is a male preponderance in the overall distribution of cases. In the present study of 415 patients, the most common operative procedure done was septoplasty in 260 (62.6 %), FESS with septoplasty in 38 (9.2 %) cases, septorhinoplasty in 41 (9.9 %) cases and DCR with septoplasty in 78 (18.3 %) cases. Endoscopic septoplasty facilitates good access to accomplish endoscopic DCR, FESS, and accurate and adequate septal graft harvest in severely deviated noses for septorhinoplasty. Complications like dental pain, paraesthesia, septal perforation, saddle nose deformity and persistent deviation are a rarity.

Keywords Endoscopic septoplasty ·
Deviated nasal septum · Revision septoplasty

Introduction

Septoplasty is one of the commonly performed operations in otorhinolaryngology practice. [1] It is the definitive treatment for a deviated nasal septum. When it deviates into one of the cavities, it narrows that cavity and impedes airflow. Often the inferior turbinate on the opposite side enlarges, which is termed compensatory hypertrophy. Deviations of the septum can lead to symptomatic nasal obstruction. The evolution of surgical approaches to the correction of a deviated septum includes classic sub-mucosal resection, traditional septoplasty and extracorporeal techniques. Traditional septoplasty techniques were initially described by Killian and Freer [2]. Septoplasty is classically performed under direct visualization using a headlight and nasal speculum. Complications of traditional septoplasty were

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reviewed, with an emphasis on prevention and treatment. The recently popularized endoscopic septoplasty is a significant advance in septal surgery.

Endoscopic surgery in the field of rhinology has evolved over the last few decades. The application of endoscopic techniques to the correction of septal deformity was initially described in 1991 by Lanza et al. [3]. Endoscopic technology greatly enhances visualization during septoplasty. Discrete septal pathologies such as isolated deflection, spurs, perforations, and contact points can be addressed in a directed fashion. These advantages can be especially important in revision cases. Endoscopic technique in conjunction with video imaging is valuable for the education of residents and staff. Various literature reports numerous advantages to this technique, including better visualization and wider, unobstructed visual field, reduced operation time, minimal post operative complications, more accurate identification of the septal area to be corrected with limited (extent of the) excision, control of bleeding, (more possibilities for limited surgical revision after septoplasty and septal perforations), concurrent surgical endoscopy of paranasal sinuses, excellent visualization and precise graft harvest in septorhinoplasty and for cases where septoplasty was done in conjunction with Dacryocystorhinostomy [4–6].

Materials and Methods

The present study is a retrospective study which comprises 415 patients presenting to the department of Otorhinolaryngology in a tertiary care centre. This study was conducted for 5 years after approval of the institutional ethics committee.

Eligibility Criteria

Inclusion Criteria

1. Deviated nasal septum with obstructive symptoms.
 2. As an adjunct to septorhinoplasty.
 3. As an adjunct to FESS.
 4. As an adjunct to DCR.
 5. Revision septoplasty.
- Septal deviation consistent with presenting symptom of chronic nasal obstruction, symptoms lasting at least 3 months without relief after 4 weeks trial of medical management including topical nasal steroids, topical or oral decongestants or oral antihistamine/decongestant combination.

Exclusion Criteria

1. Patients with histories of sinonasal malignancy.
2. Radiation therapy to the head and neck.
3. Craniofacial syndrome.
4. Acute nasal trauma or fracture in past 3 months.
5. Nasal valve collapse.
6. Adenoid hypertrophy.
7. Chronic nasal granulomatosis diseases(e.g.: Wegners, sarcoidosis, etc.).
8. Uncontrolled asthma.
9. Pregnancy.

Patients for the study were selected during routine OPD who were diagnosed with deviated nasal septum according to the mentioned criteria. The patients were counselled and explained the procedure and consent for the procedure was taken in the prescribed format.

The operative procedure was performed with anaesthetic fitness and pre operative admission 1 day prior to surgery.

A routine lab investigation required for anaesthetic fitness will be required (CBC, BT, CT, RFT, BSL-R, HIV, HbsAg, Chest x-ray, ECG).

A CT PNS was ordered if the patient was suspected to have sinusitis and a DCG was ordered if the patient is suspected to have dacryocystitis to evaluate the level of the block in the lacrimal drainage system. No special investigations were required routinely. The clinical features, Endoscopic findings with anatomical variations were noted.

The NOSE scale is a validated disease specific instrument designed to assess nasal obstruction; Stewart et al. noted that it could be used for comparing disease specific health status between groups of patients before and after treatment or to assess differences in outcome when different surgical techniques are used.[1, 15].

We use the NOSE scale and other nasal symptoms to evaluate patients. Patients who underwent concomitant surgery with septoplasty were included in this study to represent a typical population presenting with nasal airway symptoms.

Methods and Techniques used are as Follows

Endoscopic Septoplasty Operative Technique

Prior to anaesthesia, the patients vibrissae are cut using curved blunt dissecting scissors to enable clear field during endoscopic surgery, to prevent crusting from accumulating post operatively which could lead to scabs and cause trauma if removed improperly and could be painful.

Anaesthesia

Septoplasty was performed under local or general anaesthesia. In either case, the septum is anaesthetized with a haemostatic agent, 2 % lidocaine with 1/100,000 adrenaline. This solution is injected subperichondrially keeping the bevelled end of 23 No. needle towards the septum. It is used not only as a haemostatic agent but also for hydrodissection, lifting the mucosa and perichondrium from the cartilage which is seen as ‘blanching’ of the mucosa (mucosa becomes pale with hydrodissection). This is usually performed in a direction which is from posterior to anterior part of septum and inferior to superior part of septum, and the mucosa should blanch as the injection proceeds. This is because if the superior portion is injected first the streak of blood flowing downwards may hamper the view for inferior injections. The injection should extend posterior to the deviation. The agent is injected bilaterally.

Operative Procedure

Before the incision is taken the septum is palpated to assess the strength of the cartilage and attachments. Incision is taken through nostril 1 cm cranially to the caudal end of septum. In cases of a caudal septal dislocation, the incision is taken at the caudal end of the deviated portion of the cartilage. The excess portion of cartilage is trimmed then 1 cm of cartilage is retained for support. At the junction of caudal and ventral strut, the angle is made blunt and not kept sharp. This avoids weakening of the supratip area.

A Cottle elevator is then used to develop a submucoperichondrial plane along the left side of the septum. Further dissection in a posterior direction is performed using the suction Freer elevator.

Anterior and inferior ‘tunnels’ on side of the septum is created and then connected. When elevating the mucosa over spurs, care is taken under direct endoscopic visualisation to prevent mucosal tears due to thinning of the mucosa. A submucoperichondrial plane is then developed on the opposite side of the septum in a similar fashion after taking incision on cartilage at different level than mucosal incision. Once the septal cartilage and bone is isolated from the mucosa, the posterior portion of the cartilaginous septum is broken and separated from the perpendicular plate of the ethmoid and vomer, the Turbinate scissor is then used to incise the septum in an anterior to posterior manner. The Lucs forceps are then used to remove all deviated portions of the bone and cartilage. If the bony deviation is at the level of the middle turbinate, then the endoscope is again introduced and the bony part is removed. The inferior tunnel is again checked for the presence of a spur and it is sharply dissected and removed if present. Bony spur is excised with hammer and gauge where the surgeon holds the gauge in the right hand and the

assistant hammers it slowly and carefully. The endoscope is used throughout the procedure, and is placed between the mucosal flaps or within the nasal cavity to ensure correction of all septal deformities. The mucosal flaps are reapproximated and the Killian incision is closed using a 3-0 chromic gut suture. A 4-0 Vicryl rapide suture is used to further reapproximate the flaps in a quilting fashion in selected cases.

Packing

Nasal packing in the form of Merocele Nasal Packs is then placed on each side of the septum under endoscopic vision to compress the flaps together and ensuring the Merocele Nasal Packs are correctly placed in the nasal cavity and the flaps have not been disturbed or displaced during packing.

Packing is removed 24 h after surgery. An antibiotic with adequate coverage for *Staphylococcus aureus* infection (toxic shock syndrome secondary to nasal packing) was instituted.

All patients were followed up on day 8, 15, 30, 60, and 90 and after that if required.

Observations and Results

The present study includes 415 patients diagnosed with Deviated Nasal Septum as per the mentioned criteria. Their clinical features, endoscopic and CT scan findings were studied in detail as per the pretested Proforma (Tables 1, 2, 3, and 4).

- (1) Average nasal obstruction score significantly reduced at post-op 1 month and post-op 3–6 months follow-ups compared to the pre-op score ($p < 0.001$ for both the follow-ups).
- (2) Average mouth breathing score significantly reduced at post-op 1 month and post-op 3–6 months follow-ups compared to the pre-op score ($p < 0.001$ for both the follow-ups).
- (3) Average stuffiness score significantly reduced at post-op 1 month and post-op 3–6 months follow-ups compared to the pre-op score ($p < 0.001$ for both the follow-ups).
- (4) Average headache score significantly reduced at post-op 1 month and post-op 3–6 months follow-ups compared to the pre-op score ($p < 0.001$ for both the follow-ups).
- (5) Average snoring score significantly reduced at post-op 1 month and post-op 3–6 months follow-ups compared to the pre-op score ($p < 0.001$ for both the follow-ups).
- (6) Average concern score significantly reduced at post-op 1 month and post-op 3–6 months follow-ups compared to the pre-op score ($p < 0.001$ for both the follow-ups).

Discussion

The present study includes 415 patients operated as per the pre requisite inclusion criteria. Their clinical features, endoscopic and CT scan findings in relevant cases were studied as per pre test Proforma (Figs 1, 2 and 3).

Septoplasty is a commonly performed surgical procedure aimed at relieving nasal airway obstruction, often in conjunction with other nasal and sinus procedures, such as cosmetic rhinoplasty, Dacryocystorhinostomy and functional endoscopic sinus surgery (FESS). Other indications include rhinologic headache, which is due to irritation caused by the contact of the septum with the lateral nasal wall, and chronic sinusitis secondary to septal deviation. The rationale for developing an endoscopic technique from

a traditional “headlight” approach comes from the fact that during common nasal procedures, the surgeon’s view is obstructed due to the narrowing caused by septal spurs or septal deviations [7, 8].

Endoscopy enables the surgeon to localize the spurs and remove them under direct visualization by performing an incision precisely over the spur, thus minimizing surgical trauma. At times if there is any spurter from maxillary crest after spur removal, it can be cauterised under vision immediately and bleeding is controlled.

The endoscopic approach to septoplasty provides several advantages over the standard headlight technique (Hwang et al. [13] and Sufian et al. [4]). It facilitates accurate identification of the pathology due to better illumination, improved accessibility to remote areas. It allows better understanding of the lateral wall pathology associated with the septal deformity. It allows limited incision and elevation of the flaps, not compromising adequate exposure of the pathological site. Endoscopic septoplasty is associated with significant reduction in patient morbidity in both the pre-operative and postoperative period (with pack and after pack removal) due to the limited extent of flap dissection along with limited manipulation and resection of the septal framework.

Endoscopic septoplasty is useful in revision septoplasty, on patients who have persistent septal deviation. In this situation, the flaps are frequently adherent due to extensive prior dissection and cartilage resection. Thus, precise elevation in this area with endoscope avoids tearing of flaps.

Endoscopic septoplasty has been described previously by other authors [9–12] however, the techniques used have traditional septoplasty or sinus surgery instrumentation. According to Brennan et al. [13], the ideal objective in septal surgery is permanent correction of deviation with avoidance of any complication. Four basic principles are consistent with this objective: good exposure; safe elevation of flaps; resection of only a limited, necessary amount of septum; and elimination of aetiological dynamic forces. Of these four principles, the first three are best achieved by an endoscopic approach to the septum. The procedure described in this study provided a smooth transition from endoscopic sinus surgery to septoplasty. It has the advantage of a targeted approach to the specific septal problem, without the need for exposing excessive bone and cartilage, thereby improving healing time and decreasing tissue trauma. In our study, the time required for surgery could not be analyzed because our cases required different combinations of surgical procedures. Based on our experience in endoscopic septoplasty, there is a negligible to nil complication rate and it is an excellent and precise in correcting septal deviations posterior to the mobile septum. However; Hwang et al. [13], in their retrospective study of 111 patients undergoing endoscopic septoplasty, reported

Table 1 The age distribution of cases studied

Age (years)	No. of cases	Percentage of cases
<20	55	13.2
20–39	258	62.2
40–59	87	21.0
>60	15	3.6
Total	415	100.0

In the present study out of 415 cases, maximum patients were between the age group of 20–39 years i.e. 258 (62.2 %) cases, followed by 40–59 years i.e. (21.0 %) cases

Table 2 The distribution of cases studied according to the procedure

Procedure	No. of cases	Percentage of cases
Septoplasty	260	62.6
DCR with septoplasty	38	9.2
FESS with septoplasty	76	18.3
Septorhinoplasty	41	9.9
Total	415	100.0

In the present study of 415 patients, the most common operative procedure done was septoplasty in 260 (62.6 %), FESS with septoplasty in 76 (18.3 %) cases, septorhinoplasty in 41 (9.9 %) cases and DCR with septoplasty in 38 (9.2 %) cases

Table 3 Complications

Bleeding–1
Septal hematoma–3
Septal perforation–0
Synechae–1
Dental pain–0
Parasthesia–0
Persistent septal deviation–0
Saddle nose–0

Table 4 The comparison of effect of surgical procedure performed on different symptoms

Parameters (symptoms)	Pre-op	Post-op 1 month	Post-op 3–months	p values	
				Pre-op versus Post-op 1 month	Pre-op versus Post-op 3–6 months
Nasal obstruction	4 (2–4)	2 (0–3)	0 (0–1)	0.001 (Significant)	0.001 (Significant)
Mouth breathing	4 (0–4)	1 (0–3)	0 (0–1)	0.001 (Significant)	0.001 (Significant)
Stuffiness	3 (0–4)	1 (0–3)	1 (0–1)	0.001 (Significant)	0.001 (Significant)
Headache	3 (0–4)	1 (0–2)	0 (0–1)	0.001 (Significant)	0.001 (Significant)
Snoring	3 (0–4)	1 (0–3)	0 (0–1)	0.001 (Significant)	0.001 (Significant)
Concern	4 (1–4)	1 (0–3)	0 (0–1)	0.001 (Significant)	0.001 (Significant)

Values are median (min–max) of severity of symptoms score. p values are obtained using Wilcoxon's signed rank test (intra-group comparison using non-parametric analysis). $p < 0.05$ is considered to be statistically significant

Fig. 1 The age distribution of cases studied

haematoma in 0.9 %, asymptomatic perforation in 0.9 %, and synechiae formation in 4.5 % patients. In a retrospective study of 116 patients, Chung et al. [14] described transient dental pain/hypermesthesia in 4.3 %, asymptomatic septal perforation in 3.4 %, synechiae formation in 2.6 %, epistaxis 0.9 %, septal haematoma in 0.9 %, and persistent septal deviation requiring revision septoplasty in 0.9 % patients. Complication rate in the study by Gupta

[10] was found to be 2.08 % for endoscopic septoplasty. However, in our study we reported only haemorrhage which occurred in one (0.3 %) patient operated for septorhinoplasty for which repacking was done for 24 h. Three patients had septal haematoma, out of which 2 had trivial trauma in the post op period. Another reason for septoplasty haematoma is in endoscopic flap elevation, chances of flap tear are less. So if some bleeding occurs between flaps, its not drained thus forming a haematoma. In all the 3 patients, haematoma was drained under aseptic precautions.

One patient had synechie formation, which was left alone because he had no complaints.

In this study, the comparison of effect of surgical procedure performed on different symptoms score significantly reduced at post-op 1 month and post-op 3–6 months follow-ups compared to the pre-op score ($p < 0.001$ for both the follow-ups).

However, the endoscope has its own limitation which is the need for frequent cleaning of the tip of the endoscope especially when the tip of the scope touches tissue or if there is extensive bleeding. Frequent fogging occurs with a 0 degree scope hence a 30 degree scope sometimes is better because its bevel end can be used to retract the flap while inserting thus reducing fogging and cleaning.

Fig. 2 The distribution of cases studied according to the procedure

Fig. 3 The comparison of various symptoms in pre and postoperative period

Endoscopic septoplasty is an effective technique that can be performed safely alone or in combination with endoscopic sinus surgery with minimal additional morbidity. It enhances the surgical procedure and steps as the surgical assistant is able to visualise and anticipate the next surgical step and thus provide the required assistance, thus saving overall surgical time. It provides significant clinical and excellent teaching tool when used in conjunction with video monitors.

Summary and Conclusion

1. Endoscopic septoplasty is indicated to correct isolated septal spur deformity, posterior septal deformity, nasal valve obstruction and septal spur leading to contact area, persistent headache and atypical facial pain.
2. Endoscopic septoplasty facilitates good access to accomplish endoscopic DCR, FESS, and accurate and adequate septal graft harvest in severely deviated noses for septorhinoplasty.
3. Endoscopic septoplasty provides better visualization with endoscopic light compared to conventional headlight and is an excellent teaching tool for postgraduates as well as undergraduates. It also procures excellent assistance by the assistant as he can see the surgery on monitor.
4. Endoscopic septoplasty is least invasive, has minimal blood loss, minimal tissue handling leading to less postoperative oedema and pain and reduced hospitalization.
5. Endoscopic septoplasty achieves excellent correction for posterior septal spur and provides access to other concurrent endoscopic. Complications like dental

pain, paraesthesia, septal perforation, saddle nose deformity and persistent deviation are a rarity.

6. Unlike examination with speculum, endoscopic evaluation permits visualization without physical distortion of nasal anatomy. It provides improved field of vision for posterior deviation.
7. Critical areas like nasal valve regions are better assessed during surgery.
8. Closure quilting sutures can be taken easily and if there is a bilateral tear septal cartilage is repositioned back and quilting sutures are taken. Greater stability of remaining septum and safe elevation of flaps are achieved.
9. It is good for revision septoplasty and septal perforations.
10. The patient requires a shorter recovery time and the healing time improves
11. It is a targeted approach causing less tissue trauma, less post operative oedema, less time (with practice) and less complications.
12. In Conventional method assistant not able to watch clearly. So Endoscopic Septal surgery is valuable teaching tool with video monitors and the assistant also can assist better.

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