

Study of Effectiveness of Functional Endoscopic Sinus Surgery in Management of Nasal Obstruction

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Abstract: Introduction: Increased incidence of nasal obstruction is because of global climatic change due to increasing air pollution, industrial fumes and allergic factors etc in urban areas. FESS is considered as the procedure of choice for patients as primary treatment or in patients who do not respond to conservative treatment. Objectives: The present study is to assess the effectiveness of FESS on the symptom profile of patients with nasal obstruction before and after surgery. Methods: A prospective study conducted on 30 patient attending to Otorhinolaryngology department in Konaseema institute of medical sciences and research foundation, Amalapuram. Once the diagnosis and extent of the disease was established, the patients were taken up for FESS after preanaesthetic check - up. During the post - operative follow - up, the severity of symptoms was compared preoperatively and postoperatively using the "Rhinosinusitis symptom inventory" (RSI) symptom scores. Results: In 86% patients, improvement in the symptom scores was observed by the end of 6 months follow up period. The remaining 14% cases were symptomatic at the end of postoperative 6 months follow up, may be because of delayed healing of sinus mucosa due to recurrent URTI, exposure to environmental dust and pollution and personal habits like smoking. Conclusion: FESS is minimally invasive, safe and effective procedure and has greater impact in the nasal obstruction due to various conditions, as it clears the involved pathology, establishing nasal patency and normal muco - ciliary drainage of the paranasal sinuses.

Keywords: nasal obstruction, nasal sinuses, endoscopy, surgery

1. Introduction

Nasal obstruction is one of the most common health care problems and can be a result of sinonasal pathologies like chronic rhinosinusitis, nasal polyposis and nasal tumours apart from septal structural abnormalities. It has a greater impact even on functional and emotional impairment.

Increased incidence of nasal obstruction is because of global climatic change due to increasing air pollution, industrial fumes and allergic factors etc in urban areas. It is quite prevalent in rural areas due to lack of proper hygiene and malnutrition resulting in low immunity. After failure of conservative therapy for a diagnosed cause of nasal obstruction, Functional Endoscopic Sinus Surgery (FESS) is the preferred treatment. FESS was introduced by Messerklinger in late 1970s.

Now FESS is considered as the procedure of choice for patients as primary treatment or in patients who do not respond to conservative treatment¹.

Most significant development in nasal endoscopy occurred during 1950s when Hopkins developed solid rod lens with proximal cold light source. In the last part of 20th century sinonasal endoscopy was established as an important component in our diagnostic and therapeutic management².

The work of Messerklinger on sinus mucosa and mucociliary transport has brought light the nature of pathophysiology of sinus diseases which are CRS (chronic rhinosinusitis), which is due to inadequate outflow of sinus secretions or due to obstruction of natural sinus ostia into the nasal cavity, Purulent infections spread from nose to sinus and in nasal cavity sites of obstruction mostly are the ethmoid infundibulum at the entrance to the maxillary and frontal sinus³.

FESS is divided into two approaches. The Messerklinger approach (1985) is from anterior to posterior. The approach is ideal for patients with anterior ethmoid disease with or without maxillary or frontal sinus disease. It can also be extended to posterior ethmoids, sphenoid and frontal sinus if necessary⁴.

The Wigand approach (1978) is quite opposite technique, this approach is from posterior to anterior and routinely involves clearance of all the sinuses. It is ideal for patients with pansinusitis which may not respond to limited surgery. The techniques are based on reversible sinus mucosal disease and becomes normal once adequate drainage has been established⁵.

Diagnosis of nasal obstruction is based on symptom criteria. Success or failure of treatment for conditions of nasal obstruction should be based on evaluation of symptom relief supplemented by quality - of - life assessment⁶. Information

on symptom improvement is useful for counselling the patients who have troublesome symptoms not responding to conservative treatment, but responds to FESS⁷.

The present study is to assess the effectiveness of FESS on the symptom profile of patients with nasal obstruction before and after surgery. FESS advocates systemic approach to the surgical treatment of the disease of nose and paranasal sinuses.

2. Materials and Methods

The present study was done in the department of Otorhinolaryngology of Konaseema institute of medical sciences and research foundation, Amalapuram. The study period was from November 2020 to November 2022. This is a prospective analytical study. All the patients gave written informed consent. The study was approved by department of Otorhinolaryngology and Ethical committee in Konaseema institute of medical sciences and research foundation, Amalapuram.

Study population: The study subjects were the patients aged above 18 years with nasal obstruction due to various conditions and undergoing FESS. Patients attending to Otorhinolaryngology department in Konaseema institute of medical sciences and research foundation, Amalapuram, 30 subjects were chosen for the study.

Inclusion criteria: Patients with nasal obstruction due to sinonasal pathologies and undergoing FESS and those who gave consent to participate in the study.

Exclusion criteria: Patients with isolated DNS as a cause of nasal obstruction, Nasal obstruction with external nose deformities, nasal wall collapse & gross septal deviation, Revision and recurrent cases, Patients not fit for surgery.

Subsequently all the selected candidates were worked up on the following pattern:

Patients with nasal obstruction were also associated with various other symptoms, which were classified into major and minor criteria⁸. Patients with at least two major symptoms or one major and two minor symptoms were considered. All their symptoms were graded preoperatively on a 6 - point Likert scale⁹. Any history of similar complaints in any of their family members was recorded. Any history of comorbidities like diabetes mellitus, hypertension, and bronchial asthma were also recorded. Personal habits like smoking and alcohol intake were asked.

Detailed general, systemic examination and ENT examination done.

Once the diagnosis and extent of the disease was established, the patients were taken up for FESS after preanaesthetic check - up. The surgery was done either local or general anaesthesia.

Postoperatively patients were treated with antibiotics, analgesics, oral decongestants and proton pump inhibitors. Depending on the extent of the surgery, nasal packs were

removed 24 to 48 hours after the procedure. Local decongestants and alkaline nasal douchings were also started and continued during the follow up period for the first 2 to 4 weeks depending on the amount of crusting. The patients were discharged on the 2nd or 3rd postoperative day and reviewed after one week and then followed up for 6 months.

During the post - operative follow - up, the severity of symptoms was compared preoperatively and postoperatively using the "Rhinosinusitis symptom inventory" (RSI) symptom scores¹⁰. Nasoendoscopic suction toileting was performed during which the healing of the cavities and patency of the ostia were monitored. Any recurrence of the disease, crusts, synechiae and mucopus were also observed at the end of 2nd week, 4th week, and 3rd month and at the end of 6 months.

Statistical Methods

To determine the effectiveness of FESS in management of nasal obstruction, the symptomatic profile of the patient before and after the procedure was statistically analysed using the Chi - square test which is tabulated and compared¹¹. The p value <0.05 considered statistically significant.

3. Results

30 patients were randomly selected attending the Otorhinolaryngology department who were fulfilling the inclusion criteria for the study. Preoperative and postoperative symptom scores were compared using RSI SYMPTOM SCORES¹⁰.

In this study male patients were 70% [N=21], and female patients were 30% [N=9]. The average duration of symptoms was 3 years and 7 months, the range was 6 months to 15 years. 25 of these patients have bilateral disease and 5 patients had unilateral disease out of which 3 patients had disease on the right side and 2 patients had disease on the left side.

All the 30 patients undergone conservative treatment for at least 6 months prior to surgical management in the form of antibiotics, decongestants and steroids [systemic and intra nasal]. The commonest symptom was nasal obstruction [N=27, 90%] and postnasal discharge [N =27, 90%] followed by headache [N=25, 83.3]. Other symptoms were decreased sense of smell [N=15, 50%], facial pressure [N=20, 66.7%], facial congestion [N=5, 16.7%], halitosis [N=13.3%], fatigue [N=12, 40%], cough [N=19, 63.3%], dental pain [N=2, 6.7%] and ear pain / fullness [N =6, 20%] (Table 1, 2).

Table 1: Pre operative symptom assessment – Major

Symptoms	No. of Cases	Percentage
Nasal obstruction	30	100%
Post-nasal discharge	27	90%
Facial pressure	20	66.70%
Facial congestion	5	16.70%
Decreased sense of smell	15	50%

Table 2: Pre operative symptom assessment – Minor

Symptom	No. of Cases	Percentage
Headache	25	83.30%

Halitosis	4	13.30%
Fatigue	12	40%
Dental pain	2	6.70%
Cough	19	63.30%
Ear pain/fullness	6	20%

The anterior rhinoscopy examination was done in all 30 patients. This examination revealed various findings, it includes deviated nasal septum [N=18, 60%], Pale boggy mucosa [N=12, 40%], inferior turbinate hypertrophy [N=8, 26.6%], congested nasal mucosa [N=4, 13.3%], polyps [N=14, 46.6%] and mucopus [N=20, 66.6%].

All the 30 patients, preoperatively were subjected to DNE. Out of 30 patients, 18 patients had deviated nasal septum [N= 18, 60.0%], Mucopus [N=20, 66.6%], Polyp [N=16, 53.3%], nasal mucosa congestion [N=7, 23.3%], paradoxical middle turbinate [N=2, 6.66%], accessory Ostia [N=3, 10.0%] and concha bullosa [N=5, 16.6%] (**Table 3**).

Table 3: Preoperative diagnostic nasal endoscopy findings

Structures	No. of Patients	Percentage
Deviated nasal septum	18	60.00%
Mucopus	20	66.60%
Polyp	16	53.30%
Nasal mucosa congestion	7	23.30%
Paradoxical middle turbinate	2	6.66%
Accessory Ostia	3	10.00%
Concha bullosa	5	16.60%

Patients underwent non contrast CT scan of PNS for both coronal and axial cuts prior to the surgery. All the CT scans were evaluated by both radiologist and Otorhinolaryngologist. The data recorded shows that the Osteomeatal unit was blocked in N=18, 60.0% patients on both right and left nasal cavities. OMU was blocked in N=8, 26.6% patients only on the right side nasal cavity. OMU was blocked in N=4, 13.4 % patients only on left nasal cavity.

Based on the symptoms profile, anterior rhinoscopy findings, diagnostic nasal endoscopy findings and CT PNS findings of both nasal cavities, all the patients were subjected to FESS under general anaesthesia. Among them, some underwent Uncinectomy [N=30, 100%] on both right and left sides, followed by middle meatal antrostomy [N=29, 96.6% on right side] and [N=28, 93.3% on left side]. The

other procedures done were anterior ethmoidectomy [N=27, 90.0%] on both right and left sides. Posterior ethmoidectomy [N=24, 80.0% on right side] and [N=25, 83.3% on left side], Sphenoidotomy [N=16, 53.3%] on both right and left sides, Frontal recess surgery [N=14, 46.6% on right side] and [N= 11, 36.6% on left side] and middle turbinate reduction [N=10, 33.3% on right side] and [N=7, 23.3% on left side] (**Table 4**).

Table 4: Distribution of various procedures done in FESS on right and left side

Surgery Type	Right Side		Left Side	
	No. of Cases	%	No. of Cases	%
Uncinectomy	30	100%	30	100%
Middle meatal antrostomy	29	96.60%	28	93.30%
Anterior ethmoidectomy	27	90.00%	27	90.00%
Posterior ethmoidectomy	24	80.00%	25	83.30%
Sphenoidotomy	16	53.30%	16	53.30%
Frontal recess surgery	14	46.60%	11	36.60%
Middle turbinate reduction	10	33.30%	7	23.30%

Postoperatively, there was gradual improvement in the severity grade of nasal obstruction during the 1st, 2nd and 4th week follow up. In 93.3% patients' total improvement was observed at the end of 3rd month. 100% improvement of symptom score was observed at the end of 6th month (**Table 5**).

Table 5: Postoperative nasoendoscopic findings

Duration	1 st week	2 nd week	4 th week	3 rd month	6 th month
Normal	3	21	27	30	30
Crusting	22	7	3	0	0
Synechiae	5	2	0	0	0

When compared pre and postoperative scores statistically:

- At 3rd month: $\chi^2=16.5$, $p<0.001$ very highly significant.
- At 6th month: $\chi^2= 29.36$, $p<0.001$ very highly significant.

Postoperatively, there was improvement in the severity grade of facial pressure during 1st, 2nd and 4th week. In 85% patients' total improvement was observed at the end of 3rd month. In 90% patients total improvement was observed at the end of 6th month (**Figure 1**).

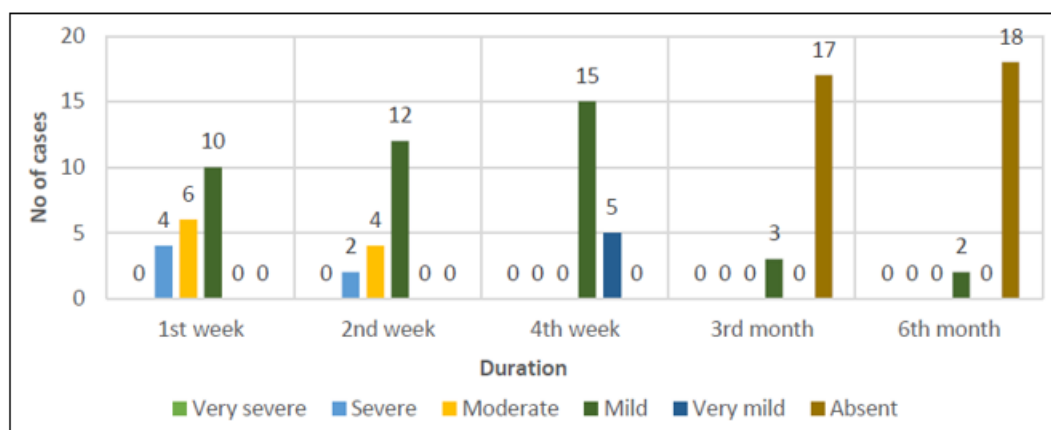


Figure 1: Postoperative symptom profile of facial pressure

When compared pre and postoperative scores statistically:

- At 3rd month: $\chi^2 = 6.32$, $p < 0.01$ highly significant.
- At 6th month: $\chi^2 = 16.5$, $p < 0.001$ very highly significant.

Postoperatively, there was improvement in the severity grade of post nasal drip at 1st and 2nd week. In 88.8% patients' total improvement was observed at the end of 4th week. In 92.5% patients total improvement was observed at the end of 3rd month and in 96.2% patients total improvement was observed at the end of 6th month (**Figure 2**).

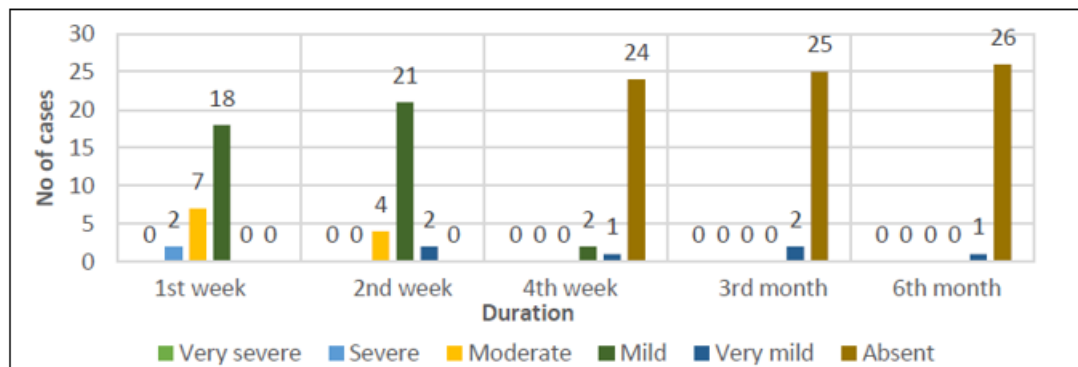


Figure 2: Postoperative symptom profile of post nasal discharge

When compared pre and postoperative symptom scores statistically:

- At 4th week: $\chi^2 = 4.02$, $p < 0.05$, significant.
- At 3rd month: $\chi^2 = 16.5$, $p < 0.01$, highly significant.
- At 6th month: $\chi^2 = 20$, $p < 0.001$, very highly significant

Postoperatively, there was improvement in the symptom score of headache at the end of 1st and 2nd week. In 28.0% patients total improvement was observed at the end of 4th week. In 88.8% patients total improvement was observed at the end of 3rd month and in 96.0% patients total improvement was observed at the end of 6th month (**Figure 3**).

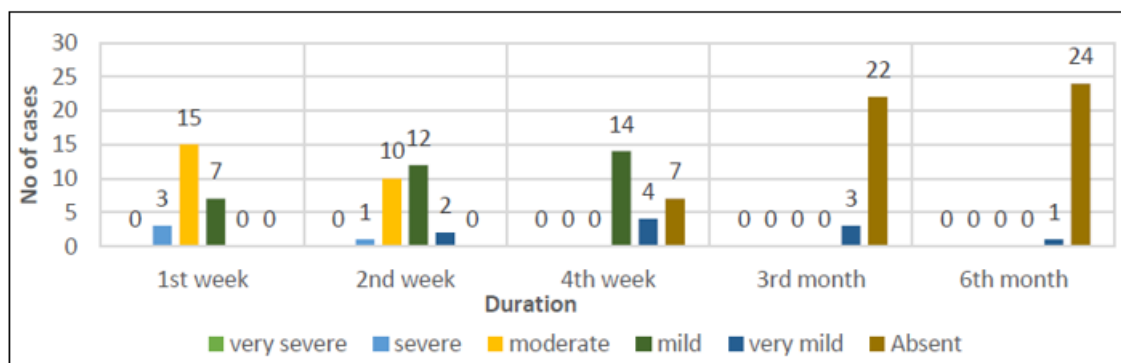


Figure 3: Postoperative symptom profile of headache

When compared pre and postoperative scores statistically:

- At 4th week: $\chi^2 = 3.06$, $p > 0.05$, not significant.
- At 3rd week: $\chi^2 = 5.12$, $p < 0.01$, highly significant.
- At 6th week: $\chi^2 = 6.32$, $p < 0.001$, very highly significant.

Postoperatively, there was improvement in the severity grade of decreased sense of smell was observed at the end of 1st, 2nd and 4th week. In 66.6% patients total improvement was observed at the end of 3rd month. In 86.6% patients total improvement was observed at the end of 6th months. (**Figure 4**)

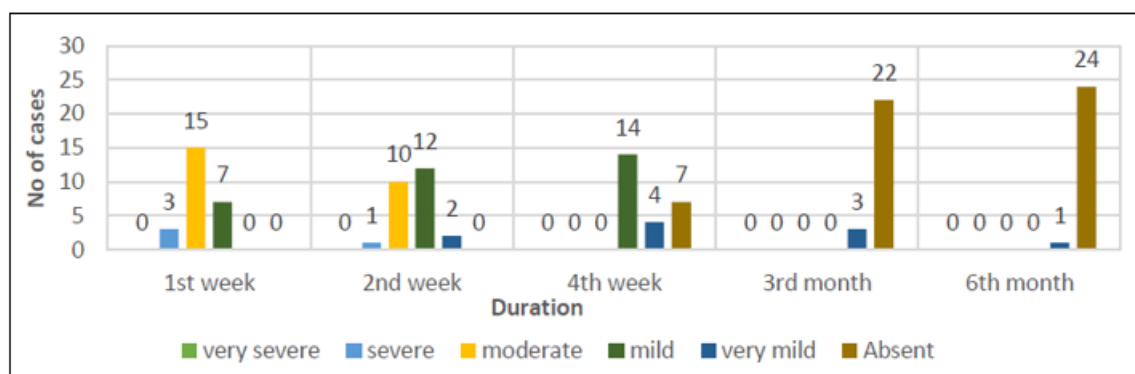


Figure 4: Postoperative symptom profile of decreased sense of smell

When compared pre and postoperative symptom scores statistically:

- At 3rd month: $\chi^2 = 16.5$, $p < 0.001$ very highly significant.
- At 4th month: $\chi^2 = 29.36$, $p < 0.001$ very highly significant.

Postoperatively, by the end of 6 months follow up period all the minor symptoms showed 100% improvement (**Table 6**).

Table 6: Comparison of minor symptom profile preoperatively and postoperatively at various time intervals

Symptom	Preoperative		Postoperative (3 weeks)		Three months		Six months	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Cough	19	63.30%	6	20.00%	2	6.66%	0	0%
Dental pain	2	6.66%	2	6.66%	1	3.33%	0	0%
Halitosis	4	13.30%	2	6.66%	0	0%	0	0%
Fatigue	12	40.00%	10	33.30%	4	13.30%	0	0%
Ear pain	6	20.00%	1	3.33%	0	0%	0	0%

Postoperatively, at the end of 6 months follow up period highest success rate in symptom profile was seen in nasal obstruction [100%], post nasal discharge and headache [96%] followed by facial pressure [90%] and least success rate observed in decreased sense of smell [86%]. All the minor symptoms showed 100% success rate¹²

4. Discussion

The present study is focused on the interaction of nasal obstruction along with other symptoms due to various conditions and comparing the symptom scores before and after the FESS.

Postoperatively at the end of 6 months follow up period highest success rate in the symptom profile was observed in nasal obstruction [100%] improvement was seen followed by post nasal discharge and headache [96%] improvement was observed and [90%] improvement was observed in facial pressure. Least success rate was observed in decreased sense of smell [86%]. All minor symptoms significantly showed 100% improvement.

All the symptoms were significantly decreased postoperatively at the end of 6 months follow up. These findings were consistent with those of the other studies^{13, 14}.

Chakravarti A, Naglot S, Dhawan R designed a prospective study, to assess the efficacy of FESS in chronic rhinosinusitis. All the chronic rhinosinusitis outpatients >18 years refractory to 3 weeks of medical therapy were radiologically evaluated with CT scans. In this study 90% patients with minimal changes on CT scans showed significant improvement in overall symptoms scores after FESS at the end of 12 months follow up¹⁸.

Rudmik L, Bhattacharya N compared preoperative and postoperative symptom scores for patients undergoing endoscopic sinus surgery. Significant decrease in major and minor symptoms were noted postoperatively. Highest success were noted for decrease in facial pressure, congestion, nasal obstruction, rhinorrhoea and headache. All the minor symptoms showed significant reduction in symptom scores postoperatively. A mean reduction of antibiotic use was noticed¹⁹.

In Venkatachalam V Pet al study, the mean follow up period was 18.3 months. Post operatively 147 [70%] had complete

relief of symptoms, 39 [18.5%] had partial relief of symptoms and 15 [7.17%] had no/poor relief of symptoms⁸.

In Bunzen D Let al study, the follow up period was 6 months and highest relief was seen in nasal obstruction [84.5%], cacosmia/halitosis [82%], hyposmia/anosmia [64.8%], and headache [60%]. They attributed the reason for failure of surgery in rest of the patients may be due to the fact that chronic sinonasal inflammatory diseases are frequently associated to a number of factors such as immune - deficiencies, muco - ciliary alterations, vasomotor hyperactivity and atopy, which would definitely influence clinical outcome and surgical result. They also said allergic rhinitis and environmental factors will also influence the outcome of the surgery²⁰.

In Nair S et al study, of total 50 patients were operated under general anaesthesia. The commonest surgical procedure performed was Uncinectomy which was standard procedure performed in all cases. Other common procedures performed included clearance of pathology from the Osteomeatal complex [84.5%] and anterior ethmoidectomy [66.3%]. Posterior ethmoidectomy was done in [30.9%], Sphenoidotomy in [26.7%] and in 42% of cases the frontal recess was enlarged¹⁶.

In Netkovskij study, FESS was performed in all cases under general anaesthesia. The extent of the surgery was determined by the extent of the disease but included Uncinectomy, middle meatal antrostomy, anterior ethmoidectomy and perforation of the ground lamella of the middle turbinate with posterior ethmoidectomy, sphenoidectomy and clearance of the frontal recess¹⁷.

Hence from the above studies the commonest step for FESS were Uncinectomy followed by middle meatal antrostomy, anterior and posterior ethmoidectomy, frontal recess ostomy and Sphenoidotomy in varying frequency and all these steps of FESS in the same order were comparable in the present study depending on the extent of disease and laterality of the disease.

FESS is an effective and safe procedure when performed by surgeons experienced in the technique. In inexperienced hands, the major complications associated with FESS include intracerebral haemorrhage, CSF leak, diplopia, blindness, intracranial penetration, meningitis and severe nasal haemorrhage.

In the present study there were no major complications recorded. The minor complications were bleeding [N=4] which was treated conservatively and synechia [N=3] which were released during the postoperative follow up. There were no permanent sequelae encountered.

In Fageeh NA, study minor complications like bleeding, synechia and facial swelling were noted. Internal carotid artery rupture [N=1] and orbital haematoma [N=2] were noted. All were managed successfully without any sequelae¹⁵. Unlike this study, all the above studies had only minor complications like bleeding, synechia formation and breach of lamina papyracea except Fageeh NA study which reported one major complication like internal carotid artery which was managed by immediate nasal packing, blood transfusion and fluid replacement.

5. Conclusion

In 86% patients' improvement in the symptom scores was observed by the end of 6 months follow up period. The remaining 14% cases were symptomatic at the end of postoperative 6 months follow up, may be because of delayed healing of sinus mucosa due to recurrent URTI, exposure to environmental dust and pollution and personal habits like smoking. These could be modified and addressed for still better impact of FESS. There were only few manageable minor complications like bleeding and synechia formation which was released during postoperative follow ups. Hence to conclude, FESS is minimally invasive, safe and effective procedure and has greater impact in the nasal obstruction due to various conditions, as it clears the involved pathology, establishing nasal patency and normal muco - ciliary drainage of the paranasal sinuses.

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