

## The complications of functional endoscopic surgery (FESS) – A clinical study

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Sinusitis is a common problem that leads to a significant amount of health care expenditure due to direct costs of physician visits and antibiotics as well as indirect costs related to reduced productivity and a decrease in quality of life.<sup>1,2</sup> The cornerstone of accurate diagnosis and treatment of chronic rhinosinusitis (CRS) is a thorough history, complete physical examination including nasal endoscopy and computed tomographic (CT) analysis.<sup>3</sup>

The treatment for maxillary sinusitis was aimed at simple drainage of suppuration of antrum. In 19<sup>th</sup> century, Caldwell<sup>4</sup> and Luc independently described technique that included the creation of a canine fossa antrostomy, complete eradication of infected mucosa, and to facilitate drainage and aeration via. inferior meatal antrostomy and closure of the oral incision. The first attempt at nasal and sinus endoscopy was made by Hirshman in 1901, using a modified cystoscope. In 1925, Maltz, a New York rhinologist, used the term sinuscopy and advocated the technique for diagnosis.<sup>5</sup> The Caldwell Luc operation became main stay of the maxillary sinus until the introduction of endoscopic sinus surgery in the 1970s, which has revolutionised the treatment of sinonasal disease.

FESS as a term and as a technique was originally introduced by David Kennedy in (1985) in USA to distinguish 'sinus surgery with endoscope' from the Caldwell-Luc operation. But years before it was introduced in Europe by Messerklinger and Stammberger.<sup>6,7</sup> Since its introduction, it has become the standard surgical intervention for patients with chronic rhinosinusitis (CRS) refractory to medical therapy. Over years physicians have performed sinus surgery, FESS was the first procedure addressing the underlying pathophysiologic mechanism of sinusitis as first described by Messerklinger in 1978. Over the last 20 years and with the advancement of surgical and diagnostic tools, FESS became not only the treatment of choice for CRS but also the treatment of orbital and skull base problems.<sup>8,9</sup> It is estimated that at present 40-50% of all ENT surgeons had attended at least one instructional course on FESS. Nowadays, FESS is a mandatory part of any ENT-Residency Training Programme.<sup>10</sup> FESS is done in a very tight and dangerous anatomical areas and hence it is associated with major fatal and minor complications. To reduce the rate of complications, only surgeons with vast experience, proper surgical and diagnostic setups are

allowed to perform this type of surgery. Over the years (since 1994) FESS moved from the traditional conservative procedure to the minimum invasive sinus technique (MIST) as first described by Messerklinger.<sup>11</sup> Pre-operative assessment and postoperative medications and follow up are very important for a better outcome and fewer complications.<sup>12</sup> The objective of this study is to evaluate our experience with FESS with respect to its complication since its introduction in our department in 1997 and compare our results with other results in the international literature.

The Messerklinger (1978) introduced the concept of FESS based on endoscopic observation and demonstration of anatomy and pathology in the middle meatus area and sinus mucociliary clearance in normal and diseased mucosa.<sup>14,15</sup>

FESS is diagnostic nasal endoscopy which allows the ENT surgeon to see subtle changes not readily identified on anterior rhinoscopy, objective evaluation of medical treatment and post operative care. Use of rigid intranasal endoscope has identified nasal pathology in majority of patients with normal finding on traditional examination. Also in patients with sinus pathology, the use of endoscope is necessary to determine the necessity of concomitant septoplasty/spurectomy. The major advantage of this surgery is the use of endoscopes improves visualization, enables greater preservation of normal structures and reduces the necessity for wider exposure and provides a safe and effective treatment of chronic and recurrent sinusitis. However, the surgery is technically demanding, since the key is the accurate diagnosis and removal of the underlying causes of sinus disease. The ability to diagnose these problems and to correct them with FESS has opened new possibilities in the field.

The concept of FESS is the removal of tissue obstructing the OMC and the facilitation of drainage while conserving the normal non-obstructing anatomy and mucus membrane.

### Indications for FESS<sup>16</sup>

Rice (1989) has divided the indications for FESS as follows:

1. Patients who fail traditional non-invasive therapy. Ideal patient is one who has repeated bouts of bacterial sinusitis that respond only briefly to antibiotics.

2. Patients who get severe bacterial sinusitis that fails to respond to antibiotics and other usual measures.
3. Patients with nasal polypi with or without asthma.
4. Patients with a mucocele.
5. Patients with periorbital cellulitis secondary to ethmoiditis.

### Material and Methods

A total of 50 cases of chronic rhino sinusitis refractory to medical treatment in the age group of 15 to 65 years were investigated and subjected to FESS during a period of one year. A uniform history and examination was documented for each patient. This included nasal obstruction, rhinorrhoea, presence of allergic symptoms, post-nasal drip, facial pain and pressure, etc. The previous treatment under taken for sinusitis, for example, Any form of non-surgical treatment like oral / local intra-nasal medications etc was duly documented and surgical treatment like antral lavage, Caldwell-luc operation, etc. was enquired into.

All patients included in this study were recurrent and refractory to medical treatment for sinus problem. All patients were examined with anterior and posterior rhinoscopy. Patients presenting with any two of the following major symptoms and signs or one major and two minor symptoms and signs for duration of more than 2 weeks were selected.

**Major symptoms and sign:** a) Nasal obstruction, b) Purulence in nasal cavity on examination, c) Purulent nasal discharge with post nasal drip, d) Hyposmia/anosmia, e) Nasal congestion/fullness, f) Facial pain/pressure.

**Minor symptoms and sign:** a) Headache, b) Halitosis, c) Fatigue, d) Dental pain, e) Cough, f) Ear pain/pressure/fullness.

**Nasal endoscopy (NE):** Lanza Kennedy criteria is used to grade nasal endoscopy findings looking at the presence of secretion, oedema and polyps. NE findings were considered positive when there was presence of either or combination of polyps, mucopus in the middle meatus or diseased mucosa.<sup>17</sup>

A diagnostic nasal endoscopy was performed pre-operatively on all patients under local anaesthesia, using 4mm 0° & 30 degree Hopkin rods. Three cotton pledgets soaked in 4% with Adrenaline/xylocian and then squeezed will be placed in nose along the floor, along the middle turbinate and along the roof, respectively for about five minutes. The patients will be placed in the supine position with head and Neck slightly flexed. The endoscopy was done in three passes:

**First pass:** The first pass of the scope was along floor and into the nasopharynx, allowing for careful examination of overall nasal anatomy, the inferior meatus, and turbinate were examined for any previous antrotomy and the endoscope was then guided further backward towards the posterior choanae, Eustachian tube orifices, Torus tubralis, adenoid pad, fossa of

Rosenmuller and entire nasopharynx was examined. Any pathology around such as postnasal discharge and mucosal oedema was noted.

**Second pass:** The second pass was made between the middle meatus and inferior turbinate, aimed at examining of the osteomeatal complex (OMC), which included a detailed assessment of the agger nasi cells, middle turbinate and high deviation of septum. The endoscope was focussed on the uncinat process and was gently guided into the middle meatus and rotated to bring the lateral wall of nose into the view thus allowing examination of the hiatus semilunaris, bulla ethmoidalis and rarely maxillary osteum, basal lamella and accessory ostium (if present) A note was made of findings in the middle meatus whether it was normal, narrowed, polypoid, oedematous inferior portion of middle meatus and the fontanelles for evidence of bulging or accessory maxillary ostia. The pass is continued by rolling the scope medially into the sphenoidal recess, examining the sphenoid sinus ostium.

**Third pass:** The third pass is made between the septum and the posterior part of the middle turbinate. The endoscope was directed superiorly to examine the superior turbinate and meatus, the sphenoidal recess and sphenoid ostium.

### Surgical procedure:<sup>18-20</sup>

All the patients were operated upon under general anaesthesia by the classical Messerklinger technique. The patient was placed in supine with head in different positions depending on operating side. Nasal decongestion was obtained with packing the nasal cavity with cotton pledget soaking in 4% xylocaine with 1:10,000 adrenaline. After five minutes, the uncinat process, the roof of middle turbinate and ethmoid bulla were injected with 2% xylocaine in 1:100,000 adrenaline under endoscopic visualisation. The uncinat process was then incised with a sickle knife and removal with straight cup forcep, exposing the bulla. The extent of surgical resection from this point was variable based on intraoperative findings. The ethmoidal bulla and then anterior and posterior ethmoid cells were removed. Posterior ethmoid cells and sphenoid sinus were left unremoved in patients with limited disease. The lateral portion of bulla was used as a landmark for the lamina papyracea. The fovea ethmoidalis was identified and followed posteriorly to the basal lamella. The natural ostium of maxillary sinus was identified in all patients with a 30° Hopkin rod and enlarged, using angled and back biting forceps to create an opening approximately 1.5×2 cms in size. The maxillary sinus was inspected using 70° telescope and disease was removed. The area of frontal recess was examined with 30° telescope and opened when there was frontal disease present. Concha bullosa of the middle turbinate was subjected to lateral laminectomy to deal with the disease and to enlarge the ostiometal

complex. Following the surgery, an antibiotic was instilled in the operating field. At the end of surgery merocel packs was placed under the middle turbinate in the nasal cavity for 48 hrs. Patient were started saline nasal spray after removal of pack from nasal cavity which was continued until crusting ceased.

**Follow up:** All patients were kept under regular follow up for period of 3 to 6 months, postoperatively. At the intervals of 3 weeks, 6 weeks and 12weeks they were subjected to meticulous examination including nasal endoscopy .During first postoperative visit following surgery, the nose was locally anaesthetised in the same manner as used for the initial diagnostic examination. Non-adherent crusts and secretions were removed using nasal endoscopes, various curved suction tips and alligator forceps. In the rest of the postoperative visits additional removal of crust and retained secretions was done until minimal crusting was present .When excessive crusting was present, nasal douche was used. If polypoid changes without crusts were noted at 3 to 6 weeks, local steroids spray was started twice a day. If any adhesions/ synechiae were noticed, they were lysed under local anaesthesia. Patient's symptoms were recorded during each visit, so were the complications recorded if any occur intra / post operatively.

## Results and Observations

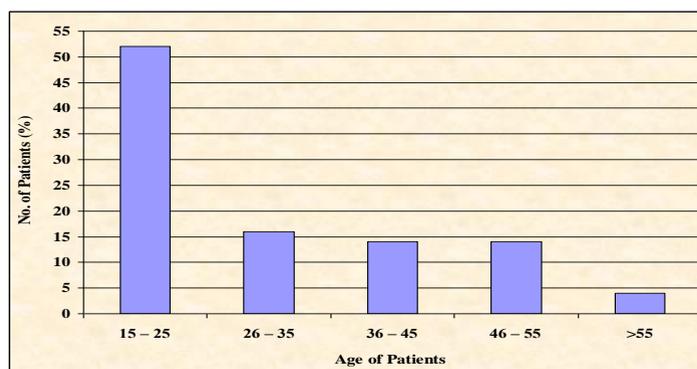
In the present study, maximum number of patients were falling in the age group of 15 – 25 years (52 %) (Table 1). In the study, males were more effected than females. Male to female ratio was 66: 34 (Table 2). In the present study, the most common major symptoms were nasal obstruction (88%) followed by nasal discharge (28%), PND (20%) and alteration smell (10%) and the minor symptoms as headache (62.5%), URTI (34%), halitosis (26%), fatigue (18%).Other associated symptoms include facial pain, epistaxis, earache and miscellaneous were seen in few patients (Table 3).

**Complications:** In the present study, synechiae formation between the inferior turbinate and septum and between middle turbinate and lateral nasal wall was the most frequent complication seen in post-operative period in 29(58%) patients. This was followed by bleeding nose in 13 (26%) patients. Orbital subcutaneous emphysema was seen in 9 (18%) patients and lower lid ecchymosis was seen in 1 (2%). There was no major complication like CSF rhinorrhoea seen in series of patients. (Table 4) In the present study, most of the patient 22 (44%) had more than one complication as mentioned above together and 9(18%) had single complication during post-operative period and remaining 19 (38%) no complication was noted. (Table 5)

**Table 1: Showing Age distribution of cases (patients)**

Age of patients (years)	No. of patients	Percentage (%)
15 – 25	26	52
26 – 35	8	16
36 – 45	7	14
46 – 55	7	14
>55	2	4
Total	50	100
p-value	0.073	

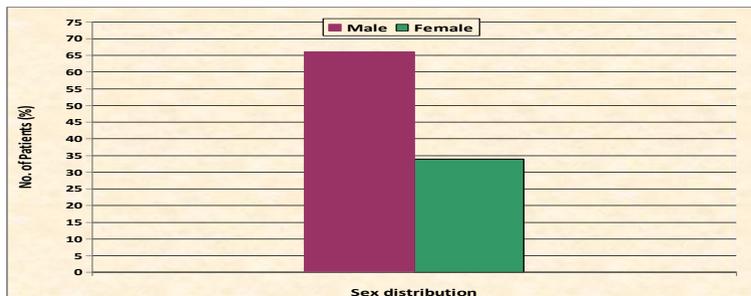
**Graph 1**



**Table 2: Sex distribution**

Sex	No. of Patients	Percentage (%)
Male	33	66
Female	17	34
p-value	0.0013	

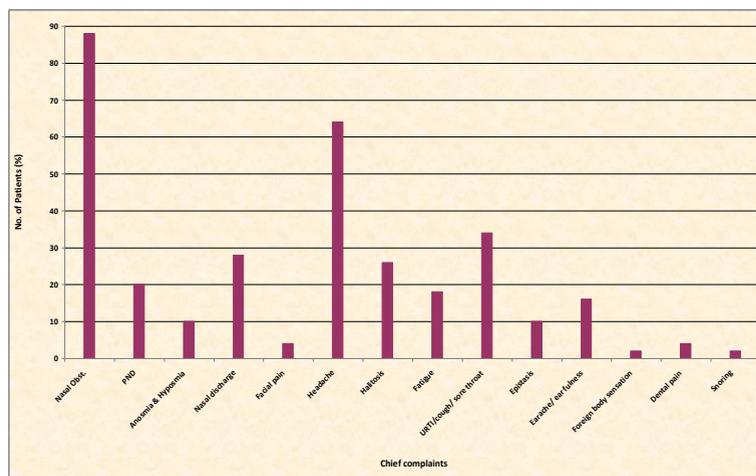
**Graph 2**



**Table 3: Chief Complaints**

Chief complaints		No. of Patients	Percentage (%)
Nasal Obst.		44	88.00
Nasal discharge		14	28.00
PND		10	20.00
Anosmia & Hyposmia		5	10.00
Facial pain		2	4.00
Headache		32	64.00
Halitosis		13	26.00
Fatigue		9	18.00
URTI/cough/ sore throat		17	34.00
Epistaxis		5	10.00
Earache/ ear fullness		8	16.00
Miscellaneous	Foreign body sensation	1	2.00
	Dental pain	2	4.00
	Snoring	1	2.00
p-value		0.004	

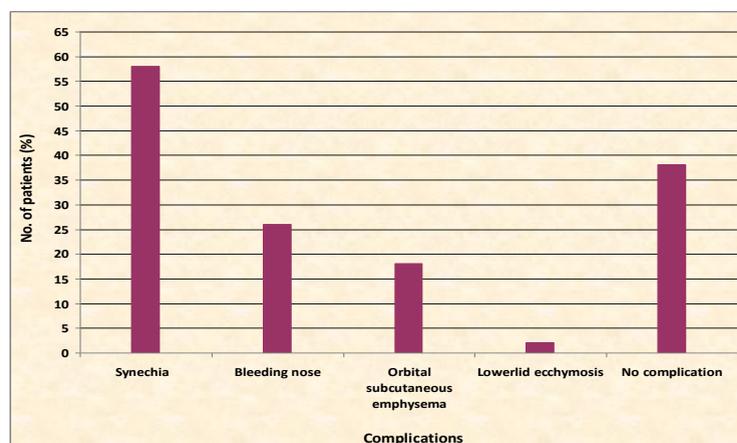
**Graph 3**



**Table 4: Complications associated with FESS**

Complications	No. of Patients	Percentage (%)
Synechia	29	58
Bleeding nose	13	26
Orbital subcutaneous emphysema	9	18
Lowerlid ecchymosis	1	2
No complication	19	38
p-value	0.040	

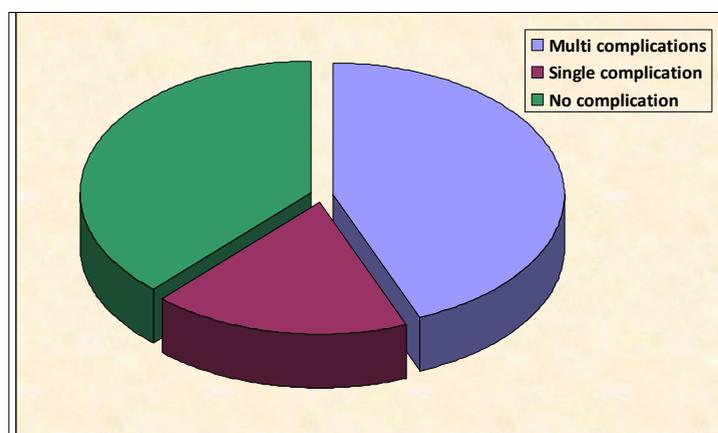
**Graph 4**



**Table 5: Complications**

Complications	No. of Patients	Percentage (%)
Multiple complications	22	44
Single complication	9	18
No complication	19	38
p-value	0.0051	

**Graph 5**



**Discussion**

Endoscopic nasal sinus surgery performed by inexperienced operators carries with it the same risks and complications as traditional intranasal sinus surgery (Stankiewicz, 1987). Patients with previous intranasal procedures, especially nasal polypectomies, have more fibrosis than unoperated patients. Sinus disease and its surgical treatment carry the risk of orbital

complications, including possibility of blindness. Stankiewicz (1987) had summarised the complications of FESS into major and minor. The major complications included significant haemorrhage (blood loss over 1200 ml intra-operatively), CSF leak and blindness, while the minor complications comprised of orbital haematoma, natural ostia closure, subcutaneous orbital emphysema, tooth pain and asthma. In his study

of 90 patients, 26 (29%) complications were noted which include haemorrhage in 2 (2.2%) patients, CSF leak in 1 (1.1%) patient, temporary blindness in 1 (1.1%) patient. Minor complications were encountered in 21% patients with orbital haematoma in 5 (5.5%) patients, synechiae in 6 (6.6%) patients, natural ostia closure in 4 (4.4%) patients, orbital subcutaneous emphysema in 3 (3.3%) patients and tooth pain in 1 (1.1%).<sup>21</sup>

Gross et al. (1989) in their series of patients reported no major complication. In their series, they noted recurrence of frontal disease in 1 (1.75%) patients, recurrent ethmoid and sphenoid disease in another 1 (1.75%) patient and epistaxis was noted in 1 (1.75%) patient.<sup>22</sup>

Schaefer et al. (1989) in their series of 100 patients reported minor complications in 14% patients which included ecchymosis of eyelid in 2%, asthma attack in (2%) and synechiae in 6% patients.<sup>23</sup>

Rice (1989) in his series of 100 patients reported a few minor complications which included excessive middle meatus scarring in 7% patients and brief ecchymosis of medial eyelids in 3% patients. Levine (1990) in his series of 250 patients experienced minor complications in 8.3% patients and major complications in 0.7% patients. The minor complications included unilateral eye ecchymosis in 0.6%, intra-operative bleeding in 7.2 %, post-operative bleeding in 1.2% and symptomatic middle meatal stenosis in 6.8% patients.<sup>24</sup>

Lusk and Muntz (1990) in their series of 31 patients undergoing FESS, experienced 2 cases (6.45%)

of synechiae postoperatively. No major complication was reported in their series. Lazar et al. (1992) in their series of 210 patients of FESS encountered significant adhesion between middle meatus and septum in 20%, granulation tissue formation in 10%, persistent polyposis in 7% and significant crusting in 11% patients.<sup>25</sup>

Gandotra et al. (2000) in their series of 69% patients encountered nasal bleeding in the immediate postoperative period in 9 (13.04%) patients, synechiae in 4 (5.79%) patients and recurrence of ethmoidal polyps in 3 (4.3%) patients. Venkatachalam and Bhat (2000) in their series of 210 patients reported injury to lamina papyracea in 2 (0.95%) patients, bleeding in 12 (5.7%) patients, synechiae in 18 (8.57%) patients and meatal antrostomy closure in 6 (2.85%) patients.<sup>26</sup>

Jakobsen and Svendstrup (2000) in their series of 237 patients noted annoying bleeding in 21% and CSF rhinorrhoea in 3 (1.26%) patients.<sup>27</sup>

In the present study, no major complication like CSF rhinorrhoea, blindness and orbital involvement was encountered. Postoperative synechiae in 29 (58%) was the most frequent complication seen in this study of 50 patients. This was followed by orbital subcutaneous emphysema in 9 (18%) and haemorrhage in 13 (26%) patients, Blood transfusion was not required in any case. Brief ecchymosis of lower lid was observed in 1 (2%) patient.

**Table 6: Complication during FESS – A comparison**

Author	Synechiae	Bleeding nose	Orbital sub. emphysema	Lower lid ecchymosis	CSF leak	Trauma lamina papyracea/ blindness
Stankiewicz(1987) (n=90)	6.6%	2.2 %	3.3%	5.5%	-	1.1%
Gross et al. (1989) (n= 57)		1.75%				
Schaefer et al. (1989) (n=100)	6%		2%			
Rice(1989) (n=100)		7.2%		3%		
Lusk and Muntz(1990) (n= 168)	6.4%					
Gandotra et al (2000) (n=69)	5.79%	69%				
Venkatachalam and Bhat (2000) (n=210)	8.57%	5.7%				0.95%
Jakobsen and Svendstup (2000) (n=237)		21%			1.26%	
Present study (n=50)	58%	26%	18%	2%		

## Conclusion

The most frequent complications seen in post operative period was synechiae (58%) followed by nose bleeding (26%) and no other major complications were noted.

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