

**FUNCTIONAL ENDOSCOPIC SINUS SURGERY :  
AN OUTCOME ANALYSIS**

**By**

**Dr. Rushdan bin Ismail**

**Dissertation Submitted  
In Partial Fulfillment Of The Requirements  
For The Degree Of Master Of Medicine**

**( Otorhinolaryngology – Head & Neck Surgery )**

**UNIVERSITI SAINS MALAYSIA – NOVEMBER 2001**

***In the name of Allah,  
The Most Beneficent,  
The Most Merciful.***

***To My Lovely Wife and Children,  
Thank you for restoring the perspective  
Of my life***

## **ACKNOWLEDGEMENTS**

I wish to extend my utmost thanks to Associate Professor (Dr) Mohamad Hamzah, a lecturer in the Department of Otolaryngology, University Sains Malaysia for giving me great assistance and consultation in preparing this dissertation.

I would also like to convey my gratitude to Associate Professor (Dr) Din Suhaimi Sidek, lecturer and Head Department of Otolaryngology for his advices during this preparation.

Thanks to Hospital Record staffs for helping me trace all the involved patients' records.

I also appreciate the encouragement and support given by my colleagues in the Department of Otolaryngology, HUSM.

Thanks to Dr. Mohd Ezani Aziz and Dr. Hanafiah for helping me with the statistical analysis

I am particularly indebted to my wife for her support and encouragement during this candidature.

<b>Lists Of Tables</b>	<b>Page</b>
Table 1.1 : Factors associated with the diagnosis of chronic rhinosinusitis .	5
Table 3.1 : Number of patients who undergone FESS performed by different surgeon	20
Table 4.1 : Percentage of common presentation.	22
Table 4.2 : Number of patients according to sex.	24
Table 4.3 : Percentage of smoking.	24
Table 4.4 : Percentage of asthma.	25
Table 4.5 : Study group ; overall benefit.	33
Table 4.6 : Post-operative feeling of patients with polyp.	34

## Lists Of Figures

Figure 4.1 : Percentage of patients according to sex	23
Figure 4.2 : Frequency of patients with smoking	24
Figure 4.3 : Frequency of patients with asthma	25
Figure 4.4 : pre-operative grading of headache	26
Figure 4.5 : post-operative grading of headache	26
Figure 4.6 : pre-operative grading of olfactory disturbance	27
Figure 4.7 : post-operative grading of olfactory disturbance	27
Figure 4.8 : pre-operative grading of nasal blockage	28
Figure 4.9 : post-operative grading of nasal blockage	28
Figure 4.10 : pre-operative grading of postnasal drainage	29
Figure 4.11 : post-operative grading of postnasal drainage	29
Figure 4.12 : pre-operative grading of rhinorhea	30
Figure 4.13 : post-operative grading of rhinorhea	30
Figure 4.14 : pre-operative grading of facial pain	31
Figure 4.15 : post-operative grading of facial pain	31
Figure 4.16 : pre-operative grading of halitosis	32
Figure 4.17 : post-operative grading of halitosis	32
Figure 4.18 : preoperative and postoperative symptom score	34

## ABSTRACT IN BAHASA MELAYU

Ini adalah satu kajian retrospektif yang bertujuan untuk mengkaji keberkesanan pembedahan FESS yang dilakukan di HUSM dan seterusnya untuk mengetahui kepuasan hati pesakit selepas pembedahan.

Seramai empat puluh lima orang pesakit telah dikaji. Pesakit telah melengkapkan borang pengumpulan data berstruktur untuk memberi penilaian terhadap tanda-tanda penyakit sinus samada sebelum ataupun selepas pembedahan.

Terdapat penurunan kadar keparahan tanda (perbandingan antara sebelum dan selepas pembedahan) seperti sakit kepala, hidung tersumbat, hidung berair (depan dan belakang) dan sakit bahagian muka (nilai  $p < 0.05$ ). Disamping itu, kebanyakan pesakit mendapati bahawa mereka merasakan secara keseluruhannya, kehidupan mereka lebih baik selepas menjalani pembedahan.

Penemuan ini menunjukkan bahawa terdapatnya peningkatan taraf kesihatan bagi pesakit yang menjalani pembedahan FESS dan memberi bukti lanjut bahawa pembedahan sinus berendoskopi berkesan untuk merawat pesakit hidung dan sinus yang kronik.

## **ABSTRACT**

This is a retrospective study to assess the result of functional endoscopic sinus surgery (FESS) which were performed in HUSM between January 1997 to December 1999 to evaluate the general satisfaction of patients after the operation.

Forty-five patients were evaluated after functional endoscopic sinus surgery. Patients completed structured data collection form (Appendix A) to quantify the severity of commonly experienced sinus-related symptoms both before surgery and after undergoing sinus surgery.

Significant decreases in nasal symptom prevalence (post-surgery versus pre-surgery) were noted for headaches, nasal congestion, nasal drainage (anterior and posterior) and facial pain ( $p$  value  $<0.05$ ). In addition, the proportion of subjects who rated the overall benefit of surgery as "better" in respect to overall quality of life.

These findings aid in quantifying the magnitude of improvement experienced by FESS patients and provide further evidence that functional endoscopic sinus surgery represents an effective treatment for chronic rhinosinusitis.



## INTRODUCTION

Chronic rhinosinusitis is a diagnosis commonly made by primary care practitioners and otolaryngologists. Rhinosinusitis may be clinically defined as a condition manifested by an inflammatory response involving the following : the mucous membranes (possibly including the neuroepithelium) of the nasal cavity and paranasal sinuses, fluids within these cavities, and/or the underlying bone. (Lanza and Kennedy, 1997)

There are five different classifications of rhinosinusitis which depend on duration and frequency of symptom and sign of rhinosinusitis. They are Acute, Subacute, Recurrent acute, Chronic and Acute exacerbation of chronic (Lanza & Kennedy, 1997). Chronic rhinosinusitis is rhinosinusitis lasting more than 12 weeks. The diagnosis is confirmed by the major and minor clinical factors complex (Table 1) with or without findings on the physical examination. A strong history consistent with chronic rhinosinusitis includes the presence of two or more major factors or one major and two minor factors.

Etiologic factors range from upper respiratory tract infections to systemic disease, but the most common pathophysiologic process leading to sinusitis is obstruction of ostiomeatal complex.

Table 1.1 : Factors associated with the diagnosis of chronic rhinosinusitis (Lanza & Kennedy, 1997)

Major Factors
Facial pain/pressures Facial congestion/fullness Nasal obstruction/blockage Nasal discharge Hyposmia/anosmia Fever (in acute only)
Minor Factors
Headache Halitosis Fatigue Dental pain Cough

Symptoms of chronic sinusitis are often due to impairment of mucociliary flow, which may be caused by one of the following :

- i. Anatomic deformity
- ii. Chronic infection
- iii. Allergy

The cardinal symptoms of chronic sinusitis are nasal congestion, nasal or postnasal discharge and pain. A headache over the forehead, the bridge of the nose and the face is usual. The patient may also suffer from anosmia, or even cacosmia (unpleasant smell) especially in infections of dental origin. Chronic irritation of nasal airway and repeated rubbing may lead to vestibulitis and epistaxis. Chronic rhinosinusitis is deemed to exist if these symptoms have persisted for three months.

The principles involved in the management of recurrent or chronic sinusitis are first to attempt to identify and treat the underlying cause and second, if possible to restore the functional integrity of the inflamed mucosal lining. Restoration of sinus ventilation and correction of mucosal apposition will allow restoration of the mucociliary clearance system.

Therapeutic entities include antibiotics, mucolytics, nasal irrigation, corticosteroids and anti-allergic therapies when appropriate either individually or in combination. Although most patients respond to medical treatment, surgery is considered for those with the intractable symptoms of chronic or recurrent sinusitis.

Thirty years ago, antrostomies and Caldwell-Luc procedures were the surgical approaches most often used to treat patients with chronic or recurrent sinusitis and plain radiographs, were the principal adjuvant diagnostic modality.

In the late 1970's, Messerklinger developed the concept of osteomeatal complex and radically altered our understanding and management of chronic sinusitis. The practical result of his theories was the introduction by Kennedy, et al. during the 1980's of ***Functional Endoscopic Sinus Surgery*** .

FESS now is the surgical procedure of choice for treating chronic or recurrent sinusitis and this surgical procedure is a functional procedure that addresses the osteomeatal complex by removing diseased tissues and restoring normal physiology.

Many reports have been published on the efficacy of FESS in the treatment of chronic sinus disease after medical failure. The overall success rate for endoscopic sinus surgery ranges from 80% to 97% depending on the criteria used to establish success (Levine HL, 1990). With the increasing importance of outcome evaluation in the determination of treatment protocol, there is a need for good quality studies to evaluate FESS as an adequate treatment of chronic sinonasal disease.

Functional endoscopic sinus surgery (FESS) is a minimally invasive technique in which sinus air cells and sinus ostia are opened via the endoscope which connected to the monitor. The goal of this procedure is to restore sinus ventilation and normal function (Kennedy, 1985).

The ability to treat paranasal sinus disease has been revolutionized by fiberoptic endoscopes and computed tomographic (CT) scanning. Fiberoptic endoscopes have made it possible to examine the nose thoroughly from the anterior nares to the postnasal space. The endoscopic procedure requires local anaesthetic and may be performed in the office. The specific features that must be identified and assessed during the examination are the middle turbinate and the middle meatus (osteomeatal complex), anatomical obstruction, mucopus and nasal polyps.

The primary objective of the 'Messerklinger' approach, championed by Stammberger

(1985, 1991), is the removal of pathology in the osteomeatal complex, sufficient to achieve ventilation and drainage, thereby addressing the underlying pathophysiology by a conservative technique: hence the term 'functional' (Kennedy et al., 1985). The title 'FESS' (functional endoscopic sinus surgery) is therefore only appropriate when performing limited surgery with preservation of existing structures.

The following list of indications are amenable to an endoscopic approach:

- Chronic rhinosinusitis
- Nasal polyposis
- Frontoethmoidal mucoceles
- Fungal sinusitis
- Repair of CSF leaks
- Orbital and optic nerve decompression
- Hypophysectomy
- Dacrocystorhinostomy

CT scanning identifies the anatomic relationships of the key structures (orbital contents, optic nerve and carotid artery) to the diseased areas, a process that is vital for surgical planning. CT also defines the extent of disease in any individual sinus, as well as any underlying anatomic abnormalities that may predispose a patient to sinusitis .

The reasoning and concepts supporting the use of FESS have become widely accepted. (The term “functional” was introduced to distinguish this type of endoscopic surgery from nonendoscopic, “conventional” procedures). (Kennedy, 1985) The goal of FESS is to return the mucociliary drainage of the sinuses to normal function. The paranasal sinuses are maintained in a healthy state by ventilation through the individual ostia and by a mucociliary transport mechanism that keeps a continuous protective layer of mucus flowing out of the sinuses.

### **Pathophysiology of Sinusitis**

All of the sinuses need ventilation to prevent infection. In the normal state, this ventilation is provided through openings (ostia) into the nose. The natural ostia open into the middle meatus lateral to the middle turbinate, with the exception of the posterior ethmoid air cells and the sphenoid sinus, which have ostia situated more posteriorly. Ciliary activity in the sinuses directs the flow of mucus toward these ostia. The middle turbinate and the middle meatus together represent the key area of the nose, known as the osteomeatal complex.

The two major factors in the maintenance of normal physiology of the paranasal sinuses and their mucous membranes are drainage and ventilation. Normal drainage of the paranasal sinuses depends on effective mucociliary clearance. This is largely dependent upon the amount of mucus produced, its composition, the effectiveness of ciliary action,

mucosal reabsorption and the condition of sinus ostia.

Most cases of sinusitis are caused by a problem in the nose(rhinogenic).

Occasionally another problem, such as a primary dental infection, leads to sinusitis. During any episode of sinusitis, the cilia function less efficiently, resulting in mucus stasis. The nasal sinus mucosa become engorged often closing the ostia. A poorly ventilated sinus is the result, and the hypoxia and mucus stasis produce ideal conditions for bacterial infection.

## **Initial Evaluation and Treatment**

As with many disease processes, the history of a patient with sinusitis is probably the most important part of the preoperative assessment (Table 1). All patients with severe or persistent symptoms should be evaluated, and many can be helped with advice and medical treatment.

The fiberoptic endoscope enables the surgeon to examine the nose in great detail and is an essential tool for diagnosis. Patients with seasonal or perennial rhinitis should be given advice about avoidance of allergens and treatment with topical nasal steroid sprays and antihistamines. Acute infective sinusitis is treated with antibiotics and vasoconstrictor nasal sprays.

In patients with nasal polyposis that is not controlled with topical corticosteroids, FESS permits the accurate removal of polyps using suction cutters (Setliff, 1995). It is not known whether the disease-free interval is extended for patients having endoscopic ethmoidectomies for polyposis compared with conventional polyp surgery, but the postoperative discomfort is minimal.

### **Candidates for Sinus Surgery**

FESS (like any sinus surgery) is most successful in patients who have recurrent acute or chronic infective sinusitis (Mackay, 1995). Patients in whom the predominant symptoms are facial pain, rhinorrhea and nasal blockage usually respond well. The sense of smell often improves after this type of surgery.

The surgical indications for rhinosinusitis have been classified as absolute (clear reason for surgery) and relative (surgery required after medical treatment has failed) (Anand, Osguthorpe, Rice, 1997)

#### **ABSOLUTE INDICATIONS FOR SURGERY**

1. Bilateral massive and extensive nasal polyposis
2. Complications of rhinosinusitis. E.g subperiosteal or orbital abscess
3. Chronic rhinosinusitis with mucocele or mucopyocele formation.
4. Invasive or allergic fungal rhinosinusitis



## **Nonendoscopic, 'Conventional' Sinus Surgery vs FESS**

It was previously believed that once the mucosa had become chronically inflamed, it was irreversibly damaged and had to be removed. This was the rationale behind the Caldwell-Luc surgical technique, which involves removal of the diseased lining of the maxillary antrum.

Similarly, the external surgical approaches to the ethmoid and frontal sinuses were designed to be "radical operations" in which the disease was completely cleared. These procedures left scars and caused significant bruising and discomfort. The Caldwell-Luc procedures also caused numb teeth. These "conventional procedures", as well as the sinus washout, concentrate on the secondarily infected sinus while ignoring the important pathology within the nose.

The rationale behind FESS is that localized pathology in the osteomeatal complex blocks the ostia and leads to inflammation in the dependent sinuses. The surgical interventions of the procedure are designed to remove the osteomeatal blockage and restore normal sinus ventilation and mucociliary function.

FESS, like all minimally invasive surgery, is designed to combine an excellent outcome with minimal patient discomfort. As mentioned, the main advantage of FESS compared with traditional techniques is that it is less invasive, resulting in minimal postoperative discomfort. Scars and damage to the nerve supply of the teeth are also avoided. The use of the endoscope permits a better view of the surgical field, and this is probably responsible for the lower rate of complications.

## **Outcome**

The results after FESS are good, with most studies reporting an 80 to 90 percent rate of success (Lund & Scadding, 1994). Good results also have been obtained in patients who have had previous sinus surgery.

Several parameters used to assess the “success” of FESS, either subjectively by comparing pre and post-op symptoms or endoscopic findings, or objectively using a rhinomanometer, measurement of ciliary beat frequency, mucociliary clearance or olfaction test. It is difficult to give percentages of objective postoperative improvement and to develop meaningful statistics because unrealistic expectations may conflict with reality (Stammberger & Hawke, 1993).

Subjectively, Stammberger (1992) raises the question of whether the patient is to be classified on the basis of clinical symptomatology or endoscopic findings. Wigand (1990) states that the criteria for evaluation must be as objective as possible, and that follow-up of small, clearly defined group of patients is more conclusive than that of large heterogenous series.

The procedure is considered successful if the majority of the patient's symptoms are resolved. Nasal obstruction and facial pain are most likely to be relieved , although postnasal drip often remains a challenge. The technique has been compared with the Caldwell-Luc procedure and , although both methods were found to be effective, there was a strong patient preference for FESS (Stammberger, 1992). The extent of disease affects the outcome, with the best results obtained in patients with limited nasal pathology producing secondary sinusitis (Kennedy, 1992).

In 1995, Hamzah, M. (1999) reported through a questionnaire study that 1750 patients had undergone FESS in Malaysia. These were performed by nineteen surgeons.

Sixty-five percent of the surgeons who corresponded feel that FESS is effective but only twenty-two percent feel that 80 percent or more of the patients benefit from the procedure. At least 30 (1.7%) complications had occurred. No temporary or permanent blindness were reported. This result is comparable to other reported series.

## **Complications**

The most catastrophic complication of FESS is blindness resulting from damage to the optic nerve. However, there is evidence that the frequency of this complication is extremely low (Cumberworth, 1994).

Cerebrospinal fluid leak is the single most common major complication of FESS, occurring in about 0.2 percent of cases (Stankiewicz, 1989). The leak is usually recognized at the time of surgery and can easily be repaired; it should be suspected if there is a clear nasal discharge postoperatively. Unless the discharge is contaminated with blood, the presence of glucose means that it is most likely to be cerebrospinal fluid.

Other less serious, but still rare complications include orbital hematoma and nasolacrimal duct stenosis. It should be emphasized that all of these complications also may occur with "conventional" sinus surgery and, therefore, patients are not undergoing a new treatment with complications that are more serious or more frequent than those in other surgeries. In the United Kingdom, the overall major complication rate of FESS is 0.4 percent, compared with 1.4 percent in patients having similar, nonendoscopic procedure (Kennedy, 1985).

## **OBJECTIVES**

**2.1 The general objectives of this study is :**

**2.1.1 To assess the result of Functional Endoscopic Sinus Surgery patients in Hospital Universiti Sains Malaysia from January 1997 to Disember 1999.**

**2.2 The specific objectives of this study are :**

**2.2.1 To evaluate long-term symptom relief of FESS**

**2.2.2 To evaluate for prognostic indicators of outcome**

**2.2.3 To evaluate the overall benefit from FESS**

## **MATERIAL & METHOD**

All patients who underwent Functional Endoscopic Sinus Surgery which were performed in Hospital Universiti Sains Malaysia from January 1997 to Disember 1999 were included in the study, and each met these criteria :

1. debilitating symptoms related to nasosinus disease
2. symptoms persisted in spite of adequate medical treatment
3. endoscopy and / or computed tomography (CT) demonstrated the presence of abnormality
4. patients gave informed and written consent after receiving information regarding the potential benefits and the risks involved.

The endoscopic sinus procedures were performed using an individualised technique by addressing the obstruction of the osteomeatal complex. The surgery were performed by four different surgeons (Table 3.1). The surgery was limited to the disease indicated by preoperative CT scan and endoscopic findings . For example, when the infundibulum was narrowed by a lateralized uncinate process draping a prominent bulla ethmoidalis, the uncinate process and bulla ethmoidalis were removed. Anterior and posterior ethmoidectomies were performed if there was evidence of thickened mucosa or opacification of the anterior and posterior ethmoid cells on CT or evidence of disease intraoperatively.

All cases were done under general anaesthesia. After suitable vasoconstriction using diluted cocaine and adrenaline, the middle turbinate is identified. This is the most important landmark for the procedure. An uncinectomy was performed, exposing the ethmoid bulla and the opening, the hiatus semilunaris, into which the frontal and maxillary sinuses drain.

The anterior ethmoid air cells are then opened, allowing better ventilation but leaving the bone covered with mucosa. Following this, the maxillary ostium is inspected and, if obstructed, opened by means of a middle meatal antrostomy. This minimal surgery will often be sufficient to greatly improve the function of the osteomeatal complex and therefore provide better ventilation of the maxillary, ethmoid and frontal sinuses.

If the intraoperative findings and/or CT scan shows disease in the posterior ethmoids and the sphenoid sinus, it is then necessary to continue further into these sinuses. However, in most cases of sinusitis, the inflammation is confined to the osteomeatal complex and the anterior ethmoids.

### **Postoperative Care**

Postoperatively, it is important to keep the nose as free from build-up of crusts as possible. The techniques used to achieve this in our patients is nasal douching which was

initially performed by the surgeon, then this will be carried out several times a day by the patient .

Normal function usually returns within one to two months. In patients with gross inflammation or polyps, a short course of systemic steroids combined with antibiotics were prescribed. Topical steroids were used postoperatively in patients who had polyps removed.

### **Data Collection**

The analysis of our patient group was performed in a retrospective manner using a standardized checklist of patient characteristics, presenting complaints, and subjective postoperative outcomes which ranged between 3 months to 3 years (Appendix A). In all cases, this was achieved by reviewing the patient's medical record, supplemented by interview during follow-up. Patient characteristics of interest include age, sex, smoking history, and history of asthma/allergy.

The operations were done by four different experience ENT surgeons in Hospital USM during that study period (Table 3.1).

Patients were seen for their first postoperative visit 4 to 6 days following surgery, at which time the nose was scoped. Non-adherent crusts and secretions were removed using the scopes, suction or nasal wash. Each patient completed a questionnaire that asked specific question about his or her preoperative and postoperative symptoms. Question



concerned were nasal obstruction/discharge, headache, facial pain, postnasal drip, and overall benefit.

The patients were then divided into 2 groups : those who received a clear benefit from the surgery and those who had any minor or no benefit from surgery. Group assignment was determined by patient responses to questionnaire. Patients were asked to evaluate how their overall symptoms changed after surgery. This was done using a visual analogue scale from 1 to 5, with 1 representing worse symptoms, 2 no change in symptoms, 3 mild improvement, 4 moderate improvement and 5 major improvement. Patients who felt that they had moderate and major benefit were placed in the clear benefit group (group B). Those who responded that they had only minimal benefit were grouped with no benefit and worse symptom group (group A) .

Table 3.1 : Number of patients who undergone FESS performed by different surgeon.

<b>Surgeon</b>	<b>Number of patients performed</b>
A	40
B	2
C	2
D	1
<b>Total</b>	<b>45</b>

## **Statistical analysis**

SPSS 10 was used to record all the data.

Paired t-test and wilconson's rank sum test were used to reveal the level of significance upon the variables.

A chi-square test was used to reveal the level of significance for the prognostic factors of outcome.

## RESULTS

### 4.1 Patient characteristics

This study involved a total of 55 patients, however only 45 patients managed to be followed-up at least 3 months and up to 3 years postoperatively with the mean of 16 months . The summary of sex, smoking and asthma are shown in figure 4.1, 4.2 and 4.3 respectively. Patients ranged in age from 12 to 66 years. Of the 45 patients, 29 patients were diagnosed to have chronic rhinosinusitis without polyps and 16 patients were associated with polyps.

### 4.2 The correlation of symptoms pre and post operative

Common presenting complaints included nasal obstruction/congestion in 93.3%, rhinorrhoea in 68.9%, headache in 60%, postnasal discharge in 48.9% of patients as shown in Table 4.1. The grading of symptoms pre and post operative were then computed using the paired t-test and wilconson's rank sum test to reveal the level of significance upon symptom relief.

Table 4.1 : Percentage of common presenting complaints.

Symptoms	Percentage of complaint
Nasal Obstruction	93.3
Rhinorhea	68.9
Headache	60
Postnasal Discharge	48.9
Facial Pain	28.9
Olfactory Disturbance	27.5
Halitosis	12.6



