

Evaluation of Modified FESS in Management of chronic rhinosinusitis

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Abstract

Purpose:

Our purpose was to evaluate the efficacy of modified Functional endoscopic sinus surgery (FESS) in patients with chronic rhinosinusitis (CRS)

Study Design:

Prospective non randomized study.

Methods.

This study was conducted in the department of Otorhinolaryngology of Ain Shams University Hospitals during the period from October 2003 to June 2007 in which cases presenting with the features of chronic rhinosinusitis were enrolled. Detailed history, physical examination, nasal endoscopic examination and computed tomography (CT) scan of the paranasal sinuses were done for all the cases. All patients refractory to medical management were subjected to modified functional endoscopic sinus surgery and were followed up for a period ranging from 1 to 3 years to assess the results. Assessment of symptoms was performed subjectively using visual analogue scoring (VAS). CT scan findings were scored using the Lund-Mackay system. Endoscopic examination findings were scored according to the staging system proposed by Giger et al., 2004.

Results.

The study population comprised of 95 cases. The most common symptoms were presence of nasal obstruction and headache. Modified FESS was done in all the cases. Recurrence was seen in 9 % of cases.

Conclusion. This study shows that modified FESS is effective for the treatment of chronic rhinosinusitis.

Key words. Endoscopic sinus surgery; chronic rhinosinusitis; partial inferior turbinectomy; partial middle turbinectomy.

Introduction

The introduction of Functional endoscopic sinus surgery (FESS) has revolutionized the surgical treatment of patients with chronic rhinosinusitis (CRS). In contrast to traditional surgical approaches based on opening of the sinuses and extensive removal of inflamed mucosa, FESS is an approach aiming at restoration of ciliary transport and preservation of lining mucosa through minimal invasive surgery on the ostiomeatal unit (Kennedy et al., 1985, Stammberger, 1986). Several long-term outcome studies on FESS show 80% to 90% success rate,

supporting this approach as the golden standard for surgery in CRS (Senior et al., 1998, King et al., 1994). However, this figure underlines that there is nevertheless a significant percentage of patients who are not improved after FESS.

The possible reasons for failure in these patients were clustered into the following 10 categories: 1) obstructed natural Ostia, 2) disease in the anterior ethmoids or frontal sinus, 3) resistant organisms, 4) intrasinus foreign body, 5) incurable mucosal disease, 6) noncompliant patient, 7) wrong primary diagnosis, 8) maxillary osteitis, 9) mucus maltransport, and 10) fundamental immunodeficiency. Many patients have multiple causes that could be individually or sequentially identified (Richtsmeier, 2001).

Ciliary dysfunction resulting from prolonged inflammatory disease may render middle meatal maxillary sinusotomy less effective in keeping the sinus free of disease (Richtsmeier, 2001). Patients with ciliary dysfunction have benefited from facilitating drainage with hypertonic irrigations via gravity dependent inferior anrostomies (Kennedy, 1987). However creating two separate Ostia run the risk of producing a circular motion of mucus from one ostium to the other, thus providing a never-ending cycle that is prone to recurrent infection

Therefore During sinus surgery, creating a large enough anrostomy opening is essential in preventing postoperative closure by inflammatory mucosal edema or recurrent sinus polyps and also allows pathologic lesions within the maxillary sinus to be easily removed.

Based on these characteristics, we developed what we call a modified FESS which is summarized as a middle meatal maxillary sinusotomy which was extended

downward to inferior meatus after resecting the posterior end of the inferior turbinate together with partial middle turbinectomy aiming at maximal drainage and aeration of the diseased field (El-Begermy et al., 2001).

Wigand stated that postoperative evaluation of functional endoscopic sinus surgery (FESS) must be as objective as possible (Watelet et al., 2004), implying the diagnostic importance of radiography (CT) and endoscopy. Symptom evaluation is subjective.

Standardized and validated scoring systems are required to correlate these three evaluation methods. Several studies have reported on the value of CT scans for the preoperative staging of chronic sinusitis. The American Academy of Otolaryngology has recommended the Lund and Mackay system (referred to hereafter as the Lund system) as the preferred method for preoperative staging of chronic sinusitis (Lund and Kennedy, 1997). Postoperative CT scan staging is an attractive way of objectively quantifying postoperative results, but is not feasible or necessary in all cases. Usually, postoperative CT scans are only obtained when symptoms persist or recur.

The endoscopic appearances of the nose are also quantified for the presence of polyps, discharge and edema, scarring or adhesions, and crusting according to a postoperative endoscopic score system (POES) suggested by Giger et al., 2004, (Table 2).

The symptom score instrument is a visual analogue scale consisting of four symptoms: facial pain or pressure, nasal obstruction, nasal discharge, and olfactory disturbance. This visual analogue scale enables a more accurate and repeatable evaluation of symptoms (Lund et al., 1991).

There are several reports in the literature about inferior turbinate resection; however, there are no substantive reports of resultant atrophic rhinitis, particularly if partial turbinectomy is performed. This late complication of turbinectomy is of course what is feared with middle turbinate resection. A review of the literature failed to provide evidence that atrophic rhinitis results from partial middle turbinectomy (Cook et al., 1995).

In the current study sinus symptom scores and nasal endoscopic exam scores were obtained preoperatively in patients undergoing modified FESS and compared to follow-up postoperative scores. The objective is to determine the effectiveness of modified FESS procedure in treatment of patients with chronic rhino sinusitis (CRS) based on symptom score outcome and endoscopic findings.

Patients and Methods

PATIENTS:

This study was carried out at the Department of Otorhinolaryngology of Ain Shams University Hospitals during the period from October 2003 to June 2007. A total of 148 patients with chronic rhino sinusitis who underwent modified functional endoscopic sinus surgery were included in the study, only 95 patients came for regular follow up for 1 to 3 years.

Exclusion criteria:

- 1- previous sinus surgery.
- 2- Patients with cranio-malformations and traumatic changes of the nose and the paranasal sinuses.
- 3- Patients with malignant disease and inverting papilloma of the nose and sinuses.

4-patients with fungal sinusitis, chronic sinusitis with nasal polyposis cystic fibrosis, primary ciliary dyskinesia, systemic vasculitis or granulomatous disease, and immunodeficiency disorders.

METHODS:

All patients , On initial presentation , had a complete history taking followed by a careful general and ear, nose, and throat examination including rigid nasal endoscopy to look for the presence of pus, polyps,

And other findings. All patients were treated with 4 weeks of broad spectrum antibiotic, the choice of which was based on endoscopically-guided cultures of sinus secretions, topical steroid sprays, mucolytic and nasal decongestants or antihistamines.

All patients failed to benefit from medical therapy for their sinus problems before surgery and therefore underwent sinus CT scan (coronal and axial views; both soft tissue and bone windows without intravenous contrast). The CT images were graded according to the radiologic grading of sinus systems proposed by Lund and Mackay which considers sinus mucosal thickening, extent of sinus opacification, and whether or not the osteomeatal complex is obstructed (Lund and Mackay, 1993). Each sinus group is assigned a numeric grade: 0 = no abnormality, 1 = partial opacification and 2 = total opacification. The sinus groups include the maxillary, frontal, sphenoidal, anterior ethmoidal and posterior ethmoidal sinuses. The ostiomeatal complex is scored as 0 = not obstructed or 2 = obstructed. A total score of 0–24 can be obtained. Patients with at least bilateral maxillary, anterior and posterior ethmoidal mucosal hypertrophy were subjected to modified FESS after a written consent.

The diagnosis of CRS was made using the American Academy of Otolaryngology Head and Neck Surgery definition. Symptoms must be present for 12 weeks or more. Two or more of the following symptoms are required for diagnosis: anterior mucopurulent drainage, posterior mucopurulent drainage, or both; nasal obstruction; and Facial pain-pressure-fullness. Required objective documentation requires endoscopy to exclude the presence of NPs and to document signs of inflammation, such as discolored mucus or edema of the middle meatus or ethmoid area. A positive imaging study by means of sinus CT is also required (**Meltzer et al., 2004**).

Patients were asked to record their CRS related symptoms before and 1-3 years after modified FESS surgery. This was done by using a 0-3 point scale, 0: absent; 1: mild; 2: moderate; and 3: severe.

Also a diagnostic nasal endoscopy was performed during the follow up period with rigid 0° and 30° optics after mucosal decongestion and topical anesthesia (Fig. 3) to evaluate the endonasal findings of the ethmoidal cavities according to a postoperative endoscopic score (POES) suggested by GIGER et al.,2004. The mucosa was graded between 0 and 3 (0, normal; 1, partially lined with mucosal hypertrophy; 2, completely lined with mucosal hypertrophy; 3, polyps). Presence or absence of purulent discharge was scored as “1” or “0,” respectively. In the same way, the opening (“0”) or closing (“1”) of the middle meatal antrostomy was graded. Thus a total score of 0 to 10 could be obtained, and each side can be considered separately (0 to 5), (Table 2). The endoscopist was not aware of the patients’ symptom improvement evaluation.

Also a postoperative coronal CT scan was performed for some patients with special

attention to the patency of MMA (**Fig. 5**) For the purpose of result analysis, only patients who attended the final follow up visit were included.

Technique of the modified functional endoscopic sinus surgery: Fig 1, 2, 3 and 4.

The procedure was performed as described by El-Begermy et al., 2001. It was performed under general anesthesia with the use of hypotensive techniques to reduce intraoperative bleeding. 2% lidocaine with 1:100,000 epinephrine was used for vasoconstriction.

The technique of the modified FESS used for treating all patients in this study included the next steps:

- 1) Complete uncinectomy: the uncinata process was incised then excised from its antrosuperior attachment to its extreme posterior end.
- 2) The fontanelle mucosa was excised to make a wide middle meatal antrostomy (MMA).
- 3) Ethmoidectomy was done as the usual anterior to posterior approach.
- 4) Partial inferior turbinectomy: resecting inferior strip and the posterior end of the inferior turbinate.
- 5) Extending the MMA downwards to the inferior meatus. Thick bone may be removed using a cutting burr and a drill.
- 6) Partial middle turbinectomy was done by resection of the inferior third of the middle turbinate in cases of mucosal hypertrophy. Additional resection of the lateral half of the middle turbinate head was done in cases of concha bullosa to improve access to the middle meatal structures.

The remainder of the endoscopic procedure (sphenoidotomy and frontal recess clearance) was performed as dictated by preoperative evaluation and intraoperative

findings. Modified FESS may be associated with septoplasty (for deviated nasal septum) to improve nasal obstruction.

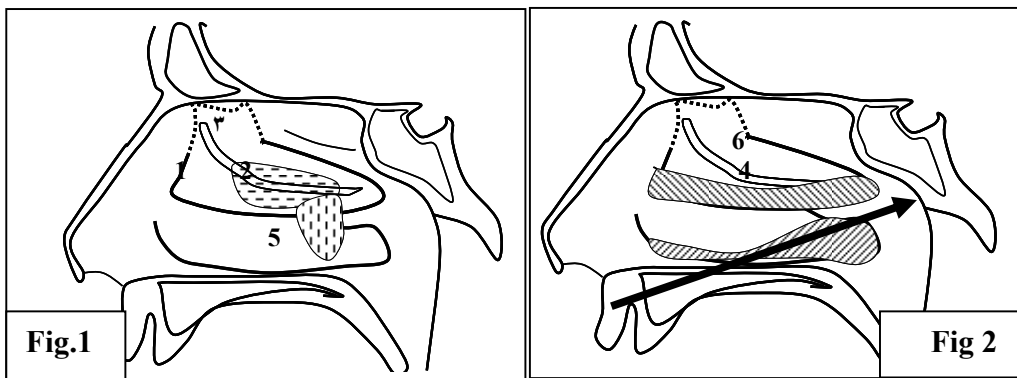


Figure 1: lateral nasal wall, side view, showing removal of the uncinete process (1) and fontanel mucosa (2), to create a wide middle meatal MMA. This is followed by anterior ethmoidectomy (3). MMA is extended downwards to inferior meatus (5) after resection of inferior turbinate.

Figure 2: lateral nasal wall, side view, shows extent of turbinate resection. This includes the inferior edge and the posterior end of the inferior turbinate (shaded area 4). A strip of inferior border of the middle turbinate is also resected (shaded area 6) after anterior ethmoidectomy. The last step exposes the posterior ethmoid and sphenoid sinuses (arrow).

During FESS, the surgery score proposed by Lund and Kennedy, 1997. Was used (Table 1), and all patients had a minimal score of 6 on each side.

The patients were discharged 48 hours later after removing the anterior nasal pack. Meticulous endoscopic cleaning was then performed weekly until normal

epithelialization was found in the ethmoidal cavities and then on monthly basis postoperatively. Patients received postoperative course of broad spectrum antibiotic, saline lavages and topical corticosteroids for three weeks or may be extended till the resolution of patient complaints.

Table 1 : Surgery score proposed by Lund and Kennedy

Surgical procedure	<i>Left</i>	<i>Right</i>
Uncinectomy		
Middle meatal antrostomy		
Anterior ethmoidectomy		
Posterior ethmoidectomy		
Sphenoidectomy		
Frontal recess surgery		
Reduction of the middle turbinate		
Reduction of the inferior turbinate		

Total points of each side

Scoring: 0 indicates no procedure performed; 1: surgery performed. The total score can range from 0 to 16 (0 to 8 for each side).

NB: Reduction of the inferior turbinate (added by us for the sake of this study).

Table 2: Postoperative endoscopic scoring (POES) of the ethmoidal cavities

Left	Right
Aspect of the mucosa in the ethmoidal cavity	
0- Normal mucosa	
1- partially lined with mucosal hypertrophy	
2- completely lined with mucosal hypertrophy	
3- Polyps	
Purulent discharge	
0- No	
1- Yes	
Middle meatal antrostomy	
0- Open	
1- Closed	

RESULTS

Patient Characteristics

Of the total cohort, 53 patients did not complete the obligatory follow up for enough period These patients were excluded from this study, leaving only 95 patients with chronic rhinosinusitis (i.e. resistant to the appropriate medical treatment). The mean age of the patients was 35 years (range, 19-51 years), with a male-female ratio of 1.5:1(57 male and 38 female). A concurrent septoplasty was performed in 47 (49.0 %) patients.

Thirty five patients (37 %) had concomitant asthma and 48 patients (50 %) were smokers.

The patients were then divided into two groups: the success group, comprising patients with cured and improved symptoms following surgery, and the failure group with unchanged or worsened postoperative symptoms .The improved symptom is defined as improvement of the complaint in at least one ranking step (score 3 became score 2 or 1) whereas the cured symptom is defined as complete

resolution or disappearance of the complaint (became score 0)

Preoperative symptoms.

Before modified FESS surgery, patients predominantly complained of feelings of nasal obstruction, facial congestion, rhinorrhea, olfactory disturbance (score: 3). Postnasal drip, facial pain, headache, coughing, and nasal crusts were rated as moderate (score 2). The remaining symptoms as epistaxis, ear symptoms and dental pain had a lower score and were of minor importance (score 1)

Postoperative symptoms.

Analysis of individual symptoms showed that more than **91%** of the

Patients reported improvement (cured or improved) of symptoms rated preoperatively as severe, including nasal obstruction (92.6%), facial pain / congestion (89.5%), Rhinorrhea (83%) and hyposmia (93.7%). Table 3

Table 3 presents a review of the symptom outcome in the study group at the time of the final follow- up examination.

Table 3. Subjective postoperative results in the study group (95 patients)

Symptom	Unchanged	Improved	cured	success
Obstruction	7 (7.4 %)	25 (26.3%)	63(66.3%)	88(92.6%)
Facial pain	10 (10.5 %)	29 (30.5%)	56 (59%)	85(89.5%)
Rhinorrhea	16 (16.8%)	35 (36.8%)	44 (46.4%)	79(83%)
Hyposmia	6 (6.3 %)	42(44.2%)	47 (49.5%)	89(93.7%)

There were no episodes of exacerbation of asthma in any patient during the follow-up period. Twenty six of the 35 patients with asthma had a reduction in medical therapy for asthma.

Based on the CT findings at the time of surgery, the sites of disease and their corresponding Lund scores are listed in Table 4. The maxillary sinus, anterior ethmoids, and posterior ethmoids were each diseased in 100 % of the cases.

Table 4: preoperative CT Sites of Disease and Lund Scores for the study group (95 patients)

Disease Site	Lund Score			No - % diseased
	0	1	2	
Maxillary sinus	0	42	53	95- 100%
Anterior ethmoids	0	47	48	95- 100%
Posterior ethmoids	0	49	46	95- 100%
Sphenoid	38	28	29	57- 60%
Frontal	40	28	27	55- 57.9%
Ostiomeatal complex	22	29	44	73- 76.8%

There was almost no difference in disease extent between both sides. The mean total Lund score of both sides together was 15 ranging from 6 to 24. In almost all patients (94%), the extent of surgery score were nearly similar on both sides. All patients underwent at least uncinectomy, extended middle meatal antrostomy, total ethmoidectomy, Partial inferior turbinectomy and partial middle turbinectomy bilaterally. No major intraoperative or postoperative complications were observed. The mean total surgery score of both sides together was 14, ranging from 12 to 16.

Despite the excellent improvement of subjective rhinosinusitis Symptoms, some patients had abnormal findings in the cavities of opened ethmoidal sinuses on postoperative endoscopic examination. Patients were divided into two groups. **Group (A):** those who had cavities described as normal if there was a normal, healthy ethmoid mucosa , an opened middle meatal antrostomy and no purulent discharge Using these criteria, 73 % (69 cases) of all cavities were without any pathology (**Fig 6**) .

The second group (**group B**) including 27% (26 cases) comprised patients displaying various endoscopic abnormalities: 5 cases (5%) Partially lined with mucosal hypertrophy (Fig5c), 4 cases (4%) Completely lined with mucosal hypertrophy, 8 cases (8 %) displaying nasal crusts and purulent discharge, Culture and sensitivity revealed *Pseudomonas* and *Proteus* infections. Medical treatment for 4-6 weeks cured the condition.

Also there were 6 cases (6%) with stenosed MMA (**Fig 7**) and 3 cases (3%) missed natural maxillary ostium i.e. failure to incorporate the natural ostium to the MMA (table 5)

During the postoperative period until the final visit, six patients with stenosed MMA and three patients with missed maxillary natural ostium underwent revision surgery. Most of the revision procedures were considered minor and involved widening of the stenosed MMA and incorporating the natural ostium into the MMA. The previous patients had high preoperative LUND score. Therefore the presence of greater disease extent preoperatively increased the need of revision surgery during the follow-up period.

Table 5: Postoperative Endoscopic findings in the ethmoidal cavities at the time of final follow-up examination.

Postoperative nasal Endoscopic findings	
Normal mucosa	69(73 %)
Partially lined with mucosal hypertrophy	5 (5%)
Completely lined with mucosal hypertrophy	4 (4%)
Nasal crustation	8 (8 %)
Stenosed MMA	6 (6 %)
Missed natural max ostium	3 (3%)

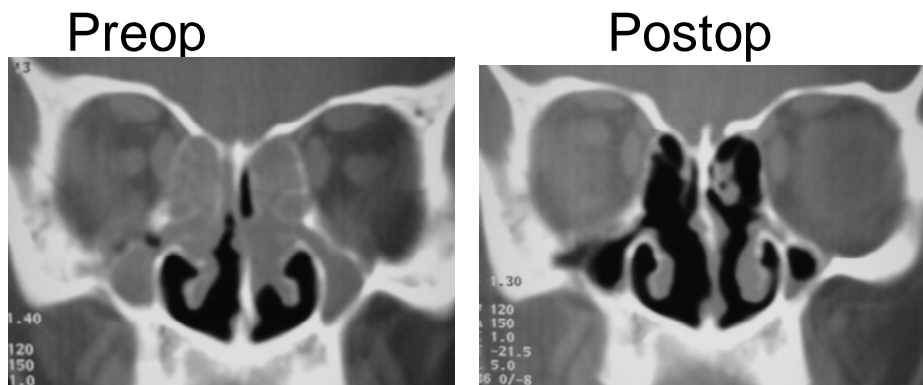


Fig 5 (A):Coronal CT (Anterior section)showing partial resection of the inferior border of MT with anterior ethmoidectomy and clearance of infection.

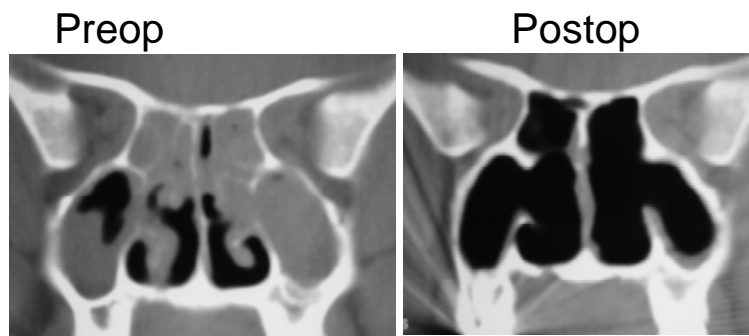


Fig 5 (b):coronal CT (Posterior section) showing removal of posterior end of IT and extended MMA

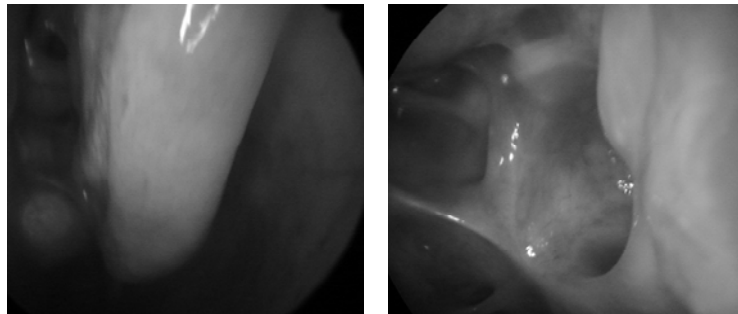
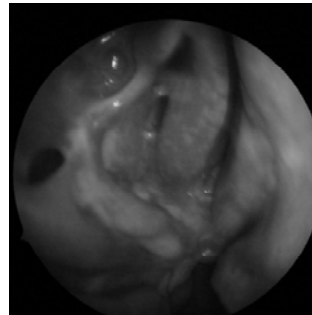


Fig 5 (c):Postop. endoscopic examination:Partial mucosal oedema of maxillary sinus ostium

Fig 6:Post op endoscopic view of the wide MMA extending into the inferior meatus behind the partially resected inferior Turbinate



Fig 7: postoperative endoscopic view showing Partially closed right MMA but still open



Discussion

Endoscopic sinus surgery is directed at the following 3 goals: (1) relief from the symptoms of chronic sinusitis, (2) restoration of the normal sinus physiology, and (3) prevention of disease recurrence.

In this study, our modified technique of FESS used for treatment of patients with chronic rhino sinusitis respects these 3 goals and differs from the ordinary FESS in several aspects.

Partial middle turbinate excision (**Fig 5 A**) provides improvement of nasal airway if obstructed by the hypertrophied MT, better exposure and safe manipulation of the posterior group of sinuses and avoids possible adhesion of its inferior redundant border to the MMA and obstruction of the OMC (increase patency rate of MMA).

Partial excision of inferior turbinate especially its posterior end (**Fig 5 B**) provides better nasal airway and gives a room to widen the MMA inferiorly.

Widening of the MMA is achieved by two steps the first is excision of the posterior part of the uncinata process with the surrounding fontanel mucosa and the second is downward extension of the MMA (**Fig: 6**). This offers both respect to the natural ostium and its inferior extension allows gravitational drainage of the mucus trapped in the maxillary sinus which may not be evacuated through the natural ostium due to defective ciliary function. This provides a break through the viscous circle of obstruction, stagnation of secretion and infection and allows ciliary and epithelial regeneration. Also it avoids recirculation of mucous from one ostium to the other thus blocking the cycle responsible for recurrent infection, if additional separate inferior antrostomy was created. Lastly the

wide antrostomy opening has less chance to be obstructed by inflammatory mucosal edema, recurrent nasal polyps or fibrosis secondary to chronic infection usually seen in patients with chronic sinusitis and also allows easy postoperative sinus wash and removal of pathologic lesions within the maxillary sinus. This technique was previously described by El-Begermy and was used in management of cases of sinusitis secondary to primary ciliary dyskinesia (El-Begermy et al., 2001 and Mabrouk et al 2005) and in cases chronic invasive fungal sinusitis (El-Begermy et al 2006).

Chronic sinusitis may present with various symptoms, but nasal obstruction, facial pain, nasal discharge and hyposmia are the most frequently encountered (Lund et al., 1991) and have been used to report treatment results in our study.

The aforementioned modification has an impact on our postoperative results and the difference between us and others. In our study, improvement (cured and improved) was 92.6% for obstruction, 89.5% for facial pain, 83% for rhinorrhea and 93.7 % for hyposmia whereas Giger et al., 2004 reported 85% improvement in obstruction, decreased facial pain and headache in 85%, improvement in post-nasal discharge in 77% and improvement in hyposmia in 81% in 73 patients of chronic rhinosinusitis .

One drawback to this study is the lack of postoperative CT scans. Preoperative evaluations of the disease extent with CT were performed in all patients. But, when considering the expense, postoperative CT scan could not be available for all patients in this study.

Most studies on endoscopic surgery in chronic sinusitis have employed subjective criteria in the assessment of surgical outcome. Because patients elect to undergo surgery to improve symptoms, it seems reasonable to use patients' subjective evaluations as the indicator for Successful surgical results (Schaitkin et al., 1993). On the other hand, Kennedy, 1992 stated that reporting FESS results without endoscopic control may only have similar accuracy to reporting results in cholesteatoma surgery based only on postoperative symptoms. So, we had to use Endoscopic (objective) and symptomatic (subjective) assessment in the follow up of patients.

Among other authors, Kennedy et al. (2000) and Lund et al. (1991) have favored these objective measurements. Kennedy et al. (2000) examined 120 patients by both endoscopic examination and questionnaires over a period of 18 months. Subjective results showed "marked improvement" in 85%, "mild improvement" in 12.5%, and "no improvement or worse" complaints in 2.5%. Despite this excellent subjective improvement, many of the patients had residual evidence of sinus disease (44.9% of all patients) on endoscopic examination. Lund et al. (1991) performed preoperative and postoperative rhinomanometry and olfactometry. Although they demonstrated a significant improvement in all symptoms examined, quantitative olfaction and anterior rhinomanometry were not improved, despite diminished symptoms. Undoubtedly, these objective findings reveal important information regarding the process of the mucosal disease, but they are not correlated or are insufficiently correlated with patients' complaints. The central concern of medical care delivery is the enhancement of patient's QOL, which was highly correlated with the leading symptoms of nasal

obstruction and postnasal drip in CRS. This comes in agreement with our study which despite the excellent improvement of subjective rhinosinusitis symptoms in 91% of cases, 27 % of patients (26 cases) had abnormal findings in the cavities of opened ethmoidal sinuses on postoperative endoscopic examination.

Endoscopic examinations were performed on all patients to determine any correlation between physical findings and subjective complaints. The patency rate of the MMA was 91%, which is higher than the results published by Ramadan, 1999.

In accordance with Orlandi and Kennedy, 2001 who reported that marked neogenesis of bone with obstruction of outflow tracts may lead to the need for revision sinus surgery, 6 cases (6%) of our failure group were reoperated upon to rewidened the stenosed MMA. This incidence was much lower than Ramadan, 1999 who looked at causes of failed ESS in 52 cases. He found that 28% had maxillary ostia stenosis, and 15% had recirculation or missed ostia whereas in the present study, a missed natural maxillary sinus ostium was the cause in 3 cases (3%) of our failure group.

Postoperative endoscopic examination revealed nasal crustations in eight cases. Culture and sensitivity revealed gram negative infection mainly pseudomonas and proteus infections and they resolved by medical treatment. Videler et al., 2006 conducted a prospective, questionnaire-based study in a group of 23 patients who underwent Denker's procedure for refractory chronic rhinosinusitis and they pointed out that none of their patients had ozaena.

Talmon et al, 2000, mentioned that 357 total inferior bilateral turbinectomies were performed over 6-year period. All patients

Suffered from chronic nasal obstruction and failed to respond to local and systemic treatment. Six months after the operation, eight patients complained of nasal crusting and at 18 months after surgery, three patients still complained of nasal crusts and they concluded that total inferior turbinectomy is an effective and relatively safe procedure. *Talmon et al.* (2000) mentioned that Ozena (atrophic rhinitis) is believed by some to be related to total inferior turbinectomy which may discourage surgeons from performing this operation. In their series, conducted in a hot, dusty climate, no such complication was observed, nor did they find any documented case in the literature. They therefore cannot regard ozena as a possible complication of this operation.

Morgenstein and Krieger, 1980 reported the efficacy of middle turbinectomy for improving the nasal airway and relieving headache associated with middle turbinate pathology. They reported well-to excellent results with no long-term adverse sequelae, including crusting, drying, or infection. Davis et al., 1991, LaMear et al., 1992 and Biedlingmaier, 1993 reported improved long-term surgical outcome in FESS patients who also had partial middle turbinectomies compared with FESS patients without middle turbinectomies. Both groups found increased middle meatus antrostomy patency rates, fewer synechiae, improved visualization of the surgical field, and greater ease of cleaning in those patients who had partial middle turbinectomies. Resection did not cause excessive drying or crusting, and the residual turbinate provided a landmark for postoperative follow-up and future surgery if necessary. Lawson, 1994 in his excellent monograph on intranasal ethmoidectomy, provided a discussion on the role of middle turbinectomy. His research found that the fear

that partial or subtotal turbinectomy would severely disturb nasal physiology and result in atrophic rhinitis was not substantiated clinically. He cited five series totaling more than 3716 patients in which there were no cases of atrophic rhinitis. Additionally, he provided indications for partial resection of the middle turbinate.

Based on Our study and the previous studies, we support a postulation that ozaena is caused by an infection and results in large cavities rather than being caused by large cavities.

Interestingly, the rate of septoplasty (49%) was much higher in this series than that reported by Kennedy, 1992 (13.3%) or Levine, 1990 (16%), indicating a higher incidence of septal deviations in our study population. Therefore, it is not surprising that rate of nasal obstruction observed preoperatively (92%) in the present series surpassed the rates reported by Kennedy, 1992 (67%) and Levine, 1990 (32%). However, it is well established that septoplasty provides beneficial effects on nasal airflow (Berger et al., 2000). In our experience; septoplasty should be integrated in the concept of FESS in all patients with significant septal deviations. This concept is supported by the patients' satisfaction documented in postoperative improvement of nasal obstruction in the present series.

CONCLUSION

- 1- The leading complaints within the symptom profile of patients with CRS are airway obstruction, facial pain, rhinorrhea and hyposmia.
- 2 - Research Outcome in CRS should integrate subjective and objective measurements using preferentially standardized instruments.

- 3- A good post surgical evaluation should include the patient's symptom report and an endoscopic examination in each case during long-term follow-ups.
- 4- Review of the other literature cited in this article also leads us to conclude that partial inferior and middle turbinectomy is an effective and relatively safe procedure
- 5-The endoscopic finding of scarring at the natural ostium of the maxillary sinuses, or failure to incorporate the natural ostium of the maxillary sinus with the surgically created MMA, is predictive of poor symptomatic outcome. Removals of these scar bands and connecting the natural ostium with the MMA during revision surgery can potentially help resolve patient complaints.
- 6- This prospective study on a small but carefully controlled group of consecutive patients suffering from CRS confirms that modified FESS is a safe and reliable procedure in the management of patients with CRS refractory to medical therapy although long-term follow-up and a larger study population would be more conclusive.

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