Impact of Endoscopic Sinus Surgery on Symptom Manifestation of Chronic Rhinosinusitis

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Abstract

Background: Rhinosinusitis is a significant health problem which results in large financial burden on society. The study evaluated the prevalence and severity of individual symptoms of chronic rhinosinusitis (CRS) and the impact of endoscopic sinus surgery (ESS) on the symptoms and medication used in patients with CRS.

Methods: Patients with refractory CRS were assessed prospectively with ESS intervention. We studied the symptoms, change in medical therapy, complications of surgery and effect of other factors like smoking, polyposis and asthma on endoscopy and computed tomography scan scores.

Result: A total of 81 patients underwent ESS for CRS. Post nasal drip (95%), headache (91%), nasal discharge (90%) and nasal obstruction (86%) were the commonest symptoms. Postoperatively, the highest improvement was seen in nasal blockage (87.2%), postnasal drip (84.4%) and headache (82.4%). Endoscopy scores were significantly worse in patients with polyps, asthma and smoking. A significant reduction in use of antibiotic and antihistaminics was seen post surgery. Seven patients who had extensive polyposis preoperatively, had recurrence and required revision surgery. Nasal synechiae formation and mild bleeding were the minor complications.

Conclusion: Endoscopic sinus surgery results in significant improvement in the symptoms of patients with CRS alongwith a definitive decrease in antibiotic and antihistaminic requirement. We conclude that ESS is an effective treatment for CRS in those who fail to respond to medical treatment.

MJAFI 2010; 66 : 41-45

Key Words: Chronic rhinosinusitis; Endoscopic sinus surgery

Introduction

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 [1,2]. 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 [3].

Functional surgical treatment by endoscopic sinus surgery (ESS) is presently the most preferred treatment for CRS [4,5] and is based on the hypothesis that diseased sinonasal mucosa can get reverted if ventilation and drainage are improved, thus restoring mucociliary clearance [6]. ESS, like all minimally invasive surgery, is designed to combine an excellent outcome with minimal patient discomfort. The use of the endoscope permits a better view of the surgical field and hence lower rate of complications as compared to conventional surgery. The objective of this study was to determine

the prevalence and severity of various symptom manifestations of CRS as well as to analyze the positive effects of ESS on the symptoms and quality of life of patients with CRS.

Material and Methods

A series of 92 adult patients undergoing ESS for medically refractory CRS formed the study group, of which 11 patients were lost to follow-up. The established cases of CRS [1] with confirmatory radiographic findings [7] and medical refractoriness of CRS as demonstrated by persisting symptoms after a minimum of six weeks of therapy with broad spectrum antibiotics, topical nasal steroids and antihistaminics were included.

The patients were clinically evaluated and followed up with endoscopic nasal examination and preoperative CT scans. Before surgery each patient completed a questionnaire, which catalogued symptoms of CRS. The patients graded the severity of the major symptoms (nasal obstruction, nasal discharge, loss of smell, nasal bleeding, headache, facial pain and posterior nasal drip) before and after surgery. The patient's symptoms were graded on a scale of 0 to 3 (0: No symptoms, 1: mild symptoms causing little or no discomfort,

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2: moderate symptoms that are interfering in daily activities but not affecting sleep and 3: severe problems affecting daily activities and sleep). Postoperatively, each symptom was reassessed and graded as success and failure (-1: worse, 0: no change, +1: improved).

Endoscopic examination was performed preoperatively and at each postoperative visit. We used endoscopic staging proposed by Lund-Kennedy to assess the following parameters: nasal mucosal edema (0 : absent, 1 : minimal, 2: gross), presence of secretion (0 : absent, 1 : thin, 2 : purulent) and presence of polyps (0 : absent, 1 : present in meatus, 2 : present in nasal cavity but not obstructing airway, 3 : nasal cavity with obstruction of airway) [8]. This assessment was performed with the total points corresponding to the sum of values obtained in both sides and ranged from 0-14. CT scans were evaluated preoperatively as per Lund- Mackay score (0: no opacity, 1: partial opacity, 2: total opacity) [8].

The study population underwent ESS with a standard technique. The surgical procedures were performed along the guidelines described by Messerklinger and Stammberger with modifications from Wigand. The extent of surgery was determined by the severity of disease and extent of involvement of sinuses as per the preoperative CT scan and nasal endoscopy [9].

The patients were followed up postoperatively for a minimum of six months to determine the effect of ESS on CRS. The various parameters analysed included patient symptoms, effect on medical therapy, number of operative procedures, complications of surgery and effect of patient factors like smoking, polyposis and asthma on the endoscopy and CT scan scores.

Descriptive statistics were drawn up on the data, the mean was found for quantitative variables and the percentage for qualitative variables. Statistical analysis was performed using SPSS (Ver10). Paired t test was performed to compare pre and post ESS variables and p value of less than 0.05 was considered significant.

Results

The symptom complex of CRS of 81 patients were analysed before and after ESS. The study group included 36 (44.4%) males and 45 (55.6%) females with a male-female ratio of 4: 5. The age of the patients ranged from 18 to 52 years with a mean age of 33.5 years. The average postoperative follow-up period was nine months, ranging from 6 to 15 months.

Fifteen (18.5%) cases had been operated on previously for CRS at other centres. These included nine patients of previous non-endoscopic polypectomies, three patients of Caldwell-Luc and three patients of previous ESS.

The four most common symptoms of CRS before ESS in the study were postnasal drip (95%), headache (91%), rhinorrhoea (90%) and nasal blockage (86%). Other symptoms were facial pain (69%) and smell dysfunction (56%). The least common symptom was nasal bleeding, which was seen only in 12 (15 %) patients. Among the patients with moderate and severe symptoms, 76% had postnasal drip, 75% nasal blockage, 71% rhinorrhoea and 65% had headache (Table 1). Post surgery 78.3% of the patients had subjective improvement in their symptoms with statistically significant improvement in the symptoms of headache, nasal blockage, postnasal drip, facial pain and rhinorrhoea (Table 2).

On analysis of the CT scan scores in patients before surgery 39 (48%) patients had unilateral and 42 (52%) had bilateral disease. Bilateral disease was mostly seen in patients with associated allergic rhinitis, asthma or polyps. The maxillary sinus (79.1%) was mostly involved followed by anterior ethmoid (48.2%), while the sphenoid sinus (27.2%) was least involved. Nine (11.2%) patients had isolated involvement of frontal sinus and seven (8.6%) had isolated involvement of sphenoid sinus. In all, 82.7% patients showed pathology in osteomeatal complex (Table 3).

A total of 75 patients were operated under local anaesthesia and six under general anaesthesia. The commonest surgical procedure performed was uncinectomy which was a standard procedure performed in all cases. Other common procedures included clearance of pathology from the osteomeatal complex (82.7%) and anterior ethmoids (48.2%). A posterior ethmoidectomy was done in 30.9%, sphenoidotomy in 27.2%, in 42% of the cases the frontal recess was enlarged and a septoplasty had to be performed in 16 (19.8%) patients. Minor complications like synechiae formation and bleeding were seen in 17 (20.9%) patients.

The number of days and type of medications used six months prior and after surgery was tabulated and the mean number of days analysed. There was a statistically significant reduction in antibiotic (20.6 days) and antihistaminic use (43.5 days) ($p < 0.05$). Use of topical nasal steroids showed a definite decrease (5.2 days) but was not found to be statistically significant (Table 4).

Table 1
Symptoms prior to endoscopic sinus surgery

Symptoms	No symptoms (%)	Mild symptoms (%)	Moderate symptoms (%)	Severe symptoms (%)	Total symptomatic
Postnasal drip	4 (5)	15 (19)	21 (26)	41 (50)	77 (95)
Headache	7 (9)	21 (26)	19 (23)	34 (42)	74 (91)
Purulent rhinorrhoea	8 (10)	15 (19)	21 (26)	37 (45)	73 (90)
Nasal blockage	11 (14)	9 (11)	23 (28)	38 (47)	70 (86)
Smell dysfunction	36 (44)	25 (31)	9 (11)	11 (14)	45 (56)
Facial pain	25 (31)	26 (32)	13 (16)	17 (21)	56 (69)
Epistaxis	69 (85)	8 (10)	3 (4)	1 (1)	12 (15)

Table 2**Post operative symptoms and success rates**

Symptoms post surgery	Failure		Success better (+1)	No symptom	Success %	p value
	Worse (-1)	No change (0)				
Postnasal drip	02	10	65	4	84.4	0.00001
Headache	04	09	61	07	82.4	0.00001
Rhinorrhoea	05	11	57	08	78.1	0.00001
Nasal blockage	05	04	61	11	87.2	0.00001
Smell dysfunction	07	13	25	36	55.5	0.5425
Facial pain	01	12	43	25	76.8	0.008
Epistaxis	0	2	10	69	83.3	0.0530

Table 3**Sinus involvement on computed tomography scan**

Site	Lund score		Lund score		Lund score	
	0	%	1	%	2	%
Maxillary	17	20.9	30	37.1	34	42
Anterior ethmoid	42	51.9	22	27.2	17	20.9
Posterior ethmoid	56	69.2	17	20.9	8	9.9
Frontal	47	58.1	18	22.3	16	19.6
Sphenoid	59	72.9	16	19.6	6	7.5
Osteomeatal complex	14	17.2	-	-	67	82.8

Of the 81 patients in the study, 22 patients had polyps, 35 had asthma and 18 gave history of smoking. The mean preoperative CT score was 12.3 out of a maximum of 24. The CT scores were higher in smokers and in those with asthma and polyps. The endoscopic score before and after ESS was calculated for each patient and the mean score was analysed to find a significant reduction from 7.2 to 4 (Table 5).

Discussion

Chronic rhinosinusitis restricts the quality of life of millions of patients. The pathology is based on the chronic inflammation of mucosa of the paranasal sinuses with secretion, stasis and bacterial infection. The symptom manifestation of CRS is varied and for clinical evaluation includes major and minor criteria. The presence of two or more of major criteria or one major and two minor criteria in the history and examination over a 6-12 weeks' time interval is suggestive of CRS [1]. Persistent changes seen on CT scan of the paranasal sinuses resistant to medical therapy is also considered diagnostic of CRS [1,8].

ESS was introduced in the 1960s by Professors Messerklinger and Wigand. It was popularized in Europe by Stammberger and subsequently in North America by Kennedy [6]. The health and normal function of the paranasal sinuses and their lining mucous membranes depends primarily on ventilation and drainage. ESS aims at maintaining physiological function and anatomical structure by restoring sinus drainage and ultimately improving sinus mucociliary function [6].

Though ESS has been regarded as a standard care

Table 4**Medication use at six months pre and post ESS**

Medication type	Preoperative (days)	Postoperative (days)	p value
Oral antibiotics	36.4	15.8	0.0093
Antihistaminics	74.7	31.2	0.00005
Topical nasal steroids	62.6	57.4	0.6941

Table 5**Preoperative and postoperative endoscopic scores**

Variables	Preoperative endoscopic	Postoperative endoscopic	Endoscopic net change	p value
Total (n=81)	7.2	4	3.2	0.00001
Polyps (n=22)	10.8	5.5	5.3	0.00001
Asthma (n=35)	9.6	5.2	4.4	0.00001
Smoking (n=18)	8.3	4.5	3.8	0.0008

for refractory CRS, its effectiveness has been questioned. The varied etiologies of CRS, especially allergic and fungal causes, and recurrences after surgery have doubted the impact of ESS [10]. Out of the spectrum of symptoms of CRS, each patient usually has a few symptoms that are more problematic than the others. Before ESS the patient is interested in understanding the effectiveness of surgery on these specific symptoms that affect their quality of life. In our study, the impact of ESS on these common symptoms of CRS that cause impairment of daily routine of patients has been evaluated.

Table 6**Analysis of preoperative symptoms and postoperative success**

Symptoms	Netkovski et al [11]		Bunzen et al [12]		Nasser et al [13]		Current study	
	Symptoms (%)	Success (%)	Symptoms (%)	Success (%)	Symptoms (%)	Success (%)	Symptoms (%)	Success (%)
Nasal blockage	93.7	87	100	83.3	76	69	86	87.2
Nasal discharge	72.5	70.5	91.6	91.6	63.5	48	90	78.1
Headache	65	59.4	87.5	62	74.4	59	91	82.4
Post nasal drip	86.2	74.3	47.3	79.2	62	47	95	84.4

As reported in the literature nasal obstruction, rhinorrhoea and headache are the symptoms of CRS that mostly impact the quality of life [11-12]. In our study we had comparable results with postnasal drip in 95%, headaches in 91%, nasal obstruction in 86% and rhinorrhoea in 76% of the patients.

Various studies using questionnaires to assess the quality of life in patients with CRS, have demonstrated significant improvement in the quality of life after ESS [11-15]. We achieved a high rate of symptom relief comparable to other reported series with 78.3% of patients with good or satisfactory outcome following the surgery. On analysis of the four common symptoms in our study, the improvement was seen in 83.1% (Table 6). It is usually seen that the patients with severe symptoms perceive a higher degree of relief from treatment [16]. The patients with moderate and severe symptoms in our study which was affecting their daily routine and sleep showed higher improvement than those with mild disease. Our study shows marked improvement in symptoms of nasal blockage, nasal discharge, post nasal drip and headache of the affected patients suggesting that ESS is an effective procedure which reduces the symptoms of CRS.

The impact of ESS was also analysed objectively by nasal endoscopy and CT scan using Lund-Kennedy and Lund-Mackay scores. In our study, the mean nasal endoscopy scores showed a marked reduction due to the clearance of pathology at functional areas of the sinuses resulting in improved ventilation and drainage after ESS. On analysis of the patient variables there was no gender variability but the patients with asthma, polyposis and smokers had significantly higher scores both before and after ESS. The net improvement after surgery was also higher in these patients. Smith et al [17] have reported similar endoscopic scores in patients with allergies and polyps. We also had higher CT scores preoperatively in patients of asthma, polyposis and smokers. The higher CT and endoscopic scores in smokers could be due to impaired nasociliary function in smokers leading to stasis and recurrent CRS [18]. The higher scores in asthmatic patients is due to the rationale of pathology of upper and lower airways as united entity causing disease [19].

Increasing use of antibiotics in patients with CRS has led to refractory cases and increase in bacterial resistance [20]. We had significant reduction in antibiotic and antihistaminics use post surgery by the patients. Decrease in antibiotic use after ESS may translate into decreased risk of developing antibiotic resistance in these patients. The use of steroid nasal spray showed a reduction which was not statistically significant as most of the patients with allergic rhinitis and gross polypoidal disease were continued on topical steroid spray post surgery for six weeks. Similar reduction in use of medication after ESS has been documented [13,14].

The complications of ESS are limited and classified as nasal, orbital and intracranial with intranasal synechiae as the most common complication encountered in various studies [21]. In our series we did not have major complications and postoperative synechiae was the most common problem, encountered in 9 (11.2%) patients. These were easily cleared by systematic postoperative outpatient care with meticulous cleaning of the nasal cavity under endoscopic guidance as OPD procedure. Minor complications like nasal bleeding were occasionally encountered in eight (9.9%) patients who were treated conservatively with packing and did not require blood transfusion.

In spite of well-performed surgical interventions, a small percentage of patients may have persistent or recurrent disease. In the literature, revision rates ranging from 3 to 14% have been documented [16, 21]. We had a revision rate of 8.7% which was seen in patients with initial extensive polyposis and asthma.

Various studies have shown significant improvement of symptoms of CRS after ESS but the success rates of individual symptoms vary [11-13] (Table 6). The symptom manifestation of CRS is varied and hence the subjective parameters used in the various studies as well as the definition of success are variable resulting in different success rates. In our study the subjective parameters of symptom improvement and objective evaluation of endoscopic scores have been considered for evaluating success. Therefore, we conclude that ESS is an effective treatment for CRS in patients who fail to respond to medical treatment.

Conflicts of Interest

This study has been financed by the research grants from the O/o DGAFMS.

Intellectual Contribution of Authors

Study Concept : Lt Col S Nair

Drafting & Manuscript Revision : Lt Col S Nair, Col RS Bhadauria, Lt Col S Sharma

Statistical Analysis : Lt Col S Nair

Study Supervision : Col RS Bhadauria

References

1. Lanza DC, Kennedy DW. Adult rhinosinusitis defined. *Otolaryngol Head Neck Surg* 1997; 117: S1-S7.
2. Bhattacharyya N. The economic burden and symptom manifestations of chronic rhinosinusitis. *Am J Rhinol* 2003; 17: 27-32.
3. Fokkens W, Lund V, Mullol J. European position paper on rhinosinusitis and nasal polyps. *Rhinol Suppl* 2007;20:1-136.
4. Soler ZM, Mace J, Smith TL. Symptom based presentation of chronic rhinosinusitis and symptom specific outcomes after endoscopic sinus surgery. *Am J Rhinol* 2008; 22: 297-301.
5. Garratt A, Schmidt L, Mackintosh A, Fitzpatrick R. Quality of life measurement : bibliographic study of patient assessed health outcome measures. *BMJ* 2002; 324: 1417-9.
6. Stammberger H, Posawetz W. Functional endoscopic sinus surgery: concept, indications and results of the Messerklinger technique. *Eur Arch Otolaryngol* 1990; 247: 63-76.
7. Bhattacharya N, Fried MP. The accuracy of computer tomography in the diagnosis of chronic sinusitis. *Laryngoscope* 2003; 113: 125-9.
8. Lund VJ, Mackay IS. Staging in rhinosinusitis. *Rhinology* 1993; 31:183-4.
9. Bhattacharya N. Computed tomographic staging and the fate of dependant sinuses in revision endoscopic sinus surgery. *Arch Otolaryngol Head Neck Surg* 1999; 125: 994-9.
10. Marks SC, Shamsa F. Evaluation of prognostic factors in endoscopic sinus surgery. *Am J Rhinol* 1997; 11: 187-91.
11. Netkovski J, Sirgovska B. The impact of functional endoscopic sinus surgery on symptoms in chronic rhinosinusitis. *Prilozi* 2006; 27: 167-74.
12. Bunzen DL, Campos A, Leão FS, Morais A, Sperandio F, Caldas NS. Efficacy of functional endoscopic sinus surgery for symptoms in chronic rhinosinusitis with or without polyposis. *Rev Bras Otorrinolaringol (Engl Ed)* 2006; 72: 242-6.
13. Nasser AF, Edilberto OP, Adel Q. Functional endoscopic sinus surgery: University of Ottawa experience and an overview. *Annals of Saudi Medicine* 1996;16: 6.
14. Bhattacharyya N. Symptom Outcomes After Endoscopic Sinus Surgery for Chronic Rhinosinusitis. *Arch Otolaryngol Head Neck Surg* 2004; 130: 329-33.
15. Poetker DM, Smith TL. Adult chronic rhinosinusitis: surgical outcomes and the role of endoscopic sinus surgery. *Curr Opin Otolaryngol Head Neck Surg* 2007; 15: 6-9.
16. Jiang RS, Hsu CY. Revision functional endoscopic sinus surgery. *Ann Otol Rhinol Laryngol* 2002; 111: 155-9.
17. Smith TL, Mendolia-Loffredo S, Loehrl TA, Sparapani R, Land P, Nattinger A. Predictive factors and outcomes in endoscopic sinus surgery for chronic rhinosinusitis. *Laryngoscope* 2005; 115: 199-205.
18. Briggs RD, Wright ST, Cordes S, Calhoun KH. Smoking in chronic rhinosinusitis: a predictor of poor long-term outcome after endoscopic sinus surgery. *Laryngoscope* 2004; 114 : 126-8.
19. Sheldon Spector. The linkage between rhinitis, sinusitis, and asthma. *Clinical and Applied Immunology Reviews* 2001; 1: 229-34.
20. Bhattacharya N, Shapiro J. Contemporary trends in microbiology and antibiotic resistance in otolaryngology. *Auris Nasus Larynx* 2002; 29: 59-63.
21. Richtsmeier WJ. Top 10 reasons for endoscopic maxillary sinus surgery failure. *Laryngoscope* 2001; 111: 1952-66.

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