

EVALUATION OF PATIENT'S OUTCOME AFTER ENDOSCOPIC SINUS SURGERY

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Abstract

Chronic rhinosinusitis (CRS) is a common problem worldwide that results in significant impairment of quality of life. Endoscopic surgery aims at maintaining physiological function and anatomical structure.

This study aimed to assess the outcome after functional endoscopic sinus surgery (FESS) for chronic rhinosinusitis with or without nasal polyps using symptom scoring and endoscopic assessment.

Thirty patients having chronic rhinosinusitis CRS with or without nasal polyps underwent endoscopic sinus surgery in Otolaryngology dept. / Sulaimaniya Teaching Hospital from May 2008 to April 2009 after failure of medical treatment to resolve the condition for more than 12 weeks. Preoperative symptoms and radiologic findings were scored as well as the extent of surgery. Post operative endoscopic findings and symptoms outcome were evaluated.

The common presenting symptoms in order of frequency were nasal obstruction, facial pressure or pain, purulent nasal or post nasal secretions, headache, hyposmia, Fatigue, cough, and halitosis. All symptom's scores significantly reduced (t-test P value < 0.000), with exception of cough (t- test P value = 0.023). Halitosis showed no significant change (t-test P value = 0.103). Patients who had the lowest radiological scores underwent the least extensive surgery.

In conclusion, most CRS symptoms can be expected to improve significantly after ESS and correlates with postoperative endoscopic examination of the nasal cavities. Lund-Mackay radiologic scoring can be used as a predictor of symptom outcome although it correlates weakly with the severity of symptoms preoperatively.

Introduction

Chronic rhinosinusitis (CRS) is a common problem worldwide that results in significant impairment of quality of life. Associated symptoms drive the patient to seek medical opinion¹. Treatment of chronic rhinosinusitis resistant to medical therapy has been historically managed by a variety of external and internal surgical procedures. The patho-physiology of chronic sinus disease has been elucidated through the work of Professor Messerklinger. He observed that chronic sinusitis is usually due to stenosis of the anterior ethmoid region. Infection can spread from the anterior ethmoid and the middle meatal regions, to secondarily affect the maxillary and the frontal sinuses. He noted that the mucosal changes that occur secondary to obstruction

of the ostiomeatal unit (OMU), resolve when normal ventilation and mucociliary clearance is restored. This knowledge has led to the acceptance of endoscopic sinus surgery as a valuable modality in the surgical management of sinus disorders².

The signs and symptoms reported by patients comprise the cornerstone of CRS criteria and are divided into major and minor factors (Table I).

Table I: Symptoms of major and minor criteria

Symptom Scores
Preop. Postop.
MAJOR CRITERIA:
Pain or facial pressure

Nasal obstruction
Hyposmia or Anosmia
Purulent nasal or postnasal secretion
MINOR CRITERIA:
Headache
Halitosis
Fatigue
Cough

A CRS diagnosis requires the presence of at least two major factors, or one major factor with two or more minor factors, or nasal purulence on examination. The duration of symptoms is another diagnostic cornerstone. Symptoms must persist for at least 12 weeks in the diagnosis of CRS. The symptom combinations required to diagnose CRS reflect the expected physical findings³.

Preoperative CT imaging is essential for the diagnosis of sinus disease, for operative planning and as an excellent intraoperative guide^{2,4}.

Radiographic findings require clinical correlation in CRS diagnosis. CT can not be used as a sole indicator of CRS and that a baseline of mucosal change should be expected in the asymptomatic population³.

Endoscopic surgery aims at maintaining physiological function and anatomical structure. The health and normal function of the paranasal sinuses and their lining mucous membranes depend primarily on two important factors, ventilation and drainage. Hence normal function of the sinuses depends on the amount of mucus produced, its composition, the effectiveness of ciliary beat, and the condition of the ostia and the ethmoidal clefts. In the maxillary sinus, mucus transportation starts from the floor of the sinus in a stellate pattern towards the natural ostium. From there it exits into the ethmoid infundibulum and through the hiatus semilunaris over the inferior turbinate posteriorly into the nasopharynx. The frontal sinus is the only sinus in which there is active inwardly directed transportation of mucus. The frontal recess may also collect secretions from other ethmoidal compartments. It is thus realized that the health of the anterior

ethmoid cells is essential for normal functioning of the other sinuses, and hence treatment must be concentrated on these cells and the ostiomeatal complex. Since each sinus has its own pattern of movement for the mucus blanket ending at the natural ostium, making an ostium in other location ineffective, and the emphasis is on clearing and widening the natural ostium⁵.

The technique of functional endoscopic sinus surgery has developed from the approaches described by Messerklinger and Wigand.

The Messerklinger technique involves an anterior to posterior approach, with resection of only the inflammatory or anatomic defects that interfere with normal mucociliary clearance of the paranasal sinuses leading to chronic infection. The procedure begins with removal of the uncinata process to expose the infundibulum. As clinically indicated, the dissection is continued with removal of the ethmoid bulla, exposure of the frontal sinus ostium, and identification of the roof of the ethmoid. Once the skull base is identified, the dissection continues posteriorly by removal of the remaining anterior ethmoidal cells, posterior ethmoidal cells, and finally the sphenoid sinus is opened under direct visualization. The ostium of the maxillary sinus is then identified using a 30-degree telescope and is widened if necessary.

The use of endoscopic sinus surgery has become more popular with improvement in the understanding of the anatomy of the lateral nasal wall and surgical training².

Patients & method

Thirty patients having chronic rhinosinusitis CRS with or without nasal polyps underwent endoscopic sinus surgery under general anaesthesia in Otolaryngology dept./ Sulaimaniya Teaching Hospital from May 2008 to April 2009 after failure of medical treatment to resolve the condition for more than 12 weeks. Medical treatment consisted of broad spectrum antibiotics against upper airway infections, topical steroids and non sedating antihistamines. The diagnosis of chronic rhinosinusitis was based on persistence of symptoms either two major or

one major and two minor criteria of CRS for greater than 3 months and the presence of mucosal disease on radiological examination. Preoperative evaluation included symptoms of major and minor criteria of CRS^{6,7} (Table I) on a 4-point Likert scale⁸ (0 indicates

symptom absent; 1 mild, 2 moderate and 3 severe symptom). Anterior rhinoscopy then rigid endoscopes were used to examine the overall nasal cavity.

Table II: Radiologic staging of sinus systems proposed by Lund and Mackay.

Sinus system	Left	Right
Maxillary		
Anterior ethmoidal		
Posterior ethmoidal		
Sphenoidal		
Frontal		
Ostiomeatal complex		
Total points for each side		

CT findings were scored according to radiologic staging of sinus systems.* The Likert scale was introduced by Rensis Likert proposed by Lund and Mackay (Table II)⁶. Scoring: For all sinus systems, except for the ostiomeatal complex, 0 indicates no abnormalities; 1, partial opacification; 2, total opacification. For the ostiomeatal complex, 0_not occluded, 2_occluded. The total score can range from 0 to 24 (0 to 12 for each side).

The Messerklinger approach was used and operative details were recorded according to the surgery score proposed by (Lund and Kennedy) (Table III)^{3,6}. Patients who had nasal septal deviation that needed to be corrected, septoplasty had been performed for them. Occurrence of complications was reported.

Table III: Surgery score proposed by Lund and Kennedy

Surgical procedure	Left	Right
Uncinectomy		
Middle meatal antrostomy		
Anterior ethmoidectomy		
Posterior ethmoidectomy		
Sphenoidectomy		
Frontal recess surgery		
Reduction of the middle turbinate		
Total points of each side		

Scoring: 0 indicates no procedure performed; 1, surgery performed. The total score can range from 0 to 14 (0 to 7 for each side). Average hospital stay was 24 hours, with post-operative follow up in 3, 7, 15, 30 days, and in 3 months. Antibiotic (Amoycillin-

Clavulanic Acid 625mg 8 hourly or Cefixime 400 mg once a day) was used for 10 days post-operatively and the patients were instructed to vigorously spray normal saline solution in their noses. Systemic decongestant used for 10 days after removal

of the nasal pack. Topical steroid was started 3 days after the procedure, and continued if necessary. Patients with sinonasal polyps used methyl prednisolone 16mg/day 5 days before and 7days after operation with tapering dose for 3 days. Nasal cleaning and crust removal were carried out in the post

operative follow up regularly and synechia if existed were excised.

All patients were interviewed post operatively at minimum of 3 month follow up; symptom outcomes compared and analyzed, nasal and ethmoidal cavities scored endoscopically (Table IV)⁹.

Table IV: Post operative endoscopic scoring of the nasal 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		

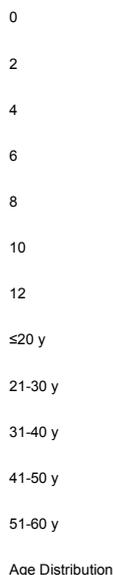
Results

Results were analyzed using SPSS 16.0 for windows. Descriptive statistics are presented within the body of the text as mean _ SD. The t tests for unpaired samples were used for comparison between groups. Correlation analyses were performed using Spearman statistics. P values lower than 0.05 were considered a statistically significant result.

Our study has included 30 patients; 14 patients were males and 16 were females,

ranged in age from 18 to 52 years. The mean age was 32.4 years and most of the cases fell into third and fourth decades respectively Figure 1. Seventeen patients were diagnosed as having chronic rhinosinusitis and 13 patients as having chronic rhinosinusitis with polyps.

Figure 1: Age distribution



Age Distribution

3
 11
 9
 3
 4
 ≤20 y
 21-30 y
 31-40 y
 41-50 y
 51-60 y

The common presenting symptoms in range of frequency were nasal obstruction (100%), facial pressure or pain (96.7%), purulent nasal or post nasal secretions (86.6%), headache (86.6%), hyposmia (80%), Fatigue (63.3%), cough (30%) and halitosis (23.3%). Post-operatively the prevalence of symptoms were nasal obstruction (30%), facial pressure or pain(53.4%), purulent nasal or post nasal secretions (36.7%), headache (36.7%), hyposmia (13.4%), Fatigue (33.4%), cough (13.4%) and halitosis

(13.4%) The total score changes for each symptom pre- and post- operatively were significantly reduced Figure 2.

Post operatively, 10 (33.3%) of patients were free of symptoms, 4 (13.3%) of patients reported reduced symptoms scores by more than 75%, in 10 (33.3%) patients symptoms scores reduction were between 50-75%, in 3 (10%) patients symptoms scores reduction were less than 50%, and unchanged symptoms in 3 (10%) patients.

Figure 2: Total symptom sores pre- and post-operatively

CT findings according to radiologic staging system proposed by Lund and Mackay

showed osteomeatal complexes reported the highest scores followed by Maxillary sinuses, anterior ethmoids, Posterior ethmoids, Frontal sinuses and Sphenoid sinuses respectively Table (V and VI).

Table V: Total radiologic scores of sinus systems by Lund and Mackay

Sinus system	Left	Right
Maxillary sinuses	37	39
Anterior ethmoids	29	30
Posterior ethmoids	19	22
Sphenoid sinuses	12	9
Frontal sinuses	11	14
Osteomeatal complex	46	48
Total points for each side	154	162

Table.VI: Lund Mackay scoring of CT Scans (bilateral)

Sinus system	Total	%
Maxillary sinuses	76	63.3%
Anterior ethmoids	59	49.2%
Posterior ethmoids	41	34.2%
Sphenoid sinuses	21	17.5%
Frontal sinuses	25	20.8%
Osteomeatal complex	94	78.3%
Total points for each side	316	

Distribution of Lund-Mackay scores and relation between distribution of Lund-Mackay scores with total pre- operative

symptom scores and bilateral surgery scores are illustrated in Table VII&VIII.

Table VII: Distribution of Lund-Mackay scores

Lund-Mackay scores	NO.	%	Average
0-4	2	6.7	4
5-9	12	40	7.91
10-14	12	40	11.75
15-24	4	13.3	18

Table VIII: Relation between distribution of Lund-Mackay scores with total pre- operative symptom Scores and Bilateral Surgery Scores

Lund-Mackay scores	Total pre- operative Symptom Scores	Mea n	Bilateral Surgery Scores	Mean
0-4	12	6	8	4
5-9	106	8.8	81	6.75
10-14	110	9.2	95	7.9
15-24	42	10.5	36	9

The extent of surgery was scored according to surgery score proposed by Lund and Kennedy Figure 3.

Septoplasty has been performed in 13 (43.3%) patients.



Figure 3: Surgery score proposed by Lund and Kennedy

No major complication reported. Post operative bleeding encountered in 4 (13.3%) patients, not sever and didn't required blood transfusions, periorbital swelling in 5

(16.7%) patients and postoperative synechia encountered in 9 (30%) These were easily controlled with local debridement.

		Left		Right	
		No. of Patient	Scores	No. of Patient	Scores
Aspect of the mucosa in the ethmoidal cavity	0 Normal mucosa	20	0	19	0
	1 Partially lined with mucosal hypertrophy	7	7	7	7
	2 Completely lined with mucosal hypertrophy	2	4	3	6
	3 Polyps	1	3	1	3
Purulent discharge	0 No	26	0	25	0
	1 Yes	4	4	5	5
Middle meatal antrostomy	0 Open	28	0	28	0
	1 Closed	2	2	2	2

Table IX: Total post operative endoscopic scoring of the nasal cavities

Discussion

Functional endoscopic sinus surgery has been accepted as a minimally invasive technique for the treatment of nasal polyposis, chronic and acute recurrent sinusitis resistant to medical therapy². Success with ESS has been categorized as marked improvement in symptoms or according to patient satisfaction with surgery⁶.

Both CRS and nasal polyps diagnosis are based on clinical criteria. The purely subjective symptoms, described by the patients, should guide the medical treatment, as far as for complementary tests to be ordered -CT scan is the foremost, to be used¹⁰.

In this study we found that Nasal obstruction and facial pressure or pain were the common presenting symptoms (100%) and (96.7%) respectively. Purulent nasal or post nasal secretions was (86.6%), headache (86.6%), hyposmia (80%), Fatigue (63.4%), cough (30%) and halitosis (23.4%). The whole symptoms reduced significantly (t- test P value < 0.000) with exception of cough (t- test P value = 0.023). Halitosis showed no significant change (t-test P value = 0.103). These results were comparable with those of Bhattacharyya N. (2004)⁹, Bunzen DL. et al (2006), (13) and Giger R. et al (2004)⁹.

Statistically significant change is seen between total pre-operative symptom scores (mean 9 ± 2.01 SD) and total post operative symptom scores (mean 2.83 ± 2.81 SD), (mean change 6.16 ± 2.64 SD), t- test P value < 0.000.

Our data confirm the findings of previous series that reported excellent subjective outcome following endoscopic sinus surgery with improvement in 80% to 92% of patients^{10,11}.

The CT findings were evaluated according to the radiologic staging of sinus systems proposed by Lund and Mackay. Three cases had unilateral right side disease otherwise there was almost no difference in disease extent between both sides (mean radiologic score of the left/right side, 5.13 ± 2.6 SD/ 5.4 ± 2.08 SD), (t test P value = 0.564). The mean total score of both sides together was 10.53 ± 3.9 SD, ranging from 4 to 20. In 2 patients radiologic scores were 4; this has been proposed a minimum score for patients submitted to ESS for CRS¹. 12 patients had 5-9 scores, 12 had 10-14 scores and 4 had 15-24 score.

There is a weak association between pre-operative symptom scores and Lund-Mackay radiological scores although it reaches significant level ($r = 0.353$, P value = 0.056). This result is compatible with Hopkins et al

(2007)¹. The mean symptom scores for patients with 0-4 radiological scores were 6, with 5-9 radiological scores were 8.8, with 10-14 radiological scores were 9.2, with 15-24 radiological scores were 10.5. This means that the radiological findings correlate weakly with the severity of symptoms.

It may be that disease site and obstruction of a single sinus complex may cause such significant symptoms that involvement of additional sinuses does not have the added impact on symptoms that might be expected. Some of the patients, particularly those with low Lund-Mackay scores, may have been wrongly diagnosed as having chronic rhinosinusitis, where symptom severity would not be expected to correlate with mucosal changes in the sinuses¹. Another possibility is that Likert scale may give erroneous answers.

A strong correlation found between post-operative symptom scores and Lund-Mackay scores ($r = 0.688$, P value < 0.000). This indicates that postoperative symptoms outcome can be predicted from C.T. findings. The more Lund-Mackay scores reflect the more the disease extent, chronic irreversible change in the mucosa and persistence of symptoms.

The extent of surgery scored according to surgery score proposed by Lund and Kennedy. Three cases has been undergone unilateral right sided operation otherwise the extent of surgery was similar on both sides (mean surgery score of the left/right side, 3.47 ± 1.43 SD/ 3.87 ± 0.97 SD), t test P value = 0.216). The mean total surgery score of both sides together was 7.33 ± 1.72 SD, ranging from 4 to 10.

A strong association is seen between surgery scores and Lund-Mackay scores ($r = 0.68$, P value < 0.000). This is also shown by Hopkins et al¹. The mean surgery scores for patients with 0-4 radiological scores were 4, with 5-9 radiological scores were 6.75, with 10-14 radiological scores were 7.9, with 15-24 radiological scores were 9. This means that patients with higher Lund-Mackay

scores have been shown to undergo more extensive surgeries.

Post operative endoscopic scores were significantly correlated with Post operative symptom scores ($r = 0.555$, P value < 0.01), but not with preoperative symptom scores ($r = 0.030$, P value = 0.874). This means that post operative endoscopic scoring can be predictive of postoperative symptom outcome yet not be predicted from preoperative symptom scores.

Also the post-operative endoscopic scores were correlated strongly with radiological scores ($r = 0.501$, P value = 0.005), this concludes that post operative endoscopic findings can be predicted from C.T. scan findings. This result also is mentioned by Hopkins et al, Giger et al and Smith et al^{1,9&12}.

No major complication reported. Minor complications that were encountered include; postoperative bleeding, periorbital swelling and postoperative synechiae. These results were comparable with those of Giger et al and Turgut S, Akyol MU and Özdem. Bajaj Y, Gadepalli C and Reddy T. N. in a series of 266 patients had one (0.37%) CSF leak and minor complications rate of 10.5%¹³.

Conclusions

Endoscopic sinus surgery is the effective treatment for medically refractory cases of rhinosinusitis with or without polyp. Most CRS symptoms can be expected to improve significantly after ESS and correlates with postoperative endoscopic examination of the nasal cavities. Lund-Mackay radiologic scoring can be used as a predictor of symptom outcome; although it correlates weakly with severity of symptoms preoperatively.

Recommendations

We recommend following up the patients post operatively for a longer period and an extended study to be taken.

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