

# Efficacy of Functional Endoscopic Sinus Surgery and Impact of Chronic Lung Disease on its outcome in Patients of Chronic Rhinosinusitis

<https://doi.org/10.47210/bjohns.2023.v31i2.984>

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## ABSTRACT

### Introduction

Chronic rhinosinusitis (CRS) is a common health condition affecting a significant proportion of population which results in considerable morbidity and deterioration in quality of life. Functional Endoscopic Sinus Surgery (FESS) has gained acceptance throughout the world as a procedure believed to improve the symptoms of chronic rhinosinusitis and consequently the general wellbeing of patients suffering from the condition. Patients with CRS are also known to have comorbidities. Chronic lung disease (CLD) i.e. bronchial asthma, COPD and chronic bronchitis are commonly associated with CRS. In view of the above, this study was carried out to determine the prevalence and severity of various symptom manifestations of chronic rhinosinusitis as well as to compare the symptomatic relief of the patients following surgery by regular follow ups and by using grading systems. This study also evaluated the impact of Chronic Lung Disease (CLD) on the outcome and complications of FESS.

### Materials and Methods

This prospective longitudinal cohort study was carried out for 18 months' duration with 50 patients amongst the patients attending the OPD of Otorhinolaryngology with chronic Rhinosinusitis following inclusion and exclusion criteria. A detailed history including associated CLD and other co-morbidities were documented. All the patients underwent pre-operative clinical, radiological and endoscopic evaluation followed by FESS. Post-operative follow up was done at 1 week, 2 weeks, 4 weeks, 8 weeks, 3 months, 6 months, 9 months and 1 year intervals for one year and assessment was done in respect to improvement of symptoms using grading scale where success is meant by complete resolution of symptoms or improvement of symptoms (score +1) and cases with no change of symptoms (score 0) or deterioration of symptoms (score -1) within 1 year of follow-up are said to be failures. Rates of complications were also assessed. Results were analyzed using SPSS software.

### Results

The mean age of this study population was 35.60 years with M: F ratio 1.27:1. Majority presented with symptoms of nasal obstruction and nasal discharge. FESS was found to be highly effective in relieving all symptoms- 88.89% for Nasal obstruction, 79.07% for Rhinorrhoea, 80.65% for Headache, 80% for Epistaxis, 75% for Facial pain/ pressure, except for smell dysfunction where it was found to be 53.57%. Among those 21 cases of OM unit patterns 13 (61.9%) were successful after FESS. In case of sporadic form 9 (69.2%), diffuse polyp form 6 (60%), infundibular form 1 (33.3%) and spheno-ethmoidal form 2 (66.7%) were successful. The success rate among CLD patients was 66.6% and those who had no co-morbidities was 65.6%. Similarly, the complication rate in CLD patients was 33.34% where in patients with no co-morbidities it was 31.25%.

### Conclusion

The leading complaints within the symptom profile of patients with CRS are nasal obstruction with nasal discharge. FESS is highly effective treatment to relieve all major symptoms of CRS except smell dysfunction. This study also concludes that chronic lung disease has got no influence in the outcome and complications of FESS.

### Keywords

Functional Endoscopic Sinus Surgery; Rhinosinusitis; Chronic Lung Disease

**C**hronic rhinosinusitis (CRS) is a common health condition affecting a significant proportion of population.<sup>1</sup> It is defined by its subjective signs- i.e. intensity and duration of its characteristic symptoms: postnasal drip, nasal obstruction and discharge, facial pressure or pain, headache, cough and olfactory dysfunction lasting longer than 12 weeks. Chronic rhinosinusitis results in considerable morbidity and deterioration in quality of life caused by the above symptoms.

Severity of objective findings used for diagnosis and staging of CRS (x-ray, CT scan of nose and PNS, bacteriology) do not correlate with the subjective symptom scores, but some of the objective signs have been reported to be valuable predictors of poor long term outcomes following conservative or surgical treatment.<sup>2</sup>

Treatment of CRS can be medical or surgical. After the failure of conservative treatment, functional endoscopic sinus surgery is the preferred treatment.<sup>3,4</sup> Over the last few decades, Functional Endoscopic Sinus Surgery (FESS) has gained acceptance throughout the world as a procedure believed to improve the symptoms of chronic rhinosinusitis and consequently the general wellbeing of patients suffering from the condition. It is based on the hypothesis that diseased sinonasal mucosa can get reverted if ventilation and drainage are improved, thus restoring mucociliary clearance.<sup>5,6</sup> Endoscopic sinus surgery (ESS), like all minimally invasive sinus surgery, is designed to combine an excellent outcome with minimal patient discomfort.

Initially thought to be highly effective in management of chronic rhinosinusitis, the relative effectiveness of endoscopic sinus surgery has recently been questioned. Some researchers have cited recurrence rates and incomplete symptoms resolution even after ESS. The varied aetiologies of chronic rhinosinusitis especially the allergic and fungal causes have doubted the impact of ESS in chronic rhinosinusitis. The relationship among FESS, sinus-related symptoms and quality of life is not well established.<sup>7</sup>

Patients with CRS are known to have comorbidities. Chronic lung disease (CLD) i.e. bronchial asthma, COPD

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and chronic bronchitis are commonly associated with CRS. The unified airway concept where different parts of the upper and lower airways are affected by the same immunological mechanisms explains this association. However, underlying immune responses are not the only factor driving the multifactorial etiology of CRS. Beside the immune factors there are also genetic, environmental, occupational and anatomic factors which contribute to the manifestation of CRS. Other co-morbidities can be diabetes mellitus (DM), peripheral vascular disease (PVD), heart disease (HD) etc. But a real therapeutic challenge has been the severe chronic upper airway disease patients as they have uncontrolled CRS with disease related factors contributing to the severity of their disease as well as negative influence on the outcome of FESS.

In view of the above, this study was carried out to determine the prevalence and severity of various symptom manifestations of chronic rhinosinusitis as well as to compare the symptomatic relief of the patients following surgery by regular follow ups and by using grading systems.

This study also evaluated the impact of chronic lung disease on the outcome and complications of FESS.

**Materials and Methods**

This prospective longitudinal cohort study was carried out for 18 months' duration with 50 patients amongst the patients attending the OPD of Otorhinolaryngology with chronic Rhinosinusitis following inclusion and exclusion criteria.

**Inclusion criteria** – Male or female > 18 and <70 years of age

Prior conservative treatment of CRS for at least 12 weeks  
No prior sinus surgery

**Exclusion criteria** – Any nasal pathologies like tumor or any growth

Any nasal structural abnormalities like Deviated Nasal Septum

Paediatric age group

Non-invasive fungal balls and invasive fungal disease

Pregnant or lactating women

A detailed history including associated CLD and other co-morbidities was documented. All the patients underwent clinical evaluation by Anterior Rhinoscopy and other associated examination of nose and throat followed by Diagnostic Nasal Endoscopy. All of them underwent X-ray as well as CT Scan of Nose and Paranasal Sinuses.

The study population underwent endoscopic sinus surgery. 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.

Patients were evaluated 1 week, 2 weeks, 4 weeks, 8 weeks, 3 months, 6 months, 9 months and 1 yr after surgery. Nasal endoscopy was performed in each post-operative visit. CT scan was done 6 months and 1 year post-operatively.

Improvement of symptoms was assessed using the following scoring scale. Where, success is meant by

complete resolution of symptoms or improvement of symptoms (score +1) and cases with no change of symptoms (score 0) or deterioration of symptoms (score -1) are said to be failures within 1 year of follow-up.

Assessment was done subjectively using questionnaires about improvement or deterioration of the symptoms and objectively using nasal endoscopy.

Pre-operative symptom scores were calculated. The symptoms included were nasal obstruction, rhinorrhoea, smell dysfunction, nasal bleeding, headache, facial pain and others. Pre-operative scores were classified as: 0 – no symptoms, 1 – mild (symptoms causing little or no discomfort), 2- moderate (symptoms interfering daily activities but not sleep), 3- severe (symptoms affecting daily activities and sleep).

Post-operative scoring was done. They were: +1 (improved), 0 (no change), -1 (worse).

Post-operative success and complication rates were analysed.

## Results

The mean age of this study population was 35.60 years with M: F ratio 1.27:1 [Table I].

**Table I: Distribution of number of patients according to age**

AGE IN YEARS	NUMBER OF PATIENTS	MEAN AGE IN YEARS
10-20	4 (8%)	35.6
21-30	15 (30%)	
31-40	14 (28%)	
41-50	12 (24%)	
51-60	4 (8%)	
60 and above	1 (2%)	

**Table II : Distribution of patients according to post-operative symptoms score**

SYMPTOMS	FAILURE		SUCCESS	SUCCESS RATE
	SCORE (-1)	SCORE (0)	SCORE (+1)	
Nasal obstruction	1	4	40	88.89%
Rhinorrhoea	2	7	34	79.07%
Headache	2	4	25	80.65%
Smell dysfunction	4	9	15	53.57%
Epistaxis	0	1	4	80%
Facial pain / pressure	1	4	15	75%

**Table III : Distribution of study population according to outcomes of Co-morbidities (n=50)**

CO-MORBIDITIES	SUCCESS	FAILURE	TOTAL
None	21 (65.63%)	11 (34.37%)	32
CLD	8 (66.67%)	4 (33.33%)	12
DM	1 (25%)	3 (75%)	4
PVD	1 (100%)	0	1
HD	0	1 (100%)	1

**Table IV : Distribution of study population according Co-morbidities and Complications (n=50)**

CO-MORBIDITIES	COMPLICATIONS	NO COMPLICATIONS	TOTAL
None	10 (31.25%)	22 (68.75%)	32
CLD	4 (33.34%)	8 (66.66%)	12
DM	2 (50%)	2 (50%)	4
PVD	1 (100%)	0	1
HD	0	1 (100%)	1

Majority of the patients presented with nasal obstruction (90%), Nasal discharge (86%) and headache in (62%). The success rates were highest for nasal obstruction (88.89%). All other symptoms also had high success rates except for hyposmia which was as low as 53.57% [Table II].

Among 50 patients, synechia occurred in 6 (12%), severe epistaxis in 5 (10%), facial odema in 1(2%) and orbital injury in 1 (2%) cases.

Among the 50 patients included in this study, we found OM unit pattern of disease in 21 cases, sporadic form in 13 cases, diffuse polyp in 10 cases, infundibular and speno-ethmoidal pattern in 3 cases each. Among 21 cases of OM unit patterns, 13 (61.9%) were successful after FESS. In case of sporadic form 9 (69.2%), diffuse polyp form 6 (60%), infundibular form 1 (33.3%) and speno-ethmoidal form 2 (66.7%) were successful.

In our study among 50 patients of chronic rhinosinusitis, 32 patients were otherwise healthy. Chronic lung disease (CLD) was found in 12 cases, diabetes (DM) in 4 cases, peripheral vascular disease (PVD) and heart disease (HD) in 1 case each. The success rates and complications in relation to the co-morbidities are detailed in Table III & IV.

Even after proper endoscopic sinus surgery, 4 (8%) cases had recurrence of disease within 1 year of follow-up.

## Discussion

CRS is a common health problem that leads to frequent visit to primary health care and Otorhinolaryngologists. It contributes to the significant amount of health care expenditure due to direct cost arising from physician visit as well as indirect cost related to missed days of work and general loss of productivity due to worsened quality of life. Thus it is essential to evaluate the outcome and effectiveness of FESS in relieving the symptoms of CRS. Because the disease itself is defined by signs and symptoms, it is logical to use the presence and severity of sinonasal symptom as primary outcome measure.

The present study focused on the interaction between

patients' symptom profiles and hence QOL before and after FESS. As reported by Senior BA et al<sup>8</sup> nasal obstruction, postnasal drip, and headache were the leading symptoms observed in the CRS population. In the present study, these symptoms were identified to be mainly responsible for worsened QOL. After FESS, a significant long-term improvement of both major symptoms and improvement in QOL was achieved in our patients.

One disadvantage of the present study was that the tool we used for outcome research was not validated before usage. However, health or QOL is not easy to measure. According to the World Health Organization, health is a "A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".<sup>9</sup> The Chronic Sinusitis Survey has been developed based on duration of symptoms. Short Form 36-Item Health Survey (SF-36)<sup>10</sup> is a general health evaluation tool that was not specifically designed for CRS, but it provides important information concerning the functional well-being of the individual and the evaluation of the overall response to treatment.<sup>11</sup> Another tool for the evaluation of the response to therapy is the Chronic Sinusitis Technology of Patient Experience (TyPE) Specific Questionnaire.<sup>12</sup> Furthermore, the Rhinosinusitis Disability Index was established, which consists of 30 items.<sup>8</sup> Most of these evaluation tools have excellent validity and reliability.<sup>10,11</sup>

Besides "subjective" measurements, the discussion of the best, most meaningful tools for treatment outcome control also includes "objective" methods. So we used both radiological (CT) and endoscopic examination for this purpose. As there is no exact measure of subjective improvement, patient satisfaction and symptomatic improvement was the objective of surgery.

This study is in agreement with the study conducted by Mishra D K et al<sup>13</sup> where they found nasal obstruction, rhinorrhoea and headache as most common symptoms with comparable success rate for nasal obstruction. But for rhinorrhoea and headache, the current study has reported lower success rate.

Findings of Lt Col Nair Set al<sup>14</sup> is similar to our study except that they have not reported any case with smell dysfunction.

**Table V : Analysis of pre-operative systems and post-operative success in different studies**

NASAL	NASAL OBSTRUCTION		RHINORRHOEA		HEADACHE		SMELL DYSFUNCTION	
	SYMPTOM (%)	SUCCESS (%)	SYMPTOM (%)	SUCCESS (%)	SYMPTOM (%)	SUCCESS (%)	SYMPTOM (%)	SUCCESS (%)
Netkovski et al	93.7	87	72.5	70.5	65	59.4	62.5	58.7
Bunzen et al	100	83.3	91.6	91.6	87.5	62	...	...
Nasser et al	76	69	63.5	48	74.4	59	...	...
Nair et al	86	87.2	90	78.1	91	82.4	...	...
Current study	90	88.9	86	79.1	62	80.7	56	53.6

Damm Michael et al<sup>15</sup> has found similar success rates for all the symptoms as this study except higher success rate in case of hyposmia.

The study conducted by Netkovski J et al<sup>16</sup> had lower success for both rhinorrhoea and headache and a slightly higher success for hyposmia [Table V].

This study is in agreement with Mishra D K, Bhatta R<sup>13</sup> et al who also found that the osteomeatal (OM) unit pattern of disease was most prevalent followed by sporadic form of disease and sphenoidal disease. Lt Col Nair Set al<sup>14</sup> in their study also concluded that OM unit involvement was the most common pattern.

I Baumann, G Blumenstock, I M Zalaman<sup>17</sup> et al in their study on impact of co-morbidities on quality of life in chronic rhinosinusitis showed that CLD had clear negative influence on symptoms and the post-operative result. In contrast, we have found no association between CLD and outcome as well as complications in FESS.

Because of small sample size in this study, there remains a chance of statistical error. Further prospective clinical studies with larger sample size are required to assess the long term outcomes of FESS but compliance for longer follow up remains a matter of concern.

## Conclusion

The leading complaints of patients with CRS are nasal

obstruction with nasal discharge. FESS is highly effective treatment to relieve all major symptoms of CRS except smell dysfunction. This study also concludes that CLD has got no influence in the outcome and complications of FESS.

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