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ORIGINAL STUDY

Change in symptomatology score after functional endoscopic sinus surgery in cases of chronic rhinosinusitis

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ABSTRACT

BACKGROUND. Chronic rhinosinusitis (CRS) is one of the most common health problems in adults, which not only causes physical symptoms, but also results in functional and emotional impairment. The aim of the present study was to investigate the effect of functional endoscopic sinus surgery (FESS) on SNOT-22 in cases of chronic rhinosinusitis.

MATERIAL AND METHODS. A total of 50 patients, between 18-60 years of age, who had taken treatment for CRS but found no improvement, were enrolled in the study. Before surgery, all patients were asked to fill the SNOT-22 form, the CT score was evaluated, and FESS was performed. A reevaluation with SNOT-22 questionnaire was performed 10 days, 1 and 3 months after surgery. The preoperative and postoperative scores and change score were calculated.

RESULTS. The initial preoperative mean score was 39.96±13.41. The percentage decrease in symptom score on the 10th day, the first and third month postoperatively was 42%, 74% and 91% respectively. Males had scored higher as compared to females. There was no correlation between the CT score and SNOT-22 score. Rhinological symptoms scored more than 74% in chronic rhinosinusitis cases.

CONCLUSION. SNOT-22 can be used in routine clinical practice to inform clinicians about a full range of problems associated with chronic rhinosinusitis. Responses on the instrument can help focus the clinical encounter. It can also aid researchers in assessing the degree and effect of rhinosinusitis on health status, QoL and to measure treatment response.

KEYWORDS: functional endoscopic surgery, quality of life, SNOT-22 scale, chronic rhinosinusitis.

INTRODUCTION

Chronic rhinosinusitis (CRS) is characterized by mucosal inflammation in the nose as well as paranasal sinuses, that lasts for more than three months. Epidemiologic studies estimate that 10-15% of the U.S. population has CRS. Its prevalence peaks between 30-60 years of age and is stable across racial and ethnic groups[1].

There are various factors associated with diagnosis of CRS[2] (Table 1).

CT scans should be done in those cases where the patient has history of recurrent frontal or maxillary sinusitis treated repeatedly by conservative means[3].

There are several systems available to stage the severity of the disease in CRS. However, the most accepted one is the Lund-MacKay CT staging system, which assesses on the CT scans the extent of opacification of each sinus and osteomeatal complex. A score of 2,1,0 is respectively based on if there is complete, partial, or no opacification[3].

Functional endoscopic sinus surgery (FESS) is considered to be the surgical option of choice in patients with CRS not responding to the medical management. This technique precisely removes the pathologic tissue inside the osteomeatal complex and restores the mucociliary clearance and sinus ventilation without harming the normal physiology and anatomy[1].

Recently, SNOT-22 scale has been used to predict the outcome in CRS. SNOT-22 scale is a rhinosinusitis related quality of life (QoL) questionnaire[4]. The aim of the present study was to investigate the effect of FESS on SNOT-22 in cases of CRS.

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Table 1. Major and minor factors of CRS.

Major factors	Minor factors
Facial pain/ pressure	Headache
Facial congestion/fullness	Fever
Nasal obstruction/blockage	Halitosis
Nasal discharge/purulent/discolored	Fatigue
Postnasal discharge	Dental pain
Hyposmia/ anosmia	Cough
Purulence in nasal cavity	Ear pain/pressure/fullness

MATERIAL AND METHODS

This is a prospective, interventional, hospital-based clinical study, which included 50 patients with CRS. The diagnosis was made using the major and minor criteria (2 major or 1 minor + 1 major factor at least). Pregnant women, patient who underwent previous nasal surgery and patients suffering from other local diseases of the nose were excluded.

A written and informed consent was obtained from the patients wherein they were explained about the study. A detailed relevant history followed by general physical and detailed ENT examination along with nasal endoscopy was carried out. NCCT PNS (axial, sagittal, coronal slices) were performed and Lund-MacKay CT scoring was done.

Procedure

Preoperatively, the patients were asked about the severity of the symptoms and score was given according to SNOT-22 scale. FESS was performed either under general (42 patients) or local anaesthesia (8 patients), according to the extent of the disease and patient's choice. Merocel® pack removal was done after five days. In our institution, patients are discharged on postoperative day 2 with Merocel® nasal pack and then, on outpatient basis, we remove the nasal pack on postoperative day 5, due to variable patient compliance to postoperative instructions.

Postoperatively, all cases were prescribed prophylactic broad-spectrum antibiotics along with nasal alkaline douche and an intranasal steroid spray, as part of the protocol.

On the 10th day, the first and third month after surgery, patients were asked about the severity of the symptoms and a score was given according to SNOT-22. The preoperative and the postoperative scores were compared and the change in score was calculated.

Instrument

The 22-item Sinonasal Outcome (SNOT-22) is a rhinosinusitis specific questionnaire to analyse the quality of life.

The 22-items are divided into four subscales:

1. Rhinological symptoms (q 1-5, 7,8)
2. Ear and facial symptoms (q 9-12)
3. Sleep function (q 13-16)
4. Psychological issues (q17-22)

It is graded from 0 to 5: 0 - no problem, 5 - the worst possible problem. The total sum of the questionnaire score, numerically indicates the impact of the disease in patients' quality of life (QoL).

Statistical evaluation

The data was entered in Microsoft Excel software and analysed using SPSS (Statistical Package for the Social Sciences) software 17.0 by applying the paired t test. The qualitative variable was expressed as mean ± SD and the quantitative variable was expressed as percentage. Categorical data was analysed using the Chi square test. A p-value < 0.05 was considered significant.

RESULTS

The mean age of the subjects was 28.76±8.47 years, (range 18-60); 16% of the subjects were below 20 years, 38% were 20-30 years, 36% were 30-40 years and 10% were included in 40-50 years age group. There were 26 (52%) males and 24 (48%) females.

Out of the total 50 patients, 29 (58%) presented CRS with polyps (CRSwNP) and 21 (42%) presented CRS without polyps (CRSsNP).

Symptomatology score

The initial preoperative mean score was 39.96±13.41. The mean symptoms scores on the 10th day, the first and third month postoperatively were 22.56±9.34, 10.16±5.29 and 3.04±1.82 respectively (Figure 1).

Symptomatology score change

A progressive increment in symptom score change was observed on the 10th day, the first and third month after surgery. The mean change in

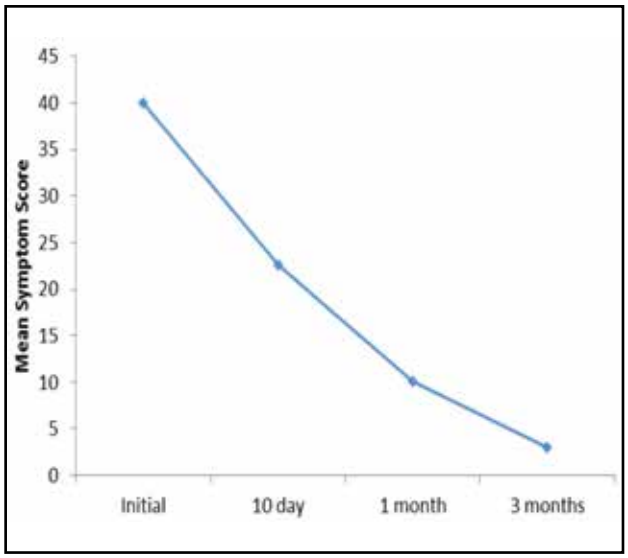

Figure 1. Graphical representation of symptoms score change.

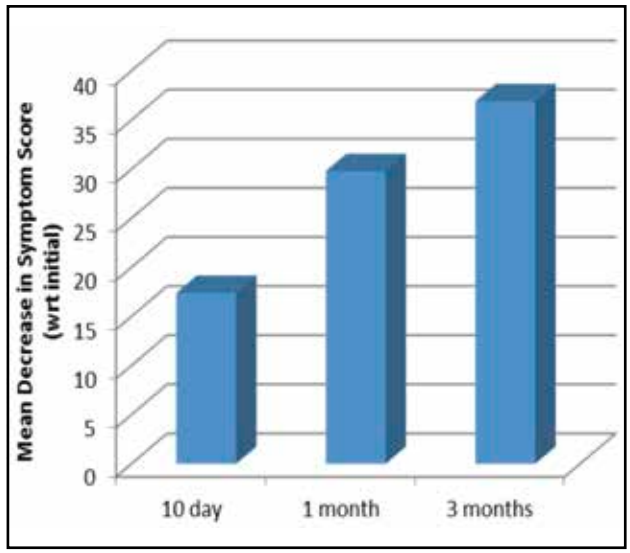

Figure 2. Bar chart showing mean change in symptom scores.

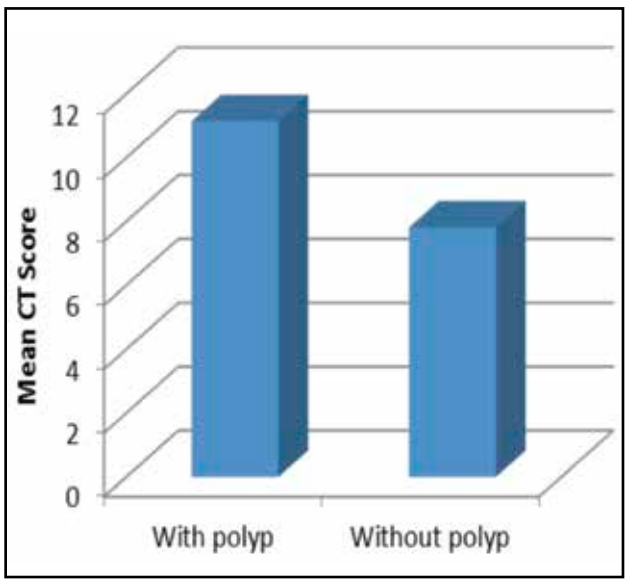

Figure 3. Bar chart showing mean CT score in subgroups.

scores was 17.4±10.3, 29.8±11.71 and 36.92±13.08 respectively (Figure 2).

Hence, on the 10th day, the first and third month the mean percentage improvement in the symptoms of our study population was 42.21±16.32%, 73.57±12.17% and 91.76±5.1% respectively.

CT score findings

The CT score was calculated using Lund-MacKay CT scale. The mean CT score was 9.74±4.62. The mean CT score of the CRSwNP subgroup was 11.14±4.27 and that of the CRSsNP subgroup was 7.81±4.46 (Figure 3).

Correlation of symptom score change and CT score

No correlation was observed between symptom score change and CT score (Table 2).

Subgroup findings

The mean age of the CRSwNP subgroup was 26.66±7.85 whereas the mean age of the CRSsNP subgroup was 31.67±8.61.

There was a change in symptoms score among

Table 2. CT score correlation with symptom score and mean change.

CT Score vs.		correlation	p-value
Symptom score	Initial	0.003	0.984
	10 day	-0.182	0.206
	1 month	0.004	0.978
	3 months	0.128	0.376
Decrease in Symptom Score (wrt initial)	10 day	0.17	0.238
	1 month	0.002	0.989
	3 months	-0.014	0.923

the CRSwNP subgroup. The mean symptoms score preoperatively was 40.17±14.42. The mean scores postoperatively on the 10th day, the first and third month were 20.83±7.51, 9.41±4.27, 2.79±1.29 respectively (Figure 4).

Among the CRSsNP subgroup, the mean symptoms score preoperatively was 39.67±12.22. The mean scores on the 10th day, the first and third month postoperatively were 24.95±11.15, 11.19±6.4, 3.38±2.36 respectively.

Scores change in subgroups

The score changes in the CRSwNP subgroup on the 10th day, the first and third month postoperatively were 19.34±10.54, 30.76±12.36, 37.38±14.09 respectively.

The score changes in the CRSsNP subgroup on the 10th day, the first and third month postoperatively were 14.71±9.55, 28.48±10.91, 36.29±11.85 respectively.

Hence, at the third-month follow-up there was a mean 92.35±4.75% improvement in symptom score in the CRSwNP subgroup and a mean 90.96±5.56% improvement in symptom score in the CRSsNP subgroup (Table 3).

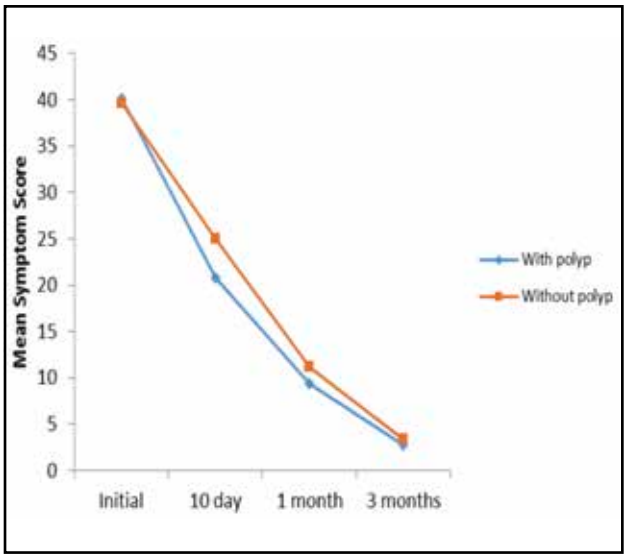

Figure 4. Graphical representation of mean change in symptom score in subgroups.

DISCUSSIONS

Age

In a study performed by Buckland et al. (2003), the age group included was 21-76 years and the mean age was 38 years[5]. Piccirillo et al. included in their study patients aged between 18.4 to 85.3 years (mean = 49 years)[6]. Deal et al., in 2004, conducted their study on patients between 18-80 years (average = 49 years)[7]. Five years later, Hopkins et al. considered 16-88 years of age group and the mean age was 50.5 years[8]. Marambaia et al. included in their study patients with a mean age of 40.7±13.5 years[9]. In 2015, Gregorio et al. evaluated patients of the age group 18-60 years[10], while Crump et al. performed their study, a year later, in the age group 40-70 years[11].

In our study, the age range was 18-60 years and the mean age was 28.76±8.47 years. In all the above studies, the age group was of wider range as compared to our study and hence the mean age group was more than 35 years, in various studies. In the presented study, the major bulk of patients was between 20 and 40 years.

Considering this age range variety, we can state that the role of age on patients' perception of CRS impact on QoL is still unknown.

Gender

In our study, out of 50 patients, 26 (52%) were males and 24 (48%) were females. Out of the above ten studies, five studies have shown female preponderance and five studies have shown male preponderance, indicating that gender has no bearing to control rhinosinusitis. Our study also has slight male preponderance.

In our results, the initial SNOT-22 score was higher in males as compared to females. But Gregorio et al. observed a clear gender difference in CRS patients, with women reporting a significantly

Table 3. Percentage decrease in symptom score in the subgroups.

% decrease in Symptoms Score (wrt initial)		10 day	1 month	3 months
With polyp	mean	46.04	75.47	92.35
	±sd	±12.67	±10.74	±4.75
Without polyp	mean	36.94	70.94	90.96
		±19.43	±13.76	±5.56
p-value (Yes Vs. No)		0.025	0.098	0.173

higher preoperative SNOT-22 score than men, despite less extensive disease (due to a raised score in the emotional domain)[10].

CT score

Bhattacharyya et al.[12] (1997) studied 221 patients. The CT scans were independently scored by radiologists who were blinded to the patients' SNOT-20 responses. The evaluation was made by using the Lund-MacKay CT score. The correlation failed to achieve statistical significance by Pearson r correlation analysis. Moreover, no significant relationship was found between the duration of symptoms and the severity of radiologic findings[12].

Zheng et al.[13] (2010) recruited a total of 121 patients in a prospective study. The Lund-MacKay CT score was 13.8±6.2. The patients were asked to fill three questionnaires – SNOT-20, SF-36 and VAS. The Lund-MacKay score and the SNOT-20 and VAS differed significantly between the CRSwNP and CRSsNP subgroups. The CT score was worse in the CRSwNP subgroup than in the CRSsNP subgroup. A lack of correlation between the CT score and SNOT-20 score was reported[13].

In our study, there was no correlation between the CT score and SNOT-22 scores. The mean CT score of CRSwNP was 11.4±4.27 and that of CRSsNP was 7.81±4.46, but again there was no correlation with SNOT-22 scores.

Hence, although CT of the paranasal sinuses has emerged as the investigation of choice for confirming a CRS and for planning sinus surgery, imaging is neither sufficiently sensitive nor sufficiently specific to be considered as a primary diagnostic tool.

Change in SNOT-22 scores

In a study performed by Hopkins et al. in 2009, the SNOT-22 was able to discriminate between patients known to suffer from CRS and a group of healthy controls ($p<0.0001$). It was also able to identify statistically significant differences in subgroups of patients with CRS. The mean preoperative score was 43.9 and the mean postoperative score was 31.3, with a change score of 12.6 ($p<0.0001$)[8].

Piccirillo et al. reported a mean ± SD SNOT-20 score at the initial visit of 1.9±0.9 and at 6 months and 1 year after surgery of 1.3±1.0 and 1.4±1.0, respectively[6]. The 5 parameters with the highest mean item scores at the initial visit were postnasal discharge, facial pain/ pressure, the need to blow the nose, waking up tired and fatigue. The authors also stated that "patients who indicated that their rhinosinusitis was improved at 6 months had statistically significantly higher mean SNOT-20 change scores than did patients who had either not improved or were worse"[6].

Marambaia et al. (2013) conducted a cross sectional study in which the median values in the total score of the SNOT-22 came out to be 53 in the study group and 8 in the control group, confirming the high impact of CRS upon the quality of life[9].

DeConde et al.[14], in 2014, compared the surgical and medical management using SNOT-22 scores. The mean score of the medical group was 44.2±19 and of the surgical group was 53.4±19.3. The patients who received surgical treatment reported significantly higher scores in the psychological dysfunction ($p<0.001$) and sleep dysfunction domains ($p<0.001$). The authors reported that "rhinologic symptoms experienced the greatest absolute change in both the medical and surgical cohorts"[14].

Crump et al. (2016) conducted a study which involved secondary analysis of SNOT-22 data that was preoperatively collected from 223 patients diagnosed with CRS and awaiting endoscopic sinus surgery. The average SNOT-22 score was 43.0, well above the range of what is considered normal[11].

Marambaia et al.[15] (2016), conducted a descriptive and analytical retrospective longitudinal study among 88 patients. The SNOT-22 was applied during the first consultation and after three years. Patients were divided into two groups: the group that evolved to the referral for surgery (26 patients) and the group that continued with medical treatment (62 patients). Regarding the SNOT-22 score during the first consultation, there was no difference between the medical and surgical group[15].

Caulley et al.[16] included thirty patients with nasal polyps in a study performed in 2016. They completed SNOT-22 scores preoperatively, at three months and six months postoperatively. The mean preoperative score was 43.80 (±16.91). Patients experienced an average of 61.8% improvement in their SNOT-22 score following EPIC (Endoscopic Polypectomy in Clinic). After three months, the mean SNOT-22 score was 15.56 and after six months the mean score was 18.50[16].

The mean initial score in our study was 39.96±13.41, which is somewhat less, as compared to studies from other countries. This difference suggests that the different lifestyles and cultures of the nations may influence the concept of QoL. The mean change in scores on the 10th day, the first and third month were 17.4±10.3, 29.8±11.71 and 36.92±13.08 respectively. Hence, there was an improvement in SNOT-22 score among the patients.

However, around 74% of patients had a high initial score in rhinological symptoms, 9% had ear and facial symptoms high initial score, 7% patients had sleep function high initial score and 5% high initial scores in psychological issues. According to this data, the majority of the patients were having

more rhinological symptoms. It was also noticed that the CRSwNP subgroup had a higher score in this domain as compared to the CRSsNP subgroup.

The most frequently reported symptoms at the initial visit in our study were: nasal obstruction, postnasal discharge, nasal discharge, facial pain/pressure, and lack of good night's sleep.

A major improvement in the symptomatology score was also noticed in the rhinological domain as compared to all other domains (CRSwNP >> CRSsNP). The rest of the three domains had subnormal levels preoperatively and an improvement was noted in all domains postoperatively.

As expected, the patients with nasal polyposis had higher mean SNOT-22 scores. The reasons are: 1). polyps tend to have higher degree of nasal airway obstruction; 2). polyps lack cilia, so there is a decreased mucociliary transport leading to thicker postnasal discharge and retained secretions.

One of the patients developed complication of nasolacrimal duct obstruction within the period of follow-up, for which the patient underwent dacryocystorhinostomy under local anaesthesia.

Subgroup study

Lind et al. performed a prospective cohort study in 2016[17]. The mean preoperative SNOT-22 score was 43.6 points for both CRSwNP and CRSsNP. The reduction in SNOT-22 score after endoscopic sinus surgery (ESS) was statistically significant in both groups. The results of the study with postoperative reduction in SNOT-22 score of more than 50% in both groups are in line with a high international standard and confirm the efficacy of ESS on QoL for patients with CRS[17].

In our study, the CRSwNP subgroup had a mean initial SNOT-22 score of 40.17±14.42 and the mean change in score on the 10th day, the first and third month weas 19.34±10.54, 30.76±12.36 and 37.38±14.09 respectively. The CRSsNP subgroup had a mean initial SNOT-22 score of 39.67±12.22 and the mean change in score on the 10th day, the first and third month was 14.71±9.55, 28.48±10.91 and 36.29±11.85 respectively, indicating an improvement in quality of life.

The limitations of the study are: lack of control group for comparative results; the patients were of different age groups; small sample size, hence extrapolation of the results can be made; SNOT-22 scale cannot be used for CRS diagnosis.

CONCLUSIONS

SNOT-22 is an easy subjective instrument for patients to complete and can be used in everyday clinical practice to inform clinicians about a full range of symptoms associated with chronic rhinosinusitis.

Responses on the instrument can help the clinical focus on patients' most important complaints.

SNOT-22 can help researchers in assessing the degree and effect of rhinosinusitis on patient's health status, QoL and to measure treatment response.

Conflict of interest: All authors declare that there are no conflicts of interest in this work.

Contribution of authors: All the authors have equally contributed to this work.

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