Functional and Clinical Outcomes of Endoscopic Sinus Surgery in Patients with Chronic Rhinosinusitis

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ABSTRACT

Background: Chronic rhinosinusitis (CRS) is a common inflammatory disorder that affects the paranasal sinuses, severely limiting quality of life and daily functioning. Endoscopic sinus surgery (ESS) has emerged as the major surgical treatment option for medically resistant CRS. This study aims to assess the functional and clinical outcomes of ESS in individuals with chronic rhinosinusitis who have failed conservative medical treatment. **Methods & Materials:** Thisprospective observational study was conducted among 80 patients at Department of Otolaryngology-Head & Neck Surgery, Bangladesh Medical University, Dhaka with chronic rhinosinusitis undergoing endoscopic sinus surgery between July 2023 and June 2024. Patients with CT-confirmed CRS who had failed at least 12 weeks of acceptable medical therapy were eligible for inclusion. Patients with cancer, immunodeficiency, or a history of sinus surgery were excluded. The Sino-Nasal Outcome Test-22 (SNOT-22) questionnaire was used to measure functional results before surgery, as well as three and six months later. Clinical indicators such as nasal blockage, facial pain, and endoscopic results were assessed. Data were entered and analyzed using SPSS version 26. **Results:** At 3 and 6 months, the mean SNOT-22 score dropped from 52.6±11.4 to 24.8±8.9 and 18.2±7.1, respectively ($p<0.001$). Significant progress was made in the following major symptoms: nasal discharge dropped from 82.5% to 17.5%, facial pain from 72.5% to 12.5%, and nasal blockage went from 90.0% to 20.0%. On endoscopy, 70.0% of patients showed normal mucosal status at the 6-month follow-up. Just 10.0% of patients experienced synechiae development, and 7.5% had persistent illness, indicating low complications. **Conclusion:** Endoscopic sinus surgery provides excellent functional and clinical outcomes in individuals with medically resistant chronic rhinosinusitis, with persistent improvement in quality of life and symptom control at 6-month follow-up.

Keywords: *Chronic rhinosinusitis, Endoscopic sinus surgery, SNOT-22, Functional outcomes*

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INTRODUCTION

The nasal cavity and the paranasal sinuses are an arrangement of air-filled spaces coated with respiratory mucosa intended for the warming, humidification, and filtration of inspired air, as well as the implementation of the sense of smell. The sinuses, which include the maxillary, frontal, ethmoid, and sphenoid sinuses, connect through narrow openings termed ostia, whose patency depends on mucociliary clearance. CRS is characterised by the occurrence of an inflammatory condition of the sinonasal tract persisting for 12 or more weeks, in which the appropriate medical care does not result in the alleviation of the symptoms. Functional endoscopic sinus surgery is intended for the recovery of sinus ventilation and drainage, as well as the perpetuation of mucosal function, after conservative care has failed [1,2]. CRS exhibits a high global prevalence and serves as a significant indication for sinonasal surgical interventions. Sequential data have revealed significant improvement in disease-specific quality of life, as assessed by the Sino Nasal Outcome Test 22 (SNOT 22), up to five years post-FESS, demonstrating considerable improvement in symptoms relating to rhinologic, sleep, and facial quality of life [3]. In addition, systematic reviews and meta-analyses have documented significant postoperative improvements in quality of life, as well as postoperative recurrence, in CRS patients undergoing FESS [4,5]. In Asia, similar analysisss has reported significant improvements in symptoms as well as quality of life in CRS patients undergoing ESS. In Bangladesh, prospective and cross-sectional studies have revealed significant improvements in postoperative symptoms scored by CRS patients with refractory CRS undergoing FESS, demonstrating an improvement in quality of life [6,7]. The functional outcome for endoscopic sinus surgery (ESS) has demonstrated a variety of improvements, which are subjective and objective. The SNOT-22 scores indicate that the nasal flow is improved, there is alleviation of facial pressure, and there is an enhancement in health status. The endoscopic examination outcome indicates that there is less disease seen on the mucosa and more patent sinuses after ESS. The benefits for patients are marked, but certain factors that influence outcomes include the presence of nasopharyngeal polyps, asthma, and the extent of disease. The revision rate for ESS surgery is estimated at 15 to 20 percent [8,9]. Despite the extensive studies regarding ESS outcomes, the following limitations exist: the available literature includes few institutional or subgroup-based studies, including those of CRS secondary to nasal polyps, as well as few long-term studies from low and middle-resource countries. Heterogeneity of outcome measures and follow-up also limits the comparability of various studies, while few South Asian studies evaluate the functional and clinical outcomes of heterogeneous CRS cases. In this analysis, it is intended to bridge the gaps and create a more contextually specific body of evidence in existing knowledge by comprehensively evaluating the functional and clinical outcomes of ESS in patients with CRSS to further understand the efficacy of the treatment modality for various patient populations. Therefore, this study aims to evaluate the functional and clinical outcomes after endoscopic sinus surgery for chronic rhinosinusitis

METHODS & MATERIALS

This prospective observational study was conducted at Department of Otolaryngology-Head & Neck Surgery, Bangladesh Medical University, Dhaka over one year from July 2023 to June 2024.

A total of 80 patients who had endoscopic sinus surgery for their chronic rhinosinusitis were included in this study. Sample size calculations were based on previous literature using a 95% confidence interval and 80% power to detect clinically significant differences.CT scan evidence of chronic rhinosinusitis; persistence of chronic symptoms for over 12 weeks despite appropriate medical treatment with oral antibiotics, nasal corticosteroids, and saline irrigations; evidence of having one or more of the following symptoms or their variants: nasal obstruction, nasal discharge, facial pain or tenderness, or a change in smell; evidence of failure of treatment after at least 3 months were included in the study. History of endoscopic sinus surgery, malignancy or granulomatous disease in the sinonasal tract; immunodeficiency states or immunosuppression, pregnancy or lactation, severe systemic diseases that prevent general anesthesia, and lack of follow-up information were excluded. Demographic variables included age, sex, place of residence, and smoking habits. Clinical variables consisted of duration of symptoms, nasal polyps, allergic rhinitis, and asthma. Symptoms reported in the preoperative period included nasal obstruction, nasal discharge, facial pain, headache, loss of smell, and sleep. The functional result was evaluated by SNOT-22 scoring at baseline, 3 months, and 6 months postoperatively. The endoscopic findings at the 6-month follow-up consisted of the status of the mucosa, formation of synechiae, and extent of disease. The collected data were entered, analyzed, and interpreted through IBM SPSS version 26. For describing demographic features, various parameters have been calculated, and for that, continuous variables have been presented as mean±SD. For categorical variables, they have been compared with a chi-square test, considering a p-value of <0.05 as significant.

RESULTS

Table I represents the demographic profile of 80 patients suffering from chronic rhinosinusitis. It was observed that patients were distributed almost similarly in both the lower age groups (30% each for ≤30 and 31-40 years), while the frequency reduced with every increment in the age category. The majority of participants in this study were males, with 57.5%. 60% of the study population consisted of urban residents. The majority had a non-smoking history, while the active smoking history was observed in 27.5% of the respondents.

Table I
Demographic characteristics of the study population (*n* = 80).

Variable	Category	Frequency (%)
Age (years)	≤30	24 (30)
	31-40	24 (30)
	41-50	20 (25)
	>50	12 (15)
Sex	Male	46 (57.5)
	Female	34 (42.5)
Residence	Urban	48 (60)
	Rural	32 (40)
Smoking status	Smoker	22 (27.5)
	Non-smoker	58 (72.5)

Table II describes the baseline characteristics of our study population of the cohort of patients, and it shows that a significant number of our population, that is, 52.5%, had symptoms for 1-3 years. Furthermore, nasal polyps were present in 42.5%, which is a significant number of polypous CRs. Allergic rhinitis co-existed with CRS in 37.5%, and 15.0% of our population had coexisting asthma. Most importantly, there was a failure of appropriate medical therapy, and all of our study population had this finding, that is, 100%.

Table II
Baseline clinical profile of patients with chronic rhinosinusitis.

Variable	Category	Frequency (%)
Duration of symptoms	<1 year	18 (22.5)
	1-3 years	42 (52.5)
	>3 years	20 (25)
Nasal polyps	Present	34 (42.5)
Allergic rhinitis	Present	30 (37.5)
Asthma	Present	12 (15)
Failed medical therapy	Yes	80 (100)

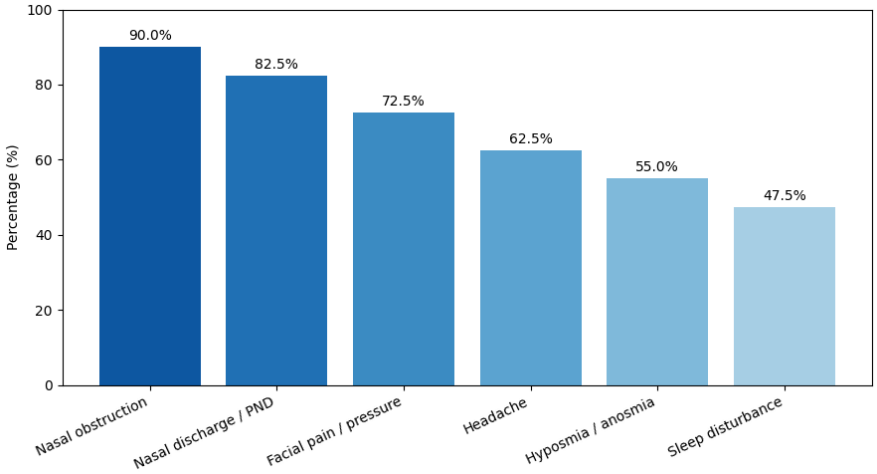

Figure 1 Preoperative symptom distribution (n = 80).

Figure 1 depicts the prevalence of preoperative symptoms among the participating patients. The most predominant symptom was a feeling of nasal obstruction, present in 90.0% of the patients. It was then followed by nasal discharge and post-nasal drip at 82.5%. In addition, 72.5% of the patients reported facial pain or pressure. Other symptoms included headache (62.5%), hyposmia or anosmia as signs of an olfactory dysfunction (55.0%), and sleep disturbance (47.5%).

Table III indicates the progression of functional outcomes using a validated SNOT-22 questionnaire. The preoperative SNOT-22 scores were high at 52.6 ± 11.4. However, postoperative SNOT-22 scores at the 3rd month were remarkably reduced to 24.8 ± 8.9. This indicates a significant improvement of 52.9%. In this case, such improved outcomes continued progressively at 6 months to 18.2 ± 7.1. This indicates a general reduction of 65.4%. It was analyzed that there were highly significant differences at all these times ($p < 0.001$).

Table III
Functional outcome assessment using SNOT-22 score.

Time point	Mean ± SD	p-value
Preoperative	52.6 ± 11.4	-
3 months postoperative	24.8 ± 8.9	<0.001
6 months postoperative	18.2 ± 7.1	<0.001

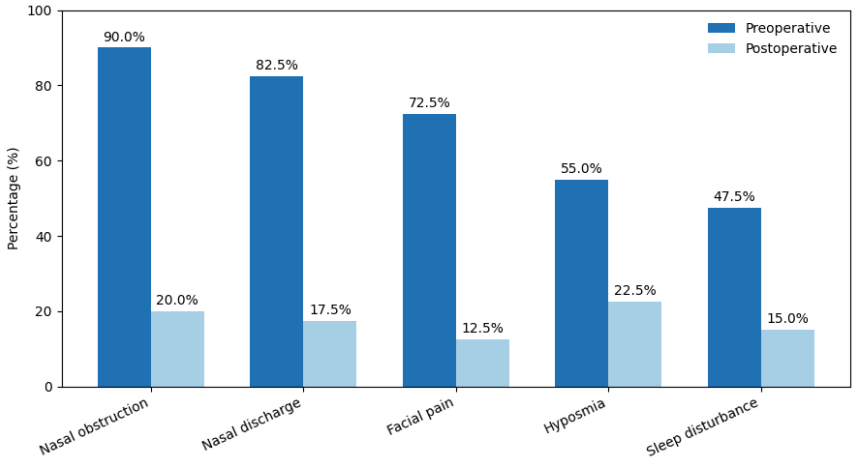

Figure 2 Comparison of key clinical symptoms before and after surgery.

Figure 2 illustrates a comparative analysis of the cardinal symptoms pre- and post-surgery. Nasal obstruction exhibited the most significant changes post-operatively, showing a reduction from 90.0% pre-surgery to 20.0% post-surgery. In addition, nasal discharge post-surgery showed a reduction from 82.5%, while facial pain showed a significant reduction from 72.5%. Olfactory dysfunction showed improved changes post-surgery. Hyposmia, used to measure olfactory dysfunction, showed a significant reduction from 55.0%, with many patients showing decreased occurrences at 22.5%. Sleep disturbance showed improved changes post-surgery.

Table IV presents the findings from the endoscopic evaluation performed to observe the effects of the surgical intervention. Six months after the surgical procedure, out of the total patients treated, 70.0% exhibited a normal mucosal appearance following surgery. Some of the patients, 22.5%, showed mild mucosal edema, while 7.5% showed edema that required medical management. Complications were rare since 10.0% of the patients showed the formation of synechiae, while 7.5% showed the presence of the disease following surgery. These results were promising based on the subjective evaluation of the effectiveness of the surgical procedure.

Table IV
Postoperative endoscopic findings at 6-month follow-up.

Finding	Category	Frequency (%)
Mucosal status	Normal	56 (70.0)
	Mild edema	18 (22.5)
	Persistent edema	6 (7.5)
Synechiae	Present	8 (10.0)
Residual disease	Present	6 (7.5)

Table V provides a complete quantitative comparison of objective and subjective outcome variables. All metrics showed statistically substantial improvement ($p < 0.001$). The SNOT-22 score decreased by 65.4% compared to baseline. Individual symptom scores showed significant decreases: nasal obstruction from 3.6±0.8 to 1.2±0.6 (66.7% reduction), facial pain from 3.1±0.9 to 0.9±0.5 (71.0% reduction), and endoscopic edema from 2.4±0.7 to 0.8±0.5 (66.7% reduction). This simultaneous improvement in subjective symptoms and objective endoscopic results validates ESS efficacy.

Table V
Comparison of pre- and postoperative outcomes.

Parameter	Preoperative Mean ± SD	Postoperative Mean ± SD	p-value
SNOT-22 score	52.6 ± 11.4	18.2 ± 7.1	<0.001
Nasal obstruction score	3.6 ± 0.8	1.2 ± 0.6	<0.001
Facial pain score	3.1 ± 0.9	0.9 ± 0.5	<0.001
Endoscopic edema score	2.4 ± 0.7	0.8 ± 0.5	<0.001

DISCUSSION

CRS, or chronic rhinosinusitis, is a substantial healthcare issue that affects the world's population, covering approximately 12% of the adult population and causing substantial impacts on the quality of life [10]. This study assessed the functional and clinical outcomes of ESS in 80 patients with medically refractory chronic rhinosinusitis, showing marked improvements in outcome measures. These results correlate with those ofRosenfeld et al. regarding ESS as the definitive surgical intervention, even after the failure of medical management [11]. The demographic distribution of our study showed a slight male dominant pattern (57.5%), which was in line with Smith et al., who showed an almost identical distribution in the study cohort [12]. The peak age distribution was in the younger age groups, with an incidence of ≤40 years old in 60%, contrasting with the study by Abdalla et al., who found a bimodal distribution with an increased peak in the elderly [13]. The higher incidence in the urban areas (60%) might likely be due to the exposure rate of environmental pollution, as reported in the studies of Chalermwatanachai et al., showing a correlation with the prevalence of CRS [14]. Baseline clinical characteristics showed that symptoms were present for 1-3 years before surgical intervention in 52.5% of patients. This duration reflects appropriate patient selection after trials of adequate medical therapy. The prevalence of nasal polyps was 42.5% in our cohort and was within the range reported in CRS populations of 25-50% [15]. Also, allergic rhinitis in 37.5% and asthma in 15.0% point toward the unified airway disease concept, with these comorbidities recognized to impact surgical outcomes [16]. All patients had documented failure of medical therapy, meeting consensus criteria for surgical candidacy [17]. The main finding of the study is a reduction in the SNOT-22 score from 52.6±11.4 to 18.2±7.1 at 6 months. This constitutes a 65.4% improvement and is well above the minimal clinically important difference of 8.9 points as reported by Hopkins et al. [18]. The results were comparable with a large prospective cohort reported by Decode et al. with mean improvements of SNOT-22 scores of 28.4 points [19]. The progressive improvement from 3 to 6 months suggests continued healing and adaptation and underlines the importance of longer follow-up for outcome assessment. Results of the individual symptom evaluation indicated remarkable improvement in all major symptoms of CRS. Nasal obstruction, being the most common presenting symptom (90%), showed a marked reduction to 20% postoperatively. The reduction of 70% is more significant than the 55% improvement rates reported by Soler et al. [20]. Complete resolution of facial pain from 72.5% to 12.5% is a marked improvement in the effectiveness of ESS in managing sin nasal pain, which is a difficult symptom domain to address. An improvement in olfactory dysfunction from 55.0% to 22.5% reflects the literature stating that olfactory recovery is related to the removal of polyps and mucosal healing [21]. In addition, the endoscopic results obtained after a follow-up period of 6 months showed positive mucosal healing, with the mucosa returning to normal in 70% of the patients. These results compare favorably with Psaltis et al., who noted only 65% normal mucosal patterns in the patients who underwent follow-up after similar periods [22]. These findings indicate the minimal rate of associated complications like synechiae (10%) and the disease itself (7.5%). These findings may be related to the present technology used for the procedure compared to the previously noted rates of complication, ranging between 15-20%. The simultaneous improvement of subjective SNOT-22 measures and objective endoscopic findings reinforces the construct validity of the multidimensional concept of surgical success in CRS. This congruence between patient-reported outcomes and objective clinical measures is an added confidence booster in the effectiveness of the procedure.

LIMITATIONS

The study was limited by its single-center design and relatively short follow-up period of 6 months, which may not capture long-term outcomes or recurrence patterns that could emerge beyond this timeframe.

CONCLUSION

Our study demonstrates that endoscopic sinus surgery is beneficial in bringing about dramatic improvements in both functional and clinical parameters in patients with chronic rhinosinusitis of medically intractable origin. The profound decrease in SNOT-22 scores, resolution of cardinal symptoms, and endoscopic healing patterns suggest that ESS is an effective therapy with excellent outcomes at 6 months.

RECOMMENDATIONS

Future studies should incorporate multicenter randomized controlled trials

with extended follow-up periods of at least 2-3 years to assess long-term efficacy, recurrence rates, and the impact of emerging adjunctive therapies on surgical outcomes.

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CONFLICT OF INTEREST
None declared

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