

The Outcome of Endoscopic Sinus Surgery in terms of Olfaction in Patients of Chronic Rhinosinusitis with Polyps

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Abstract

Objective: To assess the effectiveness of functional endoscopic sinus surgery in improving olfaction in patients diagnosed with chronic rhinosinusitis with nasal polyps, as measured by changes in Sniffin's Stick scores and olfaction scores pre and post operatively. **Methodology:** The clinical observational study was conducted at the ENT department, Services Hospital, Lahore for 6 months from 01-03-2022 to 31-08-2022. Sixty-six patients (66) diagnosed with chronic rhinosinusitis with nasal polyps were enrolled, and evaluated by using Sniffin's Stick score and olfaction baseline score. The inclusion criteria were patients aged 10-60 years of age diagnosed with this condition and willing to undergo surgery. Operative time was noted. After surgery, patients were discharged and were followed-up in OPD for 3 months. After 3 months, patients were re-evaluated for Sniffin's Stick score and olfaction score.

Results: The mean age of the patients was 36.18±13.87 years, 49(74.24%) patients were male. On pre-op evaluation the mean Sniffin's Stick score of the patients was 6.14±0.41 which improved to 7.34±0.41 on post-op evaluation. Similarly on pre-op evaluation the mean olfaction score of the patients was 8.30±5.84 which improved to 21.12±5.95 on post-op evaluation.

Conclusion: There is significant improved outcome observed in terms snuffiness and olfaction score for functional endoscopic sinus surgery in patients of chronic rhino-sinusitis with nasal polyps

Keywords: Chronic Rhinosinusitis, Nasal polyps, Functional Endoscopic Sinus Surgery, American Society of Anesthesiologists (ASA).

Introduction

Chronic rhinosinusitis with or without polyps, is common in ENT practice affecting the nose and sinuses. The therapeutic approach is prolonged administration of medication (oral and topical steroids) and if ineffective, endoscopic sinus surgery is done. The chronic rhinosinusitis may present as a condition with or without nasal polyps. The prevalence of both forms of chronic rhinosinusitis is around 11% globally.¹ Chronic rhinosinusitis with nasal polyps is considered the more severe form and is linked with prevalence ranging from 1% to 4%.¹ The olfactory dysfunction is highlighted and prominent symptoms reported by individuals with this condition. The pathophysiology of olfactory dysfunction in chronic rhinosinusitis is multifactorial, often involving substantial obstructive pathophysiology.² Endoscopic sinus surgery has proven to be an effective treatment for the chronic rhinosi-

nusitis with nasal polyps when medical intervention has not succeeded.³

The improvement in smell after sinus surgery for chronic rhinosinusitis nasal polyps are significant but research in this area is limited. Local data is scarce, highlighting the need for evidence specific to our population to support the use of sinus surgery for nasal polyps. These factors impede the binding of odorants to the olfactory receptor sites and can result in alterations to the nasal epithelium.⁴ The amelioration of chronic rhinosinusitis can yield a favorable success rate for improving olfactory loss associated with the condition, although complete restoration to normal olfaction levels is not always attainable.⁵ Chronic rhinosinusitis with nasal polyps (CRSwNP) is a common inflammatory condition that impacts a significant portion, estimated to be around 12%-14% particularly in European countries.⁶ This ailment is characterized by the presence of bilateral nasal polyps and persistent symptoms, including nasal congestion, runny nose, loss of smell, and headache. These symptoms have a profound effect on quality of life and contribute to a substantial economic burden.

Medical intervention such as nasal corticosteroids nasal irrigation antibiotics and short course of oral corticosteroids are used initially. Functional Endoscopic Sinus Surgery (FESS), along with medical treatment, has been shown in numerous studies to significantly alleviate symptoms.⁷ However, despite the benefits of ESS, many patients experience a high rate of disease recurrence in the long term, even after surgery. This highlights a pressing need for innovative therapies that can offer better long-term control of CRSwNP. Further research and the development of new treatment approaches are essential to address this challenge and improve the long-term outcomes for individuals with CRSwNP. Therefore, our study aims to fill this gap by investigating the effectiveness of ESS specifically in our local populations, with goal of identifying ways to achieve more sustainable control of CRwNP.⁸

Methodology

This clinical observational study was executed on

66 patients at the Department of Otolaryngology of Services Hospital located in Lahore for a duration of six months, commencing from March 1st, 2022, until August 31st, 2022. The ethical approval was taken from committee with ref. number 14/09/23/1189. The subjects included were those diagnosed with CRSwNP, excluding patients possessing a history of previous sinus surgery, severe comorbidities, or contraindications pertaining to FESS. Baseline assessment was performed on the patients, which involved evaluating their Sniffin's Stick score and olfaction score. The Sniffin' Stick test evaluates olfactory function through three subtests: Threshold (T), Discrimination (D), and Identification (I). The T test determines the lowest concentration of an odorant a person can detect, scored by the mean of the last four out of seven reversal points.

The D test assesses the ability to distinguish different smells using 16 triplets of pens, with each correct identification scoring 1 point (max score 16). The I test involves identifying 16 different odors from four choices, with each correct answer scoring 1 point (max score 16). The composite TDI score, summing T, D, and I, ranges from 0 to 48, indicating the overall olfactory function. Higher scores reflect better olfactory performance, with specific cutoffs used to classify normosmia, hyposmia, and anosmia.⁹ It comprises three tests of olfactory function, namely, test for odor threshold, odor discrimination, and odor identification. FESS was executed by a single surgical team, with the aid of a researcher, under general anesthesia.

The duration of surgery for each patient was noted. Post-surgery patients were discharged and monitored in the outpatient department (OPD) for a span of three months. At the conclusion of the three-month follow-up period, patients were reevaluated for their Sniffin's Stick score and olfaction score.¹⁰ Descriptive statistics were utilized to analyze the baseline characteristics of the patients. Paired t-tests or non-parametric tests were employed to compare the pre- and post-operative Sniffin's Stick scores and olfaction scores. The collected data were analyzed and interpreted to offer insights into the effectiveness of FESS in ameliorating olfaction in this specific patient population. The statistical analysis was done by applying the statistical tools of SPSS version 21.

Results

A total of 66 patients were included, falling between the age range of 13.87 – 36.18 years. Among the cohort, 49 individuals (74.24%) were male and 17 individuals (25.76) were females, establishing a male to female ratio of 2.8:1. An additional 30 patients were enrolled in a control group, which received standard medical treatment without surgery. The control group served to provide a baseline comparison, ensuring the observed improvements in the FESS group were attributable to the surgery. The results of the study have been given in detail in Table 1 below.

Table 1: Summary statistics of Pre and Post-op Sniffin's Stick Store

Sniffin's Stick score	n	Mean	SD	Minimum	Maximum
Pre-op	66	6.14	0.41	5.50	7.00
Post-op	66	7.34	0.41	6.70	8.20

On pre-op evaluation the mean olfaction score of the patients was 8.30±5.84, having range of 0.00 to 20.0. On post-op evaluation, the mean olfaction score of the patients was 21.12±5.95

having range of 8 to 30.

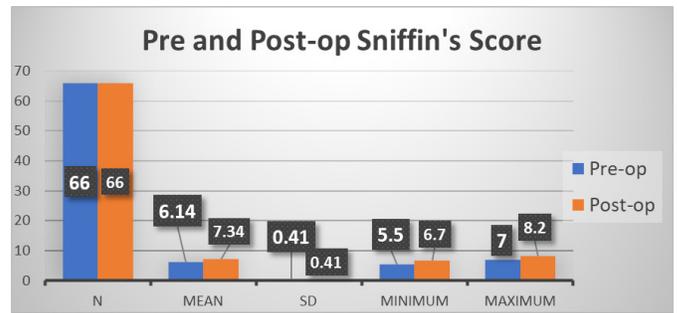


Figure 1: These summary statistics demonstrate a noticeable improvement in both the Sniffin's Stick score and olfaction score following the functional endoscopic sinus surgery. The higher post-operative scores indicate an enhancement in olfactory function among the patients with chronic rhinosinusitis and nasal polyps.

Table 2: Summary statistics of Pre and Post-op olfaction score

Olfaction score	n	Mean	SD	Minimum	Maximum
Pre-op	66	8.30	5.84	0.00	20.00
Post-op	66	21.12	5.95	8.00	30.00

Table 2 compares the pre operative and post operative Sniffin's Stick scores across different variables such as age, gender, duration of symptoms, American Society of Anesthesiologists (ASA) classification and operative time. The p-value indicate the statistically significant difference between pre-op and post-op scores of each variable.

Table 3: Mean and SD Values

Parameter	Mean ± SD	Range (Min - Max)
Duration of Symptoms (months)	3.91± 2.72	0.50 - 10
ASA I	53(80.30%)	
ASA II	13(19.70%)	
Operative Time (minutes)	38.48 ± 15.56	10 - 90
Pre-op Sniffin' Stick Store	6.14 ± 0.41	5.57 - 7
Post-op Sniffin' Stick Store	7.34 ± 0.41	6.70 - 8.20

Discussion

In this study we sought to evaluate the effectiveness of functional endoscopic sinus surgery (FESS) in improving olfaction in patients diagnosed with chronic rhinosinusitis with nasal polyps. Our methodology involved conducting a descriptive case series at the ENT department of Services Hospitals, Lahore, over six-month period. Sixty patients were enrolled and performed baseline evaluations using Sniffin's Stick score and olfaction score pre-operative. We conducted 3 month post operative evaluation. Our results demonstrated significant improvements in both Sniffin's Stick scores and olfaction scores post operatively. The purpose of study was to investigate whether FESS could serve as an effective treatment modality for olfactory dysfunction in patients with chronic rhinosinusitis and nasal polyps.

The timing and indications for functional endoscopic sinus surgery (FESS) in the management of chronic rhinosinusitis with or without polyps (CRSwNP/CRSSNP) are primarily based on the knowledge of practitioners.¹¹

The determination of when and why functional endoscopic sinus surgery is recommended in the treatment of chronic rhinosinusitis with or without polyps relies mainly on the clinical expertise and judgment of healthcare professionals. Medical protocols both the national and international levels recommend initiating pharmacological intervention for at least one-month prior to contemplating surgical intervention.¹² Following clinical evaluations, patients are typically prescribed a pharmacological intervention regimen that includes nasal corticosteroids, with the possibility of a short course of systemic corticosteroids or more prolonged antibiotic regimen.¹³⁻¹⁵ In this study on pre-operative evaluation, the mean score on the Sniffin' Stick test for patients was 6.14 ± 0.41 , which improved to 7.34 ± 0.41 on post-operative evaluation. Similarly, the mean olfaction score for patients on pre-operative evaluation was 8.30 ± 5.84 , which improved to 21.12 ± 5.95 on post-operative evaluation. While our results demonstrate significant improvements in both Sniffin's Stick scores and olfaction scores post-operatively, it is essential to consider potential confounding variables that could have influenced these outcomes.^{16,17} Patients with additional health conditions, such as diabetes or asthma, may experience different outcomes due to their overall health status, and the use of medications like systemic corticosteroids or antibiotics before and after surgery could also affect the results. Additionally, the baseline severity of CRSwNP might influence post-operative outcomes, with patients having more severe disease potentially responding differently to surgery compared to those with milder forms. Variations in surgical technique and the experience level of the surgeon performing the FESS are other confounding factors.^{18,19,20}

Louijisen et al. (2022) conducted a study that demonstrated a significant improvement in the sense of smell of patients with CRSwNP following sinus surgery, which is the most responsive CRS subgroup to surgical intervention.²¹ Moreover, improving olfaction in the CRSwNP subgroup is likely to enhance the patient's overall quality of life. Endoscopic sinus surgery also significantly improved the NOSE scale in both CRS subgroups six months following the surgery. In a study by Zhang et al. (2019) post-endoscopic sinus surgery olfactory improvements were noted in 70% of patients with CRS, while olfaction declined in 8%.²² In another study, the mean change in olfaction score improved from 2.05 ± 3.93 to 10.43 ± 4.13 after three months.⁸ Additionally, it was reported that the mean Sniffin's Stick score in cases with nasal polyps improved from 6.4 ± 3.6 to 7.5 ± 3.0 , with the difference between the groups being significant and indicating that the outcome (olfactory function) was better without polyps than with polyps.²³ Qureshi et al. (2022) conducted a five-year prospective study, of whom 75% had CRSwNP, and noted a significant improvement in measured olfaction at two years post-surgery, which became nonsignificant at five years. Interestingly, Mullol et al. (2023) also demonstrated a significant improvement in olfaction following ESS that remained significant long-term.²⁴ Mohanty et al. (2016) conducted a study examine

the impact of nasal surgery encompassing both sinus and septal procedure, on olfaction using the 16-item order identification sniff in stick test.²⁵ The conclusion at 3.5 month postoperatively revealed a notable enhancement in the sinus surgery groups, in contrast to less significant improvement in the septal surgery groups. Interestingly both groups showed non-significant changes at the 12-month marks. The study also indicates that the presence of polyps and eosinophiles served as positive prognostic factors for improved olfactory outcomes. Yang et al. (2021) investigated the effects of nasal surgery, including both sinus surgery and septal surgery, on olfaction using the 16-item odour identification 'Sniffin' stick test.²⁶ At 3.5 months postoperatively, there was a significant improvement in the sinus surgery arm, as opposed to a nonsignificant improvement in the septal surgery arm. Notably, both became non-significant at 12 months. They also found that polyps and eosinophilia were good prognostic factors for improvement in olfactory outcome.

Kamath et al. (2024) illustrated in their study that individuals with profound olfactory impairment demonstrated noteworthy enhancement subsequent to endoscopic sinus surgery, whereas individuals with moderate impairment did not encounter such marked modifications.²⁷ Therefore, an authentic assessment of the influence of ESS on smell could be established. The rationale of this study is to determine the outcome of functional endoscopic sinus surgery in improvement of olfaction in patients of chronic rhino-sinusitis with nasal polyps. The mean change in Olfaction score was improved from 2.05 ± 3.93 to 10.43 ± 4.13 after 3 months. It has been reported in a study that the mean Sniffin's Stick score was improved from 6.4 ± 3.6 to 7.5 ± 3.0 in cases with nasal polyp. The difference in both groups was significant and showed that without nasal polyps, the outcome (olfactory function) was better than with polyps. The postoperative medical treatment of individual with Chronic rhinosinusitis with nasal polyposis remains a subject of controversy. Furthermore, extensive epidemiological and olfactometric studies within the population are necessary to better understand olfactory disorder in this context. This study innovates by providing the data on the effectiveness of functional endoscopic sinus surgery in improving olfaction in chronic rhinosinusitis with nasal polyps' patients. Through rigorous statistical analysis and comprehensive assessments, it quantified the notable improvement in olfactory function post-surgery. By comparing its findings with previous research, the study adds to the existing knowledge on FESS outcomes, particularly in the context.

The localized approach is an analytical approach to medical worker for better understanding the diagnostic criteria of patients.²⁷ Future studies can enhance the evaluation of FESS for chronic rhinosinusitis with nasal polyps (CRSwNP) by using advanced techniques. Objective olfactory tests, like olfactory event-related potential (OERP) tests, can provide more accurate assessments. High-resolution imaging techniques, such as diffusion tensor imaging (DTI), can reveal structural changes in the olfactory bulb and tract. Wearable technology can monitor patients' daily olfactory experiences and nasal airflow, offering real-world data. Machine learning algorithms can analyze large datasets to identify patterns and predictors of surgical success. Integrating patient-reported outcome measures (PROMs)

through mobile health (mHealth) applications can facilitate continuous monitoring of olfactory function and quality of life. These techniques can lead to improved treatment strategies and better patient care.

Limitations

Limitation of study is the sample size which is narrow line to significant but not cover the major domains. Further the control group is not adding an effective role over to study by hindering the comparison. Additionally subjective measure for absence of a control group function and short-term focus limits the study robustness.

Conclusion

This study concluded that there is improved outcome observed in terms of snuffiness and olfaction score following functional endoscopic sinus surgery in individuals of chronic rhino-sinusitis with nasal polyps.

Recommendations

To enhance the internal validity of future studies, we recommend conducting thorough assessments of all relevant comorbidities and ongoing treatments at baseline, implementing standardized protocols for pre- and post-operative medications, stratifying patients based on key variables such as disease severity, comorbidities, and medication use, and ensuring that all surgeries are performed using a standardized technique by surgeons with comparable levels of experience. By acknowledging and addressing these potential confounding factors, future research can more accurately assess the effectiveness of FESS in improving olfaction in patients with CRSwNP, enhancing the generalizability and reliability of the findings, and providing clearer guidance for clinical practice.

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