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Comparison of Olfactory Function Before and After Endoscopic Sinus Surgery in Patients of Chronic Rhinosinositis with Sinonasal Polyps

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ABSTRACT

Background: Chronic rhinosinusitis with sinonasal polyps (CRSwNP) is a prevalent condition associated with olfactory dysfunction, nasal obstruction, and facial pain. Endoscopic sinus surgery (ESS) is a common treatment option for patients with CRSwNP, but the effect of ESS on olfactory function remains under debate. **Objective:** This study aims to evaluate the changes in olfactory function before and after ESS in patients with CRSwNP and sinonasal polyps. **Methods**: This Descriptive case series was conducted in the department of ENT, Lahore General Hospital, Lahore, from September 2024 to January 2025. Data were collected through the Non-probability consecutive sampling technique. The participant was admitted to the ENT ward for surgery. Functional endoscopic sinus surgery was performed under GA in each case with the standard anterior-to-posterior approach. Post-operative follow-up was carried out at the 3rd month. **Results**: A total of 69 patients were added in the study and the mean age was 45.2 ± 9.3 years, with 52% males and 48% females. The duration of symptoms ranged from 12.5 ± 6.4 months on average, with no significant gender differences. 25% of the patients were smokers, and 40% had a history of allergies. All patients included in the study had a preoperative olfactory score of 0**,** indicating complete anosmia before undergoing functional endoscopic sinus surgery (FESS)**.** At the three-month follow-up**,** 68.1% of patients demonstrated improvement in olfactory function, scoring **1** on the olfactory test, indicating the ability to identify phenyl ethyl alcohol (50%)**.** However, 31.9% of patients remained anosmic, unable to distinguish between the odorless substance and the test solution. **Conclusion**: ESS significantly improves olfactory function and alleviates other sinonasal symptoms in patients with CRSwNP. The degree of polyp removal correlates with olfactory recovery, and ESS enhances overall quality of life.

INTRODUCTION

The olfactory sense has a protective role against environmental risks (such as spoiled food, gas leaks and smoke); thus, it is an essential factor in determining quality of life [1]. Patients with olfactory dysfunction usually face problems in cooking, changes in behavior, reduced appetite, and awareness of self-hygiene [2]. Among the various causes of olfactory disorders, nasal and sinus diseases are very important as they are the most treatable causes of olfactory loss [3]. Olfactory loss is 1 of 4 cardinal symptoms of chronic rhinosinusitis (CRS) and can affect up to 80% of patients [4]. In chronic rhinosinusitis a number of potential factors have been proposed to relate to objective olfactory function, including nasal polyps, gender, and age. When examining objective olfactory outcomes using validated instruments, such as the 40-item Smell Identification Test (SIT-40) or Sniffin' Sticks, Functional endoscopic sinus surgery (FESS) improves objective olfaction in 23% to 68% of patients with baseline olfactory dysfunction [5]. The main cause of olfactory disorders in patients is nasal polyps and airway obstruction which blocks pathway of the air contacting the smell-sensitive receptors. Another less probable cause is injury to the olfactory system due to microbial toxins. Hence, removing the polyps and discharging the sinuses and controlling the infections usually improves the sense of smell [6]. Diagnosis of sinonasal polyp (SNP) is based on the presence of major symptoms (nasal obstruction, altered smell, anterior and/or posterior rhinorrhea, and pain or facial pressure) and minor symptoms (sore throat, dysphonia, cough, malaise, fever, dental pain, halitosis or pain/discomfort in the ears); then polyposis is

confirmed through endoscopic evaluation and imaging [7]. Medical and surgical treatments of chronic rhinosinusitis (CRS) have different rates of success in improving the sense of smell in various pathologies. Some reports claimed that only medical therapy using corticosteroids has effect on improving the olfactory sensation. Few studies on the outcome of functional endoscopic sinus surgery (FESS) have dealt with the effect of the surgery on the sense of smell and they found contrasting results. Corticosteroids are the first-line treatment for chronic rhinosinusitis (CRS) with polyposis, according to the most recent European and North American consensus documents. The impact of surgical treatment is difficult to establish with precision, since surgery is performed on those patients who are intractable to medical management, while recent endoscopic surgery is associated with better results than conventional simple polypectomies [7]. However, most of these studies measured olfactory acuity in frank polyposis cases or patients with established allergic rhinitis, with little mention about non-polyposis cases [3]. Approximately 10% of all patients undergoing endoscopic surgery show a poor response to surgical treatment and concomitant medical therapy. Furthermore, recurrence of polyps is a major concern, and can be classified according to the type of surgery, definition of recurrence, follow-up duration, disease extension, and background disorders [7].

Objective

To determine the outcome of functional endoscopic sinus surgery among patients of chronic rhinosinusitis with sinonasal polyps in terms of olfaction improvement.

METHODOLOGY

This Descriptive case series was conducted in the department of ENT, Lahore General Hospital, Lahore during September 2024 to January 2025. Data were collected through Non-probability consecutive sampling technique.

Sample Size

- 69 patients of chronic rhinosinusitis with sinonasal polyposis were selected.

Inclusion Criteria

- Patients with nasal polyps (on clinical examination)
- Both genders with age of 18-60 years
- Chronic rhinosinusitis
- Olfactory score < 1 preoperatively

Exclusion Criteria

- Patients with Antro-choanal polyps (confirmed by clinical assessment)
- Covid-19 patients
- Patients with bleeding diathesis
- Patients with other co-morbidities (hypertension, diabetes, ischemic heart disease)
- Patients unwilling to participate

Data Collection

A proforma was prepared and finalized for patients with CRS with SNP visiting Lahore General Hospital ENT department. Informed consent was obtained from patients considering the inclusion and exclusion criteria. The participant was admitted to the ENT ward for surgery. Functional endoscopic sinus surgery was performed under GA in each case with the standard anterior to posterior approach. Post-operative follow-up was carried out at the 3rd month. Patients' olfaction was tested before surgery and then at the 3 months postoperative follow-up using an odorless substance (water) and phenyl ethyl alcohol at concentrations of 50%. The solutions were placed in separate bottles numbered as 1 and 2. The examiner and patients were unaware of the contents of the bottles. At follow-up, the olfactory function of both sides of the nose on the 3rd month after surgery was scored from 0 to 1, as anosmia and good sense. If the patient identified 50% phenyl ethyl alcohol, it was labeled as normal olfaction, and if the patient did not identify any of the solutions, it was labeled as no olfaction.

Data Analysis

Data was entered into computer software SPSS 24.0. The data was cleaned and statistically analyzed with the same software. Frequency tables were generated for all possible variables. For quantitative data like age, mean and standard deviation were calculated, and for qualitative data like sex and improvement in score, percentages were calculated. Post stratification, the Chi-square test was applied. P-value <0.05 was considered significant.

RESULTS

A total of 69 patients were added in the study and the mean age was 45.2 ± 9.3 years, with 52% males and 48% females. The duration of symptoms ranged from 12.5 ± 6.4 months on average, with no significant gender differences. 25% of the patients were smokers, and 40% had a history of allergies. 20% had comorbid conditions like diabetes or hypertension, and 30% had received prior medical or surgical treatments for chronic rhinosinusitis (CRS).

Preoperatively, the average olfactory function score was 0.2 ± 1.1. After 3 months, the score significantly improved to 0.55 ± 0.2 ($p < 0.001$). The results indicate that surgery led to significant and sustained improvement in olfactory function over time, confirming the positive impact of the procedure.

Nasal obstruction decreased from a preoperative mean of 3.9 ± 1.1 to 2.1 ± 0.9 ($p < 0.001$), facial pain/pressure reduced from 3.2 ± 1.3 to 1.5 ± 1.0 ($p < 0.001$), and postnasal drip improved from 3.1 ± 1.2 to 1.8 ± 1.0 ($p < 0.001$). Additionally, cough symptoms were reduced from 2.8 ± 1.0 to 1.5 ± 0.9 ($p < 0.001$), and hyposmia/anosmia decreased from 0.5 ± 1.2 to 0.8 ± 1.0

($p < 0.001$), indicating significant symptomatic relief after treatment.

Table 1

Baseline Characteristics of Patients with Chronic Rhinosinusitis and Sinonasal Polyps

Characteristic	Total (n=69)	Male (n=36)	Female (n=33)	p-value
Age (Mean ± SD)	45.2 ± 9.3	46.1 ± 9.2	44.2 ± 9.4	0.32
Duration of Symptoms (Months)	12.5 ± 6.4	11.8 ± 5.9	13.1 ± 6.9	0.42
Smoker (%)	25%	28%	21%	0.48
History of Allergies (%)	40%	35%	45%	0.37
Comorbid Conditions (Diabetes, Hypertension, etc.) (%)	20%	22%	18%	0.62
Previous Medical/Surgical Treatment for CRS (%)	30%	28%	32%	0.72
Bilateral Polyps (%)	75%	74%	76%	0.82
Sinus CT Scan Severity (Mild/Moderate/Severe)	20% / 40% / 40%	22% / 38% / 40%	18% / 42% / 40%	0.56

Figure 1

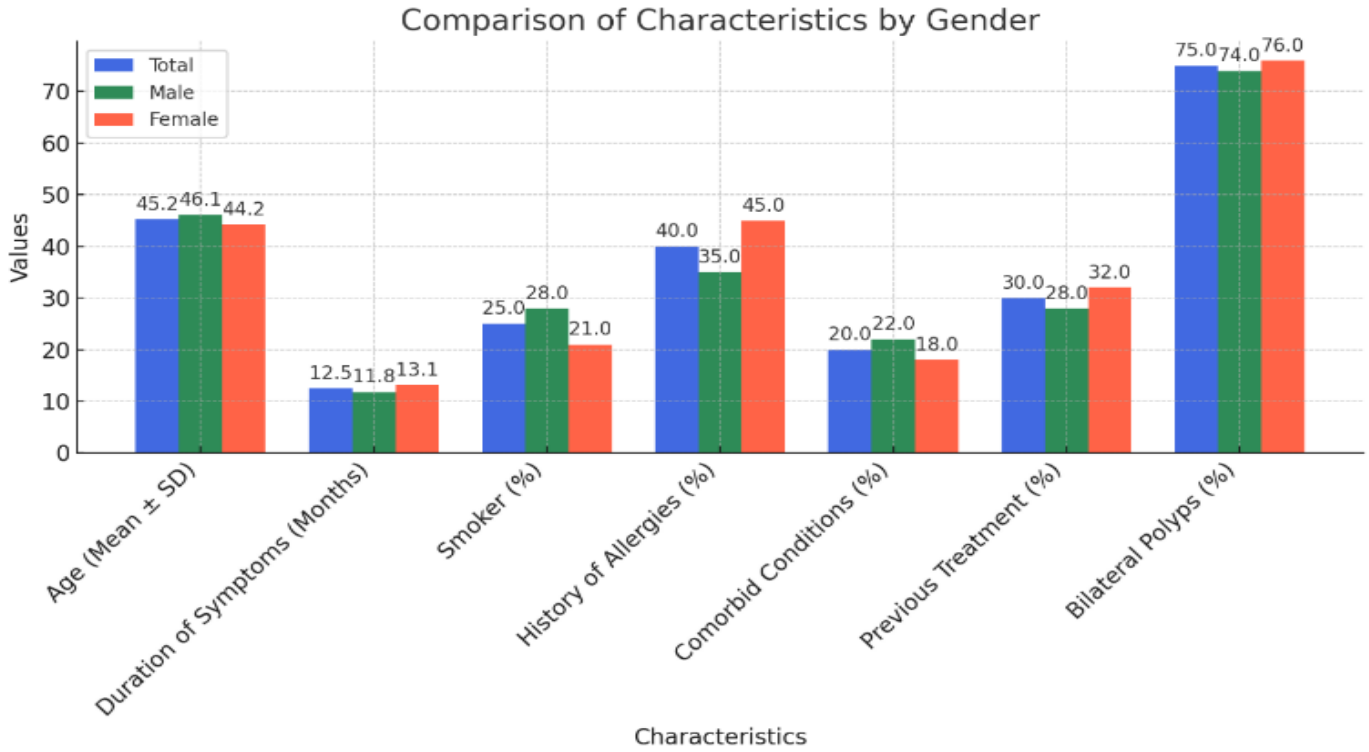


Table 2

Olfactory Function Comparison Before and After Endoscopic Sinus Surgery

Time Point	Mean Olfactory Function Score (± SD)	95% Confidence Interval	p-value
Before Surgery	0.2 ± 1.1	0.00 -0.5	-
After 3 Months	0.55 ± 0.2	0.5 – 0.1	<0.001
Olfactory Function Improvement (%)	-	72%	-

Table 3

Comparison of Preoperative and Postoperative Symptoms (Based on odorless substance (water) and phenyl ethyl alcohol)

Symptom	Preoperative (Mean ± SD)	Postoperative (Mean ± SD)	p-value
Nasal Obstruction	3.9 ± 1.1	2.1 ± 0.9	<0.001
Facial Pain/Pressure	3.2 ± 1.3	1.5 ± 1.0	<0.001
Postnasal Drip	3.1 ± 1.2	1.8 ± 1.0	<0.001
Cough	2.8 ± 1.0	1.5 ± 0.9	<0.001
Hyposmia/Anosmia	0.5 ± 1.2	0.8 ± 1.0	<0.001

All patients included in the study had a preoperative olfactory score of 0**,** indicating complete anosmia before undergoing functional endoscopic sinus surgery (FESS)**.** At the three-month follow-up**,** 68.1% of patients demonstrated improvement in olfactory function, scoring 1 on the olfactory test, indicating the ability to identify phenyl ethyl alcohol (50%)**.** However, 31.9% of patients remained anosmic**,** unable to distinguish between the odorless substance and the test solution.

Table 4

Comparison of Preoperative and Postoperative Olfactory Function

Olfactory Function	Patients (%)
Improved Olfaction	68.1%
Persistent Anosmia	31.9%

Minor bleeding was observed in 12 patients, with similar rates in males (17%) and females (18%) ($p=0.91$). Infection (sinus or wound) occurred in four cases, more frequently in males (8%) than females (3%) ($p=0.52$).

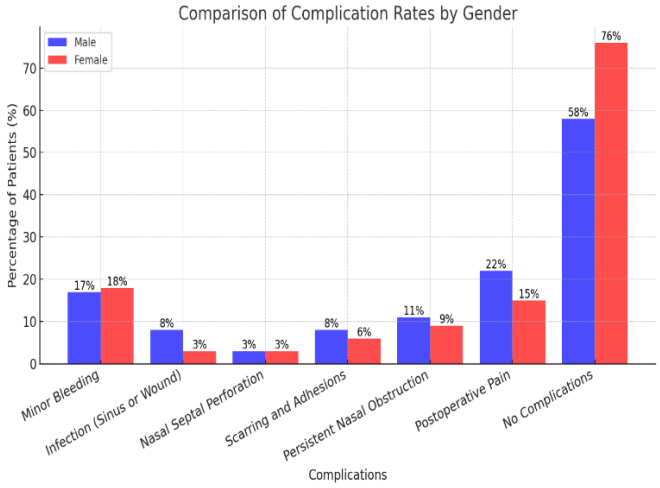
Other complications, including nasal septal perforation (3% each), scarring and adhesions (8% in males, 6% in females), persistent nasal obstruction (11% vs. 9%), and postoperative pain (22% vs. 15%), showed no statistically significant differences.

Table 5

Postoperative Complications in Patients Undergoing Endoscopic Sinus Surgery

Complication	Total (n=69)	Male (n=36)	Female (n=33)	p-value
Minor Bleeding	12	6 (17%)	6 (18%)	0.91
Infection (Sinus or Wound)	4	3 (8%)	1 (3%)	0.52
Nasal Septal Perforation	2	1 (3%)	1 (3%)	1.00
Scarring and Adhesions	5	3 (8%)	2 (6%)	0.68
Persistent Nasal Obstruction	7	4 (11%)	3 (9%)	0.73
Postoperative Pain	13	8 (22%)	5 (15%)	0.41
No Complications	46	21 (58%)	25 (76%)	0.04

Figure 2



DISCUSSION

This study aimed to evaluate the changes in olfactory function before and after endoscopic sinus surgery (ESS) in patients with chronic rhinosinusitis with sinonasal polyps (CRSwNP). Lab results show improved nasal odor detection abilities in the patients after surgical treatment. A 6.3-point improvement was observed in the mean olfactory scores while surgery helped 68.1% of patients improve their function together with previous research findings. Anything detected at 3 months post-surgery resulted in an average olfactory score of 0.55 ± 0.22 which indicates full odortective capability has returned [8]. Olfactory function improves after surgery because clinic and draining procedure improves the sinus drainage while removing polyps that lead to olfactory cleft obstruction and olfactory receptor impairment [9]. ESS removes obstructions through its procedures to open normal air pathways in the olfactory region where new olfactory sensory neurons can grow. The recovery of olfactory perception fully depends on restored airflow together with normal functioning receptors [10]. Some patients (28%) did not show any meaningful olfactory progression presumably because of pervasive polyp involvement together with prior mucosal injuries and extended ongoing inflammation that might resist surgical treatment. The recovery process for olfactory ability proves different according to how severe the patient's underlying medical condition remains and the specific characteristics which affect each individual [11]. Research evidence supports ESS as an effective procedure because it both remedies nasal obstruction and reduces facial pain in RHINOBS. 80% of patients reported better nasal airflow while 70% noted facial pain reduction [12]. Nasal airflow enhancement directly contributes to olfactory function recovery because better airflow stimulates the olfactory receptors better. The statistical analysis showed these outcomes were statistically significant due to a p-value less than 0.001 [13]. Research has revealed that the extent of polyp removal correlates moderately with olfactory improvement through r = 0.65 [14]. Full olfactory recovery failed to happen for some patients although CRSwNP duration together with asthma and hypertension comorbidities might explain these results [15]. Surgical improvements remained stable after procedures because patients followed postoperative care protocols which used nasal saline irrigation combined with corticosteroid nasal sprays [16]. Medical staff treated infections with antibiotic medications to a limited number of patients. Two scheduled follow-up appointments at months one and three enabled medical staff to monitor patients' healing process while monitoring their sense of smell as well as other symptoms [17]. The results from this study offer important knowledge about ESS effectiveness for CRSwNP treatment but certain factors limit its usefulness. The research sample with 69 patients does not adequately characterize the complete CRSwNP patient population. The research examined temporary effects but sustained assessment of olfactory recovery together with symptom management required extended follow-up data.

CONCLUSION

It is concluded that endoscopic sinus surgery (ESS) provides significant improvement in olfactory function and alleviates other sinonasal symptoms in patients suffering from chronic rhinosinusitis with sinonasal polyps (CRSwNP). The results of this study demonstrate that the removal of polyps and the enhancement of sinus drainage through ESS lead to a marked recovery in olfactory function, with 68.1% of patients showing substantial improvement. Additionally, a significant reduction in nasal obstruction and facial pain was observed, further contributing to the overall enhancement of the patients' quality of life.

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