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ORIGINAL ARTICLE

Effect of Endoscopic Sinus Surgery on Olfaction: A Prospective Analysis

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ABSTRACT

Objective: To examine the impact of endoscopic sinus surgery (ESS) on olfactory impairment in patients with chronic rhinosinusitis (CRS) and nasal polyposis over intermediate- to long-term follow-up.

Study design: Prospective, cohort study. Conducted in a tertiary care center over a period of 2 years (August 2014–July 2016).

Materials and methods: A total of 42 patients presenting for ESS were examined preoperatively and at 1st, 3rd, 6th, and 12th week postoperatively. Demographic, comorbidity, and olfactory scores were collected at each point of time. Sniffin Sticks test was used to assess the olfaction of the patients.

Results: Olfactory scores in anosmic patients significantly improved after ESS at 3-month follow-up. Only few hyposmic patients improved after surgery and others did not show any change. Among normosmic patients, 80% showed no change after surgery, whereas 20% became hyposmic postoperatively. None of the normosmics became anosmic after surgery.

Conclusion: Patients with severe olfactory dysfunction significantly improved after ESS, whereas patients with mild olfactory dysfunction did not. A realistic assessment of effects of ESS on olfaction could be derived. This will help in counseling the patients undergoing ESS in future. Olfactory impairment is an important patient safety and quality-of-life issue for patients with CRS and one that requires continued research.

Keywords: Anosmia, Endoscopic sinus surgery, Hyposmia, Sniffin sticks test.

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INTRODUCTION

Decrease in olfaction is a common problem affecting approximately 61 to 69% of patients with chronic rhinosinusitis (CRS).[1] Olfactory impairment has negative impact on patient's quality of life and ability to function safely in day-to-day life.[2] Despite being an important complaint in the setting of sinusitis, relatively few studies are available regarding the impact of endoscopic sinus surgery (ESS) on olfactory function.

In this prospective cohort study, conducted at the Department of ENT and Head and Neck Surgery in Sri Ramachandra University from August 2014 to July 2016, the impact of ESS on olfactory impairment in patients with CRS was objectively examined at various time-frames.

MATERIALS AND METHODS

Study subjects were recruited from a tertiary care center over a 2-year period as part of the prospective cohort study. All patients had a diagnosis of CRS based on the Rhinosinusitis Task Force criteria.[3] Adult (>18 and <60 years old) patients undergoing ESS were enrolled in the study. Patients with acute infections in nose and paranasal sinuses, revision ESS cases, benign and malignant tumors of the nose, and previous history of head trauma and neurodegenerative diseases were excluded from the study.

Cases selected according to the inclusion criteria were subjected to detailed history and examination. The olfaction of all patients planned for ESS was assessed preoperatively using Sniffin Sticks test. Questionnaire for evaluation of patients prior to surgery and to assess the quality of life was done. Preoperative computed tomography (CT) scan and endoscopic examination were scored with the Lund–MacKay and Lund–Kennedy scoring systems.[4] The extent of surgery was tailored to the patient's disease process as defined by signs, symptoms, CT scan, and clinical judgment. Bilateral nasal packs were removed after 24 hours of surgery and patients were administered broad spectrum antibiotics for 5 to 10 days depending on the severity of disease, along with saline nasal douches and intranasal steroid spray.

Then the patients were followed up post ESS at regular intervals and the olfaction was assessed at 1st, 3rd, 6th, and 12th week. The preoperative and postoperative olfactory scores were statistically analyzed.

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MEASUREMENT OF OLFACTORY FUNCTION

Olfactory function was measured with the Sniffin Sticks test (Burghart, Wedel, Germany). These are odor-dispensing devices that resemble pens, measuring about 14 cm in length and diameter of 1.3 cm. Each of the stick is filled with odorants dissolved in propylene glycol. The Sniffin Sticks test consists of 12 pens (consisting of different 12 odors). For odor presentation, the cap is removed by the experimenter for approximately 3 seconds and the pen's tip is placed about 2 cm in front of each nostril. And the patient is asked to sniff. Four choices are given for each pen. Out of the choices given, the patient is asked to identify the smell. If the patient identifies the odor correctly, a score of 1 is given and if the odor identified is wrong, a score of 0 is given. Each patient is made to smell all 12 pens. Total score for each nostril ranged between 0 and 12. In between each smell, time of about 10 seconds was given. Each nostril was tested at a time. The sum of the scores from both the nostrils was taken as the final olfactory score of the patient (maximum score – 24).

Right-sided testing

1	Orange	Blackberry	Strawberry	Pineapple	7	Liquorice	Cherry	Spearmint	Cookies
2	Smoke	Glue	Leather	Grass	8	Cigarette	Coffee	Wine	smoke
3	Honey	Vanilla	Chocolate	Cinnamon	9	Clove	Pepper	Cinnamon	Mustard
4	Chive	Peppermint	Fir	Onion	10	Pear	Plum	Peach	Pineapple
5	Coconut	Banana	Walnut	Cherry	11	Camomile	Rose	Cherry	Glue
6	Peach	Apple	Lemon	Grape	12	Bread	Fish	Cheese	Ham

Left-sided testing

1	Orange	Blackberry	Strawberry	Pineapple	7	Liquorice	Cherry	Spearmint	Cookies
2	Smoke	Glue	Leather	Grass	8	Cigarette	Coffee	Wine	smoke
3	Honey	Vanilla	Chocolate	Cinnamon	9	Clove	Pepper	Cinnamon	Mustard
4	Chive	Peppermint	Fir	Onion	10	Pear	Plum	Peach	Pineapple
5	Coconut	Banana	Walnut	Cherry	11	Camomile	Rose	Cherry	Glue
6	Peach	Apple	Lemon	Grape	12	Bread	Fish	Cheese	Ham

Result (Sum of correct identifications) ☐ right ☐ left

Sniffin Sticks Test

Fig. 1:

The 12 odors in Sniffin Sticks test correspond to the seven primary odors – minty, pungent, putrid, ethereal, camphoraceous, musky, and floral.[5]

INTERPRETATION

Based on the olfactory scores, the patients were divided into three groups.[6]

Table:

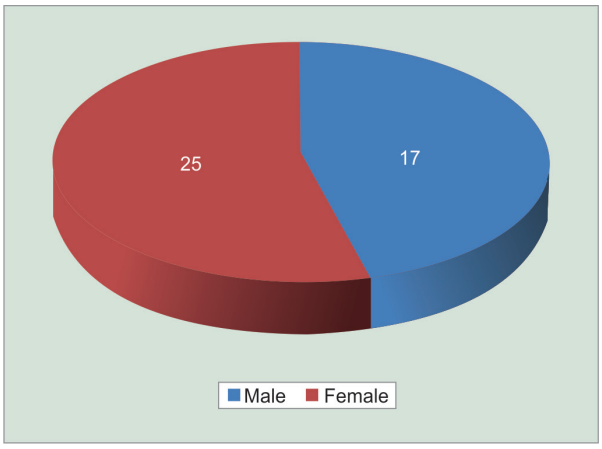
Olfactory score	*Category*
0–8	Anosmic
9–16	Hyposmic
17–24	Normosmic

SURGICAL TECHNIQUE

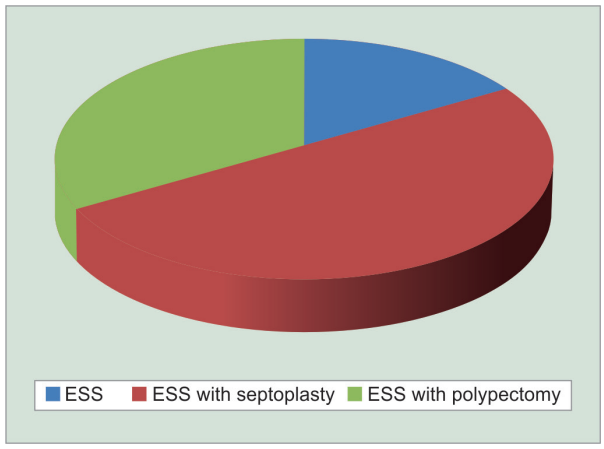
The extent of surgery was tailored to the patient's disease process as defined by signs, symptoms, CT scan, and clinical judgment. Out of the 42 patients, 7 patients underwent ESS, 21 patients underwent ESS with septoplasty, and 14 patients underwent ESS with polypectomy.

BASELINE PATIENT CHARACTERISTICS AND DEMOGRAPHICS

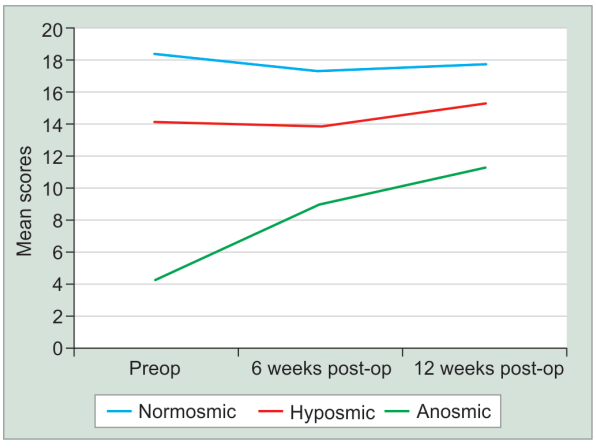
Of the 42 patients with 12-week postoperative follow-up, in this study, 71.4% (n = 30) were normosmic, 21.4% (n = 9) were hyposmic, and 7.14% (n = 3) were anosmic preoperatively.



Graph 1: Gender distribution



Graph 2: Surgeries performed



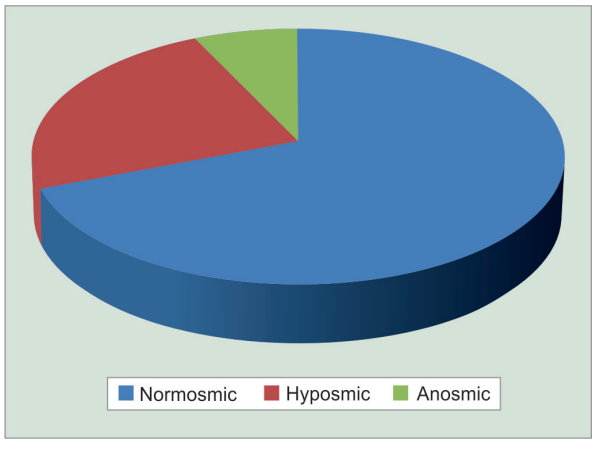
Graph 3: Olfaction

POSTOPERATIVE RESULTS

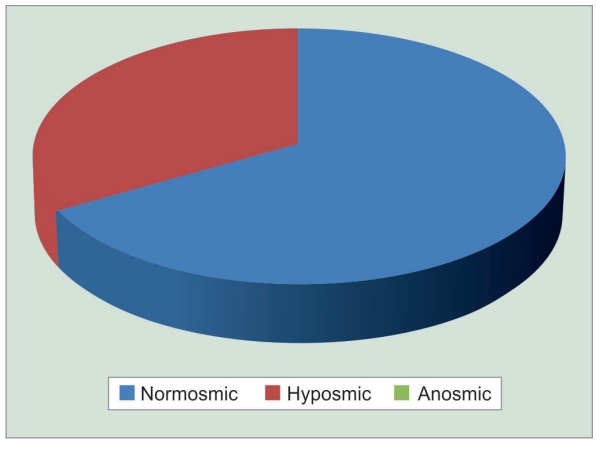
Olfactory scores in anosmic patients significantly improved after sinus surgery at 3-month follow-up. Only 4 hyposmic patients improved after surgery and 5 did not show any change. Among normosmic patients, 80% showed no change after surgery, whereas 20% showed worse olfaction. The proportion of patients with anosmia who improved after surgery was significantly greater than the proportion of patients with hyposmia who improved after surgery.

At the end of 12 weeks post ESS, no patient was anosmic (Graphs 1 to 5).

QUESTIONNAIRE TO ASSESS THE QUALITY OF LIFE



Graph 4: Preoperative olfaction



Graph 5: Postoperative olfaction

- Can you appreciate all types of smell? (0 – Yes, 3 – No)
- Are you able to appreciate only strong odors? (0 – No, 3 – Yes)
- Do you have altered taste for food? (0 – No, 3 – Yes)
- Do you have any altered sense of smell (cacosmia)? (0 – No, 3 – Yes)
- Do you relish the taste of food with pleasant odor/flavor? (0 – Yes, 3 – No)
- Do you have fear that you are unable to smell smoke or fire? (0 – No, 3 – Yes)
- Is your hunger reduced? (0 – No, 3 – Yes)
- Do you feel depressed? (0 – No, 3 – Yes)
- Are your visits to doctor increased due to your concern about lack of olfactory sense? (0 – No, 3 – Yes)
- Does it affect your occupation (fire fighters, chefs)? (0 – No, 3 – Yes)

0 – olfaction normal
1 – mild olfactory dysfunction
2 – moderate olfactory dysfunction
3 – severe olfactory dysfunction

DISCUSSION

In this prospective cohort study, we found that olfactory impairment improved in patients with anosmia after ESS but not in patients with hyposmia. This improvement in anosmic patients' objective olfactory scores was sustained at 12 weeks follow-up. Some believe that nasal polyposis patients find only brief and temporary resolution of olfactory impairment.[7] In contrast, we found significant improvement in olfactory scores in anosmic patients with nasal polyposis 3 months after surgery. Few studies in literature have showed the same results. Pade and Hummel[8] found nasal polyposis to be the most important factor in determining olfactory improvement 4 months after ESS. Minovi et al[9] found patients with nasal polyposis had a higher success rate of olfactory improvement at 6-month follow-up than other patients. Although patients with nasal polyposis are at risk for recurrent disease, the removal of mechanical obstruction from the olfactory cleft and consequent increase in intranasal volume likely improve olfactory function in the postoperative period. In contrast to our results, few studies hypothesized that anosmic patients would have underlying multifactorial olfactory impairment, including both physical obstruction of the olfactory cleft and direct inflammation of the neuroepithelium and they would not benefit from surgical treatment.[10]

According to the results of our study, all anosmics improved and only few hyposmics improved. So, we hypothesize that this difference in olfactory outcomes occurred as a result of nasal polyposis causing anosmia. Incidentally, in our study all the anosmic patients were found to have nasal polyposis. This improvement could have been because the patients with nasal polyps and anosmia are likely to have complete obstruction of the olfactory cleft and thus surgical resection of this local inflammatory process would have improved olfaction.

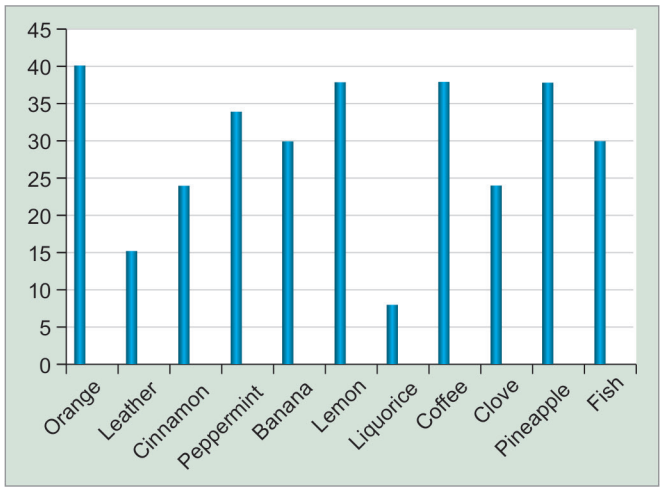
In our study, no preoperative normosmic patient became anosmic as a consequence of surgery. A total of 20% of normosmic patients became hyposmic after surgery, but none of them became anosmic. Literature has quoted a 1% risk of anosmia from nasal surgery.[11] However, it is important to note that the patient in the referenced study underwent a septoplasty under local anesthetic, not ESS. So, it is mandatory to counsel all patients undergoing ESS preoperatively that a hypothetical risk of iatrogenic anosmia after ESS exists, and it is low (less than 1%).

There are few other studies in literature, which assessed olfaction after nasal surgeries. Kimmelman et al did a prospective study using University of Pennsylvania Smell Identification Test (UPSIT) in which a total of 93 patients were followed up for 4 weeks. Klimek et al conducted a prospective study at Connecticut Chemosensory Clinical Research Center (CCCRC), involving 31 patients for a period of 6 months. Single staircase phenyl ethyl alcohol odor detection threshold test (SST), odor memory discrimination (OMD) were the other tests which were used in Jiang et al. Min et al involved a total of 80 patients for a period of 1 year using butanol threshold test (BTT).

According to literature, the Sniffin Sticks kit, which was used in our study, was used in one study.[8] It is a prospective study with a total of 206 patients. However, this study aimed to investigate predictors of nasal surgery (both ESS and septoplasty) and concluded following ESS: Improvement of sense of smell was found in 23%, no change in 68%, and decreased function was seen in 9% of the patients. In patients with septum surgery, improvement was seen in 13%, no change in 81%, and decreased function in 7%.

In our Indian population, during preoperative olfactory assessment, there was a marked difference in identification of different odors. Common odors were identified by most of the patients, but few odors, like liquorice and leather, were identified by only few patients. This could also be attributed to the prior sensitization of the patient to the familiar odors (orange, lemon, coffee, fish). This is plotted in a graph with the 12 odors (in Sniffin Sticks kit) in x-axis and the number of patients who perceived the odors in y-axis.

Olfactory outcomes following ESS have been difficult to interpret for several reasons. First, many studies report subjective olfactory results, which do not necessarily correlate with objective olfactory assessment.[12] Consequently, olfactory outcomes studies require the use of objective olfactory measures. Second, several older studies were performed retrospectively, leading to several study limitations and potential biases. More recently, more prospective olfactory outcome studies have been performed. One such attempt is our study, in which the patients are assessed for up to 12 weeks postsurgery. Several different types of objective olfactory measures, including odor discrimination, threshold, and identification testing, have been reported in the literature.



Graph 6:

Long-term follow-up is important for the following reasons. Patients assessed within the first couple of weeks after surgery may still be healing from surgery. Edema and granulation tissue may interfere with results and lead to negative results. Conversely, patients with initial recovery and significant improvement in the early post-operative period may later suffer from synechiae formation, recurrence of disease, and new polyp formation in the region of the olfactory cleft, which may again have an impact on olfaction.

CONCLUSION

Olfactory impairment is a common complaint in patients with CRS. In this prospective cohort study, olfactory dysfunction improved in patients with anosmia after ESS and was sustained at 12-week follow-up. In contrast, few patients with hyposmia did not improve after surgery. Although anosmics experienced significant improvement, olfactory function did not return to normal in most patients. No normosmic became anosmic after surgery. Olfactory impairment is an important patient safety and quality-of-life issue for patients with CRS and one that requires continued research.

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