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What is This?
Preoperative Incidence of Olfactory Dysfunction in Nasal Surgery Patients

Jeffrey Saad Jumaily, MD1,*, Christine Fayad1,*, Vartan Mardirossian, MD1, Ashok Singh, PhD2, John Stram, MD1, and Jeffrey Spiegel, MD1

Abstract

Objective. Learn the incidence of olfactory dysfunction in preoperative patients prior to nasal surgery and compare with a control group of patients who are not going to have such surgery. Assess the usefulness of the coffee/tea differentiation test in assessing preoperative dysosmia.

Study Design. Prospective controlled cohort study.

Setting. Urban medical center.

Subjects and Methods. One hundred fifty-one adult patients (aged 18-65 years) whose olfactory function was tested using the Pocket Smell Test and a coffee/tea differentiation test. A failed test required missing at least 1 item on the card or failure to report a difference between tea and coffee. The statistical analysis using the t test and the Fisher exact test were calculated using MINITAB.

Results. The study group (n = 55) had 38% men and 62% women compared with 58% men and 42% women in the control group (n = 96). The incidence of dysosmia was 32% in the study group and 14% in the control group. In the study group, 34.5% of patients failed the Pocket Smell Test and 12.4% failed the coffee/tea differentiation test as compared with 12.4% and 0%, respectively, in the control group.

Conclusion. Patients who are scheduled for nasal surgery for medical or cosmetic indications are more likely to suffer from olfactory dysfunction before surgical intervention. This should be taken into consideration when counseling patients regarding possible postoperative complications.

Keywords

rhinoplasty, smell, nasal surgery, olfactory dysfunction

Disorders of the sense of smell (dysosmias) are important because they can adversely alter patients’ quality of life. The prevalence of dysosmia has been studied by many authors who reported a wide range of estimated prevalence. Doty,1 using objective smell tests, reported this prevalence to be 2% of the normal adult population younger than 65 years, although rates as high as 20% have been reported.2 This rate rises remarkably with age to approximately half of the adults aged 65 to 80 years and 75% of seniors older than age 80 years.1,3

A plethora of conditions leads to dysosmia, including age, smoking, nasal polyposis, and chronic rhinosinusitis. Surgery in the nasal cavity has been linked to olfactory loss in some studies.1 Although nasal surgery is often intended to improve olfactory function, many authors reported worsened olfaction postoperatively with hyposmia rates as high as 34% and anosmia rates of 1%.4,5 The etiology of postoperative dysosmia has been studied but remains unclear.5

There are several smell function tests available that specifically assess olfactory range and function. Most commonly used in clinical practice are the odor identification tests. These multiple-choice tests challenge the patient to scratch a scented panel, then select from a list of forced choices and identify the smell they perceive. The Pocket Smell Test (PST) is a single booklet with a 3-item scratch-and-sniff
identification test (Figure 1). Although brief, the PST can identify dysosmia with high sensitivity, high reliability, and high negative predictive value (NPV).6 The sensitivity is 99% in detecting total anosmia with a 98% NPV. In addition, it has a 93% and 82% sensitivity in detecting hyposmia and any olfactory pathology, respectively.6 The test-retest reliability was 0.87.6

The objectives of this study are to (1) determine the incidence of olfactory dysfunction in preoperative patients who are candidates for nasal surgery compared with a control group of nonsurgical patients and (2) evaluate the usefulness of a coffee/tea differentiation test in assessing preoperative dysosmia.

Methods
We performed a prospective controlled cohort study of 151 adult patients (aged 18-65 years) at an urban medical center. Fifty-five patients who were undergoing nasal surgery were tested using the 3-item PST (Sensonics, Inc, Haddon Heights, New Jersey) and a coffee/tea differentiation test. The institutional review board (IRB) reviewed and approved the protocol numbered H-27719. Ninety-six patients who were not undergoing nasal surgery were similarly tested and served as controls. Smell testing was done with the PST. The coffee/tea differentiation test was done with dry Folgers Classic Roast Coffee Singles (The Folgers Coffee Company, Cincinnati, Ohio) and Lipton Hot Tea (Thomas J. Lipton Company, Englewood Cliffs, New Jersey) in Styrofoam cups. Erring on at least 1 item on the card or failure to report a difference between tea and coffee resulted in failure of the test. We also incorporated the coffee/tea differentiation test (CTDT) to find out if it correlates with the more objective PST as a measure of the clinical significance of hyposmia. Exclusion criteria were (1) preexisting smell disorder, (2) neurological central nervous system disorder, (3) heavy metal exposure (chromium, lead, mercury), (4) prior nasal surgery, and (5) prior head trauma. All data analysis was done using Microsoft Excel (Microsoft Corporation, Redmond, Washington). Significance was calculated using MINITAB (Minitab, Inc, College State, Pennsylvania).

Results
The control group consisted of 38% men and 62% women. The study group consisted of 58% men and 42% women. The control group had 10% smokers compared with 3.7% in the study group. The study group had 1.8% patients affected by diabetes compared with 0% in the control group. Neither group had patients with Alzheimer disease or multiple sclerosis.

The study group included patients scheduled for a variety of rhinologic procedures. These procedures included rhinoplasty (33%), septrhinoplasty (31%), functional endoscopic sinus surgery (FESS) with or without septrhinoplasty (16%), polypectomy (11%), excision of mass (4%), turbinate cautery (2%), maxillectomy (2%), and antrotomy (2%).

In the presurgical group, one-third of patients had hyposmia, which was approximately 3 times the failure rate as the control group (34.5% vs 12.4%, P = .002). The presurgical group patients failed the coffee/tea differentiation test in 10.9% of cases compared with no failures in the control group (P = .001). Men and women were analyzed separately to identify whether sex imbalance affects the overall results. Similar to the combined men and women data, the difference between the 2 groups in the PST was significant for men (P = .022, Fisher exact test) and women (P = .04). Significant difference was also found in the coffee/tea test in both men (P = .042, Fisher exact test) and women (P = .002).

Discussion
Hyposmia following nasal surgery is a well-recognized entity in the surgical literature.4,7-9 Many studies have attempted to estimate the incidence of dysosmia after nasal surgery.1,5,10 Multiple hypotheses have attempted to explain the etiology of this condition, but it remains not very well understood.4 In this prospective controlled study, our goal was to determine the prevalence of objective dysosmia in the patient population with medical or cosmetic indications for nose surgery. Subjective testing of olfactory dysfunction is known to be unreliable compared with objective tests.2 We elected to use the 3-item Pocket Smell Test instead of the University of Pennsylvania Smell Identification Test (UPSIT). The shorter version does not characterize the dysosmia as well

Figure 1. Pocket Smell Test card (figure amended from www.sensonics.com, copyright 2008).
as the 40-item UPSIT, but it is very sensitive based on direct comparison by Jackman and Doty. Studies looking at patients with Alzheimer disease also found this PST useful. The Pocket Smell Test is not used commonly in the literature to investigate dysosmia in nasal surgery patients. The objective of this study was to diagnose the literature to investigate dysosmia in nasal surgery smokers and patients with diabetes.

The trend is also seen in the CTDT, where 10.9% of study patients could not differentiate coffee from tea. No patients failed in the control group. Our subjects included a small number of smokers and patients with diabetes.

Our data show a statistically significant difference between the study group and the control group. Using the PST, the prevalence of hyposmia in the study group was 34.5%, which is 3-fold higher than the control population rate of 12.4%. This trend is also seen in the CTDT, where 10.9% of study patients could not differentiate coffee from tea. No patients failed in the control group. Our subjects included a small number of smokers and patients with diabetes.

The epidemiology of hyposmia after nasal surgery has been studied by several authors. Previous studies have demonstrated that olfactory disturbances are more common than we realize, with estimates up to 20% of nonrhinological patients demonstrating hyposmia or anosmia. It is important that we differentiate this common condition from new-onset dysosmia after nasal surgery. The incidence of anosmia is usually reported as 1% after nasal surgery, and hyposmia has been reported to be as high as 34%. Several studies were done in which the incidence of hyposmia was determined preoperatively and then retested after nose surgery. Although most of these studies did not include a control group, they emphasized that hyposmia is a common condition in patients undergoing nasal surgery. In one study, 10.3% of patients had hyposmia preoperatively, but only 2.6% of rhinoplasty patients and 3% of FESS patients developed new hyposmia postoperatively. Our data reveal a statistically significant higher incidence of hyposmia in the preoperative patients compared with the control group. Our study, like others in the literature, also shows no effect of sex on the incidence of olfactory function. A subgroup analysis based on type of nose surgery showed predictable results for the most part. The highest rate of preoperative hyposmia using the PST and CTDT was found in the polypectomy group, which is expected, as polyps are well known to adversely affect nasal patency and olfaction. In contrast, septoplasty and rhinoplasty patients had lower hyposmia rates. Interestingly, the PST failure rate in the rhinoplasty group was close to 50% of the CTDT failure rate. Several authors reported no difference in preoperative hyposmia rates based on the type of surgery (rhinoplasty, septoplasty, FESS).

The etiology of hyposmia in patients prior to undergoing nasal surgery is likely multifactorial and may be related to their underlying sinusal problem. Patients undergoing FESS often have polyps and septoplasty patients often use decongestants, which may affect their preoperative olfactory function. In the case of cosmetic nasal surgery, our analysis shows a 50% preoperative hyposmia rate by the PST, but every patient passed the CTDT. This is higher than prior reports for rhinoplasty patients. The etiology of the high hyposmia preoperatively in the seemingly asymptomatic cosmetic surgery population is unknown but may be related to preoperative factors such as medication use or concurrent undiagnosed sinonasal conditions. In this study, some of the patients who underwent rhinoplasty for cosmetic reasons also had septoplasty for nasal obstruction, which may contribute to preoperative hyposmia. We tried to exclude patients who had predisposing factors to dysosmia due to environmental exposures and neurodegenerative conditions. However, the small sample size likely plays a role as well. The study is not powered for a subgroup analysis; therefore, the significance of the high incidence in the rhinoplasty group cannot be adequately tested, especially considering that hyposmia is common in the general population. Nevertheless, our data further emphasize that an appreciable percentage of patients treated surgically for cosmetic or medical nasal indications have preoperative hyposmia.

We also found that the CTDT has a 100% negative predictive value compared with the PST, albeit it is not as sensitive. In the preoperative group, no patient failed the CTDT and passed the PST. This quick and inexpensive test may be useful as part of the office preoperative evaluation as a failed test signals olfactory deficiency. By learning more about the patient’s preoperative status, the physician can potentially dispel the patient’s anxiety, unrealistic expectations, or misconceptions postoperatively, in addition to aiding in the detection of malingersers.

### Table 1. Failure Rates of the Pocket Smell Test and Coffee/Tea Differentiation Tests in Preoperative and Control Patients

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Test Failure Rate, %</th>
<th>Coffee/Tea Differentiation Failure Rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative group</td>
<td>34.5</td>
<td>10.9</td>
</tr>
<tr>
<td>Control group</td>
<td>12.4</td>
<td>0</td>
</tr>
<tr>
<td>P value</td>
<td>.002</td>
<td>.001</td>
</tr>
</tbody>
</table>

### Conclusion

This prospective controlled study shows that preoperative patients have a higher incidence of olfactory dysfunction than the general population. Specifically, all the patients undergoing rhinoplasty were asymptomatic on preoperative CTDT, but half of them had hyposmia on the PST. It is important that surgeons and patients engage in a discussion about the risk of postoperative olfactory loss and possibly obtain a quick and easy CTDT, which can rule in olfactory dysfunction if negative. The 3-item PST is an easy to use and sensitive test for dysosmia preoperatively.

### Author Contributions

Jeffrey Saad Jumaily, data collection, data analysis, manuscript preparation; Christine Fayad, protocol design, data analysis, data collection, manuscript preparation; Vartan Mardirossian, data collection, data analysis, manuscript preparation; Ashok Singh,
statistical analysis, data analysis, manuscript preparation; John Stram, protocol design, data analysis, data collection, manuscript preparation; Jeffrey Spiegel, protocol design, data collection, data analysis, manuscript preparation.

Disclosures
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References