

## Subjective Evaluation of Smell Dysfunctions before and after Different Nasal Surgeries

Wafae Abd El-Rasoul M. Mourad<sup>1</sup>, Atef Abd Allah El Maraghy<sup>2</sup>, Tarek Mohamed Abd El-Hamed El-Zyat<sup>3</sup>, Ayman Yehia Abbas<sup>4</sup>, Gamal Abd Al-Elah Abd Al-Samea Shaban<sup>5</sup>

Department of Otorhinolaryngology, Faculty of Medicine, Al-Azhar University.  
Corresponding author: Gamal Abd Al-Elah Abd Al-Samea Shaban, Mobile: 01099946326,  
E-mail: gamshaban@gmail.com

### ABSTRACT

**Background:** olfactory dysfunctions affect daily life activities. Nasal surgeries primarily aims at elimination of nasal obstruction and removal of nasal polyps or inflamed mucosa. Improved olfactory function after these surgeries may be a secondary benefit. **Objectives:** this study aimed to evaluate different types of smell dysfunctions before and after different nasal surgeries and its liability to improve or not after surgery and to discuss CT scan results in these cases in correlation to clinical and surgical results. **Study Design:** prospective study. **Methods:** a total of 50 patients were included in this prospective study (32 men, 18 women; age range was 20–49 years, mean age 32 years, standard deviation =7.3years). Patients were suffered from different nasal diseases requiring surgical interference and complaining of smell dysfunctions as one of the main nasal symptoms. Patients were selected from those attending E.N.T Clinic in Bab EL-Sharia Hospital, Faculty of Medicine, Al-Azhar University from February 2017 to April 2018. Prior to surgery, patients received a detailed otorhinolaryngologic examination included nasal endoscopy. Olfactory function was evaluated subjectively. CT scan nose and paranasal sinuses (coronal and axial) was done before the surgical interference and repeated after complete healing of the operation. Questionnaire was directed to each patient to tell which type of smell dysfunctions he was complaining of and the severity of this dysfunction, this questionnaire was repeated after the complete post-operative period. The patients were followed up after the operation in scheduled sessions for five months. **Results:** after different nasal surgeries no change of olfactory dysfunction was found in 26% and improvement was seen in 74%. As regard patients underwent endoscopic sinus surgery no change of olfactory dysfunction was found in 32% and improvement was seen in 68%; however in the septoplasty group no change of olfactory dysfunction was found in 50% and improvement was seen in 50% and in septoplasty and inferior turbinectomy group, no change of olfactory dysfunction was found in 14.3% and improvement was seen in 85.7%. in patients who had hyposmia no change of olfactory dysfunction was found in 17.9% and improvement was seen in 82.1%, whereas in patients who had anosmia, no change of olfactory dysfunction was found in 42.9% and improvement was seen in 57.1%; patients who had cacosmia, no change of olfactory dysfunction was found in 14.3% and improvement was seen in 85.7%. Free postoperative CT was found in 92% and recurrence was seen in 8%.

**Conclusion:** the different nasal surgeries showed significant effect on olfactory function in Patients with subjective olfactory dysfunction. However, considerable number of patients with olfactory dysfunctions did not improve after surgery. CT scan is useful in the assessment of patients with olfactory dysfunction associated with many sinonasal diseases.

**Keywords:** olfactory disorders, anosmia, hyposmia, cacosmia, nasal surgeries, CT scan.

### INTRODUCTION

Olfaction plays a major role in food intake, such that odors assist in food localization and indicate the food's edibility<sup>(1)</sup>.The olfactory sense has also a protective role against environmental risks (such as spoiled food, gas leaks and smoke) and helps with gestation; thus it is an essential factor in determining quality of life<sup>(2)</sup>.The most common etiologies of smell loss are post viral upper respiratory infection (18–45% of the clinical population), nasal/sinus disease (7–56%), head trauma (8–20%), exposure to toxins/drugs (2–6%), and congenital anosmia (0–4%)<sup>(3)</sup>.Smell loss can be partial, a condition called hyposmia, or total, a condition called anosmia<sup>(4)</sup>.Quantitative olfactory disorders are usually acquired dysfunction of the olfactory system with several

causes. On the other hand, the increased ability to smell is called hyperosmia, it is the rare pathological situation and usually is linked with the exposure to toxic vapors or neurologic disorders such as migraine<sup>(5)</sup>.Cacosmia is the presence of an unpleasant and real odorant due to sinonasal or pharyngeal infections<sup>(6)</sup>. Nasal surgery eliminates nasal obstruction and could therefore contribute to improvement in olfactory function postoperatively. Another reason why patient's olfactory function improves after nasal surgery might lie in the reduction of inflammatory tissue which is removed by surgery<sup>(7)</sup>.

### AIM of the WORK

This study aimed to evaluate different types of smell dysfunctions before and after different nasal surgeries

and its liability to improve or not after surgery and to discuss CT scan results in these cases in correlation to clinical and surgical results.

## MATERIAL AND METHOD

This prospective study was carried out on 50 Patients who were suffered from different nasal diseases requiring surgical interference and complaining of smell dysfunctions as one of the main nasal symptoms who attended the ENT Clinic at Bab EL-Sharia Hospital, Faculty of Medicine, Al-Azhar University during the period from February 2017 to April 2018, written consent was taken from every Patient. Case records of all the cases were studied regarding presenting complaints, examination findings, investigation outcomes, surgical procedures done and follow up. CT scan nose and paranasal sinuses (coronal and axial) was done before the surgical interference and repeated after complete healing of the operation. Questionnaire was directed to each patient to tell which type of smell dysfunctions he was complaining of and the severity of this dysfunction, this questionnaire was repeated after the complete post-operative period. The patients were followed up after the operation in scheduled sessions for five months. 50 patients were chosen as a study group because they were fulfilling the following **inclusion criteria**: - 1. Patients were operated for treatment of different nasal diseases with any smell dysfunction. 2. The age ranges from 20 to 50 years old. 3. All the patients were free from non-rhinological diseases induces smell dysfunctions e.g. brain tumours. 4. All the patients had no history of head or nasal and sinus trauma. **Exclusion criteria**: - 1. Ages under 20 and above 50 years old. 2. Non-oriented patients with unstable mentality. 3. History of head or nasal and sinus trauma. 4. History of non-rhinological diseases induces smell dysfunctions.

## RESULTS

This study included 50 patients who had different nasal diseases and required surgical interference and complained of smell dysfunctions as one of the main nasal symptoms, underwent different nasal surgeries. Among the whole **fifty** patients there were: **28** patients had hyposmia, **14** patients had anosmia, **7** patients had cacosmia, and **1** patient had a parosmia.

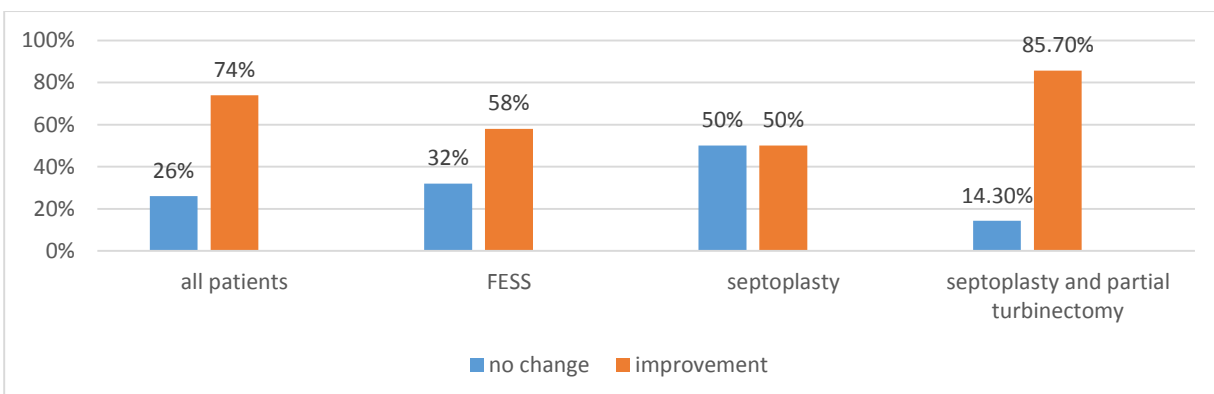
In the present study there were different significant results:-

Following different nasal surgeries no change of olfactory dysfunction was found in 26% and improvement was seen in 74%. As regard patients underwent endoscopic sinus surgery no change of olfactory dysfunction was found in 32% and improvement was seen in 68%; however in the septoplasty group no change of olfactory dysfunction was found in 50% and improvement was seen in 50%; and in septoplasty and inferior turbinectomy group, no change of olfactory dysfunction was found in 14.3% and improvement was seen in 85.7%.

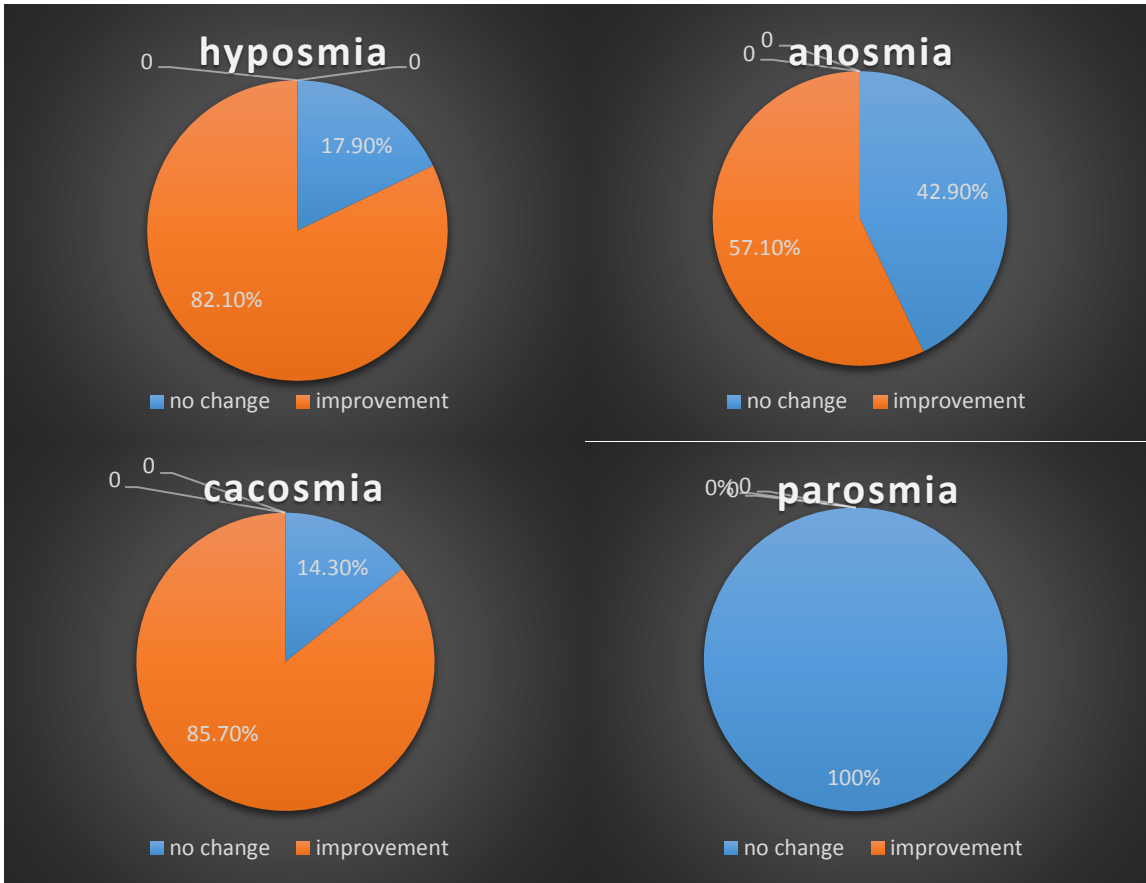
After different nasal surgeries. in patients who had hyposmia no change of olfactory dysfunction was found in 17.9% and improvement was seen in 82.1%; whereas in patients who had anosmia, no change of olfactory dysfunction was found in 42.9% and improvement was seen in 57.1%; Patients who had cacosmia, no change of olfactory dysfunction was found in 14.3% and improvement was seen in 85.7%; while in patients who had parosmia no change of olfactory dysfunction was found in 100% without any evidence of improvement (one patient only had parosmia).

After different nasal surgeries free postoperative CT was found in 92% and recurrence of the disease (nasal polyps) was seen in 8%.

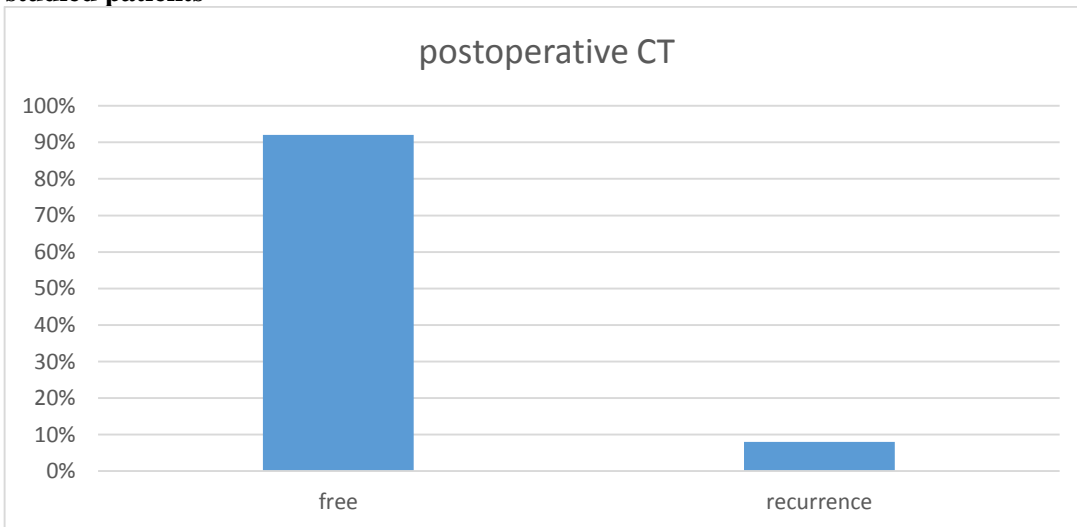
Neither age nor sex had a major impact on the outcome of surgery in terms of olfactory function.



**Figure 1: bar chart representing frequency of symptomatic improvement after surgeries done among the studied patients**



**Figure 2-** Pie charts representing association between improvement and each smell disorder among the studied patients



**Figure 3:** bar chart representing frequency of postoperative CT among the studied patients

**DISCUSSION**

Olfaction is an important nasal function. Evaluation of pre-operative olfactory function provides advantages to patients and physicians. Smell disorder is frequent in rhinological diseases, and most patients are unaware of this situation<sup>(8)</sup>. Most of the patients undergo surgery to treat nasal obstruction, headache or recurrent sinusitis. However surgery is rarely performed to specifically treat olfactory dysfunction. In spite of this, post-operative improvement of olfactory function has been reported by 50–100% of

patients<sup>(9)</sup>. In the present study in patients had hyposmia no change of olfactory dysfunction was found in 17.9% and improvement was seen in 82.1%; in patients had anosmia no change of olfactory dysfunction was found in 42.9% and improvement was seen in 57.1%; in patients had cacosmia no change of olfactory dysfunction was found in 14.3% and improvement was seen in 85.7%; and in patients had hyposmia no change of olfactory dysfunction was found in 100% (one patient only had parosmia). According to the fact that human nose can sense 10

basic smells<sup>(10)</sup>, we classified the hyposmia into mild, moderate and severe. Mild hyposmia cases could smell 3-4 of the 10 basic smells, severe hyposmia cases could smell 8-9 of the 10 basic smells, while moderate hyposmia cases were between mild and severe cases and anosmia cases could differentiate none of the 10 basic smells. In agreement with our study in a study of **Bunzen et al.**<sup>(11)</sup> they reported that regarding hyposmia and anosmia together after surgery no change of olfactory dysfunction was found in 7 patients (36.1%) and improvement was seen in 13 patients (63.9%) regarding cacosmia. The same study is in agreement with our study as after surgery no change of olfactory dysfunction was found in 2 patients (20%) and improvement was seen in 8 patients (80%), but these results were for patients had chronic rhinosinusitis only and FESS was done for them while our study was conducted on patients had different nasal diseases and different nasal surgeries. In contrast with the present study a report of **Delank and Stoll**<sup>(12)</sup> achieved normal olfaction was achieved in 25% of hyposmic patients and only 5% of anosmic patients after surgery. Cacosmia results are in agreement with results of **Bonfils et al.**<sup>(6)</sup> who reported that eradication of the disease completely will lead to treatment of cacosmia. In the present study 25 patients had different olfactory dysfunctions with sinus or sinonasal disease for which FESS was done, after surgery no change of olfactory dysfunction was found in 8 patients (32%) and improvement was seen in 17 patients (68%), this result in this group of prospectively investigated patients is in agreement with a similar study of **Delank and Stoll**<sup>(12)</sup> which showed the rate of olfactory improvement after surgery at 70%. Results from the study of **Ehnage et al.**<sup>(13)</sup> also confirmed that nasal endoscopic surgery significantly improves all olfactory parameters, including subjective and objective tests. In contrast, in a study of **Jiang et al.**<sup>(14)</sup> they observed that endoscopic surgery of the sinus and nose in patients with chronic rhinosinusitis had no considerable effect on olfactory function. In current study 74.3% and 68.6% of patients had olfactory dysfunction before and after surgery. However according to clinical follow up and by the help of CT scan, we can conclude that the causes of non-improved smell dysfunctions may be attributed to:

- Incomplete eradication of the pathology in some cases.
- The near location of the pathology remnants to the olfactory area.
- Atrophic changes of the olfactory neurons.
- The effects of rhinotoxicity of some usable nasal local drugs in long standing cases.

In the present study, septoplasty was done for four patients and septoplasty with partial turbinectomy

were done for 7 patients; in patients with septum surgery only no change of olfactory dysfunction was found in 2 patients (50%) and improvement was seen in 2 patients (50%); and in patients with septum and inferior turbinate surgery no change of olfactory dysfunction was found in 1 patient (14.3%) and improvement was seen in 6 patients (85.7%), this result in this group of prospectively investigated patients is in agreement with **Gupta et al.**<sup>(15)</sup> who found that following septal surgery improvement of olfactory function was seen in 29 (70.6%); no change was seen in 5 (20.1%); and reduced olfactory function was observed in 3 (7.3%) patients. Four patients were lost to follow-up. Also similar to our study, **Damm et al.**<sup>(16)</sup> evaluated smell function using smell rods and nasal air flow using anterior rhinomanometry in 30 patients with septoplasty and partial inferior turbinectomy. The smell test was assessed an average of 9.1 weeks postoperatively. It was observed that there was an increase in nasal air flow in 87%, an increase in smell identification in 80%, and recovery of smell discrimination in 70% of the patients. In contrast **Pade and Hummel**<sup>(17)</sup> reported improvement of olfaction in 13%, no change in 81%, and decreased function in 7% of patients after septal surgery. They observed that patients exhibiting a postoperative decrease of olfactory function had significantly higher preoperative olfactory scores than patients who experienced improvement.

In the present study, the severity of olfaction reduction had a direct relationship with the severity of nasal diseases in CT scan. This is in agreement with results of **Szaleniec et al.**<sup>(18)</sup> who reported that the extent of pathological changes in the sinuses determined by CT scan correlates with preoperative subjective olfactory scores and preoperative objective measures of olfaction. CT finding disease extending beyond the ethmoids was typically associated with persistent anosmia

## CONCLUSION

The current study confirmed the beneficial effect of nasal surgery on the olfactory function which improve quality of life. The different nasal surgeries showed significant effect on olfactory function in patients with olfactory dysfunction. However, considerable number of patients with olfactory dysfunctions did not improve after surgery due to multifactorial diseases. CT scan is useful in the assessment of patients with olfactory dysfunction associated with many sinonasal diseases.

## REFERENCES

1. **Stevenson RJ (2010):** An initial evaluation of the functions of human olfaction. *Chem. Senses*,35(1): 3–20.
2. **Neuland C, Bitter T, Marschner H et al. (2011):**

- Health-related and specific olfaction-related quality of life in patients with chronic functional anosmia or severe hyposmia. *The Laryngoscope*, 121: 867–872.
3. **Nordin S and Bramerson A (2008):** Complaints of olfactory disorders. epidemiology, assessment and clinical implications. *Curr. Opin. Allergy Clin. Immunol.*, 8: 10-15.
  4. **Keller A and Malaspina D (2013):** Hidden consequences of olfactory dysfunction: A patient report series. *BMC Ear, Nose and Throat Disorders*, 13(1): 8-17.
  5. **Upadhyay UD and Holbrook EH (2004):** Olfactory loss as a result of toxic exposure. *Otolaryngol. Clin. North Am.*, 37: 1185–1207.
  6. **Bonfils P, Avan P, Faulcon P et al. (2005):** Distorted odorant perception: Analysis of a series of 56 patients with parosmia. *Archives of Otolaryngology - Head and Neck Surgery*, 131(2): 107–112.
  7. **Schriever VA, Gupta N, Pade J et al. (2013):** Olfactory function following nasal surgery: a 1-year follow-up. *Eur. Arch. Otorhinolaryngol.*, 270: 107-111.
  8. **Kilicaslan A, Ozbilen AG, Tekin M et al. (2016):** Assessment the long-term effects of septoplasty surgery on olfactory function. *Acta Otolaryngologica*, 136: 1-6.
  9. **Wolfensberger M and Hummel T (2002):** Anti-inflammatory and Surgical Therapy of Olfactory Disorders Related to Sino-nasal Disease. *Chemical Senses*, 27: 617-622.
  10. **Castro J B, Ramanathan A and Chennubhotla C (2013):** Categorical dimensions of human odor descriptor space revealed by non-negative matrix factorization. *PLoS One*, 8: 73289-73295.
  11. **Bunzen D, Campos A, Souza Leão F et al. (2006):** Efficacy of functional endoscopic sinus surgery for symptoms in chronic rhinosinusitis with or without polyposis. *Brazilian Journal of Otorhinolaryngology*, 72(2): 242-246.
  12. **Delank KW and Stoll W (1998):** Olfactory function after functional endoscopic sinus surgery for chronic sinusitis. *Rhinology*, 36:15–19.
  13. **Ehnhage A, Olsson P, Kölbeck KG et al. (2009):** Functional endoscopic sinus surgery improved asthma symptoms as well as PEFr and olfaction in patients with nasal polyposis. *Allergy*, 64:762–769.
  14. **Jiang RS, Lu FJ, Liang KL et al. (2008):** Olfactory function in patients with chronic rhinosinusitis before and after functional endoscopic sinus surgery. *Am. J. Rhinol.*, 22: 445–448.
  15. **Gupta D, Gulati, A, Singh I et al. (2014):** Endoscopic, radiological, and symptom correlation of olfactory dysfunction in pre- and postsurgical patients of chronic rhinosinusitis. *Chemical Senses*, 39(8): 705-710.
  16. **Damm M, Eckel HE, Jungehülsing M et al. (2003):** Olfactory changes at threshold and suprathreshold levels following septoplasty with partial inferior turbinectomy. *Ann. Otolrhinol. Laryngol.*, 112 (1): 91-97.
  17. **Pade J. and Hummel T (2008):** Olfactory function following nasal surgery. *The Laryngoscope*, 118(7): 1260–1264.
  18. **Szaleniec J, Wróbel A, Stręk P et al. (2015):** Smell impairment in chronic rhinosinusitis evaluation of endoscopic sinus surgery results and review of literature concerning olfactory function predictors. *Otolaryngol Pol.*, 69(1): 33-44.