



Investigation of Olfactory Function Following Septorhinoplasty in Iranian Population by Rapid Smell Test (RST)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: All surgical procedures on nose affect the olfactory function to some extent. There are different viewpoints about olfactory function after septorhinoplasty. We aim to investigate smell perception changes in patients following septorhinoplasty. In this study the use of Rapid Smell Test (RST) as a fast and reliable clinical tool was investigated.

Methods: A prospective cohort study was done in Rasool Akram teaching hospital in 2018 and 2019. Group of 74 septorhinoplasty candidates aged over 18 was selected by convenience. Persian Smell Identification Test (PSIT) and rapid smell test (RST) was obtained from patients before surgery and one month after, if needed three months after and six months after. In addition for patients with dysfunction in any of follow up periods (one month, 3 months and 6 months after surgery) smell magnitude test (SMT) was used. All data were analyzed using Statistical Package for Social Sciences, version 24.0 (IBM SPSS Statistics Inc., Chicago, IL, USA).

Results: Out of 74 patients participating in this study 67 were female. Mean age of 25.68±5.18 years was recorded for participants. All patients before surgery had PSIT score more than 19 and

the mean PSIT score before operation was 22.63 ± 1.39 . Also all patients scored 5 out of 5 in RST before surgery. Mean PSIT score one month after surgery decreased to 22.21 ± 2.20 but still 93 percent (69 patients) of participants were in range for normal olfactory function. We recorded this to be significant (p value = 0.044). RST after one month showed the same results. The difference between RST before and after surgery was also significant (p value = 0.024). For those 5 patients with abnormal olfactory function PSIT and RST were done 3 months after operation which determines normal olfactory function for all of them. As well as PSIT, RST also shows the same results and five participants recorded 5 out of 5 three months after surgery.

Conclusion: This study showed changes in olfactory function after septorhinoplasty will resolve at most 3 months after surgery and it is safe to say there is no effect on olfactory function three months after operation. Also we demonstrated that RST can be a fast and reliable tool for assessing patients' olfactory function in clinical setting.

Keywords: Olfactory function; septorhinoplasty; rapid smell test; cohort study.

1. INTRODUCTION

All surgical procedures on nose affect the olfactory function to some extent. There are different viewpoints about olfactory function after septorhinoplasty [1-3]. Olfactory capacity might be compromised during surgery due to direct trauma to the olfactory region. This trauma can be caused by many factors such as: cautery, laser, abrasion, high osteotomies, injury to the olfactory nerves, and etc. [4]. In most nasal surgical procedures, smell perception decrease after the surgery but there have been reports of increase in olfactory function after endoscopic sinus surgery for nasal polyps and rhinosinusitis [1-5]. Nasal obstruction is reported to be one of the most common complaints in nasal and sinus diseases [6,7].

Straight nasal septum without any deformities is not so common. The 75 to 80% of adults have some degrees of nasal septum deformity [8]. Septoplasty for correction of nasal septum deviation is the 3rd most common ENT surgery in United States [6].

In addition to correction of functional nasal disorders, many people undergo septorhinoplasty for cosmetic purposes [9,10]. Smallest changes in smell perception will affect their quality of life and may decrease their satisfaction with the operation [11-14]. According to American plastic surgeons association, 8.3 million cosmetic surgeries were performed in 2003 which was three times more than 1997 and 12.1 million in 2008. This shows a rising trend of cosmetic surgeries [15,16].

Iran is the one of the recognized centers for cosmetic surgeries. According to recent reports, Iran has the first rank worldwide in ratio of

cosmetic surgeries to population [17]. Considering the extent of cosmetic surgeries on nose and the possibility of impaired olfactory function, many studies have been investigating this subject. But there has been contradictory results [18].

Olfactory dysfunction is a common problem. Overall it has been report that incidence of anosmia in general population is 5- 15% [19,20]. Sense of smell is an ability that is vital to our everyday life. It affects our quality of life, safety, psychological wellbeing and appetite [21].

There are many tests designed for evaluating olfactory function. The University of Pennsylvania Smell Identification Test (UPSIT) is a valid test used mostly in the United States, [22], but application of this test out of the US is limited due to cost and difference in general and dietary culture, it is not suitable for Iranian population, too. A study in Iran using UPSIT shown that the majority of the odorants of this test were not familiar for this population, with more than 50% of odorants of this test having less than 70% correct identification rate [23]. Therefore, it was essential to develop and adopt a SIT that is adapted to the Iranian culture. Persian smell identification test (PSIT) is Iranian version of Sniffin Sticks using 24 pens including each a specific smell. This test was developed and measured for validity and reliability by Kamrava, et al. in 2018 for Iranian population [24]. Rapid smell test (RST) is a fast test for olfactory function which is designed for Iranian culture. This test only contains 5 smells of high familiarity adapted from PSIT (coffee, smoke, cinnamon, garlic and banana); therefore, in comparison with other tests is more convenient to use in clinical setting. Considering the number of septorhinoplasties being done in Iran and the contradictory

results surrounding the effect of this surgery on olfactory function, we decided to investigate smell perception changes in patients following septorhinoplasty. We also aim to investigate the use of RST in clinical setting in comparison to other existing tests.

2. MATERIALS AND METHODS

This study was performed in accordance with the Declaration of Helsinki, and approved by the ethics committee of the Ear, Nose and Throat (ENT) and Head and Neck Research Center, Iran University of Medical Sciences (ethics ID: IR.IUMS.FMD.REC.1397.1). Informed written consent was obtained from all participants. The study was conducted in 2018-2019 in a group of 74 septorhinoplasty candidates aged over 18 were selected

Patients with following criteria were excluded from the study:

- Olfactory dysfunction before surgery
- History of chronic rhinosinusitis with or without polyps
- History of trauma to the nose
- History of previous nasal surgeries
- Moderate to severe allergies
- Genetic or congenital disorders associated with olfactory disorder
- Psychological problems
- Patients who do not complete the follow up period

After gathering informed consent from patients their demographic data was collected. Also presence of smell and taste disorders was obtained by asking from candidates.

All patients underwent general anesthesia and open septorhinoplasty. The PSIT and RST were taken from all patients before surgery and one month after. For patients with decreased score after surgery, the tests were repeated 3 and 6 months after surgery. In addition for patients with olfactory dysfunction in any of follow up periods (1, 3 and 6 months after surgery) smell magnitude test (SMT) was used.

Patients will answer 3 choice question after sniffing each pen and their score will be measured from 24 [24]. The PSIT validity and reliability was measured by Kamrava, et al. with sensitivity 99 percent and specificity of 81 percent and score of 19 and more was

considered as normal olfactory function [24]. Also, score of 17.5 was decided to be as cut point for start of smelling disorder.

RST includes 5 Iranian standard smells and makes a judgment on patient's olfactory function under a minute. According to this test people with score of five from five have normal olfactory function any score less than five is sign of smelling disorder.

SMT is a device made to assess quantitative function of olfactory system non-verbally. Sensitive and precise sensors measure peoples smelling potency and software will analyze the data and will provide an exact report of patients' olfactory function.

In order to confirm -sensitivity of RST 30 patients who referred to the clinic for other reasons such as trauma with an abnormal olfactory function confirmed by SMT, were selected. These patients' olfactory function was also investigated using RST and PSIT. Also 30 patients with a normal score on PSIT and RST before and after surgery were selected to assess the negative predictive values of RST and PSIT. SMT was done individually for these patients.

2.1 Statistical Analysis

We used Student's t-tests and repeated measures one-way analysis of variance (ANOVA) for the analysis of continuous variables. The results are expressed as means±standard deviation (SD). All data were collected using predesigned checklists and analyzed using Statistical Package for Social Sciences, version 24.0 (IBM SPSS Statistics Inc., Chicago, IL, USA). Confidence interval of 95 percent was applied and $p < 0.05$ was considered as level of significance.

3. RESULTS

Out of 74 patients participating in this study 67 (90.5 percent) were female. Mean age of 25.68 ± 5.18 years was recorded for participants (minimum age of 18 and maximum of 50 years).

All patients before surgery had PSIT score more than 19 and the mean PSIT score before operation was 22.63 ± 1.39 . Also all patients scored 5 out of 5 in RST before surgery.

Table 1. Mean scores of two smell identification tests

	Before operation	One month after	3 months after
PSIT	22.63 ± 1.39	22.21 ± 2.20	20.20 ± 0.836
RST	5	4.93 ± 0.252	5

Persian Smell Identification Test (PSIT) and rapid smell test (RST)

Table 2. Scores of three tests in 30 patients with impaired olfactory function

	Mean ± SD	Minimum	Maximum	Reference
SMT	0.844 ± 0.082	0.7	0.98	Abnormal >= 0.7
PSIT	14.066 ± 1.981	11	17	Abnormal < 19
RST	3.63 ± 0.490	3	4	Abnormal < 5

Persian Smell Identification Test (PSIT) and rapid smell test (RST) and smell magnitude test (SMT)

Mean PSIT score one month after surgery decreased to 22.21±2.20 but still 93 percent (69 patients) of participants were in range for normal olfactory function. We recorded this to be significant (p value = 0.044). The test determined five patients to have less than normal olfactory function with mean score of 15.8±0.836. RST after one month showed the same results. Same 5 patients had the score of 4 in RST one month after operation. The difference between RST before and after surgery was also significant (p value = 0.024). The overall mean RST score one month after procedure was 4.93±0.252.

For those 5 patients with abnormal olfactory function PSIT and RST was done 3 months after operation. Mean score of 20.20±0.836 was recorded for PSIT with the minimum of 19 which determines normal olfactory function for all of them. As well as PSIT, RST also shows the same results and five participants recorded 5 out of 5 three months after surgery. All the scores have been demonstrated in Table 1.

30 patients with abnormal SMT were selected with mean SMT score of 0.844±0.082. The mean score for PSIT in these patients was 14.066±1.981 (with the maximum of 17) and the mean RST score was 3.63±0.490 (with the maximum of 4). These results conquer the abnormal olfactory function which was confirmed with SMT and it can be concluded that specificity for RST is 100 percent (Table 2).

For selected 30 patients with normal olfactory function SMT was done and the maximum score was 0.62 (mean of 0.472±0.084) which shows SMT confirms the normal olfactory judgment made by RST and PSIT.

4. DISCUSSION

All surgical procedures on nose have some effect on olfactory function. There are many studies

showing contradicted results on effect of septorhinoplasty on patients' smell perception [1-3].

In this study we documented that RST and PSIT resulted in the same result when judging normal and abnormal function for olfactory system. We also reported that changes in patients' olfactory function will resolve after 3 months and septorhinoplasty does not affect smell perception after three months. The most usual cause of reduced olfactory function following surgery is mucosal damage resulting from trauma, edema, or inflammation in the olfactory area [25,26].

Dengiz, et al. [27] in a study on effects of septorhinoplasty on olfactory function using brief smell identification test (BSIT) tool suggested BSIT as a fast and reliable tool for testing olfactory function [27]. BSIT includes 12 pens and smells to assess patients' olfactory function. But we have reported that RST has the same results as PSIT and is much faster with only five smells. Dengiz reported that septorhinoplasty does not affect olfactory function but we recorded an early decrease in olfactory function after the procedure. This can suggest septorhinoplasty might affect olfactory function primarily. Although we have recorded some decrease in olfactory function in first few months but our study showed normal olfactory function in all patients after 3 months from operation.

Kilicaslan, et al. [28] investigated the long term effects of septorhinoplasty on smell perception. They reported that all patients regained normal olfactory function after 12 months from the procedure [28]. Our study showed that patients regain their normal olfactory function after 3 months. These contradictory results might be due to the mean age of two study populations. Kilicaslan's study population with a mean age of 33 years was older than ours (mean age of 25 years old).

In a study by Shemshadi, et al. 40 patients with same sex ration were investigated for olfactory function after open rhinoplasty. They assessed participants' olfactory function before procedure, one week after 6 week after and 6 months after. They showed 87.5 percent of patients experience anosmia one week after surgery. 6 weeks after surgery none of patients recorded anosmia but they had various degrees of hyposmia in 85 percent of study population. And in 6 months after surgery all patients had normal smell perception. We did not record any anosmia and we recorded a much lower fraction of hyposmia in 4 weeks after surgery. This might be due to same sex ratio in Shemshadi's study. But the overall conclusions of both studies are the same and septorhinoplasty is safe procedure concerning olfactory function.

The present study has limitations. First of the all, sample size was small and second, there was no access to any published data on the sensitivity and normal ranges of the Iranian population with respect to the smell test used. Therefore, we suggest further studies to investigate patients in various age groups and sex. Also, in our investigation, male study population was not significant; further studies with more prominent male samples are recommended.

5. CONCLUSION

It can be concluded that RST and PSIT have reliable results in judging patients' olfactory function. Also we suggest using RST instead of PSIT because of the same results, less time consuming and lower cost. This study shows changes in olfactory function after septorhinoplasty will resolve at most 3 months after surgery and it is safe to say there is no effect on olfactory function three months after operation.

CONSENT AND ETHICAL APPROVAL

Approved by the ethics committee of the Ear, Nose and Throat (ENT) and Head and Neck Research Center, Iran University of Medical Sciences (ethics ID: IR.IUMS.FMD.REC.1397.1). Informed written consent was obtained from all participants. The study was conducted in 2018-2019 in a group of 74 septorhinoplasty candidates aged over 18 were selected.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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