

Original Article

Incidence and risk factors of functional upper airway complications of primary esthetic closed rhinoplasty in two residency programs: A 6-month preliminary prospective cohort study

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ABSTRACT

Background: Although esthetic rhinoplasty has many advantages, it might lead to some complications as well. The literature includes scarce and severely controversial studies on these issues, and there is no research on complications of cosmetic closed rhinoplasty. In addition, some complications are not assessed after any rhinoplasty types. Besides, there is no investigation on the outcome of rhinoplasty carried out by graduate students. The purpose of this study was to determine these.

Materials and Methods: In this preliminary prospective cohort study, 96 healthy patients underwent closed esthetic rhinoplasty by senior residents of otolaryngology and maxillofacial surgery at Taleghani Hospital (Tehran, 2004-2006). Afterward, at 11 follow-up sessions (the 1st, 2nd, 3rd, 4th, 6th, 8th, 10th, 12th, 16th, 20th, and 24th postoperative weeks), five functional complications (hyposmia/anosmia, nasal obstruction, unpleasant voice changes, recurrent colds, and synechiae) were questioned/ examined. The presence of a symptom during at least four subsequent sessions (without elimination until the sixth postoperative month) and the appearance of synechiae in any session were regarded as positive. The data were assessed using Spearman's correlation coefficient ($\alpha = 0.05$).

Results: The incidence rates of synechiae, nasal obstruction, unpleasant voice changes, hyposmia/ anosmia, and recurrent colds were 56.25%, 37.5%, 0%, 1.04%, and 29.17%, respectively. No statistically significant relationship was found between the complications with age, gender, or the surgeon's specialty ($P > 0.05$), but the correlation with home care compliance was significant ($\rho = -0.29$, $P = 0.01$).

Conclusions: High complication rates were observed in both residency programs. Failure to follow home care instructions might prevent/delay recovery. Further in-depth studies are needed to assess this.

Key Words: Nasal obstruction, patient compliance, postoperative complications, rhinoplasty

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INTRODUCTION

Cosmetic rhinoplasty has evolved based on advancements of surgical techniques and equipments

and the increased demand of patients becoming more esthetic-oriented.^[1,2] Although esthetic rhinoplasty can favor attractiveness of the patients and therefore improve their self-esteem,^[1,2] it might also affect nasal functions by changing or traumatizing the anatomy and form of nasal tissues.^[3-5] The respiratory complications of esthetic rhinoplasty may cost patients their health, time, and additional expenses if revision surgeries are needed. Therefore, knowledge of the incidence, pattern, and risk factors of rhinoplasty is of significant clinical value. Sequelae of rhinoplasty might be more prevalent when the skill and manual

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dexterity of the surgeon is not yet fully developed. Therefore, it is of greater clinical implication to know the rate of important complications of the rhinoplasty performed by residents of oral and maxillofacial surgery (OMFS) or ear, nose, and throat (ENT).

Primary cosmetic rhinoplasty is one of the most complex esthetic surgeries in the maxillofacial area that requires precise consideration to both form and function, due to the complex and variable anatomy, visible nose position, and patient desires.^[1] Few operations in plastic surgery have generated as much debate as that of rhinoplasty.^[6] Rhinoplasty has high risks, primarily because of the limited predictability of the esthetic outcome.^[7] The literature includes studies regarding different complications of various techniques of rhinoplasty,^[3-5,8] and the findings are quite controversial.^[3-10] For example, very diverse prevalence rates have been reported for nasal obstruction and it is not clearly known that whether rhinoplasty can cause nasal obstruction.^[3,8-16] Moreover, the role of risk factors like age, sex, or patient compliance with home care instructions has not been assessed before.

Additionally, assessment of some complications is overlooked in the literature (e.g., the prevalence of recurrent cold or unpleasant voice changes). Moreover, about 90% of previous studies have been regarding augmentation rhinoplasty,^[6] and no studies have sampled uniformly from a single method of surgery such as esthetic closed rhinoplasty. Furthermore, although many patients attend to residency programs for rhinoplasty, no previous studies have evaluated the complications of surgeries done at such programs.

In view of the abovementioned controversies and the lack of any studies on the complications of esthetic-only closed rhinoplasty or the sequelae of surgeries done by residents, we aimed to document the incidence and risk factors of five functional upper airway complications of esthetic closed rhinoplasty (without septoplasty) performed by chief residents at Taleghani Hospital in 2004-2006.

MATERIALS AND METHODS

In this preliminary prospective cohort study, 96 patients who would undergo closed esthetic-only rhinoplasty with either Joseph or McCarthy classic techniques were enrolled. The exclusion criteria consisted of the patients' disagreement or failure to attend any of the 11 follow-up sessions, as well as any histories of functional disorders of the upper

air way, snoring, oral breathing, radiation therapy to the head and neck, smoking, chronic/recurrent sinusitis, recurrent cold, tumors, allergic rhinitis, septal perforation, craniofacial syndrome, nasal valve collapse, adenoid hypertrophy, sarcoidosis, Wegener granulomatosis, uncontrolled asthma, pregnancy, and history of ENT procedures such as rhinoplasty and sinus surgery.^[16] The study protocol was approved by the institutional review board of the Dental School of Shahid Beheshti University of Medical Sciences in accordance with the Helsinki Declaration, and written consents were taken from patients prior to the study. The patients were sequentially approved until arriving at the desired sample size.

All the surgeries were performed under the supervision of experienced surgeons. The operations were performed by four senior OMFS graduate students and five ENT chief residents. Both senior ENT and OMFS residents had between 1 and 2 years of experience. The patients underwent only esthetic closed rhinoplasty (without septoplasty) under general anesthesia. After the surgery, the patient was situated in a head-up position and cold compresses were applied to the surgery site for 48 h. The patient was instructed to take nonsteroidal anti-inflammatory medications, to take amoxicillin 500 mg 8 h daily for 1 week, to maintain a soft diet, and to avoid blowing the nose, laughing, coughing, or sneezing with a closed mouth, breathing through nose, and touching the nose or intranasal packs during the next 48 h. Post-operation instructions were also given to the patients. Intranasal packs were extracted after 1-3 days. The sutures were removed after 1 week, and the patient was instructed not to remove the adhesive plaster for at least 3 weeks and during the 70 next nights. Possible surgery complications were thoroughly explained to the patient both orally and in written form.^[17]

The patients' compliances were assessed by the supervising surgeon based on their reports. Poor, moderate, and good scores were assigned to complying less than one-third, between one-third and two-thirds, and more than two-thirds of home cares, respectively, during the whole follow-up period. If the home care was poor in two sessions or more, it was considered poor for the whole period. The presence/absence of synechiae was evaluated by a resident and an experienced maxillofacial surgeon using a nasal speculum and/or an applicator. The presence of nasal obstruction, any voice changes, hyposmia/anosmia,

and recurrent colds were asked from the patients. The follow-up sessions were held at the 1st, 2nd, 3rd, 4th, 6th, 8th, 10th, 12th, 16th, 20th, and 24th postoperative weeks.

Any objective signs of complications after the surgery as well as any subjective complications persisting for at least four follow-up sessions without alleviation until the 24th week were regarded as a positive complication case. Those complications which were recovered in six postoperative months were considered negative.

Statistical analysis

The Spearman's correlation coefficient was used to assess the correlation between the number of complications with patients' age, gender, and the number of performed home cares, as well as surgeons' field of specialty. The level of significance was set at 0.05.

RESULTS

Patients' mean age was 23.5 ± 4.9 years (range: 18-38 years); and 51%, 38%, 7%, and 4% were in the age range 18-22, 23-27, 28-32, and 33-38 years, respectively. Of them, 34.4% were males and 65.6% were females. Of the patients, 81 (84.4%) underwent reduction rhinoplasty and the remainder (15.6%) underwent augmentation rhinoplasty. Of the surgeries, 57.3% were performed by senior residents of the ENT department and 42.7% were carried out by chief residents of the OMFS department. The Joseph and McCarthy techniques were used with minor modifications (when necessary to obtain the most appropriate clinical outcome) in 60.4% and 39.6% of the cases, respectively [Figure 1]. The Joseph technique included skeletonization, hump removal, lateral osteotomy, tip plasty, and closure-taping, while the McCarthy technique consisted of skeletonization,

hump removal, tip correction, lateral osteotomy, and closure-taping. For the cases of augmentation rhinoplasty, only the autogenic grafts (from the septum) were used.

A total of 67 patients had functional complications. Of the complications, 64.2% were observed in the first three post-surgical months. Revision rhinoplasty was necessary for six patients before the sixth postoperative month. Eight patients (8.33%) reported unpleasant voice changes in four subsequent sessions; however, all of them recovered their normal voice before the 11th follow-up session.

Of the complications, 54 (56.3%), 36 (37.5%), 0, 1 (1%), and 28 (29.2%), respectively, were synechiae, nasal obstruction, voice changes, changes in the sense of smell, and recurrent colds [Figure 2].

Compliance with home care instructions was good in 41 cases (43%), moderate in 45 (47%), and poor in 10 cases (10%).

The Spearman's correlation test showed that there was no statistically significant relationship between the incidence of functional upper airway problems with age, gender, or the surgeon's specialty ($P > 0.05$). However, a significant correlation was observed between the number of the home care items fulfilled and the number of complications ($\rho = -0.29, P = 0.01$).

DISCUSSION

No single procedure or approach can provide various patient desires for beauty and functionality, especially when expectations of patients do not correspond with those of clinicians. Surgeons should know multiple techniques to be able to fulfill patients'

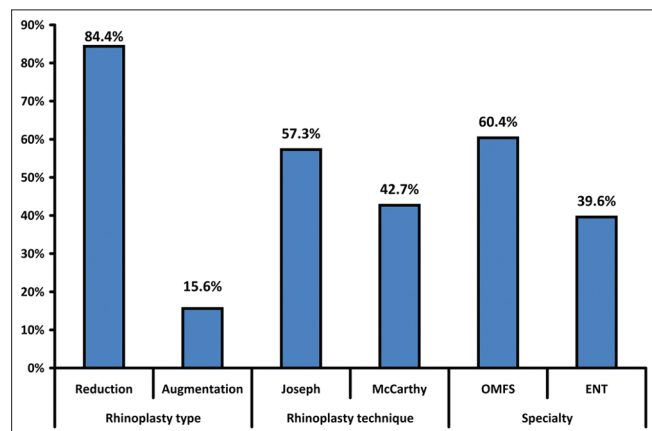


Figure 1: Frequency distribution (%) of surgeries and surgeon specialties

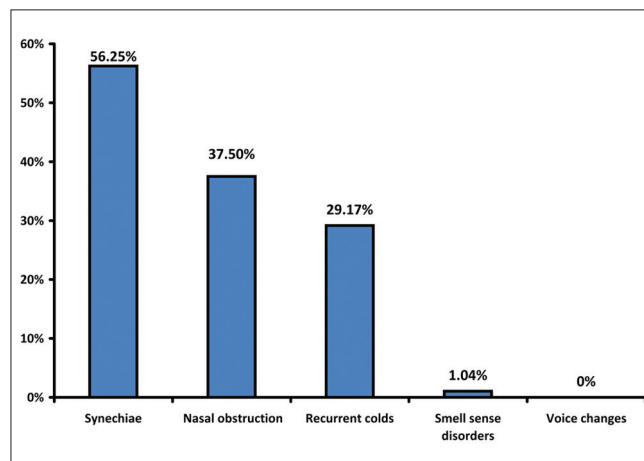


Figure 2: The incidence of the complications (%)

demands.^[1,7] Cosmetic rhinoplasty remains one of the most challenging facial cosmetic procedures. This is unlikely to change despite many advances and changes in this field. In this research, the patients' most common post-surgical complication was respiratory problems caused by synechiae and intranasal scars. Some previous studies have provided similar results.^[18] The present results indicate the importance of compliance with home care instructions. Although age and gender might affect the patient need and the proper technique in rhinoplasty, no significant correlations were observed between these factors and level of complications, perhaps because of the rather long list of exclusion criteria, which limited the types of the study. No previous studies had assessed these risk factors to compare the results.

This preliminary study was limited by some factors. Closed rhinoplasty does not leave any scars on the skin, yet it hinders the surgeon's eyesight,^[17] and therefore is more difficult to perform by first-timers. Two closed rhinoplasty techniques were used in this study, which might be difficult to teach because of limited exposure. A sample uniformly consisted of more difficult-to-teach closed surgeries might lead to higher rates of complications. Moreover, rhinoplasty techniques are frequently modified in order to obtain the most appropriate clinical outcome,^[1] therefore the methods used could not be standardized in terms of technical details. Furthermore, a clinical trial with a control group present could shed light on causations. Also of interest might be clinical trials in which the complications of surgeries carried out by residents were evaluated with the outcome of similar surgeries done by their supervisors, or compared with outcome of other residents or surgeons with more or less experience level. Another limitation of this was the shortcomings in data collection. Although data relevant to the frequency of complications seemed adequate, some points which could improve the findings were missing, including detailed patient data, details regarding surgeons and their field of specialty, etc., Therefore, future in-depth studies should address these as well. As another constraint, nasal healing is known to occur over an 18-month period after rhinoplasty, not necessarily within 6 months. However, considering the large and uniform sample of this study and the number of follow-ups, longer periods and control groups could not be evaluated. Eventually, the measurements were almost based mainly on the subjective reports of the patients, which might reduce the reliability. For

instance, patients might have falsely reported good compliance. However, apart from nasal obstruction which could be measured objectively,^[19,20] and the synechiae which was objectively evaluated, the other three symptoms could not be objectively assessed. Although according to some investigators, subjective methods for measuring nasal obstruction might be less reliable than the objective ones^[19,20] and might result in false-positive error,^[21] it should be noted that nasal obstruction is not only a reduction in the airflow. It is a symptom, which is supposed to be *felt* after iatrogenic changes in the airflow pattern. Rather than only air flow changes, it is a multifactorial phenomenon mostly caused by weakened nasal valves or reduced functionality of pain, pressure, or thermal receptors, caused by surgical scars, as well as changes in the level of secretions which might give the feeling of a "blocked nose."^[1,3,7,13,14,21] Moreover, patient satisfaction might depend more on their subjective feelings than on the level and pattern of airflow. Therefore, rhinometry has little clinical value.^[16] Future studies should also use standardized tests such as "Smell Identification Test" or "Sniffin' Sticks" test battery for assessment of olfaction.^[5,22-24] The latter allows the evaluation of odor thresholds, odor discrimination, and odor identification.^[5,22-24] Further, attention should be paid to the methodology of confirming the presence of some symptoms. In this study, we regarded the presence of a symptom through four subsequent sessions as affirmative. However, it is not known how reliable and generalizable this method could be. Because in some cases, symptom improvement might be only a matter of time, and confirmation of a symptom by a limited number of sessions might not be the best method. This criterion for confirming the complications could also relate to the significant association observed between the presence of symptoms and patient compliance, because symptom improvement might be only delayed, without being necessarily eliminated, in some of those patients with poorer home cares. It might increase the odds of symptoms lasting for a period longer than 4 subsequent sessions, and thus can flag a false positive complication (while the symptom might be improved within a longer period in some of the cases).

Some researchers have stated that nasal obstruction is the most common complication of rhinoplasty.^[3,7] It had a considerably high incidence in this study as well. Due to more mucosal tampering and changes in intranasal valves, closed rhinoplasty techniques might produce more functional complications, compared

with open rhinoplasty. Certain investigators have commented that reduction rhinoplasty might not lead to either objective nor subjective obstructions,^[11] or that it might even improve nasal obstructions in 75% of the cases.^[12] The rate of post-rhinoplasty nasal obstruction has been reported to range from 0.8% to 79%.^[3,7-10,13] An explanation for this huge controversy might be the surgery technique applied, as 90% young patients with septal deviation might benefit from septoplasty in terms of improvement of nasal airflow.^[16] The high rate of nasal obstruction seen in the current study might be attributed to high frequency of reduction rhinoplasty which has been regarded as the most common cause of nasal obstruction.^[9,14,15] The expertise and meticulousness of the surgeon might be another factor. In this study, chief residents performed the surgeries, which might explain the comparatively high rate of complications.

The rate of synechiae observed in this study was far higher than those previously reported (2-12% in nasal surgeries).^[25-27] An atraumatic surgery, controlling postoperative infections, and adequate intranasal packing might reduce the rate of synechiae.^[17,28] It has been stated that the appropriate application of intranasal packs may help with further improvements of the airway functions,^[29] while some authors believe that intranasal packs should not be extracted until re-epithelialization has been completed (7-10 days after the surgery) in order to prevent mucosal adhesion.^[17] Nevertheless, little evidence supports this notion, and extended intranasal packing might lead to other complaints such as increased postoperative pain, without necessarily reducing the rate of synechiae.^[30] In this study, nasal packing was removed after 24-72 h, which might contribute to the high rate of synechiae observed and might confirm the former theory.

In the present study, 22% of the patients complained of the emergence of recurrent colds after the surgery, which was not in agreement with another study.^[31] It is noticeable that in their study, the patients with histories of functional airway problems were treated by corrective surgeries and those with no previous airway dysfunctions showed nasal congestion, as well as blowing and sneezing when they were inspected, which could be the result of improper mucosal tampering causing mucosal defense disturbance.

Changes in voice were observed in 8.33% of the patients (in four subsequent sessions), which were likely attributed to alterations in the air flow and the

turbulence caused by the adhesion or the internal valve changes. The problem ceased after 2 months as the wounds healed and the edema was reduced. To our knowledge, there is no other study on this topic to compare the results with.

Controversy exists over the effect of rhinoplasty on the sense of smell,^[20,22-24,32,33] and all nasal surgeries might bear a certain risk to the olfaction, even when they are performed on areas remote from the olfactory epithelium,^[24,32] although it is usually temporary.^[7] Whereas the underlying mechanisms are not clear, they may include changes of intranasal volumes or psychological factors.^[4,11,24] The basic factors affecting the sense of smell can be the occurrence of adhesion, scar formations, direct trauma to the olfactory neuroepithelium, septal deviation, nasal obstruction, and increased nasal resistance leading to mucosal hypertrophy and edema.^[4,11,24] According to the literature, a moderate decrease in olfactory function might occur in as many as 20% of patients.^[22] Fiser^[34] also reported seven cases of permanent anosmia and some other grades of olfactory problems as consequences of septoplasty and rhinoplasty. In contrast, Kimmelman^[32] and Durr *et al.*^[23] stated that rhinoplasty improves the smelling function. Kimmelman^[32] reported that the type of rhinoplasty—esthetic or functional—does not make any changes in the process. Durr *et al.*^[23] studied preoperative and postoperative olfactory senses in a group of patients with history of functional problems, and found that the surgery might have positive effects on their olfaction. Nonetheless, they concluded that the rarely observed postoperative increase in olfactory threshold did not seem to be subjectively recognizable by the patients.^[23] Champion^[33] interviewed patients and reported a 10% anosmia incidence. Damm *et al.*^[22] studied 30 patients who underwent partial inferior turbinectomy with septoplasty. A total of 80%, 70%, and 54% of their sample showed improvements in odor identification, odor discrimination, and odor thresholds, respectively. They summarized these as significant betterment of olfactory function in most of cases. However, they also reported some moderate declines in olfaction in about one-fifth of their patients.^[22] Pfaar *et al.*^[24] evaluated smell sense of 30 patients with septal deviation, for an average of 5.4 postoperative months, in a lateralized fashion. Prior to surgery, odor thresholds were lower at the non-obstructed sides. However, this difference in odor thresholds between obstructed and

non-obstructed sides disappeared in the post-surgical follow-up sessions.^[24] Also, during the postoperative period of their study, a significant decrease of odor discrimination was observed, while there was no change of odor thresholds or odor identification in their research.^[24] Moreover, they inferred the absence of any significant changes in overall olfactory function with regard to their entire sample.^[24] Gandomi *et al.*^[16] studied the complications of 86 patients who underwent septoplasty with or without turbinectomy, and found significant reductions in anosmia prevalence. As the only study on esthetic rhinoplasty, Shemshadi *et al.*^[5] studied the influence of esthetic open rhinoplasty on olfaction of 40 patients. Although the olfactory function reduced first, they observed a clear return of the functionality to the baseline within 6 months.^[5] None of the studies available in the literature had assessed the changes in olfaction after an esthetic-only closed rhinoplasty. It was interesting to see that although a high rate of synechiae and obstruction was observed in this study, only one patient experienced hyposmia. The absence of major complications in presence of high rates of subjective complications can imply the low rate of objective iatrogenic damage caused by surgeons, as properly executed rhinoplasty seems to be less likely affecting the olfactory epithelium. Moreover, methodological differences might contribute to the controversy; for example, esthetic rhinoplasty might have a very low risk of neuroepithelium injury, compared to other types of rhinoplasty such as those including turbinectomy,^[4,5] which itself has been shown to cause minimal, insignificant rate of olfaction problems when being performed without septoplasty.^[24,35,36] The hyposmia might recover in time either partially or fully,^[5] although its recovery time has been debated (ranging from less than 6 to 18 months).^[5,23,33] In the current 6-month study, the presence of a symptom through at least four sessions was required to consider the case positive. Therefore, in many patients, the olfactory function might have been recovered before the fourth session or before the sixth postoperative month.

CONCLUSIONS

Within the limitations of this preliminary study, a high rate of synechiae and nasal obstruction was observed, which might imply poorer quality of surgeries performed by residents, or might be attributable to the closed reduction rhinoplasty technique carried out in this sample. Further in-depth studies are warranted

to evaluate these in more detail and also to compare the complications of surgeries performed by residents with those done by experienced surgeons.

The compliance with the home care instructions reduced the rate of functional rhinoplasty complications. It might be a real effect, or due to delaying the recovery process which might result in overestimation of complication incidence. However, age, gender, and the fields of surgeons' specialty were not associated with the incidence of complications.

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