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ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Impact of aesthetic rhinoplasty on the respiratory function of the nose in patients with a straight nasal septum

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SUMMARY

Introduction/Objective Aesthetically, the nose adds special signature to a person's look. This results in many nasal pyramid surgeries, either functional or aesthetic. The problem arises in aesthetic surgeries. Patients often tend to present their dissatisfaction with the appearance of the nose as a breathing difficulty, as they often lack the support of the environment in the decision to undergo cosmetic surgery. The objective of the paper was to examine, using subjective assessment and objective measurements, the change in the nasal respiratory function in patients who undergo aesthetic nose surgeries, despite having a straight nasal septum before the surgery.

Methods The study was conducted as a prospective, cross-sectional one, and involved 32 patients of both genders. Before and at six months after surgery all patients underwent subjective nasal breathing assessment using visual analog scale (grade 0–10) as well as objective nasal respiratory function assessment using rhinomanometry and acoustic rhinometry after anemization.

Results There were seven male and 25 female patients, age ranging 18–27 years. Objective measurements after surgery showed that the nasal cavity volume, minimum cross-sectional area, as well as the airflow through the nose reduced, while resistance to the nasal airflow increased, but with no statistical significance. The subjective assessment of nasal breathing statistically significantly improved after the surgery.

Conclusion The subjective assessment of nasal breathing postoperatively is not a relevant indicator of the objective state of the nasal respiratory function in patients after aesthetic rhinoplasty.

Keywords: aesthetic rhinoplasty; rhinomanometry; acoustic rhinometry; nasal airflow; subjective nasal breathing sensation

INTRODUCTION

Nose represents the central structure that dominates the whole face. Aesthetically, it adds special signature to a person's look and contributes to the expressiveness and beauty. For this reason, numerous nose deformities impact the person's look itself. This results in many nasal pyramid surgeries, either functional or aesthetic. Functional rhinoplasty implies a nasal pyramid surgery in cases when it is not possible to establish a good respiratory function by correction of the nasal septum only. Aesthetic surgeries are those that are performed at the request of the patient due to dissatisfaction with the appearance of the nose, without the respiratory function being compromised by the shape of the nose itself.

Primary functions of the nose are respiratory and protective ones. Protective function reflects in cleaning the air, moistening it and warming, i.e., conditioning it for lower airways. The aim of each functional rhinoplasty surgery is to establish a good nasal respiratory function. The problems arise in aesthetic surgeries. Patients often tend to present their dissatisfaction with the appearance of the nose as a breathing difficulty, as they often lack the support of the environment in the decision to undergo cosmetic surgery.

The second problem is the readiness of the surgeon not to give in to the patient's tendency to have the smallest nose possible, and this way to lead to a serious violation of the nasal respiratory function.

The success of the surgery in rhinoplasty/septorhinoplasty is measured through many aspects: the patient's satisfaction with his/her look, subjective quality of nasal breathing, but also the satisfaction of the surgeon himself/herself with the results of the surgery. There are many questionnaires for the analysis of surgical results [1–7].

It has been proven, without a doubt, that after the surgery of a deformed nasal pyramid, with the mechanical barriers for airflow through the nasal cavity present before the surgery, a good respiratory function was established. By using objective tests, such as rhinomanometry, acoustic rhinometry, and measuring of the peak nasal inspiratory flow, one obtains statistically significant improvements in the nasal respiratory function in these patients. Still, the question remains what happens with the nasal respiratory function in patients who have good respiratory function, and undergo nasal surgeries purely for aesthetic reasons.

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The objective of the paper was to examine the changes in the nasal respiratory function, using subjective assessment and objective measurements, in patients who undergo aesthetic nasal surgeries but had a straight nasal septum prior to the surgery.

METHODS

The study was conducted as a prospective and cross-sectional one, and involved 32 patients of both genders who were operated on at the ENT department of a tertiary level institution. None of the patients had a deviated septum or other nasal pathology or risk factors, such as allergy, that could affect nasal breathing. All participants had an undisturbed nasal respiratory function prior to surgery. The condition for participating in the study was a nasal septum without deviation and dissatisfaction with the nasal pyramid appearance. Before they were included in the study, all the patients had undergone an ENT examination, subjective nasal breathing self-assessment, as well as an objective nasal respiratory function assessment. In order to accurately evaluate the condition of the nasal septum, beside anterior rhinoscopy, the nasal endoscopy using rigid Storz 4 mm optics at an angle of 30°, was performed. The subjective nasal breathing sensation was self-assessed by the patient using the visual analogue scale (grade 0–10), where 0 stands for minimal and 10 for maximal nasal airflow rate. Objective assessment of the nasal respiratory function was carried out by using rhinomanometry and acoustic rhinometry. The nose volume was measured for the first 5 cm from the nasal openings. Such distance was taken into consideration in order to better establish the effects of the nose volume changes because they model the nasal pyramid, making it smaller. In this case, the Rhinoscan SRE 2000 (Interacoustics A/S, Middelfart, Denmark) device was used. Before the objective assessment of the nasal respiratory function, all the patients underwent nasal anemization. The anemization was performed in accordance with the 2005 Consensus by using 0.1% oxymetazoline spray, 50 μg in each half of the nose; the process is repeated in five minutes with one dose in each half of the nose. After the application, it was necessary to wait for 15–30 minutes and then perform the assessment [8, 9]. The anemization was performed in order to exclude the mucous component during the assessment.

All the patients underwent an aesthetic rhinoplasty procedure with the correction of the size of the nose, in order to adjust the nose to the anthropometric measurements of the face. A low-to-low lateral nasal osteotomy with cartilaginous grafts was used for this purpose.

Six months after the surgical procedure, all the patients underwent subjective and objective assessments of the nasal respiratory function, the same way it was done before the surgery. Digital and print face photos (front and profile view) were taken before and after surgery as well.

Since these are dependent sets of results, the analysis of the effect of the surgery had to be carried out by the factorial analysis, and not by comparing parametric and non-parametric properties of assessed variables. The analysis of the change in values was carried out by performing Duncan's test. The significance level values of $p < 0.05$ were considered statistically significant.

The study was carried out according to the principles of the Helsinki Declaration and it was approved by a local ethics committee (protocol number 6/00-29).

RESULTS

There were seven male (21.87%) and 25 female (78.13%) patients. The age of the patients ranged 18–27 years; the average age was 23.79 years. Age and gender distribution of study participants is shown in Figure 1.

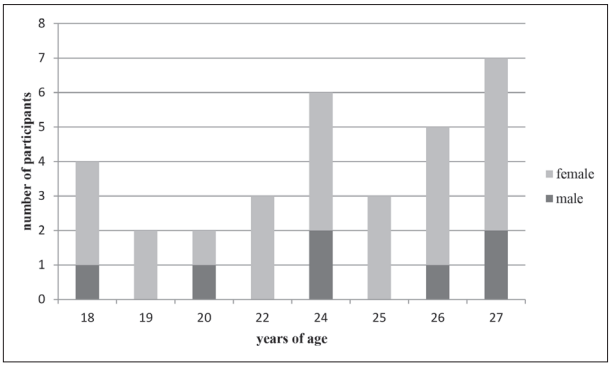

Figure 1. Age and gender distribution of the participants

A statistically significant difference in the assessment of nasal respiratory function before and after surgery was obtained only in the subjective assessment of nasal respiratory function, which proved to be significantly better after surgery in both the left ($p = 0.00072$) and the right half of the nose ($p = 0.00015$). Although all objective parameters of nasal respiratory function show postoperative degree of deterioration in relation to preoperative values, this difference was not statistically significant in any of the parameters, as shown in Table 1.

Table 1. Results and comparison of mean values of subjective and objective parameters in nasal respiratory function before and after the surgery

Parameters	Before surgery	After surgery	p
Resistance on the left side (Pa/cm³/s)	0.5408	0.5687	0.6794
Resistance on the right side (Pa/cm³/s)	0.5112	0.5445	0.6127
Total resistance (Pa/cm³/s)	0.2524	0.2737	0.4034
Airflow on the left side (L/min)	306.30	284.89	0.5357
Airflow on the right side (L/min)	319.40	278.65	0.2281
Volume on the left side (cm³)	6.7075	6.0042	0.1243
Volume on the right side (cm³)	6.2883	6.0233	0.5528
Minimum cross-sectional area on the left side (cm²)	0.4675	0.4192	0.1121
Minimum cross-sectional area on the right side (cm²)	0.4583	0.4200	0.1797
Subjective breathing sensation on the left side (VAS)	6.4348	9.1467	**0.00072**
Subjective breathing sensation on the right side (VAS)	6.3478	9.3333	**0.00015**

VAS – Visual Analogue Scale (grade 0–10)

Figure 2. Frontal and profile face image before the surgery

Figure 3. Frontal and profile face image after the surgery

Examples of the appearance of the nasal pyramid in frontal and profile view images, pre and postoperatively, are shown in Figures 2 and 3.

DISCUSSION

The nose, besides its aesthetic significance, providing its functions, has a remarkable impact on the quality of life. If the breathing and protective functions of the nose are impaired, patient breathes through the mouth, which results in constant sore throat and consequent damage of the lower airways.

It is well known that nasal respiratory function improves after functional rhinoplasty, but the surgeons need to be aware that nasal septal surgery affects nasal anthropometry and can consequently cause aesthetic complications [10].

The question remains what happens with the nasal respiratory function in patients who have preserved respiratory function, and undergo nasal surgeries for cosmetic reasons only. The presented study aimed to answer this question.

Certain authors found that aesthetic rhinoplasty does not impede the nasal respiratory function, at least not with proved statistical certainty [11, 12].

Unlike them, there is an opinion that when the low-to-low osteotomy is used, the change in the internal nasal valve results in impaired nasal breathing [13]. However, Kamburoglu et al. [14] could not prove the occurrence of nasal breathing disturbance after the reduction rhinoplasty procedures with statistical certainty.

Okland et al. [15], according to their retrospective study, with patient-centered questionnaires used, indicate that reductive rhinoplasty is not associated with a greater risk of breathing obstruction when performed with modern airway preservation techniques, but report the initial increase in obstructive symptoms only on the first postoperative visit due to perioperative swelling.

Based on their research, McKiernan et al. [16] concluded that there is some benefit after rhinoplasty, particularly in patients who also have a cosmetic reason for the surgery.

Pfaff et al. [17], in a systematic review and meta-analysis of 25 studies, found that functional and aesthetic nasal operations appear to significantly improve olfaction as well, which is directly correlated with improvement in nasal airflow and the quality of life.

By analyzing the results of our study, it could be stated that all the objective parameters for the nasal respiratory function after the surgery worsened in comparison to those before the procedure. Such differences are insignificant, but still present. There was an increase in both nasal halves individually and in the overall nasal airflow resistance, which indicates the narrowing of the respiratory space inside the nose. The reduction of the nose volume in the observed range also indicates reduction of the respiratory space. During the surgery, the size of the nasal pyramid reduces, and this results in the reduction of the nasal volume and the minimal cross-sectional area.

Pousti et al. [18] stated that the nasal cross-sectional area is the main factor which determines the nasal respiratory function, and that the nasal airflow proportionally reduces with the minimal cross-sectional area.

In our material, the minimum cross-sectional area reduced on average by 0.0483 cm^2 on the left, and by 0.0383 cm^2 on the right side. The reduction of the minimum cross-sectional area is the main reason for the increase in both individual and total nasal airflow resistance, but at the same time it is the cause of the airflow reduction.

Savović et al. [19] stated that rhinomanometry significantly correlates with the subjective score of the nasal respiratory function and that it can be used as the objective indicator in daily clinical practice. The same authors also found that the acoustic rhinometry does not correlate with the subjective score of the nasal breathing and that it has more significance in research than in clinical practice [19]. Unlike this research, Skouras et al. found that the acoustic rhinometry is good in detecting and monitoring the effects of impaired breathing, in particular in plastic surgeries of nose and nasal septum [20].

Although the objective respiratory parameters indicated the reduction of the nasal airflow and an increase in nasal airflow resistance, though not with a significant difference, the finding with regards to subjective nasal breathing indicated significant improvement of the respiratory function. After the surgery, all the patients rated their nasal breathing as significantly better. Such difference is statistically highly significant. The explanation for such occurrence may go in three directions. The first one is that the reduction of a bigger nasal pyramid and nasal volume result in better stimulation of olfactory receptors,

and therefore the persons have better sensation of the airflow in the nose. The second reason for such result might be the fact that these persons were primarily operated on for aesthetic reasons, and that only the fulfilment of their aesthetic requirements and satisfaction with the outcome leads to exaggerated results when scoring the nasal respiratory function after the surgery. The third reason could be the fact that these persons presented their nasal respiratory function before the surgery worse than it really was, in order to justify their aspiration to undergo a nose surgery as soon as possible.

Although there is no significant difference in the reduction of nasal respiratory functions following surgery in patients who had preserved nasal respiratory function before the surgery, it is important to point out that these patients need to be monitored continuously. This was also highlighted by Constantinides et al. [21], who emphasised that after aesthetic nose surgeries the patients may have asymptomatic nasal breathing difficulties for a long time. As the same authors underline, these patients do not have good correlation between the subjective score and objective nasal breathing findings.

CONCLUSION

Nasal pyramid reduction after aesthetic rhinoplasty, in patients with a nasal septum without deviation preoperatively, results in statistically insignificant reduction of the nasal airflow as well as an increase in nasal airflow resistance, as a direct consequence of the reduction of the minimal cross-sectional area as well as the volume of the nose itself.

Subjective self-assessment of nasal breathing is not a relevant indicator of the nasal respiratory function in patients who undergo aesthetic rhinoplasty.

Conflict of interest: None declared.

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Утицај естетске ринопластике на дисајну функцију носа код пацијената са правом носном преградом

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САЖЕТАК

Увод/Циљ Естетски, нос даје печат изгледу особе. Ово је разлог честих операција носне пирамиде, како функционалних, тако и естетских. Проблем се јавља код естетских операција. Пацијенти су често спремни да свој проблем са изгледом носа приказују као проблем отежаног дисања, будући да околина често нема разумевања за њихову жељу за естетском операцијом.

Циљ рада је био да се, коришћењем субјективне процене и објективних мерења, испита промена у дисајној функцији носа код пацијената који се подвргавају естетској операцији носа а имају праву носну преграду пре операције.

Методе Истраживање је спроведено као проспективно, укрштено, и обухватило је 32 пацијента оба пола. Пре и шест месеци после операције свим пацијентима је дисајна функција носа процењивана субјективно коришћењем визуелне аналогне скале (оцена 0–10) и објективно помоћу риноманометрије и акустичке ринометрије уз претходну анемизацију.

Резултати Студија је укључила седам пацијената мушког и 25 женског пола, старосне доби од 18 до 27 година. Објективна мерења после хирургије показала су смањење запремине носа, минималне површине попречног пресека, као и протока ваздуха кроз нос, док се отпор протоку ваздуха кроз нос повећао, али без присутне статистичке значајности. Субјективни осећај дисања на нос се статистички знатно поправио после операције.

Закључак Субјективни осећај дисања на нос није релевантан показатељ објективног стања дисајне функције носа код пацијената после естетске ринопластике.

Кључне речи: естетска ринопластика; риноманометрија; акустичка ринометрија; проток ваздуха кроз нос; субјективни осећај дисања на нос