The Effect on Patient Satisfaction of the Postoperative Nasal Topographic, Demographic, and Functional Results of Open and Closed Septorhinoplasty Techniques

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Aim: To evaluate the contribution to patient satisfaction of the newly reshaped topographic anatomy of the nose, demographic, and functional results in the postoperative period of septorhinoplasty surgery.

Method: A total of 370 patients applied with open and closed septorhinoplasty techniques for various reasons were grouped according to the postoperative Rhinoplasty Outcome Evaluation (ROE) Scale results; Group 1 (open rhinoplasty satisfied group, ROE $\geq$12 points, n:194), Group 2 (open rhinoplasty dissatisfied group, ROE $<$12 points, n:23), Group 3 (closed rhinoplasty satisfied group, ROE $\geq$12 points, n:137), Group 4 (closed rhinoplasty dissatisfied group, ROE $<$12 points, n:16). The groups were evaluated in respect of the effect on patient satisfaction of functional and demographic variables and satisfaction with the topographic outcome of the nose.

Results: The effect of the topographic surgical results was evaluated on patient satisfaction. A correlation was determined between nasal topographic satisfaction and patient satisfaction (r:0.228, $P = 0.009$). In the subgroup analyses, the only factor among the topographic factors which had an effect on satisfaction was the nasal tip (r:0.187, $P = 0.024$). Although 30.7% (n:39) of patients dissatisfied with the surgery reported that they were not satisfied with the nasal base results, no correlation was determined between nasal base and satisfaction (r:0.091, $P = 0.463$). The strongest correlations of patient satisfaction were determined to be with subjective (NOSE score [r:0.530, $P < 0.001$]) and objective (high nasal resistance levels [r:0.579, $P < 0.001$]) functional results.

Conclusion: The 2 basic components of postoperative satisfaction with SRP surgery were shown to be functional healing and cosmetic outcomes. Of the surgical topographic results, nasal tip and nasal base were the parts determined to require the most attention.

Key Words: Functional results, patient satisfaction, septorhinoplasty, topographic anatomic results

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The nose, which not only has a place in the aesthetic anatomy of the face, but is also an important functional organ, is currently the organ to which aesthetic surgery is most frequently applied. Interventions in this region can be made with the aim of reshaping the nose pyramid, such as rhinoplasty, or septoplasty reshaping the bone and cartilaginous nasal septum, or a combination of the 2.[1] Although modifications such as the open technique without transcolumellar incision[2] were defined at the beginning of the 1990s in septorhinoplasty surgery (SRP), the 2 most widely used basic methods are transcolumellar open surgery and endonasal approaches.[3] Each technique has advantages and disadvantages. There are studies in literature, in recent years in particular, that have evaluated both methods in respect of early surgical,[4] functional and cosmetic results, and patient satisfaction.[5,6] One of the points focused on in recent years is the effect of postoperative nasal topographic results on patient satisfaction with the surgery.[7]

However, it has been emphasized in some studies that patient satisfaction is affected by several factors such as the functional status of the nasal airway,[5,6] the aesthetic form of the nose,[5,6] the psychological status of the patient,[8] the early postoperative status of the oropharyngeal region,[9,10] or the late postoperative topographic status.

Although these factors have been evaluated separately in literature,[4–10] this study is the first to evaluate as a whole the effect on patient satisfaction of demographic variables, objective (nasal cavity resistance) and subjective (NOSE) functional status and the newly shaped topography of the nose.

The aim of this study was to evaluate the factors affecting patient satisfaction.

PATIENTS AND METHODS

Approval for the study was granted by the Local Ethics Committee (Ethics Committee approval number: 2019-14/145) and all the procedures were in compliance with the Helsinki Declaration. A retrospective evaluation was made of 413 patients, aged $>$18 years who underwent surgery for nasal deformity and respiratory difficulty in the Ear, Nose and Throat Department of a tertiary level hospital between 01.01.2015 and 01.12.2019. Data were collected from patient records, computer system records, operating notes, clinic follow-up forms and the anamnesis related to surgical indications, pre and postoperative detailed facial analysis pictures and the surgical procedures applied. In the selection of the surgical method in the preoperative period, the decision was made according to specific conditions such as the severity of the external deformity, the

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The study was conducted in accordance with the principles stated in the Declaration of Helsinki.

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presence of posterior septal deformity, and the need for graft or tip plasty. Intervention was not made to any patient for experimental purposes.

To be able to document the functional results of the surgical procedure applied in the clinic, the ROE and NOSE scoring systems were applied with rhinomanometric measurements preoperatively and at 12 months postoperatively. In addition, photographs were taken in 6 directions and archived pre and postoperatively. Unlike other studies in literature, evaluation was made of the nasal anthropometric proportion of patient satisfaction. For this purpose, patients applied with SRP surgery and with complete data were invited for a further examination. The follow-up examination of the patients, the rhinomanometric measurement evaluations and questionnaire evaluations were performed by an ENT specialist with 10 years of professional experience who was not involved in the study. Scoring was made using a Visual Analog Scale in respect of the evaluation of the effects on satisfaction of the nasal tip, nasal dorsum, columella and radix.

Following the exclusion of 32 patients who did not wish to participate in the study and 11 patients with unavailable data, evaluation was made of 370 patients. Informed consent was obtained from all the patients before the study procedures were implemented. The patients were separated into 4 groups according to the postoperative ROE score. Group 1 (open rhinoplasty satisfied group, ROE $\geq$12 points, n:194), Group 2 (open rhinoplasty dissatisfied group, ROE $<$12 points, n:23), Group 3 (closed rhinoplasty satisfied group, ROE $\geq$12 points, n:137), Group 4 (closed rhinoplasty dissatisfied group, ROE $<$12 points, n:16).

The factors affecting patient satisfaction were evaluated under 3 main headings. First as demographic characteristics (age, gender, educational status, marital status), second as surgery-related factors [technique, topographic structure of the nose (nasal tip, volume based on size of the lateral crura, width (interdomal distance), shape (broad, bulbous, boxy), projection (rotation and definition), nasal dorsum (open book deformity, middle vault cartilage asymmetry, saddle nose deformity and tip conformity), radix (radix and tip conformity) and nasal base (nostril openings, external nasal valve and columella)] and finally as the postoperative objective (nasal cavity resistance) and subjective (NOSE scoring system) functional status.

Surgical Technique

Preoperatively, an anamnesis was taken from all patients, and physical examinations and facial analysis were performed. Taking into consideration the preoperative anatomic structure of the nose and factors such as the patient's preference for deviation type, the surgical method to be applied was determined and consent was obtained. All the surgical procedures were applied under general anesthesia by the same surgical team.

Open Septorhinoplasty Technique

Following staining of the surgical area with antiseptic solution, sterile draping of the area, and adjustment of the patient position, the operation was started with a reverse V incision and lateral marginal incisions. By dissecting the flap in the subperichondrial subperiosteal plane, the lateral cartilage, upper lateral cartilage, nasal septum caudal and dorsum supraperichondral, and bone dorsum subperiosteal were exposed. In deviated septa, maximum resection was applied preserving an L frame. The dorsal hump was lowered using an osteotome and rasps, and the roof was opened. Bilateral spreader graft and columellar strut grafts were applied as standard. Cephalic trimming was applied taking care to leave 8 mm facing the lateral crus of the inferior lateral cartilage. Transdomal, interdomal, and septocolumellar sutures were applied with the aim of standard tip-plasty. To reduce open-book deformity, internal medial and external lateral osteotomies were applied. When bleeding control and hemostasis were obtained, an internal Doyle silicone splint was applied and the operation was terminated.

Closed Septorhinoplasty Technique

Following patient preparation as defined in the open septoplasty technique, the operation was started with a transfixion incision in cases that required cartilage graft, and with a transcartilaginous incision in cases where thinning of the nasal tip alone would be sufficient. Although the method was modified according to each patient, it was applied using the alar cartilage delivery technique. Following the transfixion and intercartilaginous incision, a marginal rim incision was made, the skin was separated over the alar cartilage, and a 2-pedicled flap was formed, which was attached at one end to the medial crus in the columella and at the other end to the sesamoid cartilage and bone structure. After taking the flaps out of the nostrils, cephalic resection was applied taking care to leave 8 mm facing the lateral crus of the inferior lateral cartilage. Columellar strut and spreader graft were applied at a thickness appropriate to the need of each case. Transdomal and interdomal sutures were applied with the aim of standard tip-plasty. To reduce open-book deformity, internal medial and external lateral osteotomies were applied. When bleeding control and hemostasis were obtained, an internal Doyle silicone splint was applied and the operation was terminated.

Objective Functional Analysis With Rhinomanometry

Measurements were taken with an SRE2100 device (Rhinometrics A/S, Lynge, Denmark) that produced an acoustic signal in the form of intermittent impulses in accordance with the criteria defined and recommended by the Acoustic Rhinomanometry Standardization Committee.[11] The cross-sectional areas obtained from the measurement curves, the distances and nasal cavity volume measurements were determined with the Rhinoscan vn. 2.6 software (Rhinometrics A/S, Lynge, Denmark). Measurements were taken separately from the right and left nostrils of each patient and the total nasal resistance values were calculated from the data obtained using the formula below: **Nasal resistance** ***(RN)=Transnasal pressure (P)/Nasal airflow (V), RTotal=(RLeft∗RRight)/(RLeft+RRight).***

Subjective Quality of Life Analysis Specific to the Nose using the NOSE Scale

The NOSE scale developed by Stewart et al includes the evaluation of 5 parameters related to symptoms scored on a 5-point Likert scale.[12] The raw scores obtained range from 0 to 20. To determine the total points, the points of individual responses are added and multiplied by 5, to provide evaluation made from a total of 100 points. High points indicate an impaired functional status. This questionnaire, which has been translated into many languages and has been validated, is a reliable scale providing a rapid response on the subject of nasal functions.

Subjective Aesthetic Analysis Using the ROE Scale

This scale was first used by Alsarraf et al[13] to evaluate the outcome of rhinoplasty surgery. It is a scoring system which evaluates rhinoplasty results, patient satisfaction, the appearance of the nose, function, the self-confidence of the individual, and the personal change requests related to the nose. The scale consists of 6

items scored from 0 (poor) to 4 (very good) providing a total ranging from 0 to 24. A score of ≥12 points indicates that the patient is satisfied with the nose functionally and aesthetically, and a score of <12 points indicates dissatisfaction. Patient satisfaction in this study was evaluated according to the ROE questionnaire results. Patients with a score of ≥12 were evaluated as satisfied with the surgical results and those with a score of <12 as dissatisfied.

Evaluation of the Topographic Structure of the Nose

For the patients to be able to evaluate the topographic structure of the nose, first they were given information about the nasal tip, radix, dorsum, and nasal base, as shown in the images in Figure 1. Then at postoperative 12 months, the patients were shown the photographs taken of their face from 6 directions, and instructed to mark their level of satisfaction with each of the topographic regions of the nose from 0 to 10 on a 10 cm scale divided into equal parts of 1 cm (as described by Morselli et al).[8] Before performing the evaluation, it was explained to the patients that a score of 0 to 2 points would be evaluated as very poor, 2.1 to 4 points as poor, 4.1 to 6 points as undecided, 6.1 to 8 points as good, and 8.1 to 10 points as very good. The points of each region were totaled and averaged to give an overall nasal topographic satisfaction score, thereby determining the level of satisfaction. The overall nasal topographic satisfaction points were categorized in the same way from very poor to very good. The patients with low surgical satisfaction were requested to state which topographic part of the nose they were most dissatisfied with, and if there was more than 1 part causing dissatisfaction, to list them in order of importance. All these data were recorded.

Statistical Analysis

Data obtained in the study were analyzed statistically using SPSS vn. 17.0 software (IBM Statistics for Windows version 17, IBM Corporation, Armonk, New York). Distribution of continuous data was assessed with the Kolmogorov-Smirnov test. Categorical data were expressed as number (n) and percentage (%) and quantitative data as mean ± standard deviation (SD) and median, range (minimum-maximum) values. The groups were compared preoperatively and postoperatively by ANOVA (Tukey HSD) method and expressed as p1 value in the Supplementary Digital Content, Table 2, http://links.lww.com/SCS/B903. The changes over time in repeated measurements were examined within groups with Repeated Measures ANOVA followed by the Bonferroni test. Significance levels are expressed as p2 value in Supplementary Digital Content, Table 2, http://links.lww.com/SCS/B903. When the Mauchly test was significant, Sera-Geisser adjustment was applied to determine the statistical significance of factors, ignoring the normality and variance equality in the groups. Factors related to patient satisfaction were evaluated with Spearman rho test. The contribution to satisfaction of variables determined to be related to patient satisfaction was evaluated with binary logistic regression analysis. A value of $P < 0.05$ was accepted as statistically significant.

RESULTS

In the evaluation of age, the patients in Group 2 and Group 4 were seen to have a lower mean age than the patients in the other 2 groups ($P = 0.026$). The patients in the group with low satisfaction were found to have a higher level of education ($P = 0.039$). The demographic data are shown in Supplementary Digital Content, Table 1, http://links.lww.com/SCS/B902.

No statistically significant difference was determined between the groups in respect of the preoperative nasal cavity resistance values ($P = 0.361$) and NOSE scores ($P = 0.633$), and a statistically significant difference was determined in these values postoperatively ($P < 0.001$ for all).

In the subgroup examination, a difference was determined between the satisfied and dissatisfied groups. When evaluated in respect of the change from the preoperative to the postoperative period, the changes over time in the nasal cavity resistance values in Group 1 and Group 3 were determined to be statistically significant [F (1.366) = 7.261 $P < 0.001$?2 = 0.375] and [F (1. 366) = 6.942 $P < 0.001$?2 = 0.342]. The differences in Group 2 and Group 4 were not statistically significant ($P = 0.081$, $P = 0.068$) (Fig. 2).

When the results were evaluated in respect of NOSE scores, the groups were similar in the preoperative period ($P = 0.633$). In the postoperative period, there was seen to be a significant decrease in the NOSE scores in Group 1 and Group 3 ($P < 0.001$, $P < 0.001$) and the difference in the other 2 groups was not statistically significant ($P > 0.05$ for both). The comparisons within the groups and the changes over time are shown in Supplementary Digital Content, Table 2, http://links.lww.com/SCS/B903.

The effect of the topographic surgery results on patient satisfaction was evaluated. A relationship was determined between nasal topographic satisfaction and patient satisfaction (r:0.228, $P = 0.009$). In the subgroup analysis, nasal tip was the only topographic factor with an effect on patient satisfaction (r:0.187, $P = 0.024$), and although 30.7% of the patients who were not satisfied with the surgery (n:39) reported that they were not satisfied with the nasal base results, no correlation was determined between nasal base and satisfaction (r:0.091, $P = 0.463$).

Of the patients who were satisfied with the results of the surgery (n:47), 14.2% reported that they were not satisfied with some regions of the nose, but this was not reflected in the general satisfaction. When the patients applied with open and closed methods were evaluated in respect of satisfaction with the anatomic characteristics, no significant difference was determined between the 2 methods ($P > 0.05$). When other factors related to patient satisfaction were evaluated, a weak relationship was determined between satisfaction and age (r:0.170, $P = 0.030$) and male gender

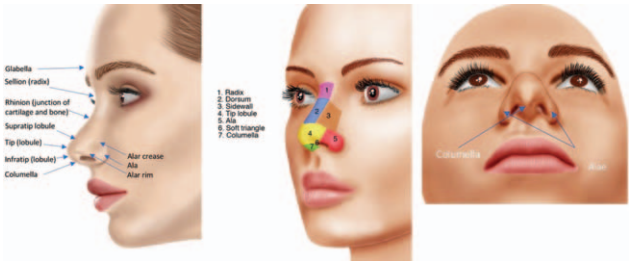

FIGURE 1. Patients who accepted to participate in the study were explained the nose type, radix, dorsum and nasal base on the figures and the patients were informed about the terms.

FIGURE 2. The photographs taken of their face from 6 directions of patients before and after surgery.

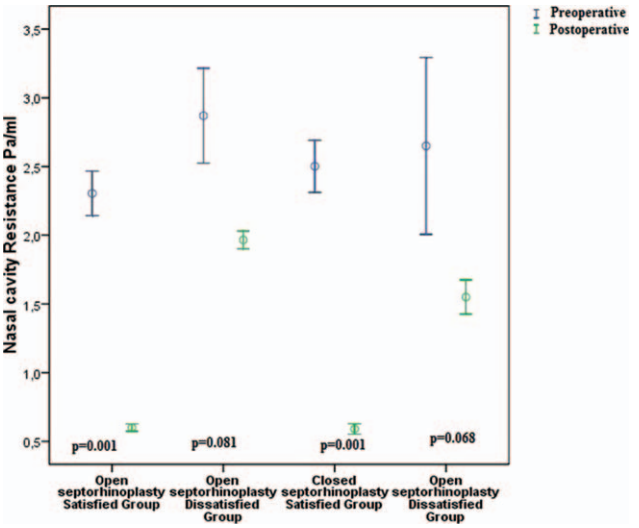

FIGURE 3. Nasal cavity resistance changes of patients after surgery.

(r:0.191, $P = 0.023$). Postoperative high NOSE scores (r:−0.530, $P < 0.001$) and high nasal resistance levels (r:−0.579, $P < 0.001$) were seen to have a negative effect on satisfaction. When evaluation was made in respect of the relationship between surgical method and satisfaction, the surgical technique was not seen to have any effect on satisfaction (r:0.002, $P = 0.965$) (Supplementary Digital Content, Table 3, http://links.lww.com/SCS/B904). In the evaluation of the topographic satisfaction of the groups, in Group 1 the nasal tip was evaluated as very good by 28.1% of the patients and as very bad by 5.1%. In Group 2, the nasal tip results were evaluated as undecided by 21.7% of the patients and as very poor by 28.6% (n:6). None of the Group 2 patients considered the nasal tip results to be good or very good. The thoughts of the patients about the reconstructed topographic regions of the nose are presented in Figure 3. Although 14.2% (n:47) of the patients who were satisfied with the surgical results stated that there were some regions of the nose with which they were not satisfied, this was not reflected in the overall satisfaction. Of the patients with overall dissatisfaction, there were patients who were satisfied with some topographic results of the nose. The nasal topographic satisfaction levels of the groups are shown in Figure 4.

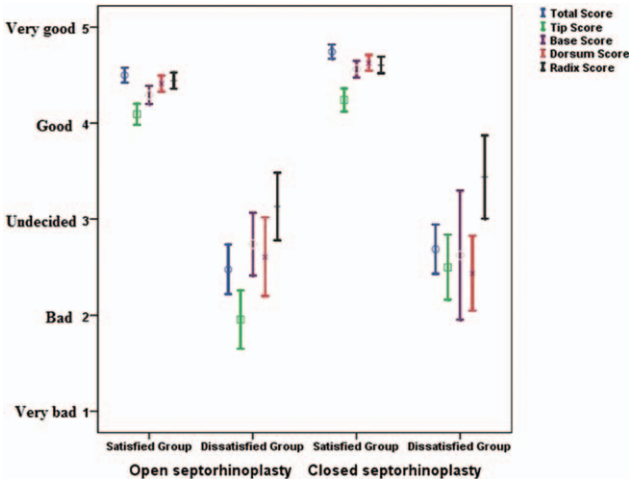

FIGURE 4. Satisfaction scores of the groups. The scores were graded on a 5-point Likert scale to be 1 very bad 5 very good.

When factors were evaluated with regression analysis related to the contribution to patient satisfaction, the factor with the most effect on satisfaction was determined to be postoperative nasal cavity resistance (OR 4.714, 95%CI 2.190−7.570). The other factors affecting patient satisfaction are shown in Supplementary Digital Content, Table 4, http://links.lww.com/SCS/B905.

DISCUSSION

The aim of this study was not to reveal a single miraculous method to overcome all the problems in functional and aesthetic nose surgery. Just as in many other surgical procedures, all the clinical problems in nose surgery can be resolved in several ways, and one of the unique points of this region is that there is no single definitive way for all problems.[7] However, many surgeons only gain experience in a single technique during training and generally tend to solve all the problems encountered with this method. It is well known that small differences in a method can create serious differences in surgical outcomes, and this can have an effect on patient satisfaction.[6] The aim of this study was to determine the contribution to patient satisfaction of the results of different treatment methods (Fig. 5).

There are studies in literature which have evaluated open and closed rhinoplasty in respect of patient satisfaction[4] and different scoring systems.[5,6] However, there are few studies which have dealt with all these factors together. Furthermore, to the best of our knowledge, there is no study in English literature which has evaluated the effect of nasal topographic results on patient satisfaction.

As previously stated, SRP is one of the surgical methods with both functional and cosmetic results. Many surgeons agree that the most challenging part of cosmetic rhinoplasty is the nasal tip, and the leading cause of dissatisfaction is anatomic localisation.[7] Bagheri et al[7] reported that there are several reasons for this, and stated that difficulties in defining the postoperative form of the nasal tip, variations in the type of surgery and that the anatomy of the tip is more complex than other parts of the nose were the most important reasons for patient dissatisfaction. In the current study, the topographic status of the nose was found to be among the factors affecting satisfaction (r:0.228, $P = 0.009$), and in the subgroup analysis, the nasal tip was determined to be the topographic factor

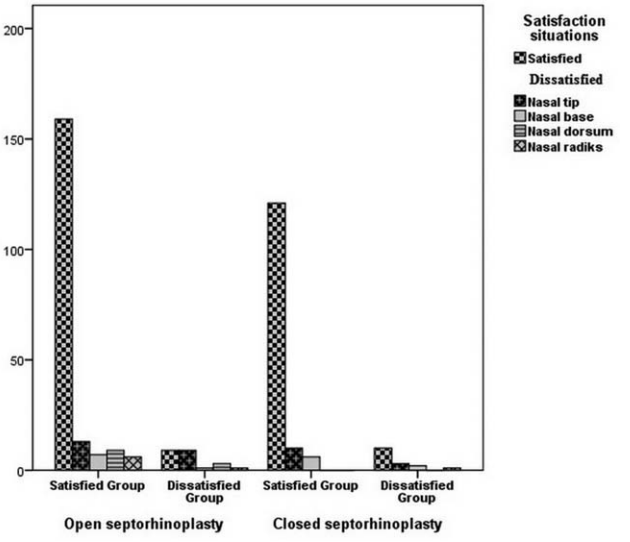

FIGURE 5. The figure shows the topographical structures that the patients were not satisfied with in the reconstructed noses.

with the most effect on satisfaction (r:0.187, $P = 0.024$). The second section within the topographic anatomy with which patients were not satisfied was the nasal base. Of the patients who were not satisfied with the surgery (n:39), 30.7% reported that they were not satisfied with the nasal base results, but in the subgroup analysis, no correlation was determined between nasal base and satisfaction (r:0.091, $P = 0.463$). The main reason for this was thought to be due to the fact that the dissatisfied patients constituted approximately 10% of the whole study population. A greater number of patients could provide significant results. In the current study, no relationship was determined between nasal dorsum, nasal radix and satisfaction. An interesting point within the current study results was that although 14.2% (n:47) of the patients who were satisfied with the surgical results reported that they were not satisfied with some areas, this was not observed to be reflected in the general satisfaction. When these patients were evaluated again, it was seen that very good results were obtained and there was no negative effect on patient general satisfaction. As there are no studies in literature that have evaluated the relationship between nasal topographic results and satisfaction, it is not possible to make a comprehensive discussion on this subject. Nevertheless, the current study can be considered to include results which will increase the interest of surgeons on this subject.

The second heading evaluated in this study was the demographic variables. This subject has been evaluated in previous studies, and the satisfaction rates of females aged <30 years have been reported to be low.[13–15] The results of the current study in respect of demographic variables were similar to the previous findings in literature. Although there could be many reasons for this, the most important reasons are the higher levels of expectation of young females and greater pressure from those around them.

Cosmetic reasons may be just as prominent as functional reasons in the etiology of SRP surgery. Both of these were evaluated in the current study, and to evaluate the functional status, both objective and subjective methods were used. There are studies in literature that have evaluated different procedures in SRP surgery from a functional aspect. One of the important points in this study was that SRP surgery made a positive contribution to nasal functions irrespective of the method used.[16–18] In a study by Brescia et al, conventional and limited approach septoplasty techniques were compared, and there was reported to be no difference between the methods in respect of functional results.[19] However, in another study by Garzaro et al, although there was no difference in rhinomanometric and NOSE scores, sinechiae were reported at a significantly lower rate in the endoscopic group ($P < 0.05$).[18] In the current study, a significant improvement was seen in the rhinomanometric results and NOSE scores in both techniques in the postoperative period. This suggests that SRP surgery is an effective method with good functional results, with no difference between the methods.

In the patients who were not satisfied with the surgery applied with both methods, the functional results were worse, and there was determined to be a strong correlation between patient satisfaction and both nasal cavity resistance and high NOSE scores and the functional component was seen to be an important point in respect of satisfaction. The results of the current study were determined to be consistent with previous findings in literature in respect of functional results.

In the current study, evaluation was made in respect of the relationship between patient satisfaction and the surgical method used. In a retrospective study in literature with an extremely large number of patients, Ors et al evaluated open, closed and modified methods. Patient satisfaction was reported to be >90% in all 3 methods and there was no significant difference between them.[6] Similarly, in another recent study which evaluated satisfaction in respect of open and endonasal septorhinoplasty techniques, no difference was reported in respect of patient satisfaction.[20] When the current study results were evaluated in respect of satisfaction, patients were satisfied with both techniques and no difference was determined between the groups in respect of patient satisfaction. Consistent with previous findings in literature, no relationship was determined in the current study between patient satisfaction and method (r:0.002, $P = 0.965$). The most important reason for this was thought to be that the correct indications for the surgical method had been determined preoperatively and there had been full discussion of the surgical method with the patients. Therefore, determining the correct surgical indications in the preoperative period will have as much effect on patient satisfaction as the correct technique. In the current study, the results in respect of the relationship between technique and patient satisfaction were similar to results in literature.

There were some limitations to this study, primarily the retrospective design. However, because of factors such as there being a cosmetic aspect to the surgery and payment policies, importance was given to the patient preparation in the clinic, written and photographic documentation and archiving for this patient group. Therefore, data loss was at a minimum level. In addition to problems related to cosmetic and nasal respiration changes, perioperative problems experienced by the patients and financial reasons can also lead to dissatisfaction. These kinds of situations were not evaluated in this study. There is a need for further more extensive studies to evaluate these conditions.

CONCLUSIONS

The results of this study clearly show that reducing patient satisfaction with SRP surgery to a single variable is a complex subject. One of the basic components of satisfaction, and perhaps the most important, is functional improvement. The results of the study also clearly demonstrate that the procedure leads to high functional improvement, irrespective of the method. Cosmetic results are another factor which has as much of an effect on satisfaction as functional status. Within the topographic structure, the nasal tip and nasal base in particular, are the sections which require more attention together with cosmetic factors.

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