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Long-term symptom relief after septoplasty

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Abstract The results for long-term symptom relief after septoplasty are contradictory in reviewed publications but the findings suggest that results are unsatisfactory. In this study, we analyzed and compared short- and long-term symptom relief after septoplasty and factors possibly associated with symptom relief. 111 patients that underwent septoplasty between 2008 and 2010 were included in the study. Medical charts were reviewed for preoperative characteristics and assessments. Data on short-term symptom relief (6 months) were retrieved from the Swedish National Quality Registry for Septoplasty; data on long-term symptom relief (34–70 months) were collected through a questionnaire. Upon the 34–70 month follow-up, 53 % of the patients reported that symptoms either remained or had worsened and 83 % reported nasal obstruction. Degree of symptom relief was significantly higher among patients not reporting nasal obstruction than among patients reporting nasal obstruction at long-term follow-up. The proportion of patients that reported "my symptoms are gone" declined from 53 % after 6 months to 18 % after 34–70 months. None of the factors taken into consideration, age at surgery, gender, follow-up time, primary operation/reoperation, history of nasal trauma, self-reported allergy, rhinometric obstruction, or same sided rhinometric, clinical and subjective nasal obstruction were associated with symptom relief. The long-term results after septoplasty are unsatisfactory. A majority of patients report that their symptoms remain after septoplasty.

Keywords Nasal surgical procedures · Nasal obstruction · Rhinomanometry · Septoplasty

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Introduction

Septoplasty is one of the most commonly performed operations by ENT surgeons worldwide. The main indication for septoplasty is nasal obstruction—a symptom which may have a severe negative impact on quality of life. As a quality of life improving procedure, symptom relief is the most important outcome for septoplasty.

In the past 15 years there have been several published articles regarding septoplasty with a success rate span from 27 to 84 %, 6 months to 11 years after surgery [1–9]. These studies have used different methods to assess success, different numbers of included patients and different dropout rates, making them difficult to compare. However, the overall impression is that many patients undergoing septoplasty are dissatisfied with the post-operative result. Some of the authors of the aforementioned studies have sought to find predictors for success after septoplasty, but clear-cut guidelines are lacking on how to select patients suitable for septoplasty to achieve good results. Preoperative assessment with rhinometry has been reported to be a valuable predictive tool in some studies [3, 6, 8, 9], but not in others [4, 5, 7]. In a review on the use of objective measures in the selection of patients for septoplasty, Holmström recommends that rhinometry should be used and that surgery is indicated when there is a good correlation between patient status, history and results of rhinometry [10].

In addition to the previously mentioned publications on the result after septoplasty, data on short-term symptom relief after septoplasty are available from the Swedish National Quality Registry for Septoplasty. This registry was operational between 1997 and 2013 (the registry was closed in 2013, revised and reopened in 2014). In this registry, symptom relief was measured through a multiple-choice questionnaire mailed to all patients 6 months after surgery. Patients were asked to rate remaining symptoms by choosing one of the following alternatives; "My symptoms are gone", "My symptoms are almost gone", "My symptoms remain", or "My symptoms have worsened". For 2,058 registered patients (nationwide) from 2009 through 2010, the symptom relief rate was 76 % when measured as "My symptoms are gone" or "My symptoms are almost gone" [11]. The symptom relief rate for our clinic during the same period was 77 %. This means that both nationally and locally, 6 months after septoplasty, about one in four patients reported either "My symptoms remain" or "My symptoms have worsened". The long-term symptom relief in the population of this registry has not been studied. There are at least two other cohort studies that have compared short- and long-term success. In these reports, satisfaction rates seem to be relatively stable: 74 % after 9 months compared to 69 % after 9 years [2], and 69 % after 6 months compared to 83 % after 10 years [8].

An understanding of long-term symptom relief, in particular factors associated with a good result, aids in both counseling patients before they undergo septoplasty, and in potentially modifying the routines by which patients are selected for operation.

The purpose of this study was to analyze long-term symptom relief and nasal obstruction after septoplasty, to compare long-term (3–5 years) with short-term (6 months) symptom relief, and to analyze factors possibly associated with symptom relief.

Materials and methods

This study was performed at the ENT clinic at the Ryhov County Hospital in Jönköping, Sweden (after approval from the Regional Ethical Review Board in Linköping, Sweden). All patients with septal deviation that underwent septoplasty on the indication nasal obstruction from January 1, 2008 to Dec 31, 2010 were identified in hospital records. The medical charts were searched for the following data points; date of surgery, gender, age, patient history of preoperative nasal obstruction (left, right, or bilateral), primary- or reoperation, preoperative clinical status (left, right, or bilateral nasal obstruction), seniority of the surgeon, whether the same surgeon decided and performed the operation, preoperative self-reported allergy (to airborne allergens), history of preoperative nasal trauma, and preoperative rhinometric results. Of these factors the following; age at surgery, gender, primary operation/reoperation, history of nasal trauma, self-reported allergy, rhinometric obstruction, same doctor at preoperative visit and at surgery, follow-up time, and same sided rhinometric, clinical and subjective nasal obstruction were analyzed for association with long-term symptom relief. Both rhinomanometric data (RhinoStream, Interacoustics, Denmark) and acoustic rhinometric data (RhinoScan, Interacoustics, Denmark) were retrieved. At the time when the patients in this study were operated (2008–2010), there were no published normal values for rhinometry [10]. Thus, the use of rhinometry in the preoperative investigation of potential candidates for septoplasty in our clinic 2008–2010 was not guided by strict criteria but rather as an aid in the decision making process. In 2010, the first recommendations for rhinometric cut-off values for use in the selection of patients suitable for septoplasty were published (for the Interacoustics equipment) [10]. Therefore we choose to perform a post hoc analysis on the rhinometric results using the recommendations published in 2010 [10]. Thus, a nasal inspiratory resistance after decongestion of $\geq$1.0 Pa s/cm^3 at 75 Pa was classified as rhinomanometric obstruction, while a mean cross-sectional area (MCA) of $\leq$0.4 cm^2 in either the part from the nostril rim to approximately the anterior border of the inferior turbinate (MCA I) or in the part from the anterior border of the inferior turbinate to the isthmus nasi (MCA II) [12] after decongestion was classified as a rhinometric obstruction.

Post-operative rhinometric investigations were not performed specifically for this study and there was no routine at our clinic to perform rhinometric investigations in the follow-up after septoplasty. Therefore no data for the comparison of pre operative and post-operative rhinometric results were available.

Data on short-term symptom relief (6 months) were retrieved from the Swedish National Quality Registry for Septoplasty through a search based on personal identity numbers. Data on long-term symptom relief were collected during autumn 2013 through a questionnaire with the same multiple-choice questions as used in the National Septoplasty registry. Patients were asked to answer to which degree the symptoms that formed the indication for septoplasty remained at the time of follow-up by choosing one of the following alternatives; "My symptoms are gone", "My symptoms are almost gone", "My symptoms remain" or "My symptoms have worsened". Data on long-term symptom relief were collected with the same questionnaire that used in the national registry with the difference that the long-term follow-up questionnaire contained an additional question on nasal obstruction. The patients were asked if

they, at follow-up, had nasal obstruction and if so, whether the obstruction was on the right side, left side, or bilateral.

Patients with other indications than nasal obstruction (acute trauma, snoring, etc.) and those who reported acute nasal trauma during follow-up were excluded. Patients who had other surgical procedures (sinus surgery, evulsio of nasal polyposis, turbinate surgery or rhinoplasty) performed simultaneously with the septoplasty or during follow-up were excluded.

Statistical analysis

Results for categorical variables, including dichotomous variables, were described with numbers and percentages and for continuous variables with mean, SD and minimum–maximum values (min–max). For comparison between two groups, Fisher's exact test was used for dichotomous variables, Mantel–Haenszel Chi-Square Exact test was used for ordered categorical variables, and Mann–Whitney *U* test was used for continuous variables. The signed test was used to analyze the difference between short- and long-term symptom relief rates. Spearman's rank correlation test was used for all correlation analysis between continuous and ordered categorical variables. All tests were two tailed and conducted at the 5 % significance level. Statistical analysis was performed using SAS version 9.3.

Results

A total of 157 patients that underwent septoplasty between January 1, 2008 and December 31, 2010 were identified in hospital records. Of these, 111 met criteria for inclusion. The response rate to the long-term follow-up questionnaire was 99/111 (89 %). Data on 6 months symptom relief rates could be retrieved from The National Quality Register for Septoplasty for 68 of the 99 (69 %) patients that answered the long-term follow-up questionnaire. There were no statistically significant differences regarding age, gender, follow-up time, or long-term symptom relief between the patients where short-term data could be retrieved and those where short-term data could not be retrieved. Three of the septoplasties were performed by a senior resident surgeon, seven septoplasties were performed by a resident with a supervising specialist. All other operations were performed by a specialist. Seventy six of 99 (77 %) patients had the same doctor at the preoperative visit and at surgery.

Mean age at surgery was 34 years (SD 12.2, min–max 13–68 years), 78 (79 %) of the patients were male and mean follow-up time was 49 months (SD 10.7, min–max 34–70 months). Eighty four of the operations were primary operations and 15 were reoperations.

The proportion of patients reporting the different degrees of symptom relief at short- and long-term follow-up are presented in Table 1.

In the group of patients ($n = 68$) where short- and long-term follow-up data could be compared, the degree of self-reported symptom relief was significantly decreased at long-term compared to short-term follow-up ($p < 0.001$). Six patients (8.8 %) reported higher- and 38 patients (55.9 %) reported a lower degree of symptom relief at long-term compared to short-term follow-up.

At long-term follow-up only 12 patients (13.3 %) reported both "My symptoms are gone" and "No nasal obstruction" (Table 2). Degree of symptom relief was significantly higher ($p < 0.0001$) among patients not reporting nasal obstruction than among patients reporting nasal obstruction at long-term follow-up (Table 2).

All patients had evidence of preoperative clinical mechanical nasal obstruction. In 85 of the 99 patients, the clinical obstruction was recorded as unilateral and in 14 patients as bilateral. Preoperative rhinometric data were available for 71 (72 %) patients. Of these, 51 of 71 (72 %) patients had a pathologic result according to the definition described in the method section.

The side of subjective nasal obstruction was recorded preoperatively for 91 of 99 patients in the study. Of these, 79 patients (87 %) suffered from unilateral and 12 (13 %) from bilateral nasal obstruction. At long-term follow-up, 90 of the 99 patients answered the question on nasal obstruction. Of these, 15 (17 %) patients reported no nasal

Table 1 Comparison of short- and long-term symptom relief

	Short-term follow-up	Long-term follow-up
My symptoms are gone	36 (52.9 %)	18 (18.2 %)
My symptoms are almost gone	19 (27.9 %)	29 (29.3 %)
My symptoms remain	10 (14.7 %)	46 (46.5 %)
My symptoms have worsened	3 (4.4 %)	6 (6.1 %)
	$n = 68$ (100 %)	$n = 99$ (100 %)

Table 2 Cross tabulation of symptom relief and self-reported nasal obstruction at long-term follow-up, $n = 90$ (nine patients did not answer the question on nasal obstruction)

	Nasal obstruction	No nasal obstruction
My symptoms are gone	3 (3.3 %)	12 (13.3 %)
My symptoms are almost gone	22 (24.4 %)	3 (3.3 %)
My symptoms remain	45 (50.0 %)	0 (0 %)
My symptoms have worsened	5 (5.6 %)	0 (0 %)
	$n = 90$ (100 %)	

obstruction, 52 patients (58 %) reported unilateral- and 23 (26 %) reported bilateral nasal obstruction.

None of the factors: age at surgery, gender, primary operation/reoperation, follow-up time, preoperative history of nasal trauma, self-reported allergy, rhinometric obstruction, same doctor at preoperative visit and at surgery, and same sided rhinometric, clinical and subjective nasal obstruction were significantly associated with long-term symptom relief.

Discussion

The main finding of this study is that more than half of the patients (53 %) reported that their symptoms remained or had worsened 34–70 months after septoplasty. Another important finding was that as many as 83 % of the patients reported nasal obstruction at long-term follow-up. There was a statistically significant correlation between a lower degree of symptom relief and persistent nasal obstruction at long-term follow-up. We could also show that the proportion of patients that reported "my symptoms are gone" declined markedly from 53 % after 6 months to 18 % after 34–70 months. For a surgical method that aims to relieve nasal obstruction and improve quality of life, the results are discouraging.

When interpreting the results, it must be taken into account the possibility that patients don't correctly remember the symptoms that formed the indication for surgery. We believe that this potential weakness is at least in part balanced by the question on present nasal obstruction at follow-up, and that the validity of the low rate of symptom relief is strengthened by the low rate of patients reporting no nasal obstruction at follow-up.

Despite differences between studies that have investigated patient-related outcome after septoplasty, the overall impression is that the results are not satisfactory [1–9]. The results in the present study do not change this picture and in several aspects are somewhat comparable to earlier reports. In 1989, Jessen et al. [2] reported that only 51 % of their patients were subjectively free from nasal obstruction at 9 months and only 26 % at 9 years, while the rates for "satisfied with the results" were 74 % at 9 months and 69 % at 9 years [2]. Our results are similar in two ways: first that the symptom relief rate after septoplasty decreases with time and second that symptom relief rates are higher than the rates for "free from nasal obstruction".

The symptom relief rates in our study can also be compared to those reported by Toyserkani and Frisch [7]. In their study, 56 % of the patients were satisfied with the overall outcome 11 years after surgery [7] while 68 % reported "improved nasal breathing". In their study, more patients reported a positive effect on nasal breathing than satisfaction with the result. This is opposite to both the results of the present study and the study by Jessen et al. There may be methodological explanation: in our study as well as in the study by Jessen et al., the end point was "no nasal obstruction" and "free from nasal obstruction", respectively, compared to "improved nasal breathing" in the Toyserkani and Frisch study. It is reasonable to believe that more patients would report improved nasal breathing than no remaining nasal obstruction.

It is also interesting to compare the results of the present study to the findings of Thulesius et al. [13], who studied the long-term outcome in patients with septal deviation, subjective nasal obstruction and pathologic rhinometric results that did not undergo septoplasty. In their group of 44 patients, 4 % reported "no" and 32 % "reduced" nasal stuffiness at 8 years follow-up [13]. We do not know the rate of *reduced* nasal obstruction after surgery in our population since we used the question "nasal obstruction" or "no nasal obstruction". However, our rates of only 16.6 % of patients reporting no nasal obstruction and 47 % of patients reporting either "symptoms gone" or "symptoms almost gone", are unsatisfactory close to the total 36 % reporting no or improved nasal stuffiness *without surgery* in the study by Thulesius et al. [13].

A difficulty when comparing studies on the outcome after septal surgery is that the surgical technique can differ between studies. The routine septal surgery in our clinic is performed with an endonasal approach without the use of endoscopes. First, a caudal septal incision is made, then the mucoperichondrium is elevated and septal tunnels are established (uni- or bilateral depending on the deformity), the cartilaginous septum is mobilized through chondrotomies ("swing- door technique"), parts that need to be removed to allow for repositioning of the septum are resected. Then the septum is fixated through internal dressings, sutures or splints and the septal caudal incision is closed. We do not routinely use antibiotics postoperatively.

Several authors have sought to find predictors for success after septoplasty. We found no association between age at surgery, gender, follow-up time, primary operation/reoperation, preoperative history of nasal trauma, self-reported allergy, rhinometric obstruction, same doctor at preoperative visit and at surgery, or same sided rhinometric, clinical and subjective nasal obstruction and long-term symptom relief. It has been recommended that septal surgery should be offered to patients where there is a good correlation between patient́s status, history and results of rhinometry [10], but in our study we could not show that this factor (same sided rhinometric, clinical and subjective nasal obstruction) was associated with symptom relief. The outcome after septoplasty has been shown to be worse when there is no history of nasal trauma [14] but neither this factor was found to be associated to symptom relief in

our study. As discussed by Toyserkani and Frisch, it may be important that surgeon and patient have the same expectations to what can be achieved with a septoplasty [7]. One aspect that can affect this factor is whether it is the same surgeon that both decides and performs the operation. Most patients operated at our clinic (77 %) had the same doctor at the preoperative visit and at surgery but this factor was not associated to symptom relief.

Seventy-nine percent of the patients undergoing septoplasty were male. The reason for a male dominance is unclear. A higher incidence of nasal trauma might be one of the causes. Interestingly, the same proportions are found in several previously published articles [1–4, 6–9].

There are several limitations to this study, most related to the fact that the majority of data points were collected through retrospective chart reviews. Another limitation is the use of non-validated questionnaires and the lack of data on smoking habits. Another potential limitation is that we lack data on the prevalence of vasomotor rhinitis in the studied population. The nasal obstruction of vasomotor rhinitis is often bilateral. Since unilateral obstruction was recorded in 87 % of the patients preoperatively we believe that the risk of this factor to influence our results is low.

The generalizability of our results may be questioned as they reflect the work of one single clinic. We believe that our results can be considered valid for other clinics for at least two reasons. First, they are in accordance with several other previously published reports showing low rates of success after septoplasty [2, 7]. Second, data on symptom relief rates after 6 months from the Swedish National Quality Registry for Septoplasty show that our clinic had the same symptom relief rate as the other Swedish clinics for the years 2009 and 2010. In our opinion there is no reason to believe that the decline in symptom relief rates from 6 months to 34–70 months after surgery seen in this study should be exclusive to our clinic.

In conclusion, our results indicate that long-term symptom relief after septoplasty is unsatisfactory and that symptom relief rates decrease over time. A majority of patients reported nasal obstruction at follow-up.

The need for further studies is evident to find ways to improve the results after septoplasty. Knowledge of local results is a prerequisite for improvement programs and a foundation for quality in the services that we offer our patients. To continuously have knowledge of local clinical results may be a cumbersome task. In Sweden, at least in part, this is facilitated by different national quality registries run by the Swedish Association for Otorhinolaryngology Head and Neck surgery. In the future, these registries will provide such outcome data on both local and national level. With the results of the present study in mind, it is obvious that both surgeons and patients should know the expected benefit of a surgical procedure to make the right decision when choosing between different treatment options.

Conflict of interest No conflict of interest exists for either Carolina Sundh or Ola Sunnergren.

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