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A prospective study using rhinomanometry and patient clinical satisfaction to determine if objective measurements of nasal airway resistance can improve the quality of septoplasty

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Abstract In the ENT Department of University Central Hospital, Turku, the waiting list for elective septoplasty grew to 4 to 5 years in the late 1980s. Therefore, a prospective clinical project was initiated during which all patients waiting for septal surgery were re-examined and nasal airway function was measured with rhinomanometry. Patients with high nasal resistance or other specific indications for nasal obstruction were selected for surgery ($n = 432$). The remaining patients were excluded from surgery and followed up ($n = 284$). Results showed that if patients were referred for septal surgery without rhinomanometric study, about 10% became symptom-free within 3 to 5 years. Patients operated on after defining a high preoperative intranasal resistance had a higher postoperative satisfaction level (85%) than those operated on with normal nasal resistances but other indications for correcting the nasal septum (69%). After 3 years, the majority of patients not treated surgically were satisfied with their conservative treatments, although certain patients still required some form of nasal surgery to relieve recurring nasal and/or sinus complaints.

Key words Rhinomanometry · Septoplasty · Postoperative clinical satisfaction

Introduction

Nasal obstruction is a common clinical symptom among patients referred to ENT Departments. According to Wengraf et al. [22], this was the main symptom in 15% of the patients visiting a British ENT outpatient clinic. In a Finnish study by Vainio-Mattila [21] of 200 randomly chosen adults, 33% had had nasal breathing difficulties on a regular or frequent basis.

Causes of nasal stuffiness are many, with allergic and vasomotor rhinitis and polyps being the most common inflammatory causes [12]. Deviation of the nasal septum is the most frequent structural deformity. In Vainio-Mattila's [21], 1974 study, 26% of the patients examined had a septal deformity that was considered clinically significant. Septal deviation can be the cause of various symptoms, but may also be asymptomatic. In our experience, patients undergoing septal reconstruction had chronic nasal obstruction, crusting, rhinorrhea, post-nasal drip, recurrent sinus pressure or pain, and epistaxis as symptoms of septal pathology [19]. However, similar symptoms may be caused also by such other diseases of the nose such as allergic rhinitis and chronic sinusitis. Therefore, the significance of a septal deviation to the symptoms of a particular patient may be difficult to assess.

A slight septal deviation in the nasal valve region can cause clear symptoms, whereas a much larger deviation in the back of the nasal cavity may result in far fewer symptoms [5, 6]. On the other hand, surprisingly marked differences have been reported between the findings on examination made by a doctor and the subjective symptoms felt by the patient [14, 15]. These difficulties in clinical assessment have led to efforts to develop objective methods of measuring nasal respiratory function.

Since the 1950s rhinomanometers have been used in attempts to determine nasal obstruction objectively. In the procedure transnasal airflow and the pressure gradient between the nasopharynx and in front of the nose are measured simultaneously, allowing nasal resistance to be calculated from these data [1]. During the past 10 years the usefulness of rhinomanometry has increased rapidly due to the use of microcomputers connected to the measuring devices. By this means, all routine mathematical analyses can be carried out within seconds [2, 4]. There have been many publications on rhinomanometry to date, although most have dealt with purely scientific work, so that the usefulness of this method in large clinical series of patients is still a matter of dispute [13].

The medical staff of the Department of Otorhinolaryngology of Turku University Central Hospital has used rhi-

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rhinomanometry in both scientific and clinical work for a long time [17, 20]. In the late 1980s, a computerized rhinomanometer was obtained that allowed intranasal measurements to be standardized and the range of normal nasal resistances to be established on symptom-free subjects with normal nasal anatomies [18]. During the past 10 years, the waiting period for septoplasty in our department grew to 4 to 5 years, resulting in about 500 patients waiting for surgery when the capacity of our clinic to operate on patients within a reasonable time was exceeded. It was then decided to start a special, prospective project during which all the patients previously waiting for septoplasty would be re-examined, symptoms carefully evaluated, and the nasal resistance measured. By this means, an effort was to be made to select for surgery only those patients in whom a septal structural deformity was considered to be the true etiology of nasal symptoms.

Materials and methods

On January 1993, 432 patients were waiting for septoplasty in our ENT Department. All patients were called for re-examination. During this visit patients filled in a special interview form in which nasal symptoms were evaluated systematically. The status of each patient's nasal findings was determined by an experienced ENT surgeon, who then completed a separate form describing the status of the nasal septum, conchae, mucosa, and nasopharynx. Rhinomanometry and nasal statuses were evaluated both before and after decongestion of the nasal mucosa with an oxymetazoline spray.

Rhinomanometry was performed using a Finnish computerized rhinomanometer, Medikro 202 [18]. The nasal resistance was calculated at radius 200, according to the method described by Broms et al. [4]. A unilateral nasal resistance after decongestion 200 Pa/(l/s) and a total nasal resistance 90 Pa/(l/s) were regarded as normal [18].

The decision to perform any subsequent nasal surgery was based on subjective symptoms, clinical status of the nose and rhinomanometric findings. A special scoring system was developed before the beginning of the project (Table 1), and this system was used by all three ENT specialists participating in the project. Group A includes those patients having high preoperative nasal resistances. Group B includes cases where the nasal resistance was low after decongestion, but other clinical findings were so clear that it was decided to carry out the operation. The patient's own wishes after careful discussion were also clearly taken into account

Table 1 Criteria applied to patients for septoplasties at University Central Hospital, Turku

A	Objective nasal obstruction Postdecongestion nasal resistance above normal values: unilateral resistance > 200 Pa/(l/s) and/or total nasal resistance > 90 Pa/(l/s)
B	Other causes for nasal obstruction and normal postdecon- gestion rhinomanometry <ul style="list-style-type: none"> - Deviations of the caudal septum causing elevated base- line resistance or unacceptable cosmetic changes to nasal shape - Facial or nasal pain, in which a septal spur was considered to be a significant factor - Septal deviation compressing the middle turbinate and obstructing the maxillary ostial region - Rhinoscopically obvious septal pathology, causing daily symptoms despite > 4 months of conservative treatment and a patient request for surgical treatment

because these patients had been waiting for surgery for many years and had already been using nasal medications with varying success. Group C consisted of patients not operated on and managed symptomatically as needed.

The patients operated on were seen postoperatively 6 months after surgery. On this occasion they were asked about their subjective satisfactions following surgery, and nasal status and results of rhinomanometry were recorded. The patients whose operations had been cancelled were called for follow-up visits after 3–6 months to evaluate the effects of any nonoperative therapy used.

In May 1996, an inquiry was sent to 63 patients who had been on the waiting list for septoplasty and had not been operated on because a cause other than structural deformity was considered to be the reason for their nasal symptoms. Each patient was asked to use a five-level scale for their overall satisfactions with the decision made 3 years earlier. They were also asked whether they still had frequent or ongoing problematic nasal symptoms and whether they were still using some nasal medication on a regular basis.

Results

In all, 432 patients were on the University Central Hospital waiting list for septoplasty (Table 2). An additional 361 patients with nasal obstructive symptoms were also evaluated. These latter patients were referred for septoplasty to the Department during the project time, and the same examination protocol was used as for patients on the original waiting list. Forty patients had become symptom-free during the years they had been waiting and were unwilling to return for examination

A total of 716 patients examined, a decision to operate was made in 55%. In 183 patients, chronic mucosal inflammatory disease and not septal pathology was considered to be the main causative etiology of nasal symptoms. These latter patients began regular intranasal medication. Of this group, 176 were seen in further follow-up 3 to 6 months later, after which 10 were operated on because the medication used was not considered sufficient and surgical correction of minor septal pathology was felt to be

Table 2 Patients and treatments provided at University Central Hospital, Turku between 1993 and 1994

Patients from the original waiting list not attending follow-up examination		77
Symptom-free patients	40	
Already operated on elsewhere	22	
Not reached	5	
Dead (from causes unrelated to nasal disease)	4	
Moved from the area	6	
Patients attending follow-up examination		
Surgical treatment		432
Septoplasty	397	
Rhinoplasty	12	
Other nasal surgery	23	
Conservative treatment		284
Medical treatment	183	
Referred for sleep disorder investigations	22	
Other out-of-ward investigations (allergy tests, sinus CT, etc.)	20	
No treatment	59	

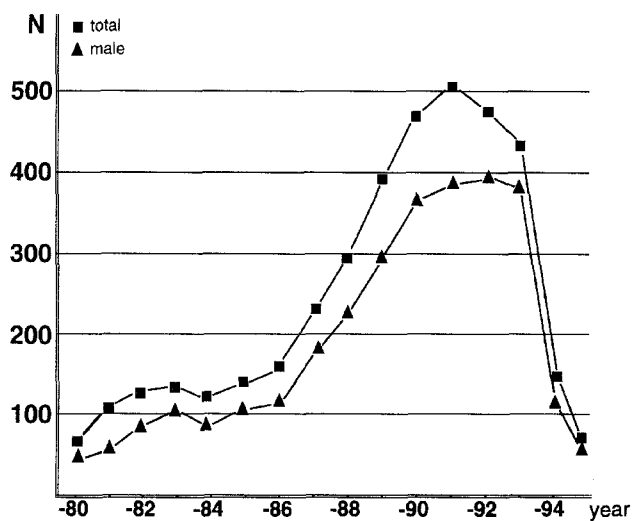


Fig. 1 The number of patients waiting for septoplasty between 1980 and 1994 at University Central Hospital, Turku

beneficial, even though rhinomanometrically measured nasal resistance was found to be normal.

As shown in Fig. 1, the waiting list for septoplasty grew rapidly during the late 1980s and then was reduced as a direct result of this project. By December 1994, only 70 patients were waiting for an operation and the expected time from referral to surgery was about 6 months.

Subjective satisfaction after surgery

The patients who were operated on were re-examined and rhinomanometry measured 6 months after surgery (Table 3). The patients' subjective satisfaction was graded on a five-level scale, and this was correlated to the clinical decisions used when deciding on an operation. The number of very satisfied and satisfied patients was highest in the group in which there was high preoperative nasal resistance after decongestion (84.7%) compared to the groups where nasal resistance was within normal limits but for other reasons the operation was carried out (69.2%). Sat-

isfaction groups 4 and 5 included 4.8% of patients with high nasal resistances and 17.3% of the patients operated on with "normal" preoperative nasal resistances. There were five technically unsuccessful operations in group A patients and three in group B, with all cases offered reoperation. Among these patients, one case of postoperative septal perforation had occurred.

Long-term satisfaction of patients not operated on

In May 1996, an inquiry was sent to the 63 patients not operated according to the criteria used in this project. Fifty-one answers were received. One patient had been operated on in a private hospital. This patient had had nasal obstruction-related facial pain as the main nasal-related symptom, but still had these symptoms even after the operation. Of the remaining 50 patients, 5 were very satisfied with the decision not to be operated on and 15 were satisfied. These patients either did not have any nasal complaints or were satisfied with the nasal medication started during our initial evaluations 3 years previously. Seventeen patients were unable to say whether or not they were satisfied. Dissatisfaction with the decision made was expressed by 6 patients and great dissatisfaction by an additional 7. All of the dissatisfied patients had normal nasal resistances and their nasal septa had been only slightly deviated at the evaluation in 1993. In these cases, mucosal inflammation due to allergy or vasomotor rhinitis was considered to be the main cause of the obstructive symptoms perceived. The patients had been treated with intranasal corticosteroids, and most of them had been seen in follow-up in the autumn of 1993, when their clinical conditions were again assessed and medical therapy was continued.

Discussion

Septoplasty is one of the most common surgical procedures performed in ENT departments. Because of the large number of patients suffering from nasal obstruction

Table 3 Postoperative satisfaction of the first 188 patients operated on (1 very satisfied, 2 satisfied, 3 cannot say, 4 dissatisfied, 5 extremely dissatisfied)

Surgical indication	Satisfaction					Total
	1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)	
A Objective nasal obstruction	50 (39.4)	55 (45.3)	16 (12.6)	2 (1.6)	4 (3.2)	127
B Other indications						
– Increased baseline resistance	2	2	1	–	–	5
– Altered cosmetic appearance						
– Facial/nasal pain related to septal spur	1	–	–	2	–	3
– Obstruction of middle meatus	1	–	–	–	–	1
– Failed conservative medical treatment > 4 months	13 (25.0)	23 (44.2)	7 (13.5)	9 (17.3)	–	52

and the high frequency of individuals with some degree of septal deformity, the waiting lists for septoplasty can be very long, as was the case in our department.

Rhinomanometry is a method for objective measurement of nasal obstruction, but its clinical usefulness in larger patient series is relatively unknown. At present, only a few prospective studies have been reported. Indeed, it has been argued that rhinomanometry is only suitable for scientific work and has little clinical benefit [13].

In our present study, rhinomanometry served an important clinical goal in order to select patients who were really in need of septoplasty and to offer other treatment modalities to the others. In our earlier study of 102 patients, we showed that when septoplasty was performed on patients in whom the decision to operate had been made without rhinomanometry, the most satisfied patients were those whose preoperative nasal resistance was high and had been reduced with the operation [19]. This finding is in accordance with other published studies on the use of rhinomanometry in rhinological surgery and was the stimulus for our present larger prospective clinical study [8, 9, 11].

We fully realize that there could be indications for septoplasty even when nasal resistance on rhinomanometry is at a low level. Therefore, certain patients (group B) underwent surgery when facial pain and sinus problems were believed to be due to septal deformities. However, our postoperative satisfaction analysis of 188 patients showed that 85% of the patients operated on with high preoperative resistance were satisfied with the results of surgery, whereas only 69% of our group B patients were satisfied. These success rates are similar to those published earlier by Dommerby et al. [7], when only patients with high nasal resistance were operated on, and Bohlin and Dahlqvist [3] found that number of satisfied patients was as high as 83% when examined 10 years after operation.

Our study confirms the hypothesis that in some patients the nasal obstruction caused by mucosal swelling, subsides by time, allowing patients become symptom-free [10, 16]. This was the case in 40 of our patients who had been on a waiting list for septal surgery for 4 to 5 years. These findings emphasize the need to perform careful rhinoscopic examinations and rhinomanometric measurements before and after decongestion of the nasal mucosa in order to determine the effect of mucosal edema on nasal obstruction.

Our project reached its objective of reducing a 4- to 5-year-long waiting period to approximately a 6-month wait, which is a very acceptable time for this kind of operation. In addition, the use of rhinomanometry gave us the opportunity to identify patients with extremely high bilateral nasal resistances and offer these individuals more rapid surgery than cases with milder and unilateral symptoms. In this respect, rhinomanometry served to classify patients into distinct categories of severity of nasal symptomatology.

Approximately 26% of our patients with mucosal inflammatory conditions were dissatisfied with the nonsurgical treatment received. In our area, there has been a tra-

dition to avoid turbinate surgery, but as a result of this study, we intend to offer this surgery to patients who still have severe obstructive symptoms despite seemingly adequate medical therapy.

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