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Sensation of nasal obstruction compared to rhinomanometric results in patients referred for septoplasty*†

J. Sipilä, J. Suonpää, P. Laippala

Department of Otolaryngology, University Central Hospital, Turku, Finland

SUMMARY

In previous studies concerning correlations between subjective nasal obstruction and rhinomanometric findings the subjects quite often had normal nasal status and symptomless nasal breathing. The correlation sometimes proved to be poor. In the present study, intercorrelations between rhinomanometry and subjective sensation of nasal patency were evaluated in 102 patients referred for septoplasty. The hypothesis was that this material should give more realistic results than normal cases. In pre-operative rhinomanometry it was found that in 62 cases the nasal airway resistance (NAR) after decongestion of the nasal mucosa was pathological compared to our normal material and in 40 cases it was within normal range. The patients were asked, before rhinomanometric recording, to indicate the narrower side of the nose, right or left. After that, both baseline and post-decongestion recordings were made. The rhinomanometric results concerning the side difference were compared to the subjective assessment. Our results showed that in the 62 cases with pathological NAR the subjective and rhinomanometric evaluation was consistent in 46 of the baseline and 50 of the decongestion cases. In the 40 patients with normal NAR the figures were 19 and 20, respectively. It is obvious that if NAR is low it is more difficult for the patient to determine the more obstructed side. We conclude that rhinomanometry rather than the subjective sensation of the subject is more suited to detect subtle side difference in resistance between the nares.

Key words: nasal obstruction, nasal patency, rhinomanometry

INTRODUCTION

The intercorrelations between rhinomanometric data, patients' subjective assessment of their nasal obstruction and rhinoscopic findings have been a topic of many studies in recent years. In some studies the nasal sensations have been provoked with different methods, such as chemical substances, e.g. menthol (Eccles et al., 1987; Eccles, 1990) or local anaesthesia (Eccles et al., 1988). Also, Jones (1989a) evaluated the effect of local application of lignocaine in his report. The common result of these studies has been that, although the patient feels subjective alterations in sensation of nasal obstruction, no change in resistance can be recorded.

In a study by Naito et al. (1991) the decongestion effect achieved with vasoconstrictor spray was analysed both with resistance values and subjective scoring. Surprisingly, many patients were unable to feel the rhinomanometrically significantly better nasal airway after decongestion.

A more physiological line of research has been to compare the subjective level on nasal obstruction and nasal resistance in a normal situation. This was done by Pinkpank (1986), who found poor correlation between rhinoscopic findings, rhinomanometry and subjective scoring. Jones et al. (1989b) asked the subjects to assess their nasal breathing on a visual analogue scale and found an extremely low correlation between this and resistance data.

In all of these above-mentioned studies, the majority of the patients had a normal nasal status and symptomless nasal breathing, or their nasal status is not described at all in the publication.

In the present study, patients with nasal obstructive symptoms and pathological nasal status were asked a simple question: "Which side of the nose do you regard as the more obstructed one?" The answer is compared to the data given by rhinomanometry and to nasal status evaluated by an ENT specialist.

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MATERIAL AND METHODS

The series included 102 patients referred for septoplasty in the University Central Hospital, Turku, Finland. There were 51 women and 51 men, and the material represents consecutive patients, cases with polyposis being excluded. Mean age was 36 years (range 17–59 years).

The primary decision to do surgery had been made on a clinical basis, without rhinomanometry. All the patients had a marked septal deviation. The subjective symptoms before the operation were investigated with a standard questionnaire and a personal interview, including questions about medical and nasal history, allergic background, possible nasal trauma, et cetera. In 62 cases nasal obstruction was the main subjective reason for the operation, in 17 cases it was facial pain, in 11 chronic rhinitis, and in five recurrent sinusitis. In seven patients other symptoms dominated, such as cosmetic problems, snoring and post-nasal drip. A detailed description of the material is given in another publication (Sipilä et al., 1992a).

The nasal status was examined before operation, and also rhinomanometry with baseline and decongestion measurements was done. The active anterior rhinomanometric method was used with the modern Finnish computerized rhinomanometer Medikro 202 (Sipilä et al., 1992b). The recommendations of the International Standardization Committee for Rhinomanometry were applied (Clement, 1984).

In this study the nasal resistance was calculated according to the Broms method at radius 200, because it has been shown to be calculable in all recordings and most reproducible and reliable in clinical practice (Sipilä et al., 1991). According to an earlier study made with 97 normal subjects the unilateral nasal resistance was determined as being normal if it was less than 200 Pa/(l/s) and for total nose value less than 90 Pa/(l/s) (Sipilä et al., 1992a).

The patients were examined by an ENT specialist before the operation and, on this occasion, rhinomanometry before and after decongestion was performed. Before this recording the patients were asked which side of the nose was more obstructed, also the possibility "no side difference", i.e. equal, was given.

RESULTS

Pre-operative rhinomanometric recordings after decongestion showed that 62 of the patients had pathological nasal airways resistances as compared to our normal material.

In 40 cases the resistance was within the normal range. Because it was suspected that in these 40 cases the nasal deviation was not the main reason for the subjective symptoms, and that other causes such as mucosal disease could be dominating, the material was divided into two groups.

The 62 cases with pathological NAR were analyzed as the first group (Group A) and the 40 with normal NAR as the second group (Group B). In group A the mean nasal resistance of the narrower side of the nose was 1,236.73±2,389.18 Pa/(l/s) with a 95% confidence interval (629.99; 1,843.46). The mean total resistance was 139.32±95.54 with a 95% confidence interval (115.06; 163.58).

In group B the mean resistance of the narrower side of the nose was 132.32±37.93 with a 95% confidence interval (120.19; 144.46). The mean of total nasal resistance for that group was 56.83±16.35 with a 95% confidence interval (51.60; 62.05). The mean side difference of resistance between the two nostrils was in group A 608% in the baseline recordings, and 346% after decongestion. In group B the mean side difference of the group was 167% and 53%, respectively.

The correlation between rhinomanometric data, before and after decongestion, and subjective sensation of the more obstructed side of the nose in group A is shown in Table 1. Before decongestion the resistance data and subjective sensation showed consistence in 46 of the cases and, after decongestion, the level of agreement was even higher; in 50 out of 62 cases, the p values showed high statistical significance. Table 2 shows the correlation in the 40 cases with normal resistance (Group B); before decongestion 19 cases, and after decongestion 20 cases, showed agreement between rhinomanometric and subjective side difference; the consistency is not statistically significant.

A similar comparison between resistance data and rhinoscopic findings in group A is shown in Table 3 and in group B in Table 4. Again, in the group with high NAR, the consistency is

Table 1. Correlation between rhinomanometrically estimated more obstructed nasal cavity and the subject's own assessment of the less patent nostril in 62 patients whose decongestion NAR was pathological (Group A). Statistical analysis was made with likelihood ratio Chi-square G^2.

baseline rhinomanometry				decongestion rhinomanometry			
	subjective sensation				subjective sensation		
	right	left	equal		right	left	equal
right	20	4	2	right	21	0	2
left	4	25	5	left	1	29	6
equal	0	1	1	equal	2	1	0
consistent 46 non-consistent 16 p=0.0002				consistent 50 non-consistent 12 p=0.0002			

Table 2. Correlation between rhinomanometry and subjective sensation of side difference in the 40 cases in which decongestion NAR was within normal limits (Group B).

baseline rhinomanometry				decongestion rhinomanometry			
	subjective sensation				subjective sensation		
	right	left	equal		right	left	equal
right	5	3	4	right	4	2	1
left	7	12	3	left	4	12	2
equal	2	2	2	equal	6	5	4
consistent 19 non-consistent 21 p=0.4689				consistent 20 non-consistent 20 p=0.2228			

Table 3. Correlation between rhinomanometric side difference and rhinoscopic judgement of more narrower nostril in the 62 patients with high decongestion NAR (Group A).

baseline rhinomanometry				decongestion rhinomanometry			
	subjective sensation				subjective sensation		
	right	left	equal		right	left	equal
right	21	5	0	right	22	1	0
left	6	28	0	left	3	33	0
equal	0	2	0	equal	2	1	0
consistent 49 non-consistent 13 p=0.0000				consistent 55 non-consistent 7 p=0.0000			

Table 4. Correlation between rhinomanometry and rhinoscopy in 40 cases with normal post-decongestion NAR (Group B).

baseline rhinomanometry				decongestion rhinomanometry			
	subjective sensation				subjective sensation		
	right	left	equal		right	left	equal
right	7	5	0	right	4	3	0
left	5	17	0	left	2	16	0
equal	3	3	0	equal	9	6	0
consistent 24 non-consistent 16 p=0.1031				consistent 20 non-consistent 20 p=0.0071			

statistically highly significant, and the p values are small also in the group with normal NAR.

In group A the mean side difference of resistance of the two nostrils after decongestion was 385% in those cases where rhinomanometry and subjective sensation showed the same side as the more obstructed, and 33.1% in cases where they did not agree. In group B the mean side difference after decongestion was 72.1% in cases where rhinomanometry and subjective evaluation agreed, and 31.9% in cases where they did not.

DISCUSSION

In earlier studies concerning correlations between NAR and subjective sensation of nasal obstruction, the correlation has often proved to be unsatisfactory. This is especially true in investigations where patients' sensations have been "fooled" by some interference of the nasal mucosa such as menthol inhalation (Eccles et al., 1987). This confirms the fact that sensation is not simply a matter of airway obstruction, but that the function of sensory nerve endings in nasal mucosa can be altered by various factors, such as by chemical provocation. Also physical trauma and chronic inflammation may cause unexpected sensations.

More astonishing is the fact that, even in some studies where nasal sensations have been scored on a visual analogue scale and have been compared to NAR data in a normal situation without provocation, a poor correlation has been encountered. In a study by Jones et al. (1989a), 190 subjects with normal nasal conditions and 60 patients suffering from chronic rhinitis were analysed. They found a number of patients who scored their nose as completely blocked while they had very low NAR and others who reported an entirely clear nose but had a very high NAR. In these cases one can ask, what do these subjects mean by a blocked or clear nose; is the individual scoring between subjects, at all, comparable. In fact, the rhinomanometer's scale is more logical, as we have shown in an earlier study (Sipila, 1991); a wide nasal cavity always gives low resistance and a narrow one a high resistance.

In the present study all patients had septal deviation and they were also all very concerned about their nasal breathing, so this is realistic material in which to use rhinomanometry for clinical purposes, such as to plan nasal surgery.

The subjective assessment of nasal obstruction was made by answering the question: "Which side of the nose, right or left or neither, is more obstructed?" This information was correlated to rhinoscopically and rhinometrically obtained data on side difference. This type of analysis was adopted because it was presumed that if subjective or resistance information is to be regarded as meaningful in evaluating the need for operation, it should at least be possible to estimate the more obstructed nasal cavity with high certainty.

Our results show that in the 62 cases with such large septal deviation that it causes an elevated NAR even after decongestion the correlation between rhinoscopy, NAR data and subjective sensation is very significant. In the 40 cases where septal deformity was so minor that NAR was within normal limits, the correlation did not exist when sensation and rhinomanometry were compared. There was, however, a statistical correlation between the rhinoscopic findings and subjective sensation even in these cases. An explanation for this might be that the doctor's estimation of the more obstructed side might have been influenced by the patient's comments or rhinomanometric data.

In cases where rhinomanometry and subjective sensation did not show the same nostril as the more obstructed, the side difference of resistance between the two sides showed to be lower than in cases in which rhinomanometry and sensation were consistent.

Our conclusion is that, in cases with clinically significant anatomical obstruction, even the patient is able to detect the more obstructed side, but in cases where causes of obstruction other than permanent anatomical faults dominate (e.g., mucosal swelling), the side difference is so small (or changing from side to side) that the individual is not capable of denoting the narrower side as well as the rhinomanometer.

In a previous study we showed that the overall test-retest accuracy of rhinomanometric methods in clinical practice is about at the level of 20%, a finding confirmed by Sheldon et al. (1992). It seems to be clear that the patient's capacity to assess changes in nasal obstruction is poorer than that.

The poor results on correlation between sensation of obstruction and NAR values found in studies where chemical provocation of nasal sensation has been used or in studies with

normal subjects can not be extrapolated to conclude that rhinomanometric data are not useful in evaluating patients for septal surgery. Our results show that, in clinical material with subjects who have pathological nasal status and harmful subjective symptoms, the NAR and sensations have a clear correlation.

We also point out that, if the patient's report of his nasal obstruction differs from the rhinomanometric data, the reason is more likely to be found in patients poor capacity to assess his nasal condition in a way which could be used for comparisons between individuals. In these cases resistance data are valuable because they are better standardized and more reproducible.

REFERENCES

1. Clement PAR (1984) Committee report on standardization of rhinomanometry. Rhinology 22: 151–155.
2. Eccles R, Lancashire B, Tolley NS (1987) Experimental studies on nasal sensation to airflow. Acta Otolaryngol (Stockh) 103: 303–306.
3. Eccles R, Morris S, Tolley NS (1988) The effects of nasal anaesthesia upon nasal sensation of airflow. Acta Otolaryngol (Stockh) 106: 152–155.
4. Eccles R (1990) Relationships between measured nasal airway resistance and the sensation of nasal airway. Fac Plast Surg Intern Quart Monogr 7.4: 278–282.
5. Jones AS, Wight RG, Crosher R, Durham LH (1989a) Nasal sensation of airflow following blockade of the nasal trigeminal afferent. Clin Otolaryngol 14: 285–289.
6. Jones AS, Willatt DJ, Durham LM (1989b) Nasal airflow: Resistance and sensation. J Laryngol Otol 103: 909–911.
7. Naito K, Cole P, Humphrey D (1991) Comparison of subjective and objective nasal patency before and after decongestion of the nasal mucosa. Am J Rhinol 5: 113–115.
8. Pinkpank A (1986) Beziehungen zwischen Selbsteinstufung der Nasenatmung, Rhinoskopie und Rhinomanometrie. HNO 34: 194–197.
9. Sheldon DM, Eiser NM (1992) Evaluation of active anterior and posterior rhinomanometry in normal subjects. Clin Otolaryngol 17: 178–182.
10. Sipilä JI, Suonpää JT, Kortekangas AE, Laippala PT (1992a) Rhinomanometry before septoplasty: An approach to clinical material with diverse nasal symptoms. Am J Rhinol 6: 17–22.
11. Sipilä JI, Suonpää JTK, Kortekangas AE Laippala P (1992b) A new Finnish computerized rhinomanometer. Acta Otolaryngol (Stockh) Suppl. 492: 58–62.
12. Sipilä J, Suonpää J, Laippala P (1991) Evaluation of nasal resistance data in active anterior rhinomanometry with special reference to clinical usefulness and test-retest analysis. Clin Otolaryngol 17: 170–177.
13. Sipilä J (1991) Modern computerized rhinomanometry in clinical practice. Thesis, University of Turku, Finland.

Dr. Jukka Sipilä
Kaskenkuja 12
SF-21420 Lieto
Finland

ANNOUNCEMENT

'NOSE' DISCUSSION GROUP

A group has recently been formed to discuss research in nasal physiology, pharmacology, pathophysiology, common cold, hay fever, nasal measurements such as rhinomanometry and acoustic rhinometry, and the treatment of nasal disease, including nasal surgery. If you would like further information on this group which is linked by electronic mail and uses an electronic mail server, please send an e-mail request for 'further information on nose' to nose-1@cardiff.ac.uk.