

Rhinomanometry

Clement PAR. Rhinomanometry.
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The importance of nasal obstruction is stressed as one of the cardinal symptoms in allergic rhinitis and the major symptom of the late phase reaction; therefore the objective measurement of this symptom is of the utmost importance. The international committee on objective assessment of the nasal airway advocated rhinomanometry as a reliable method for measuring this symptom. The author's experience with this method after nasal challenge during the early and late phase, in 18 patients and 10 normal volunteers, is discussed. If total nasal resistance is considered then 41% of the patients showed a late phase. When considering unilateral nasal resistance a late phase was observed in 82% of the patients.

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The nose has many functions. The most well known function is of course ventilation. For many years ventilation has been recorded in an objective way using rhinomanometry. In 1983 this method was standardized so that the results of different centres could be compared (1). The Standardization Committee decided that active anterior rhinomanometry (AAR) should be the method of choice to measure nasal ventilation. Another method to measure nasal patency is passive anterior rhinomanometry (PAR). Although this method is not as accurate as active anterior rhinomanometry, it is accurate enough to measure a 100% nasal resistance increase and is less time-consuming than AAR.

If another method of rhinomanometry is required than the one that is advised by the Standardization Committee, PAR must be compared with the AAR. Both methods were compared during histamine nasal provocation tests. It was shown (2) that with AAR a mean histamine threshold concentration was found which was very significantly lower than with PAR. This difference, however, was very small (less than one concentration step).

In 1983 the Standardization Committee consisted of 10 members from eight different countries. As new methods developed (e.g. acoustic rhinometry, nasal inspiratory peak flow etc.), the Standardization Committee of Rhinomanometry changed its name to "Standardization Committee on Objective Assessment of Nasal Airway", which now consists of 36 members from 22 countries (Table 1), and includes several subcommittees such as the Standardization Committee on Rhinomanometry, on Acoustic Rhinometry, on Mathematical Models, on Artificial Nose for calibration purposes and on Nasal Challenge (Table 2).

Table 1. Members of the Standardization Committee on Objective Assessment of the Nasal Airway 1995

Austria: Loidolt D., Oberascher G.	Japan: Hasegawa M., Togawa K.
Belgium: Van Cauwenberge P., Clement P.	Mexico: Santiago Diez de Bonilla J.
Brazil: Neves Pinto R., Roithmann R.	Poland: Kizeski A., Samolinski B.
Canada: Cole P.	Portugal: Andrea M.
Croatia: Risavi R.	Switzerland: Gammert C.
Finland: Sipilä J.	Spain: Fabra Llopis J. M., Olive- Perez A.
France: Eloit C.	Sweden: Malm L.
Germany: Bachert C., Schlenker W. W., Vogt K.	The Netherlands: Van Wijk G. R.
Greece: Banis C., Lampropoulos C.	United Kingdom: Eccles R., Eiser N.
Hungary: Hirschberg A.	USA: Doyle W., McCaffrey T., Pallanch J., Schumacher M. J.
Italy: Passali D., Sulisenti G.	Yugoslavia: Janosevic L.

For many years, nasal obstruction has been recognized not only as one of the major symptoms of allergic rhinitis but also as an important diagnostic parameter for the assessment of nasal response to allergen challenge. Especially during the late phase, nasal obstruction is almost the only and the most important symptom reported in many studies (3, 4, 6–8).

Personal studies

In recent studies (2) the authors used PAR for the evaluation of nasal airway resistance (NAR) in an atopic group of patients ($n = 18$) after nasal grass pollen challenge outside the season and in a control group ($n = 10$) after control solution challenge. Both groups were followed for 3 days. On the first day sneezing and nasal resistance were measured using PAR and nasal secretions collected twice

Table 2. Standardization Committee of Nasal Challenge – Members

Coordinator: Prof. L. Malm	Sweden
N. Eiser, Dr R. Eccles	United Kingdom
R. G. Van Wijk	The Netherlands
R. Neves Pinto	Brazil
W. Schentler, C. Bachert	Germany
M. Hasegawa	Japan
P. Clement, P. Van Cauwenberge	Belgium
W. J. Doyle	USA

before nasal challenge, once after control solution nasal provocation, 5 min after allergen challenge, and then every hour during 10 h consecutively. The second day the same parameters were recorded again; once in the morning and once in the evening.

Seventeen of the 18 patients (94%) showed immediate unilateral or bilateral nasal obstruction, accompanied by rhinorrhoea and sneezing (medium absolute number of sneezes eight times) for 5 min after nasal allergen challenge with grass pollen. If total nasal resistance only is considered, 82% showed a positive early phase or a significant ($P < 0.001$) 100% increase of NAR, 5 min after nasal challenge (Table 3). Between 4 and 10 h after nasal challenge 17 patients (82%) on an individual basis showed a uni- or bilateral nasal obstruction. If total nasal resistance is considered, this late phase nasal obstruction occurred only in 41%. During the late phase, however, the changes in median total NAR did not show any significant difference with the baseline value. A significant increase of median unilateral (more reacting side) NAR occurred 9 h after nasal challenge. After analysis of the data, the authors were able to recognize four types of nasal resistance occurring during the late phase: type I, no late phase (18%) or no significant resistance increase; type II, one-sided nasal blockade (28%); type III, bilateral nasal blockade (8%) and type IV, alternating blockade (46%). The median maximal increase in controls

Table 3. Median percentage increases (%) in patients during the early and late phases. The baseline value is considered to be 100%

	Baseline	Maximal increase (%)	
		EP (n=17)	LP (n=14)
NAR total	100%	+216%	+88%
NAR left	100%	+230%	+192%
NAR right	100%	+233%	+280%

Table 4. Median maximal possible increases (%) of the nasal airway resistance due to nasal cycle changes during 10 h follow-up in the controls, and in the patients during the late phase (LP, between 4 and 10 h) after nasal allergen challenge. The minimal value for every test subject is estimated at 100% (Controls n=10; patients during LP n=14)

	Baseline	MI	Baseline	MI
NAR total	100%	53	100%	161
NAR left	100%	77	100%	300
NAR right	100%	80	100%	280

MI: maximal increase compared to baseline value. Baseline: by definition the baseline value equals 100%.

due to the nasal cycle was less than 100% (NAR total fluctuations were 53%, NAR left nasal cavity 77% and NAR right nasal cavity 80%). In the patient group, however, markedly higher maximal increases were seen (NAR total 161%, NAR left nasal cavity 300% and NAR right nasal cavity 280% (Table 4).

Conclusion

It can be stated that rhinomanometry is an ideal tool to measure, objectively, the increase of nasal resistance induced by nasal allergen challenge, during both the early and the late phase of allergic reaction.

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