The present status of rhinomanometry

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SUMMARY

Rhinomanometry is today a routine method that may be used in private specialist practice, if X-Y recording is used. The results become clinical statements only when directly compared with mirror findings, i.e. by functional analysis of structure or when physiological variance is taken into account by reagibility tests. In those cases this elegant technique becomes indeed indispensable.

IN 1968 Williams stated that rhinomanometry stood today where audiometry stood 20 years ago. Owing to the efforts of numerous foreign and German rhinologists this temporary backwardness has, however, been completely made up. Today rhinomanometry is a routine method in hospital and practice mainly for three seasons:

1st reason: The measuring principle is simple, and the technique is well developed. Two data, determined simultaneously, viz. respiratory flow $\dot{V}$ and differential pressure $\triangle p$, permit succinct statements about the resistance behaviour of the nose.
2nd reason: The measuring procedure is uncomplicated, and evaluation is fast. The method of choice for taking differential pressures is currently the anterior technique with the aid of a simple adhesive strip. Its handicap, namely that it needs two unilateral measurements to make a statement about bilateral respiration, has been solved elegantly by means of fast accelerating X-Y recorders.
The advantages of this solution are (Figure 1).

1. Immediate results, because 5-10 respirations are recorded above each other.
2. An exact physical resistance curve, which may be assessed at first glance.
3. Speedy quantitative evaluation by provision of 1/sec at a $\triangle$ p of 15 mm H_2O.
4. Clearly defined statements are also possible about bilateral respiration by adding right and left respiratory flows at equal $\triangle p$.
   Normal value for $\dot{V}_{bds}$ at $\triangle p = 0.8 - 1.0$ 1/sec.
5. Improvement or deterioration of nasal respiration may be recognised by the degree of incline of the curves. This provides a simple criterion, when mirror inverted recording is used. In the case of deterioration the jaws of the respiratory curves will close, in the case of improvements they will open up.
6. When mirror inverted recording is used, comparison with the resistance curve of the pulmologists is simple. This is a point of importance for the future.

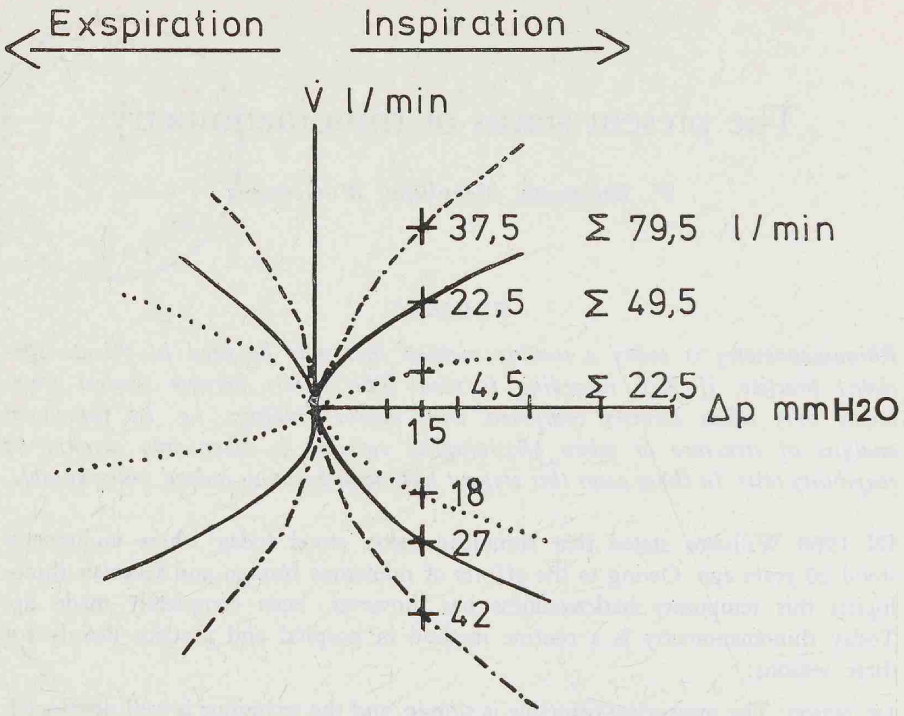

Figure 1. Rhinomanogram, mirror inverted presentation. The curves leading to the upper right correspond to the right side of the nose, the curves leading downwards correspond to the left side of the nose.
Unbroken lines = normal respiration. At 15 mm H_2O differential pressure the ventilation on the right is 23.5 l/min, on the left 27 l/min. Dotted lines = The respiratory resistance has increased. The curves incline towards the p axis. Right at 15 mm H_2O 4.5 l/min, left 18 l/min. Bilateral respiration: 22.5 l/min. Hatched line: respiration improved. The jaws of the respiratory curve are widely open. Right 37.5 l/min, left 42 l/min; bilateral 79.5 l/min.

Third and most important reason: The measured data provide strong clinical statements.

The common criticism that all measurements merely give momentary pictures and that only multiple measurements, which are very time consuming, are representative, misses out the difference between two completely different aims:

1. The functional analysis of structure by direct comparison of individual measurements with the momentary findings at inspection.
2. The testing by repeated measurements of the reagibility of the nose to external influences.

A categorical rule exists for point 1, i.e. the functional analysis of structure: No measurement should be taken without immediate comparison with the findings on inspection.

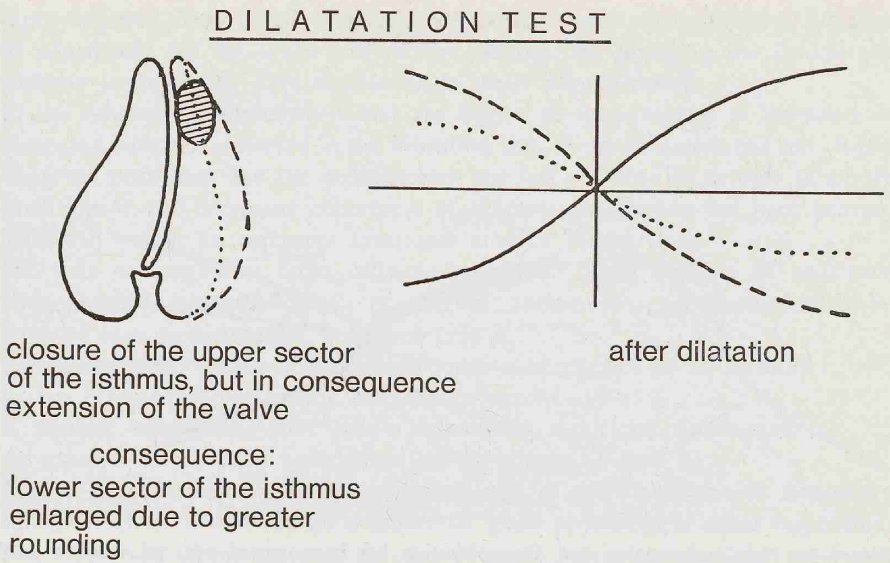

Figure 2. Principle of dilatation test. A plug of cotton wool is inserted into the upper sector of the isthmus. This improves the rhinomanometric curve of the left side. Initial values dotted: after dilatation hatched line.

The one without the other is almost valueless. It is possible to fulfil this requirement during consulting hours, as the results will be ready within 3-4 minutes. The following questions may then be answered:

1. Is bilateral nasal respiration good, satisfactory, or bad?
2. To what extent is one side of the nose less potent than the other?
3. Which parts of one side of the nose are causing the lesser potency?
   a. the vestibulum, including the anterior border of the septum,
   b. the anterior part of the main cavity of the nose up to the height of the ostium of the antrum,
   c. the posterior half of the nose from the ostium to the choana?

It is often difficult to coordinate an anterior or posterior stricture with the rhinomanometric result. But his coordination is clinically highly important, especially when correction of the nose has been unsatisfactory, or in view of the importance of posterior strictures for sinus pathology. Generally, the posterior sector of the nose has been undervalued up to now, as many rhinomanometric investigations have shown.

In problem cases normal rhinomanometry is complemented by dilatation and detumescence tests.

In the dilatation test (Figure 2) a plug of cotton wool is placed into the upper part of the nasal isthmus, so as to extend the nasal valve. Though some cross section area will thus have been reduced, the rhinomanometric result will some-

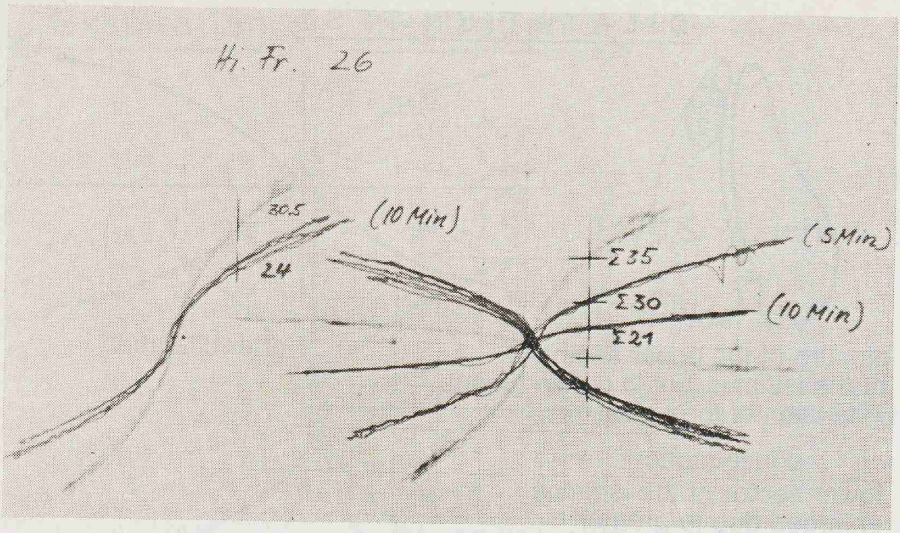

Figure 3. Nasal provocation test. Desensitisation has been carried out, yet when a drop of the allergen is placed at the right nasal cavity a pronounced reaction is noted. Left: posterior method, bilateral respiration. The initial value of 30.5 l/min deteriorates to 241/min. Right: Anterior method. The curves swinging upwards correspond to the right side of the nose, those pointing down to the left side of the nose. It is clearly visible how the initial value increasingly deteriorates after 5 and 10 minutes.

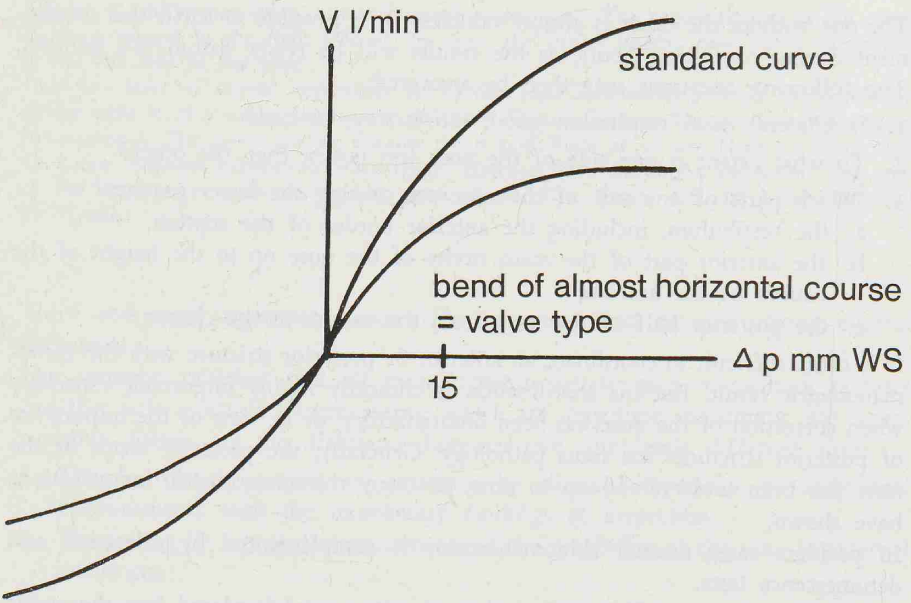

Figure 4. Valve effect when nasal alae have become attached due to suction or in the case of nasal polyps. When respiratory flow is low, the curve rises normally. The suction effect occurs when the respiratory flow increases. The graph bends to the horizontal.

times improve. This is only possible because the nasal valve fulfils a function of adjustment for the lower part of the isthmus. By rounding the isthmus its pathway is improved. This mechanism is often misunderstood.

In the subsequent detumescence test the degree of improvement of resistance is compared with that achieved in the dilatation test. If the dilatation test has clearly improved resistance, and the detumescence test has not done so or only to a very small extent, the dominant importance of the anterior stricture has been proven. This will permit an extensive functional analysis of the nose.

For tests of reagibility other consequences arise. Slight changes of resistance after physical, pharmacological, or surgical interventions are demonstrated by repeated investigations only, and then only if

1. a tendency to improvement of deterioration is repeated in all controls,
2. the effect of normal daily fluctuations exceeds 10-15%,
3. control experiments have shown statistically significant differences.

An example is the nasal provocation test in allergy (Figure 3).

This is supported by qualitative indicators, e.g., a quiet and smooth respiratory curve, which is almost always evidence of good physiological nasal respiration. The valve type of the curve in the case of nasal polyps or when the nasal alae become attached by suction is characterised by a sudden sharp flattening (Figure 4).

The objectivity of rhinomanometry has a considerable effect on patients, too. I am always surprised to note how the attides of patients who are dissatisfied with the operation may be altered by demonstration of a standard curve.

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