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Committee report on standardization of rhinomanometry

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This report represents a summary of the international meeting on standardization of rhinomanometry, held in Brussels on the 24th of February 1983.
The purpose of the meeting was to invite from every country one or maximal two workers with a sound experience in the field of rhinomanometry and to go on with the standardization procedures, started by Dr. E. Kern (1977-1981). The following investigators were present during the meeting listed in alphabetical order: Dr. W. Bachmann (German Federal Republic), Dr. P. Clement (Belgium), Dr. R. Eccles (United Kingdom), Dr. Klaassen (Netherlands), Dr. L. Malm (Sweden, representing Scandinavia), Dr. T. McCaffrey (U.S.A.), Dr. G. Mezzoli (Italy), Dr. P. Van Cauwenberge (Belgium), Dr. K. Vogt (German Democratic Republic), Dr. R. Wentges (Netherlands). Also were present as advisors: Prof. Ch. Hirsch (Engineer in fluid mechanics) and Prof. L. Kaufman (Department of statistics).

TERMINOLOGY

The first problem on the order of the day concerned terminology. The term rhinometry was rejected because confusion can exist with anthropometrical techniques involving parameters such as the length of the nose, the diameters of the nostrils, etc. Therefore, the preference was given to the term of "rhinomanometry", because it is widely used and refers to the major aim of the technique which is the measurement of the pressure encountered by air passing through the nasal cavity.

METHODS

The second problem concerns the method of measurements:

1. Technique

All members of the committee agreed that the most common and physiological technique of rhinomanometry is active anterior rhinomanometry.
The definition of active anterior rhinomanometry is: "the measurement of nasal air flow and pressure at the nostrils during respiration".

2. Fixation of pressure measuring tube

The members of the committee used different methods to fix the pressure measuring tube to a nostril. Those methods were: adhesive tape, sponge, adaptors and nozzles. The aim of the different techniques is to get an airtight seal, with minimal distortion of the nostrils and easy to apply by the paramedical personel. In conclusion, the committee agreed that the basic method is the adhesive tape technique and that every device different from this technique, can be used but should be tested against the tape method.

3. Mask

Any type of mask (large or small) that does not result in deformation of the nose and does not give leaks is acceptable. Furthermore a mask should be transparant so that deformation of the nostrils or kinking of the tubing can be excluded. When discussing rhinomanometric values, the type of mask used, should always be mentioned.

4. Differential pressure tube

The tube that measures nasal pharyngeal pressure can come out through the wall of the mask, through the pneumotachograph (if a diaphragm pneumotachograph is used) or under the mask. The most sure technique is the wall of the mask. Under the mask is also acceptable if no leakage or distortion of the tubing occurs. The tube can also run through a diaphragm pneumotachograph if this pneumotachograph has been calibrated that way and the tubing is not subject to movement during respiration.

5. Type of pneumotachograph

Two types of pneumotachographs can be used: the lamellar and the diaphragm pneumotachograph. Both pneumotachographs can be used as long as they behave in a linear fashion. This linear behaviour should be controlled at regular intervals.

6. Hygiene of the mask

The committee concluded that precautions should be taken to clean the mask and the tubing with a sterilising solution after each patient. The solution should be non irritant and without a strong smell.

7. Calibration

The general conclusion was that, although a rotameter is one of the least accurate techniques for calibration, it is accurate enough (within 5% limit) to calibrate the pneumotachograph. To calibrate the pressure transducer a simple water manometer can be used. The calibration should be performed al least once a day.

8. Position of the patient during the recording

The recording should always be performed during quiet breathing, unless the patient does not reach a flow of 300 cm^3 sec^{-1}. The patient should be in a sitting position and have a rest period of at least 30 minutes prior to rhinomanometry. Previous use of drugs, exercise or nasal valve dilatation should be mentioned on the graph.

RECORDING

The third problem concerned the different methods of recording. The X-Y-recording was considered to be the best way of recording, because it shows very well the relationship between pressure gradient and flow. Concerning the graphic representation the committee recommended for publication the mirror image technique using the four quadrants of the graph. With the mirror image display, recording of the right and left nasal cavity are represented on the same graph using quadrant II and IV for the left nasal cavity and quadrant I and III for the right nasal cavity (Figure 1). To do so the recording equipment needs a polarity change switch and the recording equipment needs to be calibrated before every recording. It was also agreed that the ordinate should represent the flow and the abcissa the pressure gradient.

The inspiration (negative pressure) should be recorded at the right side of the graph. The main and only reason to do so was that pneumologists do it in the same way.

It was unanimously decided that rhinomanometric values should be expressed in SI units (pressure in Pascal and flow in cm^3 sec^{-1}). It was suggested that from now on all committee members would inform the different companies manufacturing rhinomanometers to apply these units on their equipment.

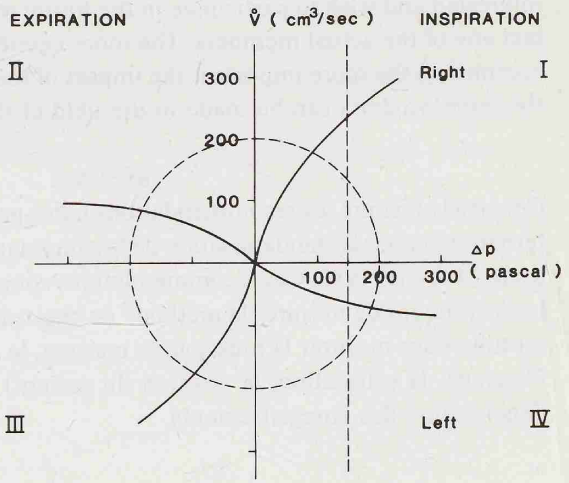

Figure 1.
Mirror image technique using the four quadrants of the graph in active anterior rhinomanometry:
- inspiration: right of the flow-axis
- expiration: left of the flow-axis
- quadrant I–III: right nasal cavity
- quadrant IV–II: left nasal cavity
- resistance should be given at a fixed pressure of 150 Pascal or at radius 2 when using Broms' model

ELABORATION OF RESULTS

The last problem the committee discussed was the elaboration of the results. The following rules were agreed upon:

1. Preference should be given to the expression of the resistance at a fixed pressure rather than at a fixed flow. The reference pressure was determined at 150 Pascal.
2. For those using the Broms' mathematical model (Broms, 1980; Broms et al., 1982) the expression of the resistance at radius 200 in a polar coordinate system was considered to be equally good as at a pressure of 150 Pascal in the usual coordinate system.
3. Although all committee members were aware of the fact that the equation was not fully correct, they accepted the equation $R = \frac{\Delta p}{\dot{V}}$ because it was much easier to work with this formula instead of the formula $R = \frac{\Delta p}{\dot{V}^n}$.
4. The committee considered that it was not necessary to standardize the way of decongestion. Each rhinomanometrist should choose the way of decongestion that he prefers (i.e. imidazoline, adrenaline, exercise, etc.) as long as he mentions it on the graph.
5. It was recommended that for a reliable measurement a minimum of three to five breaths should be recorded.

Again (Kern, 1980) this is not a final communication on the subject but a current consensus from a limited number of workers in the field. It is the hope of the committee that more countries should be represented in the committee by serious investigators familiar with the equipment and having a wide experience in the field of rhinomanometry. Those serious workers from other countries who are interested and wish to participate in the future work of the committee, can contact any of the actual members. The more countries that are represented in the committee, the more important the impact of the recommendations will be and the more progress can be made in the field of rhinomanometry.

RÉSUMÉ

Cet article résume les recommendations faites pendant la réunion du comité international pour la standardisation de la rhinomanometrie qui a eu lieu à Bruxelles le 24 février 1983. Ces recommendations concernent surtout la terminologie, les techniques de mesure (la méthode de choix de rhinomanometrie, la fixation du tube pour mesurer la pression, le masque, le choix de pneumotachographe, l'hygiène, la calibration, la position du patient) et d'enregistrement ainsi que l'élaboration des enregistrements.

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