

The applicability of the nasal adaptor method and of the pressure tube running through the diaphragm pneumotachograph for measuring ΔP and \dot{V}

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At the last meeting of the Committee on Standardization of Rhinomanometry in Brussels in 1983 active anterior rhinomanometry was recommended as the standard technique. With this method the choanal pressure is measured at the nostril by means of a pressure tube, and nasal flow is measured with a mask flow meter. We have attempted to compare the adaptor technique to the standard technique using adhesive tape. In addition, we have evaluated a technique using a pressure tube running through the diaphragm pneumotachograph. The purpose of this study was to prove that no errors in measurement occurred when these two more recent methods were applied. First we compared the adaptor and adhesive tape techniques. We used adaptors made of airtight rubber material, which are commercially available in three sizes, and an airtight adhesive tape. We examined both techniques alternately in 40 subjects and found that the shape of the curve, i.e. the more laminar and turbulent parts, remained the same.

However, the adhesive tape method provided flow values which were higher by up to 15 percent at constant differential pressure. There are three possible ways to explain this phenomenon:

1. The tape did not completely close up the nostril.
2. The tape moved during respiration responding to choanal pressure and therefore producing ΔP values which were too low.
3. The adaptor deformed the side of the nose which was being measured.

In order to solve this problem we simulated the procedures within the mask during the period of measurement using an inflexible model so that the side which was being measured could not be deformed (Figure 1). Again we found \dot{V} -values which were higher by 5 to 10 per cent using the adhesive tape technique. When applying a porous tape, the error in measurement was even larger. We concluded

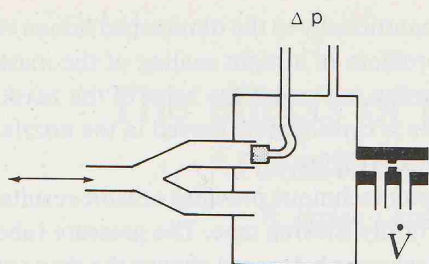


Figure 1.
An inflexible model to simulate the measurement.

that an airtight seal must be assured when the adhesive tape technique is used. It should be noted that there may be slight errors in measurement even when airtight tapes are applied because of their flexibility. When nasal adaptors were used, the sources of error which I mentioned did not occur. The adaptors are practicable and guarantee an airtight seal throughout the period of measurement. In this study we could not find a deformation of the opposite side of the nose. Theoretically this is of little importance, because a deformation would have to affect the isthmus region in order to raise the nasal resistance considerably.

We next examined the nasal pressure tube running through the diaphragm pneumotachograph. This nozzle works at turbulent flow. The insertion of a tube through the lumen does not change the physical fact of existing turbulence. Exactly the same results of measurement were obtained using two pneumotachographs when one of them was widened by the diameter of the pressure tube running through the nozzle.

Several studies showed strong linear behaviour of the nozzle with a tube up to 60 l/min (1,000 cm³/sec), which is the range of interest. In accordance with what we had expected, measurement on 40 subjects showed that the shape of the curve did not change. Of course, when this technique is applied, the pneumotachograph has to be widened by the diameter of the pressure tube or the rhinomanometric equipment has to be recalibrated.

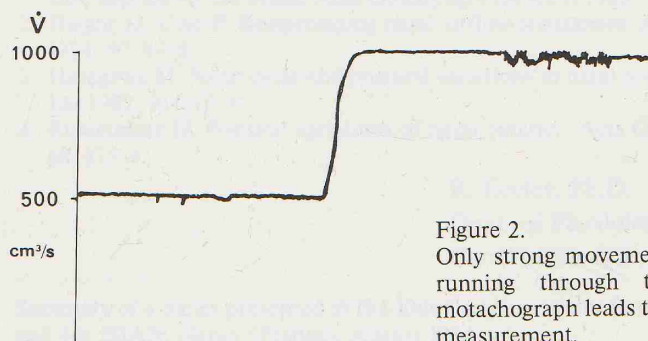


Figure 2.
Only strong movement of the pressure tube running through the diaphragm pneumotachograph leads to a considerable error in measurement.

Otherwise, the flow values would rise proportionally to the diminished lumen of the nozzle. This technique avoids the problem of airtight sealing of the mask which occurs with the pressure tube coming out under the brim of the mask. Errors may only occur if the pressure tube is considerably moved in the nozzle, which hardly ever happens in daily practice (Figure 2).

In conclusion, it may be said that the adaptor technique provides reliable results. The tape technique requires an airtight, firmly sticking tape. The pressure tube running through the diaphragm pneumotachograph does not change the shape of the curve of the rhinogram. With the nozzle widened or the rhinomanometer recalibrated, it provides the same results as previous techniques. There is no reason for not profiting from the advantages of these two new techniques for practical usage.

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