

# Measurement of the nasopharynx-maxillary sinus pressure difference as function test of the ostium of the maxillary sinus

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## SUMMARY

*Measurement of the pressure difference between the nasopharynx and maxillary sinus by using the pressure difference measurement method rarely gives information by itself on the patency of the ostium of the maxillary sinus. If a manometer examination of pressure variations in the maxillary sinus is added, these measurements are sufficient to judge the patency of the ostium. However, further investigations are required before this quick examination method is ready for clinical practice.*

FOR assessing the function of the ostium of the maxillary sinus by pressure measurement the pressure variations in the nose or nasopharynx should be measured as well as those in the maxillary sinus. These measurements can be carried out one after the other or simultaneously.

One of the main advantages of the simultaneous method (Proetz, 1932; Drettner, 1965; Cottle, 1968) is that the pressures to be compared are recorded at the same moment in nose and maxillary sinus. If the measurements are carried out one after the other, it is necessary to take into account the constant individual variation in intensity both during respiration and during sniffing and blowing the nose (Rantanen, 1974).

There are 2 methods of measuring the pressure variations in the nose or nasopharynx and in the maxillary sinus simultaneously. First, the pressure variations are recorded separately with 2 manometers — the so-called true simultaneous method. Here the pressure curves are compared after the measurements. Second, the pressure difference between nose and maxillary sinus is measured using a pressure converter for the recording (Kortekangas, 1970) (Figure 1).

This method shows the momentary pressure difference between nasopharynx and maxillary sinus at any moment. The pressure difference can be read off from the difference curve immediately after the measurement without comparing 2 curves as in the true simultaneous method described above.

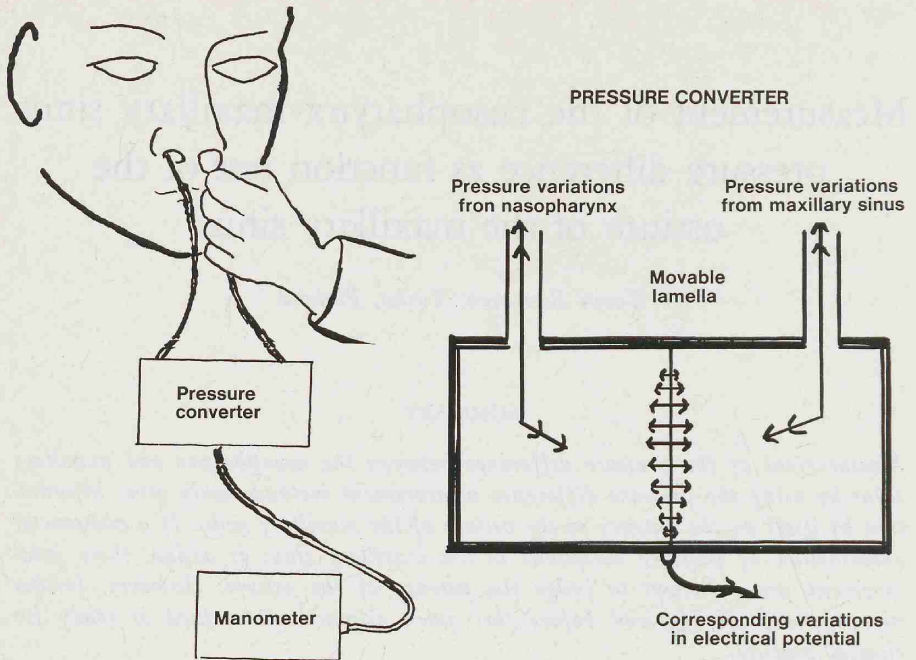


Figure 1. Arrangement of patency test of the maxillary ostium using the difference measurement method.

The construction of the pressure converter is simple. A thin lamella sensitive to pressure variations divides a cylinder into 2 chambers of equal size. The pressure variations in the nose or nasopharynx are conducted to one side of the lamella and those in the maxillary sinus to the other. If the pressure variations are the same at the same time in the nasopharynx and in the maxillary sinus, there is no deviation of the lamella as there is no pressure difference between the 2 sides of the lamella in the cylinder. In clinical practice this is the case when the ostium is patent. If the pressure variations are not of the same magnitude or not simultaneous on the 2 sides in the cylinder, the lamella deviates from the position of rest and a corresponding variation can be seen in the difference curve. If variations in the difference curve are present, it means in practice that nothing can be said about the patency of the ostium. It may be patent, partially patent or obstructed.

In a series of examinations of patients with a patent ostium no pressure difference was shown between nose and maxillary sinus in inspiration in about 35% and in expiration in 41% when the patency of the ostium was examined in 3 phases, i.e. before and after suction of the puncture needle and after irrigation (table 1). When the pressure difference between nasopharynx and maxillary sinus was examined by the difference measurement method during sniffing and blowing

Table 1. Pressure difference between nasopharynx and maxillary sinus during respiration, examined by the difference measurement method in 99 cases of patent ostium.

Phase	Pressure difference between nasopharynx and maxillary sinus		No. of ostia
	= 0	≠ 0	
Inspiration			
before suction	14 (46,3%)	16	30
after suction	12 (36,4%)	21	33
after irrigation	9 (25,0%)	27	36
No of ostia	35 (35,4%)	64	99
Expiration (as inspiration)			

the nose there was always a pressure difference although the ostium was patent under respiration. This investigation comprised 131 cases of patent ostium (table 2). In about every other case the pressure difference was more than 30 mm water.

The fact that in expiration no pressure difference between nasopharynx and maxillary sinus is observed more frequently than in inspiration and that there is always a pressure difference during sniffing or blowing the nose, is due firstly to the different pressures during respiration, sniffing and blowing the nose, and secondly, and probably more, to the general laws of gases which must always be taken into account in pressure measurements of the nose.

It is clear that measurement of the nasopharynx-maxillary sinus pressure difference during respiration alone is not sufficient to obtain information on the patency of the ostium (table 3). If separate measurement of the pressure variations in the maxillary sinus during respiration is added to the pressure difference measurement and the pressure curve obtained in this way is compared with the difference curve, more information is gained on the patency of the ostium. If no pressure variations are recorded in the maxillary sinus, the ostium is definitely obstructed. As a method for gaining information on the patency of the ostium of the maxillary sinus this examination is simpler than all others both in method and in technique. Only the nasopharynx-maxillary sinus pressure difference and the pressure variations in the maxillary sinus need be measured. This requires little time, which in my opinion is the main advantage of the method. Another

Table 2. Pressure difference between nasopharynx and maxillary sinus during sniffing and blowing the nose, using the difference measurement method. 131 cases of patent ostium.

	Pressure difference between nasopharynx and maxillary sinus in mm water				No. of ostia
	0—2	3—15	16—30	> 30	
During sniffing	—	17	38	76 (58,0%)	/131
During blowing the nose	—	21	45	65 (49,6%)	



Table 3. Assessment of patency of maxillary ostium, using the difference measurement method as function test.

Ostium	Pressure difference between nasopharynx and maxillary sinus	Pressure variations in maxillary sinus
patent	+ 05 —	+
partially patent	+	+
obstructed	+	—

advantage is that only one manometer is required. The difficulties encountered in the difference measurement are the same as in alle pressure measurements in the nose. The two most important are (1) the secretion may be a source of error if it obstructs the puncture needle and (2) the assessment of results is always difficult. When is the ostium patent or partially patent? Where is the borderline between these ostia? How great is the corresponding pressure variation in the difference curve? All these are questions waiting to be answered. Further investigations are required.

#### RÉSUMÉ

La mesure du gradient de pression entre le rhinopharynx et le sinus maxillaire donne rarement une information utile sur le degré de perméabilité de l'ostium sinusal. Une meilleure information est obtenue en ajoutant une mesure des variations de pression à l'intérieur du sinus. Cependant, des investigations complémentaires sont requises pour que cette méthode d'examen rapide soit utilisée en pratique clinique.

#### REFERENCES

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