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Olfacto-rhinomanometry (O.R.M.)

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SUMMARY

The authors have studied the changes in the rhinomanometric graphs caused by olfactory stimulations in order to find a method which can serve as an objective test for olfactometry. The results of the study of the changes in the graphs permit us to bring the objective qualitative and quantitative olfactometry into practice.

It is well-known that olfactory stimulation causes some olfacto-respiratory reflexes (Aronsohn, 1886; Capella, 1960; Willemot et al., 1971). The purpose of our study is to find a method in which these respiratory changes can be used as an objective test.

We made use of the rhinomanometry which enabled us to verify to what extent an olfactory stimulation alters the outcome of the dynamical rhinomanometric curves. In order to be able to recognize the changes caused by an olfactory stimulus the shape of the normal rhinomanometric curve must be regular in its shape, because otherwise the olfactory alterations will be difficult to recognize (Montserrat, 1974, 1977).

Our study is divided into two parts: first we studied the different types of changes and secondly we tried to find correlations between the intensity of the olfactory stimulus and the changes in the rhinomanometric curve.

1. OBJECTIVE QUALITATIVE OLFACTO-RHINOMANOMETRY

In the following we shall discuss the results obtained from 100 O.R.M.'s. The odours we used, were divided into four groups:

1. Substances exciting the trigeminal nerve, such as acetic-acid and ammonia.
2. Substances with odoriferous properties which are quitte pure such as musk, the scent of flowers and putridity.
3. Substances with gustatory components such as camphor.
4. Substances with trigeminal components such as peppermint and ether.

We used substances either in their pure form or in their saturated solutions (Table 1). The test was carried out in a quiet environment. The patient was lying on the examination table with his head bent forward 30° and his eyes blindfolded. During the rhinomanometry a bottle containing the substances, which

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Table 1.

substances	answers
camphor	olfactory + gustatory
acetic-acid	trigeminal
musk	olfactory
scent of flowers	olfactory
peppermint	olfactory + trigeminal
ether	olfactory + trigeminal
putridity	olfactory
ammonia	trigeminal

were to be tested, was offered to the patient. Other stimuli such as noises or the bottle touching the nose etc. must be avoided.

The moment at which the olfactory stimulus was given, has been recorded in the graph. In the rhinomanometric graphs we studied the variations in rythm, frequence and durations of the changes.

We have divided these changes into nine groups (Table 2).

1. Reaction of stop: the respiration stops at the base line.
2. Disorganization of the curve: this was a frequent reaction.
3. Decrease of the inspiration pressure.
4. Decrease of the expiration pressure.
5. Decrease of the frequency.
6. Increase of the frequency.
7. Increase of the inspiration pressure.
8. Increase of the expiration pressure.
9. No changes.

The conclusions obtained from this study can be summarized as follows:

1. The rhinomanometric changes are variable to a great extent.
2. The shape of the changes are not related to the stimulating substance.

Table 2.

substance	stop	dis.	d.ip.	d.ep.	d.fr.	i.fr.	i.ip.	i.ep.	n.	total
camphor	14	18	29	25	25	3	21	16	21	172
acetic-acid	89	55								144
musk	6	6	47	35	12	24	17	17	12	176
scent of flowers	3	17	34	34	14	24	17	14	16	173
peppermint	12	6	23	29	17	6	13	11	35	152
ether	24	24	29	24	18	24	6	6	6	161
putridity	34	23	44	36	18	7	6	4	2	174
ammonia	64	76								140
	246	225	206	183	104	88	80	8	92	1292

Table 3.

substance	stop	dis.	d.ip.	d.ep.	d.fr.	i.fr.	i.ip.	i.ep.
camphor	5″-11″	4″-30″	5″-33″	5″-33″	5″-33″	6″-19″	7″-45″	7″-45″
musk	2″-15″	4″-12″	5″-25″	6″-25″	5″- 9″	3″-23″	7″-13″	7″-13″
scent of flower	5″- 7″	3″-17″	6″-20″	5″-20″	5″-35″	6″-24″	12″-36″	12″-36″
peppermint	5″-14″	7″-14″	6″- 9″	5″- 9″	5″-12″	5″- 9″	18″-25″	18″-25″
ether	4″-30″	4″-16″	5″-30″	5″-30″	4″-27″	5″-30″	20″-30″	20″-30″
putridity	3″-22″	3″-17″	7″-61″	7″-61″	5″-54″	7″-10″	3″-17″	3″-17″

3. The changes are not in any way related to the patient in question or the kind of stimulus.
4. There is a clear difference between the duration of the changes caused by substances of a basically trigeminal stimulus and the duration of the changes caused by an olfactory stimulus.
5. The duration of the changes is not related to the stimulating substances (Table 3).
6. Of the odoriferous substances putridity caused the most numerous and evident changes (Montserrat, 1978, 1980).

2. OBJECTIVE QUANTITATIVE OLFACTO-RHINOMANOMETRY

In this second part of our study we tried to find an olfactory threshold. We divided this study into two parts. In the first we observed the changes in the rhinomanometric curves caused by the following four substances: rose-essence, methyl salicylate, anise essence and ammonia in four different concentrations (25, 50, 75, 100%). In the second part we observed the changes caused by lower concentrations. The solutions were put in tightly closed bottles. Two hypodermic needles were placed in each bottle. One of the needles reaching the bottom of the bottle and the other one remaining above the stimulating solution.

We injected 10 cc of air through the first needle which immersed in the solution. We tried to inject the air precisely at the time of inspiration. The air caused bubbles in the stimulation liquid containing odoriferous molecules. The same quantity of air with odoriferous molecule went out through the second needle and was used as a stimulus like in objective-quantitative O.R.M.

The first part of this study resulted in the following conclusions:

1. There was no correlation between the changes in the graphs and the concentrations.
2. Changes occurred in about 90% of the patients with a positive qualitative O.R.M. We think that in the remaining 10% of the patients their threshold level was higher than the given stimulus. We must bear in mind that the stimulus existed of 10 cc of air only.

3. The patients with a quantitative positive O.R.M. showed changes at any given concentration.

This experiment was repeated with the lower concentration. In this experiment we used the odorifical hydrosoluble substances because the former used solvents could cause a stimulus in very low concentrations. We used 3 substances: rose essence, sulphuric water and camphorated water in concentrations of 0% (distilled water), 0,5%, 1%, 2%, 5%, 10%, 15% and 20%.
During the rhinomanometry we injected 10 cc of air through the first solution; 30 seconds later we repeated the stimulation with the second solution and so on until we noticed some changes in the graphs. When a change was noticed we repeated this procedure with the same concentration. If the effect was similar, we ended the test, if not we continued the stimulation with the next concentration. When a concentration of 2% was used we found changes in 90% of the cases; using a concentration of 1% only in 65% of the cases a change occurred. The 0,5% concentration did not result in any change. Al our patients responded when we used a concentration of 15%.

From these results we can conclude:
1. The O.R.M. is a valid test for the clinical study of the olfactory function both qualitative and quantitative.
2. All the patients that demonstrate changes caused by stimuli of a concentration of 5% or more are hyposmic for the tested substances.
3. On the other hand, the patients that demonstrated O.R.M. changes caused by stimuli of a concentration less than 5% are normosmic for the tested substances.

RESUMEN

Los autores estudian las modificaciones que los estímulos olfatorios producen en las curvas de rinomanometria. La finalidad del estudio es obtener un test válido para realizar una olfatometria objetiva, tanto cualitativa como cuantitativa.

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