MANIFESTATION OF THE GASTROLINGUAL REFLEX IN CERTAIN DISEASES OF THE GASTROINTESTINAL TRACT

(UDC 616.33/.34-009.815:616.8-009.812)

S. M. Budylina

Department of Normal Anatomy (Head, Professor P. G. Snyakin),
Moscow Medical Stomatological Institute
(Presented by Active Member AMN SSSR V. V. Parin)
Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 60, No. 8,
pp. 36-39, August, 1965
Original article submitted May 13, 1964

Data reported in the literature concerning the level of taste sensation in diseases of the gastrointestinal tract have been obtained mainly by the method of measurement of the threshold of taste stimulation. These findings are highly contradictory and do not give a complete picture of the changes in this type of sensation in a given nosological disease form [1, 4, 6].

The object of the present investigations was to study the reflex relationships (tongue—stomach, stomach—tongue) in diseases of the gastrointestinal tract not accompanied by destructive changes in the oral cavity, in order to determine the role of the interoceptive link in the manifestation of these reflex reactions [7-9].

EXPERIMENTAL METHOD

Altogether, 16 persons were investigated. Their ages varied from 27 to 64 years (14 males and 2 females); they had chronic gastritis or gastric or duodenal ulcer.

The taste sensation was studied by the method of functional mobility [2, 3, 5], using a sugar solution of above-threshold concentration (44.5%), which was applied to individual fungiform papillae of the tongue by means of a bent glass capillary tube. In each experiment, four fungiform papillae were investigated simultaneously. The sensitivity of each was measured 12 times in the course of the experiment, at intervals of 2-3 min. Altogether, 120 investigations were made, comprising 5760 measurements of sensitivity. To study the gastrolingual reflex, the investigation was conducted before and after taking food.

In 10 persons the taste sensation was also studied by the method of measurement of the threshold of sensation of substances with all types of taste properties by means of the drop method. Solutions of sugar, salt, hydrochloric acid, and quinine hydrochloride were used in different concentrations. Altogether, 96 determinations of the sensitivity were made.

EXPERIMENTAL RESULTS

The results of the investigations of taste sensation using the threshold of stimulation are given in Table 1. This table shows that in 7 of the 10 patients the threshold of stimulation was raised for sweet objects, indicating a lowering of taste sensitivity for this type of stimulus. In fewer patients, the threshold for bitter was raised, and, as a rule, these changes were noted where the taste sensitivity towards sweet substances was disturbed. The taste sensitivity towards salt and acid, as indicated by the values of the threshold of stimulation, remained within normal limits, and only in one case was the sensitivity towards salt perverted, salt solutions being perceived as acid, even in concentrations above threshold.

The results of these investigations show that the disturbances affected only the perception of sweet taste and, to a slight degree, of bitter. These findings suggest that the analyzer function of the taste receptors was only very slightly affected.

TABLE 1. Thresholds of Taste Sensation in Investigated Patients (mean values)

Patient's surname	Sweet (normal 0.25-1.25% sugar solution)	Salt (normal 0.25-1.25% solution of common salt)	Acid (normal 0.05-1.25% solution of hydrochloric acid)	Bitter (normal 0.0001-0.003% solution of quinine hydrochloride)
N-a	5.0	0.17	0.3	0.004
K-a	1.75	0.5	0.13	0.0002
G-v	Not determined	0.25	0.5	0.0003
M-n	1.5	1.0	0.25	0.00045
B-v	1.87	0.15	0.15	0.005
B-n	0.75	0.75	0.75	0.0005
K-v	0.87	0.25	0.12	0.75
B-v	1.75	0.5	0.75	0.005
G-n	0.5	0.005	0.15	0.00036
O-v	1.5	Acid	0.5	0.002

TABLE 2. Indices of Functional Mobility in Patients with Diseases of the Gastrointestinal Tract before and after Taking Food (mean data)

No.	Patient's surname	Level of functional mobility		Changes in level of mobilization	P
		before eating	after eating		
1	N-a	+31—17	+32—16	+1±1,82	>0,5
2	K-a	+39— 9	+39— 9	0±1,18	>0,5
3	P-o	+42— 6	+33—15	—9±1,36	<0,01
4	G-v	+44— 4	+46— 2	+2±0,92	>0,05
5	M-n . . .	+37—11	+36—12	—1±0,98	>0,2
6	B-v	+42— 6	+43— 5	+1±0,22	>0,1
7	G-n	+41— 7	+43— 6	+1±1,06	>0,2
8	B-v	+22—26	+24—24	+2±1,11	>0,2
9	O-v	+26—22	+28—20	+2±2,27	>0.2
10	T-v	+37—11	+36—12	—1±0,95	>0,2
11	G-o . . .	+47— 1	+42— 6	—5±2,73	>0,2
12	K-v	+37—11	+28—20	—9±1,32	>0,05
13	B-v	+36—12	+31—17	—5±1,35	<0,05
14	K-v	+33—15	+30—18	—3±2,22	<0,2
15	V-n	+32—16	+29—19	—3±1,33	>0,2
16	R-n	+19—29	+12—36	—7±2,64	>0,05
For the whole group		+34—14	+32—16	—2±1,70	<0,2

Hence, by using the customary method of investigation (measurement of the threshold of taste sensation) no characteristic signs of a disturbance of taste sensation were found in these diseases. Accordingly, the taste receptor apparatus was next investigated by the method of functional mobility.

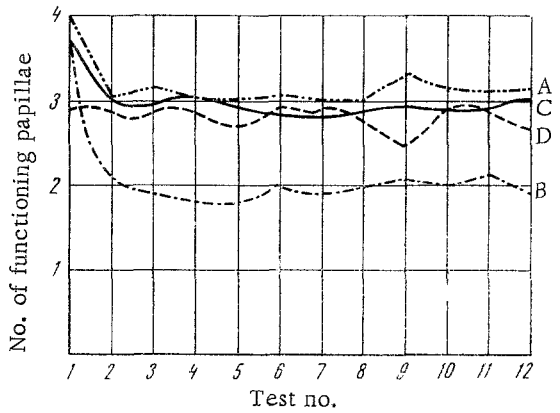
By analyzing the results of the investigation of the physiological mobility of the taste receptors when identical functional conditions prevailed in the alimentary tract, it was found that the level of mobilization of the taste receptors is not a constant value. It varies not only in different patients, but also in the same patient when tested on different days. The amplitude of variation of the level of mobilization was sometimes considerable, and in other cases it was limited. Despite these variations, it was concluded that in some patients the level of mobility was high, as in healthy subjects, while in others the level of mobility was lowered, sometimes considerably. This conclusion was confirmed by the mean values of the level of mobilization in a fasting state (before eating) in the investigated patients (Table 2).

Likewise, the level of mobilization was not the same in all the subjects after taking food.

Comparison of the data characterizing the level of mobilization before eating and immediately after eating shows that the taste receptor apparatus in the patients did not react in the normal manner to the taking of food, and there was, in fact, no reaction of the taste receptors to the entry of food into the stomach. This is illustrated by the graph (see figure) in which the level of functional mobility of the taste receptors in normal conditions and in the investigated patients is plotted. It is clear from this graph that in healthy persons the level of mobilization is lowered after taking food, whereas in patients it remains unchanged in character.

The patients with chronic gastritis and gastric ulcer showed a complete absence of changes in the reaction of the taste receptors to food (Table 2, Nos. 1-5). In the patients with duodenal ulcer, in some cases (Nos. 6, 7) demobilization was absent after taking food, while in others (Nos. 8, 9) the processes of mobilization were intensified, although not to a very marked degree, and the reaction assumed a perverted character.

These results, characterizing the taste sensation by the indices of the threshold of stimulation in chronic gastritis and peptic ulcer, suggest that the disturbance of the analyzer function of the taste receptor apparatus was very



Level of functional mobility of taste receptors in a fasting state (A, C) and after eating (B, D) in normal subjects (A, B) and patients (C, D) (mean data).

slight. However, the results of the investigation of the functional mobility demonstrate a distinctive pattern of stabilization of the level of sensitivity of the taste receptors. The taking of food did not produce a reflex decrease in the number of active taste receptors of the tongue. Whatever the initial level of mobilization of the taste receptors, it remained unchanged, indicating the loss of the reflex connection between the interoceptors of the stomach and the exteroceptors of the tongue, or a disturbance of what is called the gastrolingual reflex.

Since the patients investigated had diseases of the stomach and duodenum, it may be postulated that the disturbance of the gastrolingual reflex in this case was associated with a defect of the interoceptive link.

SUMMARY

The object of study was the state of the gustatory analyzer in diseases of the gastrointestinal tract (gastritis and gastric ulcer). Insignificant changes were noted in the gustatory sense, as well as disorders of the gastrolingual reflex, either in the form of complete absence of response of the gustatory receptors to ingestion of food or in the form of distorted reaction.

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