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The Effect of Taste and Mastication on Lymph Flow in the Neck Region

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Summary

In 10 out of 12 patients, there was a significantly stimulatory effect on lymph flow during taste and in 9 out of 10 patients there was a significant stimulatory effect on lymph flow during mastication. The stimulatory effect of mastication could be a parallel to the conditions observed in the leg but the stimulatory effect of taste could also indicate an active process perhaps of neurogenic origin.

Introduction

In a previos study, we were able to demonstrate a food stimulatory effect on the lymph flow in the neck region. This stimulatory effect was however only observed during eating and factors such as taste, mastication, smell and vision could be responsible for this stimulatory effect either separately or in combinations.

The purpose of this study was to attempt separate evaluation of the stimulatory effect of taste or mastication on lymph flow.

Material and method

Patients studied: 22 patients entered the trial, all suffering from malignant diseases but with no evidence of metastases to the head and neck region. In 12 patients the influence of taste was studied and in 10 patients the influence of mastication.

After 2 hours of fasting 100 μC ^{99m}Tc antimony sulfide colloid (Duphar Philips DRN 4333) in a volume of 0.2 – 0.3 ml (0.5 % Lidocain non vasocontringens, hyaluronidase 20 IE) was injected in the submucous tissue on one side of the tongue base. The patient was then placed in the supine position under a gamma camera (Ohio-Nuclear ON 100) covering the oral and neck region. The effect of mastication was studied with the patient's head in the oblique position. The registration of radioactivity was started immediately using a 18000 holes parallel collimator with an interphased mini-computer (Varian 620/L – 100).

A scintigram was registered every one minute during a span of 45 minutes, 10 minutes in the basal state, 12 minutes during mastication (sterilized rubber band) or 12 minutes during taste (the patients sucked a sweet weighing 3.3 g and mainly consisting of sugar and apple acid) and then postprandial up to 45 minutes.

The sequence of scintigrams were summarized and from these summations "regions of interest" (RIO) over the visualized lymph nodes were defined via a display oscilloscope.

From the sequence of registered scintigrams, time function curves were generated and normalized. Flow condition was described by

Table I Lymph flow over the neck region expressed by K-values counts/min.

No. of patients	Basal mean	Basal range	Taste mean	Taste range	Postprandial mean	Postprandial range
12	8	41 –23	75	125 30	– 1	20 –23
			Mastication			
10	10	44 – 5	98	148 32	10	20 –43

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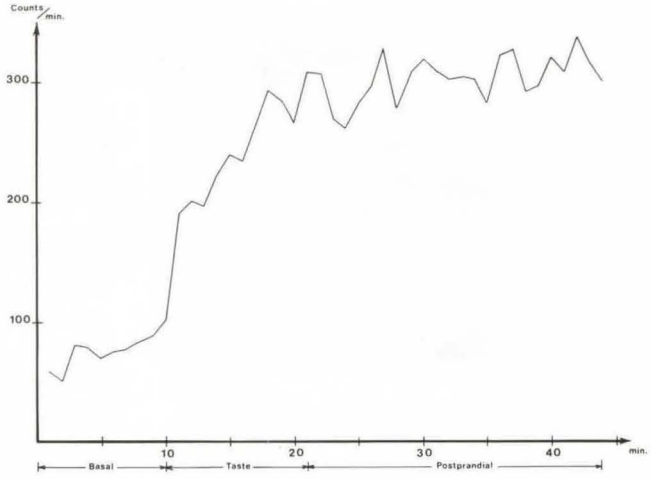

Fig. 1 Time function curve after taste. K value (counts/min.) during taste 81.

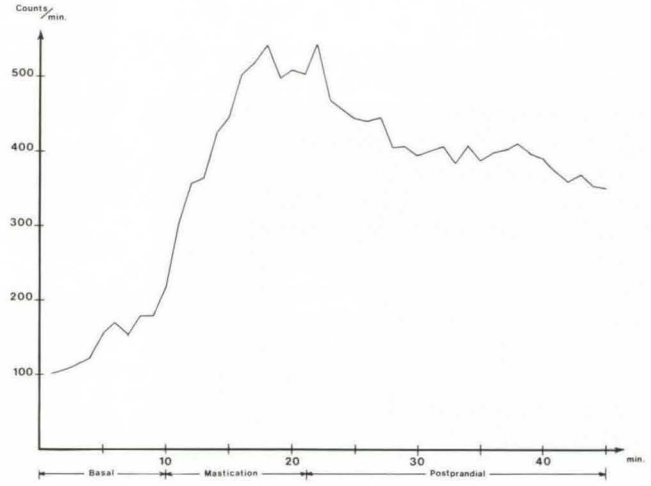

Fig 2 Time function curve after mastication. K value (counts/min.) during mastication 87.

calculation of slope (K counts/min.) on different curve locations by automatic linearregression analysis. It must be stressed that K-values calculated on normalized curves are only valid for quantitative comparison within the same patient.

Results

In table I, the results are listed. Based on K-values there was a significant ($p < 0.02$) stimulatory effect on the lymph flow during taste in 10 out of 12 patients and with a significant ($p < 0.01$) postprandial decrease. During mastication the significant ($p < 0.01$) stimulatory effect on lymph flow was seen in 9 out of 10 patients and also here followed by a significant ($p < 0.01$) postprandial decrease. After mastication the proximal lymph nodes of the deep neck chain was visualized but only free of the main bolus in the oblique position. After taste also more distally placed lymph nodes free of the main bolus were visualized. In fig. 3 and 4 the morphological conditions after mastication and taste are illustrated.

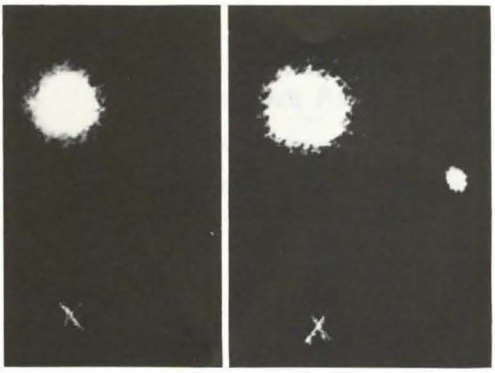

Fig. 3 Left: scintigram of the injected bolus of ^{99m}Tc antimony colloid in the tongue base during basal condition.
Right: scintigram after taste. Note visualized lymph node far from the main bolus.
X: indicates jugulum.

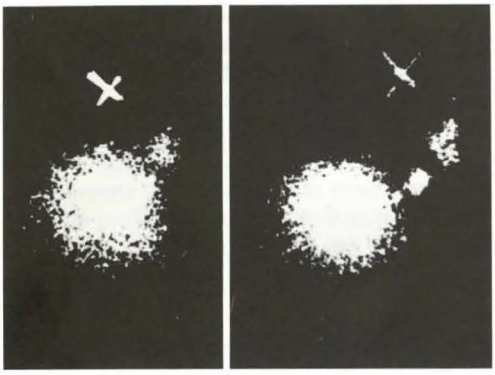

Fig. 4 Left: scintigram (frontal view) of the injected bolus of ^{99m}Tc antimony colloid and visualized lymph node after mastication.
Right: The same condition with the head in the right oblique position. The visualized lymph nodes are now in proper distance from the main bolus.
X: indicates jugulum.

Discussion

The rapidly increased lymph flow during mastication and swallowing might indicate an active process but it could also be a parallel to the conditions observed in the leg where muscular exercise promotes lymph flow probably both by an increased blood flow and contraction of the muscles (3, 4).
Muscular exercise i. e. sucking and swallowing could also be responsible for some of the stimulatory effect on lymph flow during taste. However, the extensive visualization of lymph nodes during taste in comparison to mastication could be the result of a simultaneous stimulation of neurogenic origin perhaps mediated by the taste buds.
This hypothesis finds support in the results by *Deysine* et al. (2) where sympathetic blockage significantly diminished thoracic duct lymph flow.

Acknowledgement

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