

THE EFFECT OF LONG-WAVE DIATHERMY ON THE ABSORPTIVE ACTIVITY OF THE STOMACH AND INTESTINE

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The effect of long-wave diathermy on the activity of the gastro-intestinal tract has not been adequately studied. The effect of diathermy on the secretory and motor functioning of the stomach has been investigated to a certain degree [1, 4, 10, 11, 12].

It was shown that, under the influence of diathermy, the secretory activity of the stomach decreases: the amount of juice secreted and its acidity are both reduced, while the digestive strength of the juice increases. Investigation of the motor functioning of the stomach showed that, under the influence of diathermy, the evacuatory capacity of the stomach is strengthened, at the same time that the periodic hunger contractions fail to undergo any notable changes [7].

P. K. Lipatova [5] noted that diathermy normalizes the secretory and evacuatory functioning of the stomach in patients suffering from gastritis and ulcerative disease.

We studied the effect of long-wave diathermy on the absorption of glucose, amino acids, chlorides, and water, in the stomach and intestine.

EXPERIMENTAL METHOD

The investigation was carried out on dogs with an isolated stomach pouch according to Pavlov (3), and on dogs with an isolated loop of small intestine according to Tiri [3].

Glucose was administered in a 20% solution into the stomach pouch for 60 min, and in a 7% solution into the intestinal loop for 30 min. Sugar absorption was evaluated from the difference between the amount of glucose introduced into the stomach pouch or intestine and the amount extracted from them. The concentration of glucose in the solutions was determined refractometrically using a Tseis-Vol'na Refractometer, and by the method of Hagedorn-Jensen. Absorption of a 0.03 M solution of glycine was investigated in the stomach pouch and intestinal loop. The concentration of amino nitrogen in the solution and in the extracted fluid was determined according to the method of Tsuverskalov. Sodium chloride was introduced into the stomach pouch in a 2% solution, and into the intestinal loop in a 1% solution. The concentration of chlorides in the solutions was investigated according to the method of Fol'gardt, using the modification of Rushnyak.

The organism was exposed to the action of spark-discharging diathermy with a wave length of 200 m and a frequency of 1 mhz. The electrodes of the generator were placed on the back and abdomen: the larger, indifferent - on the back, and the smaller, active - on the abdomen.

We studied the effect of diathermy with a current intensity of 0.2, 0.5 a and a duration of exposure of 10, 20, and 30 min, as well as a current intensity of 0.5 a and a duration of exposure of 30 min, on the absorption of sugar, amino acids, chlorides and water, in the stomach and intestine.

In addition to this, we set up 2 series of experiments with diathermy of the cervical sympathetic nodes, according to Grot-Egorov, with a current intensity of 0.5, 1.0 a and a duration of exposure of 10 min.

Observations were also carried out for changes in the temperature within the gastric and intestinal cavities during the action of diathermy on the organism, using an electrothermometer with a hollow electrode. We carried out 626 experiments on 6 dogs.

EXPERIMENTAL RESULTS

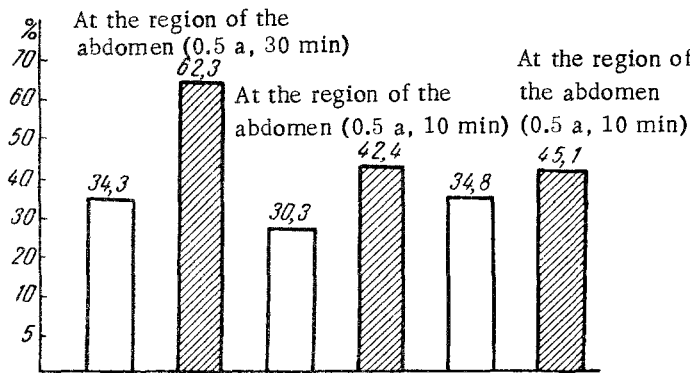


Fig. 1. The effect of diathermy on the absorption of glucose in the isolated stomach pouch of Tarzan. White columns) under normal conditions; crosshatched) with the action of diathermy.

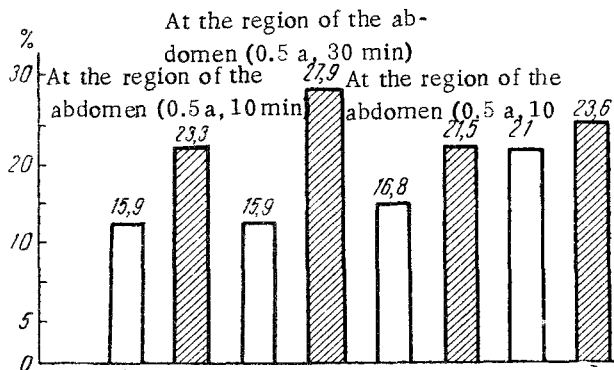


Fig. 2. The effect of diathermy on the absorption of glucose in the isolated intestinal loop of Belok. Symbols are the same as in Fig. 1.

average of 29.9%, and in Dzhul'bars - from 9 to 14.1%.

In Belok, in this series of experiments, glucose absorption in the intestinal loop was equal to an average of 51.7% before the action of diathermy, and 56.1% afterward; in Tuzik, the figures were 43.1 and 54.9% respectively.

To a large degree, glucose absorption was intensified in the stomach pouch and the intestinal loop with application of the same current intensity but with an increase in the duration of action of the diathermy on the organism to 30 min. In Tarzan, sugar absorption in the isolated stomach pouch increased from 15.9 to 27.9%. The same thing was observed in Dzhul'bars. In Belok, glucose absorption in the intestinal loop rose from 34.3 to 62.3%. An analogous picture was noted in Tuzik.

With diathermic action in the region of the cervical sympathetic nodes, using a current intensity of 0.5 a over a period of 10 min, glucose absorption in the stomach pouch and in the intestinal loop was intensified as compared with the normal level, but to a significantly smaller degree than with irradiation of the back-abdomen region. For example, in Dzhul'bars, glucose absorption in the stomach pouch in this series of experiments normally equalled an average of 19.5%, while with the action of diathermy on the cervical region, it was 23.6%; in Tarzan, the figures were 16.8 and 21.5% respectively. Under these conditions, sugar absorption in the intestinal loop of Belok and Tuzik also increased minimally (in the latter, 58.9 and 68.8% respectively).

With an increase in the current intensity to 1 a, using diathermy of the neck, no further intensification of sugar absorption occurred in the experimental dogs. Under the influence of diathermy, glycine absorption increased in the isolated stomach pouch and in the intestinal loop. Thus, in Tarzan, in the isolated stomach pouch, an average of 5.4%

With the action of diathermy in the abdominal region, using a current intensity of 0.2 a and a duration of 20 min, the absorption of glucose in the stomach and in the intestine was intensified. In the dog, Dzhul'bars, the normal absorption of glucose in the isolated stomach pouch was equal to an average of 12.5%, while under the influence of diathermy - 19.2%, and in Tarzan, 23.9 and 31.7% respectively. The same principle was also noted in relation to the intestine. In Belok, normal glucose absorption in the intestinal loop was equal to an average of 45.9%, while with the action of diathermy on the region of the stomach, it was 61.6%, and in Tuzik - 52.8 and 71.5% respectively.

With an increase in the current intensity to 0.5 a and with a duration of action of 10 min, glucose absorption was also intensified as compared with the norm, and there was no sharp difference in the degree of intensification of the absorption with current intensities of 0.2 and 0.5 a. Thus, in Tarzan, in the isolated stomach pouch, normal glucose absorption in this series of experiments was equal to an average of 15.9%, while under the influence of diathermy with a current intensity of 0.5 a, it was 23.3% (Fig. 1), and in Dzhul'bars - 18.3 and 25% respectively. In Belok, in the isolated intestinal loop, sugar absorption under the influence of diathermy with the same current intensity rose from 30.3 to 42.4% (Fig. 2).

Using the same current intensity and increasing the duration of action to 20 min, the effect was almost the same as with exposure for a period of 10 min. For example, in Tarzan, in this series of experiments, glucose absorption in the isolated stomach pouch rose, under the influence of diathermy, from an average of 9.5 to an

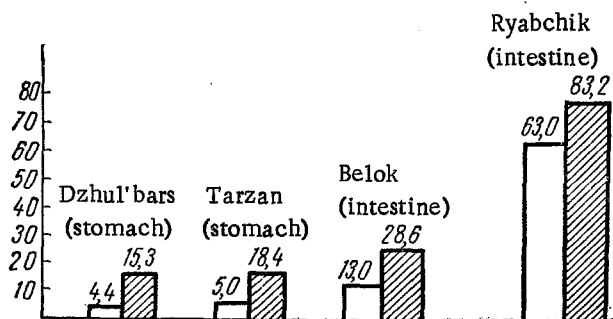


Fig. 3. The effect of diathermy on absorption of chlorides in the stomach and intestine. White columns) under normal conditions; crosshatched) with the action of diathermy.

Diathermy intensified this process both in the stomach and in the intestinal loop (Fig. 3). In Dzhu'bars, in the isolated stomach pouch, an average of 4.4% of the administered chloride was normally absorbed, while under the influence of diathermy - 15.3%; in Ryabchik, in the isolated loop of small intestine - 63 and 83.2% respectively.

Under the influence of diathermy, absorption of water was also intensified. Thus, in Dzhu'bars, in the isolated stomach pouch, it was increased from 4 to 9.6%. This process was more manifest in the small intestine. Thus, in Tuzik, in the isolated intestinal loop, an average of 20.3% of the administered water was normally absorbed, while under influence of diathermy - 41.9%.

Under the influence of diathermy, with a current intensity of 0.2 a at the region of the back-abdomen for a period of 10 min, the temperature in the lumen of the isolated stomach pouch and the isolated intestinal loop increased by 0.4-0.6°, and with a current intensity of 0.5 a, by 1-1.2°. The action of diathermy, with a current intensity of 0.5 a for a period of 10 min in the region of the neck, increased the temperature in the lumen of the stomach pouch and intestinal loop by 0.2-0.4°.

The data obtained show that under the influence of diathermy, the absorptive activity of the stomach and intestine increase. This conclusion concurs with the observations of other authors.

Intensification of the absorptive functioning of the stomach and intestine is explained by an improvement in the functional state of the absorptive elements and a heightening of blood flow to the irradiated organs. The validity of this explanation is evidenced by the investigation of V. V. Zakusov and N. S. Molchanov [2], who noted an increase in diuresis of humans and animals after exposure to diathermy in the region of the kidneys, and also by our observations, in which it was established that there is an increase in temperature within the lumina of the stomach pouch and intestine following the action of diathermy. Other authors have also observed an elevation in temperature within the stomach of 2-2.5° under the influence of diathermy [6].

Intensification of absorption in the stomach and intestine under the influence of diathermy occurs with the participation of the nervous system. Thus, in our experiments, irradiation of the conducting nervous system (the region of the cervical sympathetic nodes) was accompanied by an elevation in the absorption of glucose, though it is true that it occurred to a smaller degree than with irradiation of the abdomen. This is also testified to by the observations of other investigators [3,9], which established that, with the action of diathermy in the region of the neck, the tonus of the nervous system is elevated, and tissue and organ trophics are improved. N. A. Popov [8], carrying out diathermy of the brain, noted an intensification of the functioning of the digestive glands.

These data make it possible to recognize the incorrect viewpoints of certain authors, who have denied the participation of the nervous system in the reaction of the organism to the action of physical agents.

SUMMARY

A study was made of the effect produced by long-wave diathermy on the glucose absorption in the gastrointestinal tract. Investigations were conducted on dogs with the Pavlov stomach pouch (3 dogs) and with the isolated loop of the small intestine (3 dogs). An inquiry was made into the effect produced by long-wave diathermy current intensity 0.2-0.5 a acting for 10 min, and current intensity 0.5 a acting for 20 and 30 min) on the absorptive activity of the stomach and intestine.

of the administered amino nitrogen was normally absorbed, while under the influence of diathermy with a current intensity of 0.5 a and a duration of action of 30 min, it was 33.4%. Glycine absorption in the isolated stomach pouch was also intensified in the other experimental dogs. Absorption of glycine in the loop of small intestine was, to a significant degree, also elevated. For example, in Belok, an average of 30.3% of the administered amino nitrogen was normally absorbed in the isolated intestinal loop, while under the influence of diathermy - 56%.

Absorption of chlorides following the administration of NaCl was insignificant in the isolated stomach pouch, but appreciable in the loop of small intestine.

Exposure to diathermy with the current intensity of 0.2-0.5 a increased glucose absorption in the stomach and intestine; there was no difference noted in the degree of absorption rise with the mentioned experimental exposures. Diathermy with a current intensity of 0.5 a administered for 30 min caused a greater increase of glucose absorption.

With the mentioned exposures a study was made of the effect produced by diathermy on the absorption of glycine, chlorides and water in the stomach and intestine. The absorption of glycine, sodium chloride and water increases in the stomach and intestine of dogs.

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