EXPERIMENTAL STUDY OF THE EFFECT OF OXYGEN ON GASTRIC FUNCTION

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Introduction of oxygen into the stomach and intenstine is widely used in clinical practice for dehelminthization and in the treatment of various diseases [1-3, 5, 7, 11].

The results of an investigation of gastric function which I carried out in clinical conditions on patients with chronic gastritis undergoing oxygen therapy [6] revealed an increase in secretion and in acidity after injection of oxygen into the stomach.

The object of the present investigation was to study the effect of oxygen on the secretory, acid-forming, excretory, evacuatory, and motor functions of the stomach in experimental conditions.

EXPERIMENTAL METHOD AND RESULTS

Experiments were performed on five adult dogs weighing 12-17 kg with a gastric fistula.

Changes in the secretory, acid-forming, and motor functions were studied during mechanical stimulation (a 250 ml rubber balloon) and subcutaneous injection of 1% histamine solution (0.05 ml/kg). Histamine was used as a background secretory stimulus, for in response to its repeated injection a more or less stable level of secretion is usually created [13, 14].

The gastric functions listed above were studied initially in the experimental dogs. Then, for the next 15 days, 3-4 liters oxygen was introduced into the stomach of the fasting animals through the fistula. The injection continued for 2 h. During introduction of oxygen the dogs behaved quietly, and in most cases they were drowsy. Oxygen acted as a stimulus to gastric secretion. At the end of the injection of oxygen the volume of gastric juice was 5-8 times, and in some cases 20 times, greater than its volume during mechanical stimulation with a balloon at the beginning of the investigation. Occasionally a trace of bile was mixed with the gastric contents obtained after injection of oxygen.

In the case of four dogs with low initial acidity of the gastric juice obtained in response to a mechanical stimulus, immediately after injection of oxygen, and without any additional stimulus, the total acidity and the free hydrochloric acid were increased by 1.5-2 times, and in one dog by three times. Free hydrochloric acid was absent from the gastric contents of one of these dogs obtained in response to mechanical stimulation. The gastric juice obtained after injection of oxygen contained much free hydrochloric acid (52-125 titration units). High initial values of acidity of the gastric juice were obtained in a fifth dog in response to mechanical stimulation (total acidity 136, free HCl 98 titration units). After injection of oxygen a decrease in total acidity by 57% and in free HCl by 64% was observed.

The study of the gastric functions after 15 injections of oxygen showed that in 4 of the 5 dogs secretion was increased in response to the action of a mechanical stimulus. The secretion in one dog was diminished despite the fact that immediately after each injection of oxygen into this animal a profuse secretion of juice took place.

No appreciable change in acidity of the gastric juice was observed in response to mechanical stimulation after a course of oxygen injections. Only in one dog, with high initial indices of total acidity and free HCl, was a decrease in acidity to the normal level observed after the course of oxygen injections.

Against the background of histamine, after a course of oxygen injections, an increase in the secretion and acidity of gastric juice by 10-20 units was observed in three dogs. In two dogs with very high initial indices of secretion and acidity in response to injection of histamine, after a course of oxygen injections the volume of gastric juice was reduced by half and the acidity was lowered to the normal level.

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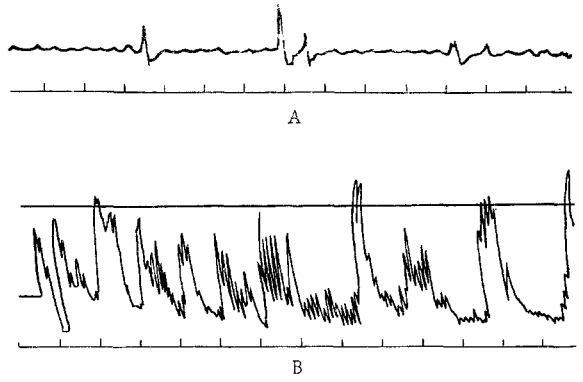

Gastric motor activity of dog No. 1 before (A) and after (B) injection of oxygen into the stomach for 15 days.

The excretory function of the stomach was studied by chromatoscopy simultaneously with investigation of the secretory function. After a course of oxygen injections into four male dogs, neutral red began to be excreted faster, the intensity of the dye increased, and its rate of excretion was diminished.

In four dogs the evacuation of curdled milk from the stomach was slowed by 30 min or more after a course of oxygen injections. In one dog, however, after injection of oxygen evacuation took place 30 min faster. This dog showed the largest increase in secretion and acidity of the gastric juice after a course of oxygen injections.

The study of kymographic tracings reflecting gastric contractions revealed an increase in motor activity of the stomach in three dogs in which contractions of a hypokinetic character were found before injection of oxygen in response to mechanical stimulation. After a course of oxygen injections the contractions were hyperkinetic in character (see figure). In two dogs with contractions of mixed hyper- and hypokinetic character, however, the gastric motor activity was reduced after a course of injections of oxygen.

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