

A SIMPLE METHOD OF SIMULTANEOUS GRAPHIC RECORDING OF THE TONE, MOTOR ACTIVITY, AND EVACUATORY FUNCTION OF THE STOMACH

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Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*,

Vol. 50, No. 8, pp. 120-122, August, 1960

Original article submitted December 20, 1958

Several methods of study of the motor function of the stomach are in regular use — roentgenological, electrophysiological, and manometric. The simplest and most widely used method of manometric recording of the motor activity of the stomach is that developed in work by V. N. Boldyrev [1], V. V. Gerbst [3], N. N. Savitskii [6], I. T. Kurtsin [5], and others, which played an important part in the study of the motor function of the stomach and intestine. The method used by these authors, however, does not enable the simultaneous permanent recording of the characteristics of all aspects of the motor activity of the stomach. In fact, these researchers studied only the periodic motor activity of the stomach or its peristaltic contractions by means of the introduction of a rubber balloon into that organ.

I. I. Veretyanov [2] suggested a convenient and simple method, which consisted of attaching a thin catheter, introduced into the stomach, to a Marey's capsule, and recording the peristaltic contractions of the stomach when it contained a liquid test breakfast. To determine the evacuatory power of the stomach, however, this author recommends recording the motor activity of the stomach for only 15 minutes, and then extracting and measuring the gastric contents. In the study of the tone of the stomach, no graphic recording was undertaken.

Gaultier [4] estimated the tone of the stomach by inflating the organ with air and measuring the volume and pressure of air introduced. Weitz [7] used water for this purpose.

The evacuatory power of the stomach is usually studied by means of the extraction of the residual gastric contents at different times, or by means of roentgenoscopy.

In order to obtain simultaneous graphic recordings of the tone, the peristalsis and the evacuatory function of the stomach in dogs with a gastric fistula, we suggest the following method. To the fistula a system is hermetically connected (Fig. 1), a system consisting of a fun-

nel 1 (volume 2-3 liters), mounted on a rigid stand 3, and a rubber tube 2 (diameter 1.5-2.0 cm). Before the experiment commences, the funnel is filled with 0.5-2.0 liters of broth, milk, carefully minced bread, and meat mixed with a large quantity of broth, and so on. The dog may also be fed with its usual breakfast, while at the same time broth is introduced into the stomach through the tube and funnel.

At this time the rubber tube must be clamped with the clamp 4 (a second clamp is indicated by number 6). A glass tube 5 (diameter 0.3-0.5 cm) is immersed in the liquid down to the level of the lower margin of the gastric fistula. As a preliminary step the tube 5 is hermetically connected by means of the rubber tube 7 to a Marey's capsule 8 mounted on a universal stand 9. The ink-writing instrument 10 in this way is inclined upward to a considerable degree. A time marker 11 with 5-second intervals is included, and the kymograph 12 is set in motion for a large number of revolutions. A paper strip is placed on the kymograph and extension.

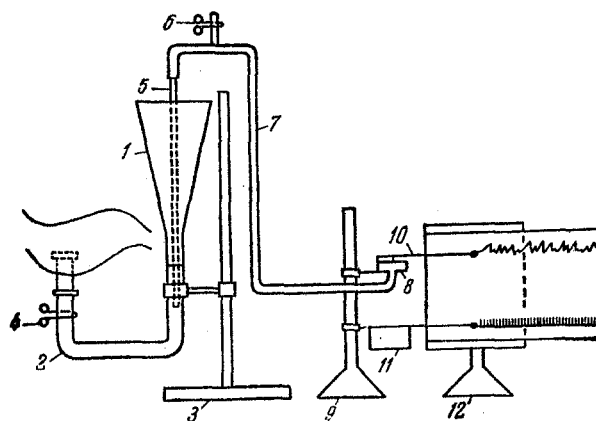


Fig. 1. Scheme of the apparatus for the simultaneous recording of the tone, motor activity and evacuatory function of the stomach.

After removal of the clamp 4, allowing free passage of fluid from the funnel into the stomach, the pen descends more or less rapidly, describing a broken curve, and it then begins to record the peristaltic contractions of the stomach, transmitted to the recording system through the column of fluid. The peristaltic contractions shown on the kymogram gradually give way to a series of high, protracted waves; the movements of the stomach then cease. The general appearance of the curve is shown in Fig. 2.

The time of arrival of the liquid in the stomach, recorded on the kymogram as a curve of fall of the pen (see Fig. 2, cut A-B), characterizes the tone of the stomach during its distension by the large volume of liquid. This function may later be estimated by the height of the recording of the peristaltic contractions in relation to the horizontal line drawn on the kymogram, which is usually the line of the time marker.

Special experiments (measurement of the volume of the gastric contents at various times during the experiment, recording of the motor activity during the free outflow of liquid from the open duodenal fistula) showed that the first waves—which were large and protracted in time—characterizing the contractions of the stomach (see Fig. 2, C, D, E) correspond to the moment of evacuation of the greater part of the gastric contents; the last wave of this type (see Fig. 2, E) together with the appearance of small, gradually lessening contractions on the kymogram or with the cessation

of all contractions of the stomach, indicates the end of the transfer of all the gastric contents into the intestine.

By the use of the method described, and keeping constant the size of the writing arm, the state of the Marey's capsule, the level of immersion of the glass tube in the liquid, the position of the funnel on the stand, and the volume of liquid introduced, the following indices of the motor activity of the stomach can be obtained:

- 1) the time taken by the liquid to pass from the funnel into the stomach (in seconds), characterizing the tone of the stomach when distended with fluid;
- 2) the level of recording of the peristaltic contractions of the stomach in relation to the horizontal line of the time marks (in mm), determining the tone of the stomach in the course of the experiment and the dynamics of its evacuation;
- 3) the number of contractions of the stomach, the amplitude of the waves (in mm) reflecting the contractions, and the coefficient of motor activity of the stomach (i.e., the ratio between the duration of the sum total of the contraction waves and the duration of the sum total of the pauses between them) — values which characterize gastric peristalsis;
- 4) the time taken by the gastric contents to pass into the intestine (in minutes), giving an indication of the evacuatory power of the stomach.

The indices referred to in items 2 and 3 should be determined in successive intervals of 15-30 minutes.

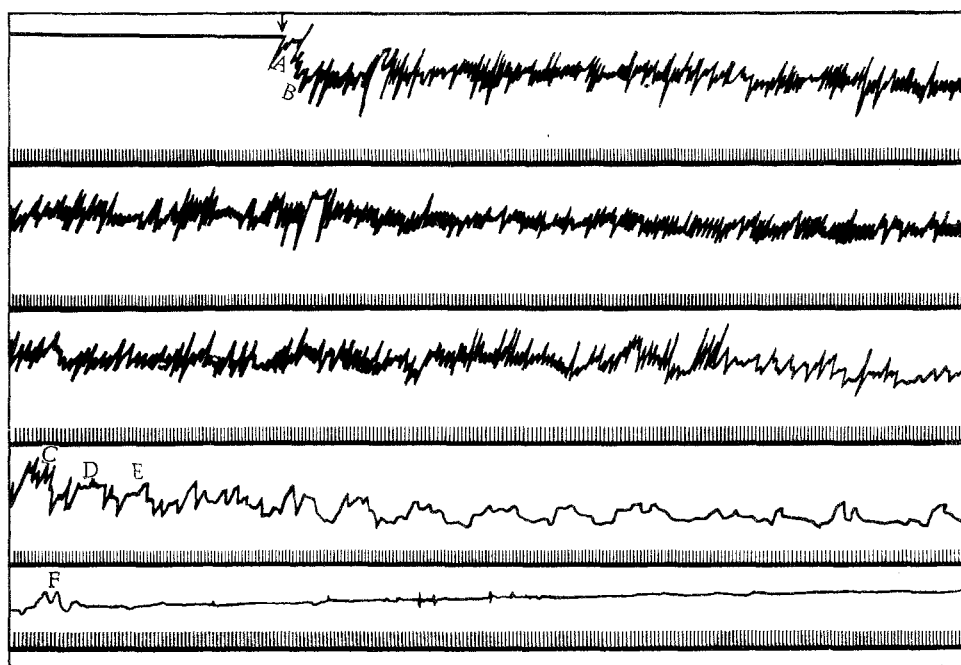


Fig. 2. Recorded curve of the tone, peristalsis and evacuatory power of the stomach after introduction of 1 liter of broth (dog Alpha). Explanation in text.

SUMMARY

Following introduction into a dog's stomach of 0.5 to 2 liters of fluids (broth, milk, mashed bread and minced meat in a large quantity of broth), a simple

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system, based on the principle of connected vessels, enables simultaneous graphic recordings to be made of the tone and peristalsis of the stomach, as well as of the time necessary to achieve complete evacuation of the gastric contents.

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