

CHANGES IN PERIODIC GASTRIC MOTOR ACTIVITY AFTER DIVISION OF THE INTESTINE AT VARIOUS LEVELS

G. I. Isakhanov

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Division of the small intestine in its proximal portions (with subsequent end-to-end reanastomosis) leads to an increase in the duration of inhibition of periodic gastric contractions after feeding and administration of pharmacological stimuli. Changes in periodic gastric contractions after division of the ileum showed no definite regular pattern.

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Clinical and experimental investigations have shown that changes in the secretory, motor, and evacuatory functions of the stomach develop after extensive resection of the small intestine [8-11]. The role of the actual division of the intestine, an essential element in any resection, causing disturbance of the integrity of the intramural apparatus, and the mechanisms of these changes have not been studied. A few findings have been obtained indicating disturbances of motor-evacuatory and periodic activity of the stomach and intestine after division of the small intestine [3, 5, 6]. The existence of active functional zones—pacemakers of peristalsis—has been established in the stomach and small intestine by the method of division [1, 2, 12-14]. Following these observations, we have studied the periodic activity of the stomach after division of the small intestine at various levels.

EXPERIMENTAL METHOD

Experiments were carried out on 13 dogs with a fistula of the gastric fundus. Besides the fistula, gastric pouches were formed in three animals by Pavlov's method and in two animals by Heidenhain's meth-

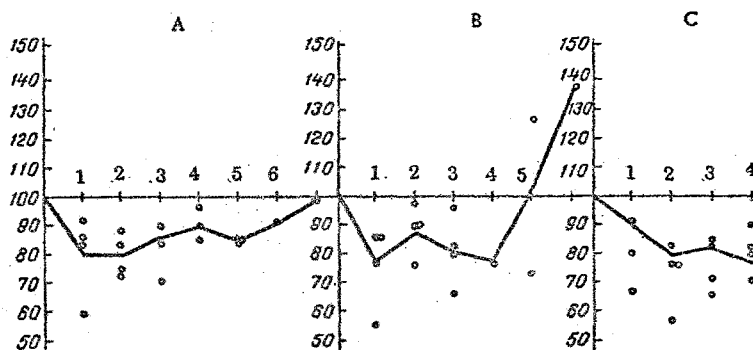


Fig. 1. Changes in duration of cycles of periodic gastric activity after division of small intestine at the level of duodenum (A), proximal jejunum (B) and ileum (C) (in percent of control values). Ordinate, deviation from initial value (in percent); abscissa, time of observation after division (in months). Circles denote mean monthly indices of duration of cycles for each dog (in percent of initial value).

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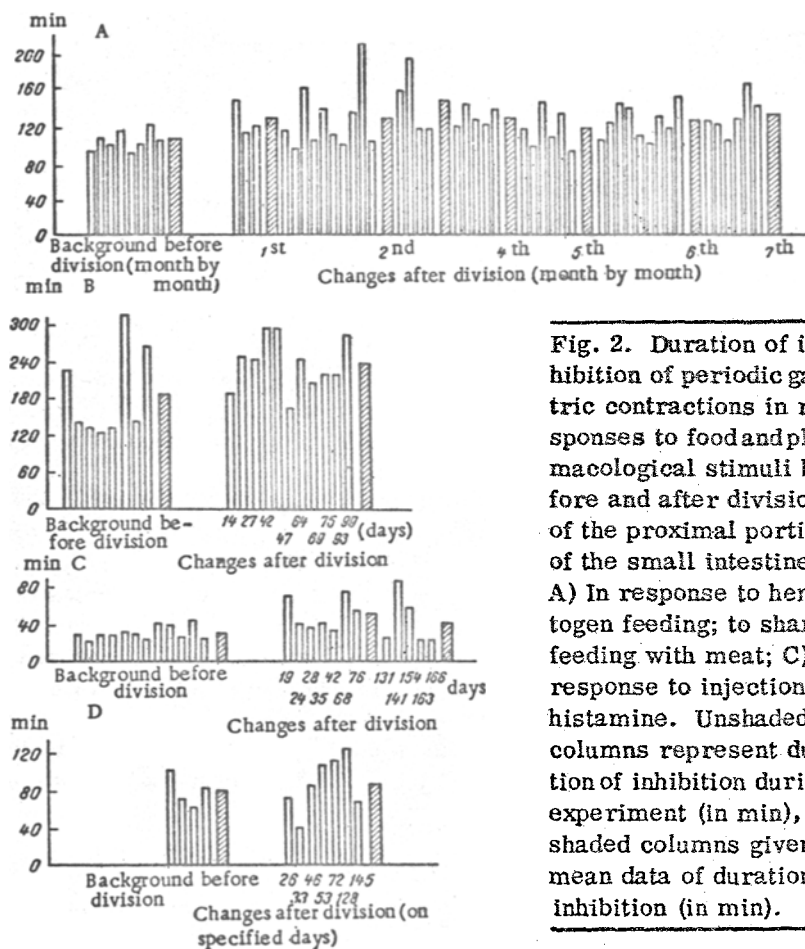


Fig. 2. Duration of inhibition of periodic gastric contractions in responses to food and pharmacological stimuli before and after division of the proximal portion of the small intestine. A) In response to hematogen feeding; to sham feeding with meat; C) in response to injection of histamine. Unshaded columns represent duration of inhibition during experiment (in min), shaded columns given mean data of duration of inhibition (in min).

od. Gastric movements were recorded by a balloon-kymographic method. The index of motor function was the duration of the cycles of normal gastric periodic activity in the absence of additional stimuli (this index characterized the state of the rhythm of the gastric periodic activity) and the duration of inhibition of periodic gastric contractions by food (sham feeding for 3 min with meat, feeding with 20% hematogen solution in a volume of 300 ml) and pharmacological (subcutaneous injection of 0.06-0.1 mg carbachol or 1.0-1.5 mg histamine) stimuli. The duration of inhibition was taken as the time from the moment of application of the stimulus to the animal to the appearance of periodic gastric contractions [7]. Feeding and administration of the stimuli were carried out in accordance with the phases of the cycles of gastric periodic activity, in periods of contractions or rest. After background studies the small intestine was divided and end-to-end reanastomosis quickly performed. Division was carried out at the level of the distal part of the duodenum, the proximal part of the jejunum and in the ileum (50-60 cm proximally to the ileocecal region). The experiments were resumed 2-3 weeks after the operation observations continued for 4-7 months.

EXPERIMENTAL RESULTS

Division of the small intestine at different levels caused changes in the rhythm of gastric periodic activity (Fig. 1). After division at the duodenal level this rhythm was considerably quickened (Fig. 1A). Similar changes in gastric periodic activity also developed after division of the proximal part of the jejunum (Fig. 1B). Common features of the changes in rhythm of periodic gastric activity after division in the region of the proximal portion of the small intestine (duodenum and proximal jejunum) were their early appearance and their duration. They were observed for 4-5 months, and in some dogs not only had they not returned to normal by the end of this period, but continued to increase in severity.

After division in the region of the ileum, changes in the rhythm of gastric periodic activity arose later—in the second or even the third month after division (Fig. 1C).

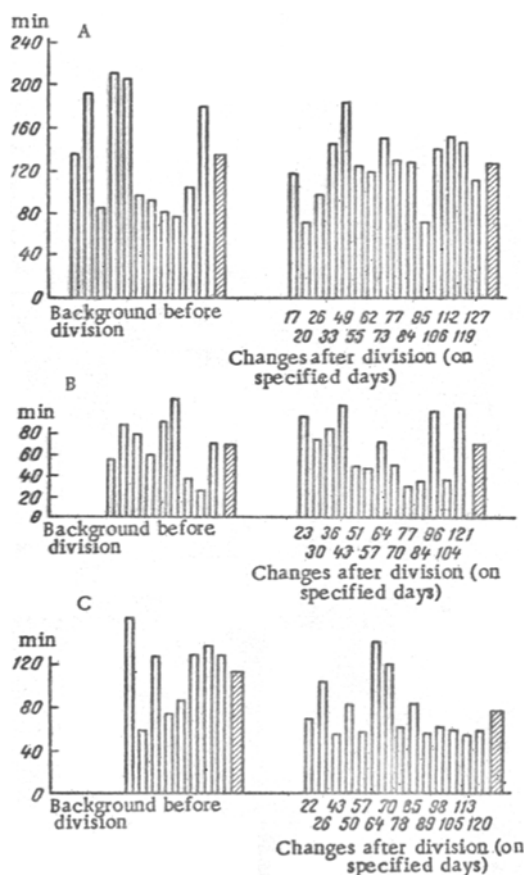


Fig. 3. Duration of inhibition of periodic gastric contractions in response to sham feeding and to injection of pharmacological stimuli before and after division of the ileum. A) In response to sham feeding with meat; B) in response to injection of carbachol; C) in response to injection of histamine. Remainder of legend as in Fig. 2.

In most experiments after division of the proximal portions of the intestine the duration of inhibition of periodic gastric contractions was increased after sham feeding or injection of carbachol and histamine. These changes were particularly marked in animals with isolated gastric pouches after feeding with hematogen solution (Fig. 2). In these dogs the duration of inhibition increased on the average by 25% during the 4-5 months after division.

After division through the ileum the duration of inhibition of periodic gastric contractions in response to sham feeding and to injection of carbachol showed different changes in different dogs. A significant decrease in the length of inhibition was observed only after injection of histamine (Fig. 3).

The results demonstrate that division of the intestine at various levels differs in its effect on the gastric secretory [4] and motor functions. Consequently, functional changes in gastric activity under these conditions are not a nonspecific response to operative trauma. They evidently arise because of injury to important intramural mechanisms which possess specific features at different intestinal levels.

It may be considered that these injuries are one of the mechanisms of functional disturbances of the stomach after resection of corresponding parts of the intestine.

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