THE MOTOR FUNCTION OF AN ISOLATED SEGMENT OF SMALL INTESTINE IN DOGS WITH ACUTE RADIATION SICKNESS

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In radiation sickness the condition of the alimentary tract undergoes a number of disturbances, and for this reason the study of the motor function of the small intestine in radiation sickness arouses particular interest. At the same time this problem is rarely discussed in the literature. There are only isolated investigations on small laboratory animals. Conard [7], for instance, demonstrated an increase in the motor function of the intestine of rats exposed to a dose of only 100 r; under these conditions there is an increase in the muscle tone and in the amplitude of the contractions. An acceleration of the passage of the contents through the gastrointestinal tract in rats was reported by Goodman, Lewis and Schuck [8].

EXPERIMENTAL METHOD

Our experiments were carried out on 3 dogs on which the Thiry-Vella operation had been performed and an area of the small intestine 20 cm long isolated in the region of the lower part of the duodenum and the proximal jejunum. The movements of this isolated segment were recorded for 4 hours every other day by means of a pneumatic system with a rubber balloon, the pressure inside which was constant and amounted to 20 mm of mercury. In normal conditions before irradiation the motor activity of the isolated intestine was studied in dogs with an empty stomach and also after a meal (200 g).

EXPERIMENTAL RESULTS

In the animals before feeding we observed periodic contractions of the isolated intestine, which were particularly well marked in the dog Iula. In the remaining dogs – Pirat and Anakonda – the rest period was associated with smaller contractions of the loop of intestine. The periods of activity of the intestine in the hungry dogs lasted 2-3 minutes. The size of the contractions at the height of the period of activity was usually equivalent to 15-20 mm of mercury. The number of contractions per minute was constant and amounted to 14-16. The tone of the isolated area of intestine changed in an undulating manner: during a period of work the tone increased and at rest it fell to a minimum. The greatest value of the tone, which was observed when the contractions were maximal, was 2-6 mm of mercury. The periods of rest lasted 1-2 minutes. In some experiments we were unable to determine the periodicity of the movements of the isolated intestine.

The results which we obtained are in full agreement with the experimental findings of L. S. Girshberg [2] and L. G. Voronin [1].

When the dogs were feeding on meat, which was given immediately before the experiment, the isolated intestine responded to this stimulus by a slight increase in the motor activity. Under these circumstances the period of activity was lengthened to 4-6 minutes, and the period of rest was shortened.

In order to obtain experimentally an increase in the motor activity of the isolated intestine, the dog was injected subcutaneously with proserin (prostigmin methylsulfate). Proserin was given to Pirat in a dose of 0.1 mg. Clinically this dose caused hardly any change. The motor activity of the intestine was intensified 6 minutes after the injection of proserin. Anakonda and Iula were injected with the same dose of proserin – 0.1 mg. In all cases we observed an increase in the motor function of the isolated intestine.
In order to produce an artificial reduction in the motor function of the isolated intestine the dogs were injected subcutaneously with atropine in a dose of 1 ml of a 1 : 1000 solution. The injection of atropine to the dog Pirat was followed by prolonged rest of the isolated loop of intestine, which came on after 2 minutes 20 seconds. The suppression of motor activity of the intestine lasted 103 minutes 40 seconds. It must be pointed out that under these conditions we were unable to observe complete rest. At definite intervals of time we could observe isolated contractions of the loop of intestine. Injection of atropine to Anakonda and Jula also gave rise to depression of the motor function of the isolated loop of small intestine. These findings are also in agreement with the research of L. S. Girshberg [2] and L. G. Voronin [1].

Acute radiation sickness was produced in the dogs by total irradiation with x-rays (in a dose of 400 r). Three