

At various times, chiefly 48 and 72 hours later, the eggs were reopened and where embryos existed, they were fixed. Photographs were made and then the specimens were sectioned. The control eggs showed no abnormality.

Results: Total eggs treated with saline -----18
 Total eggs treated with alcohol-----27

Of these 5 were completed for microscopic study; of them all fail to show a pituitary gland; 4 showed optic defects; 2 showed failure of closure of the head folds and in one no olfactory pits appeared. It made no apparent difference in the results whether the environment was changed with weak alcohol or normal saline solution. The treated embryos exhibited malformations of the nervous system. The abnormalities were chiefly (1) an absence of the pituitary gland, (2) in some an absence of an eye, (3) failure of the head folds to close, (4) in one, an absence of the olfactory pits.

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Relative Value of Splanchnic and Spinal Analgesia in Treatment of Experimentally Produced Ileus.

ALTON OCHSNER, I. M. GAGE AND R. A. CUTTING.

From the Department of Surgery, School of Medicine, Tulane University, New Orleans, La.

In a previous communication¹ we reported the results of splanchnic analgesia in the treatment of experimental ileus, and concluded that this form of treatment is undoubtedly of great value in reestablishing motility in the intestinal wall. The present communication concerns the relative value of splanchnic analgesia and spinal analgesia. Our results are based upon a series of 70 dogs. In 50 animals novocain splanchnic analgesia was produced, and records of the blood pressure, intestinal motility, and respirations were obtained on the kymographic drum. In most of the cases a single tracing of intestinal motility was obtained, and this from the terminal ileum. In some cases, however, additional tracings were obtained from the duodenum and also from the colon. In 9 animals instead of using novocain an aqueous solution of nicotine was used, as advocated by

¹ Ochsner, A., Gage, I. M., and Cutting, R. A., *J. Am. Med. Assn.*, 1928, xc, 1847.

Rosenstein and Köhler.² Nicotine is apparently an unsatisfactory substance when used in this way, since it increases the blood pressure unduly, and fails to increase the intestinal motility to a satisfactory degree. The range of blood pressure rise in all but 3 animals was greater than 90 mm. of mercury, and, while in 5 cases the tone in the ileum was raised from 10 to 50 mm., as recorded by the writing point on the kymographic drum, the other 4 animals showed insignificant effect on both tone and motility, and in the case of the duodenum and the colon the tone of the intestine was actually decreased.

The results of the present investigation, with respect to novocain, show that both the tone and amplitude of intestinal movement are markedly increased in the ileum, the average figure for the tone being an increase of 29.5 mm. and in the amplitude a value of 11.2 mm. The induction of novocain splanchnic analgesia, however, reduces the blood pressure, but not unduly, the average figure being 20 mm. of mercury. The duration of novocain splanchnic analgesia is relatively short, averaging 5½ to 6 minutes, but is sometimes much longer. Spinal analgesia was induced in 13 animals, and while the effect in general was similar to that produced by novocain splanchnic analgesia, the fall in blood pressure was much more marked, and the effect on the intestinal tone and motility was relatively inconsiderable. The fall in blood pressure, when using spinal analgesia, is from 2 to 3 times as great as results from the injection of novocain analgesia, and the effects on tone and intestinal movement tend to be inconstant and slight. In connection with both the splanchnic and spinal analgesia, the administration of ephedrin and adrenalin, in order to combat the blood pressure depression incident to the use of these two methods, was found to negative the effect of the method in that when either of these two drugs was used the effect of the analgesia was not noticeable at all or at least very slight. The explanation seems to be that both of these drugs have a direct action in relaxing the intestinal musculature.

The rationale of the treatment of ileus by the induction of both spinal and splanchnic analgesia depends upon the conception of the dual innervation of the intestine by vagus and splanchnic nerve fibers. These 2 systems of nerves are conceived to be essentially antagonistic, a stimulation of the vagus nerve producing a motor effect while stimulation of the splanchnic nerve produces an inhibitory effect. Any procedure, therefore, which tends to prevent impulses from reaching the intestine by way of the splanchnics tends to render in-

² Rosenstein, P., and Köhler, Hans, *Deut. Z. f. Chir.*, 1928, 210. *Idem*, *Med. Klin.*, 1926, xxii, 530.

operative the inhibitory system and to leave the motor supply in full control. Thus does section of the splanchnic nerve tend to increase motility. The induction of both spinal and splanchnic analgesia is the method of producing chemical section of the splanchnic nerve fibers. Spinal analgesia produces such section of the white *rami communicantes* as they leave the spinal cord. Splanchnic analgesia interrupts the fibers of the splanchnic nerves at the point at which they break up into the splanchnic plexuses anterior to the bodies of the first and second lumbar vertebrae. Nicotine splanchnic analgesia interrupts the synapses which occur in the semilunar ganglia, that is, the connection between the pre and post ganglionic fibers of the splanchnic nerves. Possibly the explanation for the relative insignificant effect of nicotine is that the drug cannot be deposited in the semilunar ganglia themselves. Novocain splanchnic analgesia, however, is much more effective, since this drug acts upon the nerve fibers themselves, and consequently interruption of impulses occurs whenever the saturation of the solution reaches a sufficient value in the region of the nerve filaments. Spinal analgesia should be as effective as splanchnic analgesia if all the fibers entering into the formation of the splanchnic nerves, or at least the reflex involved in the splanchnic control of the intestine, were blocked. The spinal analgesia is actually not as efficient as novocain splanchnic analgesia, seems to indicate that a part of the reflex involved in the inhibitory regulation of intestinal movement occurs by way of a reflex arc which does not traverse the spinal cord. Such effect that spinal analgesia has on intestinal motility seems to be somewhat more prolonged than does the effect produced by splanchnic analgesia, and the explanation for this is not clear.