be easily put through them. To insure maximal comfort the holes should be padded. A pillow which maintains the spinal column in a flexed position is placed under the belly. Another pillow is placed between the fore and hind limbs after which the latter are secured. A canvas corset which is attached to the median line of the board is bound about the animal and tied along the dorsum. Lateral movement is reduced by a wooden slat inserted along the corset on each side. By means of this apparatus the dog may be inclined at any desired angle. When the board is placed at an angle of about 45°, flow of spinal fluid is facilitated (Fig. 1). The puncture is preceded by infiltration of the skin and muscles with 0.5% novocain, the injection being carried down to and including the intervertebral space at the level at which the puncture is to be made. A small amount is also injected against and through the dura.

We have found the apparatus and procedure just described of so much assistance that in our hands lumbar puncture in the dog is a relatively easy procedure.

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Direct Observations on the Mechanism of Pain in Duodenal Ulcer.

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An extensive literature has developed with respect to the mechanism of pain in gastric and duodenal ulcer. For this reason, in this brief report, we shall make no reference to previous studies but merely describe some observations made during the course of an operation under local anesthesia upon a patient with a duodenal ulcer.

The patient, a well developed white male 37 years of age, first experienced epigastric distress of the ulcer type in 1920. A diet of bland food together with the daily ingestion of powders (presumably alkalies) afforded some relief, but in April, 1922, his distress became so marked that an operation was advised and performed elsewhere. At operation a duodenal ulcer was found and a posterior gastro-enterostomy done. This gave more or less complete relief until 1924, at which time epigastric pain returned more severe than before and persisted intermittently until we first saw the patient in March, 1928. The symptoms and findings at this time were those of a gastro-jejunal ulcer. In April, 1928, the abdomen was opened

by one of us (L.R.D.). A jejunal ulcer was found as well as the scar of an old ulcer on the anterior wall of the duodenum about 1½ cm. distal to the pylorus. There was no evident pyloric stenosis. The jejunal ulcer was excised, the gastro-enterostomy disconnected, and the openings in the stomach and jejunum closed. Following this operation the patient remained free from distress only until October, 1928, when he returned to the hospital, this time complaining of symptoms similar to those of 1920. The periods of distress bore the time relations to food taking characteristic of duodenal ulcer and the distress itself was completely relieved by food and adequate alkalies. On accurate medical management he remained entirely comfortable but after leaving the hospital he was unable to continue treatment and returned in January, 1932. At this time he presented a symptomatology and picture of epigastric distress quite characteristic of ulcer and the introduction of 0.5% HCl by stomach tube was repeatedly found to initiate and reproduce faithfully this same distress. This "acid test" has been found by one of us (W.L.P.) to be positive in a large proportion of such ulcers. It should probably be emphasized that the introduction of 0.5% HCl into the stomach, several hours before the observations described below were made, reproduced the typical pain in severe form, thus indicating that the pain-producing mechanism was very sensitive.

The patient desired surgical relief and, since it was quite apparent that he was not following with sufficient accuracy the medical management prescribed, a partial gastrectomy was advised. The operation was performed January 12, 1932, under local infiltration anesthesia, using ½% novocaine and adrenalin. The abdomen was opened and the stomach exposed with a minimum of discomfort. At this time he felt no ulcer distress. A puckered scar was visible on the anterior wall of the duodenum about 1 cm. distal to the pylorus. On very gently rubbing the serosa over this scar with the gloved finger, the patient complained of pain similar to his ulcer distress. This pain persisted after the rubbing was discontinued. The patient was then told that something would be done to entirely relieve his distress, whereupon the region of the ulcer was rather firmly compressed between the thumb and forefinger of the operator and massaged gently but firmly. This produced severe distress. Several guide threads of fine silk were now introduced into the anterior wall of the pyloric antrum and, by means of these, traction was made on the duodenum, pulling it toward the left. Every time this traction was made, the patient complained of severe pain resembling his ulcer distress.

While this distress was present and while the traction was continued, 20 cc. of 5% sodium bicarbonate solution were injected by means of a hypodermic needle into the lumen of the pylorus. The distress was almost immediately relieved and this relief persisted for about 5 minutes. Twenty cc. of 0.5% HCl were then injected into the first part of the duodenum in the same way and almost immediately the patient complained of a burning type of pain. This persisted until an injection of sodium bicarbonate solution was made. The relief obtained from this last injection was not so striking as at first nor did it persist. After about 3 minutes the patient complained of severe cramping pain which radiated up into his chest. This radiation had been frequently noted before in association with the cramping type of pain. Simultaneous with the appearance of this cramping pain there appeared a deep circular contraction ring just distal to the ulcer. This local spasm of the duodenum after a while passed distally only to be succeeded by several subsequent similar spasms. All during this time the patient complained of very severe cramp-like pain. It is interesting in view of this observation that several peristaltic waves were seen passing over the pyloric antrum at a time when no distress was experienced.

The distress was now so great that the remainder of the operation, a partial gastrectomy of the Polya type was completed under general anesthesia. A chronic ulcer about 2 cm. in diameter was found on the anterior wall of the first part of the duodenum immediately beneath the scar.

These observations show that typical ulcer pain and distress can be produced by mechanical stimulation of the ulcer region in the duodenum by massage or traction. They show in addition that distress originating from such an ulcer may be relieved by the application of alkali to the mucosal surface of the ulcer and that, furthermore, distress can be produced again by the exposure of the ulcer to 0.5% HCl. This distress is not associated with a visible contraction of the stomach or duodenum. A peristaltic wave in the region of the pyloric antrum was observed at a time when the patient felt no ulcer distress. The appearance, however, of severe cramp-like pain simultaneously with the occurrence of marked contraction of the circular musculature of the duodenum in the immediate region of the ulcer certainly suggests that this type of ulcer pain may be produced by muscular spasm at the site of the lesion. It should be noted that following the last injection of the sodium bicarbonate solution into the duodenum the patient complained bitterly of nausea.