Method of distending the stomach.—The distension was done by a rubber baloon (connected to a tube) passed from mouth through oesophagus and its position in the stomach was ensured through palpation per abdomen.

Duodenum.—The rubber baloon was put in the stomach as above and directed to the duodenum through a midline incision of about three inches made in the anterior abdominal wall. Later the abdomen was closed in seperate layers.

The end of the tube which carried the baloon was fixed to a limb of 'T' tube, the one limb of which was connected to a mercury manometer and the other limb to a pump.

RESULTS

Stomach

There was an initial fall of blood pressure in all the dogs, except in two, where there was an initial rise, when the stomach was distended at various degrees of pressure During distension there was a fall of 12-100 mm. Hg. At 40 mm. Hg of air distension, the mean fall was by 13.75 per cent at 60 mm Hg of air pressure it was 24.33 per cent at 80 mm Hg 24.62 per cent and at 100 mm Hg pressure of air distension it was 27.55 per cent. Thus, the fall in the blood pressure in all dogs was directly proportional to the distension.

There was gradual fall of blood pressure in 7 dogs and sudden fall in 3, at 40 mm Hg air pressure. At 60 mm Hg of air pressure there was gradual fall in 8 dogs and sudden in 2. At 80 mm Hg air distension it was grudual fall in 6 dogs, and sudden in 4. At 100 mm Hg air pressure the fall was gradual in 6 dogs and sudden in 4. The recovery time varied from immediate to 240 secs. After cessation of the stimulus the blood pressure returned to the original level and in most of the cases over shot the original mark for some time only. In a few dogs it remained low.

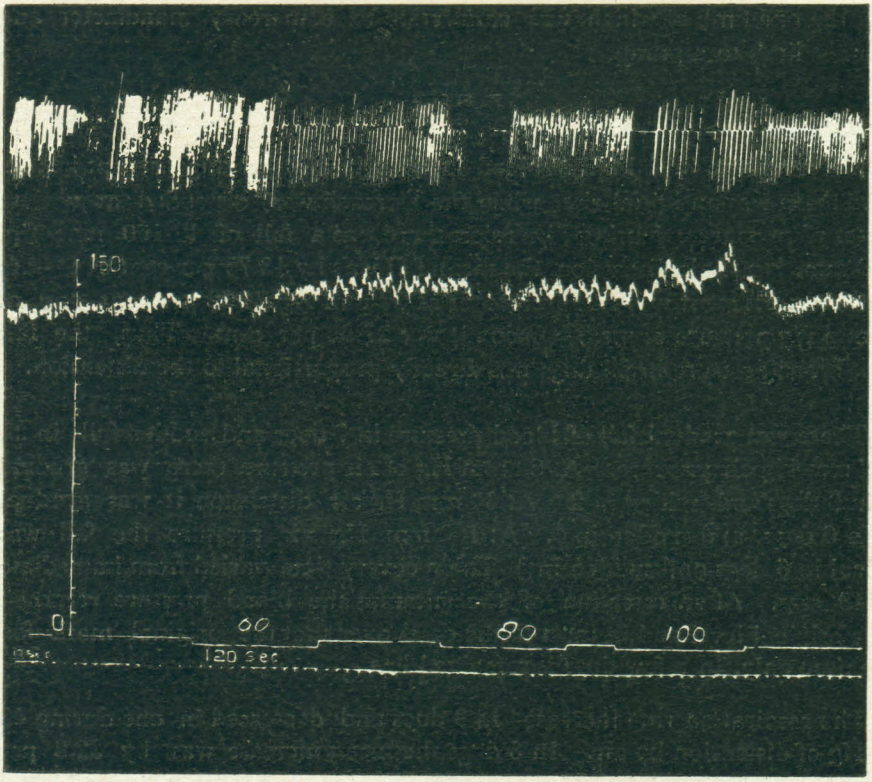
The respiration rate increased in 9 dogs and decreased in one during 40 mm Hg of distension by air. In 6 dogs the mean increase was by 32.8 per cent, whereas in remaining 3 it increased to such an extent that it could not be counted. At 60, 80, and 100 mm Hg air pressure the rate increased in all the dogs. A mean increase by 37.1 per cent was seen in 8 dogs and marked increase in 2 at 60 mm. Hg air pressure. At 80 mm Hg of air distension a mean increase by 40.29 per cent was observed in 8 dogs and marked increase in 2 dogs. At 100 mm Hg of air distension the mean increase in respiration rate was by 36.23 per cent in 7 dogs, and marked increase in 3.

There was decrease in the amplitude in 4 dogs, first rise then fall in one, increase in one, no change in 2 and fluctuations in two dogs at air distension

of 40 mm of Hg. At 60 and 80 mm Hg air pressure there was decrease in 6 dogs, first rise and then fall in one and fluctuations in 2 dogs. Distending by air at 100 mm of Hg gave rise to a decrease of amplitude of respiration in 5 dogs, increase then decrease in one, fluctuations in 3 and increase in one.

Duodenum

The minimum air pressure to arouse the response from duodenum was 60 mm Hg. Initial changes in the blood pressure at 60 mm Hg distension by air were a rise in 4, fall in 5 and no change in one dog. At 80 mm Hg air pressure, a rise in 3, fall in 4 and no change in 3 dogs was seen. At 100 mm

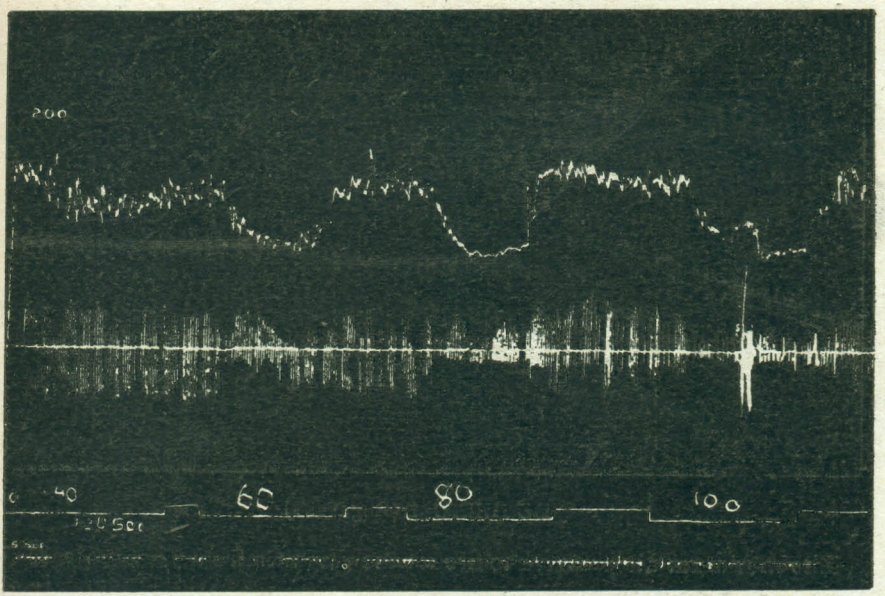


DEODENUM (Dog No. 8)

Hg air distension, a rise in 4, fall in 3 and no change in 3 dogs were observed. During distension by air at 60 mm Hg a mean rise by 5.27 per cent in six dogs, a fall by 12.00 per cent in dog No. 8 and no changes in 3 dogs were observed. At 80 mm Hg air pressure a mean rise by 5.9 per cent in 8 dogs and fall by 6.9 per cent in dog No. 2 and no change in dog No. 3 were observed. At 100 mm Hg air distension a mean rise by 8 per cent in 8 dogs

and mean fall by 30.8 per cent in 2 dogs were seen. At 60 mm Hg air pressure there was sudden change in 4 dogs, gradual in 3 dogs and no change in 3 dogs. At 80 mm Hg air pressure sudden change in 5 dogs, gradual in 4 and none in one, were recorded, and at 100 mm Hg of air the changes were sudden in 5 and gradual in 5 dogs. Recovery of blood pressure was almost immediate in all dogs except in two where it was in 60 and 200 seconds respectively.

At 60 mm Hg air distension an increase of 2-6/min of respiration rate was seen in 3 dogs, decrease of 3/min in one and no change in 6 dogs.



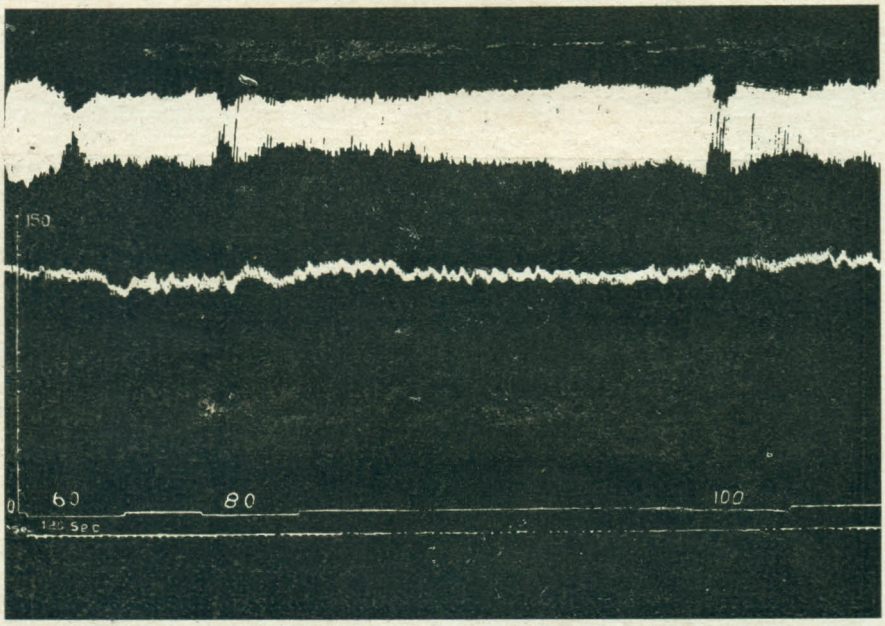
STOMACH (Dog No. 10)

At 80 mm Hg air pressure there was an increase of 13/min in dog No. 5, decrease of 6/min in dog No. 8 and no change in 8 dogs. At 100 mm Hg of air pressure a rise of respiration rate 3/min in dog No. 1, 19/min in dog No. 5 and decrease of 14/min in dog No. 9 and no change in 7 dogs were recorded.

At 60 mm Hg air distension there was decrease in the amplitude in 5, dogs, increase in 1, and no change in 4 dogs. At 80 mm Hg air pressure decrease in 6 dogs, increase in one and no changes in 3 were recorded. Results at 100 mm Hg air pressure were similar.

DISCUSSION

Abdominal distension has been studied in the past in relation to visceral pain, pupillary dilation and to the various vagal and stretch receptors, Harper 1935. Mayer and Pribam (1872) showed that there is slowing of heart accompanied by a rise in blood pressure. Brodie and Russel (1900) showed that by distending the stomach there is first a slight rise of B.P. and then a fall.

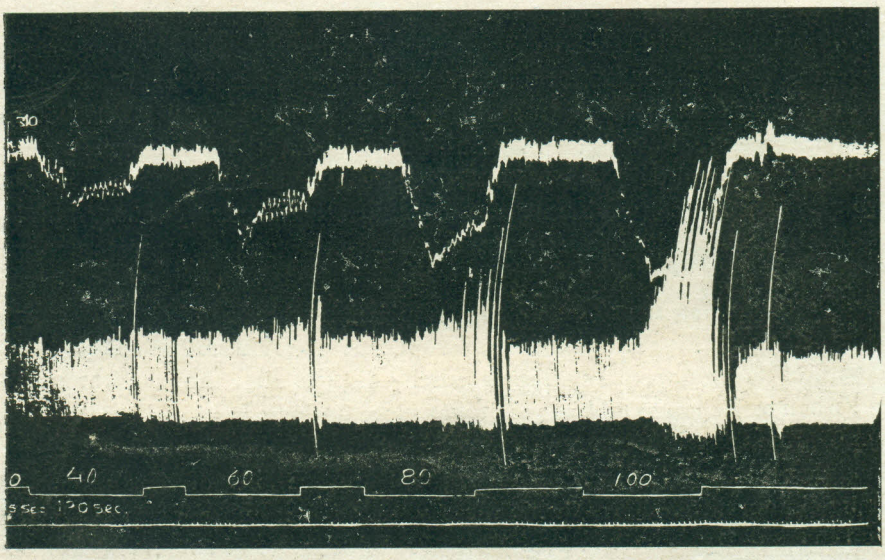


DEODENUM (Dog No. 9)

The minimum air pressure to arouse the response from stomach and duodenum was 40 and 60 mm of Hg respectively Irving, *et al* (1937) observed in cats that the minimum pressure required to alter the blood pressure from the pyloric sphincter and upper duodenum varied between 10 to 30 mm Hg. Thus there appears to be a difference in threshold pressure in cats and dogs.

The blood pressure on raising the intragastric pressure always decreased and this decrease was found to be directly proportional to the rise in distending pressure. The mean fall at 40 mm Hg air pressure was by 13.75 per cent at 60 mm by 24.33 per cent at 80 mm Hg by 24.62 per cent and at 100 mm Hg air pressure by 27.55 per cent. The maximum fall in any dog (dog No. 1) was 59 per cent at 100 mm Hg air pressure and minimum fall at 40 mm Hg was by 6 per cent in dog No. 7.

As distinct from the stomach, the duodenum on its distension elicited a pressure response most consistently and the mean rise in blood pressure was by 5.27 per cent at 60 mm Hg air pressure and this gradually increased to 80 per cent at 100 mm Hg air pressure. The depressor response from duodenum was occasional and inconsistent.



STOMACH (Dog No. 6)

It thus becomes obvious that from the stomach depressor and from the duodenum both pressure and depressor responses could be elicited. The receptors for both these responses must necessarily be some sort of stretch receptors. Mayer and Pribam (1872) have shown that the afferent impulses for the depressor response from stomach do not rise from its mucous membrane and possibly arise from muscular and or peritoneal coats. Distension whether of stomach or from any part of gastro intestinal tract results in an increase in intra-abdominal pressure. Guyton and Adkins (1954) have demonstrated that increase in the intra-abdominal pressure obstructs the venous return in inferior vena cava below the level of the liver. They have further observed that a rise in intra-abdominal pressure by as little as 1-2 cm of water above vena cava pressure is sufficient to collapse the inferior vena cava Decrease in the venous return thus brought about can produce a fall in blood pressure. Distension of the duodenum increases the blood pressure. Two peculiarities of the duodenum should be noted at this stage. Firstly, the duodenum is partly adherent to the porterior abdominal wall and secondly the lumen of the duodenum is much narrower than that of stomach. Because of these two

facts, slight increase in the volume of air within the duodenum increases the intra duodenal pressure remarkably and that this volume change is not sufficient to increase the intra-abdominal pressure to an extent of impending the venous blood flow in the abdominal inferior vena cava. Irving *et al* (1937) while ascertaining the afferent innervation of the stomach and duodenum in cats have concluded that the afferent fibers for the stomach and duodenum travel in the vagus. The fibers for the pressor response from the duodenum and of depressor response from the stomach travel in the vagus. The fact must remain, therefore, that either there are two different types of stretch receptors having pressor and depressor effects respectively or that the receptors of the two responses are common but have different central connections. This is a problem which needs elucidation by further work.

On distending the stomach, the respiration rate consistently increased and in some dogs it increased to an extent that it could not be counted. Distension of duodenum to any degree usually did not alter the respiratory rate and when any change took place it was more an increase in rate than decrease. Intermittent periods of apnea lasting for the duration of 1-2 respirations were irregularly observed throughout the periods of distension. The change in amplitude of respiration was variable but more often a decrease than increase was observed at any pressure of distension in stomach Decrease in amplitude of respiration was variable at any pressure of distension of duodenum. The increase in the rate of respiration increased on distending stomach, may be secondary to the fall in blood pressure, a response mediated from the baroreceptors. This does not appear to be a likely explanation because had this been true the distension of duodenum, which consistently produces a rise in blood pressure would have resulted in a decrease in respiration rate.

Paintal (1953, 1954a, 1954b) pointed out that such a distension leads to localized compression of the base of the lungs accompanied by stretching of the neighbouring portions of the lungs. It is suggested that this stretching stimulates the previously inactive pulmonary stretch receptors of the Hering Breuer reflex which cut short the inspiration and thus increase the rate and decrease the amplitude of respiration.

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