

Value of X-Ray Evidence of Bowel Obstruction in Various States of Intestinal Stasis.

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X-ray evidence of gas in the small intestine in experimental simple mechanical obstruction and in strangulation obstruction has been reported previously.^{1, 2} It was found that definite evidence of gaseous distention of the bowel proximal to a simple obstruction was present as early as 4 or 5 hours after the establishment of the obstruction and in 20 to 24 hours the intestinal distention was fairly general in the proximal bowel. The X-ray was not found to be of the same value in detecting the presence of strangulation as it was in the early recognition of simple obstruction of the intestine.

These X-ray observations have now been extended to include cases of isolated loop obstruction, mesenteric vein ligation and experimental peritonitis.

In 23 dogs, segments of intestine from 10 inches to 3 feet in length were isolated from the rest of the intestinal tract (ileum, jejunum or duodenum) and the ends were turned in forming loops obstructed at both ends. Intestinal continuity was re-established by end-to-end or lateral anastomosis. The obstructed loop may be regarded as a form of strangulation obstruction because of the interference with the vascular supply as a result of the greatly increased intra-intestinal pressure. The intestinal anastomosis obviated the confusing factor of an additional simple obstruction which was found difficult of evaluation in the interpretation of the findings in a previous study even though lead shot were attached to the strangulated segment.

These dogs lived from 21 hours to 13 days (average 3.5 days), and post mortem examination revealed discoloration and distention of the obstructed loop, and peritonitis. Perforation of the loop was the cause of the peritonitis in one-third of the cases.

In 3 dogs the superior mesenteric vein was ligated. Two of these died within 4.5 hours but one young pup survived and appeared to be in good health when he was sacrificed after 13 days. Post mor-

¹ Wangenstein, O. H., and Lynch, F. W., *PROC. SOC. EXP. BIOL. AND MED.*, 1930, **27**, 674.

² Goehl, R. O., Lynch, F. W., Borman, C., and Wangenstein, O. H., *PROC. SOC. EXP. BIOL. AND MED.*, 1930, **27**, 952.

tem examination revealed no definite distention or discoloration of the bowel. Adequate collateral circulation had been quickly established to permit of return of the portal blood by other routes.

Experimental peritonitis was produced in 6 dogs by introducing liver, liver anaerobes or bile into the peritoneal cavity and by hepatic artery ligation. Death occurred in 13 to 48 hours (average 19 hours).

Results. X-ray films of the dogs with obstructed loops usually revealed some evidence of gas in the obstructed loop at the end of 8 or 10 hours, but the appearance of definite gaseous distention was an inconstant finding, occurring as early as 8 hours but in some cases not being definite after more than 100 hours. Fluid levels were demonstrable in some of the loops.

After mesenteric vein ligation, X-rays were negative in the 2 dogs dying early and in the animal that recovered gaseous distention was variable, being seen best at 23 hours, 72 hours, and 5 days.

Gaseous shadows were observed early (1 to 11.5 hrs.) in 4 cases of peritonitis but could not be satisfactorily demonstrated in 2 dogs dying at 13 and 20 hours.

From the experiments one may conclude that although X-ray evidence of gaseous distention is an early and valuable sign of simple intestinal obstruction it is distinctly of less value in strangulation obstruction or in stasis due to mesenteric vein occlusion. Gas shadows are also observed early as a rule in peritonitis.

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Technique of Spinal Anesthesia in the Dog.

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Lumbar puncture of the spinal canal of the dog has been practiced in the Laboratory of Experimental Surgery for the administration of regional anesthesia as well as during the course of other experiments. In the literature, however, it is generally conceded to be virtually impossible to perform successful lumbar puncture upon the dog.¹ We are describing the technique of the method in the hope that it may be of value to others. Out of 45 successive dogs upon which lumbar puncture has been attempted, 37 were suc-

¹ Ochsner, A., Gage, I. M., Cutting, R. A., *Arch. Surg.*, 1930, **20**, 802.