

Pathological Changes in Liver Accompanying Intestinal Obstruction and Strangulation.

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In an effort to determine whether or not a consistent significant damage in the liver is produced by intestinal obstruction and strangulation of the intestine, we produced these 2 conditions experimentally in 28 dogs by severing the intestine under aseptic technique and closing the ends, and by constriction of a loop (varying from 2 inches to 12 inches in length) of intestine so that the lumen of the bowel and the entire blood supply were obstructed, respectively. The animals with simple obstruction lived for a variable length of time or were killed, 1 to 12 days after operation. This variability introduces an error since the ones killed may have lived a day or 2 longer if left to die spontaneously. When a strangulation was produced, death took place in 24 to 48 hours with considerably more uniformity, depending directly upon the length of the strangulated loop.

There are few and conflicting reports on the effect of intestinal obstruction on the liver, Colp and Louria¹, Seulberger², Trinchera³.

A definite and the most significant histological effect produced in the livers of dogs with simple intestinal obstruction consisted of central necrosis of the cells of the liver lobules with loss of nuclei and fragmentation of the cells. This change, although observed in nearly all animals in a mild form, was present to a marked degree in 54% of the dogs, and was occasionally present (11%) to the extent commonly seen following certain fatal toxemias. A much more frequent change, but with questionable significance, was a widening of the sinusoidal spaces and thinning of the hepatic cells into cords of cells which had apparently retained their vitality. Occasionally the large sinusoidal spaces intervening between these cords of cells were filled with blood. Usually, however, only a small amount of blood, or none, was present. Cloudy swelling was of course present in varying degrees. The same kind and degree of pathological

¹ Colp, R., and Louria, H. W., *Arch. Surg.*, 1925, **10**, 756.

² Seulberger, P., *Beit. z. Klin. Chir.*, 1930, **148**, 583.

³ Trinchera, Carmelo, *Ann. Ital. Chir.*, 1931, **10**, 682, Abst. in *Zent. f. d. ges. Chir.*, 1932, **56**, 294.

change was observed in animals dying from obstruction accompanied by strangulation, except that the percentage of animals revealing the most marked damage was greater (27% as compared with 11%). Control biopsy at operation was done in each case.

Hepatic function tests using 40 mg. phenoltetraiodophthalein⁴ per kilo of body weight were performed on 16 occasions in animals with intestinal obstruction and on 6 occasions in animals with strangulation in addition to obstruction. In 29 control dogs the average retention was 9.8% in 5 minutes and 4% in 10 minutes, which is similar to the normal figures reported previously by Graham, Cole, Copher, and Moore.⁴ The average of the readings on animals with intestinal obstruction at various stages of illness was 21% after 5 minutes and 10.6% after 10 minutes. The retention in animals ill with strangulation was slightly higher, i. e., 24.5% and 12.5% for the 5 and 10 minute periods respectively. When an accidental infection such as local peritonitis or abscess was found, the retention figures were the highest. This observation agrees to a large extent with clinical data and suggests that the excretion test of hepatic function is more sensitive to infection within the liver than to any other pathological condition. It is possible that there is an absorption of bacteria from the obstructed or strangulated intestine and that the resulting infection accounts for the hepatic changes we found. However we saw bacteria in considerable numbers in the liver in only 3 of our dogs. We realize however that they may have been present in many more. Cultures were not made.

We also collected samples of lymph from the thoracic duct, portal blood and systemic blood before and after intestinal obstruction and strangulation and injected them into guinea pigs and mice intraperitoneally. Although occasionally the samples obtained after obstruction and strangulation were more toxic than before the conditions were produced, the difference was so slight that the absorption of a toxin from the obstructed or strangulated loop could not be assumed.

⁴ Graham, E. A., Cole, W. H., Copher, G. H., and Moore, S., *Diseases of the Gallbladder and Bile Ducts*, Lea and Febiger, Phila., 1928.