

METHODS

A METHOD OF STUDYING THE EXTERNAL SECRETORY FUNCTION OF THE LIVER IN DOGS WITH AN INTACT GALL BLADDER AND HEPATO-DUODENAL CIRCULATION

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Two main types of operations are used for studying the secretory function of the liver: in one of these a fistula of the gall bladder is made (Schiff's method) and in the other (Schwann's method) the common bile duct is ligated as well. In both cases, however, in the course of the experiment the bile is excluded from the digestion or no bile from the gall bladder reaches the intestine.

The subsequent modifications and improvements introduced into these basic methods [1, 3, 4, 6, 7, 8] have to some extent overcome these defects, but the natural process of secretion of bile during digestion cannot be observed even with them.

To obtain a complete picture of the work of the liver in the various periods of digestion it is essential both that bile should circulate constantly, and that true interaction should take place between the gall bladder and the liver, i.e., that the system for excreting bile into the intestine should be intact. This is especially important in the study of the secretion of the various components of bile. Since the existing methods could not enable experiments to be carried out in these conditions, a simple method was devised, based on the principle of keeping the whole biliary system intact with the exception of the duct from one of the lobes of the liver, which was cannulated.

The main feature of the operation is the cannulation of the duct from the lobe of the liver and fixation of a tube in the duct. Polyethylene and polyvinyl chloride tubes 2.0-2.5 mm in diameter and 30-40 cm in length were used. Sleeves 3-4 mm thick, made of a tube of larger diameter, were fixed to the outer surface of these tubes at intervals of 5-7 cm, starting 1.0-1.5 cm from the end. These sleeves were necessary for fixing the tube in the duct and in the abdomen. The tubes were sterilized in alcohol immediately before the operation.

A midline laparotomy was performed on the anesthetized animal (the incision started 2 cm anteriorly to the costal angle). The liver was drawn into the operation wound from behind the duodenum. Any of the ducts from the lobes of the liver was dissected. The most convenient duct for manipulation is that of the left lobe of the liver. The duct was ligated at the place where it joined the common hepatic duct, and the assistant pulled slightly on the thread. A thread was passed beneath the free part of the duct between the lobe of the liver and the ligature. The duct chosen for cannulation was then partially divided with fine-pointed scissors, and the tube inserted for 1.0-1.5 cm, i.e., to the first sleeve, into the hole thus made. The tube was fixed in the duct by the thread passed beneath it. The tube was also fixed to the duct on the other side of the sleeve. It was then fixed on both sides of the next sleeve to the outer surface of the duodenum near the point of entry of the common bile duct. The liver was then allowed to fall back into position and a spare length of tube was left in the abdomen, the rest being secured on both sides of sleeves to the inner surface of the abdominal wall. The end of the tube, 6-8 cm in length, was brought out of the wound. The abdomen was closed. As a rule by the end of the operation the secretion of hepatic bile had begun.

Experiments may be performed on dogs undergoing this procedure 24 h after the operation. For the first few days after the operation the concentration of the components of the bile secreted in a fasting state before application of a food stimulus remains depressed. This applies to cholic acid, phospholipids, and the lipoprotein complex.

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If this method is combined with that described by the authors earlier [2], the concentrating power of the gall bladder working in natural conditions can be determined. Knowing the size of the isolated lobe in relation to the rest of the liver an estimate may be made of the total volume of bile secreted by the liver when the gall bladder is functioning normally. A drawback of the method is the loss of part of the bile, although this has no visible effect on the general condition of the animals.

Cannulation of a lobe of the liver has been used in the authors' laboratory on rats (L. S. Vasilevskaya), and in contrast to the method of cannulation of the common bile duct [5], the loss of all the bile from digestion is avoided.

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