

METHODS FOR OBTAINING PURE CYSTIC AND HEPATIC BILE IN A CHRONIC EXPERIMENT

(UDC 612.357.7-08 + 616.36-008.8-072.5-092.9)

M. F. Nesterin and R. V. Narodetskaya

Laboratory of Physiology and Pathology of Digestion (Head—Prof. G. K. Shlygin),
Institute of Nutrition, AMN SSSR, Moscow

(Presented by Active Member AMN SSSR, V. V. Parin)

Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 59, No. 4,
pp. 120-123, April, 1965

Original article submitted October 14, 1963

I. Obtaining cystic bile. The necessary condition for studying the chemical composition of cystic bile is to obtain it from a normally functioning gallbladder with an uninjured wall and preservation of the blood supply and innervation. The only method of obtaining cystic bile from an intact gallbladder is its puncture during an operation. However, such a method has its disadvantages—the impossibility of obtaining bile many times from the same animal and the absence of complete assurance that preoperative preparation of the animal and the process of the operation itself will not affect the true value of the concentration of the bile components. The various modifications of forming a cystic fistula, even while retaining its position in situ [2, 3], do not meet such demands.

To obtain pure cystic bile in a chronic experiment we developed a method in which the intactness of the gallbladder and its function were completely preserved.

The principle of the method consists in suturing to the gallbladder an isolated segment of the intestine through which puncture of the gallbladder is done by means of an inserted needle.

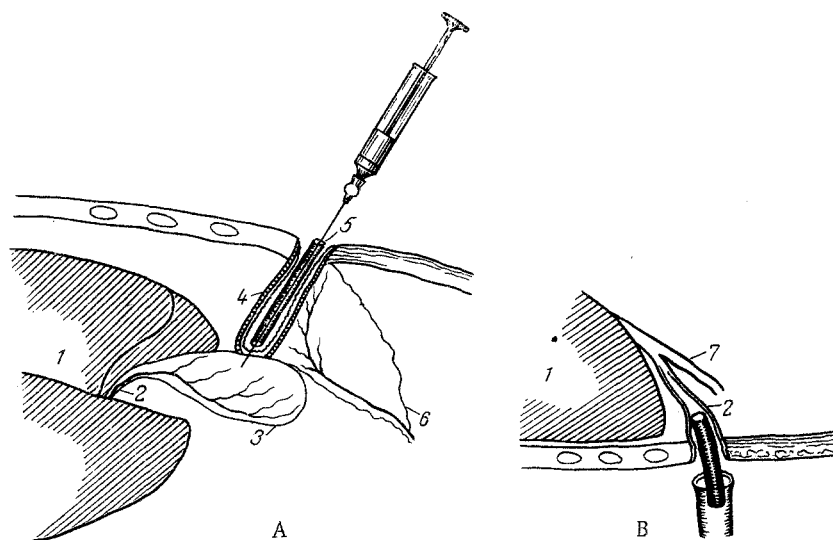


Fig. 1. Scheme of the operation for obtaining cystic (A) and hepatic (B) bile.
1) Liver; 2) cystic duct; 3) gallbladder; 4) isolated segment of intestine; 5) rubber tube with inserted needle; 6) mesentery of isolated segment of intestine; 7) common bile duct.

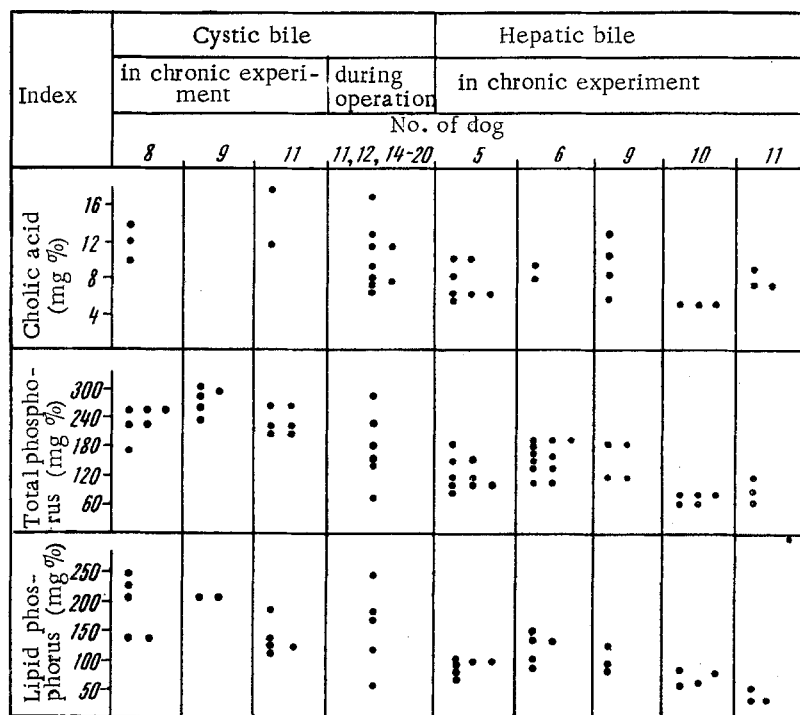


Fig. 2. Content of certain components in the cystic and hepatic bile.

This method makes possible a study of the composition of the cystic bile under various physiological conditions, and also in the presence of experimental disorders of gallbladder functioning caused by repeated injection of various substances into it.

Description of operation. The abdominal cavity is bared by an incision from the xiphoid process in an anesthetized animal. By means of a thread the distance from the gallbladder to the upper corner of the wound is determined. From the middle section of the small intestine, a segment of the intestine with one clearly evident nutrient vessel corresponding to this distance is resected. The mesentery of the intestinal segment is sectioned to the root for its greater mobility. The intactness of the intestinal tract is restored. The proximal end of the resected segment is blindly sutured by burying only one mucous membrane inside the segment. The gallbladder is drawn to the wound together with one of the segments of the right lobe of the liver. The blind end of the intestinal segment is sutured to the gallbladder in 5-6 places; the suture encompasses only the serous membrane of the bladder and intestine. As a result the cavity of the isolated segment of the intestine is separated from the wall of the gallbladder by a layer of mucous membrane. The open end of the intestine is sutured into the wound, as is usually done in Thiery's operation (Fig. 1, A). Thus the tissue "tube" does not disturb the normal topography of the bladder and does not limit its mobility.

Bile can be obtained from the animals after 10-12 days. The dog, without any preparation, is strapped to the table in a dorsal position. A boiled rubber tube with a fine puncture needle (12 cm long) with a mandrin is fed into the isolated segment of the intestine until reaching the stop. The end of the needle should not protrude from the tube during insertion. While holding the rubber tube with one hand, with a short abrupt movement the intestinal mucosa and wall of the gallbladder is punctured, during which a characteristic sound is heard and the hand has the feeling of "caving in" into the cavity. The mandrin is removed from the needle, a syringe is connected, and the transparent cystic bile is collected. After this the syringe with the needle and the rubber hose are simultaneously withdrawn. The mucosa with the isolated segment of the intestine instantly closes the site of puncture. The procedure of obtaining the bile takes not more than 2 min.

Dogs, thus prepared, were under our observation for several periods (up to 8 months). As a result of numerous punctures we did not note any complications. The frequency of the punctures depended on the problems of the investigation. We were able to perform six punctures of the gallbladder of one animal during the course of one day.

After carrying out several series of experiments we reoperated on two dogs in order to examine the site of

connection of the gallbladder with the intestine, which revealed good adhesion of the intestine with the gallbladder without signs of accretion. The shape and topography of the gallbladder were the same as before the first operation.

A morphological investigation of the removed gallbladder did not elicit changes of its mucosa.

II. Obtaining hepatic bile. The method lies in the removal of the gallbladder and suturing the cystic duct into the wound. During the operation the bile is collected by means of a thin rubber tube inserted into the cystic duct.

Description of operation. The abdominal cavity is opened just as in the first operation. A Pean forceps is applied to the fundus vesicae felleae. The blunt end of the gallbladder is separated from the liver and the negligible hemorrhage occurring here can easily be stopped by tamponing with gauze pads. The gallbladder, separated from the liver, is sutured into the anterior part of the wound at the level of the duct or neck of the bladder. Then the abdominal cavity is sutured and the gallbladder removed.

After the wound heals the hepatic bile is obtained. In these cases a thin rubber drain is inserted into the cystic duct (Fig. 1, B), which precludes contact of the hepatic bile with the remains of the cystic mucosa. Outside of the experiment the bile losses in such dogs were minimal, since the well-fixed cystic duct is pressed by the muscles of the abdominal wall. Both described operations were carried out on two dogs with intervals of 3 and 4¹/₂ months between them.

Figure 2 shows certain data on the composition of the hepatic and cystic bile, obtained during fasting by the two described methods, and also data on the composition of the cystic bile obtained during operation on various dogs.

Determination of cholic acid [5], total [1] and lipid phosphorus [4] was done by the usual methods. The concentration of the components in the hepatic bile was lower than in the cystic bile. A great variation of values was noted in the bile obtained from the gallbladder during the operation.

LITERATURE CITED

1. K. S. Zamyckina, Byull. éksper. biol., 35, No. 2, (1953), p. 13.
2. I. K. Smirnov, Byull. éksper. biol., No. 8, (1962), p. 122.
3. B. J. Cohen, Proc. Soc. exp. Biol. (N. Y.), 103, (1960), p. 122.
4. J. Folch, et al., J. biol. Chem., 191, (1951), p. 833.
5. J. G. Reinhold and D. W. Wilson, Ibid., 96, (1932), p. 637.

All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.
