A Method of Compensating for Bile Loss in Acholic States

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Bile collected from a patient with acholia is sterilized by filtration through acetate cellulose membranes, freeze-dried, and dispensed into glutoid capsules which are swallowed by the patient.

Key Words: *acholia; biliary fistula*

Since reconstructive operations on the biliary tract are usually performed in patients with acholia, we have proposed a method of compensating for bile loss in patients with an external biliary fistula [5].

A long-lasting release of bile via external biliary fistula leads to serious complications. Early return of bile improves general condition, normalizes all types of metabolism, and makes it possible to prepare the patient for surgery [2].

Methods of compensating for bile loss exist and are used in medical practice. One method is the ingestion of bile mixed with coffee, but many patients refuse to drink such a mixture because of the strong vomiting reflex. A. F. Gredzhev [3] proposed a method in which bile mixed with furacilin and antibiotics is administered intragastrally; however, in the stomach bile loses its properties under the action of gastric juice and antibiotics and, moreover, the procedure causes vomiting and carries a risk of damage to pharyngeal, esophageal, and gastric mucous membranes.

Another approach implicates the creation of a microgastrostoma which is connected to the external biliary fistula [4]. The drawbacks of this method are the need for operative intervention, which increases the risk for the patient, and nonphysiologic exposure of the gastric mucosa to bile.

The techniques for obtaining sterile bovine bile, tableting avian bile, and freeze-drying bile are now available [6]. We propose to compensate bile loss with sterile freeze-dried native bile.

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MATERIALS AND METHODS

Bile flowing from the fistula was collected into a glass vial and perfused through acetate cellulose membranes for microbiological analysis. The membranes were arranged in a column for filtration in the order of decreasing pore size; thus, the first layer consisted of two membranes with pore size of 0.91-1.05 μ; the second, of two 0.551-0.65 μ membranes; the third, of two 0.251-0.35 μ membranes; and the fourth, two 0.05-0.15 μ membranes to remove from the bile of the fistula wall breakdown products.

Filtered bile is collected into a glass vial, dispensed into glass ampuls (0.5 ml in each), and freeze-dried.

Immediately before use by patients with external biliary fistula, bile is dispensed into glutoid capsules which are swallowed by the patients.

Calculation of the amount of bile necessary to make up for bile loss in an experimental animal or in a patient is based on the following considerations. According to T. T. Berezov *et al.* [1], solid substances make up 2.6% of hepatic bile on average. Since about 800 ml of bile are produced daily in a human being, 2.6% of dry substance will be equivalent of 20.8 mg. This amount of bile is weighed and encapsulated immediately before use.

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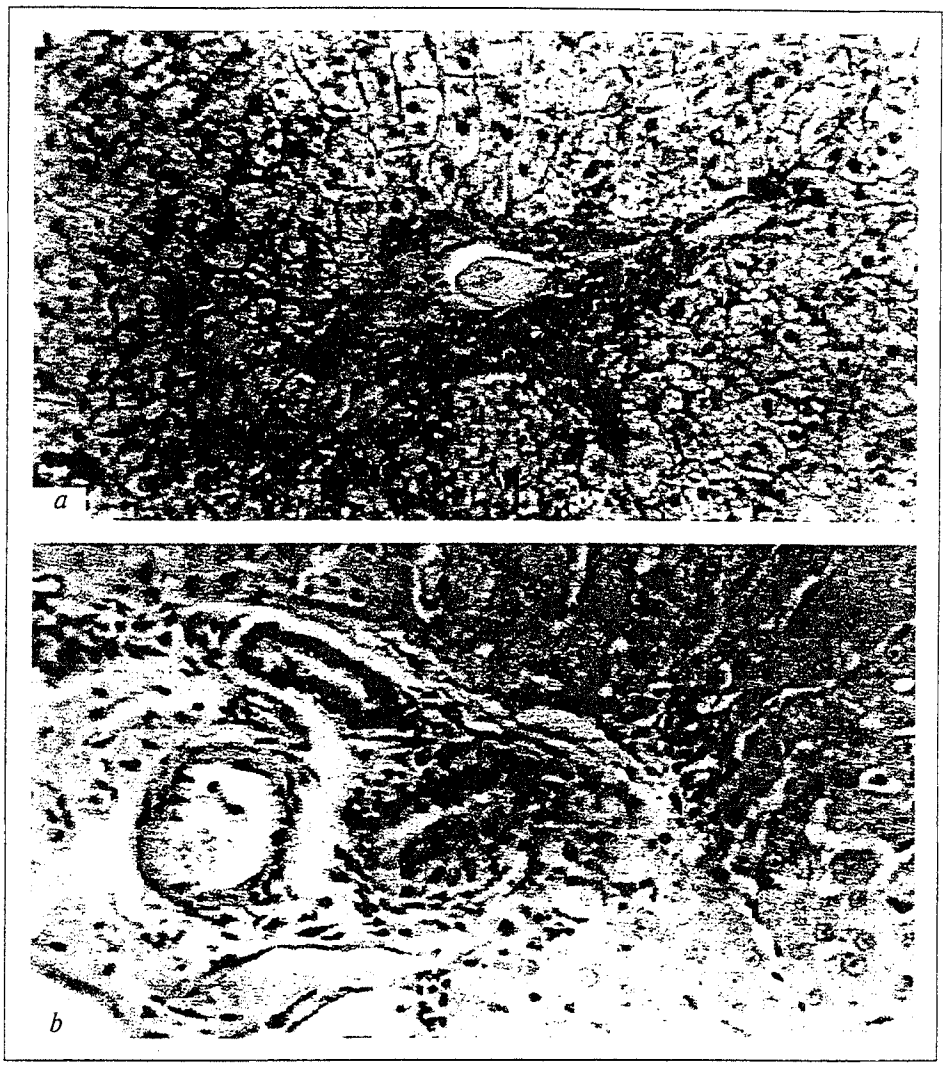

Fig. 1. Cat liver after 20-day acholia (*a*) and after bile return started on day 1 of acholia (*b*); *a*) granular degeneration of hepatocytes with vacuolar degeneration; stasis, perivascular edema, and infiltration by lymphocytes and histiocytes; *b*) granular degeneration of hepatocytes and perivascular edema and infiltration by lymphocytes and histiocytes in the triad area; the sinusoids are dilated. Here and in Figs. 2 and 3: hematoxylin and eosin staining; ×200.

In our method we use dry bile enclosed in glutoid capsules (gelatin capsules treated with an alcoholic solution of formalin; they are produced by the pharmaceutical industry) which pass the stomach and break down predominantly in the jejunum, so that the gastric mucosa is not exposed to the adverse effects of bile.

Compensation for bile loss using our method during the preparation of patients for reoperation to remove the external biliary fistula can improve treatment results. Patients with an external biliary fistula can swallow capsules before meals and wash them down with tap water.

The efficacy of our method was checked in an experiment on two groups of cats. The first (control) group consisted of cats with a complete external biliary fistula for 20 days (n=10) and the second (test) group, of cats with an external biliary fistula for 20 days and with return of bile in capsules from the first day (n=7). In all cats, histological examinations of the liver and various parts of the small intestine were performed.

RESULTS

Liver of cats with 20-day acholia: blurred boundaries between lobules, vascular stasis and hyperemia, and small areas of cells from the histiocytic series along the course of vessels; granular and, in places, vacuolar degeneration of hepatocytes (Fig. 1, *a*). Liver of cats with 20-day acholia and return of bile from day 1 of acholia: small areas of leukocytic infiltrates, marked edema around triads, and dilated sinusoidal capillaries; presence of multinuclear hepatocytes (Fig. 1, *b*).

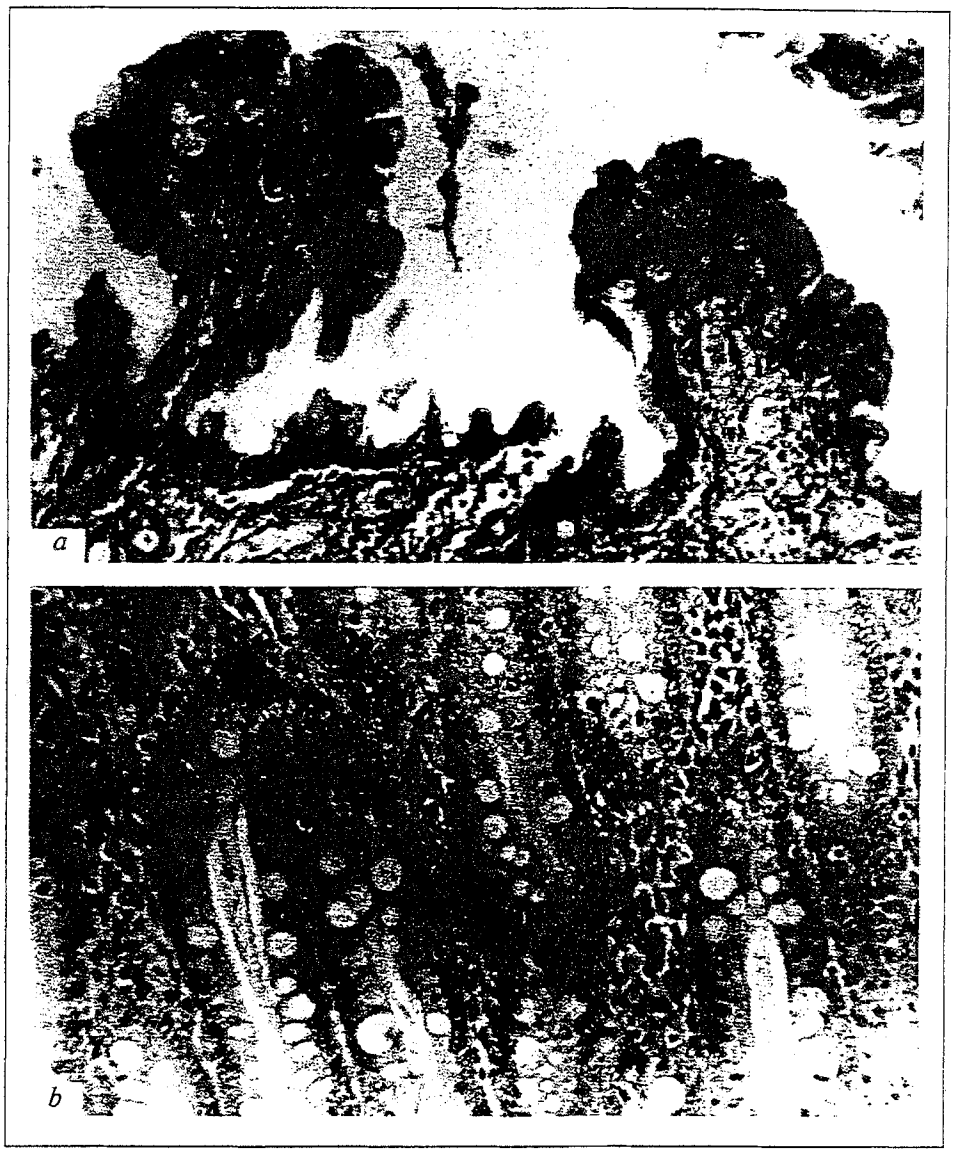

Fig. 2. Cat duodenum after 20-day acholia (*a*) and after bile return started on day 1 of acholia (*b*); *a*) the villi are shortened and have thickened rims, the boundaries between cells are blurred, and the number of goblet cells is reduced; *b*) increased number of secreting goblet cells.

Duodenum of cats with 20-day acholia: reduced number of goblet cells, shortened villi with thickened rims, indistinct cell contours, stasis in the submucosa, and proliferation of fibrous connective tissue (Fig. 2, *a*). Duodenum of cats with 20-day acholia and return of bile from day 1 of acholia: increased number of secreting goblet cells, flattened villi in places, edema in the submucosa, occasional segmented cells, and presence of goblet cells in large numbers in the submucosa where they were more numerous than in the villi (Fig. 2, *b*)

Jejunum of cats with 20-day acholia: shortened villi and submucosal sclerosis (Fig. 3, *a*). Jejunum of cats with 20-day acholia and return of bile from day 1 of acholia: large numbers of secreting goblet cells in the rims of villi, loosened submucosal fibers, and hyperplasia of lymphoid structures (Fig. 3, *b*). A similar histological appearance was presented by the ileum of cats if bile was returned to them from the first day of acholia.

Thus, the absence of bile in the intestine leads to profound degenerative changes in the walls of various parts of the small intestine. Bile should be returned to the intestine from the first day of acholia, as this will greatly improve the condition of the mucosa and submucosa. The proposed method of bile return increases the efficacy of therapy.

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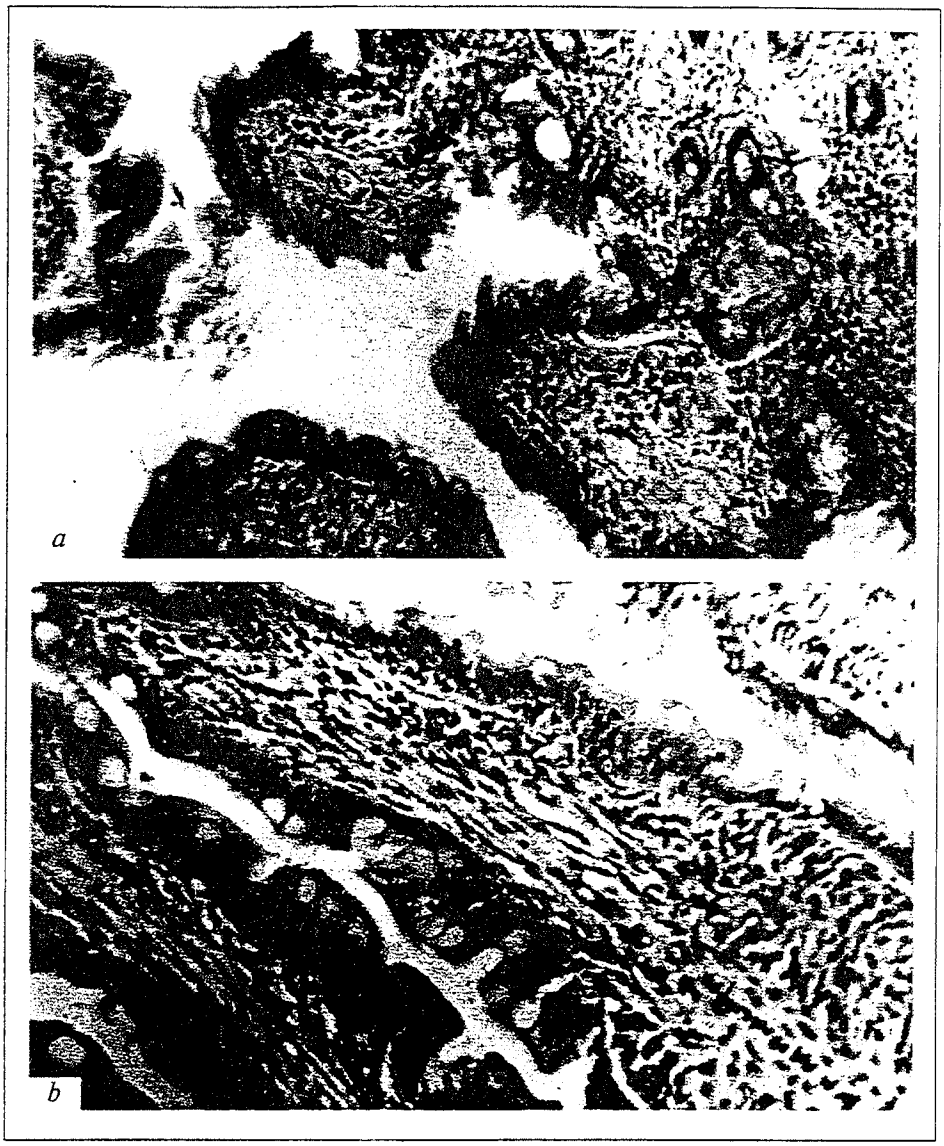

Fig. 3. Cat jejunum after 20-day acholia (*a*) and after bile return started on day 1 of acholia (*b*); *a*) the villi are thickened and the submucosa is sclerotic; *b*) increased number of goblet cells in the rims of villi.

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