METHODS OF INVESTIGATING THE EXOCRINE FUNCTION OF THE PANCREAS AND SOME RESULTS OBTAINED

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An operative method of isolating the main pancreatic duct is suggested, which abolishes the risk of injury to the duct and the need for division of the duodenum.

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The following methods have been suggested for investigating the exocrine function of the pancreas: to exteriorize the papilla of the main duct together with a small portion of the duodenum on to the surface of the abdominal wall [12], to introduce a tube into the main pancreatic duct in order to collect the juice [5, 10, 11, 13, 14], and to isolate the main duct together with part of the resected duodenal wall and to fashion a closed cylindrical sac from the latter; a fistula is formed into the sac thus formed, the lateral end of which is led into the caudal part of the free end of the duodenum [1, 3, 8, 9]. Disadvantages of the first method include loss of juice and a high mortality among the animals; those of the second method include thickening of the wall of the main duct because of catheterization, leading to redistribution of the discharge of juice between the two pancreatic ducts; and of the third, constant irritation of the gland by the fistula, which lies close to the pancreas, and the need for division of the duodenum. In addition, in all cases injury to the pancreas takes place during the operation and its natural position is subsequently modified.

A method has recently been developed by means of which the pancreas can remain in its natural position and mechanical irritation of the gland by the fistula is abolished. This is done by dividing the duodenum between the two pancreatic ducts, and anastomosing (end to side) the oral end of the duodenum to the jejunum, at a point 80-100 cm away from the site of division. The fistula opening into the caudal segment of the duodenum lies about 25 cm away from the main duct [4]. However, even this method had its disadvantages: trauma to the gland during the operation and division of the duodenum.

An attempt was therefore made to find a method which would maintain the natural position of the pancreas during isolation of the main duct, prevent injury to it during the operation, and avoid the need for division of the duodenum.

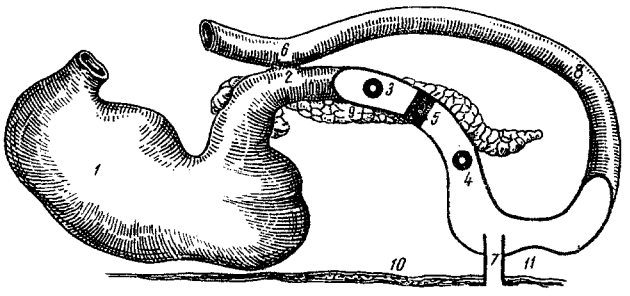

Fig. 1. Scheme of operation to isolate the main pancreatic duct. 1) Stomach; 2) duodenum; 3) accessory pancreatic duct; 4) main pancreatic duct; 5) seromuscular bridge; 6) duodenojejunostomy; 7) fistula into small intestine; 8) jejunum; 9) pancreas; 10) abdominal wall; 11) constriction of duodenum.

The operation shown diagramatically in Fig. 1 is carried out as follows. A longitudinal incision 5-6 cm long is made in the duodenum over the main pancreatic duct and in the direction of the accessory duct. The duodenal wall is trimmed on both sides of this incision to prevent the possibility of an anastomosis which usually develops in the presence of a wide seromuscular or serous bridge. Next, at a distance of 1 cm orally to the main duct, for 1.5-2 cm the mucous membrane alone or together with the muscular layer is removed in the direction of the accessory duct, and the bridge thus formed is then sutured by three rows of ligatures. On organic glass fistula tube is introduced into the duodenum 3-5 cm in a caudal direction from the bridge thus formed. A side-to-side duodenojejunostomy is formed between the oral end of the duodenum and a

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loop of jejunum situated 80-90 cm away from the seromuscular or serous bridge. The possibility that some of the pancreatic juice may move along the duodenum and past the fistula is prevented by the pressure difference between open duodenal fistula and the caudal of the duodenum. This was proved by injecting the collected pancreatic juice at the end of the experiment through the fistula tube into the duodenum. On every occasion a comparatively high pressure had to be created by raising the funnel 25-30 cm above the animal's spine.

Constriction of the duodenal wall by partial resection caudally to the fistula, followed by suturing the edges together, or partial invagination of the duodenal wall, followed by suturing at the base of the invagination is also recommended; in this way the edges of the duodenal wall are approximated and a funnel-like dilatation is produced to ensure improved flow of the juice through the fistula.

Because the pancreatic secretion contains small traces of intestinal juice as an impurity, activated pancreatic juice is obtained and the possibility of masking of pancreatic activity is ruled out. This is also indicated by data in the literature describing the very low intensity of secretion by the small intestine in the absence of mechanical stimulation [2, 7, 10].

For simultaneous study of the secretory function of the stomach and pancreas, isolation of a Pavlov gastric pouch can be combined in the same dog with isolation of the main pancreatic duct by the method suggested. A stainless steel fistula tube is inserted into the gastric pouch, and the usual organic glass tube into the duodenum. The orifices of both fistulas lie in the midline of the abdominal wall.

Experiments were carried out on 18 dogs 49-61 days after the operation, using strong and weak food stimuli: 200 g raw meat and 300 ml milk. The results corresponded to those published in the literature. After feeding with meat, the secretion of juice in 6 dogs reached a maximum during the first hour and in 12 dogs during the second hour from receiving the food stimulus. The intensity of secretion then gradually diminished. The total volume of pancreatic juice secreted by the different animals during 6 h varied from 97.2 to 303.4 ml.

The intensity of pancreatic secretion following administration of milk was lower than after meat. Secretion of juice by 4 dogs reached a maximum in the first hour, by 5 in the second, by 1 in the third, and by 1 in the fifth hour. Secretory activity of the pancreas then gradually decreased. The total volume of juice secreted by the different animals was 27-119.2 ml.

The activity of trypsin, lipase, and amylase was determined in the pancreatic juice by the methods of G. K. Shlygin and co-workers. The enzymic activity of the juice corresponded almost completely to the rate of its secretion.

The suggested method thus enables investigation of the exocrine function of the pancreas to be carried out under normal conditions. It should also be noted that the dogs undergoing the operation returned to their normal state and body weight within 1-1.5 months. The animals require no special care after the operation, as is necessary when the classical Pavlov method is used to isolate the main pancreatic duct.

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