

Modified Puestow Procedure for Retrograde Drainage of the Pancreatic Duct *

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PERMANENT decompression of the pancreatic duct is the objective of the direct surgical attack on chronic relapsing pancreatitis. This has been attempted from both ends and the middle with varying success. Sphincterotomy, popularized by Doubilet and Mulholland,² provides drainage when obstruction of the duct is confined to its terminal portion. In recognition of the inadequacy of this procedure in some cases, Doubilet¹ has recently proposed dividing the body of the pancreas and implanting both severed ends of its duct into a Roux Y jejunal loop.

Link⁵ is given credit by Puestow and Gillesby⁷ for the first retrograde drainage of the pancreatic duct in the treatment of pancreatitis. His cutaneous fistula required frequent probing, however, to keep it patent. Internal retrograde drainage as a pancreaticojejunostomy was described by Zollinger, Keith and Ellison, in 1954⁹ and later in the same year by DuVal.³ In 1956, in their article on resection of the pancreas for the treatment of chronic relapsing pancreatitis, Longmire, Jordan and Briggs⁶ mentioned having tried caudal pancreatectomy with anastomosis of the remaining pancreas to a Roux loop of jejunum, in 1951. They had given up the procedure, however, because of poor results.

Retrograde drainage through the side of the duct opened throughout the tail, body and part of the head was described by Puestow and Gillesby,⁷ in 1958. They described removing the spleen and amputating the

tail of the pancreas after the gland had been mobilized as far as the superior mesenteric vessels. A probe was passed down the dilated pancreatic duct and the duct split as far toward the right side as possible. Hemostasis from the cut edges was obtained with mattress sutures. The mobilized portion of the gland was then inserted into a Roux loop of jejunum which covered it like a sheath. The diagonal free end of the jejunal loop was sutured to the capsule of the pancreas to cover the opened duct completely. This procedure is appealing from a theoretical point of view, particularly for the patient with several areas of constriction in the duct and saccular dilatation between as in the authors' illustrations. An alternate method involved opening the distal 4 to 6 inches of the Roux loop of jejunum along its antimesenteric border and sewing this to the pancreas on either side of the split. The present paper is concerned with a simplified modification of this alternate method.

Modified Technic

Patients suffering from the chronic relapsing pancreatitis have frequently had several upper abdominal procedures before architectural changes in the gland make them candidates for retrograde drainage. Multiple adhesions resulting from surgery or the inflammatory process itself may render mobilization of the pancreas and spleen quite time consuming. This is especially true in the presence of dilated veins along both edges of the pancreas which may be associated with portal hypertension caused

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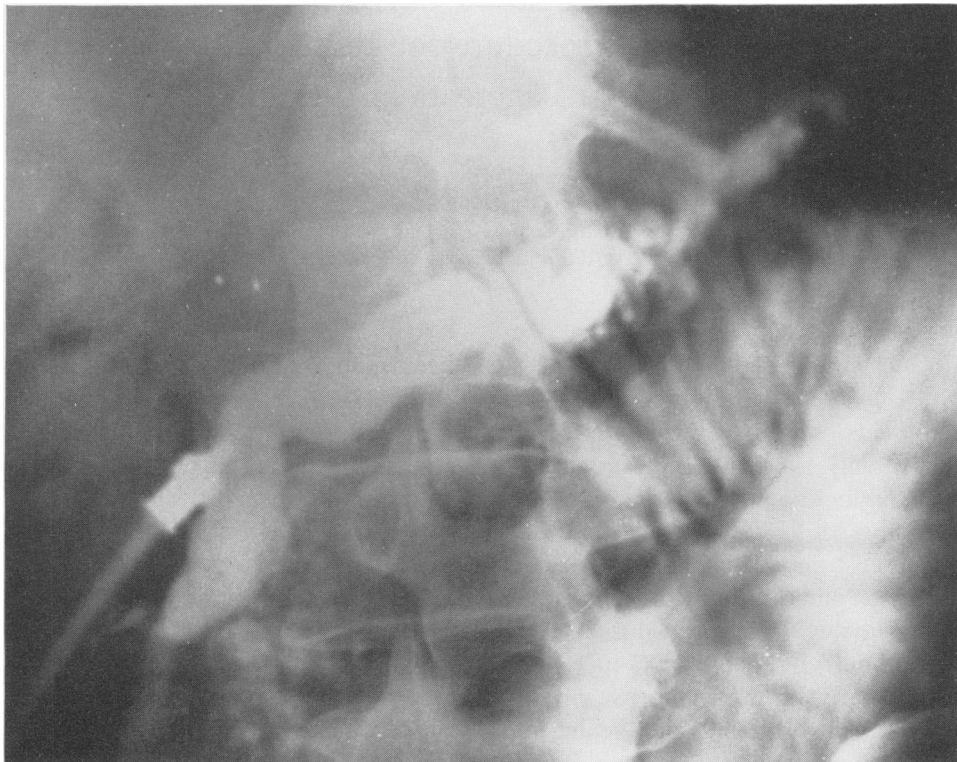


FIG. 1. Operative pancreatogram through a needle showing a diffusely dilated pancreatic duct with calcification in the head of the gland. Note contrast material in duodenum.

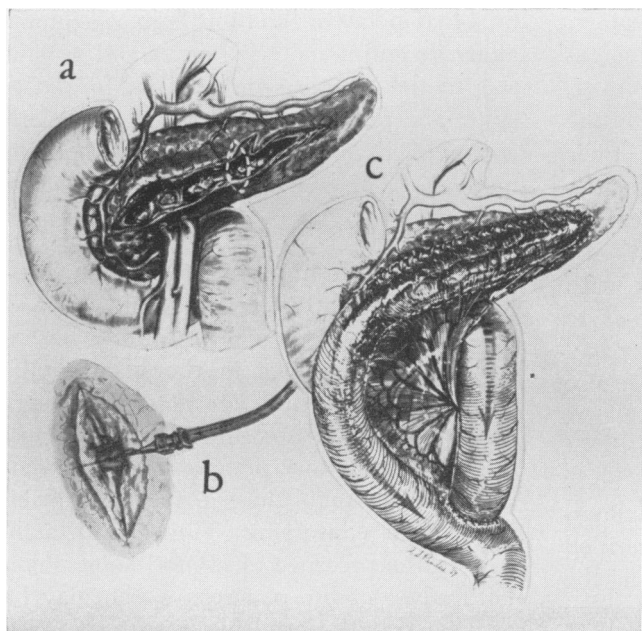
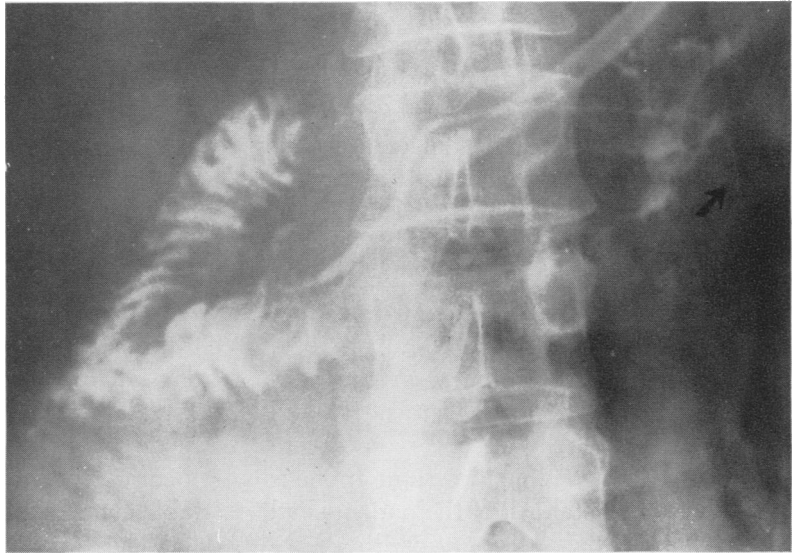


FIG. 2. a. Dilated pancreatic duct split longitudinally toward the tail and somewhat to the right of the mesenteric vessels. b. Ellipse of pancreas removed from body of gland with needle inserted into exposed duct. c. Opened pancreatic duct covered by retrocolic Roux loop of jejunum with free end toward the tail of the pancreas to minimize angulation.

FIG. 3. Operative pancreatogram through fine polyethylene catheter (arrow) inserted into duct exposed by removing an ellipse of pancreas.



by inflammatory constriction of the splenic and portal veins. Needless sacrifice of the spleen may rob a patient with such pathology of the only available means for a splenorenal shunt should it become necessary. It may also make him vulnerable to complications such as intravascular clotting which occasionally follows splenectomy done for whatever cause. Removal of even a few centimeters of the tail of the pancreas likewise discards valuable islet cells in patients who are likely to develop diabetes in the course of their disease.

Most of these disadvantages can be avoided by leaving the spleen and tail of the pancreas alone. The anterior surface of the gland is exposed throughout the tail, body and part of the head if feasible. At times the dilated pancreatic duct may be felt as a cystic structure beneath the capsule of the gland. In such instances it is possible to insert a needle into this duct and make a pancreatogram (Fig. 1), to serve as a guide for subsequent operation.

If the duct cannot be located by palpation, removal of a small transverse ellipse of tissue from the body of the pancreas will serve to expose the duct (Fig. 2b). This can then be injected by needle or cannulated with a fine polyethylene catheter

(Fig. 3) for the performance of a pancreatogram. In removing the ellipse of tissue, it is important to leave a margin of intact gland for later suture to a jejunal loop. A pancreatogram is helpful in indicating the extent of the operation necessary to relieve the various areas of obstruction (Fig. 4) and it also provides a useful record of the pathologic change which was present.

After locating the pancreatic duct and demonstrating the areas and degree of obstruction, the duct is opened longitudinally both toward the tail and toward the head (Fig. 2a). It is rarely necessary to split the distal most portion in the tail as the duct is narrowing down there anyway. The split is usually continued somewhat to the right of the mesenteric vessels. All individual sacculations should be opened if possible but a uniformly dilated duct need not be opened so extensively. Hemostasis should be obtained by individual suture ligation as recommended by Puestow and Gillesby.

A Roux Y loop of jejunum is then brought up in a retrocolic fashion. The end of the loop is beveled and the antimesenteric border is split for a sufficient distance to cover the opened pancreatic duct like a roof. Anastomosis is performed to the cap-

sule of the pancreas on either side of the opened duct, in two layers if possible. The outer layer should be of nonabsorbable suture. The direction of the free end of the jejunal loop is toward the tail of the pancreas to minimize angulation (Fig. 2c).

Surgical Results

A small group of seven patients was treated by this modified Puestow procedure between August 1958 and October 1959. All patients were men between the ages of 32 and 48 years. Three were negro and four were white. All but one were severe alcoholics, three having delirium tremens while in the hospital. All of the patients had normal gallbladders by x-ray or direct observation at operation, but five of the seven had moderate to severe narrowing of the pancreatic portion of the common duct with proximal dilatation. This had previously been treated by sphincterotomy in three, cholecystojejunostomy en Roux Y in one, and cholecystoduodenostomy in one in whom a subtotal gastrectomy had been per-

formed previously for ulcer. There was x-ray evidence of calcification either of the head of the pancreas or diffusely throughout the gland in four. The pancreatic duct was dilated to from 8 to 20 mm. in four. All patients had had multiple attacks of pancreatitis with serum amylase levels ranging from 530 to 3,320 Somogyi units. In the two in whom the duct was relatively normal in size at operation, there had been prolonged elevation of the serum amylase ranging from 1,400 to 2,800. A third patient had a cavity $4 \times 2 \times 2$ cm. in the body of the pancreas which contained pancreatic juice under pressure in spite of no gross demonstrable connection with the major pancreatic duct. The patient who maintained the highest amylase values had developed massive bilateral pleural effusions of almost pure pancreatic juice and eventually a bronchopleural fistula associated with a 60-pound weight loss.

Postoperatively, the most striking observation was the immediate relief of pain. This was so marked in a few cases that the pa-

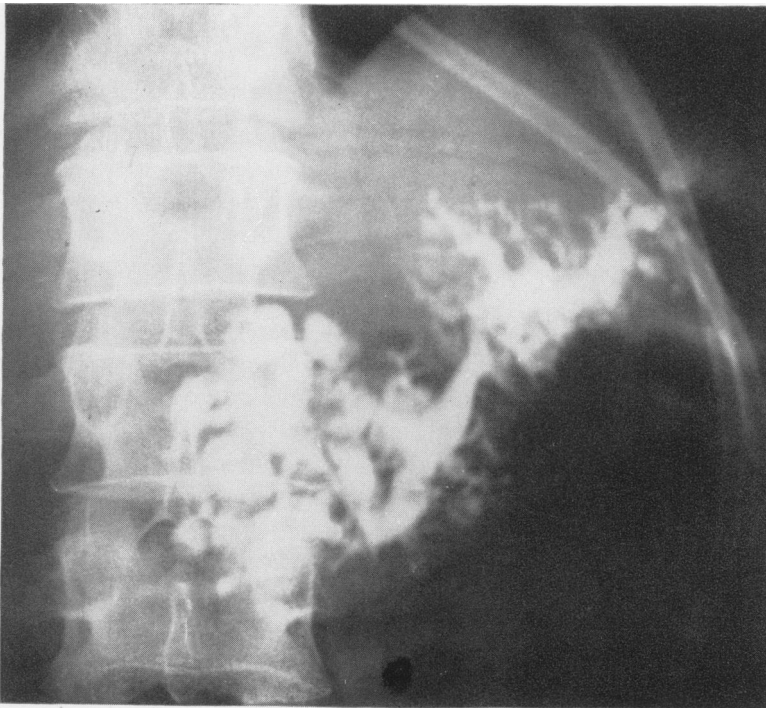


FIG. 4. Operative pancreatogram performed through a needle showing multiple areas of sacular dilatation and no communication with the duodenum.

tients required no narcotics for the ordinary postoperative wound discomfort. In three patients, however, there was a recurrence of the old type of pain during the brief period of follow up. One of these recurrences was quite mild and was readily relieved by hypodermic injections of saline. In one patient, a mild recurrence was followed by an attack of his old pain eight months postoperatively brought on by drinking. He continued to have attacks of severe abdominal pain and vomiting over the next three months until a strangulated volvulus of the small intestine was corrected. He has been asymptomatic since that time. One patient had recurrence of left upper abdominal pain while still in the hospital in spite of a rapid decline of the serum amylase level to normal (Fig. 4). He was subsequently admitted to another hospital where operation, seven months later, disclosed carcinomatosis presumably pancreatic in origin.

Amylase levels fell promptly in four patients, most dramatically in the one with bilateral pleural effusions in whom it dropped from 1,800 to 210 in less than a week. Amylase levels were not recorded immediately postoperatively in two patients, and in one, with a normal sized duct, the level remained around 1,400 even though the patient was asymptomatic.

There were no operative deaths in this small series. One patient developed bronchopneumonia postoperatively which considerably delayed his convalescence. One patient with a normal sized pancreatic duct and a minimal amount of fibrosis of the pancreas developed an anastomotic leak and a wound infection. The wound granulated in slowly and he became asymptomatic. There was one other minor wound infection. The patient who had had bilateral pleural effusions of pancreatic juice continued to drink heavily and was readmitted to the hospital 11 months postoperatively with a massive upper gastro-intestinal hemorrhage. He required 12 transfusions during the acute bleeding episode. Subsequent

x-ray studies revealed large esophageal varices. At reoperation, pressures measured in an omental vein and in a jejunal arcade averaged 350 mm. of saline and splenoportograms showed an extrahepatic block with marked narrowing of the splenic, superior mesenteric and proximal portal veins in the region of the pancreas. The liver appeared normal. A splenorenal shunt proved impossible because of the inflammation about the splenic vein. Splenectomy and oversewing of the varices was resorted to with good immediate results.

In the two months following the submission of this paper for publication, this procedure was performed on two additional patients who met the criterion of diffuse calcification of the pancreas. Both were male alcoholics with normal gallbladders and greatly dilated pancreatic ducts. Both had immediate relief of symptoms, and one has significantly improved his steatorrhea in the six months since operation.

The follow up period in this group is much too short to allow any conclusions as to the ultimate result. It is generally recognized that chronic pancreatitis in an alcoholic is likely to remain symptomatic in spite of surgery if the patient continues to drink.

Discussion

Selection of suitable cases for this type of retrograde drainage of the pancreatic duct is essential for a good result. A diagnosis of chronic recurrent pancreatitis based on four or five attacks of pain with elevation of the serum amylase is not sufficient. There must be evidence of advanced disease with duct obstruction.

Such advanced disease is suggested by weight loss and the onset of diabetes. The development of bulky greasy stools that float is virtual proof of pancreatic duct obstruction or of a burned out stage of pancreatitis with destruction of the secretory activity of the gland.

An abnormal secretin test likewise gives evidence of impaired secretory function. DuVal has stated⁴ that failure to concentrate bicarbonate to 90 mEq./liter in at least one 20-minute specimen was his most valuable indication of chronic pancreatitis. Insufficient tests were performed in the present series for adequate evaluation.

Longmire, Jordan and Briggs placed additional importance on the failure to obtain an elevated serum amylase during an attack when this had occurred previously. A persistent elevation of serum amylase on the other hand, may be associated with advanced disease. Several of the patients in the present series maintained high serum amylase values for weeks. In one of these, however, the pancreatic duct was normal in size with no demonstrable obstruction by pancreatogram (Fig. 3). After his duct had been opened in the course of exploration and x-ray visualization, retrograde drainage was instituted to avoid a pancreatic fistula. Despite this, the serum amylase remained at its previous high level even though he became asymptomatic.

At present, there is no substance, like cholegraffin, which will selectively visualize the pancreatic duct preoperatively. Occasionally reflux and visualization does occur during intravenous bile duct studies as shown by Thal, Goott, and Margulis.⁸ Some patients also have had pancreatograms associated with previous sphincterotomy. Evidence of dilatation of the duct at the time of previous operation coupled with persistent symptoms of pancreatitis constitute fair indications for retrograde drainage.

The single most useful criterion in the selection of cases is demonstration of calcification in the gland by x-ray. This may be present diffusely throughout the pancreas or may be localized to the head. It must be associated with symptoms of recurrent pancreatitis, however, to constitute an indication for operation as there are some patients with diffuse calcification who are totally asymptomatic. One of our pa-

tients became asymptomatic with the development of calcification while being observed on the medical service. He had refused operation and had continued to drink except during hospital admissions.

In the absence of fibrosis of the pancreas which usually accompanies advanced disease of this gland, retrograde drainage of the pancreatic duct is fraught with technical difficulties. The pancreas is much more vascular than when the inflammatory process is partially or totally burned out. The duct may be normal in caliber and very difficult to locate without almost transecting the gland. This necessitates covering the area with a jejunal loop. The normal pancreas holds sutures poorly making an anastomotic leak likely after such a procedure.

A possible complication of retrograde drainage of the pancreas is the development of peptic ulceration with hemorrhage. This is more likely to occur if the pancreatic portion of the common duct has already been bypassed by a cholecysto- or choledochojejunostomy. It is immaterial in the patients with little or no effective communication between the pancreatic duct and duodenum and does not apply of course in patients who have already had a subtotal gastric resection. Bleeding from varices caused by an associated portal hypertension must always be considered in such instances.

Too few patients have been studied with trioleic acid before and after retrograde drainage to draw any conclusions about regeneration of the pancreas. There has been no appreciable change in those that have been studied over a brief period of follow up.

Summary

A modified technic for performing retrograde drainage of the pancreatic duct as described by Puestow and Gillesby has been presented. It has the advantage of simplicity and spares the spleen and tail

of the pancreas. The extent of operation is dictated by pancreatogram when possible. Surgical results with seven patients have shown almost uniform relief of pain and return of serum amylase levels to normal. One patient with persistence of pain in the hospital was later found to have pancreatic carcinoma. Improper selection of patients for this procedure increases the risk of anastomotic leak and resulting wound infection as the normal pancreatic capsule holds sutures poorly. The most useful criterion of advanced disease with duct obstruction is calcification in the pancreas by x-ray. There must be associated symptoms of recurrent pancreatitis to constitute an indication for operation.

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