
Pancreaticogastrostomy Following Pancreatoduodenectomy

PHILIPPE ICARD, M.D., and FRANÇOIS DUBOIS, M.D.

Operative death following pancreatoduodenectomy results essentially from a pancreatojejunal anastomosis leakage. Pancreaticogastrostomy has been used infrequently. Seventeen patients (12 with malignant tumors and 5 with chronic pancreatitis) have undergone pancreaticogastrostomy following pancreatoduodenectomy. There was no operative mortality rate and no pancreaticogastrostomy leakage. Our data agree with data concerning pancreaticogastrostomy published in literature; cumulative mortality rate including our results is 4.5% (6 out of 134 patients) with only one transient benign pancreatic fistula reported. Many advantages offered by this method can explain these positive results including trypsin neutralization by gastric acidity and the possibility of nasogastric aspiration on contact with the anastomosis. Furthermore, permeability of the pancreatic duct can be easily verified by endoscopic examination. However, external pancreatic insufficiency does not seem to occur in long-term follow-up. These results suggest that this simple and safe method merits a more widespread application.

THE MORTALITY RATE following pancreatoduodenectomy in most centers is approximately 7–20%.^{1–5} In approximately 50% of the cases, the mortality rate seems to be related to a pancreatojejunal anastomosis leakage.^{6,7} Although a wide variety of methods of reconstruction after Whipple resection have been described, a method for preventing this leakage is still awaiting widespread recognition. Waught and Claggett⁸ in 1944 performed the first human pancreaticogastrostomy. Despite the low mortality and morbidity rates encountered after pancreaticogastrostomy, this method has been used only occasionally.^{9–17} Our early clinical results in 17 patients who have undergone a pancreaticogastrostomy are reported here.

From the Department of Digestive Surgery C.M.C. de la Porte de Choisy, Paris, France

Methods

Technical Aspects

After removal of the head of the pancreas with the entire duodenum and the distal part of the stomach, the transected surface of the remaining pancreas, proven free of tumor, was freed from retroperitoneal attachment for 1–2 cm.

A corresponding transverse opening of about 3 cm was made on the posterior gastric wall, and the anastomosis was performed with an interrupted row of 3/0 polyglycolic acid sutures. Each stitch was passed through the pancreas, through the main duct, especially when the duct was dilated, and through the seromuscular layer of the stomach (Fig. 1). The posterior row of sutures was tied from the inside and the anterior row from the outside. Biliary anastomosis was then performed, followed by gastrojejunal anastomosis approximately 30/40 cm distal to it (Fig. 2). Cholecystectomy was performed in all patients but not vagotomy. Drainage was placed to the right and posterior of the pancreaticogastrostomy. Nasogastric aspiration was left in place until the return of intestinal activity.

Patients

From September 1981 to December 1986, 17 patients (average age: 60 years, ranging from 34–81 years) underwent pancreatoduodenectomy with pancreaticogastrostomy. Twelve patients had malignant tumors (7 pancreatic adenocarcinoma, 3 duodenum cancer, 1 ampullary cancer, and 1 sarcoma). Five patients had chronic pancreatitis on histologic examination.

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Correspondence: François Dubois, M.D. C.M.C. De la Porte de Choisy, 6 Place de Port au Prince, 75 013 Paris, France.

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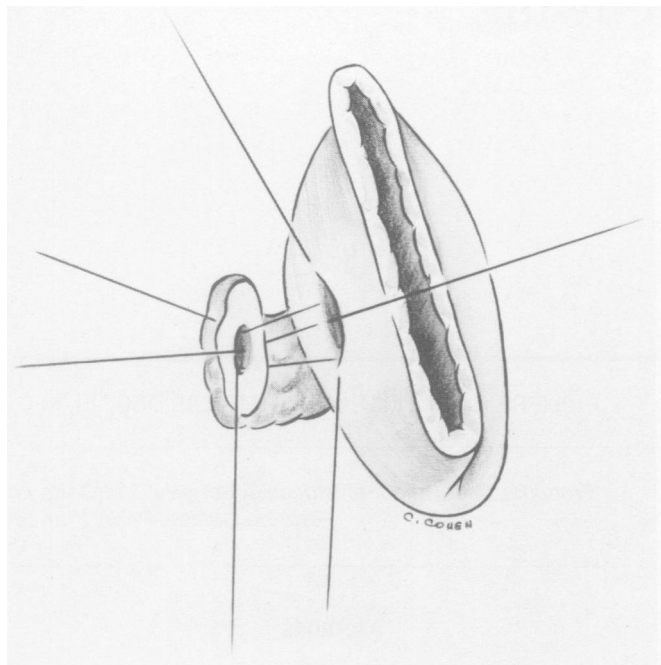


FIG. 1. Row of interrupted 3/0 sutures between the anterior surface of the pancreas and the posterior wall of the stomach.

Results

The major results were as follows: (1) there was no operative mortality rate; (2) no pancreatogastric anastomosis leakage occurred; and (3), postoperative complications occurred in two patients. One patient had perito-

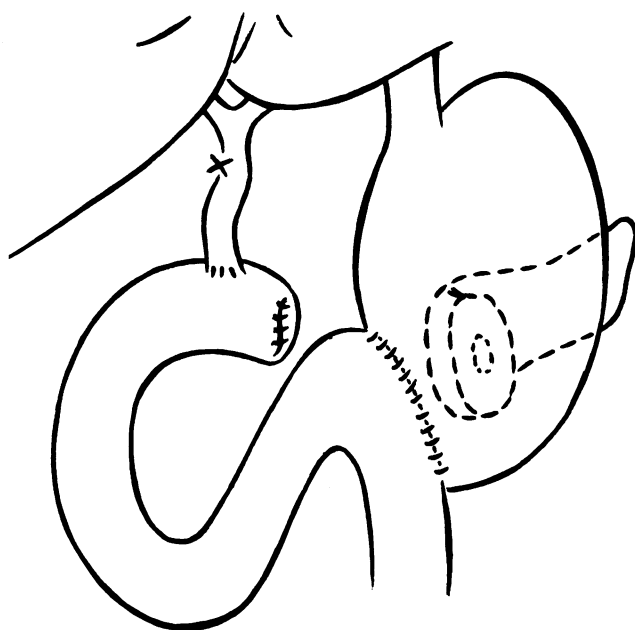


FIG. 2. Reconstruction of biliary, pancreatic, and intestinal continuity.

neal bleeding due to a breakdown of hemostasis on a collateral of the mesenteric superior vein, which was controlled by prompt reoperation. Another patient had continuous gastrointestinal bleeding. Endoscopic examination and reoperation with gastrostomy failed to reveal the origin of this bleeding, which stopped spontaneously.

Thus, morbidity rates in relation to the pancreaticogastrostomy may perhaps be attributed to this gastrointestinal bleeding. The average postoperative hospital stay was 15 ± 3 days. Periodic clinical evaluations in all patients suggest the permeability of the pancreatic duct because none of the patients presented with symptoms of pancreatic insufficiency. One patient (chronic pancreatitis) had two recurrent anastomotic ulcers (after 12 and 20 months, respectively), which necessitated two successive degastrogastrostomies and truncal vagotomies (the latter were performed by left thoracotomy). Three out of 11 patients with malignant tumors died 13, 24, and 50 months after the operation, respectively, and postmortem examination confirmed the permeability of the pancreatic duct.

Discussion

On the basis of experimental studies on dogs carried out by Tripodi and Sherwin in 1934¹⁸ and then by Person and Glenn in 1939,¹⁹ which showed evidence of long-term pancreatic secretion after pancreaticogastrostomy, Waugh and Clagett in 1944⁸ performed the first human pancreaticogastrostomy. This technique, though rarely used, was reintroduced by Mackie et al.¹⁷ in 1975 and by Reding²⁰ in 1978.

Our results (no mortality and low morbidity rates without pancreaticogastrostomy leakage) are consistent with data concerning this method of reconstruction published in the literature: cumulative mortality is 4.5% (6 out of 134 patients, including our patients) with only one pancreatic leakage, mentioned by Mackie (Table 1). This single case of pancreatic fistula disappeared after prolonged use of nasogastric aspiration. The main complication appears to be pancreatic anastomosis bleeding in the stomach (4 cases out of 136 patients); thus, we recommend careful hemostasis of the pancreatogastric anastomosis.

Pancreaticogastrostomy presents the following advantages:

1. It is a simple method of reconstruction because the pancreas lies in natural apposition to the posterior wall of the stomach, and so the anastomosis is easy to accomplish technically without tension.

2. The very low incidence of pancreatitis and pancreatic fistula is probably a consequence of trypsin neutralization by gastric acidity.

TABLE 1. Operative Mortality Rates and Nonlethal Complications Reported for Pancreaticogastrostomy after Radical Pancreatoduodenectomy

Reference	Year	No. of Cases	Operative Deaths	Cause of Death	% Operative Mortality Rate	Death Related to Anastomotic Leak	Nonfatal Complications
Waugh and Clagett ⁸	1946	1	0	0	0	—	—
Wells et al. ⁹	1952	3	1	Pulmonary Infection	33	—	—
Dill-Russel ¹⁰	1952	2	1	Biliary peritonitis	50	—	—
Ingebrigtsen and Langfeldt ¹¹	1952	2	0	—	0	—	—
Sames ¹²	1952	1	0	—	0	—	—
Nanson ¹³	1954	1	0	—	0	—	—
Silverstone ¹⁴	1956	1	0	—	0	—	—
Millbourn ¹⁵	1959	7	0	—	0	—	—
Pataky and Popik ¹⁶	1959	1	0	—	0	—	—
Mackie, Rhodes, and Park ¹⁷	1975	25	2	Pancreatic abscess Biliary fistula	8	1	2 Biliary fistulas 1 Transitory pancreatic fistula nonoperated
Reding ²⁰	1978	6	0	—	0	—	—
Telford and Mason ²¹	1981	9	0	0	0	—	—
Flautner et al. ²⁴ *	1985	27	0	0	0	0	2 Biliary fistulas 1 Pancreatic anastomosis bleeding nonoperated
Kapur ³⁰	1986	31	2	Peritoneal bleeding Unexplained death	6.4	—	1 Biliary fistula 1 Bleeding nonoperated 1 Pancreatic anastomosis bleeding operated 4 Pulmonary infections
Our patients	1987	17	0	0	0	—	1 Peritoneal bleeding 1 Intestinal bleeding
Total		134	6	—	4.5	1	15

* Pylorus preservation.

Other probable contributing factors are the possibility of nasogastric aspiration on contact with the anastomosis; and the absence of a long jejunal loop where pancreatic and biliary secretions can accumulate, increasing intraluminal pressure and loop weight. Furthermore, the significant distance between pancreatic and biliary anastomosis prevents, in the event of leakage of one of these anastomosis, deleterious effects on the other.

Telescoping the pancreatic stump into the posterior wall of the stomach¹⁷ or performing mucosa-to-mucosa anastomosis²¹ have been proposed. Nevertheless, in our opinion, none of these technical modifications seems necessary. Radiologic and endoscopic access to pancreaticogastrostomy is simple, allowing long-term evaluation of the permeability of the anastomosis and of the amount of pancreatic enzymes. Thus, Millbourn¹⁵ successfully reoperated because of an obliterated duct discovered 2 years and 3 months after initial pancreaticogastrostomy. Current progress in endoscopic surgery would probably prevent the necessity of such a reoperation.

To prevent anastomotic peptic ulceration and weight loss, pylorus preservation has been recommended primarily in chronic pancreatitis.^{22,23} This pylorus preservation can be performed with pancreaticogastrostomy,

as Flautner et al.²⁴ have reported. The almost unanimously reported positive results after pancreaticogastrostomy are comparable with the best results reported after pancreatojejunal anastomosis in most recent series.^{4,25-29}

In conclusion, this method of reconstruction merits widespread utilization due to its simplicity and safety.

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