

Pylorus-Preserving Total Pancreatectomy

Early and Late Results

M. Wagner^a K. Z'graggen^a C.E. Vagianos^a C.A. Redaelli^a F. Holzinger^a
C. Sadowski^a C. Kulli^a H. Zimmermann^b H.U. Baer^a M.W. Büchler^a

Departments of ^aVisceral and Transplantation Surgery and ^bPathology, University of Bern, Inselspital, Bern, Switzerland

Key Words

Pancreatic cancer · Periampullary cancer · Total pancreatectomy · Mortality · Morbidity · Long-term outcome

Abstract

Background/Aims: Preservation of the pylorus is an accepted alternative procedure to the classical Whipple operation for pancreatic head resection but data describing its value for total pancreatectomy are sparse. **Methods:** A prospective analysis of 22 total pancreatectomies performed in a consecutive series of 436 pancreatic resections from 1.11.93 to 1.5.99. **Results:** 11 patients underwent total pancreatectomy with preservation of the pylorus. Histopathological examination revealed pancreatic adenocarcinoma in 16 cases and duodenal adenocarcinoma in 1 patient, 5 patients had other types of pancreatic neoplasm. In-hospital mortality was 4.5% (n = 1), cumulative morbidity was 59% and reoperations were performed in 9.1% of cases (n = 2). Median follow-up was 37 months (range 5–66). 62% of patients (n = 13) developed tumor recurrence and 13 patients died during the follow-up period with 10 deaths being cancer related. There was no difference concerning postoperative and follow-up morbidity of survival between patients undergoing pylorus-preserving total pancreatectomy or

pancreatectomy with gastrectomy. However, postoperative body weight was increased 3, 6, 9 and 12 months following preservation of the pylorus. **Conclusion:** Total pancreatectomy with preservation of the pylorus is a feasible type of resection for all types of pancreatic or ampullary tumors, which shows a similar morbidity and long-term survival but improved nutritional recovery compared with standard total pancreatectomy.

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Introduction

Originally, total pancreatectomy was introduced as a safer and oncological more radical treatment form for pancreatic cancer in comparison to pancreatic head resection [1–3]. However, several series have shown that perioperative outcome as well as long-term survival was no better than after partial pancreatoduodenectomy [2, 4]. In addition, the value of total pancreatectomy was compromised by the risk of severe metabolic disorders due to the complete loss of pancreatic endocrine and exocrine functions [5]. Therefore, the classical Whipple procedure (cWhipple) is still recommended as the procedure of choice for the treatment of cancer restricted to the head of the pancreas [6, 7]. Due to advances in pancreatic surgery and perioperative intensive care management, pancreatic

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M.W. Büchler, MD
Department of Visceral and Transplantation Surgery
Inselspital, CH-3010 Bern (Switzerland)
Tel. +41 31 632 24 04, Fax +41 31 632 26 00
E-Mail markus.buechler@insel.ch

head resections can now be performed with great safety [8–10].

In order to omit the side effects of partial stomach resection [11, 12], the more conservative pylorus-preserving Whipple resection (pp-Whipple) has been introduced by Watson [13] and Traverso and Longmire [14]. Several mostly retrospective studies have shown that preservation of the pylorus does not increase postoperative morbidity and mortality when compared with the cWhipple procedure [12, 15–20]. Moreover, long-term survival was similar after the two procedures in all these studies with the exception of one rather small retrospective series [12, 15–20]. Therefore, pylorus-preserving pancreatoduodenectomy is now considered a valid alternative to the classical Whipple procedure for the treatment of all forms of pancreatic and ampullary cancers.

There remains a minority of cases where total pancreatectomy is indicated in order to achieve radical resection [4, 21]. Although total pancreatectomy with preservation of the pylorus or duodenum has been reported for patients with chronic pancreatitis [22, 23], there exists only sparse information in the literature describing the outcome after pylorus-preserving total pancreatectomy [24, 25]. This prompted an analysis of our series of 22 consecutive patients undergoing total pancreatectomy for pancreatic or ampullary tumors.

Patients and Methods

From 1.11.93 to 1.5.99, all patients undergoing pancreatic resections were recorded prospectively in a statistical database (SPSS, Chicago, Ill., USA). Standard work-up in patients with suspicion of pancreatic or periampullary cancer included contrast CT or MRI to stage tumor and perioperative risk assessment consisted of ASA score determination [26, 27] in combination with spirometry and ergometry. Patients with signs of biliary obstruction underwent endoscopic retrograde cholangiopancreatography (ERCP) to insert an endoscopic stent into the common bile duct (CBD). If no contraindications for major surgery were detected, these patients underwent surgical exploration. The abdominal cavity was explored through a midline incision in order to exclude metastatic or locally advanced disease. If no contraindication for resection was found, a 'Kocher maneuver' was performed, the lesser sac was opened and biopsies from suspicious peripancreatic lymph nodes were taken. The superior mesenteric vein (SMV) was dissected from the neck of the pancreas and the gastroduodenal artery was ligated near its origin. Cholecystectomy was followed by complete lymphadenectomy of the hepatoduodenal ligament and the common bile duct was dissected proximal to the cystic duct. The pancreas was resected in total together with the spleen in order to ensure radicality. En bloc resection was performed together with the duodenum, the peripancreatic lymph nodes and the distal stomach in classic pancreatoduodenectomy procedures (cTotal). The pylorus was preserved if the proximal

duodenal resection margin was tumor-free; a 4-cm postpyloric duodenal segment was available for anastomosis and peripyloric lymph nodes showed no tumor infiltration. In these cases (ppTotal), the gastroepiploic vessels as well as the vagal branches to the pylorus were preserved. Lymphadenectomy was completed along the celiac and superior mesenteric vessels and the retropancreatic region of the aorta. Reconstruction after total pancreatectomy consisted of an interrupted end-to-side hepaticojejunal anastomosis in a single-layer technique using the first jejunal loop. An end-to-side anastomosis of the duodenal remnant with the jejunal loop was done in a two layer fashion in cases with ppTotal or an end-to-side interrupted two-layer gastro-jejunosomy was performed in a retrocolic omega-loop-fashion in cTotal. A drainage was placed near the biliary and enteral anastomosis and the abdomen was closed with a running suture in anatomical layers. Antithrombotic prophylaxis consisted of subcutaneous application of low-molecular-weight heparin once a day (3,000 IU/day s.c.). Antibiotics (Piperacillin 4 g and Metronidazole 500 mg or Piperacillin 4 g in combination with Tazobactam 500 mg, American Home products) were given immediately preoperatively and were continued for 48 h postoperatively.

Postoperatively, patients were transferred to the ICU. Abdominal drainage was removed when the secreted fluid measured less than 100 ml/day or at day 5 at the latest. All patients underwent a gastric contrast study at day 5 after surgery and thereafter solid food intake was started. Blood glucose concentrations were measured in 4 to 6-hour intervals and regulated by intravenous administration of insulin (Actrapid®, Novo Nordisk Pharma AG, Küssnacht, Switzerland). After starting oral food intake, patients received either semi-long acting insulin (Mixtard®, Novo Nordisk Pharma AG) or a combination of long-acting insulin as baseline therapy (Insulotard®, Novo Nordisk Pharma AG) in combination with short-acting insulin (Actrapid®) before the meals. Patients were instructed to measure blood glucose levels and to inject insulin by themselves. All patients received pancreatic enzymes (Creon forte®, Kali-Duphar Pharma AG, Bern, Switzerland) in order to treat exocrine pancreatic insufficiency.

Adverse events occurring within 30 days after surgery were recorded as early outcome results. Curative resection was defined as no residual tumor and microscopically clear resection margins. Delayed gastric emptying (DGE) was defined as the inability to tolerate oral food intake for more than 10 days after surgery. Postoperative bleeding was defined as the occurrence of blood loss either through the abdominal drains or by hematemesis in combination with a decrease in systemic hemoglobin content of more than 20 g/l to a value of under 80 g/l within 24 h, requiring at least two units of blood to prevent further blood loss. After discharge, all patients were followed every three months thereafter in combination with our nutritional and diabetic services. The registered data included survival, tumor recurrence, course of pain and body weight as well as capability to work. In addition, any adverse event leading to readmission to the hospital was registered. Insulin requirements and blood glucose levels were recorded and insulin regime was adjusted by the patient's primary care physician in collaboration with the department of diabetology. Persisting diarrhea was defined as the occurrence of more than 3 bowel movements per day for more than 3 months after surgery. Malnutrition was recorded if oral or parenteral hyperalimentation was needed. For statistical analyses, a χ^2 test, a Fisher's exact test or Mann-Whitney U test were applied where appropriate. Analysis of survival was calculated according to Kaplan-Meier and the levels of significance were tested with a log-rank test. Differences were considered significant at $p < 0.05$.

