

Radical Distal Pancreatectomy with En Bloc Resection of the Celiac Artery, Plexus, and Ganglions for Advanced Cancer of the Pancreatic Body: A Preliminary Report on Perfect Pain Relief

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ABSTRACT

Objective The purpose of this study was to report the effect of radical distal pancreatectomy with en bloc resection of the celiac artery, plexus, and ganglions for locally advanced cancer of the pancreatic body on intractable abdominal and/or back pain and to explore the histopathologic mechanism of this pain.

Patients Five patients with pancreatic body cancer involving the celiac and/or common hepatic artery underwent this radical surgery intended to cure the cancer.

Design A retrospective analysis was performed.

Main outcome measures Surgical magnitude, postoperative pain control, postoperative outcome, and histopathologic findings were studied.

Results Arterial reconstruction, gastrointestinal reconstruction, and blood transfusions were unnecessary. The organ deficit was limited to the distal pancreas, spleen and left adrenal gland. There was no postoperative mortality. Postoperative complications occurred in four patients, who were successfully managed with

medical treatment. This led to prolonged hospital stays. The intractable preoperative abdominal and/or back pain was completely relieved immediately after surgery in all patients. Perfect pain control has been maintained from surgery to the last follow-up. Histopathologic examination of the surgical specimens revealed cancer invasion of the celiac plexus in all patients.

Conclusions This operation offers not only disease radicality but also perfect pain relief. The survival benefit has not yet been fully defined.

INTRODUCTION

Carcinoma of the body of the pancreas is often discovered at an advanced stage after the patient has developed abdominal and/or back pain, or a palpable abdominal mass. This can be explained by the fact that carcinoma in the pancreatic body does not cause jaundice, which could indicate the presence of a relatively early tumor of the head of the pancreas. Pancreatic body carcinomas are considered unresectable when associated with intractable abdominal and/or back pain because the celiac and hepatic arteries are involved in most of these patients

[1]. Intractable pain is always progressive and resistant to various modalities of pain control. Consequently, intractable pain results in a poor quality of life in the short survival period. Distal pancreatectomy with en bloc resection of the celiac and common hepatic arteries and the surrounding nerve tissues such as the celiac plexus and ganglions has recently been advocated as a radical resection for advanced carcinoma of the body of the pancreas [2, 3, 4]. In this operation, the arterial supply to the liver and stomach is maintained via the pancreatoduodenal arcades from the superior mesenteric artery [5]. This procedure has made complicated arterial reconstruction unnecessary. Furthermore, the whole gastrointestinal tract is preserved, unlike the original Appleby procedure involving total gastrectomy for gastric cancer [5]. It is associated with low morbidity and mortality, and has resulted in long-term survival in selected patients [2, 3]. However, there has been only one case report of the use of this procedure in a patient with intractable pain [4]. The purpose of this study was to report the effect of this radical resection on the intractable pain associated with advanced cancer of the pancreatic body. In addition, the mechanism of the intractable pain was examined histologically.

METHODS

Between 1997 and 2000, five patients with carcinoma of the body of the pancreas causing intractable abdominal and/or back pain

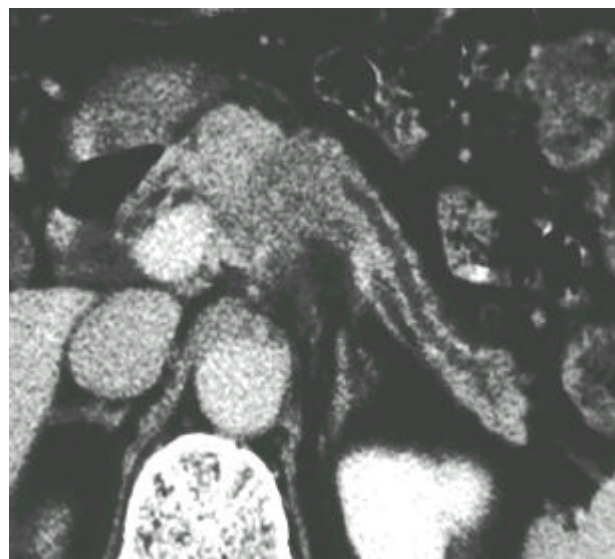


Figure 1. A preoperative contrast-enhanced CT showing a mass in the pancreatic body with retroperitoneal invasion. The distal pancreatic duct is dilated (Case 4).

underwent the radical resection intended to cure the cancer. No radiotherapy or chemotherapy was employed. The tumors had a median diameter of 55 mm (ranging from 45 to 70 mm). Retroperitoneal invasion was noted on preoperative computed tomography in all patients (Figure 1) and one of them (Case 1) had a finding of adrenal involvement. Encasement of the celiac, common hepatic and/or splenic arteries was found in all patients on preoperative arteriography. However, they had no hepatic, peritoneal, or para-aortic metastasis and no involvement of the superior mesenteric artery.

All five patients complained of continuous, severe preoperative abdominal pain. Two patients (Cases 4 and 5) also had back pain. A

Table 1. Patient characteristics

	Age/Sex	Tumor size (mm)	Symptom	Preoperative analgesics	Pain control
Case 1	76/F	45	Severe abdominal pain, body weight loss	Morphine sulfate 20 mg/day (per os)	Poor
Case 2	63/M	70	Severe abdominal pain, body weight loss	Diclofenac Na 150 mg/day (suppository)	Poor
Case 3	67/M	45	Severe abdominal pain	Diclofenac Na 150 mg/day (suppository)	Poor
Case 4	64/M	55	Back and abdominal pain	Diclofenac Na 150 mg/day (suppository)	Fair
Case 5	60/M	55	Back and abdominal pain	Diclofenac Na 75mg/day (per os)	Fair

Table 2. Results of radical distal pancreatectomy with en bloc resection of the celiac artery, celiac plexus, and celiac ganglions.

	Major vessels resected	Operative time (min)	Blood loss (mL)	Postoperative complications	Postoperative hospitalization (days)	Pain control	Follow-up period (months)	Outcome
Case 1	CA, CHA, LGA, IMV, PVw, LRV	545	690	Gastric ulcer, delayed gastric emptying	45	Immediate, complete	12	Died of hepatic recurrence
Case 2	CA, CHA, LGA, IMV, PVw	445	969	Gastric ulcer	70	Immediate, complete	15	Died of retroperitoneal recurrence
Case 3	CA, CHA, LGA, IMV, RHAr	405	532		45	Immediate, complete	8	Died of retroperitoneal recurrence
Case 4	CA, CHA, LGA, IMV, PVs	458	985	Pancreatic fistula	55	Immediate, complete	4	Died of ileus
Case 5	CA, CHA, LGA, IMV, PVw	504	821	Diarrhea	52	Immediate, complete	11	Alive without recurrence

CA, celiac axis; CHA, common hepatic artery; LGA, left gastric artery; IMV, inferior mesenteric vein; PVw, portal vein resection); PVs, portal vein (sleeve resection); LRV, left renal vein; RHAr, replaced right hepatic artery

weight loss of more than 10 kg was noted in two patients (Cases 1 and 2). Diclofenac sodium was used for pain control by all of the patients. One of the patients (Case 1) also used oral morphine. However, there was not enough time left before surgery to increase the dosage or to change the analgesics. The pain was poorly controlled in three patients (Table 1).

In all patients, complete macroscopic tumor removal was achieved by distal pancreatectomy with en bloc resection of the celiac artery, common hepatic artery, left gastric artery, celiac plexus, bilateral celiac ganglions, ventral half of the nerve plexus around the superior mesenteric artery, paraaortic lymph nodes, diaphragmatic crus, and left adrenal gland (Figure 2). Combined resection of the major vessels such as the portal vein, left renal vein, and inferior mesenteric vein was required. The whole alimentary tract including the stomach was preserved.

A retrospective analysis was performed regarding the surgical magnitude, postoperative pain control, postoperative outcome, and histopathologic findings.

ETHICS

Informed consent was obtained from each patient.

STATISTICS

Descriptive statistics were used. Data are reported as median and range values.

RESULTS

The median operative time was 458 min (range: 405 to 545 min). The median blood loss was 821 mL (range: 532 to 985 mL) (Table 2). No

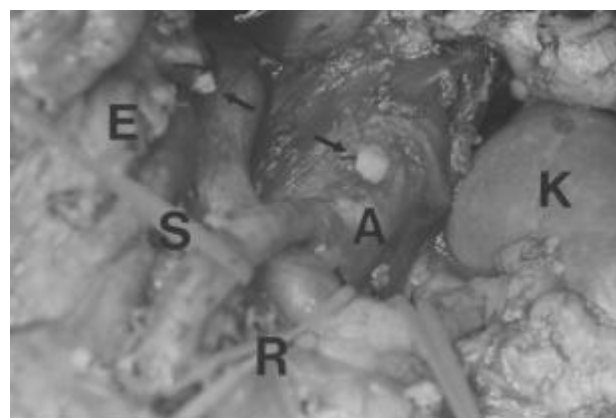


Figure 2. An operative photograph taken after the resection (Case 3). Complete removal of the tumor is achieved by distal pancreatectomy with en bloc resection of the celiac, common hepatic, and left gastric arteries, the celiac plexus and ganglions, paraaortic lymph nodes, the diaphragmatic crus, and the left adrenal gland. Arrows indicate the stumps of the celiac artery and the common hepatic artery. The superior mesenteric artery (S) and the left renal vein (R) are taped. E: Cut end of the pancreas; A: Aorta; K: Left kidney.

blood transfusions were administered. There was no postoperative mortality. Postoperative complications were noted in four of five patients. All were managed medically (Table 2). Postoperative diarrhea was well controlled in four patients with loperamide hydrochloride (2-6 mg/day). Only one patient (Case 5) required opium. Glucose tolerance was not affected in any of the patients. The median postoperative hospital stay was 52 days (range: 45 to 70 days). Intractable abdominal and/or back pain was completely relieved immediately after surgery in all patients. None of the patients required analgesics at the time of discharge from the hospital. Excellent pain control continued until death in the three patients (Cases 1, 2, and 3) who died of tumor recurrence 8 to 15 months after surgery and in the patient (Case 4) who died of ileus. In the patient who is still alive (Case 5), it also continued until the last follow-up which was carried out 11 months after surgery. The postoperative performance status (PS) was also maintained at 0-1 in all patients.

Histopathologic examination of the surgical specimens revealed all surgical margins including the retroperitoneum were negative. According to the UICC/AJCC staging system, all patients had stage IVA tumors: 3 patients had G2 (moderately differentiated) and 2 patients had G3 (poorly differentiated) carcinoma, respectively. Lymphatic permeation of cancer cells was found in all patients and venous invasion in 3 patients. Notable perineural infiltration extending to the celiac plexus was shown in all patients. In the patient with the most severe pain (Case 1), neural invasion extended into the celiac ganglion.

DISCUSSION

Intractable abdominal and/or back pain due to advanced pancreatic carcinoma severely compromises the quality of life during the short survival period. Medical treatment with anti-inflammatory agents and narcotics is often unsuccessful. Celiac plexus block has been used where medical treatment has failed [6, 7].

New techniques including intrathecal morphine administration via a subcutaneous pump [8] and thoracoscopic splanchnicectomy [9, 10, 11] have been used with more success. However, complete pain relief is difficult to achieve. In our patients, complete and continued pain relief was achieved following radical distal pancreatectomy with en bloc resection of the celiac artery for advanced cancer of the pancreatic body.

Pancreatic adenocarcinoma frequently involves nervous tissue and spreads along nerve fibers [12, 13]. We confirmed this showing nervous tissue involvement extending in an extrapancreatic direction from the primary lesion to the celiac plexus and celiac ganglions in patients with intractable abdominal and/or back pain. This strongly suggests that cancer involvement of the celiac plexus or celiac ganglions results in intractable pain. Because radical distal pancreatectomy with en bloc resection of the celiac artery includes complete removal of the celiac plexus and celiac ganglions as well as the retroperitoneal tissues, it is understandable that the operative procedure results in excellent pain control. Although the rate of cure of pancreatic body cancer after this operation has not been determined, some long-term survivors have been reported [2, 3].

The extensiveness of this operative procedure is significant. However, all patients who underwent the procedure survived. Complicated resections of great vessels were required, but arterial reconstruction was not necessary. Although the operative time was long, the low blood loss obviated the need for blood transfusions. Preservation of the entire stomach made gastrointestinal reconstruction unnecessary. Arterial supply to the stomach was maintained by the right gastroepiploic and the right gastric arteries via the pancreatoduodenal arcades from the superior mesenteric artery. Gastric preservation reduced the organ deficit to only the distal pancreas, spleen, and left adrenal gland. Postoperative complications were common, but were controllable with medical treatment. Acceptable surgical magnitude, minimal organ deficit and

excellent pain control support the use of this procedure as a radical resection in patients with advanced cancer of the pancreatic body. In fact, Kimura [4] has reported successful social rehabilitation with the disappearance of back pain in a patient who underwent this procedure. However, the long postoperative hospital stay must be shortened by reducing the morbidity, particularly in light of the short survival period. In conclusion, radical distal pancreatectomy with en bloc resection of the celiac artery, celiac plexus, and celiac ganglions can provide patients having locally advanced cancer of the pancreatic body with complete and enduring pain relief. Long-term studies of large numbers of patients will be necessary to define the survival benefit of this procedure.

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Key words Celiac Plexus; Ganglia, Sympathetic; Hepatic Artery; Pain, Intractable; Pancreatic Neoplasms; Surgery

Abbreviations PS: performance status

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References

1. Kelsen DP, Portenoy R, Thaler H, Tao Y, Brennan M. Pain as a predictor of outcome in patients with operable pancreatic carcinoma. *Surgery* 1997; 122:53-9. [97369427]

2. Ozaki H, Kinoshita T, Kosuge T, Yamamoto J, Shimada K, Inoue K, et al. An aggressive therapeutic approach to carcinoma of the body and tail of the pancreas. *Cancer* 1996; 77:2240-5. [96224888]
3. Mayumi T, Nimura Y, Kamiya J, Kondo S, Nagino M, Kanai M, et al. Distal pancreatectomy with en bloc resection of the celiac artery for carcinoma of the body and tail of the pancreas. *Int J Pancreatol* 1997; 22:15-21. [98048261]
4. Kimura W, Han I, Furukawa Y, Sunami E, Futakawa N, Inoue T, et al. Appleby operation for carcinoma of the body and tail of the pancreas. *Hepatogastroenterology* 1997; 44:387-93. [97307316]
5. Appleby LH. The coeliac axis in the expansion of the operation for gastric carcinoma. *Cancer* 1953; 6:704-7.
6. Caratozzolo M, Lirici MM, Consalvo M, Marzano F, Fumarola E, Angelini L. Ultrasound-guided alcoholization of celiac plexus for pain control in oncology. *Surg Endosc* 1997; 11:239-44. [97236728]
7. Wiersema MJ, Wiersema LM. Endosonography-guided celiac plexus neurolysis. *Gastrointest Endosc* 1996; 44:656-62. [97133658]
8. Gilmer-Hill HS, Boggan JE, Smith KA, Frey CF, Wagner FCJr, Hein LJ. Intrathecal morphine delivered via subcutaneous pump for intractable pain in pancreatic cancer. *Surg Neurol* 1999; 51:6-11. [99135587]
9. Takahashi T, Kakita A, Izumika H, Iino Z, Furuta K, Yoshida M, et al. Thoracoscopic splanchnicectomy for the relief of intractable abdominal pain. *Surg Endosc* 1996; 10:65-8. [96263789]
10. Barthes FLP, Chapuis O, Riquet M, Cuttat JF, Peillon C, Mouroux J, et al. Thoracoscopic splanchnicectomy for control of intractable pain in pancreatic cancer. *Ann Thorac Surg* 1998; 65:810-3. [98186449]
11. Ihse I, Zoucas E, Gyllstedt E, Lillo-Gil R, Andren-Sandberg A. Bilateral thoracoscopic splanchnicectomy: effects on pancreatic pain and function. *Ann Surg* 1999; 230:785-91. [20081679]
12. Takahashi T, Ishikura H, Motohara T, Okushiba S, Dohke M, Katoh H. Perineural invasion by ductal adenocarcinoma of the pancreas. *J Surg Oncol* 1997; 65:164-70. [97380125]
13. Zhu Z, Friess H, Di Mola FF, Zimmermann A, Graber HU, Korc M, et al. Nerve growth factor expression correlates with perineural invasion and pain in human pancreatic cancer. *J Clin Oncol* 1999; 17:2419-28. [20030034]