

A STUDY ON POSTOPERATIVE MORTALITY AND MORBIDITY AFTER PANCREATODUODENECTOMY

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ABSTRACT : The early postoperative results of pancreatoduodenectomy performed in our institute during the last 20 years were reviewed, dividing the cases into two groups, from 1970 to 1979 and from 1980 to 1989.

Among a total of 136 pancreatoduodenectomies, 52 were performed in the earlier decade and 84 in the latter decade. Patients were significantly older in the latter than in the earlier decade. In the earlier decade, postoperative complications developed in 28.8% of the patients with a 19.2% overall mortality rate. In the latter decade, the complications occurred in 27.4% with a 6.0% mortality rate. There was a significant decrease in overall mortality rate between the two decades. The most common complication was the dehiscence of pancreatojejunoostomy, but life-threatening major leakage was decreased. It was considered that recent improvements in surgical techniques and intraoperative and perioperative management contributed to the improvement of the results of this procedure. However, continuing efforts are needed to reduce the morbidity rate, which remains high.

INTRODUCTION

Pancreatoduodenectomy is accepted as a standard operation for malignant lesions in the area of the head of the pancreas. The main disadvantage of this procedure is said to be a high postoperative mortality and morbidity rate due to the fact that it is one of the most intricate and difficult procedures in surgery of the gastrointestinal tract¹⁻³⁾. It has been reported, however, that recent improvements in surgical

techniques and intraoperative and perioperative management have reduced the risk of failure of pancreatoduodenectomy⁴⁻⁶⁾. To confirm this trend in our series, the early postoperative results of pancreatoduodenectomy performed in our institute during the last 20 years were reviewed.

PATIENTS AND METHODS

Between January 1970 and December 1989, 136 patients underwent pancreatoduodenectomy at

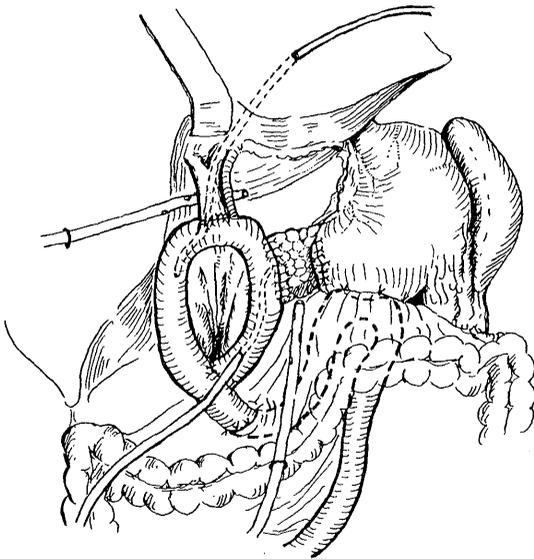


Fig. 1. Our method of reconstruction after pancreatoduodenectomy. Note the P-loop jejunal limb.

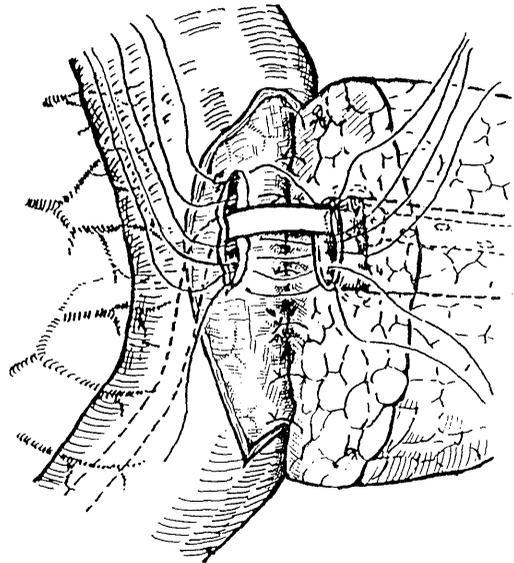


Fig. 2 b. Pancreatojejunostomy in the latter decade. When the duct is dilated, duct-to-jejunal mucosa anastomosis is performed.

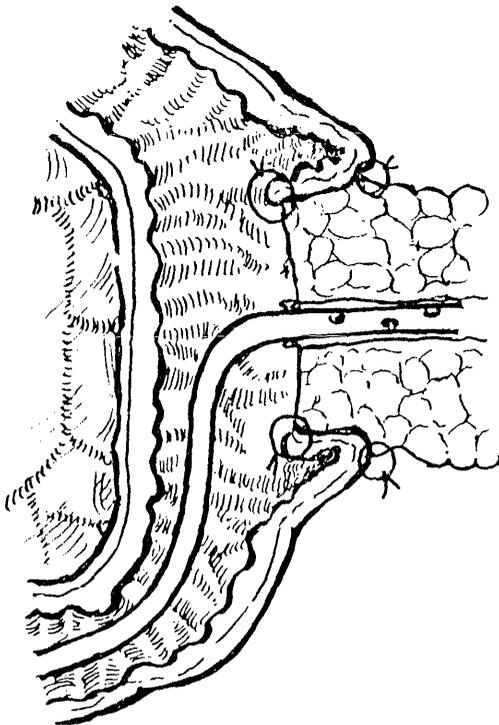


Fig. 2 a. Pancreatojejunostomy in the earlier decade. Note that the cut stump of the pancreas is invaginated into the jejunal lumen, and that the decompression tube does not have a knot.

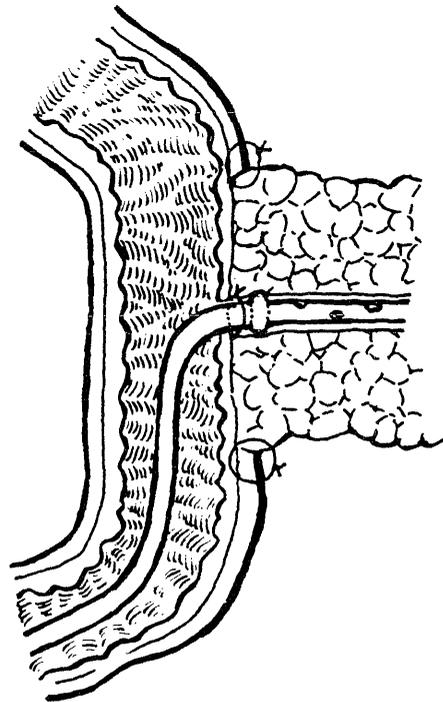


Fig. 2 c. Pancreatojejunostomy in the latter decade. When the duct is normal in size, duct-to-jejunal anastomosis is not performed. Note the presence of a knot and holes on the decompression tube.

the Second Department of Surgery, Nagasaki University School of Medicine. The mean age was 61.5 years, ranging from 30 to 84. There were 81 males and 55 females. The patients were divided into two groups on the basis of decades, that is, from 1970 to 1979 and from 1980 to 1989, to elucidate the trends in mortality and morbidity rate after operation. In each group, age, surgical indications, postoperative complications, mortality rate in hospital, 30-day mortality rate, treatment of the complications and preoperative laboratory data were analyzed.

Our standard method of pancreatoduodenectomy was described elsewhere^{7,8)}. Briefly, the resection is done in the usual manner and the reconstruction is a modification of Child's method as shown in **Figure 1**. New methods of anastomosis between the remaining pancreas and the jejunum were done in the latter decade. One was a change in the anastomotic procedure itself and the other a change in the decompression tube. In the earlier decade, the whole cut stump of the remaining pancreas was invaginated in the jejunal lumen (**Fig. 2a**), but in the latter decade, the duct-to-jejunal mucosa anastomosis was employed (**Fig. 2b**). A silastic plastic catheter without a knot was used for decompression of the remaining pancreatic duct in the earlier decade (**Fig. 2a**), while in the latter decade a knot was made 5cm from the tip of the catheter to prevent the tube from sliding out of the pancreatic duct (**Fig. 2b**). When the duct-to-jejunal mucosa anastomosis was ruled out, the tube was simply ligated with the

pancreatic duct using absorbable purse-string suture (**Fig. 2c**). There were no holes in the catheter on the jejunal side of the knot. In these cases, pancreatic juice was drained totally to the outside of the body. Eighty patients with obstructive jaundice, that is, those in whom total bilirubin was more than 10mg/dl, underwent preoperative biliary drainage. Chi-squared test and Student t-test were used for statistical analysis of the data.

RESULTS

The 52 patients undergoing surgery in the earlier decade had a mean age of 57.6 years, while the 84 patients in the latter decade had a mean age of 64.1. The patients in the latter were significantly older than those in the earlier decade ($p < 0.01$).

The indications for pancreatoduodenectomy are summarized in **Table 1** for each decade. The total number of patients in the latter decade was higher because the resection of bile duct carcinoma and pancreatic carcinoma increased.

Postoperative complications developed in 38 of 136 patients (27.9%) during the 20 year period (**Fig. 3**). Fifteen patients died in hospital after operation, and the overall mortality rate was 11.0%. Nine of these patients died within 30 days after surgery, showing a 30-day mortality rate of 6.6%. In the earlier decade, postoperative complications developed in 15 patients (28.8%). The overall mortality rate was 19.2% (10 patients) and the 30-day mortality rate was 11.5%. In the

Table 1. Indications for pancreatoduodenectomy in the 136 patients

Diagnosis	Number of Patients			Total
	Total (n=136)	1970-1979 (n=52)	1980-1989 (n=84)	
Carcinoma of the:				
Bile duct	40	14	26	
Ampulla	36	22	14	
Pancreas	33	7	26	
Stomach	5	2	3	
Duodenum	4	2	2	
Gallbladder	3	0	3	
Colon	1	0	1	122
Chronic pancreatitis	9	4	5	
Benign duodenal tumor	2	0	2	
Others	3	1	2	14

latter decade, complications occurred in 23 patients (27.4%) and 5 of whom died, indicating an overall mortality rate and 30-day mortality rate of 6.0% 3.6%, respectively. There was a significant decrease in overall mortality rate from the earlier to the latter decade ($p < 0.02$).

Table 2 shows the incidence and overall mortality rate by each complication. The most common complication in both decades was dehiscence of pancreateojejunostomy. The incidence did not change from the earlier to the latter decade. However, major leakage, which often causes a fatal outcome, decreased from 50% to 17%, although the decrease was not statistically significant. Other major life-threatening complications were bile leakage and liver failure.

The dehiscence of pancreateojejunostomy was also analyzed according to disease (**Table 3**). Patients with carcinoma of the head of the pancreas showed a lower incidence of dehiscence of pancreateojejunostomy than patients with carcinoma of other sites or benign disease.

Management and prognosis of patients with dehiscence of pancreateojejunostomy is shown in **Figure 4**. All 5 patients who developed major leakage of pancreatic juice died due to gastrointestinal and/or intra-abdominal bleeding, followed by multiple organ failures. All except

one of 13 patients with minor leakage were cured by conservative treatment only. The conservative treatment during the last 7 years included nutritional support by means of total parenteral nutrition and H2-blocker for gastrointestinal bleeding. In the earlier decade, total parenteral nutrition was not employed extensively and H2-blocker was not used at all.

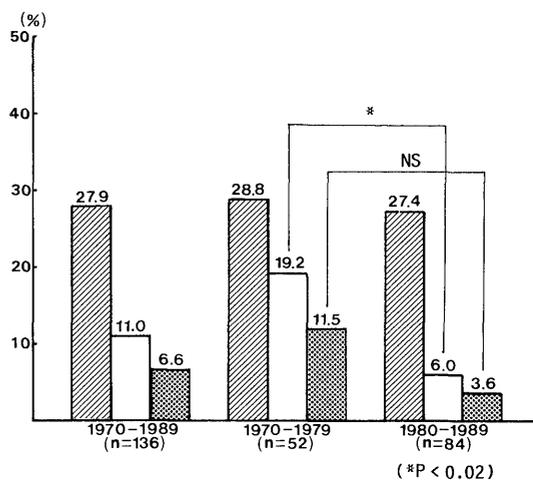
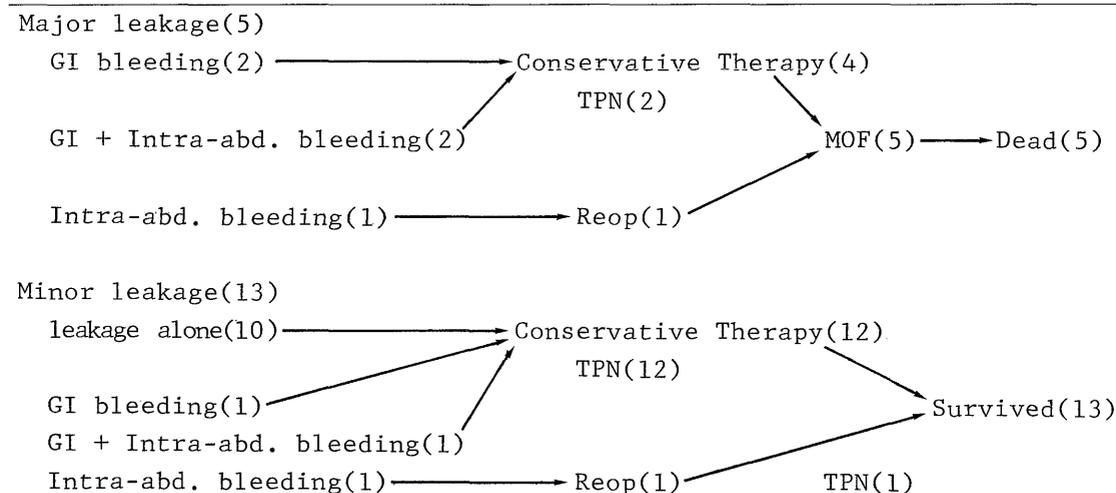


Fig. 3. Morbidity, overall mortality and 30-day mortality rates in the total period and each decade. Morbidity rate, overall mortality rate and 30-day mortality rate.



(): Number of patients, GI bleeding: Gastrointestinal bleeding, Intra- abd.: Intra-abdominal, Reop: Reoperation, TPN: Total parenteral nutrition.

Fig. 4. Management and prognosis in the event of dehiscence of pancreateojejunostomy.

Table 2. Various postoperative complications and respective mortality rates

	Number of patients (%)			Mortality rate % []	
	total (n=136)	1970-1979 (n=52)	1980-1989 (n=84)	1970-1979	1980-1989
Dehiscence of pancreatojejunostomy	18 (13.2)	6 (11.5)	12 (14.3)	50 [3/6]	17 [2/12]
major leakage	5	3	2	100 [3/3]	100 [2/2]
minor leakage	13	3	10	0 [0/3]	0 [0/10]
Dehiscence of CJS	4 (2.9)	2 (3.8)	2 (2.4)	100 [2/2]	0 [0/2]
Liver failure	3 (2.2)	2 (3.8)	1 (1.2)	100 [2/2]	100 [1/1]
GI bleeding	2 (1.5)	1 (1.9)	1 (1.2)	100 [1/1]	0 [0/1]
Intra-abdominal abscess	2 (1.5)	1 (1.9)	1 (1.2)	0 [0/1]	0 [0/1]
Pneumonia	2 (1.5)	1 (1.9)	1 (1.2)	0 [0/1]	100 [1/1]
Intra-abdominal bleeding	1 (0.7)	0 (0)	1 (1.2)	0 [0/0]	0 [0/1]
Others	6 (4.4)	2 (3.8)	4 (4.8)	100 [2/2]	25 [0/4]
Total	38 (27.9)	15 (28.8)	23 (27.4)		

n : number of patients [] : number of patients
 GI bleeding : Gastrointestinal bleeding
 CJS : Cholangiojejunostomy

Table 3. Incidence of dehiscence of pancreatojejunostomy and mortality rate according to disease

Diagnosis	No. of Cases with Dehiscence			Incidence	Mortality rate (%)
	Total (n=136)	1970-1979 (n=52)	1980-1989 (n=84)		
Carcinoma of the:					
Head of the pancreas	2/33	0/7	2/26	6.1%	0 (0)
Ampulla of Vater	5/36	3/22	2/14	13.9%	2 (5.6)
Terminal common bile duct	7/40	1/14	6/26	17.5%	2 (5.0)
Other sites	2/13	1/4	1/9	15.4%	1 (7.7)
Chronic pancreatitis	1/9	1/4	0/5	11.1%	0 (0)
Other benign diseases	1/5	0/1	1/4	20.0%	0 (0)

Preoperative laboratory data such as red blood cell count, serum total protein, albumin, total bilirubin, choline esterase, SGOT and total cholesterol are shown in **Table 4** for the patients with and without complications. There was no significant differences in any of the data.

Table 4. Preoperative laboratory data

Items	Complications (-) (N=98)	Complications (+) (N=38)
RBC ($\times 10^6/\mu\text{l}$)	370 \pm 69	409 \pm 42
TP (g/dl)	6.8 \pm 0.7	6.9 \pm 0.7
Alb. (g/dl)	3.5 \pm 0.6	4.0 \pm 0.5
T. Bil (mg/dl)	7.5 \pm 6.4	7.1 \pm 7.2
Ch-E ($\Delta\text{pH/h}$)	0.61 \pm 0.14	0.64 \pm 0.28
SGOT (IU/L)	55.6 \pm 35.8	66.2 \pm 33.8
T. Chol. (mg/dl)	203.7 \pm 75.8	191.5 \pm 104.0

(mean \pm SD)

N : Number of patients, Alb. : Albumin, T. Bil : Total bilirubin, Ch-E : Choline esterase, T. Chol : Total cholesterol

DISCUSSION

The patients undergoing pancreatoduodenectomy were significantly older in the latter decade than in the earlier decade in our department. Moreover, in the latter decade, resection was performed on patients with more advanced stages of the carcinoma of the head of the pancreas, which had been considered unresectable in the earlier decade.

The present study, however, revealed a significant reduction in overall mortality rate from the earlier to the latter decade. We confirmed that pancreatoduodenectomy can be performed with a postoperative mortality rate of approximately 6%, similar to that reported in other series⁹⁻¹².

The morbidity rate still remains high. The main postoperative complication was dehiscence of pancreatojejunostomy, which occasio-

nally resulted in death due to intra-abdominal hemorrhage or abscess followed by multiple organ failures. The frequency of dehiscence with major leakage of pancreatic juice, however, decreased in the latter decade. The decrease was not statistically significant because of the small number of patients suffering dehiscence of pancreatojejunostomy. The decrease of major leakage was accomplished by performing a duct-to-jejunal mucosa anastomosis between the remaining pancreas and jejunum¹¹⁾, and by using a different kind of decompression tube in the pancreatic duct. Duct-to-jejunal mucosa anastomosis is easier in patients with carcinoma of the head of the pancreas than in patients with a normal pancreas, because the pancreas is hardened and the duct is dilated. This could account for the fact that the incidence of dehiscence of pancreatojejunostomy was lower in patients with carcinoma of the head of the pancreas than in patients with carcinoma of other sites. In patients with a normal-sized pancreatic duct, duct-to-jejunal mucosa anastomosis is difficult. It is sufficient to insert a purse-string sutured decompression tube into the jejunal lumen with addition of anastomosis between the pancreatic parenchyma and seromuscular layer of the jejunum. There are no holes in the catheter on the jejunal side, resulting in total drainage of pancreatic juice outside the body in these cases.

Total parenteral nutrition (TPN) was used extensively in the postoperative management of the patients in the latter decade. TPN enhances the nutritional condition of the patients, contributing to anastomotic healing. Moreover, TPN cured minor leakage from the pancreatojejunostomy in conjunction with adequate drainage of the abdominal cavity in almost all patients. The drains inserted at the time of operation were used when anastomotic leakage occurred. A silastic or Penrose drain should be inserted with great care close to each anastomotic site.

Continuing efforts are needed to improve the surgical results of pancreatoduodenectomy, especially to reduce the high morbidity rate.

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