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Original Articles

Postoperative Complications and Survival After Pancreatoduodenectomy in Patients Aged over 70 Years

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Abstract: An analysis of postoperative complications and survival was conducted in 31 patients undergoing pancreatoduodenectomy (PD) for carcinoma of the pancreas or periampullary carcinoma. Of them, 11 were over 70 years of age and 20 were under 70. Anastomotic leakage was the most common complication after PD. Definite pancreatic leakage was found in one patient in the over 70 group, and one case each of pancreatic, biliary, and gastric leakage were found in the under 70 group. All complications were treated conservatively without any further operative intervention. The overall morbidity rate was 41.9% (13/31), being 45.5% (5/11) in the over 70 group and 40.0% (8/20) in the under 70 group, and no operative deaths occurred within 30 days after surgery. The cumulative survival rate of the patients aged over 70 years with carcinoma of the pancreas or periampullary carcinoma did not differ significantly from the rate of those under 70. It was thus concluded that PD achieves an adequate prognosis and survival in patients over 70 years of age.

Key Words: periampullary carcinoma, pancreatoduodenectomy, geriatric surgery

Introduction

According to 1989 statistics, the average lifespan in Japan has increased to 75.5 years for males and 81.3 years for females, making this country one of the most rapidly graying nations in the world. As a result, geriatric surgery performed on patients over 70 years of age has increased threefold when compared with just 10 years ago.[1] In this category of surgery, pancreatoduodenectomy (PD) is not uncommon because 80% of carcinoma of the pancreas and the periampullary region occurs in patients aged 60–80 years.[2]

However, it is well known the elderly do not generally tolerate surgical intervention well because of diminished cardiovascular, pulmonary, and renal function. As a natural corollary, the frequency of postoperative complications is higher in such patients than in the young.[3,4]

An analysis of postoperative complications and survival was conducted on patients aged over and under 70 years of age who underwent PD for carcinoma of the pancreas or periampullary carcinoma to evaluate the indications for this procedure in elderly patients.

Patients and Methods

Subjects

The subjects consisted of 51 patients with carcinoma of the pancreas and 19 with periampullary carcinoma (12 with carcinoma of the distal common bile duct and 7 with carcinoma of the ampulla of Vater). The subjects were selected from among the patients treated at Fukui Medical School Hospital between its opening in October 1983 and December 1989. Of the 51 patients with carcinoma of the pancreas, 18 (35.3%) underwent a tumor resection (15 had PD and 3 had total pancreatectomy), while the remaining 33 were unresectable due to locally advanced carcinoma. On the other hand, among the 12 patients with carcinoma of the distal common bile duct and the 7 patients with ampullary carcinoma, PD was performed in 10 (83.3%) and 6 (85.7%) cases, respectively.

In this study, 31 PD patients were chosen from these two series (Table 1). None of them had renal, cardiac, respiratory, or hepatic failure and were considered to be suitable for PD in theory.

Eleven patients were over 70 years of age and 20 were under 70 (range: 39–82 years). No operative

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Table 1. Comparison of the groups

Site of tumor	Patient numbers (≧70	<70)	M/F	Age (years)
Pancreas	15 (5	10)	10/5	39–81
Ampulla of vater	6 (2	4)	3/3	51–73
Common bile duct	10 (4	6)	5/5	56–82
Total	31 (11	20)	18/13	39–82

deaths occurred within 30 days after surgery and the patients were followed up until April 1990.

Brief Description of the PD Technique

In most of the patients over 70 years of age, PD including regional lymph node dissection was performed in the same manner as in those under 70 years of age. The pancreas is usually transected at the left margin of the portal vein in PD, while the regional lymphadenectomy extends to the second group of nodes (R_2) in accordance with the Japanese General Rules for Carcinoma of the Pancreas[5] or Biliary Tract.[6] The main blood vessels around the pancreas, especially the portal vein, are resected when portal vein involvement is suspected by preoperative angiography and the operating findings suggest that a resection of these could improve the chances of success for radical surgery. In one patient from each age group the portal vein was resected, and reconstruction was done by end-to-end anastomosis of the superior mesenteric vein to the portal vein.

Pancreaticojejunostomy is the most important part of gastrointestinal reconstruction after PD. This operation is performed by end-to-side anastomosis as a rule, making a selective use of duct-mucosal suture or the duct insertion method depending on the degree of pancreatic duct dilatation. The details of these procedures have already been described.[7]

Statistics

To analyze survival, Student's *t*-test and the generalized Wilcoxon test (G-WLCX) were used for statistical evalution. *P* values of less than 0.05 were regarded as significant.

Results

Postoperative Complications

Anastomotic leakage, especially pancreatic leakage, was the most common complication after PD. Mild pancreatic leakage was defined as the seepage of pancreatic juice or slight exudate from the necrotic pancreatic stump, while definite pancreatic leakage involved the detection of intestinal contents in the drain fluid or a radiological demonstration of leakage from the pancreatojejunal anastomosis. According to the criteria above, mild pancreatic leakage and definite leakage were respectively found in one patient in the over 70 group, while mild and definite pancreatic leakage were noted in one and five of the under 70 group, respectively. Biliary and gastric leakage were also found in one patient each of the under 70 group. Furthermore, pneumonia occurred in one patient and gastric hemorrhage from acute gastric mucosal lesions occurred in two patients in the over 70 group (Table 2). Thus, the overall morbidity rate was 41.9% (13/31), being 45.5% (5/11) in the over 70 group and 40.0% (8/20) in the under 70 group. One patient with pneumonia died 5 months after PD due to multiple organ failure. All of the remaining complications were successfully treated conservatively without any operative intervention. In the two patients with portal vein resection, no complications arising from this procedure were observed, although the patient who eventually died of pneumonia was one of these two. The overall mortality rate associated with PD was 3.2% (1/31).

Table 2. Postoperative complications

Complications	Patient numbers ≧70 years	<70 years
Anastomotic leakage		
Definite pancreatic[a]	1	1
Mild pancreatic[b]	1	5
Biliary		1
Gastric		1
Pneumonia	1	
Gastric hemorrhage	2	
Total	5	8

[a] Defined as the "seepage of pancreatic juice" or a "slight exudate from the necrotic pancreatic stump"
[b] Defined as involving the detection of intestinal contents in the drain fluid or the radiological demonstration of leakage from the pancreatojejunal anastmosis

Survival in Relation to Tumor Site and Curability

Of the 15 patients undergoing resection of carcinoma of the pancreas, a curative operation was able to be performed in seven patients (two in the over 70 group). Six of these, except for one in the under 70 group, had regional lymph node metastases. In the over 70 group, two patients died of metastasis to the liver, one of local recurrence and/or carcinomatous peritonitis, and one died of postoperative pulmonary complications. In the under 70 group two died of metastasis to the liver (a patient with portal vein resection was included in this group) and seven of local recurrence and/or

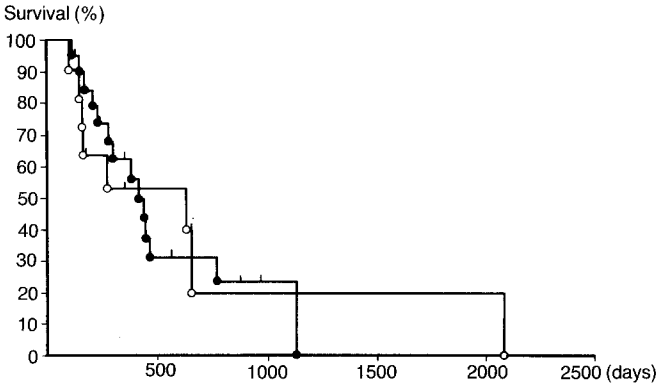

Fig. 1. Cumulative survival after pancreatoduodenectomy (PD) in patients ≥70 (*open circles*, $n = 11$) and <70 years old (*solid circles*, $n = 20$)

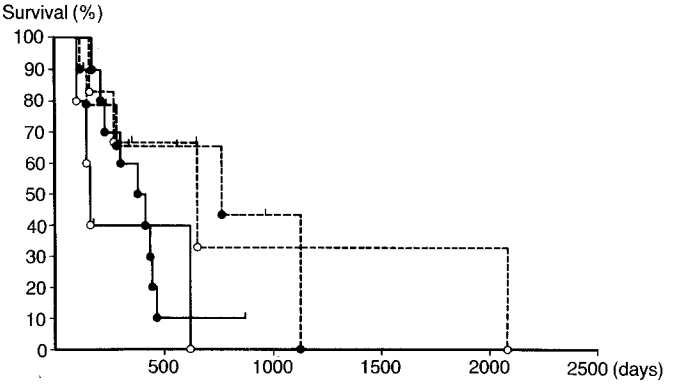

Fig. 2. Cumulative survival after PD in relation to the site of the tumor. *Open circles, solid line*, ≥70 years old, pancreatic carcinoma ($n = 5$); *solid circles, solid line*, <70 years old, pancreatic cancer ($n = 10$); *open circles, dashed line*, ≥70 years old, periampullary carcinoma ($n = 6$); *solid circles, dashed lines*, ≥70 years old, periampullary carcinoma ($n = 10$)

Table 3. Survival period in fatal cases after operation

	Mean ± S.D. (months)	Range (months)	Median (months)
Pancreatic carcinoma			
≥70 years	8.3 ± 8.6[ac]	3.4–20.9	4.2
<70 years	11.2 ± 4.0[ad]	5.3–15.5	13.2
Periampullary carcinoma			
≥70 years	26.2 ± 29.3[bc]	5.0–68.8	13.4
<70 years	16.2 ± 14.7[bd]	4.0–37.5	9.0

No significance for comparison indicated by the paired letter superscript

carcinomatous peritonitis. One patient of each group has survived (for 2 years and 5 months in the under 70 group, and for 6 months in the over 70 group) without any signs of recurrence. On the other hand, of the 16 patients with periampullary carcinoma (i.e., carcinoma of the distal common bile duct and ampulla of Vater), curative surgery was able to be performed in 11 (3 of the over 70 group). Nine of them had no regional lymph node metastases. In the over 70 group, two patients died of metastasis to the liver and local recurrence and two of other diseases at 2 years and 6 months and 5 years and 9 months after PD, respectively. In the under 70 group, three patients died of metastasis to the liver, one of local recurrence and/or carcinomatous peritonitis, and one of other diseases. The remaining seven patients (two in the over 70 group) have survived for periods ranging from 3 months to 2 years and 8 months.

The average survival period in fatal cases after PD was 8.3 ± 8.6 months for the patients aged over 70 with carcinoma of the pancreas and 26.2 ± 29.3 months for the geriatric patients with periampullary carcinoma. In the patients with periampullary carcinoma, the average survival period in eventually fatal cases was longer for the elderly patients, though the difference between the two age groups was not significant (Table 3).

Regarding the cumulative survival rates for carcinoma of the pancreas or periampullary carcinoma, there were no significant differences between the patients over 70 years of age and those under 70 (Fig. 1). When the cumulative survival rate was compared between the two age groups according to the disease, there was no significant difference found between these two diseases (Fig. 2), although patients with periampullary carcinoma tended to live somewhat longer after surgery. Curative operations ironically did not provide any longer survival than non-curative surgery in either age group or for either disease, and the cumulative survival showed no age-related differences.

Discussion

Abdominal surgery on elderly patients has a high risk of postoperative complications and once complications develop, multiple organ failure is likely to ensue.[8,9] Infection generally underlies such multiple organ failure, and since PD patients often undergo several gastrointestinal anastomoses they have a high risk of developing fatal intraperitoneal infections secondary to anastomotic disruption.[10–13]

To reduce the mortality and morbidity of geriatric patients after PD, we feel that the following procedures are required. Nutritional supplementation by intravenous hyperalimentation is necessary both preoperatively and postoperatively. If the patients have severe jaundice, percutaneous transhepatic bile duct drainage must be performed to reduce the

serum bilirubin level to less than 5.0 mg/dl. When performing PD, it is important that a reliable surgical technique with a minimum risk of anastomotic disruption be chosen and undertaken in a skilled manner. Since pancreatic anastomosis has a high risk of stump disruption,[14,15] special provisions, such as temporary drainage of the pancreatic juice should be provided. If pancreatic leakage still occurs, a longer retention of the tube in the pancreatic duct may allow for a spontaneous cure.

With regard to the occurrence of postoperative complications, however, our series showed no significant differences between the under 70 and over 70 age groups regarding the nature and incidence of complications. Furthermore, there were no operative deaths in the patients over 70 years of age, while only one patient (9.1%) died of postoperative complications. This mortality rate after PD is markedly lower than the 20%–33% reported several years previously for pancreatic resection[3,14] and is quite similar to that reported recently.[11,16,17] These results suggest that PD can be performed safely even on the patients over 70 years of age.

As for the prognosis and survival after PD, the cumulative survival rate of patients over 70 years of age with carcinoma of the pancreas and periampullary carcinoma did not significantly differ from that of the patients under 70. Unfortunately curative surgery did not achieve a longer survival in either age group of patients who had either type of carcinoma. This may have been because of the short follow-up period after PD and the long survival of patients aged over 70 years with periampullary carcinoma and the histologically non-curative surgery due to carcinoma cells at the common hepatic duct. However, in the patients with periampullary carcinoma curative surgery had a favorable effect, since all of the patients without lymph node metastasis survived in both age groups, except for those dying of non-cancerous disease.

In conclusion, our study showed that patients over 70 years of age can tolerate PD well and can also survive as long as those under 70 with a good quality of life (as determined by a questionnaire survey). Therefore, PD can be performed on geriatric patients without developing an excessive complication rate and with an adequate prognosis and survival, provided that appropriate perioperative management is carried out.

References

1. Tamakuma S, Mochizuki H, Ono S (1988) Recent aspects of geriatric surgery (in Japanese). Geka Chiryo (Surg Therapy) 58:384–390
2. Cordis L, Cold EB (1984) Epidemiology of pancreatic cancer. World J Surg 8:808–821
3. Obertop H, Bruining HA, Schattenkerk MF, Eggink WF, Jeekel J, Van Houten H (1982) Operative approach to cancer of the head of the pancreas and the peri-ampullary region. Br J Surg 69:573–576
4. Hiramatsu Y, Yamamoto M, Kojima Y, Yamanaka E (1991) Intra- and postoperative fluid management for aged patients (in Japanese). Shokaki Geka (Gastroenterol Surg) 14:51–58
5. Japan Pancreas Society (1986) General rules for cancer of the pancreas, 3rd edn (in Japanese). Kanehara, Tokyo 9–19
6. Japan Society of Biliar Surgery (1986) General rules for surgical and pathological studies on cancer of biliary tract, 2rd edn (in Japanese). Kanehara, Tokyo 13–40
7. Kojima Y, Katayama K, Note M, Shimada H, Nakagawara G (to be published) Pancreaticojejunostomy and pancreatic leakage after pancreaticoduodenectomy. Int Surg
8. Dahn M, Kirkpatrick R, Bouwman D (1980) Sepsis, glucose intolerance, and protein malnutrition. Arch Surg 115:1415–1418
9. Inagaki J, Rodriguez V, Bodey GP (1974) Cause of death in cancer patients. Cancer 33:568–573
10. Warren KW, Choe DS, Plaza J, Relihan M (1975) Results of radical resection for periampullary cancer. Ann Surg 181: 534–540
11. Kairaluoma MI, Kiviniemi H, Stahlberg M (1987) Pancreatic resection for carcinoma of the pancreas and the periampullary region in patients over 70 years of age. Br J Surg 74:116–118
12. Telford GL, Mason GR (1981) Improved technique for pancreaticogastrostomy after ancreaticoduodenectomy. Am J Surg 142:386–387
13. Icard P, Dubois F (1988) Pancreaticogastrostomy following pancreatoduodenectomy. Ann Surg 207:253–256
14. Cooperman AM, Herter FP, Marboe CA, Helmreich ZV, Perzin KH (1981) Pancreatoduodenal resection and total pancreatectomy – An institutional review. Surgery 90:707–712
15. Nakase A, Matsumoto Y, Uchida K, Honjo I (1977) Surgical treatment of cancer of the pancreas and the periampullary region: Cumulative results in 57 institutions in Japan. Ann Surg 185:52–57
16. Shutze WP, Sack J, Aldrete JS (1990) Long-term follow-up of 24 patients undergoing radical resection for ampullary carcinoma, 1953 to 1988. Cancer 66:1717–1720
17. Kairaluoma MI, Stahlberg M, Kiviniemi H, Haukipuro K (1989) Results of pancreatoduodenectomy for carcinoma of the head of the pancreas. Hepatogastoroenterology 36:412–418