

Surgical Palliation for Pancreatic Cancer

The UCLA Experience

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We reviewed the records of 340 patients with a tissue diagnosis of pancreatic cancer treated at UCLA Medical Center between 1973 and 1988. Sixty-one patients underwent pancreatic resection (group I), 173 had some form of surgical palliation (group II), and 106 had neither (group III). The diagnosis was made 1 to 2 months more quickly in the last 8 years of the review than in the first 8 years, but the effect of early diagnosis on curability was negligible. Biliary obstruction was best treated by cholecystojejunostomy or choledochojejunostomy, which were equally effective. Anastomoses to the jejunum were safer and more effective than were those to the duodenum for the relief of biliary obstruction. Gastrojejunostomy should be performed prophylactically as well as therapeutically. It was effective and safe in both settings. Surgical palliation for pancreatic cancer was generally effective and was associated with an operative mortality rate of less than 10%. However morbidity was high, with significant complications occurring in one third of cases.

SINCE PANCREATIC CANCER was first described by Montiere in 1836, the apparent global incidence of the disease has increased three or four times.^{1,2} In the United States in 1990, about 27,000 new cases will be diagnosed. Approximately the same number of patients will die of the disease during that period.³⁻⁵ By the time the diagnosis is made, only 10% to 15% of patients with pancreatic cancer are suitable for possible curative resection.⁶⁻⁸ Consequently 85% to 90% of the patients require some form of palliation. The symptoms that most commonly require relief in patients with pancreatic cancer are jaundice, gastric outlet obstruction, and pain. Opinions vary concerning the best approach to the treatment of these problems, as well as their efficacy.

To shed some light on these issues, we reviewed retrospectively a 16-year experience (1973 to 1988) with the palliation of pancreatic cancer at the University of California, Los Angeles (UCLA).

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Methods

From 1973 to 1988, 340 patients with proved tissue diagnoses of pancreatic ductal adenocarcinoma were treated at UCLA. Other pancreatic tumors (*e.g.*, islet cell tumors, cystadenomas, squamous cell carcinomas) as well as cancers of the distal common bile duct, duodenum, and ampulla of Vater, were excluded from the analysis. The hospital charts of all 340 patients were reviewed. Follow-up to the time of death was available on all patients through the UCLA central tumor registry.

There were 185 male (54.4%) and 155 female (45.6%) patients, with a male to female ratio of 1.2 to 1. The patients' ages ranged from 12 to 88 years (mean, 63 years).

We divided the patients into three groups based on the treatment provided (Table 1).

Group I

These patients ($n = 61$, 31 male and 30 female) underwent pancreatic resections. Their ages ranged from 13 to 84 years (mean, 55.5 years). The most common operation was the Whipple pancreaticoduodenectomy (49 patients). Eleven of these were pylorus-preserving resections. Total pancreatectomy and distal pancreatectomy with splenectomy were performed in six patients each. This group was further subdivided according to the year in which the patients underwent surgery. Twenty-two patients were treated between 1973 and 1980 (group IA). Thirty-nine patients were treated between 1981 and 1988 (group IB).

Group II

These patients ($n = 173$, 98 male and 75 female) had procedures to relieve obstructive jaundice and/or gastric

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TABLE 1. Procedures Performed for Pancreatic Cancer

Procedure	1973 to 1980	1981 to 1988	Total
Pancreatic resection	22	39	61
Choledochojejunostomy (loop CDJ, 25; Roux-en-Y, 35)	20	40	60
Cholecystojejunostomy (loop CCJ, 48; Roux-en-Y, 26)	25	49	74
Choledochooduodenostomy/ cholecystoduodenostomy	4	12	16
Nonoperative biliary decompression	0	15	15
Gastrojejunostomy alone	2	6	8
Total	73	161	234

outlet obstruction. Their ages ranged from 29 to 85 years (mean, 63 years).

Of the 150 patients who underwent a biliary bypass procedure, 70 (46.7%) also had a gastrojejunostomy performed at the same time. Only eight patients had a gastrojejunostomy without a biliary bypass. Of the 173 patients, 22 (12.7%) had recently undergone a bypass procedure at another hospital before being referred to UCLA. For such patients further surgery at UCLA was limited to revision of the previous bypass procedure. This group was also further subdivided according to the year when the patients underwent surgery. Fifty-one patients were seen between 1973 and 1980 (group IIA). One hundred twenty-two patients were seen between 1981 and 1988 (group IIB).

Group III

The patients in this group (n = 106, 56 male and 50 female) had neither resection nor bypass. Their ages ranged from 37 to 88 years (mean, 65 years). Most of them (n = 71) underwent a laparotomy but only a tissue biopsy was performed. This was because at the time of the operation there was no evidence of biliary or gastric outlet obstruction requiring bypass. The remaining patients (n = 35) in this group were not operated on for a variety of reasons (e.g., advanced age, widespread disease, general ill health, lack of symptoms, patient refusal). In these patients tissue diagnoses were based on percutaneous biopsy of the pancreatic mass or liver metastases, or by biopsy of easily accessible metastatic deposits elsewhere (e.g., in the skin). This group was also subdivided according to the year in which the patients came to the hospital. Fifty patients were seen between 1973 and 1980 (group IIIA). Fifty-six were seen between 1981 and 1988 (group IIIB).

In all the groups, the patient's age and sex, symptoms, the interval between the onset of the symptoms and the diagnosis, and the length of survival were determined. In groups I and II a number of factors related to jaundice were compared. These included preoperative serum bili-

rubin level (highest level and its duration), functional status of the liver, operative mortality (within 30 days of the operation or before discharge from the hospital) and morbidity, the effectiveness of the operative procedure in relieving jaundice clinically (disappearance of color) and biochemically (return of serum bilirubin to normal levels), and the incidence of recurrent jaundice.

In the 80 patients in group II (80 of 150; 53.3%) who underwent biliary bypass alone at their first operation, the incidence of later symptoms of gastric outlet obstruction was determined. Similarly the efficacy, mortality, and morbidity of a gastrojejunostomy performed either alone or with a biliary bypass were assessed. Cholecystojejunostomy (CCJ) and choledochojejunostomy (CDJ) also were compared in regard to efficacy, operative mortality, operative morbidity, recurrence of jaundice, and survival rates. Finally subgroups IA, IIA, IIIA were compared to subgroups IB, IIB, and IIIB to see if the diagnosis was established any sooner in the more recent time period. The effects on survival were analyzed.

Results

The presenting symptoms, their duration, and patient characteristics are summarized in Table 2. Jaundice without pain was seen in only 19% and 19.8% of patients in groups I and II, respectively. Jaundice with pain was seen in 68.9% and 67% of patients in groups I and II, respectively. However in group III, jaundice was infrequent. It was seen in association with other symptoms at some stage of the disease in only 6.6% of cases. Moderate to severe pain, either alone or with other symptoms, was seen in 60.6% and 71.1% of patients in groups I and II, respectively. In group III pain was the chief complaint. It was present in 84% of the patients. Although nausea was seen in the majority of cases, vomiting was unusual. It was seen as the principal symptom in only 3% of the patients in group II and 2% of those in group III.

The diagnosis was made more quickly after the onset of symptoms in two of the groups in the later study period (1981 to 1988) (Table 2). In group I, although the interval was reduced by 4.1 weeks, the difference was not significant. In group II it was reduced by 5.4 weeks and in group III it was reduced by 8.2 weeks ($p < 0.05$ for each).

Information about liver function is shown in Table 3. Liver function was judged abnormal if the concentration of any one of the enzymes (alkaline phosphatase, SGOT, or SGPT) or the total serum bilirubin level was elevated above normal. The highest bilirubin levels were similar in all three groups. In group IA (1973 to 1980), the highest preoperative bilirubin level was 13.5 mg/dL compared to 6.5 mg/dL in group IB (1981 to 1988) ($p < 0.05$); no such differences were seen in groups II and III. Liver function was normal more often in group IB (48.7%) compared to group IA (31.8%) ($p < 0.05$).

TABLE 2. Symptoms in Pancreatic Cancer

Group	Duration Before Diagnosis (Weeks)	Female	Male	Painless Jaundice Alone	Jaundice + Other Symptoms	Pain Alone or with Other Symptoms	Vomiting Alone or with Other Symptoms
IA	13.7	10	12	6/22 27.3%	17/22 77.3%	13/22 59.1%	0 0
IB	9.6	20	19	6/39 15.4%	25/39 64.1%	24/39 61.5%	0 0
I A + B		30	31	19% 3/51 5.9%	68.9% 36/51 70.6%	60.6% 38/51 74.5%	0 1/51 2.0%
IIA	17.3*	22	29	9/122 7.4%	80/122 65.6%	85/122 69.7%	4/122 3.3%
IIB	11.9*	53	69	19.8% 0 0	67% 4/50 8%	71.1% 44/50 88%	2.9% 1/50 2%
IIA + B		75	98	0 0 0	3/56 5.3%	45/56 80.4%	1/56 1.8%
IIIA	24.1*	23	27	0 0	6.6% 6.6%	84% 84%	1.9% 1.9%
IIIB	15.9*	27	29	0	0	0	0
III A + B		50	56	0	0	0	0

* A versus B $p < 0.05$.

For this and subsequent tables, group I patients are those who underwent pancreatic resections, group II patients are those who had surgical biliary bypass and/or gastric bypass procedures, and group III patients

are those who had only an exploratory laparotomy without bypass or no surgical exploration. A refers to patients treated between 1973 and 1980; B refers to patients treated between 1981 and 1988.

Table 4 lists the results of the various biliary bypass procedures. The jaundice cleared biochemically (*i.e.*, total serum bilirubin returned to normal) in 32%, 42%, and 50% of the CDJ, CCJ, and curative resection patients, respectively. In this regard both resection and the CCJ were more effective than the CDJ ($p < 0.05$). The jaundice cleared clinically (*i.e.*, the skin discoloration disappeared), but the bilirubin did not return to normal in 77%, 74%, and 83.6% of the patients undergoing CDJ, CCJ, and resection, respectively (not significant). The jaundice recurred at some point before the patient died in 13.1%, 13.5%, and 11.5% of the patients undergoing CDJ, CCJ, and resection, respectively (not significant).

An analysis of the patients who developed recurrent jaundice revealed that they had higher preoperative bilirubin levels (17.5 ± 2.6 versus 8.7 ± 2.5 , $p < 0.05$) than the patients in whom jaundice did not recur. Although the patients in whom the jaundice recurred also appeared to be older (65.2 ± 3.4 versus 59.5 ± 3.2 years), have a longer duration of jaundice (4.1 versus 2.4 weeks) and a higher frequency of liver metastases at the time of exploration (55% versus 48%), these differences were not significant.

The mortality rate for patients undergoing CDJ was greater (11.7%) than for those undergoing either a CCJ (5.4%) or resection (4.9%) ($p < 0.05$ for both). For the

TABLE 3. Liver Function in Pancreatic Cancer

Group	Number	Highest Preop. Bilirubin	Duration of Jaundice	Liver Function		Metastases	
				Normal	Abnormal	Yes	No
IA	22	13.5 + 1.9*	2.3 + 0.5	7/22 31.8%	15/22 68.2%	0	22
IB	39	6.5 + 1.3*	1.5 + 0.9	19/39 48.7%	20/39 51.3%	0	39
IIA	51	15.3 + 1.9	3.8 + 0.5 2.9 + 0.9	11/51 21.6%	40/51 78.4%	25/51 49%	26/51 51%
IIB	122	13.8 + 2.5		18/122 14.8%	104/122 85.2%	77/122 63.1%	45/122 6.9%
IIIA	50 (only 4 pts. with jaundice)	16.4 + 4.8	3.4 + 0.4	10/50 20%	40/50 80%	32/50 64%	18/50 36%
IIIB	56 (only 3 pts. with jaundice)	12.8 + 1.4	5 + 1.2	9/56 16.1%	47/56 83.9%	53/56 94.7%	3/56 5.3%

* A vs. B $p < 0.05$.

In group III patients, jaundice was unusual and generally occurred as a terminal event. Liver function was judged abnormal if the following

serum values were exceeded: alkaline phosphatase, 105 U/L; SGOT, 40 U/L; SGPT, 50 U/L; and total bilirubin, 1.2 mg/dL.

TABLE 4. Efficacy of Various Biliary Bypass Procedures

Procedure	Number	Jaundice Cleared		Jaundice Recurred	Mortality Rate	Morbidity Rate
		Biochem.†	Clin.†			
Cholechojejunostomy						
1973–1980	(A) 20	8/20 40%	16/20 80%	2/20 10%	3/20 15%	6/20 30%
1981–1988	(B) 40	21/40 52.5%	30/40 75%	6/40 15%	4/40 10%	17/40 42.5%
Cholecystojejunostomy						
1973–1980	(A) 25	11/25 44%	19/25 76%	4/25 16%	1/25 4%	6/25 24%
1981–1988	(B) 49	20/49 40.8%	36/49 73.5%	6/49 12.2%	3/49 6.1%	14/49 28.6%
Cholecho- or Cholecystoduodenostomy						
1973–1980	(A) 4	0/4 0	3/4 75%	0/4 0	0/4 0	3/4 75%
1981–1988	(B) 12	2/12 16.7%	8/12 66.7%	4/12 33.3%	1/12 8.3%	7/12 58%
Nonsurgical Therapy						
1973–1980	(A) 0	0	0	0	0	0
1981–1988	(B) 15	2/15 13.3%	4/15 26.7%	2/15 13.3%	4/15 26.7%	10/15 66.7%
Resection						
1973–1980	(A) 22	14/22 63.6%*	19/22 86.4%*	3/22 13.6%	2/22 9.1%	3/22 13.6%
1981–1988	(B) 39	17/39 43.6%*	32/39 82.1%*	4/39 10.3%	1/39 2.5%	8/39 20.5%

Jaundice cleared biochemically: cholecystojejunostomy (42%) and Resection (50%), each better than cholechojejunostomy (32%) $p < 0.05$.

Mortality rate: cholecystojejunostomy (5.4%) and Resection (4.9%), each better than cholechojejunostomy (11.7%) $p < 0.05$.

Morbidity rate: cholecystojejunostomy (27%) and Resection (18%), each better than cholechojejunostomy (38.3%) $p < 0.05$.

* For patients undergoing resection, the last serum bilirubin concentration obtained was often at the time of hospital discharge, on average about 2 weeks after operation. At this time the bilirubin level was often

still above normal. Because these patients all eventually became clinically nonjaundiced, the bilirubin measurement was usually not repeated. Thus these values do not reflect accurately the eventual complete normalization of liver function, which was the rule in this group.

† Biochemical clearing of jaundice meant that the total serum bilirubin concentration decreased to 1.2 mg/dL or less. In other patients the jaundice cleared clinically, *i.e.*, the yellow discoloration disappeared even though the serum bilirubin concentration may still have been elevated above this value.

same procedures the frequency of serious morbidity was 38.3%, 27%, and 18%, respectively ($p < 0.05$ for CDJ versus CCJ and resection) (Table 5). Patients in whom the duodenum was used (either a cholechooduodenostomy or a cholecystoduodenostomy) for biliary bypass suffered complications (usually sepsis, failure to clear jaundice, or recurrence of jaundice) in 63% of cases ($p < 0.001$ versus all other operative procedures).

Nonoperative biliary decompression was used in 15 patients as definitive treatment in the later study period (1981 to 1988) (Table 4). In this small group, jaundice cleared biochemically in 13.3%, clinically in 26.1%, and recurred in 13.3%. The mortality rate was 26.7% and the morbidity rate 66.7%. Both the mortality and morbidity rates were significantly greater than for the operative procedures ($p < 0.005$).

Gastrojejunostomy was performed in 70 of the 150 patients (46.7%) undergoing biliary bypass. Of these, 50 of these procedures were performed for either actual or imminent gastric outlet obstruction and 20 were performed prophylactically. Of these 70 gastrojejunostomies, two

(2.9%) failed completely. Nine (12.9%) took longer than 20 days to function. Three patients (4.3%) required re-exploration after 2 weeks. Thus overall 20% of these patients had some problems. Of the eight patients who underwent gastrojejunostomy as the sole procedure, one gastrojejunostomy failed to function for 30 days. The remaining gastrojejunostomies functioned within 10 days. Of the 80 patients who underwent biliary bypass alone, 20 (25%) required a gastrojejunostomy later (from 10 days to 24 months after the biliary bypass). All of them functioned within 10 days. An additional 19 (23.9%) of these 80 patients undergoing biliary bypass alone developed marked nausea and vomiting in the terminal stages of their disease. However none of these patients, because of their frailty, had investigations to exclude gastric outlet obstruction as the cause. They were managed with either nasogastric suction or total parenteral nutrition until they died.

Survival for the various groups is summarized in Tables 6 and 7. As expected the overall survival for group I (19.5 ± 2.6 months) was greater than for group II (8.0 ± 0.7

TABLE 5. Morbidity of Various Operations for Pancreatic Cancer

Complication	Cholecysto(ducho)- Duodenostomy (16 pts)	Cholecysto- Jejunostomy (74 pts)	Choledocho- Jejunostomy (60 pts)	Resection (61 pts)
Cholangitis	4	7	5	0
Wound infection	2	4	2	0
Pneumonia	1	2	3	2
Bacteremia	1	1	0	0
Wound dehiscence	0	1	0	0
Small bowel obstruction	0	2	0	0
Cardiac (MI, Failure)	0	2	4	0
Abscess	0	0	2	4
Hemorrhage	0	0	2	3*
Fistula	0	0	1 (Bile)	4*
Renal failure	0	0	2	1
Thrombophlebitis	0	1	3	0
Ischemic small bowel	0	0	0	2
Reoperation	2 (13%)	1 (1%)	5 (8%)	7 (11%)
No. complications/No. pts	10 in 10 pts	20 in 20 pts	24 in 24 pts	16 in 11 pts
Complication rate	10/16 (63%)	20/74 (27%)	24/60 (40%)	11/61 (18%)

* Hemorrhage: 2 from gastrojejunostomy suture line, 1 from portal

vein; all required reoperation; Fistula: all from the pancreaticojejunostomy; none required reoperation.

months) ($p < 0.005$) and group III (4.6 ± 1.1 months) ($p < 0.001$). In group I, the survival time was significantly longer in the later period of the study (1981 to 1988) (22.1 versus 16.2 months) ($p < 0.05$). However there were no significant differences in survival times for groups II (7.8 versus 7.1 months) and III (4.5 versus 4.8 months) in the two time periods. In group II patients undergoing a CDJ alone survived 6.8 ± 2.8 months compared to 6.1 ± 2.0 months when a gastrojejunostomy was added (not significant). Similarly those patients undergoing CCJ alone survived 8.6 ± 2.7 months compared to 9.6 ± 4.6 months when a gastrojejunostomy was also done (not significant).

Discussion

Symptomatology

At UCLA, over a period of 16 years (1973 to 1988 inclusive), we saw 340 patients with a tissue diagnosis of adenocarcinoma of the pancreas. Although often described as a presenting symptom in the disease, painless jaundice was uncommon (group I, 19%; group II, 6.9%). More often jaundice was associated with other symptoms, especially pain. It was seen in about 70% of both the group I and group II patients. Similar figures have been reported

by others.⁹⁻¹² Jaundice was less common in group III patients (in only 6.6% of cases). Indeed the diagnosis might have been arrived at earlier in this group if jaundice had been present more frequently. When it did appear, it was a terminal event in association with gross hepatic infiltration by the tumor. Pain was the major symptom in 61%, 71.7%, and 84% of the patients in groups I, II, and III, respectively. The patients in groups I and II complained mainly of intermittent upper abdominal colicky pain. In group III the pain was more often constant and it was felt in the back as well as the upper abdomen. Thus the characteristics of the pain of pancreatic cancer seemed to alter as the disease advanced and back pain seemed to correlate with unresectability.

Diagnosis

The interval between the first symptoms and the establishment of the diagnosis has attracted considerable attention. Efforts to shorten this interval have been stimulated by the hope that earlier diagnosis would result in increased resectability and survival rates. In 1970 Beall et al.¹³ found this interval to be 18 weeks. Andersson et al.¹⁴

TABLE 6. Overall Survival Statistics

Group	Number	Total Group Survival (months)
IA	22	16.2 + 4.1
IB	39	22.1 + 3.3
IIA	51	7.8 + 1.1
IIB	122	7.1 + 0.8
IIIA	50	4.5 + 0.9
IIIB	56	4.8 + 0.6

TABLE 7. Survival Data for Nonsurgically Palliated Group III Patients

	Laparotomy	No Laparotomy	Total
1973-1980 (A)	30 pts.	20 pts.	50 pts.
Survival (months)	3.9 + 0.9	4.8 + 0.8	—
1981-1988 (B)	41 pts.	15 pts.	56 pts.
Survival (months)	4.1 + 0.5	4.9 + 0.7	—
Death from			
Hepatic Failure	27/71 (38%)	13/35 (37.1%)	—
Multiorgan Failure	40/71 (56.3%)	19/35 (54.3%)	—
Myocardial Failure	4/71 (5.6%)	3/35 (8.6%)	—

in 1976 found the interval to be 14 weeks for carcinoma of the head of the pancreas and 22 weeks for carcinoma of the body and tail. At UCLA this interval varied among the three groups and especially between the two time periods of the study (1973 to 1980 *versus* 1981 to 1988). In group I patients, those who underwent resection, it was not reduced significantly. Nevertheless the preoperative bilirubin levels for group IA were higher than for group IB (13.5 *versus* 6.5 mg/dL, $p < 0.05$), which suggested that the disease was being treated at an earlier stage. In groups II and III patients, the time to diagnosis was reduced by 5.4 weeks to 11.9 weeks and by 8.2 weeks to 15.9 weeks, respectively ($p < 0.05$ for both groups II and III). With this the resectability rate increased from 13.8% in group IA to 21.5% in group IB ($p < 0.05$). Conversely the proportion of patients who were offered neither resection nor palliation decreased from 40.1% (65 of 159 patients) in group IIIA to 22.7% (41 of 181 patients) in group IIIB ($p < 0.05$).

Jaundice

Much discussion has centered on the ideal surgical procedure for the relief of jaundice. There is general agreement that jaundice should be relieved as early as possible. Prolonged jaundice impairs liver function and this may lead to liver failure. Indeed 38% of group III patients (nonpalliated) died with a variety of problems related to the liver (increasing jaundice and pruritus, recurrent cholangitis and/or liver failure). Jaundice is associated also with anorexia and malabsorption, which may lead to malnutrition. Pruritus, usually difficult to control with drugs, has been reported in 25% of patients by Baker et al.¹⁵ In the present series pruritus was seen in 20.6% of patients with jaundice. Finally persistent jaundice is an unpleasant reminder to both the patient and his or her family of the uncontrolled nature of the disease.

Choledochojejunostomy and Cholecystojejunostomy

Comparisons have been made before between a CCJ and CDJ. Deschamps et al.¹⁶ reported that the jaundice failed to clear in 25% of their patients who underwent CCJ compared to 10.3% of those undergoing CDJ. The mortality rates were 10% and 7%, respectively, for the two operations. They favored the use of the common bile duct for relief of the biliary obstruction. Blievernicht et al.¹⁷ also reported a higher recurrence rate for jaundice in their patients who underwent CCJ as opposed to CDJ. However Sarr et al.¹⁸ in their extensive review of the literature could find no advantage to the CDJ compared to the CCJ.

Our results (Table 4) also showed no difference in efficacy between the two operations. The frequency with which jaundice was relieved both biochemically and clinically was similar for both, as were the recurrence rates for jaundice. However the mortality and morbidity rates

when the common duct was used for the bypass were greater than they were in those undergoing CCJ (11.7% *versus* 5.4% mortality, and 38.3% *versus* 27% morbidity, respectively; $p < 0.05$). Although one might postulate that the patients who had a CDJ had more advanced disease, a larger tumor, a longer operation with more blood loss, and so on, we found no evidence for these factors. Thus the reasons for the differences in mortality and morbidity rates were not apparent from this retrospective analysis.

In general we recommend a CCJ because it is effective and generally can be done more quickly and easily. Of course the concern about the use of the gallbladder to relieve obstructive jaundice is appropriate. When the tumor has involved the distal common bile duct, the cystic duct/common duct junction may be obstructed, or it may become obstructed as the tumor grows. Then a CCJ would not be effective, and a CDJ is indicated. For that reason it is important to ensure cystic duct patency visually and/or by an operative cholangiogram before using the gallbladder for decompression.

Choledocho/cystoduodenostomy

We used the duodenum infrequently for biliary bypass because of the concern that the anastomosis would lay too close to the tumor. With subsequent spread of the tumor to that area, jaundice could recur. Indeed jaundice persisted more often (33%) and recurred more frequently (33%) when the duodenum was used compared to when the jejunum was used (Table 4). Major postoperative morbidity occurred in 63% of the patients. It is unclear why others have had more success with this operation. For example the Cleveland Clinic group¹⁹ recently reported their results in which choledochooduodenostomy apparently provided excellent palliation. Nevertheless such opinions are few and we recommend anastomoses to the jejunum instead. They can be performed safely and easily in most instances, and reobstruction is less likely. A loop jejunostomy without a jejunojejunostomy is satisfactory. In the occasional patient in whom a long survival might be anticipated, a Roux-en-Y jejunostomy may be preferred.

Nonoperative biliary drainage (endoscopic or percutaneous transhepatic stenting) was used only as definitive treatment for jaundice in the later period (1981 to 1988). It was associated with higher rates of recurrent jaundice, mortality, and morbidity compared to operative biliary bypass, and the jaundice cleared clinically in only 25% of the cases. However this form of palliation was reserved for the poorest-risk patients. Therefore our experience should not be interpreted as a condemnation of this approach. More recent studies suggest that endoscopic stenting to relieve obstructive jaundice from periampullary tumors can be a safe and effective alternative to surgical bypass in selected patients.²⁰

A total of 61 patients (group I) underwent pancreatic

resection in an attempt to cure the pancreatic cancer. Because the majority of these patients eventually died with recurrent disease, in retrospect most of these procedures were also palliative in nature. In that regard these operations were quite effective. The jaundice resolved clinically in about 85% of these patients by the time they were discharged from the hospital. It recurred usually just before death in about 10% of cases. The overall mortality rate for pancreatic resection was 4.9%, and in the years 1981 to 1988 it was only 2.5% (1 of 39 patients). Nevertheless it is important to stress that we do not advise pancreatotomy in patients in whom cure does not appear to be possible.

Gastrojejunostomy

Doberneck et al.²¹ reported their experience with gastrojejunostomy in pancreatic cancer. They found that delayed gastric emptying (inability to tolerate oral fluids by the eighth postoperative day) complicated the recovery of 26% of their patients who had no preoperative evidence of duodenal obstruction and 57% of those who did. They believed that the resultant prolongation of hospital stay negated any putative benefits of the procedure. Weaver et al.²² recently reviewed their experience with gastrojejunostomy and found that the operative mortality rate in their patients varied from 40% to 90%. They questioned its value under any circumstances.

Our experience has been more encouraging than that related in either of these reports. At UCLA 70 patients had combined biliary bypass and gastrojejunostomy. The procedure was prophylactic in 20 and therapeutic in 50 patients. The mortality rates were similar in the two groups (5% and 12%, respectively). Although the overall morbidity rate was 20% and reoperation was needed in 3 patients, 68 of these 70 gastric bypasses eventually functioned. Of the 80 patients who underwent biliary bypass alone, 20 (25%) required a gastrojejunostomy from 10 days to 24 months later. All of these functioned within 10 days. Unfortunately we could find nothing to suggest that their eventual obstruction should have been predicted earlier in this group of patients. There were no differences in survival rates between patients undergoing a CDJ or CCJ alone or one of these procedures combined with a gastrojejunostomy. The operative mortality rates were also similar whether a biliary bypass procedure was combined with a gastrojejunostomy (8.6% with and 6.3% without).

For all of these reasons, we think that a gastrojejunostomy should be performed in almost all patients who undergo a biliary bypass and are expected to live beyond a few weeks. If possible an antecolic gastrojejunostomy, distal to the biliary bypass, should be used. Although it is unusual, a retrocolic anastomosis is more likely to become involved by tumor invading the transverse mesocolon.

Pain

The etiology of pain in pancreatic cancer is unclear, but a number of possibilities have been suggested. Some believe that pancreatic and common bile duct obstruction produce ductal hypertension and this causes pain. This is the rationale for pancreatic ductal decompression in patients with pancreatic cancer, a technique that has not been widely practiced.²³⁻²⁶ We have not performed this procedure, although a rigorous study of its efficacy has not been done.

However of those patients who underwent a palliative biliary bypass (which would have relieved biliary ductal hypertension), less than 10% reported any noticeable relief from pain after surgery. Even in those patients whose pain was improved, it invariably recurred within a few weeks to months after operation.

Invasion of the pancreatic and peripancreatic nerves (visceral and somatic) may be another cause of pain in these patients. Many ablative procedures have been described in an effort to relieve pain. These include individual resection of the greater, lesser, or least splanchnic nerves,²⁷⁻²⁹ celiac and superior mesenteric gangliectomy,³⁰ and division of the post ganglionic fibers from the celiac plexus.³¹ None of these procedures has been used at UCLA. However we have had some experience with intraoperative destruction of the celiac ganglia. This has been done by injecting 20 to 30 mL of 50% ethanol into either side of the aorta in the region of the ganglia. Of 30 patients treated in this way, 19 (63.3%) had abolition or significant reduction in their pain for 1 to 4 months. In the remaining 11 (34.7%) the procedure failed. Either there was no pain relief or the pain returned within a few days. Other authors also have found this procedure useful.³²⁻³⁴ It is associated with minimal morbidity (none in the present series), and if the intraoperative attempt fails, a percutaneous approach can be used by an anesthesiologist at a later date. Nevertheless a controlled study of its efficacy is needed.³⁵

Survival

In groups II and III, despite more rapid diagnosis, there was no improvement in survival from the early period to the later one. This was not the case for group I patients who lived an average of 6 months longer after pancreatic resection in the later time period (16.2 ± 4.1 versus 22.1 ± 3.3 months, $p < 0.05$). The explanation for this improved survival is not clear. It is unlikely to be due to earlier diagnosis because there was statistically no difference in the time to diagnosis in this group.

Table 7 summarizes the fate of those patients who were not palliated (group III). More than one third of them died primarily from hepatic failure and more than one half from multiple-organ failure. The patients have been

subdivided into those who underwent laparotomy and those who did not. The causes of death and survival times were similar in the two subgroups. This suggests that laparotomy might be avoided in those patients in whom both the diagnosis and unresectability of the cancer are certain, and in whom jaundice and/or duodenal obstruction do not require operative relief.

We reviewed the records of 340 patients with pancreatic cancer treated at UCLA from 1973 to 1988. In the last half of the study, the diagnosis was made up to 2 months sooner than in the first half. This was associated with a higher resectability rate (13.8% versus 21.5%), and fewer patients with disease so far advanced that no palliative treatment could be offered (40.1% versus 22.7%). For relief of obstructive jaundice, CCJ and CDJ were equally effective (75%). However the use of the common duct was associated with slightly higher mortality and morbidity rates. In our experience, the duodenum was less satisfactory to decompress the obstructed biliary tree. Mortality and morbidity rates were high and the jaundice recurred in one third of cases. Gastrojejunostomy was safe and effective in most cases. It should be done in all patients, even if gastric outlet obstruction is not present at the time of exploration. If it is not done, at least 25% of patients will require a second operation to relieve the obstruction that develops as the tumor grows. Patients undergoing pancreatic resection for attempted cure have experienced an average increase in survival of about 6 months during the last half of the study. This does not appear to be due to earlier diagnosis.

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