Carcinoma of the Pancreas *

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AT A TIME when the mortality from other types of intestinal cancer is slowly diminishing it is disturbing to see the reverse happen in carcinoma of the pancreas. According to the 1960 Statistical Bulletin of the Metropolitan Life Insurance Company [4] the death rate for cancer of the pancreas in men has risen from 4.9 to 5.5 per cent and for women from 3.6 to 4.4 per cent of all cancer deaths as compared to 1948. During the same period the death rate for cancer of the digestive organs as a whole decreased from 43.1 to 35.8 per cent for men and from 36.8 to 34.1 per cent for women.

It is thus apparent that pancreatic carcinoma is exacting a greater toll in life than previously, in particular as compared to other kinds of intestinal cancer. One of the reasons for this occurrence is the failure of surgery or the adjuvant x-ray or chemotherapy to control pancreatic cancer. It is reasonable therefore to be doubtful as to whether or not a pancreatic carcinoma has ever been cured. Certainly there are reports of occasional prolonged survivals with autopsy reports to indicate effectual eradication of the malignant process,[3, 6, 8, 9] but in view of the fact that patients have been known to survive eight or nine years in apparent good health, only then to succumb to sudden eruption of the malignant disease, such reports must be accepted with some degree of skepticism.

There are several reasons for the universally poor results in treatment of pancreatic carcinoma.

The gland lies deep and the tumors are therefore unsuitable for direct palpation.

There is a paucity of symptoms in the early stages of the disease and this is suggestive that the process has been going on for a long time before it is suspected that something may be amiss.

The retroperitoneal location of the tumors provides little margin for expansion or invasion before removal becomes impossible.

The proximity of the portal vein, hepatic and superior mesenteric arteries may preclude removal depending on the location of the tumor even in its early stages.

The profuse and variable lymphatic and venous drainage of the pancreas invites early and widespread dissemination of the tumor cells.

The radical removal of carcinoma of the head of the pancreas had its inception in 1935 when Whipple reported a successful two-stage removal of carcinoma of the ampulla of Vater.[10] In 1937 Brunschwig [1] reported a two-stage operation with removal of carcinoma of the head of the pancreas and the entire duodenum. Trimble *et al.*[7] reported the first one-stage operation for carcinoma of the ampulla of Vater and head of the pancreas in 1941.

At present there is no controversy about the effectiveness of surgical removal of ampullary lesions. This has been adequately established. The decision whether and when to attempt resection of a primary

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TABLE 1. *236 Patients Operated Upon for Diagnosis or Treatment of Carcinoma of the Pancreas*

Location	Men	Women	Total
Head	77	49	126
Body	56	45	101
Cauda	7	2	9
			236

pancreatic tumor however continues to be debated. This present report deals exclusively with carcinoma of the pancreas as encountered at operation in the department of surgery of The New York Hospital over a 30-year period from 1932–1962.

Material

Every patient who underwent an operation for diagnosis or treatment of pancreatic carcinoma is included. Excluded are the patients where the tumor was found only at autopsy and unpreceded by surgical exploration. The tumors are discussed according to their primary location, i.e., head, body or cauda of the pancreas.

Age and Sex. There were a total of 236 patients, 140 men and 96 women. The incidence according to location may be seen in Table 1.

There is a preponderance of men for all three sites but this is most pronounced for those tumors located in the cauda of the gland. The ages of the patients ranged from 26 to 86 years. The incidence according to age, location, and sex may be seen in Table 2.

Table 2 shows that carcinoma of the pancreas, regardless of its location, is most commonly encountered in people over the age of 50, but it is by no means rare between the ages of 40 and 50. This in particular seems applicable in the case of tumors of the body in men. Our youngest patient was a woman aged 26 who incidentally developed the symptoms during pregnancy. Our oldest patient was a man aged 86.

Signs and Symptoms of Carcinoma of the Pancreas

Tumors in the Head of the Pancreas (126). The signs and symptoms in carcinoma of the pancreas vary a great deal. A common misconception is that jaundice associated with a tumor in the head of the pancreas is usually unaccompanied by pain. In the present series there were 30 women who had experienced pain before admission to the hospital. Similarly there were 48 men who had experienced pain. Thus 62 per cent of the total number of patients with tumor in the head of the pancreas had pain as a symptom. Only eight of our patients with carcinoma of the head of the pancreas were not jaundiced on admission to the hospital. Jaundice was thus the most common symptom and was found in over 93 per cent of the patients, and of these 58 per cent had pain.

The pain experienced by patients with carcinoma of the head of the pancreas was variable. It was most frequently located in the epigastrium and often radiated to the back. Right upper quadrant pain was also common. An atypical kind of pain was not unusual. Thus one patient complained solely of left lower quadrant pain and no other cause was found at operation.

Loss of weight was experienced by at least half of the patients. The amount of weight lost varied from a few to 100 pounds. This in many instances preceded

TABLE 2. *Location of Carcinoma of the Pancreas as to Age and Sex*

	Head		Body		Cauda	
Age	M	F	M	F	M	F
20–30	—	1	—	1	—	—
31–40	4	—	2	2	—	1
41–50	8	6	12	2	2	—
51–60	27	15	14	15	3	—
61–70	25	18	18	13	1	1
71–80	9	9	10	12	1	—
81–90	4	—	—	—	—	—
Totals	77	49	56	45	7	2

TABLE 3. *Carcinoma of the Pancreas (236 Patients)*

Location	Time from Onset of Symptoms Until Operation							
	Less than 1 mo.		1–3 mo.		3–6 mo.		More than 6 mo.	
	M	F	M	F	M	F	M	F
Head	30%	39%	42%	25%	16%	14%	12%	22%
Body	9%	8%	23%	40%	30%	26%	38%	26%
Cauda	10%	—	70%	50%	—	—	20%	50%

the development of other symptoms. Other symptoms in order of decreasing frequency were anorexia, pruritus and fatigue. Diarrhea was experienced by only 14 patients or little over 10 per cent and only twice could this be attributed to steatorrhoea.

Diabetes of recent onset was recognized in nine of the patients and thrombophlebitis in only five. The thrombophlebitis however was usually recurrent and migrating in nature and resistant to anticoagulant therapy. Other symptoms only occasionally encountered were nausea and vomiting. The vomiting usually indicated duodenal obstruction from encroachment by the tumor. Massive bleeding from the stomach or duodenum was observed twice. Once this was caused by tumor invasion of the stomach.

Carcinoma of the Body of the Pancreas (101). Among 101 patients in whom the tumor originated in the body of the pancreas, there were 13 who experienced jaundice (approximately 13%). Occasionally the jaundice was caused by extension of the tumor into the region of the head, but also equally common was metastatic involvement of the liver.

In this group of patients pain was indeed the most severe as well as the most common symptom. All the patients save nine, or 91 per cent of the total number, arrived in the hospital complaining of pain. The most common location was epigastric and radiating to the back similar to pain from carcinoma of the head. Pain in the right upper quadrant was rare, instead girdle-type pain, pain in the back only or lower abdominal pain was found more often. Six of the patients definitely stated that the pain was worse on lying down. Weight loss was experienced by 73 per cent of the 101 patients and was thus more common than amongst those with tumors of the head. Anorexia and vomiting were frequent and were both encountered in 30 per cent of the patients. The vomiting when persistent was almost always associated with direct invasion of the duodenum in its third portion where it crosses the mesenteric vessel. Diabetes believed to be of recent development was found in six per cent of the patients. Massive bleeding in the form of melena or hematemesis was encountered in 6 per cent of the patients and was usually the result of direct invasion of the stomach or duodenum by tumor.

Carcinoma of the Cauda of the Pancreas (9). The symptoms of tumor in the cauda of the gland were very similar to those in the body. Pain and loss of weight were the most common, both were present in eight of the nine patients. The duration of symptoms varied a great deal and often it was difficult to be sure whether the symptoms had been due to the carcinoma or to other causes.

Table 3 shows the delay in diagnosis from the onset of symptoms. The number of patients with carcinoma of the cauda is hardly large enough to warrant conclusions, but certainly the diagnosis seems to be made earlier in patients with carcinoma of the head rather than the body of the pancreas.

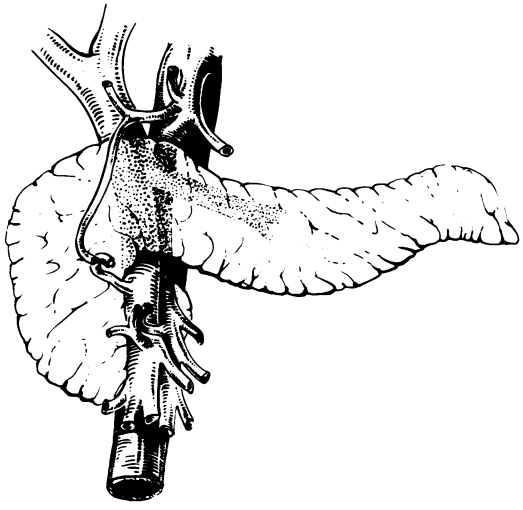

FIG. 1. The proximity of the portal vein, hepatic and mesenteric arteries may preclude surgical removal depending on the location of the tumor even in its early stages.

The logical reason why carcinoma of the head of the pancreas is diagnosed earlier than that of the body seems to be the frequent and possibly early occurrence of jaundice with the former. The rare and late occurrence of jaundice in patients with carcinoma of the body and cauda of the pancreas is largely responsible for the delayed operative intervention for these particular tumors.

The first radical pancreato-duodenectomy in The New York Hospital was performed in two stages in 1940. To date we have not established any unyielding criteria for this operation but rather have evaluated each patient on an individual basis. As a rule every patient with a localized tumor was considered a possible candidate for resection. However, because radical pancreato-duodenectomy is a major operation which exacts a considerable toll in morbidity and mortality, it has been embarked upon only after critical evaluation. Thus the patient who is to undergo this procedure should therefore be in reasonably good health, if hopes for survival are to be entertained.

The immediate postoperative mortality for all patients with pancreatic carcinoma was 10 per cent and where a pancreatoduodenectomy was carried out for lesions in the head of the gland, 24 per cent. The selection of patients for radical pancreatoduodenectomy is not to be based on the chronological age of the patient but rather on the physiological age and the stage of the disease. Thus we have in this group four patients over the age of 70 who underwent the radical operation for carcinoma in the head of the pancreas. Three of these survived and left the hospital, which is a mortality of 25 per cent or the same as for the group as a whole.

Resectability of the Tumors

Carcinoma of the pancreas, as other malignant tumors, may become unresectable by either direct spread or distant metastases. Three areas are mainly involved in the estimate of direct spread. These are the hepatic artery where its gastroduodenal branch has its origin, the portal vein and superior mesenteric vein where they lie between the uncinate process and body of the pancreas and thirdly the superior mesenteric artery where it courses under the body of the gland.

Table 4 shows the location of metastases most frequently encountered at operation that preclude resection. Some of these pa-

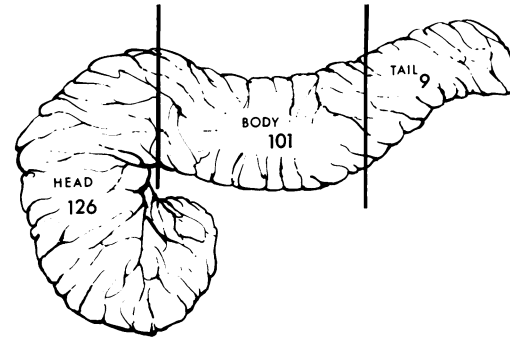

FIG. 2. Location of carcinoma of the pancreas demonstrated at operation in 236 patients.

tients had metastases in more than one organ or area. The liver however is the most frequently involved organ. None of the patients undergoing resection in this series had evidence of metastases at the time of operation.

When distant metastases are not found and the patient is judged physically able to withstand resection, the next step is to determine whether any of the three structures mentioned earlier have been encroached upon or compromised by the tumor. A portal venogram may be helpful in this respect since occlusion or distortion of this vein would weigh against resectability. Most of the time, however, these structures have to be exposed and traced by dissection in order to gain the information needed. Mobilization of the duodenum by the Kocher maneuver is quite helpful in delineating the tumor but is of no use in determining resectability since the portal vein is included between the uncinate process and body.

In order to demonstrate the portal vein we usually expose it above the transverse colon where it traverses the third portion of the duodenum. At the same time it usually becomes clear whether involvement of the mesenteric artery has occurred. To identify the hepatic artery it is necessary to enter the lesser sac and trace the artery into the hepato-duodenal ligament. The gastroduodenal branch ordinarily is found just medial to the common duct and portal vein, or where the hepatic artery turns to run alongside these structures. At this point the margin of safety is extremely small and frequently tumor is encroaching directly on the hepatic artery itself and makes resection unfeasible.

TABLE 4. *Carcinoma of the Pancreas (236 Patients)*

Location of Metastases Found At Operation or Autopsy	
Liver	73
Lymph nodes	33
Peritoneum	24
Lung	5
Pleura	3
Skeletal	3
Adrenal	2
	143

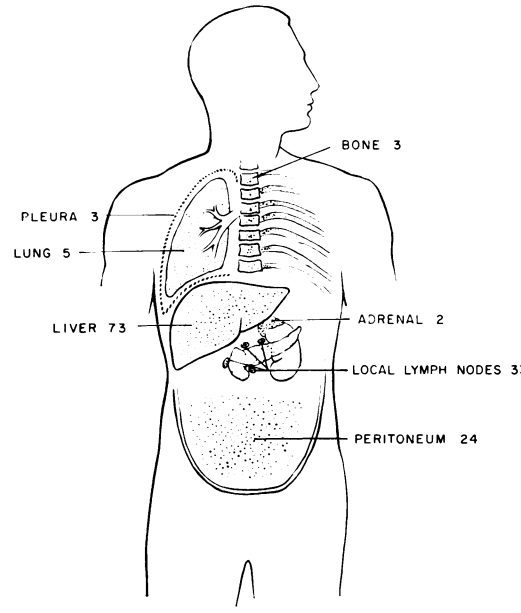

FIG. 3. Location of metastatic carcinoma of the pancreas found at operation or autopsy in 236 patients.

Diagnosis of Carcinoma of Pancreas Before and During Operation

We have already alluded to the interval between onset of symptoms and establishment of diagnosis. Because of delay in hospitalization there is usually no difficulty encountered in establishing the diagnosis of carcinoma of the body or cauda of the pancreas at operation. The tumors are commonly far advanced and biopsies of the pancreas itself in these instances have established histological diagnosis in over two-thirds of the cases where biopsy was performed.

When we are dealing with carcinoma of the head of the pancreas there is a different story. These tumors are often small and surrounded by a large area of pancreatitis. There is therefore commonly a thick cap-

TABLE 5. *Carcinoma of the Head of the Pancreas. Cause of Death Following Pancreato-Duodenectomy (25 patients)*

Renal failure	1
Fecal fistula and recurrent tumor	1
Liver necrosis	1
Liver necrosis and renal failure	1
Biliary fistula, acute purulent cholecystitis	1
Pulmonary embolism	1

sule of edematous or indurated pancreatic tissue which has to be penetrated before tissue can be obtained upon which a positive diagnosis can be made.

We have also found that our pathologists have had a considerable degree of difficulty establishing from frozen section whether cancer was present or not. This has resulted in a few negative reports on frozen section which later on paraffin sections were demonstrated to be malignant; on the other hand we have not had any false positive frozen sections. On the whole we have found that rapid sections from lesions in the head of the pancreas have only been accurate in about 50 per cent of our cases where employed.

We do try whenever possible to make the decision for or against radical removal on the basis of gross findings at the time of surgery and believe that the gross findings are as a rule more reliable than those reported from immediate examination of an open biopsy.

For the past few years we have to an increasing degree used percutaneous transhepatic cholangiography preoperatively in these patients who are jaundiced. We have been impressed with the degree of accuracy this method offers.

We have had a 75 per cent success in delineating the biliary ductal system preoperatively in the jaundiced patient, and the rate of success is even higher where there is obstruction due to a malignant tumor.

We believe that in most instances this method also allows differentiation between ampullary and pancreatic tumors and is therefore extremely useful when the decision for or against resection has to be made.

The typical case of carcinoma of the head of the pancreas does not offer any difficulties during operation. There is a discrete tumor in the head of the organ and the rest of the gland is turgid, thickened and rounded from the resulting obstruction of the main duct. The gallbladder and common duct are dilated, bluish and thin-walled. Palpable dilatation of the pancreatic duct has been an infrequent finding in our series but when present is an aid to diagnosis.

The real difficulties in diagnosis do arise when cholelithiasis also is present and particularly choledocholithiasis. It is also possible to encounter a thick-walled edematous gallbladder and common duct without cholelithiasis. When this occurs and when the tumor in the head of the pancreas is not discrete it may be almost impossible to establish the correct diagnosis.

At one time we thought that when bougies could be passed with relative ease from the dilated common duct into the duodenum, a carcinoma could be excluded. Lately, however, this has proven to be a false assumption.

Unavoidably in situations like this mistakes will be made but we know of only one of our patients where a radical pancreato-duodenectomy was done without biopsy and the tumor proved to be calcific pancreatitis rather than carcinoma. This patient has done well since operation.

Surgery for Carcinoma of the Pancreas and Survival

Lesions in the Head of the Gland—Radical Pancreato-Duodenectomy. Radical removal of carcinoma in the head of the pancreas was undertaken 25 times. Six of the patients died in the immediate postoperative period or within a month from surgical complications. The causes of death

are listed in Table 5. Liver necrosis and renal failure account for three of the six deaths. We have been particularly impressed with the incidence of renal failure in this group of patients and diminished urine output is usually the rule rather than the exception. The oliguria when the specific gravity is high is not an ominous sign but rather evidence of an extrarenal difficulty which can then be traced to lack of plasma volume since large amounts are lost into the operative area in the days following operation. It is therefore important to maintain both red cell and plasma volumes at acceptable levels during the postoperative period.

A more serious situation arises when there is oliguria with a low specific gravity or frank anuria with rapid rise in blood urea nitrogen and potassium levels. These patients usually die from lower nephron nephrosis and although dialysis sometimes may help the outlook is extremely grave.

The liver necrosis encountered following pancreato-duodenectomy often may be traced to interference with the hepatic artery or its branches. When the gastroduodenal artery is secured from the hepatic artery it is usually found that the margin from tumor is extremely narrow. Consequently it is easy to compromise the lumen of the mother artery when ligatures are applied. In one of our cases a frank thrombosis of the hepatic artery was demonstrated at postmortem. One patient died with a biliary fistula and at postmortem was found to have also an acute purulent cholecystitis, the gallbladder having been left in place at the time of resection.

Seven of the 25 patients undergoing pancreato-duodenectomy died within three months of surgery (Table 6). This includes the patients who died in the immediate postoperative period. One patient was lost to follow up within six months of the operation and may be presumed dead. Sixteen survived more than six months after surgery Four patients survived more than two years. One of these survived in good health for nine years [2] only then to die from recurrent pancreatic carcinoma.

TABLE 6. *Carcinoma of the Head of the Pancreas. Survival after Operation*

Months	Pancreato-Duodenectomy No.	Cholecysto-Jejunostomy No.
0– 3	7	13
4– 6	1	7
7–12	9*	2
13–18	2	4
19–24	1	2
24>	4**	—
Lost to follow up	1	7

* 1 patient still alive with recurrence.
** 2 still alive without known recurrence.

We have two patients alive at present two and three years following operation without evidence of recurrence and one patient alive a year and a half after operation with evidence of recurrence.

Cholecysto-Jejunostomy

There were 35 patients who underwent cholecysto-jejunostomy for carcinoma of the head of the pancreas (Table 6). Seven of these patients were lost to follow up soon after leaving the hospital. Of the remaining patients, 13 were dead within three months of the operative procedure. Seven survived up to six months and eight survived from seven to 24 months. None survived for a full two years but six were still alive one year following the operative procedure.

Other Operations

The variety of operations applied to lesions in the head of the pancreas may be seen in Tables 6 and 7. Exclusive of the radical pancreato-duodenectomy and the simple exploratory laparotomy, there were seven other types of operations utilized to relieve either common duct or duodenal obstruction following other operations. The tables also demonstrate the results ob-

TABLE 7. *Miscellaneous Operations. Survival in Months (66 Patients)*

Operation	No.	0–3	4–6	7–12	13–18	Lost to Follow up
Cholecystogastrostomy	19	9	4	4	2	
Cholecysto- or choledocho-duodenostomy	10	3	2	3	1	1
Gastroenterostomy	1	1				
Cholecysto- and gastroenterostomy	4	2	1		1	
T-tube drainage	9	4	4*	1		
Exploratory laparotomy	23	13	2	2		6

*One of these patients is still alive.

tained. It may be seen that the results are pretty much the same as with cholecystojejunostomy. None of the patients survived a full two years and the majority are dead within six months of operation.

Carcinoma of the Body of the Pancreas

Resection of a carcinoma of the body of the pancreas was undertaken five times, or in about 5 per cent of the total number of cases. In none of these patients was the head of the gland or duodenum removed. The results of resection are poor, none of the patients survived two years but good palliation from pain was obtained in one of these patients. The palliative operation in the form of cholecysto- or gastroenterostomy also did little to prolong life as compared to the group where laparotomy and biopsy alone were carried out. Table 8 shows the types of operations and results in carcinoma of the body of the pancreas.

The tendency of carcinoma of the body of the pancreas to invade and obstruct the third portion of the duodenum is particularly frequent in this group of patients. Quite often the symptom bringing these patients to a physician's attention is pernicious vomiting. The symptomatic relief here following gastroenterostomy is pronounced and welcome although without prolongation of life.

Carcinoma of the Cauda of the Pancreas

All of the patients with carcinoma of the cauda of the pancreas were considered unresectable at the time of operation. Six of them were dead within three months of operation, one survived nine months and one died two years following operation. The biopsy taken from the tumor in the patient who survived two years did not show cancer and an autopsy was not performed at the time of death. It therefore

TABLE 8. *Carcinoma of the Body of the Pancreas. Survival in Months (101 Patients)*

Operation	No.	0–3	4–6	7–12	13–18	19–24	Lost to Follow up
Exploratory laparotomy	63	39	9	5	2	0	8
Cholecystojejunostomy	12	5	3	2	0	0	2
Gastroenterostomy	16	8	5	0	1	0	2
Resection of tumor	5	1	2	1	1	0	0
Miscellaneous	5	2	3	0	0	0	0

TABLE 9. *Causes of Early Death After Operation Other Than Pancreato-Duodenectomy (211 Patients)*

	Exploratory Laparotomy	Cholecysto-gastrostomy	Cholecysto-enterostomy	Gastro-enterostomy	Resection of Tumor (Ca in cauda)	Common duct* Drainage (external)
No. deaths	9	1	4	3	1	3
Myocardial infarction	1	—	—	—	—	—
Pulmonary infarction	2	—	1	1	—	—
Massive tumor	4	—	—	1	—	—
Liver failure	1	—	—	—	—	—
G-I bleeding	—	—	2	—	—	—
Pneumonia	1	—	1	—	—	—
Peritonitis	—	1	—	1	1	1
Bile fistula	—	—	—	—	—	1
Renal failure	—	—	—	—	—	1

remains possible that this tumor was not a true carcinoma.

Causes of Death Following Operations Other than Pancreato-Duodenectomy

We have noted that liver necrosis and renal failure accounted for three of six postoperative deaths that followed a radical pancreato-duodenectomy. Table 9 reviews the causes of postoperative deaths following other types of operations.

Three of nine patients who underwent simple drainage of the common duct died in the immediate postoperative period. One of these deaths was from peritonitis but the other two from renal failure and the effects of continued loss of bile from the common duct. An external biliary fistula in a patient with carcinoma of the head of the pancreas is of course poorly tolerated because of constant fluid and electrolyte loss and total interruption of the normal entero-hepatic circulation of bile salts. In some patients this problem may be temporarily solved by feeding the bile back by mouth or through naso-gastric tubes, but as a rule internal drainage should be provided whenever possible to add to the patient's comfort. Massive involvement of tumor, peritonitis and pulmonary infarcts were the most common causes of death.

The patients classified as having died from massive tumor had extensive involvement of many organs and a more exact immediate cause of death could not be assigned. The patients who died from peritonitis were encountered early in the study before the advent of antimicrobial therapy. Pulmonary infarcts accounted for four of the postoperative deaths. The reported incidence of venous thrombosis in carcinoma of the pancreas is extremely high. One such report found that 56 per cent of patients with a lesion in the body or tail had venous thrombosis at autopsy.[5] It is therefore rather surprising that more of our patients did not succumb to this complication.

Discussion

The results reported here in the treatment of carcinoma of the pancreas are truly dismal. In our hands this disease has proved to be incurable. As mentioned earlier there are a few reports in the literature on persons who have survived for several years following removal of pancre-

atic carcinoma. Some of these patients have died of unrelated disease and on autopsy been found to be free of tumor. Whether this proves that pancreatic carcinoma can be cured remains unsettled.

Our experience seems to indicate, however, that survival beyond two years is not to be expected unless removal of the tumor is carried out. We believe this is probably a reflection on the early stage of the tumor and slow growth rather than on the efficacy of the surgery. It is therefore possible, although unlikely, that some of the survivors following pancreato-duodenectomy would have experienced the same result with a palliative procedure alone. It is possible also that we should consider all our operations including resection as palliative ones. In this context it is quite clear that the best and most lasting palliation is obtained by resection of the tumor. Usually these patients are free from pain and jaundice for longer periods of time than following any of the other modalities of treatment and a few are able to lead a useful life for a number of years.

The palliation following operations other than resection is quite variable. When jaundice or vomiting have been the main features based on common duct obstruction and encroachment on the third portion of the duodenum by tumor, the relief is usually prompt and striking. The remission may last up to six months for patients with invasion of the duodenum and up to a year or more for persons who have had jaundice alone.

The duodenal obstruction however is usually caused by a tumor of the body of the pancreas and pain tends to compromise the relief obtained from vomiting. When pain has been an early symptom the outlook for palliation is quite a bit worse. Occasionally the pain may be relieved by procedures relieving obstruction. However, if the pain has been caused by invasion into adjacent structures it is likely to persist. Thus the right upper quadrant pain associated with jaundice is often relieved by a cholecystoenterostomy which decompresses the biliary tract, whereas the deep boring epigastric pain from tumors extending beyond the pancreas is rarely relieved by any surgical procedure short of removal.

The effect of the palliative operation as far as prolongation of life is concerned may be found by comparing these to the procedures of laparotomy with biopsy alone (Table 8, 9).

There seems to be some slight prolongation of life but not marked. It may therefore be said that the value of the palliative operations lies in offering symptomatic relief but not in prolonging life to an appreciable degree.

Six of these patients received x-ray therapy directed mainly to control pain. Adequate and accurate information indicates that there was no benefit in four patients and only questionable temporary relief in two, and this was of very short duration.

At the present we prefer to use cholecysto-enterostomy of the Roux-en-Y type to decompress the biliary tree in palliative operations. In the past quite a few patients were treated by cholecysto-gastrostomy, but this procedure was not found to be quite satisfactory, one of the main objections was the frequent occurrence of bilious regurgitation.

There are various technics for re-establishing gastro-intestinal continuity after radical pancreato-duodenectomy. We have usually anastomosed the divided pancreas to the end of the jejunum. This anastomosis is in two or three layers and invaginates the pancreas into the jejunum.

The gallbladder should be removed at the time of pancreato-duodenectomy since its junction is largely abolished following removal of the common duct, and complications such as occurred to one of our patients, and probably caused his death, may otherwise result. We anastomose the he-

patic duct end-to-side to the jejunum about 15 cm. from the pancreatic anastomosis. The gastro-jejunostomy comes last in sequence and is usually placed retrocolic as are the other anastomoses. This arrangement is considered by us to reduce the danger of marginal ulceration, and we have not observed its occurrence in our patients with pancreatic carcinoma.

Summary

The surgical treatment of carcinoma of the pancreas is, in most instances, palliative rather than curative because the tumor has extended beyond its primary site by the time the diagnosis has been made. Early diagnosis is difficult because of the nature and location of the pancreas.

Surgical procedures for obstruction of the common duct, the duodenum and the pancreatic ducts relieve symptoms but seldom prolong life. The Whipple operation originally intended as curative is proving actually to be only palliative.

Patients with tumors of the pancreas which have not extended beyond the parent organ and who are considered to be good operative risks should continue to be treated by the Whipple resection of the duodenum and pancreas by those who are experienced in the performance of the procedure.

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Discussion

Dr. Kenneth W. Warren (Boston): This has been a most interesting paper, despite the justifiable pessimistic attitude, since it is confined to primary carcinoma of the pancreas which tumors are predominantly of ductal origin and are rarely favorable for resection. It is important to point out, as Dr. Glenn has in his manuscript, that a distinction should be made between carcinoma arising in the head of the pancreas, on the one hand, and carcinoma arising in the ampulla of Vater, the distal common bile duct and the duodenum, on the other. The tragedy of not making this distinction is often the reason for a poor result after pancreatoduodenectomy.

I would like to point out one other feature about certain tumors which arise in the head of the pancreas and are favorable for resection. They include cystadenocarcinoma, malignant islet cell tumors, and leiomyosarcomas which probably originate in the duodenum but extend into the pancreas. At inspection and palpation it may be extremely difficult to differentiate the cytologic nature of these rare tumors. Carcinoids are especially difficult to recognize.

In this instance (Slide), a malignant islet cell tumor in the head of the pancreas invaded the