

THE SURGICAL TREATMENT OF CARCINOMA OF THE BODY OF THE PANCREAS*

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RESECTIONS OF CARCINOMA of the body of the pancreas have been reported on rare occasions since the first solid tumor of this organ was excised in 1882 by Trendelenberg. Up to 1930, Oberling and Guerin¹ were able to collect only 11 instances of successful resections of malignant neoplasms of the body. These included four "epitheliomas" and seven sarcomas. The literature since 1930 contains but few reports of such cases. In Gordon-Taylor's² patient, a male, age 54, a large epithelial tumor arising in the midportion of the body was excised in 1927 but not reported until 1934. In 1938, Doberer³ reported two instances of resection of carcinoma of the body of the pancreas; in one, the tumor arose from the superior border and was about "the size of a prune," in the other the neoplasm was quite large, involved the distal seven centimeters of body and tail, and also necessitated splenectomy. The first patient was well two and one-half years later, the second died on the fifth postoperative day. In the patient cited by Milhet, Dormay and Feyel⁴ in 1940 a large carcinoma of the body was resected. There was relief from pain but finally cachexia and death two months later. In the series of six patients with pancreatic cancer reported by Harvey and Oughterson⁵ in 1942, their "Case 1" presented a carcinoma of the body that was resected by subtotal pancreatectomy; there was survival for five months, death being due presumably to metastasis. In 1943, Rockey⁶ reported an instance of subtotal pancreatectomy for carcinoma extensively invading the organ; the patient died 15 days later of bile peritonitis.

The purpose of this communication is to record a small personal series of patients in whom attempts were made to deal with carcinoma of the body of the pancreas. There were six resections of the body, including the spleen, and two total pancreatectomies, including total duodenectomy and splenectomy.

The technic for resection of the body of the pancreas has been evolved principally as a result of experience in recent years in excision of pancreatic tissue for hyperinsulinism. The steps in the technic of such resections employed in the patients reported here may be summarized as follows (Fig. 1):

Anesthesia: Preferably continuous spinal.

1. High midline, transverse or inverted-T incision.
2. Approach to the pancreas by transection of the gastrocolic omentum from the level of the head of the pancreas to the gastrosplenic vessels.
3. Retraction of stomach upward and transverse colon downward.

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4. At this point, the body of the pancreas may be excised in one of three ways, depending upon the expediency of each situation.

a. Transection of pancreas at level of the neck, with resection proceeding distally of body and tail; hemostasis being secured by ligation of branches from the splenic vessels.

b. Division and ligation of gastrosplenic vessels, then transection of neck of pancreas and splenic artery and vein at this level, with excision of body of pancreas and spleen *en masse* proceeding from the neck distally.

c. Division and ligation of gastrosplenic vessels, then elevation of spleen by grasping in right hand; this brings the tail and body of pancreas forward together with splenic artery and vein. Transection of neck of pancreas and splenic vessels at level of superior mesenteric vessels, with excision of body of pancreas and spleen *en masse*.

5. Interrupted interlocking silk mattress sutures are placed about 0.5 cm. proximal to the cut edge of the remaining neck of pancreas. The transected main pancreatic duct, if apparent, is grasped with a hemostat and ligated separately.

6. The transverse mesocolon is repaired except in the region below the pylorus. Here, one or two soft rubber drains are inserted to the site of pancreatic transection.

7. Closure of the abdominal wound.

In some instances of redundant stomach the gastrohepatic omentum may be transected, the stomach retracted downward and the body of the pancreas excised over the lesser curvature of the stomach.

Total duodenopancreatectomy and splenectomy for practically complete replacement of the pancreas by carcinoma was performed in two patients as follows:

1. In each instance the pancreas was exposed *via* the gastrocolic route. 2. The gastrosplenic vessels were divided. 3. The spleen was grasped with the right hand and elevated to mobilize the body of the pancreas. 4. The splenic vessels were divided about three centimeters distal to the origin of the portal vein. 5. The peritoneum along the convex border of the duodenum was incised to mobilize the head of the pancreas and duodenum. 6. The pylorus was transected several centimeters proximal to the pyloric sphincter, and upper segment of stomach closed. 7. The common bile duct was transected below the level of the superior border of first portion of duodenum. 8. The head of the pancreas and duodenum were completely mobilized and lifted away from the superior mesenteric vessels, the uncinate process of the pancreas and terminal portions of duodenum brought out to the right from beneath these vessels after transection of the ligament of Treitz. 9. Transection of jejunum just distal to ligament of Treitz and closure of distal segment. 10. Removal of entire pancreas and duodenum with attached lower pylorus and spleen. 11. Gastro-enterostomy (Billroth II). 12. Choledochojejunostomy using loop of jejunum about 15 cm. distal to above anastomosis; jejunojejunostomy between loops to choledochojejunostomy.

CASE REPORTS

RESECTIONS OF THE BODY OF THE PANCREAS AND SPLEEN

Case 1.—J. L. (233821), male, age 32. (Previously reported in detail). The patient had attacks of hyperinsulinism and was explored in another institution in September, 1939, where two tumors in the tail of the pancreas were observed and biopsied, with diagnosis of islet-cell carcinoma. In January, 1940, a large rounded tumor, 15 cm. in greatest diameter, was resected together with portions of infiltrated stomach wall and jejunum. There was no evidence of metastasis. He was free from attacks of hyperinsulinism until July, 1942, when these recurred, and in August, 1942, exploratory

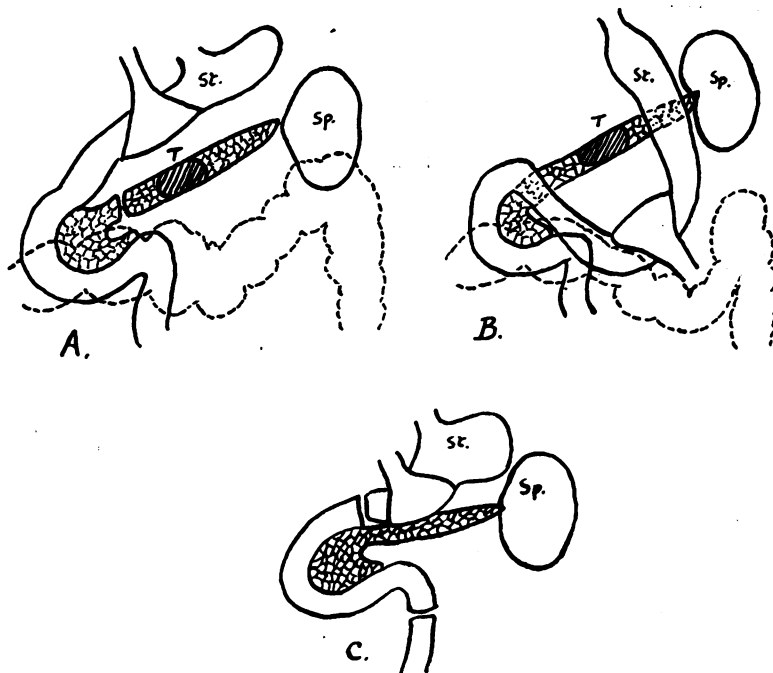


FIG. 1.—A. Schematic representation of excision of body of pancreas and spleen *via* gastrocolic route. St. stomach. Sp. spleen. T. neoplasm in body of pancreas.

B. Showing access to body of pancreas by downward retraction of redundant stomach.

C. Total pancreatectomy with total duodenectomy and splenectomy. This is followed by gastrojejunostomy and cholechojejunostomy.

celiotomy revealed multiple hepatic metastases—biopsy only was performed. Attacks recurred after a short respite, and from June to December, 1943, alloxan was injected in attempted chemotherapy.⁸ The attacks were controlled for periods of three weeks. Finally, at the patient's request another celiotomy was performed to remove the remaining head of the pancreas and what liver metastases could be resected. The portal vein was divided accidentally, necessitating ligation. He died two hours after operation. He survived three years and 11 months after excision of the primary growth.

Case 2.—P. F. (162585), female, age 73, was admitted, July 27, 1940, complaining of a mass in the epigastrium and dull intermittent epigastric pain, both noted for two months. She stated that she had had "stomach trouble for 50 years." Examination revealed a firm, rounded mass in the midepigastrium situated over the aorta and transmitting a bruit. Roentgenograms of the stomach were normal. The clinical impression was abdominal tumor of undetermined origin or aortic aneurysm. Celiotomy was per-

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formed August 1, 1940. The mass was discovered to be a rounded carcinoma in the body of the pancreas, 4 cm. in diameter, near the neck. The neck was transected and body of pancreas, with spleen, resected. There were a few metastatic nodes in the liver, not exceeding 1 cm. in diameter, and several enlarged and firm periaortic lymph nodes. Immediate recovery from the operation was satisfactory, but the patient expired suddenly on the third day. Necropsy revealed an antemortem thrombus in a branch of the portal vein and several hepatic infarcts. There were several old healed myocardial infarcts.

Case 3.—M. K. (295967), male, age 66. A physician, in June, 1942, developed constant severe epigastric pain not related to eating or bowel movements. Appetite became very poor, and he lost 12 pounds in five months. The pain finally developed a high girdle distribution, was very severe, especially upon lying down, and became more or less

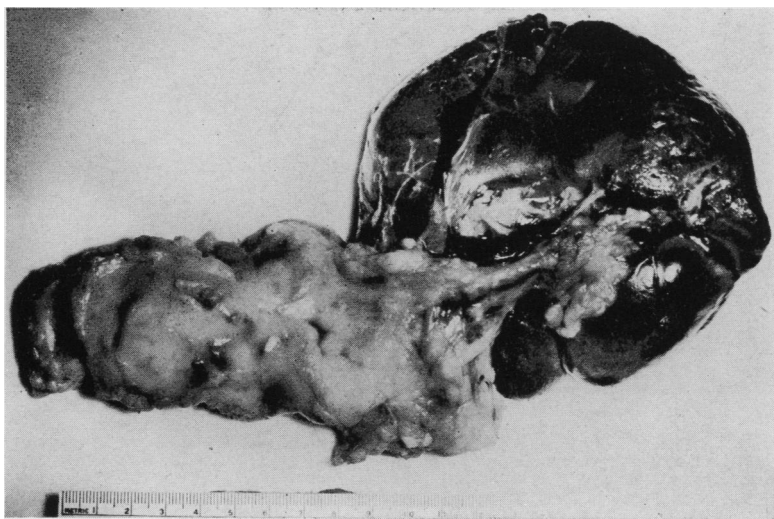


FIG. 2.—Case 3: Surgical specimen consisting of entire body of pancreas infiltrated by carcinoma, and spleen.

constant. After numerous consultations, he made his own diagnosis of neoplasm of the pancreas. Icterus had developed. Physical examination was negative except for upper abdominal tenderness. Celiotomy was performed November 2, 1942, and revealed a carcinomatous mass in the midportion of the body of the pancreas, with multiple hepatic and peritoneal metastases. With the abdomen open it was decided to resect the body and tail of the pancreas in an attempt to alleviate pain. The jaundice appeared to be due to intrahepatic obstruction from metastases as the common duct was not enlarged. The surgical specimen is shown in Figure 2. Immediate recovery was satisfactory and there was much less pain during the postoperative period. He died five weeks later, cachexia having become very pronounced. Necropsy revealed carcinomatosis.

Case 4.—H. D. (170446), female, age 55, was admitted September 5, 1943, complaining of generalized fatigue for over a year; periods of nausea and vomiting for one month; and loss of 20 pounds during the past four months, attributed to "dieting." Slight icterus. On physical examination, the right lobe of the liver was moderately enlarged but smooth. Roentgenologic examination revealed normal stomach, extrinsic pressure narrowing in the upper half of the descending portion of the duodenum and nonvisualization of the gallbladder. The clinical impression was carcinoma of the head of the pancreas. Celiotomy was performed September 11, 1943. An oval carcinomatous mass, about 4 cm. in diameter, was found in the proximal portion of the body of the pancreas and extending into the neck. It was planned to excise this by pancreatoduodenectomy,

with transection of the pancreas in midportion of the body well beyond the neck. The operation was begun in the usual manner by mobilizing the head of the pancreas and duodenum. When mobilization of the neck was attempted the first portion of portal vein was accidentally opened due to tumor infiltration of an appreciable segment of the wall. Before hemorrhage could be arrested the portal and superior mesenteric veins had been ligated and had retracted some distance from each other. It was felt that the patient would not survive and that termination of the operation as quickly as possible was indicated. Transection of the pancreas through the tumor was carried out to excise

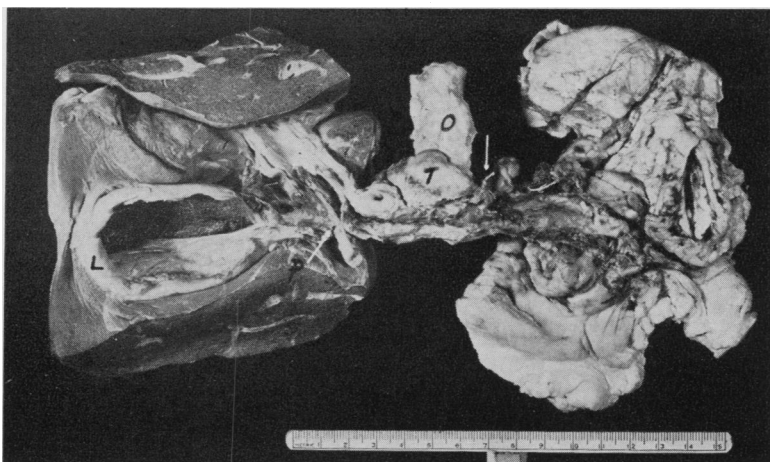


FIG. 3.—Case 4: Necropsy specimen obtained on tenth postoperative day. L, liver and gallbladder. P, ligated portal vein; O, proximal portion of body of pancreas, with bisected portion of tumor; T, *in situ*; small white arrow to right of pancreas indicates site of ligation of superior mesenteric vein.

the mobilized lower stomach, head of pancreas and duodenum. A gastrojejunostomy was performed and a urethral catheter tied into the transected common duct and brought to the outside through the abdominal wound. The immediate postoperative course was astounding in that recovery was relatively satisfactory. She survived for ten days. Necropsy revealed acute biliary fibrinopurulent peritonitis. She had had a pelvic operation 20 years previously. There were extensive omental adhesions to the lower anterior abdominal wall and in addition to this collateral venous circulation was obvious at the base of the mesentery of the small bowel and in the retroperitoneal spaces. The necropsy specimen showing ligated portal and superior mesenteric veins is demonstrated in Figure 3.

Case 5.—G. M. (50813), male, age 49, was admitted October 9, 1943, complaining of severe spasms of pain in the back of five months duration, with radiation to each side which was described as affording the sensation of "giant ice tongs" having been applied to his body. There had been loss of 20 pounds weight in four months. Palpation of the abdomen was negative except for moderately enlarged liver. Roentgenologic study of the alimentary tract was negative. The patient had been luetic but had had extensive treatment. The clinical impression was carcinoma of the pancreas. Celiotomy was performed October 11, 1943. A tumor mass, 10 cm. in length and 6 cm. in width, was situated along the superior border of the pancreas and apparently arising from this organ. No metastases were apparent. Resection of the body of the pancreas and spleen together with adherent left adrenal gland was carried out (Fig. 4). There was diffuse but not marked cirrhosis of the liver and this organ was biopsied. Immediate convalescence was satisfactory. Pain was completely relieved. He was discharged on the 20th day. At home,

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he did not continue to improve, icterus developed and became progressively worse. Weakness became more pronounced and there was loss of appetite. He succumbed November 18, 1943, five and one-half weeks after operation. Necropsy revealed large intrahepatic metastases not appreciable on the surface, situated just within the porta hepatis and occluding the right and left hepatic ducts.

Case 6.—C. P. (325186), female, age 55, was admitted, January 12, 1944, complaining of "gas pains" in the left upper quadrant and pain in the region of the umbilicus, with radiation through the body to the back, two months duration. She stated she had had "stomach trouble all of her life." There was loss of 20 pounds weight in the past

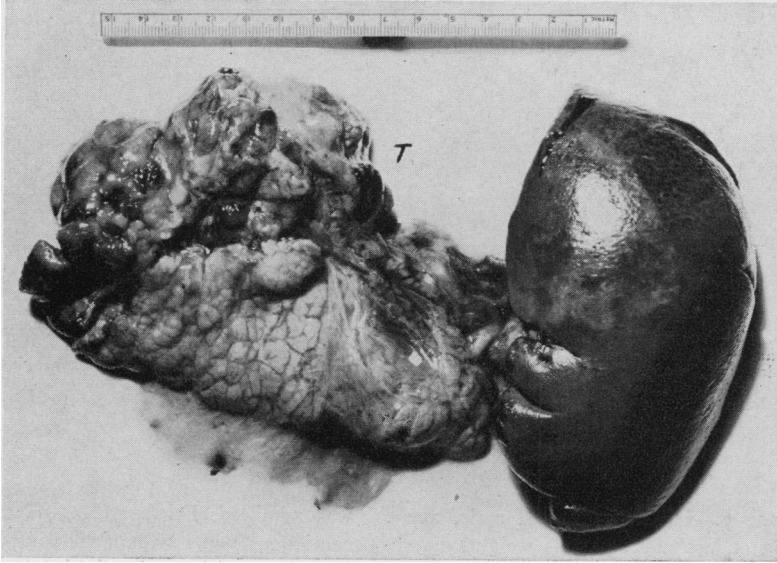


FIG. 4.—Case 5: Surgical specimen consisting of entire body of pancreas with large carcinoma (T) arising from upper border, and spleen.

month. Physical examination revealed marked tenderness in the upper abdomen and a firm tender nodule within the umbilicus, suspected of being a metastasis. Cholecystograms revealed nonvisualization of the gallbladder. The clinical impression was possibly carcinoma of the gallbladder. Celiotomy was performed on January 15. The lower portion of the stomach was studded with metastatic nodules as was the falciform ligament and deeper aspect of the umbilicus. In the wall of the lesser curvature of the stomach there was an oval, firm area assumed to be malignant neoplasm. In the distal portion of the body of the pancreas there was an oval, firm mass, 4 cm. in greatest diameter, obviously carcinoma. The liver and peritoneal surfaces were free from metastases. The gallbladder wall was slightly thickened and it contained numerous small stones. A subtotal gastrectomy was performed leaving about one-sixth of the stomach. The spleen was then mobilized and used as a handle to elevate the body of the pancreas. The latter was transected about 3 cm. distal to the neck, with resection of tumor-bearing portion of pancreas and the spleen. The stump of pancreas was closed with interrupted interlocking silk mattress sutures. A Pólya gastrojejunostomy was performed. The falciform ligament and umbilicus with surrounding tissue were excised (Fig. 5). The gallbladder filled with small stones was not removed. Convalescence was rather stormy due primarily to failure of function of the gastro-enterostomy. The patient however was sustained by glucose, casein digest, and gelatin intravenously, and eventually improved. She was dis-

charged on the 44th day after operation, able to partake of general diet, free from pain, and in fair general condition. Three months after operation her condition remains relatively satisfactory. There is no abdominal pain, she is able to eat a varied diet and is ambulatory.



FIG. 5.—Case 6: Surgical specimen consisting of: Pt. distal portion of body of pancreas with carcinoma (C) and spleen.

S, lower 5/6 of stomach resected because of serosal metastases from pancreatic neoplasm. G. large metastasis which at operation was thought to be primary carcinoma in stomach. U. umbilicus and falciform ligament containing metastases.

TOTAL PANCREATECTOMY

Case 7.—H. H. (302199), male, age 67, was admitted, February 24, 1943, complaining of loss of 40 pounds weight, diarrhea, continuous upper abdominal pain of five months duration, icterus for two months, with severe pruritis, and pain in the chest, cough, edema of ankles, and hoarseness of two weeks duration. Physical examination revealed dullness and absent breath sounds in the left thorax; the abdomen was negative except for a moderately enlarged and smooth liver and questionable fluid wave. Icteric index 115. Roentgenograms of the chest showed massive left hydrothorax. The stomach and colon were normal. Left thoracentesis was performed (625 cc. of bloody fluid), on February 22. Celiotomy was performed February 26, 1943. The entire pancreas was found extensively indurated by carcinoma; there were several hepatic metastases. Total pancreatectomy, total duodenectomy and splenectomy with gastrojejunostomy and cholecystojejunostomy were performed. Immediate recovery was satisfactory but the patient succumbed on the third day. Necropsy revealed massive bilateral pulmonary consolidation as the immediate cause of death.

Case 8.—N. R. (309791), male, age 29, was admitted, May 20, 1943, because of 40 pounds weight loss in four months, upper abdominal pain, more or less constant, and increasing in severity, three months; increasing icterus and pruritis, two months. Physical examination was essentially negative except for upper abdominal tenderness, moderate enlargement of the liver and severe icterus (icteric index 159). Celiotomy was performed May 27, 1943. The pancreas was diffusely involved by carcinoma; there were no hepatic metastases. Total pancreatectomy, with total duodenectomy and splenectomy, gastrojejunostomy and cholecystojejunostomy were performed. Immediate recovery was satisfactory, but after the second day the course was rather stormy. Less insulin than anticipated was required. The details of the postoperative course from this standpoint will be reported elsewhere (Goldner and Clark). He succumbed on the ninth

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day. Necropsy revealed metastases to mediastinal lymph nodes, suprarenals, both kidneys, a small perforation of the common duct from which there was a sinus to the abdominal wound; bilateral partial atelectasis, in short, the patient died of exhaustion.

A summary of the results in the above series of patients is given in Table I:

TABLE I
RESECTIONS OF THE BODY OF THE PANCREAS AND SPLEEN

Case No.	Pathologic Condition	Course
Case 1	Islet-cell carcinoma invading entire body.	Lived 3 years, 11 months. Died after 3rd celiotomy as a result of portal vein ligation.
Case 2	Carcinoma, proximal portion of body. Few hepatic metastases.	Died 3rd day (portal thrombosis?)
Case 3	Carcinoma invading entire body. Multiple hepatic metastases.	Lived 5 weeks. Died of carcinomatosis.
Case 4	Carcinoma of proximal portion of body and neck.	Lived 9 days. Died of bile peritonitis. Portal vein ligated.
Case 5	Carcinoma arising in upper border of body.	Lived 5.5 weeks. Died of "exhaustion." Necropsy revealed single large intrahepatic metastasis.
Case 6	Carcinoma of tail of pancreas, with metastasis to stomach and retroperitoneal lymph nodes.	Living 3 months after resection of body of pancreas and radical gastrectomy. Evidence of recurrence.
TOTAL PANCREATECTOMY AND DUODENECTOMY WITH SPLENECTOMY		
Case 7	Entire pancreas replaced by carcinoma. Metastases in liver.	Died 3rd day. Massive bilateral lobar pneumonia.
Case 8	Entire pancreas replaced by carcinoma. Metastases in liver.	Died 9th day of "exhaustion."

Immediate operative mortality, 50% (4 cases).

Survivals, 4 cases; 5 weeks, 5.5 weeks, 3 years, 11 months, one living 3 months in fair condition, respectively.

SECONDARY INVOLVEMENT OF BODY OF PANCREAS

Neoplasms arising in viscera adjacent to the body of the pancreas may involve the latter by direct extension. This does not constitute a contraindication for excision of these growths since resection of the body and tail of the pancreas *en masse* with them is quite feasible. The author has performed total gastrectomy, with splenectomy, transverse colectomy, and resection of the body and tail of the pancreas for carcinoma primary in the stomach. The patient survived six months, with a period of symptomatic improvement. In another patient a large adrenal (left) carcinoma, 20 cm. in diameter, infiltrating the under surface of the left diaphragm, the muscles of the left posterior abdominal cavity, the hilum of the spleen, about the upper pole of the left kidney, and the posterior surface of the body and tail of the pancreas, was resected *en masse*, with its extensions, including the under surface of diaphragm, body and tail of pancreas, *etc.* The patient is living and well, without evidence of recurrences two years later. He is at work full time as a draughtsman. A third patient with a very large carcinoma of the splenic flexure infiltrating the stomach, hilum of the spleen, and body of the pancreas was recently subjected to successful resection of the lower three-fourths of the stomach, together with body of the pancreas, spleen, most of transverse colon, and upper two-thirds of descending colon. Other cases of excision of portions of the body of pancreas with neoplasms arising in adjacent organs have been reported elsewhere.⁹ The success of massive resections as described above is dependent, to a large extent, upon the liberal use of blood transfusions. Transfusions are begun at the out-

set of the operation and continued as needed to maintain a systolic pressure of 100 Mm. of mercury. Quantities of 2000 to 3000 cc. are sometimes necessary and must be employed without hesitation. Plasma transfusions alone do not suffice.

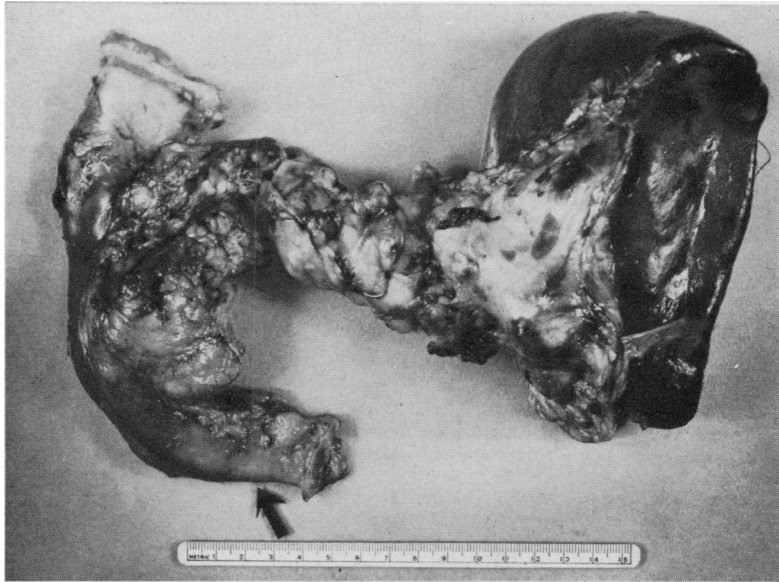


FIG. 6.—Case 8: Surgical specimen consisting of entire pancreas infiltrated by carcinoma, spleen, lower stomach and entire duodenum. Arrow indicates duodeno-jejunal junction.

DISCUSSION.—In six of the eight patients subjected to partial or total pancreatectomy, metastases were apparent at the time of operation. What, then, was the justification for the operation? With the abdomen open it was felt that the primary growth should be resected as a means of palliation since in all of these patients (except Case 1) constant severe pain was an outstanding complaint. The pain of cancer of the body of the pancreas is characteristically severe, non-colicky, and more or less constant, and its amelioration would constitute a degree of palliation. Appreciable amelioration of pain was actually accomplished in Cases 3, 5 and 6. However, the question remains, principally of academic interest, whether such relief was afforded by the removal of the cancerous pancreas, or by the extensive division of sympathetic nerves which such operations entail.

The results obtained in the above series of patients are far from encouraging. The great difficulty in this field lies in the fact that patients are not subjected to celiotomy early enough in the course of the disease to permit of complete excision by radical resections. Cancer of the body of the pancreas is, indeed, a silent lesion in its earlier development (except when it may arise in the neck and proximal portion of the body and produce icterus, as in Case 4). It is removed from the alimentary and biliary tracts and, therefore, does not produce obstructive symptoms early. With exception of Case 1 (insulin-pro-

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ducing islet-cell carcinoma) the above patients' serious complaints were of two, five, four, five, two, five, and four months duration, respectively, an average of three and eight-tenths months. Early in these periods it would appear to have been hardly justifiable from the histories as given, to make the diagnosis of carcinoma of the body of the pancreas and advise operation. There is no purpose to be served by repeating here the classical signs and symptoms of carcinoma of the body of the pancreas, since these are well known and when present the patients usually are in an advanced stage of the disease. As mentioned in a previous communication, there is perhaps some parallelism between the present situation surrounding the surgery of cancer of the pancreas and the situation of gastrectomy for carcinoma of the stomach during the quarter century following Billroth's first successful pylorotomy. Relatively few patients were subjected to partial gastrectomy during this period and the large majority of the patients who underwent exploratory celiotomy for gastric cancer were considered inoperable. Indeed, the future of gastrectomy for cancer was not considered very bright by some authorities of that period. It is hoped that, with the feasibility of radical pancreatectomy now well established, persistent efforts will result in a more hopeful future for this particular branch of surgery than would appear to be justifiable on the basis of experiences up to the present time.

SUMMARY

Cancer of the body of the pancreas is manifested clinically late in the course of the disease. While radical resection of such neoplasms is feasible, few patients are subjected to operation early in the evolution of these growths.

Six instances of resection of the body of the pancreas with splenectomy and two instances of total pancreatectomy, with total duodenectomy and splenectomy, are recorded. The immediate operative mortality was 50 per cent (four cases, including the two total pancreatectomies). One patient with islet-cell carcinoma invading the entire body and later manifesting hepatic metastases lived three years and 11 months. Of the remaining three, two survived five weeks and five and one-half weeks, respectively, had metastases at the time of operation, but experienced appreciable amelioration of severe abdominal pain. The third is living, comfortable, and in fair general condition three months following resection of the body for carcinoma and subtotal gastrectomy for metastases to the stomach. Metastases to the falciform ligament and umbilicus were also resected.

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DISCUSSION.—DR. ROY D. McCLURE, Detroit, Mich.: I wish to report a successful case of total pancreatectomy for primary carcinoma of the pancreas, showing the feasibility of Doctor Brunschwig's experience:

A 46-year-old male was admitted to the Henry Ford Hospital, January 2, 1944, for treatment of painless obstructive jaundice. A diagnosis of probable carcinoma of the pancreas was made on the basis of the history of gradually deepening jaundice, plus the presence of a palpable mass in the midepigastrium in the region of the pancreas.

Celiotomy by my associate, Dr. Lawrence Fallis, was performed, January 14, 1944, under nupercaine anesthesia. A transverse incision was made in the transpyloric plane. Exploration revealed a distended gallbladder, a dilated common duct, and an enlarged pancreas which was indurated throughout.

A one-stage, complete pancreatectomy, duodenectomy and splenectomy was performed. Section showed carcinoma of the pancreas. Restoration of the continuity of the intestinal tract was by terminolateral gastrojejunostomy, with implantation of the common duct into the jejunum proximal to the anastomosis.

The patient left the hospital on the 23rd day after operation, following an uneventful postoperative course. He returned to part-time work two months later. His insulin requirements have been 26 units of protamine insulin daily, supplemented about twice weekly by 8 units of regular insulin.

This patient was shown in our clinic one week ago today. His jaundice has entirely disappeared. His strength is improving, and he has the appearance and mental attitude of a healthy normal man. Doctor Fallis is continuing his studies of this case. Not so many years ago we thought the pancreas an essential organ.

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