

Pancreatic Pseudocyst: *

A Cause of Obstructive Jaundice

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COMPRESSION of the terminal common duct by the inflammatory reaction of acute pancreatitis not infrequently causes obstructive jaundice which usually subsides following the acute episode.²³ In chronic pancreatitis, however, a more permanent type of obstructive jaundice may result from distortion and narrowing of the intrapancreatic segment of the common bile duct by progressive fibrosis of pancreatic tissue,⁴ or more rarely by compression of the duct by a pseudocyst.²² This latter type of obstructive jaundice is more serious since some form of surgical therapy is usually required to effect its relief.

Jaundice has been reported in approximately 9 per cent of all patients having a pancreatic pseudocyst.¹¹ In many of these, however, jaundice has been due to co-existing pancreatitis or to calculous disease of the biliary tract.²² Obstructive jaundice resulting from compression of the common bile duct by a pancreatic pseudocyst has been relatively uncommon when strict criteria are used to establish a direct causal relationship.¹⁸ Thirteen of the 15 previously reported cases in which such a relationship had been documented either by operative findings or postmortem examination were either published as isolated case reports or included within large series of patients with pancreatitis or pancreatic pseudocyst arising in all portions of the gland.^{2, 5-8, 10, 13-16, 23} The differential diagnosis of this lesion from others which more commonly cause

obstructive jaundice frequently has been difficult.

Our experience with five patients with obstructive jaundice secondary to pseudocyst of the head of the pancreas during the past 4 years is the basis for this report. Those patients in whom compression of the terminal common duct was not definitely established as being due to the pseudocyst have been excluded from this review. It is significant that a malignant neoplasm was strongly considered in the differential diagnosis of four of the five patients even though there were preoperative findings consistent with pre-existing pancreatitis in each case. One patient had previously received irradiation therapy because of an erroneous clinical diagnosis of pancreatic carcinoma.

This report outlines the diagnostic and therapeutic criteria which have evolved from this experience, giving special emphasis to the features which differentiate pseudocyst of the head of the pancreas from carcinoma of the pancreas in cases of obstructive jaundice.

Case Reports

Case 1. A 44-year-old Negro man was admitted to the Cincinnati Veterans Administration Hospital on October 31, 1961 with jaundice and a 2-month history of epigastric distress with radiation to the back. The pain was relieved by sitting and intensified when recumbent. A weight loss of 20 pounds had accompanied his present illness. The past history was unremarkable, and he denied any excessive intake of alcohol.

The patient appeared chronically ill and obviously icteric. A round mass, 10 cm. in diameter,

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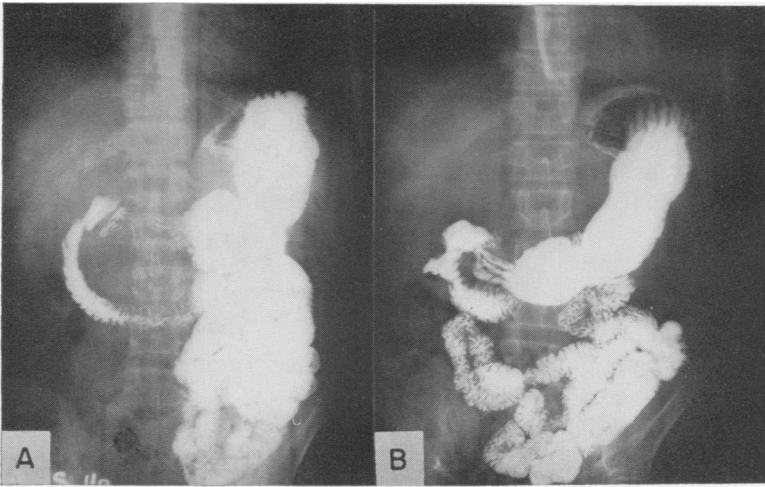


FIG. 1. a) Preoperative upper gastro-intestinal x-ray demonstrates enlargement of the duodenal sweep and smooth flattening of inner border. b) Postoperative x-ray shows the duodenal sweep to be normal in contour and size.

was palpable in the right upper quadrant. It appeared to be separate from the liver, the right lobe of the latter extending three fingerbreadths below the right costal margin. The remainder of the examination was normal.

Blood count, urine, and several serum amylase determinations were normal. Serum bilirubin was 8.1 mg. %, with a direct fraction of 4.9 mg. %, and the alkaline phosphatase was 21.8 Bodansky units. Several days following admission, the serum bilirubin rose to 13.6 mg. %, with a direct fraction of 7.8 mg. %. One week later the serum bilirubin had decreased to 3.2 mg. %, with a direct component of 1.7 mg. %. Coincident with the decrease in serum bilirubin, the abdominal mass became smaller and less tender. Examination of the stool for occult blood was negative on one occasion and faintly positive on another. Roentgenograms of the abdomen revealed pancreatic calcifications, and an upper gastro-intestinal x-ray study demonstrated enlargement of the head of the pancreas with displacement and flattening of the duodenal loop (Fig. 1a).

Exploratory laparotomy was performed on December 5, 1961, and a pseudocyst, 10 cm. in diameter, was present in the head of the pancreas. The remainder of the pancreas was fibrotic. After a choledochotomy had been performed, a No. 4 Bakes dilator was passed with difficulty through the ampulla. Following duodenotomy, a needle aspiration of the pancreatic cyst yielded 250 cc. of turbid brownish fluid. A 3-cm. stoma was created between pseudocyst and duodenal lumen. Biopsy of the cyst wall was interpreted as fibrous tissue consistent with pancreatic pseudocyst. The postoperative course was uneventful, and on December 20, 1961 the total serum bilirubin had decreased to 0.9 mg. %, with a direct fraction of 0.45 mg. %, and the serum alkaline phosphatase had fallen to 2.2 Bodansky units. A T-tube cholangiogram per-

formed 7 days following cystoduodenostomy delineated the extent of previous external compression of the common bile duct; however, it showed satisfactory emptying of the contrast medium into the duodenum (Fig. 2). Postoperative upper gastro-intestinal x-rays demonstrated the duodenal loop to have a normal contour (Fig. 1b). The patient has remained asymptomatic since discharge from the hospital.

Case 2. A 44-year-old white man was admitted to the Cincinnati Veterans Administration Hospital on June 6, 1960 complaining of back pain of 9 months duration and 45 pounds weight loss. A history of chronic alcoholism for many years was elicited. In April, 1960 he had been hospitalized at another institution where a diagnosis of carcinoma of the pancreas was made on the basis of severe back pain, the presence of an epigastric mass and moderately severe jaundice. Palliative irradiation therapy was administered to the right flank area with only mild relief of back pain. Just prior to this admission jaundice had become less evident.

On initial examination the patient appeared chronically ill and was in acute distress due to severe back pain. Mild clinical jaundice was detectable. A large mass, 20 cm. in diameter, was palpable in the epigastrium, and the liver edge was palpable 6 cm. below the right costal margin. Except for mild hypochromic anemia, the blood analysis, urine, blood urea nitrogen and serum amylase determinations were normal. Serum bilirubin on June 21, 1960 was 1.8 mg. % with a direct fraction of 0.9 mg. %, and the alkaline phosphatase was 27 Bodansky units. Numerous examinations of stool for occult blood were negative. Upper gastro-intestinal x-rays revealed a large mass which displaced the stomach and duodenum

and contained calcifications in the region of the head of the pancreas (Fig. 3).

Exploratory laparotomy was performed on June 21, 1960, and a large cystic mass was found within the head of the pancreas. A diffuse inflammatory reaction and edema of the tissues in the upper abdomen were thought to be the result of the previous irradiation therapy. Duodenotomy was performed, and needle aspiration of the cyst confirmed the diagnosis of a pseudocyst. A 4-cm. stoma was created between the medial wall of the duodenum and the cystic cavity which contained about 900 cc. of greenish-brown fluid. Following construction of a cystoduodenostomy and during the exploration of the cystic cavity, it was found that the common bile duct had been inadvertently severed, and because of this a choledochoduodenostomy was performed. The amylase activity of the cystic fluid was 292 Somogyi units. At the time of hospital discharge on July 6, 1960, serum bilirubin was 0.7 mg. % with a direct component of 0.36 mg. % and the alkaline phosphatase 15.6 Bodansky units. The patient was readmitted 18 months later because of massive upper gastro-intestinal bleeding and expired shortly after admission. Postmortem examination indicated the immediate cause of death to be spontaneous esophageal perforation, and an active gastric ulcer

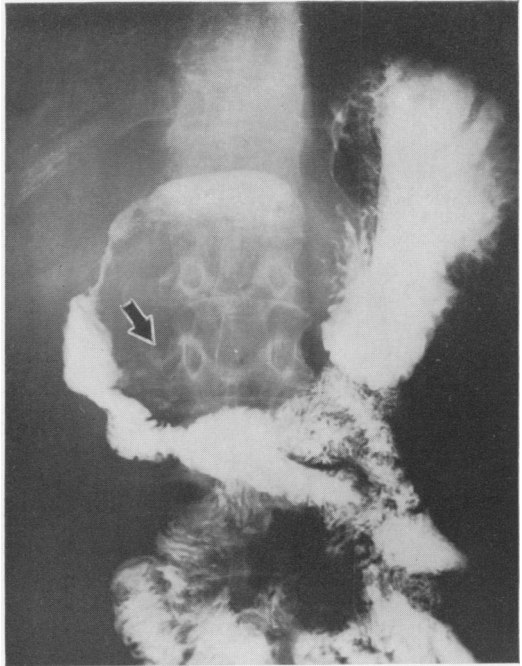


FIG. 3. The duodenal sweep is markedly enlarged and there are multiple calcifications in the head of the pancreas (arrow). Distorted mucosal pattern of the duodenum suggests invasion by carcinoma.



FIG. 2. T-tube cholangiogram, 1 week postoperative, demonstrates residual flattening of the common bile duct due to pressure from the pseudocyst. Note numerous pancreatic calculi.

the probable cause of the upper gastro-intestinal bleeding. The pancreas contained a small pseudocyst in the tail as well as diffuse chronic pancreatitis; however, the cystoduodenostomy and choledochoduodenostomy which had been performed 18 months previously were patent.

Case 3. A 36-year-old white man was admitted to the Cincinnati Veterans Administration Hospital on July 18, 1960 with a 2-month history of weakness and a 40-pound weight loss. Jaundice, dark urine and diffuse abdominal pain with radiation to the back had been noted for 6 days. The patient gave a long history of chronic alcoholism. In 1957 a cystojejunostomy, using the Roux-en-Y principle, had been performed for drainage of a pseudocyst located in the mid-portion of the pancreas. He remained asymptomatic until the onset of the present illness. The patient appeared chronically ill and lethargic; there was obvious icterus of the skin and sclerae. Examination of the heart and lungs was not remarkable. The liver edge was palpable 5 cm. below the right upper quadrant. There was palmar erythema and vascular spiders were present on the skin of the face and chest.

Blood count, urine, blood urea nitrogen and multiple serum amylase determinations were normal. Serum bilirubin on admission was 10.7 mg. % with a direct component of 6.6 mg. %, but by

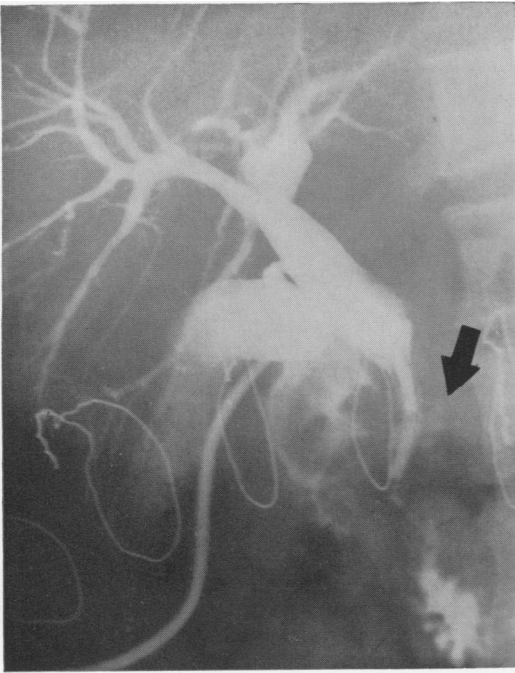


FIG. 4. Postoperative cholangiogram showing persistent dilatation of the common bile duct proximal to the site of compression by the pseudocyst. Residual pancreatic calculi are evident (arrow).

August 4, 1960 the direct component had risen to 8.1 mg. % and the total bilirubin to 15.8 mg. %. During this time the serum alkaline phosphatase increased from 30 to 50 Bodansky units. Numerous calcifications noted on the abdominal roentgenograms were interpreted as within the pancreas. Upper gastro-intestinal x-rays demonstrated a large mass in the region of the head of the pancreas with extrinsic compression of the second portion of the duodenum.

On August 12, 1960, exploratory laparotomy was performed. The extra-pancreatic portion of the common duct was 2 cm. in diameter and the gallbladder was large and tense. The duodenum was compressed by a cystic mass located within the head of the pancreas. At duodenostomy, needle aspiration of the cystic cavity yielded 100 cc. of greenish-brown fluid. A cystoduodenostomy established a 4-cm. communication between the pseudocyst and duodenum. Pathology report from a biopsy specimen of the cyst wall was consistent with the operative diagnosis of pancreatic pseudocyst.

A T-tube cholangiogram performed 10 days following operation demonstrated residual dilatation of the common bile duct above the site of external compression (Fig. 4). Postoperative upper gastro-intestinal roentgenograms demonstrated a normal duodenal loop. By September 1, 1960 the bilirubin had decreased to 1.9 mg. %, with a

direct fraction of 0.8 mg. %, and the serum alkaline phosphatase had decreased to 8 Bodansky units. The patient has remained asymptomatic following discharge from the hospital.

Case 4. A 50-year-old Negro man was admitted to the Cincinnati General Hospital on October 27, 1962 with a 3-week history of periumbilical cramping pain and dark urine, a 2-week history of jaundice and pruritus, and a 2-day history of light colored stools. He had lost 20 pounds during the course of his present illness. He admitted to a long history of heavy alcoholic intake.

The patient appeared chronically ill, and there was evidence of recent weight loss. The skin and sclerae were obviously icteric. The liver was enlarged with extension of the right lobe to the iliac crest. On the right lateral edge of the liver there was a cystic mass which was interpreted as distended gallbladder. The remainder of the physical examination was normal.

Complete blood count revealed a white blood count of 17,780 with 74% neutrophils, hemoglobin of 9.4 Gm. % and hematocrit of 32 vol. %. Serum amylase was 250 Somogyi units. Blood urea nitrogen, serum electrolytes, serology, serum proteins, calcium, phosphorus and serum transaminase were normal. Liver function studies revealed serum lipids to be 1,425 mg. % with a cholesterol of 512 mg. %. Serum bilirubin was 22.0 mg. % with a direct fraction of 13.3 mg. %, and the serum alkaline phosphatase was 18.4 Bodansky units. Percutaneous needle biopsy of the liver showed extrahepatic obstructive bile stasis. On November 9, 1962 serum amylase was 346 Somogyi units. Serum bilirubin had fallen to 15.8 mg. % with a direct fraction of 8.7 mg. %; however, the alkaline phosphatase remained elevated. Upper gastro-intestinal x-rays showed hepatomegaly, possible gallstones and pancreatic calcifications.

The patient was transferred to the Surgical Service on November 5, 1962 with a clinical diagnosis of obstructive jaundice secondary to malignant neoplasm. Exploratory laparotomy was performed on November 15, 1962 and two distinct cystic masses, each approximately 8 cm. in diameter, were found within the head and tail of the pancreas. The gallbladder was large and distended, and the common duct was moderately dilated. Choledochotomy was performed, but no stones were found in the common duct. A duodenostomy was carried out in the second portion of the duodenum, and after identifying the ampulla of Vater, a needle aspiration of the pancreatic cyst through the medial wall of the duodenum was performed. A pancreatic cystoduodenostomy was carried out for treatment of the cyst in the pancreatic head, and a cystojejunostomy with Roux-Y anastomosis was used for drainage of the cyst

in the tail of the pancreas. Amylase activity of the fluid from the proximal cyst was 21,000 Somogyi units, and that from the distal cyst was 7,000 Somogyi units. Pathologic examination of a biopsy specimen of the cyst wall was reported as being consistent with pancreatic pseudocyst. Postoperative course was uneventful, and by December 14, 1962 the serum bilirubin had decreased to 2.0 mg. %, with a direct fraction of 1.1 mg. %. The patient has remained asymptomatic since discharge from the hospital, and he has gained 20 pounds of body weight.

Case 5. A 40-year-old white man was admitted to the Cincinnati Veterans Administration Hospital on October 28, 1963 with a 10-day history of jaundice, anorexia and excruciating epigastric pain radiating to the back. Partial relief of the back pain was experienced only in the sitting position. A weight loss of 10 pounds had been noted during this period, and he denied a history of alcoholism.

The patient had been hospitalized in August, 1962 because of right upper quadrant pain and hepatomegaly. Liver biopsy at that time established the diagnosis of posthepatitic cirrhosis and oral cholecystogram performed during that admission indicated normal function of the gallbladder without calculi.

The patient appeared chronically ill and was grossly icteric. The liver was enlarged and firm and extended 7 cm. below the right costal margin. A round mass at the liver edge, near the right flank, was interpreted as being a distended gallbladder. The remainder of the physical examination was normal.

Complete blood count, blood urea nitrogen, blood sugar, multiple serum amylase and transaminase determinations were normal. On October 31, 1963 the serum bilirubin was 11.1 mg. % with a direct fraction of 7.7 mg. %, and the serum alkaline phosphatase was 11.5 Bodansky units. The serum bilirubin rose to 13.9 mg. % with a direct fraction of 8.9 mg. %, and the alkaline phosphatase determination rose to 13.5 Bodansky units by November 12, 1963. Two stool guaiac determinations were negative. Chest roentgenogram was negative. Upper gastro-intestinal x-rays revealed a large mass in the region of the head of the pancreas compressing the duodenal loop.

On November 15, 1963, exploratory laparotomy revealed a large cystic mass within the head of the pancreas. The mass felt to be the gallbladder preoperatively was identified as such, and there were numerous adhesions in the region of the common bile duct. A duodenotomy was performed over the second portion of the duodenum and a small spontaneous opening was noted on the medial aspect of the duodenal wall which was draining thick, greenish-brown fluid. Compression of the gallbladder

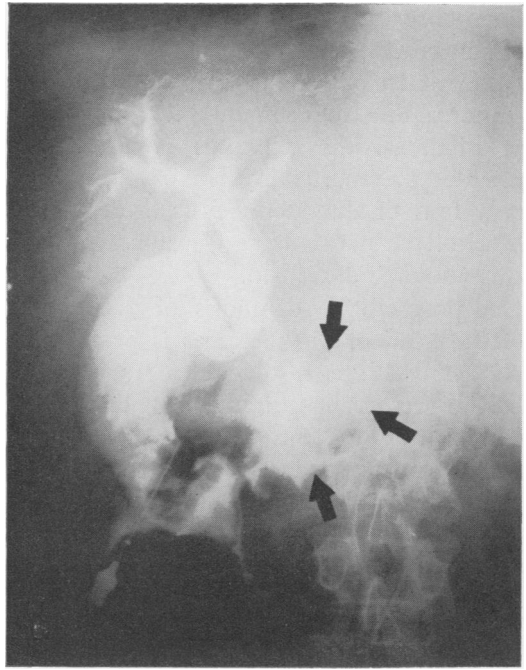


FIG. 5. Cholangiogram at operation demonstrates free communication of the common bile duct and the cyst cavity (arrows).

increased the flow of this bile-like fluid. Operative cholecystogram demonstrated a communication of common bile duct with this cystic cavity (Fig. 5). The opening on the medial duodenal wall was enlarged by means of sharp and blunt dissection, and it was found to communicate with a cystic mass in the head of the pancreas. This mass was lined with gray, shaggy tissue, and the capacity of the cyst was estimated at 200 cc. Because of a questionable constriction of the common duct, a Roux-en-Y cholecystojejunostomy was performed. Pathologic examination of a biopsy of the cyst wall was consistent with pancreatic pseudocyst. The postoperative course was uneventful and by December 9, 1963 the serum bilirubin had decreased to 2.5 mg. % with a direct fraction of 1.3 mg. %, and the alkaline phosphatase to 5.6 Bodansky units. The patient has remained asymptomatic since discharge from the hospital on December 12, 1963.

Discussion

Obstructive jaundice secondary to compression of the common bile duct by a pancreatic pseudocyst occurs only when the cyst is located in the head of the pancreas. Since most pseudocysts are located within the body and tail of the pancreas, these lesions rarely cause obstructive jaundice.¹⁸ A number of published reports confirm

these observations. In the series of 24 cases of pancreatic pseudocysts reported by Reinhoff¹⁶ only one patient had obstructive jaundice due to common bile duct compression. Of the 32 cases of pancreatic pseudocyst reported by Hoxworth, *et al.*¹² only four of the pseudocysts arose in the head of the pancreas and in none of these was jaundice described.

A presumptive diagnosis of pseudocyst of the head of the pancreas is possible in patients with a history of chronic alcoholism, recurrent episodes of pancreatitis and obstructive jaundice and in the presence of an upper abdominal mass. Roentgenographic demonstration of pancreatic calcifications and a widened duodenal loop on barium x-ray study are of further aid in establishing the diagnosis. The relative importance of these diagnostic criteria must be considered since they rarely are all present in one patient, as noted in this review. Moreover, the possibility that a malignant neoplasm may be responsible for obstructive jaundice in the presence of chronic pancreatitis must always be considered.

Three patients in the present series gave a history of chronic alcoholism, one of mild alcoholic intake and one denied ingestion of any alcohol. Although one patient had been previously treated for a pseudocyst of the distal pancreas by a Roux-en-Y procedure, none of the five had a history consistent with chronic, recurrent pancreatitis. Significant recent weight loss was noted in all of the patients. An upper abdominal mass was palpable preoperatively in four of the five patients with pseudocysts of the head of the pancreas associated with common bile duct compression. This fact may be of practical importance in differentiating this lesion from a pancreatic neoplasm associated with jaundice. In a review of 100 cases of pancreatic carcinoma, Gullick⁹ noted that a palpable mass was present in only 15.6 per cent of those with a neoplasm in the head of the pancreas. In a collective series of 707 cases of pancreatic carcinoma

arising in all locations of the gland, Berk⁸ noted the presence of a palpable mass in 37.3 per cent, but in only 12.1 per cent of his own cases. A distended gallbladder was definitely palpable preoperatively in three of the five patients in this review. Since this finding is commonly associated with the presence of a malignant neoplasm in the pancreaticoduodenal area, it is important to recognize that it may also be associated with benign lesions such as the one being reported.

In the present series all patients had obvious clinical jaundice with significant elevations of the serum bilirubin and alkaline phosphatase concentrations during the course of their illness. During the preoperative period of observation these levels were noted to rise in three of the patients. In one patient only one set of bilirubin and alkaline phosphatase determinations were obtained preoperatively, and in the remaining patient a significant decrease in bilirubin and alkaline phosphatase values was noted. In only one patient was the serum amylase concentration elevated preoperatively. Although a persistent elevation of the serum amylase may occasionally occur in patients with malignant neoplasms of the pancreas, such a finding is rare and more often supports a diagnosis of pancreatic pseudocyst than carcinoma.^{1, 20}

In the second patient a clinical diagnosis of pancreatic carcinoma had been made elsewhere, and irradiation therapy had been administered without relief. The occurrence of a serious error such as this emphasizes the clinical similarity of malignant neoplasms and pseudocysts of the head of the pancreas. Epigastric pain radiating to the back when associated with weight loss and obstructive jaundice has long been an important presumptive sign of pancreatic carcinoma. It is of interest that severe epigastric pain with radiation to the back was an important presenting symptom in four of the five patients.

Radiography is of definite value in the

differential diagnosis between pseudocyst and other lesions, especially pancreatic carcinoma, which may cause obstructive jaundice. The demonstration of pancreatic calculi indicates the presence of chronic pancreatitis but does not exclude coexisting neoplasm. Pancreatic calculi were demonstrated in each of the five cases in this report. Enlargement of the duodenal sweep and pressure on the antrum and lesser curvature of the bulb, as noted in all of our patients, were indicative of the presence of a mass in the head of the pancreas. Salik¹⁷ has emphasized his observations that flattening and enlargement of the duodenal sweep has been smooth, and that the mucosal pattern of the duodenum was flattened but not distorted with benign lesions. In pancreatic carcinoma, however, invasion of the duodenal wall is frequent, and distortion, elongation and fixation of the duodenal folds is common. The distortion and mucosal irregularity of the duodenum noted on the upper gastro-intestinal study of one patient in this series (Fig. 3) strongly suggested carcinoma rather than pseudocyst of the head of the pancreas. The presence of pancreatic calcifications and a virtual clearing of deep jaundice during the period of observation, however, established the correct diagnosis. The presence of a post-bulbar imprint by an enlarged common duct is of little help in the differentiation of the two lesions since it may occur in either condition.

Operative cholangiography may be very useful in the management of patients with these lesions. This has been particularly true in cases in which the anatomic relationship of the distal common duct to the pancreatic pseudocyst has not been clearly defined. An operative cholangiogram, in Case 5, demonstrated a communication between the common duct and the pseudocyst, a spontaneous cystoduodenostomy and constriction of the distal common bile duct. The latter finding indicated the advisability for establishing proximal biliary drainage.

Internal drainage of pancreatic pseudocysts located in the distal two thirds of the gland has now been an accepted procedure that has given excellent long-term results.^{12, 21} Cystogastrostomy has proven to be the procedure of choice when the cyst is adjacent and adherent to the wall of the stomach. Cystojejunostomy with the Roux-en-Y anastomosis has been effective for drainage of cysts which are not adjacent to the gastric wall. Despite the fact that cystoduodenostomy was utilized even earlier than cystogastrostomy,¹⁹ it has only rarely been used in the treatment of pancreatic pseudocysts. In an extensive review of the literature concerning surgical treatment of pancreatic pseudocysts in 1958, Warren, Marsh, and Sandusky²¹ noted that cystoduodenostomy had been used in only 15 cases, while cystogastrostomy had been used in 107 patients. Since their report, others have effectively utilized cystoduodenostomy.^{12, 16, 18}

The location of pseudocysts of the head of the pancreas which cause jaundice usually renders them ideal for direct drainage into the duodenum. In Case 5, a spontaneous communication between cyst and duodenum, although small, had been already established at the time of the operation. The relationship of the biliary and pancreatic ducts to the area in which the stoma must be constructed between pseudocyst and duodenum requires a more careful appraisal of anatomy than when using other forms of internal drainage.

In the first patient treated by pancreatic cystoduodenostomy, the course of the distal common duct in relation to the pseudocyst and duodenum was not fully appreciated and accounted for inadvertent severance of the common duct. The injury was recognized and corrected without subsequent difficulty. This was the only serious complication in this group of patients treated by cystoduodenostomy, and it most likely could have been avoided by cholangiography or intubation of the common duct at

the time of operation. In each patient the stoma between pseudocyst and duodenum was so constructed that the diameter was at least 3 cm. There is no evidence that premature closure of the stoma has occurred in any of the patients in this series. The only patient who subsequently died of another cause following discharge from the hospital, Case 2, had a patent stoma at the time of postmortem examination. The other four patients have remained asymptomatic.

Summary

Obstructive jaundice resulting from compression of the common bile duct by a pancreatic pseudocyst is uncommon. Five patients with this complication, have been treated at this medical center during the past 4 years.

The clinical picture presented by patients having obstructive jaundice due to pseudocysts of the head of the pancreas and pancreatic carcinoma may be very similar, but a correct preoperative differentiation of these two lesions is possible. The significant clinical and roentgenographic features which differentiate these two lesions, as well as other diagnostic criteria, are presented.

Successful management of these pseudocysts is primarily dependent upon surgical decompression by internal drainage. Although the specific type of internal drainage should vary according to the position of the cyst, cystoduodenostomy may be used effectively in those pseudocysts of the head of the pancreas which are in close relationship to the duodenum, provided that the importance of the anatomic relationships of the biliary and pancreatic ducts are recognized.

Acknowledgment

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