

Endoscopic Retrograde Cholangiopancreatography at Henry Ford Hospital: 1972-1977

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Between 1972 and 1977, 440 patients underwent endoscopic retrograde cholangiopancreatography (ERCP) at Henry Ford Hospital. The procedure was found to be most useful for identifying the site and nature of an extrahepatic obstruction, the diagnosis of pancreatic cancer, and the preoperative evaluation of chronic pancreatitis. One death occurred as a result of cholangitis in a patient with cancer of the pancreas. Review of the data has led us to refine our indications for ERCP. It has been shown to be a valuable technique with a low incidence of complications in evaluating pancreaticobiliary disease. Based on our study, it would be indicated for jaundiced patients without dilated ducts by echogram or with failure of or contraindication to percutaneous transhepatic cholangiography (PTC), carefully selected patients with unexplained abdominal pain, preoperative evaluation of patients with chronic pancreatitis, and in patients with presumed primary biliary cirrhosis.

Endoscopic cannulation of the ampulla of Vater was first described in 1968 by McCune.¹ Since the development of new duodenoscopes in Japan in 1970, the technique has been widely employed and carefully described.²⁻⁴ Endoscopic retrograde cholangiopancreatography (ERCP) permits excellent visualization of the pancreatic duct as well as intra- and extrahepatic biliary ducts, whatever the level of serum bilirubin.

Materials and Methods

These studies were performed with a duodenoscope manufactured by Olympus Corporation. Patients fast from the night before. Intravenous dextrose is given during the procedure. Patients receive intravenous diazepam (Valium) to tolerance and when the duodenum is intubated, tridihexethyl chloride (Pathilon) is administered intravenously for anticholinergic effect. In most cases, after the ampulla of Vater has been located, 0.2–0.5 mg of glucagon is given intravenously to reduce duodenal motility and to relax the ampulla.

Four hundred and forty-four patients between 23 and 85 years of age (female to male ratio—1:1.2) underwent ERCP at Henry Ford Hospital between 1972 and 1977. The procedure was successful in 313 (71.1%) patients.

Patients were divided into three groups (Table I). The largest category contained 271 patients with unexplained abdominal pain who were further subdivided into three groups: 115 patients with suspected pancreatic carcinoma, 97 with suspected pancreatitis, and 59 with suspected biliary tract disease. The second category consisted of 121 patients who had unexplained jaundice. In the third group, 48 patients were examined for preoperative evaluation of chronic pancreatitis.

Results of the ERCP procedure are shown in Table I.

Submitted for publication: August 28, 1978

Accepted for publication: September 27, 1978

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TABLE I
ERCP Evaluation

Group I: Unexplained Abdominal Pain (271 cases)	Group II: Unexplained Jaundice (121 cases)	Group III: Preoperative Evaluation of Chronic Pancreatitis (48 cases)
Suspected Pancreatic Cancer (115)	CBD Stones 13	Normal 8
Normal ERCP 58	CBD Stricture 4	Dilatation and/or Stricture 25
Abnormal Pancreatic Duct 23	Biliary Tract Cancer 3	Pseudocyst 4
a) Cancer (18)	Choledochal Cyst 1	Unsuccessful ERCP 11
b) Pancreatitis (5)	Pancreatic Cancer 11	
Ampullary Cancer 1	Normal CBD and/or PD 52	
Cholelithiasis 1	Unsuccessful ERCP 29	
Unsuccessful ERCP 32		
Suspected Pancreatitis (97)		
Normal ERCP 55		
Abnormal Pancreatic Duct 11		
Biliary Tract Disease 5		
Unsuccessful ERCP 26		
Suspected Biliary Tract Disease (59)		
CBD Stones 6		
Gallbladder Stones 2		
Stricture 1		
Normal 22		
Pancreatic Duct Only 20		
Unsuccessful ERCP 8		

Case Reports

Case 1

A 50-year-old man came to the hospital with a history of recurrent epigastric pain radiating to his back since 1966. He was an occasional beer drinker. In 1967, he was treated for mumps with orchitis and questionable pancreatitis. In 1970, he developed diabetes mellitus, which was controlled by diet. Four years later, steatorrhea was documented. On upper gastrointestinal series, compression of the duodenal sweep and calcification within the pancreas was noted. ERCP showed dilatation and tortuosity of the pancreatic duct and its radicals (Figure 1). The patient underwent distal pancreatectomy with a Roux-en-Y pancreatico-jejunostomy. The pathologic examination of the tissue confirmed the diagnosis of chronic pancreatitis.

Case 2

A 45-year-old man with a long history of ethanol ingestion had had several hospital admissions for recurrent abdominal pain. Upper gastrointestinal and gallbladder series and barium enema were within normal limits. His amylase on the last admission was markedly elevated. ERCP revealed a pancreatic duct with multiple strictures (Figure 2). After subtotal pancreatectomy, microscopic study showed severe fibrotic replacement of pancreatic tissue.

Case 3

A 66-year-old man came to the hospital with a three-month history of abdominal pain and weight loss. Physical examination was unrevealing. All biochemical and radiological tests were unremarkable except for an elevated alkaline phosphatase. On ERCP the pancreatic duct was "cut off", presumably due to obstruction by a mass. A cut-off sign of the right hepatic duct was also noted and was thought to be due to metastatic obstruction of the duct (Figure 3). At operation, there was adenocarcinoma of the pancreatic head metastatic to the liver.

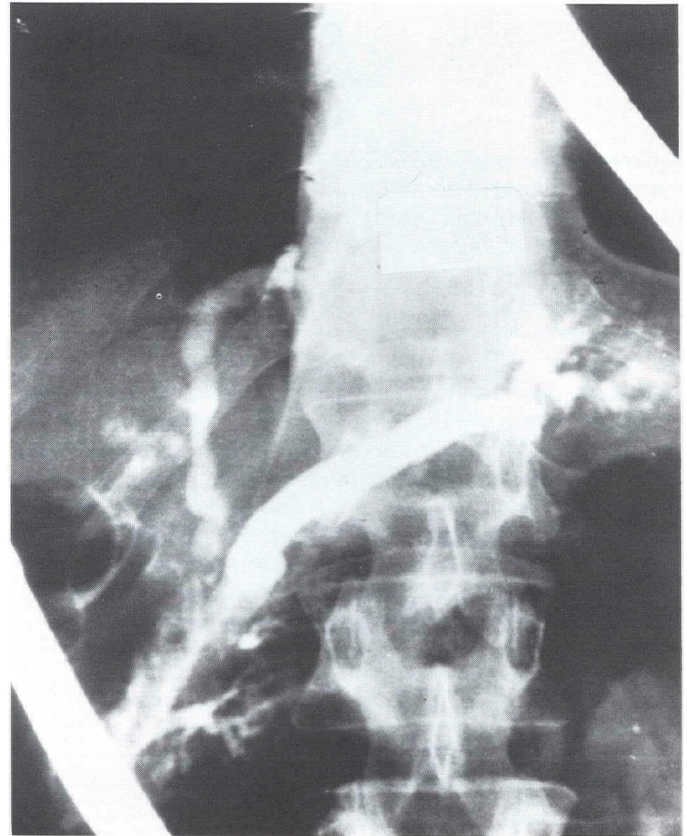


Fig. 1: Case 1
Dilated pancreatic duct crosses the spine. The common bile duct is also opacified parallel to the spine.

Case 4

A 66-year-old woman was transferred to Henry Ford Hospital because of obstructive jaundice. She had had a cholecystectomy six years earlier. She continued to have some nonspecific right-upper quadrant pain and indigestion. Three weeks before admission, she noted yellow eyes along with acholic stool and choluria. ERCP showed a dilated common bile duct with multiple stones (Figure 4).

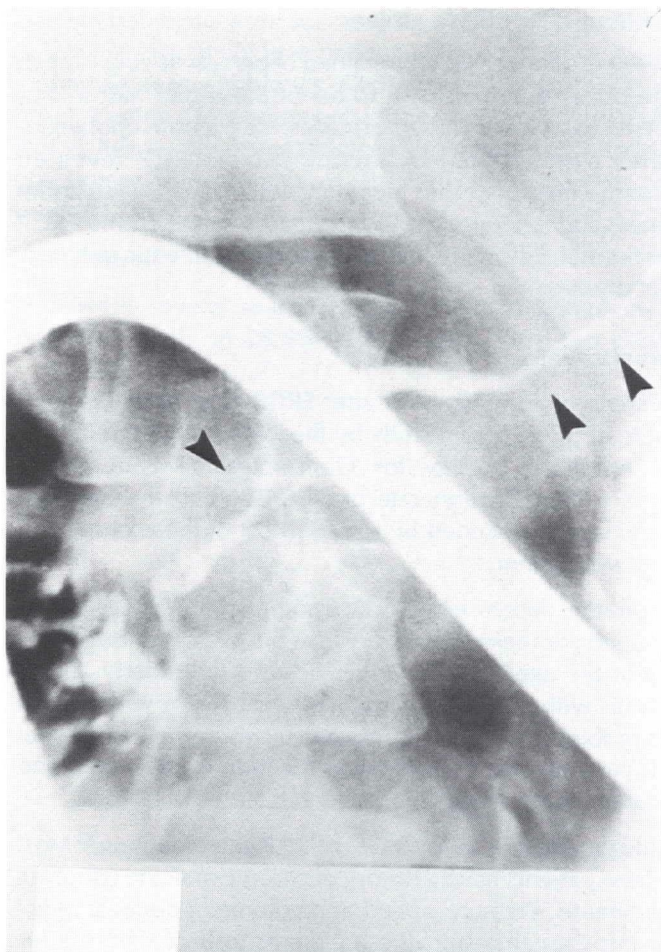


Fig. 2: Case 2
Arrows identify points of stricture in the pancreatic duct.

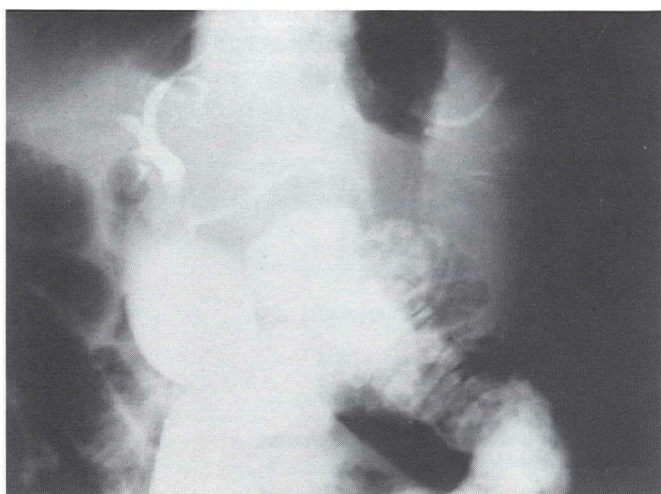


Fig. 3: Case 3
Pancreatic duct is cut off in the proximal body. Right hepatic duct also fails to fill. Contrast material fills the bowel loops below.

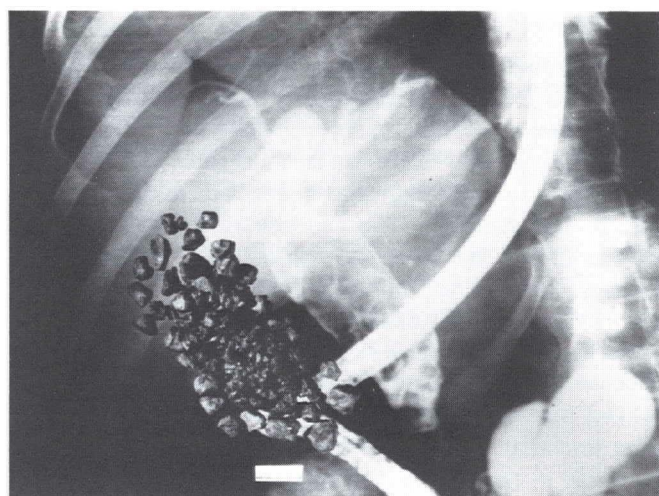


Fig. 4: Case 4
Markedly dilated common bile duct filled with stones. Postoperative stone collection overlaps the x-ray film.

Discussion

Pancreatitis

In our study, cases of pancreatitis had abnormalities that included diffuse narrowing, discrete stenosis, dilatation, tortuosity, biliary and pancreatic duct calculi, pseudocysts and narrowing of the distal common bile duct (CBD). However, there were a few patients whose pancreatic ducts were normal but were proven at surgery to have chronic pancreatitis. Parenchymal disease of the pancreas does not necessarily correspond with ductal alterations⁴; in eight cases of chronic pancreatitis ERCP showed normal or minimal changes in the pancreatic duct. Pancreatic pseudocyst communicates with the duct system in 60% of the cases.⁵ Its most common site is the head, and single pseudocysts are seen more often than multiple cysts.⁶ In all of our cases, the abdominal echogram preceded ERCP. If cystic changes were suspected in the pancreas, we avoided the injection of excessive contrast because of the danger of infecting a pseudocyst. ERCP in cases with definite pseudocyst was done only if the patient was scheduled for surgery and ERCP was required for preoperative evaluation.

Preoperative evaluation of the pancreatic duct allows the surgeon to design the surgical procedure. The severity of major PD pathology depends on the number of attacks and the destructive effects of the inflammation. The surgical lesion, be it obstruction, stricture or pseudocyst, has been found in different stages of chronic pancreatitis, isolated or combined in the same case.⁷⁻¹² ERCP not only provides a basis for selecting a drainage procedure or resection of the pancreas,¹³⁻¹⁷ but is also useful for postoperative assessment of a prior drainage procedure.^{15,18}

Pancreatic cancer

Differentiating pancreatitis from pancreatic cancer by ERCP is sometimes difficult. The duct could be completely normal in the presence of parenchymal pancreatic carcinoma; however, when the major pancreatic duct is involved, characteristic configurations have been reported.¹⁹ The two most common radiologic features in pancreatic carcinoma are obstruction, the so-called cut-off sign, and tapered stricture of the duct, a "rat-tail" configuration. However, a false-positive diagnosis could occur if the pancreatic duct is blocked by a pseudocyst or is incompletely filled. Freeny *et al*¹⁹ found that in 11 cases in which ERCP findings were reviewed blindly, the diagnosis of pancreatic cancer was correct and that PD encasement or obstruction occurred exclusively in carcinoma. Our study tends to support that conclusion although the diagnosis will always be difficult in patients who have pancreatitis complicated by cancer.

Patients with jaundice

In our study of 115 icteric cases, we found that 52 had normal CBD and/or PD. In most, a liver biopsy was performed thereafter and revealed evidence of liver cirrhosis, chronic active hepatitis with cholestasis, or primary biliary cirrhosis (three cases). The demonstration of a patent normal biliary duct in these cases of prolonged jaundice is very valuable because it reduces the risk from needle biopsy of the liver, excludes other causes of jaundice in liver disease, and avoids laparotomy in cases of primary biliary cirrhosis.²⁰⁻²³

In 32 patients with obstructive jaundice, pancreatic head carcinoma was found in 11 cases. Stones in the CBD have been cited as the most frequent cause of extrahepatic biliary obstruction,²¹ which was found in 13 of our cases.

Carcinoma of the biliary tract, although not very common, should be part of the differential diagnosis for jaundice.²⁴ Radiologic features encountered by ERCP are: 1) stenosis of the bile duct system with dilatation of the upper duct system and its branches and a normal appearance of the duct below the site of obstruction; 2) abrupt blockage of the common bile duct with irregular ragged contour; 3) complete stenosis of the hepatic duct without filling of its branches.

All three features have occurred in our experience.²⁵ Stenosis of the CB can also be caused by extrinsic compression or by a stricture or scarring of inflammatory origin, and differentiation may be difficult, particularly in patients with sclerosing cholangitis.²⁶ ERCP avoids the prolonged period of observation usually necessary before deciding upon laparotomy in jaundiced patients.^{22,23,27}

Problems after biliary surgery

Fifty-nine of our cases complained of persistent epigastric or right-upper quadrant pain. Most of these had had a cholecystectomy in the past. In all cases, intravenous cholangiograms were normal or inconclusive. ERCP revealed abnormalities in 9 cases including CBD stones, gallbladder stones, and stricture (Table I). In cases in which the ERCP was normal, follow-up has not revealed pancreatic or biliary tract disease.

Complications

A variety of complications after ERCP have been reported (Table II).²⁸⁻³² A recent study by the Research Committee of the American Society for Gastrointestinal Endoscopy³³ found a complication rate of 21.6/1000 in the reported examinations obtained by survey. Most of these complications were minor.

Respiratory depression may be a complication of diazepam, although the incidence is very low. Slow intravenous injection of the agent, and a lower dose in the elderly and in patients with chronic obstructive lung disease will prevent this problem. We did not encounter this complication, but four patients had a paradoxical reaction to diazepam and became hyperactive.

Acute pancreatitis follows 1% of ERCP examinations.³³ Most of these patients have a history of chronic or acute relapsing pancreatitis. Pressure, speed and volume of contrast injection into the pancreatic duct are predisposing factors for this complication. The amount of injected contrast should be small although pancreatitis has been reported after injection of as little contrast as 2 ml.³⁰ Pancreatic pseudocyst infection has also been reported after ERCP,³¹ and the presence of a pseudocyst contraindicates ERCP except as a preoperative maneuver. In our series, two patients had severe and three patients had moderate pancreatitis, none of whom required surgery. All had had prior episodes of pancreatitis.

TABLE II
Reported Complications of ERCP²⁸⁻³³

I. Premedications	
Diazepam:	Apnea
Anticholinergics:	Tachycardia
II. Pancreatitis	
III. Hyperamylasemia (asymptomatic)	
IV. Sepsis	
Cholangitis	
Infected Pseudocyst	
V. Possible transmission of hepatitis	
VI. Instrumentation	
Submucosal injection of the contrast	
Injury to the papilla of Vater	

In our series, one death occurred due to cholangitis and septic shock. This patient was found to have obstructive jaundice due to pancreatic head carcinoma. Three other

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cases of cholangitis were successfully treated with antibiotics. We now routinely give patients with obstructive jaundice intravenous antibiotics (Cephazolin, 1.0 gm every 6 hours), starting a few hours before the procedure. Although there is little evidence that bacteria are introduced into the duct system by cannulation, the possibility cannot be dismissed.³¹

ERCP failures

There were several reasons for failure to accomplish a satisfactory study in 28.9% of our cases. First, our early

experience had a high failure rate, a factor reflected in our data. Patients with Billroth-II type gastrectomies were successfully cannulated in only 50% of cases. Patients with chronic pancreatitis are difficult to cannulate in some cases because of severe obstructive changes at the ampulla. A malignant obstructive lesion at the pancreatic head may also interfere with cannulation. A few patients had pyloric narrowing, and we could not intubate the pylorus. However, in our last 200 cases the failure rate was reduced to 20%, a rate which is generally accepted as reasonable.

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