

# Pancreaticopleural Fistula: Report of Two Cases and Review of the Literature

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Pancreaticopleural fistulas are a rare complication of pancreatitis. We report two cases from our institution and review 37 cases of pancreaticopleural fistulas identified in the literature. Endoscopic retrograde cholangiopancreatography was more sensitive compared to computed tomography in demonstrating pancreaticopleural fistulas (79% versus 43%, respectively). Medical therapy with total parenteral nutrition, octreotide, and/or chest tube placement was successful in resolving the pancreaticopleural fistula in up to 33% of cases. None of the patients who underwent pancreatic duct stent and/or nasopancreatic drain placement required surgical intervention. Endoscopic retrograde cholangiopancreatography is the initial test of choice when the diagnosis of pancreaticopleural fistula is suspected. Early endoscopic intervention with pancreatic duct stent placement is recommended given its high success rate in fistula closure. Medical therapies are useful adjuncts to endoscopic therapy, but rarely result in pancreaticopleural fistula closure alone. Surgical interventions should only be considered after failure of endoscopic and medical therapies.

**KEY WORDS:** pancreatitis; pancreatic fistula; endoscopic retrograde cholangiopancreatography; pancreatic duct.

Pancreaticopleural fistulas are an uncommon complication of chronic pancreatitis, estimated to occur in 0.4% of patients presenting with pancreatitis (1). Unlike the small pleural effusions that can be seen in acute pancreatitis, pancreaticopleural fistulas can produce large and recurrent pleural effusions. We report two cases from our institution as well as review 37 published case reports of pancreaticopleural fistulas from 1990 to 2004. The results are compared to a literature review spanning from 1965 to 1989 published by Rockey and Cello in 1990 (1).

## METHODS

Case reports of pancreaticopleural fistulas in the English literature from 1990 to 2004 were identified by querying the key words “pancreatic pleural fistula” and “pancreaticopleural

fistula” in the National Library of Medicine PubMed system. Subjects who were under 18 years of age were excluded. Patients were considered to have a pancreaticopleural fistula if a fistulous tract was seen on radiologic or surgical examination or if a large exudative pleural effusion was present with an amylase level higher than 4000 U/L in the absence of an esophageal perforation.

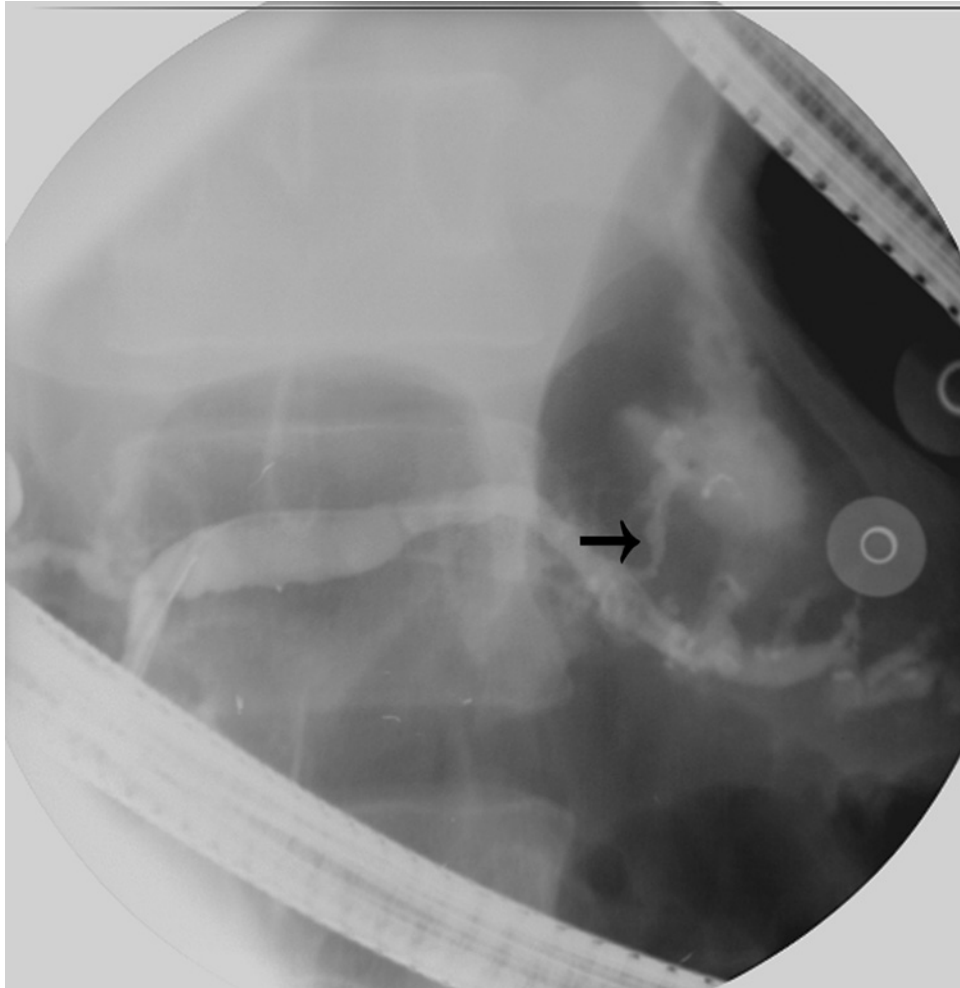
## CASE REPORT 1

A 32-year-old African-American male with a history of alcoholism and chronic pancreatitis presented with a 4-day history of nausea, vomiting, and epigastric pain. The abdominal pain was similar to his prior pancreatitis episodes. He reported having an alcoholic binge four days prior to admission. On physical exam, the patient was found to have decreased breath sounds bilaterally at the lung bases and epigastric tenderness. The admission laboratory data were as follows: amylase, 394 U/L; lipase, 114 U/L; total bilirubin, 0.7 mg/dl; AST, 64 U/L; ALT, 27 U/L; and alkaline phosphatase, 119 U/L. Abdominal and pelvic computed tomography (CT) showed a moderate left pleural effusion, a large right pleural effusion, evidence of chronic pancreatitis, and a 1.6 × 1.8-cm cyst at the junction of the pancreatic body and tail. The cystic area was noted to extend through the esophageal hiatus into the lower posterior mediastinum. A diagnostic thoracentesis revealed an exudate with a pleural fluid LDH

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**Fig 1.** Pancreatogram obtained during ERCP demonstrating leakage of contrast from the pancreatic duct to a pancreatic cyst leaking into the mediastinum (indicated by arrow).

of 376 U/L (serum LDH, 339 U/L) and a pleural fluid total protein of 5.1 g/dl (serum total protein, 7.0 g/dl). The pleural fluid amylase was 3279 U/L. Cytology of the pleural fluid was negative for malignancy.

Endoscopic retrograde cholangiopancreatography (ERCP) performed under general anesthesia showed pancreatic duct changes compatible with chronic pancreatitis. A pancreaticopleural fistula was visualized extending from the pancreatic duct in the body/tail region to a pancreatic cyst leaking into the mediastinum that ultimately drained into the right pleural space (Figure 1). A 10-cm 10-French stent was placed in the pancreatic duct to bridge the site of the fistula (Figure 2). During the procedure, high peak airway pressures were noted on the ventilator, which was thought to be related to the large pleural effusion on the right. A chest tube was then placed for drainage and was subsequently removed 3 days later. The patient was discharged on total parenteral nutrition (TPN) and was given nothing by mouth.

A follow-up CT scan 4 weeks later revealed resolution of the pancreatic cyst, fistulous tract, and pleural effusions. A repeat ERCP confirmed resolution of the fistula and the pancreatic

stent was removed at that time. The patient was restarted on an oral diet and the TPN was stopped. No recurrence of the pancreaticopleural fistula was noted on follow-up.

## CASE REPORT 2

A 47-year-old Caucasian female without a history of pancreatitis presented with abdominal pain. She was diagnosed with choledocholithiasis and underwent successful stone extraction by ERCP. Several months later, the patient presented to another institution with recurrent abdominal pain and shortness of breath. On physical exam, the patient was noted to have decreased breath sounds bilaterally in the lung bases and epigastric tenderness. The admission blood work was as follows: amylase, 638 U/L; lipase, >2000 U/L; total bilirubin, 0.6 mg/dl; AST, 17 U/L; ALT, 20 U/L; and alkaline phosphatase, 148 U/L. Abdominal and pelvic CT showed bilateral pleural effusions and enhancement in the paraesophageal fat extending from the carina inferiorly into the abdomen. No fistulous tract or changes consistent with acute or chronic pancreatitis were seen. An upper gastrointestinal



**Fig 2.** Successful pancreatic duct stent placement across the site of the fistula.

series did not reveal esophageal perforation. Pleural fluid obtained by thoracentesis revealed an exudate with a total protein of 4.0 g/dl (serum total protein, 6.2 g/dl) and a pleural fluid LDH of 937 U/L. The pleural fluid amylase was 11,113 U/L. Routine culture of the pleural fluid was negative. The patient was managed conservatively and referred to our institution for further management, by which time she was eating a regular diet and no longer having abdominal pain or dyspnea.

Magnetic resonance cholangiopancreatography (MRCP) was performed that showed a paraesophageal fluid collection and bilateral (right greater than left) pleural effusions. No fistula was visualized. ERCP showed a narrowed pancreatic duct in the genu requiring dilation and a pancreaticopleural fistula extending from the pancreatic duct in the tail to a pancreatic cyst leaking into the mediastinum. A 10-cm 5-French stent was placed in the pancreatic duct to bridge the site of the fistula.

One week later, a repeat CT revealed a small left pleural effusion and subdiaphragmatic rim-enhancing fluid collections extending from the diaphragmatic hiatus to the level of the left psoas muscle, but no fistulous tract was seen. A repeat ERCP 4 weeks after the pancreatic duct stent was placed showed no evidence of a persistent fistula; therefore, the pancreatic stent was removed at

that time. A follow-up CT 2 months after the last ERCP revealed resolution of the pleural effusion and the subdiaphragmatic fluid collections. The pancreaticopleural fistula did not recur during follow-up.

## RESULTS

Thirty-seven cases of pancreaticopleural fistulas reported in the Western literature from 1990 to 2004 were identified. The most common etiology of pancreatic disease was alcohol abuse, in 31 patients (84%), followed by gallstones, in 3 patients (8%), and unknown, in the remaining 3 patients (8%). Thirty of the patients (81%) were male and seven (19%) were female. The mean age of this cohort was 46.5 years (range, 22–84 years). Twenty-six patients (70%) had a history of pancreatitis.

Dyspnea was the most common presenting complaint, seen in 28 patients (76%). Chest pain, cough, and abdominal pain were reported in 11 (30%), 8 (22%), and 7

(19%) patients, respectively. Five patients (13%) experienced weight loss, while nausea and anorexia were each reported in one patient (3%).

The mean serum amylase on admission was 1441 U/L (range, 161–8000 U/L). The pleural effusions were left-sided in 19 patients (~51%), right-sided in 12 patients (~32%), and bilateral in 6 patients (~16%). The mean pleural fluid amylase was 53,622 U/L (range, 2000–446,600 U/L).

Changes consistent with chronic pancreatitis were seen on ERCP and/or CT in 17 patients (46%), not seen in 1 patient with gallstone pancreatitis (3%), and not mentioned in the remaining cases (51%). Pseudocysts were identified on imaging in 16 patients (43%), not seen in 5 patients (14%), and not mentioned in 16 patients (43%).

Of the 33 cases in which ERCP results were available, 22 (67%) were successful in demonstrating a pancreaticopleural fistula and 4 (12%) showed a leak from the pancreatic duct not extending to the pleural space. ERCP was nondiagnostic in 4 cases (12%) due to pancreatic duct structuring or blockage, in 2 cases (6%) from underfilling, and in 1 case (3%) for unclear reasons. CT was successful in making the diagnosis in 11 out of 32 patients (34%) and was considered suggestive of pancreaticopleural fistula in 3 patients (9%). In the 30 cases in which both CT and ERCP were performed, CT was able to make the diagnosis in 3 cases (10%) when ERCP could not, while ERCP made the diagnosis in 15 cases (50%) when CT could not. The pancreaticopleural fistula was identified in all 8 patients undergoing MRCP; ERCP was unable to make the diagnosis in only 1 of these 8 patients. There was one case report of the initial diagnosis of a pancreaticopleural fistula by transabdominal ultrasound, which was subsequently confirmed by CT and ERCP.

Of the 26 cases where the treatment regimen was discussed, 21 patients (81%) had a trial of nonsurgical management. This was successful in 12 (57%) and failed in 9 (43%). The pancreaticopleural fistulas healed with medical therapy alone with TPN, chest tube placement, and/or octreotide in up to 33% of cases (Table 1). On the other

TABLE 1. SUCCESS RATES OF NONSURGICAL THERAPY IN PANCREATICOPLEURAL FISTULA RESOLUTION

	<i>Number of patients with fistula resolution</i>
Chest tube placement	0/1 (0%)
TPN	0/1 (0%)
TPN, octreotide	1/4 (25%)
TPN, chest tube placement	1/3 (33%)
TPN, chest tube placement, octreotide	1/3 (33%)
Pancreatic duct stent and/or nasopancreatic drain placement	9/9 (100%)

TABLE 2. OPERATIVE INTERVENTIONS

<i>Procedure</i>	N	%
Distal pancreatectomy	7	50
Pancreaticojejunostomy	3	~21
Distal pancreatectomy and pancreaticojejunostomy	1	~7
Middle segment pancreatectomy and pancreaticojejunostomy	1	~7
Pedicled intercostal flap	1	~7
Unknown	1	~7

hand, none of the nine patients who underwent endoscopic intervention required surgery (Table 1)—seven patients had pancreatic duct stents placed, one patient had a nasopancreatic drain inserted, and one patient required nasopancreatic drainage after initial stent placement did not resolve the pancreatic duct leak. Four of these nine patients also required placement of a chest tube during their hospital course.

Distal pancreatectomy was performed in 14 of 26 patients (54%) undergoing surgery and was the most common operative intervention (Table 2). One patient who failed medical management with TPN alone died before scheduled surgical intervention could be performed.

## DISCUSSION

Fistulous communication between the pancreas and extraabdominal organs such as the pleura, mediastinum, bronchi, and pericardium in the setting of pancreatitis is rare. Pancreaticopleural fistulas are estimated to occur in 0.4% of patients presenting with pancreatitis and 4.5% of patients with pancreatic pseudocysts (1).

The typical patient in our review was a middle-aged alcoholic male who most often complained of dyspnea and had a left-sided pleural effusion. A history of pancreatitis was noted in a majority of cases and evidence of chronic pancreatitis on imaging was found approximately half of

TABLE 3. COMPARISON OF PATIENT DEMOGRAPHICS

	<i>Rockey and Cello, 1990 (1)</i>	<i>This study</i>
Males	80%	81%
Mean age	44 years	46.5 years
Alcoholic pancreatitis	80%	84%
History of pancreatitis	52%	70%
Mean serum amylase	636 U/L	1441 U/L
Side of pleural effusion		
Left	67%	51%
Right	19%	32%
Bilateral	14%	16%
Mean pleural fluid amylase	18,450 U/L	53,622 U/L
Presence of pseudocyst	79%	43%

the time. A comparison of the patient demographics between our series and the review from 1990 by Rockey and Cello (1) is summarized in Table 3.

Pancreaticopleural fistulas are usually readily identified by ERCP (2–5, 10–13, 16, 17, 19–21, 23, 25–27). In our series, a fistulous tract or extravasation of contrast from the pancreatic duct was demonstrated in approximately 79% of patients undergoing the procedure. However, the diagnostic capabilities of ERCP can be limited if incomplete opacification of the pancreatic duct occurs, such as with underfilling (12), stone (10), and/or stricture (7, 10, 14, 15, 22, 28). CT has also been successful in identifying pancreaticopleural fistulas, although it is less sensitive (43%) compared to ERCP (79%) in this review. Performing CT immediately after ERCP has been reported to increase the sensitivity of CT in detecting pancreaticopleural fistulas (8), presumably because of the contrast injected directly in the pancreatic duct at the time of ERCP. Recently, MRCP has been shown to be useful in making the diagnosis (4, 5, 10, 12, 15). Although transabdominal ultrasound has been reported to visualize pancreaticopleural fistulas (21), overlying bowel gas and body habitus often preclude adequate visualization.

Once the diagnosis of pancreaticopleural fistula is suspected, the results from this series suggest that ERCP should be performed as the next step. In addition to clarifying or making the diagnosis, therapeutic maneuvers can be performed during ERCP. The first report of pancreatic stent placement leading to successful resolution of a pancreaticopleural fistula was in 1993 by Saeed *et al.* (23). Since then, other reports have also demonstrated the efficacy of endoscopically placed pancreatic stents to assist in fistula closure (9–11, 13, 16, 19, 29). Stent placement creates a path of least resistance for the pancreatic secretions to flow into the duodenum and/or bridges the pancreatic duct leak to allow healing (23). Pancreatic duct strictures or stones downstream to the site of contrast extravasation can be identified and treated during ERCP by balloon dilation, stone extraction, and stent placement after performing pancreatic sphincterotomy. These interventions can reestablish the flow of pancreatic secretions through the pancreatic duct. When large pancreatic duct stones are present, using extracorporeal shock wave lithotripsy has been reported to facilitate stone extraction and subsequent pancreaticopleural fistula closure (3).

Other authors have reported resolution of pancreaticopleural fistulas after endoscopic placement of a nasopancreatic drain (3, 9). Application of low intermittent suction through such drains can further decrease the intraductal pressure and facilitate closure of the fistula. An added advantage is that pancreatograms can be easily obtained to confirm fistula closure without further ERCPs.

However, nasopancreatic drainage is not as well tolerated by patients compared to pancreatic duct stent placement and may require hospitalization while the drain is in place.

In this series, medical therapy alone with TPN, octreotide, and/or chest tube placement was unsuccessful in a majority of cases. The success rate of pancreaticopleural fistula closure with different combinations of these interventions ranged from 0% to 33%. This suggests that treatment aimed at restoring the anatomic continuity of the pancreatic duct is more important than a reduction in pancreatic secretion. We advocate the use of TPN in combination with pancreatic duct stent placement in patients with pancreaticopleural fistulas and add octreotide only if the fistula persists. Chest tubes should only be placed if there is pulmonary compromise due to large pleural effusions. The chest tube should be removed as soon as possible, since it can create a lower resistance pathway for pancreatic secretions distal to a pancreatic duct stricture or stone, potentially favoring persistence of the fistula.

Fifty-two percent of patients in our series required operative intervention, compared to 69% of patients included in the literature review by Rockey and Cello from 1965 to 1989 (1). While it is difficult to directly compare the two studies, the lower number of surgeries in our series may reflect the increased use of pancreatic duct stents and nasopancreatic drains for treatment of pancreaticopleural fistulas in the last decade. In our series, none of the patients who underwent pancreatic duct stent or nasopancreatic drain placement required operative intervention. While this result is impressive, it is important to note that reporting bias could exist because cases of unsuccessful endoscopic management are less likely to be reported. Our literature review and experience suggest that surgery should be considered after failure of conservative management including ERCP and previously described medical therapy.

One of several interventions can be performed during laparotomy. The most common procedure reported was distal pancreatectomy alone (14, 17, 20, 25, 26), followed by pancreaticojejunostomy alone (20, 22, 25). This is similar to the results reported by Rockey and Cello (1). Amer *et al.* reported the successful use of a pedicled intercostal muscle flap to successfully seal a fistula (6).

Pancreaticopleural fistulas are a rare complication of pancreatitis that were frequently managed surgically prior to the advent of therapeutic endoscopy. CT is often the initial imaging study obtained in these patients, although it identifies the fistula less than half of the time. Promising results have been reported with MRCP and this may eventually prove to be the initial imaging modality of choice when the diagnosis is suspected. Although ERCP is more invasive than CT or MRCP, it is a very sensitive test to

identify pancreaticopleural fistulas and therapeutic interventions can be performed to treat the fistula and associated anatomic derangements.

We advocate early endoscopic intervention with pancreatic duct stent placement. Medical therapies such as TPN and octreotide are adjuncts to endoscopic therapy but rarely result in fistula closure by themselves. This approach will likely significantly decrease the need for operative intervention. Surgery should be performed only after failure of endoscopic and medical therapy. Chest tube placement should be considered if the patient's pulmonary status is compromised due to pleural effusions. More studies are needed to further define the roles of these medical and endoscopic interventions in the management of pancreaticopleural fistulas.

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