A 36-year-old man presents with a 10-day history of progressive dyspnea and discomfort on the left side of his chest. Three weeks earlier, he was discharged from the hospital after a 2-week stay for acute pancreatitis. The patient is afebrile. Heart rate is 115 beats per minute; blood pressure, 150/85 mm Hg; and respiration rate, 20 breaths per minute. Chest examination reveals an absence of breath sounds on the left side, with dullness to percussion. The serum amylase level is 938 U/L (normal, 25 to 125 U/L); lipase, 605 U/L (normal, 7 to 60 U/L); and alanine aminotransferase, 7 U/L (normal, 10 to 60 U/L). Alkaline phosphatase, aspartate aminotransferase, total bilirubin, and albumin levels are normal. Analysis of the pleural fluid after thoracentesis reveals the following values: pH, 10; glucose, 39 mg/dL; amylase, 38,192 U/L; lipase, 35,867 U/L; and white blood cell count, 637/μL. The chest film reveals a large, leftsided pleural effusion (Figure 1). A CT scan of the abdomen confirms this finding and shows the effusion, with a small amount of peripancreatic fluid, and a small pseudocyst near the head of the pancreas (Figure 2). Conservative management with total parenteral nutrition (TPN) and intravenous octreotide is initiated. During the next few days, pleural fluid reaccumulates, and thoracentesis is performed again. Endoscopic retrograde pancreatography (ERP) reveals a normal biliary duct, with no stones or strictures. However, the pancreatogram shows a fistulous tract arising from the area of the pancreatic head and running up toward the diaphragm (Figure 3). Because of technical difficulties related to the anatomy of the pancreatic duct in the pancreatic head, stenting of the duct is not achieved, despite repeated attempts. Recurrent accumulation of pleural fluid requires another thoracentesis; surgery is planned. A Roux-en-Y cyst-jejunostomy is performed successfully, and the patient's hospital course is uneventful. Eight days after surgery, a chest tube placed during the procedure is removed, and he is discharged. Two weeks later, the effusion has not recurred. PATHOGENESIS Pleural effusion can develop in the setting of acute pancreatitis. The incidence varies from 3% to 17%. The effusions are frequently small and left-sided and are thought to be lymphatic or sympathetic in origin. Pleural effusion associated with chronic pancreatitis and a pseudocyst is less common. In this setting, the effusion results from pancreatic duct disruption or pancreatic pseudocyst extension to the pleural cavity. Pancreatic-pleural fistula secondary to chronic pancreatitis is a rare cause of recurrent pleural effusion. When the pancreatic duct ruptures during pancreatitis, the omentum and adjacent structures contain the site of inflammation. However, when less inflammation is present, as in chronic pancreatitis, the fluid follows the path of least resistance. Anterior rupture results in pancreatic ascites (pancreatic-peritoneal fistula), whereas in posterior rupture, the fluid tracks to the mediastinum, usually through the esophageal or aortic hiatus. Once in the mediastinum, the pancreatic secretions may break through to one or both of the pleural spaces to form a chronic pancreaticpleural effusion. DIAGNOSIS Pancreatic-pleural fistula is reported mostly in men with chronic alcoholism. Pancreatic pseudocyst occurs in 69% to 77% of patients with pancreatic-pleural fistula. The presentation of pancreaticpleural fistula is often confusing, because of the predominance of pulmonary symptoms and the relative absence of abdominal complaints. A fistula should be considered when a new left-sided effusion develops in a patient with a history of pancreatitis or long-term alcohol abuse. Markedly elevated amylase and lipase levels in an exudative aspirate suggest the diagnosis. The mildly elevated serum amylase level found in most patients with a pancreatic-pleural fistula is thought to result from resorption of amylase from the pleural spaces. The differential diagnosis of amylase-rich pleural effusion includes acute pancreatitis, lung carcinoma, metastatic carcinoma, pneumonia, esophageal perforation, lymphoma, leukemia, liver cirrhosis, hydronephrosis, and pulmonary tuberculosis. However, in pancreatic-pleural fistula, the pleural fluid amylase is usually pancreatic isoamylase in origin, which may aid in the diagnosis. CT is recommended in the diagnosis of pancreatic-pleural fistula, because it shows pancreatic...
parenchymal atrophy, in addition to dilatation of the pancreatic ducts, calcifications, and pseudocysts. Moreover, the fistula can sometimes be revealed. ERP is useful for imaging the pancreatic ductal anatomy, and it can demonstrate a fistulous tract that extends to the pleural cavity. However, ERP is an invasive procedure that carries the risk of infection, pancreatitis, and bleeding. In addition, the pancreatogram may fail to demonstrate the entire anatomy of the pancreatic-pleural fistula. Magnetic resonance pancreatography is a noninvasive imaging method of assessing pancreatic diseases. The image produced can depict not only parenchymal and ductal structural changes but also extrapancreatic complications, including pancreaticopleural fistula. Because the contrast media is not injected, there is no risk of infection.

**TREATMENT Medical therapy.** Standard medical therapy for pancreatic-pleural fistula consists of TPN and bowel rest. Repeated thoracentesis and, sometimes, thoracostomy tube placement have been used for large pleural fluid accumulations. The success rate with this approach ranges from 40% to 60%. Octreotide, a long-acting somatostatin analog, has been used to treat pancreatic fistulas. Somatostatin analogs decrease the volume of fistula output, and they seem to promote closure of the fistula. In one study, failure to achieve fistula closure with octreotide was attributed to pancreatic duct stenosis, pseudocyst, or patient noncompliance. Complications related to nonoperative therapy include malnutrition, TPN-associated problems, central venous catheter infections, and deep venous thrombosis. A trial of conservative therapy usually lasts about 3 weeks. For patients who do not respond to such therapy initially, a delay in proceeding to more invasive measures increases morbidity and mortality. **Stent placement.** Internal pancreatic fistulas have been treated successfully with insertion of a stent in the pancreatic duct by ERP. Because the main pancreatic duct is usually disrupted, the stent should be placed to bridge the site of rupture. However, it is probably more important that the stent decrease intraductal pressure by bypassing either the Oddi sphincter or any stricture in the duct. The response following stent placement is usually dramatic, and patients can quickly resume oral intake. The stents are kept in place for 4 to 12 weeks. Follow-up intervals have ranged from 9 to 30 months, with no recurrences. Repair of the fistulous tract where it extends to the chest is unnecessary, because removal of the obstruction and disruption of the pancreatic duct prevent further passage of fluid to the chest. Data are currently lacking on long-term consequences of pancreatic duct stent placement. **Surgery.** If the pancreatic-pleural fistula fails to close with conservative or endoscopic treatment, surgery is indicated. Distal pancreatectomy is recommended for fistulas that arise from the body and tail of the pancreas and are not associated with ductal strictures in the head of the gland. If a large pseudocyst not amenable to resection is present, or if a ductal stricture cannot be encompassed by the resection, then internal drainage of the pseudocyst or the actual fistula must be performed. Fistulas that arise from the head of the gland are also treated, in general, by an internal drainage procedure, whether or not an associated pseudocyst or ductal stricture is present. Pancreaticoduodenectomy and distal subtotal pancreatectomy are rarely justified for fistulas, because they are associated with high morbidity and mortality. Internal drainage is usually accomplished with a Roux-en-Y pancreaticojejunoanastomosis or cyst-jejunostomy.

**References: REFERENCES:**


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