Introduction

Pancreatic-pleural fistula (PPF) is an infrequent complication (0.4%) of pancreatitis. PPF is more commonly (67%) seen with alcohol related chronic pancreatitis (CP). Clinical presentation of PPF may vary from chronic cough to respiratory distress in patients with previously diagnosed or undiagnosed CP. Over a period of time, treatment has been shifted from medical or surgical therapy to endoscopic therapy. Here we describe two cases with different clinical presentations, evaluation and successful management by endoscopy.

Case 1

A 43-year-old man was diagnosed to have alcohol related CP for the last 4 years and was on medical treatment. He presented with epigastric pain with moderate intensity, radiating to back and associated with respiratory distress. On examination, respiratory rate was 26 breaths per minute with room air oxygen saturation of 90%. Mild upper abdominal tenderness was noticed in the epigastric region. Air entry was decreased on right base and mid axillary region with a dull note on percussion. On evaluation, total leukocyte counts 12 × 10^9/L (4–11 × 10^9/L), serum amylase was 1364 U/L (25–125 U/L), lipase 2537 U/L (73–393 U/L) with normal liver and kidney function tests.

On chest radiograph (CXR) bilateral pleural effusion was seen (right > left) [Figure 1a]. Contrast enhanced computerized tomography (CECT) abdomen showed chronic pancreatitis with walled off pancreatic necrosis (WOPN) limited to tail region.
with bilateral pleural effusion and ascites [Figure 1b and 1c]. Clinical diagnosis of acute exacerbation of chronic pancreatitis was made. In view of persistent respiratory distress pleural fluid tapping was done, which provided temporary relief.

Pleural fluid analysis revealed neutrophil predominant exudative fluid. Acid fast bacilli or atypical cells were not seen. Pleural fluid adenosine deaminase level was 25.2 IU/L. Pleural fluid total protein level was 4.2 g/dl (>3 g/dL). Fluid amylase and lipase were done with value of 10,925 U/L and 99,886 U/L, respectively. High amylase and protein content of pleural fluid confirmed the diagnosis of PPF. There was no definite fistulous tract visualized on CECT abdomen. Patient had persistent spikes of fever along with respiratory distress and chest pain. Endoscopic Retrograde Cholangio-Pancreatography (ERCP) was performed, which revealed leak of contrast towards the tail region of pancreatic duct [Figure 1d]. A 7 Fr x 10 cm pancreatic stent was placed in the main pancreatic duct. Respiratory distress and fever resolved and also there was complete resolution of pleural effusion on CXR [Figure 1e]. Repeat ERCP and stent exchanges were done on at four months interval for one year and the leak totally disappeared [Figure 1f]. The patient was stent free by one year of event free follow-up. Patient is doing well and asymptomatic after one year of follow-up.

**Case 2**
A 57-year-old man, with a history of chronic alcohol intake presented with complaints of chronic dry cough and dyspnea on exertion for the last three months. He underwent repeated pleural tapping for the same and was started on empirical antitubercular treatment. The symptoms persist on medical management. Patient did not have any history of pain abdomen, trauma or fever. On examination, respiratory sounds were decreased on the left basal and mid region. CXR showed left moderate pleural effusion [Figure 2a]. CT scan revealed features of CP [Figure 2b] with left moderate pleural effusion. Pleural tap revealed exudative fluid with amylase level of 2186 U/L, which was not tested during the earlier episodes of pleural tapping. Serum amylase was normal. Diagnosis of PPF was made and antitubercular drugs were discontinued. ERCP revealed contrast leak and fistulous tract near the tail of pancreas [Figure 2c]. Pancreatic duct stenting was done with 7 Fr x 12 cm plastic stent crossing the fistulous track. On follow-up ERCP sessions the contrast leak disappeared [Figure 2d], cough and dyspnea gradually improved. Follow-up CXR showed complete resolution of pleural effusion [Figure 2e]. Pancreatic stent was removed after six months and the patient is asymptomatic at two years of follow-up.

**Discussion**
Pleural effusion is seen in 3–7% of cases of pancreatitis with higher incidence in patients with CP.[3] In our series it was associated with acute exacerbation of chronic pancreatitis in first case and CP in the second. Pleural effusion in pancreatitis is of two types. First is reactionary type, which is usually small and left sided or bilateral and characterized by normal fluid amylase value (<1000 U/L) and low proteins (<3 g/dL) and more common in acute pancreatitis. Second type is due to PPF, which is massive, predominantly left sided, refilling and characterized by high pleural fluid amylase value (>1000 U/L) and high protein content (>3 g/dL).[5] Diagnosis of PPF requires high degree of clinical suspicion and assessment of pleural fluid amylase.[6]

Leakage of pancreatic fluid from pseudocyst or WOPN or rarely from pancreatic duct, give rise to pancreatic fistula.[5,7,8] WOPN

![Figure 1](image-url): (a) Chest radiograph showing bilateral pleural effusion. (b) CT abdomen showing walled off pancreatic necrosis in tail of pancreas (white arrow). (c) CT thorax showing bilateral pleural effusion. (d) ERCP showing pancreatic duct cannulation and collection (white arrow). (e) Chest radiograph showing resolution of pleural effusion. (f) ERCP showing no leak from pancreatic duct.
Treatment of PPF compromises of medical, endoscopic and surgical management. Medical management consists of administration of somatostatin analogues which has been shown to decrease pancreatic secretions and increase fistula closure rates. King, et al. demonstrated a success rate of 31% with medical therapy alone. Endoscopic intervention in the form of ERCP with pancreatic duct stenting has emerged as first line therapy for PPF. Main aim of ERCP is to decrease pressure in the pancreatic ductal system, drainage of pancreatic pseudocyst and bypassing fistulous connections, and preferential drainage of pancreatic secretions into the duodenum, which help in healing of fistula tract. In a series of 43 patients, success rate of 100% with ERCP and stenting is reported. Both of our patients were successfully treated with ERCP and pancreatic duct stenting. High success rate of early surgery as compared to medical therapy alone (94% vs. 31%) is reported. With recent advances and expertise in endoscopy and it being less invasive, endoscopic interventions are favored over surgical therapy. Surgical intervention is reserved for patients with failed medical or endoscopic intervention.

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Conflicts of interest
There are no conflicts of interest.

References

1. Wronski M, Slodkowski M, Cebulski W, Moronczyk D, Krasnodebski IW. Optimizing management of pancreaticopleural fistulas. World J Gastroenterol 2011;17:4688-703.
2. Aswani Y, Hira P. Pancreaticopleural fistula: A review. JOP 2015;16:90-4.
3. Machado NO. Pancreaticopleural fistula: Revisited. Diagn Ther Endosc 2012;2012:815476.
4. Kord Valeshabad A, Acostamadiedo J, Xiao L, Mar W, Xie KL. Pancreaticopleural fistula: A review of imaging diagnosis and early endoscopic intervention. Case Rep Gastrointest Med 2018;2018:7589451.
5. Ranjan P, Bansal R, Sachdeva M, Kumar M. Pancreaticopleural fistula: Report of two cases and review of literature. J Dig Endosc 2013;4:123-7.
6. Branca R, Rodríguez RM, Rogers JT, Ayo DS, Moyers JP, Light RW. Routine measurement of pleural fluid amylase is not indicated. Arch Intern Med 2001;161:228-32.
7. Sut M, Gray R, Ramachandran M, Diamond T. Pancreaticopleural fistula: A rare complication of ERCP induced pancreatitis. Ulster Med J 2009;78:185-6.
8. Vyas S, Gogoi D, Sinha SK, Singh P, Yadav TD, Khandelwal N. Pancreaticopleural fistula: An unusual complication of pancreatitis diagnosed with magnetic resonance cholangiopancreatography. JOP 2009;10:671-3.
9. Villena V, Pérez V, Pozo F, López-Encuentra A, Echave-Sustaeta J, Arenas J, et al. Amylase levels in pleural effusions: A consecutive unselected series of 841 patients. Chest 2002;121:470-4.
10. Ali T, Srinivasan N, Le V, Chimpiri AR, Tierney WM. Pancreaticopleural fistula. Pancreas 2008;36:e26-31.
11. King JC, Reber HA, Shiraga S, Hines OJ. Pancreatic-pleural fistula is best managed by early operative intervention. Surgery 2010;147:154-9.
12. Neher JR, Brady PG, Pinkas H, Ramos M. Pancreaticopleural fistula in chronic pancreatitis: Resolution with endoscopic therapy. Gastrointest Endosc 2000;52:416-8.