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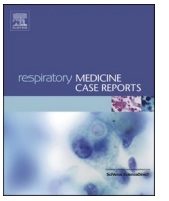

Case Report

# Emphysematous pancreatitis with pulmonary embolism: A case report

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ABSTRACT

*Background:* Emphysematous pancreatitis is a severe systemic inflammatory process with reports of pulmonary embolism in the setting of acute pancreatitis rarely described.
*Case presentation:* A 61-year-old woman presented with severe abdominal pain of 1 day duration. She was found to have acute interstitial pancreatitis. During her hospitalization, the patient developed worsening abdominal pain associated with increasing oxygen demands, requiring supplemental oxygen through nasal cannula. Workup showed pulmonary embolism in the posterior segmental branch of the left lower lobar artery and development of emphysematous pancreatitis was noted on imaging. The patient was started on intravenous antibiotics and therapeutic anticoagulation; her condition improved and was discharged home.
*Conclusion:* Patients with severe acute pancreatitis may be at risk for pulmonary embolism due to immobilization and other inflammatory mechanisms. Mitigating individualized risk factors and anticoagulation use as prophylaxis should be considered in patients with pancreatitis to prevent embolism. Early detection by clinicians is critical to reduce misdiagnosis and mortality rates.

## 1. Introduction

Acute Pancreatitis (AP) is a sudden inflammatory process of the pancreas described as a local tissue damage that can activate a systemic inflammatory response [1]. Around 5–10% of AP progress into acute necrotizing pancreatitis (ANP) that either stay sterile or become infected [2]. Emphysematous pancreatitis (EP) is an uncommon variant defined as necrotizing infection of the pancreas concomitant with gas forming organisms from the bowel [3]. This condition is a rare and serious complication of acute pancreatitis with a high case fatality rate [4].

In addition, vascular complications in pancreatitis are common and their combination is serious and life threatening. While portosplenic and splanchnic venous thrombosis are often documented, extra-splanchnic involvement is rare [5]. In fact, there are very few cases reported in the literature of pulmonary embolism (PE) in AP. Early diagnosis and treatment of patients with PE can decrease the mortality rate from 10 to 20% (in patients with undiagnosed PE) to 2–8% [6].

In this study, we report a case of acute pancreatitis complicated by emphysematous necrosis and pulmonary embolism. We will discuss its pathogenesis and management. Highlighting these two fatal complications of pancreatitis can enable prompt diagnosis and

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highlight the importance of awareness and timely diagnosis and treatment.

## 2. Case presentation

A 61-year-old woman presented with acute diffuse abdominal pain of 1 day duration. She complained of persistent, stabbing in nature, abdominal pain radiating to the back. She also reported nausea and 2 episodes of vomiting. No fever, dyspnea, or chest pain were reported.

The patient had a history of controlled hypertension and diabetes for more than 5 years. She's a non-smoker and a non-alcoholic.

On physical examination, the patient's vital signs on admission were as follows: temperature was 36 °C, respiratory rate was 20 breaths/min, saturation was 95% on room air, heart rate was 76 beats per minute and blood pressure was 134/90 mmHg.

The patient was ill-appearing. She had a soft abdomen with diffuse tenderness to palpation mainly prominent in the periumbilical area. No guarding or rebound tenderness were noted. Bowel sounds were present. Cardiopulmonary auscultation was within normal limits. No skin manifestation or lower limb edema were seen.

*On Day 1 of admission,* White blood cell count was elevated with high neutrophil count, with normal CRP. Liver function tests were also elevated, except for bilirubin. Lipase and amylase were also high, with normal triglyceride and creatinine levels and mild hypokalemia (3.1mEq/L). Labs on day 1 are illustrated in Table 1. Abdominal and Pelvic computed tomography (CT) Scan with intravenous (IV) contrast showed acute interstitial pancreatitis with a bulky appearance of the pancreatic head and extensive peripancreatic fluid and fat stranding (Fig. 1). Chest CT with IV contrast was then performed to rule out active infectious process (including Coronavirus Disease infection) as per infectious control protocol. The main thoracic vessels were normal in caliber. There were no pleural or pericardial effusion nor infectious infiltrative or consolidating process. Hepatobiliary ultrasound found a distended and thickened gallbladder with multiple gallstones in its lumen, but obstructive stones were not visualized in the common bile duct.

The patient was initially diagnosed with acute interstitial pancreatitis associated with distended gallbladder and multiple gallstones in its lumen. Initial treatment consisted of aggressive hydration, analgesics, and scheduled ambulation associated with compression stocking as prophylaxis for venous thromboembolism.

On Day 3 of admission, MRCP showed mildly dilated common bile duct and prominent proximal intra hepatic biliary tree likely attributed to the compression by a 1.9 cm duodenal diverticulum arising from the second portion. No evidence of biliary ductal stones or intraluminal lesions (Fig. 2).

On Day 4 of admission, patient developed tachypnea and desaturation requiring 1–2 L of oxygen by nasal cannula. In parallel, her abdominal pain was progressively worsening. Despite the decrease of lipase and white blood count, the neutrophils percentage remained elevated at 86.9% and CRP remarkably increased. Procalcitonin was found to be positive and D-dimer was found to be elevated.

A CT Chest with IV contrast showed a filling defect at the posterior segmental branch of the left lower lobar artery consistent an acute pulmonary embolus (Fig. 3). Repeat CT Abdomen and pelvis demonstrated further increase in the distal peripancreatic fluid tracking along the left para renal space with interval appearance of free air within it extending to the retro mesenteric plain around the celiac trunk. Findings were suggestive of emphysematous pancreatitis or gas forming superimposed infection (Fig. 4).

Upon diagnosis of emphysematous pancreatitis and pulmonary embolism, broad spectrum IV antibiotics and therapeutic anticoagulation with enoxaparin were initiated.

On Day 9 of admission: CT showed unchanged air bubbles within the peripancreatic collection. The latter appearing more well defined, indicating a walled-off collection and a superimposed gas forming infection (Fig. 5).

Patient was discharged home after the improvement of her symptoms. After 1 month, repeat CT scan showed persistence of left sub splenic/anterior pararenal abscess that was successfully drained by interventional radiology. Culture of the pus showed pan sensitive *Klebsiella Pneumoniae* that was treated accordingly. Subsequently, patient underwent uneventful prophylactic cholecystectomy.

**Table 1**
WBC: White blood cells, ALT: Alanine Transaminase; AST: Aspartate aminotransferase, ALP: Alkaline phosphatase, GGT: Gamma-glutamyl transferase, CRP: C-reactive protein cystectomy.

| Variable | Day 1 | Day 4 | Reference range |
|---|---|---|---|
| WBC (x 10*3/μL) – (% Neutrophils) | 22.88 (89.9%) | 6.59 (86.9%) | 4–10 |
| ALT (U/L) | 99 | | <34 |
| AST (U/L) | 145 | | <33 |
| ALP(U/L) | 300 | | 35–105 |
| GGT(U/L) | 333 | | <40 |
| Total Bilirubin (U/L) | 0.6 | | 0.2–1 |
| Direct Bilirubin (U/L) | 0.4 | | 0–0.3 |
| Lipase (U/L) | 1631 | | 13–60 |
| Amylase (U/L) | 3870 | | 28–100 |
| CRP (mg/dl) | 0.2 | 17.8 | <0.5 |
| Creatinine (mg/dl) | 0.77 | | 0.51–0.95 |
| Triglyceride (mg/dl) | 49 | | <200 |
| D-dimer (ug/L) | – | 2550 | <0.5 |
| Procalcitonin (ng/ml) | – | 1.4 | <0.5 |

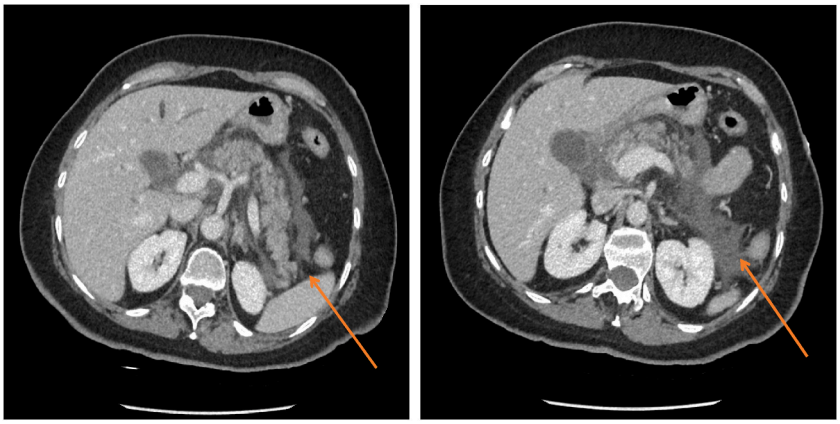

**Fig. 1.** Axial slice of CT Scan from admission demonstrating peripancreatic fluid with preserved pancreatic parenchyma, consistent with acute interstitial pancreatitis.

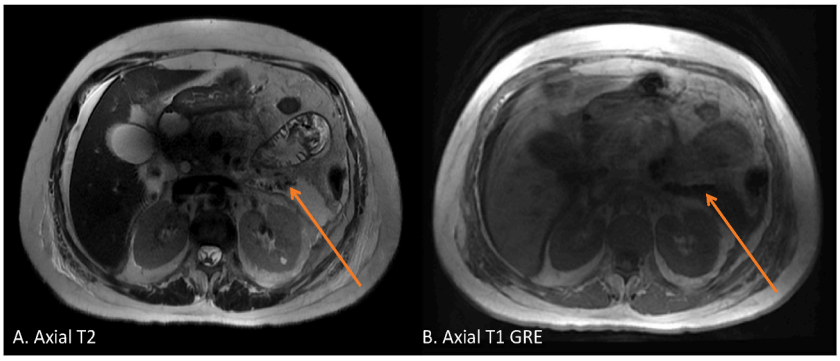


**Fig. 2.** MRCP from Day 3 of admission. Fig. 2A. Showing foci of low T2 signal intensities within the peripancreatc fluid collection at the left anterior pararenal space. Fig. 2B. Showing susceptibility artifact on T1 GRE sequences, indicating air bullae.

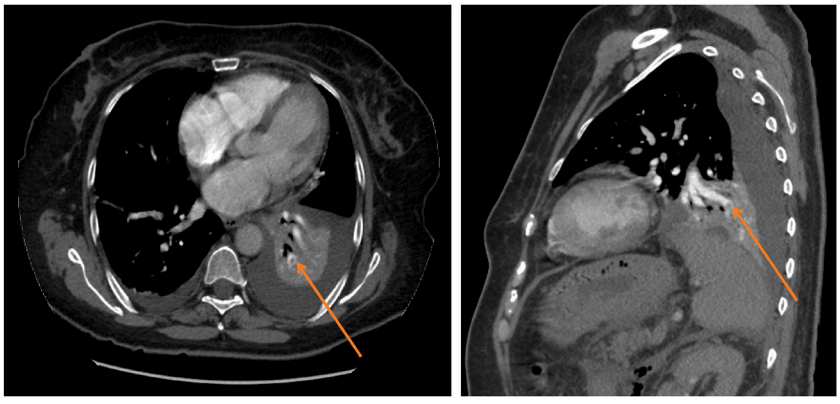

**Fig. 3.** CT Chest from day 4 of admission showing a filling defect at the posterior segmental branch of the left lower lobar artery, suggestive of acute pulmonary embolism. Also a mild bilateral pleural effusion with complete collapse of the left lower lobe.

## 3. Discussion

Serious vascular complications associated with pancreatitis have been well described, with hemorrhage being the most common. Other complications are splenic vein thrombosis and less frequently portal and superior mesenteric vein thrombosis [7]. According to a systematic review and meta-analysis in 2015, it was found that in patients with pancreatitis the pooled prevalence of splenic vein, portal vein and mesenteric vein thrombosis was 11.2%, 6.2% and 2.7% respectively [8]. These venous thromboses are correlated to their location close to the pancreas [9]. In contrast to splanchnic venous thrombosis, pulmonary embolism and extra splanchnic venous

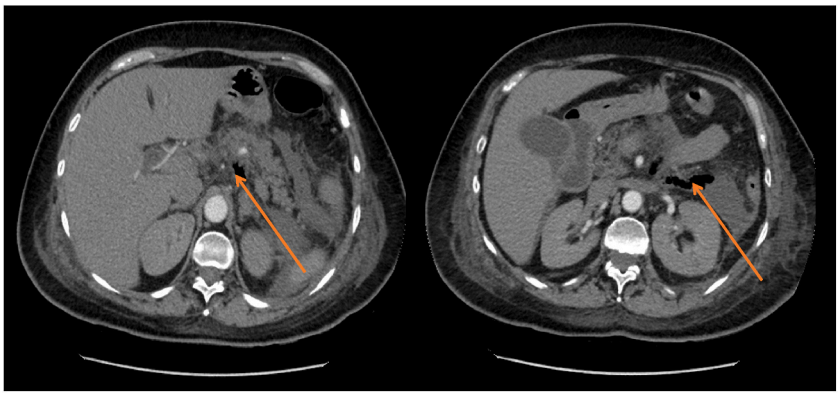

**Fig. 4.** Axial slice of CT Abdomen from day 4 of admission showing free air within the peripancreatic fluid collection, indicating emphysematous pancreatitis/gas forming superimposed infection.

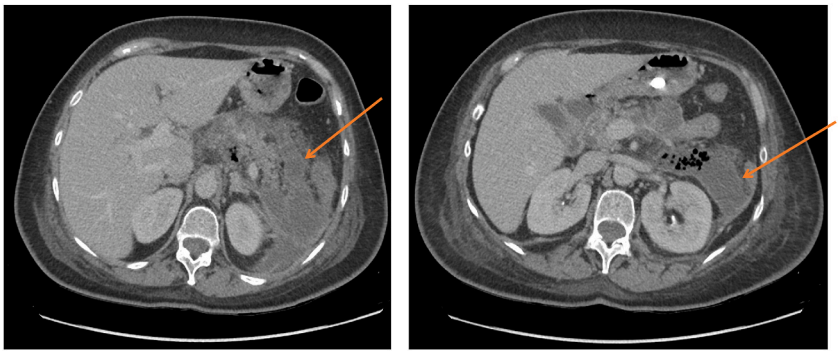

**Fig. 5.** Axial slice of CT Abdomen from day 9 of admission. Unhanged air bubbles within the peripancreatic collection, the latter appearing more well defined on today's exam, indicating a walled-off collection and a superimposed gas forming infection.

thrombosis are atypical [5].

Pulmonary embolism is a rare complication of pancreatitis, and there have been very few descriptions of it. Vascular thrombosis and hypercoagulable states complicating pancreatitis are thought to be due to release of proteolytic enzymes from the pancreas and direct vasculitis. The following mechanisms have been hypothesized to possibly contribute to the formation of the pulmonary thrombus: (1) a cyst communicating with the pancreatic duct penetrates into the vasculature; (2) pancreatic juice enters the vascular and triggers the formation of a thrombus secondary to vasculitis proximally or distally; (3) hypercoagulability complicates pancreatitis due to a combination of hepatic dysfunction, hypertrypsinaemia (resulting in raised fibrinogen and Factor VIII concentrations), and cachexia; (4) vascular changes, due to proteolytic damage or inflammation, may also play a significant part; and (5) acute pancreatitis provokes deleterious effects in endothelium-dependent relaxing response for acetylcholine (Ach) in isolated mesenteric rings that were strongly associated with high plasma nitrous oxide (NOx) levels as consequence of intense inflammatory responses. Furthermore, the sub sensitivity of contractile response to phenylephrine in both mesenteric and pulmonary rings might be due to complications of this pathological condition in the early stages of pancreatitis [10].

In this report, we describe a case of acute pancreatitis that was complicated by emphysematous changes and pulmonary embolism in a 61-year-old patient.

The patient was an elderly woman diagnosed with acute necrotizing pancreatitis complicated by peripancreatic collection. She had no history of hypercoagulable disorders or lower limb venous thrombosis and no previous hematologic diseases, recent trauma or surgeries. Work-up revealed normal complete blood count, normal triglyceride level and absence of atrial fibrillation on electrocardiogram. Her risk factors for thrombosis included systemic inflammatory response syndrome caused by the pancreatitis, prolonged bed rest (scheduled ambulation and compression stockings), and older age.

During her hospitalization, the patient started complaining of shortness of breath that was associated with desaturation requiring 1–2L of oxygen by nasal cannula. Initially, we considered that the shortness of breath and desaturation were caused by atelectasis and congestion for which incentive spirometry and diuretics were respectively prescribed. Given lack of improvement and a strongly positive D-dimer, we suspected PTE. CT angiogram of the chest found a pulmonary embolus in the left lower lobar artery.

Roch. et al. found that severe necrotizing pancreatitis is associated with higher risk of venous thrombotic complications [11]. We postulate that the etiology of pulmonary thromboembolism is the presence of severe systemic response syndrome, vascular injury with possible hypercoagulability triggered by pancreatic secretions going to the blood vessels on the background of the patient's individual

venous thrombosis factors.

The number of AP cases complicated by PE in the literature is very limited. We compared our case with seven cases of AP complicated by PE reported by Fu et al. [12] The age range varied with two patients in their twenties, four patients in their thirties and one patient in their sixties. Gender ratio was male to female 3:4. Dyspnea and shortness of breath was present in six out seven patients. Our patient had worsening dyspnea and as their major symptom. Four patients had venous thrombosis in the extremities; three of them in the lower extremities which manifested as edema. Our patient had no lower limb edema, erythema or warmth and did not complain of any lower extremity pain. After diagnosing PE on CT, lower extremity thrombosis was not examined. D-dimer in these patients was between 500 and 1680 μg/L while our patient had a higher D-dimer of 2550 μg/L.

In patients with AP and PE, dyspnea is the most common symptom which may or may not be associated with thrombosis [12]. Other symptoms include pleuritic chest pain and palpitations. Clinical signs comprise of desaturation, tachypnea, and tachycardia. Massive PE may also cause hypotension and sudden arrest [13]. The majority of clinical presentations are vague and may lead to repeated misdiagnosis [14]. Therefore, early suspicion and recognition of the possibility of PE in AP is crucial. When PTE is suspected, the possibility of thrombosis should be directly evaluated followed by the detection of D-dimer level, pulmonary artery pressure measurement and pulmonary angiography [15]. Moreover, fibrinogen, troponin, brain natriuretic peptide, and electrocardiography are important secondary examination tools for acute PE. When the diagnosis of PE is confirmed, anticoagulation therapy should be initiated immediately, and thrombolytic therapy should be given if needed.[16]

Pulmonary embolism is a rare complication of pancreatitis but could be fatal, hence, the importance of highlighting this adverse event. Taking it into consideration in the management of pancreatitis, whether through systemic anticoagulation or mechanical devices, as well as through routine venous thromboembolism prophylaxis, remains critical.

## 4. Conclusions

Acute pancreatitis complicated with emphysematous pancreatitis and pulmonary embolism is a very rare condition and it is associated with a high mortality rate. Early recognition and investigation of thromboembolism by clinicians is crucial to avoid misdiagnosis and reduce both morbidity and mortality, especially with the initiation of treatment in a timely manner.

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## Declaration of competing interest

Authors have no disclosures.

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