Official Case Reports Journal of the Asian Pacific Society of Respirology
Respirology Case Reports
OPEN ACCESS

Pleural effusion secondary to chronic pancreatitis in childhood

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Keywords
Chronic pancreatitis, paediatric, pleural effusion.

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Received: 12 March 2021; Revised: 5 May 2021; Accepted: 6 May 2021; Associate Editor: John Kolbe.

***Respirology Case Reports*, 9 (7), 2021, e00788**

doi: 10.1002/rcr2.788

Abstract

Pleural effusion secondary to a pancreatico-pleural fistula is a very rare presentation in children, with limited reports in the literature. We describe two differing presentations of pleural effusions resulting from chronic pancreatitis (CP) with successful resolution of the pleural effusion. These cases highlight the need for consideration of this rare paediatric diagnosis, and the variety of investigations, management strategies, and complications that can occur in the setting of CP in children.

Introduction

Chronic pancreatitis (CP) is a progressive fibroinflammatory disease that leads to irreversible destruction of the pancreatic parenchyma, ducts, and loss of exocrine function [1]. Complications of CP include pseudocysts, splenic vein thrombosis, gastrointestinal bleeding secondary to gastric varices, pseudoaneurysms of the splenic artery, and disconnected pancreatic duct syndrome (DPDS) [2–5]. Rare complications of CP include pancreatic pleural effusion (PPE) and pancreatic ascites (PAs), occurring secondary to the formation of an internal fistula. A high index of suspicion is required to make these diagnoses [6]. We describe two paediatric patients with CP and pleural effusions secondary to a pancreatico-pleural fistula (PPF), the investigations and management strategies employed, and review the existing literature.

Case Report

Case 1

A six-year-old male presented to the surgical outpatient clinic with a known history of CP and chronic abdominal pain. A routine abdominal ultrasound was performed with the incidental finding of a large left-sided pleural effusion. He had no other significant past medical history. There was extensive family history of pancreatitis and pancreatic carcinoma.

The patient had no signs of respiratory distress or infective symptoms. He had growth failure (weight < first centile) with static height (10–25th centile). A chest X-ray (CXR) revealed a large-volume pleural effusion without midline shift (Fig. 1A). He had elevated serum lipase of 458 U/L (<60) and serum albumin of 34 g/L (32–47). His inflammatory markers were not elevated and his faecal elastase was low, 46 μg/g (>200), suggestive of pancreatic insufficiency.

He remained asymptomatic despite repeat imaging on day 5 (D5) revealing an increasing pleural effusion. He was admitted for commencement of total parenteral nutrition (TPN). Computed tomography (CT) abdomen (D8) and a subsequent magnetic resonance cholangiopancreatography (MRCP) performed on day 17 confirmed a pancreatic pseudocyst with a peripancreatic collection extending through the oesophageal hiatus with associated posterior mediastinal fluid collection, and discontinuity between the pancreatic body (Fig. 1B–D). There was no history of trauma. Given the absence of respiratory symptoms, conservative management was initially employed to try to avoid the general anaesthesia required for a pleural tap or pleural drain insertion in the paediatric population.

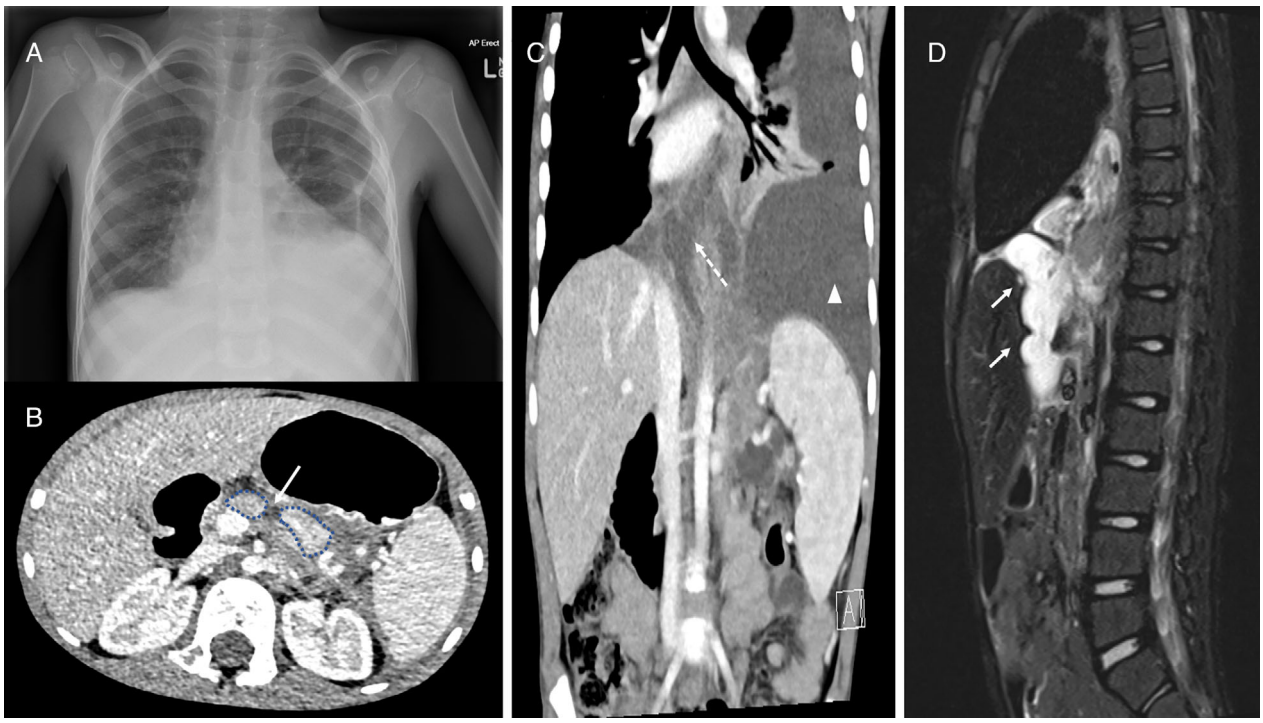

Figure 1. Chest X-ray (CXR) on presentation (A), discontinuity between the pancreatic body (blue outline) and a pancreatic collection (long arrow) (B), mediastinal collection (dotted arrow) and pleural effusion (arrowhead) (C), and posterior mediastinal collection (short arrows) (D).

Due to the presence of abdominal discomfort and a persistent large pancreatic pseudocyst, in discussion with both the paediatric and adult gastroenterology and surgical teams, a distal subtotal pancreatectomy and splenectomy were performed (D59). Intraoperatively, a major pancreatic duct disruption in the proximal body of pancreas and left upper quadrant varices consistent with splenic vein thrombosis were noted. The pseudocyst was drained and approximately 500 mL was aspirated from the left pleural space with elevated lipase 155 U/L, amylase 169 U/L (a normal serum amylase level for paediatrics at our centre is 27–131 U/L), and a negative microscopy, culture, and sensitivity (MCS).

Genetic testing revealed PRSS1 heterozygosity and alpha-1 anti-trypsin (A1AT) heterozygote, PIMZ genotype. He was discharged home on nasogastric feeds with improvement in his weight to the fifth centile on day 71, without re-accumulation of the pancreatic pseudocyst or pleural effusion.

Case 2

A 13-year-old male presented with dyspnoea, tachypnoea, and decreased exercise tolerance, with a known history of CP. A CXR demonstrated a large left-sided pleural effusion with mediastinal shift (Fig. 2A). He had short stature with height (fourth centile) and weight (seventh centile). Genetic tests revealed heterozygosity for G551D, a cystic fibrosis transmembrane conductance regulator (CFTR) mutation, with a normal sweat chloride level of less than 7 mmol/L (<40). There was no other significant past medical history or family history.

Given his symptomology, a left pleural pigtail drain was inserted with 2.9 L drained within 24 h. The pleural fluid had elevated lipase of 1470 U/L and a negative MCS, which confirmed the presence of a PPF. He had elevated serum lipase 101 U/L and decreased serum albumin 24 g/L (32–47). His inflammatory markers were not elevated. A CT chest and abdomen performed on day 2 demonstrated interval increase in the size of the pancreatic pseudocyst compared to previous imaging (Fig. 2B). He was kept nil by mouth, commenced on TPN, and completed a course of intravenous antibiotics. The chest drain was removed on day 19.

He experienced persistent abdominal discomfort and on day 20, an endoscopic drainage of the large peripancreatic fluid collection was performed. A 10 mm × 10 mm HOT AXIOS (Boston Scientific) metal cyst-gastrostomy stent was deployed with approximately 1.8 L drained (Fig. 2C). On day 1 post stent insertion (D21), he developed large-volume haematemesis (400 mL) with a new splenic artery pseudoaneurysm detected on a CT angiogram. As the pseudoaneurysm was directed towards the pseudocyst and did not occur at the point of the stent, the bleeding most

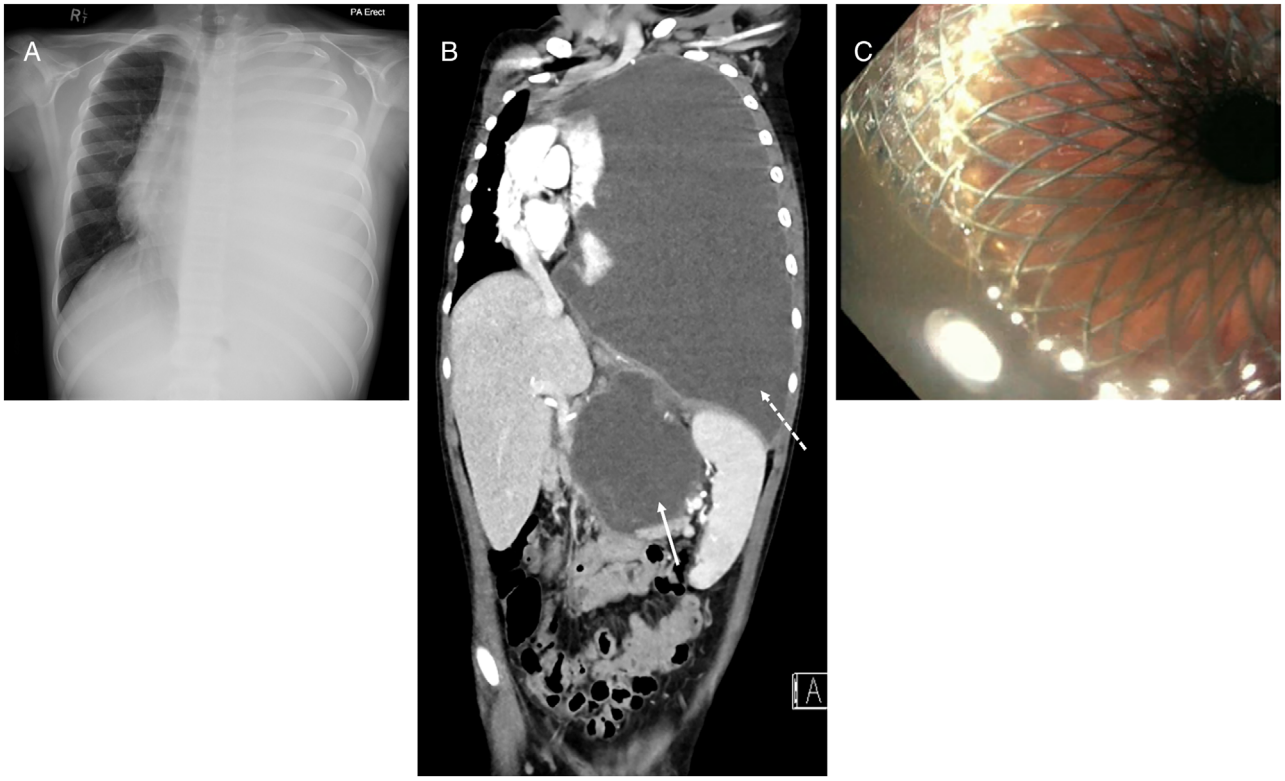

Figure 2. Chest X-ray (CXR) on presentation (A), pancreatic pseudocyst (long arrow) with large pleural effusion (dotted arrow) (B), and deployed cyst-gastrostomy stent (C).

likely occurred due to clot lysis with the reduction in pseudocyst pressure post stent insertion. The pseudoaneurysm was successfully coiled. He was discharged home on day 42 with ongoing outpatient management, and without recurrence of the pleural effusion or pancreatic pseudocyst.

Discussion

Pancreatic fistulas are rare, occurring approximately in 0.4% of adult patients with pancreatitis and 4.5% of patients with pancreatic pseudocysts [7], with the majority occurring as a complication of CP [8]. There are a few cases reported in paediatric patients. An internal pancreatic fistula is characterized by drainage of pancreatic secretions into a body cavity rather than the duodenum [6]. The pancreatic fistula forms due to a leak from an incompletely formed or ruptured pseudocyst, or a direct pancreatic duct leakage [9]. Anterior duct disruption leads to PAs, while posterior disruption results in a mediastinal pseudocyst or a PPE [6], which is the most likely cause for case 2's presentation.

DPDS is another complication resulting in complete discontinuity of the pancreatic duct. The secretions of the remnant pancreatic body and/or tail enter the retroperitoneum resulting in pancreatic necrosis or a pseudocyst [10,11]. Case 1 is an example of DPDS.

A pancreatic fistula resulting in a PPE or PA is confirmed with elevated amylase and protein content in the pleural and/or ascitic fluids, as described in both cases. Serum amylase may also be elevated [6,12]. Children with pancreatic fistulae usually present with significant malnutrition, low serum albumin <30 g/L, and a history of progressive abdominal distension [12]. Both our patients had poor growth and borderline low albumin levels with significant improvement in their nutritional status post management of the PPF and pancreatic pseudocyst.

MRCP is the non-invasive imaging technique of choice for detecting CP-specific abnormalities, such as dilatation and strictures of the main pancreatic duct and its branches or pancreatic duct calculi [13]. MRCP also has the greatest sensitivity (77.8%) in detecting pancreatic fistulae in paediatric patients, followed by the CT scan (57.1%) and endoscopic retrograde cholangiopancreatography (ERCP) (25%) [14]. A higher fistula detection rate with ERCP (62–78%) was described in adult studies [9,15]. Demonstration of the fistula with imaging was not possible in some cases [16], as was the case in both our patients.

The management of PPF in the paediatric population is extrapolated from adult literature, given the rarity of the condition. Conservative treatment is recommended as the first-line therapy, consisting of gastrointestinal rest, TPN, thoracic drainage, and somatostatin analogues, with success in 33–60% of adult patients [9]. Endoscopic pancreatic stenting has been shown to effectively resolve the PPF [17,18]. ERCP is a safe procedure with low risk of bleeding (<1%) in children [19,20]. In two small studies of children with pancreatic duct disruption and PPF, ERCP and stenting procedures were successful in 80% of cases [21,22].

Other PPF management strategies comprise of endoscopic sphincterotomy and placement of a nasopancreatic drainage tube [23]. Surgical treatment options in adults for the disconnected left pancreatic remnant include internal drainage such as a Roux-en-Y cystojejunostomy, Roux-en-Y fistulojejunostomy, and Roux-en-Y pancreaticojejunostomy, or distal pancreatectomy with splenectomy [24,25]. The indication for splenectomy in managing splenic vein thrombosis remains unclear [25].

Idiopathic CP is the main aetiology of paediatric CP [3,26], which is the most likely cause for case 2. There are however known genetic mutations associated with hereditary pancreatitis including PRSS1, SPINK1, CFTR, chymotrypsin C (CTRC), calcium-sensing receptor (CASR), and the carboxyl ester lipase (CEL) gene [27–29]. While cystic fibrosis carrier status confers a small risk for CP [30], the role of a single G551D mutation remains unclear. The PRSS1 mutation is strongly associated with early-onset pancreatitis with rapid progression to CP [29]. This mutation has likely contributed to case 1's early diagnosis of CP, six months prior to presenting with the pleural effusion. The significance of A1AT variants for CP in the paediatric population is unknown [31]. Patients with hereditary pancreatitis have higher incidences of exocrine and endocrine failure as well as risk of pancreatic cancer and will require follow-up into adulthood [32].

In conclusion, pancreatic effusion secondary to a PPF is a rare presentation in children. The diagnosis of a PPF should be considered even if undetected on imaging modalities as the PPF may not always be visualized. Given the infrequent presentation and potential serious complications that may arise in paediatric patients, a multidisciplinary team approach in defining the management path for these patients is recommended.

Disclosure Statement

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

Author Contribution Statement

Both authors contributed to the drafting of the manuscript, data analysis, draft revision, and approval of the final draft for publication.

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