

# Arterial Pseudoaneurysm Mimicking a Mural Nodule Within a Pancreatic Cyst

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## ABSTRACT

Pancreatic cysts with high-risk characteristics are at increased risk of harboring high-grade dysplasia or pancreatic cancer. Endoscopic ultrasound may clarify the nature of the cystic lesion and its malignant potential. A mural nodule found through endoscopic ultrasound within a cyst may represent malignancy and require fine-needle aspiration. Pancreatic pseudocysts are benign walled-off fluid collections that form in the setting of pancreatitis and may be difficult to differentiate from neoplastic cysts. Pseudoaneurysms form when pancreatitis inflammation damages vessel walls and can cause fatal hemorrhage. We present a pancreatic pseudocyst with pseudoaneurysm mimicking a neoplastic cyst with a mural nodule.

**KEYWORDS:** Pancreatic cysts; Pseudoaneurysm; Pseudocyst; Mural nodule; Endoscopic ultrasound

## INTRODUCTION

A rising prevalence of pancreatic cysts in the United States has occurred because of the increasing quality and frequency of cross-sectional imaging in an aging population.<sup>1</sup> Although most of these cysts are benign, many have malignant potential.<sup>2,3</sup> Intraductal papillary mucinous neoplasms and mucinous cystic neoplasms are mucin-producing cystic tumors of the pancreas.<sup>2-4</sup> Pancreatic cysts with high-risk characteristics have a higher probability of harboring high-grade dysplasia or pancreatic cancer and may warrant endoscopic ultrasound (EUS) with fine-needle aspiration (FNA) of areas concerning for malignancy.<sup>3,5</sup>

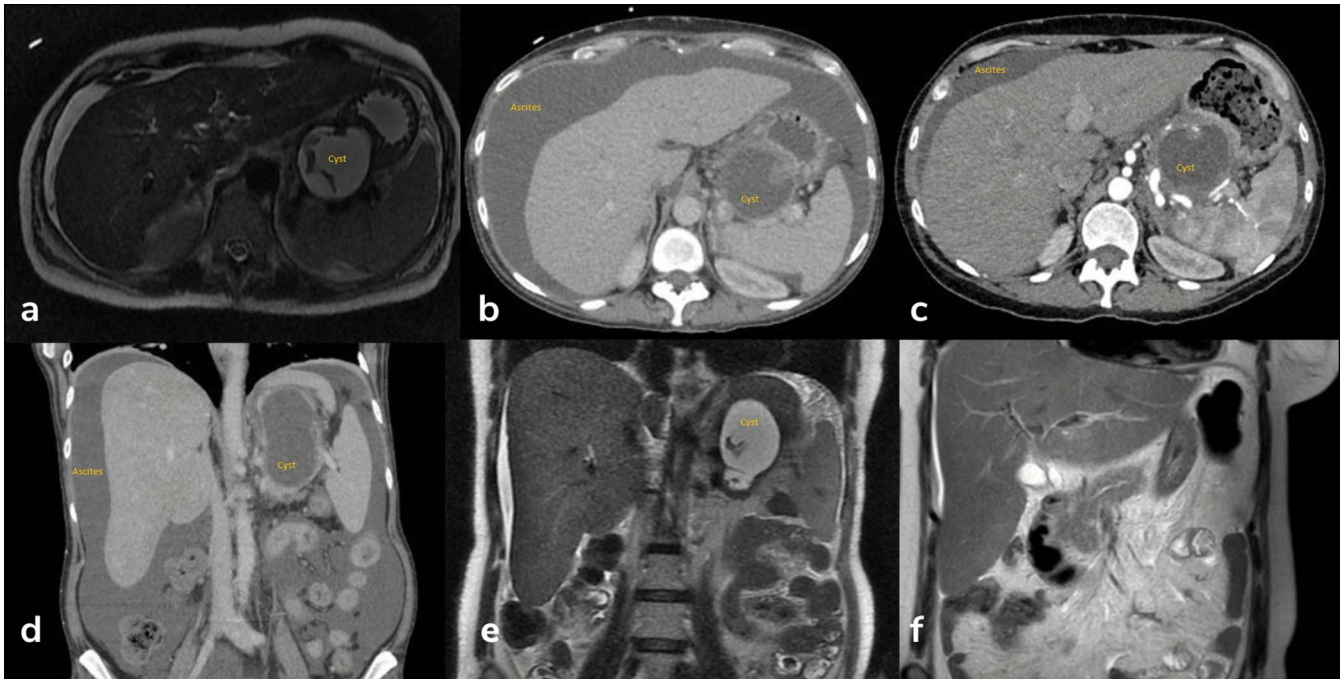
Pancreatic pseudocysts are benign walled-off fluid collections that form after a prior episode of acute pancreatitis or in the setting of underlying chronic pancreatitis.<sup>2,3</sup> Pancreatic pseudocysts have a reported incidence of 5%–16% in acute pancreatitis and 20%–40% in chronic pancreatitis. Acute pancreatitis in the setting of chronic pancreatitis also leads to pseudocyst formation.<sup>6</sup> A clinical history of acute pancreatitis or chronic pancreatitis and a comparison of prior cross-sectional imaging may help distinguish pseudocysts from cystic neoplasms. EUS can be helpful to further characterize the nature of a cystic lesion as a pseudocyst or a neoplasm.<sup>3,7</sup>

A pseudoaneurysm is a rare complication that occurs when pancreatic inflammation damages the wall of adjacent vasculature and is at high risk of fatal hemorrhage. Pseudoaneurysms can occur in the setting of a pseudocyst with an incidence of 6.3%.<sup>7,8</sup>

## CASE REPORT

A 41-year-old woman with a history of chronic liver disease with ascites, alcohol use disorder, and chronic abdominal pain presented to the emergency department because of acute worsening of pain in the epigastrium and left upper quadrant. The pain was dull in character with intermittent sharp cramping. The patient reported poor appetite and weight loss.

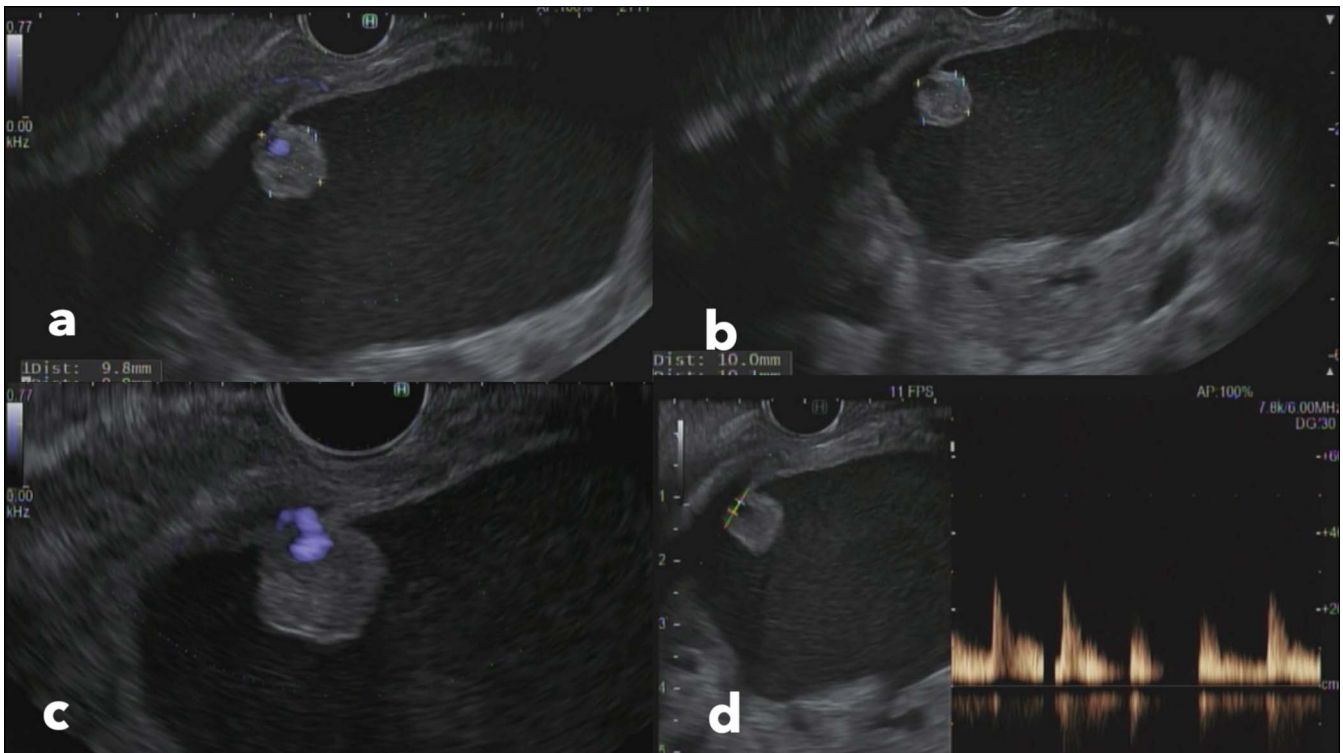
On examination, the patient was afebrile and with normal vital signs. On abdominal examination, there was tenderness to palpation in the epigastrium and left upper quadrant without any signs of guarding and rigidity.



**Figure 1.** Cross-sectional imaging showing 5.5-cm thick-walled fluid collection arising from the tail of the pancreas, (A) MRI T2, axial, (B) CT scan venous phase, axial, (C) CT scan arterial phase, axial, (D) CT scan venous phase, coronal, (E) MRI T2, coronal, and (F) MRI T2, coronal: Imaging from 3 years earlier showing normal pancreatic parenchyma without any signs of pancreatitis or cyst. CT, computed tomography; MRI, magnetic resonance imaging.

The patient's hemoglobin was 10.2 g/dL (normal range: 11.6–15 g/dL) and white blood cell count was  $11.7 \times 10^9/L$  (normal range:  $4.5\text{--}11.0 \times 10^9/L$ ). The patient had an elevated

alkaline phosphatase of 402 IU/L (normal range: 44–147 IU/L) and International Normalized Ratio of 1.2 (normal range: 0.8–1.1), but other aminotransferase levels and



**Figure 2.** EUS with Doppler: a  $10 \times 10$ -mm hyperechoic mural lesion with a pulsatile vessel, worrisome for pseudoaneurysm. (A–C) Vascular enhancement within the mural lesion. (D) Pulsatile doppler flow of the vascular structure within the mural lesion. EUS, endoscopic ultrasound.



**Figure 3.** CT angiogram: pseudoaneurysm off a branch of the left gastric artery corresponding to EUS findings. CT, computed tomography; EUS, endoscopic ultrasound.

bilirubin levels were within normal limits. Lipase levels were within normal limits (54 U/L, normal range: 0–160 U/L).

Abdominal and pelvic computed tomography with contrast was performed on the day of admission, which revealed a 5.5-cm thick-walled cystic lesion in the tail of the pancreas extending into the splenic hilum. Calcifications with peripancreatic stranding of the pancreas were present (Figure 1). Abdominal MRI was performed during admission, which revealed a 5.5-cm thick-walled cystic mass with debris. It also revealed a dilated common bile duct, stage 4 liver fibrosis, and portal venous hypertension. The patient's abdominal MRI from 3 years earlier showed normal pancreatic and liver parenchyma (Figure 1).

EUS was performed during hospitalization to further evaluate the cyst and abdominal pain. The cyst was 5.5 cm in size, unilocular with debris, and had a 10 mm × 10 mm hyperechoic lesion arising from its wall that resembled a mural nodule. Color Doppler showed the hyperechoic lesion to have pulsatile vascular flow (Figure 2).

FNA was not performed given the suspicion that the lesion was a pseudoaneurysm rather than a mural nodule. Computed tomography angiogram displayed a focal arterial blush arising from a branch of the left gastric artery along the anterior wall of the pseudocyst, confirming the diagnosis of a pseudoaneurysm (Figure 3).

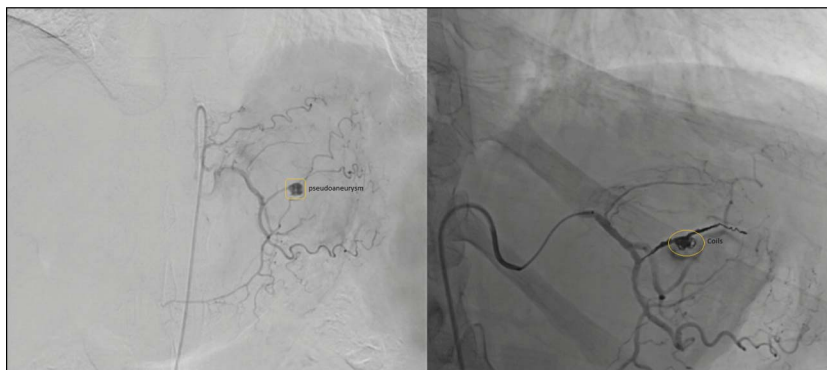
The patient underwent transarterial coiling embolization of the pseudoaneurysm because of the high morbidity and mortality associated with bleeding pseudoaneurysm<sup>9</sup> (Figure 4). The pseudocyst was treated conservatively because it did not display any signs of infection nor was it large enough to cause any mass effect to explain the abdominal pain. The patient was referred to a liver and pancreas specialist. On a 6-week follow-up, the patient reported improved oral intake, and the pseudocyst was stable without any acute changes on abdominal MRI.

## DISCUSSION

Our patient had a history of alcohol use disorder but did not have a prior diagnosis of pancreatitis. The presence of pancreatic parenchymal calcifications on imaging is consistent with chronic pancreatitis and, in the context of a history of alcohol use, raised the suspicion of a pancreatic pseudocyst.<sup>7</sup> Within the differential of the cystic lesion was a mucinous cyst, such as an intraductal papillary mucinous neoplasm. Hypoechoic structures on the wall of a mucinous cyst are described as mural nodules, dysplastic growths at high risk of transforming into cancer.<sup>3,10</sup>

Chronic pancreatitis causes parenchymal inflammatory changes and calcifications, which may mask any underlying tumor changes.<sup>11</sup> This makes the diagnosis difficult even with EUS-FNA.<sup>11</sup>

EUS-guided tissue sampling of a suspected mural nodule may determine whether a cyst should undergo surgical resection.



**Figure 4.** Interventional radiology: coil embolization of the pseudoaneurysm.

According to the Fukuoka guidelines, cysts with high-risk stigmata on EUS imaging such as the presence of blood supply in the cystic mural nodule  $\geq 5$  mm in size should undergo resection in surgically fit patients without any further investigations.<sup>12,13</sup>

Fortunately, in this case, the pseudoaneurysm was recognized as a hyperechoic lesion in the wall of the pseudocyst at the time of EUS, and needle biopsy was not performed. Chronic pancreatitis complicated with a bleeding pseudoaneurysm has an incidence of 30%–50%.<sup>14</sup> Some of the risk factors leading to pseudoaneurysmal bleeding are pancreatic necrosis, peripancreatic infection, peripancreatic fluid collections, multiorgan failure, vasculitis, long-term anticoagulant use, and iatrogenic injuries.<sup>15</sup>

Pseudoaneurysms have been described as donut-shaped lesions with a thick outer wall and a central anechoic area on EUS imaging.<sup>16</sup> Pseudoaneurysmal hemorrhage has also been reported with endoscopic drainage of pseudocysts and walled-off pancreatic necrosis.<sup>8,17,18</sup>

Pseudoaneurysms within pseudocysts have been associated with hemorrhagic complications in 2.5% of cases and a mortality rate as high as 90%.<sup>17,18</sup> Thus, prophylactic endovascular management is recommended.<sup>19</sup>

## DISCLOSURES

Author contributions: H. Kalsi made substantial contributions to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafted the work. TL Jue revised the work for important intellectual content, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work. R. Pannala made substantial contributions to the conception or design of the work and the acquisition, analysis, or interpretation of data for the work. TL Jue is the article guarantor.

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