



Approach to walled-off pancreatic fluid collections in adults

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INTRODUCTION

Walled off pancreatic fluid collections (PFCs) are a complication of pancreatitis. Walled-off PFCs with little or no necrosis (commonly referred to as pancreatic pseudocyst) are encapsulated, mature fluid collections that are often related to chronic pancreatitis and less commonly to acute pancreatitis. Pancreatic pseudocysts are caused by inflammation and subsequent damage of the pancreatic ducts leading to extravasation and accumulation of pancreatic fluid.

Walled-off PFCs with necrosis (also referred to as walled-off pancreatic necrosis) are mature, encapsulated collections of pancreatic or peripancreatic necrosis that are often related to an episode of acute necrotizing pancreatitis. Patients with walled-off pancreatic necrosis may have a prolonged clinical course with complications such as infection (eg, infected pancreatic necrosis) and intolerance of oral intake.

This topic will discuss the approach to evaluating and managing patients with walled-off PFCs with or without necrosis. Endoscopic interventions for walled-off PFCs are discussed in more detail separately. (See "[Endoscopic interventions for walled-off pancreatic fluid collections](#)".)

The diagnosis and management of acute pancreatitis and its complications including acute peripancreatic fluid collections are discussed separately:

- (See "[Clinical manifestations and diagnosis of acute pancreatitis](#)".)

- (See "[Pancreatic debridement](#)".)

The clinical manifestations of chronic pancreatitis and its complications are discussed separately:

- (See "[Chronic pancreatitis: Clinical manifestations and diagnosis in adults](#)".)
- (See "[Overview of the complications of chronic pancreatitis](#)".)

The classification of pancreatic cysts is discussed separately. (See "[Classification of pancreatic cysts](#)".)

Diagnosis and management of pancreatic cystic neoplasms are discussed separately. (See "[Pancreatic cystic neoplasms: Clinical manifestations, diagnosis, and management](#)".)

ETIOLOGY AND CLASSIFICATION

Walled-off PFCs are classified as ([table 1](#)) [1]:

- **Pancreatic pseudocysts** – Pancreatic pseudocysts are encapsulated, mature PFCs occurring outside the pancreas that have a well-defined wall with minimal or no necrosis. Pancreatic pseudocysts are often related to chronic pancreatitis as a result of progressive ductal obstruction. The ensuing elevation in intraductal pressure may then induce ductal leakage, with accumulation of a peripancreatic fluid collection. (See "[Overview of the complications of chronic pancreatitis](#)".)

Pancreatic pseudocysts are less commonly related to an episode of acute pancreatitis or to pancreatic trauma (eg, blunt injury, postsurgical) [2]. If a pancreatic pseudocyst is related to acute pancreatitis, the mature wall usually develops at least four weeks after the acute episode.

- **Walled-off pancreatic necrosis** – Walled-off PFCs with necrosis are mature, encapsulated collections of pancreatic or peripancreatic necrosis that have developed a well-defined inflammatory wall after at least four weeks following an episode of acute necrotizing pancreatitis. Walled-off pancreatic necrosis may contain liquid and solid elements (with or without loculation). (See "[Clinical manifestations and diagnosis of acute pancreatitis](#)", section on '[Local complications](#)'.)

CLINICAL FEATURES

Clinical presentation — The spectrum of clinical presentations for walled-off PFCs ranges from patients who are asymptomatic with incidental imaging findings to patients with abdominal pain, nausea, vomiting, early satiety, and/or weight loss (due to gastric outlet obstruction) or jaundice (due to bile duct compression). For patients with infected PFCs, fever may be present.

Laboratory studies — An elevated lipase level is common in patients with walled-off PFCs.

Radiologic imaging — The imaging appearance of a walled-off PFC depends on its size, location, and presence of necrosis or hemorrhage. Although pancreatic pseudocysts and walled-off pancreatic necrosis may be seen on transabdominal ultrasound, contrast-enhanced computed tomography (CT) scan and/or magnetic resonance imaging (MRI) is also obtained to confirm the diagnosis and as part of preprocedure evaluation. (See "[Endoscopic interventions for walled-off pancreatic fluid collections](#)", section on 'Preprocedure evaluation'.)

Findings on CT scan or MRI of pancreatic pseudocyst include ([image 1](#)) [1]:

- A well-circumscribed fluid collection that is usually round or oval
- The fluid collection is typically extra-pancreatic
- Homogenous fluid density
- No non-liquid components within the fluid
- A well-defined wall that completely encapsulates the fluid collection
- Absence of internal septa within the cyst cavity

Findings on CT scan or MRI of walled-off pancreatic necrosis include ([image 2](#)) [1]:

- Heterogenous fluid collection with liquid and non-liquid density, with varying degrees of loculation
- A well-defined wall that completely encapsulates the fluid collection
- Intra-pancreatic and/or extra-pancreatic location
- Absence of internal septa within the cyst cavity

DIAGNOSTIC APPROACH

The diagnosis of walled-off PFC may be suspected in a patient with a history of acute or chronic pancreatitis who is found to have a PFC on imaging. If the diagnosis is suspected based on transabdominal ultrasound, contrast-enhanced imaging with contrast-enhanced computed tomography (CT) scan and/or magnetic resonance imaging (MRI) is performed to confirm the diagnosis, assess the PFC characteristics (eg, maturity of the wall, presence of non-liquid material), and define its relationship to the stomach and duodenum. Other cystic lesions (eg,

cystic neoplasm) can often be excluded based on imaging characteristics. (See ['Differential diagnosis'](#) below.)

If the diagnosis of walled-off PFC is uncertain, either because the clinical setting is unclear or when radiologic imaging findings are atypical, additional testing options are:

- Endoscopic ultrasound (EUS) with sampling of the cyst – EUS can be performed along with sampling of the fluid collection and cyst wall. The preferred route for sampling the cyst is EUS because it can assess for features that are suggestive of a cystic neoplasm (eg, mural nodules), although fine needle aspiration of the cyst under CT-guidance is a reasonable alternative. EUS findings that suggest a cystic neoplasm include internal septations within the cyst cavity, echogenic mucin, or a mass lesion. The cyst fluid can be analyzed for cytology, tumor markers and molecular markers ([table 2](#)), and this is discussed in more detail separately. (See ["Pancreatic cystic neoplasms: Clinical manifestations, diagnosis, and management"](#), section on ['EUS-FNA findings associated with specific cysts'](#).)

The amylase level in the cyst fluid will be elevated if there is communication with the pancreatic ductal system. Thus, a high amylase concentration in the cyst fluid suggests a pseudocyst or a retention cyst, although there have been case reports of elevated amylase levels in patients with cystic neoplasms such as side-branch intraductal papillary mucinous neoplasm. Retention cysts are small, dilated pancreatic duct side branches arising due to obstruction. Thus, an elevated amylase level alone is not sufficient to establish a diagnosis of walled-off PFC. (See ["Classification of pancreatic cysts"](#), section on ['Retention cysts'](#).)

Cyst fluid can be sent for Gram stain and culture if there is concern that the fluid collection may be infected (eg, elevated white blood cell count, fever).

- Other tests – Pancreatic ascites and pleural effusion may develop in patients with chronic pancreatitis following disruption of the pancreatic duct that leads to fistula formation in the abdomen or chest or following rupture of a pseudocyst with leaking of pancreatic fluid into the peritoneal cavity or pleural space. If such fluid collections are present, evaluation of the fluid may also help establish a diagnosis if the imaging findings (in conjunction with the clinical setting) are not diagnostic. A high amylase concentration (typically above 1000 international units/L) in pleural fluid or ascites suggests that the fluid is pancreatic in origin [3]. However, analysis of pleural fluid or ascites is rarely needed to establish the diagnosis. (See ["Overview of the complications of chronic pancreatitis"](#), section on ['Pancreatic ascites/pleural effusion'](#).)

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of walled-off PFC includes (see ['Diagnostic approach'](#) above):

- Cystic neoplasms of the pancreas – Although contrast-enhanced computed tomography (CT) scan or magnetic resonance imaging (MRI) can often distinguish between PFC and a cystic neoplasm of the pancreas, endoscopic ultrasound (EUS) with fluid sampling is often performed if the diagnosis remains uncertain. EUS can delineate features of the cyst wall and internal cyst contents. Combined with fine-needle aspiration, EUS can help differentiate cystic neoplasms from walled-off PFC. Imaging features such as internal septations, echogenic mucin, or a mass lesion suggest a cystic tumor rather than walled-off PFC. The diagnosis of pancreatic cystic neoplasms and EUS-guided fine-needle aspiration are discussed separately. (See ["Pancreatic cystic neoplasms: Clinical manifestations, diagnosis, and management"](#) and ["Endoscopic ultrasound-guided fine needle aspiration in the gastrointestinal tract"](#).)
- Other conditions – Cystic degeneration of a solid pancreatic tumor and non-neoplastic pancreatic cysts (eg, retention cysts) are conditions that can be distinguished from PFC based on endoscopic evaluation with EUS and/or endoscopic retrograde cholangiopancreatography (ERCP). (See ["Clinical manifestations, diagnosis, and staging of exocrine pancreatic cancer"](#) and ["Classification of pancreatic cysts"](#).)

MANAGEMENT

The management of a walled-off PFC is informed by the patient's symptoms, the characteristics and location of the fluid collection, and whether complications such as biliary or gastric outlet obstruction have developed.

General measures — The following measures apply to all patients with walled-off PFCs:

- Nutrition – We obtain nutrition consultation for most patients because symptoms related to walled-off PFC (eg, nausea, early satiety) may limit the patient's oral intake and affect nutritional status. For patients who are tolerating oral intake, we advise adhering to a low-fat diet consisting of small, frequent meals. For patients who do not tolerate oral intake, nasoenteric feeding can be initiated, and this is discussed separately. (See ["Enteral feeding: Gastric versus post-pyloric"](#).)

For patients with walled-off PFC, nasoenteric feeding may reduce the need for endoscopic intervention by relieving pain and improving nutritional status. In a small observational study of nasojejunal feeding in 21 patients with walled-off pancreatic necrosis, 17 patients (81 percent) experienced pain relief in one to four days, and after 7 to 10 days of nutritional support, an oral diet was successfully resumed. Three patients (17 percent) had recurrence of pain and ultimately required endoscopic drainage [4].

- Avoid alcohol – We advise that patients refrain from alcohol because of its association with acute and chronic pancreatitis. (See ["Etiology and pathogenesis of chronic pancreatitis in adults"](#) and ["Pathogenesis of acute pancreatitis", section on 'Alcohol-induced pancreatitis'](#).)
- Multidisciplinary care – Care of patients with walled-off PFCs may require a multidisciplinary effort with specialists from gastroenterology, interventional radiology, and surgery.

Asymptomatic patients without complications — Patients with uncomplicated pancreatic pseudocysts with no or minimal symptoms are observed clinically, and follow-up abdominal imaging with a contrast-enhanced computed tomography (CT) scan or magnetic resonance imaging (MRI) is obtained in three to six months. For patients with pseudocyst resolution or decrease in cyst size on follow up, we obtain no further imaging studies. Imaging should be repeated sooner than three months if the patient develops symptoms such as abdominal pain, jaundice, early satiety, or fever. (See ['Patients with symptoms or complications'](#) below.)

Spontaneous resolution of pancreatic pseudocysts is not uncommon, with reported rates ranging from 8 to 70 percent [5,6]. In one study of 19 patients with pseudocysts with a mean diameter size of 9.7 cm, five patients (26 percent) had complete resolution and 11 patients (58 percent) experienced decrease in pseudocyst size in one year [5].

Patients with symptoms or complications — Drainage of mature, walled-off PFCs is indicated for patients with symptoms and/or complications attributed to the PFC [2,7] (see ['Our approach to drainage'](#) below):

- Symptoms – Persistent abdominal pain, nausea, emesis, early satiety, anorexia, weight loss, or jaundice
- Complications – Infection, bleeding, or obstruction (ie, gastric, duodenal, or biliary obstruction)

Our approach to drainage — For patients with walled-off PFC who require drainage, the choice of intervention is individualized and based on multiple factors including cyst characteristics

(location, extent, communication with pancreatic duct), presence of walled-off necrosis, pancreatic duct stricture or biliary obstruction, and hemodynamic status of the patient [2].

Prior to intervention, preprocedure evaluation includes contrast-enhanced CT scan with early imaging during the arterial phase to exclude pseudoaneurysm, although contrast-enhanced MRI is a reliable alternative [8]. Preprocedure evaluation and management of patients with pseudoaneurysm is discussed separately. (See "[Endoscopic interventions for walled-off pancreatic fluid collections](#)".)

- Pancreatic pseudocyst without complications – For most patients with symptomatic pancreatic pseudocyst abutting the stomach or duodenum, we perform endoscopic ultrasound (EUS)-guided transmural drainage rather than surgery or percutaneous drainage because transmural drainage is effective for resolving walled-off PFC but with lower morbidity than surgery and no need for external drains [9]. (See "[Endoscopic interventions for walled-off pancreatic fluid collections](#)", section on 'Endoscopic ultrasound-guided transmural drainage'.)
- Walled-off pancreatic necrosis without or with infection – We typically manage walled-off PFCs with necrosis with EUS-guided transmural drainage followed by direct endoscopic necrosectomy [10-15]. (See "[Endoscopic interventions for walled-off pancreatic fluid collections](#)", section on 'Patients with walled-off necrosis'.)

Alternatives or additions to EUS-guided transmural drainage include percutaneous drainage or surgical step-up approach (percutaneous catheter drainage followed by video-assisted retroperitoneal debridement, if needed), and this is discussed separately [15-17]. (See "[Pancreatic debridement](#)", section on 'Step-up approaches'.)

Most centers perform EUS-guided drainage for walled-off pancreatic necrosis because it is effective with possibly a lower risk of bleeding; however, large randomized trials comparing EUS and non-EUS transmural drainage of walled-off necrosis are lacking [18]. (See "[Endoscopic interventions for walled-off pancreatic fluid collections](#)", section on 'Adverse Events'.)

- Pancreatic duct stricture associated with walled-off PFC – For patients with main pancreatic duct stricture and walled-off PFC, EUS-guided transmural drainage can be performed alone or in combination with endoscopic retrograde cholangiopancreatography (ERCP)-guided transpapillary stent placement and drainage. (See "[Endoscopic interventions for walled-off pancreatic fluid collections](#)", section on 'ERCP-guided transpapillary drainage'.)

- Pancreatic pseudocyst communicating with the main pancreatic duct – For patients with relatively small (ie, 3 cm or less) but symptomatic pseudocysts in communication with the main pancreatic duct, we perform transpapillary pancreatic stent placement as initial therapy. Placement of a transpapillary stent provides continuous drainage of pancreatic fluid and facilitates resolution of the pancreatic ductal disruption that is responsible for the pseudocyst. (See ["Endoscopic interventions for walled-off pancreatic fluid collections", section on 'ERCP-guided transpapillary drainage'](#).)
- Biliary obstruction related to walled-off PFC – For patients with biliary obstruction from external compression related to a walled-off PFC, we typically perform ERC) with biliary sphincterotomy and biliary stent placement in conjunction with endoscopy-guided drainage of the walled-off PFC. If the fluid collection resolves, repeat cholangiogram and removal of the biliary stent during a follow up ERCP is performed. Management of biliary obstruction caused by complications of chronic pancreatitis, including pancreatic pseudocyst, is discussed separately. (See ["Overview of the complications of chronic pancreatitis", section on 'Biliary obstruction'](#).)
- Walled-off PFCs extending beyond the peripancreatic space – For patients with PFCs that extend along the paracolic gutter and/or into the pelvis, an approach consisting of endoscopic drainage combined with percutaneous drainage is typically used to achieve resolution of PFC [19]. (See ['Percutaneous drainage'](#) below.)
- Patients with walled-off PFC requiring drainage who cannot tolerate anesthesia – Patients with walled-off PFC who cannot tolerate anesthesia for interventional endoscopy or surgery can be managed with radiology-guided percutaneous drainage. (See ['Percutaneous drainage'](#) below.)

Types of drainage procedures

Endoscopic drainage — For patients with symptomatic walled-off PFC that is adherent to the stomach or duodenum on radiographic and/or endoscopic imaging, EUS-guided transmural drainage is commonly performed [18,20,21]. Transmural drainage is accomplished by accessing the PFC via the creation of a tract through the gastric or duodenal wall with placement of one or more stents. For patients with walled-off PFC with necrosis, transmural approach is necessary to allow evacuation of debris (also referred to as direct endoscopic necrosectomy).

Limited data have suggested that EUS-guided transmural drainage of pancreatic pseudocysts was more effective than conventional endoscopic drainage (ie, transmural puncture guided by direct endoscopic visualization without EUS) [22,23]. In a trial including 30 patients with

pancreatic pseudocyst, EUS-guided transmural drainage resulted in higher rates of technical success compared with conventional endoscopic drainage (100 versus 33 percent) [22].

For selected patients (ie, those with a pseudocyst that communicates with the pancreatic duct or those with pancreatic duct stricture), drainage is typically accomplished with ERCP-guided placement of a transpapillary pancreatic stent (with or without pancreatic sphincterotomy).

Endoscopic interventions for walled-off PFCs including patient preparation, techniques, efficacy, and complications are discussed separately. (See "[Endoscopic interventions for walled-off pancreatic fluid collections](#)".)

Percutaneous drainage — For patients with walled-off PFC, percutaneous drainage is typically used when endoscopic drainage is unsuccessful or not technically feasible. As an example, patients with necrosis extending into the paracolic gutters and/or pelvis often require percutaneous drainage to access these dependent areas [24,25]. However, percutaneous drainage as monotherapy for patients with walled-off PFCs has been largely replaced by an endoscopic approach due to higher morbidity, risk of pancreato-cutaneous fistula formation, and need for an external drain. In an observational study of 164 patients with symptomatic PFCs, treatment success rates were higher in patients managed endoscopically compared with percutaneous drainage (70 percent versus 31 percent) [26]. The endoscopic approach was also associated with a lower rate of requiring surgical intervention (4 percent versus 11 percent).

Surgery — Surgical drainage of walled-off PFC (and debridement if needed) is indicated for patients who have failed endoscopic and/or percutaneous interventions or as an alternative for walled-off PFCs with necrosis, infection, or symptoms related to gastric outlet or biliary obstruction. Surgical cyst-gastrostomy (with or without debridement) can be approached laparoscopically or open [27,28]. For patients with walled-off pancreatic necrosis, the goal is to drain the fluid collection, remove the devitalized pancreatic and peripancreatic tissue while preserving viable functioning pancreas, and control resultant pancreatic fistulas. Surgical management for PFCs is discussed separately. (See "[Pancreatic debridement](#)".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "[Society guideline links: Pancreatic cysts](#)".)

SUMMARY AND RECOMMENDATIONS

- **Classification** – Walled-off pancreatic fluid collections (PFCs) are classified as follows ([table 1](#)) (see '[Etiology and classification](#)' above):
 - **Pancreatic pseudocysts** – Pancreatic pseudocysts are encapsulated, mature PFCs occurring outside the pancreas that have a well-defined wall with minimal or no necrosis. Pancreatic pseudocysts are often related to chronic pancreatitis as a result of progressive ductal obstruction. The ensuing elevation in intraductal pressure may then induce ductal leakage, with accumulation of a peripancreatic fluid collection.
 - **Walled-off pancreatic necrosis** – Walled-off PFCs with necrosis are mature, encapsulated collections of pancreatic or peripancreatic necrosis that have developed a well-defined inflammatory wall after at least four weeks following an episode of acute necrotizing pancreatitis.
- **Clinical presentation** – The spectrum of clinical presentations for walled-off PFCs ranges from patients who are asymptomatic with incidental imaging findings to patients with abdominal pain, nausea, vomiting, early satiety, and/or weight loss (due to gastric outlet obstruction), or jaundice (due to bile duct compression). (See '[Clinical presentation](#)' above.)
- **Diagnostic approach** – The diagnosis of walled-off PFC may be suspected in a patient with a history of acute or chronic pancreatitis who is found to have a PFC on imaging. If the diagnosis is suspected based on transabdominal ultrasound, contrast-enhanced imaging with contrast-enhanced computed tomography (CT) scan and/or magnetic resonance imaging (MRI) is performed to confirm the diagnosis, assess the PFC characteristics (eg, maturity of the wall, presence of non-liquid material), and define its relationship to the stomach and duodenum. (See '[Diagnostic approach](#)' above.)
- **Management** – General measures for patients with walled-off PFCs include (see '[General measures](#)' above):
 - Nutrition – We obtain nutrition consultation because symptoms related to walled-off PFC (eg, nausea, early satiety) may limit the patient's oral intake and affect nutritional status. For patients who are tolerating oral intake, we advise adhering to a low-fat diet consisting of small, frequent meals.
 - Avoid alcohol – We advise that patients refrain from alcohol.
 - Multidisciplinary care – Care of patients with walled-off PFCs may require a multidisciplinary effort with specialists from gastroenterology, interventional radiology, and surgery.

Management of patients with pancreatic pseudocyst with minimal or no symptoms includes clinical observation and follow up imaging. We typically obtain abdominal imaging with a contrast-enhanced CT scan or MRI in three to six months, and spontaneous pseudocyst resolution is not uncommon. (See '[Asymptomatic patients without complications](#)' above.)

For patients with walled-off PFCs who are symptomatic or have complications, we suggest a drainage procedure (**Grade 2C**). (See '[Our approach to drainage](#)' above.)

For most patients with symptomatic pancreatic pseudocyst that is adherent to the stomach or duodenum on radiographic and/or endoscopic imaging, EUS-guided transmural drainage is usually performed.

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GRAPHICS

Revised definitions of morphological features of acute pancreatitis

1. Interstitial edematous pancreatitis

Acute inflammation of the pancreatic parenchyma and peripancreatic tissues, but without recognizable tissue necrosis

Contrast-enhanced computed tomography criteria:

- Pancreatic parenchyma enhancement by intravenous contrast agent
- No findings of peripancreatic necrosis

2. Necrotizing pancreatitis

Inflammation associated with pancreatic parenchymal necrosis and/or peripancreatic necrosis

Contrast-enhanced computed tomography criteria:

- Lack of pancreatic parenchymal enhancement by intravenous contrast agent, and/or
- Presence of findings of peripancreatic necrosis (refer to below—acute peripancreatic fluid collection and walled off necrosis)

3. Acute peripancreatic fluid collection (APFC)

Peripancreatic fluid associated with interstitial edematous pancreatitis with no associated peripancreatic necrosis. This term applies only to areas of peripancreatic fluid seen within the first four weeks after onset of interstitial edematous pancreatitis and without the features of a pseudocyst.

Contrast-enhanced computed tomography criteria:

- Occurs in the setting of interstitial edematous pancreatitis
- Homogeneous collection with fluid density
- Confined by normal peripancreatic fascial planes
- No definable wall encapsulating the collection
- Adjacent to pancreas (no intrapancreatic extension)

4. Pancreatic pseudocyst

An encapsulated collection of fluid with a well-defined inflammatory wall usually outside the pancreas with minimal or no necrosis. This entity usually occurs more than four weeks after onset of interstitial edematous pancreatitis to mature.

Contrast-enhanced computed tomography criteria:

- Well circumscribed, usually round or oval
- Homogeneous fluid density
- No non-liquid component
- Well-defined wall (ie, completely encapsulated)
- Maturation usually requires >4 weeks after onset of acute pancreatitis; occurs after interstitial edematous pancreatitis

5. Acute necrotic collection (ANC)

A collection containing variable amounts of both fluid and necrosis associated with necrotizing pancreatitis; the necrosis can involve the pancreatic parenchyma and/or the peripancreatic tissues
Contrast-enhanced computed tomography criteria:

- Occurs only in the setting of acute necrotizing pancreatitis
- Heterogeneous and non-liquid density of varying degrees in different locations (some appear homogeneous early in their course)
- No definable wall encapsulating the collection
- Location—intrapancreatic and/or extrapancreatic

6. Walled-off necrosis (WON)

A mature, encapsulated collection of pancreatic and/or peripancreatic necrosis that has developed a well-defined inflammatory wall. WON usually occurs >4 weeks after onset of necrotizing pancreatitis.

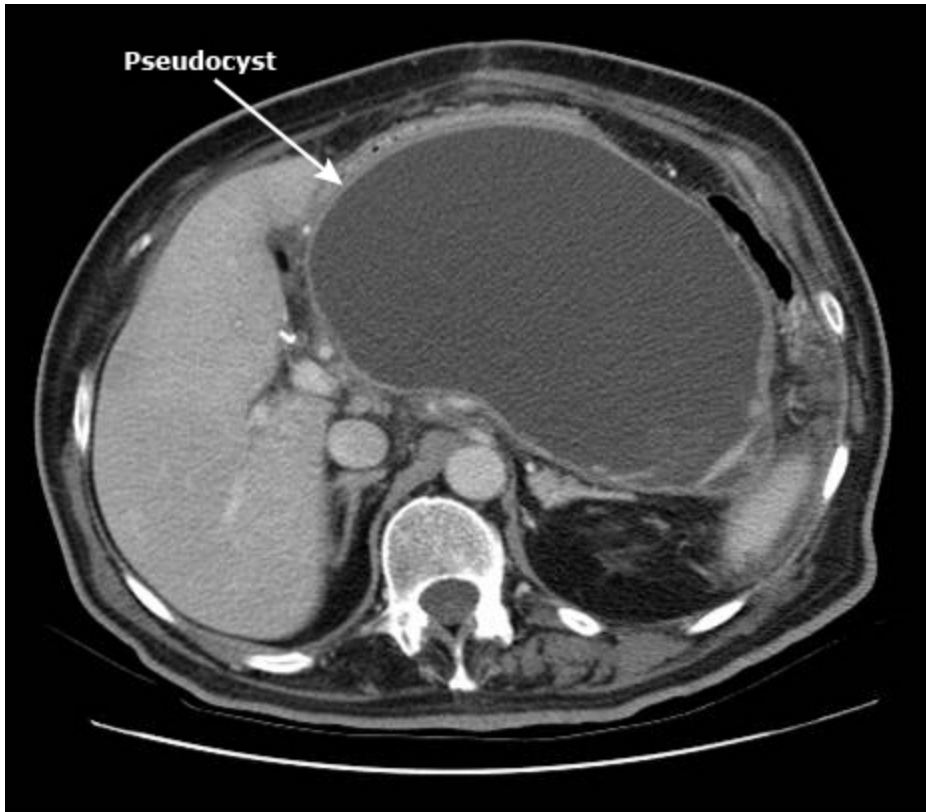
Contrast-enhanced computed tomography criteria:

- Heterogeneous with liquid and non-liquid density with varying degrees of loculations (some may appear homogeneous)
- Well-defined wall, that is, completely encapsulated
- Location—intrapancreatic and/or extrapancreatic
- Maturation usually requires four weeks after onset of acute necrotizing pancreatitis

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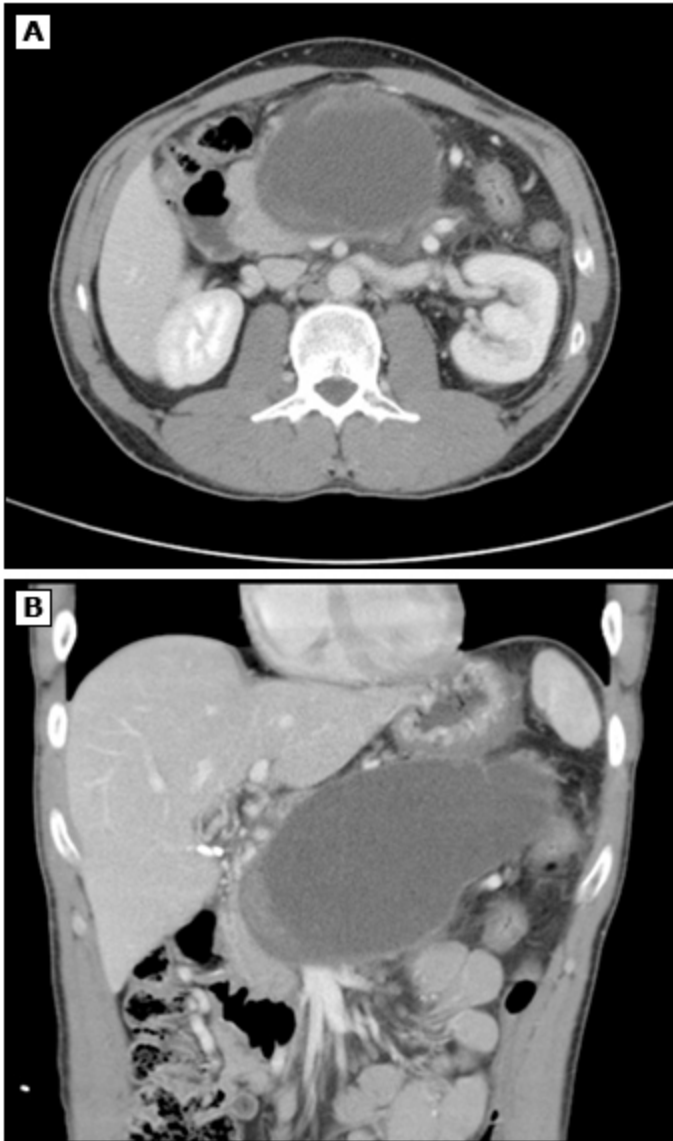
Pancreatic pseudocyst



Computed tomographic scan showing a massive pancreatic pseudocyst compressing the stomach and obliterating the pancreas.

Graphic 80720 Version 5.0

CT scan showing walled-off pancreatic necrosis



Contrast-enhanced CT scan showing walled-off pancreatic necrosis in both axial (A) and coronal (B) projections. This morphologic variant of necrosis is well suited to minimally invasive methods of debridement.

CT: computed tomography.

Graphic 66932 Version 8.0

Key demographic and clinical features of patients with pancreatic cystic neoplasms^[1-4]

	Serous cystic tumor	Mucinous neoplasm	Main-duct intraductal papillary mucinous neoplasm	Branch-duct intraductal papillary mucinous neoplasm	Pseudocyst
Age of presentation	Variable, usually 5th to 7th decade	Variable, usually 5th to 7th decade	Variable, usually 5th to 7th decade	Variable, usually 5th to 7th decade	Usually decades
Gender distribution	Females > males	Almost exclusively females	Females = males	Females = males	Female
Typical clinical presentation	Incidental or abdominal pain or mass effect	Incidental or abdominal pain or malignancy related	Incidental or pancreatitis or pancreatic insufficiency or malignancy related	Incidental or pancreatitis or malignancy related	Incidental or abdominal mass effect
Typical imaging characteristics	Microcystic/honeycomb appearance Oligocystic appearance less common	Unilocular or septated cyst ± wall calcifications Solid component, if present, may suggest malignancy	Dilated main pancreatic duct ± parenchymal atrophy Solid component, if present, may suggest malignancy	Dilated pancreatic duct branch or branches Solid component, if present, may suggest malignancy	Solid mass ± calcification
Typical aspirate characteristic	Thin, often bloody	Viscous	Viscous	Viscous or thin	Bloody
Typical cytology findings	Cuboidal cells that stain positive for glycogen; yield <50%	Columnar cells with variable atypia Stains positive for mucin; yield <50%	Columnar cells with variable atypia Stains positive for mucin; yield <50%	Columnar cells with variable atypia Stains positive for mucin; yield <50%	Characteristic branching with mucin High yield solid component

		High yield from solid component for malignancy	High yield from solid component for malignancy	High yield from solid component for malignancy	
Typical carcinoembryonic antigen (CEA) level	<5 to 20 ng/mL in majority of lesions	>200 ng/mL in approximately 75% of lesions	>200 ng/mL in approximately 75% of lesions	>200 ng/mL in approximately 75% of lesions	Insuffi
Typical glucose level	>50 mg/dL in majority	<50 mg/dL in majority	<50 mg/dL (limited data)	<50 mg/dL in majority	Insuffi
Typical DNA analysis	Allelic loss affecting chromosome 3p and VHL mutation specific	K-ras mutation specific (>90%), not sensitive (<50%) TP53, PTEN, PIK3CA, high DNA amount or high-amplitude allelic loss seen in malignancy	K-ras and GNAS mutation specific (>90%), not sensitive (<50%) TP53, PTEN, PIK3CA, high DNA amount or high-amplitude allelic loss seen in malignancy	K-ras and GNAS mutation specific (>90%), not sensitive (<50%) TP53, PTEN, PIK3CA, high DNA amount or high-amplitude allelic loss seen in malignancy	CTNNE specific
Relative malignant potential	Negligible	Moderate	High	Low to moderate	Moder
Treatment	Resect if symptomatic	Resection	Resection and post-resection surveillance	Closely monitor or resect Post-resection surveillance required	Resect

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Contributor Disclosures

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