# Acute pancreatitis

Majid Sorouri

Gastroenterologist, DDRI, Shariati hospital, TUMS

1/15/2026

- Definitions:
  - ✓acute pancreatitis
  - ✓Severity of AP
  - ✓Morphologic (Image-Based) Classification
- Incidence/ epidemiology
- Causes
- Diagnosis
- Tests for Severity
- Diagnosis of infected necrosis

- **Definitions:**
  - ✓acute pancreatitis
  - ✓Severity of AP
  - ✓Morphologic (Image-Based) Classification
- Incidence/ epidemiology
- Causes
- Diagnosis
- Tests for Severity
- Diagnosis of infected necrosis

# Acute pancreatitis:

based on the Revised Atlanta Classification if ≥ 2 of the following are present:

- **Abdominal pain** consistent with pancreatitis
- Serum amylase and/or **lipase** > 3 times the upper limit of normal
- Characteristic findings from abdominal **imaging**

# Revised Atlanta Criteria

- **Mild acute pancreatitis:**

  both the absence of organ failure and the absence of local or systemic complications

- **Moderately severe acute pancreatitis:**

  ✓transient organ failure (organ failure resolving in ≤ 48 hours) or

  ✓local or systemic complications without persistent organ failure

- **Severe acute pancreatitis :**

  a persistence of organ failure for > 48 hours ( 15%-20% of cases of AP)

  ✓ in the respiratory, renal, or cardiovascular system

# Morphologic (Image-Based) Classification

1. **Interstitial edematous pancreatitis** (IEP)

2. **Necrotizing pancreatitis**

# Morphologic (Image-Based) Classification

1. **Interstitial edematous pancreatitis (IEP)**:

✓*Contrast-enhanced CT criteria:*

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

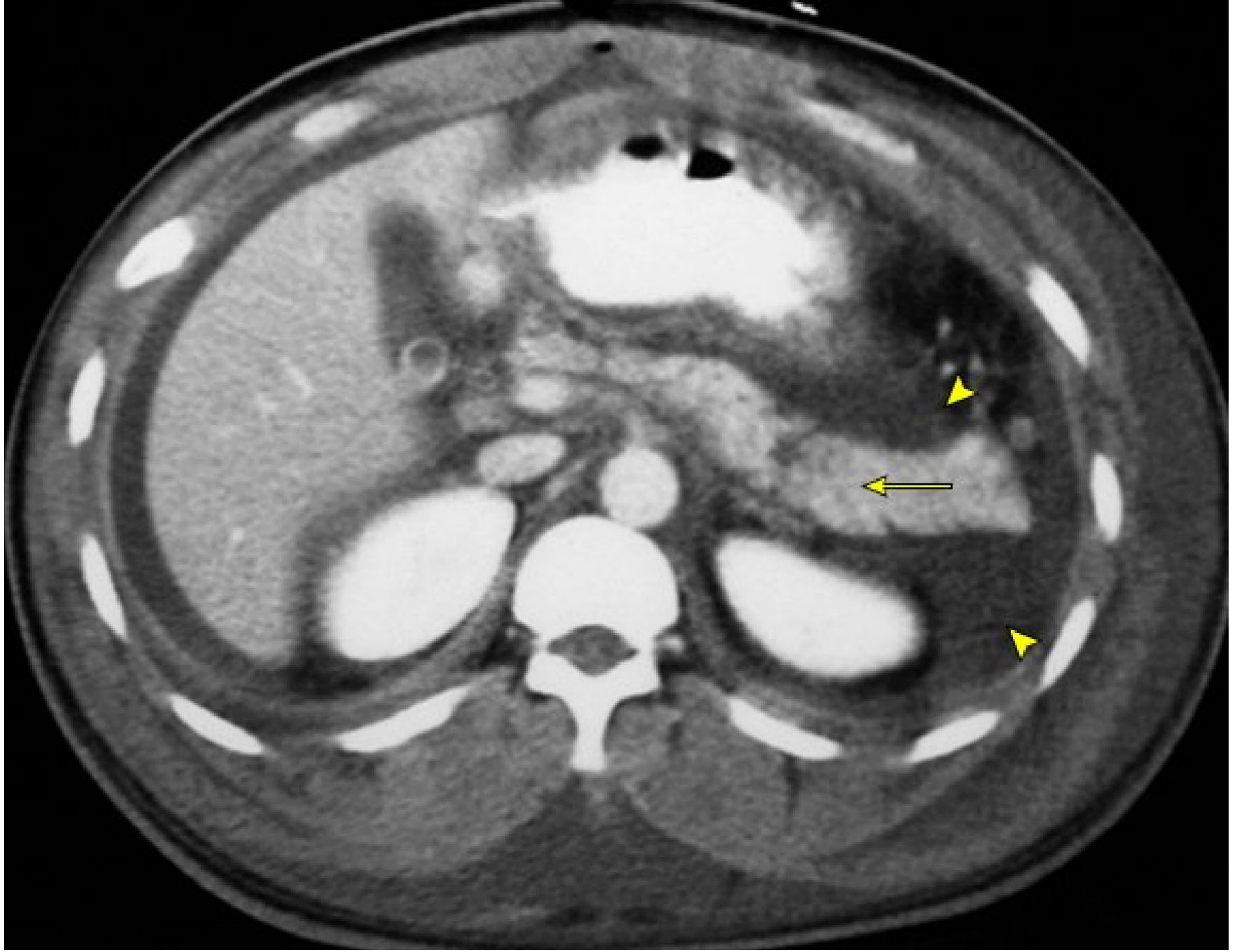
✓**Acute peripancreatic fluid collection**

✓**Pancreatic pseudocyst**

# Acute peripancreatic fluid collection

- ✓areas of peripancreatic fluid seen within the *first four weeks*

- ✓*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)



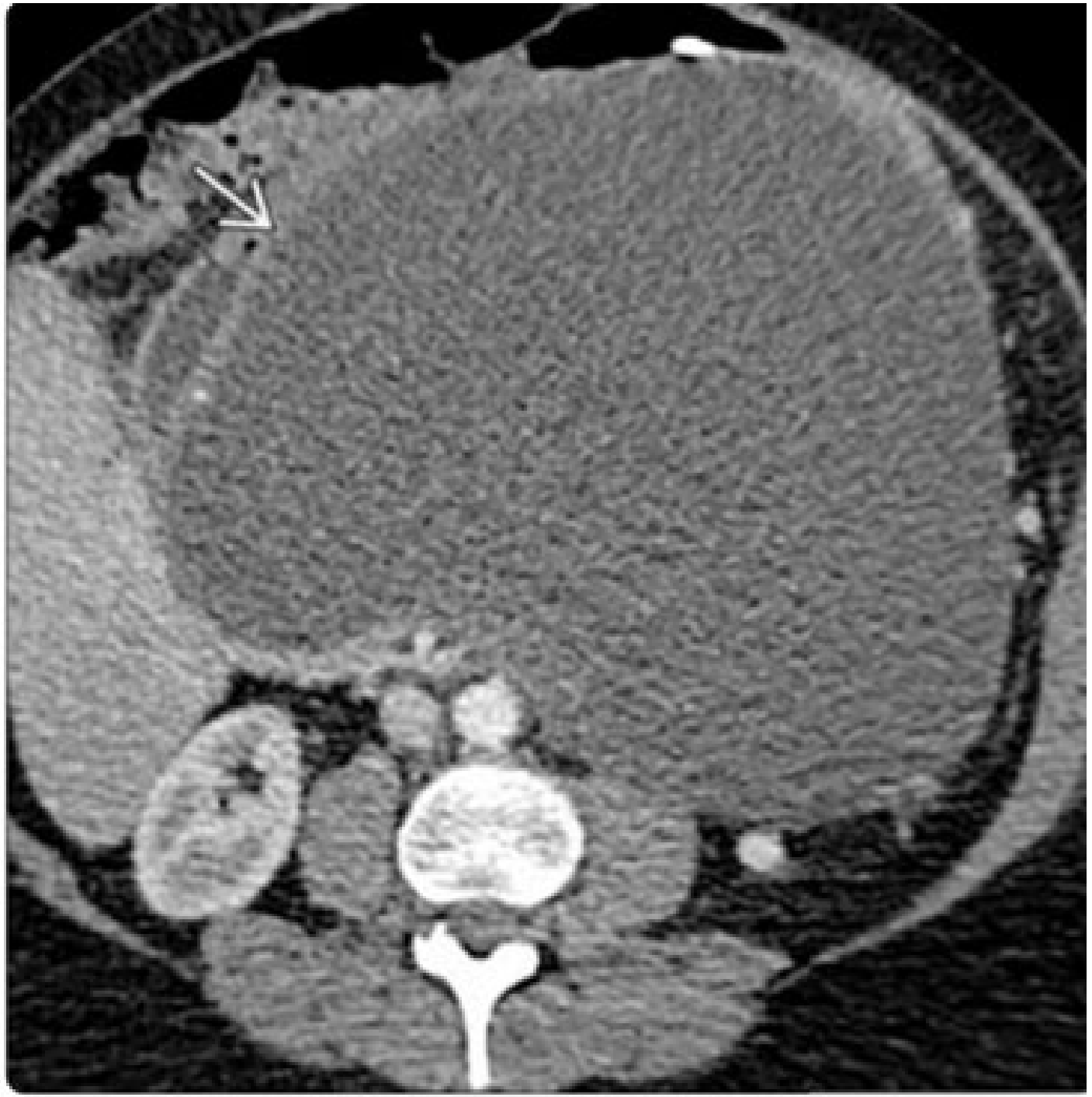
CT scan reveals acute IEP with an acute peripancreatic fluid collections (APFC) around the body and tail of the pancreas (arrowheads).

There is mild heterogeneity of the enhanced pancreas (arrow).

2026 UpToDate

# Pancreatic pseudocyst

- *Contrast-enhanced computed tomography criteria:*
  - Well circumscribed, usually round or oval
  - **Homogeneous** fluid density
  - No non-liquid component
  - Well-defined **wall** (completely encapsulated)
  - Maturation usually requires **>4 weeks** after onset of IEP



a large, well-defined, loculated fluid collection, several months after a bout of acute edematous pancreatitis.

the collection is simple in appearance without debris or hemorrhage, compatible with a **pseudocyst**.

# Morphologic (Image-Based) Classification

## 2. **Necrotizing pancreatitis**:

✓ *Contrast-enhanced computed tomography criteria:*

- Lack of pancreatic parenchymal enhancement by intravenous contrast agent, and/or
- Presence of findings of peripancreatic necrosis

✓ Necrosis of both the pancreas and the peripancreatic tissues: most common

✓ Necrosis of only the peripancreatic tissue: less common

✓ Necrosis of only the pancreatic parenchyma : rare

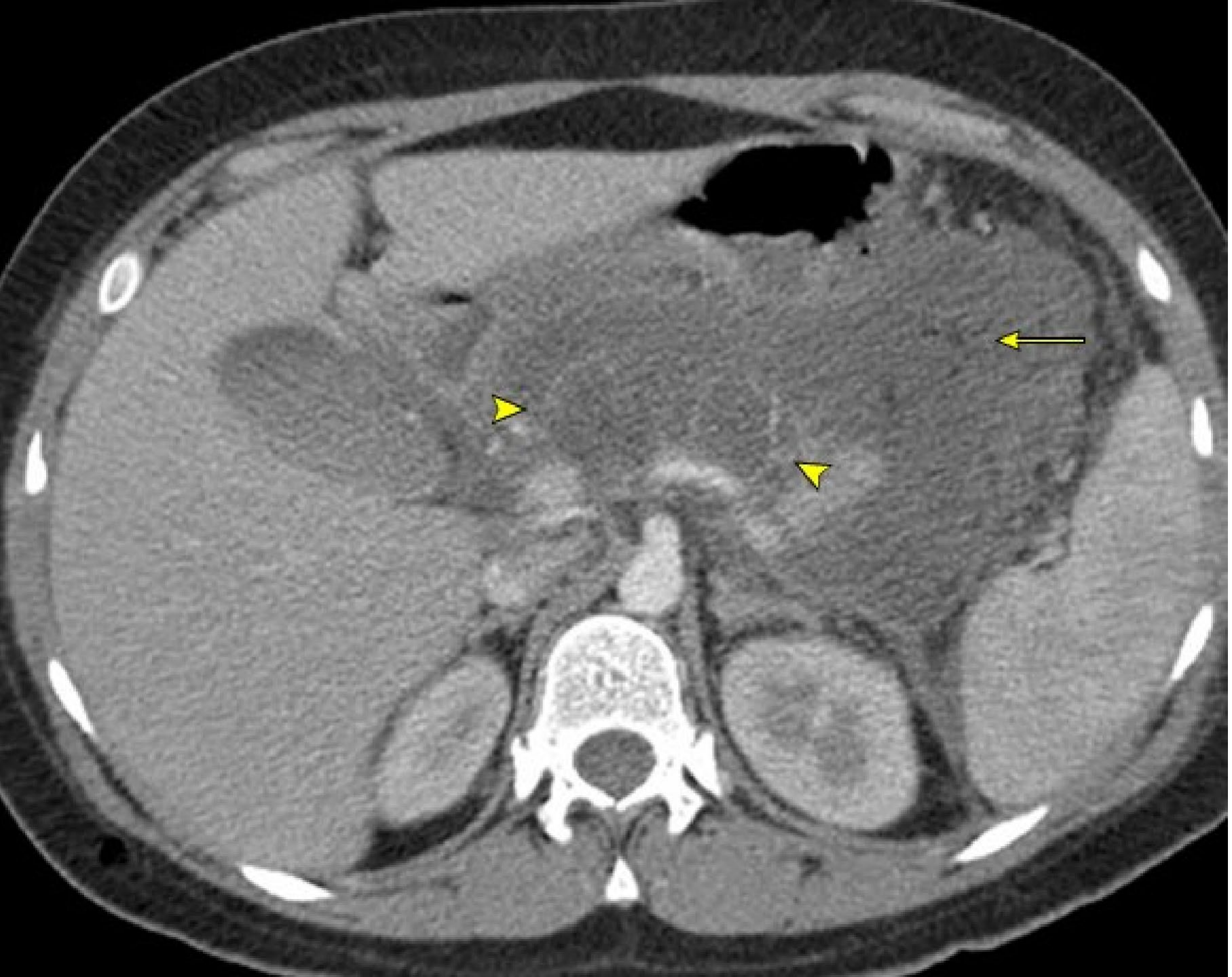
✓ **Acute necrotic collection**

✓ **Walled-off necrosis**

# Acute necrotic collection

- *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 extra-pancreatic

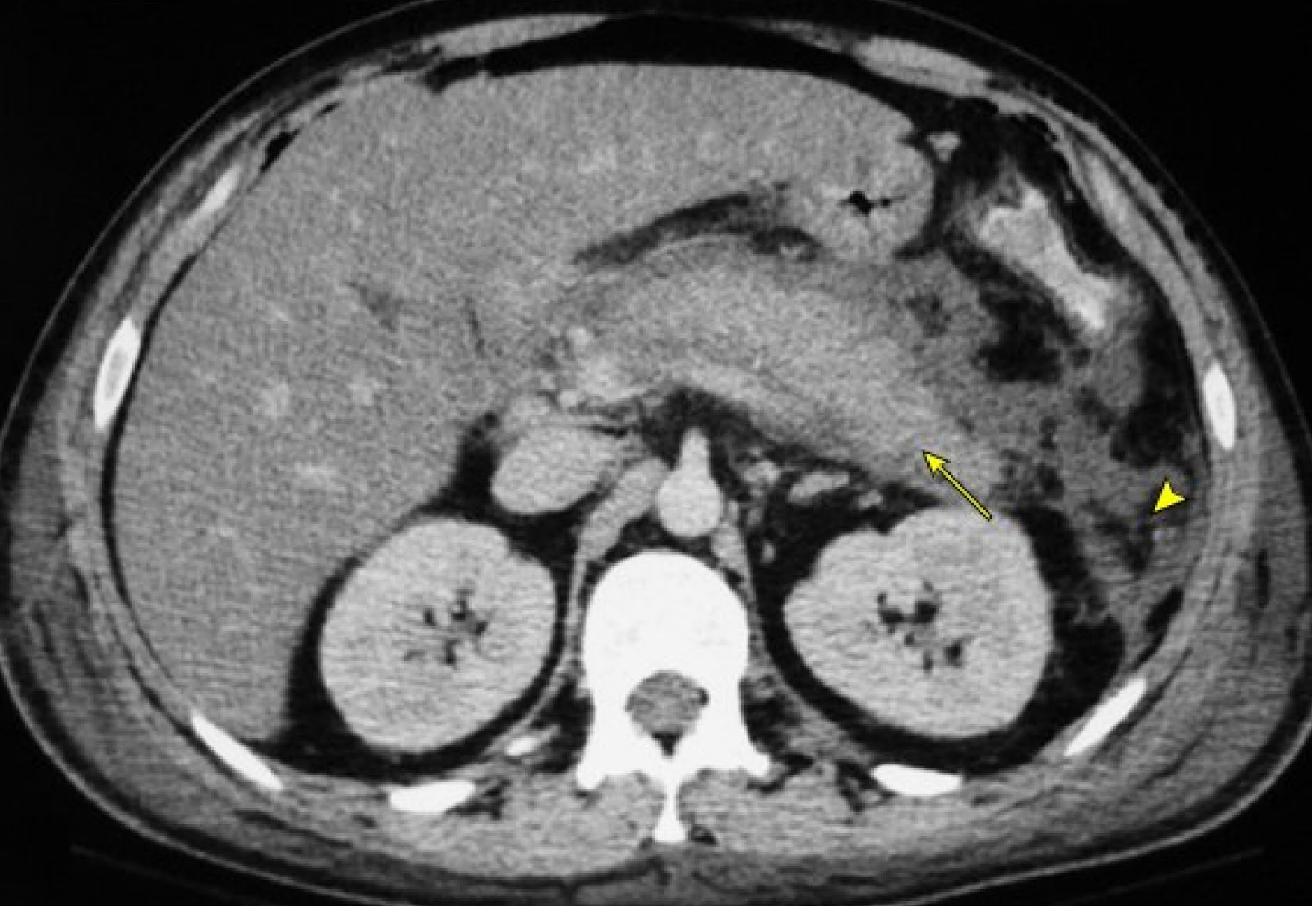


CT scan reveals an acute necrotic collection in a 20-year-old female with acute pancreatitis.

The axial CT image shows pancreatic necrosis with a non-enhancing region in the neck and the body of the pancreas (between arrowheads).

In the surrounding anterior pararenal space, there is a large fluid accumulation that contains islands of necrosis (arrow).

2026 UpToDate



CT scan of a 34-year-old male with acute pancreatitis reveals the pancreas enhances homogeneously (arrow) but there is evidence of peripancreatic necrosis (arrowhead).

2026 UpToDate

# Walled-off necrosis

- *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 extra-pancreatic
  - ✓Maturation usually requires **four weeks** after onset of acute necrotizing pancreatitis



heterogeneous enlargement and diminished enhancement of the pancreas , consistent with severe **acute necrotizing pancreatitis**.



CT in the same patient 4 weeks later shows the development of walled-off necrosis with a well-defined, peripherally enhancing wall.

Note the multiple nondependent gas bubbles, indicating infection.

- Definitions:
  - ✓acute pancreatitis
  - ✓Severity of AP
  - ✓Morphologic (Image-Based) Classification
- **Incidence/ epidemiology**
- Causes
- Diagnosis
- Tests for Severity
- Diagnosis of infected necrosis

| | Incidence/Prevalence | Reference |
|---|---|---|
| acute pancreatitis | 34 cases per 100,000 person-years | Lancet Gastroenterol Hepatol 2016 Sep;1(1):45 |
| moderately severe or severe disease | 15–20% of all acute pancreatitis episodes | *Clin Gastroenterol Hepatol*. 2020;18(7):1567-1575.e2. |
| early organ failure | 30–40% necrotizing pancreatitis<br><10% in interstitial edematous disease | *World J Gastroenterol*. 2019;25(34):5162-5173. |
| Necrotizing pancreatitis | 2–8 cases per 100,000 person-years<br>(in populations where acute pancreatitis incidence is 20–40 per 100,000) | *World J Emerg Surg*. 2020;15(1):44.<br>*Nat Rev Gastroenterol Hepatol*. 2019;16(3):175-184. |
| pancreatic and/or peripancreatic necrosis | 10–20% of all acute pancreatitis episodes | *Nat Rev Gastroenterol Hepatol*. 2019;16(3):175-184. |
| radiologic evidence of necrosis | 20–40% clinically “severe” acute pancreatitis | *World J Emerg Surg*. 2020;15(1):44. |
| Infected necrosis | 30–40% of necrotizing pancreatitis | *World J Gastroenterol*. 2019;25(34):5162-5173. |

| | Incidence/Prevalence | Reference |
|---|---|---|
| Overall mortality | 1.6 deaths per 100,000 person-years<br>2–5% acute pancreatitis<br>10–20% necrotizing pancreatitis | *Nat Rev Gastroenterol Hepatol*. 2019;16(3):175-184.<br>*World J Emerg Surg*. 2020;15(1):44.<br>Lancet Gastroenterol Hepatol 2016 Sep;1(1):45 |
| DALYs lost | 3.6 million due to AP globally | *BMC Gastroenterol*. 2021;21(1):332.<br>*BMC Gastroenterol*. 2024;24(1):398. |
| Hospital length of stay | 1weeks, mild non-necrotizing acute pancreatitis<br>3–4 weeks, extensive or infected necrosis | *World J Emerg Surg*. 2020;15(1):44. |
| chronic pancreatitis | 1.4 per 100 person-years, after a first AP<br>4.3 per 100 person-years after RAP | *BMC Med*. 2020;18(1):388.<br>*Nat Rev Gastroenterol Hepatol*. 2019;16(3):175-184. |
| exocrine insufficiency | 20–40% necrotizing pancreatitis | *World J Emerg Surg*. 2020;15(1):44.<br>*Nat Rev Gastroenterol Hepatol*. 2019;16(3):175-184. |
| diabetes | 20–40% necrotizing pancreatitis | *World J Emerg Surg*. 2020;15(1):44.<br>*Nat Rev Gastroenterol Hepatol*. 2019;16(3):175-184. |

- Definitions:
  - ✓acute pancreatitis
  - ✓Severity of AP
  - ✓Morphologic (Image-Based) Classification
- Incidence/ epidemiology
- **Causes**
- Diagnosis
- Tests for Severity
- Diagnosis of infected necrosis

| Causes and risks for acute pancreatitis | |
|---|---|
| Gallstones | about 40% of AP cases |
| Alcohol misuse | about 35% of AP cases |
| idiopathic | about 10% of AP cases |
| Hypertriglyceridemia | about 1%-4% of AP cases |
| Blunt or penetrating abdominal trauma | about 1.5% of AP cases |
| Post- ERCP | AP occurs in about 5%-10% of patients having ERCP |
| Genetic predisposition: CFTR, PRSS1, SPINK1 | |
| Morbid obesity | |
| Type 2 diabetes | |
| Smoking | |
| Toxins : scorpion venom, organophosphate poisoning | |
| Infections | |
| Autoimmune pancreatitis type 1 or 2 | |

| Medications : about 2% of AP cases | |
|---|---|
| azathioprine | estrogens |
| furosemide | didanosine |
| metronidazole | pentamidine |
| 5-ASA | sulfonamides |
| sulfasalazine | valproic acid |
| tetracycline | calcium |


1. Forsmark CE, Vege SS, Wilcox CM. Acute Pancreatitis. N Engl J Med. 2016 Nov 17;375(20):1972-1981.
2. Quinlan JD. Acute pancreatitis. Am Fam Physician. 2014 Nov 1;90(9):632-9.
3. Párniczky A, Abu-El-Haija M, Husain S, et al. EPC/HPSG evidence-based guidelines for the management of pediatric pancreatitis. Pancreatology 2018 Mar;18(2):146-160
4. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; AGA Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterology. 2018 Mar;154(4):1096-1101.

Microlithiasis and biliary sludge have both been shown to be associated with acute pancreatitis.

Wang HH, Portincasa P, Liu M, Tso P, Wang DQ. Similarities and differences between biliary sludge and microlithiasis: Their clinical and pathophysiological significances. Liver Res 2018 Dec;2(4):186-199.

Initiate workup for etiology including evaluation for

**gallstones** (abdominal ultrasound in most patients)

(ACG Strong recommendation, Low-quality evidence)

and history for **alcohol** usage

(ACG Conditional recommendation, Moderate-quality evidence)

and new or high-risk **medications**

in all patients with new-onset pancreatitis.

- Obtain serum **triglyceride** levels if the patient does not have gallstones and/or a significant history of alcohol use.

  (ACG Conditional recommendation, Moderate-quality evidence)

- Consider hypertriglyceridemia as the etiology of acute pancreatitis if serum triglyceride levels are > 1,000 mg/dL (11.3 mmol/L).

- In adults > 40 years old, consider an MRI/MRCP and/or EUS study to evaluate for a pancreatic or extra-pancreatic tumor as a possible cause of acute pancreatitis.

  (ACG Conditional recommendation, Low-quality evidence)

- Consider genetic testing in adults < 30 years old if there is no evident cause and family history of pancreatic disease.

  (ACG Conditional recommendation, Low-quality evidence)

# incidence of acute pancreatitis during pregnancy
# 1 case per 1,000 to 10,000 pregnancies

- in cases of acute pancreatitis reported during and after pregnancy,
  - 12% occur in first and second trimesters
  - 50% occur in third trimester
  - 38% occur in early postpartum period
- reported causes during pregnancy
  - gallstones in > 65%
  - alcohol misuse in 5%-10%
  - idiopathic in 15%
  - familial hypertriglyceridemia-induced pancreatitis in 5%

Ducarme G, Maire F, Chatel P, Luton D, Hammel P. Acute pancreatitis during pregnancy: a review. J Perinatol 2014 Feb;34(2):87-94

- Definitions:
  - ✓acute pancreatitis
  - ✓Severity of AP
  - ✓Morphologic (Image-Based) Classification
- Incidence/ epidemiology
- Causes
- **Diagnosis**
- Tests for Severity
- Diagnosis of infected necrosis

# The diagnosis of acute pancreatitis requires ≥ 2 of the following criteria (Revised Atlanta Classification):

(ACG Strong recommendation, Moderate-quality evidence)

- **Abdominal pain** consistent with acute pancreatitis (severe epigastric or periumbilical pain):
  - Worsens after eating or drinking, especially fatty foods
  - May radiate to the back, chest, or flanks
  - Is usually severe in intensity, but can be variable
  - Typically becomes constant over time
  - May last for days
- **Serum lipase** (the preferred test) and/or amylase > 3 times the upper limit of normal

- Findings from abdominal **imaging** characteristic of acute pancreatitis, including signs of:
  - Choledocholithiasis or pancreatic duct disruption
  - Impaired pancreatic perfusion
  - Diffuse or occasionally localized enlargement of the pancreas due to inflammatory edema
  - Pancreatic- and/or peripancreatic-associated collections
  - Necrosis involving the pancreas and/or peripancreatic tissues

- Lipase testing is preferred over amylase testing in cases of suspected acute pancreatitis due to the increased sensitivity of lipase testing.

- Serum lipase levels tend to rise earlier and stay elevated longer in patients with acute pancreatitis.

- Serum amylase levels may be normal in patients with flares of chronic pancreatitis from conditions such as alcohol-induced pancreatitis.

- Reserve serum amylase testing for situations when the diagnosis is in question.

| Test | Sen. | Sp. | LR+ | LR- | PPV | NPV |
|---|---|---|---|---|---|---|
| **Lipase** | 79% | 89% | **7** | 0.24 | 68% | 6.6% |
| Amylase | 72 | 93 | **10.3** | 0.3 | 74 | 8 |
| Cochrane Database Syst Rev 2017 Apr 21;(4):CD012010 | | | | | | |

| Test | Sen. | Sp. | LR+ | LR- | PPV | NPV |
|---|---|---|---|---|---|---|
| **Lipase** | 79% | 89% | **7** | 0.24 | 68% | 6.6% |
| Amylase | 72 | 93 | **10.3** | 0.3 | 74 | 8 |
| Cochrane Database Syst Rev 2017 Apr 21;(4):CD012010 | | | | | | |

Sen.= Test positive in pancreatitis patients

Sp.= Test negative in non-pancreatitis patients

| Test | Sen. | Sp. | LR+ | LR- | PPV | NPV |
|---|---|---|---|---|---|---|
| **Lipase** | 79% | 89% | **7** | 0.24 | 68% | 6.6% |
| Amylase | 72 | 93 | **10.3** | 0.3 | 74 | 8 |
| Cochrane Database Syst Rev 2017 Apr 21;(4):CD012010 | | | | | | |

PPV= probability of pancreatitis in Test positive
PPV= Px Sen./ [Px Sen.+ (1-P)(1-Sp.)] = True pos/ True pos + False pos.

NPV= probability of health in Test negative
NPV= (1-P)x Sp./ [Px (1-Sen.) + (1-P)Sp.)]= True neg/ True neg + False neg

| Test | Sen. | Sp. | LR+ | LR- | PPV | NPV |
|---|---|---|---|---|---|---|
| **Lipase** | 79% | 89% | **7** | 0.24 | 68% | 6.6% |
| Amylase | 72 | 93 | **10.3** | 0.3 | 74 | 8 |

Cochrane Database Syst Rev 2017 Apr 21;(4):CD012010

LR+= probability of pancreatitis in Test positive
LR+ = Sen./ 1-Sp. = **True pos/ False pos**

LR- = probability of pancreatitis in Test negative
LR- = 1-Sen./ Sp. = **False neg/ True neg**

| | LR + | LR - |
|---|---|---|
| Bad | < 2 | > ½ |
| Not bad | 2-5 | ½ - 1/5 |
| Good | 5-10 | 1/5 – 1/10 |
| Very good | >10 | < 1/10 |

In patients with abdominal pain that is consistent with acute pancreatitis, serum lipase and/or amylase > 3 times ULN confirms the diagnosis of acute pancreatitis.

(ACG Strong recommendation, Moderate-quality evidence)

- ✓Imaging is not needed in patients who meet the clinical criteria of acute pancreatitis.

- ✓Obtain an abdominal ultrasound in all patients with acute pancreatitis to assess for gallstones
  (ACG Strong recommendation, Low-quality evidence).

Only if the diagnosis is *uncertain* or there is *failure to improve* clinically within 48-72 hours, obtain contrast-enhanced CT or MRI to confirm the diagnosis and assess for complications such as fluid collections or necrosis.

(ACG Strong recommendation, Low-quality evidence)

For diagnosis of acute pancreatitis, CECT has

sensitivity = 90%

Specificity = 90%

**LR+ = 9**

**LR- = 0.11**

Tenner S, Baillie J, DeWitt J, Vege SS; American College of Gastroenterology (ACG). American College of Gastroenterology guideline: management of acute pancreatitis. Am J Gastroenterol. 2013 Sep;108(9):1400-15.

## MRCP appears able to rule out CBD stones

- based on 1 randomized trial and 2 prospective cohort studies

| Test | Sen. | Sp. | LR+ | LR- | PPV | NPV |
|---|---|---|---|---|---|---|
| MRCP | 100% | 91% | **11** | **0** | 50% | 100 |
| mild resolving gallstone pancreatitis were randomized to laparoscopic cholecystectomy (LC) and intraoperative cholangiography (IOC) vs. preoperative MRCP<br>patients with negative MRCP underwent LC and IOC and patients with positive MRCP had preoperative ERCP followed by LC<br>**J Am Coll Surg 2005 Jun;200(6):869** | | | | | | |
| MRCP | 80% | 83% | 4.7 | 0.24 | 89% | 71% |
| reference standard was ERCP; for choledocholithiasis, agreement between MRCP and ERCP was 90.6% (kappa = 0.808)<br>**Am J Gastroenterol 2005 May;100(5):1051** | | | | | | |
| MRCP | 83% | 93% | 12 | 0.18 | 77% | 95% |
| **AJR Am J Roentgenol 2005 Jun;184(6):1854** | | | | | | |

# Endoscopic Ultrasound

- EUS, or MRCP, is suggested to **screen** for **choledocholithiasis** if the condition is highly suspected and in the absence of cholangitis and/or jaundice.
  (ACG Conditional recommendation, Moderate-quality evidence)

- If there is suspected **idiopathic** acute pancreatitis after a negative routine work-up for a biliary etiology, consider EUS as the first step to assess for occult microlithiasis, neoplasms, and chronic pancreatitis.
  (IAP/APA Grade 2C, Weak Agreement)

- EUS is the most sensitive imaging study for visualization of the bile duct.

# EUS may have higher diagnostic accuracy for biliary disease compared to MRCP in patients with idiopathic acute pancreatitis after routine laboratory testing and conventional radiologic methods

- based on systematic review of diagnostic cohort studies with methodologic limitations
- systematic review of 34 diagnostic cohort studies evaluating EUS and/or MRCP for etiologic diagnosis accuracy in patients with **idiopathic acute pancreatitis**
- IAP defined as acute pancreatitis with no identifiable etiology by routine laboratory studies and conventional radiologic methods (transabdominal ultrasound and CT scan)
- methodologic limitations included use of retrospective and prospective studies and clinical heterogeneity in prior radiologic studies before EUS or MRCP

- overall diagnostic yield of 64% (EUS) vs. 34% (MRCP)

Reference - Gastrointest Endosc 2018 May;87(5):1180

# Endoscopic Retrograde Cholangiopancreatography (ERCP)

- ACG recommends MRCP or EUS rather than diagnostic ERCP to screen for choledocholithiasis in the absence of cholangitis or jaundice.

  (ACG Conditional recommendation, Moderate-quality evidence)

- ERCP is **not needed** in most patients with gallstone pancreatitis who lack laboratory or clinical evidence of ongoing biliary obstruction.

  (ACG Strong recommendation, Moderate-quality evidence)

- Routine use of **urgent** ERCP in patients with acute biliary pancreatitis and no cholangitis is suggested **against.**

  (ACG Conditional recommendation, Low-quality evidence)

- Perform ERCP within **24** hours of admission for patients with acute pancreatitis and concurrent acute cholangitis.

  (ACG Strong recommendation, Moderate-quality evidence)

- AGA recommends performing ERCP within **72** hours if there is high suspicion of a persistent, CBD stone, such when there is a possible bile duct stone visible on noninvasive imaging, a persistently dilated CBD, or jaundice.

# Normal bilirubin level after 2 days of hospitalization for gallstone pancreatitis suggests low risk for CBD stones

- based on derivation cohort study
- 100 patients with gallstone pancreatitis and elective ERCP or intraoperative cholangiography were evaluated
- ◦ 21 patients had CBD stones
- serum total bilirubin > 1.35 mg/dL (23 mcmol/L) on second hospital day occurred in 48 patients, and was best clinical predictor of CBD stones

– sensitivity 90%
– specificity 63%
– positive predictive value 40%
– negative predictive value 96%

– LR+ = 2.43
– **LR- = 0.16**

Reference - Am J Gastroenterol 1998 Apr;93(4):527

# Alanine aminotransferase (ALT) ≥ 150 units/L may suggest gallstone pancreatitis as cause in patients with acute pancreatitis

based on systematic review and meta-analysis without assessment of study quality

systematic review evaluating ALT, AST, Alk-P, and Bill testing for distinguishing gallstone pancreatitis in 8 diagnostic cohort studies including 557 patients with acute pancreatitis

reference standards were sonography, computed tomographic scanning, endoscopic retrograde cholangiopancreatography, or laparotomy

pooled prevalence for gallstone pancreatitis 52% in studies evaluating ALT

| | Sen. | Sp. | LR+ | LR- | PPV |
|---|---|---|---|---|---|
| ALT ≥ 150 | 48% | 96% | **12** | 0.54 | 95% |

Am J Gastroenterol 1994 Oct;89(10):1863

- Definitions:
  - ✓acute pancreatitis
  - ✓Severity of AP
  - ✓Morphologic (Image-Based) Classification
- Incidence/ epidemiology
- Causes
- Diagnosis
- **Tests for Severity**
- Diagnosis of infected necrosis

# CLINICAL PREDICTORS

- Older age
- Alcoholic pancreatitis
- Short time interval to symptom onset

  (between the onset of symptoms and hospital admission < 24 hours )
- Obesity (BMI> 30)
- Organ failure

A pleural effusion and/or pulmonary infiltrates during the first 24 hours may be associated with necrosis and organ failure.

Talamini G, Uomo G, Pezzilli R, et al. Serum creatinine and chest radiographs in the early assessment of acute pancreatitis. Am J Surg 1999; 177:7.

# Assessing for severity and complications of acute pancreatitis:

- Tests for severity : BUN, hematocrit, CRP levels.

- Additional blood tests for organ function/potential organ failure:
  creatinine, liver function tests, albumin,
  glucose, LDH, WBC count, calcium, and ABG

# CRP > 150 mg/L appears to have moderate-to-high accuracy for predicting severity of acute pancreatitis

- based on systematic review with results limited by heterogeneity
- systematic review of 30 cohort studies (17 prospective and 13 retrospective) with 5,988 patients with acute pancreatitis comparing the accuracy of CT-based scoring systems and laboratory testing for predicting severity and mortality
- CRP measured 24-72 hours after admission (most at 48 hours after admission)
- in studies evaluating CRP, range of reported severe acute pancreatitis 10.2%-43%, and range of reported mortality 2%-12.5%
- mortality in acute pancreatitis 0.73 (CI 0.66-0.81) in analysis of 2 studies with 363 patients

  - CRP level > 150 mg/L for severity of acute pancreatitis :

- sensitivity 71% (95% CI 59%-81%)
- specificity 87% (95% CI 66%-96%)
- **LR + = 5.5**
- **LR - = 0.3**

Reference - Front Physiol 2019;10:1002

# Admission hematocrit ≥ 44% or rise in BUN at 24 hours may have moderate-to-low accuracy for predicting persistent organ failure or pancreatic necrosis in patients with acute pancreatitis

- based on post hoc analysis of prospective cohort study data
- 1,612 patients (median age 53 years) with acute pancreatitis from 3 independent prospective cohorts with clinical data were used to compare the accuracy of measured blood urea nitrogen (BUN), hematocrit, and creatinine for predicting persistent organ failure (severe acute pancreatitis) and pancreatic necrosis
- persistent organ failure developed in 18.2%; pancreatic necrosis in 25.4%; death in 4.9%

| Test | Sen. | Sp. | LR+ | LR- | PPV | NPV |
|---|---|---|---|---|---|---|
| for predicting **persistent organ failure** | | | | | | |
| admission hematocrit ≥ 44% | 59% | 74% | 2.3 | 0.55 | 37% | 88% |
| rise in BUN at 24 hours | 63% | 79% | 3 | 0.47 | 42% | 90% |
| for predicting pancreatic **necrosis** | | | | | | |
| admission hematocrit ≥ 44% | 54% | 77% | 2.35 | 0.6 | 44% | 84% |
| rise in BUN at 24 hours | 57% | 77% | 2.48 | 0.56 | 46% | 84% |

Reference - Am J Gastroenterol 2015 Dec;110(12):1707

# SCORING SYSTEMS

- Ranson's criteria
- APACHE II score
- Systemic inflammatory response syndrome score
- BISAP score
- Harmless acute pancreatitis score
- CT severity index
- Modified Marshall scoring

# Ranson criteria to predict severity of acute pancreatitis

| | |
|---|---|
| **0 hours** | |
| Age | >55 |
| White blood cell count | >16,000/mm3 |
| Blood glucose | >200 mg/dL (11.1 mmol/L) |
| Lactate dehydrogenase | >350 U/L |
| Aspartate aminotransferase (AST) | >250 U/L |
| **48 hours** | |
| Hematocrit | Fall by ≥10 percent |
| Blood urea nitrogen | Increase by ≥5 mg/dL (1.8 mmol/L) despite fluids |
| Serum calcium | <8 mg/dL (2 mmol/L) |
| pO2 | <60 mmHg |
| Base deficit | >4 MEq/L |
| Fluid sequestation | >6000 mL |

# Defining features of systemic inflammatory response syndrome (SIRS)

| **Two or more of the following conditions:** |
| --- |
| Temperature $>38.3^{\circ}C$ or $<36.0^{\circ}C$ |
| Heart rate of $>90$ beats/minute |
| Respiratory rate of $>20$ breaths/minute or $PaCO_2$ of $<32$ mmHg |
| WBC count of $>12{,}000$ cells/$mm^3$, $<4000$ cells/$mm^3$, or $>10$ percent immature (band) forms |

# CT findings and grading of acute pancreatitis (CT severity index)

| Grading based upon findings on unenhanced CT | | |
|---|---|---|
| **Grade** | **Findings** | **Score** |
| A | Normal pancreas - normal size, sharply defined, smooth contour, homogeneous enhancement, retroperitoneal peripancreatic fat without enhancement | 0 |
| B | Focal or diffuse enlargement of the pancreas, contour may show irregularity, enhancement may be inhomogeneous but there is no peripancreatic inflammation | 1 |
| C | Peripancreatic inflammation with intrinsic pancreatic abnormalities | 2 |
| D | Intrapancreatic or extrapancreatic fluid collections | 3 |
| E | Two or more large collections of gas in the pancreas or retroperitoneum | 4 |

| Necrosis score based upon contrast-enhanced CT | |
|---|---|
| **Necrosis (%)** | **Score** |
| 0 | 0 |
| <33 | 2 |
| 33-50 | 4 |
| ≥50 | 6 |

CT severity index equals unenhanced CT score plus necrosis score: maximum = 10, ≥ 6 = severe disease.

# Modified Marshall scoring system for organ dysfunction

| Organ system | Score | | | | |
|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 |
| Respiratory ($PaO_2/FiO_2$) | >400 | 301-400 | 201-300 | 101-200 | ≤101 |
| Renal* | | | | | |
| (serum creatinine, micromol/L) | ≤134 | 134-169 | 170-310 | 311-439 | >439 |
| (serum creatinine, mg/dL) | <1.4 | 1.4-1.8 | 1.9-3.6 | 3.6-4.9 | >4.9 |
| Cardiovascular (systolic blood pressure, mmHg)¶ | >90 | <90, fluid responsive | <90, not fluid responsive | <90, pH <7.3 | <90, pH <7.2 |
| For nonventilated patients, the $FiO_2$ can be estimated from below: | | | | | |
| **Supplemental oxygen (L/min)** | **$FiO_2$ (percent)** | | | | |
| Room air | 21 | | | | |
| 2 | 25 | | | | |
| 4 | 30 | | | | |
| 6-8 | 40 | | | | |
| 9-10 | 50 | | | | |

# International Association of Pancreatology (IAP) / American Pancreatic Association (APA) recommend the following for prognostication and predicting the severity of AP:

- SIRS is advised to predict SAP at admission and persistent SIRS at 48 hours.
- During admission, a three-dimensional approach:
  - ✓ **host risk factors** (age, comorbidity, BMI),
  - ✓ **clinical risk stratification** (eg, persistent SIRS),
  - ✓ **monitoring response** to initial therapy (persistent SIRS, BUN, creatinine)

Working Group IAP/APA Acute Pancreatitis Guidelines. IAP/APA evidence-based guidelines for the management of acute pancreatitis. Pancreatology 2013; 13:e1.

# ACG recommend the following clinical findings associated with a severe course for initial risk assessment:

- **Patient characteristics:**
  - Age >55 years
  - Obesity (BMI>30 $kg/m^2$)
  - Altered mental status
  - Comorbid disease
- **SIRS:**

  Presence of >2 of the following criteria:
  - Pulse >90 beats/min
  - Respirations >20/min or $PaCO_2$ <32 mm Hg
  - Temperature >38 or <36°C
  - WBC >12,000 or <4,000 $cells/mm^3$ or >10 % immature neutrophils (bands)
- **Laboratory findings:**
  - BUN >20 mg/dL
  - Rising BUN
  - Hematocrit >44 %
  - Rising HCT
  - Elevated creatinine
- **Radiology findings:**
  - Pleural effusions
  - Pulmonary infiltrates
  - Multiple or extensive extra-pancreatic collections

Tenner S, Vege SS, Sheth SG, et al. American College of Gastroenterology Guidelines: Management of Acute Pancreatitis. Am J Gastroenterol 2024; 119:419.

# Non-enhanced MRI may reliably stage severity of acute pancreatitis

- based on prospective cohort study without independent validation
- 90 patients with acute pancreatitis had nonenhanced magnetic resonance imaging (NE-MRI) and CECT scan for assessment of severity of acute pancreatitis
- good correlation between CT severity index and MRI severity index scores (Spearman's rank correlation 0.6)
- for detecting severe acute pancreatitis based on imaging criteria, NE-MRI had :
  - sensitivity 100%,
  - specificity 82.6%,
  - positive predictive value 100%, **LR+= 5.75**
  - negative predictive value 21% **LR- = 0**

Reference - J Magn Reson Imaging 2007 Aug;26(2):331

- Definitions:
  - ✓acute pancreatitis
  - ✓Severity of AP
  - ✓Morphologic (Image-Based) Classification
- Incidence/ epidemiology
- Causes
- Diagnosis
- Tests for Severity
- **Diagnosis of infected necrosis**

- there is no absolute correlation between the extent of necrosis and the risk of infection and duration of symptoms.

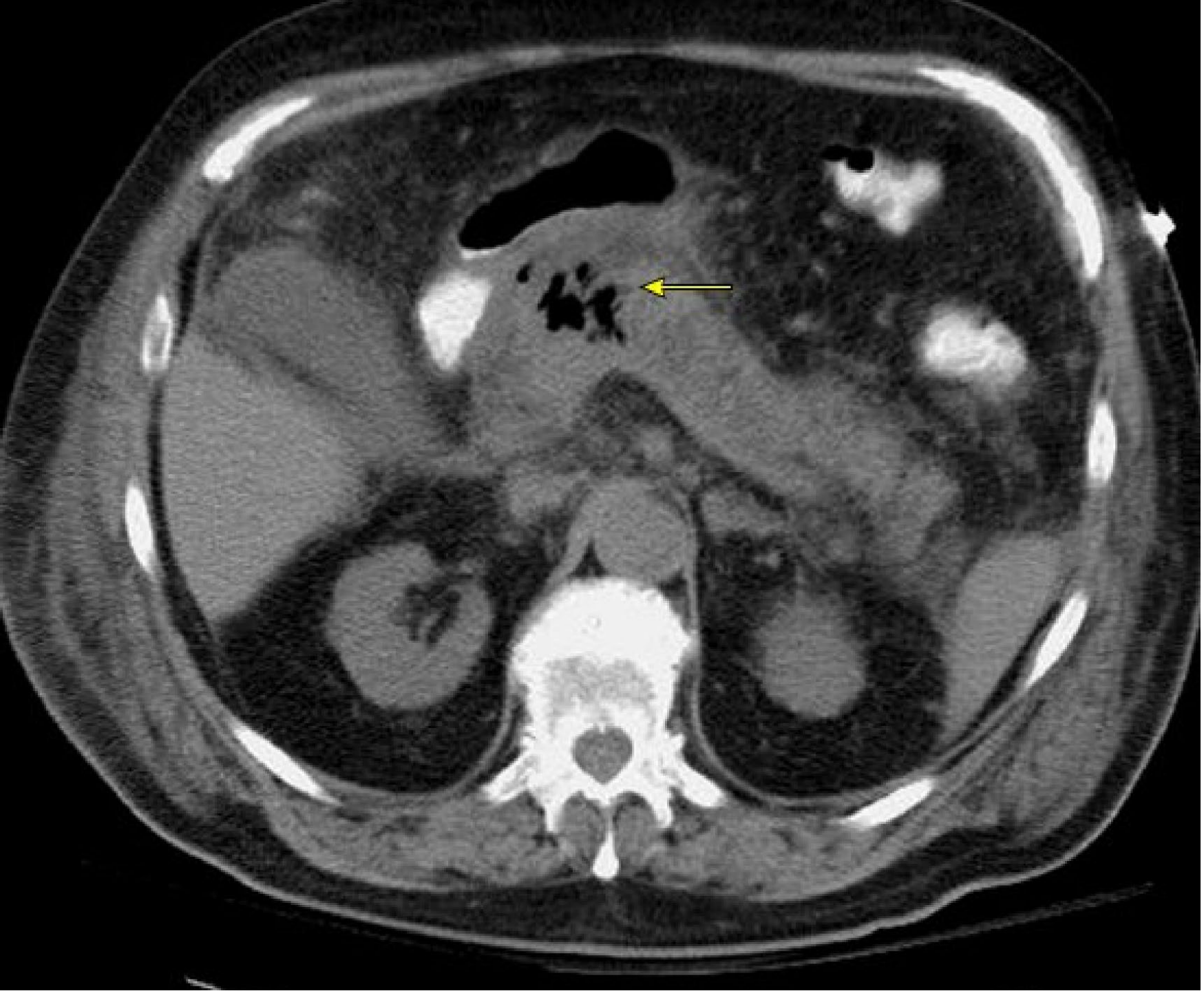
- Solid necrosis may evolve early in the course to variable liquefaction and variable reabsorption.

- If necrosis is not completely reabsorbed, it may persist as an area of walled-off pancreatic necrosis (WOPN), which may be symptomatic and a cause of pain or mechanical obstruction of the duodenum and/or bile duct.

- Infected necrosis is rare in the first week

- Infection is presumed if **extraluminal gas** is present in non-enhancing area(s) on contrast-enhanced CT.
  - ✓This is virtually **pathognomonic** for the presence of gas-forming organisms, without or with perforation.

- The diagnosis of infection is based definitively only by image-guided, **FNA** with positive Gram stain and culture.



CT scan reveals gas bubbles (arrow) within an area of pancreatic necrosis.
The presence of gas bubbles is a pathognomonic sign of infection of the necrosis.

2026 UpToDate

- **AGA** recommendations on CT-guided FNA for investigation of AP:

  ✓Suspect infected necrosis in patients with sterile pancreatic necrosis :
    ✓ persistent or worsening symptoms
    ✓ evidence of infection, usually after 7-10 days of illness.

  ✓If infection is suspected : CT-FNA with culture and Gram stain

- **ACG** states for possible infected necrosis:
  - pancreatic or extra-pancreatic necrosis + deteriorate or fail to improve after 7-10 days of hospitalization
  - management strategies:
    - CT-FNA for Gram stain and culture to guide use of appropriate antibiotics **or**
    - empiric use of antibiotics without CT-FNA

(ACG Strong recommendation, Moderate-quality evidence)

- Definitions:
  - ✓acute pancreatitis
  - ✓Severity of AP
  - ✓Morphologic (Image-Based) Classification
- Incidence/ epidemiology
- Causes
- Diagnosis
- Tests for Severity
- Diagnosis of infected necrosis