

**Acute pancreatitis
after Revised Atlanta Classification**

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Disclosures

Nothing to Disclose

CLASSIFICATION OF ACUTE PANCREATITIS


<p>Atlanta* criteria (1992)</p> <ul style="list-style-type: none"> • Mild acute pancreatitis (80% cases) (Acute Interstitial/edematous pancreatitis) <ul style="list-style-type: none"> - Acute Absence of organ failure - Absence of local complications • Severe acute pancreatitis (20% cases) (Acute Hemorrhagic Necrotizing (fulminant) pancreatitis) <ul style="list-style-type: none"> - Local complications +/- - Organ failure defined as <ul style="list-style-type: none"> • SBP < 90 mm Hg • PaO₂ ≤ 60 mm Hg • GI bleed ≥ 500 ml/24 hrs • Cret ≥ 2 mg/dl after rehydration - Ranson score ≥ 3 or APACHE ≥ 8 	<p>Revised Atlanta criteria (2012)</p> <ul style="list-style-type: none"> • Mild acute pancreatitis <ul style="list-style-type: none"> - Absence of organ failure - Absence of local complications • Moderately severe acute pancreatitis <ul style="list-style-type: none"> - Local complications +/- - Transient organ failure (<48 h) • Severe acute pancreatitis <ul style="list-style-type: none"> - Persistent organ failure** (>48 h) and/or death
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*defined as a score of 2 or more for one of these(CVS, Renal, Resp) organ systems using the modified Marshall scoring system

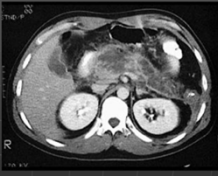
Diagnosis of Acute pancreatitis
Two out of the three features

- 1. Typical pain of pancreatitis.
- 2. Elevated (>3 times) levels of Serum amylase/ lipase.
- a CECT is not usually required for diagnosis in the emergency room or on admission to the hospital
- 3. In selected cases imaging study such as contrast enhanced CT scan of abdomen.
- **Examples:**
- In delayed presentation, A/L may be normal ,
- When history is difficult to obtain as in demented, disoriented patients.
- *Classification of acute pancreatitis—2012. Gut 2013;62:102-111*

Edematous Vs Necrotizing



Acute edematous pancreatitis



Acute Necrotizing pancreatitis


The above clinical classification recognizes the importance of pancreatic necrosis, but overlooks intermediary forms of disease with fluid collections.

Bradley E., International symposium on Acute Pancreatitis . Atlanta 1992.

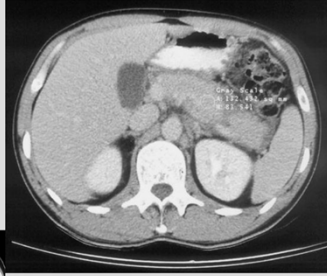
Acute Pancreatitis

CT features in *interstitial pancreatitis* include:

1. homogenous contrast enhancement;
2. diffuse or segmental pancreatic enlargement;
3. irregularity, heterogeneity, and lobularity of the pancreas;
4. obliteration of the peripancreatic fat planes



Normal pancreas

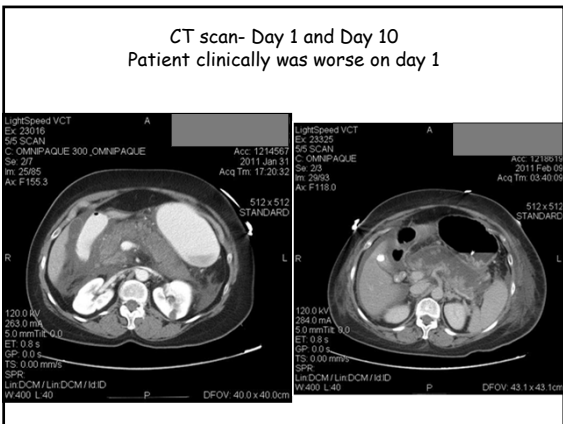


CT scan obtained with intravenous and oral contrast material shows an enlarged and homogeneously enhancing pancreatic gland.

Acute Pancreatitis			
Two phases	Early	Late	
	1st week	After 1st week	
Severity	Mild	Moderate	Severe
	No organ failure	Organ failure less than 48 h	Organ failure longer than 48 h
	Two types		
	Oedematous	Necrotizing	
Complications	< 4 wk : acute peripancreatic collection > 4 wk: pseudocyst		< 4 wk : acute necrotic collection > 4 wk: walled-off necrosis

- ### Single Markers Of Prognosis
1. Obesity: BMI > 30
 2. Ecchymosis
 3. Admission hemoconcentration >44 Lack of it
 4. Failure to correct hemoconcentration to < 44 in 24 hours
 5. Serum creatinine > 2mg/dL on admission, failure to reduce to < 2 with fluid administration
 6. Fasting blood sugar > 125 mg/dL
 7. Urinary trypsinogen activation peptide < 30 nmol/L (negative predictive value)
 8. Pleural effusion
 9. C-Reactive protein > 150mg/L at 48 hours

- ### BISAP (Bed Side Index of Severity) Score
- BUN > 25
 - Impaired mental status
 - SIRS
 - 2 or more of the following variables
 - Fever of > 38°C (100.4°F) or < 36°C (96.8°F)
 - Heart rate of > 90 beats per minute
 - Respiratory rate > 20 bpm or arterial carbon dioxide tension (PaCO2) of < 32mm Hg
 - Abnormal white blood cell count (>12,000/μL or < 4,000/μL or >10% immature [band] forms)
 - Age > 60 years
 - Pleural effusions
 - ≥ 3 predict pancreatic necrosis
 - And organ failure
 - Mortality prediction similar to APACHE II

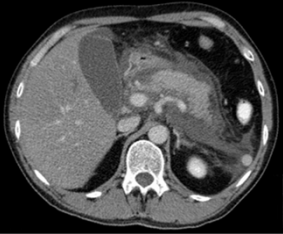
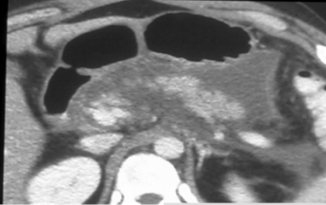


- ### Terms used in Revised Atlanta classification
- Interstitial edematous pancreatitis:
 - inflammation or stranding in the (peri)pancreatic tissues without tissue necrosis
 - Pancreatic parenchyma enhances ,IV contrast Lack of peripancreatic necrosis
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- ### New Definitions of Peripancreatic Fluid collections
1. Acute Peri-Pancreatic Fluid Collections. (APFCs).
 2. Pancreatic Pseudocysts (PPC).
 3. Acute Necrotic Collections (ANC).
 4. Walled off necrosis (WON)

Acute Peri-Pancreatic Fluid Collections. (APFCs)

- Complicates acute interstitial edematous pancreatitis (IEP).
- In 30%-50% of cases.
- **Imaging studies show:**
 - Pancreas shows edema.
 - Non-localized. Between tissue planes
 - No encapsulated wall.
 - No necrosis
 - No solid component in APFC
- *Complete resolution in 70% of cases in two weeks.*
- If no resolution develops into a pseudocyst.

Acute Peripancreatic Collection

- < 4 weeks
- In interstitial pancreatitis
- Homogeneous - fluid density
- No fully definable wall
- Adjacent to pancreas
- Confined by normal fascial planes

Acute peripancreatic fluid collection

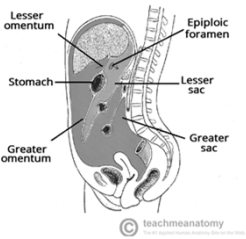
Peripancreatic fluid associated with interstitial edematous pancreatitis with no associated peripancreatic necrosis. This term applies only to areas of peripancreatic fluid seen within the first 4 weeks after onset of interstitial edematous pancreatitis and without the features of a pseudocyst.

CECT criteria

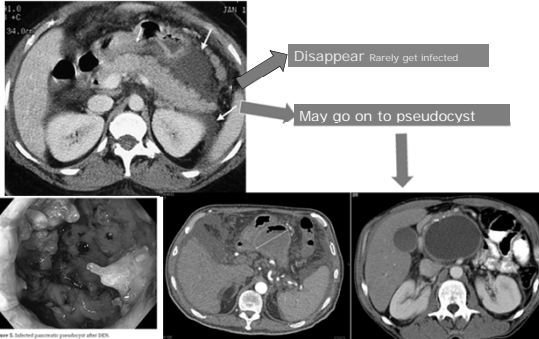
- ↳ Occurs in the setting of interstitial edematous pancreatitis
- ↳ Homogeneous collection with fluid density
- ↳ Confined by normal peripancreatic fascial planes
- ↳ No definable wall encapsulating the collection
- ↳ Adjacent to pancreas (no intrapancreatic extension)

Localization of fluid collections

- Lesser Sac
- Anterior pararenal space
- Posterior pararenal space
- In and around the left lobe of liver
- Spleen



Natural history of edematous pancreatitis and fluid collections



Disappear Rarely get infected

May go on to pseudocyst

Figure 6. Subacute pancreatitis pseudocyst after 30%.

Natural History of APFC

APFC

- Occur in 30-50% of AP

- Do not needle APFC

Disappear

Get Infected

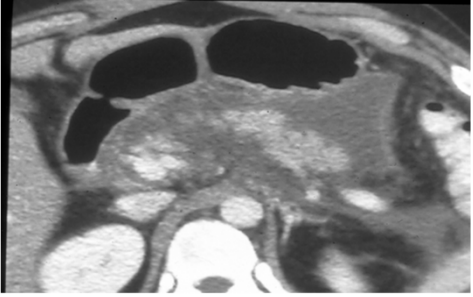
a. Dx: aspiration by FNA

b. Rx: -antibiotics -surgery

Pseudocyst forms after 4 weeks

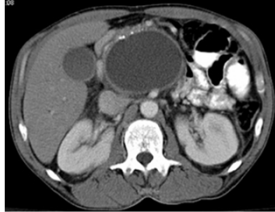
Brun A, Agarwal N, Pitchumoni CS. J Clin Gastroenterol. 2011.

FNA is not indicated



Peri-pancreatic pseudocysts.

- Consequence of APFC After 4 weeks
- a well defined wall of inflammatory reactive granulation tissue .
- Imaging shows complete enhancement of pancreas
- No necrosis .
- Usually resolves .
- **Indication for intervention.**
- **(No rule of six)**
- Symptomatic.
- Growing in size.
- Compresses on adjacent organs.
- Evidence of infection .
- Suspicion of a neoplastic cyst.



Pre-drainage evaluation of a pseudocyst

1. Exclude a cystic neoplasm.
2. R/O IPMN or a pancreatic cancer.
3. Exclude solid content in a pseudocyst.
4. Delineate the relationship with stomach or duodenum.
5. Exclude vascular structures in the route of approach to the cyst.(Important in patients with portal hypertension).
6. Trans papillary approach is possible only when there is a communication with a pancreatic duct. ERCP/ MRCP needed.

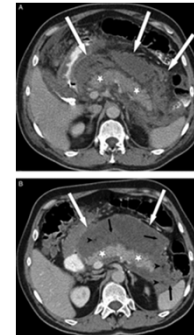
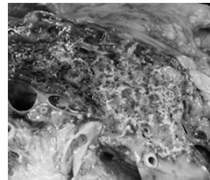
*Barthel et al Gastrointest Endosc 2008;67:245-252
Varadarajulu et al Gastro intest Endoscopy 2007;66:1107-1119
Hookey et al Gastrointest Endosc 2006;63:635-645*

Pancreatic Necrosis

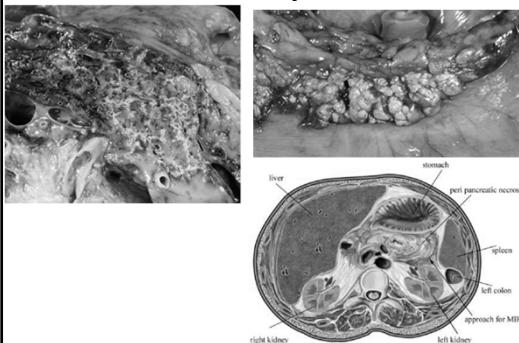
- Approximately 15% of patients with AP.
- Focal or diffuse regions of non-viable pancreatic tissue
- On CECT necrosis is characterized by areas of pancreatic tissue with absent or poor contrast media enhancement (hypoperfusion) or lack of enhancement of the entire gland
- Infected necrosis generally occurs within 3 weeks of onset of AP.
- Note mortality in infected pancreatic necrosis is double that of pancreatic abscess.

Necrotizing pancreatitis:

- Pancreatic parenchymal necrosis and/or peripancreatic necrosis
- Pancreatic parenchyma areas without enhancement by intravenous contrast and/or
- Peripancreatic necrosis

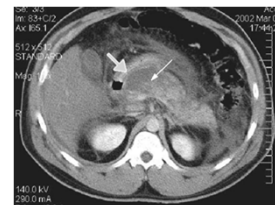


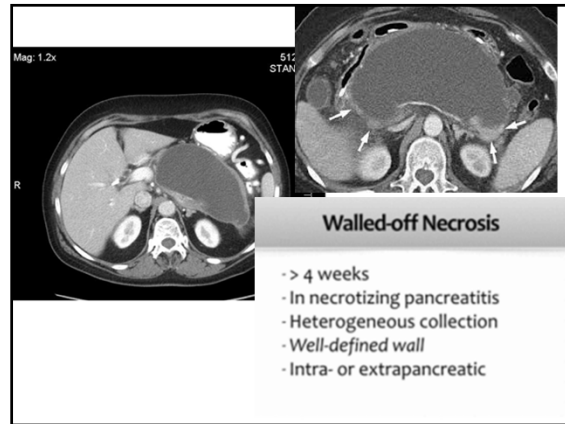
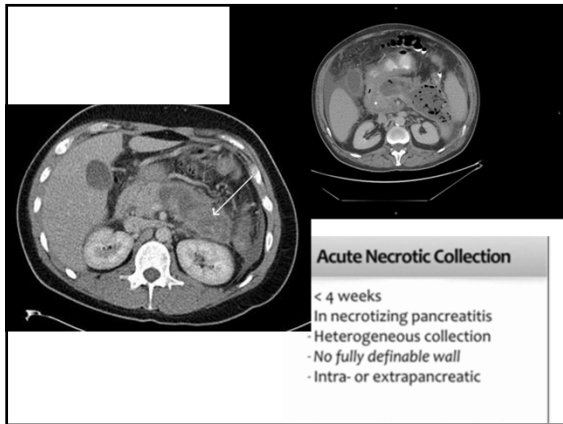
Severe Acute pancreatitis



Acute Necrotizing collections (ANCs)

- Result of necrotizing pancreatitis.
- Affect parenchyma only, or peripancreatic tissues only or both pancreatic and peri-pancreatic regions.
- Pathogenesis: microcirculatory disruption.
- Affected areas of pancreas do not show enhancement .
- Peripancreatic necrosis may not be visible early in the course . (peripancreatic tissue normally does not enhance).
- Detection of ANCs and APFCs initially may be difficult .
- Solid and liquid components.

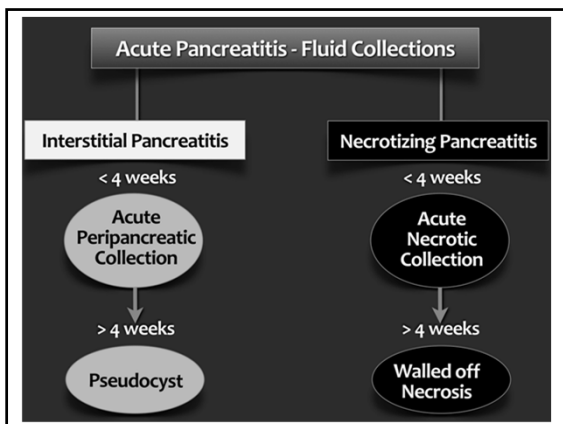




Infection of (Peri)pancreatic Necrosis

- **Diagnosis:**
 - Gas bubbles on CT almost 100% specificity
 - Rare- indicate presence of communication with the GI tract
 - Procalcitonin- seroloical marker of pancreatic infection - especially in conjunction with organ failure
 - Specificity 83-91% → cannot use as sole diagnostic test
 - Increase accuracy when used in combination of other markers of infection

Sarr MG, Nagorney DM, Mucha P, Jr, et al. Br J Surg. 1991;78:576-581
Mofidi R, Suttie SA, Patil PV, et al. Surgery. 2009;146:72-81



Current Management in Acute Pancreatitis

- Conservative approach
- Adequate pain relief
- Intravenous fluids and early enteral feeding
- No prophylactic antibiotics
- In case of multi organ failure → ICU

Early decisions

Assess hemodynamic status .
resuscitative measures begun as needed.
Aggressive IV hydration
Preferably Ringer lactate.
Risk assessment should be performed to stratify patients into higher- and lower-risk admission to an intensive care setting if indicated
Patients with organ failure should be admitted to an ICU

Lactated Ringer's solution reduces systemic inflammation compared with saline in patients with acute pancreatitis

- One liter of Ringer's lactate solution contains:
 - 130 mEq of sodium ion = 130 mmol/L
 - 109 mEq of chloride ion = 109 mmol/L
 - 28 mEq of lactate = 28 mmol/L
 - 4 mEq of potassium ion = 4 mmol/L
 - 3 mEq of calcium ion = 1.5 mmol/L
- Ringer's lactate has an osmolarity of 273 mOsm/L .The lactate is metabolized into bicarbonate by the liver, which can help correct metabolic acidosis.



Fluid resuscitation Necessary: the earlier the resuscitation, better the outcome, "aggressive?,"Golden Hours "

- Type of fluid: Colloids and/or crystalloids:
 - Among crystalloids, lactate Ringer's better than normal saline.
 - Use colloids especially when albumin < 2.0 g/d
- Amount of fluid Total fluid in first 24 h: variable
- Rate of infusion Initial bolus 1000 mL over one hour followed by 3 mL/Kg per hour (200 mL/h) for 24-48 h
- Monitoring Urine output > 0.5 mL/kg/h
- CVP: not good for monitoring due to third space loss and hypoalbuminemia
- Duration of resuscitation 24-48 h, until signs of volume depletion disappear.

Fischer and Gardner Am JI Gastro. 2012;107:1146
Taludkar and Vege Curr Gastroenterol Rep. 2011;13:123

Early oral refeeding (EORF) based on hunger in moderate and severe acute pancreatitis: A prospective controlled, randomized clinical trial
Nutrition January 2015

- Current practice: The decision to recommence oral feeding is commonly based on resolution of abdominal pain and normalization of laboratory findings, including pancreatic amylase and lipase
- In patients with moderate or severe AP, EORF based on hunger was safe and superior to Conventional oral feeding (CORF.)
- EORF was associated with shorter hospital LOS
- did not increase clinical complications.
- EORF based on hunger should be considered as a valid option in the management of AP.



When to do cholecystectomy?

- Same admission if pancreatitis is not severe.
- delaying surgery unnecessary. within 48 hours of hospital admission without awaiting the normalization of pancreatic and liver enzyme levels.
- prospective trial from Harbor-UCLA Medical Center
- LOS in the early LC group was reduced mean LOS was reduced to 3.5 days, from a mean of 5.8 days,
- no difference observed in perioperative complication rates.
- Arch Surg. 2012;147 (11):1031-1035.

No Prophylactic antibiotics

routine prophylactic antibiotics in severe acute pancreatitis are not recommended.

not recommended to use antibiotics in patients with sterile necrosis to prevent infected necrosis.

The 2013 American College of Gastroenterology (ACG) guidelines

initial management of acute pancreatitis

Administer antibiotics in:

- 1. ascending cholangitis.
- 2. Extra-pancreatic infections eg. pneumonia.
- 3. Documented infected pancreatic necrosis.
- Consider infected necrosis in patients with pancreatic or extrapancreatic necrosis whose condition deteriorates or who fail to improve after 7–10 days of hospitalization.
- Obtain initial CT-guided fine-needle aspiration (FNA) for Gram stain and culture,
- or administer empiric antibiotic therapy after obtaining cultures for infectious agents, without CT FNA.

How should sterile pancreatic necrosis be managed?

- Managed conservatively.
- Intervention needed only rarely as in multiorgan dysfunction not improving despite maximal therapy in ICU.

- Pezelli et al. *Practical Guide lines for acute pancreatitis. Pancreatology 2010; 10:523*.
- Banks PA and Freeman MJ. *Practice Guidelines in acute pancreatitis. Am. J Gastroenterol. 2006; 101:2379*

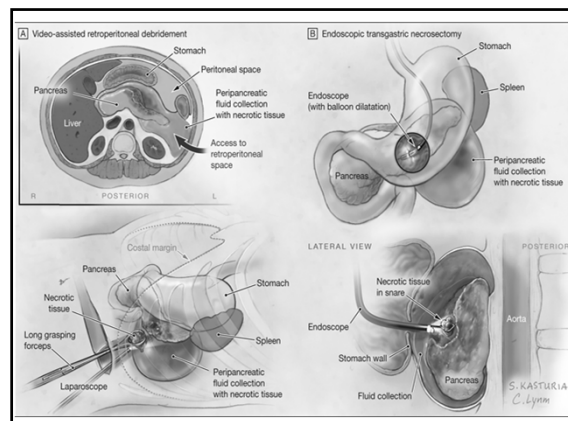
Is necrosectomy obsolete for IPN ? A paradigm shift needed?

- 1960s Explorative laparotomy to total pancreatectomy.
- 1990s, 100% mortality if IPN is not operated immediately.
- 2007. severe IPN benefit from delayed surgical necrosectomy and drainage.
- 2015, minimally invasive techniques, Percutaneous catheter, endoscopic transluminal drainage. Followed by video assisted retroperitoneal or endoscopic drainage. Improved outcome over open necrosectomy.

Chang Y. *WJG*. 2014;20:16925
Rosenberg *Surg Infect* 2015

A paradigm shift in the treatment of pancreatic necrosis and peripancreatic infections

- open surgical procedures are being replaced by endoscopic or percutaneous procedures.
- Surgery is now reserved for cases in which an endoscopic or percutaneous approach is not
- abdominal compartment syndromes).
- Open procedures, especially early on, carry significant mortality and morbidity and should be delayed until the patient's clinical situation is stable.
- Transluminal drainage/necrosectomy



Indications for ERCP in AP

- Suspected traumatic pancreatitis
- Severe gallstone AP with ongoing bile duct obstruction
- In severe AP patients - Multiple co-morbid conditions / unfit for surgery
- MRCP and EUS may prevent a proportion of ERCPs for suspected CBD stones who do not have cholangitis. EUS is superior to MRCP in detecting <5mm stones

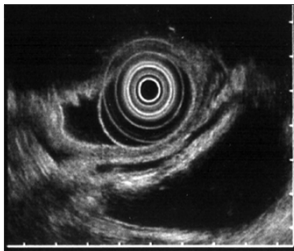
IAP/APA evidence based guidelines for the management of acute pancreatitis. *Pancreatolgy* 2013;13:e1-15

Pseudocysts: When to intervene?

- > 6 cm in size is no longer the threshold for intervention
- Total resolution is documented in cysts > 6cm in size
- Logic dictates that larger the pseudocysts, longer the duration the less likely spontaneous resolution will occur.
 - Pseudocysts (with underlying chronic pancreatitis), PC with thicker wall or known communication with a duct needs intervention

Recommendation : close clinical and radiological follow up, action be taken when PC increases in size, becomes symptomatic or complications are suspected.

Pseudocyst Drainage: Role of EUS



- Localizes cyst
- Determines distance from stomach wall
- Detects vascular structures

Baron. *J gastrointest Surg* 2008;12:369
Baron. *Gastro endoscc. Clin NA* 2007;17:559
Ahlawat etal *JOP* 2006;7:616

Pancreatic Abscess

- A well defined, thick walled, circumscribed collection of pus
- Containing little or no pancreatic necrosis
- In proximity to the pancreas
- Typically arise 4 weeks after onset of AP
- Organism: E.Coli, Klebsiella, Proteus, Psudomonas, ENterobacter, Candida, Staph, Streptococcus fecalis
- Polymicrobial in the majority

Differentiation from infected necrosis is vital because of the nearly double mortality risk for infected necrosis compared with pancreatic abscess

Thank you all.