Acute Pancreatitis: changes in terminology, classification and management - what the radiologist needs to know.

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**Learning objectives**

The goal of our exhibit is to discuss the changes introduced by two recent publications- the revised Atlanta classification 2012 and the international association of pancreatology/American pancreatic association (IAP/APA) evidence-based guidelines for the management of acute pancreatitis and highlight the changes that are most important for the radiologist.

We plan to discuss how the guidelines for management will affect the imaging of acute pancreatitis and its complications. We will illustrate new definitions described in the revised classification using CT images to demonstrate types and stages of acute pancreatitis as well as the complications.

**Background**

As one of the most common, hospitalisation requiring, acute gastrointestinal diseases worldwide, acute pancreatitis has a reported incidence of 13-45 cases per 100,000 persons per year. With such a high incidence, high hospital cost and high mortality of up to 30% in severe cases, international evidence-based treatment guidelines are obviously required.

The revised Atlanta classification of acute pancreatitis and the revised evidence-based guidelines for the management of acute pancreatitis from the IAP/APA were both published in 2012. Both are important international consensus papers which update the previous working classification systems and best practice guidelines to more clearly define the diagnosis, imaging and treatment of acute pancreatitis. In the interim since the publication of the original Atlanta classification in 1992 and the publication of the original International Association of Pancreatology (IAP) treatment guidelines in 2002, there have been substantial advances in knowledge about, the imaging of and the treatment of pancreatitis. The revised system of classification and guidelines will hopefully lead to a standardised approach to imaging and management of acute pancreatitis.

**Findings and procedure details**

The revised International association of Pancreatology/American PanCreatic association evidence-based guidelines for the management of acute pancreatitis provides multiple recommendations; we focus specifically on those related to diagnosis, imaging and intervention.
**Definition:** The definition of acute pancreatitis as agreed by the working group is based on the fulfillment of 2 of 3 of the following: clinical (upper abdominal pain), laboratory (serum amylase or lipase >3 upper limit of normal) and/or imaging (CT, MRI, ultrasonography) criteria.

**Initial imaging:** The working committee commented that contrast-enhanced abdominal CT abdomen may be useful but is usually not necessary to diagnose acute pancreatitis. Suggested scenarios where cross-sectional imaging may be required to confirm the diagnosis include sedated patients, suspicion of duodenal perforation, or a prolonged period between onset of symptoms and presentation, when serum markers may have normalized.

The working group strongly agreed (GRADE 1B evidence) that as treatment and follow-up of pancreatitis depends on the underlying cause of the pancreatitis, right upper quadrant transabdominal ultrasound should be performed on admission, to evaluate for a biliary cause.

After negative routine work-up for biliary etiology, endoscopic ultrasonography (EUS) is recommended as the first step to assess for occult microlithiasis, neoplasms or chronic pancreatitis. If EUS is negative, (secretin-stimulated) MRCP is advised as a second step to identify possible morphologic abnormalities. CT of the abdomen should be performed (i.e. if not performed before). (GRADE 2C evidence, weak agreement)

**Initial CT:** The working group strongly agreed (GRADE 1C evidence) the indication for initial CT assessment in acute pancreatitis can be: (1) diagnostic uncertainty, (2) confirmation of severity based on clinical predictors of severe acute pancreatitis, or (3) failure to respond to conservative treatment or in the setting of clinical deterioration. The recommended optimal timing for initial CT assessment is at least 72-96 hours after onset of symptoms.

The group advised against routine early CT in acute pancreatitis for a number of reasons: (1) lack of current evidence that early CT improves clinical outcome or that early detection of necrosis will influence treatment; (2) CT scoring systems have not been shown to be any better than clinical scoring systems in predicting prognosis and severity of disease; (3) there is some evidence that suggests that an early, inappropriate CT may increase the duration of hospital stay, does not improve clinical outcomes, and has the risks of contrast allergy and nephrotoxicity as well as exposure to unnecessary extra radiation. Because pancreatic and peripancreatic necrosis may only become obvious 72 hours after onset of the acute process, a CT to assess the severity of pancreatitis using the CT severity index (CTSI) criteria should be performed only thereafter.
Follow-up imaging: With regard to the indication for follow-up scanning, either with CT or MRI, the group strongly agreed (GRADE 1C evidence) that a follow up examination should be performed when there is a lack of clinical improvement, clinical deterioration, or especially when invasive intervention is considered.

Routine, weekly follow-up CT is advocated in some older guidelines, but there is minimal evidence to support this. MR may be required to distinguish between pseudocysts and walled-off necrosis as defined by the revised Atlanta classification at least 4 weeks after the index episode of acute pancreatitis. CT is frequently not able to detect necrosis in a fluid-predominant collection.

Optimal protocol to detect necrosis?

Multi-detector CT with thin collimation and slice thickness (5mm) with 100-150 ml of non-ionic intravenous contrast material at 3 ml/s, during the pancreatic and/or portal venous phase (i.e. 50-70 s delay). A portal venous phase examination is sufficient for follow-up examinations.

For MRI - requirements include pre and post intravenous contrast axial FS-T2 and FS-T1 scanning. The group also commented that various protocols are suggested in the literature but currently there are no existing dedicated radiological guidelines. For CT, both the pancreatic and portal venous phase are sufficient for discriminating viable from non-viable pancreatic tissue. More complicated clinical indications such as hemorrhage, arterial pseudoaneurysm and mesenteric infarction would obviously require further phases. An MR with T2-weighted images is advised when the differentiation between pseudocysts and collections with necrosis (i.e. acute necrotic collection and walled-off necrosis) is clinically important.

Role of MRCP and EUS in biliary pancreatitis?

MRCP and EUS may prevent unnecessary ERCPs. One Randomised controlled trial found that EUS could safely replace diagnostic ERCP in patients with biliary pancreatitis. EUS is superior to MRCP in excluding the presence of small (<5 mm) gallstones, the presence of small calculi cannot be excluded by a negative MRCP, and this is relevant because these small stones are often the cause of biliary pancreatitis. However, MRCP is less invasive, less operator-dependent and probably more widely available than EUS. Therefore, in clinical practice there is no clear superiority for either MRCP or EUS.

Indications for intervention:

Specifically in necrotizing pancreatitis, intervention should be considered when there is documented, infected necrotizing pancreatitis with clinical deterioration, preferably when the necrosis has become walled-off or in the absence of documented infected necrotizing...
pancreatitis, ongoing organ failure for several weeks after the onset of acute pancreatitis, preferably when the necrosis has become walled-off. Less common indications for intervention are: Abdominal compartment syndrome, Ongoing acute bleeding, Bowel ischemia, ongoing gastric outlet, intestinal, or biliary obstruction due to mass effect from large walled-off necrosis (arbitrarily >4-8 weeks after onset of pancreatitis. (GRADE 1C evidence).

Walled-off necrosis usually occurs at least 4 weeks after onset of acute pancreatitis. The presence of gas in peripancreatic collections on CT is considered evidence of infected necrotizing pancreatitis, irrespective of the source of the gas (i.e. loss of integrity of the gastrointestinal tract or through gas-forming bacteria).

Grade 1C evidence suggests that routine percutaneous FNA of peripancreatic collections to detect bacteria is not indicated, because clinical signs and imaging signs (i.e. gas in peripancreatic collections) are accurate predictors of infected necrosis in the majority of patients.

There is good evidence (Grade 1C) that intervention should be deferred for at least 4 weeks after initial presentation to allow the collection to become 'walled-off' with consultation with a specialist center before interventional treatment advisable.

Grade 1A evidence suggests that the optimal interventional strategy for patients with suspected or confirmed infected necrotizing pancreatitis is initial image-guided percutaneous (retroperitoneal) catheter drainage or endoscopic transluminal drainage, followed, if necessary, by endoscopic or surgical necrosectomy.

The revised Atlanta classification of acute pancreatitis 2012:

differentiates the early and late phases of acute pancreatitis as well as differentiating interstitial edematous from necrotizing pancreatitis. New radiological terminology is also introduced for the pancreatic and peripancreatic fluid collections associated with pancreatitis. One of the main problems of previous classifications was the multitude of different terms used to describe the pancreatic and peripancreatic fluid collections seen on CT. The term pseudocyst was used invariably for all collections of varying age and aetiology. The new classification emphasises the difference between collections consisting of fluid alone and those collections that result from necrosis of the parenchyma +/-peripancreatic tissues.

Definition of types of acute pancreatitis:

Acute pancreatitis can be subdivided into two types: interstitial oedematous pancreatitis and necrotising pancreatitis.
**Interstitial oedematous pancreatitis:** diffuse (or rarely focal) inflammatory oedematous enlargement of the pancreas. Findings on CT are typically smooth parenchymal enhancement, with mild peri-pancreatic fat stranding and minimal peripancreatic fluid. Fig 1. No findings of necrosis. Clinical symptoms resolve within 1 week.

**Necrotising pancreatitis:** is rare affecting about 5-10% of patients and manifests as necrosis involving both the pancreas and peripancreatic tissues. If CT is performed in the early acute stages, the extent of necrosis may be underestimated. In the early acute stages, the parenchymal enhancement can be markedly heterogeneous and over the first week, areas of poor enhancement become more demarcated and confluent, representing pancreatic parenchymal necrosis. Figs 2 & 3.

In peripancreatic necrosis, the pancreas enhances normally, but the peripancreatic tissues become necrotic.

This new revised classification identifies 2 distinct phases of acute pancreatitis - early (1 or 2 weeks after the onset) and late (thereafter).

The natural progression of pancreatic and peripancreatic necrosis is highly variable, because it may remain solid or liquefy, remain sterile or become infected, persist, or resolve with time.

The diagnosis of infected pancreatic necrosis is important because of the need for antibiotic treatment and likely active intervention- the presence of infection is suggested radiologically when there is extraluminal gas in the pancreatic and/or peri-pancreatic tissues on CT. Fig. 10.

**Acute peripancreatic fluid collection (APFC):** homogeneous fluid without a recognizable wall, confined by the peripancreatic fascial planes, occurs within the first 4 weeks after the onset of interstitial edematous pancreatitis. Figs 1 & 4.

**Pancreatic pseudocyst:** occurs only in the setting of interstitial edematous pancreatitis and occurs at least 4 weeks after the acute onset, radiological appearance is of a homogeneous, well-defined fluid collection with well-defined walls and no solid components. Fig.7.

**Acute necrotic collection (ANC):** occurs in necrotising pancreatitis, involving the parenchyma +/- peripancreatic tissues, is radiologically heterogeneous poorly defined collection, with fluid and solid components and no clearly defined wall. Figs 5& 6.
Walled-off necrosis (WON): this takes at least 4 weeks to develop. after the onset of necrotising pancreatitis, developing either within the parenchyma or peripancreatic tissues, and demonstrating a very well-defined inflammatory wall, with heterogeneous fluid and solid components centrally. figs 8 & 9.

Images for this section:

**Fig. 5:** ANC - Acute necrotic collection of the pancreatic and peripancreatic tissues - note the heterogeneity of the collection components and poorly defined walls. No air seen within the collection to suggest infection.
**Fig. 2:** Acute necrotising pancreatitis - axial post contrast images demonstrates lack of normal enhancement of the parenchyma of the head and uncinate process of the pancreas with normal enhancement of the remainder of the gland.
**Fig. 3:** Acute necrotising pancreatitis - coronal post contrast image from the same patient in Fig. 2.
**Fig. 1:** Acute interstitial oedematous pancreatitis - there is peri pancreatic fat stranding and a small volume of peri-pancreatic fluid. The pancreatic parenchyma enhances throughout although the appearance is quite heterogeneous due to oedema.
Fig. 6: ANC - acute necrotic collections in this patient with acute necrotising pancreatitis. Heterogeneous collection of the head and neck and peri pancreatic tissues without a clearly defined wall.
Fig. 4: APFC - Acute peri pancreatic fluid collection in this patient with acute interstitial oedematous pancreatitis. Note there is also portal vein thrombosis.
**Fig. 8:** WON - Walled off necrosis - in this patient with a history of necrotising pancreatitis. Note the well defined wall and heterogeneous fluid and solid contents.
Fig. 9: WON - Walled off necrosis - in this patient with a history of necrotising pancreatitis. Note the well defined wall and heterogeneous fluid and solid contents.
Fig. 7: Pancreatic pseudocyst in this patient 2 months post an episode of acute interstitial oedematous pancreatitis. Note the well-fined wall and homogeneous fluid content.
Fig. 10: Infected pancreatic necrosis suggested by the presence of extraluminal gas in the peri-pancreatic tissues in this patient with a recent episode of necrotising pancreatitis of the pancreatic body and tail.
Conclusion

Both the revised Atlanta classification and the IAP/APA evidence-based guidelines for the management of acute pancreatitis have refined the definition of acute pancreatitis and its complications in a continued attempt to improve treatment and communication amongst physicians. As the radiologists, it is important to understand these new revisions, classifications and terminology in order to help standardise the diagnosis and management of acute pancreatitis.

International standard utilisation of this classification will help clinicians to predict the outcome of patients with acute pancreatitis and will allow more accurate comparison of patients and disease management.

Personal information

References


