

## The classification of acute pancreatitis: Current status

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### Summary

The Atlanta Classification of acute pancreatitis (AP) is widely accepted and has been used by physicians and radiologists since 1992. However, advances in knowledge of the disease process, improved imaging, and ever-changing treatment options have rendered some of its definitions ambiguous and highlighted the inadequacy of its classification of severity. This review discusses revision of the Atlanta Classification (2008) and it describes a new determinant-based classification (2012). In contrast to the Atlanta Classification, the revised version and new classification are based on evidence but still need to be developed through systematic review of new data and further international consultation.

**Keywords:** Acute pancreatitis, classification, severity

Acute pancreatitis (AP) is an inflammatory disease of the pancreas. It has a mild, self-limiting course in 80% of patients who recover without complications. The remaining patients have a severe disease with local and systemic complications, and this disease carries a mortality risk of 10-24% (1-3). The treatment of mild AP is conservative and supportive, but severe episodes may require minimally invasive techniques or even surgical intervention. Thus, the accurate classification of the severity of AP is crucial. Key steps are to define its severity, to monitor the course of the disease, and to make informed clinical decisions. In clinical research, accurate classification of the severity of AP can be used as an effective means of communication among physicians and valid comparison of results from different institutions.

The assessment of AP severity has continually been of interest to clinicians, and several systems to classify pancreatitis emerged in the 20th century (4-7). The Atlanta Classification (Table 1) is a clinically based classification system resulting from an international meeting, the 1992 International Symposium on Acute Pancreatitis (8,9). Briefly, the Atlanta Classification categorizes AP as "mild" to "severe." The latter

is distinguished by organ failure and/or local complications (see the note in Table 1). The Atlanta symposium attempted to offer a global "consensus" and a universally applicable classification system for AP. The definitions of AP, its severity, and organ failure and local complications in the Atlanta Classification are widely accepted and used by physicians and radiologists, representing an important step forward in the classification of AP.

Although the Atlanta Classification has proved useful in the years since 1992, many of its definitions proved confusing and have not been accepted or

**Table 1. Summary of the 1992 Atlanta Classification of AP**

Severity	Definition
Mild AP	Associated with minimal organ dysfunction and an uneventful recovery; lacks the features of severe AP.
Severe AP	Associated with organ failure <sup>a</sup> and/or local complications <sup>b</sup> .

Note:

<sup>a</sup> Organ failure and systemic complications

- Shock: SBP < 90 mmHg.
- Pulmonary insufficiency: PaO<sub>2</sub> ≤ 60 mmHg.
- Renal failure: Creatinine ≥ 170 μmol/L (≥ 2 mg/dL) after rehydration.
- Gastrointestinal bleeding: 500 mL in 24 hours.
- Disseminated intravascular coagulation: Platelets ≤ 100,000/mm<sup>3</sup>, fibrinogen < 1.0 g/L and fibrin-split products > 80 μg/L.
- Severe metabolic disturbances: Calcium ≤ 1.87 mmol/L or ≤ 7.5 mg/dL.

<sup>b</sup> Local complication

- Acute fluid collections.
- Pancreatic necrosis.
- Acute pseudocyst.
- Pancreatic abscess.

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utilized by the pancreatic community. Bollen *et al.* (10,11) evaluated the use of the Atlanta definitions in a total of 447 articles, published after 1993, identified by a MEDLINE search. They found that more than half of the studies used alternative definitions of the predicted severity and actual severity of AP and organ failure. Interpretations of the Atlanta definitions of local complications also varied widely.

Increased knowledge of the pathophysiology of necrotizing pancreatitis, improved imaging of the pancreatic parenchyma and peripancreatic collections, and the development of new interventions to manage complications, such as minimally invasive radiologic, endoscopic, and laparoscopic procedures have resulted in several studies identifying shortcomings in the

Atlanta Classification. The limitations of Atlanta Classification can be summarized as follows: patients identified as having "severe AP" consist of subgroups with very different outcomes (12-16), forms of AP with higher risks of mortality, such as necrotizing pancreatitis (14,15,17) (sterile or infected? pancreatic or peripancreatic?), were inadequately described or categorized, and organ failure (18-22) was not adequately categorized (transient or persistent?).

In order to establish a more accurate classification system, the Acute Pancreatitis Classification Working Group revised the Atlanta Classification in 2008 (23) (Table 2). An obvious feature of the revised classification is that AP is classified into two phases: an early phase (usually within the first week of onset)

**Table 2. Revision of The Atlanta Classification of AP**

	Severity	Definition
1st week	Non-severe AP	absence of organ failure or the presence of organ failure <sup>a</sup> that does not exceed 48 hours in duration.
	Severe AP	persistence of organ failure that exceeds 48 hours duration ( <i>i.e.</i> , organ failure recorded at least once during each of three consecutive days).
After 1st week	Interstitial edematous pancreatitis (IEP)	CECT demonstrates diffuse or localized enlargement of the pancreas and normal, homogeneous enhancement of the pancreatic parenchyma.
	Necrotizing pancreatitis <sup>b</sup>	CECT demonstrates the presence of necrosis in either the pancreatic parenchyma or the extra pancreatic tissues. The necrosis should be further classified into as Sterile or Infected.

Note:

<sup>a</sup> Organ failure is defined in accordance with the Marshall scoring system as a score  $\geq 2$  for at least one of these three organ systems: respiratory, renal, and cardiovascular.

<sup>b</sup> Necrotizing pancreatitis includes the necrosis of the pancreas alone, or the pancreas and peripancreatic tissues, or peripancreatic tissues alone.

**Table 3. Determinant-based Classification of AP**

	Mild AP	Moderate AP	Severe AP	Critical AP
(Peri)pancreatic necrosis	NO	Sterile	Infected	Infected
	AND	AND/OR	OR	AND
Organ failure	NO	Transient	Persistent	Persistent

Note:

#### Local Determinant

The local determinant of severity is necrosis of the pancreas and/or peripancreatic tissue. This is covered by the term (peri) pancreatic necrosis.

#### Definitions

- (Peri) pancreatic necrosis is nonviable tissue located in the pancreas alone, or in the pancreas and peripancreatic tissues, or in peripancreatic tissues alone. It can be solid or semisolid (partially liquefied) and is without a radiologically defined wall.
- Sterile (peri) pancreatic necrosis is the absence of proven infection in necrosis.
- Infected (peri) pancreatic necrosis is defined when at least one of the following is present:
  - Gas bubbles within (peri) pancreatic necrosis on computed tomography
  - A positive culture of (peri) pancreatic necrosis obtained by image-guided fine-needle aspiration
  - A positive culture of (peri) pancreatic necrosis obtained during the first drainage and/or necrosectomy.

#### Systemic Determinant

The systemic determinant of severity is a certain degree of distant organ dysfunction due to AP. This is covered by the term organ failure.

#### Definitions

- Organ failure is defined for 3 organ systems (cardiovascular, renal, and respiratory) on the basis of the worst measurement over a 24-hour period. In patients without preexisting organ dysfunction, organ failure is defined as either a score of 2 or more for the assessed organ system according to the SOFA (Sepsis-related Organ Failure Assessment) score or when the relevant threshold is breached, as shown:
  - Cardiovascular: need for inotropic agent
  - Renal: creatinine  $\geq 171 \mu\text{mol/L}$  ( $\geq 2.0 \text{ mg/dL}$ )
  - Respiratory:  $\text{PaO}_2/\text{FiO}_2 \leq 300 \text{ mmHg}$  (40 kPa).
- Persistent organ failure is the evidence of organ failure in the same organ system for 48 hours or longer.
- Transient organ failure is the evidence of organ failure in the same organ system for less than 48 hours.

and a subsequent phase occurring after the first week of onset of the disease. These two phases have a distinct pathophysiology. Because the first phase is characterized more by the presence or absence of organ failure and less by morphologic findings in and around the pancreas, AP should be classified as being in the first phase based on "functional" or "clinical" parameters. In the second phase, the need for treatment is determined by the presence of symptoms and/or complications. Therefore, "morphologic" criteria should be used to classify AP in the second stage because morphologic criteria can be used to guide treatment. Briefly, the clinical classification is used during the early phase of disease (within the first week of onset) while the morphologic classification is used during the subsequent phase (usually after the first week after onset).

Several comprehensive reviews of the available evidence have noted several flaws with this revised classification: *i*) "mild" and "severe" are not sufficient to categorize the severity of AP and cannot differentiate between subgroups with different outcomes (24-28); *ii*) the classification of severity should be based on key factors that are causally associated with severity, rather than on descriptions of events that may correlate with severity but are not causally associated with it (29-31); *iii*) there are insufficient grounds for ending the first phase 1 week after onset of symptoms. Further, clinical events can occur in individual patients in any order on any day, so severity should be categorized based on key events when they occur and without regard to the sequence they occur in (32,33).

Given the aforementioned flaws of the Atlanta Classification, a determinant-based classification of AP severity was developed in 2012 (34) (Table 3). Systematic reviews of the evidence and expert opinions have favored this classification over the revised Atlanta Classification. New data and international consultation may lead to a different answer in the future and necessitate further revisions, but the transition from a classification based on "clinical experience" to one based on "evidence-based determinants" is a step in the right direction.

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