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Original Article

Significant inter-observer variation in the diagnosis of extrapancreatic necrosis and type of pancreatic collections in acute pancreatitis – An international multicenter evaluation of the revised Atlanta classification

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ABSTRACT

Background: For consistent reporting and better comparison of data in research the revised Atlanta classification (RAC) proposes new computed tomography (CT) criteria to describe the morphology of acute pancreatitis (AP). The aim of this study was to analyse the interobserver agreement among radiologists in evaluating CT morphology by using the new RAC criteria in patients with AP.
Methods: Patients with a first episode of AP who obtained a CT were identified and consecutively enrolled at six European centres backwards from January 2013 to January 2012. A local radiologist at each center and a central expert radiologist scored the CTs separately using the RAC criteria. Center dependent and independent interobserver agreement was determined using Kappa statistics.
Results: In total, 285 patients with 388 CTs were included. For most CT criteria, interobserver agreement was moderate to substantial. In four categories, the center independent kappa values were fair: extrapancreatic necrosis (EXPN) (0.326), type of pancreatitis (0.370), characteristics of collections (0.408), and appropriate term of collections (0.356). The fair kappa values relate to discrepancies in the identification of extrapancreatic necrotic material. The local radiologists diagnosed EXPN (33% versus 59%, $P < 0.0001$) and non-homogeneous collections (35% versus 66%, $P < 0.0001$) significantly less frequent than the central expert. Cases read by the central expert showed superior correlation with clinical outcome.

Abbreviations: AP, acute pancreatitis; CECT, contrast-enhanced computed tomography; Central exp, Central expert; CRP, C-reactive protein; CT, computed tomography; EXPN, extrapancreatic necrosis; IEP, Interstitial Oedematous Pancreatitis; IQR, interquartile range; Local rad, local radiologists; No, number; RAC, the revised Atlanta classification; SIRS, systemic inflammatory response syndrome.

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Conclusion: Diagnosis of EXPN and recognition of non-homogeneous collections show only fair agreement potentially resulting in inconsistent reporting of morphologic findings.

1. Introduction

Acute pancreatitis (AP) is a complex disease with potentially severe and fatal outcome [1,2]. Simple but clear definitions of the disease are crucial in interdisciplinary consultation, communication, and in reporting of clinical research. Such were the incentives to update the 1992 Atlanta Classification on AP [1]. Besides redefining the disease into three levels of clinical severity, the 2012 revised Atlanta Classification (RAC) has put substantial efforts into clarifying the terminology on the morphologic subtypes of AP and associated peripancreatic collections based on computed tomography (CT)-based criteria [1]. Two morphologic types of AP are discriminated: acute interstitial oedematous pancreatitis and acute necrotising pancreatitis. Acute necrotising pancreatitis is subdivided into three forms: pancreatic parenchymal necrosis, extrapancreatic necrosis (EXPN), and combined necrosis. Peripancreatic collections are classified into four types depending on content and maturation. Acute peripancreatic fluid collections and pancreatic pseudocysts are composed of fluid only and occur in interstitial oedematous pancreatitis. On CT, these collections show a homogeneous fluid density with no or incomplete well-defined wall (acute peripancreatic fluid collection) or a complete wall (pseudocyst). Acute necrotic collections and walled-off necrosis are associated with acute necrotising pancreatitis and contain varying amounts of fluid and necrotic material. On CT, these collections have various densities (fat, fluid, solid material) with no or incomplete well-defined wall (acute necrotic collection) or a complete wall (walled-off necrosis) [1,3–5]. The RAC provides approximate time frames for these pancreatic collections. Acute peripancreatic fluid collection and acute necrotic collection pertain to the first four weeks of disease after which they usually turn into a completely encapsulated pseudocyst and walled-off necrosis, respectively.

It is well established that the morphologic types of AP differ in outcomes, therapies, and prognosis. For prognostication, stratification, and comparing of interinstitutional data, accurate assessment of AP morphology in the different stages of disease is imperative [1]. The extent of variation in interpretation of the new CT criteria is, however, unknown [6–8]. The aim of this study was to assess the interobserver agreement among radiologists in the evaluation of CT morphology using the RAC criteria.

2. Methods

2.1. Patients and study design

Patients >18 years with a first episode of AP were consecutively identified at six European study centres, going backwards from January 2013 to January 2012. Each center included 50 patients in whom at least one contrast-enhanced CT (CECT) was performed. The cases were anonymously enrolled and each patient obtained a code blinded for all investigators except for the referring center. CECTs performed within 3 months from date of admission were recorded and subsequently reviewed and scored by a local radiologist at each center. The time frame of 3 months was chosen because most CTs are performed within this period and controversies in nomenclature and management of pancreatic collections are most evident during this phase. Exclusion criteria were insufficient quality of the CECT, signs of chronic pancreatitis (i.e. pancreatic calcifications) or patients with prior pancreatitis-related invasive intervention, except from endoscopic retrograde cholangiography. Each CECT was performed in the pancreatic and/or in the portal venous phase (see Supplementary file 1 for CT specifications). Severity and CT morphology of AP were defined according to the RAC (see Box 1 for definitions) [1].

The following clinical data was collected from review of medical notes: systemic inflammatory response syndrome (SIRS) upon admission, highest level of C-reactive protein (CRP) during hospitalisation, need for invasive intervention, organ failure (persistent and transient, in line with the RAC), and in-hospital mortality. The six participating local radiologists had expertise in the field of abdominal radiology, each with more than five years' experience. A short instruction sheet was provided to local radiologists to assist in interpretation (Supplementary file 2). All individual CECTs were scored according to a protocol based on the parameters stated in the RAC (Supplementary file 3). Subsequently, all CECTs were reviewed and scored (using the same scoring sheet) by a central expert radiologist (T.L.B) using open source DICOM viewer software (32-bit OsiriX version 3.3, Geneva, Switzerland). Local and central reviewers were blinded to any clinical data except for the timing (number of days after onset of symptoms) of each CECT. Formal approval of the local medical ethical committee was requested and obtained at each study center.

Box 1
Morphological features and CECT criteria in AP according to the RAC.

Morphology groups	CECT criteria	Time
Interstitial oedematous pancreatitis (IEP)	Homogenous enhancement of the pancreatic parenchyma, normal or minor inflammatory changes of the peripancreatic tissue (see below – APFC or pancreatic pseudocyst)	–
Necrotising pancreatitis	Heterogeneous enhancement of the pancreatic parenchyma and/or peripancreatic tissue necrosis (see below – ANC or WON)	–
Acute peripancreatic fluid collection (APFC)	Homogeneous fluid density. No complete wall. No necrosis. Associated with IEP. Solely extrapancreatic location.	≤4 weeks
Pancreatic pseudocyst	Homogeneous fluid density. Fully encapsulated. No necrosis Associated with IEP. Solely extrapancreatic location.	>4 weeks
Acute necrotic collection (ANC)	Heterogeneous and non-liquid density. No complete wall. Associated with necrotising pancreatitis. Intra- or extrapancreatic location	≤4 weeks
Walled-off necrosis (WON)	Heterogeneous and non-liquid density. Fully encapsulated. Associated with necrotising pancreatitis. Intra- or extrapancreatic location	>4 weeks

CECT = contrast enhanced computed tomography.

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