



Research Article

Impact of Fluid Collection According to Revised ATLANTA Classification on Patient Prognosis in Acute Pancreatitis: A Radiological Study

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Received: 20 August 2023; Revised: 30 September 2023; Accepted: 10 October 2023

Abstract

Background: Acute pancreatitis is a complex and challenging disease. The revised Atlanta Classification emphasizes accurate characterization of collections that complicate acute pancreatitis and standardizes terminology across specialties, which helps to decide the treatment strategy. As a result, the role of imaging in the management of acute pancreatitis has substantially increased. **Objective:** This study aimed to categorize the fluid collections in acute pancreatitis using the 2012 ATLANTA classification and to compare the type of collection with the patient's clinical variables like length of hospital stay, ICU stay, presence of organ failure, type of organ failure, presence of infection, and outcome. **Methods:** This descriptive cross-sectional hospital-based study was conducted for two years. A total of 120 patients with acute pancreatitis-associated fluid collections were included in the study. **Results:** In our study, hospital and intensive care unit admission, as well as the length of stay, presence of organ failure, presence of infection, and the patient's outcome, all showed statistically significant relationships with walled-off necrosis (WON). **Conclusions:** The revised ATLANTA classification provides clear definitions to classify acute pancreatitis using easily identified clinical and radiologic criteria and thereby helps to determine the proper patient outcome and management.

Keywords: Acute pancreatitis, ATLANTA classification, Pseudocyst, Walled-off necrosis.

تأثير تجمع السوائل وفقا لتصنيف أتلانطا المنقح على تشخيص المريض في التهاب البنكرياس الحاد: دراسة بالأشعة التشخيصية

الخلاصة

الخلفية: التهاب البنكرياس الحاد هو مرض معقد وصعب. يؤكد تصنيف أتلانطا المنقح على التوصيف الدقيق للأسباب التي تعقد التهاب البنكرياس الحاد ويحدد المصطلحات عبر التخصصات، مما يساعد على تحديد استراتيجية العلاج. نتيجة لذلك، زاد دور الأشعة التشخيصية في علاج التهاب البنكرياس الحاد بشكل كبير. **الهدف:** تصنيف مجموعات السوائل في التهاب البنكرياس الحاد باستخدام تصنيف أتلانطا لعام 2012 ومقارنة نوع المجموعة مع المتغيرات السريرية للمريض مثل مدة الإقامة في المستشفى، والإقامة في وحدة العناية المركزة، ووجود فشل الأعضاء وأنواعه، ووجود العدوى الجرثومية، والنتائج. **الطريقة:** أجريت هذه الدراسة الوصفية المقطعية القائمة على المستشفى لمدة عامين. تم تضمين ما مجموعه 120 مريضا يعانون من تجمع السوائل المرتبطة بالتهاب البنكرياس الحاد في الدراسة. **النتائج:** أظهر دخول المستشفى ووحدة العناية المركزة، بالإضافة إلى مدة الإقامة، ووجود فشل الأعضاء، ووجود العدوى، ونتائج علاج المريض، علاقات ذات دلالة إحصائية مع النخر المعزول (WON). **الاستنتاجات:** يوفر تصنيف أتلانطا المنقح تعريفات واضحة لتصنيف التهاب البنكرياس الحاد باستخدام معايير سريرية وإشعاعية يسهل تحديدها، وبالتالي يساعد على تحديد النتائج المناسبة للمريض وعلاج حالته.

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Article citation: Kejriwal A, Das S, Mohanty J, Das S. Impact of fluid collection according to revised ATLANTA classification on patient prognosis in acute pancreatitis: A radiological study. *Al-Rafidain J Med Sci.* 2023;5(Suppl 1):S37-41. doi: <https://doi.org/10.54133/ajms.v5i1S.258>

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INTRODUCTION

Acute pancreatitis occurs due to the sudden onset of pancreatic inflammation that occasionally affects distant organ systems and frequently includes peripancreatic tissues. The severity of the condition varies greatly, from mild versions that solely affect the pancreas to severe diseases with multisystemic organ failure and death [1]. Some of the most common causes are gallstones, drinking alcohol, endoscopic retrograde cholangiopancreatography (ERCP), and damaged cell pathways. The primary pathobiological mechanisms of acute pancreatitis include inflammation and injury to different pancreatic organs in addition to edema, necrosis, and inflammation of pancreatic tissue. Although recent diagnostic and treatment advancements have significantly reduced the death rate, severe acute pancreatitis usually has a catastrophic course. Early assessment of pancreatitis severity is crucial, as is early treatment at a facility with the right resources. This is possible by looking at severity using clinical severity scores, lab parameters, and imaging studies like contrast-enhanced CT—pancreatic necrosis raises the risk of illness and death. Timely screening of acute pancreatitis patients using imaging techniques like CECT and grading disease severity can significantly help predict outcomes [2]. The CT severity index, which goes from 0 to 10, is very effective in determining the severity of acute pancreatitis. It considers changes in pancreatic morphology, peripancreatic alterations, and the amount of pancreas necrosis. The modified CT severity index, which includes extrapancreatic complications and removes some potential drawbacks of CTSI, was introduced in 2004 [2]. It is easier to figure out the level of pancreatic necrosis (by dividing it into three groups: less than 30%, more than 30%, and more than 30%) and extrapancreatic inflammation (by checking for the presence or absence of peripancreatic fluid) [3]. Acute pancreatitis may now be classified using clearly defined clinical and radiological criteria, thanks to the revision of the Atlanta classification by an international web-based consensus. The modifications have suggested two distinct phases of acute pancreatitis: an early phase, usually the first week, where clinical parameters are crucial for treatment, and a late phase (after the 1st week), where morphological and clinical criteria are used [4]. Organ failure and local/systemic complications have been used to categorize the severity of the condition into three groups: grade 1 mild AP, grade 2 moderately severe AP, and grade 3 severe AP. Collections were given particular attention when the criteria were revised and were categorized into four different types based on their content, degree of encapsulation, and time. Four types of fluid collection were defined. The collection seen in interstitial pancreatitis is called acute peripancreatic fluid collection (less than four weeks after onset), which

develops into a pseudocyst after four weeks. In contrast, the collection seen in necrotic pancreatitis is called acute necrotic collection (less than four weeks after onset), which develops into WON collection after four weeks (Figure 1, 2) [4,5].

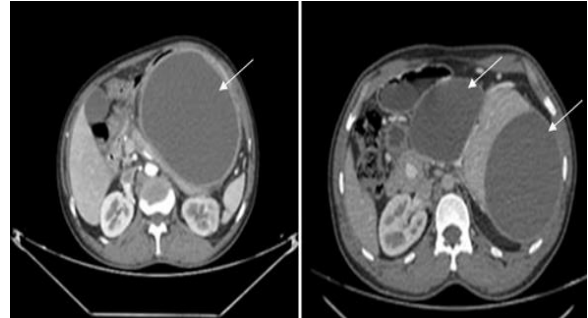


Figure 1: Large thin-walled pseudocyst in lesser sac region displacing the stomach anteriorly. Pancreatic pseudocyst communicating with splenic subcapsular pseudocyst (white arrows).

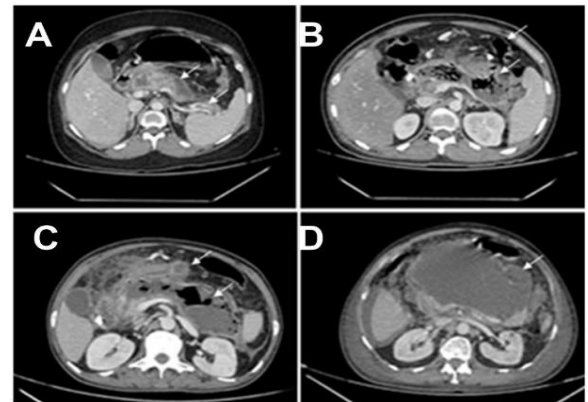


Figure 2: Walled-off necrotic collection along with splenic vein thrombosis (A). Walled-off necrotic collection communicating with jejunal loop (B). Large infected won communicating with the intra-abdominal collection, not communicating with bowel loop (C). Large walled off necrotic collection (D).

It also acknowledges that in some circumstances, it may be impossible to distinguish clearly between the entities above using only CECT; additional modalities may be required for better assessment. Uncontrolled local inflammation causes systemic inflammatory response syndrome (SIRS), which increases the risk of multiple organ failure [6]. Patients with severe acute pancreatitis frequently die of lung injuries associated with pancreatitis (adult respiratory distress syndrome) [7]. In cases of pancreatitis, various organ system failures, such as respiratory, renal, and cardiovascular system failures, can help forecast the patient outcome [8]. Infection can also help predict pancreatitis's outcome and is usually associated with a higher mortality rate [9].

METHODS

A descriptive cross-sectional hospital-based study was conducted for two years. A total of 120 patients with acute pancreatitis-associated fluid collections were included in the study. Institutional Ethics Committee approval was obtained for the study with the reference number IEC/IMS.SH/SOA/2021/266, dated December 27, 2021. Patients who refused to consent, pregnant females, patients for whom contrast cannot be provided, and patients suffering from other chronic diseases or malignancies were excluded. The patients were classified into pseudocyst and WON collections based on the revised 2012 ATLANTA classification. The two groups were then followed up, and the type of collection was compared with the patient's clinical variables like length of hospital stay, ICU stay, presence of organ failure, type of organ failure, presence of infection, and outcome.

Statistical analysis

SPSS Windows version 26.0 was used to analyze the data. For all continuous variables, the mean was calculated; percentages were used for categorical variables. The Chi-square and T-tests were employed to compare percentages and mean values, respectively. Appropriate graphs were made for the results. Statistical significance was determined by the *p*-value <0.05.

RESULTS

In this study, the majority of 34 patients were between the ages of 31 and 40 (28.3%), and the mean age was 39.5 years. Out of 120 patients, 86 (71%) were males, and 34 (28%) were females. The two most common causes of pancreatitis were alcohol abuse in 60 (50%) patients and gallstones in 19 (16%). In our study, 51 (42.5%) patients developed pseudocysts, and 69 (57.5%) patients developed WON. Fifty-one patients had pseudocysts, out of which 34 (66.6%) patients were admitted to the hospital, 17 (33.3%) patients were not admitted to the hospital, and 69 patients had WON, out of which 68 (98.5%) patients were admitted to the hospital and 1 (1.4%) patient was not admitted. The average hospital stay for patients with pseudocyst was 4.2 days, and the average for patients with WON was 6.4 days (Table 1). In total, 51 patients had pseudocysts, of which 21 (41.1%) were admitted to the ICU and 30 (58.8%) were not admitted to the ICU. Sixty-nine patients had WON, of which 46 (66.6%) were admitted to the ICU and 23 (33.3%) were not admitted to the ICU. The average ICU stay for patients with pseudocyst was 0.72 days, and the mean ICU stay for patients with WON was 1.59 days. In the study, 51 patients had pseudocysts, out of which 7 (13.7%)

patients developed organ failure and 44 (86.2%) did not develop any organ failure. 69 patients had WON, out of which 25 (36.2%) patients developed organ failure and 44 (63.7%) patients did not develop any organ failure.

Table 1: Hospital stay with walled-off necrosis and pseudocyst

Hospital stays	Yes n(%)	No n(%)	Total	<i>p</i> -value
Pseudocyst	34(66.7)	17(33.3)	51	0.00001
WON	68(98.5)	1(1.5)	69	
Total	102(85)	18(15)	120	
<i>ICU stay</i>				
Pseudocyst	21(41.2)	30(58.8)	51	0.005
WON	46(66.7)	23(33.3)	69	
Total	67(55.8)	53(44.2)	120	
<i>Organ Failure</i>				
Pseudocyst	7(13.7)	44(86.3)	51	0.005
WON	25(36.3)	44(63.7)	69	
Total	32(26.7)	88(73.3)	120	
<i>Infection</i>				
Pseudocyst	2(3.9)	49(96.1)	51	0.004
WON	35(50.7)	34(49.3)	69	
Total	37(30.8)	83(69.2)	120	
<i>Mortality</i>				
Pseudocyst	1(1.9)	50(98.1)	51	0.001
WON	15(21.7)	54(78.3)	69	
Total	16(13.3)	104(86.7)	120	

WON: Walled-off necrosis; n= number of cases

Of the 25 patients who developed OF in the WON category, 17 developed multiorgan failure, and only eight developed a single OF. Of the seven patients who developed OF in the pseudocyst category, two developed multiorgan failure, and five developed single-organ failure. Fifty-one patients had pseudocysts, out of which 2 (3.9%) patients had an infection, 49 (96%) did not have the disease, and 69 patients had WON, out of which 35 (50.7%) patients had an infection and 34 (49.2%) patients did not have the condition. In the study, 51 patients had pseudocysts, out of which 1 (1.9%) patient did not survive, 50 (98.03%) had a favorable outcome, 69 patients had WON, out of which 15 (21.7%) patients did not stay, and 54 (77.2%) patients had a favorable outcome.

DISCUSSION

In this study, 120 patients were selected and followed up for at least four weeks, and the collections that persisted were evaluated and categorized into pseudocysts and WON. The two groups of patients were then followed up, and their prognosis was judged based on hospital stay, ICU stay, presence or absence of organ failure, type of organ failure, infection, and mortality. In the current study, 42.5% developed pseudocysts, and 57.5% developed WON (Table 1). Our results are similar to the work of Bezmarivec *et*

al., who did a study on the management of (peri)pancreatic collections in acute pancreatitis [10]. In this study, 51 patients with pseudocysts were admitted to the hospital, but only 34 (66.6%) were admitted and 17 (33.3%) were not. On the other hand, 69 patients with WON were admitted to the hospital, but only 68 (98.5%) were admitted and one (1.4%) was not, showing that WON patients had a higher rate of hospital admission; WON and hospital admission showed a significant correlation ($P<0.05$) (Table 1). The average hospital stay for patients with pseudocyst was 4.2 days, and the average for patients with WON was 6.4 days, indicating a higher duration of hospital stay for WON patients. This follows the study by Enas Ahmed Reda Alkareemy *et al.*, in which the average hospital stay for acute pancreatitis patients was 6.89 ± 1.98 days, ranging from 3–10 days [11]. The patients had pseudocysts, out of which 21 patients (41.1%) were admitted to the ICU and 30 patients (58.8%) were not admitted to the ICU (Table 1). Sixty-nine had WON, of which 46 patients (66.6%) were admitted to the ICU and 23 (33.3%) were not admitted to the ICU. In patients from the WON collection, 25.5% more patients were admitted to the ICU than in the pseudocyst category. WON and ICU admission rates were significantly correlated ($p=0.005$). In our present study, the average ICU stay for patients with pseudocyst was 0.72 days, and the mean ICU stay for patients with WON was 1.59 days. Therefore, a WON patient's average ICU stay was longer than that of a pseudocyst patient. This follows the study by Shafiq *et al.*, in which 85 out of 189 patients, i.e., 44.9%, were admitted to the ICU [12]. In our present study, 51 patients had pseudocysts, out of which seven patients (13.7%) developed organ failure and 44 (86.2%) did not produce any organ failure; 69 patients had WON, out of which 25 patients (36.2%) developed organ failure and 44 (63.7%) did not develop any organ failure. In patients with WON collection, 22.5% more patients developed organ failure compared to the pseudocyst category. The rate of organ failure and WON were significantly correlated ($p=0.005$). However, a study by Langkisch *et al.* found that organ failure is independent of the extent of pancreatic necrosis [13]. Of the 25 patients who developed OF in the WON category, 17 developed multiorgan failure, and only eight developed a single OF. Out of the seven patients who developed OF in the pseudocyst category, two patients developed multiorgan failure, and five patients developed single-organ failure; according to a study by Shaheen and Akhtar, 182 (24%) out of the 760 pancreatitis patients experienced it. Out of the 182 patients, 125 (69%) who had organ failure had multiple OFs, while 57 patients (or 31%) had a single kind. Multiple organ failure was associated with a greater mortality rate (46%) than a single type (25%) in patients [14]. In our present study, 51 patients had pseudocysts, out of which 2 (3.9%) patients had an

infection and 49 (96%) did not have an infection; 69 patients had WON, out of which 35 patients (50.7%) had a disease and 34 patients (49.2%) did not have an infection. In patients in the WON category, 46.8% more developed an infection than in the pseudocyst category. WON and disease were significantly correlated ($p=0.004$). In line with research by Buchler *et al.*, which followed 204 patients and found that 85 had a necrotizing illness, of which 66% had sterile necrosis and 34% had infected necrosis [9], In our present study, 51 patients had pseudocysts, out of which one patient (1.9%) did not survive, 50 (98.03%) had favorable outcomes, 69 patients had WON, out of which 15 patients (21.7%) did not stay, and 54 patients (78.2%) had a favorable outcome. In patients in the WON category, 19.8% more did not survive compared to the pseudocyst category. WON and mortality were significantly correlated ($p=0.001$). A study by Petrov *et al.* found that organ failure and infected pancreatic necrosis both contribute equally to death in people with acute pancreatitis. This means that having either condition means you have a serious illness. Organ failure and infected pancreatic necrosis signify highly severe illnesses, and the relative fatality risk doubles [15]. Additionally, it is consistent with research by Fu *et al.*, who found that severe acute pancreatitis had a 16.3% (105/643) death rate [16]. These results imply that the clinical variables mentioned above showed statistically significant relationships with WON. Our findings suggest that CECT assessment of collection type is crucial for the clinical management of the illness during the acute stages of symptom development. The results were in line with the research of Balthazar *et al.*, who discovered that a timely CT scan could be a helpful predictor of morbidity and mortality in patients with acute pancreatitis [17].

Conclusion

The current investigation revealed that 57.5% of the study population had walled-off necrosis and 42.5% had pseudocysts based on the CECT findings interpreted using the 2012 ATLANTA categorization. So, using the revised 2012 ATLANTA classification to check the type of CECT collection helps get the new system into radiology practice. This makes it easier for doctors to talk to each other correctly and supports the radiologist's role as an important member of the multidisciplinary team treating people with acute pancreatitis.

Conflict of interests

No conflict of interest was declared by the authors

Funding source

The authors did not receive any source of fund.

Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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