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Assessment of Severity of Pancreatitis by Computerized Tomography Using Revised Atlanta Classification and Comparison with BISAP Clinical Scoring System

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ABSTRACT

Background: Untreated acute pancreatitis can have high morbidity and mortality. It is a serious gastrointestinal emergency. Its incidence is approximately 51.0 % and it can cause both local and systemic problems. The diagnosis usually involves laboratory tests like amylase and lipase as well as an ultrasound exam. The ideal imaging test is a contrast-enhanced CT scan. This study used scoring systems based on laboratory and radiological investigations to determine the clinical progression and outcome.

Methods : Patients who were diagnosed with acute pancreatitis and in whom computed tomography was done were included. From the imaging findings, the category and subcategory of acute pancreatitis and types of fluid collections were described in these patients using the revised Atlanta classification. BISAP score was calculated in all these patients. The clinical outcome assessed in these patients is the duration of stay in the hospital, mortality, presence of persistent organ failure, the occurrence of infection and need for intervention. Finally, the correlation between the Revised Atlanta classification and BISAP score was analyzed and compared with clinical outcomes.

Results: The analysis of the correlation between Revised Atlanta classification severity grade and BISAP score, among the n=57 patients with mild acute pancreatitis n=56, had BISAP score less than 3 and only one had BISAP score greater or equal to three. Among the n=25 patients graded as moderately severe acute pancreatitis, n=20 cases had a BISAP score of less than 3 and n=5 had BISAP score greater than or equal to three. Among the n=08 patients graded as severe acute pancreatitis, n=3 had a BISAP score of less than 3 and n=5 had BISAP score greater than or equal to three.

Conclusion: Standardizing nomenclature and facilitating proper documentation of a variety of imaging abnormalities in acute pancreatitis is made possible by incorporating the new Atlanta categorization system into daily practice. We can triage, predict, and treat patients with acute pancreatitis with greater precision by integrating the new Atlanta classification with BISAP clinical grading, significantly improving medical care.

KEYWORDS: Acute Pancreatitis, Computerized Tomography (CT), BISAP score, Revised Atlanta scoring system

INTRODUCTION

An abrupt, mostly diffuse pancreatic inflammatory condition known as acute pancreatitis is characterized by a wide range of involvement of the pancreatic gland, nearby retroperitoneal tissues, and other distant organ systems. [1, 2] The clinical and systemic course of acute pancreatitis can range from a moderate illness with episodes of nausea, vomiting, and upper abdomen pain to severe, life-threatening consequences like multi-organ failure including sepsis, renal failure, and acute respiratory distress syndrome, and death. In the majority of cases, alcohol consumption and biliary tract illnesses are the most common causes of acute pancreatitis. Other reasons include physical injury, medical procedures, medications, genetics, infections, toxins, hyperparathyroidism, hypercalcemia, hyperlipidemia, and mechanical obstruction, as well as congenital malformations such as pancreatic divisum and ERCP-induced pancreatitis. During the initial assessment and treatment of acute pancreatitis, it's crucial to make an early diagnosis and stage the disease's severity precisely. Patients with moderate acute pancreatitis can be handled with fluid replacement and supportive care, but those with severe acute pancreatitis need intensive care unit-level nonoperative treatment and nutritional assistance (ICU). The assessment of severity becomes essential to a clinician because severe acute pancreatitis carries a risk of rapid worsening. [3]The International Symposium on Acute Pancreatitis in Atlanta, Georgia, in 1992 led to the creation of a clinically based classification system for acute pancreatitis. Although the Atlanta severity grading system was retrospective, the length of organ failure was not indicated, and local complications did not appear to affect mortality, criticism of the approach was mounting. An international, web-based consensus that updated the Atlanta classification

in 2012 offered precise standards for categorizing acute pancreatitis using readily recognizable clinical and radiologic criteria. The severity of acute pancreatitis was categorized as mild, moderately severe, and severe, with an emphasis on organ failure. [4]Over the past few decades, several multifactorial scoring methods based on clinical and biochemical data have been employed. These include mentioning a few, the Ranson score described in 1974, BISAP, and APACHE II. Each of these scoring systems has its drawbacks, such as limited sensitivity and specificity, scoring system complexity, and the inability to get a final score for a patient until 48 hours following admission. [5]With the introduction of contrast-enhanced images, the grading method has significantly improved. An indicator of pancreatic necrosis and a predictor of disease severity can be found in the attenuation values of pancreatic parenchyma during an intravenous bolus study. [6, 7]For the identification of prolonged pancreatic necrosis, contrast-enhanced CT has demonstrated an overall accuracy of 87 percent with a sensitivity of 100 percent. Greater pancreatic non-enhancement increases the sensitivity and specificity for identifying pancreatic necrosis, and complications have also been demonstrated to correlate with the level of non-enhancement. [8]Early CT scans frequently miss growing necrosis, though, until such areas are more well-defined, which might not happen for another 2-3 days after the initial clinical beginning of symptoms. Modified CTSI was created in 2004 to enhance acute pancreatitis staging. According to a study comparing the CTSI and modified CTSI with APACHE II, the modified CTSI is superior to the CTSI for determining the severity of acute pancreatitis, while the CTSI is superior to APACHE II for determining the severity of severe acute pancreatitis. [9] The current study aimed to assess the severity of pancreatitis by Computed Tomography using Revised Atlanta classification and comparing it with BISAP clinical scoring system and clinical outcome.

MATERIAL AND METHODS

This cross-sectional study was conducted in the Department of Radiology, in collaboration with the department of medicine and surgery, Prathima Institute of Medical Sciences, Naganoor, Karimnagar, Telangana State. Institutional Ethical committee permission was obtained for the study. Patients diagnosed with acute pancreatitis cases are admitted to surgery and medicine wards and in whom computed tomography is done.

Inclusion Criteria

All patients diagnosed with a case of acute pancreatitis based on clinical findings and laboratory investigations, in whom Computed Tomography of the Abdomen was done are included in the study.

Exclusion Criteria

1. Patients with elevated renal parameters.
2. Pregnant patients
3. Patients with contrast allergy and medically unfit for a contrast study
4. Patients less than 18 years of age.

Sample size calculation:

$n=4pq/d^2$

Where n=sample size, p=prevalence taken as p=4, q= 94 d=absolute error

n=4*6*94/25=90

N=90 patients who were diagnosed as a case of acute pancreatitis by clinical and laboratory parameters and in whom computed tomography was done were selected for the study. All of the scans were performed using a TOSHIBA 16 slice CT scanner with a slice width of 10 mm, a 2.5 mm collimation, a 0.75s rotation time, a table feed of 15 mm, and a 3mm reconstruction interval. Pre and post-contrast scans were routinely performed. The CT scans were acquired through the portal venous phase approximately 80seconds after contrast injection. When necessary, sagittal and coronal images were acquired using the maximum intensity projection (MIP) and average intensity projection (AIP) techniques. All the tests were done with due permission from the Institutional Ethical Committee and informed consent from the subject/attenders.

Statistical analysis: The data was collected and uploaded on an MS Excel spreadsheet and analyzed by SPSS version 22 (Chicago, IL, USA). Quantitative variables were expressed on mean and standard deviations and qualitative variables were expressed in proportions and percentages. Fisher's exact test has been used to find the difference between two proportions. One-way Anova test (Kruskal Wallis test) was used to analyze the means of different groups.

RESULTS

A total of n=90 patients who were diagnosed clinically and based on transabdominal ultrasonography as acute pancreatitis and proceeded with Contrast-Enhanced Computed Tomography (CECT) of the abdomen and pelvis were studied. These patients were followed up till the management of the condition either conservatively or in any form of intervention. Among the age groups included the majority of cases belonged to 41 – 50 years with 40% of the cases of study. The mean age of the cases in the study was 43.52 $\pm$ 8.54 years. The male-to-female ratio was approximately 10: 1 the details of the demographic profile of the cases in the study have been depicted in Table 1

The cause of pancreatitis in the majority of cases n=73(81.11%) cases were chronic alcoholism followed by gall stones in n=9(10%) cases, a trauma in n=6(66.67%) n=2(2.22%) cases were idiopathic in origin. Out of the n=90 patients, the majority of about 57.78% patients had Interstitial edematous pancreatitis (IEP), and 17.78% patients had necrotizing pancreatitis. Walled-off necrosis in 10% of cases

Age in years	Male	Females	Total (%)
18 – 20	3	0	03(3.33)
21 – 30	15	1	16(17.78)
31 – 40	10	1	11(12.22)
41 – 50	33	3	36(40.00)
51 – 60	11	2	13(14.44)
61 – 70	10	1	11(12.22)
Total	82	8	90(100.00)

Table 1: Demographic profile of the cases included in the study

and pseudocyst in 14.44% of cases are given in Table 2

CT findings		Frequency	Total
Acute Necrotising collection	Pancreatic	6	16
	Peripancre-atic	3	
	Pancreatic + Peripancre-atic	7	
Walled off necrosis		9	9
Interstitial edematous pancreatitis (IEP)	Without fluid collection	22	52
	With fluid collection	30	
Pseudocyst		13	13

Table 2: CT findings in the patients of the study

Organ failure was found to be present in n=13(14.44%) of cases and organ failure was not found in n=77(85.56%) cases. Out of the n=13 cases of organ failure persistent organ failure was found in n=3(23.07%) cases and transient organ failure in n=10(76.92%) cases. The total n=13 cases of organ failure with the duration of the failure have been depicted inFigure 1

In our study, while grading according to the revised Atlanta classification of severity of acute pancreatitis, n=57(63.33%)had mild acute pancreatitis, n=25(27.77%) patients had moderately severe acute pancreatitis and n=8(8.89%) had severe acute pancreatitis. In this group, n=22(24.44%) had Systemic Inflammatory Response Syndrome (SIRS) and n=68(75.56%) did not have SIRS. N=9(10%) of patients had blood urea nitrogen levels > 25mg/dl at the time of admission to the hospital. N=5(5.55%) had impaired mental status. The majority of the patients of 51.11% had

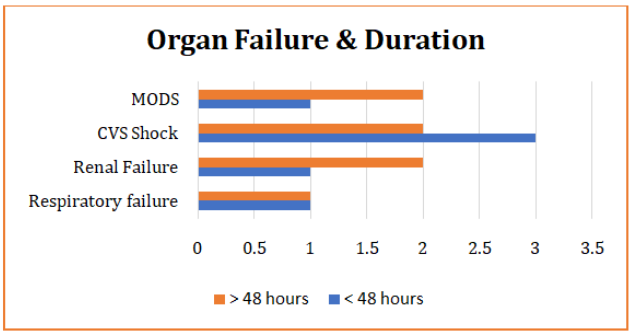

Figure 1: The organ failure with duration

a BISAP score of 0 and a BISAP score of one was found in 21.11% of cases, as depicted in Table 3 . Lower BISAP scores indicate a lesser risk of mortality and a BISAP score of > 3 corresponds to a higher risk of mortality.

BISAP Score Grade	Frequency (%)
Zero	46(51.11)
One	19(21.11)
Two	11(12.12)
Three	09(10.00)
Four	05(05.56)

Table 3: Showing the BISAP scores in the cases of study

In the analysis of the correlation between Revised Atlanta classification severity grade and BISAP score, among the n=57 patients with mild acute pancreatitis n=56 had BISAP score less than 3 and only one had BISAP score greater or equal to three. Among the n=25 patients graded as moderately severe acute pancreatitis, n=20 cases had a BISAP score of less than 3 and n=5 had BISAP score greater than or equal to three. Among the n=08patients graded as severe acute pancreatitis, n=3 had a BISAP score of less than 3 and n=5 had BISAP score greater than or equal to three. This corresponds to a p-value of 0.001 by the One-way ANOVA test which is a statistically significant value given in Table 4

Analyzing the clinical outcome of the patients out of the n=90 patients the mortality was in n=3(3.33%) cases all these patients were graded as severe acute pancreatitis according to the Revised Atlanta grading system. Out of the total n=8 cases of severe pancreatitis n=3 did not survive. In the mortality cases, n=2 had interstitial oedematous pancreatitis, and n=1 case with necrotizing pancreatitis with the peripancreatic collection. The BISAP scores of all the n=3 cases of mortality were found to be 4. In the comparison of BISAP scoring and Revised Atlanta grading the p values were <0.01 and good correlation for predicting clinical outcomes. The mean duration of stay in mild acute grades is 5.5 days, moderately acute pancreatitis was 12.5

Revised Atlanta Grade	BISAP SCORE	
	More than 3	Less than 3
Mild Acute Pancreatitis	1	56
Moderately Acute Pancreatitis	5	20
Severe Acute Pancreatitis	5	03
One-way ANOVA (P-value)	0.0133*	

* Significant

Table 4: Revised Atlanta grades versus BISAP scores in thecases of study

days and severe pancreatitis was 14.5 days. The analysis of organ failure in n=13 cases found all these were categorized as moderately severe and severe grades as per the Revised Atlanta classification. The BISAP scores in all these cases were 3 and 4. The p values were <0.01 by One-way ANOVA analysis. Since in the revised Atlanta classification the grading of acute pancreatitis is based on persistent organ failure the sensitivity of the scoring system was superior.

DISCUSSION

The Revised Atlanta classification of acute pancreatitis has recently had a significant influence on accurately recognizing and prioritizing the patients with acute pancreatitis, allowing for the best possible care and improved outcomes. To provide prompt intervention and reduce mortality and morbidity in patients with acute pancreatitis, it is also highly helpful to forecast the severity of pancreatitis in advance. Similar to that, BISAP clinical grading for acute pancreatitis is an easy-to-use, easily-accessible, and trustworthy system to evaluate patients with acute pancreatitis clinically.Only a few studies have compared the Revised Atlanta Classification and a clinical grading system like BISAP, which can significantly improve patient care both radiologically and clinically and hence have an impact on the diagnosis and management of patients with acute pancreatitis with improved outcomes.A total of n=90 patients were diagnosed clinically and the majority of cases belonged to 41 – 50 years with 40% of the cases studied. The mean age of the cases in the study was 43.52 ± 8.54 years. The mean age of the cases in the study by AH Kumar et al.[10] was 48.42 years. The male to female ratio was approximately 10: 1. The presenting symptoms of pancreatitis include sudden-onset severe abdominal pain, nausea, and vomiting. In the majority of cases, n=73(81.11%) cases were chronic alcoholism followed by gall stones in n=9(10%) cases, a trauma in n=6(66.67%) n=2(2.22%) cases were idiopathic in origin. Alcohol abuse is the commonest cause as reported by the other studies on acute pancreatitis.[11–13]The common etiological factor as per AH Kumar et al.,[10] was gall stones in 74% of cases followed by alcoholism in 18% of cases. They had higher females as compared to males probably due to highly prevalent gall stones in females in North India. In this study based on the Revised Atlanta classification of severity of acute pancreatitis, n=57(63.33%) had mild acute pancreatitis, n=25(27.77%) patients had moderately severe acute pancreatitis and n=8(8.89%) had severe acute pancreatitis. Studies are done so far found No single scoring index was able to reliably predict the result, comparing different scores, but they were helpful in the initial triage of patients.[14, 15]The current study emphasizes the possibility that initial patient triage and subsequent management could still benefit from using Ranson's score. In this study, the prediction of mortality was superior to the BISAP score of >3. Zhang et al.,[16]statedthat there are statistically significant trends for increasing severity and mortality with increasing BISAP. Analyzing the clinical outcome of the patients out of the n=90 patients the mortality was in n=3(3.33%) cases all these patients were graded as severe acute pancreatitis according to the Revised Atlanta grading system. Out of the total n=8 cases of severe pancreatitis n=3 did not survive. The revised Atlanta criteria for classifying AP into various severities based on the presence and duration of organ failures is presently the most accepted classification worldwide.[17, 18]Careful evaluation of cases of mortality revealed n=2 cases had interstitial oedematous pancreatitis and n=1 case with necrotizing pancreatitis with the peripancreatic collection. The evidence of infection is more among acute necrotizing pancreatitis and those with severe and moderately severe grades of acute pancreatitis Many of these patients have mild acute grades and only require elective intervention in the later stages of the disease, we can therefore conclude that both the Revised Atlanta classification grading and the BISAP scoring are good predictors of the need for intervention in acute necrotizing pancreatitis.

LIMITATIONS OF THE STUDY

The strength of the study is that it included an adequate number of patients calculated with sample size and required investigations. Since all the lab investigations are not done every day of admission it was not possible to calculate the scores at different times of hospital stay. Although daily monitoring of renal functions amylase and lipase was done. Since this study was a short-term cross-sectional study a long-term study with the above scoring systems will be useful.

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