

Research Article



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DIAGNOSTIC ACCURACY OF MODIFIED CT SEVERITY INDEX FOR PREDICTION OF ACUTE PANCREATITIS SEVERITY

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ABSTRACT

Background: Severe pancreatitis patients have an increased risk of developing systemic inflammatory responses, cardiovascular failure, gastrointestinal bleeding, respiratory failure, renal failure-related organ failure, and DIC (disseminated intravascular coagulation).

Aim: to evaluate the diagnostic accuracy of the radiographic scoring system. To compare the clinical scoring of Bedside Index for Severity in Acute Pancreatitis (BISAP) with the radiographic scoring system, Modified Computed Tomography Severity Index (MCTSI)

Methods: all individuals had non-contrast and contrast-enhanced MDCT. Utilizing scans of 5 mm thickness reconstructed at 0.625 to 1.5 mm starting from upper diaphragm boundary to below pubis symphysis, MDCT was performed utilising same radiography conditions and equipment.

BISAP scores were computed using a combination of biochemical parameters and clinical conditions. The scoring criteria consisted of five points, each reflecting a condition such as the presence of a pleural effusion, age greater than 60, systemic inflammatory response syndrome, altered mental status, or blood urea nitrogen level greater than 25 mg/dl, and all within 24 hours of presentation

Result: Of the research individuals, 54% (n=27) did not experience any organ failure. Those with an MCTSI <4 had sensitivity, specificity, and p-values of 96, 40, and 0.000, respectively; those with a BISAP <2 had sensitivity, specificity, and p-values of 100, 30, and 0.000, respectively. In 28% of the individuals (n=14), transient organ failure was seen. The sensitivity, specificity, and p-value for subjects with an MCTSI score >4 (4-6) were 95, 30, and 0.01 respectively, whereas the corresponding values for subjects with a BISAP score of >2 were 83, 46, and 0.02 respectively.

Conclusion: The current study suggests that the MCTSI is a straightforward scoring system that reliably predicts the severity and organ failure in people with acute pancreatitis.

Keywords: organ failure, modified computed tomography severity index, acute pancreatitis, and bedside index for severity in acute pancreatitis.

INTRODUCTION

Acute pancreatitis is a highly prevalent abdominal inflammatory condition, occurring in around 51% of cases worldwide. The major causes of acute pancreatitis include gallstones, alcohol use, and elevated triglyceride

levels (HTG). Based on the 2012 Revised Atlanta classification, pancreatitis can be classified as mild, moderate, or severe.

People with various kinds of pancreatitis have an overall death rate of around 5–10%; however, people with severe pancreatitis have a far higher mortality rate of approximately 36–50%.¹

Severe pancreatitis patients have an increased risk of developing systemic inflammatory responses, cardiovascular failure, gastrointestinal bleeding, respiratory failure, renal failure-related organ failure, and DIC (disseminated intravascular coagulation). These complications lengthen hospital stays and eventually result in death. It is critical to detect and treat people with acute pancreatitis within 24 hours of the beginning of symptoms in order to minimize mortality and morbidity. Accurate care planning for individuals with severe acute pancreatitis is facilitated by the prediction of illness outcomes and severity in subjects suffering from acute pancreatitis.²

When predicting the severity of acute pancreatitis in subjects, a number of parameters are taken into account. These include single parameters such as C-reactive protein (CRP), serum blood urea, creatinine and pleural effusion nitrogen, as well as multi-parametric scores like APACHE II, Bedside Index of Severity in AP (BISAP), Ranson's score, and Systemic Inflammatory Response Syndrome (SIRS). The Modified CT Severity Index (MCTSI), Computed Tomographic Severity Index (CTSI), Renal Rim Sign, and/or Balthazar grading system are among the radiographic scoring methods, including CT (Computed Tomography), that are used to determine the severity of acute pancreatitis. There isn't a single grading scheme that is acknowledged as the industry standard. On the other hand, the CTSI, which was used to develop MCTSI, is a reliable indicator of organ failure and extra-pancreatic problems, as well as pancreatic necrosis and inflammation.³

BISAP, which was initially presented in 2008 by Wu et al., is the most widely used and straightforward scoring system in clinical settings. Scores of more than or equal to 3 indicate higher mortality with moderate and severe acute pancreatitis. Because BISAP and MCTSI are readily available, often utilised, and ineffectual, they are widely and globally used.⁴

In order to predict the severity and organ failure in subjects with acute pancreatitis, the current study compared the clinical scoring of Bedside Index for Severity in Acute Pancreatitis (BISAP) with the radiographic scoring system, Modified Computed Tomography Severity Index (MCTSI). Additionally, the diagnostic accuracy of MCTSI was evaluated.

MATERIALS AND METHODS

The current cross-sectional clinical study was carried out to evaluate the diagnostic accuracy of the radiographic scoring system, Modified Computed Tomography Severity Index (MCTSI), in comparison to the clinical scoring of Bedside Index for Severity in Acute Pancreatitis (BISAP) for predicting the severity and organ failure in subjects with acute pancreatitis. The study was carried out after approval from the relevant ethical committee.

The study's inclusion criteria included subjects of both sexes and all ages who met at least two of the following criteria: pain radiating from the epigastrium to the back, pancreatic enlargement, decreased/heterogenous echogenicity, and/or serum amylase/lipase three times higher than the normal limit, which is >180 U/L for amylase and 210 U/L for lipase.

Subjects having a history of asthma, multiple myeloma, renal illness, allergy to iodinated contrast, and unwillingness to engage in the study were the exclusion criteria. Following the research subjects' final inclusion, each subject had a thorough medical examination and their complete history documented. Within 5 days of inclusion and symptom onset, all individuals had non-contrast and contrast-enhanced MDCT. Utilizing scans of 5 mm thickness reconstructed at 0.625 to 1.5 mm starting from upper diaphragm boundary to below pubis symphysis, MDCT was performed utilising same radiography conditions and equipment.

BISAP scores were computed using a combination of biochemical parameters and clinical conditions. The scoring criteria consisted of five points, each reflecting a condition such as the presence of a pleural effusion, age greater than 60, systemic inflammatory response syndrome, altered mental status, or blood urea nitrogen level greater than 25 mg/dl, and all within 24 hours of presentation. The MCTSI radiographic scoring system employed a ten-point scoring system that included the following: the degree of pancreatic inflammation (0–4), the existence of extrapancreatic complications (0–2), and necrosis of the pancreas (0–4). After the post-contrast

study, the MCTSI was computed, and based on the corresponding scores of 0-2, 4-6, and 8-10, the condition was graded as mild, moderate, or severe.

Using SPSS software version 21 (Chicago, IL, USA) for statistical assessment and one-way ANOVA and t-test for result formulation, the gathered data were examined. The data were presented as a mean, standard deviation, percentage, and number. At $p < 0.05$, the significance threshold was maintained.

RESULTS

The purpose of this study was to compare the diagnostic accuracy of the radiographic scoring system, Modified Computed Tomography Severity Index (MCTSI), with the clinical scoring of the Bedside Index for Severity in Acute Pancreatitis (BISAP) in order to predict the severity and organ failure in subjects with acute pancreatitis. Fifty participants of both genders, ranging in age from 12 to 73 years, with a mean age of 38.3 ± 6.28 years, were included in the current study.

Table 1 contains a list of the research individuals' demographic details. The majority of study participants (38%; $n = 19$) were between the ages of 31 and 40, followed by 20% ($n = 10$) in the 21–30 age range, 14% ($n = 7$) in the 12–20 age range, 8% ($n = 4$) in the 41–50 and >70 age range, and the least amount of participants (6%; $n = 3$) in the 51–60 and 61–70 age range. In the current study, there were 18% ($n=9$) females and 82% ($n=41$) men (Table 1).

The research's findings demonstrated that, when clinical scoring based on BISAP score was evaluated, 20% ($n=10$) of the study patients had a BISAP score of 0–2, while 80% ($n=40$) of the subjects had a BISAP score of 3-5. Based on MCTSI scoring, radiographic scoring was determined. As shown in Table 2, 14% ($n = 7$) of the research individuals had an MCTSI score of 0–2, 50% ($n = 25$) had a score of 4-6, and 36% ($n = 18$) had an MCTSI score of 8–10.

In terms of forecasting the severity of the disease and organ failure in the subjects with acute pancreatitis, 54% ($n=27$) of the study subjects showed no signs of organ failure; in subjects with MCTSI < 4 , the corresponding sensitivity, specificity, and p-value were 96, 40, and 0.000, respectively; in subjects with BISAP < 2 , the corresponding sensitivity, specificity, and p-value were 100, 30, and 0.000.

In 28% of the individuals ($n=14$), transient organ failure was seen. The sensitivity, specificity, and p-value for subjects with an MCTSI score > 4 (4-6) were 95, 30, and 0.01 respectively, whereas the corresponding values for subjects with a BISAP score of > 2 were 83, 46, and 0.02 respectively. There was statistical significance in these outcomes. Nine (18%) research participants had persistent organ failure; sensitivity, specificity, and p-value for an MCTSI score of ≥ 8 (8–10) were, respectively, 100, 78, and 0.000; for a BISAP score of > 2 , these values were, respectively, 74, 85, and 0.000 (Table 3).

DISCUSSION

In order to predict the severity and organ failure in subjects with acute pancreatitis, the current study compared the clinical scoring of the Bedside Index for Severity in Acute Pancreatitis (BISAP) with the radiographic scoring system, Modified Computed Tomography Severity Index (MCTSI). Additionally, the diagnostic accuracy of MCTSI was evaluated. Fifty participants of both genders, ranging in age from 12 to 73 years, with a mean age of 38.3 ± 6.28 years, were included in the current study. Table 1 contains a list of the research individuals' demographic details.

The majority of study participants (38%; $n = 19$) were between the ages of 31 and 40, followed by 20% ($n = 10$) in the 21–30 age range, 14% ($n = 7$) in the 12–20 age range, 8% ($n = 4$) in the 41–50 and >70 age range, and the least amount of participants (6%; $n = 3$) in the 51–60 and 61–70 age range. In the current study, there were 18% ($n=9$) females and 82% ($n=41$) men. These characteristics were similar to those of the studies conducted by Wu BU et al.⁵ in 2008 and Mortelet KJ et al.⁶ in 2004, in which the authors evaluated participants with acute pancreatitis who had comparable characteristics.

Upon evaluating the clinical scoring system using the BISAP score, it was observed that 20% ($n = 10$) of the study patients had a BISAP score of 0–2, while 80% ($n = 40$) of the subjects had a BISAP score of 3-5. Based on MCTSI scoring, radiographic scoring was determined. Of the research individuals, 14% ($n = 7$) had an MCTSI score of 0–2, 50% ($n = 25$) had a score of 4-6, and 36% ($n = 18$) had an MCTSI score of 8–10. These outcomes were in line with research conducted in 2013 by Huang W et al. and in 2011 by Conner OJ et al., who found that participants with acute pancreatitis had similar radiographic and clinical scores.

In the current study, the severity of the disease and organ failure were also evaluated in subjects with acute pancreatitis; among these, 54% (n=27) of study participants did not exhibit any organ failure; sensitivity, specificity, and p-value were 96, 40, and 0.000, respectively, for subjects with MCTSI <4 and 100, 30, and 0.000, respectively, for subjects with BISAP <2. In 28% (n=14) of the participants, transient organ failure was seen. The sensitivity, specificity, and p-value for subjects with an MCTSI score >4 (4-6) were 95, 30, and 0.01 respectively, whereas the corresponding values for subjects with a BISAP score of >2 were 83, 46, and 0.02 respectively.

There was statistical significance in these outcomes. Nineteen (18%) research participants had persistent organ failure. The sensitivity, specificity, and p-value for an MCTSI score of ≥ 8 (8–10) were, respectively, 100, 78, and 0.000; for a BISAP score of >2, these values were, respectively, 74, 85, and 0.000. These findings were consistent with research by Meher S et al. (2015) and Khanna A et al. (2013), which found that in patients with acute pancreatitis, predictions of organ failure and disease severity had comparable significance.

CONCLUSION

Within its limitations, the present study concludes that Contrast-enhanced computed tomography is reliable and efficacious imaging modality for assessing and diagnosing acute pancreatitis, and MCTSI is an accurate and simple radiographic scoring system with the reliable prediction of disease severity and organ failure in subjects with acute pancreatitis. However, the present study had a few limitations including small sample size, short monitoring period, and geographical area biases. Hence, more longitudinal studies with larger sample size and longer monitoring period will help reach a definitive conclusion.

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TABLES

S. No	Characteristics	Percentage (%)	Number (n=50)
1.	Mean age (years)	38.3±6.28	
2.	Age range (years)	12-73	
a)	12-20	14	7
b)	21-30	20	10
c)	31-40	38	19
d)	41-50	8	4

e)	51-60	6	3
f)	61-70	6	3
g)	>70	8	4
3. Gender			
a)	Males	82	41
b)	Females	18	9

Table 1: Demographic characteristics of the study subjects

Scoring system	Percentage (%)	Number (n=50)
Clinical scoring		
BISAP score		
0-2	20	10
3-5	80	40
Radiographic scoring		
MCTSI		
0-2	14	7
4-6	50	25
8-10	36	18

Table 2: Clinical and radiographic scoring in the study subjects

Organ failure	% (n)	Sensitivity	Specificity	p-value
No organ failure				
MCTSI <4	54 (27)	96	40	0.000
BISAP <2	54 (27)	100	30	0.000
Transient organ failure (BISAP)				
MCTSI score >4 (4-6)	28 (14)	95	30	0.01
BISAP >2	28 (14)	83	46	0.02
Persistent organ failure				
MCTSI score ≥8 (8-10)	18 (9)	100	78	0.000
BISAP >2	18 (9)	74	85	0.000

Table 3: Prediction of severity and organ failure in the study subjects