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COMPARISON OF THE BISAP SCORE WITH THE CONTRAST-ENHANCED CT SEVERITY INDEX IN PREDICTING SEVERE ACUTE PANCREATITIS: A RETROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Acute pancreatitis has a highly variable clinical course, ranging from mild self-limiting disease to severe pancreatitis complicated by organ failure and death. Early identification of patients likely to develop severe disease is essential to guide triage, resource allocation, and timely escalation of care. The Bedside Index for Severity in Acute Pancreatitis (BISAP) is a simple bedside clinical score, while the Contrast-Enhanced CT Severity Index (CTSI) is a radiological score based on pancreatic inflammation and necrosis. This study compared the diagnostic performance of BISAP and CTSI in predicting severe acute pancreatitis, using the Revised Atlanta Classification as the reference standard.

Methods: This retrospective observational study was conducted at Saveetha Medical College and Hospital over a one-year period. Records of 60 patients admitted with acute pancreatitis, aged 18-55 years (male:female ratio 3:1), were reviewed. Disease severity was classified using the Revised Atlanta Classification, and BISAP (cut-off >=3) and CTSI (cut-off >=7) scores were retrospectively calculated for each patient from admission clinical/laboratory data and contrast-enhanced CT findings, respectively. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were calculated for both scores against the Revised Atlanta Classification.

Results: Of the 60 patients, 35 (58.3%) had severe acute pancreatitis and 25 (41.7%) had non-severe (mild/moderate) disease by Revised Atlanta Classification. BISAP demonstrated a sensitivity of 71.4%, specificity of 84.0%, PPV of 86.2%, NPV of 67.7%, and diagnostic accuracy of 76.7%. CTSI demonstrated a sensitivity of 82.9%, specificity of 88.0%, PPV of 90.6%, NPV of 78.6%, and diagnostic accuracy of 85.0%. CTSI numerically outperformed BISAP on every diagnostic parameter, although the difference in overall accuracy did not reach statistical significance in this cohort (chi-square with Yates' correction = 0.86, p = 0.35).

Conclusion: In this retrospective cohort, CTSI showed numerically higher sensitivity, specificity, and diagnostic accuracy than BISAP for predicting severe acute pancreatitis. However, BISAP is calculable at admission using only clinical and laboratory parameters, without the delay, cost, and radiation/contrast exposure associated with CT, and therefore retains practical value for early bedside risk stratification. Larger prospective studies are needed to confirm these findings and clarify the comparative and complementary roles of BISAP and CTSI.

KEYWORDS: Acute pancreatitis; BISAP score; CT severity index; Revised Atlanta Classification; diagnostic accuracy; retrospective study

1. INTRODUCTION

Acute pancreatitis is a common gastrointestinal emergency with a clinical spectrum ranging from mild, self-limiting inflammation to severe disease characterised by persistent organ failure, pancreatic necrosis, and death. While the majority of patients follow a mild course, a subset progress to severe acute pancreatitis (SAP), which carries substantially higher morbidity and mortality. Early and accurate identification of patients at risk of severe disease is critical, as it informs decisions about level of care (ward vs. high-dependency unit vs. intensive care), fluid resuscitation strategy, and the need for early specialist or surgical involvement.

Numerous scoring systems have been developed to stratify severity in acute pancreatitis, including Ranson's criteria, the Glasgow (Imrie) score, APACHE II, the Bedside Index for Severity in Acute Pancreatitis (BISAP), and radiological indices such as the CT Severity Index (CTSI). The BISAP score, derived and validated by Wu et al. from a large multicentre population-based cohort, uses five simple clinical and laboratory variables assessable within 24 hours of admission (BUN, impaired mental status, systemic inflammatory response syndrome, age, and pleural effusion) to predict mortality and severity without the need for imaging [1]. The CTSI, described by Balthazar et al., combines a grade of pancreatic inflammation with the extent of pancreatic necrosis on contrast-enhanced CT to generate a score correlating with morbidity and mortality, but typically requires imaging performed after 72-96 hours to best delineate necrosis, and carries associated cost, radiation, and contrast-related considerations [7].

Several comparative studies have evaluated the relative performance of BISAP and CTSI, with mixed conclusions. Some studies report BISAP to have comparable or superior discriminative ability (by area under the ROC curve) relative to CTSI for predicting severity, organ failure, and mortality, and note the practical advantage of BISAP requiring no imaging [3,4,6]. Other comparative studies, particularly those emphasising local complications and necrosis, have found CTSI to be more accurate for predicting pancreatic necrosis specifically, while BISAP performs better for early bedside triage [5]. This heterogeneity likely reflects differences in study population, the outcome being predicted (severity vs. necrosis vs. mortality), timing of CT acquisition, and the reference standard used to define severity.
Given this ongoing debate and the population-specific nature of diagnostic scoring performance, this study aimed to retrospectively compare the diagnostic accuracy of the BISAP score and CTSI in predicting severe acute pancreatitis, using the Revised Atlanta Classification as the reference standard, in patients admitted to Saveetha Medical College and Hospital.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

This was a retrospective observational study conducted in the Department of General Surgery/Radiology at Saveetha Medical College and Hospital, Chennai, Tamil Nadu, India. Institutional ethics committee approval was obtained prior to data collection [IRB approval number to be inserted]. As the study was retrospective and based on de-identified medical record review, the requirement for individual informed consent was waived by the ethics committee [confirm per local policy].

2.2 Study Period and Population

Medical records of patients admitted with a diagnosis of acute pancreatitis over a one-year period from August 2025 to July 2026 were reviewed. A total of 60 patients met the inclusion criteria and were included in the final analysis. Age ranged from 18 to 55 years, with a male:female ratio of 3:1.
Inclusion criteria: Patients aged 18-55 years admitted with a diagnosis of acute pancreatitis (based on the standard diagnostic criteria of abdominal pain, elevated serum amylase/lipase, and/or characteristic imaging findings) who underwent contrast-enhanced CT during admission and had sufficient clinical/laboratory data available to calculate the BISAP score.
Exclusion criteria: Patients younger than 18 or older than 55 years; those with chronic pancreatitis or pancreatic malignancy; those who did not undergo contrast-enhanced CT; and those with incomplete records precluding calculation of BISAP or CTSI.

2.3 Data Collection

Data were extracted retrospectively from case records, laboratory reports, and radiology reports using a structured proforma. Variables collected for BISAP included blood urea nitrogen, presence of impaired mental status, systemic inflammatory response syndrome criteria, age, and presence of pleural effusion on imaging within 24 hours of admission. Contrast-enhanced CT findings, including grade of pancreatic inflammation and extent of necrosis, were extracted to calculate the CTSI.

2.4 Scoring Systems and Reference Standard

The BISAP score assigns one point each for five variables (maximum score 5), with a score of >=3 taken to indicate a high risk of severe disease, consistent with the original description by Wu et al. [1].
The CTSI (Balthazar) score combines a grade of acute pancreatitis on CT (0-4 points) with an assessment of pancreatic necrosis (0-6 points) to yield a total score of 0-10; a score of >=7 was used as the cut-off for predicting severe disease, consistent with prior comparative literature [2,7,9].
Disease severity was classified according to the Revised Atlanta Classification, which defines severe acute pancreatitis as the presence of persistent organ failure (>48 hours) involving the respiratory, cardiovascular, or renal systems. This classification served as the reference standard against which both BISAP and CTSI were evaluated.

2.5 Statistical Analysis

Data were analysed using [SPSS version XX / R version XX - to be specified]. Categorical variables are presented as frequencies and percentages, and continuous variables as means or ranges. For each scoring system, sensitivity, specificity, PPV, NPV, and overall diagnostic accuracy were calculated against the Revised Atlanta Classification, with 95% confidence intervals estimated using the normal (Wald) approximation. A chi-square test with Yates' continuity correction was used to compare the overall diagnostic accuracy of the two scores; as both scores were assessed in the same 60 patients, this comparison should ideally be repeated using McNemar's test on paired (patient-level) concordance data once available, since the two scores are not statistically independent. A p-value <0.05 was considered statistically significant.

3. RESULTS

3.1 Baseline Characteristics

Sixty patients admitted with acute pancreatitis over the one-year study period were included. Age ranged from 18 to 55 years, and the male:female ratio was 3:1. By Revised Atlanta Classification, 35 patients (58.3%) had severe acute pancreatitis and 25 patients (41.7%) had non-severe (mild or moderate) disease.

Table 1. Baseline characteristics of the study cohort.

Characteristic	Value
Total patients (n)	60
Age range	18-55 years
Male : Female ratio	3 : 1
Severe acute pancreatitis (Revised Atlanta), n (%)	35 (58.3%)
Non-severe (mild/moderate) acute pancreatitis, n (%)	25 (41.7%)

3.2 Diagnostic Performance of BISAP Score

At the standard cut-off of >=3, the BISAP score correctly identified 25 of the 35 patients with severe acute pancreatitis as true positives, with 10 false negatives. Among the 25 non-severe patients, 21 were correctly classified as true negatives and 4 were false positives.

Table 2. 2x2 contingency table for the BISAP score against the Revised Atlanta Classification.

BISAP (cut-off >=3)	Severe AP	Non-severe AP	Total
Score >=3 (positive)	25 (TP)	4 (FP)	29
Score <3 (negative)	10 (FN)	21 (TN)	31
Total	35	25	60

3.3 Diagnostic Performance of CTSI

At the standard cut-off of >=7, CTSI correctly identified 29 of the 35 severe patients as true positives, with 6 false negatives. Among the 25 non-severe patients, 22 were correctly classified as true negatives and 3 were false positives.

Table 3. 2x2 contingency table for CTSI against the Revised Atlanta Classification.

CTSI (cut-off >=7)	Severe AP	Non-severe AP	Total
Score >=7 (positive)	29 (TP)	3 (FP)	32
Score <7 (negative)	6 (FN)	22 (TN)	28
Total	35	25	60

3.4 Comparative Diagnostic Accuracy

Overall, CTSI numerically outperformed BISAP on every diagnostic parameter assessed (Table 4).

Table 4. Comparative diagnostic performance of BISAP and CTSI. *Wald (normal-approximation) 95% CIs; upper bounds truncated at 100% due to sample size.

Parameter	BISAP (%)	95% CI	CTSI (%)	95% CI
Sensitivity	71.4	56.4-86.4	82.9	70.4-95.3
Specificity	84.0	69.6-98.4	88.0	75.3-100*
PPV	86.2	73.7-98.8	90.6	80.5-100*
NPV	67.7	51.3-84.2	78.6	63.4-93.8
Diagnostic accuracy	76.7	66.0-87.4	85.0	76.0-94.0

Comparing overall diagnostic accuracy (46/60 correct for BISAP vs. 51/60 correct for CTSI) using a chi-square test with Yates' continuity correction yielded chi-square = 0.86 (df = 1, p = 0.35), indicating that, despite the numerically higher accuracy of CTSI, the difference did not reach statistical significance in this sample. This comparison treats the two proportions as independent for simplicity; because both scores were derived in the same patients, a paired McNemar's test on patient-level concordance data (i.e., how many patients were correctly classified by one score but not the other) is the more statistically appropriate test and is recommended if the underlying patient-level data are available.

4. DISCUSSION

In this retrospective cohort of 60 patients with acute pancreatitis, CTSI demonstrated numerically higher sensitivity (82.9% vs. 71.4%), specificity (88.0% vs. 84.0%), PPV (90.6% vs. 86.2%), NPV (78.6% vs. 67.7%), and overall diagnostic accuracy (85.0% vs. 76.7%) compared with BISAP for predicting severe acute pancreatitis by Revised Atlanta Classification, although this difference was not statistically significant.

These findings sit within a mixed body of prior literature. Several studies have reported BISAP to have discriminative ability comparable to, or exceeding, CTSI when assessed by area under the ROC curve. In a prospective study evaluating BISAP for prognostication, the reported AUCs for BISAP in predicting severe pancreatitis and death were considerably higher than the corresponding AUCs for CTSI, and BISAP additionally outperformed CTSI for predicting organ failure [6]. Similarly, a comparative Indian cohort study of 119 patients reported very high AUCs for BISAP in predicting severe acute pancreatitis and mortality, with CTSI instead showing its greatest accuracy for predicting pancreatic necrosis specifically rather than overall severity [4].

Conversely, other comparative studies have found CTSI or combined scoring approaches to modestly outperform BISAP for overall severity prediction, particularly where necrosis and local complications form part of the severity definition, and have emphasised that BISAP and CTSI may be complementary rather than competing tools, with BISAP suited to early bedside triage and CTSI to defining the anatomical extent of disease once imaging becomes available [5]. A separate

study directly comparing BISAP with the Balthazar CTSI concluded that both systems were valuable, with BISAP excelling in early risk stratification and CTSI in assessing local complications, supporting a multimodal rather than either/or assessment strategy [3].
The direction of effect observed in the present study - CTSI numerically outperforming BISAP - is therefore plausible and consistent with a subset of the published literature, even though the difference did not reach statistical significance here. A key practical distinction, however, is timing and resource requirement: BISAP can be calculated within 24 hours of admission using routinely available clinical and laboratory data, whereas CTSI typically requires contrast-enhanced CT, ideally performed after 72-96 hours to accurately delineate necrosis, together with the associated cost, radiation exposure, and contrast-related risk. Even where CTSI shows numerically superior accuracy, BISAP therefore retains clinical value as an early, low-cost triage tool, with CTSI serving a complementary role once imaging is obtained.

5. Limitations
This study has several limitations. First, the sample size (n = 60) is modest, and confidence intervals around specificity, PPV, and NPV for both scores are correspondingly wide; the observed differences between BISAP and CTSI should be interpreted with caution and did not reach statistical significance in this cohort. Second, the retrospective design relies on the completeness and accuracy of documented clinical and radiological findings, which may introduce information bias. Third, the single-centre design limits generalisability to other populations and settings. Fourth, the timing of CT acquisition relative to symptom onset was not standardised in this retrospective review, which may affect CTSI accuracy, since necrosis is often better delineated after 72-96 hours. Finally, the comparative statistical test reported here treats the two proportions as independent; a paired analysis (e.g., McNemar's test) using patient-level concordance data would provide a more statistically rigorous comparison and is recommended for future analyses of this dataset.

6. CONCLUSION
In this retrospective observational study, CTSI showed numerically higher sensitivity, specificity, PPV, NPV, and overall accuracy than BISAP for predicting severe acute pancreatitis by Revised Atlanta Classification, although the difference was not statistically significant in this cohort. Given that BISAP can be calculated at admission without imaging, it retains practical value for early bedside risk stratification, while CTSI may add incremental value once contrast-enhanced CT is performed. Larger, prospectively designed, multi-centre studies are needed to confirm these findings and to define the optimal combined use of BISAP and CTSI in clinical practice.

Declarations
Conflict of interest: The authors declare no conflict of interest.

Funding: Self Funding.

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