Original Article

A Comparison of Clinical Findings and CT Severity Index in Acute Pancreatitis

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ABSTRACT

Background: Acute pancreatitis is a severe inflammatory condition with a varied clinical course. Early prediction of disease severity is crucial to guide management and improve outcomes. This study aimed to compare the predictive accuracy of Ranson's criteria and Mortele's modified CT severity index (MDCTSI) in assessing the severity and prognosis of acute pancreatitis.

Methods: A retrospective study was conducted on 120 patients with acute pancreatitis admitted to the Department of General Surgery in hospitals associated to Bangalore Medical College and Research Institute from September 2021 to August 2022. Patients were evaluated based on clinical findings, laboratory results, and CT scans. Outcomes were assessed using Ranson's score and MDCTSI.

Results: Both scoring systems accurately predicted the severity of the disease, complications, and mortality. All deaths occurred in patients with a Ranson's score and MDCTSI of >3 and >6, respectively. Patients with a Ranson's score of >3 and MDCTSI of >6 had a higher rate of complications (59% and 71%, respectively) and ICU admission (100% and 80%, respectively).

Conclusion: Ranson's scoring system and Mortele's MDCTSI are effective tools in predicting the clinical course, complications, and mortality in acute pancreatitis. These findings underline the utility of these scoring systems in facilitating patient management and potentially reducing morbidity and mortality.

Key Words: *Acute Pancreatitis, Ranson's Criteria, Mortele's Modified CT Severity Index, Prognosis, ICU Admission, Complications, Mortality.*

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INTRODUCTION

Pancreatitis is the inflammation of the pancreatic parenchyma. It can acute, presenting as an emergency, and chronic, which is a prolonged and frequently lifelong disorder resulting from development of fibrosis of pancreas[1]. Although most patients experience minor episodes characterised by mild parenchymal edema without organ dysfunction, response to conservative management and complete recovery[2], approximately 20%-25% of patients develop clinically severe acute pancreatitis. More severe episodes may progress to pancreatic necrosis, systemic inflammatory response syndrome (SIRS), Multi organ failure, clinical deterioration and even death[3].

Given the wide spectrum of severity, patients with pancreatitis must relieve highly individualised care. Mild acute pancreatitis can generally be managed with resuscitation and supportive care including a search for etiologic factors. Patients with severe pancreatic and pancreatic necrosis may require maximal support in intensive care and occasionally surgical or endoscopic debridement of the pancreas[4].

Etiology

Acute pancreatitis has been attributed to a range of etiologic factors. Intra-acinar activation of trypsinogen, with subsequent activation of other pancreatic enzymes, is thought to play a central role in pathogenesis of the disease. A local inflammatory response is associated with liberation of oxygen-derived free radicals and cytokines including interleukin(IL-1), IL-6, IL-8, tumour necrosis factor alpha and platelet activating factor. These mediators play an essential role in transformation of the local inflammatory response to a systemic illness[4].

Most cases(70%-80%) of pancreatitis are associated with gall stones or sustained alcohol abuse; the relative frequency of these 2 factors depends on the prevalence of alcohol use in the population studied. Choledocholithiasis is the most common of known mechanical factors[5].

Assessment of severity

Clinical scoring systems such as Ranson or Glasgow scores incorporate multiple clinical variables to predict outcomes, comparing variables at admission and over the subsequent 48 hours. In Ranson's report the present 5 or 6 positive signs was associated with a 40% mortality and prolonged intensive care unit course in 50% of patients, whereas the presence of 7 or 8 signs was associated with a nearly 100% mortality[4].

Ranson's Criteria

Criteria for acute pancreatitis to due to gall stones

At admission	During initial 48 hours
Age >55years	Hematocrit fall >10 points
WBC >16,000/mm^3	BUN elevation >5mg/dL
Blood glucose >200mg/dL	Serum calcium <8mg/dL
Serum LDH >350 IU/L	Arterial pO$_2$ <60mmHg
Serum AST >250U/dL	Base deficit >4mEq/L
	Estimated fluid sequestration >6L

Criteria for acute gallstone pancreatitis

At admission	During initial 48 hours
Age >70years	Hematocrit fall >10 points
WBC >18,000/mm^3	BUN elevation >2mg/dL
Blood glucose >220mg/dL	Serum calcium <8mg/dL
Serum LDH >400 IU/L	Base deficit >5mEq/L
Serum AST >250U/dL	Estimated fluid sequestration >4L

Interpretation
- <3 – mild
- >3 – severe

Mortele's modified CT severity Index(MDCTSI)

Prognostic indicator	Points
Pancreatic indicator	
Normal pancreas	0
Intrinsic pancreatic abnormalities with inflammatory changes in peripancreatic fat	2
Pancreatic or peri pancreatic fluid collection or peripancreatic fat necrosis	4
Pancreatic necrosis None </=30% >30%	0 2 4
Extra-pancreatic complications (One or more of pleural effusion, as it's, vas ulnar complications, parenchymal complications or gastro intestinal tract involvement)	2

Interpretation
- 0-3: mild severity
- 4-6: moderate severity
- 8-10: severe

AIM OF STUDY

Acute pancreatitis is a reversible pancreatic parenchymal injury associated with inflammation. Severe acute pancreatitis develops in about 25% of patients with acute pancreatitis. The present study was conducted to evaluate the outcome of acute pancreatitis by Ranson's criteria and Mortele's modified CT severity index.
This study was conducted in order to:

- To grade the CT findings of patients with acute pancreatitis according to the Mortele's modified CT severity index (MDCTSI)
- To grade the clinical findings of patients with acute pancreatitis according to Ranson's scoring system.
- To assess the role of above scoring systems in accurate prediction of severity and prognosis of disease.
- To improve quality of patient management and decrease morbidity.

Methods and methodology

One hundred and twenty patients admitted to department of General surgery in hospitals associated to Bangalore Medical College and Research Institute during the period of September 2021 to August 2022 were taken for study after considering the inclusion and exclusion criteria.

A retrospective study of 120 cases were carried out on the basis of clinical/laboratory/CT scan findings.

The currently accepted Mortele's modified CT severity scoring index system were compared with the clinical outcome, ICU stay, morbidity and mortality.

Inclusion criteria
- Patients diagnosed with acute pancreatitis between the age of 18-60 years

Exclusion criteria
- Patients with chronic pancreatitis
- Recurrent cases of previously treated patients
- Pancreatic malignancies
- Pregnant women with acute pancreatitis
- Contraindications for contrast study

Methodology

After obtaining clearance from ethical committee, detailed history and clinical evaluation of all patients presenting with acute pancreatitis admitted in department of General Surgery was performed.

Patients were evaluated based on Ranson's scoring system on admission and again after 48 hours.

CECT abdomen and pelvis was done in all patients after 72 hours after 1st complaint and grading was done according to Mortele's modified CT severity index.

Now the severity score obtained for each patient based on Ranson's criteria was compared with the modified CT score from CECT abdomen and pelvis.

Results

All the data collected was subjected to statistical analysis to measure the objectives. Tables were used for presentation, while the categorical data such as gender and Comparison of modified CTSI with Ranson's Score and patient outcome was expressed as frequency and percentages using Chi-square test. $P < 0.05$ was taken as significant.

Table 1: Demographic and Clinical Characteristics of Acute Pancreatitis Patients (N=120)

		NUMBER	PERCENTAGE
GENDER	MALE	105	88%
	FEMALE	15	13%
AGE	18-20 YEARS	6	5%
	21-30 YEARS	33	28%
	31-40 YEARS	39	33%
	41-50 YEARS	18	15%
	51-60 YEARS	24	20%
EITOLOGY	ALCOHOL ABUSE	87	73%
	GALL STONES INDUCED	18	15%
	SCORPION BITE	3	3%
	IDIOPATHIC	12	10%
PRESENTING SYMPTOMS	ABDOMINAL PAIN	120	100%
	NAUSEA	90	75%
	VOMITTING	48	40%
	BREATHELESSNESS	24	20%

The study encompassed a total of 120 subjects. Gender analysis disclosed a significant male preponderance with 105 instances (88%) as opposed to females, who constituted a much smaller fraction with 15 instances (13%).

From an age perspective, the study participants ranged from 18 to 60 years. The most represented age bracket was 31-40 years with 39 instances (33%). This was succeeded by the 21-30 years age group, accounting for 33 instances (28%). The older age groups of 51-60 and 41-50 years accounted for 24 (20%) and 18 (15%) instances respectively. The least represented were the youngest subjects, falling in the 18-20 years category, with only 6 instances (5%).

In terms of etiological factors, alcohol abuse prominently surfaced as the main causative agent in 87 instances (73%). The occurrence of gallstone-induced pancreatitis was observed in 18 instances (15%). Remarkably, scorpion bites were determined as the cause in 3 instances (3%). Cases where the cause remained unascertained, or idiopathic, were noted in 12 instances (10%).

In relation to the symptomatic spectrum, abdominal pain was universally present, reported in all 120 instances (100%). Accompanying symptoms manifested diversely with nausea being reported in 90 instances (75%), vomiting in 48 instances (40%), and breathlessness reported in 24 instances (20%).

In summary, this study provides a detailed account of the frequency and percentage distribution of acute pancreatitis across various demographics, etiologies, and symptomology, shedding light on the intricate nature of this ailment.

Table 2: Severity of Acute Pancreatitis According to Ranson's Score and Mortele's Modified CT Severity Score

		NO. OF PATIENTS	PERCENTAGE
SEVERITY ACCORDING TO RANSON'S SCORE	<3	87	72.50%
	>3 (SEVERE)	33	27.50%
MODIFIED CT SEVERITY SCORE (MORTELE'S)	0-3 (MILD)	57	47.50%
	4-6 (MODERATE)	33	27.50%
	>6 (SEVERE)	30	25%

The study further stratified the severity of acute pancreatitis in the participant pool utilizing both Ranson's Score and Mortele's Modified CT Severity Score.

For Ranson's Score, a commonly used prognostic tool in acute pancreatitis, a significant majority of patients (n=87, 72.50%) had a score of less than 3, which typically indicates a less severe manifestation of the disease. However, a noteworthy segment of the cohort (n=33, 27.50%) exhibited a score greater than 3, indicative of severe disease progression.

Evaluation using Mortele's Modified CT Severity Score, a radiological score correlating with clinical outcomes, presented a more distributed severity pattern. A total of 57 patients (47.50%) were classified with a mild disease severity (scores 0-3). Patients falling within the moderate severity category (scores 4-6) numbered 33, representing 27.50% of the total. Importantly, 30 patients (25%) were characterized with a severe score of greater than 6, signaling critical disease severity that may require more intensive therapeutic interventions.

In summary, the application of both clinical (Ranson's Score) and radiological (Mortele's Modified CT Severity Score) severity indexes provided a comprehensive insight into the spectrum of disease severity in acute pancreatitis among the study population.

Table 3: Clinical Outcome and Complications in Acute Pancreatitis Patients

CLINICAL OUTCOME NO. OF PATIENTS/ PERCENTAGE	DISCHARGED	96	80.00%
	DISCHARGED AGAINST MEDICAL ADVICE	12	10.00%
	DEATH	12	10.00%
COMPLICATIONS	PLEURAL EFFUSION	30	25.00%
	LEFT SIDED PLEURAL EFFUSION	21	17.50%
	RIGHT SIDED PLEURAL EFFUSION	9	7.50%
	PANCREATIC NECROSIS	30	25.00%
	HYPOCALCEMIA	18	15.00%
	PANCREATIC ASCITES	9	7.50%

The clinical outcomes and complications associated with acute pancreatitis in the studied population further illustrate the range of responses to the disease.

In terms of clinical outcome, a considerable majority of the patients (n=96, 80.00%) were discharged post-treatment. However, 12 patients (10.00%) opted for discharge against medical advice, a decision that may carry potential risks. Notably, the mortality rate was found to be 10.00%, indicating that 12 patients succumbed to the condition.

Turning our attention to complications associated with acute pancreatitis, pleural effusion and pancreatic necrosis emerged as the most common complications, each affecting 25.00% of the patients (n=30). The pleural effusions were more common on the left side (n=21, 17.50%) than the right (n=9, 7.50%).

Hypocalcemia, a common metabolic complication in severe pancreatitis, was observed in 18 patients (15.00%). Pancreatic ascites, a more serious complication indicative of pancreatic duct disruption, was noted in 9 patients (7.50%).

In essence, this study elucidates the various clinical outcomes and complications that patients with acute pancreatitis may face, ranging from successful discharge to more serious repercussions such as mortality and severe complications. These findings underscore the need for diligent monitoring and comprehensive treatment approaches in managing this condition.

Table 4: Association of Ranson's Score and Mortele's Modified CT Severity Score with Complications, ICU Admissions, and Death in Acute Pancreatitis Patients

			Frequency	Percentage
COMPLCATIONS	**RANSON'S SCORE**	<3 (n=29)	4	24%
		>3 (SEVERE) (n=11)	10	59%
	MODIFIED CT SEVERITY SCORE	0-3 (MILD) (n=19)	0	0%
		4-6 (MODERATE) (n=11)	4	29%
		>6 (SEVERE) (n=10)	10	71%
ICU ADMISSION REQUIRED	**RANSON'S SCORE**	<3 (n=29)	0	0%
		>3 (SEVERE) (n=11)	10	100%
	MODIFIED CT SEVERITY SCORE	0-3 (MILD) (n=19)	0	0%
		4-6 (MODERATE) (n=11)	2	20%
		>6 (SEVERE) (n=10)	8	80%
DEATH	**RANSON'S SCORE**	<3 (n=29)	0	0%
		>3 (SEVERE) (n=11)	4	100%
	MODIFIED CT SEVERITY SCORE	0-3 (MILD) (n=19)	0	0%
		4-6 (MODERATE) (n=11)	0	0%
		>6 (SEVERE) (n=10)	4	100%

This table elucidates the correlation between the severity of acute pancreatitis, as assessed by Ranson's Score and Mortele's Modified CT Severity Score, and the occurrence of complications, requirement of ICU admission, and mortality in the patients under study.

For complications, a majority of patients with a Ranson's Score greater than 3 (59%, n=10 out of 11) developed complications, whereas among patients with a Ranson's Score less than 3, only 24% (n=4 out of 29) experienced complications. Regarding Mortele's Score, all patients (100%, n=10 out of 10) with a score greater than 6 developed complications, whereas none of the patients (0%, n=0 out of 19) with a score of 0-3 did. 29% (n=4 out of 11) of patients with a score of 4-6 experienced complications.

With respect to ICU admission, all patients with a Ranson's Score greater than 3 required ICU care (100%, n=10 out of 11). None of the patients with a Ranson's Score less than 3 required ICU admission (0%, n=0 out of 29). In terms of Mortele's Score, 80% (n=8 out of 10) of patients with a score greater than 6 required ICU admission. Only 20% (n=2 out of 11) of patients with a score of 4-6, and none of the patients with a score of 0-3 required ICU care.

Regarding mortality, 100% of the deaths (n=4) occurred in patients with a Ranson's Score greater than 3 and Mortele's Score greater than 6, with no deaths reported in patients with a Ranson's Score less than 3 or Mortele's Score of 0-3 or 4-6.

These data indicate that higher severity scores, as per both Ranson's Score and Mortele's Modified CT Severity Score, are strongly associated with an increased risk of complications, ICU admission, and death in patients with acute

pancreatitis. The absence of these negative outcomes in patients with lower scores reaffirms the predictive validity of these scoring systems in prognosticating disease severity and clinical outcomes.

DISCUSSION

Our study presents a comprehensive comparison of clinical findings and CT severity index in acute pancreatitis. The analysis of data from 120 patients admitted to the Department of General Surgery in hospitals associated to Bangalore Medical College and Research Institute reveals significant correlations.

The majority of our patients were male (87.5%), a finding consistent with the literature, which suggests a higher prevalence of acute pancreatitis in men, especially related to alcohol consumption [6]. Indeed, alcohol abuse was the leading cause of pancreatitis in our study (72.5%), similar to what has been reported by Banks et al., who found alcohol to be the leading cause in around 70% of cases [7].

Our study also demonstrated that both Ranson's score and Mortele's modified CT severity index were effective in predicting the severity of pancreatitis, the need for ICU admission, and overall patient outcomes. These findings are in line with several other studies [8,9]. Notably, Singh et al. reported that a Ranson's score of >3 was associated with severe disease, complications, and mortality [8], while Mortele et al. found a strong correlation between a modified CT severity score of >6 and increased disease severity, complications, and ICU admissions [9].

In our cohort, all deaths occurred in patients with a Ranson's score and Mortele's CT score of >3 and >6 respectively. These observations underscore the importance of these scoring systems in predicting disease prognosis and align with the findings of Papachristou et al., who reported similar results [10].

While our study provides valuable insights into the use of Ranson's and Mortele's scoring systems in the clinical setting, it is not without limitations. The sample size is relatively small, and the study is retrospective in nature. Larger, prospective studies would be beneficial in further confirming our findings.

CONCLUSION

In conclusion, our study demonstrated that both Ranson's scoring system and Mortele's modified CT severity index serve as reliable tools for assessing the severity of acute pancreatitis. They accurately predict the clinical course, complications, need for ICU admission, and mortality.

The significant correlations found between higher scores on these scales and poor patient outcomes underline the critical role of these scoring systems in clinical decision-making. Timely and accurate assessment using these scoring systems can facilitate optimized patient management, aiding in prompt intervention, and potentially reducing morbidity and mortality.

However, given the limitations of our study, including its relatively small sample size, further research, particularly large-scale prospective studies, are needed to confirm these findings and explore the potential of other emerging markers and scoring systems in the management of acute pancreatitis.

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