

Can the Computed Tomography Severity Index be a Prognostic Tool in Acute Gallstone-Induced Pancreatitis?

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Abstract:-

➤ Objective

Acute Biliary pancreatitis is a clinical condition that is commonly encountered in surgical emergencies and can have high mortality. It is difficult to identify patients that can have a fulminant course. This study analyses the relationship between CTSI score, morbidity, and mortality.

➤ Design

219 patients admitted to the Department of General Surgery, IGMC, Shimla with acute gallstone-induced pancreatitis were the subjects of our prospective observational study. We tried to establish a relationship between CTSI, morbidity, and mortality.

➤ Results

In total, 36 of 219 (13.69%) patients with acute GSP developed severe pancreatitis of whom 11 patients had the edematous type of pancreatitis and 25 had necrotizing pancreatitis. Of these 25 patients, 8 had CTSI of 4-6 and 17 had CTSI of 7-10. CTSI had a direct relation with clinical severity ($p=0.044$) and morbidity ($p=0.031$). Mortality was seen in patients who had a CTSI of 7 – 10 ($p=0.134$).

➤ Conclusion

Patients having high CTSI are associated with increased morbidity and clinical severity when compared to patients with low CTSI but a direct correlation with mortality could not be established.

Keywords:- CTSI, Acute Gall Stone Induced Pancreatitis, Mortality, Morbidity.

I. INTRODUCTION

Among gastrointestinal disorders, acute pancreatitis (AP), an inflammatory condition of the pancreas, is one of the most frequent reasons for hospitalization [1]. To categorize the severity of pancreatitis, several prognostic scoring systems incorporating clinical, biochemical, and radiological criteria have been proposed. The majority of AP cases are mild, but managing the disease's moderate and severe manifestations, which include necrosis and multiorgan failure, is still difficult. The severe variety has a dismal prognosis; it affects 8.8% of AP patients [2], and death from severe AP (SAP) can reach

28% [2]. Because early care escalation and vigorous therapy may minimize complications and unfavorable outcomes of AP in high-risk patients, it is imperative to forecast the severity of the condition. Unfortunately, pancreatitis research is in jeopardy, so efforts to gather clinically useful data are of utmost relevance [3].

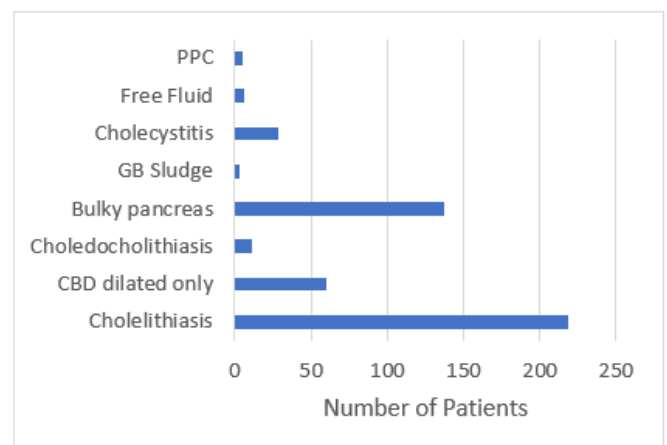


Fig 1: USG Abdomen Findings

A. Abbreviations and Acronyms

Abbreviations used in this paper: GSP, Gallstone Pancreatitis; IGMC, Indira Gandhi Medical College; CTSI, Computed Tomography Severity Index; CECT, Contrast-enhanced computed Tomography; PPC, Peripancreatic Collection.

II. METHODS

A. Patients and study design

This prospective observational study was conducted in IGMC, Shimla, HP, India. In conclusion, all patients with acute GSP diagnosed between April 1st, 2021, and March 31st, 2022, were included in the current study without any bias. Patients were treated by accepted standards & care. Only in cases where the infection was either suspected or confirmed were antibiotics given. Antibiotic therapy was not given as a preventive measure. Invasive procedures were typically only carried out when there was a suspicion of infected necrosis. The severity of Pancreatitis, as defined by the Revised Atlanta Classification and CTSI score was calculated as defined by Balthazar.

B. Data Collection

During the first three days of hospital admission, prospective data collection was done on the demographics of the patients and the results of their lab tests. Additionally, information on the onset and type of organ failure, such as respiratory, cardiovascular, and renal failure, was logged during the patient's hospital stay. Age, sex, the length of the hospital stay, organ failure (as measured by MMS as depicted in Table 1 at admission and after 48 hours), CTSI as depicted in Table 2, and invasive procedures were all recorded.

At the treating physician's discretion, contrast-enhanced CT (CECT) was frequently carried out in cases of clinical deterioration after 72 – 96 hours after the onset of symptoms. Based on Balthazar's Scoring system, CTSI was documented.

C. Definitions

Acute GSP was diagnosed based on the Revised Atlanta Classification which required any two of the following three criteria:

- Typical upper abdominal pain homologous with acute pancreatitis.

Table 1: MMS Score

	0	1	2	3	4
Respiratory PaO₂/FiO₂	>40 0	301-400	201-300	101-200	<101
Renal S. creatinine (mg/dl)	<1.4 4	1.4-1.8	1.9-3.6	3.6-4.9	>4.9
Cardiovascular S.B.P in mmHg	>90	<90, Fluid Responsive	<90, Fluid non-responsive	<90, pH<7.3	<90, pH<7.2

- Serum lipase or amylase activity at least three times greater than the upper limit
- Characteristic radiological findings of acute pancreatitis [4]

Necrotizing pancreatitis was defined as either pancreatic parenchymal necrosis with or without extrapancreatic necrosis, or extrapancreatic necrosis alone.

D. Statistical analysis

Normal data are shown as mean SD or median with interquartile range. In the case of ordinal categorical variables, proportions were compared using the 2 test or by a linear-by-linear 2 association test. The cutoff for statistical significance was p 0.05.

III. RESULTS

Out of 219 patients diagnosed with acute gall stone induced pancreatitis, only 36 patients underwent CECT Abdomen. Of these only 25 patients were found to have necrotizing pancreatitis. USG findings and CECT findings have been depicted in Figures 1 and 2 respectively.

A. Relationship of CTSI with Clinical Severity

3 patients with mild pancreatitis and 5 patients with severe pancreatitis had a CTSI score of less than 6, while 1 patient with mild pancreatitis and 16 patients with severe pancreatitis scored above 6.

Table 2: CTSI Score

Prognostic indicators	Points
Pancreatic inflammation	
• Normal pancreas	0
• Intrinsic pancreatic abnormalities (with inflammatory changes in peripancreatic fat)	2
• Pancreatic or peripancreatic fluid collections or peripancreatic fat necrosis	4
Pancreatic necrosis	
None	0
≤30%	2
>30%	4
Extra pancreatic complications: (one or more pleural effusions, ascites, vascular complications, parenchymal complications, or gastrointestinal tract involvement)	2

B. Relationship of CTSI with Hospital Stay

The morbidity of the patient in the form of hospital stay was assessed. None of the patients with CTSI of more than 7 and 2 patients with CTSI of 4 – 6 stayed in the hospital for less than 7 days. While 6 patients with CTSI of 4 – 6 and 17 patients with CTSI more than 7 stayed in the hospital for more than 7 days.

C. Relationship of CTSI with Mortality

All the patients who died had a CTSI of more than 7. While 8 patients with CTSI of 4-6 and 13 patients with CTSI of more than 7 survived.

IV. DISCUSSION

This study was conducted to understand the association between CTSI, morbidity, and mortality in acute gallstone-induced pancreatitis

Our research found a connection between CTSI and the severity of the illness and, consequently, morbidity. However, no link to mortality could be found. According to earlier research, the computed tomography severity index is equally accurate at predicting severity as other scoring systems like Ranson, APACHE II, or BISAP [5]. Additionally, the CTSI showed a strong association between clinical rating systems and morphological severity. As parenchymal pancreatic necrosis seldom manifests within 48 hours, a CT scan was performed in these chosen patients after that time [6].

In our study, patients with acute GSP were prospectively enrolled, and data collection after the beginning of symptoms at the ER began on the day of first admission.

Table 3: CTSI vs characteristics

	CTSI 4 - 6	CTSI 7 - 10	P value
Mild	3	1	0.044
Severe	5	16	
<7 days	2	0	0.031
> 7 days	6	17	
Mortality	0	4	0.134
Survivor	8	13	

Other studies may have included patients who overcame the initial stage of the disease, and inclusion may have begun after patients were transferred to centers with pancreatic expertise or upon ICU admission.

The inability to identify the underlying cause of organ failure is a shortcoming of our investigation. For instance, it can be challenging to discern between organ failure brought on by sepsis and organ failure brought on by SIRS without evidence of infection. This is a well-known restriction of research on infectious necrosis and organ failure.

Furthermore, the prognosis of individuals with necrotizing pancreatitis is significantly influenced by pre-existing comorbidities. When compared to patients without considerable comorbidity, vulnerable patients with secure comorbidity may get organ failure more quickly.

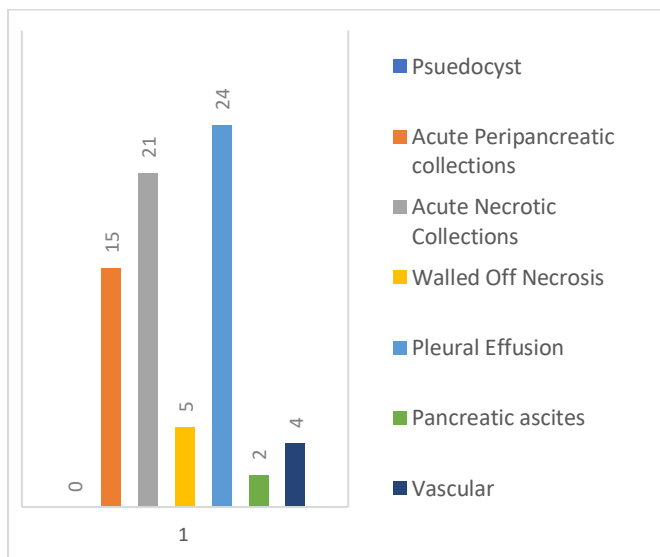


Fig 2: Local Complications detected on CECT

The fact that we employed a modified version of the Marshall Scoring System to determine organ failure by 2012 Revised Atlanta Classification may also be viewed as a limitation of this study since the modified Marshall Score does not account for endotracheal intubation for respiratory failure, the use of vasopressors for persistent hypotension following fluid resuscitation, or renal replacement treatment for renal adequacy. In patients receiving supportive therapy, arterial oxygen levels may be normal [7].

Another drawback is that not all patients could receive contrast-enhanced CT scans. Radiation exposure should be avoided and saved for patients who do not see a clinical improvement.

The sample included in this study does not represent the entire population with acute pancreatitis because CT scans are typically only performed in more severe cases.

Another limitation is that Contrast-enhanced CT could not always be performed on every patient. The risk of radiation exposure should be avoided and should be reserved for patients who do not improve clinically. The population taken for this study does not represent the whole acute pancreatitis population as CT scan is mostly done in the more severe cases.

There must be many confounding factors in the study such as potential inter-observer variability between radiologists interpreting CT images, differences in the etiology, and high heterogeneity among patient demographics which also attributes to the limitation of this study.

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CONTRIBUTORS

SKY drafted the manuscript in close collaboration with DKS and AC coauthored the writing of the manuscript. RKS, AK, IB, and MCP have helped in proofreading. The final text was peer-reviewed, modified, and approved by all authors.

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Competing interests None declared.

Patient consent Informed consent was taken from all participants.

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