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CT EVALUATION OF ACUTE PANCREATITIS AND ITS PROGNOSTIC CORRELATION WITH CT SEVERITY INDEX

Radiology

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ABSTRACT

Introduction – Of all the abdominal diseases, pancreatitis is one of the most complicated and clinically demanding. Compared to USG, computed tomography (CT) is much more sensitive and accurate at both diagnosing and demonstrating the extent of the condition. The current study's objective is to evaluate the clinical outcome and prognosis connection of acute pancreatitis based on the CT severity index. **Material And Methods-** The present prospective study was done among refereed suspected 20 cases of acute pancreatitis to department of Radiology JNUIMSRC for CECT imaging during the study period of one year from 1-january-2024 to 1-February-2025. CECT was performed in all cases following protocol. Assessment of severity of acute pancreatitis was done in all cases by Balthazar CTSI scoring and Mortele Modified CTSI scoring. Data was analyzed using SPSS version 25.0. **Results –** Out of 20 patients 65% were male and 35% were females. The mean age of patients was 57.9 years. The mean BMI was 22.4 kg/m2 . The main cause of AC was alcohol (45%). Majority of the cases were categorized as mild pancreatitis (50%) according Balthazar CTSI score. Majority of the cases were categorized as severe pancreatitis (45%) using the Modified Mortele CTS score. Intervention, length of stay, Infection , organ system failure and death were significantly associated with severe grade ($p<0.05$) when seen in MM CT score. **Conclusion –** The score is simpler to calculate and has less inter-observer variation when using the modified CT severity index. Scores derived using the modified Mortele index, as opposed to the Balthazar index, demonstrate a stronger statistical association for all clinical outcome measures in all patients.

KEYWORDS

acute pancreatitis, correlation, CT, evaluation, outcome, severity.

INTRODUCTION

Acute pancreatitis (AP) is a disorder that is becoming more and more common; incidence rates vary greatly by nation and range from 20 to 80 per 100,000. [1] According to the recent Indian researches, the incidence of acute pancreatitis ranges from 12 to 20 cases per year and the average mean age presentation is 8.3 to 9.3 years.[2] Up to 5% of cases may result in mortality, and clinical presentation can range from momentary stomach discomfort to systemic inflammatory response syndrome [3, 4].

Acute pancreatitis is commonly classified into three categories: mild, moderately severe, and severe, as will be covered in more detail below. With relatively little death and morbidity, mild acute pancreatitis is self-limiting and frequently detected biochemically or clinically without the need for imaging. On the other hand, symptoms of moderately severe acute pancreatitis include local or systemic problems, as well as temporary (less than 48 hours) organ failure. Severe acute pancreatitis is the term used to describe organ failure that lasts more than 48 hours.[5,6]

AP may be imaged with either contrast enhanced computed tomography (CECT) or magnetic resonance imaging (MRI) with or without contrast. Studies have also shown that contrast-enhanced computed tomography (CECT) can be utilized to identify pancreatic necrosis and evaluate the severity of acute pancreatitis (AP).[7,8] While pancreatic ischemia can be seen within 48 hours after the start of acute pancreatitis (AP), the extent of pancreatic necrosis can be properly assessed by computed tomography with contrast (CECT) between 3 to 7 days after the onset of AP.[9-12] Thus, there has not been a comprehensive discussion regarding the possibility of early assessment of the severity of acute pancreatitis (AP) based on contrast-enhanced computed tomography (CECT) data. [13]

Balthazar combined the previous grading system with the degree and presence of pancreatic necrosis to produce the CT Severity Index (CTSI) in 1990. Although the CTSI combination score had significant limitations, it turned out to have a superior predictive accuracy than the Balthazar score. The following development of organ failure, extra pancreatic parenchymal problems, or peripancreatic vascular complications did not substantially correlate with the index score [6,14]. Given these drawbacks, Mortele and colleagues proposed a simpler and modified CT scoring method in 2004 to see if the scores produced with this might be more correctly utilised to predict the clinical outcome. In comparison to the currently accepted Balthazar CT severity index, the modified Mortele CTSI was found to have similar interobserver variability and to correlate more closely with patient outcome measures, such as the length of hospital stay, the need for surgery or intervention, and the occurrences of infection, organ failure, and death [15].

Hence the present study was conducted to assess the prognostic correlation of patient outcome with currently accepted Balthazar and the Modified Mortele Computed Tomography severity indices in acute pancreatitis.

MATERIAL AND METHODS

The present prospective study was done among suspected cases of acute pancreatitis to department of radiology JNUIMSRC for CECT imaging during the study period of one year from 1-January 2024 to1 January 2025. Ethical permission was taken from institutional ethical committee before commencement of study. Patients were asked to sign an informed consent form after explaining them the complete procedure of research.

Through convenience sampling total 20 cases of suspected acute pancreatitis were taken for the study after matching the inclusion and exclusion criteria.

Inclusion Criteria- Patients with age above 18 years; patients with symptoms of acute pancreatitis as referred by physicians and patients willing to participate in the study.

Exclusion Criteria- Patients below the age of 18 years, patients underwent any kind of treatment for the same compliant in past and

those who were not willing to participate were excluded from the study.

The demographic and clinical history of patients was taken through a self prepared questionnaire having details like age, gender, BMI, chief complaint, present illness and past history of disease. The main laboratory investigation like CBC, blood sugar, amylase and lipase level were done in advance. The outcomes like length of hospital stay, need for surgery, evidence of infection, occurrence of organ failure and mortality rate were also noted down. The imaging modality test CECT was done for all the patients following the protocol. A three-phase (control, pancreatic parenchymal phase (40 seconds), and portal venous phase) protocol with positive oral contrast administration was used for the initial assessment of acute pancreatitis. The pancreatic parenchymal phase is the optimal phase for assessment for necrosis because normal pancreatic tissue enhances greatest during this phase. Subsequent imaging with CT was generally performed using a single-phase technique in the portal venous phase.

Assessment of severity of acute pancreatitis was done in all cases by Balthazar CTSI scoring [13] and Mortele Modified [16] CTSI scoring. Each case was assigned a CT grade from A to E and awarded points from 0-4 as in table 1 and table 2.

Table 1 Balthazar Scoring System

Grade A	Normal pancreas	0 point
Grade B	Focal or diffuse enlargement of the pancreas (including contour irregularities, non-homogenous attenuation of the gland, dilation of the pancreatic duct and foci of small fluid collections within the gland, as long as there was no evidence of peri-pancreatic disease	1 point
Grade C	Intrinsic pancreatic abnormalities associated with hazy streaky densities representing inflammatory changes in the peri-pancreatic fat	2 point
Grade D	Single ill defined fluid collection (phlegmon)	3 point
Grade E	Two or multiple, poorly defined fluid collections or presence of gas in or adjacent to the pancreas	4 point

The presence and extent of necrosis in each case was classified into four categories and awarded points from 0-6 as follows:
Necrosis absent 0 Points
< 30% necrosis 2 Points
30-50% 4 Points
> 50% necrosis 6 Points

The Balthazar CTSI was calculated by adding the above points in each case and the total score was then categorized as:
Mild pancreatitis CTSI score 0-3
Moderate pancreatitis CTSI score 4-6
Severe pancreatitis CTSI score 7-10

Table 2 Mortele Modified CTSI Scoring

Normal pancreas	0 point
Intrinsic pancreatic abnormalities with or without inflammatory changes in peripancreatic fat	2 Points
Pancreatic or peripancreatic fluid collection or peripancreatic fat necrosis	4 point

The presence and extent of necrosis in each case was scored from 0-4 as follows:
Necrosis absent 0 Points
< 30% necrosis 2 Points
> 30% necrosis 4 points
To the above score, 2 points were added for the presence of extrapancreatic findings.

The Modified CTSI was calculated by summing these values and the total score was then categorized as:
Mild pancreatitis Modified CTSI score 0-2
Moderate pancreatitis Modified CTSI score 4-6
Severe pancreatitis Modified CTSI score 8-10

The severity is classified into three categories based on clinical and morphologic findings according to revised Atlanta classification [5]

1. **Mild –** No organ failure and no local or systemic complications.
2. **Moderate –** Presence of transient organ failure less than 48h and/or presence of local complications.
3. **Severe –** Persistent organ failure > 48 hour

All the data was noted down in Microsoft excel sheet and results were analyzed. For statistical analysis, IBM SPSS version 25.0 (IBM Corp, Armonk, NY, USA) was utilised. The counts (n) and proportions (%) of the qualitative variables and the means (m) and standard deviations (SD) of the quantitative variables were used to do a descriptive analysis of the variables. Student t-test was used to analyse the data. The categorical variables were analysed using a χ-square test, and where the frequencies were less than or equal to 5, a Fisher's exact test was run. Every test had bilateral contrasts, and a significance level of $p < 0.05$ was deemed appropriate for all analyses.

RESULTS

Majority of the cases were categorized as mild pancreatitis (50%) according Balthazar CTSI score. Majority of the cases were categorized as severe pancreatitis (45%) using the Modified Mortele CTS score. According to revised Atlanta classification majority of the cases were categorized as mild pancreatitis (70%) as shown in table 2.

Table 1 Classification Of Patients According To Severity Of Acute Pancreatitis

Type of classification	Type of severity	Frequency (percentage)
Balthazar CTSI score	Mild	10 (50)
	Moderate	4 (20)
	Severe	6 (30)
Modified mortele CTSI	Mild	3 (15)
	Moderate	7 (35)
	Severe	9 (45)
Revised Atlanta classification	Mild	14 (70)
	Moderate	2 (10)
	Severe	4 (20)

Intervention, length of stay, Infection and organ system failure was significantly more (p-value = 0.001, 0.003, 0.002, 0.001 respectively) associated with mild grade and death were significantly associated with severe grade (p value-0.001) as shown in table 3.

Table 2 Relation of prognostic outcome with Balthazar CTSI score

Prognostic outcome	Mild (10) N (%)	Moderate (4) N (%)	Severe (6) N (%)	P value
Stay in hospital	2 (20)	1 (25)	2 (33.3)	0.001
Intervention	3 (30)	1 (25)	1 (16.6)	0.003
Surgical debridement	1 (10)	0	1(16.6)	0.235
Infection	2 (20)	1 (25)	0 ()	0.002
Organ failure	2 (20)	1 (25)	1 (16.6)	0.001
Death	0	0	1 (16.6)	0.001

Intervention, length of stay, Infection , organ system failure and death were significantly associated with severe grade ($p<0.05$) as shown in table 3.

Table 3 Relation of prognostic outcome with Modified mortele CTSI

Prognostic outcome	Mild (3) N (%)	Moderate (7) N (%)	Severe (9) N (%)	P value
Stay in hospital	0	2 (28.5)	2 (22.2)	0.002
Intervention	1 (33.3)	1 (14.2)	1 (11.1)	0.001
Surgical debridement	1 (33.3)	2 (28.5)	1(11.1)	0.238
Infection	1 (33.3)	1 (14.2)	1 (11.1)	0.001
Organ failure	0	1 (14.2)	2 (22.2)	0.002
Death	0	0	2 (22.2)	0.001

DISCUSSION

Imaging is a key component in the diagnosis and treatment of pancreatic disorders, which present with a wide range of symptoms. Simple x-rays, ultrasonography (USG), endoscopic ultrasound, endoscopic retrograde cholangiopancreaticography (ERCP), computed tomography (CT), magnetic resonance imaging (MRI), and magnetic resonance cholangiopancreaticography (MRCP) are among the imaging modalities available for the pancreas.

Compared to USG, computed tomography (CT) is more sensitive and accurate at both diagnosing and demonstrating the extent of a condition [17].

For the majority of patients, CT is an essential diagnostic technique for determining the aetiology of endocrine and exocrine pancreatic insufficiency. Of all the gastrointestinal illnesses, pancreatitis is one of the most complicated and clinically difficult [18].

The present study was done to assess the prognostic correlation of patient outcome with currently accepted Balthazar and the Modified Mortele Computed Tomography severity indices in acute pancreatitis at a tertiary care center among 20 patients.

Out of 20 patients 65% were male and 35% were females. The mean age of patients was 57.9 years and the main cause of AC was alcohol (45%) in our study. There were 32 (34.4%) females and 61 (65.6%) males in a prospective research by Block et al., with a male to female ratio of 2:1 [19]. The male to female ratio in Silverstein et al.'s prospective investigation of 102 patients was also 2:1 [20]. In line with the current study, Casas et al.'s analysis of 148 patients revealed that gallstones were the cause of acute pancreatitis in 57% of cases, alcohol overindulgence in 21%, and both in 5% of cases [21]. Alcohol and biliary calculi jointly accounted for 80–90% of the causes of acute pancreatitis, although the frequency varied among groups, according to Steinberg et al.[22]

In present study Balthazar CTSI score classified the majority of cases as mild pancreatitis (50%). Based on the Modified Mortele CTS score, the majority of cases (45%) were classified as severe pancreatitis. The majority of cases (70%) were classified as mild pancreatitis in the updated Atlanta classification. This study was quite comparable to one by Irshad Ahmad Banday et al. [23], in which acute pancreatitis was classified as mild in 22/50 (44%), moderate in 11/50 (22%) and severe in 17/50 (34%) patients when the Balthazar CT Severity Index was used.

Statistical significant relationship was found between intervention, hospital stay, infection, organ failure and death with severity of pancreatitis in our study when compared on the basis of two scoring system but more prominent and accurate association was present in Modified Mortele CTS score. This also correlated with the study by Irshad Ahmad Banday et al., which concluded that Modified CT Severity Index is a simpler scoring tool and more accurate than the Balthazar CT Severity Index [23]. The findings of our study were also found to be comparable to a study by Shivanand Melkundi et al., which demonstrated a stronger association between acute pancreatitis severity grades based on MCTSI and patient outcome metrics than acute pancreatitis severity grades based on CTSI [24].

Limitations - Contrast CT should not be used in patients with impaired renal function or in patients who are pregnant. The expense and radiation exposure made it impossible to do follow-up studies again. Patients received various treatments, which altered the course of their care.

The tiny sample size could have had an impact on the outcome. According to the updated Atlanta classification, CECT becomes helpful beyond the first week. But only clinical measures are helpful within the first week.

CONCLUSION

Improved contrast Computed Tomography (CT) is a highly effective diagnostic method for evaluating the severity of acute pancreatitis, detecting pancreatic necrosis, and showing local consequences. Compared to the Balthazar index, the scores acquired using the modified Mortele index demonstrated a greater association for all outcome measures in all patients.

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