Original Research Paper

Radio-Diagnosis

EVALUATION AND PROGNOSTIC CORRELATION OF ACUTE PANCREATITIS USING CT SEVERITY INDEX

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ABSTRACT **Background:** Of all abdominal emergencies, pancreatitis is one of the most complicated and clinically difficult. The preferred imaging technique for determining the severity of acute pancreatitis and its consequences is computed tomography (CT). **Aim:** To evaluate the clinical outcome of acute pancreatitis and prognostic correlation based on the CT severity index. **Settings and Design:** We included 30 patients with suspected acute pancreatitis attending department of Radio Diagnosis, KVG medical college and hospital during the study period (January 2022 to May 2022). All the patients were evaluated by contrast enhanced CT. The severity of pancreatitis was scored using CT severity index (Balthazar), modified severity index (Mortele) and revised Atlanta classification and the cases were classified into mild, moderate and severe. The outcome parameters studied were Length of hospital stay, Need for surgery or percutaneous intervention, incidence of infection or organ failure and death. **Results:** The age group of patients was 16 to 69 years with maximum patients (36%) between 25 and 35 years. Majority were males (81%). According to Modified CT Severity Index, 15% patients had mild, 42% patients had moderate and 43% had severe pancreatitis. Majority of the cases (44%) were categorized as severe pancreatitis according modified Mortele CT score. Majority of the cases were categorized as mild pancreatitis according Balthazar CTSI score and revised Atlanta classification. 38% patients are considered to have end organ failure. Hepatic failure is the most common system failure seen in 22% patients. 36% patients had evidence of systemic infection. 10% patients required surgical interventions. **Conclusions:** The score is simpler to calculate and the inter-observer variability is decreased using the modified CT severity index.

INTRODUCTION:

Acute pancreatitis is a difficult condition that manifests as acute stomach discomfort and increased pancreatic enzyme levels. Acute pancreatitis is typically a benign condition that responds to conservative treatment. In 10%–20% of instances, the illness is severe and may cause major morbidity and fatality, typically as a result of complications brought on by multi-system organ failure or septic necrosis.[1]

The clinician's job is to identify patients who will develop multi-organ system failure within a few hours of admission and to administer the necessary care, including fluid resuscitation, breathing support, and intensive care if required. Thus, a severity index rating can be useful in this effort.

Although there are a number of clinical scoring methods available for evaluating the clinical parameters of acute pancreatitis in both adults and children, no single clinical scoring system is capable of statistically significantly predicting the clinical prognosis. At this level, a severity ranking system based on computed tomography is used. Numerous studies with varied degrees of statistical significance have demonstrated the value of a CT-based severity assessment system in the context of acute pancreatitis.

The first step in this process was the creation of the CT rating system by Balthazar.[2] This score system was developed based on how the pancreatic inflammation appeared on the CT scan. Later, he and his team modified this grading system to include both the presence of necrosis and pancreatic inflammation, and they established the CT severity index (CTSI). Before Mortele[3] and his team produced the modified CT severity index, this CTSI was the most extensively used system (MCTSI). This scoring system made the CT scoring system more inclusive by factoring in the existence of additional pancreatic problems in addition to the pancreatic inflammation and necrosis.

With this background, the present aimed to assess the prognostic correlation of patient outcome with currently accepted Balthazar and the Modified Mortele Computed Tomography severity indices in acute pancreatitis.

METHODOLOGY

A cross-sectional study was conducted after approval of institutional ethical committee. The study was conducted in the department of Radiodiagnosis of KVG Medical College and Hospital, Karnataka, India. The study was conducted for 6 months.

A total of 30 patients were anticipated to be referred to the radiology department during the six-month research period with clinical/ laboratory/ ultrasonogram diagnosis of acute pancreatitis.

We included 30 patients who had been diagnosed with acute pancreatitis either clinical, laboratory, or ultrasonographic means and gave their agreement to take part in the trial. Patients with a known history of iodinated contrast agent allergies, deranged renal function tests (serum creatinine > 1.5 mg/dl after rehydration), chronic pancreatitis suggested by intraductal calculi, ductal stricture, and parenchymal calcification, as well as pancreatitic pathologies like pancreatic cancer and cysts, as well as patients with a history of pancreatitis surgery, were all excluded from the study. Pregnant ladies were also not included in our study.

A complete clinical examination was performed on each patient to evaluate them. The clinical information included demographic information, a thorough clinical history with the patient's presenting symptoms, a physical examination (both local and systemic) with measurements of the patient's temperature, pulse rate, blood pressure, respiratory rate, and icterus, as well as any history that might point to a possible etiology, such as pathology of gallstones, alcohol consumption, a history of abdominal trauma, drug use, any metabolic disease, or any recent surgical intervention or procedure.

Toshiba Alexion 16 slice and GE Optima 660 128 slice CT scanners were used for the CT examination. The abdomen

and pelvis were captured in the axial sections as plain and post-contrast pictures, and they were then reformatted in the sagittal and coronal planes. Before and after administration of oral (10-20ml water soluble contrast in 500-1000ml distilled water) and intravenous non-ionic iodinated contrast of 1.5-2ml/kg dose at 3-4ml/s, continuous serial axial sections of thickness 5mm, with interval of 5mm and large FOV in cranio-caudal direction were taken.

A variety of soft tissue window configurations were used to view each image. A senior consultant radiologist reviewed the photos after a senior resident reported them.

Pancreatitis cases were categorised into mild, moderate, and severe instances based on the severity of the condition as determined by the CT severity index, modified severity index, and revised Atlanta classification. In each case, the clinical outcome in our investigation was contrasted with the revised Atlanta classification, Modified Mortele's CTSI, and Balthazar's CTSI.

The outcome parameters studied were Length of hospital stay, Need for surgery or percutaneous intervention, incidence of infection or organ failure and death.

The data recorded was analyzed using the Statistical Package for Social Sciences (SPSS), 21 version. The associations were evaluated with the use of Student's t-test for quantitative variables and χ^2 tests for categorical variables. The level of significance was set at 5% for all significance tests. The sensitivity, specificity and accuracy for each of the findings were calculated.

RESULTS
The study included 30 patients with Acute Pancreatitis. They were followed up till discharge, death or AMA. Demographics and other etiologic and complications are summarized in table 1. The age group of patients was 16 to 69 years with maximum patients (36%) between 25 and 35 years. Majority were males (81%). The most common etiology for acute pancreatitis was alcohol and the most common complication was pleural effusion.

Table 1: Patients characteristics

Patient characteristics	Frequency (%)	
Age	<30 years	4 (13.3%)
	31 to 40 years	14 (46.7%)
	41 to 50 years	9 (30%)
	51-60 years	2 (6.7%)
	>60 years	1 (3.3%)
Gender	Males	23 (76.7%)
	Females	7 (23.3%)
Etiology	Alcoholic	16 (53.3%)
	Cholelithiasis	5 (16.7%)
	Others	9 (30%)
Extra pancreatitic complications	Ascites	3 (10%)
	Pleural effusion	5 (16.7%)
	Pleural effusion and ascites	4 (13.3%)
	Others	3 (10%)
	No complications	15 (50%)

According to Modified Mortele CT Severity Index, 16.7% patients had mild, 40% patients had moderate and 43.3% had severe pancreatitis.

Majority of the cases were categorized as mild pancreatitis according Balthazar CTSI score and revised Atlanta classification. (Table 2)

Table 2: Severity of pancreatitis using various scoring systems

Severity Scores	Mild	Moderate	Severe
Balthazar CTSI score	17 (56.7%)	9 (30%)	4 (13.3%)
Modified Mortele CTSI	5 (16.7%)	12 (40%)	13 (43.3%)
Revised Atlanta Classification	21 (70%)	3 (10%)	6 (20%)

The outcome parameters studied were Length of hospital stay, Need for surgery or percutaneous intervention, incidence of infection or organ failure and death. Length of hospital stay, organ failure and infection were significantly more associated with severe grade according to Balthazar CTSI and modified Mortele CTSI. Infection, organ system failure and death were significantly associated with severe grade [Table3 and 4].

Table 3: Patient outcome based on Balthazar CTSI

Outcome	Mild (n=17)	Moderate (n=9)	Severe (n=4)	p-value
Length of hospital stay	16.1±2.3	19.4±3.1	28.8±4.7	<0.001
Intervention/ debridement	1 (5.9%)	2 (22.2%)	1 (25%)	0.386
Organ Failure	2 (11.8%)	3 (33.3%)	3 (75%)	0.032
Infection	1 (5.9%)	2 (22.2%)	4 (100%)	0.002
Death	0	1 (11.1%)	1 (25%)	0.513

Table 4: Patient outcome based on Modified Mortele CTSI

| Outcome	Mild (n=5)	Moderate (n=12)	Severe (n=13)	p-value
Length of hospital stay	7.3±3.1	22.6±1.9	31.1±4.2	<0.001
Intervention/ debridement	0	1 (8.3%)	3 (23.1%)	0.599
Organ Failure	0	3 (25%)	5 (38.5%)	0.04
Infection	0	1 (8.3%)	6 (46.2%)	0.028
Death	0	0	2 (15.4%)	0.779

Cross tabulation was used to enter the modified Mortele CTSI severity grading and Balthazar CTSI severity grading, and the Pearson Chi square test was used to assess them both. The MCTSI and CTSI severity grading were significantly correlated (p=0.01) according to the Pearson Chi Square test. (Table 5)

### Table 5: Association between modified Mortele and Balthazar CTSI

|		Balthazar CTSI			Total
		Mild	Moderate	Severe	
Modified Mortele CTSI	Mild	4 (80%)	11(90.9%)	2 (15.4%)	17(56.7%)
	Moderate	1 (20%)	1 (9.1%)	7 (53.8%)	9 (30%)
	Severe	0	0	4 (30.8%)	4 (13.3%)
	Total	5(100%)	12 (100%)	13(100%)	30 (100%)

Chi-square value=13.25, p=0.01

The ROC curve demonstrated that modified Mortele CTSI was superior to Balthazar CTSI in predicting ICU admission, scoring 87% (79–94%) versus 76% (64–87%).
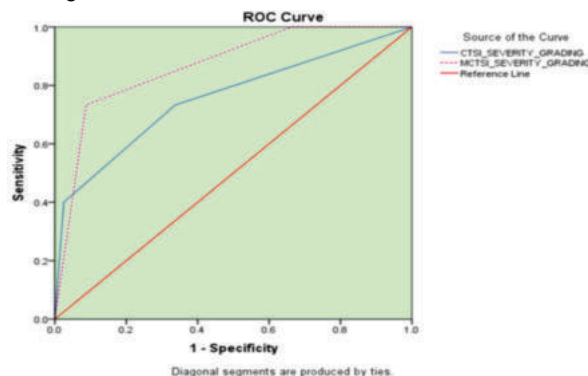
Figure 1: The ROC curve for predicting the ICU admission – A comparison of MCTSI and Balthazar CTSI
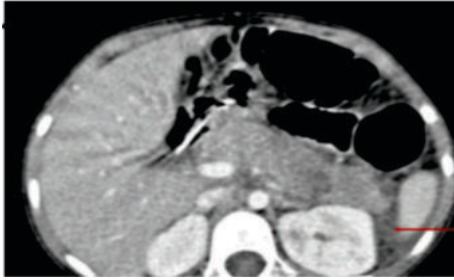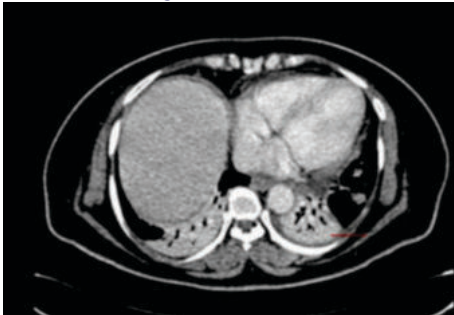
Bulky pancreas with heterogeneous enhancement
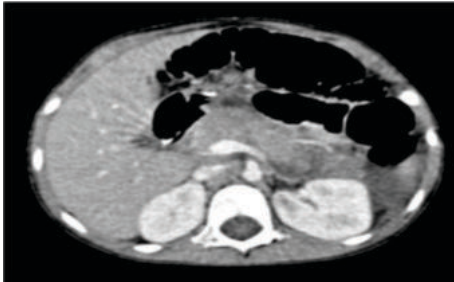
Bulky pancreas with mild ascites both Balthazar and modified CTSI score 4 suggestive of moderate pancreatitis.


Bulky, heterogeneous pancreas with peri pancreatic fat standing & few necrotic areas seen within pancreas (<30%), and thickened gerota's fascia


Minimal bilateral pleural collection and basal subsegmental atelectasis (red arrow) Balthazar CTSI score 6 and modified CTSI scores 8 suggestive of intermediate and severe pancreatitis respectively.

Diffusely edematous pancreas with peripancreatic fat stranding (green arrow), fluid collection (yellow arrow) and perinephric fascial thickening (red arrow).
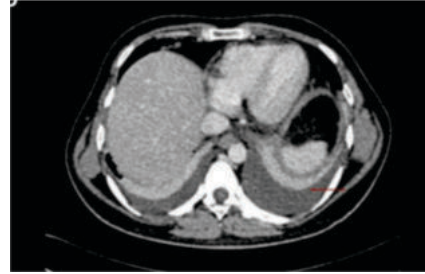
Bilateral pleural effusion and basal sub segmental atelectasis (red arrow) Balthazar CTSI score 5 and modified CTSI score 6 suggestive of intermediate and moderate pancreatitis respectively.
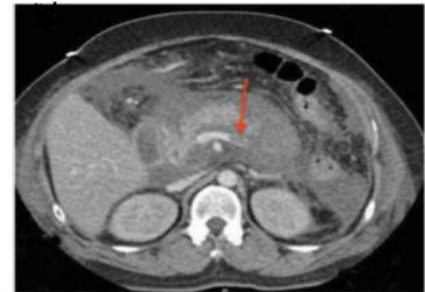
Acute necrotizing pancreatitis complicated by splenic vein thrombosis.

DISCUSSION:

In the study population, the Mortele CTSI severity index severity grading was used and evaluated. When the modified Mortele CTSI was used, the majority of the patients (43.3%) in our study population were categorised as having severe acute pancreatitis, while the majority (56.7% and 70%, respectively) were categorised as having mild when the Balthazar CTSI and Atlanta classification were applied. One possible explanation for this discrepancy is that whereas a single peripancreatic collection is maintained as mild AP in CTSI, it transitions to moderate AP in MCTSI. This conclusion that the majority of cases in the Balthazar CTSI were classified as mild is consistent with the study by Sameer Raghuwanshi et al.[4], in which the majority of patients (42%) were classified as mild AP when the Balthazar CTSI was used. However, the majority of the patients (44%) in their study were put in severe AP when the modified Mortele CTSI was used. Using the modified Mortele CTSI, 43.3% of the subjects in our study were classified as severe.

Cross tabulation was used to enter the modified Mortele CTSI severity grading and Balthazar CTSI severity grading, and the Pearson Chi square test was used to assess them both. The MCTSI and CTSI severity grading were significantly correlated (p=0.01) according to the Pearson Chi Square test. Length of hospital stay; organ failure and infection were significantly more associated with severe grade according to Balthazar CTSI and modified Mortele CTSI. Infection, organ system failure and death were significantly associated with severe grade. This is in contrast to the pioneer study conducted by Koenraad J. Mortele et al.[5] in which there was no significant association between CTSI and the occurrence of organ failure. Koenraad J. Mortele et al.[5]study showed similar results, with both modified Mortele CTSI and Balthazar CTSI showing significant association between the severity grading and the clinical outcome parameters except for that of the Balthazar CTSI and the occurrence of organ failure. Similar findings to ours were found in the study by Irshad et al.[6], which demonstrated a substantial correlation between the CT severity grading and clinical indicators such as length of hospital stay, type of intervention, likelihood of organ failure, and mortality. Both the MCTSI and CTSI indices shown a substantial correlation between the severity grading and the

clinical outcome indicators in the study by Thomas L. Bollen et al.[7], however unlike our investigation, theirs did not demonstrate any statistical superiority of MCTSI over CTSI. Their research revealed no distinction between MCTSI and CTSI.

CONCLUSION

Both the modified Mortele CTSI and the Balthazar CTSI demonstrated a strong correlation with the clinical outcome parameters of length of hospital stay, organ failure, and infection.In comparison to CTSI, modified Mortele CTSI performed better at predicting ICU admission. Modified Mortele CTSI is a reliable tool for predicting negative clinical outcomes in acute clinical settings.

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