# Utility of modified CT severity index for evaluation of acute pancreatitis and its correlation with clinical outcome: A cross sectional study

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**Abstract**
**Objectives:** This study was conducted to assess the prognostic value of MDCT in patients with acute pancreatitis and to correlate the MCTSI with clinical severity and outcome.
**Material and Methods:** A total of 45 patients with acute pancreatitis were included in the study. The radiological and clinical severity of the pancreatitis was scored using MCTSI and BISAP score respectively. Clinical outcome was scored using duration of hospital stay, surgical intervention, infection, end organ failure and death.
**Results:** In this prospective study of 45 patients, Pancreatic inflammation, necrosis and complications were found in 45%, 22%, 40% of patients respectively. MCTSI was classified as moderate (55.55%), severe (37.77%) and mild (6.66%). The mean MCTSI was not significantly high in the subgroup of patients who had infection (p value 0.448), organ failure (p value 0.807) and who underwent surgical intervention (p value 0.807). There was statistically significant correlation found between MCTSI and duration of hospital stay (p value= 0.013) and serum amylase values (p value = 0.007).
**Conclusion:** MCTSI is a very useful tool for the screening of patients with acute Pancreatitis, for the classification of severity accurately and to predict the clinical outcome.

**Keywords:** acute pancreatitis, modified CT severity index

## Introduction
Acute Pancreatitis is defined as an acute inflammatory process of the pancreas, caused by activation of the proteolytic enzymes within the gland [1]. In most cases, AP is mild and self limiting; however a fraction of patients develop a severe disease that can progress to systemic inflammation and cause pancreatic necrosis, multiorgan failure, and potentially death. Early, quick and accurate risk stratification of AP patients would permit evidence based early initiation of intensive care therapy for patients with severe AP. Many clinical scores have been developed including Ranson criterion, BISAP score and APACHE score for the evaluation and prognosticating patients with acute pancreatitis.

Clinical assessment by the clinician is poor in predicting the severity of acute pancreatitis on admission, and it fails to identify up to two-thirds of patients, who eventually develop complications or die [2]. Staging the severity of this disease and early recognition of severe cases are essential so that the most suitable treatment can be provided for each patient, with the aim of reducing morbidity and mortality. Although the initial diagnosis of acute pancreatitis is based upon the clinical and laboratory parameters, imaging plays a very important role in evaluation of these patients. The assessment of disease severity must be objective and early detection of pancreatic necrosis is the most important aspect in its management. This study was carried out to evaluate the efficacy of modified CT severity index in assessing the severity of acute pancreatitis and its correlation with clinical severity and outcome.

## Materials and Methods
The descriptive, cross sectional study was carried out in the Department of Radio diagnosis, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun over a period of 12 months. 45 patients who were diagnosed with acute pancreatitis were recruited from medical and surgical departments, after taking a proper written informed consent.

### Inclusion Criteria
▪ Patient with acute pancreatitis who underwent CECT abdomen.

### Exclusion Criteria
▪ Patients admitted with clinical suspicion of acute pancreatitis having normal findings on contrast enhanced MDCT.
▪ Pancreatitis due to trauma

### Equipment
Seimens Somatom Sensation multi detector computed tomography - 64 slice (MDCT).
All patients were scored using Modified CT severity index and BISAP score. Patient outcome taken into consideration on

basis of duration of hospital stay, need of surgical intervention, occurrence of infections, end organ failure and death. Correlation was estimated by using the percentage, frequency charts, chi sqaure test and pearson correlation.

## Results

The study group consisted of 32 male and 13 female patients (n=45). There was a male preponderance seen with a male to female ratio of 2.4:1. Minimum age was 18 years and maximum age was 85 years with the mean age being 40.68±12.99 years. The most common presenting complaint was abdominal pain (45/45) followed by vomiting (33/45). 10 patients presented with fever and 11 patients presented with jaundice. Diarrhoea was the least common presenting complaint. In the present study, gallstones were the most common cause of pancreatitis in 53.33% (24/45) of the patients. In the remaining 46.66% of patients (21/45), the causative factor was alcohol abuse. Amylase and lipase were elevated at presentation in 38 (84.44%) and 37(82.22%) patients respectively.

On the basis of MCTSI, patients were divided into three categories i.e. mild (0-2), moderate (4-6) and severe (8-10), which included 3 (6.66%), 25 (55.55%) and 17 (37.77%) patients respectively. Pancreatic necrosis was seen in all 17 patients with severe pacreatitis and none in mild group as per MCTSI, however 5/25 (20%) with moderate pacreatitis showed evidence of necrosis. Out of 22 patients with pancreatic necrosis, 12 patients (54.54%) had morbidity and 1 patient (4.54%) had mortality. The incidence of morbidity was lower in patients without necrosis being 43.47% and none of these patients showed mortality. All of the patients (100%) with acute pancreatitis showed evidence of pancreatic inflammation on MDCT in our study; extra pancreatic complications (fig 1) in the form of pleural effusion, ascites, vascular complications, parenchymal complications, or gastrointestinal tract involvement were seen in 40 patients (88.88%) however only 22 patients (48.88%) showed evidence of pancreatic necrosis. Pancreatic pseudocyst was seen in 3 cases (6.66%), however none of the cases had evidence of pancreatic abscess. As far as extra pancreatic complications are concerned, all the 17 patients (100%) having severe pancreatitis and 22 patients (88%) having moderate pancreatitis had one or other extra pancreatic complication, where as 1 patient (33.33%) with mild pancreatitis showed evidence of extra pancreatic complication. The mean duration of hospital stay of our study group was 9.05 ± 4.75 with a range from 4 to 28 days; amongst these the mean duration of hospital stay of patients having severe pancreatitis as per MCTSI was 10.7 ± 3.83 which was statistically significantly higher as compared to patients having moderate and mild pancreatitis (p value = 0.025). Occurrence of infection, organ failure and requirement of surgery are indicators of bad clinical outcome (Table 1, fig 2). Patients were divided into two groups depending upon the presence or absence of Infection and organ failure, mean MCTSI score was significantly higher in the group of patients having infection and organ failure (p value = 0.001 and 0.003 respectively). The mean MCTSI of the two groups divided based on the requirement of surgical intervention however showed no statistically significant difference (p value =

0.571). Correlation was determined keeping MCTSI as dependent variable and duration of hospital stay, BISAP score, TLC, serum amylase, lipase, LDH, creatinine and bilirubin as predictor variables; there was significant positive correlation found between MCTSI and duration of hospital stay (p value = 0.019) and BISAP score (p value = 0.030), however there was no statistically significant correlation seen with TLC (p value = 0.634), serum amylase (p value = 0.07), serum lipase (p value = 0.993), serum LDH (p value = 0.746), Serum creatinine (p value = 0.252)and serum bilirubin (p value = 0.219).(Table 2).

**Table 1:** Comparison of patients with pancreatic complication and adverse clinical outcome with severity according to MCTSI

|  | Mild | Moderate | Severe |
|---|---|---|---|
| Pancreatic Necrosis (n=22) | 0 | 5 (20%) | 17 (100%) |
| Pancreatic Inflammation (n=45) | 3 (100%) | 25(100%) | 17(100%) |
| Extra Pancreatic Complications (n=40) | 1 (33.33%) | 22 (88%) | 17 (100%) |
| Surgical Intervention (n=7) | 0 (0%) | 5 (20%) | 2 (11.7%) |
| Infection (n=23) | 1 (33.33%) | 11 (44%) | 11 (64.7%) |
| Organ failure (n=7) | 0 (0%) | 2 (8%) | 5 (29.4%) |

**Table 2:** Showing correlation between MCTSI and duration of hospital stay, BISAP score, hematological and biochemical markers or disease severity

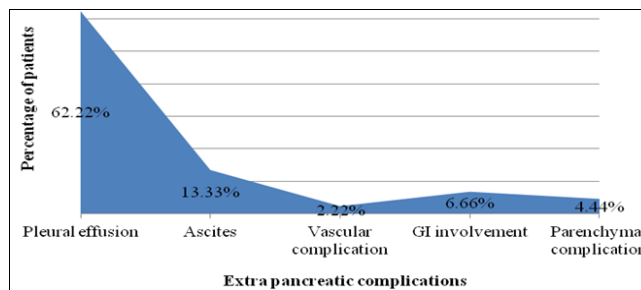| Predictor variables | Dependent variable MCTSI | |
|---|---|---|
|  | r value | p value |
| Duration of hospital stay | 0.350 | 0.019 |
| BISAP score | 0.324 | 0.030 |
| TLC | -0.73 | 0.634 |
| Serum amylase | -0.266 | 0.07 |
| Serum lipase | -0.001 | 0.993 |
| Serum LDH | 0.050 | 0.746 |
| Serum Creatinine | 0.174 | 0.252 |
| Serum Bilirubin | 0.187 | 0.219 |



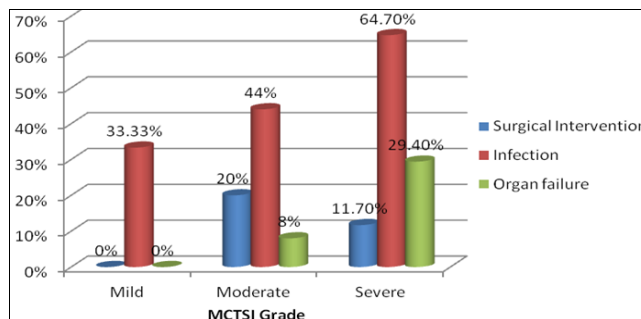**Fig 1:** Percentage of patients with extra pancreatic complications



**Fig 2:** Bar diagram depicting comparison of patients with adverse clinical outcome with severity according to MCTSI
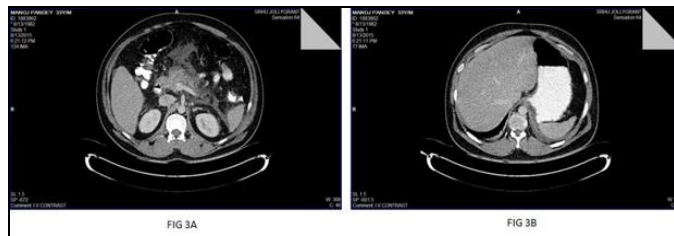
**Fig 3A and 3B:** showing thickening of Gerota's fascia with bilateral pleural effusion
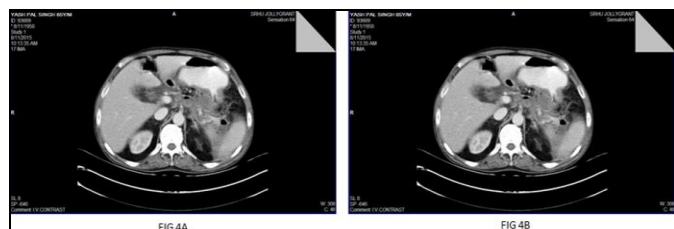


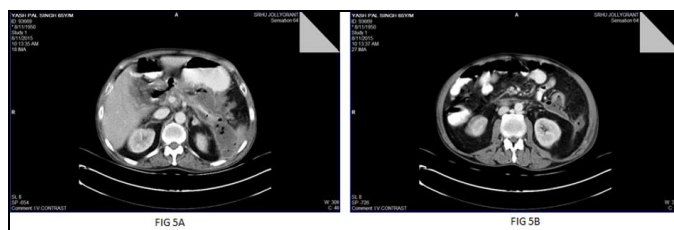**Fig 4 A and 4B:** showing Bulky pancreas with Peripancreatic fat stranding with few hypodense areas in tail



**Fig 5A and 5B:** Showing Per pancreatic and per splenic fluid collection with thickening of Gerota's and latero-conal fascia

## Discussion

During the last two decades, management of severe acute pancreatitis has changed from a more aggressive surgical intervention towards a more conservative approach, except when infected necrosis has been confirmed. Hence it is very important from the treatment aspect to assess the severity of acute pancreatitis and the presence of necrosis by CECT.

The present study included patients between the age of 18 to 85 years. Mean age of presentation is 40.68 years in our study population. 62.22% patients were between the age group of 26-45 years. The higher incidence of acute pancreatitis could be attributed to the fact that there is high prevalence of alcoholism. This study is in concordance with the study done by Balthazar et al. [3], Jauregui et al. [4] and Bollen et al. in which average age was 45 years [5].

Male: Female ratio on our study was 2.4:1 with 32 male patients and 13 female patients which constituted 71.11% and 28.88% patients respectively. Study conducted by Balthazar et al in 1985 showed 75% patients were male [3]. Another study conducted by Kim et al in 2008 showed the similar prevalence of acute pancreatitis among males (70%) [6]. Higher incidence in males can be attributed to more alcohol consumption by males.

In our study, biliary calculi was the most common causative factor for acute pancreatitis (53.3%). Alcohol was responsible for 46.66% cases of acute pancreatitis. Our study was in comparison to the study conducted by Bohidar et al. in the year 2003 with 48% patients having pancreatitis due to biliary

disease and 28% due to alcohol abuse [7]. Similar studies done by Bollen T L et al. [5] and Jauregui et al. [4] showed biliary stones as the predominant etiological agent. This may be attributed to geographical distribution and the prevalence of gall stone disease or alcohol abuse in the population studied. Our study had different subset of patients in mild, moderate and severe categories according to MCTSI in comparison to the studies done by Mortele et al. [8] in 2004 and Bollen et al. [5] in 2011, with lesser number of patients with mild pancreatitis and more number of patients in moderate and severe pancreatitis. The explanation to this can be that our hospital being a tertiary centre, more number of severe cases were referred to us.

Our study showed Pleural effusion was the most common extra pancreatic complication, present in 28 cases (62.22%) which was predominantly left sided (18 out of 28 cases; 64,38%), followed by ascites which was observed in 6 cases (13.33%), vascular complication was least common, present only in 1 case (2.22%), similar results were observed by banday et al. In their study the most common extra pancreatic complication in the study group was pleural effusion found in 28 (56%) patients [9]. This observation tallies with Mortele et al., who also found that the commonest extrapancreatic abnormality was left pleural effusion [8].

In our study, none of the patients who had mild pancreatitis according to MCTSI scoring underwent surgical intervention. Surgical intervention was required in 7 patients (15.55%). These patients underwent necrosectomy. 5 out of these 7 patients had moderate pancreatitis (20%) and 2 had severe pancreatitis (11.7%). In contrary, the study conducted by Bollen et al showed more number of patients who underwent surgical intervention. In their study 2 (3%) patients with moderate and 17(49%) patients with severe MCTSI underwent surgical intervention [5]. Present study demonstrated that pancreatic necrosis is directly related to the severity of acute pancreatitis. None of the patients with mild pancreatitis showed pancreatic necrosis. Out of the 22 patients with evidence of pancreatic necrosis, 7 patients had necrosis involving more than 30% of pancreatic parenchyma. In 15 patients degree of necrosis was less than 30%. Out of the total 17 patients with severe pancreatitis, in 10 patients the degree of necrosis was less than or equal to 30%. Remaining 7 patients had necrosis of more than 30%. The extent of the necrosis was more in patients with severe pancreatitis.

Out of 22 patients with pancreatic necrosis, 12 patients (54.54%) had morbidity and 1 patient (4.54%) showed mortality. The incidence of morbidity was lower in patients without necrosis being 43.47% and none of these patients showed mortality. In our study the only mortality seen was in severe pancreatitis group, similar results were observed by raghuvanshi et al, who found that 83.33% mortality belonged to severe pancreatitis group where as only 16.7% mortality was seen in moderate pancreatitis group as per modified CTSI [10]. On Comparing the modified CT severity index with the patient outcome we found that the mean duration of hospital stay was significantly longer in patients with severe pancreatitis (p value = 0.025). Long duration of hospital stay as an indicator of clinical severity and poor clinical outcome was well correlated with high MCTSI score seen in severe pancreatitis. Mortele et al. [8], Bollen et al. [5] and Raghuvanshi

*et al.* [10] in their respective studies also concluded that patients having severe Pancreatitis as per MCTSI required longer hospital stays.

There was no significant difference seen in the mean MCTSI score in the two subgroups of patients divided based on the requirement of surgical intervention. This result also very much favoured the precise predictive value of MCTSI as far as clinical outcomes are concerned. On the other hand requirement of surgical intervention did not show favouring association with MCTSI, possibly due to the fact that most of the patients are being managed conservatively these days.

BISAP score is a validated tool for clinical severity and outcome in patients with acute pancreatitis; it was positively correlated with MCTSI in our study which is suggestive of the fact that MCTSI can very well predict the patient outcome and clinical severity in acute pancreatitis, similar results were also found by Manoharan *et al*, who concluded that BISAP and MCTSI were correlated well for mortality with high positive value of 0.904 which was highly significant (0.01) [11].

Our study also had couple of limitations; the sample size was inadequate to evaluate mortality and morbidity prediction based on CT criteria. The patients with both alcohol and gall stone pancreatitis were included although patients with alcoholic pancreatitis have poorer prognosis.

**Conclusion**

CT as a non invasive investigation is a useful tool in assessing the severity of pancreatitis and should be performed in all patients with acute pancreatitis. MCTSI is an indispensable tool for the screening of patients with acute pancreatitis, for the classification of severity accurately and to predict the clinical outcome in the form of occurrence of infection and organ failure as well. Modified CT severity index as an early evaluation tool has a very good predictive value in assessing the patient outcome in the form of duration of hospital stay, morbidity and mortality.

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