

Modified Computed Tomography Severity Index and its relation to prognosis of acute pancreatitis at a tertiary care hospital of Peshawar

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ABSTRACT

Introduction: Acute pancreatitis is diagnosed by medical history, physical examination, and typically a blood test for the pancreatic enzymes amylase and/or lipase, whose levels are usually elevated to 3 times beyond normal values. Despite this, if the diagnosis remains uncertain, abdominal Computed Tomography (CT) is performed.

Objective: To evaluate the modified computed tomography severity index (MCTSI) and its relation to prognosis in acute pancreatitis.

Materials & Methods: A cross sectional study was conducted in January 2019 based on retrieved hospital data of the Department of Surgery, Rehman Medical Institute, Peshawar for the years 2016 to 2018, on all patients diagnosed as first time acute pancreatitis who underwent spiral CT with intravenous contrast within 4 days of onset of symptoms. Descriptive data analysis was carried out using SPSS 22.0.

Results: The MCTSI scoring showed that the age group 60 and above were affected by acute pancreatitis and its complications and gender wise in that age group female were affected the most. Results showed that the score <6 showed good prognosis with very little mortality rate and that also depending on what kind of pancreatic and extra pancreatic complication they developed and also >6 had poor prognosis and the mortality rate was as high as 30%.

Conclusion: The Modified CT Severity Index is a simpler scoring tool, in this study, it had a stronger statistical correlation with the prognosis of acute pancreatitis.

Keywords: Diagnostic Imaging; Tomography, Emission-Computed; Pancreatitis, Acute Necrotizing; Amylases.

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INTRODUCTION

Acute pancreatitis is the sudden inflammation of the pancreas ranging from mild to life threatening, but more commonly subsides over time. Gallstones and alcohol abuse are the main causes; additional causes include abdominal surgery, cigarette smoking, cystic fibrosis, family history of pancreatitis, and hypercalcemia. In Pakistan, gallstones are the leading cause.¹ Severe abdominal pain is the predominant symptom. Blood tests and imaging procedures such as Computed Tomography help to diagnose the condition. Whether mild, moderate, or severe, acute pancreatitis usually requires hospitalization.²

Despite great advances in critical care medicine over the past 20 years, the mortality rate of acute pancreatitis has remained at around 10%. The relative inaccessibility of the pancreas often makes diagnosis of pancreatic problems difficult, and delays treatments. There are no easy ways to see the pancreas directly without surgery, and available imaging studies are often inadequate.

Diagnosis of acute pancreatitis usually requires a detailed medical history, physical examination, followed by confirmation through a blood test for pancreatic digestive enzymes such as amylase or lipase, because these enzymes can be elevated up to 3 times the normal during the acute disease.¹ If the enzyme levels remain normal, as can happen at times, the diagnosis becomes uncertain.

Due to the unpredictable course and outcome of the disease, and the importance of early identification of patients likely to undergo a fulminant course, Balthazar et al (1990)³ developed the Computed Tomography Severity Index (CTSI) to demonstrate the applicability of Computed Tomography (CT) criteria for predicting patient mortality in acute pancreatitis; however, this study was limited to a few patients and subsequent studies showed equivocal findings and insufficient correlation with clinical outcomes.

The hypothesis as to whether the CTSI, performed within 48 hours post-admission, could be prognostic for morbidity and mortality, and thereby also predict the necessity for admission to the Intensive Care Unit (ICU) was tested and found useful in a prospective observational study.⁴

Numerous grading systems with sensitivities of about 70% are commonly used today as indicators of organ failure and disease severity. Contrast material-enhanced computed tomography is used in addition to help evaluate local pancreatic morphology and the presence and extent of pancreatic necrosis.⁵

The revised Atlanta classification system, introduced in 2015, better defined the clinical diagnosis, Computed Tomographic (CT) manifestations and disease course of acute pancreatitis into two morphologic subtypes. In terms of the clinical outcomes, all of the patients with mild AP according to the 1992 Atlanta classification showed improvement. But, 11 patients (5.4%) with severe AP according to the 1992 Atlanta classification showed no improvement. They comprised 5.4% of the patients with severe AP. All of the patients with mild AP and moderately severe AP according to the revised classification showed improvement. However, those 11 patients who showed no improvement comprised 64.7% of the patients with severe AP according to the revised classification⁶

CT grade was sensitive for predicting outcome in acute pancreatitis. Pancreatic necrosis, estimated on early, contrast-enhanced CT and seen only in patients having severe disease, was a specific predictor of morbidity and mortality.^{7,8}

The Modified CT Severity Index (MCTSI)⁹ is an extension of the original CT severity index (CTSI) was developed by Balthazar and colleagues in 1990 for distinguishing mild, moderate and severe forms of acute pancreatitis.

The original CT severity index has been followed internationally and has been very useful. However, it has several limitations:

- It has been found that complications like organ failure, do not correlate well with the score given by original CTSI.
- Inter-observer variability with original CTSI can result in different scores for the same patient.
- It has been observed that patients with >30% necrosis have similar morbidity and mortality, thus including an additional 50% in the score was not practically useful.

These limitations have resulted in the creation of the modified CTSI which correlates more closely with patient outcome in terms of duration of hospital stay and development of organ failure.⁹

Studies have compared the four prevailing scoring systems for validity and predicting outcomes in acute pancreatitis. These include the Bedside Index for Severity in Acute Pancreatitis (BISAP), the Ranson's scoring system, the Acute Physiology, Age, and Chronic Health Evaluation II (APACHE-II), and the CTSI.

According to a study from India,¹⁰ in which a total of 119 consecutive patients with acute pancreatitis of whom 76 (63.9%) were having their first attack of acute pancreatitis were included with mean age of 38.94 ± 14.59 years, male majority of 70.6%, and mean BMI of 29.20 ± 3.21 kg/m², alcohol at 40.3% was the most common cause of acute pancreatitis, followed by gall stones at 31.1%; mortality of 10.1% ($n=12$) was observed. The study concluded that BISAP was the most accurate in predicting mortality with a sensitivity of 100% and a specificity of 69.2%.

However, CTSI was the most accurate in predicting pancreatic necrosis, with an AUC of 0.958.¹⁰

There is a study comparing CTSI and MCTSI;¹¹ significant correlation between the need for surgical or percutaneous interventions and the severity of pancreatitis was seen with both the CTSI ($p=0.0324$) and the MCTSI ($p=0.0112$). Similarly, the presence of infection was correlated with higher scores on both the CTSI ($p<0.0001$) and the MCTSI ($p<0.0001$). For both outcome parameters, however, a stronger correlation was seen with the modified index than with the Balthazar index.

The observers graded the morphologic severity of pancreatitis as mild in 136 (69%), moderate in 41 (21%), and severe in 19 (10%) cases. Interobserver agreement between the two observers was 0.85 (95% CI, 0.80–0.90), indicating excellent agreement.

For the MCTSI, the morphologic severity of pancreatitis was graded as mild in 86 (44%), moderate in 75 (38%), and severe in 35 (18%) cases, with interobserver agreement of 0.90 (95% CI, 0.85–0.95), also indicating excellent agreement. Both CT indexes were also compared with the APACHE II index.¹¹

In the original study of Mortele et al (2004),⁹ a significant correlation ($p=0.0024$) was seen between the MCTSI and the development of organ failure, but the CTSI did not correlate significantly with the development of organ failure ($p=0.0513$).

A study at a tertiary care hospital of Jammu¹² about the correlation of modified CT severity index and its relation to the clinical outcome of acute pancreatitis where cholelithiasis related acute pancreatitis was seen in 40% cases and alcoholic pancreatitis was seen in 36% of cases (together accounting for 76% of cases), majority of patients (44%) were categorized as severe pancreatitis, 38% patients were grouped into moderate pancreatitis, and 18% were categorized as mild pancreatitis. The outcome parameters in terms of length of hospital stay, need of intervention, development of infection, and development of organ failure were more in patients with higher MCTSI.¹²

According to another study which was conducted at Burla, Odisha, India, modified CT severity score was found to be significantly correlated with organ failure ($p<0.002$), systemic infections ($p=0.001$), and duration of hospital stay ($p=0.01$). The inclusion of extra pancreatic parenchymal complications in the MCTSI makes it a better prognostic indicator than CT severity scoring, used earlier, for assessing adverse clinical outcomes in patients with acute pancreatitis.¹³

According to studies in India^{10,14} the conclusion was that the prognostic performance of various clinical and radiological scoring systems in acute pancreatitis is comparable with BISAP having the highest accuracy for predicting Persistent Organ Failure (POF) and mortality.

There is a perceptual rise in the incidence of pancreatitis in this part of the world as it has very common causative factors, but there is no documented study regarding this topic in Khyber Pakhtunkhwa province. The study will be of help in relating the prognosis score to CT severity index and will provide guidelines for patient care considering the local environment based on the degree of conformity of results with the global literature.

MATERIALS & METHODS

A cross-sectional descriptive study was conducted in January 2019 at the Department of Surgery, Rehman Medical Institute, Peshawar, Khyber Pakhtunkhwa, Pakistan on data retrieved from patient records for the duration of January 2016-December 2018. The main focus of data collection was patients diagnosed with acute pancreatitis, and included all patients with the diagnosis of first-time acute pancreatitis who underwent spiral CT with intravenous contrast within 48 hours of admission. A modified CT severity index scoring criteria was used to assess the prognosis of acute pancreatitis. Data were entered through a structured Performa and analyzed by SPSS 22.0 for descriptive statistics.

Modified CTSI

The MCTSI was used for this study.⁹ Scores are generated by estimating pancreatic inflammation and necrosis to give a score out of 10.

The following table provides the scoring criteria.

Table 1: Scoring criteria for the MCTSI scores.⁹

MCTSI Score	Pancreatic Condition
Pancreatic Inflammation	
0	Normal Pancreas
2	Intrinsic pancreatic abnormalities with or without inflammatory changes in peripancreatic fat
4	Pancreatic or peripancreatic fluid collection or peripancreatic fat necrosis
Pancreatic necrosis	
0	None
2	30% or less
4	More than 30%
Extra pancreatic complications	
2	One or more of pleural effusion, ascites, vascular complications, parenchymal complications and/or gastrointestinal involvement

The score is as such:

- Mild Acute Pancreatitis: 0-2
- Moderate Acute Pancreatitis: 2-4
- Severe Acute Pancreatitis 6 and above

In modified CT severity index, the extra pancreatic organ/tissue involvement is also studied.

RESULTS

Data of 199 patients of acute pancreatitis were retrieved and analyzed. Ages of patients included in the study ranged between 17-80 years. In Table 2 is given the gender and age distributions of patients; 106 (53.3%) were males and 93 (46.7%) were females.

Table 2: Distribution of pancreatic condition by gender and age groups (n=199).

Characteristic	Pancreatic Inflammation	Pancreatic Necrosis	Extra Pancreatic complications
Gender			
Male	106 (100%)	32 (30.1%)	50 (47.2%)
Female	93(100%)	12 (12.1%)	55 (59.1%)
Age (years)			
Below 20	23	5	11
21-30	8	0	3
31-40	18	0	8
41-50	42	19	27
51-60	47	18	28
61 and above	61	2	28

Figure 1 gives the results of acute pancreatitis categories following the MCTSI scoring criteria. Out of 199 patients, 13% had mild pancreatitis, whereas majority were falling in the moderate pancreatitis category (71%). Only 16% cases were in severe acute pancreatitis.

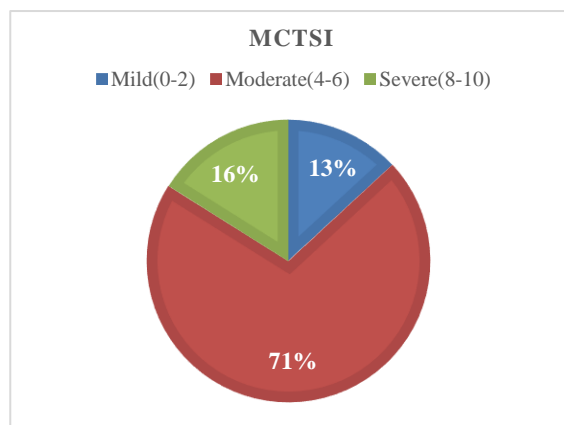


Figure 1: Distribution of acute pancreatitis categories based on the MCTSI scoring criteria (n=199).

A significant association was observed between pancreatic inflammation and patients aged 61 and above with ($p=0.009$), the major contributor being the female gender (46.7%).

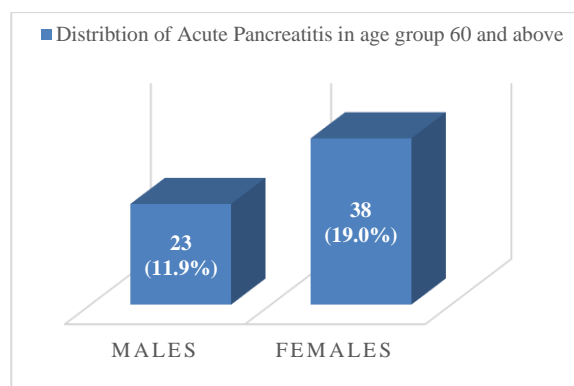


Figure 2: Distribution of Acute Pancreatitis in above 60 age group (n=61).

DISCUSSION

Acute pancreatitis is becoming one of the leading cause of morbidity in recent years, its incidence rising with the passage of time yet the exact cause of this increase is not determined. In Pakistan¹ the leading cause of pancreatitis are as follows; idiopathic (48%), gall stones (30%), dyslipidemia (20%), traumatic (2%). Acute pancreatitis can be diagnosed via various techniques and investigations. The introduction of the CT severity index in 1990 was a significant advance in the assessment of patients with acute pancreatitis; however, a new criterion of scoring was introduced called Modified CT Severity Index which is done after 48 hours of hospital admission and has better correlation with clinical outcomes. In the present study, MCTSI was used instead of CT or combination of CT and MCTSI, because the only difference in statistical significance between CTSI and MCTSI may be attributed to the inclusion of extra pancreatic complications in the MCTSI system.

The MCTSI provided important information regarding the prognosis and severity of the disease. According to the present study, 16% patients were having mild disease, 71% were having moderate disease, and 13% were having severe disease. In general, the study showed the maximum cases to be of moderately diseased patients while in contrast, a study conducted at Jammu hospital in 2013,¹² when using the Modified CT Severity Index, a much larger number, viz. 22/50 (44%) patients were placed in the severe pancreatitis group and 9/50 (18%), 19/50 (38%) patients as mild and moderate pancreatitis respectively. The Balthazar CT Severity Index graded 22 (44%) patients into the mild group while the Modified CT Severity Index, only considered 9(18%) of these patients to be in this group. That study used the Balthazar score along with the MCTSI.¹²

According to the present study the mean age of disease distribution was 48.97 ± 16.18 years; according to a study done at Basaveshwar hospital, Gulbarga, India,¹⁵ the mean age of patients was 41.25 ± 14.17 years. Maximum number of patients were falling in the age group of 31-40 years (28%). Next in the line of maximum disease distribution was 41-50 which was 21%.

Studies have reported strong correlation between CT evaluation and clinical severity of acute pancreatitis. In the present study, patients in the mild group showed good outcome and only a few of them needed very aggressive treatment otherwise the patient had a good prognosis; likewise, the patients in the moderate group showed good outcomes as well, perhaps due to the mild precipitating factors of acute pancreatitis or because of the treatment provided to them in our hospital. The mortality in the mild diseased group was nil, and in moderate was 2-3%, while the patients in severe group the mortality increased to 30%, as the involvement of the extra pancreatic tissues and the necrosis of the pancreas make the prognosis grave. Peri-pancreatic inflammatory changes were found in all patients. The need of hospital stay, percutaneous or surgical intervention and the occurrence of infection all depend on the MCTSI scoring criteria.

LIMITATIONS

The limitations of the study were loss of follow up on the patients, and the lack of a large sample size that would allow better generalization.

CONCLUSION

The Modified CT Severity Index is a simpler scoring tool that provides robust measures for prognosis of acute pancreatitis.

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