

A study to evaluate acute pancreatitis using modified CT severity index and correlating with clinical outcome in tertiary care hospital

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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 CT Severity Indexes with clinical outcome. **Material and Methods:** 60 patients diagnosed with acute pancreatitis who underwent contrast-enhanced MDCT within 3 days of the onset of symptoms during the study period were included in the study. The severity of the pancreatitis was scored using both the modified CT severity indexes and CT severity indexes. Patient clinical outcome was scored using parameters such as: mean duration of hospital stay, the need for surgical intervention, occurrences of infection, end organ failure and death. For both the CT and modified CT severity indexes, correlation between the severity of the pancreatitis and patient outcome was estimated using the percentage, frequency charts and chi-square test. **Results:** When applying the modified index, the severity of pancreatitis and the following parameters significantly correlated than the CT severity index: the length of the hospital stay (2-23 days), the occurrence of end organ failure (28/60 patients) (modified CT severity index [$p < 0.001$] vs CT severity index [$p = 0.035$]). Highly significant correlation between the grading of severity of pancreatitis and the prediction of systemic infection (21/60 patients) was seen using the modified CT severity index ($p = 0.001$), not the CT severity index ($p = 0.172$). There was no significant correlation between grading of severity of pancreatitis based on the modified CT severity index and the need for the surgical intervention (modified index [$p = 0.117$] vs CT severity index [$p = 0.017$]). **Conclusion:** There was highly significant correlation between the MCTSI score and the prediction of end organ failure, systemic infection and duration of hospital stay than CTSI score. 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 when used before three days of symptom onset.

Key Word: Computed Tomography, Modified CT Severity Index, Acute Pancreatitis

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INTRODUCTION

Acute pancreatitis is a process of acute inflammation of pancreas usually caused by biliary stone, alcohol ingestion, metabolic factors and drugs. Abdominal pain is

the major symptom of acute pancreatitis. It is generally classified into mild and severe forms. Mild pancreatitis, also called as interstitial or edematous pancreatitis is associated with minimal organ failure and an uneventful recovery¹. Severe pancreatitis also called as necrotizing pancreatitis occurs approximately in 20% of the patients and is associated with organ failure or local complications, including necrosis, infection or pseudocyst formation². The diagnosis is usually established by leukocytosis, elevated serum amylase, serum lipase. A computed tomography (CT) scan confirms the clinical impression of acute pancreatitis. The assessment of the severity of acute pancreatitis has a significant role in management. Mild pancreatitis responds well to the supportive therapy, whereas severe pancreatitis requires intensive monitoring and specific treatment.²the aim of

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this study is to determine whether early CT is effective in assessing the severity of acute pancreatitis and in predicting the prognosis and clinical outcome in these patients. To study the prognostic value of MDCT in acute pancreatitis. To correlate CT severity indexes with clinical outcome

MATERIALS AND METHODS

Study design: Prospective Observational study

Study setting: Department of radio diagnosis, K.S. Hegde Hospital, Mangalore

Study period: The study was conducted from October 2012 to October 2013

Sample Size: 60 subjects

Sampling Methods: Purposive sampling Method of collection of data Patients admitted to K.S.HegdeHospital with clinical impression of acute pancreatitis who underwent contrast enhanced MDCT during study period within three days of admission were included in the study. All scans were done using GE Bright speed 16 - slice MDCT with 120 KVp and 300 m A with 5 mm slice thickness. Bolus tracking method is used for post contrast scan with the tracker placed in the descending aorta at the level of dome of diaphragm. 70-80 ml of 350mg/ml non ionic iodinated contrast (IOHEXOL) was injected using pressure injector at the rate of 3-4ml/sec. Threshold set at 150 Hounsfield units(HU) and delay of 3 seconds was given after the attainment of threshold for arterial phase. Venous phase acquired after a delay 60 seconds from the time of contrast injection. Scanning was done in cranio-caudal direction in arterial and venous phases; from the level of diaphragm to aortic bifurcation in the arterial phase and from the level of diaphragm to the level of pubic symphysis in the venous phase. Images were retro reconstructed with 1.25 mm slice thickness and reformatted in sagittal and coronal planes for analysis. The severity of pancreatitis was scored using modified CT severity index and classified into three categories (mild, moderate and severe). The modified index is a 10 point scoring system derived by assessing the degree of pancreatic inflammation (0 to 4 points) pancreatic necrosis (0 to 4 points) and extrapancreatic complications (0 or 2 points). Clinical outcome parameters included the length of hospital stay, the need for surgical intervention and the occurrence of infection, organ failure and death.

Inclusion criteria

- Patients admitted with clinical suspicion of acute pancreatitis who underwent contrast enhanced MDCT within three days of admission.

Exclusion criteria

- Patients admitted with clinical suspicion of acute pancreatitis who did not undergo contrast enhanced MDCT.

- Pancreatitis due to trauma.

Statistical methods: Data entry and management was done in excel, pre-determined data format have been introduced as datasets which was incorporated into a single master computer at the base. The data sets were transferred into SPSS after data cleaning and recoding with data definitions. Results on continuous measurements are presented on Mean ± Standard Deviation and results on categorical measurements are presented in Number and percentage. Significance is assessed at 5% level of significance. Chi-square/Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. The Statistical software namely SAS 9.2, SPSS 19.0, Stata 10.1, were used for the analysis of the data and Microsoft Word and Excel have been used.

RESULTS

In our study Out of 60 subjects 42(70%) were male and 18 (30%) were females.

Table 1:- Distribution of subjects according to Age group.

Age Group	Number of subjects
21-30yrs	11 (18.33%)
31-40yrs	22 (36.66%)
41-50yrs	14 (23.33%)
51-60yrs	7 (11.66%)
>60yrs	6 (10%)

In our study patients age group ranging from 21 to 78years with a mean 38.25 + 10.67years. Majority were in 36.66% were in the age group 31-40yrs followed by 23.33% in 41-50yrs age group , 18.33% in 21-30yrs age group, 11.66% in 51-60yrs age group and above 60yrs there were 10% In our study, 32 of 60 patients were alcoholic comprising of 53.33%, 23 (38.33%) patients had gall stones and remaining patients were grouped as others which consisted of 5 patients, diagnosed as pancreatic carcinoma (n=3) and idiopathic (n=2). All 60 patients (100 %) presented with pain abdomen. 43 patients (71.66%) had vomiting, 21(35%) patients had fever and 6(10%) of patients had jaundice at the time of admission. Amylase was elevated in 43 (71.66%) patients at presentation. Lipase was elevated in 54(90%) patients at presentation. In 6 (10%) patients ultrasound was normal. 54 (90%) patients had abnormal ultrasound findings such as bulky pancreas with altered echogenicity, peripancreatic fat stranding, fluid collection, ascites or pleural effusion. After diagnosing Acute Pancreatitis based on the clinical presentation, biochemical parameters and ultrasonography, patients were subjected to CT scan of the abdomen according to the standard protocol. The severity of the pancreatitis was assessed by assigning point system by using Modified CT Severity Index and CT Severity Index. The severity of pancreatitis

is scored using CT severity index and classified into three categories (mild, moderate and severe). The CTSI is a 10 point scoring system derived by assigning points to the degree of pancreatic inflammation (0 to 4 points) and pancreatic necrosis (0 to 6 points). According to the CT Severity Index, the patients were graded into mild (n=42), moderate (n=15) and severe (n=3). 70% patients had mild, 25% patients had moderate and only 5% patients had severe pancreatitis as per CTSI score. The modified index is a 10 point scoring system derived by assigning points to the degree of pancreatic inflammation (0 to 4 points) pancreatic necrosis (0 to 4 points) and extrapancreatic complications (0 or 2 points). All patients were graded into mild (score 0- 3), moderate (score 4-6) or severe (score 7-10). Modified CT Severity index was calculated by adding points assigned to each parameter. The severity of pancreatitis is classified into three categories: mild (0-3 points), moderate (4-6 points) and severe (7-10 points). According to the Modified CT Severity Index, the patients were graded into mild (n=23), moderate (n=27) and severe (n=10) i.e. 38.33% patients had mild, 45% patients had moderate and 16.67% had severe pancreatitis.

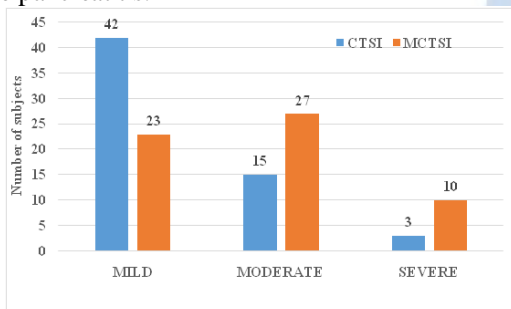


Figure 1: Graph showing Distribution of subjects according to MCTSI and CTSI.

The Figure 1 clearly depicts the distribution of patients in each category. In CTSI scoring system, 42 patients (70%) belonged to mild category, 15 (25%) patients had moderate and only 3 (5%) patient belonged to severe pancreatitis. But in MCTSI scoring system 23(38.33%) patients found to have mild pancreatitis and 27 (45%) patients found to have moderate and 10 (16.67%) patients severe pancreatitis. The discrepancy is attributed to the inclusion of extra pancreatic complications in MCTSI scoring system. Hence, two extra points were added to the severity index in addition to the pancreatic inflammation and necrosis findings. Clinical outcome of patients in our study was assessed by following parameters: end organ failure, evidence of systemic infection, surgical intervention and duration of hospital stay. 28 of 60 patients (46.66%) are found to have end organ failure. Of these 28 patients who developed end organ failure, 8

patients had mild, 10 patients had moderate and 10 patients had severe pancreatitis according to the MCTSI. 34.78% of patients who had mild pancreatitis had end organ failure, whereas end organ failure is seen in 37.03% and 100% of patients who had moderate and severe pancreatitis respectively ($p < 0.001$). According to CTSI, of these 28 patients, 15 patients had mild, 10 patients had moderate and 3 patient had severe pancreatitis. 35.71% of patients who had mild pancreatitis had end organ failure, whereas end organ failure is seen in 66.6% and 100% of patients who had moderate and severe pancreatitis respectively ($p = 0.035$). The above statistics shows that, highly significant correlation exists between the prediction of end organ failure with the classification according to the MCTSI ($p < 0.001$) than CTSI ($p = 0.035$). A total of 21 (35%) patients who had fever and leukocytosis were considered to have systemic infection. Of these 21 patients, 3 patients had mild, 9 patients had moderate and 9 patients had severe pancreatitis according to the MCTSI. 13.04% of patients who had mild pancreatitis had systemic infection, whereas systemic infection is seen in 33.33% and 90% of patients who had moderate and severe pancreatitis respectively ($p < 0.001$) According to CTSI, of these 21 patients, 10 patients had mild, 8 patients had moderate and 3 patient had severe pancreatitis. 23.80% of patients who had mild pancreatitis had systemic infection, whereas systemic infection was seen in 53.33% and 100% of patients who had moderate and severe pancreatitis respectively ($p = 0.172$). With above statistical values, it can be concluded that, there is a highly significant correlation between the prediction of systemic infection with the classification according to the MCTSI ($P = 0.001$), compared to the classification according to CTSI which is not statistically significant ($p = 0.172$). Surgical intervention was required in 6 (10%) patients. In our study, none of the patients who had mild pancreatitis according to MCTSI scoring underwent surgical intervention. 3(11.11%) belonged to group of moderate pancreatitis, underwent surgical intervention. 3(33.33%) belonged to group of severe pancreatitis, underwent surgical intervention the statistical p value 0.107 is not significant. One patient, who had mild pancreatitis according to CTSI scoring underwent surgical intervention. Two patients (13.33%) belonged to group of moderate pancreatitis, underwent surgical intervention. 3(100%) patient who had severe pancreatitis underwent surgical intervention. The statistical p value 0.017 is significant.

Above statistical analysis shows significant correlation between CTSI scoring system ($p = 0.0017$) and surgical intervention as compared to the MCTSI scoring system (0.117). Duration of hospital stay in our study was

ranging from 4 to 25 days with mean duration of 11 days. The mean duration of hospitalization in mild, moderate and severe classes of Acute Pancreatitis according to Modified CT Severity Index was 7, 11 and 15 days respectively. Whereas it was 7, 12 and 9 days respectively

as per the CT Severity Index. The above values shows that mean duration of hospitalization correlates well with the severity classification based on the MCTSI than CTSI.

Table 2: Patient outcomes and duration of hospitalization in severity based on Modified CT Severity Index.

MCTSI	MILD	MODERATE	SEVERE
Total number of patients	23	27	10
Mean duration of hospitalization (in days)	7	11	15
Surgical intervention	0 (0%)	3 (11.11%)	3 (33.33%)
Infection	3 (13.04%)	9 (33.3%)	9 (90%)
End organ failure	8 (34.78%)	10 (37.03%)	10 (100%)

Table 3: Patient outcomes and duration of hospitalization in severity based on CT Severity Index

CTSI	MILD	MODERATE	SEVERE
Total number of patients	42	15	3
Mean duration of hospitalization (in days)	7	12	9
Surgical intervention	1 (2.38%)	2 (13.33%)	3 (100%)
Infection	10 (23.80%)	8(53.33%)	3 (100%)
End organ failure	15 (35.71%)	10 (66.66%)	3 (100%)

DISCUSSION

Initial clinical assessment of the progression of acute pancreatitis alone has been inadequate in identifying patients who develop a severe disease. Identifying severe cases are important and can play a significant role in management decision and in reducing the morbidity and mortality associated with severe acute pancreatitis. Ranson score, Glasgow score, APACHE II, Marshall and SOFA (Sepsis-related organ failure assessment) scoring system are different severity scoring system studied in the past and proven to be indicators of the clinical severity. But, none of the above scoring system are proven to be the precise indicators of the adverse clinical outcome. 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. Mean age of presentation was 38.25 + 10.67years in our study population. It is concurrent with study done by Thomas *et al*³, Jauregui *et al*⁴.The prevalence of chronic alcohol abuse and biliary stones are common in fourth and fifth decades explain the high incidence of the acute pancreatitis in this age group. M: F ratio in our study is about 2.3:1. Similar results are seen by Freeny *et al*⁵. But studies done by mortelet *et al*², Bollen *et al*³ showed slightly lesser ratio than our study. As alcohol was the most common etiological factor in our study which is common in males, a high M: F ratio was observed. Chronic alcohol abuse is the most common etiological factor in our study constituting 53.33% of

cases. Similar results were observed by Dugemier T L6 and Freeny *et al*⁵. In contrary, studies done by Bollen T L *et al*³ and Jauregui *et al*⁴ showed biliary stones as the predominant etiological agent.

Correlation of CT Scoring Indexes With patient outcome parameters: Our study showed a significant correlation of grades of severity of pancreatitis based on both MCTSI and CTSI with patient outcome parameters. However MCTSI was more closely associated with patient outcome than CTSI in our study. Several studies reported a strong correlation between the CT evaluation and the clinical severity of acute pancreatitis 7-11 and some studies have not corroborated these findings.12-15 This difference in statistical significance between CTSI and MCTSI in our study may be attributed to the inclusion of extrapancreatic complications in the MCTSI system. We assume that the presence of ascites and pleural fluid may be responsible for the improved correlation with MCTSI, because they may be early indicators of organ dysfunction. Another important difference between the MCTSI and CTSI is that, MCTSI differentiates only between presence and absence of acute fluid collections and, therefore does not require a count of the collections as in case of CTSI. Similar study was done by Mortelet K J *et al*². In his study, when applying the modified index, the severity of pancreatitis and the following parameters correlated more closely than when the previously established CTSI was applied: the length of the hospital stay, the need for surgical or percutaneous procedures, and the occurrence of infection. Significant correlation between the severity of pancreatitis and the development of organ failure was

seen only using the MCTSI ($p = 0.0024$), not the CTSI ($p = 0.0513$). Our study resulted in almost similar findings except that CTSI score showed statistically significant correlation with prediction of surgical intervention than MCTSI score. In contrary to our study results, Bollen T L *et al*³ showed no statistically significant differences between the two CT scoring systems with regard to all the studied severity parameters. The differences observed may be due to differences in criteria for organ failure and clinically severe AP (the present study used criteria in accordance with the Marshall criteria of end organ failure).

CONCLUSION

Our study showed highly significant correlation between the MCTSI score and the prediction of end organ failure, systemic infection and duration of hospital stay. However no significant correlation found with the need for surgical intervention. There was significant correlation of grades of severity of acute pancreatitis based on MCTSI with patient outcome parameters than grades of severity of acute pancreatitis based on CTSI. Extra pancreatic complications, when included in the CT scoring system (MCTSI) were significantly correlated with end organ failure and adverse clinical outcome. Hence MCTSI may be more useful scoring system than CTSI. 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 when used within three days of symptom onset.

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