# **ORIGINAL ARTICLE**

# Role of CTSI and MCTSI to Determine the Outcome of Acute Pancreatitis

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#### ABSTRACT

Background: Acute pancreatitis is the inflammation of pancreas. The computed tomography and modified computed tomography severity indexes have been designed to determine the severity of the pancreatitis.<sup>1</sup> But there is a need to explore the more helpful tool for detection of severity of the pancreatitis.

Aim: To compare CTSI and MCTSI in terms of outcome of patients presenting with acute pancreatitis

Methods: This descriptive case series was done in Radiology department, Services Hospital Lahore from Mar 2015 to Aug 2015. Sample size consisting of 93 patients wereselected using consecutive non probability sampling method with clinical diagnosis of acute pancreatitis. These patients underwent contrast enhanced MDCT and the severity of the pancreatitis was scored using both the modified CT severity indexes and CT severity indexes. For both the CT and modified CT severity indexes, correlation between severity of pancreatitis and outcome of patients was estimated by using the percentage, frequency charts and pearsonchi-square test.

**Results:** In clinical outcome parameters i.e. the length of hospital stay (mean=20 sd 8.07), the occurrence of end organ failure (67/93), systemic infection (59/93) and the need for the surgical intervention were highly correlated with severe MCTSI than severe CTSI.

Conclusion:MCTSI is better and improved tool for screening of patients for severity of the acute pancreatitis. It can also help in the prediction of clinical outcome.

Keywords: Computed Tomography, Modified computed tomography Severity Index, Pancreatitis

## INTRODUCTION

Acute pancreatitis is an inflammatory process of pancreas. Severe pancreatitis also called necrotizing pancreatitis is associated with a protracted clinical course, often complicated by sepsis, multi organ failure and a mortality rate of up to 50%<sup>2</sup>. Radiological imaging has got increasingly importance in the staging and therapy of acute pancreatitis. The conventional & modified computed tomography severity index (CTSI& MCTSI) were designed to determine the severity of pancreatitis depending upon several pancreatic and extra pancreatic parameters.

Acute pancreatitis is an inflammatory process of pancreas is commonlyoccurred due to biliary stones, alcoholism, few metabolic factors and drug abuse. The Abdominal pain is the main symptoms of acute pancreatitis. It is classified into mild & severe forms. Patients with mild severity of pancreatitis have less organ failure and early recovery.<sup>3</sup>But patients with severe acute pancreatitis, occurs in 20% cases of acute pancreatitis, showed more organ failure or few complications, e.g.necrosis, infection or pseudocyst formation.<sup>4</sup> The diagnosis of acute pancreatitis can be done by evaluating leukocytosis, raised serum amylase and serum lipase level. The diagnosis can be confirmed onCT scan.

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Treatment of acute pancreatitis depends on the severity level. Mild severity showed better response to the treatment than severe pancreatitis, which requires serious monitoring and precise treatment<sup>1</sup>. The purpose of this study was to determine whether MCTSI has better correlation with patients' outcome as compared to CTSI in patients with acute pancreatitis.

The objective of the study was to compare CTSI and MCTSI in terms of outcome of patients presenting with acute pancreatitis.

#### MATERIAL AND METHODS

Study design: Descriptive case series.

Setting:New Radiology department Services hospital (SIMS) LAHORE.

Duration: Six months from Mar 2015 to Aug 2015 Sample size:By taking the least percentage among all the outcome variables that is 40%, confidence level 95%, margin of error 10% then sample of 93 was calculated. Sampling Technique: Non probability consecutive. **Inclusion Criteria:** 

- All the confirmed cases of acute pancreatitis.
- Patients of both genders of age 18 50 years.
- Patients with CTSI score of 7 to 10 and patients with MCTSI score of 8 to 10.

Exclusion criteria: Pancreatitis due to trauma.

Data Collection: Individuals admitted with clinical diagnosis of acute pancreatitiswith CTSI score of 7/10 and

MCTSI score of 8/10 were enrolled. All CT scans were done using 16 - slice Toshiba Aequilion MDCT (Multi detector computed tomography) with 120 KVP and 300 mAs with 5 mm slice thickness. 70-80 ml of 350mg/ml nonionic iodinated contrast (IOHEXOL) was injected using pressure injector at the rate of 3-4ml/sec. 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. The severity of the pancreatitis was scored using both the CTSI & MCTSI. Patient's clinical outcome was then scored using parameters such as: hospital stay, requirement of surgical intervention, occurrence of infection in other organs, end organ failure. Patient were followed up-till 10 day of admission except for hospital stay and outcome was recorded on approved proforma as per operational definition. For both the CTSI & MCTSI, correlation between the severity of pancreatitis and patient outcome is estimated. Patients were closely followed for the outcome of disease by keeping the records of the contact numbers and addresses of the patients included in the study.

The severity of acute pancreatitis was countedby using MCTSI and was classified in 3groups (mild, moderate & severe). The MCTSI is 10-point scoring system derived by measuring the degree of inflammation (0 - 4 points) pancreatic necrosis (0 - 4 points) and extrapancreaticdifficulties (0 - 2 points). Only severe category was included in study as per operational definition. Clinical outcome was measured in terms of duration of hospital stay, requirement of surgical intervention, organ failure and infection. Collected data were analyzed by frequency, percentage and Pearson Chi square test to assess the statistical significance. Patients of acute pancreatitis with raised serum amylase (N = 20 - 140U/L) and serum lipase (N= 0-- 160 U/L) levels along with CT findings described below.CT findings that confirm the patient of acute pancreatitis were:

- Diffusely inflamed pancreas with low density due to oedema.
- The pancreas ha less density than liver & spleen with contrast.
- Pancreas is wider than abdominal aortic diameter indicating that it has inflammation.

Outcome determined in terms of

**Mean Length of hospital stay:** If the patient hospital stay was greater than 7 days from dmission till discharge.

**Need for surgery:** When there was necrosis within the pancreas, confirmed on CT as hypodense lesions which don't enhance on contrast administration. When there were peri-pancreatic collections, confirmed on CT as normal enhancement of the pancreas with surrounding septated heterogeneous peri-pancreatic collections with fluid- and fat densities.

**Infection of any organ system:** When there were presence of positive Gram stain on culture with fever >100°F and WBC > 15,000/mm<sup>3</sup>.

**Organ Failure:**Respiratory failure, when  $PaO_2 < 60mmHg$  or prerequisiteof ventilator support. Cardiovascular system failure, whenSBP < 90mmHg, no hypovolemia, peripheral hypo-perfusion, or need of continuous vasopressor or inotropic agents infusion to stabilize the SBP>90mmHg. Renal failure, when serum creatinine level > 300µmol/L or urine output < 500mL/24hr, or need dialysis.

**Data Analysis:**Data analysis done with SPSS v 20. Mean and standard deviation calculated for age & length of hospital stay.Frequency & Percentage calculated for gender and outcome like need for surgery, infections and organ failure.Pearson Chi square Test applied to compare the infection, organ failure and need for surgery between severe CTSI and severe MCTSI.T test was applied to compare the mean hospital stay between severe CTSI and severe MCTSI. P-value <0.05 was taken as significant.

# RESULTS

Patients had mean age 33 + 8.01 years. Out of 93 cases, 59 (63.4%) were male and 34 (36.6%) were females with a male to female ratio of 1.7: 1. Table 1.

Out of 93 patients, 67 (72.04%) patients developed end organ failure had severe MCTSI and 33 patients (35.48%) with end organ failure with severe CTSI (p=0.0001). Out of 93 patients, 48 (51.61%) patients developed systemic infection with severe MCTSI and 59 patients (63.44%) had systemic infection with severe CTSI (p=0.103). Out of 93 patients, 25 (26.88%) patients needed surgical intervention with severe MCTSI and 21 patients (22.58%) needed surgical intervention with severe CTSI (p=0.497). The mean duration of stay was 20 + 4.77 days. The mean duration of hospitalization in severe classes of acute pancreatitis MCTSI was 20 + 4.77 days and CTSI was 21±5.45 days (p-value = 0.163). Table 2

Age group (in years)	f	Percentage %		
18-25	11	12		
26-35	31	33		
36-50	51	55		
Total	93	100		
Mean + SD	33 + 8.01 y	33 + 8.01 years		
Male	59 (63%)			
Female	34 (37%)			

Table 1: Age distribution of the study group.

Table 2: Outcomeof patients according to CTSI & MCTSI

(n=93)		Severe	Severe	P-
		MCTS	CTSI	Value
End Organ Failure	Yes	67	33	0.0001
	No	26	60	
Systemic Infection	Yes	48	59	0.103
	No	45	34	
Surgical	Yes	25	21	0.497
Intervention	No	68	72	
Needed				
Hospital stay	Mean±SD	20±4.23	21±5.45	0.164
(days)				

Study series	dy series Mortele et al <sup>59</sup>		Bollen et al <sup>62</sup>	
Total no of patients		66	196	
MCTSI	Mild	34 (52%)	86 (44%)	
	Moderate	22 (33%)	75 (38%)	
	Severe	10 (15%)	35 (18%)	
CTSI	Mild	42 (63%)	136 (69%)	
	Moderate	19 (28%)	41 (21%)	
	Severe	5 (9%)	19 (10%)	
Duration of hospital stay in days		0-34(mean-7)	0-113 (mean-6)	
Surgical intervention		10 (15%)	19 (10%)	
Infection		21 (32%)	7 (4%)	
End organ failure		9 (14%)	38 (19%)	

Table 3: Comparison table between present study and others studies.

## DISCUSSION

Initial examination of acute pancreatitis progression on clinical basis alone is not enough to identify the patients who actually have a severe stage of disease. So identification of severe diseased patients is very important. It can showan important role in the decision making for appropriate therapy and to reduce the morbidity & mortality, related to severe stage of acute pancreatitis. Glasgow score, Ranson score, APACHE II, Marshall & Sepsis related organ failure assessment scores are different scoring system which determine the severity of disease have already been studied before. They have been proved to be good indicators of severity of disease and disease progression in clinical assessment. But, none of the above scoring system are proven to be the precise indicators of the adverse clinical outcome.

During last twenty years, treatment of the severe acute pancreatitis has been transformed from more invasive surgical interventionsto the more conventionalmethod, except in cases with confirm infected necrosis. Hence it is essential from treatment point of view to determine the severity of the disease and the presence of necrosis by CT scan.

In our stud, the mean age of patients was 33 years. This resultswassynchronized with other studies conducted by Thomas et al<sup>5</sup>. & Jauregui et al<sup>6</sup>. More than 50% patients of acute pancreatitis are ranged between36-50years. Chronic alcohol consumption and biliary stones are the most common risk factors for development of acute pancreatitis in this age group. M: F ratio in our study is about 1.7:1. Similar results are seen by Freeny et al<sup>7</sup>. In our study which is common in males, a high M: F ratio was observed.

In our study, we observed a strong correlation between outcome of patient with severity grades of pancreatitis on both;CTSI and MCTSI scans. Though, MCTSI was found to be more correlated with outcome of patients as compared to CTSI. Numerous surveys conducted before determined the strong relationship between evaluation of severity of ace pancreatitis on CT and Clinical examination<sup>4,8-11</sup> while few surveys did not verified these results<sup>12-15</sup>.

In our study, thestatistical difference in the significance in CTSI &MCTSI may be accredited to inclusion of extra-pancreatic complications in MCTSI system. It has been considered that existence ascites &pleural fluid may also cause an enhanced relationship with MCTSI, as they are early signs of organ failure. Another

very important difference between MCTSI & CTSI is that the MCTSI distinguishes only between presence or absence of acute fluid and, thus does not need count of poolslike in CTSI.

Similarly, when Mortele et al<sup>4</sup>, applied MCTSI, the severity of acute pancreatitis and the following parameters related more strongly as compared to the already recognized CTSI: hospital stay, equipment offurther surgical intervention or laparoscopy, and the development of the infection. The significantly strong correlation can be seen between severity of acute pancreatitis and organ failure by using only MCTSI (p = 0.0024), but not for CTSI (p = 0.0513). In our study, we almost obtained similar findings except that severeCTSI score presented statistically significant correlation for forecast of the surgical intervention as compared to MCTSI.

But Bollen et al<sup>16</sup>, showed statistically insignificant difference between both CT index systems, regarding all the planned severity factors. The difference may be becauseof the differences in the criteria for organ failure & clinically severity of acute pancreatitis.

In our study, we included patients with severe MCTSI to detect severe pancreatitis on MCTSI & CTSI. The sensitivity of CTSI was 35%,than MCTSI. Thus MCTSI is found to be more helpful for screening the patients of severe acute pancreatitis as compared to CTSI. Jauregui et al.,<sup>6</sup>also obtained similar findings, and concluded that for detection of severe pancreatitis, MCTSI & CTSI has sensitivity of 61% vs. 38%, and specificity of 66% vs. 100% respectively.

**Role of Extra pancreatic Complications in Assessment of Severity:** In a study done by Mole D J et al<sup>17</sup> showed that extra pancreatic complications are associated more closely with the multi organ failure than presence of infection. In our studyextrapancreatic complications were significantly associated with adverse outcome.<sup>18</sup>

Patients with extra-pancreatic complications showed more severity on MCTSI as compared to CTSI, thus increase the number of moderate &severe pancreatitis cases on MCTSI than CTSI. This lead to the more close relationship with effects on MCTSI. Waele et al<sup>15</sup> observed similar findings and proposed that, extra-pancreatic inflammation evaluated on abdominal CT permitsthe more accurate approximation of severity of the disease and mortality within 24 hours.

**Prediction of pancreatic infection and correlation with patient outcome:** In our study, 59 (63.4%) patients who were categorized as severe pancreatitis by MCTSI had evidence of systemic infection. About 33(56.7%) patients who were categorized as severe pancreatitis by CTSI had systemic infection,however 26(43%) patients who were declaredas moderatepancreatitis by CTSI yet had developed systemic infection. Beger H G et al<sup>19</sup>did clinical study on 114 patients with acute necrotizing pancreatitis, found 23.8% to have infection. Hence classifying the patients according to the MCTSI may yield a better prediction of pancreatic infection. Also, the mean duration of hospital stay was more than those without evidence of infection.

# CONCLUSION

We observed highly significant correlation between MCTSI and prediction of outcome in patients with acute pancreatitis.Thus, MCTSI is better and improved modality for screening of patients for severity of the acute pancreatitis. It can also help in the prediction of clinical outcome.

Limitations in the Present Study: Our study had two important limitations. All patients of acute pancreatitis could not be screened on CT due to limited finance and some cases of severe pancreatitis along with kidney failure were unable to received contrast medium before CTSI.<sup>20</sup> All patients of acute pancreatitis were included regardless whether the attack was for first time or relapse. This, difference in first episode and relapses were not distinguished.

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