



COMPARISON OF THE MODIFIED CT SEVERITY INDEX WITH THE CT SEVERITY INDEX FOR THE ASSESSMENT OF ACUTE PANCREATITIS SEVERITY

Medicine

Dr Sowmya Anand Assistant Professor

Dr Sanjay SC Head of The Department

Dr TM Harishkar Junior Resident

ABSTRACT

Introduction: Acute pancreatitis (AP) is a frequent, mild, self-limiting condition with only minor or temporary systemic symptoms. In the evaluation of AP, imaging by CT or MRI is helpful for diagnosis as well as for identifying regional pancreatic problems and directing interventional therapies. **Material and methods:** A retrospective analysis of a prospectively collected database was performed. The demographic, clinical, and laboratory data of the 40 cases of acute pancreatitis in patients were reviewed for this study. 40 patients underwent CECT or MRI within 1 week of onset of symptoms. A single radiologist performed imaging studies and recorded all pancreatic, peripancreatic, and extrapancreatic findings and complications. **Results:** According to CTSI, the number of patients with mild moderate and severe disease were 19, 14 and 7 respectively; According to MCTSI, the number of patients with mild, moderate and severe disease were 7, 18, 15 respectively. Mean length of hospital stay and ICU stay was 4.48 ± 2.03 and 1.7 ± 2.11 respectively. Both the scoring systems more accurately correlated with the length of ICU stay, organ failure and necrosectomy and accurately correlated with infection and percutaneous catheter drainage. **Conclusion:** MCTSI showed superior and better correlation with disease severity than CTSI. There was statistical significant association noted with CTSI and MCTSI each with the severity parameters and outcome assessed.

KEYWORDS

Modified CT Severity Index, CT Severity Index, Acute pancreatitis,

INTRODUCTION:

In most cases, acute pancreatitis (AP) is a frequent, mild, self-limiting condition with only minor or temporary systemic symptoms. However, clinically significant AP with local and systemic consequences occurs in about 15-20% of patients [1].

For the purpose of identifying individuals who are most at risk of developing clinically severe AP early on, a number of clinical and laboratory prognostic scoring systems have been developed. These rating methods' overall accuracy ranges from 70% to 80% [2].

In the evaluation of AP, imaging by CT or MRI is helpful for diagnosis as well as for identifying regional pancreatic problems and directing interventional therapies.

The purpose of this study was to compare the modified CT severity index (MCTSI) with the CT severity index (CTSI) regarding assessment of severity parameters in a cohort of patients with acute pancreatitis (AP).

MATERIALS AND METHODS:

A retrospective analysis of a prospectively collected database was performed. The demographic, clinical, and laboratory data of the 40 cases of acute pancreatitis in patients were reviewed for this study. Institutional review board approval and written informed consent of each patient were obtained.

AP was defined as two or more of the following: characteristic abdominal pain (i.e., severe upper abdominal pain), serum amylase or lipase levels three or more times the upper limit of normal (i.e., > 210 U/L and > 180 U/L, respectively), and changes consistent with AP on cross-sectional imaging [3]. 40 patients underwent CECT or MRI within 1 week of onset of symptoms. Severity parameters included clinical severity of pancreatitis, length of hospital stay, ICU stay, intervention (percutaneous catheter drainage, necrosectomy), organ failure, infection, death. A single radiologist performed imaging studies and recorded all pancreatic, peripancreatic, and extrapancreatic findings and complications.

Discrimination analysis and kappa statistics were performed. All statistical analyses were performed using SAS version 9.1 (SAS Institute), SPSS version 15.0 (SPSS), and MedCalc version 10.4.3.0 (MedCalc). In all cases, the morphologic severity of pancreatitis was assessed using the CTSI, developed by Balthazar et al. [4], and the MCTSI, more recently developed by Mortelet et al. [5]

For the CTSI, the morphologic severity of pancreatitis was categorized as mild (0–3 points), moderate (4–6 points), or severe (7–10 points).

For the MCTSI, the morphologic severity of disease was categorized as mild (0–2 points), moderate (4–6 points), or severe (8–10 points).

Severity parameters for all patients were collected during the course of each patient's hospitalization, including in-hospital mortality, length of hospital stay, admission to and length of ICU stay, presence and duration of organ failure (transient, ≤ 48 hours; persistent, > 48 hours), pancreatic infection (infection of pancreatic or peripancreatic necrosis or collections documented on the basis of percutaneous aspiration), need for intervention (endoscopic or percutaneous drainage or surgical necrosectomy), and clinical severity of pancreatitis.

AP was defined as clinically severe if the patient died, had organ failure persisting more than 48 hours, had local pancreatic complications that required intervention (endoscopic or radiologic drainage or surgical necrosectomy), or had prolonged hospitalization (such as need for enteral feeding or parenteral antibiotics). This new definition of clinically severe AP is in accordance with the most updated version of the revised Atlanta classification [6]

Organ failure was defined as a score of 2 or more in one or more of the three (respiratory, renal, and cardiovascular) organ systems of the modified Marshall score [6,7].

Descriptive statistics were used for baseline characteristics, outcomes of interest, and extrapancreatic findings. Chi-square or Fisher's exact tests were used to assess relationships between categorical outcomes and morphologic severity of CTSI and MCTSI. Analysis of variance or Kruskal-Wallis tests were used to assess relationships between numeric outcome variables and morphologic severity of CTSI and MCTSI.

The area under curve (AUC) with standard error and 95% CI was calculated for each scoring system. The receiver-operating characteristic (ROC) curve was examined for an optimal cut-off value for both CT scoring systems that most closely correlated with clinical severity of disease. A reduced p value of < 0.01 was considered statistically significant.

RESULTS:

According to CTSI, the number of patients with mild moderate and severe disease were 19, 14 and 7 respectively; According to MCTSI, the number of patients with mild, moderate and severe disease were 7, 18, 15 respectively. More number of patients were in the moderate and severe groups as per MCTSI. However, about 19 (i.e 47.5%) of the patients had mild disease according to CTSI. (Table 1) Mean length of hospital stay and ICU stay was 4.48 ± 2.03 and 1.7 ± 2.11 respectively. (Table 2)

Now, when intervention was compared, with CTSI, 3/14 patients required percutaneous catheter drainage in moderate disease, 3/7 patients of severe disease required percutaneous catheter drainage. With MCTSI, 6/15 patients with severe disease required PCD. For necrosectomy, 3/7 of severe disease patients of CTSI underwent necrosectomy, 3/7 of severe disease patients of MCTSI required necrosectomy. When organ failure was assessed, 5/14 patients of CTSI with moderate disease developed Organ failure versus 1/18 patients of MCTSI had organ failure. 4/7 patients with severe disease as per CTSI developed organ failure as against 8/15 patients of severe disease with MCTSI. Infection, 2/14 patients with moderate disease suffered from infection in CTSI group as against 1/18 patients of MCTSI with moderate disease. 4/7 patients with severe disease had infection in the CTSI versus 5/15 patients in MCTSI severe disease group. 1 patient of the severe disease group dies in both the CT scoring system. (Table 3) Both the scoring systems more accurately correlated with the length of ICU stay, organ failure and necrosectomy and accurately correlated with infection and percutaneous catheter drainage. (Table 4-6)

DISCUSSION:

The results of our study show MCTSI superior and better than CTSI in correlating clinically with the severity of the disease, though there is no statistically significant difference noted. Since the degree of pancreatic necrosis and the symptoms of pancreatic inflammation serve as the primary markers for both scoring systems, this might be simply explained. The fact that MCTSI places some emphasis on extrapancreatic problems distinguishes these 2 scoring systems from one another.

However, given the extrapancreatic complications score is just 0–2 points, it could not have a substantial impact different scores produced by the two systems. We noted a significant association between scoring systems and severity parameters. By using the updated definitions, the current study confirmed the earlier observations by Balthazar et al. and Mortelet et al. and showed a significant association between the CT scoring systems and clinical severity of disease and all severity parameters.

Mortelet et al.[5] used the length of hospital/ICU stay, the need for surgical or percutaneous procedures, the incidence of pancreatic infection, and the development of organ failure as clinical outcomes. Bollen et al.[8] used the same parameters with the addition of mortality rate and the APACHE II score as clinical outcomes. Contrastingly, a previous study[9] observed moderate and fair agreement between the CTSI and the MCTSI scoring systems and the severity of the acute pancreatitis.

The 'lower than expected' level of agreement between the two scoring systems could be attributed to its different study design done using the determinant based classification.

CONCLUSION:

MCTSI showed superior and better correlation with disease severity than CTSI. There was statistical significant association noted with CTSI and MCTSI each with the severity parameters and outcome assessed. According to our study's results using the updated Atlanta classification of acute pancreatitis severity, there was good agreement between CTSI and MCTSI scores and the clinical severity assessment parameters.

Table 1 : Distribution severity of pancreatitis based on CTSI and Mod. CTSI scores among study patients.

Variable	Category	n	%
CTSI	Mild	19	47.5%
	Moderate	14	35.0%
	Severe	7	17.5%
MCTSI	Mild	7	17.5%
	Moderate	18	45.0%
	Severe	15	37.5%

Table 2: Descriptive for length of hospital and ICU stay among study patients

Parameter	N	Mean	SD	Median	Min	Max
Length of Hospital Stay	40	4.48	2.03	4	2	9
ICU Stay	40	1.7	2.11	0	0	6

Table 3 intervention compared with CTSI and MCTSI

	CTSI			MCTSI		
	MILD	MODE RATE	SEVERE	MILD	MODE RATE	SEVERE
DISTRIBUTION OF PATIENTS (n=40)	19	14	7	7	18	15
P CATHETER DRAINAGE (n=6)	0	3	3	0	0	6
NECROSECTOMY (n=3)	0	0	3	0	0	3
ORGAN FAILURE						
TRANSIENT(n=9)	0	5	4	0	1	8
PERSISTENT(n=3)	0	0	3	0	0	3
INFECTION(n=6)	0	2	4	0	1	5
DEATH(n=1)	0	0	1	0	0	1

Table 4: Comparison of severity parameters based on CTSI scores among study patients

Parameters	Mild		Moderate		Severe		p-value
	Mean	SD	Mean	SD	Mean	SD	
Length of Hospital Stay	2.79	0.54	5.00	0.78	8.00	0.58	<0.001*
ICU Stay	0.11	0.46	2.07	1.44	5.29	0.76	<0.001*
	n	%	n	%	n	%	
Percutaneous Catheter Drainage	0	0.0%	3	21.4%	3	42.9%	0.02*
Necrosectomy	0	0.0%	0	0.0%	3	42.9%	<0.001*
Organ Failure							
Persistent	0	0.0%	0	0.0%	3	42.9%	
Transient	0	0.0%	5	35.7%	4	57.1%	<0.001*
None	19	100.0%	9	64.3%	0	0.0%	
Infection	0	0.0%	2	14.3%	4	57.1%	0.001*
Death	0	0.0%	0	0.0%	1	14.3%	0.09

Table 5: comparison of severity parameters based on MCTSI scores among study patients

Parameters	Mild		Moderate		Severe		p-value
	Mean	SD	Mean	SD	Mean	SD	
Length of Hospital Stay	2.57	0.54	3.44	0.98	6.60	1.45	<0.001*
ICU Stay	0.00	0.00	0.33	0.77	4.13	1.25	<0.001*
	n	%	n	%	n	%	
Percutaneous Catheter Drainage	0	0.0%	0	0.0%	6	40.0%	0.003*
Necrosectomy	0	0.0%	0	0.0%	3	20.0%	0.07
Organ Failure							
Persistent	0	0.0%	0	0.0%	3	20.0%	
Transient	0	0.0%	1	5.6%	8	53.3%	<0.001*
None	7	100.0%	17	94.4%	4	26.7%	
Infection	0	0.0%	1	5.6%	5	33.3%	0.04*
Death	0	0.0%	0	0.0%	1	6.7%	0.43

Table 6 : ROC analysis to determine the AUC for CTSI, MCTSI scores for different severity parameters

PARAMETERS	CTSI	MCTSI
LENGTH OF ICU STAY	0.98	0.99
P CATHETER DRAINAGE	0.87	0.88
NECROSECTOMY	0.96	0.95
ORGAN FAILURE	0.96	0.96
INFECTION	0.88	0.88

REFERENCES:

- Forsmark CE et al. AGA Institute technical review on acute pancreatitis. Gastroenterology 2007; 132:2022–2044
- Papachristou GI, Whitcomb DC. Predictors of severity and necrosis in acute pancreatitis. Gastroenterol Clin North Am 2004; 33:871–890
- Banks PA, Freeman ML; Practice Parameters Committee of the American College of Gastroenterology. Practice guidelines in acute pancreatitis. Am J Gastroenterol 2006; 101:2379–2400
- Balthazar EJ, Robinson DL, Megibow AJ, Ranson JH. Acute pancreatitis: value of CT in establishing prognosis. Radiology 1990; 174:331–336
- Mortelet KJ, Wiesner W, Intrieri L, et al. A modified CT severity index for evaluating acute pancreatitis: improved correlation with patient outcome. AJR 2004; 183:1261–1265
- Acute Pancreatitis Classification Working Group. Proposed revision of the Atlanta classification of acute pancreatitis. Pancreas Club Website. Published January 14, 2009. Accessed March 25, 2009.
- Marshall JC, Cook DJ, Christou NV, Bernard GR, Sprung CL, Sibbald WJ. Multiple organ dysfunction score: a reliable descriptor of a complex clinical outcome. Crit Care Med 1995; 23:1638–1652.
- Bollen TL, et al. Comparative evaluation of the modified CT severity index and CT severity index in assessing severity of acute pancreatitis. Am J Roentgenol 2011; 197:386–92.
- Apisarnthanarak P et al. Comparison of CT Severity Index and Modified CT Severity Index in the Clinical Severity Assessment of Acute Pancreatitis. Journal of Health Science and Medical Research. 2022 May 4;40(4):425–35.