



COMPUTED TOMOGRAPHY EVALUATION OF ACUTE PANCREATITIS: CORRELATION BETWEEN MODIFIED CT SEVERITY INDEX AND PATIENT OUTCOME.

Radiodiagnosis

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ABSTRACT

Introduction: Acute pancreatitis (AP) is a protean disease with dynamic imaging characteristics & a broad clinical spectrum of findings varying from mild to severe. AP and its complications are recognized as an important cause of morbidity & mortality in hospitalized patients. CT is the imaging method of choice for assessing the extent of acute pancreatitis, its complications and subsequent management.

Aims and Objective: 1) To evaluate the AP on Computed Tomography and grade the severity as per modified CT Severity Index. 2) To correlate the modified CT Severity Index with patient outcome. 3) To evaluate the etiological factors of acute pancreatitis.

Materials and Methods: A hospital based prospective study was conducted from November 2016 - April, 2018 on 50 IPD patients referred to the Department of Radio diagnosis with findings suggestive of AP. Patients underwent NC & CECT. Severity of pancreatitis was scored using MDCTI. Outcome parameters included the length of hospital stay; the need for surgery or percutaneous intervention; and the occurrences of infection, organ failure (OF), and death. Pearson chi square test and Fisher's exact test were performed.

Results: We included 50 cases [30 males & 20 females, age range 17-69 (mean 40.16± 14.08 years)]. Chronic alcohol abuse was the most common etiological factor seen in 44% cases followed by cholelithiasis seen in 34% cases. According to MDCTI, 4% patients had mild, 64% patients had moderate and 32% had severe pancreatitis. Modified CT severity score was found to be significantly correlated with organ failure (p=0.005), systemic infection (p<0.001), duration of hospital stay (p=0.020) and need for surgery or intervention (p=0.017).

Conclusion: Modified CT severity index is a good prognostic indicator of clinical outcome of patients with acute pancreatitis and showed significant correlation with all the clinical outcome parameters.

KEYWORDS

Acute pancreatitis, Modified CT Severity Index (MCTSI), contrast enhanced computed tomography.

INTRODUCTION:

AP (Acute Pancreatitis) is an acute inflammatory process of the pancreas that may involve adjacent or remote tissues and organs [1,2]. As per Atlanta classification (1992) AP is classified into mild and severe forms. Mild pancreatitis (interstitial or edematous pancreatitis) is associated with minimal organ failure and an uneventful recovery. Severe pancreatitis (necrotizing pancreatitis) occurs in approximately 20% of patients and is associated with organ failure or local complications and may have significant morbidity (34-95%) and mortality (2-39%) [3,4,5]. Early diagnosis and precise staging of disease severity are important goals in the initial evaluation and management of acute pancreatitis. While patients with mild acute pancreatitis can be managed with fluid resuscitation and supportive care, those with severe acute pancreatitis require transfer to a specialized or intensive care unit (ICU) [6].

Gallstones and alcohol are the two most common etiological factors for acute pancreatitis and together they contribute 80%-90% of all causes, with gallstone pancreatitis being more common [7-9]. Other less common causes include iatrogenic e.g. endoscopic retrograde cholangiopancreatography (ERCP), trauma, malignancy, drugs, congenital (pancreatic divisum, annular pancreas), metabolic disorders (hyperlipidaemia, hypercalcaemia), various infections and in some cases may be idiopathic [10]. It typically presents with abdominal pain and is usually associated with raised pancreatic enzymes in blood or urine.¹¹The incidence of AP is increasing due to change in lifestyle of population i.e increased intake of alcohol, smoking and obesity.¹²

Contrast Enhanced CT is considered to be the gold standard imaging modality in the evaluation of patients with acute pancreatitis [13]. The CT imaging features of acute pancreatitis include focal or diffuse enlargement of the pancreas, peripancreatic fat stranding, pancreatic and/or peripancreatic necrosis, peripancreatic fascial thickening and fluid collections [14]. The role of imaging is not only to diagnose acute pancreatitis but to demonstrate the presence and extent of pancreatic necrosis and the various complications of acute pancreatitis. Ideally, doing CECT after 48-72 hours of onset of an acute attack yield higher accuracy in depiction of necrotising pancreatitis [15].

Multiple factor scoring systems are available for the assessment of severity of pancreatitis like The Acute Physiology Score and the

Chronic Health Evaluation II (APACHE II) [16] & Ranson's criteria [17] but they have their own limitations.

CT Severity Index (CTSI) was created by Balthazar in 1990 by combining the original grading introduced in 1985 with the presence and extent of pancreatic inflammation and necrosis. CTSI was found to have a better prognostic accuracy than the previous score but it, too, had limitations. The score obtained with this index did not include the presence of organ failure, extra pancreatic parenchymal complications or peripancreatic vascular complications and their correlation with the final outcome and had only moderate interobserver variability [18].

Therefore, a modified and simplified CT scoring system (MCTSI) was proposed by Mortelet et al. (2004), which incorporated the above findings and is easier to calculate & reproduce and correlates more closely with the patient outcome measures like the occurrence of infections, organ failure, the need for surgical or percutaneous intervention, the length of hospital stay, and death than the CTSI with similar inter-observer variability. This index includes presence or absence of acute fluid collection rather than count of collections. In contrast to the CTSI, the MCTSI incorporates extra pancreatic complications in the assessment and simplifies the evaluation of the extent of pancreatic parenchymal necrosis (none, ≤ 30%, or > 30%) and peri-pancreatic inflammation (presence or absence of peri-pancreatic fluid) [19].

AIMS AND OBJECTIVES

1. To evaluate the acute pancreatitis on Computed Tomography and grade the severity as per modified CT Severity Index.
2. To correlate the modified CT Severity Index with patient outcome.
3. To evaluate the etiological factors of acute pancreatitis.

MATERIAL & METHODS

Study design – Hospital based prospective study.

Study was conducted for a period of 1½ years i.e. from November, 2016 to April, 2018 on 50 IPD patients with clinical suspicion of acute pancreatitis, elevated serum amylase and/or lipase level or with acute pancreatitis detected on ultrasound referred to the department of Radiodiagnosis, Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, India.

Inclusion criteria –

1. IPD patients with clinical suspicion of acute pancreatitis, elevated serum amylase and/or lipase level or with acute pancreatitis detected on Ultrasound willing to undergo Contrast enhanced CT.

Exclusion criteria –

1. All patients with hypersensitivity to CT contrast agents, patients whom CT is contraindicated due to any other reason such as Chronic Kidney Disease.

2. All pregnant women.

3. Suspected acute pancreatitis patients who did not undergo contrast enhanced CT or with normal pancreas on CT scan & normal serum amylase level.

4. Cases of Chronic Pancreatitis suggested by intraductal calculi, ductal stricture and parenchymal calcification, pancreatic carcinoma and metastasis, simple pancreatic cyst and postoperative patients.

Method of data collection -

All patients were detailed about the purpose of study. Informed consent was taken. All patients were evaluated by non-contrast and biphasic contrast- enhanced CT (pancreatic parenchymal phase & portal venous phase) of pancreas with Siemens128 slice dual source spiral CT.

All patients initially underwent a plain non contrast pancreatic CT. 1000 ml of water was used as oral contrast agent. A dual-syringe injector system (stellant medrad) was used for intravenous administration of 80-100 ml non-ionic contrast media (300mg I/ml) at 4-5 ml per seconds followed by 20 to 30 ml saline chaser bolus. A circular region of interest (ROI) was placed within the abdominal aorta just below the diaphragm. The threshold CT value was preset at 100 HU and the scans were obtained in the cranio-caudal direction from the domes of the diaphragm to the level of pubic symphysis in the supine position. The following protocols with a scan delay of 20 second & 50 seconds from the bolus tracking was preselected for pancreatic parenchymal & portal venous phase. The study was performed at the following settings: rotation time, 0.5 seconds; beam collimation, 128x0.6mm; section thickness 5.0mm; pitch ratio 0.9; table speed 12.6cm per second; scan time 0.5 second, gantry tilt 0.0; voltage 120 kVp; and tube current 300 mAs. Post-processing images were reconstructed into FOV depending on the patient's physique, at 1.25 mm sections. Image analysis was performed at a syngovia work station on an LCD monitor.

The details recorded were demographic data, detailed clinical history & physical examination (local and systemic) and laboratory data. Detailed history suggestive of possible etiology such as gallstone disease, alcohol abuse, trauma to abdomen, infections, drug intake, metabolic disorder or any recent surgical intervention or procedure was taken. The patients were evaluated on the day of CT examination, on the 5th day after the initial CT examination and on the day of discharge on the basis of clinical outcome parameters. The severity of pancreatitis was scored using modified CT severity index and classified into three categories (mild, moderate and severe).

Diagnostic criteria:

Presence of at least two of the following features is required for the diagnosis of Acute Pancreatitis:

1. Acute abdominal pain suggestive of acute pancreatitis.
2. Serum amylase/lipase ≥ 3 times the upper normal limit.
3. US/CT scan imaging findings suggestive of acute pancreatitis..

Modified Computed Tomography Severity Index is as follows:

Pancreatic Inflammation	Points
Normal pancreas	0
Intrinsic pancreatic abnormalities with or without inflammatory changes in peripancreatic fat	2
Pancreatic or peripancreatic fluid collection or peripancreatic fat necrosis	4

Percentage Necrosis	Points
0	0
<30 or equal to 30 %	2
>30 %	4
Extra Pancreatic Complications	Points
Pleural effusion	
Ascites	
Vascular complications	
Parenchymal complications	
Gastrointestinal tract involvement	2

Modified CT Severity Index

Pancreatic Inflammation + Percentage Necrosis + Extra Pancreatic Complications

Mild	-	0 to 2
Moderate	-	4 to 6
Severe	-	8 to 10

Clinical outcome Parameters:-

- a) Hospital stay (days).
- b) Intervention (aspiration or drainage) or Surgery.
- c) Infection (Fever >100°F or WBC > 15,000 /mm³).
- d) Organ Failure

- Respiratory failure - PaO₂/FiO₂ < 300 mm hg or PaO₂ < 60 mmHg or need of ventilation.
- Cardiovascular failure - Systolic BP < 90 mm hg, not fluid responsive.
- Renal failure – S. Creatinine > 300 μmoles/L (3.5mg/dl) or Urine output of less than 500ml/24hr.
- e) Death.

Statistical Analysis:-

Data analysis was done using SPSS version 22.0. Data transformation by recoding, counting and cross tabulation was performed and obtained information was processed using Pearson chi-square and Fisher's-exact test.

RESULTS:

Study included 50 patients between the age group ranging from 17 years to 69 years with a mean age of 41 (40.16 ± 14.08) yrs. Maximum number of patients were seen in the age group 26-35 years which consisted of 19 patients (38%).(Table -1)

Table-1 : Age distribution of the study group –

Age group (in years)	No of patients	Percentage (%)
15-25	6	12
26-35	19	38
36-45	9	18
46-55	8	16
>55	8	16

Table- 2: Sex distribution of the study group –

Sex	No of patients	Percentage (%)
Male	30	60
Female	20	40
Total	50	100

Out of 50 cases, 30 (60%) were males and 20 (40%) were females with a male to female ratio of 1.5:1 indicating acute pancreatitis is more prevalent in males in this part of country. This is due to more susceptibility of the male patients for the etiological factors causing acute pancreatitis.(Table – 2)

Etiological distribution of Acute Pancreatitis

Alcohol was the most common etiological factor seen in 44% cases seen in males. Gall stones were found in 34% cases and were most common etiological factor seen in female, 8 (16%) cases were idiopathic and remaining patients were grouped as others which consisted of 3 cases of hypertriglyceridemia (> 300mg/dl). Alcohol

and gall stones together constituted 78% of all etiological factors.(Table-3)

Table-3: Etiology of Acute Pancreatitis

Cause	No of patients	%	No of Males	% of total	No of Females	% of total
Gall stones	17	34	04	08	13	26
Alcohol	22	44	22	44	00	00
Others	03	06	01	02	02	04
Idiopathic	08	16	03	06	05	10

All 50 patients (100 %) presented with pain abdomen. 31 (62%) had nausea and vomiting, 19 (38%) had fever, 14 (28%) patients had jaundice at the time of admission and 11 (22%) presented with abdominal distension.

COMPUTED TOMOGRAPHIC EVALUATION

In our study, pancreas was not found to be normal in any of the CT scans. Pancreatic inflammation with peripancreatic fluid collections and presence & extent of necrosis observed in various patients on CT was as follows. (Table-4).

Table- 4 : Individual characteristics of MCSTI on Computed tomography evaluation.

Characteristics	No of patients (%)
Normal Pancreas	0
Intrinsic pancreatic abnormalities	26 (52%)
Pancreatic or peripancreatic fluid collections / Fat necrosis	24(48%)
Pancreatic Necrosis	24(48%)
≤ 30 % Necrosis	18 (36%)
>30 % Necrosis	06(12)

EXTRAPANCREATIC COMPLICATIONS

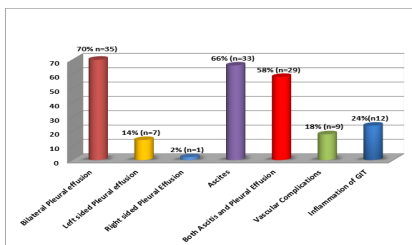


Figure-1 : Extrapancreatic Complications in Acute pancreatitis.

Out of 50 patients, 46 (92%) patients had one or more extra pancreatic complications. The most common extrapancreatic complication was pleural effusion seen in 43 (86%) patients. 33 (66%) patients had ascites. 9 (18%) patients were found to have one or more vascular complications. Venous thrombosis (involving splenoportal axis and superior mesenteric vein) was the most common vascular complication. Fig-1.

Grading of Severity of acute pancreatitis according to Modified CT Severity Index:

According to the MCSTI, 2(4%) patients had mild, 32(64%) had moderate and 16(32%) had severe pancreatitis. (Table-5). Few illustrations of cases as per severity grading and extrapancreatic complications have been provided in Fig-2 to 12.

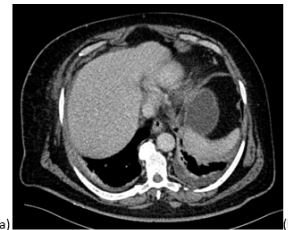
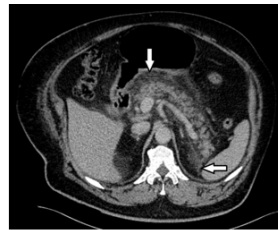
Table-5: Grading of Severity of acute pancreatitis according to Modified CT Severity Index.

MCSTI	No of Patients	Percentage (%)
Mild	2	4.0%
Moderate	32	64.0%
Severe	16	32.0%
TOTAL	50	100.0%



(a)

Figure 2 A 35 year old female with mild acute interstitial edematous pancreatitis and gall stone.(MCSTI – 2). Axial CECT image shows peripancreatic fat stranding (white arrows); pancreas is bulky and enhances completely without any evidence of necrosis. No extrapancreatic complications. A large hyperdense calculus within the lumen of gall bladder (black arrow) is seen.



(a)

(b)

Figure 3 A 67 year old alcoholic male with acute interstitial edematous pancreatitis.(MCSTI – 4). Axial CECT images. (a) shows peripancreatic fat stranding (white arrows) without an acute peripancreatic fluid; the pancreas enhances completely without any evidence of necrosis. (b) bilateral pleural effusion with basal subsegmental atelectasis.



(a)

(b)

Figure 4 Acute interstitial edematous pancreatitis and pleural effusion (not shown) in a 45 year old alcoholic male. (MCSTI – 6).Axial CECT images (a,b) shows peripancreatic fat stranding with extensive acute peripancreatic fluid collections (white arrows) in the peripancreatic region extending to bilateral pararenal spaces (right>left). The pancreas enhances completely without any evidence of necrosis, but has a mild heterogeneous appearance due to oedema.



(A)

(B)

Figure 5 A 32 year old female with gallstone induced acute necrotising pancreatitis.MCSTI – 6). Axial CECT images (a,b) shows multiple hyperdense calculi within the gall bladder lumen (black arrow),pancreas is thickened and heterogenous with diffuse stranding of peripancreatic fat planes.There is a nonenhancing area involving head and neck part of pancreas suggestive of necrosis (< 30%) (black arrowhead) with mild peripancreatic fluid collection (white arrows).

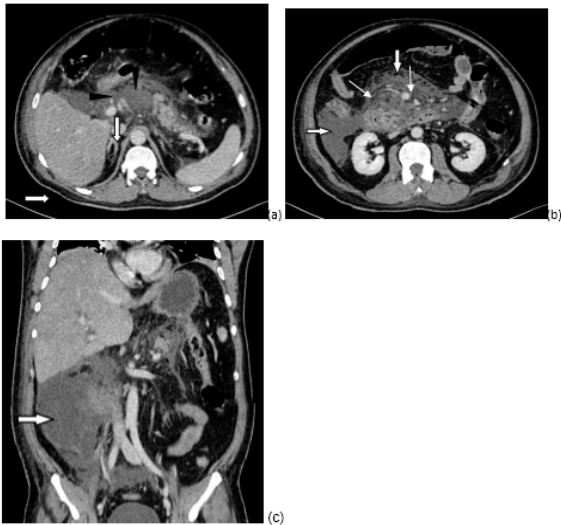


Figure 6 A 65 year old male with gallstone induced acute necrotising pancreatitis with acute necrotic collections. (MCSTI – 8). Axial and reformatted coronal CECT images (a,b,c) shows moderate acute heterogeneous peripancreatic fluid collections in the right anterior pararenal,peripancreatic region and retroperitoneal spaces (white arrows).There is extensive stranding of peripancreatic fat planes. There is nonenhancement of the part of head,neck and body of pancreas suggestive of necrosis (> 30%) (black arrowheads).CBD is dilated.

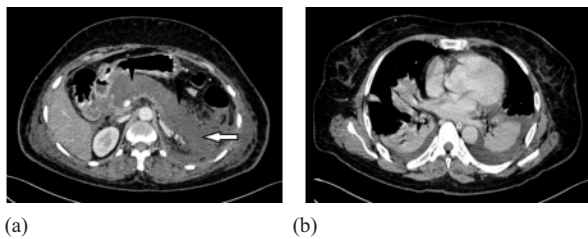


Figure 7 A 45 year female with ideopathic acute necrotising pancreatitis and acute necrotic collection.(MCSTI – 10). Axial CECT images (a) shows diffusely bulky, hypodense pancreas with non post contrast enhancement suggestive of full width extensive intrapancreatic necrosis (> 90%) (black arrowhead) with acute necrotic collection in the left retroperitoneal space (white arrow).(b) bilateral pleural effusion.

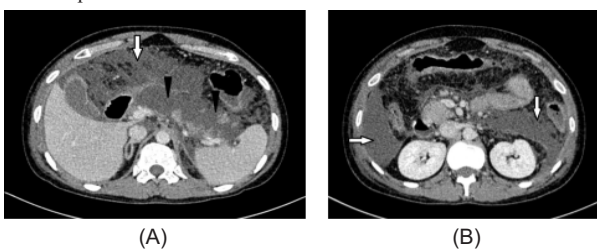


Figure 8 A 24 year male with alcoholic acute necrotising pancreatitis and necrotic collections with ascites (not shown).(MCSTI – 10). Axial CECT images (a) shows diffusely bulky, hypodense pancreas with non post contrast enhancement suggestive of near full width extensive intrapancreatic necrosis (> 90%) (black arrowhead) with acute necrotic collections in the peripancreatic and bilateral retroperitoneal space (white arrow).

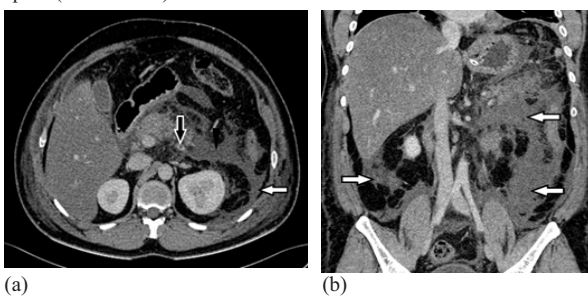


Figure 9 Acute necrotic collections in a 32 year male with acute necrotising pancreatitis & splenic vein thrombus with pleural effusion.(MCSTI – 10).Axial and reformatted coronal CECT images (a,b) shows acute peripancreatic fluid collections in left anterior pararenal and retroperitoneal space extending into bilateral paracolic gutters upto the pelvis (white arrows). There is nonenhancement of the part of body and tail of pancreas suggestive of necrosis (> 30%) (black arrowhead).A hypodense intraluminal filling defect is seen in the splenic vein (black arrow).

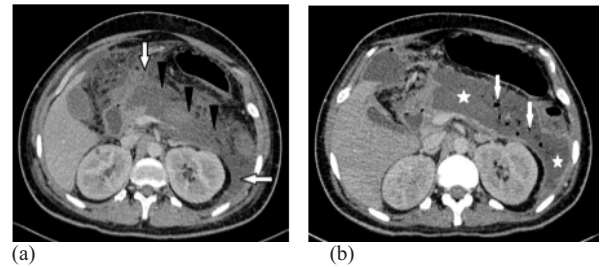


Figure 10 24 year old male with acute necrotising pancreatitis and acute necrotic collections. Axial CECT images (a) shows extensive necrosis involving the pancreatic and peripancreatic tissue (black arrowheads) and acute necrotic collections (white arrows) (b) Imaged four weeks later shows a large heterogeneous encapsulated collection (white stars) with mildly enhancing wall with multiple air foci (white arrows) noted within suggestive of infected WON.

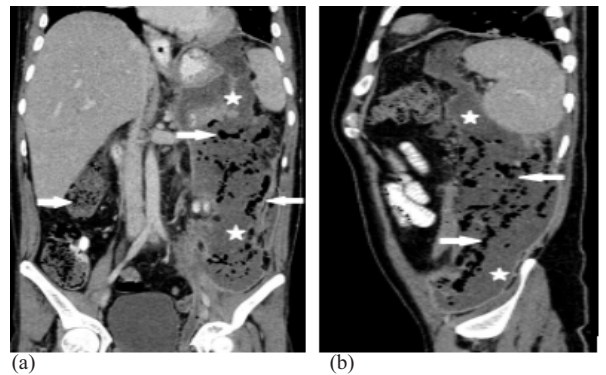


Figure 11 Infected Walled-off necrosis (WON) in a 24 year old male imaged five weeks after an acute attack of alcoholic necrotising pancreatitis. Reformatted coronal and sagittal images (a,b) shows a large heterogeneous encapsulated collection (white star) with multiple air foci (white arrow) noted within, with enhancing thick wall in the peripancreatic and peri hepatic region, extending along entire left intrabdominal region upto pelvis inferiorly. Excessively amount of air in the fluid collection is indicative of infection.

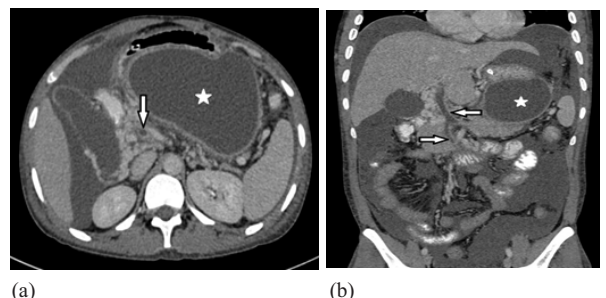


Figure 12 Pseudocyst with portal vein and superior mesenteric vein thrombosis in a 25 year old alcoholic male of acute necrotising pancreatitis with ascites. Axial and reformatted coronal images (a,b) shows a hypodense intraluminal filling defect in the main portal vein extending into the superior mesenteric vein (white arrows). Pseudocyst- oblong, low-attenuated, homogeneous fluid collection with a well defined enhancing rim in the lesser sac (white stars).

Correlation of Modified CT Severity Index with outcome parameters:
Organ Failure : Out of 50 patients, 25 (50%) developed organ failure. Respiratory failure was the most common system failure followed by cardiovascular and renal systems. Respiratory failure with renal failure

was seen in 15(30%) patients and cardiac failure with respiratory failure in 09 (18%). One (2%) patient had organ failure involving all the three systems.

Systemic Infection: A total of 25 (50%) patients who had fever (Temp>100°F) and leukocytosis (WBC > 15,000cells/cumm) were considered to have systemic infection.

Surgical Intervention: Surgical intervention was required in 8(16%) patients. Five patients underwent USG / CT guided percutaneous catheter drainage / fine needle aspiration for peripancreatic fluid collections. Two underwent exploratory laprotomy for pseudocysts, one of which was infected. Procedures performed were, cystogastrostomy combined with cholecystectomy and drainage of infected cyst combined with cholecystectomy. One patient underwent pancreatic necrosectomy.

Mean duration of Hospitalization: Duration of hospital stay in our study was ranging from 3 to 21 days with mean duration of 9.6 days. The mean duration of hospitalization in mild, moderate and severe classes of Acute Pancreatitis according to MCSTI was 6, 9 and 14 days respectively. (Table – 6)

Table-6: Patient outcomes and duration of hospitalization in severity based on Modified CT Severity Index.

MCTSI	MILD	MODERATE	SEVERE	p-value
Total number of patients	02	32	16	-
Mean duration of hospitalization (in days)	06	09	14	0.020
Surgical intervention	0 (%)	02 (6.3%)	06 (37.5%)	0.017
Infection	0 (0%)	11 (34.4%)	14 (87.5%)	< 0.001
End organ failure	0 (%)	12 (37.5%)	13 (81.3%)	0.005

MORTALITY RATE

Mortality in our study was seen in 2 (4%) patients. One patient had severe pancreatitis and another patient with moderate pancreatitis died due to multiple organ failure and infection.

DISCUSSION

The present study was undertaken to determine the prognostic value of computed tomography in assessing the severity of acute pancreatitis by modified CT Severity Index in patients and its correlation with clinical outcome. Mean age of presentation in our study group is 41 yrs. It is concurrent with study done by Parhi et al. [20] and Banday et al. [21]. In studies by Mortele et al. [19] and Bollen et al. [22] mean age was 49 and 53 yrs respectively. The study group consisted of 30(60%) males and 20(40%) females with a M:F ratio of 1.5:1. Similar results were seen by Sahu et al. [6] in their study.

In our study most common etiological factor for acute pancreatitis was chronic alcohol abuse (44%) followed by gall stones (34%). In males, alcohol was found to be most common etiological agent seen in 73% of cases while in females, cholelithiasis was most common agent seen in 65% cases. Similarly Sahu et al. [6] in their study found chronic alcohol abuse as the most common cause of acute pancreatitis (50%) followed by gall stone disease(25%). In our study alcohol and gall stones together constituted 78% of all etiological factors. This also correlated with the study by Tenner et al. [23], which concluded that cholelithiasis and alcoholism together accounted for 79% of cases respectively.

Considering the clinical presentation, the most common symptom was pain abdomen seen in all 50 patients (100 %) followed by nausea and vomiting in 31 (62%) which correlates with study by Sahu et al. [6] and Parhi et al. [20].

In our study 26(52%) patients had intrinsic pancreatic abnormalities with or without inflammatory changes in peripancreatic fat (2 points) with remaining 24(48%) patients having pancreatic /peripancreatic fluid collection or peripancreatic fat necrosis (4 points). Similar results were found in the study conducted by Melkundi et al. [24] In their study of 100 patients, all patients had pancreatic inflammation, 52

(52%) patients were given 2 points while 48 (48%) patients were given 4 points. 24 (48%) patients in our study showed pancreatic necrosis. 18 (36%) patients had less than or equal to 30% necrosis while 6 (12%) patient had more than 30% necrosis. This also correlated with the study by Raghuvanshi et al. [25], where in study of 50 patients, 25(50%) patients showed varying percentage of pancreatic necrosis respectively.

Pleural effusion was the most common extrapancreatic complication seen in 43 (86%) patients. Ascites was the second most common complication seen in 33 (66%) patients. This correlates with the study by Sahu et al. [6] and Bollen et al. [22] in whom the most common extrapancreatic complication was pleural effusion followed by ascites. Among vascular complications seen in 9 (18%), venous thrombosis (involving splenoportal axis and superior mesenteric vein) was the most common. Similarly Bollen et al. [22] reported vascular complications in 16% cases. Inflammation (thickening of bowel wall) of gastrointestinal tract was seen in 12 (24%). Similarly a recent study by Raghuvanshi et al. [25], found gastrointestinal tract involvement in 12 (24%) patients. In our study extrapancreatic complications were significantly associated with adverse outcome. Patients who had extrapancreatic complications had more severity score according to the MCTSI. In our study according to the MCSTI, 2(4%) patients had mild, 32(64%) had moderate and 16(32%) had severe pancreatitis, thereby increase in the number of patients having moderate and severe pancreatitis. This resulted in the more close association with the patient outcome in MCTSI.

Majority of cases in our study are moderate type of acute pancreatitis which correlates with study by Melkundi et al. [24] in whom 64% of cases belonged to moderate category. In the study conducted by Bollen et al. [22] majority of cases were found to be mild type of acute pancreatitis. This is due to the fact that in our institution maximum numbers of admitted patients from various clinical departments are first referred for ultrasonography of pancreas. A significant proportion of patients of acute pancreatitis who had mild symptoms and were diagnosed clinically (based on typical clinical presentation and elevated serum amylase and/or lipase levels) and on the basis of ultrasonography reports did not undergo CECT scanning. Patients with very mild symptoms do not require cross-sectional imaging for diagnosis or management of their condition. This is in accordance with current recommendations for cross-sectional imaging and clinical practice [3,6,13,19,22].

Correlation of MDCTI with patient Outcome Parameters

CT severity assessment using MCTSI showed significant correlation of grades of severity of pancreatitis with outcome parameters including mean duration of hospital stay, presence of organ failure, evidence of infection and need for intervention.

The reason for statistical significance in the MCTSI system may be attributed to the inclusion of extrapancreatic complications. It is the presence of ascites and pleural fluid which may be largely responsible for the improved correlation with MCTSI, because they may be early indicators of organ dysfunction.

Significant correlation between the severity of pancreatitis and the development of organ failure was seen using the MCTSI (p = 0.005). The grade of severity of AP as predicted by MCTSI shows highly significant correlation with the occurrence of infection (p value < 0.001). Evidence of infection in our study is seen in 34.4% and 88% of patients with moderate and severe pancreatitis respectively as compared to no infection in patients with mild pancreatitis. Hence classifying the patients according to the MCTSI may yield a better prediction of pancreatic infection. Compared with the study by Bollen et al. [22], a greater proportion of our cases had organ failure and infection. This is likely because a higher percentage of our cases belonged to the severe and moderately severe categories of AP.

According to our study, the grade of severity of AP as predicted by MCTSI shows significant correlation with the mean duration of hospitalization (p value = 0.020) and the need for intervention (p value = 0.017). MCSTI however, not only showed a stronger correlation for all parameters, it also could be used to accurately predict the development of organ failure as well as the length of the hospital stay when comparing patients with moderate and severe pancreatitis.

The strong relationship between the MCSTI and the patient outcome in

this study corroborates with the findings of Sahu et al. [6], Mortele et al. [19] and Raghuvanshi et al. [25]. This also correlated with the study by Banday et al. [21], which concluded that Modified CT Severity Index is a simpler scoring tool and more accurate than the previously used CTSI.

The present study showed a significant association between organ failure and evidence of infection with mortality. All of our patients with mortality had organ failure as well as evidence of infection; while no death occurred in patients with no organ failure; or those without evidence of infection.

MCTSI correctly categorized all cases that had evidence of infection or needed intervention and also those that developed organ failure. This is significant in clinical settings as it is imperative to identify all patients of AP who may have a potentially complicated clinical course and likely to develop significant morbidity or mortality and to provide them timely appropriate management strategies.

Limitation of study: Not all patients who were diagnosed with AP underwent CECT. Proportion of patients with AP had either mild symptoms obviating imaging, or are unable to undergo imaging studies because of their condition. As a result, our study may appear inclined towards more moderate/severe AP. However, all other studies will agree with this topic because patients with very mild symptoms do not require cross-sectional imaging for diagnosis or management of their condition. This is in accordance with current recommendations for cross-sectional imaging and clinical practice. Differences in treatment regimes and health care practices among institutions could account for the difference in length of hospitalization and ICU stay.

Conclusion

Contrast enhanced Computed Tomography is an excellent diagnostic modality to grade the severity of acute pancreatitis and depict complications. It was concluded, Modified CT severity index is a good prognostic indicator of clinical outcome of patients with acute pancreatitis. It showed significant correlation with all the clinical outcome parameters including end organ failure, duration of hospitalization, systemic infection and with need for surgical intervention.

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