

Role of CECT in Acute Pancreatitis and Correlation of MCTSI with Clinical Outcome

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A B S T R A C T

Introduction: Acute pancreatitis is one of the major complex abdominal pathology causing significant morbidity and mortality. CT imaging plays an important role in the diagnosis and staging of acute pancreatitis.

The purpose of this study is to evaluate the role of CECT in characterization of acute pancreatitis and to assess the clinical outcome based on Modified CT severity index.

Material and Methods: The study was done in a span of 1 year (January 2018 to December 2018) on all clinically and biochemically suspected cases of acute pancreatitis (study sample = 48). All these patients were subjected to CECT and scoring was based on Modified CT severity index (MCTSI).

Results: The most commonly affected age group in this study was 41-50 years (58.33%) with a male predominance (62.5%). Cholelithiasis (43.75%) was observed to be the most common etiology followed by alcoholism (37.5%). The most common extrapancreatic complication was found to be pleural effusion (47.91%) followed by ascites (33.33%). Under MCTSI, patients were grades as mild, as moderate and as severe. The prognostic outcome (depending on parameters such as length of hospital stay need for intervention, presence of infection and solid organ failure) was significantly affected with increase in grade of acute pancreatitis.

Conclusion: In conclusion, CECT plays a better role in identification and characterization of acute pancreatitis; and MCTSI is a better predictor of overall prognosis and clinical outcome.

Keywords: Pancreatitis, Computed Tomography, Modified CT Severity Index.

INTRODUCTION

Acute pancreatitis occurs due to exudation of pancreatic fluid containing proteolytic enzymes into the pancreatic interstitium and into surrounding tissues thereby inciting an inflammatory response.

The diagnosis of acute pancreatitis requires two of the following three features:¹

(1) Sudden onset epigastric pain radiating to back (2) Rise of serum amylase and/or lipase levels to at least 3 times greater than the upper limit of normal; and (3) Characteristic imaging findings on contrast-enhanced computerized tomography (CECT), MRI, or transabdominal ultrasonography (US) studies suggestive of acute pancreatitis.

The most common etiology in adults is cholelithiasis followed by alcohol consumption. Other causes include hypertriglyceredemia, drug induced, trauma etc.³

Among the various imaging modalities, CT offers higher sensitivity and accuracy in diagnosing acute pancreatitis.² CECT is considered as the gold standard in diagnosing acute pancreatitis as it is also sensitive in evaluating pancreatic

necrosis and extrapancreatic complications.⁴ The chance of diagnosing pancreatic necrosis is highest when the scan was performed 24-48 hours after disease onset.⁵

Acute pancreatitis is suspected when abdominal CT demonstrates enlarged pancreas (with or without necrosis) with peripancreatic fat stranding; with associated adjacent thickening of facial planes and fluid collections.⁶

In 1990, Balthazar introduced CT Severity Index (CTSI) as a grading system for assessing the severity of acute pancreatitis.⁷ However this scoring system didn't include extrapancreatic complications such as organ failure, vascular complications etc.^{7,8}

To overcome these drawbacks, in 2004 Mortelet et al introduced Modified CTSI (MCTSI), a more simpler and easier index which has a better correlation with clinical outcome such as length of hospital stay need for intervention, presence of infection and solid organ failure.⁹

As acute pancreatitis is one of the major complex abdominal pathology causing significant morbidity and mortality; early diagnosis of acute pancreatitis and its complication is mandatory for better prognosis.

Aim

The aim of this study is to evaluate the role of CECT in characterization of acute pancreatitis and to assess the clinical outcome based on Modified CT severity index.

MATERIAL AND METHODS

It is a prospective observational study done in a span of 1 year (January 2018 to December 2018) on all clinically and biochemically suspected cases of acute pancreatitis (study sample = 48); referred to Dept of Radiodiagnosis, KIMS & RF, Amalapuram. All these patients were subjected to CECT (figure1-4) and scoring was based on CTSI AND MCTSI.

Diagnostic criteria:

- Acute abdominal pain and tenderness suggestive of pancreatitis with age > 20 years
- Serum amylase/lipase \geq 3 times the normal.
- Imaging findings (USG and/or CT) suggestive of acute pancreatitis.

Inclusion criteria

All referred patients with clinical/laboratory/ultrasonography diagnosis of acute pancreatitis, who were willing to undergo CECT.

Exclusion criteria

- Patients with acute on chronic pancreatitis, chronic pancreatitis or other pancreatic pathology such as neoplasm, cysts etc.
- History of previous pancreatic surgery.
- Pregnant females.
- Patients with renal failure (serum creatinine >1.5 mg/dl after rehydration), contrast allergy.
- Patients not willing to participate in the study.

Assessment of severity

CTSI:

| Prognostic Indicator | Points |
|--|--------|
| Normal pancreas | 0 |
| Focal or diffuse enlargement of the pancreas | 1 |
| Intrinsic pancreatic abnormalities with inflammatory changes in peripancreatic fat | 2 |
| Single ill defined collection or phlegmon | 3 |
| Two or more poorly defined collections or presence of gas in or adjacent to the pancreas | 4 |
| Extent of pancreatic inflammation was assigned points from 0-4. The presence and extent of necrosis was classified into 4 categories and awarded points from 0-6. | |

| Necrosis | Points |
|--|-----------------|
| None | 0 |
| \leq 30% | 2 |
| 30-50% | 4 |
| \geq 50% | 6 |
| CTSI was calculated by adding the above points in each case and the total score was then categorized as: | |
| Mild pancreatitis | CTSI score 0-3 |
| Moderate pancreatitis | CTSI score 4-6 |
| Severe pancreatitis | CTSI score 7-10 |

MCTSI

| Prognostic Indicator | | Points |
|--|--|------------------|
| Pancreatic inflammation | 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 |
| Pancreatic necrosis | None | 0 |
| | \leq 30% | 2 |
| | \geq 30% | 4 |
| Extrapancreatic complications | One or more of the following: Pleural effusion, ascites, vascular complications, parenchymal complications, or gastrointestinal tract involvement | 2 |
| The MCTSI was calculated by summing these values and acute pancreatitis was then categorized as: | | |
| Mild pancreatitis | | MCTSI score 0-2 |
| Moderate pancreatitis | | MCTSI score 4-6 |
| Severe pancreatitis | | MCTSI score 8-10 |

Clinical Outcome Parameters:

- the length of hospital stay (in days)
- need for intervention (surgical/aspiration and drainage),
- evidence of infection in any organ system (combination of a fever > 100°F and elevated WBC >15,000/ mm³),
- evidence of organ failure (PaO₂ < 60 mm Hg or need of ventilation, systolic BP of < 90 mm Hg, serum creatinine of >300 μ moles / L or urine output of < 500 ml / 24 h) and death.

RESULTS

In our study after meeting the above mentioned inclusion criteria; a total of 48 patients were included.

Age and sex distribution

In the present study, 30 (62.5%) were males and 18 (37.5%) were females with a male:female ratio of 1.67:1. The age of the patients included in this study ranged between 21-65 years with the majority (28 patients; 58.33%) in 41 to 50 years.

Clinical scenario

In our study most common presenting symptom is abdominal

| causes | Males (n=30) | | Females (n=18) | |
|----------------------|--------------|-------|----------------|------|
| | No of cases | % | No of cases | % |
| Alcohol | 18 | 60 | 0 | 0 |
| Gall stones | 7 | 23.33 | 14 | 77.7 |
| Idiopathic | 3 | 10 | 3 | 16.6 |
| hypertriglyceredemia | 2 | 6.66 | 0 | 0 |
| Drug induced | 0 | 0 | 1 | 5.55 |

Table-1: Etiological pattern

| Radiological Findings | No of cases | Percentage |
|--------------------------------|-------------|------------|
| Extra pancreatic complications | 33 | 68.75% |
| Pleural effusion | 23 | 47.91% |
| Left effusion - | 13 | 56.52% |
| Bilateral pleural effusion - | 9 | 39.13% |
| Right pleural effusion | 1 | 2.08% |
| Ascites | 16 | 33.33% |
| GIT inflammation | | |
| Thickening of the wall | 10 | 20.83% |
| Infection | 9 | 18.75% |
| Vascular complications | | |
| Venous thrombosis | 3 | 6.25% |
| Arterial hemorrhage | 0 | 0 |
| Solid organ abnormality | 2 | 4.16% |

Table-2: Extrapancreatic complications:

| Score | Grade | No.. of cases |
|-------|----------|---------------|
| 0-2 | Mild | 12 (25%) |
| 4-6 | Moderate | 16 (33.33%) |
| 8-10 | Severe | 20 (41.16%) |

Table-3: Modified ct severity index scoring

| Parameters | Mild (n=12) | Moderate (n=16) | Severe (n=20) |
|--|-------------|-----------------|---------------|
| Average duration of hospital stay (in days) | 6 | 14 | 30 |
| Underwent intervention | 0 | 6 | 9 |
| Infection | 0 | 1 | 8 |
| Solid organ failure | 0 | 1 | 5 |
| No. of Deaths | 0 | 1 | 6 |

Table-4: Patient outcome based on MCTSI

| Grading system | Grade in CTSI | Grade in MCTSI |
|----------------|---------------|----------------|
| Mild | 21 | 12 |
| Moderate | 10 | 16 |
| Severe | 17 | 20 |

Table-5: Comparison of grade according to CTSI and MCTSI

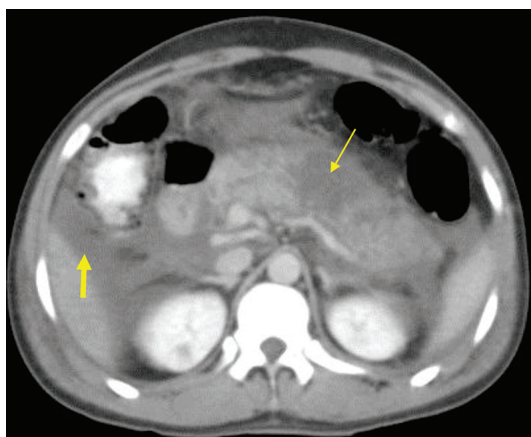


Figure-1: Bulky pancreas with extensive peripancreatic fat stranding and gland necrosis >50% associated with ascites (MCTSI score = 10)

pain observed in all patients (100%) and next most common presenting symptom was nausea associated with vomiting

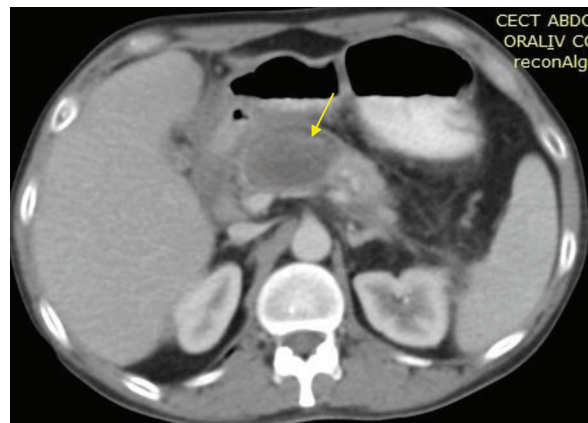


Figure-2: Cystic lesion within the pancreas with heterogeneous nonenhancing area within. Suggestive of walled off necrosis.

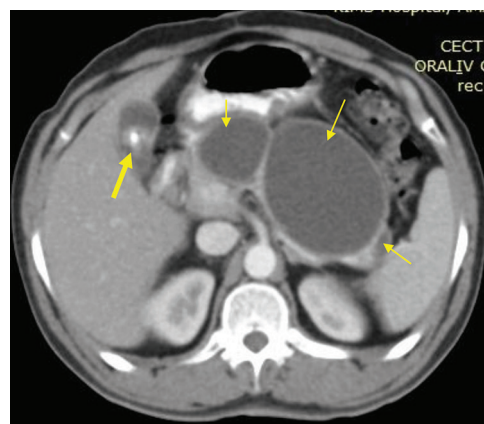


Figure-3: Two well defined cystic lesions noted within the pancreatic body and tail region. Another tiny cyst noted in the tail region. Suggestive of multiple pseudopancreatic cysts. Note is made on calculus within the gall bladder with hyperdense debris and minimal pericholecystic collection.

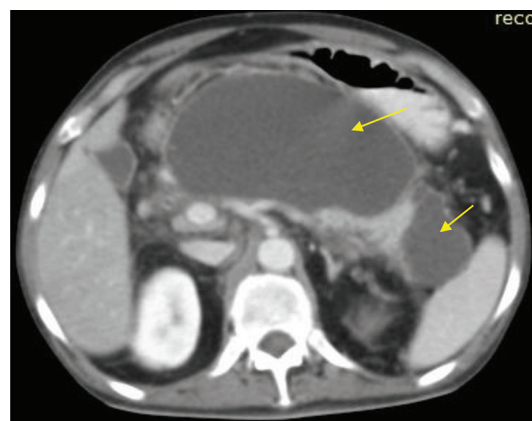


Figure-4: Two walled off necrosis noted involving body and tail of pancreas

seen in 36 patients (75%). Nine (18.75%) patients developed fever (>100°F) and 3 patients (6.25%) had diarrhoea. As per table 1 60 % male were alcoholic, 23% male and 77% female were having gall stone. 23.33 % patients in male group having idiopathic etiology and 16% female having idiopathic etiology. Hypertriglyceridemia was present 6.66% patients and absent in female (table-1).

Extra pancreatic lesion was present in 68.75% patients. Pleural effusion present in 47.91%, Ascites present in 33.33% and infection was present in 18.75 % patient (table-2).

25 % patient have mild severity index, 33.33% have moderate severity index and 41.16 % have severe severity index (table-3).

Severe acute pancreatitis patients average duration of stay in hospital was 30 days. 9 patients in that group went intervention and there was 6 deaths. All patients with mild acute pancreatitis recovered. one patient out of 16 moderate acute pancreatitis died (table-4).

Grade in CTSI was higher in mild group but lower in severe and moderate group (table-5).

DISCUSSION

The present study was undertaken to evaluate the role of CECT in characterization of acute pancreatitis and to assess the clinical outcome based on Modified CT severity index.

The study group comprised of 30 males and 18 females with a male:female ratio of 1.6:1. Prospective study done by Silverstein et al also showed male preponderance with a male:female ratio of 2:1.¹⁰

In our study, the most common etiology was found to be cholelithiasis (43.75%) followed by alcoholism (37.5%), idiopathic (12.5%), hypertriglyceredemia (4.17%) and drug induced (2.08%). Prospective study done by Raghuvanshi et al¹¹ on 50 patients also found that cholelithiasis (42%) and alcoholism (38%) were the major causes of acute pancreatitis which is concomitant with the present study.

This study shows that the most common presenting complaint was pain in the epigastrium (100%) followed by nausea associated with vomiting (25%) which is comparable to the study done by Laharwal et al¹² on 50 patients where epigastric pain was observed in all patients and nausea with vomiting in 76% of study population.

Complications of acute pancreatitis

In the present study, majority of the study population presented with acute peripancreatic collection (41.67%) followed by acute necrotic collection (20.83%). Studies done by Laharwal et al¹², Raghuvanshi et al¹¹ have reported peripancreatic collection to be the most common presenting feature with an incidence of 88% and 72% respectively in their study population.

Extrapancreatic complications were found 33 patients (68.75%) with pleural effusion being the most common local complication (47.91%) followed by ascites (33.33%). This is in comparison with the study done by Raghuvanshi et al¹¹ where similar findings of pleural effusion and ascites were found to be the most common extrapancreatic complications. Similar Study by Wongnai Anchalee et al¹³ had stated pleural effusion as the most common extra pancreatic complication. In our study left sided pleural effusion is common (56.52%) which is in comparison to the study done by Raghuvanshi et al.¹¹

In this study, three cases (6.25%) were found to have venous thrombosis (portal vein) which was found to be the most common vascular complication and another fairly common complication was found to be gastrointestinal tract (GIT)

inflammation (8.33%). Study done by Banday et al¹⁴ on 50 patients stated that ascites (36%) was the second most common extrapancreatic complication followed by GI involvement (26%). Similar incidence was also reported by Balthazar et al (14%).⁷

CT scoring:

In the present study, Balthazar scoring system was applied and the study population was categorized into mild (21/48), moderate (10/48) and severe (17/48) pancreatitis. However when modified CTSI was used to grade acute pancreatitis; mild grade was observed in 12 patients (25%), moderate in 16 patients (33.33%) and severe in 20 patients (41.16%); with a significant increase in severity of the grade. The higher incidence of severe pancreatitis in our study is probably due to higher number of referrals from local primary or secondary care centres which lack proper intensive care facilities.

This is comparable to the study done by Banday et al.¹⁴ in a tertiary care hospital, where Balthazar CTSI and MCTSI was applied. In their study, CTSI graded acute pancreatitis as mild in 22/50 (44%), moderate in 11/50 (22%) and severe in 17/50 (34%) patients. However when MCTSI was applied; a larger number, viz. 22/50 (44%) patients were placed in the severe pancreatitis group.

Clinical outcome

In our study the severity grade of acute pancreatitis by MCTSI correlated better with clinical outcome when compared to CTSI with respect to length of hospital stay, need for intervention, occurrence of infection or solid organ failure. This is comparable to the similar study by Banday et al where MCTSI was proved to be a better prognostic indicator than CTSI. Study done by Mortelet et al⁹ reported that MCTSI is a better predictor of clinical outcome. The shift in the severity grade is attributable to the presence of extrapancreatic complications. Study by Shivanand et al¹⁵ also quoted that MCTSI is more closely associated with patient outcome. However study by Munoz-Bongrand et al¹⁶ showed no significant difference between the two scoring systems with respect to the severity of the disease which is quite contrast to our study. This observational difference might be due to variations in organ failure criteria.

It is interesting to note that there is no definite association between the degree of necrosis (30-50% necrosis or >50%) and clinical prognosis when CTSI was used. This is a major limitation for CTSI as it offers a technical challenge to accurately grade the degree of necrosis.

A note to be made on the correlation between mortality rate and severity of MCTSI grade in this study. Acute pancreatitis with higher grade of severity showed significant increase in morbidity and mortality which is similar to the study by Banday et al.¹⁴

CONCLUSION

Contrast enhanced Computed Tomography serves as an excellent diagnostic modality to demonstrate and characterize acute pancreatitis. It also helps to stage the severity of the disease and identify its complications. MCTSI shows a strong correlation with clinical outcome and is helpful in assessing patient mortality and organ failure when compared with CTSI.

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