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A study on significance of computed tomographic evaluation of acute pancreatitis: A prospective observational study

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Abstract
Background: Acute pancreatitis is a common disease with high rate of morbidity and mortality. Computed tomography is the gold standard technique not only for its global picture of the pathology and for the non-invasive method of evaluating the morphology of pancreas and peripancreatic regions in an acute situation.
Aim & Objectives: The purpose of the study was to determine the value of computed tomography evaluation in early diagnosis of severity, differences between pancreatitis & acute pancreatitis caused by mass lesions.
Methodology: A prospective study comprise of 60 patients on clinical suspicion/diagnosis of acute pancreatitis, altered biochemical parameters (serum amylase, serum lipase) in favor of acute pancreatitis, Ultrasonography suggestive of acute pancreatitis and known case of chronic pancreatitis with features of acute symptoms referred to Department of Radio-diagnosis, Medical College and Research Hospital for computed tomography scan of abdomen and pelvis using Toshiba Asteion spiral Computed Tomography scan. Plain and post-contrast series of the abdomen and pelvis were taken.
Results: In this prospective study of 50 patients, 40 were male and 10 were female patients. Among these edematous pancreatitis was in 20% patients and pancreatic necrosis was in 24% patients. Other features like diffuse/focal pancreatic enlargement in (75%), peri-pancreatic fat stranding in (64%) and peri-pancreatic fluid collection in (40%). Among this alcohol was the most common cause of AP (84%). The accuracy and sensitivity of serum amylase and serum lipase in diagnosing AP were 40% and 64% respectively with CT showing 100% accuracy and sensitivity. Modified CT severity index was classified as mild (2 and 4), moderate (6) and severe (8 and 10) of which majority were mild (66%), moderate (22%) and severe (12%).
Conclusion: Computed tomography is a sensitive, non-invasive imaging in early diagnosis and staging of severity of acute pancreatitis which help in prediction of prognosis of the disease. It helps to differentiate between edematous and necrotizing pancreatitis as serum lipase and amylase levels do not help to differentiate the type of AP. Modified CT severity index helps in evaluating the percentage pancreatic necrosis and to predict the possibility of developing local and systemic complications and necessity of tertiary care.

Keywords: Computed tomography, acute pancreatitis, modified CT severity index, pancreatic necrosis, sensitivity

Introduction

Acute pancreatitis is a disease with high rate of morbidity and mortality and is known to run an unpredictable course. It has a broad spectrum of findings that varies in severity from mild interstitial or edematous pancreas to severe forms with significant local and systemic complications. Severe pancreatitis occurs in 20%–30% of all patients with acute pancreatitis and is characterized by a protracted clinical course, multiorgan failure, and pancreatic necrosis.

Treatment of patients with acute pancreatitis is based on the initial assessment of disease severity. Individual laboratory indexes (markers of pancreatic injury, markers of inflammatory response), while promising, have not yet gained clinical acceptance. Numeric grading systems like RANSON and APACHE II are commonly used today as indicators of disease severity. While RANSON score cannot be used for the first 48 hrs, APACHE score is cumbersome to use.

Computed tomography is the gold standard technique not only for its global picture of the pathology and complications but also for the non-invasive method of evaluating the morphology of pancreas and peripancreatic regions in an acute situation. It is unaffected by bowel gas distension and obesity, which is a definite disadvantage on ultrasonographic evaluation. Contrast material enhanced computed tomography helps in early diagnosis and staging of severity of acute pancreatitis and its complications which helps in prediction of prognosis of the disease.

CT severity index was used initially which was popularly called Balthazar scoring system. This scoring system is based on pancreatic morphology, number of peri-pancreatic fluid collections and pancreatic necrosis. Now Modified Computed Tomography Severity Index (MCTSI) has been introduced which differs from the Computed Tomography Severity Index (CTSI) by including the presence of extra pancreatic complications and grading the peripancreatic fluid collection in terms of presence or absence instead of the number of fluid collections. The grading of necrosis is also different in this system.

Therefore, present study was undertaken to assess the MCTSI in evaluating the severity of acute pancreatitis and to correlate MCTSI with clinical outcome and hospital stay in this area.

Aim and Objectives

1. To determine the value of computed tomography evaluation in early diagnosis of acute pancreatitis.
2. To differentiate between acute edematous and acute necrotizing pancreatitis.
3. To evaluate the complications using modified computed tomography severity index.

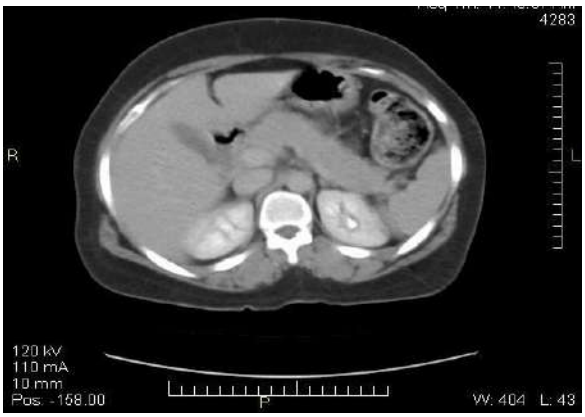

Fig 1: Normal CT Scan of Pancreas

Methodology

Type of study

Prospective study

Source of data

This study was conducted in Department of Radio-diagnosis in Gove Medical College & Hospital, Srikakulum, Andhra Pradesh, India. This study comprised of 50 cases on clinical suspicion/diagnosis of acute pancreatitis, altered biochemical parameters (serum amylase, serum lipase) in favor of acute pancreatitis, Ultrasonography suggestive of acute pancreatitis and known case of chronic pancreatitis with features of acute symptoms are taken up for computed tomography study and evaluated.

Selection criteria

Inclusion Criteria

1. All the patients who are suspected/diagnosed of acute pancreatitis based on clinical and laboratory findings (serum amylase & serum lipase).
2. Patients who are diagnosed acute pancreatitis on ultrasonography.
3. Patients who present as acute on chronic pancreatitis.

Exclusion Criteria

1. Chronic pancreatitis.
2. Congenital pancreatic lesion.
3. Pancreatic carcinoma and metastasis.
4. Pancreatic trauma.

Equipment

Toshiba Asteion single slice spiral Computed Tomography scan.

Protocol

Plain and post-contrast series of the abdomen and pelvis were taken. Acquisition of contiguous axial sections, of thickness 5mm of abdomen and pelvis, 3mm in region of interest in the cranio-caudal direction from the level of the xiphisternum to pubic-symphysis before and after administration of oral and intravenous iodinated contrast of 80-100 ml. All images were viewed in a range of soft tissue window settings.

The patient was explained prior to the procedure and written consent was taken from the patient/ bystander.

The patient was asked to be in overnight nil-oral status and after obtaining renal function tests the contrast-enhanced CT was done.

Clinical details, laboratory, ultrasonography and computed tomography findings of the case will be recorded as per the proforma.

Observation and Results

In this study of 50 cases, 40 patients were male and 10 were female.

Table 1: Gender distribution

Gender	Number of patients	%
Male	40	80
Female	10	20
Total	50	100

All the 60 patients are grouped in age of <25, 25-35, 36-45, 46-55 and >55 years. Number of patients belonging into each group and mean age of patients are calculated.

Table 2: Age distribution

Age in years	Number of patients	%
< 25	7	14
25-35	20	40
36-45	10	20
46-55	8	16
> 55	5	10

Patients are divided according to the symptoms they presented with.

Table 3: Various symptoms of the Acute pancreatis

Symptoms	Number of patients
Epigastric pain	10
Epigastric pain radiating to back	12
Rebound tenderness	9
Nausea	3
Vomiting	17
Diffuse pain abdomen	25

The patients who underwent ultrasound prior to CT are grouped according to normal, direct evidence of pancreatitis and abnormalities consistent with pancreatitis.

Table 4: Ultrasound findings

Ultrasound findings	Number of patients (n=50)	%
No abnormality detected	12	24
Direct evidence of pancreatitis	27	54
Abnormalities consistent with pancreatitis	11	22

AP is divided into edematous and necrotizing pancreatitis depending on the basis of morphology and pancreatic parenchyma.

Table 5: AP is divided into edematous and necrotizing pancreatitis depending on the basis of morphology and pancreatic parenchyma.

Types of AP	Present in number of patients		%
Edematous pancreatitis	15		30
Necrotizing pancreatitis	5	Total = 12	24
<30			
>30	7		

Table 6: CT findings seen in cases of AP

CT findings	Number of patients		%
	Present	Absent	
Peri-pancreatic fat stranding	32	18	64
Diffuse/focal pancreatic enlargement	35	15	70
Peri/pancreatic fluid collection	20	30	40

The CT findings seen in cases of AP.
Most common cause of AP in our study was alcohol.

Table 7: Common causes AP

Causes	No of patient	%
Alcohol	42	84
GB/ CBD Calculus	4	8
Hyperlipidemia	3	6
Smoking	10	20

The extra-pancreatic complications noted in our study with ascites being the most common, then bilateral pleural effusion.

Table 8: Extra hepatic complications in AP

Extra pancreatic complications	No of patients	%
Ascites	28	56
Bilateral pleural effusion	7	14
Left pleural effusion	6	12
Right pleural effusion	2	4
Splenic vein thrombosis	2	4
Portal vein thrombosis	1	2
None	15	30

Table 9: Patients developing pseudocyst as a consequence of AP

Pseudocyst	Number of patients (n=50)	%
Present	18	36
Absent	32	64

Table 10: Patients developing infected necrosis AP

Infected Necrosis	Number of patients (n=50)	%
Present	4	8
Absent	46	92

CT findings are compared with serum lipase and serum amylase levels for sensitivity. CT shows 100% sensitivity, serum lipase 65% sensitivity and serum amylase 45% sensitivity.

Table 11: Accuracy f serum amylase, serum lipase with CT findings

	Positive	Negative	Accuracy/ Sensitivity
Serum amylase	20	30	40%
Serum lipase	32	18	64%
CT	50	0	100%

Patients are distributed according to MCTSI scores which shows majority in score 4 of 43% and least in score 10 of 1.6%.

Table 12: Distribution of patients according to MCTSI scores.

MCTSI Total score	No of patients	%
2	9	18
4	20	40
6	10	20
8	8	16
10	3	6

MCTSI scores are distributed according to their age group is as follows, with maximum number of patients in 25-35 yrs age group.

Table 13: Distribution of patient according to MCTSI total scores with respect to age groups.

Age group	No of patients in MCTSI total scores				
	2	4	6	8	10
<25	1	3	2	1	0
25-35	2	8	2	2	1
36-45	0	6	4	2	0
46-55	3	2	1	0	0
> 55	1	1	2	0	0

MCTSI scores are grouped as mild (2 & 4), moderate (6) and severe (8).

Table 14: Distribution of CT grade when AP is classified as mild, moderate and severe

MCTSI scores	Number of patients (n=50)	%
2 & 4 (mild)	33	66
6 (moderate)	11	22
8 &10 (severe)	6	12

Table 15: Distribution of pancreatic necrosis according to mild, moderate and severe CT grades.

CT grade	Pancreatic necrosis (n=50)	%
Mild (2 & 4)	4	8
Moderate (6)	3	6
Severe (8 & 10)	6	12

Table 16: Patients who needed Intervention in AP.

Intervention	No of patients (n = 50)	%
Radiological guided – A, PC	4	8
Fluid tap –A, PE	6	12
Surgical	2	4
Total no of patients	12	24%

Discussion

This was a prospective study conducted in rural settings from January 2017 to August 2019 in Govt Medical College and Research Hospital at Srikakulam.

50 cases diagnosed as acute pancreatitis were included in this study. These patients underwent CECT of the abdomen and pelvis, were graded according to the modified CT severity index. The mean age of patients in the study was 36.50 ± 12.45 years. The maximum patients were in the age group of 25 to 35 years (40%). The next group with maximum patients was in the 36 to 45 years group (20%). The minimum age of patients was 17 years and maximum age was 62 years. These observations was similar to that of a study conducted by Similar results were seen by Baig *et al.* [1] in whose study male to female ratio is 2.75:1 with 73% males and 27%. females.

Alcohol was the most common cause of AP seen in 42 (84%) patients, 4 (8%) patients were having GB/CBD calculi and 3 (6%) patients were having hyperlipidemia. Out of this one patient had both alcohol and CBD calculus. This finding was similar to previous study by Banday IA *et al*. in which alcohol was the cause of pancreatitis in 18 patients and all of them were male [2].

Out of 50 cases, 15 (30%) patients had edematous pancreatitis. 12 (24%) patients showed evidence of pancreatic necrosis out of which 5 had <30 of necrosis and 7 had >30 of necrosis. CT plays an important role in differentiating edematous and necrotizing form of AP, since clinical assessment alone cannot predict the severity of disease. A study by Bollen *et al.* [3] identified necrosis in 18% and 15% of patients with AP respectively. They concluded by saying that necrosis almost always occurs within 48 hrs after onset of symptoms. Glandular necrosis is an important feature for determining prognosis and guiding treatment in patients with AP.

Diffuse/focal pancreatic enlargement was seen in 75% patients, peri-pancreatic fat stranding was seen in 64% patients and peri-pancreatic fluid collection was seen in 40% patients. Peri-pancreatic fat stranding was detected in normal USG findings, serum amylase and lipase levels which suggests early finding in AP.

In the ultrasound studies conducted on the patients with AP direct evidence of pancreatitis (bulky and hypo echoic pancreas with peri pancreatic fluid) was seen in 26 patients (43.3%), Features consistent with pancreatitis was seen in 28 patients (56%) in form of ascites, pleural effusion (unilateral / bilateral). No abnormality was detected in 15 (30%) of the patients. In the observation made by Balthazar *et al.* [4] abnormal ultrasound findings are seen in 33–90% of patients with AP. Edematous pancreatitis was depicted on ultrasound as an enlarged hypoechoic gland. Thus the main role of ultrasound in the imaging of AP is limited to the detection of cholelithiasis and choledocholithiasis and identification of fluid collections.

The accuracy and sensitivity of serum amylase in diagnosing AP is 40%. The accuracy and sensitivity of serum lipase in diagnosing AP is 64%. The samples were taken at the time of CECT and follow-up serum amylase/lipase levels were not included in these study. When compared with CT findings of these patients, it showed 100% accuracy and sensitivity which helps in early diagnosis and predicting the severity of AP. Balthazar *et al.* [4] says that early overall detection rate of 90% with 100% sensitivity. CECT is the most important imaging modality for diagnosis and staging of AP due to its ability in demonstrating early inflammatory changes as well as development of complication.

The CT grades were classified into 2, 4, 6, 8 and 10 according to the MCTSI. We further classified the grades into mild (grade 2 & 4), moderate (grade 6) and severe (grade 8 & 10). The previous studies by Bollen *et al.* [3] and Mortele *et al.* [5] have classified grade 2 as mild, grade 4 and 6 as moderate and grade 8 and 10 as severe. The prognosis of patients with grade 2 and 4 pancreatitis was similar and milder than patients who had a grade of 6 as observed in our study, hence were grouped together in our study.

The maximum patients were seen to fall in the grade 2 and 4 category (66%) and minimum patients (12%) were seen in grade 8 and 10 category. Similarly most of the patients were of mild CT severity (66%) and minimum patients had a severe grade (13%). Moderate pancreatitis was present in 22% of patients. According to the study by Bollen *et al.* [3] the morphologic severity of pancreatitis was graded as mild in 86 (44%), moderate in 75 (38%), and severe in 35 (18%) cases. The study had patients with severe pancreatitis as the minimum number of patients which is similar to our study. Most patients are of mild grade in our study that possibly explains early use of CECT usefulness in mild cases of AP.

The extra-pancreatic complications were seen in 43 patients (71.6%) in our study. Ascites was seen in 28 patients (56%), bilateral pleural effusion in 7 patients (14%), left pleural effusion alone in 6 patients (12%), right pleural effusion alone in 2 patients (4%), splenic vein thrombosis in 2 patients (4%) and portal vein thrombosis in 1 patient (2%). According to Chishty *et al.* [6] conducted a study in 40 patients of which extra-pancreatic complication was seen in 89%.

Pseudocyst was seen in 18 patients (36%) in our study. Pseudocyst formation occurred in 50% of patients in a study conducted by Gonzalez *et al.* [7]. Infected necrosis was detected in 4 patients (8%). The total percentage of patients developing local complications in the study was 36.6%. Presence of local complications was positively associated with CT grading. There was evidence of development of local complications in patients with mild pancreatitis.

In our study intervention was needed in the form of laparotomy in 2 patients with large pseudocysts due to AP. Radiological intervention was needed in 4 patients (8%) of grade 6, 8 and 10. Aspiration of pseudocyst and pleural effusion was needed in 6 patients (12%) with grade 4 and 6 of pancreatitis. Thus patients who need an intervention have more moderate and severe CT grades. This is similar to the study by Bollen *et al.* [3] which demonstrated that development of local complications and need for intervention was significantly associated with grade of pancreatitis.

No mortality due to pancreatitis was observed in our study. In the study by Bollen *et al.* [3] mortality was seen in 6% of patients and in 1.5% patients in the study by Mortele *et al.* [5].

Conclusion

CECT helps in differentiating between edematous and necrotizing pancreatitis. Serum lipase and amylase levels do not help to differentiate the type of AP. The MCTSI helps in evaluating the percentage pancreatic necrosis. Modified CT severity index can be used to predict the possibility of developing local and systemic complications and necessity of tertiary care (as this is done in a rural setting). MCTSI grading correlates directly with the development of local and systemic complications. Modified CT severity index can predict the need for interventions.

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