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Evaluation of computed tomography value in early diagnosis of acute pancreatitis- A Prospective Observational Study

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A B S T R A C T

Background: Acute pancreatitis is a disease with high rate of morbidity and mortality and is known to run an unpredictable course. 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. 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 ofRadiology & Imaging, BSMMU, Dhaka, Bangladesh from January to June 2024. Plain and post-contrast series of the abdomen and pelvis were taken.

Results: Outof 60 patients, 45 were male and 15 were female patients. Among these edematous pancreatitis was in 20% patients and pancreatic necrosis was in 23.3% patients. Other features like diffuse/focal pancreatic enlargement in (75%), peri-pancreatic fat stranding in (63.3%) and peri-pancreatic fluid collection in (40%). Among this alcohol was the most common cause of AP (83.3%). The accuracy and sensitivity of serum amylase and serum lipase in diagnosing AP were 40% and 63.3% 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.

INTRODUCTION

Computed Tomography (CT) is highly accurate and sensitive than USG in both diagnosing as well as demonstrating the extent. Early assessment of the cause and severity of acute pancreatitis is of utmost importance for prompt treatment and close monitoring of patient with severe disease.Acute Pancreatitis is a common condition presenting as acute abdomen. This condition is broadly classified into two subtypes: one, oedematous or mild acute pancreatitis and two, a necrotizing or severe acute pancreatitis. The majority of patients have mild interstitial edematous pancreatitis (IOP) which is self-limiting. However 20% have severe acute pancreatitis (SAP) which can progress to a systemic inflammatory response syndrome (SIRS) and result in septic systemic complications with significant morbidity and mortality [1].The most common causes of pancreatitis are choledocholithiasis and ethanol abuse. Other causes include trauma, metabolic disorders (hyperlipidemia, hypercalcemia), ERCP induced pancreatitis, medications (azathioprine, sulphonamides), tumours, and congenital anomalies such as pancreas divisum [2].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. 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. 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.

METHODS & MATERIALS

This study was conducted in Department of Radiology & Imaging, BSMMU, Dhaka, Bangladesh from January to June 2024. This study comprised of 60 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.

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.

Procedure: The clinical details recorded were demographic data, detailed clinical history with presenting symptoms like pain abdomen, nausea, vomiting, and fever with duration, physical examination (local and systemic) including pulse rate, blood pressure, respiratory rate, temperature and icterus and any history suggestive of possible aetiology such as gallstone disease, alcohol abuse, trauma to abdomen, drug intake, metabolic disorder or any recent surgical intervention or procedure. 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.

RESULTS

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. In this study of 60 cases, 45 patients were male and 15 were female.

Table 2: Age distribution

Ageinyears	Numberof patients	%
<25	8	13.3
25-35	24	40
36-45	12	20
46-55	10	16.7
>55	6	10

Patients are divided according to the symptoms they presented with.

Table 1: Gender distribution

Gender	Numberof patients	%
Male	45	75
Female	15	25
Total	60	100

Table 3: Various symptoms of the Acute pancreatis

Symptoms	Number of patients
Epigastric pain	12
Epigastric pain radiating to back	14
Rebound tenderness	11
Nausea	3
Vomiting	19
Diffuse pain abdomen	27

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=60)	%
No abnormality detected	14	23.3
Direct evidence of pancreatitis	32	53.4
Abnormalities consistent with pancreatitis	14	23.3

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			
<30	5	Total = 12	24
>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	50	83.3
GB/ CBD Calculus	5	8.3
Hyperlipidemia	4	6.6
Smoking	12	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

Extrapancreaticcomplications	No of patients	%
Ascites	34	56.6
Bilateralpleuraleffusion	8	13.3
Leftpleuraleffusion	7	11.6
Rightpleuraleffusion	2	3.3
Splenicveinthrombosis	2	3.3
Portalveinthrombosis	1	1.6
None	18	30

Table9: Patientsdevelopingpseudocyst, infectednecrosis asaconsequenceofAP

Pseudocyst	Numberofpatients(n=50)	%
Present	22	36.6
Absent	38	63.4
InfectedNecrosis		
Present	5	8.3
Absent	55	91.7

Table10: Accuracyof serumamylase,serumlipasewithCT findings

	Positive	Negative	Accuracy/Sensitivity
Serumamylase	20	30	40%
Serumlipase	32	18	64%
CT	50	0	100%

CT findings are compared with serum lipase and serum amylase levels for sensitivity. CT shows 100% sensitivity, serum lipase 64% sensitivity and serum amylase 40% sensitivity.

Table11: DistributionofpatientsaccordingtoMCTSIscores.

MCTSI Total score	No of patients	%
2	11	18.4
4	24	40
6	12	20
8	10	16.6
10	3	5

Patients are distributed according to MCTSI scores which shows majority in score 4 of 40% and least in score 10 of 5%.

Table12: DistributionofpatientaccordingtoMCTSItotalscores with respect to age groups.

Age group	Noof patients inMCTSI total scores				
	2	4	6	8	10
<25	1	3	2	1	0
25-35	2	9	2	2	1
36-45	0	7	5	2	0
46-55	4	2	1	0	0
>55	1	1	2	0	0

MCTSIscoresaredistributedaccordingtotheiragegroupis as follows, with maximum number of patients in 25-35 yrs age group.MCTSI scores are grouped as mild (2 & 4), moderate (6) and severe (8).

Table 13: Distribution of CT grade when AP is classified as mild, moderate and severe

MCTSI scores	Numberof patients(n=60)	%
2 & 4(mild)	40	66.6
6 (moderate)	13	21.7
8 &10 (severe)	7	11.7

Table 14: Distribution of pancreatic necrosis according to mild, moderate and severe CT grades

CT grade	Pancreaticnecrosis(n=60)	%
Mild (2 &4)	5	8.3
Moderate (6)	4	6.6
Severe (8&10)	7	11.6

Table15: PatientswhoneededInterventioninAP.

Intervention	Noof patients(n = 60)	%
Radiologicalguided –A, PC	5	8.3
Fluid tap –A,PE	7	11.6
Surgical	2	3.3
Totalnoof patients	14	23.3

DISCUSSION

Computed Tomography (CT) is highly accurate and sensitive than USG in both diagnosing as well as demonstrating the extent. Early assessment of the cause and severity of acute pancreatitis is of utmost importance for prompt treatment and close monitoring of patient with severe disease. Typical CT findings in acute pancreatitis include focal or diffuse enlargement of the pancreas, heterogeneous enhancement of the gland, irregular or shaggy contour of the pancreatic margins, blurring of peripancreatic fat planes with streaky soft tissue stranding densities, thickening of fascial planes. Total 60 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 $\pm$ 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 were similar to that of a study conducted by Similar results were seen by Baig et al [3]. in whose study male to female ratio is 2.75:1 with 73.3% males and 26.7%. females. Alcohol was the most common cause of AP seen in 50 (83.4%) patients, 5 (8.3%) patients were having GB/CBD calculi and 5 (8.3%) 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 [4]. Out of 60 cases, 18 (30%) patients had edematous pancreatitis. 14 (23.3%) 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 [5]. 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 34 patients (56.6%) in form of ascites, pleural effusion (unilateral / bilateral). No abnormality was detected in 18 (30%) of the patients. In the observation made by Balthazar et al. [6] abnormal ultrasound findings are seen in 33–90% of patients with AP. 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 this 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. [6] 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. [5] and Mortele et al. [7] 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 (66.6%) and minimum patients (11.6%) were seen in grade 8 and 10 category. Similarly, most of the patients were of mild CT severity (66.6%) and minimum patients had a severe grade (13.3%). Moderate pancreatitis was present in 21.6% 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. [8] 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. [9]. 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. [5] 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. [5] mortality was seen in 6% of patients and in 1.5% patients in the study by Mortele et al [7].

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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