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EVALUATION OF ACUTE PANCREATITIS BY USG AND CT

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ABSTRACT

Background: USG and abdominal CT are the most commonly used diagnostic imaging modalities for the evaluation of pancreas. **Aim**: The present study was done to note and compare the findings on Ultrasound and CT in case of acute pancreatitis. **Materials and method**: The present prospective study was conducted on all patients suspected of acute pancreatitis referred to the Radiology department at CHHATRAPATI SHIVAJI SUBHARTI HOSPITAL, Meerut for evaluation by Ultrasonography and Computed Tomography. Serum amylase, serum lipase and standing/supine abdominal radiographs were correlated with the imaging findings as and when required. Ultrasound criteria used to diagnose acute pancreatitis were bulky pancreas, heterogenous echotexture (hypoechoic or hyperechoic), extra pancreatic findings (fluid collections, pleural effusion) and Modified CT Severity Index (CTSI) was used as CT criteria to diagnose Acute Pancreatitis. **Results**: The present study comprised of 83.72% and 16.28% males and females respectively. From the analysis, it was observed that CT was better evaluating the factors of parenchyma, MPD, calcification, pseudocyst collection, ascites, necrosis, complications and adjacent areas of the pancreas in comparison to USG and helped in better to determine the pathological process of pancreas and surrounding extent and involvement. **Conclusion**: CT is superior and more accurate in staging of acute pancreatitis and thus helps the clinician to understand the prognosis of patient and helps to decide management plan at the time of hospital admission only.

KEYWORDS: Acute Pancreatitis, ultrasound (US), Computed Tomography (CT) scan.

INTRODUCTION

Acute Pancreatitis is very common disorder of pancreas with significantly rising incidence from the last few years. Two most common causes of acute pancreatitis are biliary lithiasis and chronic consumption of alcohol. In an urban environment, more common cause is the consumption of alcohol, while the dominant cause in other environments is biliary calculosis. Despite to the progress in diagnosis and therapy, 10-25% of patients with severe form of acute pancreatitis end with lethal outcome.[1]

Rapid assessment becomes a necessity to avoid potential catastrophic consequences. Diagnosis relies on laboratory investigations and radiological imaging. Cross sectional imaging with Ultrasound and Computed Tomography (CT) has afforded rapid, accurate and non-invasive evaluation of pancreas. Ultrasound provides the first reliable, cross-sectional view of pancreatic anatomy. However, it has limitations in obese patients and in those with large amount of bowel gas. CT offers a diagnostic method that does not have these limitations. But CT is expensive, exposes patients to ionizing radiation and has difficulty in defining tissue planes in lean patients.[2,3]

Therefore the present study was done by keeping in mind the three objectives i.e. a) To note the findings on Ultrasound and CT in case of acute pancreatitis; b) To note the advantages of one imaging modality over the other vis-à-vis the diagnosis of pancreatitis and c) To note the limitations of one imaging modality over the other vis-à-vis the diagnosis of pancreatitis.

MATERIALS AND METHOD

The present prospective study was conducted on all patients suspected of acute pancreatitis on clinical and laboratory examination (i.e. raised serum amylase and lipase) and referred to the Radiology department at CHHATRAPATI SHIVAJI SUBHARTI HOSPITAL, Meerut for evaluation by Ultrasonography and Computed Tomography from 1st July 2017 to 30

November 2018. The required permission was taken from institutional review board, human ethics committee.

Patients were examined using Ultrasound and CT scan as imaging modalities after obtaining consent for the same. Patient with relevant clinical history were examined. Serum amylase, serum lipase and standing/supine abdominal radiographs were correlated with the imaging findings as and when required. Informed consent was taken from the patient following which radiological examination was done. The study included 43 patients according to the inclusion and exclusion criteria.

Inclusion criteria
• Age: Any age.
• Gender: Both
• Referred to our department with complaints of abdominal pain and suspected diagnosis of pancreatitis
• Already diagnosed cases of pancreatitis and referred to radiology department.

Exclusion criteria
• Patients refusing consent to participate in the study
• Pregnant females
• Elevated serum creatinine levels (>1.5 mg/dl)

Equipment
• USG machine- Samsung Accuvix A30
• CT scan machine- Philips Ingenuity 128

Ultrasound technique used for visualizing pancreas in cases of pancreatitis (Figure 1a-1d):
a. Compression scanning technique with curved linear transducer to displace gas and fluid from the overlying stomach and duodenum which causes obscuration to visualize the body of the pancreas.
b. Localizing the vascular landmarks for visualizing the body of the pancreas which includes splenic vein (SV), its confluence with the superior mesenteric vein (SMV), and the superior mesenteric artery (SMA).
c. The left lateral decubitus (LLD) position was used to best see the pancreas adjacent to the duodenum.

CT technique used for visualizing pancreas in cases of pancreatitis (Figure 2a-2b & 3a-3b)
Both IV and oral contrast was given to patient for optimum imaging of pancreas. Thin-section images were taken by acquiring images 30-40 seconds after the administration of iodinated contrast (i.e. during the peak of pancreatic arterial perfusion) using helical CT scan. Triphasic study was carried out which included arterial, portal and delayed venous phase for imaging cases of pancreatitis.

Ultrasound criteria used to diagnose acute pancreatitis: were bulky pancreas, heterogenous echotexture (hypoechoic or hyperechoic), extra pancreatic findings (fluid collections, pleural effusion).

CT Criteria to diagnose Acute Pancreatitis: Modified CT Severity Index (CTSI)[4] given by Mortele was used as mentioned in table 1.

Statistical analysis: Data so collected was tabulated in an excel sheet, under the guidance of statistician. Data was analyzed using IBM SPSS. Statistics Windows, Version 22.0. (Armonk, NY: IBM Corp) for the generation of descriptive and inferential statistics.

RESULTS
In the present study, 43 patients of acute pancreatitis were examined to compare the modalities between USG and CT scan. The present study comprised of 83.72% and 16.28% males and females respectively. The maximum subjects were in the age group of 41-50 years (17) followed by 21-30 years (14) as shown in table 2.

Abdominal pain, vomiting, fever and weight loss was reported in 53.49%, 41.86%, 32.56% and 9.30% respectively (table 3).

From the below tabulated analysis, it was observed that CT was better evaluating the factors of parenchyma, MPD, calcification, pseudocyst collection, ascites, necrosis, complications and adjacent areas of the pancreas in comparison to USG and helped in better to determine the pathological process of pancreas and surrounding extent and involvement (table 4, 5). USG determined parenchymal echotexture of 22 (51.16%) patients and CT determined parenchymal echotexture of 29 (67.44%) patients which proves that CT fared a better role in evaluating PARENCHYMA of the gland in comparison to USG (table 6).

USG observed MPD of 6 (13.95%) patients and CT determined MPD of 9 (20.93%) patients which proves that CT fared a better role in evaluating MPD of the gland in comparison of USG (table 7). USG found calcification among 10 (23.26%) patients and CT determined calcification of 15 (34.88%) patients which proves that CT fared a better role in evaluating CALCIFICATION of the gland in comparison of USG (table 8).

Mild, moderate and severe grade of acute pancreatitis was reported in 44.19%, 32.56% and 23.25% of the subjects respectively (table 9).

Table 1: Mortele Modified CTSI Scoring.

Variables	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
Necrosis	
Absent	0
< 30% necrosis	2
> 30% necrosis	4
To the above score, 2 points were added for the presence of extrapancreatic findings.	
Modified CTSI was calculated by summing these values and the total score was then categorized as:	
Mild pancreatitis	Modified CTSI score 0-2
Moderate pancreatitis	Modified CTSI score 4-6
Severe pancreatitis	Modified CTSI score 8-10

Table 2: Demographic profile of the study population.

Gender	Age group (in years)						Total	
	21-30		31-40		>41			
	N	%	N	%	N	%	N	%
Male	13	30.23	9	20.93	14	32.56	36	83.72
Female	1	2.33	3	6.98	3	6.98	7	16.28
Total	14	32.56	12	27.91	17	39.53	43	100.00

Table 3: Symptomatology and laboratory investigations of the study population.

Variables	N	%
Symptoms		
Abdominal pain	23	53.49
Vomiting	18	41.86
Fever	14	32.56
Weight loss	4	9.30

Table 4: USG diagnosis of lesions.

Diagnosis	N	%
Obscured	16	37.21
Normal	7	16.28
Acute edematous pancreatitis	9	20.93
Acute on chronic pancreatitis	2	4.65
Acute pancreatitis with peri pancreatic fluid collection	3	6.98
Acute pancreatitis with pseudocyst	6	13.95
Total	43	100

Table 5: CT diagnosis of lesions.

Diagnosis	N	%
Acute edematous pancreatitis	17	39.54
Acute necrotising pancreatitis	7	16.28
Acute pancreatitis with pseudocyst	6	13.95
Acute pancreatitis with other complications	5	11.63
Acute on chronic pancreatitis	8	18.61
Total	43	100

Table 6: CT (parenchyma).

USG (parenchyma)	CT (parenchyma)				Total	
	Yes		No			
	N	%	N	%	N	%
Yes	18	41.86	4	9.30	22	51.16
No	11	25.58	10	23.26	21	48.84
Total	29	67.44	14	32.56	43	100

Table 7: CT (MPD).

USG (MPD)	CT (MPD)				Total	
	Yes		No			
	N	%	N	%	N	%
Yes	5	11.63	1	2.33	6	13.95
No	4	9.30	33	76.74	37	86.05
Total	9	20.93	34	79.07	43	100

Table 8: CT (calcification).

USG (calcification)	CT (calcification)				Total	
	Yes		No			
	N	%	N	%	N	%
Yes	10	23.26	0	0	10	23.26
No	5	11.63	28	65.12	33	76.74
Total	15	34.88	28	65.12	43	100

Table 9: Grading severity of acute pancreatitis using modified mortele CTSI.

Severity	N	%
Mild	19	44.19
Moderate	14	32.56
Severe	10	23.25

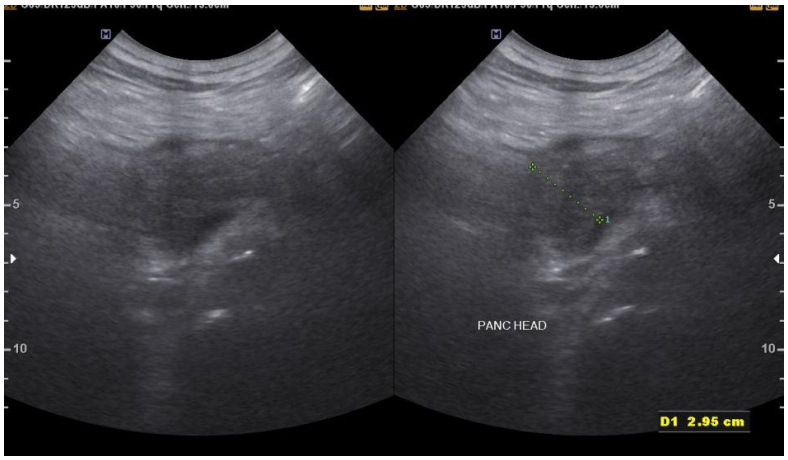

Figure 1a

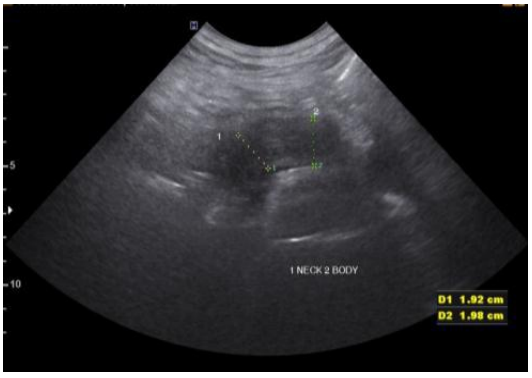

Figure 1b

Figure 1c

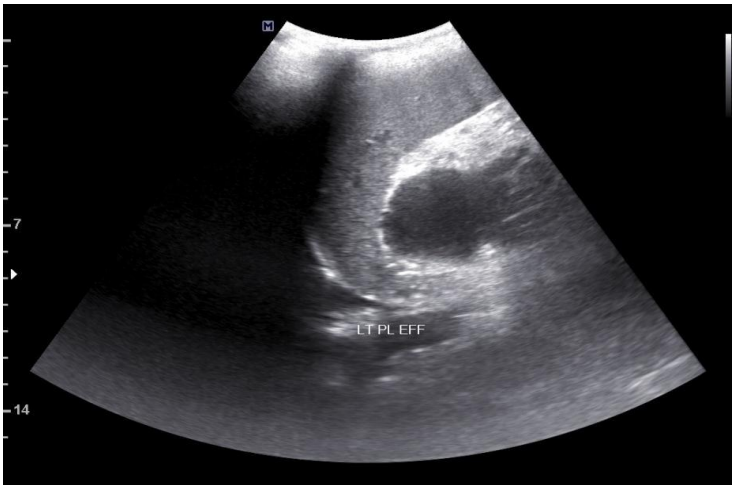

Figure 1d

Figure 1 (a-d): USG images show bulky and hypoechoic pancreas with peripancreatic fluid- suggestive of acute pancreatitis. Associated left pleural effusion noted.

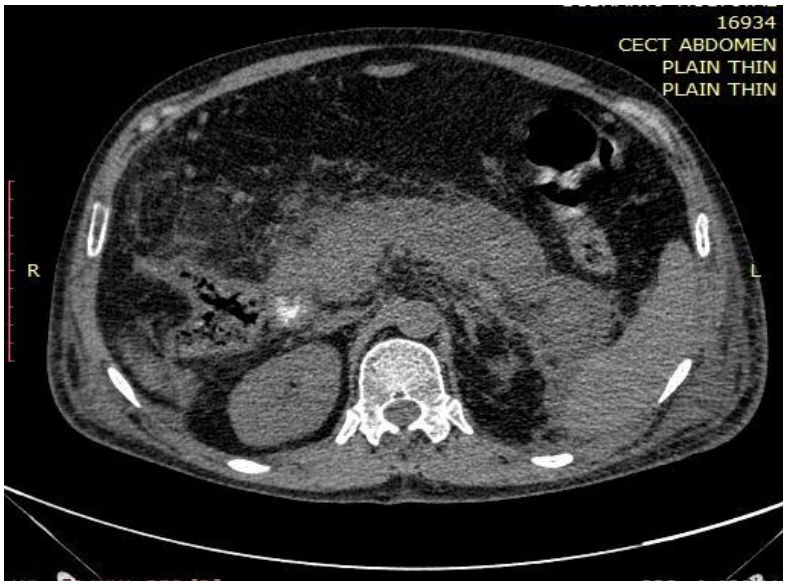

Figure 2a

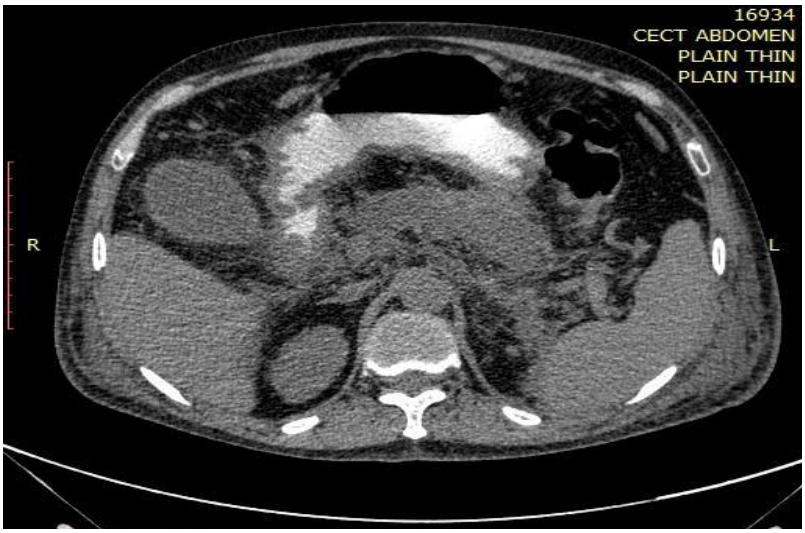

Figure 2b

Figure 2 (a-b): Axial CECT images show bulky pancreas with evidence of peripancreatic and mesenteric fat stranding- suggestive of acute pancreatitis.

Associated thickening of left para-renal fascia noted.

Fig 3 (a-b) Axial CECT image shows bulky pancreas with evidence of non- enhancing necrotic areas in body and tail- suggestive of acute necrotizing pancreatitis. Associated ascites also noted.

DISCUSSION

The pancreas is a retroperitoneal organ situated in the anterior pararenal space of the retroperitoneum, where it lies anterior to the perirenal (Gerota's) fascia and posterior to the parietal peritoneum.[5] Acute pancreatitis is an acute inflammatory disease of the pancreas characterized by auto digestion of the pancreatic parenchyma, interstitial fat necrosis and necrotizing vasculitis, resulted from the inappropriate intracellular activation of proteolytic pancreatic enzymes. The inflammatory process may be limited to the pancreas, spread to surrounding tissues or even involve the remote organs, resulting in multi-organ failure and occasional death.[6]

The present study included 43 patients who underwent USG as well as CT scan examination with 36 (83.72%) males and 7 (16.28%) females, with males being more affected than females. Of these most patients were of age >41 years (39.53). Aastha Bhatt et al[2] in their study included 50 patients with 38 (76%) males and 12 (24%) females, with males being more affected than females. Most of the patients were of age 41-50 years (34%). The study group Sameer Raghuwanshi et al[7] research consisted of 35 male and 15 female patients with a male: female sex ratio of 2:1 In a prospective study by Block et al[8], consisted of 61 (65.6%) males and 32 (34.4%) females with a male to female ratio of 2:1. Silverstein et al[9], in his prospective study of 102 patients, also had a male to female ratio of 2:1.

The main presenting symptom of acute pancreatitis is abdominal pain, typically in the epigastric region which is most of times radiating to the back. The pain is often accompanied by fever, nausea and vomiting. Nausea, vomiting and abdominal distension were due to gastric and intestinal hypomotility. In the present study abdominal pain, vomiting, fever and weight loss was reported in 53.49%, 41.86%, 32.56% and 9.30% of the subjects respectively. Similar results were reported by Sneha Madhusudan Karwa et al[3] and Aastha Bhatt et al[2] in their study.

The typical laboratory finding is the increase in the serum and/or urine levels of amylase and lipase.[10] Elevated amylase levels are not specific to acute pancreatitis and may be caused by bowel obstruction, infarction, cholecystitis, or perforated ulcer. The duration of hyperlipidemia often exceeds that of hyperamylasemia; however hyperlipidemia is also nonspecific and may also be seen in perforated peptic ulcer, acute cholecystitis and intestinal ischemia.[11] Although both increased serum amylase and lipase are nonspecific as discussed above, serum lipase is considered more sensitive and specific than serum amylase in the diagnosis of pancreatitis.

Imaging in patients of acute pancreatitis is undertaken to confirm the clinical diagnosis, to exclude other causes of abdominal pain mimicking pancreatitis, to investigate the etiology of pancreatitis, and to grade the severity of the disease. Ultrasound (US) is the first line imaging modality for the confirmation of the diagnosis of the disease and the ruling out of other causes of acute abdomen. Contrast-enhanced computed tomography (CT) plays a significant role in evaluating the extent and evolution of the disease and its complications.[3]

Ultrasound (US) is a quick, cheap, readily available repeatable, free of radiation and easy to perform and can be carried out at the bedside makes it the first-line imaging modality of choice in most centers for the confirmation of the diagnosis and the ruling out of other causes of acute abdomen. Next advantage of US is that, it allows evaluating the gallbladder and biliary tract, to detect gallstones and dilatation of the bile ducts which may be the cause of acute pancreatitis in most of cases. However, there are certain limitations to this modality related to paralytic ileus accompanying in the first 48 hours of the disease those results in non-visualization or obscuration of pancreas. Pancreas may appear normal in the cases of mild acute pancreatitis. In the present study USG of 37.21% appeared to be obscured while of USG the 12% patients were either examined to a suboptimal level or diagnosed to have normal gland. This leads to a diagnostic dilemma and a CT Scan becomes mandatory for the patient. Similar results were reported by Aastha Bhatt et al[2] and Karwa SM et al.[3]

Contrast-enhanced CT scan is considered as the gold standard in the evaluation of the patients with acute pancreatitis. It not only establishes the diagnosis of acute pancreatitis as well as allows staging the severity of the disease.[12] Acute pancreatitis on CT scan shows acute edematous pancreatitis, acute necrotising pancreatitis, acute pancreatitis with pseudocyst, acute pancreatitis with other complications and acute on chronic pancreatitis. CT scan in early stages of the acute pancreatitis may show reactive pleural or pericardial effusion. Similar results were reported by Aastha Bhatt et al[2] and Karwa SM et al.[3]

CT severity index (CTSI) is based on the presence and severity of inflammation and necrosis of pancreas. Total score of 10 points is given based on the severity. Although this system could be reasonably used to predict overall prognosis in patients with acute pancreatitis, however this index does not correlate appropriately with subsequent development of extra pancreatic complications, vascular complications and organ failure. Hence an attempt was made to improve the prognostic value of CT in cases of acute pancreatitis in form of modified CT severity index.[13] Mild, moderate and severe grade of acute pancreatitis was reported among 44.19%, 32.56% and 23.25% of the subjects respectively.

CONCLUSION

Ultrasound by non-invasiveness, lack of radiation hazard and by ability to demonstrate structural changes in organ is the initial investigation of choice in evaluation of pancreatitis. Ultrasound can detect presence of inflammation and characterize the size, shape and echo texture of the gland, but because pancreas is retroperitoneal organ it is difficult to easily evaluate it. CT is superior and more accurate in staging of acute pancreatitis and thus helps the clinician to understand the prognosis of patient and helps to decide management plan at the time of hospital admission only.

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