

Efficacy of Multidetector Computed Tomography in the Evaluation of Pancreatitis

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Abstract: The purpose of this study was to evaluate the value of dual-phase multidetector computed tomography (MDCT) as a useful tool for assessing acute and chronic pancreatitis. Oedematous parenchyma, necrosis, peripancreatic inflammation and acute fluid collections are signs of acute pancreatitis on MDCT. Pancreatic parenchymal calcification, MPD dilatation and calculi, parenchymal atrophy, pseudocysts etc are features of chronic pancreatitis on MDCT. CTSI was used to classify pancreatitis. According to our study MDCT is the imaging modality of choice in acute pancreatitis and pancreatic parenchymal phase is the optimal phase for assessment for necrosis. The CT accuracy for Acute pancreatitis was 91.9% while as for diagnosing chronic pancreatitis 78% and for diagnosing acute on chronic pancreatitis in this study was 86%. Conclusion of this study was MDCT is the imaging modality of choice in acute pancreatitis. It also allows better detection of calcification, ductal dilatation and gland atrophy in chronic pancreatitis.

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I. Introduction

Non invasive diagnostic tests in pancreatitis include plain radiography, ultrasound, computed tomography (CT) and magnetic resonance imaging (MRI). However, CT has remained the gold standard for evaluation of pancreatic pathology despite the advent of other imaging modalities [1]. Multiphase helical scanners with rapid infusion of intravenous contrast medium allow for the delineation of pancreatic parenchymal, arterial, and venous studies with identification of malignant and benign lesions [2].

Multidetector CT (MDCT) and spiral CT represent state of the art in evaluation of known or suspected pancreatic pathologies, as it capitalises on optimal pancreatic imaging including 1-5mm thin slices, scans at narrow increments allowing the entire pancreas to be visualised in under 20 seconds and scanning during phases of optimal vascular opacification (arterial and venous phases) by iodinated intravenous contrast material. A dual phase technique (i.e. apancreatic and portal venous phases) is commonly used for imaging in pancreatitis. [3,4]

II. Patients and Method

The study was conducted in the Department of Radiodiagnosis, GMC Srinagar, for a period of 12 months from November 2016 to November 2017. A total of 100 patients were included in the study who were referred to our department with history, clinical, biochemical and USG suspicion of pancreatitis. Contrast Enhanced Multiphase Multi Detector Computed Tomography was performed and evaluated for the underlying pancreatic pathology. All patients were required to fast for at least 8 hours before the scan and scanning was performed with the 6 slice motion CT with the patient in supine position on the gantry table.

Oral contrast was administered in selected cases. A topogram will be first obtained with the dome of diaphragm as superior aspect and third part of duodenum as inferior aspect. This was followed by non enhanced 2.5mm sections of the abdomen after proper instructions to the patient to take deep long sustained breaths. Contrast scans were then obtained by intravenous injection of contrast material of 60 ml to 80 ml at the rate of 2.5 ml/sec

III. Results

Majority of the patients in our study belonged to the age group 31-40 years (28%).85%of the patients were males.In the study 63% of the pancreas appeared enlarged and 14% atrophied.The density was found to be decreased in the majority of the cases 91%.Maximum number (59%) of the pancreas showed heterogeneous enhancement.In one case the pancreas did not show any enhancement on contrast.24% of the cases showed calcification and the rest 76% did not have any calcification.66% of the patients showed normal diameter of the duct and 34% showed increased diameter.On the above mentioned observations it was found that acute pancreatitis was more common 62% followed by chronic pancreatitis. Acute pancreatitis was classified into mild (interstitial) pancreatitis which was more common (40%) than severe necrotising pancreatitis , which was seen in22% of cases.

CT FEATURES OF ACUTE PANCREATITIS

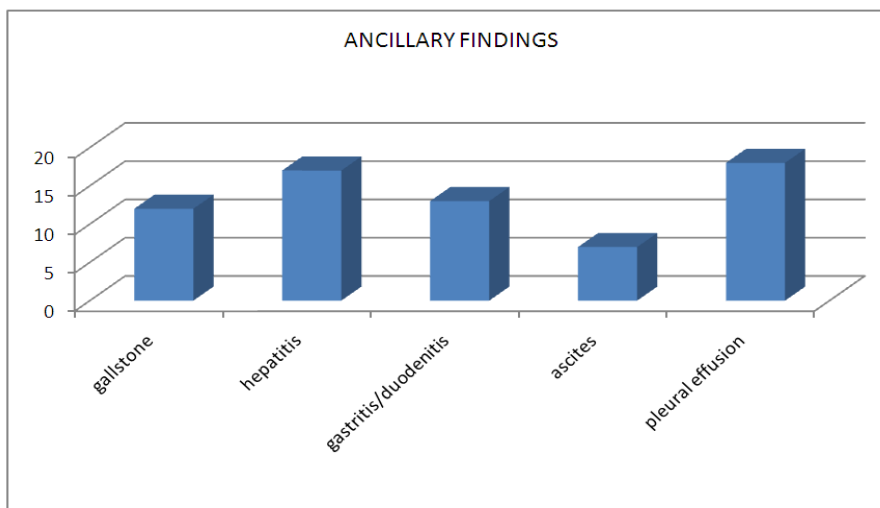
S. NO	CT FEATURES		NUMBER OF CASES	PERCENTAGE (%)
1.	SIZE	ENLARGED	51	82
		NORMAL	11	18
		DECREASED	0	0
2.	DENSITY	DECREASED	53	85
		NORMAL	9	15
3.	CONTRAST ENHANCEMENT	HOMOGENEOUS	40	65
		HETEROGENEOUS	21	33.6
		NO ENHANCEMENT	1	1.4
4.	CALCIFICATION		0	0
5.	PANCREATIC DUCT DIAMETER	NORMAL	52	84
		DILATED	10	16
6.	DUCT/GLAND RATIO	<0.5	62	100
		>0.5	0	0

CT FEATURES OF CHRONIC PANCREATITIS

S. NO	CT FEATURES		NUMBER OF CASES	PERCENTAGE (%)
1.	SIZE	ENLARGED	5	21
		NORMAL	5	21
		DECREASED	13	48
2.	DENSITY	DECREASED	23	100
		NORMAL	0	0
3.	CONTRAST ENHANCEMENT	HOMOGENEOUS	0	0
		HETEROGENEOUS	23	100
4.	CALCIFICATION	PRESENT	14	61
5.	PANCREATIC DUCT DIAMETER	NORMAL	4	18
		DILATED	19	82
6.	DUCT/ GLAND RATIO	<0.5	14	57
		>0.5	9	33

FEATURES IN ACUTE ON CHRONIC PANCREATITIS

S. NO	CT FEATURES		NUMBER OF CASES	PERCENTAGE (%)
1.	SIZE	ENLARGED	7	46
		NORMAL	7	46
		DECREASED	1	8
2.	DENSITY	DECREASED	15	100
		NORMAL	0	0
3.	CONTRAST ENHANCEMENT	HOMOGENOUS	0	0
		HETEROGENEOUS	15	100
4.	CALCIFICATION		10	67
5.	PANCREATIC DUCT DIAMETER	NORMAL	10	67
		DILATED	5	33
6.	DUCT/GLAND RATIO	<0.5	13	86
		>0.5	2	14



Patient Outcomes Using CT Severity Index in acute pancreatitis

S.NO	OUTCOME FACTOR	CT Severity Index		
		Mild (0-3 points)	Moderate (4-6 points)	Severe (7-10 points)
1.	No. of patients	34	16	12
3.	Length of hospital stay (days)	3-7 days	10-20 days	>30 days
4.	Intervention or surgery	2	5	5
5.	Infection	4	9	9

CT ACCURACY

S.NO.	TYPE OF PANCREATITIS	CT DIAGNOSIS	Final DIAGNOSIS	CT ACCURACY (%)
1.	Acute pancreatitis	62	57	91.9
2.	Chronic pancreatitis	23	18	78
3.	Acute on chronic pancreatitis	15	13	86

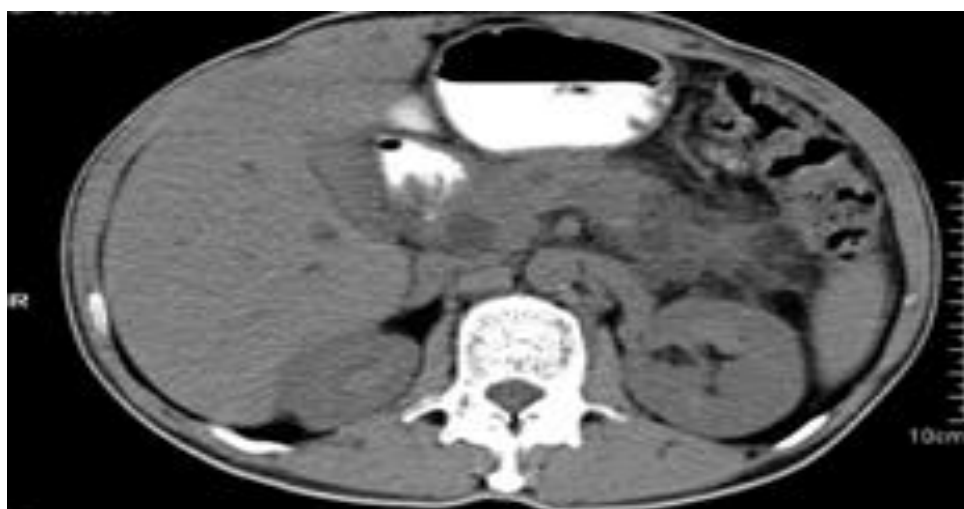


Fig 1: Severe Acute Pancreatitis – The pancreas appears to be swollen, hypodense with a necrotic area in the head and tail of the pancreas.

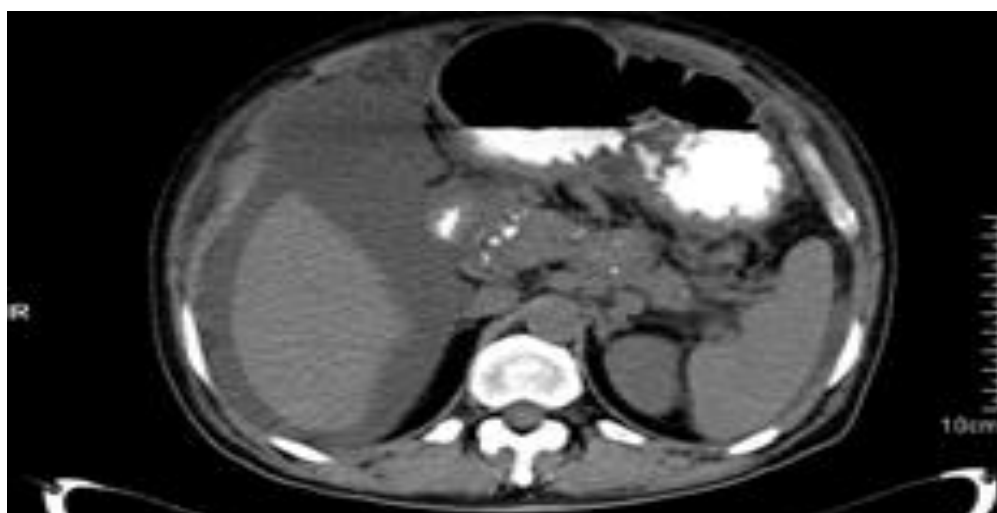


Fig 2: Acute on Chronic Pancreatitis-- The pancreas appears to be hypodense and oedematous. There are calcifications seen in the pancreatic parenchyma.



Fig 3: Chronic Pancreatitis – The pancreas appears to be atrophied

IV. Discussion

The radiologic features and role of CT scanning in initial diagnosis of pancreatitis are well established in literature. CT examination played an important role in the initial assessment of the severity of acute pancreatitis [5].

In our study, 63% of the cases had enlargement of the pancreas of which 47 (75%) cases showed diffuse involvement of the pancreas and a segmental distribution in the remaining cases. In 9 cases, the inflammatory process predominantly involved the head of the pancreas. 14 cases had small atrophied pancreas and in the rest 23 the pancreas appeared to be normal in size. The findings are almost similar to that observed by Kalmar JA et al [6].

Oedematous pancreatitis can be differentiated from necrotising pancreatitis by injection of contrast media. Marier [7] studied this and found in operative confirmed cases that oedematous pancreatitis maintains uniform enhancement without alteration of density, necrotic cases are devascularised and do not enhance with intervenous contrast media.

Calcification was seen in 24% of the cases. No calcification was seen in AP, 14 cases (61%) of CP showed calcification, and 10 cases (67%) of acute on chronic pancreatitis showed calcification. Kalmar JA, Matthews CC et al [6] in their study got 30% calcification in cases of pancreatitis.

Pancreatic ductal dilation was seen in 34% of the cases in which 19 cases were of chronic pancreatitis. 10 cases of AP and 5 cases of acute on chronic pancreatitis also showed ductal dilation. In majority of the cases the pancreatic duct appeared irregular in margin and the ratio between the gland and duct were < 0.5 . Karasawa et al [8] observed in his study that 73% of the ductal dilatation in chronic pancreatitis were irregular margined and those with smooth border and gland duct ratio > 0.5 were suggestive of underlying carcinoma.

Pancreatic pseudocysts are the most common cystic lesion of the pancreas Elliot K. Fisfman et al [9]. Intrapancreatic collection was seen in 40% of the cyst, out of which 70% had collection in the head, 62% in the body 9% in the tail of the pancreas. Extra pancreatic fluid collection was most commonly seen in lesser sac in 48% of cases.

In our study hemorrhage in a pseudocyst was seen in 3 cases. Gas bubbles were seen in 3 cases suggestive of an abscess Ruedi F. Thoeni et al [10]. Silverstein W et al [5] observed that 10% of the AP showed pseudocyst, and Morel and Rohner [7] found that 40% to 70% of the CP had pseudocyst. Silverstein W et al [5] also found that hemorrhage were seen in 5% and abscess in 3% of the cases. Whereas Kalmar et al [6] observed that abscess were found in 8% cases. In our study pseudocyst were seen in 27% of the cases and abscess were seen in 11% of cases.

CT severity index is to improve the early prognostic value of acute pancreatitis. Patients with grade A-E pancreatitis has been assigned 0-4 points, plus 2 points for 30%, 4 points for 50% and 6 points for more than 50% necrosis. A severity index that grades in 3 categories (0-3,4-6, and 7-10 points) more accurately reflects the prognostic value of CT as judged after the review of initial CT scans.

In our study, patients who had a severity index of 0-2, exhibited no mortality or morbidity. In contrast, a severity index of 7-10 yielded 33% mortality and 75% complication rate. In our study there were 12 patients of severe acute pancreatitis according to the CTSI The length of hospital stay (> 30 days), surgical intervention (41%) and rate of infection (75%) is seen to be higher in the severe grade as compared to the other. These findings are well in concordance with the study of Belthazar se al [11] who observed 92% morbidity and 17% mortality in patients with high CTSI.

In our study, 62 cases were diagnosed as acute pancreatitis in the study out of which 57 turned out to be correct on follow up, either on clinical assessments, lab findings, or surgical. Out of the 5 cases which were wrongly diagnosed, 1 patient was very obese and had fatty infiltration of the pancreas which lead to lower attenuation on CT. The other 2 cases were having severe necrotising pancreatitis and the scan was done in the first 24 hrs and they were diagnosed as mild acute pancreatitis. The patients deteriorated clinically and the biochemical parameters also increased steadily. On follow up scans, they revealed necrotic areas in the parenchyma. Rest of the two cases were having very small focal pancreatic involvement which was missed on the initial CT.

Therefore in this study, the CT accuracy for Acute pancreatitis was 91.9%. This is in concordance with the study done by Belthazar et al [11].

The CT accuracy for diagnosing chronic pancreatitis in the study was 78%. Out of the 23 cases diagnosed on CT, 18 turned out to be correct. Two of the falsely reported cases were of mucinous neoplasm and was reported as pseudocyst based on the USG findings and raised serum amylase. The rest of the 3 cases were of small focal mass lesions of pancreas.

The CT accuracy for diagnosing acute on chronic pancreatitis in the study was 86%. Out of the 15 cases reported on CT, 2 were of pancreatic neoplasm who presented with clinical features of acute pancreatitis.

Secondary CT findings – fatty infiltration of the liver were seen in 17 cases from all grades of pancreatitis. Ascites were seen in 7 cases, Pleural effusion were noted in 18 cases, seen commonly in the left side.

Thus it was found in our study that CT examination apart from diagnosing a clinically suspected/diagnosed case of pancreatitis, also have proved to be a good parallel modality of determining prognosis.

V. Conclusion

MDCT is the imaging modality of choice in acute pancreatitis. It also allows better detection of calcification, ductal dilatation and gland atrophy in chronic pancreatitis. The pancreatic parenchymal phase is the optimal phase for assessment for necrosis. Acute pancreatitis can be graded by giving CTSI or MCTSI which are equally helpful for predicting patient outcome.

Bibliography

- [1]. Dupuy DE, Costello P, Ecker CP: Spiral CT of the Pancreas. Radiology 1992;jun;183(3):815-818
- [2]. Shams J, Stein A, Cooperman: CT for pancreatic disease. Surgical clinics of North America 2001, Volume 81, No.2, 254-270
- [3]. Bharwani N, Patel S, Prabhudesai S, Fotheringham T, Power N. Acute pancreatitis: The role of imaging in diagnosis and management. Clinical Radiology 2011;66:164-75.
- [4]. O'Connor OJ, McWilliams S, Maher MM. Imaging of acute pancreatitis. AJR 2011;197:W221–W225.
- [5]. Silverstein W, Isikoff MB, Hill MC, Barkin J. on Diagnostic imaging of acute pancreatitis: prospective study using CT and sonography. AJR Am J Roentgenol. 1981 Sep;137(3):497-502.
- [6]. Kalmar JA, Matthews CC, Bishop LA. Computerized tomography in acute and chronic pancreatitis. South Med J. 1984 Nov;77(11):1393-5.
- [7]. Morel P et al. Surgery for chronic pancreatitis. Surgery Feb 1987 101(2):130-5
- [8]. Karasawa, Goldberg, Moss et.al. Pancreatic duct gland ratio and its significance Radiology, August 1983, Vo1.148: 489- 493.
- [9]. Elliot K. Fishman, Lesniak RJ, Hohenwarter, Taylor AJ. Spectrum of causes of pancreatic calcifications. AJR 2002; 178:79-86.
- [10]. Ruedi F, Thoeni, Francis Blankenberg Pancreatic abscess. Radiologic clinic of North America Vo1.31: 1085-1113; September 1993.
- [11]. Balthazar EJ et al . acute pancreatitis: value of CT in establishing prognosis. Radiology 1990;174:331-6

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