

Computed Tomography Evaluation of Acute Pancreatitis and Its Complications – A Prospective Study at a Tertiary Referral Center

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ABSTRACT

BACKGROUND

Acute pancreatitis (AP) is described as acute inflammation of the pancreas with or without peripancreatic abnormalities. The present study describes the role of computed tomography in the evaluation and grading of acute pancreatitis. Acute pancreatitis is a dynamic disease having biphasic mortality peaks due to two overlapping phases, which include early and late due to increased obesity, ageing of population, alcohol abuse, increased gall stone incidence, the worldwide AP incidence is increasing. Most important causes of AP in developing countries such as India include increased alcohol consumption. Contrast enhanced computed tomography plays an important role in diagnosis of the disease and helps in determining the prognosis of the disease. Modified CT severity index scoring system is the most commonly used scoring system for assessment of the severity of the disease.

METHODS

The present study is a prospective study of patients presenting with signs and symptoms of acute pancreatitis referred to the Department of Radio Diagnosis at Katuri medical college. This study comprised of 50 patients with clinical suspicion / diagnosis of acute pancreatitis, raised pancreatic biochemical parameters like serum amylase and serum lipase. Contrast enhanced computed tomography was performed in these patients, findings reported, and the disease was classified using modified CT scoring index system (MCTSI).

RESULTS

The mean age of the patients in the present study was 42.3 ± 12.28 years. Most of the patients presented with abdominal epigastric pain, abdominal distension. Acute pancreatitis was divided into acute oedematous pancreatitis and necrotising pancreatitis, the former being common. Complications included, ascites, pleural effusions, splenic vein thrombosis, portal venous thrombosis, and haemorrhages.

CONCLUSIONS

Contrast enhanced CT is useful to differentiate between oedematous and necrotising types of pancreatitis. The MCTSI helps in better evaluation of pancreatic necrosis grading. The modified computed tomography score index correlation with the development of local and systemic complications in acute pancreatitis is well established. Ideally, conducting contrast enhanced computed tomography (CECT) after 48 - 72 hours of acute attack, increases the probability of identifying necrotising pancreatitis. CT in particular has an overall accuracy of about 87 % and sensitivity and specificity of 100 % in the recognition of pancreatic necrosis.

KEYWORDS

Computed Tomography, Acute Pancreatitis, Pseudocyst, Modified CT Score Index

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DOI: 10.18410/jebmh/2021/126

How to Cite This Article:

Naara RK, Boddepalli M, Munjuwanpalli N, et al. Computed tomography evaluation of acute pancreatitis and its complications – a prospective study at a tertiary referral center. J Evid Based Med Healthc 2021;8(11):643-647. DOI: 10.18410/jebmh/2021/126

*Submission 20-10-2020,
Peer Review 28-10-2020,
Acceptance 25-01-2021,
Published 15-03-2021.*

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BACKGROUND

Pancreatic diseases are poorly understood, difficult to manage and remain costly despite exponential growth in medical knowledge and in disease treatments. The mortality and morbidity in patients with acute pancreatitis depend on the severity of the disease and time frame after the onset of clinical symptoms. In severe cases the mortality rate ranges from 45 – 50 % whereas in mild to moderate cases it ranges from 35 – 40 %.

Most of the deaths occur in the late course of the disease due to sepsis and its related complications, whereas in the early course of the disease most of the deaths occur due to multi organ failure. Computed tomography plays an important role in early diagnosis of the disease and helps in identification of local complications and using the CT scoring system it helps in prognostication of the disease process. Acute pancreatitis is described as acute inflammation of the pancreas with or without peripancreatic abnormalities. The early used grading system for acute pancreatitis was Balthazar scoring system which graded the pancreatitis or used a sub scoring system from A - E which included the pancreatic and adjacent structures changes. Following which a CT severity index system was devised which included the Balthazar system and also the grading of the extent of pancreatic necrosis. Further stratification of the disease was done by the combined grading and classified as mild moderate and severe disease. Further a modified CT scoring system was devised (MTSI) which included extra pancreatic complications also which play an important role in prognostication of the disease.

Revised Atlanta classification (RAC) of acute pancreatitis-2012 categorised severity of AP into mild, moderately severe and severe entities and also clearly defined various types of collections associated with AP¹. AP is a dynamic disease having biphasic mortality peaks due to two overlapping phases, which include early and late.

Due to increased obesity, ageing of population, alcohol abuse, increased gall stone incidence, the worldwide AP incidence is increasing². Most important cause of AP in developing countries such as India is increased alcohol consumption.

Objectives

1. To study various stages and grading of acute pancreatitis using computed tomography.
2. Establish various complications of acute pancreatitis using modified CT scoring index.

METHODS

This is a prospective study conducted from November 2016 to October 2018. The main source of data for the study are the patients presenting with signs and symptoms of acute pancreatitis referred to the Department of Radiodiagnosis at Katuri Medical College. This study comprised of 50 patients with features of acute pancreatitis, raised blood pancreatic parameters like serum amylase, serum lipase.

Ultrasonographic features indicative of acute pancreatitis and acute exacerbation of signs and symptoms in a known case of chronic pancreatitis are evaluated.

Statistical Analysis

Demographic variables were expressed as mean + / - standard deviation and as median (expressed as range). Comparison of categorical variables were done using chi square test or with Fischer test. A P-value of 0.05 was considered as statistically significant. For assessment of severity of pancreatitis as mild, moderate and severe for MCTSI scores, interobserver agreement was done by Cohens Kappa statistics. The different diagnostic variables such as sensitivity, specificity and predictive values were reported with respect to clinical severity assessed as mild, moderate and severe disease.

Equipment

- GE BrightSpeed select elite 16 slice CT machine.
- Contrast material (Omnipaque / Iohexol) used when required.
- In case of any emergency, necessary care will be taken.

Protocol

All the patients were asked to be in nil by mouth status for an overnight prior to the day of examination after obtaining proper renal function tests. The procedure of the examination was explained, and an informed written consent was obtained prior to the examination from the patient / bystander. Continous serial axial sections of abdomen were acquired from the level of xiphisternum to the pelvis in 5 mm, 3 mm sections and images were interpreted prior and after 80 ml of intravenous contrast in adjusted soft tissue window settings.

RESULTS

Age in Years	No. of Patients	Percentage %
< 25	2	4 %
25 - 35	17	34 %
36 - 45	11	22 %
46 - 55	13	26 %
> 55	7	14 %

Table 1. Age Wise Distribution of Patients

Symptoms	No. of Patients
Epigastric pain	16
Radiating to back	12
Nausea	6
Vomiting	18
Diffuse abdominal pain	32

Table 2. Patients were Divided According to the Symptoms They Presented with

Types of AP	No. of Patients	Total	Percentage %
Oedematous	8	8	16 %
Necrotising	7	11	22 %
< 30 %			
> 30 %	4		

Table 3. AP was Grouped as Oedematous & Necrotising Pancreatitis Based on Imaging Appearance

Causes	No. of Patient	Percentage %
Alcohol	38	76 %
Gallbladder / common bile duct calculus	6	12 %
Hyperlipidaemia	4	8 %
Smoking	12	24 %

Table 4. Aetiology / Causes of Acute Pancreatitis

All the 50 patients studied were grouped in different age groups as shown. Number of subjects belonging into each subgroup and mean age of patients were calculated.

Of a total of 50 patients in the study done, males included 88 % and females 12 %. Most of 34 % patients were in the age group of 25 - 35 yrs. And the least about 14 % patients were > 55 years of age group. Mean age in the study was of + SD: 42.3 ± 12.28 years. Acute oedematous pancreatitis was seen in 16 % cases and necrotic pancreas was seen in 22 % cases in our study. Pancreatic enlargement which was diffuse or focal was noted in 70 % patients, fat stranding surrounding the pancreas in 80 % patients and fluid collections around the pancreas was seen in 62 % patients in the present study. The most common predisposing / aetiological factor for acute pancreatitis was alcohol seen in 76 % cases, 24 % cases had smoking, 12 % patients had gallbladder / common bile duct calculi and 8 % cases had hyperlipidaemia.

In patients with acute pancreatitis of the extrapancreatic complications, ascites was the most common and seen in 30 % cases, 22 % cases had bilateral pleural effusion, left pleural effusion was seen in 24 % patients, 2 % patients had only right pleural effusion, 4 % patients had splenic vein thrombosis and 2 % patients had portal vein thrombosis. 50 % patients showed no evidence of complication. 26 % patients had pseudocyst and 2 % patients had infected necrosis due to AP in this study. MCTSI was classified as mild (2 and 4), moderate (6) and severe (8 and 10) of which majority had mild AP in 50 % patients, 38 % patients had moderate, and 12 % patients had severe AP. Distribution of pancreatic necrosis according to MCTSI was 2 % patients in mild, 8 % patients in moderate and 12 % patients in severe pancreatitis. In our study intervention was needed in the form of radiological guidance in 8 % patients, fluid aspiration without radiological guidance in 20 % patients.

Illustrative Cases

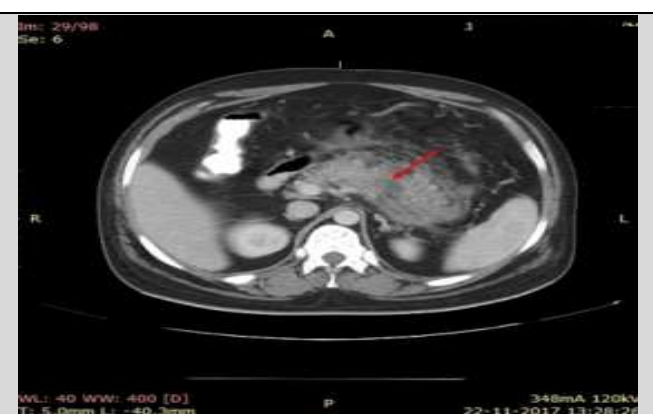


Figure 1. Axial Contrast Enhanced CT Image of Abdomen in Parenchymal Phase Showing Bulky and Homogeneously Enhancing Pancreas (Arrow) in Acute Oedematous Pancreatitis with Peripancreatic Fat Stranding



Figure 2. Axial Contrast Enhanced (Parenchymal Phase) CT Images of Abdomen Showing Multiple Well Defined Peripherally Enhancing Irregular Hypodense Areas (Arrow) Involving the Head and Body of Pancreas in a Case of Acute Necrotising Pancreatitis



Figure 3. Axial Contrast Enhanced CT Image of Abdomen in Parenchymal Phase Showing Well Defined Peripherally Enhancing Fluid Collection (Pseudocyst) (Arrow) in the Region of Tail of Pancreas in a Case of Acute Pancreatitis

DISCUSSION

50 cases presented with clinical and / or laboratory features suggestive of pancreatitis were studied. Most of the patients were male (88 %) as compared to female (12 %). This is in comparison to study by Chand et al.¹ (2017) in which there were 73 % male patients and in a study by Kim et al.² (2008) in which 70 % patients were males. It was mentioned in reports that differences in age and sex distribution of AP in various geographic areas are likely due to differences in aetiology.

The maximum number of patients in our study were between the age groups of 25 - 35 years (34 %) following which most of the cases were of 46 - 55 years (26 %). In most of the studies the highest incidence was between 46 - 55 years whereas in the present study high incidence was

between 25 - 35 years. This difference could be attributed to difference in demographic characteristics of the studies.

Most of the patients in this study were presented with the complaints of diffuse abdominal pain (64 %), followed by vomiting's (36 %) and epigastric pain (32 %). Other less common presentations were epigastric pain radiating to back (24 %) and nausea (12 %). In total abdominal pain was observed in 48 (96 %) cases.

In present study, alcohol was the causative aetiological / predisposing factor in 38 (76 %) patients, and in 6 (12 %) cases gallbladder / common bile duct calculi were seen and in 4 (8 %) patients hyperlipidaemia was predisposing factor. In one case dual aetiological predisposing factor of alcohol and calculus in GB was observed.

Studies conducted by Shivanand S. Melkundi et al.³ and Vengadakrishnan et al.⁴ showed similar association with alcohol as cause of AP. In this study, out of 50 cases, 8 (16 %) patients had oedematous pancreatitis. 11 (22 %) cases there was necrotic pancreas and in 7 (14 %) of these cases < 30 % of necrotic pancreas and in 4 (8 %) patients > 30 % of pancreatic necrosis was seen.

However, a study conducted by Vikhyath Shetty et al.⁵ showed pancreatic necrosis in 20 (66.7 %) cases of whom majority 12 (40 %) had pancreatic necrosis of more than 30 % which shows dis-concordance with the percentage of patients having more than 30 % of pancreatic necrosis in our study ideally. Conducting CECT after 48 - 72 hours of acute attack, increases the probability of identifying the 52 necrotising pancreatitis. CT in particular has an overall accuracy of about 87 % and sensitivity and specificity of 100 % in the recognition of pancreatic necrosis.

In this study, diffuse / focal pancreatic enlargement was seen in 70 % patients, peri-pancreatic fat stranding was seen in 80 % patients and peri-pancreatic fluid collection was seen in 62 % patients. Edward et al.⁶ showed comparable results with fluid collections in approximately 56 % of cases.

In our study computed tomography showed an 100 % sensitivity and specificity for early diagnosis and foreseeing the complications of acute pancreatitis. Balthazar et al.⁷ reports that early overall detection rate of 90 % with 100 % sensitivity. Hence, contrast computed tomography scan could be considered as gold standard diagnostic modality for interpretation and classification and grading of the acute pancreatitis due to its capability in imaging of early pathological changes and further for seeing and imaging the complications. Early CT examination in patients of acute pancreatitis is thus, a helpful prognostic marker of morbidity and mortality.

The previous studies by Bollen et al.⁸ and Mortelet et al.⁹ have classified grade 2 as mild, grade 4 and 6 as moderate and grade 8 and 10 as severe. However, in this study both grade 2 and 4 were grouped under mild severity.

The maximum patients in this study were seen to fall in the grade 2 and 4 category (50 %) and minimum patients (12 %) were seen in grade 8 and 10 category. Similarly, most of the patients were of mild CT severity (50 %) and minimum patients had a severe grade (12 %). Moderate pancreatitis was present in 38 % of patients.

According to the study by Bollen et al.⁸ the morphological severity of AP was graded as mild in 86 (44 %), moderate in 75 (38 %), and severe in 35 (18 %) cases. In a study by Manisha Lokhwani et al.¹⁰ moderate disease was found in 65 % of cases followed by severe disease in 32.5 % of cases.

In the present study 25 cases (50 %) demonstrated extrapancreatic complications. Ascites was seen in 15 patients (30 %), bilateral pleural effusion in 11 patients (22 %), left pleural effusion alone in 12 patients (24 %), right pleural effusion alone in 1 patient (2 %), splenic vein thrombosis in 2 patients (4 %) and portal vein thrombosis in 1 patient (2 %). There are no cases with findings of splenic artery pseudo aneurysm.

According to Shivanand et al.¹¹ conducted in 100 patients, extra-pancreatic complications were seen in 53 patients (53 %), which correlates with this study.

Pseudocyst was seen in 13 patients (26 %) in our study. Out of them, one was identified in gastric wall and two are intrahepatic. However, no pseudocysts were observed dissecting the posterior mediastinum or spleen. Pseudocyst was seen in 17 patients (32.0 %) in the study of Jeevangi et al.¹² which is similar to our study.

In 34 % cases local complications were demonstrated. 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 radiological intervention was needed in 4 patients (8 %) of grade 4, 6 and 10. Aspiration of ascites and pleural effusion was needed in 10 patients (20 %) with grade 4 to 10 of pancreatitis. This is similar to the study by Bollen et al.⁸ who demonstrated that development of local complications and need for intervention was significantly associated with grade of pancreatitis.

CONCLUSIONS

CECT is useful in differentiating oedematous from necrotising pancreatitis. The MCTSI score helps in better evaluation of pancreatic necrosis grading.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

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