



THE ROLE OF MULTIDETECTOR COMPUTED TOMOGRAPHY (MDCT) IN DETECTING AND EVALUATING THE COMPLICATIONS ASSOCIATED WITH ACUTE PANCREATITIS AT A TERTIARY CARE CENTRE

Radiology

Dr. Abhiram S	Post Graduate, Department of Radiology and Imaging
Dr. Seema U	Senior Consultant Radiologist, Department of Radiology and Imaging , Aster Hospital Whitefield
Dr. Suresh A	Professor & Head, Department of Radiology and Imaging, Vydehi Institute of Medical Sciences and research centre

ABSTRACT

Introduction: Biliary lithiasis and alcoholism are common causes of acute pancreatitis that can lead to severe and life-threatening complications. Ultrasound abdomen and pelvis is an initial investigation of choice to detect inflammatory changes in the pancreas. However, Contrast-enhanced computed tomography is the imaging study of choice and the gold standard for the diagnosis and detection of complications of acute pancreatitis. **Aims and Objectives:** To study the role of MDCT in detecting and evaluating the complications associated with acute pancreatitis. **Material and Methods:** A thorough retrospective search of the database was done for two years between 2021 and 2023 at a tertiary care hospital in Bengaluru, India. A total of 117 patients were included in the study with clinical suspicion of Acute pancreatitis. Data analysis was done using Microsoft Excel data sheet 2019 to calculate the descriptive statistics. **Results:** In the present study, the majority of study participants presented with pseudocyst in 32 cases (31.6%) followed by acute peri-pancreatic fluid collection in 29 cases (30%) and necrotic collection in 12 cases (15%). Extra-pancreatic complications were found being the most common local complication with bilateral pleural effusion in 44 cases (29.9 %) followed by ascites in 37 cases (25%). In this study, 28 cases (24%) were found to have splenic vein thrombosis which was found to be the most common vascular complication and another fairly common vascular complication was found to be portal vein thrombosis. Gastrointestinal involvement was found in 10 (9%) cases as one of the extra-pancreatic complications of acute pancreatitis **Conclusion:** Contrast-enhanced Computed Tomography is an excellent diagnostic tool for demonstrating and characterizing acute pancreatitis. It can also predict morbidity, mortality rate, and duration of hospital stay in patients with acute pancreatitis.

KEYWORDS

INTRODUCTION

Pancreatitis, an inflammatory disorder of the pancreas, is characterized by moderate to severe abdominal pain, nausea, vomiting, indigestion, weight loss and steatorrhea, affecting the personal, professional and social life of the individual [1]. The most common etiologies are biliary lithiasis and alcoholism. Less frequent causes include hypertriglyceridemia, hypercalcemia, drugs, autoimmune disease and parasitosis among others [2]. The prevalence rate of the pancreas in India is 7.9 per 100,000 [3].

Acute pancreatitis can be classified into two groups according to its morphological features in acute interstitial edematous pancreatitis and necrotizing acute pancreatitis [2]. Contrast-enhanced computed tomography (CECT) is the imaging study of choice and gold standard for the diagnosis and detection of complications of acute pancreatitis. The CT scan should be performed at least 3-5 days after the onset of clinical symptoms since necrosis begins after 48-72 hours from the onset [2]. CT imaging helps to detect complications associated with acute pancreatitis as well as to ascertain vascular and non-vascular complications associated with it.

Complications that occur during and after an episode of acute pancreatitis are responsible for the 2% to 10% mortality reported in this disease. The early detection of these complications by clinical, laboratory means or imaging studies is essential for the proper management of these patients. Thus the study was conducted to determine the utility of MDCT in evaluating the occurrence of various vascular & non-vascular complications in patients with acute pancreatitis.

METHODS AND MATERIALS

Vydehi Institutional Ethics Committee issued approval ECR/747/Inst/KA/2015/RR-21. A thorough retrospective search of the database was done in the Department of Radiology at our tertiary care hospital. The study was conducted for two years between 2021 and 2023. A total of 117 patients underwent CT scan.

Inclusion Criteria

- Patients with symptoms consistent with acute pancreatitis and elevated lab parameters (serum amylase & lipase).
- Known case of chronic calcific pancreatitis with clinical symptoms of acute exacerbation.

Exclusion Criteria

- Patients with known contrast allergy.
- Patients with deranged RFT

Study Material

All the study participants underwent dynamic contrast helical CT scans of the abdomen according to standard protocol. Multiplanar reconstruction and maximum intensity projections were used to assess and quantify the vascular & non-vascular complications present. Before and after administration of dilute oral and intravenous iodinated contrast agents findings were used to assess and record. All the findings were documented by using a pretested predesigned questionnaire which included patient general information, clinical features of acute pancreatitis and findings of CT scan. Before the review, the study participant's informed and written consent was obtained.

CE-CT is considered to be the gold standard imaging modality in the evaluation of patients with acute pancreatitis [4]. CE-CT should be performed 48-72 hours after the onset of an acute attack. With this delay, the scan yields a higher accuracy in the depiction of necrotizing pancreatitis [5].

The major indications for CE-CT in patients with acute pancreatitis are [6]

- 1) To establish or confirm the diagnosis when clinical signs and laboratory investigations are indeterminate. CE-CT can also sometimes demonstrate the cause of pancreatitis or may reveal an alternative diagnosis.
- 2) To determine the severity of acute pancreatitis and to detect pancreatic and peri-pancreatic complications.
- 3) To guide percutaneous interventions, such as catheter drainage of fluid collections (usually later in the disease process).

CE-CT Technique

Our standard protocol for imaging acute pancreatitis is 100 ml intravenous (IV) contrast at a rate of 3 ml/second with image acquisition at approximately 60 s (optimal pancreatic enhancement is at 40 s, but imaging at 60 s optimises vascular opacification and enhancement of other organs). The CT images demonstrated in this study were performed on a Siemens Somatom Definition AS scanner (128 slices) using Omnipaque 300 in patients with normal renal function and Visipaque 270 in patients with impaired renal function.

Statistical Analysis

Data obtained was entered in MS Excel and analysed using SPSS 20 version software. The qualitative data was presented in the form of frequency and Proportions and quantitative data was presented as mean $\pm$ standard deviation or median (Q1, Q3). Appropriate tests of significance were used in the study.

RESULTS

Among 117 participants, the mean age of the participants was 38.40 ± 13.56 SD. 45.3% of the study participants belong to age group of 31 to 50 years. There were 97 (82.9%) males and 20 (17.1%) females in the study. Maximum number 100 (85.5%) of patients had complained acute pain abdomen, followed by recurrent pain abdomen and jaundice were 6.8%. In the present study, majority of study participants presented with Pseudocyst (33.6%) followed by acute peri-pancreatic fluid collection cases (30%) and necrotic collections (18%), as shown in (Table 1).

Table 1: Characteristic Details Of The Study Participants.

SL NO	Characteristic details	Frequency (percentage)
1)	Age in years	
	10-30	42 (35.9%)
	31-50	53 (45.9%)
	51-70	20 (17.1%)
	71-90	2 (1.7%)
2)	Gender	
	Male	97 (82.9%)
	Female	20 (17.1%)
3)	Clinical features	
	Acute pain abdomen	100 (85.5%)
	Epigastric pain	01 (0.9%)
	Epigastric pain with vomiting	02 (1.7%)
	Pain abdomen - 1 month	04 (3.4%)
	Pain abdomen - 2 month	01 (0.9%)
	Rec pain abdomen	01 (0.9%)
	Rec pain abdomen + jaundice	08 (6.8%)
4)	Diagnosis	
	A) Acute interstitial edematous pancreatitis	96 (82.0%)
	1. Acute peripancreatic fluid collection	29 (30.2%)
	2. Pseudocyst of pancreas	32 (33.3%)
	3. Glandular edematous changes only	28 (29.1%)
	B) Acute necrotising pancreatitis	21 (17.0%)
	1. Acute necrotic collection	12 (57.1%)
	2. Walled off necrosis	7 (33.3%)
	3. Pancreatic necrotic changes only	2 (09.5%)
5)	Extra pancreatic complications	
	Pleural effusion	44 (29.9%)
	Ascitis	37 (25%)
	Adjacent bowel inflammation	21 (14.4%)
	Pseudocyst	15 (10.0%)
	Vascular	28 (18.9%)
	Fistula - Pancreatico-pleural	2 (0.01%)
6)	Vascular complications	
	A) Venous thrombosis	
	1. Splenic vein	15 (62%)
	2. Portal vein	6 (25%)
	3. Superior mesentric vein	2 (8.3%)
	4. Portal vein + Superior mesentric vein	1 (0.4%)
	B) Pseudoaneurysm	
	1. Splenic artery	1 (25%)
	2. Gastroduodenal artery	2 (50%)
	3. Splenic + Gastroduodenal artery	1 (25%)

Complications Of Acute Pancreatitis

Among the 117 acute pancreatitis attacks follow-up computed tomography presented local and vascular complications. Pseudocyst (Figure 1) is one of the most commonly observed local complications in the participants (33.6%), followed by 30% of the participants developed Acute peri-pancreatic fluid collection (APFC) and Acute Necrotic collection (ANC) (Figure 2) in 10% of the participants. Extra-pancreatic collections such as ascites and bilateral pleural effusion among the study participants were 25% and 29.9% respectively.

The follow-up CT scan revealed additional fluid collections in different areas, including the lesser sac along the gastro-splenic and

gastro-phrenic ligaments, as well as the lesser omentum (0.9%), left paracolic gutter (0.9%), right paracolic gutter (1.7%), and splenic hilum (0.9%).

A common vascular complication, such as splenic vein thrombosis (see Figure 9), was observed in 15 (12.8%) of the participants. Other vascular complications, such as portal vein thrombosis and superior mesenteric vein (SMV) thrombosis, were observed in 5% and 1.7% of the participants, respectively.

A vascular complication such as splenic vein thrombosis (Figure 3) is one of the commonest finding which was observed in 15 (12.8%) participants. Other vascular complications such as portal vein thrombosis and superior mesenteric vein (SMV) thrombosis were observed in 5% and 1.7% participants respectively.

Pancreaticopleural fistulas (PPF) (see Figure 4) are rare complications of acute or chronic pancreatitis, occurring in approximately 5% of cases. They are an even less frequent cause of pleural effusion, accounting for less than 1% of cases. PPFs occur more regularly in men in their 5th and 6th decade of life, especially those with chronic alcoholism. However, any cause of pancreatitis can be associated with fistulization [7].

Another uncommon clinical condition is a pancreatic pseudoaneurysm (see Figure 5), which has been observed in 0.03% of cases. It is crucial to identify this condition early as it can lead to life-threatening complications. A pancreatic pseudoaneurysm typically occurs when a peripancreatic or pancreatic artery erodes into a pseudocyst [8].

Illustrated cases:

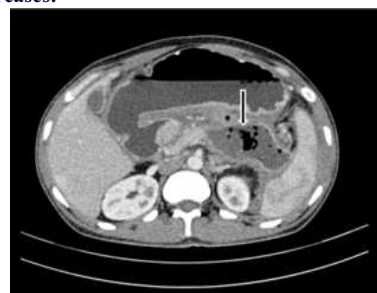


Figure 1: Axial image of contrast enhanced CT examination shows infected pseudocyst (arrow) as one of the commonest local complication of acute pancreatitis.

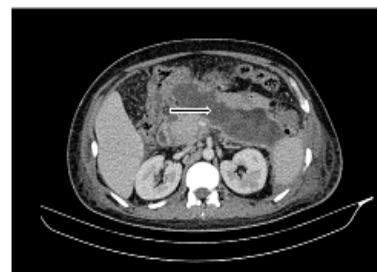


Figure 2: Axial image of contrast enhanced CT examination shows necrotic collections (arrow) as one of the complication of acute pancreatitis.



Figure 3 : Axial image of contrast enhanced CT examination shows splenic vein thrombosis (arrow) as one of the commonest vascular complication of acute pancreatitis.



Figure 4: Sagittal reformatted image of contrast enhanced CT examination shows the collection at the region of the tail of pancreas, which is communicating with the main pancreatic duct, seen extending superiorly and crossing the diaphragm, lateral to the oesophageal hiatus, into the mediastinum and bilateral pleural cavities forming pancreatico-pleural fistula.

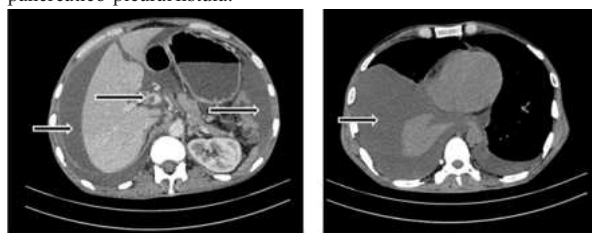


Figure 5: Axial image of contrast enhanced CT examination shows peri hepatic free fluid [ascites], portal vein thrombosis & peri splenic free fluid [ascites], pleural effusion (arrow) as extra pancreatic complications of acute pancreatitis.

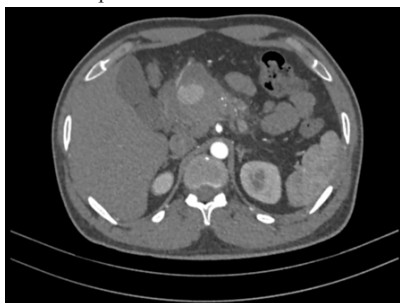


Figure 6: Axial image of contrast enhanced CT examination shows intrapancreatic pseudocyst with pseudoaneurysm supplied by GDA as one of the extra pancreatic complications of acute pancreatitis.

DISCUSSION

This study aimed to assess the effectiveness of CECT in identifying complications of acute pancreatitis. The study included 97 male and 20 female participants. A previous study by Sheetal et al., also indicated a higher prevalence of males, with a male to female ratio of 1.6:1 [9].

In our study, the most common presenting complaint was acute abdominal pain (85.5%), followed by vomiting (1.7%). This is similar to a study conducted by Laharwal et al., which observed epigastric pain in all 50 patients and nausea with vomiting in 76% of the study population [10].

In our study, biliary lithiasis and alcoholism are frequent causes of acute pancreatitis, which can result in severe and life-threatening complications. According to Steinberg et al., biliary calculi and alcohol together accounted for about 80-90% of the causes of acute pancreatitis, with the frequency varying across different populations. Peripancreatic inflammatory changes were the most common CT findings, seen in 88% of acute pancreatitis cases [11]. Mendez et al. reported that out of 32 patients, 28 (87.5%) exhibited the spread of the inflammatory process beyond the pancreas. In the current study, the pancreatic gland was found to be enlarged in 60% of cases [12]. Silverstein et al. also found pancreas enlargement in 68% of cases, consistent with the findings of this study [11].

Complications Of Acute Pancreatitis

In our study, the majority of participants presented with Pseudocyst (33.6%), followed by acute peri pancreatic fluid collection (30%) and necrotic collections (18%). In the study conducted by Sheetal et al., the most common complication presented was acute peri-pancreatic fluid collection (41.67%), followed by acute necrotic collection (20.83%). Similar findings were reported by Laharwal et al. and Raghuwanshi et al., with peripancreatic collection as the most common presenting feature with an incidence of 88% and 72% respectively in their study population [10,13].

Extrapancreatic complications were found in most of the patients, with the most common complications being ascites (25%) followed by bilateral pleural effusion (29.9%). This is in comparison with the study done by Raghuwanshi et al., where similar findings of pleural effusion and ascites were found to be the most common extrapancreatic complications [13]. Meanwhile, studies conducted by Sheetal et al. and Wongnai Anchalee et al. had stated pleural effusion as the most common extrapancreatic complication [9,14].

In this study, 24 (20.5%) cases were found to have splenic vein thrombosis, which was the most common vascular complication. Another fairly common vascular complication was found to be portal vein thrombosis (0.5%). In the study conducted by Sheetal et al., portal vein thrombosis (6.25%) was found to be one of the most common vascular complications [9].

In our study, GI involvement was found in 21 (17%) cases as one of the extrapancreatic complications of acute pancreatitis. Similar findings were noted in the study conducted by Banday et al. in which they reported that ascites (36%) was the second most common extrapancreatic complication followed by GI involvement (26%) [15]. Similar incidence was also reported by Balthazar et al. (14%) [16].

Limitations

This study did not focus on developing interventions or management strategies for the condition, nor did it include any follow-up to assess the long-term consequences of these complications. Additionally, since the study was carried out in a single institution, it was restricted to a relatively smaller and less diverse group of patients.

CONCLUSIONS

Acute pancreatitis can be severe and life-threatening, particularly when associated with complications. Contrast-enhanced MDCT serves as an excellent modality to characterize the type of pancreatitis (edematous vs necrotizing) and detect the associated complications. It helps in the definitive diagnosis of life-threatening vascular and non-vascular complications that may not be clinically apparent and aid in an appropriate intervention.

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