Original Article

Multiphasic CT in Complicated Acute Pancreatitis

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Abstract

Background: Acute pancreatitis is a common inflammatory disorder with a variable clinical course, and complicated cases may develop pancreatic necrosis, fluid collections, vascular abnormalities, and gastrointestinal complications. Multiphasic computed tomography (CT) provides comprehensive assessment of pancreatic and vascular pathology and may assist in severity assessment and therapeutic planning. This study evaluated the role of multiphasic CT in the assessment of complicated acute pancreatitis. **Material and Methods:** A hospital-based, observational study was conducted among 110 adult patients with clinically diagnosed complicated acute pancreatitis. Patients underwent Multiphasic Contrast-enhanced CT, including unenhanced, pancreatic/arterial, and portal venous phases. Pancreatic and peripancreatic abnormalities, necrosis, fluid collections, vascular complications, and extrapancreatic findings were documented. Modified CT Severity Index (MCTSI) scores were calculated. CT findings were correlated with clinical severity, management, follow-up, and in-hospital outcomes. **Results:** The mean age was 46.8 ± 14.2 years, with males comprising 65.5% of patients. Alcohol-related pancreatitis was the commonest etiology (41.8%). Peripancreatic fat stranding (93.6%) and pancreatic enlargement (83.6%) were the most frequent CT findings, while pancreatic/peripancreatic necrosis was observed in 55.5%. Ascites and pleural effusion were present in 60.9% and 46.4%, respectively. Vascular complications were identified in 29.1%, with splenic vein thrombosis (15.5%) being most frequent. Severe MCTSI was observed in 50.0% of patients. Pancreatic necrosis increased significantly with MCTSI severity ($p<0.001$). ICU admission occurred in 26.4%, intervention was required in 47.3%, and in-hospital mortality was 10.0%. **Conclusion:** Multiphasic CT effectively characterized the diverse pancreatic, peripancreatic, and vascular complications of acute pancreatitis. It provided important information regarding disease severity and supported clinical and therapeutic decision-making.

Keywords: Acute pancreatitis; Multiphasic Computed Tomography; Pancreatic necrosis; Vascular complications; Modified CT Severity Index; Peripancreatic collections; CT severity.

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Introduction

Acute pancreatitis (AP) is a common acute inflammatory disorder of the pancreas with a variable clinical course, ranging from mild, self-limiting disease to severe forms associated with persistent organ failure and local complications. [1] According to the Revised Atlanta Classification, AP is categorized as mild, moderately severe, or severe based on the presence and duration of organ failure and local or systemic complications.[2] Complicated acute pancreatitis may be associated with pancreatic and peripancreatic necrosis, acute fluid collections, pseudocysts, walled-off necrosis, vascular complications, gastrointestinal complications, and biliary or intestinal obstruction. Pancreatic necrosis, particularly when infected, is an important determinant of morbidity and mortality and may require prolonged intensive management and intervention.[2–6] Imaging has a central role in the diagnosis, severity assessment, and characterization of complications in AP.[7] Contrast-enhanced Computed Tomography (CECT) provides rapid and comprehensive evaluation of pancreatic parenchymal enhancement, necrosis, peripancreatic collections, inflammatory changes, and adjacent abdominal structures. It also permits assessment using established radiological severity scoring systems, including the CT Severity Index and Modified CT Severity Index.[7-9] However, the extent of necrosis and local complications may evolve with time, and early CT may underestimate the severity of pancreatic injury. Multiphasic Computed Tomography provides additional information by evaluating pancreatic and vascular abnormalities during different phases of contrast enhancement.[10] The pancreatic/arterial phase facilitates assessment of pancreatic perfusion and arterial complications, whereas the portal venous phase provides better delineation of pancreatic and peripancreatic necrosis, fluid collections, venous thrombosis, and other abdominal complications. An arterial phase is particularly valuable for detecting pseudoaneurysm and active hemorrhage, which are potentially life-threatening complications of AP.[11,12] Accurate identification of these complications is essential for determining the need for conservative management, endoscopic or percutaneous drainage,

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angiographic embolization, or surgery. Therefore, Multiphasic CT may provide comprehensive anatomical and vascular assessment in patients with complicated AP and facilitate timely therapeutic planning. The present study was designed to evaluate the role of Multiphasic CT in identifying and characterizing pancreatic, peripancreatic, vascular, and other abdominal complications of acute pancreatitis and to assess its clinical utility in guiding management.

Materials and Methods

A hospital-based, observational study was conducted to evaluate the role of Multiphasic Computed Tomography (CT) in the diagnosis and characterization of complications of acute pancreatitis. The study was carried out in the Department of Radiodiagnosis. A total of 110 patients with clinically diagnosed acute pancreatitis and suspected or established complications were included in the study.

Study Population: The study included adult patients diagnosed with acute pancreatitis who underwent Multiphasic Contrast-enhanced CT of the abdomen for evaluation of disease severity, local complications, or clinical deterioration. Patients were enrolled consecutively during the study period after fulfilling the predefined eligibility criteria.

Acute pancreatitis was diagnosed when at least two of the following three criteria were present:

1. Characteristic acute upper abdominal pain.
2. Serum amylase and/or lipase levels greater than three times the upper limit of normal.
3. Imaging findings compatible with acute pancreatitis.

Sample Size: A total of 110 patients were included in the study from August 2023 to July 2026 over 3 yrs. Eligible patients presenting during the study period were recruited consecutively until the required sample size was achieved.

Inclusion Criteria

Patients fulfilling the following criteria were included:

- Age ≥18 years.
- Patients with clinically and/or biochemically diagnosed acute pancreatitis.
- Patients with suspected or established local or systemic complications of acute pancreatitis.
- Patients referred for Multiphasic Contrast-Enhanced CT evaluation.
- Patients who provided informed consent for participation.
- Patients with adequate clinical, laboratory, imaging, and follow-up information.

Exclusion Criteria

Patients were excluded if they had:

- Age <18 years.
- Contraindication to iodinated intravenous contrast administration.
- Severe renal dysfunction preventing Contrast-enhanced CT.
- Inadequate or technically unsatisfactory CT examination.
- Previous pancreatic surgery.
- Known pancreatic malignancy or other pancreatic pathology that could interfere with interpretation.
- Chronic pancreatitis without evidence of an acute episode.
- Incomplete clinical records or inadequate follow-up information.
- Patients who did not provide consent for participation.

Clinical and Laboratory Assessment: At enrolment, demographic and clinical information was recorded using a structured data collection proforma. The parameters included age, sex, presenting symptoms, duration of symptoms, etiology of pancreatitis, history of alcohol intake, gallstone disease, previous episodes of pancreatitis, and relevant co-morbidities.

Baseline laboratory investigations were recorded, including complete blood count, serum amylase, serum lipase, liver function tests, renal function tests, serum electrolytes, blood glucose, and inflammatory markers, wherever available. Patients were clinically assessed for evidence of systemic inflammatory response and organ dysfunction. The severity of acute pancreatitis was classified according to the Revised Atlanta Classification, with particular attention to the presence and duration of organ failure and local complications.

Multiphasic CT Examination: All patients underwent Multiphasic Contrast-enhanced Multidetector CT (MDCT) of the abdomen using the institutional CT protocol. An initial unenhanced CT phase was obtained, followed by intravenous administration of a non-ionic, iodinated contrast agent. Contrast-enhanced images were subsequently acquired during the pancreatic/arterial phase and portal venous phase. An additional delayed phase was obtained when clinically indicated, particularly for characterization of vascular abnormalities, collections, or equivocal findings. Thin-section axial images were acquired and Multiplanar Reformatted Images were reconstructed in the coronal and sagittal planes. The relevant technical parameters, including tube voltage, tube current, slice thickness, pitch, contrast volume, injection rate, and timing of image acquisition, were recorded.

Evaluation of Pancreatic Findings:

The pancreatic parenchyma was systematically evaluated for:

- Pancreatic enlargement.
- Contour irregularity.
- Heterogeneous enhancement.
- Areas of decreased or absent enhancement.
- Pancreatic necrosis.
- Peripancreatic inflammatory changes.
- Pancreatic duct abnormalities.

The presence, location, extent, and percentage of pancreatic necrosis were assessed wherever identifiable. Areas of absent or markedly reduced enhancement relative to normally enhancing pancreatic tissue were considered suggestive of necrosis.

Evaluation of Pancreatic and Peripancreatic Collections: The presence and characteristics of fluid collections were assessed. Collections were evaluated with respect to:

- Location.
- Size and extent.
- Wall formation.
- Internal contents.
- Presence of gas.
- Relationship to adjacent organs.
- Evidence of infection or secondary complications.

Collections were categorized according to the Revised Atlanta Classification as appropriate, including:

- Acute peripancreatic fluid collection.
- Acute necrotic collection.
- Pancreatic pseudocyst.
- Walled-off necrosis.

Evaluation of Vascular Complications: The arterial and venous structures adjacent to the pancreas were carefully evaluated on Multiphasic CT.

The arterial phase was specifically assessed for:

- Pseudoaneurysm formation.
- Active contrast extravasation.
- Arterial thrombosis.
- Arterial narrowing or compression.
- Other arterial abnormalities.

The portal venous phase was used to evaluate the portal vein, splenic vein, and superior mesenteric vein for thrombosis, stenosis, compression, or collateral formation. The presence of perigastric or peripancreatic collaterals and other findings suggestive of portal hypertension was also recorded.

Evaluation of Extrapancreatic Complications: The CT examination was additionally assessed for complications involving adjacent organs and other abdominal structures. These included:

- Gastrointestinal wall thickening.
- Bowel ischemia.
- Bowel perforation.
- Gastrointestinal fistula.
- Biliary obstruction.
- Gastric or duodenal obstruction.
- Ascites.
- Pleural effusion.
- Peritoneal or retroperitoneal collections.
- Abdominal vascular complications.
- Other relevant extrapancreatic abnormalities.

CT Severity Assessment: The severity of pancreatic and extrapancreatic involvement was assessed using the Modified CT Severity Index (MCTSI). The score incorporated the extent of pancreatic inflammation, pancreatic necrosis, and extrapancreatic complications. Patients were categorized into appropriate severity groups based on their CT scores. The relationship between CT severity and clinical outcome was subsequently evaluated.

Assessment of Contribution of Different CT Phases: The diagnostic contribution of each CT phase was assessed separately and in combination. The unenhanced phase was evaluated for hemorrhage, calcification, and hyperattenuating contents. The pancreatic/arterial phase was assessed particularly for pancreatic enhancement and arterial complications such as pseudoaneurysm and active bleeding. The portal venous phase was evaluated for pancreatic necrosis, peripancreatic collections, venous thrombosis, and extrapancreatic complications. The ability of Multiphasic CT to identify additional findings that were not adequately characterized on a single phase was documented.

Follow-Up: All included patients were followed clinically from the time of CT examination until hospital discharge or death. Patients were monitored for clinical progression, development of new complications, persistence or resolution of existing complications, and requirement for therapeutic intervention.

During follow-up, the following outcomes were recorded:

- Clinical improvement or deterioration.
- Development of persistent organ failure.
- Development or progression of pancreatic necrosis.
- Infection of pancreatic or peripancreatic collections.
- Development of vascular complications.
- Gastrointestinal or biliary complications.
- Requirement for percutaneous drainage.
- Requirement for endoscopic intervention.
- Requirement for angiographic embolization.
- Requirement for surgical intervention.
- Intensive care unit admission.
- Duration of hospital stay.
- In-hospital mortality.

Where clinically indicated, follow-up Contrast-enhanced CT or other appropriate imaging examinations were performed to assess the evolution of pancreatic necrosis, collections, vascular abnormalities, and other complications. Follow-up imaging findings were compared with the initial Multiphasic CT findings. The initial CT findings were also correlated with operative findings, endoscopic findings, interventional radiology procedures, microbiological results, and subsequent imaging, wherever available, to assess their diagnostic and clinical relevance.

Correlation of CT Findings With Clinical Outcome: The relationship between CT detected complications and subsequent clinical outcomes was analyzed. Particular attention was given to whether the presence and extent of pancreatic necrosis, peripancreatic collections, vascular complications, and higher CT severity scores were associated with ICU admission, invasive intervention, prolonged hospitalization, persistent organ failure, and mortality. All CT examinations were reviewed by experienced radiologists with expertise in abdominal imaging. Images were assessed systematically using the predefined study proforma. When required, Multiplanar Reconstructions were used to establish the extent and anatomical relationships of complications. The radiological findings were documented before correlation with subsequent clinical, surgical, endoscopic, angiographic, microbiological, and follow-up findings.

Statistical Analysis: Data were entered into a structured database and analyzed using SPSS.21statistical software. Continuous variables were expressed as mean ± standard deviation for normally distributed data or median with interquartile range for non-normally distributed data. Categorical variables were expressed as frequencies and percentages.

The association between categorical variables was assessed using the Chi-square test or Fisher's exact test, as appropriate. Continuous variables were compared using the independent-samples t test or Mann–Whitney U test, depending on data distribution. Correlations between CT severity scores and clinical parameters were assessed using Pearson or Spearman correlation analysis, as appropriate. The diagnostic performance of relevant CT findings, wherever applicable, was assessed using Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value, and Diagnostic Accuracy. Receiver operating

characteristic (ROC) curve analysis was performed where appropriate to assess the predictive ability of CT severity measures for clinically relevant outcomes. A two-sided p value <0.05 was considered statistically significant.

Results

A total of 110 patients with complicated acute pancreatitis were included in the study. The mean age of the study population was 46.8 ± 14.2 years, with an age range of 19–78 years. There was a male predominance, with 72 (65.5%) males and 38 (34.5%) females. Abdominal pain was present in all patients (110, 100%), followed by vomiting in 78 (70.9%), fever in 52 (47.3%), and abdominal distension in 41 (37.3%). The median duration of symptoms was 4 days (IQR: 2–7 days). Alcohol was the most common identified etiology, accounting for 46 (41.8%) cases, followed by gallstone disease in 39 (35.5%), hypertriglyceridemia in 12 (10.9%), and other/idiopathic causes in 13 (11.8%). Diabetes mellitus and hypertension were present in 24 (21.8%) and 27 (24.5%) patients, respectively [Table 1]. The mean hemoglobin concentration was 11.8 ± 1.9 g/dL, while the mean total leukocyte count was 14,280 ± 5,460 cells/mm³. Median serum amylase and lipase levels were 1,084 U/L (IQR: 612–2,145) and 1,856 U/L (IQR: 924–3,420), respectively. The mean serum creatinine was 1.42 ± 0.76 mg/dL, and the median CRP level was 146 mg/L (IQR: 82–238). The mean serum calcium level was 7.9 ± 0.8 mg/dL. Organ failure was observed in 38 (34.5%) patients, of whom 24 (21.8%) developed persistent organ failure. ICU admission was required in 29 (26.4%) patients. According to clinical severity, 18 (16.4%) patients had mild acute pancreatitis, 44 (40.0%) had moderately severe disease, and 48 (43.6%) had severe acute pancreatitis [Table 2].

Multiphasic CT demonstrated a wide spectrum of pancreatic and extrapancreatic abnormalities. Peripancreatic fat stranding was the most frequent finding, observed in 103 (93.6%) patients, followed by pancreatic enlargement in 92 (83.6%). Pancreatic or peripancreatic necrosis was identified in 61 (55.5%) patients. Acute peripancreatic fluid collections were present in 48 (43.6%), while acute necrotic collections were observed in 42 (38.2%). Pancreatic pseudocysts and walled-off necrosis were identified in 24 (21.8%) and 29 (26.4%) patients, respectively. Gas within collections was observed in 16 (14.5%) patients. Among extrapancreatic findings, ascites was the most common, occurring in 67 (60.9%) patients, followed by pleural effusion in 51 (46.4%). Biliary dilatation or obstruction was present in 22 (20.0%), while gastric/duodenal involvement and bowel wall abnormalities were observed in 19 (17.3%) and 15 (13.6%) patients, respectively. Gastrointestinal fistula was identified in 9 (8.2%) patients. The overall distribution of pancreatic, peripancreatic, and extrapancreatic findings is shown in [Table 3 and Figure 1]. Vascular abnormalities were detected in 32 (29.1%) patients on Multiphasic CT [Table 4; Figure 2]. Splenic vein thrombosis was the most frequent vascular complication, occurring in 17 (15.5%) patients, followed by portal vein thrombosis in 9 (8.2%) and superior mesenteric vein thrombosis in 5 (4.5%). Combined venous thrombosis was observed in 4 (3.6%) patients. Arterial complications included splenic artery pseudoaneurysm in 8 (7.3%), hepatic artery pseudoaneurysm in 2 (1.8%), gastroduodenal artery pseudoaneurysm in 3 (2.7%), and other arterial pseudoaneurysm in 1 (0.9%). Active contrast extravasation or bleeding was identified in 7 (6.4%) patients. Arterial thrombosis or stenosis was observed in 4 (3.6%), while collateral vessel formation was present in 13 (11.8%) patients. Some patients had more than one vascular abnormality. According to the Modified CT Severity Index (MCTSI), 55 (50.0%) patients were categorized as having severe CT involvement, while 43 (39.1%) had moderate involvement and 12 (10.9%) had mild involvement. Thus, half of the study population demonstrated severe radiological disease [Table 5]. The distribution of patients according to MCTSI category is illustrated in [Figure 3]. The frequency of major complications increased progressively with increasing MCTSI severity [Table 6]. Pancreatic necrosis was identified in 1 (8.3%) patient with mild MCTSI, compared with 19 (44.2%) patients with moderate MCTSI and 41 (74.5%) patients with severe MCTSI (p<0.001). Similarly, acute necrotic collections were significantly more frequent in patients with severe CT involvement, occurring in 27 (49.1%) compared with 14 (32.6%) and 1 (8.3%) patients in the moderate and mild groups, respectively (p=0.004).

Walled-off necrosis demonstrated a significant association with CT severity, increasing from 0 % in the mild group to 16.3% in the moderate group and 40.0% in the severe group (p<0.001). Venous thrombosis was also significantly more frequent with increasing MCTSI severity (p=0.036), as was pseudoaneurysm (p=0.018). Ascites and pleural effusion were significantly more common among patients with severe CT involvement (p=0.021 and p=0.047, respectively). Gastrointestinal complications were observed in 20.0% of patients with severe MCTSI compared with 9.3% and 0 % in the moderate and mild groups, respectively (p=0.032). During follow-up, 58 (52.7%) patients were managed conservatively, whereas 21 (19.1%) underwent percutaneous drainage, 13 (11.8%) required endoscopic intervention, 8 (7.3%) underwent angiographic embolization, and 10 (9.1%) required surgical intervention. Overall, 29 (26.4%) patients required ICU admission, while prolonged hospitalization of more than 14 days occurred in 46 (41.8%) patients. Persistent organ failure was documented in 24 (21.8%) patients. Clinical improvement during follow-up was observed in 91 (82.7%) patients, whereas 11 (10.0%) patients died during hospitalization [Table 7].

Table 1: Demographic and Clinical Characteristics of the Study Population (n=110)

Variable	Findings
Age (years), mean ± SD	46.8 ± 14.2
Age range (years)	19–78
Male, n (%)	72 (65.5)
Female, n (%)	38 (34.5)
Abdominal pain, n (%)	110 (100.0)

Vomiting, n (%)	78 (70.9)
Fever, n (%)	52 (47.3)
Abdominal distension, n (%)	41 (37.3)
Duration of symptoms (days), median (IQR)	4 (2–7)
Alcohol-related pancreatitis, n (%)	46 (41.8)
Gallstone-related pancreatitis, n (%)	39 (35.5)
Hypertriglyceridemia, n (%)	12 (10.9)
Other/idiopathic etiology, n (%)	13 (11.8)
Diabetes mellitus, n (%)	24 (21.8)
Hypertension, n (%)	27 (24.5)

Table 2: Laboratory Parameters and Clinical Severity of Acute Pancreatitis (n=110)

Parameter	Mean ± SD / Median (IQR) / n (%)
Hemoglobin (g/dL)	11.8 ± 1.9
Total leukocyte count (cells/mm³)	14,280 ± 5,460
Serum amylase (U/L)	1,084 (612–2,145)
Serum lipase (U/L)	1,856 (924–3,420)
Total bilirubin (mg/dL)	2.1 ± 1.8
AST (U/L)	118 (62–246)
ALT (U/L)	136 (71–284)
Serum creatinine (mg/dL)	1.42 ± 0.76
Blood urea nitrogen (mg/dL)	31.6 ± 18.4
CRP (mg/L)	146 (82–238)
Serum calcium (mg/dL)	7.9 ± 0.8
Serum sodium (mEq/L)	136.4 ± 4.8
Serum potassium (mEq/L)	4.2 ± 0.6
Organ failure, n (%)	38 (34.5)
Persistent organ failure, n (%)	24 (21.8)
ICU admission, n (%)	29 (26.4)
Mild AP, n (%)	18 (16.4)
Moderately severe AP, n (%)	44 (40.0)
Severe AP, n (%)	48 (43.6)

Table 3: Multiphasic CT Findings in Complicated Acute Pancreatitis (n=110)

CT Finding	n	%
Pancreatic enlargement	92	83.6
Peripancreatic fat stranding	103	93.6
Pancreatic/peripancreatic necrosis	61	55.5
Acute peripancreatic fluid collection	48	43.6
Acute necrotic collection	42	38.2
Pancreatic pseudocyst	24	21.8
Walled-off necrosis	29	26.4
Gas within collection	16	14.5
Ascites	67	60.9
Pleural effusion	51	46.4
Biliary dilatation/obstruction	22	20.0
Gastric/duodenal involvement	19	17.3
Bowel wall abnormality	15	13.6
Gastrointestinal fistula	9	8.2

Table 4: Vascular Complications Detected on Multiphasic CT (n=110)

Vascular complication	n	%
Any vascular complication	32	29.1
Splenic vein thrombosis	17	15.5
Portal vein thrombosis	9	8.2
Superior mesenteric vein thrombosis	5	4.5
Combined venous thrombosis	4	3.6
Splenic artery pseudoaneurysm	8	7.3
Hepatic artery pseudoaneurysm	2	1.8
Gastroduodenal artery pseudoaneurysm	3	2.7
Other arterial pseudoaneurysm	1	0.9
Active contrast extravasation/bleeding	7	6.4
Arterial thrombosis/stenosis	4	3.6
Collateral vessel formation	13	11.8

Table 5: Distribution of Patients According to CT Severity Score (n=110)

Modified CT Severity Index (MCTSI)	Severity category	n	%
0–2	Mild	12	10.9

4–6	Moderate	43	39.1
8–10	Severe	55	50.0
Total		110	100.0

Table 6: Distribution of Major Complications According to CT Severity Category

Complication	Mild MCTSI (n=12)	Moderate MCTSI (n=43)	Severe MCTSI (n=55)	Total n (%)	p value
Pancreatic necrosis	1 (8.3)	19 (44.2)	41 (74.5)	61 (55.5)	<0.001
Acute necrotic collection	1 (8.3)	14 (32.6)	27 (49.1)	42 (38.2)	0.004
Pseudocyst	1 (8.3)	8 (18.6)	15 (27.3)	24 (21.8)	0.198
Walled-off necrosis	0 (0.0)	7 (16.3)	22 (40.0)	29 (26.4)	<0.001
Venous thrombosis	1 (8.3)	8 (18.6)	18 (32.7)	27 (24.5)	0.036
Pseudoaneurysm	0 (0.0)	3 (7.0)	10 (18.2)	13 (11.8)	0.018
Ascites	4 (33.3)	24 (55.8)	39 (70.9)	67 (60.9)	0.021
Pleural effusion	3 (25.0)	18 (41.9)	30 (54.5)	51 (46.4)	0.047
Gastrointestinal complication	0 (0.0)	4 (9.3)	11 (20.0)	15 (13.6)	0.032

Table 7: Management and Clinical Outcome of Patients According to Multiphasic CT Findings

Outcome	n	%
Conservative management	58	52.7
Percutaneous drainage	21	19.1
Endoscopic intervention	13	11.8
Angiographic embolization	8	7.3
Surgical intervention	10	9.1
ICU admission	29	26.4
Prolonged hospital stay (>14 days)	46	41.8
Persistent organ failure	24	21.8
Clinical improvement during follow-up	91	82.7
In-hospital mortality	11	10.0

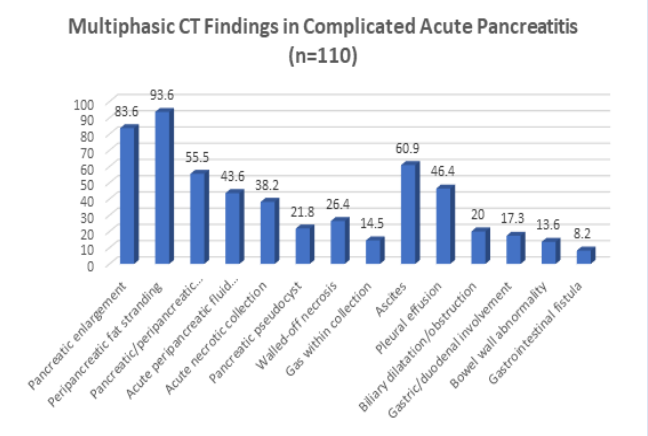

Figure 1: Multiphasic CT Findings in Complicated Acute Pancreatitis (n=110)

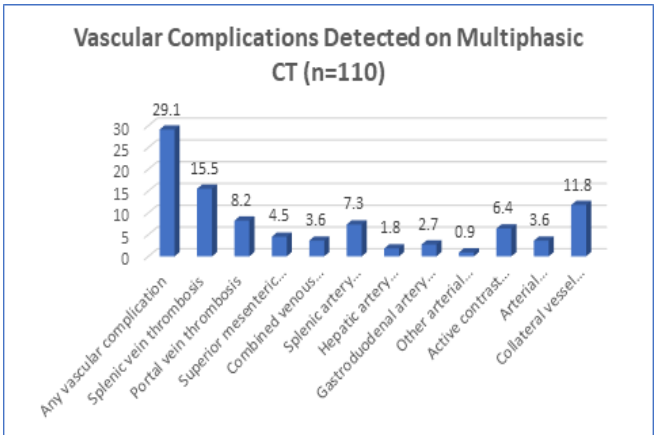

Figure 2: Vascular Complications Detected on Multiphasic CT (n=110)

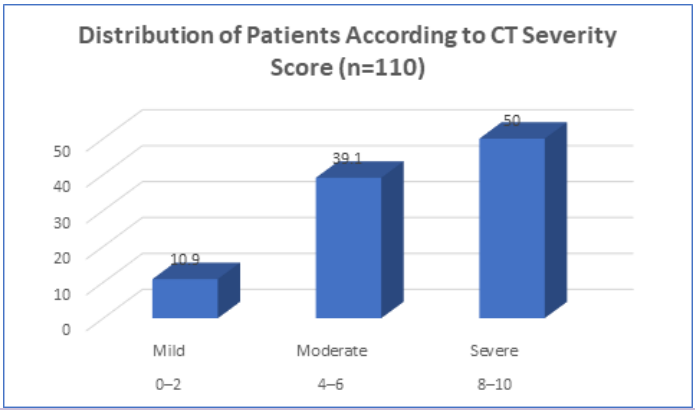

Figure 3: Distribution of Patients According to CT Severity Score (n=110)

Discussion

The present study evaluated the role of multiphasic computed tomography (CT) in 110 patients with complicated acute pancreatitis (AP), focusing on pancreatic and peripancreatic abnormalities, vascular complications, CT severity, and clinical outcomes. The mean age was 46.8 ± 14.2 years, with male predominance (65.5%). Alcohol was the leading etiology (41.8%), followed by gallstones (35.5%). This profile was comparable to previous Indian cohorts. Negi et al,[13] in 123 patients, reported 72.4% males, with alcohol and gallstones accounting for 59.3% and 35.6%, respectively. Similarly, a large North Indian cohort reported male predominance of 69.2%, with alcohol and gallstones responsible for 48.5% and 32.4% of cases. Abdominal pain was universal (100%), followed by vomiting (70.9%), fever (47.3%), and abdominal distension (37.3%). The biochemical profile showed marked inflammation, with mean leukocyte count of 14,280 ± 5,460/mm³ and median CRP of 146

mg/L, accompanied by hypocalcemia and renal dysfunction. Organ failure occurred in 34.5%, persistent organ failure in 21.8%, and ICU admission in 26.4%, reflecting the complicated nature of the study population. Multiphasic CT demonstrated extensive local disease. Peripancreatic fat stranding (93.6%) and pancreatic enlargement (83.6%) were most frequent, while pancreatic/peripancreatic necrosis occurred in 55.5%. Acute peripancreatic fluid collections, acute necrotic collections, pseudocysts, and walled-off necrosis were observed in 43.6%, 38.2%, 21.8%, and 26.4%, respectively. These findings correspond with the Revised Atlanta Classification, which recognizes necrosis and evolving fluid collections as major local complications. Early CT may underestimate necrosis because microvascular impairment and structural necrosis evolve over several days. Vascular abnormalities were identified in 29.1% of patients, most commonly splenic vein thrombosis (15.5%), followed by portal vein thrombosis (8.2%) and superior mesenteric vein thrombosis (4.5%). This is consistent with the meta-analysis by Anis et al,[14] which reported a pooled splanchnic venous thrombosis incidence of 17%. Arterial complications included splenic artery pseudoaneurysm (7.3%), other pseudoaneurysms, and active bleeding (6.4%), highlighting the importance of arterial-phase imaging and its role in planning embolization.

Increasing MCTSI severity showed strong associations with necrosis, walled-off necrosis, venous thrombosis, pseudoaneurysm, and other complications ($p<0.001$). Previous studies similarly demonstrated strong correlations between MCTSI and hospital/ICU stay and overall clinical severity. During follow-up, 52.7% were managed conservatively, whereas others required drainage, endoscopic intervention, embolization, or surgery. Overall mortality was 10.0%. Thus, Multiphasic CT provided comprehensive morphological and vascular assessment and demonstrated important prognostic value. Its ability to identify necrosis, collections, vascular complications, and extrapancreatic disease makes it particularly valuable in complicated AP, facilitating risk stratification, treatment planning, and prediction of adverse outcomes.

Conclusion

Multiphasic CT provided comprehensive evaluation of pancreatic, peripancreatic, vascular, and extrapancreatic complications in patients with complicated acute pancreatitis. Pancreatic necrosis and peripancreatic inflammatory changes were the predominant CT findings, while vascular complications were identified in a substantial proportion of patients. Increasing MCTSI scores were significantly associated with major complications, including necrosis, walled-off necrosis, venous thrombosis, and pseudoaneurysm. Multiphasic CT therefore appears to be a valuable imaging modality for accurate characterization of complications, assessment of disease severity, and guiding timely therapeutic management.

Limitations: The study was conducted at a single centre with a relatively small sample size of 110 patients, which may limit the generalizability of the findings. The observational design may have introduced selection and referral bias, particularly because patients with complicated disease were preferentially evaluated. Variations in the timing of CT and follow-up imaging may also have influenced the detection and evolution of pancreatic and vascular complications. Further multicentric studies with larger cohorts and standardized follow-up protocols are warranted.

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Conflicts of interest

There are no conflicts of interest.

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