

## Contrast Enhanced Computed Tomographic Evaluation of Vascular Complications of Pancreatitis

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### Abstract

**Aim:** This study is designed to assess the role of Contrast Enhanced Computed Tomography in the evaluation of Vascular Complications of Pancreatitis. **Method:** Hospital based prospective study in 150 patients with pancreatitis based on clinical and laboratory findings. CT scan Imaging was done with 128 slice GE Optima CT machine. **Results:** Out of the 150 pancreatitis cases, 87.3% are males. Acute pancreatitis (81, 54%) is the major morphologic type. Majority of the AP cases are of interstitial edematous type (55, 67.9%). Mild AP is found in 25.9%, Moderate AP constitutes 48.1% and Severe AP in 25.9% cases. Vascular complications observed as 26.67% in the age range of 41 to 50 years. Acute necrotizing type is the leading cause. Vascular complications is highest with severe AP (85.7%) with MCTSI scores of 8 and 10. In our study, there is high association of vascular complications with necrotizing pancreatitis as well. In 110 vascular uncomplicated cases, meticulous analysis reveals indirectly that vascular complications are less associated with mild and moderate acute pancreatitis. 80% are constituted by venous complications, 15% accounted to arterial complications. Both arterial and venous complications constitute to 5%. Splanchnic vein thrombosis is the most common venous complication followed by isolated portal vein and isolated splenic vein thrombosis. Rare cases of right hepatic artery pseudoaneurysm, splenic artery pseudoaneurysm, co-existing thrombus and pseudoaneurysm in superior mesenteric artery, left renal vein thrombosis, inferior mesenteric vein thrombosis have been reported. An exceptional case of thrombosis of splenic vein, portal vein, superior mesenteric vein, left renal vein, inferior vena cava and right atrium have been reported. Another notable case is pulsatile pseudocyst. Vascular complications significantly affects the patient's outcome in terms of various outcome parameters. The average length of hospitalization for vascular complicated cases is 16-20 days and for vascular uncomplicated cases, it is 1-5 days. Mortality rate in the study with vascular complications is 2.5%. **Conclusion:** Our study also yielded a statistically highly significant result of vascular complications being associated with higher MCTSI score. The MCTSI score increases, the prevalence of vascular complications increases and therefore significantly affects the patient's outcome in terms of various outcome parameters.

**Keywords:** Vascular complications, MCTSI score, acute pancreatitis, Splanchnic vein thrombosis

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### Introduction

Pancreatitis is a systemic disease with the release of inflammatory mediators and digestive enzymes, leading to the auto-digestion of the organ[1]. Extravasation of these enzymes damage peripancreatic tissues, dissects across tissue planes and envelopes adjacent organs and vasculature. Vascular complications are seen in a quarter of the cases and are potentially catastrophic, rapidly deteriorating the patient's condition. Thus, early detection and appropriate management is of utmost importance. Vascular complications, both arterial and venous, are known to occur in patients who have severe acute pancreatitis. Arterial bleeding is one of the most life-threatening complications, and although virtually all peripancreatic vessels can be involved, the splenic artery is the most common because of its anatomical contiguity with the pancreas. Erosion of arteries can result in free hemorrhage from the erosion site or in the formation of a pseudoaneurysm. The latter has the potential to rupture into the lesser sac, into the peritoneal cavity, or into an

adjacent hollow organ. In patients with history of acute pancreatitis, one should suspect a pseudoaneurysm when a cystic pancreatic mass demonstrates transient vascular enhancement. In addition to arterial complications, venous thrombosis in the portal-mesenteric circulation can occur. In the order of frequency, the splenic vein is involved most, followed by the portal and the superior mesenteric veins. When the splenic vein is involved, left sided portal hypertension can occur with the development of gastric and mesenteric varices. When there is a segmental occlusion of the portal venous system, cavernous transformation of the portal vein occurs. SMV thrombosis is a rare complication of pancreatitis and may lead to mesenteric ischemia. Before the advent of modern cross sectional imaging modalities, pancreas was truly one of the "hidden" organs of abdomen being only analyzed by indirect methods of analyzing its neighbouring organs such as by barium meal[2]. Its wide availability with rapid acquisition time makes contrast enhanced CT, the most frequently applied imaging technique. Contrast enhanced CT is a standard imaging modality which enables complete visualisation of the pancreas and retroperitoneum, even in the setting of bowel gas or overlying bandages from a recent surgical procedure and helps to detect the complications of pancreatitis such as fluid collection, pseudocyst, abscess, vein thrombosis and pseudoaneurysm[3]. The CT severity index was used previously and now we use a modified form to predict the outcome of the condition while maintaining or improving the

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interobserver agreement. The modified CT severity index incorporates features reflecting organ failure and extrapancreatic complications for predicting course and thus, can be used as prognostic indicator of the severity of pancreatitis[4]. The modified index is found to have stronger prognostic correlation than the accepted index and could also predict the length of hospital stay and development of organs failure. In addition, CECT can also be used to guide associated percutaneous/interventional procedures. Primary outcome was to determine prevalence of vascular complications in cases of pancreatitis. Secondary outcome was to assess correlation between prevalence of vascular complications and Modified Computed Tomography Severity Index (MCTSI) and the outcome of patients.

**Materials and methods**

**Source of data**

Data was collected from patients referred to department of Radiodiagnosis, Narayana Medical College, Nellore with the Clinically suspected/Lab findings/Ultrasonography suggestive of pancreatitis in age group of 18-80 years for a period of 2 years.

**Study design**

Hospital based prospective study.

**Sample size**

The study is proposed to be conducted in 70 patients with pancreatitis, but later the sample size is increased to 150 owing to ample case load.

**Inclusion criteria**

All the patients who are suspected of having pancreatitis based on clinical and laboratory findings (serum amylase and serum lipase), Patients who are diagnosed pancreatitis on ultrasonography.

**Exclusion criteria**

Patients below age of 18 years; Congenital pancreatic lesion; Pancreatic carcinoma and metastasis; Pregnancy; Severe renal failure; Allergic reaction to contrast media.

**Technique**

Patient is kept nil orally for minimum of 8-10 hours prior to the CT scan to avoid the complications while administering the contrast media. Risks are explained and informed consent is taken. Imaging is done with 128 slice GE Optima CT machine. Positive/neutral oral contrast is administered to the patient and after 4 hours, routine antero-posterior topogram of abdomen is taken initially, followed by serial axial sections of 5mm from the level of both domes of diaphragm to the pubic symphysis in the supine position with breath

held and reconstructed to 2.5mm sections. Intravenous contrast (Ultravist) calculated as per age and body weight is administered to the patient and serial axial sections are taken immediately, arterial phase is taken after 10 to 15 seconds followed by venous phase within 60-90 seconds. Delayed serial axial sections are taken for upper abdomen after a duration of 3 minutes if required.

**Statistics**

Number or percentage used to frequency of each identification. chi square test used to analyze significancy of Modified CT severity index (MCTSI) in Acute pancreatis cases. SPSS Ver 18.0 used to analyze the statistics. P value <0.05 is statistically significant.

**Results**

A total of 150 cases of pancreatitis are included in the study. Out of the 150 cases, 131 (87.3%) are male and 19 (12.7%) are female, indicating that acute pancreatitis is prevalent in male in this part of the country. This might be due to more susceptibility of the male patient for the etiological factors causing acute pancreatitis, especially alcoholism.

Among 150 cases, 81 patients (54%) had acute episode, 35 patients (23%) had chronic pancreatitis and 34 patients (23%) who had chronic pancreatitis suffered from an acute episode. Out of the total 81 acute pancreatitis cases, 55 patients had interstitial edematous type and 26 had necrotizing pancreatitis.

Morphological severity of acute pancreatitis cases is given by Modified CT severity index (MCTSI) which incorporates features reflecting organ failure and extrapancreatic complications for predicting the outcome.

Morphologic Severity of Pancreatitis (Grading of Acute Pancreatitis according to Modified CT severity index):

The prevalence of vascular complications in cases of pancreatitis in our study group comprising 150 patients is 40 (26.67%). Out of 40 patients with vascular complications, 37 are male and 3 are females. The maximum cluster of cases are seen in the age range of 41 to 50 years (27.5%).

Amongst 40 vascular complicated cases, 25 ( 62.5%) of them had acute pancreatitis, 8 (20%) are diagnosed with chronic pancreatitis and 7 (17.5%) who had chronic pancreatitis, suffered an acute episode at the time of presentation. Out of the 25 patients with acute episode, 17 (68%) revealed necrotising type and 8 (32%) were of interstitial edematous type(IEP). Considering gender and morphological type, prevalence of vascular complications is highest in males with necrotizing pancreatitis(NP) i.e, in 15 patients (37.5%).

**Table 1: Correlation between MCTSI and vascular complications**

Age group (yr)	2		4		6		8		10		Total
	M	F	M	F	M	F	M	F	M	F	
18-20	0	0	IEP-1 NP-0	0	0	0	0	0	0	0	1
21-30	0	0	0	0	IEP-2 NP-0	0	IEP-0 NP-1	0	IEP-0 NP-2	0	5
31-40	0	0	0	0	IEP-2 NP-0	0	IEP-0 NP-2	0	IEP-1 NP-1	0	6
41-50	0	0	0	0	IEP-1 NP-0	0	IEP-0 NP-3	0	0	0	4
51-60	0	0	0	0	IEP-1 NP-0	0	IEP-0 NP-1	0	IEP-0 NP-2	IEP-0 NP-1	5
61-70	0	0	0	0	0	0	IEP-0 NP-2	IEP-0 NP-1	0	0	3
71-80	0	0	0	0	0	0	IEP-0 NP-1	0	0	0	1
81-90	0	0	0	0	0	0	0	0	0	0	0
91-100	0	0	0	0	0	0	0	0	0	0	0
Vascular complicated cases (n)	0	0	1	0	6	0	10	1	6	1	25
Total pancreatitis cases (N)	17	4	16	4	17	2	11	1	8	1	150
Correlation (%)	0	0	6.25	0	35.3	0	90.9	100	75	100	

Correlation between MCTSI and vascular complicated pancreatitis cases: MDCT is the most frequently used imaging modality to evaluate pancreatitis and it has the ability to detect most vascular complications. They include both arterial and venous complications.

**Table 2: Distribution of vascular complications as per morphological type**

	Venous	Arterial	Both	Total
Acute (IEP+NP)	20	5	0	25
IEP	6	2	0	8
NP	14	3	0	17
Chronic	7	0	1	8
Acute on chronic	5	1	1	7
Total	32	6	2	40

The major arterial and venous complications in our study group are enumerated as:

**Table 3: Enumeration of venous complications as per morphological type(n=32)**

Venous complications	IEP	NP	Chronic	Acute on chronic	Total
Splenic vein thrombosis (SVT)	2	1	1	1	5
Portal vein thrombosis (PVT)	0	5	0	1	6
Superior mesenteric vein thrombosis (SMVT)	1	0	1	0	2
Splenic + portal vein thrombosis	0	2	0	1	3
Portal + SMV thrombosis	0	3	0	1	4
Splenic + Portal + SMV thrombosis	2	1	4	0	7
SVT + PVT + SMVT + IVC + Left RVT + R. atrium	0	1	0	0	1
SVT + Hemorrhagic pancreatitis	1	0	0	0	1
SVT + Left renal vein thrombosis (RVT)	0	0	0	1	1
PVT + Inf. mesenteric vein thrombosis (IMVT)	0	1	0	0	1
SVT + Portal vein cavernoma	0	0	1	0	1

Multitudinous thrombotic, hemorrhagic complications and complications arising due to impaired venous drainage such as sinistral portal hypertension, cavernous transformation of portal vein, portal biliopathy, gall bladder wall varices, Transient hepatic attenuation difference (THAD), splenic infarction, spontaneous splenic rupture, subcapsular hematoma, bowel wall infarction, hepatic parenchymal infarction, rupture of pseudoaneurysm, haemorrhage into pseudocyst, erosions of the upper gastrointestinal (GI) arteries and formation of varices, Hemosuccus pancreaticus can occur.

Other complications:

Hemorrhagic pancreatitis in 1, Cavernous transformation of portal vein in 2, Pulsatile pseudocyst in 1, THAD in 7, Sinistral portal hypertension + varices in 4, Extrahepatic portal vein obstruction in 1, Pancreatic hematoma in 1, Subcapsular splenic hematoma in 1, Splenic infarct in 4, Liver infarct in 2, Bowel ischemia in 4, Pneumatosis intestinalis in 2, Bowel perforation in 1, Left kidney infarct in 1 case respectively (Total=32).

**Table 4: Morphological stratification of vascular uncomplicated cases(n=56)**

MCTSI	2		4		6		8		10	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
18-20	IEP-2	IEP-1	IEP-0	IEP-1	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0
21-30	IEP-2	IEP-0	IEP-1	IEP-2	IEP-1	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-1	NP-0	NP-1	NP-0
31-40	IEP-6	IEP-0	IEP-6	IEP-0	IEP-3	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-1	NP-0	NP-2	NP-0	NP-0	NP-0	NP-1	NP-0
MCTSI	2		4		6		8		10	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
41-50	IEP-2	IEP-0	IEP-4	IEP-0	IEP-3	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-0	NP-0	NP-1	NP-1	NP-0	NP-0	NP-0	NP-0
51-60	IEP-4	IEP-1	IEP-2	IEP-1	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-0	NP-0	NP-1	NP-0	NP-0	NP-0	NP-0	NP-0
61-70	IEP-1	IEP-1	IEP-1	IEP-0	IEP-0	IEP-1	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0
71-80	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0
81-90	IEP-0	IEP-1	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0
91-100	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0	NP-0
Total	IEP-17	IEP-4	IEP-14	IEP-4	IEP-7	IEP-1	IEP-0	IEP-0	IEP-0	IEP-0
	NP-0	NP-0	NP-1	NP-0	NP-4	NP-1	NP-1	NP-0	NP-2	NP-0
	IEP-21 NP-0		IEP-18 NP-1		IEP-8 NP-5		IEP-0 NP-1		IEP-0 NP-2	
	21		19		13		1		2	

Efforts have been put in to assess patient’s outcome in cases of pancreatitis with vascular complications. The outcome of the patient had been examined in terms of the length of hospitalization, requirement of percutaneous procedures and surgery, post surgical and procedural complications, infection, organ failure and death. In addition, co-morbid conditions such as chronic liver disease, cholelithiasis, choledocholithiasis, cholecystitis, cholangitic abscess, GB perforation, diverticulitis etc are observed in 14 (35%) vascular complicated cases and in 30 (27.2%) patients without vascular complications.

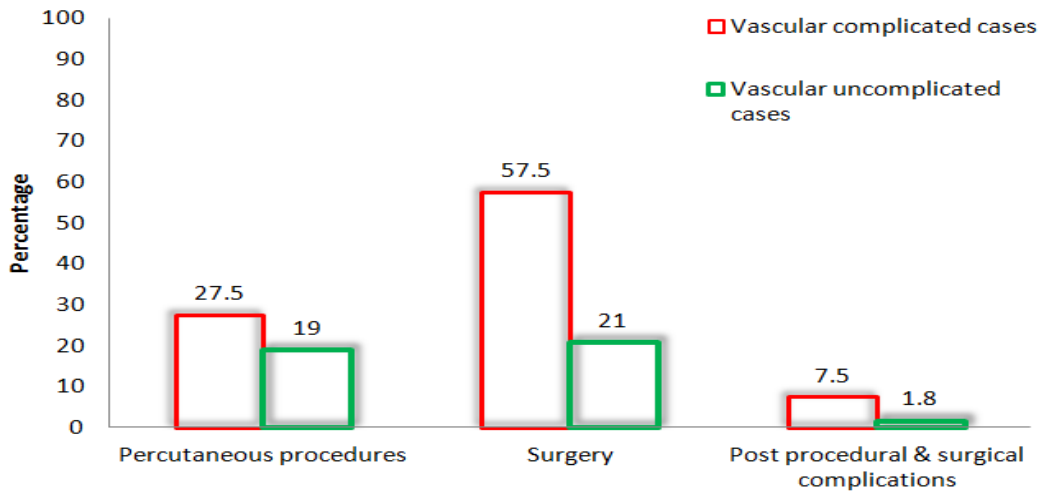


Fig 1: Requirement of percutaneous procedures, surgery, their complications.

Table 5: Length of hospitalization in vascular complicated vs vascular uncomplicated pancreatitis cases.

Length of hospitalization (Days)	Vascular uncomplicated cases	Vascular complicated cases
1-5	63	0
6-10	22	2
11-15	23	10
16-20	1	14
21-25	1	9
26-30	0	2
> 30	0	2
Death	0	1
Total	110	40

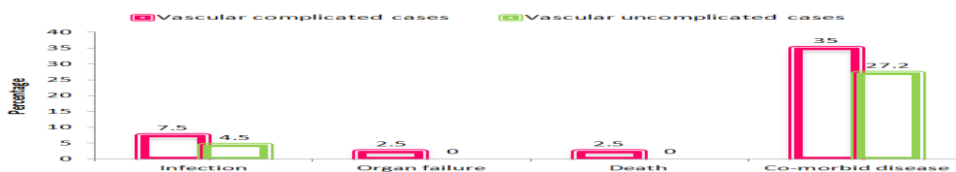
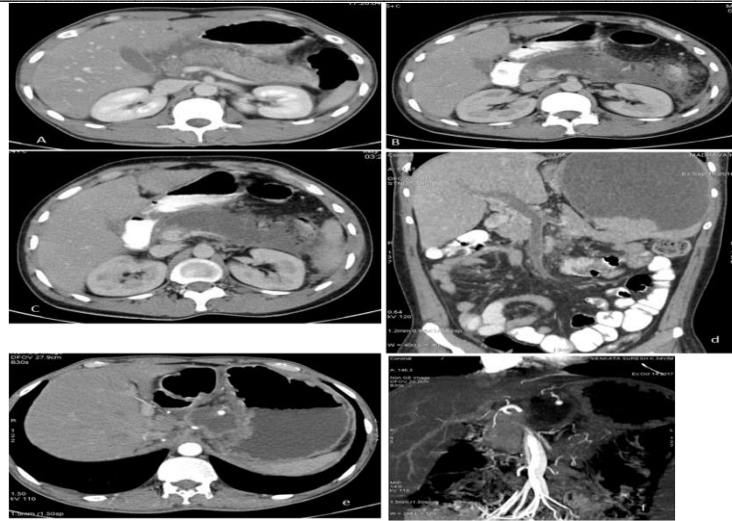


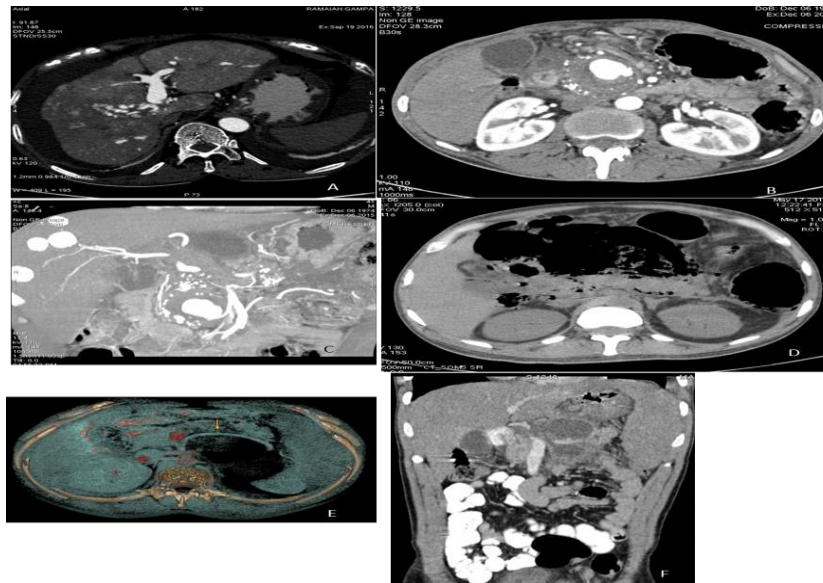
Fig 2: Patient’s outcome in vascular complicated vs uncomplicated cases.

**Patient’s outcome**

Infection in 3 cases (7.5%) in Vascular complicated, and 5 cases(4.5%) in Vascular uncomplicated ; Organ failure in 1case(2.5%) of Vascular complicated group, and Death in 1(2.5%) case of Vascular complicated, and Co-morbid disease in 14(35%) cases in Vascular complicated, and 30(27.2%)cases observed in Vascular uncomplicated group respectively.



**Figure 3: A. Interstitial Edematous acute pancreatitis Axial sections of CECT showing bulky head, body, and tail of pancreas with peripancreatic fat standing and fluid collection. B. Acute necrotizing pancreatitis Axial sections of CECT showing bulky head and body of pancreas showing heterogenous attenuations, with non-enhancing ill-defined hypodense collection noted adjacent to the body, tail of pancreas extending superiorly along the lesser sac with severe peripancreatic fat standing. C. Portal vein and splenic vein thrombosis Axial CECT showing necrotizing pancreatitis showing a hypodense partial filling defect noted in the portal vein and splenic vein thrombosis. D. Portal, splenic and SMV thrombosis with intrasplenic pseudocyst Coronal CECT demonstrates pancreatitis with filling defect in the PV, SV, SMV and well-defined hypodense collection in the splenic parenchyma.**



**Fig 4: A. Pancreatitis with portal vein thrombosis, sinistral hypertension and multiple periportal, spleno- gastric, spleno-renal collaterals and esophageal varices. B & C: Case of acute on chronic pancreatitis demonstrating pseudoaneurysm from superior mesenteric artery. Splenic vein thrombosis also noted. Calcified granulomas also noted in liver. D. A case of NP with SMA thrombosis. Free fluid and intraperitoneal air as a bowel perforation following vascular compromise noted. E. Axial and coronal reformatted images showing small splenic artery pseudoaneurysm, hemorrhage into pseudocyst in a case of pancreatitis. In the same patient there are co-existing venous complications of splanchnic thrombosis. E. & F: Axial and coronal reformatted images showing small splenic artery pseudoaneurysm, hemorrhage into pseudocyst in a case of pancreatitis**

#### Discussion

Out of 150 cases of pancreatitis, 131 males (87.3%) and 19 females (12.7%) are affected indicating that acute pancreatitis is prevalent in males in this part of the country. This is due to more susceptibility of the males for the etiological factors causing acute pancreatitis, especially alcoholism. The same is reflected in a study by Lipce Nath et al. (2016)[5] out of 60 cases 54 (90%) were male and 6 (10%) were females.

81 patients (54%) had acute episode, 35 patients (23%) had chronic pancreatitis and 34 patients (23%) who had chronic pancreatitis suffered from an acute episode. Out of the total 81 acute pancreatitis cases, 55 patients (67.9%) were of interstitial edematous type and 26 (32.1%) had necrotizing pancreatitis. In a study group of 240 patients by Emil J. Balthazar et al[6]. 123 patients had chronic pancreatitis (51%); 107 patients had acute pancreatitis (44.5%).

MCTSI scores have been assigned from 0-10. Mild AP with MCTSI scores of 0 & 2 was found in 21 cases (25.9%), Moderate AP with MCTSI scores of 4 & 6 found in 39 cases (48.1%) and Severe AP with MCTSI scores of 8 & 10 noted in 21 cases (25.9%). In any morphologic severity type, males showed much higher prevalence.

Our study regarding Severe AP is higher than study by Mortelet et al[4]. In our study it was found that 48.1% of cases are of Moderate type and 25.9% of cases are of Mild type which does not correlate with Mortelet et al. study. In another study by Moinuddin Ahmed et al[7]. Out of 210 patients, 95(45.24%) patients had severe, which is higher than the result obtained in our study; 73(34.76%) had moderate and 39(18.57%) had mild pancreatitis.

The prevalence of vascular complications maximum cluster of cases are seen in the age range of 41 to 50 years (27.5%). Amongst 40 vascular complicated cases, 25 ( 62.5%) of them had acute pancreatitis, 8 (20%) are diagnosed with chronic pancreatitis and 7 (17.5%) who had chronic pancreatitis, suffered an acute episode at the time of presentation. Considering gender and morphological type, prevalence of vascular complications is highest in males with necrotizing pancreatitis i.e, in 15 patients (37.5%). The same (26.67%) is reflected in a study by Moinuddin Ahmed et al. where in out of 210 patients, approximately one quarter of patients with pancreatitis developed vascular complications. The overall median age was 43.25 years. In the present study, out of the 25 acute pancreatitis cases, the maximum cluster of cases are seen in the age range of 31-40 years (24%) followed by 21-30 years and 51-60 years (20%), 41-50 years (16%). The highest number of cases (11, 44%) noted with MCTSI score of 8, followed by 10 (7, 28%), score 6 (6, 24%), 4 (1, 4%) and 2 (0). Considering gender, age group and morphological type, prevalence of vascular complications is highest in males with necrotizing pancreatitis i.e, in 3 patients (12%). Correlation between prevalence of vascular complications and MCTSI is expressed in % and it is highest with MCTSI 8 (91.6%), followed by 10 (77.7%), 6 (31.5%), 4 (5%) and 2 (0). Hence, the overall % for severe AP is 85.7%, for moderate AP 17.9% and mild AP is 0. In our study, it can be concluded that prevalence of vascular complications is highest in severe AP with MCTSI scores of 8 and 10. Prevalence and detection rate increases with increasing MCTSI score.

All the 11 cases with MCTSI score 8 (100%) are of necrotising type. With MCTSI score of 10, 6/7 (85.7%) are of necrotising type. With MCTSI score 6, all the 6 cases (100%) are of interstitial edematous type. With score 4, the only case (100%) is of interstitial edematous type. This underscores the association of vascular complications with MCTSI score and necrotising pancreatitis.

In the present study, detection rate of venous complications is 21.3% (32/150) which closely conforms to a study conducted by Moinuddin Ahmed et. al; out of 210 pancreatitis cases, 56 cases (26.6%) had venous complications.

In the present study, potential venous and arterial complications have been enumerated. Amongst 32 venous complicated cases, the greatest number is constituted by combined splenic, portal and superior mesenteric vein (splanchnic) thrombosis (7/32, 21.8%). Splanchnic vein thrombosis is most common in chronic pancreatitis (4/7, 57.1%); Isolated portal vein thrombosis (6/32, 18.75%); Isolated splenic vein thrombosis (5/32, 15.6%). The next order of frequency is Portal+SMV thrombosis (4/32, 12.5%), Splenic+portal vein thrombosis (3/32, 9.3%), Isolated superior mesenteric vein thrombosis (2/32, 6.2%). The most frequently thrombosed veins are portal vein (23), splenic vein (21), superior mesenteric vein (15), inferior mesenteric vein (1), left renal vein (1).

According to Moinuddin Ahmed et. al, a total of 24(11.43%) patients were found to have splenic vein thrombosis. The most frequently thrombosed vessel was the splenic vein (SV), in 17(70.83%) cases; followed by the portal vein (PV), 11(45.83%); and the superior mesenteric vein (SMV), 4(16.66%). Isolated SV thrombosis was noticed in 10(41.66%) patients, isolated PV thrombosis in 4(16.66%) and isolated SMV thrombosis in 2(8.33%). A combination of SV and PV thrombosis was seen in 6(25%) while SMV+PV and SMV+SV

were found in 1(4.1%) patient each. None of the patients had pseudoaneurysms.

In our study, the order of frequency of miscellaneous vascular and its related complications (32) are, Transient hepatic attenuation difference (THAD) recorded in 7 patients (7/32, 21.8%), Sinistral portal hypertension with varices in 4 patients (4/32, 12.5%), splenic infarction (12.5%), bowel ischaemia (12.5%), portal vein cavernoma in 2 patients (6.25%), pneumatosis intestinalis (6.25%), liver infarcts (6.25%), bowel perforation in 1 patient (1/32, 3.1%), pulsatile pseudocyst (3.1%), Haemorrhagic pancreatitis (3.1%), haemorrhage into the pseudocyst (3.1%), pancreatic haematoma (3.1%), subcapsular splenic haematoma (3.1%) and left kidney infarct (3.1%).

In our study, the outcome parameters considered are length of hospitalization, requirement of percutaneous procedures and surgery, post surgical and procedural complications, infection, organ failure and death. In addition, co-morbid conditions such as chronic liver disease, cholelithiasis, choledocholithiasis, cholecystitis, cholangitic abscess, GB perforation, diverticulitis etc are observed in 14 (35%) vascular complicated cases and in 30 (27.2%) patients without vascular complications. The average length of hospitalization for vascular complicated cases is 16-20 days and for vascular uncomplicated cases, it is 1-5 days. For patients with vascular abnormalities, 40 patients (100%) had to stay for > 5days. 38 patients (95%) had to stay for > 10 days. 28 patients (70%) had to rest at hospital for minimum of 15 days, whereas 14 patients (35%) had to stay for more than 20 days. 12.5% of the patients (5) had to remain in the hospital for a minimum period of 25 days. 2 patients (5%) have to spend over a month in the hospital. Mortality rate in the study with vascular complication is 2.5%. For patients without vascular abnormalities, 63 patients (57.2%) had to stay for 1-5 days. 47 patients (42.7%) had to stay for > 5days. 25 patients (22.7%) had to stay for > 10 days. 2 patients (1.8%) had to rest at hospital for minimum of 15 days, whereas 1 patients (0.9%) had to stay for more than 20 days. There was no patient who stayed beyond 25 days. There is no mortality associated with vascular uncomplicated pancreatitis.

Pancreatitis in combination with vascular complications is dangerous and potentially lethal. Ismail H Mallick et al[8]. opined that the pathogenesis of haemorrhagic complications is multifactorial. One of the factors is mediated by severe pancreatic inflammation and pancreatic necrosis which takes place during the early phase of acute pancreatitis. Infection rate is higher in cases with vascular abnormalities (3/40, 7.5%) than in vascular uncomplicated cases (5/110, 4.5%). Organ failure occurred in 1 patient (1/40, 2.5%) in vascular complicated severe AP. Mortality rate in the study with vascular complication is 2.5%.

Yashant Aswani et al[9]. focused on multitudinous venous complications in the setting of pancreatitis and classified and discussed various venous complications on clinicoradiologic grounds into 3 categories: thrombotic or hemorrhagic complications and complications arising due to impaired venous drainage.

Ammori et al[10] discussed in detail presentation, diagnosis and management of haemorrhagic complications of pancreatitis. All patients had alcohol induced pancreatitis complicated either by haematemesis (3), intraperitoneal haemorrhage (1) or both (1). Source of bleeding was pseudocyst wall (2), splenic artery pseudoaneurysm (2) and splenic artery rupture (1).

Nina Kokabi et al (2010)[11] extensively studied sinistral portal hypertension associated with splenic vein thrombosis in the setting of acute pancreatitis in 23 cases. The patients were managed appropriately as per previous published literature. Li Wang et al (2012)[12] also worked upon Sinistral Portal Hypertension, its clinical features and surgical treatment of chronic splenic vein occlusion in pancreatitis cases comprising of 8 men and 5 women. They inferred that surgical intervention such as splenectomy offers a good long-term outcome in symptomatic patients. Ghulam Mujtaba et. Al[13] reported a rare case study of spontaneous splenic rupture in one patient with acute necrotizing pancreatitis. Patil et al[14]. presented the spectrum of splenic complications in 14 cases of pancreatitis and explored the anatomical causal relationships and pathological basis of such

complications. Our study harmonizes with this study that, indirectly as the MCTSI score increases, the prevalence of vascular complications increases and therefore significantly affects the patient's outcome in terms of various outcome parameters.

#### Conclusion

Contrast enhanced CT is currently considered as the imaging technique of choice for evaluating Acute Pancreatitis severity, assessing local, extra pancreatic and vascular complications and for predicting clinical outcome. Meticulous efforts have been put in to comprehensively analyse the pancreatitis cases in terms of demographics, morphologic type and severity, assigning MCTSI score to the acute pancreatitis cases. Our study also yielded a statistically highly significant result of vascular complications being associated with higher MCTSI score. Venous complications are most predominant amongst them. The MCTSI score increases, the prevalence of vascular complications increases and therefore significantly affects the patient's outcome in terms of various outcome parameters.

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