

Role of Multi-slice CT in Imaging of Pancreatitis

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Abstract

Background and Objectives: Siemens Somatom Sensation Cardiac 16 slice Multi-Slice computed tomography (Multi-Slice CT) scan has proven to be an extremely useful tool in the assessment of both inflammatory and mitotic conditions of the pancreas. With its high-quality imaging capabilities, Multi-Slice CT can clearly display parenchymal abnormalities and accurately show the extrapancreatic spread of disease in inflammatory conditions.

In chronic pancreatitis, Multi-Slice CT is the modality of choice due to its ability to provide detailed views of calcifications. This feature is essential in making an accurate diagnosis and assessing the severity of the condition.

Overall, the use of Multi-Slice CT in acute and chronic pancreatitis has been a significant breakthrough in the field of medical imaging. With its high resolution, detailed images, and exceptional performance, Multi-Slice CT has become the preferred imaging modality for both diagnosis and management of pancreatic conditions.

Material And Methods: The study has been carried out in the Department of Radiodiagnosis, NC Medical College and Hospital, Israna, Panipat for a period of 8 months from June 2022 to February 2023. 50 patients were taken into consideration after taking a brief note of properly informed written consent and complete history, thorough clinical examination was done and these patients were subjected to CT scan.

Results and conclusion: Biliary duct obstruction, gallstones, and alcohol consumption are known to be the most common causes of pancreatitis in adults. Despite the various causes of pancreatitis, Multi-Slice CT has played a crucial role in detecting and visualizing the condition.

With its unique and pioneering ability, Multi-Slice CT can detect calcification, ductal dilatation, and gland atrophy, particularly in cases of chronic pancreatitis. In acute pancreatitis, Multi-Slice CT is considered the imaging modality of choice and can be used to grade the severity of the condition using CTSI or MCTSI scores, which have been shown to be equivalent in determining a patient's critical condition.

Overall, the use of Multi-Slice CT in diagnosing and managing pancreatitis has been crucial in improving patient outcomes and should continue to be used as a primary tool in the detection and evaluation of the condition.

Key words: Multi-Slice CT (Multi-Slice computerized tomography), pancreatitis, necrosis, CECT (Contrast enhanced computerized tomography) and calcification.

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I. Introduction:

In acute and chronic pancreatitis, Multi-Slice CT has demonstrated its usefulness in detecting early stage disease, identifying complications, and providing critical information to guide treatment decisions. The Siemens Somatom Sensation Cardiac 16 slice Multi-Slice Ct scan, in particular, has shown exceptional performance in detecting subtle changes in the pancreas and surrounding tissues, leading to earlier and more accurate diagnoses. When combined with advanced image-processing techniques such as multiplanar reconstructions and curved reformations, thin-section Multi-Slice CT can provide highly detailed imaging of the pancreatic ductal anatomy, allowing for more accurate diagnosis and better treatment planning. Chronic pancreatitis is often viewed as a distinct entity from acute pancreatitis, as recurrent episodes of acute pancreatitis can lead to the development of chronic pancreatitis over time. This condition is characterized by irreversible fibrosis and atrophy of the pancreas, which can lead to exocrine and endocrine deficiencies and persistent clinical symptoms such as diabetes and malabsorption.[1,2,3]

Multi-Slice CT imaging is a crucial tool for diagnosing acute pancreatitis in patients who exhibit clinical symptoms. When it comes to pancreatic calcifications, it's important to note that they can originate from

either the parenchymal tissue or the ducts. Over time, the gland can become atrophied as a result of the calcifications. [4,5]

The staging of acute pancreatitis often utilizes the CT severity index (CTSI), which considers both the volume of fluid collections and the presence or absence of pancreatic necrosis. This index has been shown to have a strong correlation with morbidity and mortality, making it an important tool for assessing the severity of the condition.[6,7]

Chronic pancreatitis is a condition characterized by inflammation and fibrosis of the pancreas, which cannot be reversed. In some cases, chronic pancreatitis may result in the development of an inflammatory pseudomass, leading to focal enlargement with fibrosis. [8]

When it comes to detecting the presence and extent of pancreatic necrosis, peripancreatic inflammation, and fluid collections, contrast-enhanced CT is considered the most effective imaging modality. [1,9]

While MRI provides diagnostic capabilities similar to Multi-Slice computed tomography (Multi-Slice CT), it offers the added benefit of not exposing the patient to ionizing radiation, and its ability to provide more detailed soft tissue characterization. However, contrast-enhanced CT (CECT) remains a widely used imaging modality for evaluating acute pancreatitis, due to its conventional role in detecting and grading this serious condition. [8,10]

II. Material And Methods

The study has been carried out in the Department of Radiodiagnosis, NC Medical College and Hospital, Israna, Panipat for a period of 8 months from June 2022 to February 2023. 50 patients were taken into consideration after taking a brief note of properly informed written consent and complete history, thorough clinical examination was done and these patients were subjected to CT scan. The laboratory findings and ultrasound results suggested that the patients were at risk for pancreatitis. As a result, a contrast-enhanced CT scan was conducted on the affected patients, using a non-ionic iodinated contrast media with a dose of 1.5mg/kg, administered at a flow rate of 2.5ml/sec. For adults with this condition, a dual-phase CT scan was performed, with a pancreatic parenchymal phase at 40 seconds and a portovenous phase at 70 seconds. In contrast, paediatric patients underwent a single portovenous phase after a non-contrast scan.

Inclusion Criteria:

- Individuals suspected or diagnosed with acute pancreatitis based on clinical and laboratory findings, including elevated serum amylase and serum lipase levels.
- Individuals diagnosed with acute pancreatitis through ultrasonography.
- Individuals presenting with acute-on-chronic pancreatitis.
- Serum creatinine levels of 1.5 mg/dl or lower.

Exclusion Criteria:

- Individuals who have an allergy to contrast agents.
- Individuals with impaired kidney function or Serum creatinine levels higher than 1.5 mg/dl.
- Pancreatitis resulting from trauma.
- Pancreatic cancer and its metastases.
- Congenital abnormalities of the pancreas.

III. Results

The majority of cases involving acute pancreatitis showed an increase in serum amylase levels. Among adults, biliary duct obstruction, gallstones, and alcohol consumption were found to be the most common causative factors. In cases of Chronic pancreatitis, presence of calcification in pancreatic parenchyma was typically accompanied by a dilated main pancreatic duct. However, in chronic pancreatitis, there was slightly less diffuse gland atrophy. Vascular complications, groove pancreatitis, portal hypertension, fistula, and pseudoaneurysm were the least common complications associated with chronic pancreatitis.

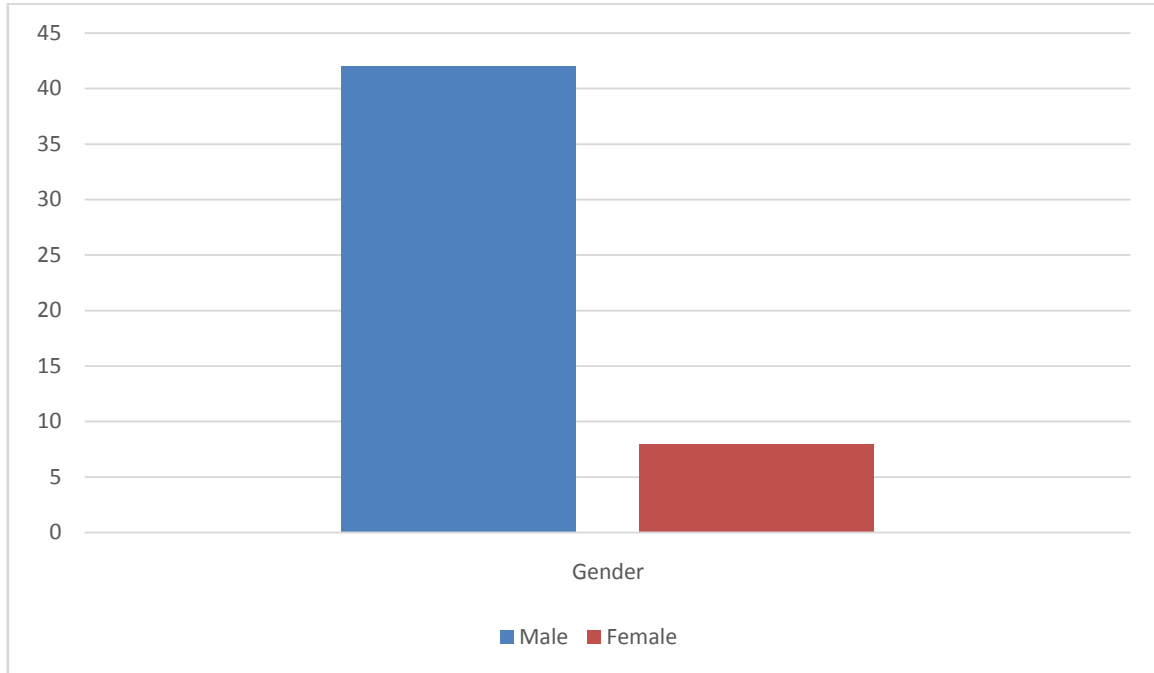
Of the 50 patients, 35 were diagnosed with acute pancreatitis and only 15 were diagnosed with chronic pancreatitis. Five patients had acute-on-chronic pancreatitis and were therefore included in both categories.

In those diagnosed with chronic pancreatitis, a dilated main pancreatic duct was noted in 12 out of 15 patients (80%). Calcification in the pancreatic parenchyma was observed in 14 out of 15 patients (93%), while some or diffuse gland atrophy was detected in 14 patients (93%).

These findings are illustrated in the tables and graphs below.

Gender	Number of patients	Percentage(%)
Male	42	84%
Female	8	16%
Total	50	100%

Table 1- Gender distribution of patients with Pancreatitis



Graph 1- Gender distribution of patients with Pancreatitis

Type	Number of patients	Percentage(%)
Acute Pancreatitis	35	70%
Chronic Pancreatitis	15	30%
Total	50	100%

Table 2- Patients distribution on the basis of chronicity.

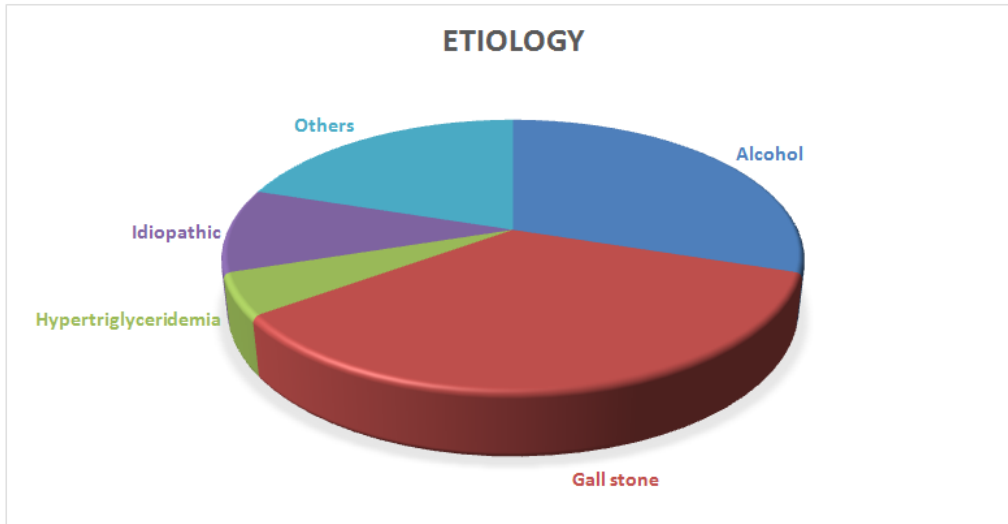
Pseudocyst	Number of patients (n=35)	Percentage
Absent	27	77.15%
Present	8	22.85%

Table 3- Presence of Pseudocystas asequelae in patients of Acute Pancreatitis

Findings	Number of Patients	Percentage (%)
Ascites	20	40%
Pseudocyst	8	16%
Fat Stranding	35	70%
Necrosis	5	10%
Cystic changes	2	4%
Portal Hypertension	3	6%
MPD dilatation	12	24%
Calcification	14	28%
Pancreatic Atrophy	14	28%

Subcapsular Collection	1	2%
Vascular Complication	1	2%
Pleural Effusion	5	10%

Table 4- Distribution of imaging findings seen on Multi-Slice CT in Patients with Pancreatitis

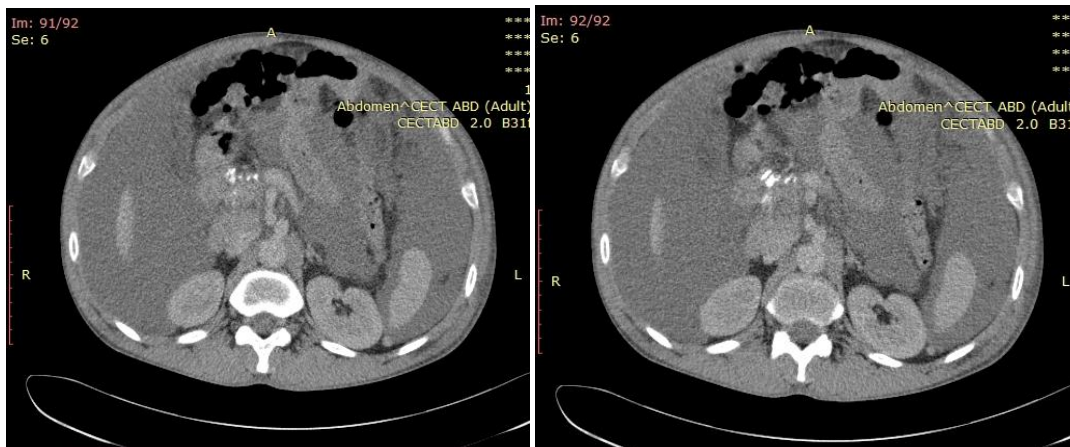


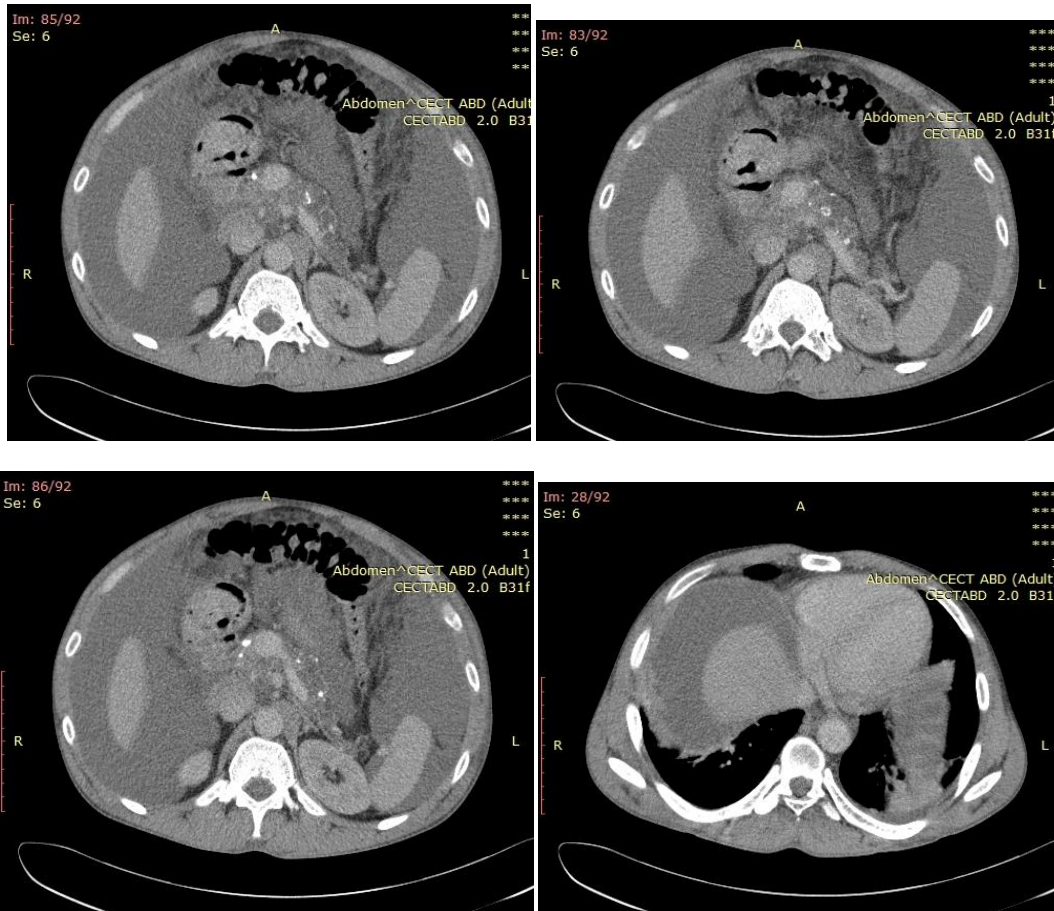
Graph 2- Etiology of Pancreatitis

Causes	Percentage
Alcohol	30
Gall Stone	35
Hypertriglyceridemia	5
Idiopathic	10
Others (Medications, Autoimmune, Trauma, Smoking etc)	20

Table 5- Etiology of Pancreatitis

Case 1- Chronic Pancreatitis with Acute Phase

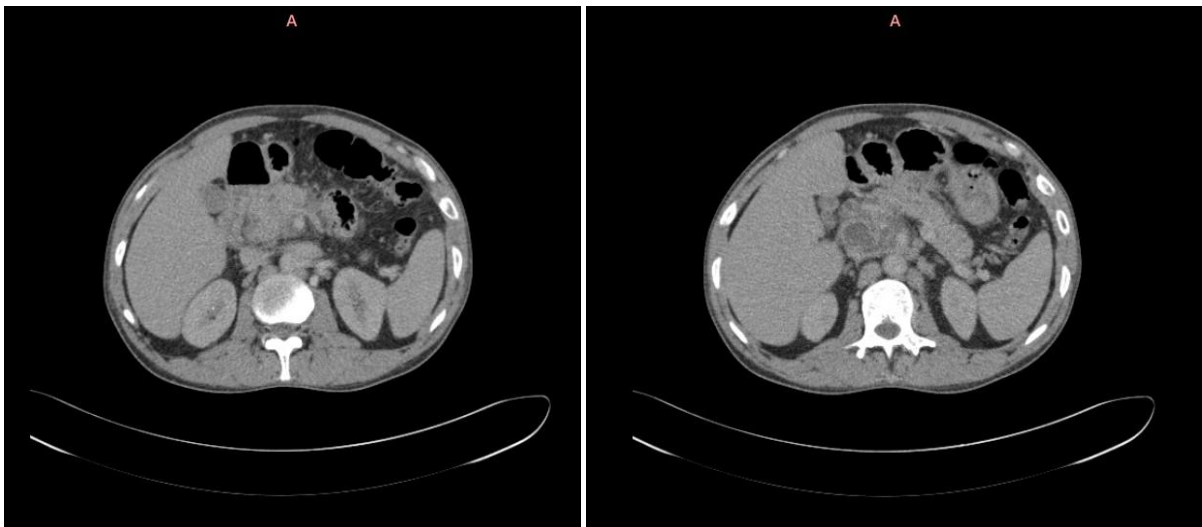


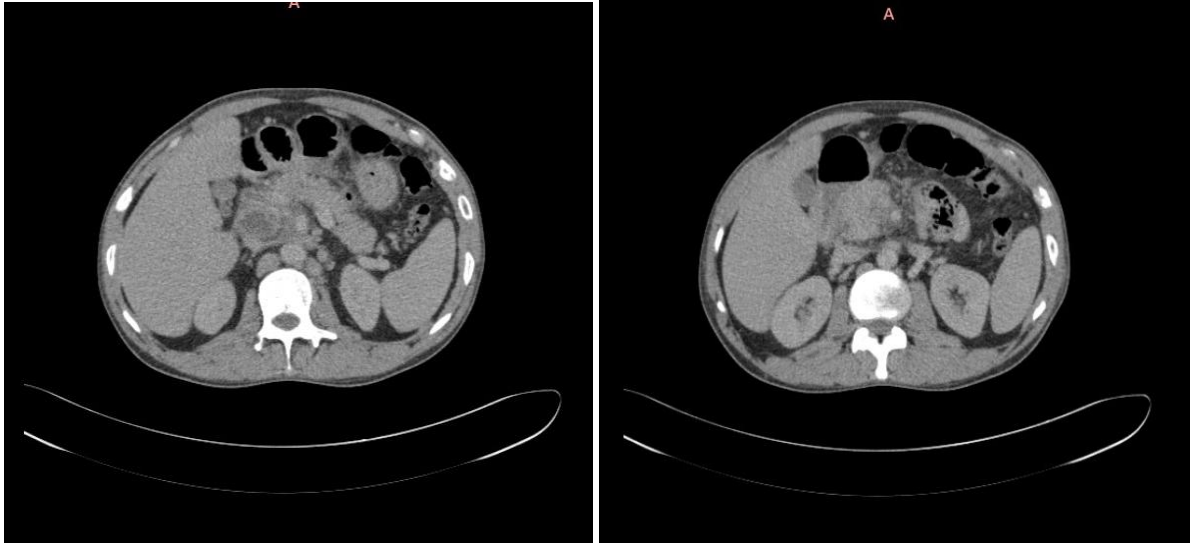


Case 1-

CECT images reveal bulky pancreatic head and uncinate process, diffuse parenchymal calcification and a well defined hypodense lesion of size approx. 30x30mm with peripheral calcification noted at head of pancreas with mild peripancreatic fat stranding. Free fluid noted at perisplenic, perihepatic, bilateral paracolic gutter and in pelvis. Left side mild pleural effusion noted.

Case 2- Paraduodenal Pancreatitis/ Groove Pancreatitis.



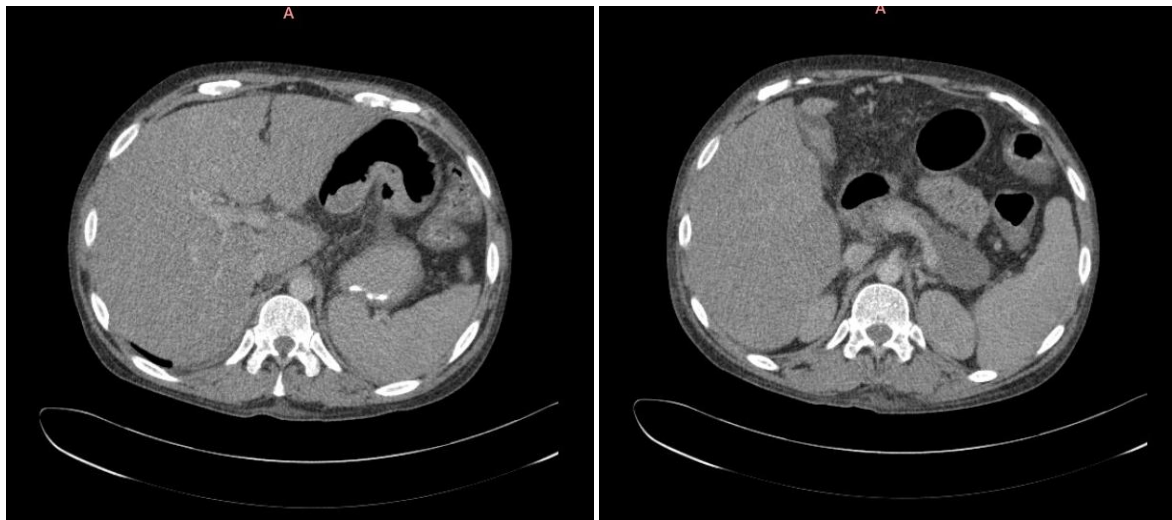


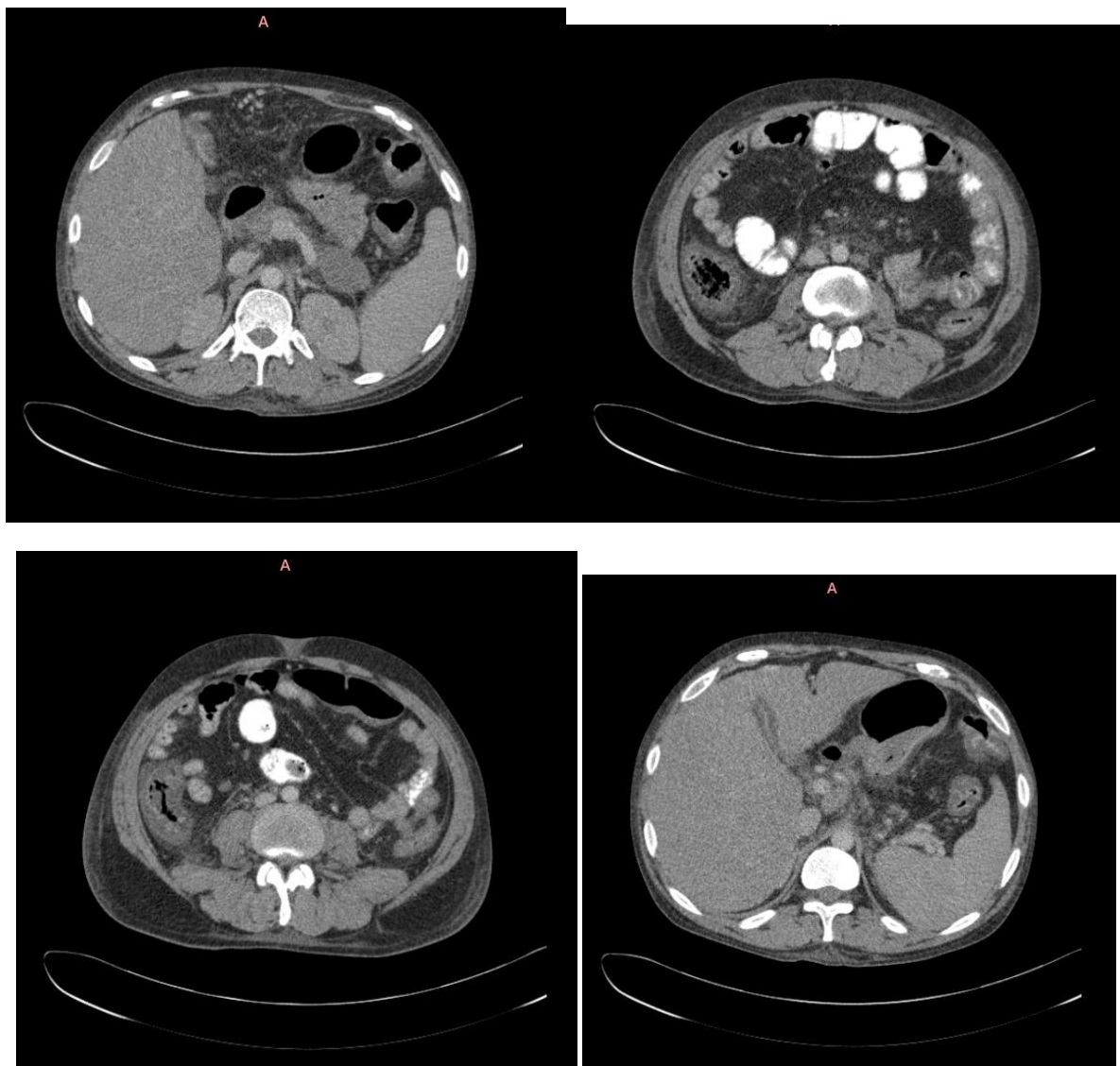
Case 2-

CECT images show head and uncinata process of the pancreas are bulky in size and shows internal non enhancing cystic area of size approx 23x18 mm with effacement of the pancreatico- duodenal groove, associated adjacent mild fat stranding with loco-regional subcentimetric size lymph nodes and small collaterals.

MPD at this head region measures approx 3.2 mm. Rest of the pancreatic duct not visualised.

Case 3- Chronic Pancreatitis with Peritonitis.



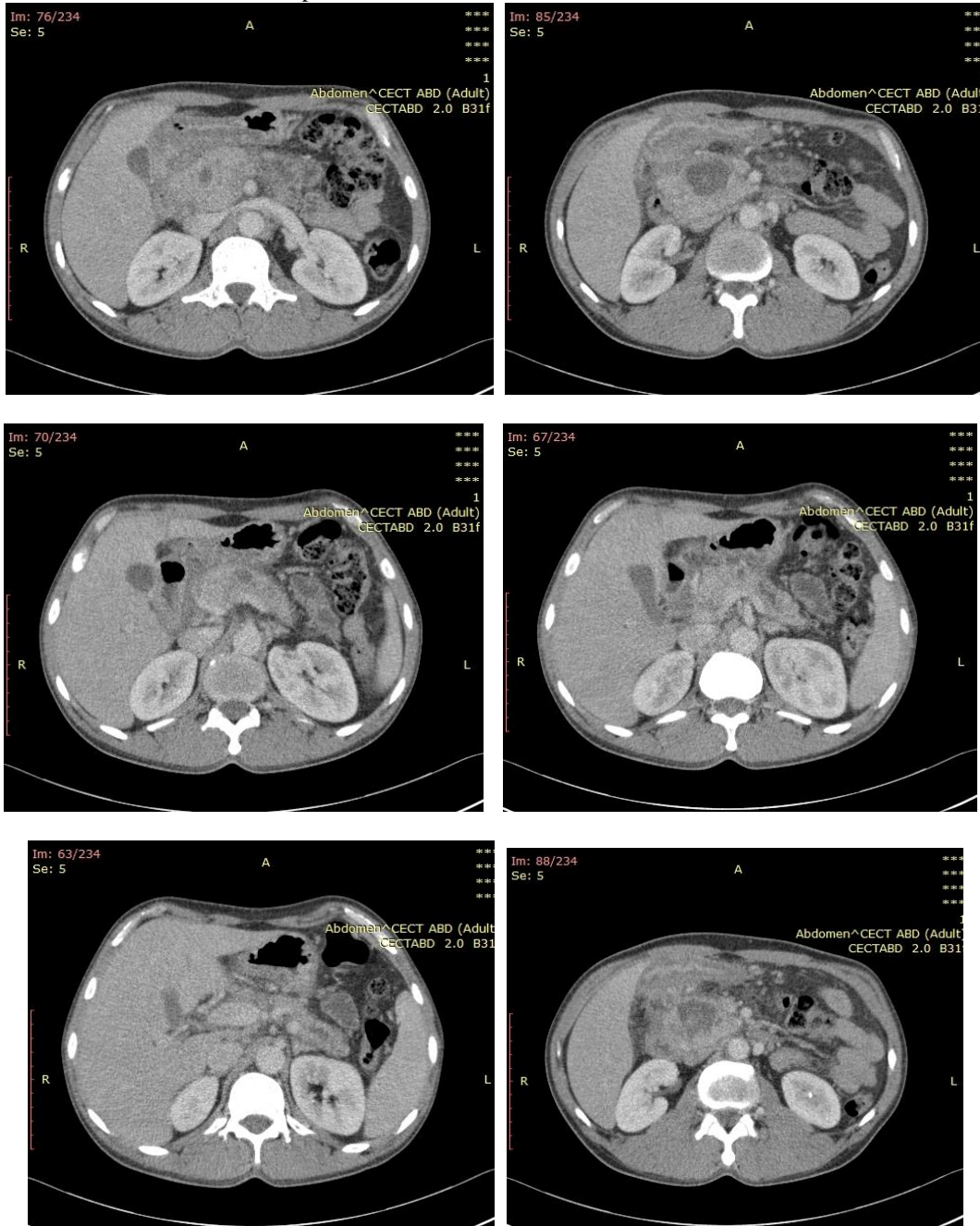


Case 3-

CECT images reveal Pancreas is diffusely atrophied with dilated main pancreatic duct in body region. There is a non enhancing cyst measuring 47 mm X 33 mm in tail region which appears to be communicating with the MPD.

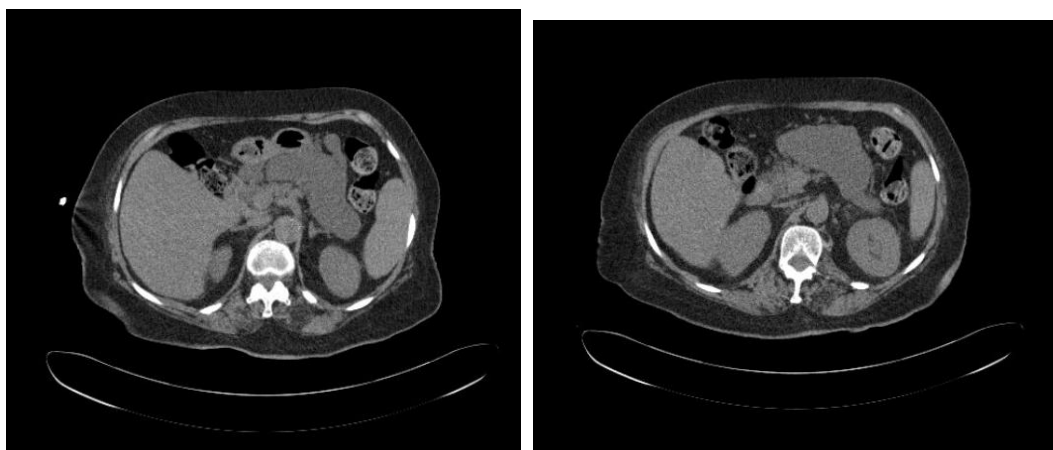
Small amount of fluid is noted in lesser sac with diffuse mesenteric fat stranding and peritoneal thickening.

Case 4- Acute Pancreatitis with Intrapancreatic Necrotic areas.



Case 4- CECT images reveal bulky head and uncinate process of pancreas with irregular walled intrapancreatic cystic areas and dilated MPD, Peripancreatic fat stranding and surrounding minimal free fluid.

Case 5- Pancreatic Pseudocyst.



Case 5-

CT images reveal large well circumscribed multiloculated, thin walled and homogeneously fluid attenuating cystic lesion noted in the lesser sac region measuring approx. 11 x 7 x 5cm (TR x CC x AP). Thin Septae within the lesion also seen.

IV. Discussion

Imaging plays a vital role in both the diagnosis and staging of acute and chronic pancreatitis. Its utility lies in its ability to determine the severity of the disease and to confirm the presence of pancreatic or peripancreatic complications. [5,10,11]

The widespread availability of Multi-Slice CT and its consistently high image quality have made it the preferred imaging technique for diagnosing pancreatitis. It can help determine the underlying causes of the condition, such as structural abnormalities, gallstones or biliary duct obstruction. Additionally, Multi-Slice Ct can identify specific features of chronic pancreatitis, such as pancreatic ductal dilatation with a beaded appearance. [3,12]

Patients with a history of upper abdominal pain, heavy alcohol consumption, and elevated levels of amylase or lipase often present with significant changes in the pancreas. In 2008, a team of international experts in the field of pancreatitis, led by the Acute Pancreatitis Classification Group, conducted a series of iterative web-based consultations to refine the Atlanta classification system. This effort was undertaken by a group of experts assigned to the task, who looked at the actual data and revised the classification system in an effort to improve the clinical diagnosis and management of acute pancreatitis. [13,14]

V. Conclusion

Multi-Slice Ct is the preferred imaging technique for acute pancreatitis and can be graded using either the CTSI or MCTSI score, both of which are equally effective in determining the patient's condition. It plays a crucial and innovative role in visualizing, detecting, and accurately establishing calcification, ductal dilatation, and gland atrophy, particularly in cases of chronic pancreatitis. Multi-Slice Ct can provide valuable and accurate information for diagnosing acute pancreatitis, characterized by abdominal pain and elevated levels of pancreatic enzymes in the blood and urine. The severity of the disease can be assessed based on the presence of pancreatic edema, peripancreatic inflammation, and fluid collections. Laboratory indices can also be used as markers of pancreatic injury and inflammatory responses. With concrete findings from a Multi-Slice Ct scan, a more precise diagnosis and better management of the condition can be achieved.[14]

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