

**Original article**  
**Orthopaedics**

# EVALUATION OF ULTRASOUND AND CT FINDINGS IN CONJUNCTION WITH ITS COMPARISON IN PANCREATITIS AND ITS COMPLICATIONS

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**Abstract:**

**Objective-** The study aims to evaluate the spectrum of findings and compare the role of ultrasonography (US) and CECT in evaluation of pancreatitis and its complications.

**Materials And Methods:** Fifty patients with clinical suspicion of pancreatitis and raised serum amylase and lipase levels were investigated by US and CECT. Ultrasonography was done using both curvilinear and linear probes for delineating pancreas, portal vein, splenic vein, gall bladder, liver and pleural effusion. CECT was done after administration of intravenous and oral contrast and images were taken in arterial and portal venous phase. Fischer's exact test was used to evaluate the collected data.

**Results:** US depicted some findings like biliary obstruction, septations and echoes within pseudocyst much better than CECT. Altered pancreatic morphology, number of pseudocysts, pancreatic parenchymal calcification, peri-pancreatic fat stranding and collection were much better depicted by CECT. Mediastinal extension of pseudocysts was appreciated solely on CECT. Findings like pleural effusion, ascites, dilated MPD, complications like vascular thrombosis were equally appreciated on US and CECT.

**Conclusion:** Cross sectional imaging in conjunction with radiation free ultrasonography has been recommended as the most judicious diagnostic imaging pathway. In proven cases of pancreatitis with pseudocyst formation, US can be used for follow up of patient to indicate resolution or changes

in size and secondary features like hemorrhage and infection within pseudocysts. US findings which are thought to serve as secondary indicators of pancreatic necrosis like heterogeneous appearance and peri-pancreatic collection gave unequivocal results in present study, so further markers which can predict pancreatic necrosis should be evaluated.

**Keywords:** *pancreatitis, ultrasonography, computed tomography, pseudocyst*

## Introduction

## Objective

The study aims to evaluate the spectrum of findings and compare the role of ultrasonography (US) and CECT in evaluation of pancreatitis and its complications.

## Materials And Methods

This prospective study was conducted on fifty patients with clinical suspicion of pancreatitis and raised serum amylase and lipase levels with approval of ethical committee of the hospital. Written informed consent was obtained from all the patients. The study was conducted in GMC & Hamidia hospital Bhopal, from July 2017 to April 2018.

Ultrasonography was done on PHILIPS HD 7 and Esaote MyLab Seven using both curvilinear and linear

probes. Both gray scale and colour doppler sonography were performed and findings regarding pancreas, portal vein, splenic vein, gall bladder, liver and pleural effusion were evaluated. CECT was done on GE discovery NM 60. Scans were taken from the chest to the pelvic floor. After 120 minutes of administration of oral contrast, 100 ml of iohexol was injected into each patient via ante cubical vein. Images were taken in arterial and portal venous phase.

## Inclusion criteria

Patients with clinical suspicion of pancreatitis and raised serum amylase - lipase levels, undergoing ultrasonography and CECT

## Exclusion criteria

Known allergy or renal failure with high serum creatinine levels

(contraindication for contrast)

Pregnant females and children

Un-cooperative patients

## Results

Present study aims to investigate the difference in diagnostic accuracy for pancreatitis between ultrasound and CECT in consideration with clinical and laboratory findings.

Of total patients imaged for pancreatitis, 9 (18%) were females and 41 (82%) were males. Abnormal ultrasound findings included bulky/heterogeneous echo texture of pancreas, peri pancreatic collection, gall stones, vascular thrombosis, pseudocysts, ascites, pleural effusion as described below (Tables 1,2)

Fischer's exact test was used to evaluate the data and 2 tailed p values were calculated.

**Table 1 :**  
**Comparison of pancreatitis findings on US and CECT**

	Altered Pancreas (Bulky/Heterogenous)	Peripancreatic Fat Stranding/Collection	Pseudocyst	Dilated MPD	Pancreatic Calcification	Ascites	Right PE	Left PE	Vascular Thrombosis	Cholelithiasis/Choledocolithiasis
US	27	23	23	9	2	25	14	29	3	9
CECT	37	44	23	9	4	25	14	29	3	3

**Table 2:**  
**Comparison of pancreatic pseudocysts findings evaluated on US and CECT**

	Size < 5Cm	Size > 5Cm	Single	Multiple	Wall Thickness > 5Mm	Air Foci	Septation	Mediastinal Extension	Echoes/Debris
CECT	11	13	12	11	3	1	1	3	-
US	11	13	17	6	3	1	8	-	21

Pancreas exhibited altered morphology in 27 (54 %) patients on US, while this was seen in upto 37 (74%) patients on CECT. *CECT was better in evaluating altered pancreatic morphology with P value of 0.0035.* Peri pancreatic fat stranding/collection was noted in 44 (88%) cases by

CECT, while US demonstrated fat stranding/collection in 23 (46%) cases. CECT proved to be better than US in detecting peri-pancreatic fat stranding and collection with p value of 0.025. Ultrasound detected biliary tract obstruction in 9 patients, while CECT detected the same in 3 patients.

US seems to be finer than CECT in evaluating biliary tract obstruction with p value of 0.009. Parenchymal calcification was noted in 2(4%) patients on US in comparison to 4(8%) patients on CECT (figure 4). Dilated MPD was reported in 9 patients on both CECT and US. Vascular complications

were found in 3(6%) patients, which were equally visualized on US and CECT. Pancreatic pseudocysts were found in 23 cases (46%) out of which 3 (6%) cases were reported to have mediastinal extension which was visualized only on CECT (figures 5,6). Septations within pancreatic pseudocyst which are suggestive of complications like haemorrhage or infection accounted for 8(16%) patients on US, while they were appreciated only in 1 patient (2%) on CECT (figures 2,3). US proves to be superior than CECT in depicting septations within pseudocysts with p value of 0.022. However CECT depicted the number of pancreatic pseudocysts more accurately than US. Multiple pseudocysts were found in 6 (12%) patients on US and 11 (22%) patients on CECT (figure 5). One patient manifested air foci within peri-pancreatic collection evincing peri-pancreatic abscess formation. Of patients showing pancreatic necrosis on CECT, pancreas appeared heterogeneous in 50 % patients, while peri-pancreatic fluid was found in 53 % patients on US. (figure 1). Left sided pleural effusion was found in 29 (58%) patients and was far more common than right sided pleural effusion which was seen in 14 patients (28%). Ascites was found in 25 (50%) of patients which was equally appreciated on both US and CECT. 15 patients (30%) had mild ascites, 10 patients(20%) moderate and 5 (10%) had gross ascites. Pancreatitis was more prevalent in men than in women. Alcohol was the most common cause of pancreatitis in our study group.

## Discussion

Pancreatitis is an inflammatory disorder of pancreas and is amongst

the common causes of epigastric pain and hospital admissions. Imaging plays pivotal role in staging and guiding management of pancreatic lesions.

Clinically and diagnostically, acute pancreatitis can be expressed as mild and severe acute pancreatitis. It is important to differentiate between these as severe pancreatitis can lead to grave complications and exhibits high mortality rate.<sup>1</sup> Moreover milder variety responds to conservative management in comparison to severe variety that requires a more aggressive approach. Though severe pancreatitis is manifested in only 15-25% of acute pancreatitis cases, its mortality rate is as high as 15-48.4%.<sup>2</sup> Acute pancreatitis presents with a wide clinical spectrum of findings and complications.<sup>3</sup> Timely and expeditious diagnosis in the evaluation of the severity of pancreatitis is decisive in its management.<sup>4,5</sup>

Pancreatic pseudocyst is described as a circumscribed fluid collection that communicates with main pancreatic duct and is surrounded by a wall of fibrous tissue but not lined by epithelium.<sup>6</sup> It eventuates as a result of pancreatic ductal disruption subsequent to increased pancreatic ductal pressure attributed primarily to the obstruction of the main pancreatic ductal system or secondarily to pancreatic necrosis following an attack of acute pancreatitis.<sup>7</sup> Formation of pseudocyst is a frequent clinical problem and complicates the course of chronic pancreatitis in 30% to 40% of patients.<sup>8</sup>

Of the wide array of imaging techniques available, CT and abdominal ultrasound are very useful in confirming the diagnosis of pancreatitis and ruling out other pathologies that may mimic pancreatitis. Other

ancillary findings and complications can also be assessed.

In established cases of acute pancreatitis, CECT is considered the investigation of choice in assessment of pancreatic necrosis and has become integral part of classification system.<sup>9</sup>

## Role Of Ultrasound

Abdominal ultrasound examination is a first line diagnostic modality of choice in patients with clinical suspicion of pancreatitis usually presenting with epigastric pain. Though US is operator dependent and has limited role in acute pancreatitis due to poor visualization of pancreas by excessive bowel gases caused by paralytic ileus and meteorism which accompanies acute pancreatitis.<sup>10,11</sup>

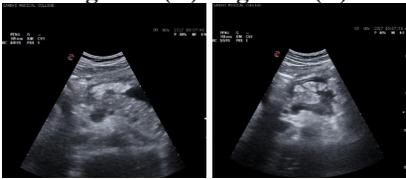
Examination after 48 hours of acute episode is considered more informative as paralytic ileus accompanying pancreatitis usually resolves by this time.<sup>9</sup>

Abnormal US findings are visualized in 33%–90% of patients with acute pancreatitis.<sup>12</sup> Majority cases of acute pancreatitis can be attributed to gall stones or alcohol intake. Gall bladder and biliary tree can be evaluated by US.<sup>13</sup> Fatty liver changes can also be well appreciated. Abdominal US is a medical diagnostic imaging modality that is commonly used for pancreatitis because of its convenience, portability, safety in terms of radiation exposure, and low cost.<sup>14,15</sup>

Pancreatic parenchymal echo texture was evaluated for homogeneity/heterogeneity (hypo/hyper echoic in comparison to liver). Pancreatic size was delineated with pancreatic head up to 3.0 centimetre and body/tail upto 2.5 cm on appropriate sections.<sup>9</sup> Continuity of pancreatic

capsule was delineated along with any necrotic areas. Diffusely bulky hypoechoic pancreas, extra-pancreatic collections, splenic vessels, pleural effusion can be visualized in acute pancreatitis patients on US. Detection of intra parenchymal and retroperitoneal fluid collections correlates poorly with pancreatic necrosis.<sup>13</sup> Pancreatic calcifications with dilated MPD can be seen in chronic pancreatitis patients.

**Figure 1 (A) Figure 1 (B)**



**Ultrasound images depicting bulky and heterogeneous pancreas with peri pancreatic collection and fat stranding**

**Figure 2 : Ultrasound image depicting pseudocyst showing internal echoes**



**Figure 3 : Ultrasound image depicting pseudocyst showing thick internal septations and mobile internal echoes**



**Role Of CECT**

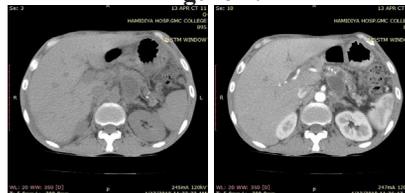
Cross sectional imaging enhances accuracy in diagnosing pancreatitis. CT is integral to diagnosis and management of acute pancreatitis

and is considered as gold standard in its diagnosis.<sup>16</sup> CECT is the imaging modality of choice to evaluate pancreatic morphology and stage the severity of inflammatory processes, detect pancreatic necrosis, and depict local complications. CT has been shown to yield an early overall detection rate of 90% with nearly 100% sensitivity after four days for pancreatic gland necrosis. CT severity index based on combined assessment of peri pancreatic fluid collections and degree of pancreatic necrosis was developed to improve prognostic accuracy.

In chronic pancreatitis cases, pancreatic parenchymal calcifications and irregularly dilated MPD can be visualized.

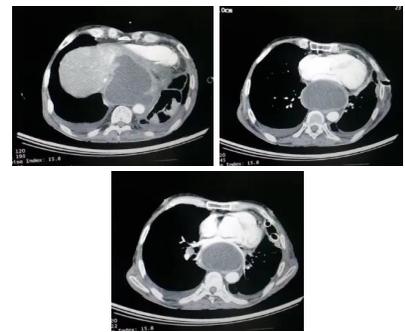
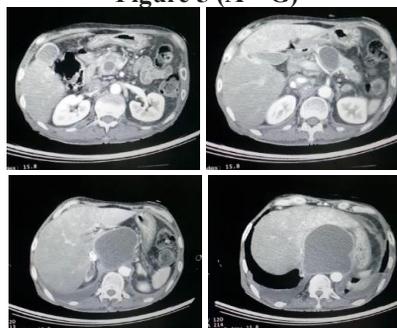
Though CECT has its own complications regarding radiation hazards and nephrotoxicity due to contrast,<sup>13</sup> it should be used as a complimentary study along with ultrasound in the evaluation of pancreatic lesions to improve diagnostic accuracy.<sup>16</sup>

**Figure 4:**



**Axial NECT and CECT image showing atrophied pancreas with irregularly dilated MPD and few parenchymal calcifications.**

**Figure 5 (A – G)**



**Axial CECT images of upper abdomen and chest depicting a large, peripherally enhancing peripancreatic collection extending into mediastinum with bilateral mild pleural effusion.**

**Conclusion**

Cross sectional imaging in conjunction with radiation free ultrasonography has been recommended as the most judicious diagnostic imaging pathway. Findings like septations, echoes and debris within pseudocyst which indicate complications like secondary haemorrhage or infection within pseudocyst were better appreciated on US than CECT. In proven cases of pancreatitis with pseudocyst formation US should be used for follow up of patient to indicate resolution or changes in size and secondary features like haemorrhage and infection within pseudocysts.

US findings which are thought to serve as secondary indicators of pancreatic necrosis like heterogeneous appearance and peri-pancreatic collection gave unequivocal results in present study, so further markers which can predict pancreatic necrosis should be evaluated.

**Limitations**

Radiologists were not blinded to the clinical/laboratory presentation or the sonography findings. However it is unlikely that this resulted in

significant bias because the diagnosis of pancreatitis on CT is based purely on radiographic findings. Secondly our results are limited to single tertiary care level hospital and the clinical applicability to other centres is unknown.

### Further recommendation

CT has a limited role in showing pancreatic duct/ biliary duct integrity for which MRI is better which is non ionizing and less nephrotoxic.

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