



ROLE OF ULTRASONOGRAPHY AND COMPUTED TOMOGRAPHY IN DIAGNOSIS OF PANCREATITIS AT GOVT. MEDICAL COLLEGE, BETTIHA, W. CHAMPARAN, BIHAR

Radio-diagnosis

Dr. Shyam Baboo*	M.D. (Radio-diagnosis), Associate Professor, Department of Radio-diagnosis, Govt. Medical College, Bettiah, W. Champaran, Bihar.. *Corresponding Author
Dr. Rajiv Kumar	M.D., DMRD (Radio-diagnosis), Professor & Head, Department of Radio-diagnosis, Govt. Medical College, Bettiah, W. Champaran, Bihar.
Dr. Debarshi Jana	Young Scientist (DST) Institute of Post-Graduate Medical Education and Research, A.J.C. Bose Road, Kolkata-700020, West Bengal, India

ABSTRACT

BACKGROUND AND OBJECTIVES : Objective of our study was to diagnose pancreatitis by ultrasound and computed tomography and to define limitations and advantages of one modality over other. **MATERIALS AND METHODS :** We studied findings of acute and chronic pancreatitis on two modalities i.e. ultrasound and C.T between 16-62 years of age from March 2019 to February 2020. Patients were confirmed to have pancreatitis based on imaging findings on either modality and a combination of clinical features suggestive of pancreatitis and biochemical values to support a diagnosis of the same. In acute pancreatitis, CT severity index also taken into consideration. The index focuses on the presence and degree of pancreatic inflammation and necrosis on a 10 point severity scale, points are awarded for the presence or absence of fluid collections. Patients in whom the diagnosis of pancreatitis was made purely on clinical grounds without any imaging (ultrasound or CT) and patients in whom no imaging was done prior to surgery where a diagnosis of pancreatitis was made was excluded from the study. **RESULTS :** Epigastric pain is the most common symptom in acute pancreatitis. Mostly the patients are alcoholic. It affects males more than females. In our study 81% of patients are males. **CONCLUSION:** Ultrasound is the initial investigation for pancreatitis but CT is investigation of choice. Ultrasound sometimes is not accurate because of bowel gas and other technical problems. Alteration in the size and echogenicity were the most common ultrasonography findings. Bulky hypoechoic pancreas was considered diagnostic of acute pancreatitis on ultrasonography. Duct dilatation and calcification were seen in chronic pancreatitis on ultrasonography.

KEYWORDS

INTRODUCTION :

The pancreas is a difficult organ to evaluate by both clinical and routine radiological methods. An inflammatory pathology involving the pancreas will form part of the differential diagnosis of other conditions presenting with abdominal pain. The combination of appropriate clinical findings and laboratory tests permit an accurate diagnosis of acute pancreatitis in most patients. Chronic pancreatitis, on the other hand, forms a much more difficult entity to evaluate clinically or biochemically.

The clinical and biochemical parameters form a key factor in the diagnosis of Acute Pancreatitis. But the history and clinical presentation may be misleading and the biochemical parameters (particularly serum amylase/lipase values) can be normal, particularly when the test is performed a few days after the initial attack. To exclude other abdominal catastrophes and support the clinical suspicion of acute pancreatitis, conventional radiographs have been used. Radiographic studies are of limited value in patients suspected of having acute pancreatitis, both to support and exclude its diagnosis. Supine, lateral decubitus and erect films of the abdomen, help exclude other diagnosis such as a perforated viscus. Nonspecific finding are found in radiographs in patients with acute pancreatitis, including adynamic ileus or a sentinel loop. In addition, pancreatic calcifications may be found in patients with chronic pancreatitis, and peripancreatic gas is seen uncommonly in patients with pancreatic abscess. These tests are rather insensitive and nonspecific.

Cross-sectional imaging with ultrasound and CT has afforded rapid, accurate and noninvasive evaluation of the pancreas. Ultrasound provided the first reliable, reproducible, cross-sectional view of pancreatic anatomy. However, it has limitations in obese patients and in those with large amounts of bowel gas.

CT offers a diagnostic method that does not have these limitations. But CT is expensive, exposes patients to ionizing radiation, and has difficulty in defining tissue planes in lean patients. Modern ultrasound machines allow quick and comprehensive evaluation of the abdomen and the pancreas with its ductal system. Because the examination is inexpensive, noninvasive, and well accepted by the patient, it is currently one of the first imaging techniques performed for the evaluation of suspected chronic pancreatitis.

MATERIALS AND METHODS :

This study included 55 cases of pancreatitis who were diagnosed on

imaging studies (Ultrasound or CT) or on a constellation of signs, symptoms and laboratory data indicative of pancreatitis during the period from March 2019 to February 2020. The study was conducted in Govt. Medical College, Bettiah, W. Champaran, Bihar.

THE INCLUSION CRITERIA:

One or more imaging modality (Ultrasound and/or CT) were employed for the diagnosis. Patients were confirmed to have pancreatitis based on imaging findings on either modality and a combination of clinical features suggestive of pancreatitis and biochemical values to support a diagnosis of the same.

EXCLUSION CRITERIA:

Patients in whom the diagnosis of pancreatitis was made purely on clinical grounds without any imaging (ultrasound or CT) being done and patients in whom no imaging was done prior to surgery where a diagnosis of pancreatitis was made.

Informed consent was obtained in all patients. The sonographic study was done by a curvilinear 3 – 5 MHz probe. The sonographic study was not repeated. The CT study was done within 3 to 4 days of admission using 10mm sections throughout the abdomen and 5 mm section throughout the pancreas. The CT study was not repeated. Oral and intravenous contrast was given in all patients.

A total of 55 cases were studied of which 45 had acute pancreatitis and 10 had chronic pancreatitis. In the 45 cases with acute pancreatitis, ultrasound alone was done in 20 cases, CT alone in 4 cases and both modalities were employed in the remaining 21 patients. All the 10 cases with chronic pancreatitis had an ultrasound study but only one required a CT scan.

RESULT AND DISCUSSION :

The study was done on 55 patients who were diagnosed to have pancreatitis which included 45 patients with acute and 10 patients with chronic pancreatitis.

AGE AND SEX DISTRIBUTION

The majority of patients with acute pancreatitis were in the 21 to 40 years age group who represented 55.5% of the total patients with acute pancreatitis. The average age of patients in acute pancreatitis was 41 years with a range from 16 to 67 years.

In patients with chronic pancreatitis, the majority of patients were aged below 30 years (50%) and the average age of patients with chronic pancreatitis was lower (29 years) as compared to acute pancreatitis.

The majority of patients with pancreatitis were males (45 out of 55 patients) representing 81.8% of the total. It was also noted that females with acute pancreatitis tended to be older (47.8 years) as compared to males (35.9 years).

PRESENTATION

All patients presented with abdominal pain and vomiting. Most of the patients had a history of alcohol consumption (23 out of 45 patients with acute pancreatitis) and 7 patients gave a history of an alcoholic binge prior to onset of symptoms. Trauma was seen as an etiological factor in two cases, both following a road traffic accident. In two cases, one of whom was positive for rheumatoid factor, was an autoimmune etiology proposed. One patient was an epileptic on carbamazepine and this was suggested as a cause of pancreatitis. In 13 patients, no cause could be found and these were labeled as being idiopathic in nature. Other causes included hyperlipidemia and cholelithiasis.

The serum and / or ascitic fluid amylase was elevated in all the cases of acute and in none of the cases of chronic pancreatitis.

ULTRASOUND FINDINGS IN ACUTE PANCREATITIS

This was done in 41 out of 45 patients (90.7%). The pancreas was evaluated and the findings noted.

1. Visualization:

The pancreas was visualized in 29 patients (70.7%) and obscured in the remaining 12. This was a better yield for a visualized pancreas as compared to a study reported by Calleja and JS Barkin which stated that in acute pancreatitis, overlying bowel gas disturbances may obscure the pancreas in 40% of patients.

2. Size:

An enlarged pancreas is due to the interstitial edema within the pancreas- edematous pancreatitis. A bulky pancreas was seen in 16 patients (55.2%) which was more than that reported by RB Jeffrey Jr. where only a third of patients with acute edematous pancreatitis had an enlarged gland. In one case, a patient with acute on chronic pancreatitis, the pancreas was contracted. The pancreas was normal size in 12 patients (41%).

3. Echotexture

Due to the edema, a bulky, hypoechoic pancreas is characteristic of edematous pancreatitis. However, this may not be the case always and one series has shown this finding only in a third of patients with edematous pancreatitis. In the present study, hypoechoic pancreas was seen in 13 patients (44.8%) but as many as 11 patients (37.9%) had a normal echogenicity of the pancreas. In the remainder, the pancreas had a heterogeneous echotexture representing 17.3% of the cases. Of the 5 patients with a heterogeneous echotexture pancreas, 2 were cases of acute on chronic pancreatitis.

4. Duct dilatation

The presence of duct dilatation in acute pancreatitis is very variable and could be compressed due to edema or the hypoechoic pancreas may render the duct more easily visible. In this study, it was seen in only 3 patients (10.4%) of whom 2 were cases of acute on chronic pancreatitis. Thus, duct dilation was seen in only 1 patient (3.4%).

5. Calcification

This is mainly a feature of chronic pancreatitis and in this study both the patients with calcification (representing 6.9% of patients with a visualized pancreas) had acute on chronic pancreatitis.

6. Focal lesions

In the 4 patients (13.8%) with focal lesions within the pancreas, 2 had traumatic pancreatitis resulting in contusions.

Other findings noted include ascites in 17 patients (41.5%) and effusions in 8 patients (19.5%). Two other findings which could provide a clue to the etiology were fatty liver as a manifestation of hyperlipidemia (seen in 18 patients, 43.9%) and gallstones (seen in 8 patients, 19.5%).



Fig. 1 : Ultrasonography showing Diffusely hypoechoic and bulky pancreas with mild peripancreatic fluid

CT FINDINGS IN ACUTE PANCREATITIS

CT was done in 21 patients (56%) and in 4 patients (9.3%) a CT alone was done.

1. Visualization

CT visualization of the pancreas was possible in all cases (25 patients) due to noninterference by the overlying bowel gas.

2. Size

In 23 patients (92%), the pancreas was bulky. The one case in which the pancreas was contracted, was a patient with acute on chronic pancreatitis. One case had a normal sized pancreas. As mentioned in literature, a normal pancreas is seen on CT in very mild forms of pancreatitis. Due to lack of surgical correlation, the incidence of normal CT scans in mild acute pancreatitis is not known.

3. Duct dilatation

This was seen in 3 patients (12%) of whom 2 were cases of acute on chronic pancreatitis.

4. Focal lesions

Focal lesions were seen in 5 patients (20%) which is comparable to that reported by EJ Balthazar where 18% of patients were seen to have focal lesions.

a) Fluid collections and exudates:

Fluid collections were seen in 7 patients (28%), and exudates in 18 patients (72%) with acute pancreatitis.

b) Stomach wall and Gerota's fascia thickening:

Stomach wall thickening was seen in 20 patients (80%) and Gerota's fascia thickening, usually on the left (14 patients), seen in 16 patients (64%).

c) Ascites and Plural effusions:

Free intraperitoneal fluid representing pancreatic ascites was seen in 4 patients (16%) which was more than that reported by EJ Balthazar (7%).

Pleural effusions were seen in 10 patients (40%) which was also more than that reported by EJ Balthazar. It was seen more often on the left side (60%).

Other findings included fatty liver (11 patients, 44%), cholecystitis (8 patients, 32%) and portal vein thrombosis (1 patient, 4%).

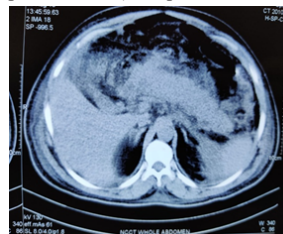


Fig 2 : NCCT

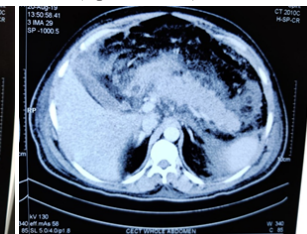


Fig 3 : CECT

Fig 2 and 3 : Diffusely hypodense and bulky pancreas with mild peripancreatic fluid and streakiness of contrast to adjacent transverse mesocolon

Comparison Between Ultrasonography and CT in Acute Pancreatitis

The overall visualization of the pancreas was far better by CT than by

ultrasound. In a study done between 1979-1980 on 102 patients, good to excellent visualization of the pancreas was present in 64% of CT scans as compared to 20% of sonographic studies. With improvements in technology, visualization of the pancreas is better on both modalities. This study showed that the pancreas is visualized in as many as 70.7% of patients on ultrasonography and in 100% of patients on CT in acute pancreatitis.

Alterations in size were better appreciated on CT. On CT, 23 patients with acute pancreatitis (92%) were seen to have a bulky pancreas. Of the remainder, one had a contracted pancreas due to underlying chronic pancreatitis; and in one case, the pancreas was normal. This patient had clinical features and laboratory findings suggestive of acute pancreatitis and was managed conservatively. He was asymptomatic at the time of discharge. Incidentally, the ultrasound study of this patient was also normal.

Duct dilation and calcification were picked up in three patients on both modalities. Ultrasound proved more useful in detecting free fluid as seen in 17 patients, in contrast to CT which picked up the same finding in 4 patients. However, due to the facility to inject intravenous contrast, the complication of portal vein thrombosis was picked up on the CT scan of one patient. Probably a colour Doppler sonographic study could have detected the same.

The sensitivity of ultrasonography in detecting acute pancreatitis was 59% in those patients in whom the pancreas was visualized. However if all the sonographic studies were considered, sonography diagnosed acute pancreatitis in only 17 of 41 cases representing 41.5% of cases. CT had a sensitivity of 96% mainly due to better visualization (100%) and better assessment of size. As all the patients had pancreatitis, the specificity could be estimated. However, the positive predictive value of both ultrasound and CT was 100%. This means that all patients with a bulky, hypoechoic pancreas on ultrasound have acute pancreatitis. It must be pointed out that 5 patients were taken up for surgery and of these 2 had a normal pancreas on ultrasound. In the other 3, the pancreas was obscured. Hence, as mentioned in the study by SJ Hessel et al, a negative ultrasound study does not exclude significant and, at times, life-threatening pancreatic disease.

ULTRASOUND FINDINGS IN CHRONIC PANCREATITIS

This was done in all the 10 patients.

1. **Size alterations**

The size of the pancreas in chronic pancreatitis is considered to correlate with the activity or chronicity of the disease process. This study showed an atrophic pancreas in 6 patients (60%) and a normal sized pancreas in the remaining 4 patients (40%).

2. **Calcifications**

Calcifications appears as clumps of high level echoes within the Parenchyma or within a dilated excretory system. Calcifications was seen in 4 patients (40%), and it is the most common finding along with a dilated system in chronic pancreatitis.

3. **Duct dilatation**

This is the most reliable sign in chronic pancreatitis. The incidence of abnormal main pancreatic duct varies from 20% to 52.3% of cases. This study showed this finding to be most common along with calcifications/calculi and was seen in 9 patients (90%). However, ERCP is considered to be more sensitive than ultrasound for detecting ductal changes.

4. **Echogenicity**

The infiltration by retroperitoneal fat may alter the echogenicity of the pancreas making it hyperechoic. Acute inflammation may cause areas of decreased echogenicity. Echotexture abnormalities were seen in 7 patients (70%) with 4 patients (40%) being heterogeneous in echotexture. Studies have shown echotexture alterations in 55-57% of cases.

5. **Ascites**

This was seen in one patient.

6. **Pseudocysts**

This was seen in one patient.

CT FINDINGS IN CHRONIC PANCREATITIS

CT was done only in one case which showed an atrophic pancreas, calcifications and a dilated main pancreatic duct which were the most common findings noted by PH Luetmer, David H. Stephens in 54%, 50% and 68% of cases respectively

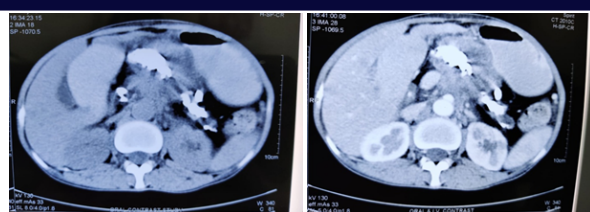


Fig 4 : NCCT

Fig 5 : CECT

Fig 4 and 5 : Atrophic pancreatic Parenchyma with coarse calcification within and dilated MPD with calcification within (Chronic calcific Pancreatitis)

COMPARISON

All the patients who were diagnosed as having chronic pancreatitis on ultrasound were treated as such and findings were confirmed by CT in one case. The sensitivity was 100%, higher than the sensitivity reported by L. Bolondi et al which was 70%. The number of patients in the current study was small due to low incidence (0.2-3%) in the general population.

However, in all the patients, the ultrasound visualization was adequate and the observation of a dilated pancreatic duct and an atrophic pancreas was diagnostic of chronic pancreatitis. Hence, as suggested by L. Bolondi et al, ultrasound, should be first diagnostic step when pancreatic disease is suspected. Ultrasound may lead to a definite diagnosis and visualize complications of chronic pancreatitis. In fact, the most accurate assessment of chronic pancreatitis is achieved by a combination of clinical evaluation (symptoms and pancreatic function tests) and radiologic definition of duct and parenchyma changes.

CONCLUSION :

- Maximum number of cases were between 16—62 years of age.
- Pain abdomen in the epigastrium and periumbilical region radiating to the back, nausea and vomiting were the most frequent presenting complaints.
- Ultrasonography visualized pancreas in about 70% patients whereas CT visualized pancreas in 100% patients.
- Alteration in the size and echogenicity were the most common ultrasonography findings.
- Bulky hypoechoic pancreas was considered diagnostic of acute pancreatitis on ultrasonography.
- Duct dilatation and calcification were seen in chronic pancreatitis on ultrasonography.
- Ultrasonography has a PPV of 100% and Sensitivity of 59% in patients in whom pancreas were visualized.
- CT visualized pancreas in all patients.
- Estimation of size and detection of calcification were diagnostic of pancreatitis.
- Extra pancreatic spread of inflammation was better noted on CT.
- CT has a PPV of 100% and Sensitivity of 96%.
- Thus it is seen that both Ultrasonography and CT have roles to play in the diagnosis of pancreatitis and both are complementary to each other.

REFERENCES :

1. Bannister L.H — Alimentary system chapter 12 in Gray's anatomy. William's P.L et al Ed. Edinburg: E LBS Churchill Livingstone, 2005; 123 1-1237.
2. Greenberger N. J., P.P. Toskes, and K.J. Isselbacher — Acute and Chronic Pancreatitis Harrison Principal of Internal Medicines. Fauci A.S. et al Ed. McGraw-Hill, 1 6t edition 2005; 1895-1906.
3. Janet M. Torpy, MD, Writer; CassioLynn, MA, Illustrator; RichardM. Glass, MD, Editor JAMA. 2008;299(13):1630-1630.
4. Dr Yuranga Weerakkody and Dr Natalie Yang et al. 2009
5. Takahashi N, Fletcher JG, Hough DM et-al. Autoimmune pancreatitis: differentiation from pancreatic carcinoma and normal pancreas on the basis of enhancement characteristics at dual-phase CT. AJR Am J Roentgenol. 2009;193(2): 479-84.
6. IR L HAMERS, MD, 2F G VAN DEN BERG, MD and 1A B J GROENEVELD, MD, PhD, FCCP, FCCM The British Journal of Radiology, 82 (2009), e11-e14.
7. Van Baal MC, Van Santvoort HC, Bollen TL, Bakker OJ, Besselink MG, Gooszen HG. Systematic review of percutaneous catheter drainage as primary treatment for necrotizing pancreatitis. British Journal of Surgery. 2011;98(1):18-27.
8. John N.Ly, Frank H., Miller, —MR imaging of the pancreas a practical approach Radiol Clin N Am 40, 2002; 1289-1306
9. Joseph T.F., Peter R Mueller, —Interventional Approach to Pancreatic Fluid Collection Radiol Clin N Am 2003; 41: 1217-1226
10. Greenberger N. J., P.P. Toskes, and K.J. Isselbacher — Acute and Chronic Pancreatitis Harrison Principal of Internal Medicines. Fauci A.S. et al Ed. McGraw-Hill, 1 6t edition 2005; 1895-1906.