



A Comparative Analysis between Ultrasonography and computed Tomography in Evaluation of Acute Pancreatitis.

KEYWORDS

radiological findings in acute pancreatitis US AND CT FINDINGS

Dr. M. Narasimha Chary

Dr. A. Swetha

MD RD, Assistant Professor, Department of Radio Diagnosis, Guntur Medical College, Guntur
Guntur district, AP

MD RD, Civil Assistant Surgeon, Department Of Public Health & Family Welfare, PHC keshampet, RangaReddy district, Telangana

Dr. Rama Krishna Narra

MDDM (Neuroradiology), Associate Professor, Department of Radiodiagnosis, Katuri Medical College, Guntur, Guntur district, AP

ABSTRACT

Background: The present study aims to study ct & us findings among 60 patients suffering with acute pancreatitis

METHODOLOGY: This is a comparative study. Study population consisted of patients presenting in the emergency room with constellation of symptoms, signs, and laboratory data and imaging studies consistent with pancreatitis. This study was carried out at Government General Hospital, Guntur in the Department of Radiodiagnosis from November 2013 to August 2015.

Study included 60 patients who presented with clinical, biochemical and imaging findings satisfying the Practice guidelines in acute pancreatitis- 2013, American college of Gastroenterology

Ultrasonography and computed tomography was carried out in all the 60 cases, the pancreas was evaluated and the following findings were noted.

Results: The overall visualisation of pancreas was far better by CT than by ultrasound examination. In a study by Silverstein et al on 102 patients good to excellent visualisation of pancreas was found in 64% of CT scans as compared to 20% of sonographic studies. With improvements in technology visualisation of the pancreas is better on both modalities. This study showed that the pancreas is visualised in as many as 77% on ultrasonography and in 100% of patients on CT in acute pancreatitis.

The sensitivity of ultrasound in detecting acute pancreatitis in the present study is 73% In a study conducted by Adrienne van et al the sensitivity was 21-57%

The sensitivity of CT in detecting acute pancreatitis in the present study is 96%. Of the 60 cases 58 showed changes in size of the pancreas (i.e bulky), the remaining two cases had normal sized pancreas. These 2 patients had clinical and laboratory findings suggestive of acute pancreatitis. In a study by Adrienne van Randen et al, the sensitivity of CT in detecting acute pancreatitis is 51-85%.

CONCLUSION: Maximum number of cases were between 21 -40 years of age. Abdominal pain in the epigastric and periumbilical region radiating to the back, nausea and vomiting were the most frequent presenting complaints.

Pancreas was visualized in 76% of the patients on ultrasound examination and in 100% patients on CT examination.

The most common ultrasonographic findings were alteration in the size and echogenicity of pancreas.

Bulky and hypoechoic pancreas was considered diagnostic of acute pancreatitis on ultrasonography.

Duct dilatation and calcification were seen in patients who had acute on chronic pancreatitis.

Ultrasonography has a sensitivity of 76% in diagnosis.

The most common CT features were enlarged pancreatic size and presence of peripancreatic fat stranding.

Extra pancreatic spread of inflammation and complications were better assessed by computed tomography.

Computed tomography had a sensitivity of 96% in diagnosing acute pancreatitis.

Thus both Ultrasonography and Computed tomography have role in diagnosing acute pancreatitis and both are complementary to each other, although CT was better in staging the disease and assess the prognosis.

INTRODUCTION

Acute pancreatitis is an inflammatory process of the pancreas that can involve peripancreatic tissues or remote organ systems, or both.

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 values) can be normal, particularly when the test is performed a few days after the initial attack. Radiologist has three primary roles in patients with pancreatitis: to confirm the diagnosis if the initial clinical impression is unclear, to assess the severity of the inflammatory process, and to detect complications^{1,2}. Diagnosis of acute pancreatitis is usually made clinically, but in some patients it may be unclear, particularly if it develops in an already critically ill, post operative, or trauma patient. In these patients, CT or sonography can identify features of acute pancreatitis: gland enlargement, indistinct gland contour, changes in parenchymal texture or attenuation, fluid collection formation, and thickening of the peripancreatic fascial planes^{3,4}

AIMS & OBJECTIVES

- To study the findings on ultrasound and CT in patients with acute pancreatitis.
- To compare imaging features of acute pancreatitis on both the modalities.

METHODOLOGY

STUDY SETTING AND DURATION: This is a comparative study. Study population consisted of patients presenting in the emergency room with constellation of symptoms, signs, and laboratory data and imaging studies consistent with pancreatitis. This study was carried out at Government General Hospital, Guntur in the Department of Radiodiagnosis from November 2013 to August 2015.

STUDY POPULATION: Study included 60 patients who presented with clinical, biochemical and imaging findings satisfying the Practice guidelines in acute pancreatitis- 2013, American college of Gastroenterology.

INCLUSION CRITERIA:

Patients who satisfied The American College Of Gastroenterology practice guidelines 2013 were included in the study. The diagnosis of

acute pancreatitis was established by the presence of 2 of the 3 following criteria:

- (i) abdominal pain consistent with the disease,
- (ii) serum amylase and / or lipase greater than three times the upper limit of normal, and / or
- (iii) characteristic findings from abdominal imaging

EXCLUSION CRITERIA:

- (i) Patients with only chronic pancreatitis and no acute attack
- (ii) 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.

All the patients who satisfied the above criteria were included in the study. Informed consent was obtained from all the patients. The sonographic study was done with Esoate My Lab 40 Doppler machine by a curvilinear 3 – 5 MHZ probe.

The CT study was done within 3 to 4 days of admission using a 16 slice MDCT GE(General Electronics) Machine with 10mm sections throughout the abdomen and 5 mm section throughout the pancreas. A total of 60 patients were studied .All the patients underwent both Ultrasonography and CT. The advantages and disadvantages of one modality over the other were compared and analysed.

RESULTS

The study group included 60 patients who were diagnosed to have acute pancreatitis. The following table shows age distribution.

TABLE 1: AGE DISTRIBUTION

AGE	MALE	FEMALE	TOTAL	PERCENTAGE
<20years	2	0	2	3%
21-30years	16	1	17	29%
31-40years	18	2	20	34%
41-50years	11	0	11	18%
51-60years	4	4	8	13%
>60years	2	0	2	3%

Among the 60 cases acute pancreatitis was most common between the age group 21-40 years constituting 63%.

The following are the aetiologies of acute pancreatitis after evaluation with detailed history, laboratory data and imaging findings.

TABLE 2: AETIOLOGY

AETIOLOGY	NO. OF PATIENTS
ALCOHOLISM	36
GALL STONES	12
IDIOPATHIC	06
HYPERTRIGLYCERIDEMIA	03
DRUG INDUCED	02
TRAUMA	01

Among the patients studied the most common aetiology was alcohol followed by gallstones together constituting around 80% of patients. In 10% of the cases no cause could be identified and were labelled as being idiopathic.

FINDINGS OF ULTRASOUND:

1. VISUALISATION

TABLE 3: VISUALISATION ON ULTRASOUND

ACUTE PANCREATITIS	NO.OF PATIENTS	PERCENTAGE
Visualised	46	77%
Not visualised	14	23%

TABLE 4: SIZE

SIZE	NO.OF PATIENTS	PERCENTAGE
BULKY	44	96%
NORMAL	02	4%

The size of the pancreas was assessed in patients in whom pancreas was visualised on ultrasound. Out of 46 patients in whom the pancreas was visualised it was bulky in 44 patients and it was normal in size in 2 patients.

TABLE 5: ECHOGENICITY

ECHOGENICITY	Hypoechoic	Hetegenous	Normal	Hyperechoic
NO.OF PATIENTS	22	24	0	0

TABLE 6: DUCT DILATATION

	NO.OF PATIENTS	PERCENTAGE
DUCT DILATATION	5	11%

TABLE 7: CALCIFICATION

	NO.OF PATIENTS	PERCENTAGE
CALCIFICATION	2	4%

TABLE 8: FOCAL LESIONS

	NO OF PATIENTS	PERCENTAGE
Focal lesions	6 patients	13%

TABLE 9: EXTRA PANCREATIC FINDINGS

EXTRA PANCREATIC FINDINGS	NO.OF PATIENTS	PERCENTAGE
Ascites	17	28%
Pleural effusions	22	37%
Fatty Liver	20	33%
Gall stones	12	20%
Fluid collection	10	17%

TABLE 10: SIZE

SIZE	NO.OF PATIENTS	PERCENTAGE
BULKY	58	96%
NORMAL SIZE	2	4%

TABLE 11: OTHER FINDINGS

	NO OF PATIENTS	PERCENTAGE
Duct dilatation	7	12%
Calcification	5	8%
Focal lesions	12	20%

TABLE 12: EXTRA PANCREATIC FINDINGS:

	NO OF PATIENTS	PERCENTAGE
Ascites	10	16%
Fluid collections	18	30%
Pleural effusions	22	37%
Stomach wall thickening	38	64%
Gerota's fascia thickening	38	64%
Fatty liver	20	33%
Cholelithiasis	12	20%
Portal vein thrombosis	1	2%

DISCUSSION

The study was conducted on 60 patients diagnosed to have acute pancreatitis according to the American College of Gastroenterology Guidelines.

AGE AND SEX DISTRIBUTION

The majority of the patients with acute pancreatitis were in the age group of 21 to 40 years who represented 56.6% of the total patients. The majority of the patients with acute pancreatitis were males 53 out of 60 patients representing 83.3% of the total number of patients. It was also noted that acute pancreatitis in females

occurred in older age group (51-60 years) as compared to males (21-40 years).

Studies by Silverstein et al conducted on 102 patients, 65 were male patients(average age 41 years) and 37 were female patients (average age 32 years)¹

PRESENTATION AND ETIOLOGY^{2,3}

All the patients presented with abdominal pain and few of them had vomiting. Majority of the patients had history of alcohol consumption (36 out of 60 patients) and 7 patients gave a history of alcohol binge prior to the onset of symptoms. The next major cause of acute pancreatitis in the present study was cholelithiasis. Trauma was seen as an etiological factor in one case following a road traffic accident. Two of the patients were epileptic and were on antiepileptics and this was suggested as a cause of acute pancreatitis. In 6 cases no cause was identified and was labelled as being idiopathic⁴. The most common etiology was alcohol which was also the same in a study conducted by Silverstein et al 1981.

ULTRASOUND FINDINGS IN ACUTE PANCREATITIS

Ultrasonography was carried out in all the 60 cases, the pancreas was evaluated and the following findings were noted.

1. Visualisation⁵:

The pancreas was visualized in 46 patients (77%) and obscured in the remaining 14 patients. This was a better yield when compared to a study conducted by Calleja and JS Barkin which stated that overlying bowel gas shadows obscured visualization of pancreas in 40% of the patients.

STUDY	VISUALISED PANCREAS	PERCENTAGE
Silverstin et al(1981)	29 Out of 143	20%
Calleja and JS Barkin		60%
Present study	46 out of 60	77%

2. Size:⁶

Pancreas in acute pancreatitis is enlarged due to the interstitial edema. A bulky pancreas was visualised in 44 patients(96%) which is more than that reported by RB Jeffrey Jr. where only one third of patients with acute pancreatitis had enlarged pancreas. In the present study the pancreas is normal in size in 2 cases 4% (out of 46 patients in whom pancreas was visualised on ultrasound)

STUDY	BULKY PANCREAS	NORMAL SIZED PANCREAS
RB Jeffrey Jr	33%	67%
Present study	44(96%)	02(4%)

3. Echotexture:⁷

A bulky hypoechoic pancreas is characteristic of edematous pancreas seen in acute pancreatitis. However this may not be the case always and one series has shown that this finding is seen only in 44% of the patients with acute pancreatitis. In the present study hypoechoic pancreas was seen in 22 patients representing 48 %; pancreas had heterogenous echotexture in 24 cases (52%)

Echotexture	Hypoechoic	Heterogenous
Finstad et al	44%	56%
Present study	48%	52%

4. Duct dilatation⁷:

The presence of duct dilatation in acute pancreatitis is very variable, it could be compressed due to edema or the hypoechoic pancreas may render the duct more easily visible. In this study it was seen only in 5 patients (11%) of whom 2 were cases of acute on chronic pancreatitis.

Duct dilation finstad etal	4% (2 out of 48 patients)
Present study	11%(5 out of 46 patients)

5. Calcification:

This is mainly a feature of chronic pancreatitis and in this present study both the patients with calcification (representing 4% of the patients with a visualised pancreas) had acute on chronic pancreatitis.

6. Focal lesions⁷:

Six patients showed focal lesions with in the pancreas in the form of ill defined hypoechoic areas.

STUDY	Focal lesions
Finstad et al	23%(11 out of 48 cases)
Present study	13%(6 out of 46 cases)

Other findings include Ascites in 17 patients (28%), pleural effusions in 22

patients(37%). Two other findings which could provide a clue to the etiology were fatty liver as a manifestation of hyperlipidemia seen in 20 patients and cholelithiasis in 12 patients^{7,8}.

CT FINDINGS IN ACUTE PANCREATITIS

CT was done in all 60 patients, some of whom underwent CT examination on the day of admission and some patients underwent 3-4 days after admission

1. Visualisation:

The pancreas was visible in all patients (60 cases).

2. Size:⁹

In 58 patients the pancreas was enlarged some of which showed only the enlargement of tail. In 2 patients the size of the pancreas was within normal limits. A normal sized pancreas is usually seen in milder forms of acute pancreatitis. Due to lack of surgical correlation, the incidence of normal size of pancreas on CT Scans in milder acute pancreatitis is not known.

STUDY	BULKY PANCREAS
Silverstein(1981)	70 out of 98 patients 71%
Present study	58 out of 60 patients 96%

1. Duct dilatation:

Dilatation of pancreas was seen in 7 patients (12%) of whom 2 cases were acute on chronic pancreatitis.

2. Focal lesions:⁹

Focal lesions were seen in 12 patients (20%) which is comparable to that reported by EJ Balthazar where 18% of patients were seen to have focal lesions

5. Extra pancreatic findings:

a) Fluid collections

18 out of 60 patients (30%) with acute pancreatitis showed fluid collections

b) stomach wall and gerota's fascia thickening

Stomach wall thickening was noticed in 38 patients (64%) and gerota's fascia thickening on the left side most commonly was seen in 38 patients (64%)

c) Ascites and pleural effusions^{9,10,11}

Free intra peritoneal free fluid representing Ascites was seen in 10 patients (16%) which was more than reported by EJ Balthazar (7%)

Pleural effusions were seen in 22 patients (37%) which was also more than that reported by EJ Balthazar. The pleural effusions were predominantly on the left side

Other findings included fatty liver in 20 patients (33%), cholelithiasis in 12 patients and portal vein thrombosis in one patient (2%)

Comparison Between Ultrasonography And CT In Acute Pancreatitis

The overall visualisation of pancreas was far better by CT than by ultrasound examination. In a study by Silverstein et al on 102 patients good to excellent visualisation of pancreas was found in 64% of CT scans as compared to 20% of sonographic studies. With improvements in technology visualisation of the pancreas is better on both modalities. This study showed that the pancreas is visualised in as many as 77% on ultrasonography and in 100% of patients on CT in acute pancreatitis.

The sensitivity of ultrasound in detecting acute pancreatitis in the present study is 73% In a study conducted by Adrienne van et al the sensitivity was 21-57%

The sensitivity of CT in detecting acute pancreatitis in the present study is 96%.Of the 60 cases 58 showed changes in size of the pancreas(i.e bulky), the remaining two cases had normal sized pancreas. These 2 patients had clinical and laboratory findings suggestive of acute pancreatitis. In a study by Andrienne van Randen et al, the sensitivity of CT in detecting acute pancreatitis is 51-85%12.

CONCLUSION

- Maximum number of cases were between 21 -40 years of age.
- Abdominal pain in the epigastric and periumbilical region radiating to the back ,nausea and vomiting were the most frequent presenting complaints.
- Pancreas was visualized in 76% of the patients on ultrasound examination and in 100% patients on CT examination.
- The most common ultrasonographic findings were alteration in the size and echogenicity of pancreas .
- Bulky and hypoechoic pancreas was considered diagnostic of acute pancreatitis on ultrasonography.
- Duct dilatation and calcification were seen in patients who had acute on chronic pancreatitis.
- Ultrasonography has a sensitivity of 76% in diagnosis.
- The most common CT features were enlarged pancreatic size and presence of peripancreatic fat stranding.
- Extra pancreatic spread of inflammation and complications were better assessed by computed tomography.
- Computed tomography had a sensitivity of 96% in diagnosing acute pancreatitis.
- Thus both Ultrasonography and Computed tomography have role in diagnosing acute pancreatitis and both are complementary to each other,although CT was better in staging the disease and assess the prognosis.

FIGURES

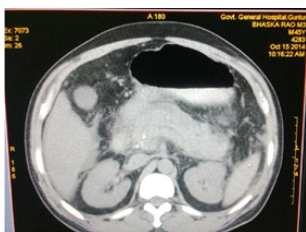


FIGURE 1:Bulky pancreas with peripancreatic fat stranding, anterior renal fascia thickening and calcifications in the head of the pancreas

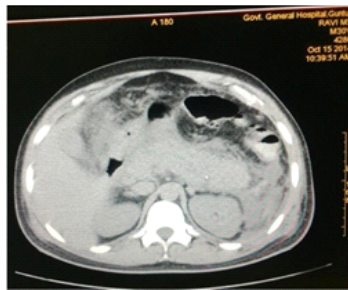


FIGURE2: Bulky pancreas with dilated duct and decreased echogenicity



FIGURE3 : Bulky pancreas with stranding in the periglandular fat and irregular fluid collection anterior to the pancreas



FIGURE4:Enlarged gland with heterogenous echogenicity

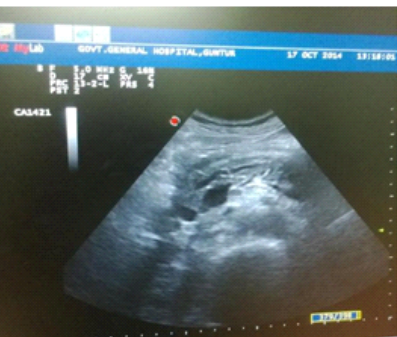


FIGURE 5 : The gland appears uniformly enlarged with smooth outline and stranding in the peripancreatic fat. The left anterior renal fascia is thickened. No evidence of any fluid collection



FIGURE6 : The pancreas is bulky and hypoechoic with the main pancreatic duct dilated

REFERENCES

1. Bradley EL III. A clinically based classification system for acute pancreatitis. Arch Surg 1993;12 || 8:58690
2. Calleja G.A., J.S Barkia, —Acute Pancreatitis: Medical Clin North Am 1993; 77 (5): 1037-1055
3. Lees WR. Pancreatic ultrasonography. Clin Gastroenterol. 1984 Sep;13(3):763-789
4. Freeny PC, Lawson TL. Radiology of the pancreas. New York: Springer Verlag, 1982:121-122
5. Silverstein W. M. B.Isikoff, M. C.Hill, J. Barkin. —Diagnostic Imaging of Acute Pancreatitis Prospective Study Using CT and Sonography || AJR 1981; 137:497502
6. Jeffrey Jr R. B., -Sonography in Acute Pancreatitis —Radiol Clin N Am 1989; 27 (1): 5- 17

7. Finstad TA Tchelepi H,Ralls PW.Sonography of acute pancreatitis: prevalence of findings and pictoral essay.Ultrasound Q2005;21:95-104
8. Haaga JR,Alfidi RJ, Zelch MG,et al.Computed tomography of the pancreas. Radiology 1976;120:589-595.
9. Balthazar E,J, Robinson D.L., Megibon A.J., Ramson J,H.C. —Acute pancreatitis value of CT in establishing prognosis || . Radiology 1990;174:331-336
10. Balthazar E.J —Complication of acute pancreatitis clinical and CT evaluation || RadiolClinNam 2002;40: 1211-1227
Add references here
11. Finstad TA Tchelepi H,Ralls PW.Sonography of acute pancreatitis: prevalence of findings and pictoral essay.Ultrasound Q2005;21:95-104
12. Adrienne van Randane et al A comparison of the Accuracy of Ultrasound and Computed Tomography in common diagnoses causing acute abdominal pain Eur Radiol. 2011 Jul; 21(7): 1535–1545