ROLE OF ULTRASOUND IN THE EVALUATION OF PANCREATIC LESIONS

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ABSTRACT

BACKGROUND
The anatomical location of pancreas at stomach bed makes its optimal visualisation a challenge due to bowel gases. These difficulties can be minimised by consistently and continuously optimising patient factors and machine settings and using excellent scanning techniques.
Aims and Objectives - To study the various features of pancreatic lesions by ultrasonography and assess the role of ultrasound.

MATERIALS AND METHODS
Fifty six patients with signs and symptoms suggestive of pancreatic lesions were evaluated over a period of 12 months using Siemens Sonoline Omnia/Siemens G 50 machines with 3.5 MHz convex and 5-10 MHz multifrequency linear transducer.

RESULTS
Ultrasound could conclusively detect the pancreatic pathology in 48 (86 %) out of 56 patients. However, in eight (25%) of acute pancreatitis patients, the pancreatic visibility was poor due to bowel gases.

CONCLUSION
Ultrasound being a non-invasive, quick and reliable modality, it still remains as a first line of investigation for suspected pancreatic pathologies. We recommend ultrasound as a primary diagnostic tool for suspected pancreatic pathologies.

KEYWORDS
Pancreas, Ultrasonography.

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BACKGROUND

Ultrasound screens for disease rapidly, safely and inexpensively. It detects incidental primary pancreatic pathology and complications of the pathology. It characterises lesions based on their B mode and Doppler characteristics. Another important advantage of US examination is the possibility to correlate the US findings with the point of maximal tenderness.(1) However, the anatomical location of pancreas at stomach bed makes its optimal visualisation a challenge due to bowel gases. The difficulty is further aggravated due to paralytic ileus/hyperventilation by patient secondary to pain. These difficulties can be minimised by consistently and continuously optimising patient factors and machine settings and using excellent scanning techniques.(2)

Therefore, the present study was done to study the various features of pancreatic lesions by ultrasonography and assess its role.

Aims and Objectives

To study the various features of pancreatic lesions by ultrasonography and assess the role of ultrasound.

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MATERIAL AND METHODS

The present study was carried out in the Department of Radiodiagnosis, Himalayan Institute of Medical Science, Swami Ram Nagar, Dehradun, over a period of 12 months. Patients presenting with signs and symptoms suggestive of pancreatic lesions were included in the study.

A complete history and clinical examination was done (After obtaining written informed consent) followed by ultrasonographic examination.

Machine

Siemens Sonoline Omnia/Siemens Sonoline G 50.

- 3.5 MHz convex transducer.
- 5-10 MHz multifrequency linear transducer.

Overnight fasting was preferred, though it was not mandatory.

Wherever required, pancreatic and left upper quadrant retroperitoneal visibility was improved by having the patient drink a glass of water.

A firm, slow, graded compression technique was used wherever it was necessary to move bowel loops out of the way to improve the pancreatic visibility.

The ultrasonographic diagnosis was correlated with CECT abdomen, serum amylase or serum lipase levels whichever performed.

RESULTS

Fifty-six patients presenting with signs and symptoms suggestive of pancreatic pathology were evaluated over a period of 12 months.

Majority of the cases consisted of acute pancreatitis- 32 cases (57%). This was followed by pseudopancreatic cyst,

which is a well-known complication of pancreatitis. In our study, it constituted 16 cases (29%). The other pancreatic lesions were pancreatic head mass 4 cases (7%) and chronic pancreatitis- 04 cases (7%).

Sl. No.	Sonographic Diagnosis (No. of Cases)	Final Diagnosis
01	Acute pancreatitis-24 Pancreas obscured due to bowel gases- 08	Acute pancreatitis -32
02	Pseudopancreatic cyst- 16	Pseudopancreatic cyst - 16
03	Pancreatic head mass- 04	Pancreatic head mass - 04
04	Chronic pancreatitis- 04	Chronic pancreatitis - 04

Table 1. Various Pancreatic Lesions (Sonographic vs. Final Diagnosis)

The commonest pathology related to pancreas was acute pancreatitis in 32 cases (57%).

Sl. No.	Symptom	No. of Cases	%
01	Pain in Abdomen	40	71%
02	Vomiting	32	57%
03	Lump/Fullness in Abdomen	16	29%
04	Jaundice	04	07%
05	Pruritis	04	07%

Table 2. Symptoms in Pancreatic Lesions

Pain was the commonest symptom present in 40 cases (71%). This was followed by vomiting in 40 cases (71%), abdominal fullness- 16 cases (29%), jaundice- 04 cases (7%) and pruritis in 04 cases (07%).

Sl. No.	Symptoms	No. of cases	Percentage
01	Pain in abdomen	32	100%
02	Vomiting	28	88%

Table 3. Symptomatology in Acute Pancreatitis

Pain in abdomen was the chief presenting complaints of all (100%) patients of acute pancreatitis. Twenty-eight patients (88%) had associated vomiting.

Sl. No.	Feature	No. of Cases	%
01	Bulky Pancreas	24	75%
02	Decreased Echogenicity of Pancreas	24	75%
02	Peritoneal Fluid	15	47%
03	Pleural Effusion	10	31 %
04	Intrapancreatic/ Peripancreatic Collection	00	00%
05	Pancreatic Calcification	00	00%
06	Pancreatic Duct Dilatation	00	00%
07	Pancreas Obscured Due to Bowel Gases	08	25%

Table 4. Sonographic Features of Acute Pancreatitis

The most common sonographic appearance of acute pancreatitis was diffuse bulky pancreas with decrease in echogenicity seen in 24 cases (75%). Fluid in peritoneal cavity was present in fifteen cases (47%). There was no intrapancreatic or peripancreatic collection in any of the above cases. Pleural effusions were also detected on ultrasound in 10 cases out of total 20 cases which had pleural effusion (Ranging from minimal streak to moderate amount) as detected by ultrasound and CT scan combined. The pancreatic visualisation was not possible in 8 cases (25%) due to overlying bowel gases.

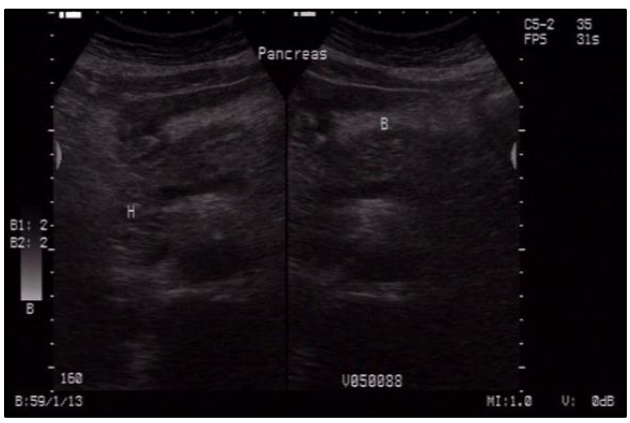

Figure 1. Diffusely Bulky and Hypoechoic Pancreas in Acute Pancreatitis

Figure 2. Corresponding CT Image showing Bulky Pancreas with Fat Stranding - Acute Pancreatitis

01	Alcohol	08	25%
02	Cholelithiasis with Choledocholithiasis	04	12.5%
03	Cholelithiasis	10	31.25%
04	Trauma	01	3.1%

Table 5. Possible Aetiological Factors of Acute Pancreatitis

10 cases (31 %) out of 32 had cholelithiasis. 04 cases (12 %) had cholelithiasis associated with choledocholithiasis. 08 patients (25%) were alcoholic. All of them were male. In 01 case (3.1%) there was a history of trauma followed by traumatic pancreatitis. No obvious aetiological factor could be made out in rest of the 9 cases (32 %).

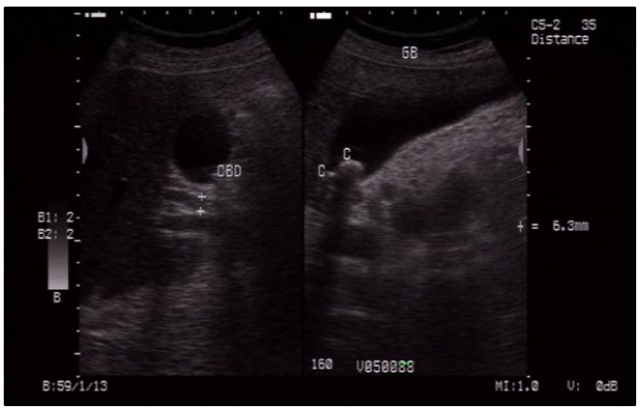

Figure 3. Cholelithiasis in a Case of Acute Pancreatitis

Pseudopancreatic Cyst

16 cases of pseudopancreatic cyst were included in the study. All were male patients. 12 cases (75%) were in the age group 21-40 years. All had the chief complaint of fullness and vague lump in abdomen following an episode of acute abdominal pain in the past. Ultrasound showed thin walled anechoic area suggestive of fluid with well-defined margins in the lesser sac region. The cyst contained internal echoes in dependant part suggestive of sediments. The largest size of the cyst was 13 x 12 x 10 cm with the average size being 10 x 10 x 6 cm. Underlying pancreatic parenchyma was heterogeneous in eleven cases and was not visualised in the region of the cystic area in two patients. In the two patients, pancreas could not be satisfactorily evaluated due to the large cystic area anterior to it pushing the pancreas out of the focal zone. Serum amylase was raised in all the sixteen cases.

Chronic Pancreatitis

The patients had history of recurrent upper abdominal pain, radiating to back, severe on onset. All were diagnosed as acute pancreatitis in the past. USG showed atrophic pancreatic parenchyma with irregular outline and few areas of calcification ranging from fine calcifications to coarse nodular calcifications. Pancreatic duct showed varying degrees of dilatation.

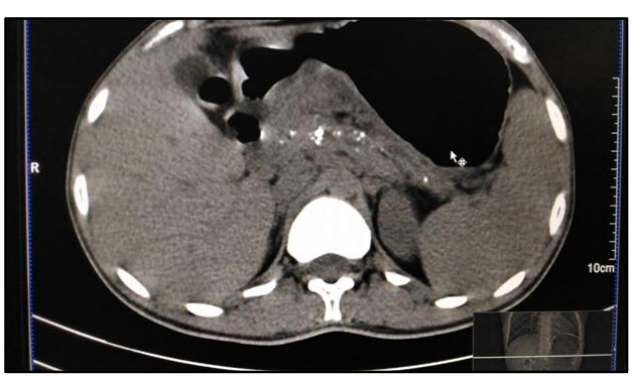

Figure 4. Chronic Pancreatitis as Confirmed on CT scan. Pancreatic Parenchyma Calcifications and Atrophy

Carcinoma Head of Pancreas

Four cases of carcinoma head of pancreas were included in the study. The patients were above 50 years of age. Two of these were male and two were female. All patients had history of jaundice and loss of appetite, associated with pruritis and pain in upper abdomen. Ultrasound demonstrated bilobar intrahepatic biliary radicles dilatation with dilated CBD and pancreatic duct in all the cases with an ill-defined hypoechoic area within the pancreatic head which denoted the mass. The average size of the mass was 3.3 x 2.6 cm. No pancreatic parenchymal calcification was noted. The margins of the dilated pancreatic duct were regular.

Figure 5. Bilobar Intrahepatic Biliary Radicles Dilatation in a Case of Pancreatic Head Mass

Thus, USG was sensitive enough for detection of pancreatic abnormalities. However, in case of acute pancreatitis, the pancreatic view was significantly hampered in 8 (25 %) out of 32 cases due to bowel gases, which tend to be more due to ileus of adjacent bowel. Moreover, the patient was not given water to improve the pancreatic visibility due to the nil per oral status.

Thus, ultrasound could not give a conclusive finding in 8 out of 32 cases of acute pancreatitis. The final diagnosis was confirmed by either CT scan findings or serum amylase/lipase correlation.

DISCUSSION

Fifty-six patients with signs and symptoms suggestive of pancreatic lesions were evaluated over a period of 12 months. The findings were correlated and confirmed with either CT scan findings or serum amylase/lipase levels.

Symptoms were varied. The commonest symptom was pain in abdomen- 40 cases (71%). This was followed by vomiting in 32 cases (57%). Lump /fullness in abdomen was complained by 16 patients (29%) each. Jaundice- 04 cases (7%) and pruritis 04 (07%).

Acute Pancreatitis

32 cases of acute pancreatitis were included in the study. Age group ranged from 18 to 47 years. 18 were female patients and 14 were male.

Luo, Yuan and Peng et al studied 627 patients who underwent ultrasound examination for acute pancreatitis. Among them, 293 were male and 334 were female, aged from 4 to 82 years, with an average of 43.02 years.[3]

Out of the 14 male patients, eight were alcoholic, four had cholelithiasis while one patient had trauma as the predisposing factor. 18 were female patients in which there was associated cholelithiasis in six and cholelithiasis with choledocholithiasis in the other four. Rest of the eight females had no apparent predisposing factors. None of these female patients were alcoholics. Thus, overall biliary tree calculi (Including isolated cases of cholelithiasis and also cholelithiasis with choledocholithiasis) were present in 14

(44%) out of 32 cases of acute pancreatitis. However, whether these calculi were the aetiological factor or mere an incidental finding could not be ascertained, especially for the larger or isolated free floating medium and large-sized calculus.

Steinberg and Tenner observed that gallstones are the most common cause of pancreatitis, accounting for approximately 45 percent of cases. Alcohol is the second most common cause, accounting for 35 percent cases. After gall stones and alcoholism, miscellaneous causes account for approximately 10 percent of cases of acute pancreatitis. Finally, approximately 10 percent of the cases are idiopathic.[4]

The major presenting symptom in all the patients was severe pain in epigastrium, this was associated with few episodes of vomiting in 28 and abdominal trauma in 1 patient. All the patients had a short duration of symptoms. Serum amylase and serum lipase were significantly raised in all the patients (100%). Ultrasound suggested the diagnosis of acute pancreatitis in 24 out of 32 patients. In eight (25%) patients, pancreas and retroperitoneal area was obscured due to bowel gases. Moreover, the patient could not be given water orally to improve the echo window as the patients were kept nil orally.

Schmoller, Kunit and Frick et al said that a precondition for ultrasonic diagnosis of the retroperitoneum is an optimal preparation of the patient to eliminate flatulence in the intestines. If the large vessels of the retroperitoneum are well demarcated, the optimal examination conditions are present.[5]

Munoz and Katerndahl observed that in 35 percent of cases, the pancreas is obscured secondary to bowel gas. Baseline CT scanning is indicated in the following situations: (1) the diagnosis is in doubt; (2) severe pancreatitis is suspected because of high fever (higher than 38.8° C [102°F]), distension and leukocytosis; or (3) the patient has an elevated severity score as determined by the MOSF or APACHE II criteria.[6]

The features suggestive of acute pancreatitis were that of a diffusely bulky hypoechoic pancreas with ill-defined margins. There was no intrapancreatic or peripancreatic collection in any of the case. Fifteen patients had associated fluid in the peritoneal cavity. Ultrasound demonstrated ascites in all the 15 patients who had ascites on CT scan. Due to limitation of proper positioning and breath holding due to pain, pleural effusion was detectable in 10 out of 20 patients with pleural effusion (As present on CT scan).

Badea found that the diagnosis of acute pancreatitis includes the increase in the volume of the pancreas region, structural changes in the parenchyma and significant decrease in echoes. The increase in volume is assessed qualitatively by noting the displacement of abdominal organs (Especially the stomach and the transverse colon) and quantitatively by measuring the anteroposterior diameter at the level of the pancreas body. A diameter exceeding 24 mm at this level as well as a marked anterior convexity of the pancreas corresponds to a pathological increase in volume of the gland, a fact that is associated with oedema.[7]

Pseudopancreatic Cyst

16 patients of clinically suspected pseudopancreatic cyst were included in the study. All were male patients. 12 were of the age group of 21-40 years. All had the chief complaint of fullness and vague lump felt in the abdomen following an episode of acute pain in abdomen in the recent past. Ultrasound could confidently make the diagnosis of pseudopancreatic cyst in all the cases. Sonographic features were a large anechoic area with well-defined contour anterior to the pancreas. The cyst contained internal echoes with dependant sediments. The largest size of the cyst was 13 x 12 x 10 cm with the average size being 10 x 10 x 6 cm. Underlying pancreatic parenchyma was heterogeneous in eleven cases and was not visualised in the region of the cystic area in three patients. In the two patients, pancreas could not be satisfactorily evaluated due to the large cystic area anterior to it pushing the pancreas out of the focal zone. No pancreatic calcification was noted in any of the cases. There was significantly raised serum amylase in all cases. Majority of these cases were treated conservatively. Three cases underwent cystogastrostomy. Ultrasound was recommended as the preferred followup modality for these patients as it is quick, noninvasive and reliable.

Figure 6. Pseudopancreatic Cyst, as Confirmed on CT scan

Pancreatic Head Mass

Four cases of pancreatic head mass were included in the study. These were in age group of 50-75 years. Two were male and two female. There presenting complaints were jaundice and loss of appetite. This was associated with pruritis and pain in upper abdomen.

Freelove and Walling observed pancreatic cancer rarely occurs in persons younger than 50 years, and the risk increases with age. Women account for 57 percent of new cases. Smoking, diabetes, and obesity increase risk. Symptoms primarily are caused by mass effect rather than disruption of exocrine or endocrine function. Jaundice (82%), pain, and weight loss (92%) are classic symptoms of pancreatic cancer. Rising bilirubin levels can cause severe pruritis.[8]

Ultrasound demonstrated bilobar IHBRD, dilated CBD and pancreatic duct in all four cases with a hypoechoic area within the pancreatic head. The average size of the mass was approximately 3.3 x 2.6 cm. No pancreatic parenchymal calcification was noted. The margins of the dilated pancreatic duct were regular. No obvious associated enlarged lymph nodes could be seen on ultrasound. These findings were further confirmed on CT scan.

Costa, Tassinari and Bondi et al found that ultrasound is inexpensive, noninvasive, well accepted by the patients, easily repeated and can be performed at bedside. Intestinal gas and particularly air in duodenum can prevent a complete visualisation of pancreatic head, but usually some manoeuvres such as scanning in the left lateral decubitus, in the upright position or after filling the stomach with fluid can improve the visualisation. Sometimes, mostly in small tumours (Less than 2 cm), the neoplastic lesion is not detectable, while the "indirect signs", such as dilatation of main pancreatic duct and/or common bile duct are well visualised.[9]

Miura, Takada and Hodaka et al observed that the accuracy of conventional US for diagnosing pancreatic tumour is only 50-70%. The presence of obscuring overlying bowel gas and the variable skill of the operator limit the sensitivity of US for identification and staging of pancreatic lesions.[10]

Thus USG accurately diagnosed 48 out of the total 56 cases, comprising of acute pancreatitis, chronic pancreatitis, pseudopancreatic cyst and pancreatic head mass. In 8 (25%) out of total 32 cases of acute pancreatitis, the retroperitoneal (Including the pancreatic) visibility was hampered due to bowel gases (Ileus). In these cases, a further imaging investigation in the form of CT abdomen was needed to establish the diagnosis. In few other cases with diagnosed acute pancreatitis, the CT scan further helped in judging the severity and extent of acute pancreatitis. Thus, in our study, ultrasound has an accuracy of 86% for the detection and evaluation of pancreatic lesions. Hence, we recommend ultrasound as the preferred modality for screening of patients suspected with pancreatic pathology.

CONCLUSION

Fifty-six patients presenting with signs and symptoms suggestive of pancreatic lesions were evaluated over a period of 12 months.

Following Observations were made

1. Patients presented with varied clinical symptoms. The commonest symptom in patients presenting with pancreatic lesions was pain in abdomen in 40 cases (71%). This was followed by vomiting in 28 cases (50%). Abdominal lump was another common complaint in 16 cases (29%).
2. The sensitivity of ultrasound for diagnosis of acute pancreatitis falls due to poor echo window caused by bowel gases. However, it is a noninvasive and reliable tool for diagnosis and followup of the complications of acute pancreatitis like pseudopancreatic cyst.
3. The direct visibility of a small pancreatic head mass may be hampered by bowel gases, but the indirect signs of CBD and pancreatic duct dilatation are helpful indicators of an underlying pancreatic head mass.

In our study, USG correctly detected 48 out of the total 56 cases, thus having an accuracy of 86% for the detection and evaluation of pancreatic lesions.

Ultrasound is the mainstay of radiological investigation for patients presenting with symptoms related to abdominal pathology. It is a safe, quick, reliable, non-invasive and cost effective tool for screening for various abdominal pathologies including pancreas.

In view of these findings, we recommend ultrasound as the primary diagnostic tool for evaluation of various pancreatic lesions.

REFERENCES

[1] Mazzei MA, Guerrini S, Squitieri NC, et al. The role of US examination in the management of acute abdomen. Critical Ultrasound Journal 2013;5(Suppl 1):S6.
[2] Downey DB. The Retroperitoneum and great vessels. In: Rumack CM, Wilson SR, Charboneau JW, et al. eds. Diagnostic Ultrasound. 3rd edn. Missouri: Elsevier Mosby 2005; p. 443.
[3] Luo Y, Yuan CX, Peng YL, et al. Can ultrasound predict the severity of acute pancreatitis early by observing acute fluid collection? World J Gastroenterol 2001;7(2):293-5.
[4] Steinberg W, Tenner S. Acute pancreatitis. N Engl J Med 1994;330(17):1198-210.
[5] Schmoller H, Kunit G, Frick J. Ultrasonic diagnosis of the retroperitoneal space. Eur Urol 1979;5(2):113-6.
[6] Munoz A, Katerndahl DA. Diagnosis and management of acute pancreatitis. Am Fam Physician 2000;62(1):164-74.
[7] Badea R. Ultrasonography of acute pancreatitis-an essay in images. Rom J Gastroenterol 2005;14(1):83-9.
[8] Freelove R, Walling AD. Pancreatic cancer: diagnosis and management. Am Fam Physician 2006;73(3):485-92.
[9] Costa PL, Tassinari M, Bondi A, et al. Pancreatic head mass: what can be done? diagnosis: ultrasonography. J Pancreas 2000;1(Suppl 3):91-4.
[10] Miura F, Takada T, Amano H, et al. Diagnosis of pancreatic cancer. HPB (Oxford) 2006;8(5):337-42.