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Original Research Article

Comparative Evaluation of Two Imaging Modalities and Their Application in the Evaluation of Pancreatic Changes Due to Acute Pancreatitis

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Abstract:

Background and Aim: A common radiological problem is the evaluation of suspected pancreaticobiliary pathology, which is routinely diagnosed using a variety of imaging modalities such as ultrasonography (USG), computed radiography, magnetic resonance cholangiography, and endoscopic retrograde cholangiopancreatography (ERCP). The current study aimed to compare two imaging modalities and their application in the evaluation of pancreatic/peripancreatic alterations caused by acute pancreatitis.

Material and Methods: The current investigation was conducted on 80 patients suspected of having acute pancreatitis, as evidenced by high blood amylase and serum lipase levels, over a two-year period in the Department of Radiodiagnosis at an Indian tertiary care institute. A real-time ultrasound scan of the abdomen and triple-phase contrast-enhanced computed tomographies of the abdomen were performed on all patients.

Results: Males accounted for 70 of the 80 cases included in the study, with 49 cases of acute pancreatitis and 21 cases of acute on chronic pancreatitis. There were ten females, with six cases of acute pancreatitis and four cases of acute or chronic pancreatitis. Both CT and US detected the same number of cases of necrosis involving the body of the pancreas, but US detected one less case of necrosis involving the head of the pancreas than CT, with US detecting 20 cases compared to CT's 21 cases with a sensitivity of 95.5%.

Conclusion: The current investigation revealed that US has comparable sensitivity to CT in detecting fluid accumulation and necrosis in pancreatitis, except in the tail of the pancreas. However, due to its lack of value in thoracic imaging, US failed to detect mediastinal pseudocysts and infected necrosis.

Keywords: Mediastinal Pseudocysts, Necrosis, Pancreatitis, Ultrasonography.

Introduction

Pancreaticobiliary diseases are among the most prevalent and frequently seen conditions in clinical practise. A common radiological problem is the evaluation of suspected pancreaticobiliary pathology, which is routinely diagnosed using a variety of imaging modalities such as ultrasonography (USG), computed radiography, magnetic resonance cholangiography, and endoscopic retrograde cholangiopancreatography (ERCP). Plain abdominal roentgenograms are part of the normal first diagnostic workup for any acute abdominal pain.

In assessing individuals with acute pancreatitis, conventional radiography tests have low sensitivity and specificity. To rule out a perforated hollow viscus, abdominal films are taken in the upright and lateral decubitus positions. Nonspecific features on conventional radiographs in a case of acute pancreatitis include the sentinel loop sign, which is a focused area of adynamic ileus adjacent to an intra-abdominal inflammatory process, and the colon cut-off sign, which reflects a paucity of gas distal to the splenic flexure.[1]

In rare situations of pancreatic abscess, peripancreatic extraluminal gas might be observed. Rifkind et al [2] observed plain film abnormalities such as pancreatic calcification, obscuration of the psoas margin, stomach curvature distortion, greater gastrocolic separation, and pleural effusion being larger on the left in an analysis of 73 cases. Several radiologic prognostic scoring systems for pancreatitis have been developed over the last two decades. The CT severity index (CTSI), developed by Balthazar et al [3] in 1990, is the most extensively used for clinical and research purposes. CTSI is a scoring system that assesses and integrates pancreatic and extrapancreatic inflammation as well as the degree of pancreatic

necrosis.The same author created a modified CTSI in 2004 to address numerous potential restrictions that came from using the CTSI.[4] Extra pancreatic problems were included to the assessment in modified CTSI, and the method of measuring the extent of pancreatic parenchymal necrosis (none, 30%, or > 30%) and objectifying the presence or absence of peripancreatic fluid was simplified. When compared to the CTSI in the initial research of 66 patients, the MCTSI demonstrated a better correlation between the length of hospital stay and, more critically, the development of organ failure, which is the key determinant of mortality in the early phase of AP.[5]

Material and Methods

The current investigation was conducted on 80 patients suspected of having acute pancreatitis, as evidenced by high blood amylase and serum lipase levels, over a two-year period in the Department of Radiodiagnosis at an Indian tertiary care institute.

- All instances of acute pancreatitis with high serum amylase and serum lipase levels were included.
- The study included patients who agreed to participate.

Criteria for Exclusion

- Patients with contraindications to intravenous contrast agents • Pregnant women • Traumatic pancreatitis
- The study included patients who were willing to provide written informed permission. This study collected demographic, clinical, and laboratory data on all consecutive patients who met the inclusion and exclusion criteria and had a primary diagnosis of acute pancreatitis throughout the one-and-a-half-year study period. They all had a real-time ultrasound scan of the abdomen with a Philips IU22 curvilinear transducer of 2 to 6 MHz and triple-phase contrast-enhanced computed tomography of the abdomen with a Philips INGENUITY 128 slice CT in Victoria Hospital or a Siemens SOMATOM 6 slice CT in Bowring hospital, as described below.
- The triple-phase contrast-enhanced computed tomography scan protocol
- The pancreas is evaluated using a triple phase dynamic scan of the whole pancreatic. CT is performed from the hepatic dome to the iliac crest using 5 mm-thick slices and 2.5 mm reconstructions. A power injector is used to deliver 120 to 150 mL of intravenous contrast through a 20-gaugeAngio catheter at a rate of 4 to 5 mL/second. Each phase should ideally be completed in a single breath-hold.
- An arterial-phase scan of the upper abdomen is acquired 25 to 30 seconds 28 after the start of the contrast injection, with reconstructions of 1.25 mm utilising 2.5 mm thick slices. The liver and pancreas both have arterial opacification, with little contrast in the portal vein.
- With 2.5 mm reconstructions utilising 5 mm thick slices, the pancreatic or parenchymal phase of the upper abdomen is achieved 45 to 50 seconds 28 after the commencement of contrast administration.
- A portal-venous or hepatic phase scan of the entire abdomen is taken 65-70 seconds 28 after the start of the contrast injection, using 2.5 mm reconstructions on 5 mm-thick slices.

Statistical investigation

The collected data was assembled and input into a spreadsheet programme (Microsoft Excel 2007) before being exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). The confidence level and level of significance for all tests were set at 95% and 5%, respectively.

Results

The age range 41-50 years has the highest number of patients with acute pancreatitis. The age range of 41-50 years has the highest number of people with acute or chronic pancreatitis.

Males made up 70 of the 80 cases in the study, with 49 cases of acute pancreatitis and 21 cases of acute and chronic pancreatitis. There were ten females, with six cases of acute pancreatitis and four cases of acute or chronic pancreatitis.

Both US and CT were able to distinguish between normal-sized pancreatic, pancreas with increased head and body size, and atrophic pancreas. However, only 16 cases were identified by the US, compared to 52 by CT, which was statistically significant (p 0.001).

With a sensitivity of 80%, the US detected 26 cases of acute peripancreatic fluid collection compared to 33 cases by CT. Both US and CT detected the same number of hepatic, splenic, and pararenal space pseudocysts. The US found three cases of smaller sac pseudocysts compared to four cases by CT with an 80% sensitivity and twenty cases of peripancreatic pseudocysts compared to 21 cases by CT with a 95% sensitivity. The ultrasound and CT both detected one case of hemorrhagic peripancreatic pseudocyst.

Both CT and US detected the same number of cases of necrosis involving the body of the pancreas, but US detected one less case of necrosis involving the head of the pancreas than CT, with US detecting 20 cases compared to CT's 21 cases with a sensitivity of 95.5%.

Table 1: Age distribution of acute and acute on chronic pancreatitis

Age (in Years)	Patients with Acute Pancreatitis N (%)	Patients with Acute on Chronic Pancreatitis N (%)
<20	4 (7.27)	2 (8)
21-30	13 (23.63)	6 (24)
31-40	13 (23.63)	7 (28)
41-50	17 (30.9)	8 (32)
51-60	5 (9.09)	1 (4)
>60	3 (5.45)	1 (4)
Total	55	25

Table 2: Gender distribution of acute and acute on chronic pancreatitis

Type of pancreatitis	Male	Female	Total
Acute Pancreatitis	49	6	55
Acute on ChronicPancreatitis	21	4	25
Total	70	10	70

Table 3: Distribution according to pancreatic/peripancreatic changes (Fluid collection)

Pancreatic/peripancreatic changes (fluid collection)		Modality	
		US	MDTC
Acute peripancreatic fluid collection (<4weeks)		26	33
Pseudocysts	Peripancreatic	19	20
	Hepatic	6	6
	Splenic	4	4
	Thoracic/mediastinal	0	4
	Lesser sac	3	4
	Psoas muscle	0	1
	Pararenal space (right/left)	9	9
	Peripancreatic	19	20

Discussion

Several imaging techniques are utilised to evaluate pancreaticobiliary diseases; the most widely used noninvasive modalities are USG, computed tomography (CT), and MRCP. The most often utilised invasive procedures are percutaneous transhepatic cholangiography (PTC) and endoscopic retrograde cholangiopancreatography (ERCP). In the first diagnosis of chronic pancreatitis, EUS, ERCP, MRI, and CT all show comparable good diagnostic accuracy. EUS and ERCP outperform, whereas the US has the lowest accuracy. Thus, the choice of imaging modalities can be determined based on invasiveness, local availability, experience, and cost.

The average age of the patients in this study was 39.2 + 11.7 years. This was comparable to Silverstein et al.[6] study, in which the mean age was 32 years. These findings were consistent with earlier research[7,8]. The majority of patients in this study were between the ages of 41 and 50. The youngest patient was 18 years old, and the oldest was 71 years old. The majority of the patients in the current study were males, as opposed to females. This ratio was higher than in the previous investigations. [9,10] Ferrari et al [11] evaluated 131 cases, with males accounting for 47% and females accounting for 53%. Upadhyaya et al [12] evaluated 100 patients, 46% of whom were men and 54% of whom were women. Kushwah et al. investigated 50 patients, 20 (40%) of whom were males and 30 (50%) of whom were girls. In our study of 50 patients, 32% were males and 68% were females, which are similar to Kushwah et al. [13] Alcoholism, which was the most common cause of acute pancreatitis, may have contributed to the increase in males. In the current study, it was also discovered that males with acute pancreatitis tended to be older than females. Males with acute pancreatitis were older than females, according to Silverstein et al.[6]

The current investigation found a normal pancreas in 7 cases, an enlarged head in 49 cases, an enlarged body in 44 cases, and an expanded tail in 14 cases. Atrophic pancreas was found in 13 of the patients. In comparison, Calleja G.A and J.S Barkin [14] reported that overlaying intestinal gas problems concealed the pancreas in 40% of patients. The yield in the current investigation was considerably higher, with abnormality recognised in 78% of the cases and hidden in 22%.

The current investigation found acute peripancreatic fluid accumulation in 26 instances. Pseudopancreatic pseudocysts were found in 20 cases, hepatic pseudocysts in 6, splenic pseudocysts in 4, pararenal pseudocysts in 9, and smaller sac pseudocysts in 4. The current study did not find a single incidence of mediastinal pseudocyst. The

United States discovered one case of a hemorrhagic peripancreatic pseudocyst. US identified pseudocyst in 46% of subjects. Gonzalez et al[15] found that pseudocyst development occurred in 52.5% of 99 pancreatitis patients studied. US observed 19 cases of pancreatic necrosis involving the head, 21 cases involving the pancreatic body, and 2 cases involving the tail in the current study. In our investigation, we found acute extra pancreatic necrosis (4 weeks duration) in 15 cases of the head, 21 cases of the body, and 2 cases of the tail of the pancreas. One instance had peripancreatic walled off necrosis.

Conclusion

Except in the region of the pancreas' tail, the current investigation indicated that US had equivalent sensitivity to CT in detecting fluid collection and necrosis in pancreatitis. However, due to its lack of value in thoracic imaging, US failed to detect mediastinal pseudocysts and infected necrosis.

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