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RESEARCH ARTICLE
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ROLE OF IMAGING MODALITIES IN THE DIAGNOSIS OF ACUTE PANCREATITIS.

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ABSTRACT

Introduction: Acute pancreatitis is an acute inflammatory disorder of the pancreas that can range from mild, self-limiting symptoms to severe, life-threatening illness with multiorgan failure. Accurate and timely diagnosis is essential, with imaging playing a critical role.

Material and Methods: A prospective observational study was conducted over two years in the Department of Radiodiagnosis in collaboration with the Department of Surgery, NC Medical College and Hospital, Israna, Panipat. Patients of either gender, aged 20–70 years, admitted with acute pancreatitis were included. Ultrasonography (USG) was performed using Voluson P8 with curvilinear, linear, and Doppler probes. Contrast-enhanced CT (CECT) was carried out using a GE 32-slice CT scanner, and MRI was performed on a 1.5 Tesla Siemens system.

Results: USG detected pancreatic enlargement, altered echotexture, and peripancreatic fluid collections, with a sensitivity of 87% for diagnosing acute pancreatitis. CT demonstrated 100% sensitivity in visualization and size assessment of the pancreas, and was superior in detecting complications that were missed on USG. While USG proved to be a rapid, non-invasive, safe, and cost-effective initial screening tool, CT provided more detailed diagnostic information and better delineation of disease extent.

Conclusion: CT scan remains the gold standard for diagnosing and staging acute pancreatitis. However, USG is a valuable first-line modality in emergency and critical care settings, serving as an initial screening technique that can be supplemented by CT for confirmation and evaluation of complications.

Keywords: Acute pancreatitis, Ultrasonography, CT scan, Diagnosis.

INTRODUCTION

Pancreas is a dual gland having endocrine and exocrine function and a difficult organ to evaluate by both clinical finding and radio-imaging modalities. 80% volume of pancreas is contributed by the exocrine part, 2% by the endocrine β-islets that secretes pancreatic hormones and rest 18% is formed by the ducts and blood vessels. Exocrine pancreas has role in digestion and resembles salivary gland as it has secretory units; acini having zymogen granules that discharge by exocytosis.[1] In India, acute pancreatitis is a common pathological condition with overall prevalence of 8/1,00,000 cases presenting with pain abdomen whereas worldwide the annual incidence is 5-50/1,00,000.[2] Acute

inflammation of pancreas is associated with increase in pancreatic enzymes, that is premature activation of phospholipase A2 in pancreatic duct that causes formation of lyso-phosphatidylcholine from phosphatidylcholine; resulting in disruption of pancreatic tissue and necrosis of surrounding fat; characterized by severe epigastric pain radiating to back in 50% patients, fever, nausea, vomiting and loss of appetite. Serum pancreatic amylase or lipase levels are increased in blood.[3] Though a combination of clinical and laboratory findings permit an accurate diagnosis of acute pancreatitis, however the radio-imaging techniques serve as reliable tool in the diagnosis of pancreatic pathologies. Earlier studies of conventional radiographs were nonspecific for pancreatic pathology and inflammatory changes but imaging with ultrasound and computed tomography has afforded quick, reliable accurate and non-invasive evaluation of pancreas.[4] Sometimes the history/clinical symptoms may be misleading and biochemical parameters such as serum amylase can be raised in some other non-pancreatic pathologies like intestinal obstruction, intestinal perforation, peritonitis, ectopic pregnancy, hepatic cirrhosis etc. and all these conditions form a differential diagnosis for acute pancreatitis which can be excluded by screening ultrasonogram and estimation of serum lipase levels. Level of serum amylase can be normal when the test is conducted few days after the initial attack of acute pancreatitis. Plain abdominal radiographs can contribute in the diagnosis of pancreatic calcifications and to exclude hollow viscus perforations but have not much role in the diagnosis of acute pancreatitis.[5] Ultrasonography served as the first reliable, cost effective, reproducible, non-invasive, cross-sectional view of pancreatic anatomy and radiation free imaging, but it has limitations in obese patients and those with large amounts of bowel gas.[6]. CT scan doesn't have these limitations but is expensive and exposes patients to ionizing radiation.[5] On the other hand, CT scan facilitates pancreatic imaging in finer detail.[7] The present study was designed to understand the role of imaging modalities in the diagnosis of pancreatitis.

MATERIAL AND METHOD

The present study was conducted in the department of Radiodiagnosis in collaboration with the department of Surgery in NC Medical College and Hospital, Panipat over a period of 02 years.

Study type: The study was prospective observational study conducted on the patients of either gender under the age group 20-70 years admitted in surgery department.

Ultrasound machine- Voluson P8 with curvilinear transducer, high frequency linear array transducer and Doppler probe

CT scan- GE Healthcare 32 slice CT scan machine.

MRI - 1.5 tesla Siemens.

Inclusion criteria

- Patients of age group between 20 to 70 years irrespective of gender; diagnosed with acute pancreatitis based on either USG or CT scan techniques along with clinical and biochemical profile suggestive of pancreatitis

Exclusion criteria

- Pregnant or expecting pregnancy
- Not willing to participate in study
- Previous history of hypersensitivity reactions, bronchial asthma- for CT
- Altered renal functions
- Patients in whom the diagnosis was based only on clinical profile without undergoing imaging modality

Methodology

Informed consent was taken from all the participants. The study group included 50 participants of both male and female gender between 20 to 70 years of age. A detailed clinical history was taken and examination was done after admission in the hospital. Routine investigations were done such as

complete blood count, serum calcium, blood urea, serum amylase. Ultrasonography, CT scan, MRI were done using the above mentioned equipment.

Statistical analysis- The data was collected and entered in MS excel sheet and analyzed using standard statistical tests using SPSS software ver. 23

RESULTS

Out of 50 participants, 28 were males (56%) and 22 were females (44%) [Figure 1.1]. Maximum cases are between the age group 31-40 years (figure 1.2) and least between 61-70 years. Based on the size, out of 45 patients whose pancreas was visualized in USG, it was enlarged in 42 patients and appeared normal in 3 patients (figure 1.3). Out of these 45 patients in whom pancreas was visualized, 43 cases were visualized fair to excellent, shape was normal in all and 41 patients had hypo-echoic texture (table 1.1). Ascites was observed in 28 patients, fatty liver in 12 cases and gallstones were seen in 4 patients (table 1.2). On CT scan, pancreas was visualized in all cases (100%). 43 cases reported bulky pancreas on CT scan, 2 had normal size and 5 have contracted pancreas. Calcification was seen in 4 cases and focal lesions in 9 patients. Exudates were observed in 24 patients. Pleural effusion was seen in 26 cases. 21 patients reported to be having fatty liver, 3 cases had cholecystitis and 2 had portal vein thrombosis (table 1.3).

FIGURES

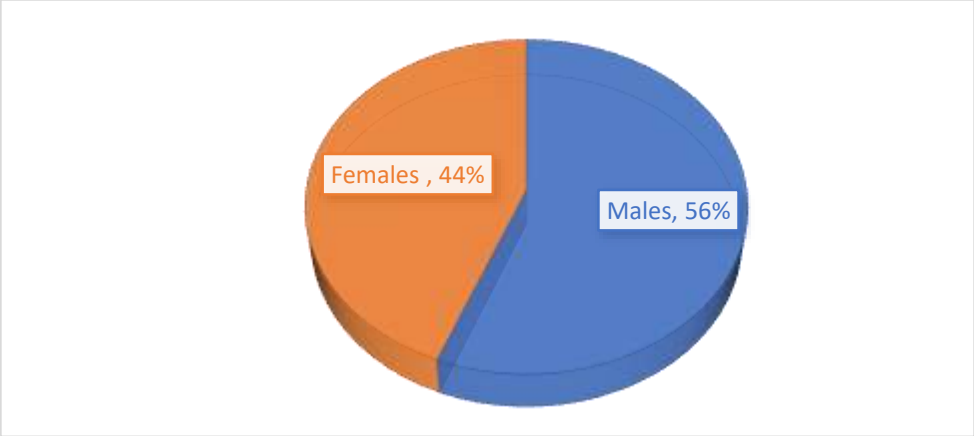

Figure 1.1 Gender distribution in the study.

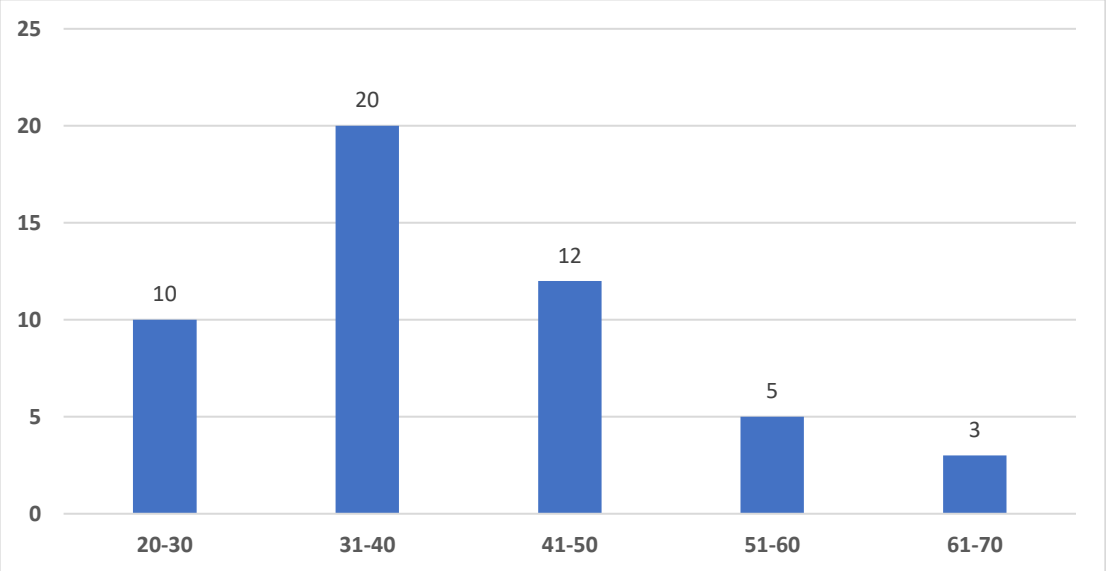

Figure 1.2 Age distribution in the study

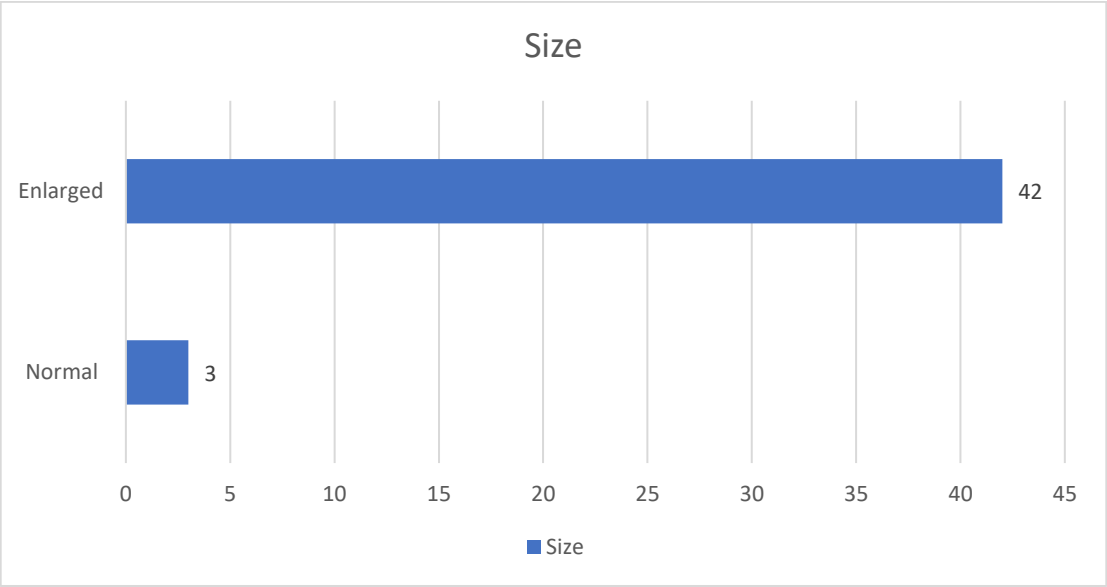

Figure 1.3 Pancreatic enlargement- based on size.

TABLES

Table 1.1 Intra pancreatic findings on USG in acute pancreatitis

USG appearance	Categorization	Number of cases
Visualization	Fair to excellent	43
Shape	Normal	46
	Altered	0
Echotexture	Hyper-echoic	0
	Hypo-echoic	41
	Mixed	0

Table 1.2 Extra pancreatic findings on USG in acute pancreatitis

Findings	Cases (46)
Ascites	28
Fatty liver	12
Gallstones	4

Table 1.3 Intrapancreatic and extra-pancreatic findings on CT scan in acute pancreatitis

Findings		Number of cases
SIZE OF PANCREAS	Normal	2
	Bulky	5
	Contracted	43
INTRAPANCREATIC FINDINGS	Calcification	4
	Focal lesions	9
EXTRAPANCREATIC FINDINGS	Fatty liver	21
	Pleural effusion	24
	Portal vein thrombosis	2
	Cholecystitis	3

DISCUSSION

Acute pancreatitis is a common disease entity presenting to the surgical emergency. Most common cause of acute pancreatitis in our country is alcoholism with male preponderance and most commonly presenting in the 4th decade of life.[2] In the studies conducted by Buchler MW et al[8] (61%), the incidence of male cases was higher, which is in concurrence with our study. While diagnosing a case of acute pancreatitis, a thorough medical history has to be taken, a complete physical examination has to be done and biochemical profile needs to be completed. Radio-imaging techniques are needed for conformation. The management is mainly conservative but surgery is required when there is biliary pancreatitis and if complications develop secondary to acute pathology.[9] In a study conducted by Jeffrey et al one third of the patients with acute oedematous pancreatitis had an enlarged gland.[10,11] Due to the oedema, a bulky hypo-echoic pancreas is the characteristic of oedematous pancreatitis. However always this is not true and in a study by Jeffrey etal, one series has shown this finding only in a one third of patients with oedematous pancreatitis.[11] In our study 41 patients reported hypo-echoic texture of pancreas on USG. Overall visualization of pancreas was much better by CT scan as compared to USG. In our study 90% visualization of pancreas was by USG and 100% by CT. In a study done between 1979-1980 on around 102 patients, good to excellent visualization of pancreas was seen in 64% of CT scans as compared to 20% by sonography techniques.[12] With improvement and advancement in the technology, visualization of pancreas is much better on both the modalities; as evident in our study.[13,14] In a study conducted by Garber S and William R, it was observed that CT scan had a sensitivity around 96% primarily because of better visualization (100%) and better assessment of the size.[15] However in a study done by Meire and Dewbury , the positive predictive value of both ultrasound and CT was 100%.[16] In the study done by Uma Maheshwari Rao and Sree Lalitha, it was observed that Ultrasonography visualized pancreas on about 70% patients, whereas CT visualized pancreas in 100% patients and hence it was found that CT is the investigation of choice for pancreatitis evaluation.[5] As suggested by Balthazar et al, USH should be the first diagnostic step whenever the pancreatic disease is suspected.[17]

CONCLUSION

Ultrasonography and CT scan have their own roles to play in the diagnosis of acute pancreatitis, whereas it can be said that USG is useful as the initial screening tool and CT scan as the definitive diagnostic modality. USG is simple, non-invasive, inexpensive and safe technique in the imaging of pancreatitis, but CT scan overcomes the limitations of ultrasonography and is a confirmative investigation in the diagnosis and staging of acute pancreatitis and more useful modality in the assessment of the severity of the disease. Therefore, Ultrasonography is the initial investigative tool which is supplemented by CT scan; yielding the confirmative investigative modality in the diagnosis and staging of acute pancreatitis.

REFERENCES

1. Singh H, Singh I, Yadav M. Structure and functions of gastrointestinal system. In: Textbook of Physiology for Medical Students. 2nd ed. New Delhi. Elsevier;2023:p264.
2. Williams NS, Bulstrode CJK, O'Connell PR. The pancreas. In: Bailey and Love's Short practice of Surgery. 25th ed. Hodder Arnold London;2008:p1130-53.
3. Singh H, Singh I, Yadav M. Gastrointestinal secretions. In: Textbook of Physiology for Medical Students. 2nd ed. New Delhi. Elsevier;2023:p278.
4. Lalith S, Illagovan G. Comparative study of ultrasonography and computed tomography in diagnosis of acute pancreatitis. International Journal of Contemporary Medicine Surgery and Radiology.2019; 4(3):28-33.
5. M Uma Maheswara Rao, Sree Lalitha S.P.J, Saai Raghuvendra. "Ultrasonography v/s Computed tomography in the evaluation of Pancreatitis: A Preliminary study". Journal of Evolution of Medical and Dental Sciences.2015;4(35):6099-110.
6. Silverstein W, Isikoff MB, Hill MC, Barkin J. Diagnostic imaging of acute pancreatitis prospective study using CT and sonography.AJR.1981;137(3):497-502.

7. Calleja GA, Barkin JS. Acute pancreatitis. Medical Clin North Am,1993;77(5):1037-55.
8. Buchler MW, Gloor B, Muller CA et al. Acute necrotizing pancreatitis:treatment strategy according to the status of infection.Ann Surg.2000;232:619-26.
9. Shah PS, Shah SC et al. Aetiology and pathogenesis of acute pancreatitis, chapter 2 Management of acute pancreatitis, by Bhansali SK and Shah SC, Jaslok hospital. 2006:2-6.
10. Jeffrey Jr RB, "Sonography in acute pancreatitis" Radio Clin N Am.1989;27(1):5-17
11. Jeffrey Jr RB, Federle MP, Crass RA."Computed tomography of pancreatic trauma" radiology.1993;147:491-4
12. Sheedy PF, Stephen DH, Hattery RR, MacCarty RL, Williamson Jr B- Computed Tomography of the Pancreas. Radiol Clin Am.1977;15(3):349-66
13. Freeny PC-Radiology of the Pancreas;Two decades of Progress in imaging and intervention.AJR,1988;150:975-81
14. Hessel SJ et al. A prospective evaluation of Computed Tomography and Ultrasound of the Pancreas.Radiology.1982;143:129-33
15. Garber As, William R Lees.Pancreatic inflammatory disease:In Abdominal and General Ultrasound.Cosgrove DH.
16. Meire, K Dewbury Ed.Edinburgh:Churchill Livingstone.1993;1023:143-56.
17. Balthazar EJ.Complication of acute pancreatitis clinical and CT evaluation.Radiol Clin Am.2002;40(5):1211-27.