



Diagnostic accuracy of ultrasound and CECT abdomen and pelvis in acute pancreatitis and reflection over its management

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ABSTRACT Acute pancreatitis has a highly variable clinical course which is a very common condition. The management of acute pancreatitis patients from diagnosis to treatment is mainly dependent in a radiologist who plays a vital role in the diagnosis and staging to identification and treatment of complications, as well as in determining the underlying aetiology. The aim of this article is (i) to find out the diagnostic accuracy of Ultrasound and Contrast Enhanced Computed Tomography (CECT) of abdomen and pelvis in acute pancreatitis by the appearances of the various stages of pancreatitis, the evidence for the use of staging classifications and the associated complications. (ii) To manage the cases according to the reflection of the techniques. In this study which found CECT abdomen has better accuracy than the ultrasound, but due to cost effectiveness of ultrasound, it is considered as first line of diagnostic technique in our set up.

KEYWORDS : Acute pancreatitis, Ultrasound, CECT

Introduction

Oldest reference of pancreas dates back to as far as 300 BC when Herophilus first identified it. However the identification of the vital exocrine function of pancreas in the digestion is credited to the great Claude Bernard, the French physiologist. This came only after two millenniums in the 19th century. He through his animal experiments proved beyond doubt the digestive function of the gland. He was also the first one to identify that bile can induce pancreatitis. His noble work not only lead to the historical start of pancreatic enzyme supplementation but also paved the path for further study on the etiopathogenesis of the disease. The association of acute pancreatitis to chronic alcoholism and gallstone disease makes it understandable that the disease has been present in humans since antiquity. Chiari in 1886 described the pathophysiology of pancreatitis when he said that "the pancreas succumbs to its own digestive process".¹ In 1878 Friedrich linked chronic inflammation of the pancreas per se to alcoholism. He designated the condition as "Drunkard's Pancreas".² In light of Bernard's work and on his autopsy findings of two patients who died of acute pancreatitis, Opie in the early 20th century proposed the famous Common Channel Hypothesis. This was universally accepted and remained in vogue for several decades despite various attempts to refute the hypothesis.³ Finally the experiments on American Opossums conclusively disproved "Opie's Myth". Various other hypothesis to explain how gallstone passage causes pancreatitis were proposed such as "Impaired outflow Hypothesis" based on pancreatic duct obstruction caused by stone impacted at the distal CBD and "Duodenal reflux hypothesis" based on transient incompetence of sphincter of Oddi by passage of gallstones leading to reflux of duodenal contents.

Acute pancreatitis was such a curse on chronic alcoholics and some patients with gallstone diseases that Moynihan in 1925 described it as "the most terrible of all the calamities that occur in connection with the abdominal viscera". He summed up the indications and detailed procedures of the operations.⁴ The identification of serum amylase in the 1929 led to the spectrum of biochemical investigations for the confirmation of the diagnosis. However elevated serum amylase still continues to be the most commonly used investigation to confirm acute pancreatitis.

The identification of hereditary pancreatitis in the 1950's gave an insight on the genetic mechanism of the disease. Various other less common causes of acute pancreatitis were identified lately. Ranson proposed a system based on multiple indices to classify acute pancreatitis into mild and severe grades in the 1970's. It was soon followed by several other systems to assess the severity of the disease. This was found invaluable in appropriate triage and management of the severe cases in ICU with invasive monitoring and full supportive therapy. It was the pioneering work of Steer and Saluja (1999) who described the cellular mechanism of acute pancreatitis known as the co-localization theory.⁵ The need to define and classify pancreatitis across the globe led to four international consensus meeting over 40 years; however the issue is still under critical revision. Ultrasonography was a useful imaging investigation, until CT was introduced in the picture. The high quality images provided not only the morphological description of the disease but led to early identification of severe variety of pancreatitis, which was crucial to improve the prognosis in patients. CT was able to identify pancreatic necrosis as early as third day of the attack, and was very useful for following patients with other complications such as pseudocysts etc. CT images lead Balthazar to describe a CT severity index to identify severe cases.⁶ The treatment of this disease was basically conservative for the initial era. Role of surgery in certain complications like Pancreatic abscess and gangrene was suggested as early as 1886 by Senn and described as late as by Bem and Bradley et al in the 1998's and till date also where it is limited to the above mentioned complications and for biliary surgery.⁷

Major improvements in the field of ICU care, CT giving reliable early reports of pancreatitis, antibiotics to prevent septic complications in severe cases, ERCP in gallstone pancreatitis led to decrease in mortality.⁸ Therefore last century saw great advances made in the understanding of the disease, its diagnosis and management. This was made possible only by vast improvements in the field of science and technology.

The disease has been present in all corners of the world. Various studies from different countries have observed varied results in the incidence and distribution pattern of the disease.^{9,10,11} These temporal and spatial differences were attributed to alcohol consumption

pattern. These have also led to the identification of appropriate centres where severe cases can be managed. Thus giving an idea of the present health infrastructure of the community and the fields where improvements are required. With the AIDS pandemic, a rise in the incidence of the disease has been noted possibly due to drug induced pancreatitis from the use of Highly Active Anti Retroviral Therapy (HAART) regime

Materials and methods

This study comprises of 73 patients of acute pancreatitis admitted in IMS and SUM Hospital, Bhubaneswar during the period of Sept. 2014 to Sept. 2016. The study included patients whose diagnosis of acute pancreatitis was confirmed using the criteria of elevated serum amylase or lipase more than three times of their normal upper limit and other investigations. All patients selected for this study were subjected to detailed history taking, full clinical examination, relevant haematological, biochemical and radiological examination. History of Presenting Illness, pain, nausea and vomiting. Features suggestive of paralytic ileus such as distension, not passing faeces and flatus

Statistical Analysis

Chi-square test was used for evaluation of the significance of difference in distribution of different data arrays. Irrespective of the method used, differences between various parameters among different groups were considered significant if the p value was less than 0.05. If p value was >0.05 then the differences were considered statistically insignificant. Gallstones and alcohol were found to be the two most important etiological factors (86%) to be considered in patients of acute pancreatitis. Gallstones were found to be the commonest etiological factor (52%) of acute pancreatitis in the region.

Results & Discussion

Acute pancreatitis was found to be almost equally common in both sexes. Cases of acute pancreatitis associated with alcoholism, were mostly seen in the 20-39 year age group (76.66%). Acute alcoholic pancreatitis was responsible for majority of cases of acute pancreatitis in males (66.67%) however it was uncommon in the general female population (18.99%) of Odisha (Table-1).

Table 1, Age incidence of acute pancreatitis among patients studied

| Age group (years) | gallstone | Alcohol | Total | p value | Chi-square |
|-------------------|-------------|-------------|-------------|---------|------------|
| <39 | 7 (23.23%) | 23 (76.66%) | 30 (41.09%) | <0.0001 | 29.572 |
| >39 | 37 (86.09%) | 6 (13.95%) | 43 (58.9%) | | |

This is consistent with prevalent consumption pattern of alcohol in the male population of Odisha which is much less in females. Most cases (86.09%) of gallstone associated acute pancreatitis in both males and females were seen in the 50-69 year age group, which parallels the incidence of gallstone disease in them. Acute pancreatitis associated with gallstones was responsible for majority (81%) of cases in females (Table-2).

Table-2, Comparison of acute pancreatitis due to different causes in the male and female population in the study

| SEX | Gallstone | Alcohol | Total | Chi-square | p value |
|--------|-------------|-------------|-------------|------------|---------|
| Female | 30 (81.08%) | 7 (18.99%) | 37 (50.68%) | 18.687 | 0.0001 |
| Male | 12 (33.34%) | 34 (66.67%) | 36 (49.31%) | | |

Gallstone induced pancreatitis was found to be almost twice more common in the females than in males in the population. This correlates well with the higher incidence of gallstone disease in females. Pain abdomen had been the symptom most consistently present in patients of acute pancreatitis in the series. Detailed history of pain may therefore help in differentiating acute

pancreatitis from other conditions, nevertheless the diagnosis of acute pancreatitis should always be considered in patients presenting with any acute upper abdomen pain. The details of the various symptoms like nausea and vomiting, retching or hiccoughs, abdominal distension, not passing stool and flatus, fever and signs like tachycardia, tachypnoea, hypotension, Icterus, abdominal distension, tenderness, guarding/rigidity, ascites, absent/reduced bowel sound, pleural effusion underscore the importance of variation of presentation.

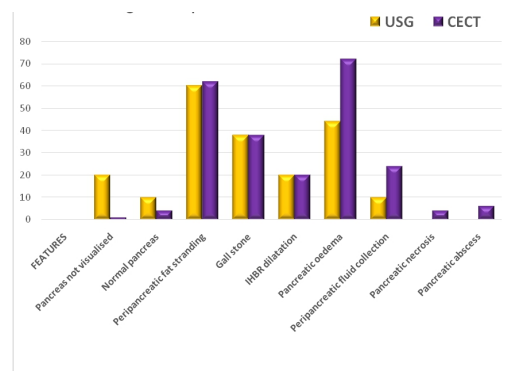
In the present study diagnosis of acute pancreatitis was confirmed by an elevated serum amylase and/or lipase more than three times their normal upper limit. It was seen that although serum amylase was elevated more than the diagnostic criteria in most cases (82%), lipase was elevated in all the cases. This may be related to the large number of alcoholic patients in the study where amylase is usually not always increased. Thus Serum lipase is a more reliable biochemical test than serum amylase in the diagnosis of acute pancreatitis. Serum bilirubin and alkaline phosphatase levels were consistently elevated in gallstone pancreatitis and were of help in diagnosing gallstone induced pancreatitis. Ultrasonography was found to be efficient imaging investigation in detecting gallstones in cases of acute pancreatitis, therefore helps in confirming biliary etiology. It should be done early in patients of acute pancreatitis to exclude biliary etiology. This may help in planning early intervention if required. In our series of 73 patients, USG could not visualize pancreas in 20 patients (27%) and gallstones were accurately detected in 38 cases (52%). Peripancreatic fat stranding was detected in 60 cases (82%). Pancreatic edema was detected in only 44 cases (60%) (Table-3).

Table 3, Comparison of USG and CECT

| FEATURES | NO. OF CASES | NO. OF CASES |
|---------------------------------|--------------|--------------|
| Pancreas not visualized | 20(27%) | 1(1.4%) |
| Normal pancreas | 10(13.2%) | 4(5.4%) |
| Peripancreatic fat stranding | 60(82%) | 62(84.9%) |
| Gall stone | 38(52%) | 38(52.05%) |
| IHBR dilatation | 20(27%) | 20(27.6%) |
| Pancreatic oedema | 44(60.2%) | 72(98.6%) |
| Peripancreatic fluid collection | 10(13.6%) | 24(32.8%) |
| Pancreatic necrosis | 0 | 4(5.4%) |
| Pancreatic abscess | 0 | 6(8.2%) |

Ranson's scoring demonstrated that most (79.5%) cases of acute pancreatitis were of mild severity. Severe acute pancreatitis was detected in 18 out of 73 (24.7%) cases. CT could visualize pancreatic pathology in 100% cases. Both the pancreatic and extrapancreatic complications could be detected accurately. Management protocol according to Balthazar CTSI had 35 cases (47.9%) in mild grade, 21 cases (28%) in moderate, 17 cases (23%) in severe grade. The modified CTSI had a slightly different percentage of cases. Mild-25 cases (34.2%), Moderate 26(35%), Severe -22 (30.1%). 5 cases out of 26 in the moderate grade developed complications (19.2%) and the mortality was 3.8%. In the severe grade 8 cases developed complications, (36.3%) and mortality was 13.6% (Figure-1).

Figure-1 – Comparison of CECT abdomen and Ultrasound features



CT scan was found to be excellent investigation in cases of acute pancreatitis by demonstrating enlargement or edema of pancreas, peripancreatic fluid collection, pancreatic necrosis, gallstones etc.

Conclusion

There is a significant correlation between acute pancreatitis severity degree in USG and CECT results according to Balthazar score. CT and USG results significantly correlate with acute pancreatitis severity by Ranson's score. CTSI scoring system determined the grades of acute pancreatitis and its management policies in around 90-95% of cases. Early identification of acute pancreatitis and their appropriate management in ICU with appropriate invasive monitoring and adequate supportive therapy is vital to improve the prognosis in patients of acute pancreatitis

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