DIAGNOSTIC ACCURACY OF TRANSABDOMINAL ULTRASOUND IN ACUTE PANCREATITIS TAKING CONTRAST ENHANCED CT AS GOLD STANDARD

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Abstract

Objective: To determine the diagnostic accuracy of transabdominal ultrasound in diagnosing acute pancreatitis taking contrast enhanced CT as a gold standard.

Background: Pancreatitis is an inflammation of pancreas in which pancreatic enzymes acts on pancreatic parenchyma and cause necrosis of gland. The outcome does not affect morphology and function of pancreas this process is known as acute pancreatitis. Recurrent attacks of pancreatitis cause abnormality in it structure and also in function; these recurrent attacks are known as chronic pancreatitis.

Methods: A cross sectional was carried out in the Department of Radiology, Hayatabad Medical Complex Peshawar from July, 2018 to Jan, 2019 (06 months). A lower-frequency transducer of 3.5 to 5 MHz curved array was selected. Longitudinal transabdominal sonogram of pancreas was obtained and then CT of the abdomen pelvis with and without contrast was done. All patients of either gender, 18-60 years old having acute pancreatitis, were taken to contribute in the study.

Results: As per acute pancreatitis on transabdominal ultrasound, 34 (13.78%) patients were diagnosed with acute pancreatitis. As per acute pancreatitis on CT scan, 41 (16.73%) were diagnosed with acute pancreatitis. As per trans abdominal ultrasound, sensitivity was recorded as 45.33%, specificity was (49.16%), positive predictive value (PPV) 13.88%, negative predictive value (NPV) 83.27% whereas accuracy was recorded as 48.57%.

Conclusion: Transabdominal ultrasound is a safe and authentic method for the diagnosis and monitoring of acute pancreatitis and severe acute pancreatitis.

Keywords: Acute Pancreatitis, Ultrasound, Contrast enhanced CT.

INTRODUCTION

Acute pancreatitis is commonly encountered inflammatory process of pancreas.[1] The incidence of acute pancreatitis currently ranges from 40 cases per year per 100000 adults and increasing steadily.[2] Despite continuous improvement in care, high mortality rate ranging from 81.2% to 100% among hospitalized patients have been reported[3]. Although the pathophysiology of acute pancreatitis is not clear, the recent hypothesis is that, there is cascade of inflammatory process resulting in acute pancreatitis.[4] The acute complications or organ failure determines severity of acute pancreatitis, which is then graded as mild, moderate and severe.

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Mild acute pancreatitis will never lead to any complications nor organ failure. Moderately severe acute pancreatitis can cause complications or leads to organ failure which lasts fewer than 48 hours. Severe acute pancreatitis will lead to single or multiorgan failure that persists for greater than 48 hours.[5] Currently management of acute pancreatitis and its complications is limited to provide supportive measures along with pharmacological agents which includes, prophylactic antibiotics, antisecretory agents, protease inhibitors, antioxidants, immunomodulators and non-steroidal anti-inflammatory drugs.[6]

Trans abdominal ultrasound using curved probe, computed tomography scan of abdomen and pelvis with pancreatic protocol (CECT) and magnetic resonance cholangiopancreatography (MRCP) are commonly used for diagnosis, to know severity and cause of acute pancreatitis. The accuracy of the transabdominal ultrasound ranges from 66% to 83%.[7] Sensitivity of transabdominal ultrasound is 80% and specificity is 95%.[8] Sensitivity and specificity as 100% and 95.3%

respectively using contrast-enhanced computed tomography scan (CECT) of abdomen making this modality as gold standard.[9] In a study, the incidence of acute pancreatitis was 30.0 per 100 000 population overall, mortality was 6.4% at 60 days.[10]

Although CT scan has significant sensitivity and specificity for the diagnosis of acute pancreatitis but as it is costly, not freely available in the periphery and has high radiation exposure. Therefore, the mainstay of our study was to know the diagnostic accuracy of transabdominal ultrasound in the diagnosis of acute pancreatitis as its accuracy has been reported variably by various authors.

MATERIALS AND METHODS

A cross sectional descriptive study was conducted at the Department of Radiology and Imaging, Hayatabad Medical Complex Peshawar from July 2018 to Jan 2019. Ethical approval was obtained from the Hospital Research and Ethical Committee. Written Consent was obtained from all patients. Total 245 patients of either gender aged 18-60 years with clinical and laboratory parameters of acute pancreatitis labelled by clinicians were included in the study. Patients who had history of gestational amenorrhea, chronic pancreatitis, recurrent pancreatitis and hemodynamically unstable patients were excluded. Data was analyzed by using SPSS version-25. The numerical variables (age of patient) were presented as mean and standard deviation (SD) while frequency and percentages were used for categorical variables (gender). Data was stratified by age and gender to deal with effect modifiers.

RESULTS

There were 245 patients included in our study out of which 175 (71.43%) were male and 70 (28.57%) were females. (Table-1) 80 (32.65%) patients were in 18-30 years age group, 64 (26.12%) patients were in 31-45 years age group whereas 101 (41.22%) patients were in age group of 46-65 years. (Table-2).

Mean age ±SD was 40±11.49 years. Mean ± SD for BMI was 26kg/m2 ± 1.1. Mean ±SD for duration of symptoms was recorded 5±1.22, (Table-3).

As per transabdominal ultrasound, sensitivity was 45.33%, specificity was (49.16%), and positive predictive value (PPV) was recorded as 13.88%, negative predictive value (NPV) was recorded as 83.27% whereas accuracy was recorded as 48.57%. (Table-4).

As per acute pancreatitis on transabdominal ultrasound, 34 (13.78%) patients were diagnosed with acute pancreatitis. (Table-5) As per acute pancreatitis on CT scan, 41 (16.73%) were diagnosed with acute pancreatitis. (Table-6) Stratification of acute pancreatitis on transabdominal ultrasound with respect to age and gender is given in Table-7 & Table-8 respectively.

TABLE-1: GENDER WISE DISTRIBUTION

GENDER	Frequency	Percentage
Male	175	71.43%
Female	70	28.57%
Total	245	100%

TABLE -2: AGE WISE DISTRIBUTION

Age Group	Frequency	Percentage
18-30 Years	80	32.65%
31-45 Years	64	26.12%
46-65 Years	101	41.22%
Total	245	100%

TABLE -3: DESCRIPTIVE STATISTICS OF CASES

Numerical Variables	Mean ±SD
Age (years)	40 ±11.49
Duration of Symptoms	5 Days ±1.22
BMI	26 kg/m2 ±1.10

TABLE-4: SENSITIVITY, SPECIFICITY, POSITIVE PREDICTIVE VALUE, NEGATIVE PREDICTIVE VALUE AND ACCURACY FOR TANSABDOMINAL ULTRASOUND

TRANSABDOMINAL ULTRASOUND	VALUES
Sensitivity	45.33%
Specificity	49.16%
Positive Predictive Value (PPV)	13.88%
Negative Predictive Value (NPV)	83.27%
Accuracy	48.57%

TABLE-5: FREQUENCY AND PERCENTAGE FOR ACUTE PANCREATITIS ON TRANSABDOMINAL ULTRASOUND

AP ON TRANSABDOMINAL ULTRASOUND	FREQUENCY	PERCENTAGE
Yes	34	13.91%
No	211	86.13%

TABLE-6: FREQUENCY AND PERCENTAGE OF ACUTE PANCREATITIS ON CT SCAN

ACUTE AP ON CT SCAN	FREQUENCY	PERCENTAGE
Yes	41	16.74%
No	204	83.26%

TABLE-7: STRATIFICATION OF ACUTE PANCREATITIS ON TRANSABDOMINAL ULTRASOUND WITH RESPECT TO AGE.

Age	ACUTE AP	Frequencies	Percentages	Diagnostic Accuracy
18-30 Years	Yes	15	06.12%	48.57%
	No	65	26.53%	
31-45 Years	Yes	12	4.89%	
	No	52	21.22%	
46-65 Years	Yes	07	02.85%	
	No	94	38.36%	

TABLE- 8: STRATIFICATION OF ACUTE PANCREATITIS ON TRANSABDOMINAL ULTRASOUND WITH RESPECT TO GENDER

Gender	ACUTE PANCREATITIS	Frequencies	Percentages	Diagnostic Accuracy
Male	Yes	25	10.2%	48.57%
	No	150	61.2%	
Female	Yes	09	03.6%	
	No	61	24.8%	

DISCUSSION

Acute pancreatitis can be mild (MAP) or severe (SAP) presenting clinically and may or may not lead to functional and morphological changes. Although SAP accounts for only 15–25% of acute pancreatitis cases, its mortality rate may be as high as 15–48.4%.[11] Early diagnosis of disease and clinical grading of acute pancreatitis is mainstay of management to decrease the mortality.[12]

Present study was carried out to assess the diagnostic accuracy of transabdominal ultrasound in the diagnosis of acute pancreatitis, taking CT scan gold standard. In our study Mean age (±SD) was 40±11.49 years whereas majority of the patients (41.22%) patients were in age group of 46-65 years. Diagnosis of acute Pancreatitis was supported by transabdominal Ultrasound in 71 (45.51%) cases. CT scan confirmed acute pancreatitis in 81 (41.67%) cases. In our study, sensitivity and specificity was 45.33% and 49.16% respectively. Positive predictive value and negative predictive value were 13.88% and 83.27% respectively. The diagnostic accuracy of transabdominal ultrasound in diagnosing acute pancreatitis was 48.57%. In a study by Tenner et al., a total 110 consecutive patients with acute pancreatitis, ultrasonography was found to be 77.80% sensitive in assessing moderate and severe types of acute pancreatitis. The low specificity of ultrasound was 44.00% which is comparable to our study. The ultrasound in acute pancreatitis at early stage is helpful in diagnosing the severity of the disease, in decision making and management. [13]

The death rate in patients presenting with acute pancreatitis was 10-15%, in which patients with pancreatitis secondary to gall bladder stones have a higher death rate than patients with pancreatitis secondary to alcohol consumption.[14] There is marked improvement in health care facilities in tertiary care hospital, thus providing good patient care and resulting in decreasing overall death ration in these patients.[15] Type 2 diabetes mellitus is an underlying cause in patient who ultimately have higher morbidity and thus increased mortality.[16] In patients who have associated multiorgan failure, will have higher rate of mortality which is approaching approximately 30%.[17] In such patients no significant decrease in mortality noted over past few years. As patient care is markedly improved so if patient even presents with severe pancreatitis but without organ failure, death rate approaches zero. To assess the severity of acute pancreatitis and predict outcome multiple grading system are introduced. Some of clinical scoring systems e.g., Ranson criteria, Glasgow, Imrie are used for analysis of severity The APACHE II scoring system, though difficult and confusing, but clinically it is very useful. Laboratory findings like amylase and lipase are also used. Genetic markers are under studies and are not clinically used.

Peritoneal lavage is an invasive procedure and has a with low sensitivity (54%) and high specificity (93%). Another very important, widely applicable easily available modality is CT scanning of the abdomen. It has very higher fine details of upper abdomen and provides details of cause and outcome of pancreatitis.[18] Another clinical criteria known as Balthazar criteria is also clinically and radiologically used has specificity of 88% and sensitivity of 87%.[19]

In another retrospective study carried out by Mikolasevic et al using data of 822 patients, (n = 198; 24.1%) in patients with fatty liver, who presented with acute pancreatitis. Results of the study showed that there was higher occurrence of moderately severe (35.4% vs 14.6%) and severe acute pancreatitis (20.7% vs 9.6%) in patients with fatty liver than those without nonalcoholic fatty liver.[20]

Ultrasound using curvilinear probe imaging modality, commonly used for AP because of its cost effectiveness, easy availability, portability and lack of ionizing radiation.[21]

Despite of being useful modality with lack of ionizing radiation and being cost effective, trans-abdominal ultrasound has low diagnostic sensitivity in diagnosing acute pancreatitis. There is also a question whether Transabdominal ultrasound is as useful for diagnosing AP or SAP as CT scan. New studies suggest recent technique using contrast-enhanced ultrasound (CEUS) which will be able to diagnose SAP because of its insight to detail which include pancreatic parenchymal necrosis. This method is also superior to contrast enhanced CT as there will be no iodinated contrast media associated hepatic and renal toxicity. If there is any statistical difference in diagnostic accuracy between transabdominal ultrasound and CEUS for the diagnosis of AP and SAP, CEUS examination should be used where available.[22]

CONCLUSION

In the present study we concluded that transabdominal ultrasound is an accurate and safe method for the diagnosis of acute pancreatitis. Ultrasound has improved patient care in acute pancreatitis by proper preoperative planning and its management.

LIMITATIONS AND RECOMMENDATIONS

Main limitation of the study was structures in front of the pancreas, bowel gas, which obscure

the pancreas. This limitation can be overcome by using CT, which provides more accurate diagnosis. Sample size was small due to single center study. Studies should be conducted in multicenter to have large sample size.

We recommend that ultrasound should be used routinely for accurate diagnosis of acute pancreatitis which will help in proper management of these patients in order to reduce the morbidity & mortality in these cases.

DISCLOSURE

None.

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None.

AUTHOR CONTRIBUTION

S. No.	Author	Contribution
1.	Dr Maimoona Afsar	Design of study & drafting
2.	Dr Ghazala Wahid	Critical review & final approval
3.	Dr Mahnoor Rehman Khan	Acquisition of data & drafting
4.	Dr Faryal Bashir	Data collection & Analysis
5.	Dr Maria Musammar	Data analysis & interpretations
6.	Dr Rabeea Ihtesham	Final Critical review

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