

ACCURACY OF DIAGNOSTIC ULTRASOUND IN DETECTION OF PANCREATIC HEAD CARCINOMA

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ABSTRACT

Background and Objective: The diagnosis of carcinoma of head of pancreas can be established by many modalities including computed tomography (CT) and ultrasonography (USG). USG is considered a least invasive, readily available and inexpensive investigation as compared to CT scan. Objective of this study was to determine the diagnostic accuracy of USG for detection of pancreatic head tumors taking endoscopic retrograde cholangiopancreatography (ERCP) as gold standard.

Methods: This cross-sectional study of six months duration was conducted in New Radiology Department of Services Hospital, Lahore. Patients of both genders, 125 in number, having suspicion of pancreatic tumor based on clinical and laboratory findings were enrolled for the study. Ultrasound abdomen was done by consultant radiologist and findings were noted regarding presence or absence of pancreatic carcinoma. Patients then underwent ERCP and ultrasonography findings were compared with ERCP findings, regarding detection of carcinoma head of pancreas.

Results: The sensitivity, specificity and accuracy of USG for detection of pancreatic carcinoma was 88.3%, 86.4%, and 88%, respectively.

Conclusion: USG is a reliable test for detection of pancreatic head carcinoma.

Key Words: Pancreatic carcinoma, USG, ERCP.

INTRODUCTION

Pancreatic cancer incidence has wide variation across the globe. Incidence rate for pancreatic cancer in 2012 was 7.4 per 100000 people in Northern America and differences in incidence rates were twenty fold between the populations with the highest rate (Czech Republic - 9.7), and the population with the lowest rate (Pakistan - 0.5).¹ It is associated with significant mortality, which has not decreased in recent years.² In United States from year 2005 to 2011³ it had an overall 5-year survival rate of 8%.

Sixty five percent of the pancreatic cancer occurs in pancreatic head.⁴ These present earlier as compared to body and tail tumors due to bile duct and pancreatic duct obstruction. Surgical resection offers the only chance for cure and this depends upon the early detection of the tumor. Most of patients have unresectable disease at the time of diagnosis. Even in patients with resectable tumour, the survival rate is only 23%.⁵

To improve the patient survival rate, early detection of PC is critical. Currently a wide range of imaging tools are available, such as multi detector computerized tomography (MDCT), magnetic resonance (MR) imaging, endoscopic sonography, endoscopic retrograde cholangiopancreatography (ERCP), and angio-

graphy.^{6,7} Endoscopic ultrasound (EUS) and EUS-guided fine needle aspiration with cytological examination are the procedures of choice to confirm the tissue diagnosis.⁸ Rapidly developing novel imaging techniques, including dual energy, low tube voltage CT techniques, iterative reconstruction CT algorithms, functional MRI methods, and hybrid positron emission tomography/MR, are expected to show excellent performance for pancreatic cancer imaging in the near future.⁴

CT is commonly used in diagnosis and staging of pancreatic carcinoma as visualization of pancreas by transabdominal ultrasound has limitations and results are affected by overlying bowel gas as well as sonographer experience.⁹ Despite these limitation, transabdominal ultrasound remains the first line imaging test for patients with suspected pancreatic cancer, due to its wide availability, safety and low cost. It is sensitive to observe distention of the biliary and pancreatic ducts, find pancreatic mass and extrapancreatic metastasis.¹⁰ Considering transabdominal ultrasound, a commonly used modality, this study was designed to evaluate its diagnostic accuracy in comparison to endoscopic retrograde cholangiopancreatography (ERCP). So that ultrasound can be used for the diagnosis of pancreatic

head carcinoma in place of ERCP which is invasive and uncomfortable for the patient as well as more expensive and not easily available.

PATIENTS AND METHODS

Sample size of 125 cases was calculated with 95% confidence level. Sensitivity of USG as 70% taking histopathology as gold standard. After approval from ethical committee, male and female patients with age > 18 years coming through outpatient department, in-patient or surgical emergency of Services Hospital Lahore, having suspicion of pancreatic tumor on the basis of clinical background (painless jaundice, clay colored stools, anorexia, weight loss) and laboratory investigations (raised bilirubin, alkaline phosphatase, gamma glutamyltransferase) were included by non-probability purposive sampling as random sampling is not feasible in such cases. Patients with previous history of pancreatic surgery were excluded. Their demographic information was recorded on a proforma.

Ultrasound abdomen was done by consultant radiologist with curvilinear 3.5 MHz probe. Findings were noted regarding presence or absence of pancreatic carcinoma. Pancreatic carcinoma was diagnosed on the basis of one of the following (1) ill-defined hypoechoic mass having reduced vascularity on Doppler in comparison with normal pancreatic parenchyma, with dilated common bile duct (CBD) and/or pancreatic duct (Fig. 1) (2) diffuse enlargement of pancreatic head with dilated CBD and pancreatic ducts (double duct sign) (3) hypoechoic mass with enlarged peripancreatic lymph nodes.

Patients then underwent ERCP. ERCP findings were noted. The abnormal findings were indentation, stenosis and obstruction in CBD and obstruction, stenosis, abnormal branching pattern and narrowing for the pancreatic duct. Aspirates from pancreatic duct were obtained and sent for cytopathology. Ultrasonographic findings were compared with ERCP findings regarding detection of pancreatic head mass.

Data Analysis Procedure

The data was entered in SPSS version 17.0 and analyzed. The demographic variable (age of patients) were presented as simple descriptive statistics, mean and standard deviation. Gender was presented as frequency and percentage. Confounding variables (experiences of radiologist and physician) were controlled. Ultrasound was performed by a radiologist having minimum 3 years of experience while the referring physician had five years of experience.

Findings of USG were compared with ERCP results and sensitivity, specificity of USG was determined by guarantying a 2 x 2 table, taking ERCP as gold standard.

RESULTS

There were total one hundred and twenty-five patients included in this study. The mean age of the patients was 54.43 ± 12.10 years (range 45 – 78). Distribution of age is given in Table 1. There were 80 (64%) male patients in the study while 45 (36%) patients were female. The female to male ratio was 1:1.7. Out of 125 patients included in the study, the USG was detected to be positive in 94 patients. Of these, 91 were proved on ERCP findings so were labelled as true positive, while rest of the 3 patients were labeled as false positive. USG was negative in total 31 patients. Out of these 12 were positive on ERCP finding (false negative) and 19 were also seen negative on ERCP findings (true negative) (Table 2). Diagnostic accuracy of USG for diagnosis of pancreatic carcinoma was calculated.

The sensitivity, specificity, and accuracy of USG for detection of pancreatic carcinoma was 88.3%, 86.4%, and 88%, respectively.

Table 1: Distribution of Patients by Age (n = 125).

Age in Years	No. of Patients	Percentage
41 – 50	38	30.4
51 – 60	49	39.2
61 – 70	22	17.6
70 – 80	16	12.8

Table 2: Comparison of USG Versus ERCP Findings (n = 125).

Transabdominal Ultrasonography	ERCP Finding (Gold Standard)		Total
	Positive	Negative	
Positive	91 (TP)	3 (FP)	94
Negative	12 (FN)	19 (TN)	31
Total	103	22	125

Key:

TP = True positive
FP = False positive

FN = False negative
TN = True negative

DISCUSSION

This study was performed to determine the diagnostic accuracy of the USG for diagnosis of carcinoma of head of pancreas in comparison to ERCP. In literature, there are other clinical trials which have described the diagnostic accuracy of the USG for pancreatic carcinoma in comparison with different modalities. The results of various authors vary with each other due to variation in inclusion criteria and imaging tools used for comparison.

Mean age of patients in our study was 54.43 ±

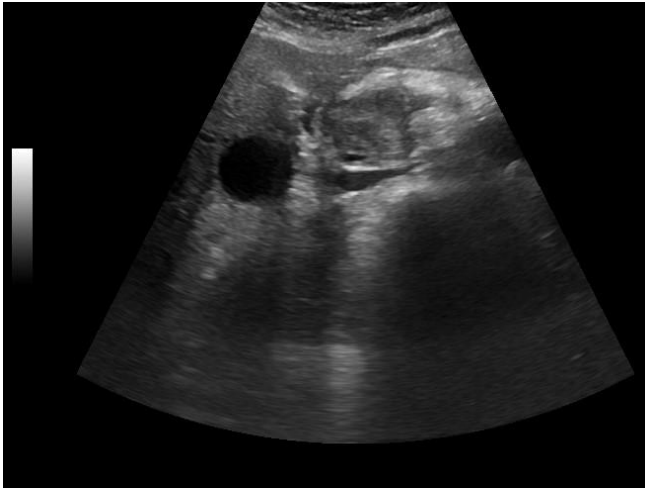


Fig. 1a: Hypoechoic mass in Pancreatic Head.

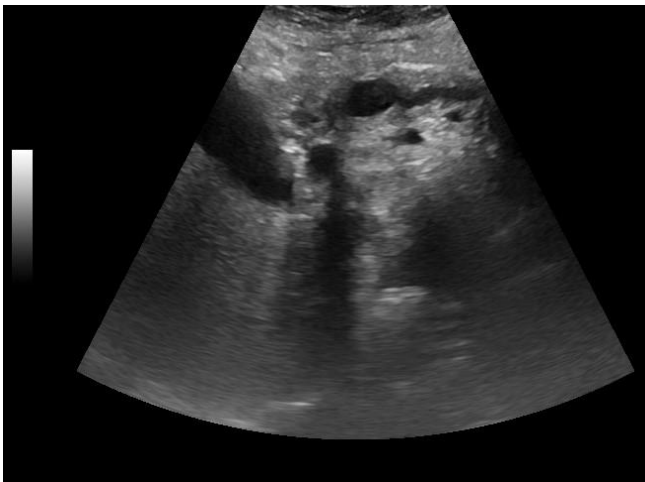


Fig. 1b: Dilated Pancreatic Duct.

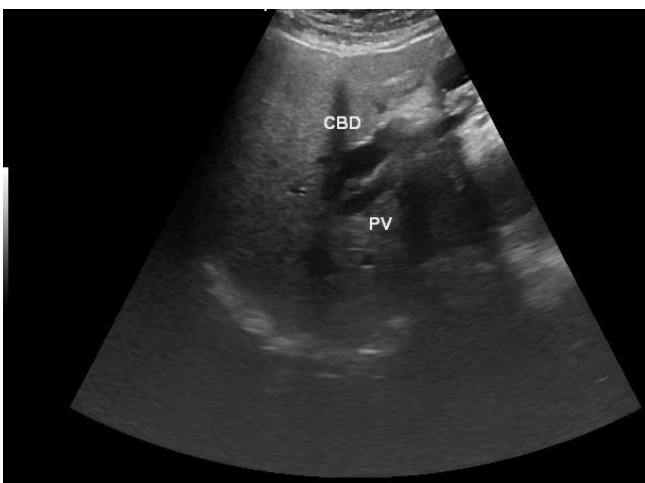


Fig. 1c: Dilated common bile duct (CBD-common bile duct, PV-portal vein).

12.10 years as compared to 62.4 ± 9.1 years in a study

by Kulig.¹¹ Female to male ratio in present study was 1:1.7 while it was 1.1:1 in Kulig's study.

In our study the diagnostic accuracy of ultrasound for the diagnosis of CA head of pancreas was 88%. In the study by Kulig¹¹ for establishing the role of ultrasound in staging of pancreatic cancer the diagnostic accuracy of abdominal ultrasonography in all patients was 85.6% for all T categories, which though comparable was less than our study. Our study was specific for CA head of pancreas, the region easily visualized by ultrasound, while in Kulig's study the pancreatic body and tail cancers were also included where tumor detection is quite difficult due to the lack of biliary dilatation and the presence of gas bubbles in the stomach and transverse colon, which cause posterior shadowing.⁴ This reduces the sensitivity of examination. In this situation, oral administration of water or other contrast agents may help to delineate the entire organ.

In another study by van Delden, et al¹² transabdominal USG was performed among 80 patients suspected to have pancreatic carcinoma. The sensitivity and specificity of transabdominal USG for detection of tumor was 89% and 77% respectively. The results of this study were also comparable to that of ours. The findings of transabdominal USG were compared with laparoscopic USG and it was found that sensitivity and specificity of laparoscopic USG was high i.e. 97% and 92%, respectively.

In study by Chen et al¹³ the diagnostic values of EUS, US and CT scans were compared with each other for detection and staging of periampullary tumor. For detection of tumor, USG showed only 24% sensitivity, followed by CT scan which showed 39% sensitivity. However, EUS showed a higher sensitivity of 97%. Low sensitivity of transabdominal ultrasound is obvious as this study was specific for periampullary tumors which are obscured on transabdominal ultrasound by gas in the duodenum and large bowel. Endoscopic US (EUS) achieves a high-resolution view by placing the ultrasound transducer in proximity to the periampullary region and avoids interference from soft tissues and bowel gas.¹⁵

It is **concluded** that the sensitivity, specificity and diagnostic accuracy of USG abdomen for detection of malignancy of head of pancreas is high which makes it a reliable investigation among patients with pancreatic head carcinoma. As it is safe, low cost and easily available investigation, its use is recommended in all patients in whom malignancy of head of pancreas is suspected. Patients with abdominal USG positive for malignancy should be worked-up further for staging purposes and treatment planning. It is also recommended that radiologists should also look for it in routine abdominal ultrasonography.

Authors' Contribution

NK: Conception of study/Data collection/Initial Draf-

ting. MC: Revising the article and approval of final version for publication. AA: Data collection.

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