Original Article

Role of Ultrasonography in the diagnosis of Chronic liver disease (CLD) and comparison with Laboratory diagnosis

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Abstract

Background: Chronic liver disease (CLD) is a major hepato biliary problem in day-to-day practice in Bangladesh.

Objective: The aim of this study was to assess the efficacy of ultrasonography in the diagnosis of chronic liver disease.

Materials and Methods: This cross sectional study was carried out in the Department of Radiology and Imaging of Dhaka National Medical College Hospital during July 2014 to June 2015 for a period of one year. Clinically suspected chronic liver disease (CLD) patients of either sex were recruited as a study population. Patients had history of neoplasm of liver or duration of suffering was less than 6 months were excluded from the study. Initially 72 patients were approached for this study. Among them 58 patients agreed to be the study subjects. Sonography was carried out on these 58 patients but only 50 patients subsequently underwent laboratory investigations or liver biopsy. So, finally 50 patients were included in this study.

Results: Out of fifty patients male (58%) were predominant than female (42%). Mean age was 44.3 years (range: 16-65 years) and maximum (44%) patients were found in 36-45 age group. According to the sonographic findings, 18 patients were diagnosed as hepatitis, 16 patients as fatty liver, 12 patients as cirrhosis and 4 as normal. According to the laboratory investigations, finally 11 patients were diagnosed as cirrhosis, 14 patients as fatty liver, 21 patients as hepatitis and 03 patients as normal and 01 patient as storage disease which was not diagnosed by ultrasonogrsphy.

Conclusion: Ultrasonography is one of the useful diagnostic modality for the diagnosis of chronic liver disease.

Keywords: *Chronic liver disease, ultrasonography*

Introduction

Chronic liver disease is a disease process of the liver that involves a process of progressive destruction and regeneration of the liver parenchyma leading to fibrosis and cirrhosis. Chronic liver disease refers to disease of the liver which had lasted over a period of 6 months. It consists of a wide range of liver pathologies which include inflammation (chronic hepatitis), liver cirrhosis, and hepatocellular carcinoma.[1]

Chronic liver disease (CLD) is a one of the major cause of mortality and morbidity worldwide.[2] It has been documented that liver-related mortality usually results from complications of CLD including advanced cirrhosis and hepato-cellular carcinoma (HCC). It has been estimated that liver disease is the 12th leading cause of death in the United States.[3] Chronic liver diseases are marked by the gradual destruction of liver tissue over time and replacement of normal liver with nodules of scar tissue. Several liver diseases fall under this category. The primary three entities considered in diffuse chronic liver diseases are cirrhosis, fatty infiltration and chronic hepatitis. The end results of the gradual destruction are cirrhosis and fibrosis of the liver.

The standard method for determining, staging and grading CLD is liver biopsy.[4] The invasiveness of this method, and its associated morbidity and mortality has led to the emergence of less invasive methods which include medical imaging techniques (computed tomography,

magnetic resonance imaging and ultrasound), serum markers (both direct and indirect markers of fibrosis) and transient elastography.[5] All of these techniques have the potential to reduce the number of biopsies performed in a high risk population.

Ultrasound can identify the manifestations of CLD such as liver fibrosis and cirrhosis which are characterized by the presence of vascularized fibrotic septa and regenerating nodules.[6] Ultrasound is an attractive diagnostic tool because it is readily available, inexpensive, well tolerated and is already extensively used in the diagnostic work-up of patients with CLD. The diagnostic accuracy of ultrasound needs to be established to inform clinicians of its role in patients at high risk of CLD.

Chronic liver disease (CLD) is a major hapatobilliary problem in day-to-day practice in Bangladesh. The aim of this study was to assess the efficacy of ultrasonography in the diagnosis of chronic liver disease.

Method:

This cross sectional study was carried out in the Department of Radiology and Imaging of Dhaka National Medical College Hospital during July 2014 to June 2015 for a period of one year. Clinically suspected chronic liver disease (CLD) patients of either sex were recruited as a study population. Patients with history of neoplasm of liver or duration of suffering of less than 6 months and refusal by those patients to do lab tests were excluded from the study. Initially 72 patients were approached for this study. Among them 58 patients agreed to be the study subjects. Sonography was carried out on these 58 patients but only 50 patients subsequently underwent laboratory investigations or liver biopsy. So, finally 50 patients were included in this study.

All these patients selected in this study undergone Ultrasonographic examination by using real time scanner equipped with 3.5, 5.0, and 7.5 MHZ transducers. Abdominal ultrasound was performed with the patient in a supine, sagital, transverse, coronal and subcostal oblique views.[7] The patients were asked to hold breathing at different phase of respiration. Sonographic criteria for diagnosing CLD, in case of hepatitis were considered as presence of increased liver size, decreased parenchymal echogenecity, thickening of the GB and peri-portal cuffing[8]. In case of cirrhosis, reduction of the liver size, presence of coarse parenchyma, contour irregularity of the liver surface, hepatic nodularity & ascites were considered[9]. In case of fatty liver, presence of increased liver size, diffuse liver parenchymal hyper-echogenecity, poor visualization of intrahepatic vessels and increased reflectivity of liver than renal cortex were considered[10].

Sonograms of all the patients were performed by GE LOGIQ P5 & PHILIPS CLEAR VUE 350 ultrasound scanner. Selection of probe and frequency was dependent of the physical build of the patient and according to 3.5 - 5.0 MHz.

In this study the laboratory tests of the patients include alanine amino transferase (ALT), aspartate amino transferase (AST), alkaline phosphatase, serum bilirubin, serum albumin, Prothombin time (PT) and serum protein electrophoresis. In case of hepatitis serology was considered as the gold standard[11]. In case of cirrhosis[12] and fatty liver[13], liver biopsy was done to confirm the diagnosis. The above laboratory examinations were carried out by a pathologist and the reports were collected and were compared with sonographic findings.

Result:

Out of fifty patients male (58%) were predominant than female (42%). Mean age was 44.3 years (range: 16-65 years) and maximum (44%) patients were found in 36-45 age group. According to the sonographic findings, 18 patients were diagnosed as hepatitis, 16 patients as fatty liver, 12 patients as cirrhosis and 4 as normal. In this study the final diagnosis of the patients were made by laboratory diagnosis. According to the laboratory investigations, finally 11 patients were diagnosed as cirrhosis, 14 patients as fatty liver, 21 patients as hepatitis and 03 patients as normal and 01 patient as storage disease which was not diagnosed by ultrasonogrsphy. The validity of ultrasonogram in the diagnosis of hepatitis, cirrhosis and fatty liver was determined by calculating sensitivity, specificity, accuracy, positive predictive value and negative predictive values. In case of hepatitis, sensitivity and specificity of sonographic diagnosis were 85.71% and 100.00%. In case of cirrhosis, sensitivity and specificity of sonographic diagnosis were 100.00% and 97.43%. In case of fatty liver, sensitivity and specificity of sonographic diagnosis were 100.00% and 94.44%.

Table I: Demographic, sonographic and laboratory findings of the patients (n=50)

	Number of Patients	Percentage
Age		
16-25	1	2%
26-35	4	8%
36-45	22	44%
46-55	17	34%
56-65	6	12%
Total	**50**	**100%**

Sex		
Male	29	58%
Female	21	42%
Total	**50**	**100%**

Disease according to sonographic diagnosis

Hepatitis	18	36%
Fatty Infiltration	16	32%
Cirrhosis	12	24%
Normal	4	8%
Total	**50**	**100%**

Disease according to laboratory diagnosis

Hepatitis	21	42%
Cirrhosis	11	22%
Fatty liver	14	28%
Normal	03	06%
Storage diseases	01	02%
Total	**50**	**100%**

Table II: Comparison of sonographic diagnosis with laboratory diagnosis of hepatitis

Sonographic diagnosis	Final laboratory diagnosis		Total
	Disease positive	Disease negative	
Test positive	18	0	18
Test negative	3	29	32
Total	**21**	**29**	**50**

Table III: Validity parameters of Ultrasonography for the diagnosis of hepatitis

Validity parameters	Percentage
Sensitivity	85.71
Specificity	100.00
Accuracy	94.00
Positive Predictive Value	100.00
Negative Predictive Value	96.66

Table IV: Comparison of sonographic diagnosis with laboratory diagnosis of cirrhosis:

Sonographic diagnosis	Final laboratory diagnosis		Total
	Disease positive	Disease negative	
Test positive	11	1	12
Test negative	0	38	38
Total	**11**	**39**	**50**

Table V: Validity parameters of Ultrasonography of cirrhosis

Validity parameters	Percentage
Sensitivity	100.00
Specificity	97.43
Accuracy	98.00
Positive Predictive Value	91.66
Negative Predictive Value	100.00

Table VI: Comparison of sonographic diagnosis with laboratory diagnosis of fatty liver:

Sonographic diagnosis	Final laboratory diagnosis		Total
	Disease positive	Disease negative	
Test positive	14	2	16
Test negative	0	34	34
Total	**14**	**36**	**50**

Table VII: Validity test of fatty liver

Validity parameters	Percentage
Sensitivity	100.00
Specificity	94.44
Accuracy	96.00
Positive Predictive Value	87.50
Negative Predictive Value	100.00

Discussion:

Chronic liver disease leads to physical inability and early mortality in a proportion of patients. The prognosis in many occasions depends on early diagnosis and managements.

In this study out of 50 patients 29 were male and 21 were female. Age distribution of the patients varied from 16 years to 65 years with an average of 44 years. Maximum patients age group were between 36 years to 45 years. Liver disease incidence increases with age.[14] In this study, sensitivity and specificity of USG were 85.71% and 100.00% in case of hepatitis, 100.00% and 97.43% in case of cirrhosis & 100.00% and 94.44% in case of fatty liver. Matsuoka et al. found sensitivity 90.3%, specificity 47.7%, PPV, 73.9% and NPV 75% in case of hepatitis.[15] Dewbury KC and Clark BE found sensitivity 87.5%, specificity 81.5%, accuracy 87%, positive and negative predictive value were 85.7%and 88.5% respectively in case of cirrhosis.[16] Foster et al.

showed sensitivity, specificity, accuracy, positive and negative predictive values were 100% , 97.7%, 98%, 87%, 95.7% respectively in their study in case of fatty liver.[17] The overall sensitivity and specificity of ultrasound for the detection of fatty liver, compared to histology, were 84.8% and 93.6% respectively.[18] Heidelbaugh and Sherbondy in their study using high resolution ultrasonography in patients with cirrhosis confirmed with biopsy or laparoscopy found a sensitivity and specificity for cirrosis of 91.1% and 93.5% respectively and positive and negative predictive values of 93.2% and 91.5% respectively.[19]

Conclusion

Ultrasound is a useful and sensitive imaging modality, which can diagnose chronic liver disease and very accurately measures the size of liver and echogenicity of the liver.

Laboratory diagnosis is also the important part of the diagnosis of chronic liver disease for better management. Ultrasound is more convenient because it is cheap, simple, non- invasive, and easily available and can be done rapidly and repeatedly without any hazards of radiation. On the basis of present study it can be concluded that both ultrasound and serological test or ultrasound and biopsy would increase the efficiency for the diagnosis of chronic liver disease. As regards to the diagnostic accuracy of ultrasonography in the diagnosis of chronic liver disease is significantly reduces the false positive rate. It can be concluded that ultrasonography is one of the useful diagnostic modality for the diagnosis of chronic liver disease.

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