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Usefulness of Ultrasonographic Determination of Portal Vein Diameter and Splenic Width in the Diagnosis of Oesophageal Varices in Hepatitis B Virus Related Chronic Liver Disease.

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Abstract

Background: Almost 90% of the cirrhotic patients develop esophageal varices. In many studies, portal vein diameter and splenic width found to be correlated with oesophageal varices in patients with hepatitis B virus related chronic liver disease. **Aim of the study:** The aim of the study was to evaluate the usefulness of portal vein diameter and splenic width in the diagnosis of oesophageal varices in hepatitis B virus related chronic liver disease. **Methods:** This method comparison study was conducted in the Department of Medicine, Dhaka Medical College Hospital, Dhaka from July 2013 to May 2014. The study included 110 sample. **Result:** The mean age was found 46.72±13.32 years with range from 24 to 80 years. Majority (83.6%) patients were male and 18(16.4%) were female. The mean portal vein diameter was found 12.45±1.8 mm with range from 9 to 16 mm and the mean splenic width was found 48.77±6.98 mm with range from 35 to 73 mm.the mean portal vein diameter was found 10±1.15 mm in grade I, 11.56±1.53 mm in grade II. 12.75±1.6 mm in grade III and 14.46±0.52 mm in grade IV.The validity of portal vein diameter (≥11.5) and splenic width (≥42.5 mm) for prediction of oesophageal varices. **Conclusion:** Ultrasonographic Determination of portal vein diameter and splenic width may be useful in detecting oesophageal varices in advanced stage of hepatitis B virus related chronic liver disease.

Keywords: Ultrasonographic Determination, Portal Vein Diameter, Splenic Width, Oesophageal Varices and Hepatitis B Virus.

INTRODUCTION

Esophageal variceal bleeding is one of the most dreaded complications of chronic liver disease because of its high mortality. The prevalence of varices in patients with chronic liver disease is approximately 60-80% and the risk of bleeding is 25-35%. The incidence of esophageal varices (EVs) increases by nearly 5% per year, and the rate of progression from small to large varices is approximately 5 to 10 % per year.[1] Increasing size of varices is associated with an

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increase in variceal- wall tension to a critical level at which varices rupture and cause life-threatening bleeding. The mortality rate from variceal bleeding is about 20% when patients are treated optimally in hospital.[2] Incidence of first variceal hemorrhage ranges from 20 to 40% within two years. Recurrent bleeding occurs in 30 to 40% of patients within the next two to three days and in up to 60% within one week. Therefore, the prevention of variceal bleeding is an important goal in management of patients with chronic liver disease. Universal endoscopic screening of EVs is recommended in conjunction with primary prophylaxis in patients who are at high risk of variceal bleeding.[3,4] But this screen is invasive, and many patients will not have varices, rendering this method cost ineffective. Thus, noninvasive diagnosis of portal hypertension may be useful.[5] Recently, several studies have attempted to identify the variables that can predict the presence of EVS, even large EVS-noninvasively. examining biochemical, clinical, and ultrasonographic parameters alone or in combination, with promising results overall. Another study suggest that prevalence of oesophageal varices increased with a higher Child-Pugh class, but Child-Pugh score was not a predictor of oesophageal varices.[6] Finally, there has been a lack in uniformity in the classification and diagnosis of EVs in previous studies, in which EVs were not categorized by a single endoscopist or in the same endoscopy unit.[7] Portal vein diameter and splenic width appears to be correlated with oesophageal varices in patient with hepatitis B virus related chronic liver disease.[5] Splenomegaly is recognized as one of the diagnostic signs of chronic liver disease and portal hypertension. Several studies showed that Splenomegaly may be a good predictor of oesophageal varices. There was a good correlation between in vivo ultrasound assessment of splenic width and true splenic volume.[8] The area under the receiver operating characteristic curve of regression function (RF) model, which was composed of the splenic width and portal vein diameter, was higher than that of the platelet count, with cut-off value of 0.3631. The RF model had an excellent sensitivity of 87.2% and an acceptable specificity of 59.5% with an overall accuracy of 80.1%

Objective:

General: To evaluate the usefulness of portal vein diameter and splenic width in the diagnosis of oesophageal varices in hepatitis B virus related chronic liver disease.

Specific:

- Measurement of portal vein diameter & splenic width by ultrasonography of abdomen.
- Detection and grading of oesophageal varices by endoscopy of upper gastrointestinal tract.
- To compare portal vein diameter and splenic width among different grades of esophageal varices.
- To analyze and investigate whether portal vein diameter and splenic width can predict various grade of oesophageal varices in hepatitis B virus related chronic liver disease.

MATERIALS & METHODS

This method comparison study was conducted in the Department of Medicine, Dhaka Medical College Hospital, Dhaka from July 2013 to May 2014. The study included 110 sample

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comprised in patients with chronic liver disease caused by hepatitis B virus attending in the Department of Medicine, DMCH, Dhaka. ANOVA test was used to compare the means of more than two groups. Receiver operating characteristic (ROC) Curves was generated to determine the cut off values for the best sensitivity and Specificity of the variables with regard to the presence of esophageal varices. Also, the ROC curves were used to identify the cut off prevalence-adjusted negative and positive predictive values for the presence of esophageal varices. A model with a cutoff value above 0.7 is considered to be useful, and a cutoff value between 0.8 and 0.9 indicates excellent diagnostic accuracy. A P-value will consider to be statically non-significant if >0.05 and statistically significant if ≤0.05. Statistical analysis was carried out by using the Statistical Package for Social Sciences version 16.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

Inclusion criteria:

All the patients with chronic liver disease aged ≥18 years, who have hepatitis B virus positive

Exclusion criteria:

- Chronic liver disease caused by etiology other than hepatitis B virus and cryptogenic cause.
- Patients with active gastrointestinal bleeding at the time of admission.
- History of endoscopic variceal sclerotherapy or band ligation.
- Transjugular intrahepatic portosystemic stent shunt placement.
- History of surgery for portal hypertension.

RESULT

In this study, it was observed that majority (26.4%) patients belonged to age 31-40 years (Figure 1). The mean age was found 46.72±13.32 years with range from 24 to 80 years. Majority (83.6%) patients were male and 18(16.4%) were female (Figure 2).Table I shows portal vein diameter and splenic width of the study population. The mean portal vein diameter was found 12.45±1.8 mm with range from 9 to 16 mm and the mean splenic width was found 48.77±6.98 mm with range from 35 to 73 mm. Table II shows oesophageal varices of the study population, it was observed that more than half (50.9%) patients had grade III, 4(3.6%) had grade I, 27(24.5%) had grade II 13(11.8%) patients had grade IV. Table III shows that the mean portal vein diameter was found 10±1.15 mm in grade I, 11.56±1.53 mm in grade II. 12.75±1.6 mm in grade III and 14.46±0.52 mm in grade IV. The mean portal vein diameter difference was statistically significant ($p<0.05$) between four groups. Table IV shows that the mean splenic width found 42±3.46 mm in grade I, 43.63±3.75 mm in grade II, 50.89±5.73 mm in grade III and 57±7.22 mm in grade IV. The mean splenic width difference was statistically significant ($p<0.05$) between four groups. Table V shows the receiver-operator characteristic (ROC) curve of portal vein diameter and splenic width for prediction of oesophageal varices. The validity of portal vein diameter (≥11.5) and splenic width (≥42.5 mm) for prediction of oesophageal varices were correlated by calculating sensitivity, specificity, accuracy, positive predictive values and negative predictive values (Table VI).

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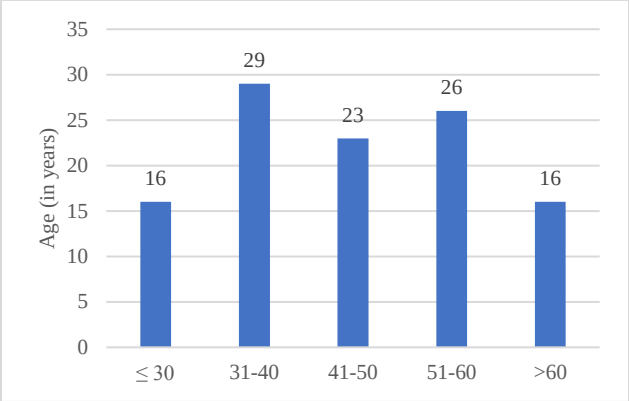

Figure 1: Age distribution of the study population (n=110)

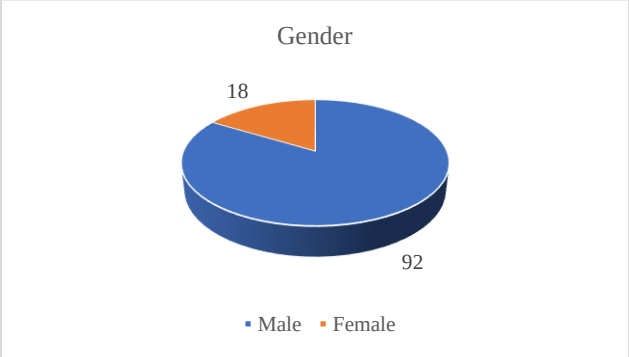

Figure 2: Gender distribution of the study people (n=110)

Characteristics	Mean±SD	Range (min-max)
Portal vein diameter (mm)	12.45±1.8	(09-16)
Splenic width (mm)	48.77±6.98	(35-73)

Table I: Distribution of the study population according to portal vein diameter and splenic width (n=110)

Oesophageal varices		**Number of population**	**Percentage**
Absent		10	78.2
Present	Grade I	4	7.3
	Grade II	27	10.9
	Grade III	56	3.6
	Grade IV	13	11.8

Table II: Distribution of the study population according to oesophageal varices (n=110)

Portal vein diameter (mm)	**Oesophageal varices**										**P value**
	Absent (n=10)		**Grade I (n=4)**		**Grade II (n=27)**		**Grade III (n=56)**		**Grade IV (n=13)**		
	n	%	n	%	n	%	n	%	n	%	
9	4	40	2	50	2	7.4	4	7.1	0	0	
10	3	30	0	0	5	18.5	0	0	0	0	
11	2	20	2	50	8	29.6	6	10.7	0	0	
12	0	0	0	0	4	14.8	14	25	0	0	
13	1	10	0	0	4	14.8	10	17.9	0	0	
14	0	0	0	0	4	14.8	18	32.1	7	53.8	
15	0	0	0	0	0	0	2	3.6	6	46.2	
16	0	0	0	0	0	0	2	3.6	0	0	
Mean±SD	10.1±1.3		10±1.15		11.56±1.53		12.75±1.6		14.46±0.52		0.001
Range (min-max)	(9-13)		(9-11)		(9-14		(9-16)		(14-15)		

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Table III: Association between oesophageal varices with portal vein diameter (n=110)

Splenic width (mm)	Oesophageal varices										P value
	Absent (n=10)		Grade I (n=4)		Grade II (n=27)		Grade III (n=56)		Grade IV (n=13)		
	n	%	n	%	n	%	n	%	n	%	
≤40	5	50	2	50	6	22.2	2	3.55	0	0	
41-50	5	50	2	50	21	77.8	28	50	0	0	
51-60	0	0	0	0	0	0	24	42.9	11	84.6	
>60	0	0	0	0	0	0	2	3.55	2	15.4	
Mean±SD	42.6±3.3		42±3.46		43.63±3.75		50.89±5.73		57±7.22		0.001
Range (min-max)	(40-48)		(39-45)		(36-50)		(35-62)		(52-73)		

Table IV: Association between oesophageal varices with splenic with (n=100)

Parameter	Cut off value	Sensitivity	Specificity	Area under the ROC curve	95% Confidence interval (CI)	
					Lower bound	Upper bound
Portal vein diameter	≥11.5	71	60	0.627	0.421	0.833
Splenic width (mm)	≥42.5	88	60	0.811	0.711	0.911

Table V: Receiver-operator characteristic (ROC) curve of portal vein diameter and splenic width for prediction of oesophageal varices.

Validity test	Portal vein diameter	Splenic width
Sensitivity	71	88.0
Specificity	60	60.0
Accuracy	70	85.5
Positive predictive value	94.7	95.7
Negative predictive value	17.1	33.3

Table VI: Sensitivity, specificity, accuracy, positive and negative predictive values of the portal vein diameter and splenic width for prediction of oesophageal varices.

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DISCUSSION

This method comparison study was carried out withan aim to assess the usefulness of portal vein diameter and splenic width as a noninvasive parameter in the diagnosis of oesophageal varices in hepatitis B virus related chronic liver disease and to identify biochemical and ultrasonographic parameters of esophageal varices in patients with hepatitis B virus related chronic liver disease. In this series it was observed that among 110 patients with chronic liver disease caused by hepatitis B virus were predominant in 4 decade and their mean age was 46.72=13.32 years with range from 24 to 80 years. Similarly, Abu El Makarem et al (2011), Zaman et al and Mahassadi et al (2012) showed the mean age was 48 years, 49.0 years and 49.5 years respectively.[9,10,11] Masjedizadeh et al,[12] found 12.9% of the patients with liver cirrhosis were less than 30 years, 23.6%between 30-50 years and 63.6% were over 50 years old. which is higher with the current study. Similarly, Said et al,[13] Hong et al and Gue et al showed the mean age of the patients with liver cirrhosis were 53.1=12.2 years. 53.1 ±12.2 years and 53 ±12 years respectively.[5,14] The lower mean age obtained in this study may be due to increased life expectancy. geographical and racial influences may have significant impacts on chronic liver disease caused by hepatitis B virus. Regarding the sexual variation in chronic liver disease caused by hepatitis B virus was more common in male subject. Where 83.6% and 16.4% were male and female respectively and male to female ratio was 5.1:1. Number of investigators found male predominant. Said et al,Gue et al,Masjedizadeh et al and Sumon et al found in their studies that the study subjects were male which Was 76.7, 56.5. 70.0 and 75.0 percent respectively.[12,13,14,15] Similar observations regarding the sex incidence were also made by Mahassadi et al, Makarem et aland Hong et al.[5,11,16] This male predominant ratio in this study may be due to hospital bed ratio for male to female, male predominance of patient at OPD and socioeconomic condition allow female patients to attend hospital in more Severe stages of disease.In this present study it was observed that the mean portal vein diameter was found 12.45±1.8 mm with range from 9 to 16 mm. Hong et al showed the mean portal vein diameter of all patients was 12.6±1.9 mm range from 9 to 26 mm.[5] In another study Mahassadi et al,[11] obtained that median value of Portal vein diameter 12.0 mm, Makarem et al,[16] found the mean Portal vein diameter 13.04±1.9 mm, which are comparable with the current study. In this present series it was observed that the mean splenic width was found 48.77±6.98 mm with range from 35 to 73 mm. Similarly, Hong et al,[5] found the mean splenic width was 50.6 ± 10.1 mm in their study patients. In this current series it was observed that 10 cases oesophageal varices absent and 100 cases oesophageal varices present among them more than half (50.9%) of the patients had grade III, 24.5% grade II. 11.8% grade IV and 3.6% had grade I. In another study 106 of 150 patients had EVs observed by Baig et al.[17] and found patients with EVs, 36 patients had grade 1 varices, 54 had grade 2 varices and 16 had grade 3 varices. Mahassadi et al.[11] showed No varices 23.49%, Stage 1 6.3%, Stage 2 48.6% and Stage 3 21.6%, which are comparable with the current study. Large esophageal varices were found in 29.2% patients observed by Said et al.[13] (2010). In another study. Zaman et al,[18] mentioned that endoscopic findings included esophageal

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varices in 68.0% of patients and 30.0% were large. Cherian et al,[19] reported that overall, 22.3% patients had no esophageal varices, 42.3% had small varices (Gr I-II) and 35.4% had large varices (Gr III-IV). Madhotra et al,[20] showed that 51.0% had varices: of whom. 90 had only esophageal varices out of which 66 small and 2-4 large. In another study. Masjedizadeh et al,[12] out of 140 cirrhotic patients had esophageal varices 85.0%. among these patients, 51.19% had small varices and 35.6%% had large varices. In my present study it was observed that the mean portal vein diameter was found 10-1.15 mm varied from 9-11 mm in grade 1, 11.56± 1.53 mm varied from 9- 14 mm in grade II. 12.75±1.6 mm varied from 9-16 mm in grade III and 14.46±0.52 mm varied from 14-15 mm in grade IV. The mean portal vein diameter was significantly ($p<0.05$) increased with grade of Oesophageal varices. Hong et al,[5] mentioned in their study that mean portal vein diameter was found 11.9±1.7 mm in absence of varices and 12.9 ± 1.6 mm presence of varices. The difference was statistically significant ($p< 0.001$), which is consistent with the current study. In this current study it was observed that the mean splenic width was found 42±3.46 mm varied from 39-45 mm in grade 1, 43.63±3.75 mm varied from 36-50 mm in grade II, 50.89±5.73 mm varied from 35 -62 mm in grade III and 57±7.22 mm varied from 52-73 mm in grade IV. The mean splenic width was significantly ($p<0.05$) increased with grade of Oesophageal varices. Similarly. Hong et al,[5] reported that the mean spleen width 44.8± 7.0 mm absence of varices and 52.5 ± 10.1 mm in presence of varices. Receiver-operator characteristic (ROC) were constructed using portal vein diameter and splenic width of the patients with oesophageal varices, which gave a splenic width cut off value of (≥42.5 mm) as the value with a best combination of sensitivity and specificity for oesophageal varices. At this cut-off value the sensitivity and specificity of portal vein diameter in diagnosing oesophageal varices were found to be 71.0% and 60.0%. respectively. At this cut- value the sensitivity and specificity of splenic width in diagnosing oesophageal varices were found to be 88.0% and 60.0%. Respectively. In this current study it was observed that the validity of portal vein diameter cutoff value ≥11.5 mm for prediction of oesophageal varices sensitivity 71.0%, specificity 60.0%. accuracy 70.0%, positive predictive values 94.7% and negative predictive values 17.1%. On the other hand, the validity of splenic width cutoff value ≥42.5 mm for prediction of oesophageal varices sensitivity 88.0%, specificity 60.0%, accuracy 85.5%. positive predictive values 95.7% and negative predictive values 33.3%. Hong et al,[21] mentioned in their study that patients with a spleen width >44.5 mm and portal vein diameter of >11.75 mm would benefit from more frequent endoscopies. However, endoscopies could be postponed in patients with a spleen width of ≤44.5 mm, a portal vein diameter of ≤11.75 mm. Moreover, the tree model proved to be well calibrated (predicted outcomes in the training Sample were reproduced fairly in the test sample) and achieved a comparable diagnostic accuracy of 84.4% in the test sample. Patients in the test sample can also be organized into the high-risk 83.4% and low-risk 14.5% groups, which are comparable with the current study.

Limitation of the study

Data collection from hospitalized patient who were at a relatively more advanced stage of the disease than that of outpatient consultation,

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enrolled in this study, which may produce a population bias. So further studies may be needed with representative sample.

CONCLUSION

From data it seems that ultrasonographic variables (Portal vein diameter and splenic width) may be useful in detecting oesophageal varices in advanced stage of hepatitis B virus related chronic liver disease. This study revealed that in advanced stage of chronic liver disease portal vein diameter and splenic width can predict oesophageal varices. But in less advanced stage it is not clear whether this variable can predict the presence of oesophageal varices. Further studies may be needed in this regard.

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