



## A STUDY OF PORTAL VEIN DOPPLER INDICES AND ITS CORRELATION WITH OESOPHAGEAL VARICES IN CIRRHOSIS

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### ABSTRACT

**Introduction:** Esophageal varices are distended and tortuous portosystemic collateral channels formed due to obstruction of portal vein or its tributaries at lower end of oesophagus due to increased portal venous pressure. This may lead to rupture and lead to variceal haemorrhage which is immediately life threatening in 20-30 % mortality associated with each bleeding episode. This makes the diagnosis of oesophageal varices in patient with cirrhosis important. **Aims & Objectives:** To study portal venous doppler indices and its correlation with oesophageal varices in cirrhosis patients. **Materials and Methods: Inclusion criteria:** 1) Age more than 18 years. 2) Clinical and radiological evidence of chronic liver disease. **Exclusion criteria:** 1) Patients with previous history of variceal bleed, 2) Patients with portal vein thrombosis. **Results:** Out of the 100 patients, 10 (10%) did not have oesophageal varices, 25 (25%) had small oesophageal varices and 65 (65%) had large oesophageal varices. **Conclusion:** 100 cirrhotic patients (87 men, 13 women) were enrolled in the study. Mean age of the study population was  $48.95 \pm 12.65$  years. Cirrhosis was predominantly observed in men (Male: Female – 6.7:1) and 31-60 years age group (81%). In the logistic regression analysis of 100 patients, presence of hepatic encephalopathy (odds ratio 14.49, 95% Congestive Index (CI) 1.094-191.90), serum bilirubin (odds ratio 1.418, 95% CI 1.039-1.935), portal vein diameter (odds ratio 1.857, 95% CI 1.121-3.074) found to have independent predictive value for the presence of Large Esophageal Varices (LEV). Child Pugh Score (CPS) grade C has 339.14 times more likely to have LEV compared to CPS grade A.

**KEYWORDS :** Cirrhosis, Portal vein, Doppler indices, Esophageal varices.

### INTRODUCTION:

Oesophageal varices are porto systemic collaterals i.e. vascular channels that link the portal venous and also systemic venous circulation.<sup>1</sup>

The portal vein is formed by the union of the superior mesenteric vein and splenic vein, links up with the lower esophageal vein at the gastroesophageal junction (GEJ) to form esophageal varices. Varices appear as serpentine venous channels that course through several levels from the lamina propria to deep sub mucosa of esophagus and achieve their greatest prominence as a rule, 2 to 3 cm above the gastro esophageal junction and in time progress to the mid oesophagus.<sup>2</sup> They occur because of portal hypertension.<sup>3</sup>

Portal hypertension is defined as " hepatic venous pressure gradient (HVPG) greater than 5mmHg. It is due to combination of two simultaneously occurring processes:

1. Increased intrahepatic resistance through the liver because of cirrhosis and regenerative nodules
2. Increased splanchnic blood flow which occurs secondary to vasodilatation inside the splanchnic vascular bed.<sup>4-6</sup>

Variceal hemorrhage is immediately life threatening with 20-30% mortality associated with each bleeding episode.<sup>4</sup> This makes the diagnosis of esophageal varices in patients with cirrhosis important.<sup>7</sup>

Sclerotherapy and band ligation are two therapeutic uses for endoscopy in addition to being a diagnostic tool. Endoscopy, however, is an invasive procedure many people do not like. Infection, duodenal hematoma, hemorrhage, intestinal perforation, arrhythmias, airway obstruction, and aspiration are the most common complications following diagnostic endoscopy. Our study aimed to determine how Doppler

indices of Portal and hepatic vessels can be used to predict the presence of esophageal varices and to evaluate the severity of esophageal varices.

### AIMS AND OBJECTIVES:

#### AIM:

To study portal vein doppler indices and its correlation with esophageal varices in cirrhosis patients.

#### OBJECTIVES:

1. To evaluate portal hypertension parameters in liver cirrhosis by using doppler ultrasound.
2. To correlate portal hypertension parameters in predicting esophageal varices.

### MATERIALS AND METHODS:

**Study design:** Hospital based Prospective analytical study

**Study period:** One year

**Study setting:** Department of General Medicine (General Medicine wards, AMC ) SVRRGGH, TIRUPATI.

**Study subjects:** Patients admitted in SVRRGGH under Department of General Medicine radiologically diagnosed liver cirrhosis who are fulfilling the below mentioned inclusion and exclusion criteria.

**Sample size:** 100

#### Inclusion criteria:

1. Age more than 18 years with clinical and radiological evidence of chronic liver disease.
2. Patients and patient attenders who are willing to give informed consent are included in the study.

**Exclusion criteria:**

1. Patients with previous history of variceal bleed.
2. Patients with portal vein thrombosis.
3. Patients who received surgical and endoscopic intervention for Portal hypertension.

**RESULTS:**

One hundred cirrhotic patients (87 men, 13 women) were enrolled in the study. Mean age of the study population was 48.95 ± 12.65 years. Cirrhosis was predominantly observed in men (Male: Female – 6.7:1) and 31-60 years age group (81%).

**Table 1: Clinical findings among study population**

Findings	Number (%)
Ascites	84 (84)
Hepatic encephalopathy	36 (36)
Jaundice	61 (61)

Table 1 shows ascites was found among 84 patients, hepatic encephalopathy was found among 36 patients and jaundice was found among 61 patients.

**Table 2: Mean values of Doppler study parameters**

Doppler study parameters	Mean	SD
Spleen size	14.33	2.29
Portal vein diameter	11.94	3.16
HARI	0.69	0.07
HAPI	1.36	0.32
SARI	0.71	0.09
Portal vein velocity	11.90	4.53
Portal vein surface area	1.47	0.73
Liver index	9.40	4.61
Congestive index	0.24	0.14

Table 2 shows mean values of doppler study. Mean spleen size was 14.33 ± 2.29, mean portal vein diameter was 11.94 ± 3.16, Mean Hepatic Artery Resistance Index (HARI), Mean Hepatic Artery Pulsatility Index (HAPI) and Mean Splenic Artery Resistance Index (SARI) were 0.69 ± 0.07, 1.36 ± 0.32 and 0.71 ± 0.09 respectively. Mean portal vein velocity was 11.90 ± 4.53, Mean liver index and Mean congestive index were 9.40 ± 461 and 0.24 ± 0.14 respectively.

Out of the 100 patients, 10 (10%) did not have oesophageal varices at endoscopy, 25 (25%) had small oesophageal varices (SEV) and 65 (65%) have large oesophageal varices (LEV).

**Table 3: Logistic Regression Analysis Results**

Variable	P value	Odds ratio	95% CI
Age	0.100	1.064	0.988-1.146
Ascites	0.213	0.184	0.013-2.642
Hepatic encephalopathy	0.043*	14.49	1.094-191.90
Jaundice	0.723	1.458	0.181-11.75
Platelet count	0.255	1.000	-
Serum bilirubin	0.028*	1.418	1.039-1.935
Albumin	0.755	1.271	0.281-5.740
INR	0.041	0.006	0.000-0.821
CPS -Group A	0.037	1	
CPS -Group B	0.074	9.984	0.799-124.72
CPS -Group C	0.010*	339.14	3.98-289.00
Spleen size	0.594	0.890	0.580-1.367
Portal vein diameter	0.016*	1.857	1.121-3.074
HARI	0.152	209.2	0.011-289.00
HAPI	0.058	0.025	0.001-1.132
SARI	0.248	0.002	0.000-74.22
Portal vein velocity	0.050	0.703	0.494-1.000
Portal vein surface area	0.440	0.575	0.141-2.344
Liver index	0.573	1.089	0.809-1.466
Congestive index	0.169	0.003	0.000-11.97

Table 3 shows the results of a logistic regression analysis in 100 patients. In this analysis presence hepatic encephalopathy (odds ratio 14.49, 95% CI 1.094 -191.90), serum bilirubin (odds ratio 1.418, 95% CI 1.039 - 1.935), portal vein diameter (odds ratio 1.857, 95% CI 1.121 - 3.074). found to have independent predictive value for the presence of LEV. CPS grade C has 339.14 times more likely to have LEV compared to CPS grade A.

**DISCUSSION:**

A Hospital based Prospective analytical study for a period of one year done in the Department of General Medicine (General Medicine wards, AMC) S.V.R.R. Govt. Gen. Hospital, Tirupati. One hundred cirrhotic patients (87 men, 13 women) were enrolled in the study. Mean age of the study population was 48.95 ± 12.65 years. Cirrhosis was predominantly observed in men (Male: Female – 6.7:1) and 31-60 years age group (81%).

Ascites was found among 84 patients, hepatic encephalopathy among 36 patients and jaundice among 61 patients.

The severity of liver disease as assessed by Child Pugh Scoring was: Child A in 19%, Child's B and C in 31% and 50% respectively.

Mean Platelet Count among study population was 150510.0 ± 38948.94, Mean Serum Bilirubin was 4.94 ± 5.91, Mean Albumin and Mean INR were 3.04 ± 0.66 and 1.67 ± 0.44 respectively.

**Doppler study parameters:**

Mean Spleen Size was 14.33 ± 2.29, Mean Portal Vein diameter was 11.94 ± 3.16, Mean HARI, Mean HAPI and Mean SARI were 0.69 ± 0.07, 1.36 ± 0.32 and 0.71 ± 0.09 respectively. Mean Portal Vein velocity was 11.90 ± 4.53, Mean Liver Index and Mean Congestive Index were 9.40 ± 461 and 0.24 ± 0.14 respectively.

The results of a logistic regression analysis in 100 patients show presence of hepatic encephalopathy (odds ratio 14.49, 95% CI 1.094-191.90), serum bilirubin (odds ratio 1.418, 95% CI 1.039-1.935), portal vein diameter (odds ratio 1.857, 95% CI 1.121-3.074) found to have independent predictive value for the presence of LEV. CPS grade C has 339.14 times more likely to have LEV compared to CPS grade A.

According to Toyonaga et al. <sup>8</sup>, patients with resistant varices were more likely to have the "pipeline" form of variceal feeding pattern (a large, dilated LGV running up the esophagus) than patients without resistant varices (100 vs. 3%, respectively), and larger diameter of the LGV was in patients with resistant varices than in patients without resistant varices (12.4 2.0 vs. 7). These studies have been used to support EUS examinations of the LGV. According to Hino et al and Kiyono S <sup>9,10</sup>, a possible contributing factor for variceal recurrence following endoscopic treatment is either a high hepatofugal flow velocity in the LGV or an anterior branch dominant pattern.

A total of 44 non-cirrhotic portal hypertension patients were enrolled in a retrospective observational research by Cunningham et al. <sup>87</sup>, and 15 of them exhibited high-risk varices. According to the study's findings, spleen diameter more than 17.2 cm was able to predict high-risk varices with a sensitivity of 78.6% and a specificity of 64.3%. The LSM and PSR may not be as helpful in patients with non-cirrhotic portal hypertension as they are in cirrhotic patients.

Shabestari et al. <sup>11</sup> showed significant correlation between the size of esophageal varices and portal vein mean velocity (p =

0.04) and logistic regression analysis did not show any significant associations between Doppler parameters and the size of esophageal varices. He also concluded that none of hepatic vasculature Doppler measurements had a significant role in predicting the size of esophageal varices.

**Table 4 : Comparison Doppler parameters of our study with Shabestari et al.**<sup>11</sup>

Studies Parameters	Shabestari et al.11			In our study		
	No EV	LEV	P value	No EV	LEV	P value
PVV (cm/sec)	15.5 (10.8-20.2)	10.47 (6.6-14.4)	0.08	13.49 ± 4.16	11.53 ± 4.57	0.405
PV DM (mm)	11.2 (9.9-12.5)	11.4 (9.3-13.5)	0.38	12.49 ± 2.33	12.13 ± 2.82	0.412
HARI	0.69 (0.60-0.79)	0.71 (0.68-0.75)	0.83	0.75 ± 0.08	0.69 ± 0.06	0.020
HAPI	1.46 (1.05-1.87)	1.38 (1.18-1.6)	0.70	1.41 ± 0.18	1.30 ± 0.32	0.030

### CONCLUSION:

- One hundred cirrhotic patients (87 men, 13 women) were enrolled in the study. Mean age of the study population was 48.95 ± 12.65 years. Cirrhosis was predominantly observed in men (Male: Female – 6.7:1) and 31-60 years age group (81%)
- Mean spleen size was 14.33 ± 2.29, mean portal vein diameter was 11.94 ± 3.16, Mean HARI, Mean HAPI and mean SARI were 0.69 ± 0.07, 1.36 ± 0.32 and 0.71 ± 0.09 respectively. Mean portal vein velocity was 11.90 ± 4.53, mean liver index and mean congestive index were 9.40 ± 461 and 0.24 ± 0.14 respectively.
- Of the 100 patients, 10 (10%) did not have oesophageal varices (EV) at endoscopy, 25 (25%) had small oesophageal varices (SEV) and 65 (65%) have large oesophageal varices (LEV). The relationship of absence of EV or presence of SEV/LEV with various clinical, laboratory and ultrasonographic characteristics on univariate analysis. Five factors were found to be significantly different between the three groups. These were age (P=0.024), serum bilirubin (P=0.001), INR (P=0.001), HARI (P=0.020), HAPI (P=0.030). No significant difference is observed for the other parameters.
- The results of a logistic regression analysis in 100 patients show presence of hepatic encephalopathy (odds ratio 14.49, 95% CI 1.094-191.90), serum bilirubin (odds ratio 1.418, 95% CI 1.039-1.935), portal vein diameter (odds ratio 1.857, 95% CI 1.121-3.074). found to have independent predictive value for the presence of LEV. CPS grade C has 339.14 times more likely to have LEV compared to CPS grade A.

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