

## A STUDY OF CORRELATION OF ESOPHAGEAL VARICES IN CIRRHOTIC PATIENTS WITH PORTAL HAEMODYNAMICS WITH SPECIAL REFERENCE TO PORTAL VEIN DIAMETER, PORTAL VEIN VELOCITY, CONGESTION INDEX, LIVER VASCULAR INDEX

Arvind Chouhan<sup>1</sup>, Sushma Trikha<sup>2</sup>, Sanjay Dhawle<sup>3</sup>, Jyoti Nagwanshi<sup>4</sup>, Subhash Chandra<sup>5</sup>

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**ABSTRACT: OBJECTIVE:** Approximately two thirds of patients with decompensated cirrhosis and one third of those with compensated cirrhosis have varices at the time of diagnosis. Therefore, it is essential to identify and treat those patients at highest risk because each episode of variceal hemorrhage carries a 20% to 30% risk of death, and 70% of patients not receiving treatment will die within 1 year of the initial bleeding episode.<sup>(1)</sup> **METHODS:** For this study, patients with cirrhosis with or without the evidence of any upper Gastrointestinal bleed, admitted in the department of medicine, JA Group of Hospitals, GR Medical College were taken. The study was conducted between September 2011 and November 2012 and cases were evaluated on the basis of clinical, haematological, ultrasonographic and endoscopic findings. Total number of cases were 100. **RESULT:** The prevalence of esophageal varices was 75% in cirrhotic patients out of which 28% had bleeding. The prevalence of gastric varices was 1.33%. The portal vein diameter correlated with the presence of varices while portal vein velocity, congestion index and liver vascular index had no significant correlation with esophageal varices. The Portal vein diameter more than 1.4 cm can predict varices with sensitivity 76 % ( $p < 0.05$ ) and Portal vein diameter more than 1.5 cm can detect bleeding varices in cirrhotic patients with sensitivity 55.56% and specificity 80.70%. **CONCLUSION:** This study showed that duration of illness, spleen size and tense ascites on ultrasonography and portal vein diameter correlated with the presence of esophageal varices. The duration of illness and portal vein diameter are also correlated with bleeding manifestation

**KEYWORDS:** Decompensated cirrhosis, Variceal hemorrhage, tense ascites.

**INTRODUCTION:** Approximately two thirds of patients with decompensated cirrhosis and one third of those with compensated cirrhosis have varices at the time of diagnosis. Varices develop annually in 5% to 15% of patients with cirrhosis and enlarge by 4% to 10% each year. It is essential to identify and treat those patients at highest risk because each episode of variceal hemorrhage carries a 20% to 30% risk of death, and 70% of patients not receiving treatment will die within 1 year of the initial bleeding episode.<sup>(1)</sup> Use of accurate and specific noninvasive methods may help to identify high risk patients for esophageal varix development bleeding who can benefit from prophylactic pharmacologic and endoscopic therapies and to avoid unnecessary endoscopy in low risk patients.

The purpose of our study is to assess the portal haemodynamic values like portal vein diameter, portal vein velocity, congestion index and liver vascular index for predicting the presence of esophageal varices in patients with cirrhosis who cannot undergo upper gastrointestinal endoscopic screening because of cost or invasive nature.

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**MATERIAL AND METHODS:** Total number of cases were 100. Informed consent was taken from all the patients. Each patient was subjected to a detailed history and clinical examination. All patients underwent haematological, biochemical, ultrasonographic and upper gastrointestinal endoscopic assessment.

**Inclusion Criteria:**

1. All the patients with proven or suspected case of liver cirrhosis.
2. Age between 15-70 yrs.

**Exclusion Criteria:**

1. Patient with history of any bleeding diathesis.
2. Patient with history of any coagulation disorder.
3. Patients with history of any coexistent illness or infection that could influence the platelet count.
4. Patients with splenomegaly and ascites whose cause were other than cirrhotic portal hypertension.
5. Patient having history of drug intake that may alter the liver enzyme levels, haematological, bleeding and coagulation profiles.

Depending on the presence of esophageal varices and bleeding, patients were divided into three groups: GROUP A-cirrhotic patients with non-bleeding EV, GROUP B-cirrhotic patients with bleeding EV and GROUP C-cirrhotic patients without EV.

**COLOUR DOPPLER:** Realtime sonography enhanced by duplex doppler and colourflow doppler images were used for noninvasive evaluation of the portal hemodynamics.

Normal portal vein diameter is in the range 6.4 to 12.1 mm.<sup>(2,3)</sup> PVD exceeding 13 mm indicates PTHT with a degree of specificity 100% but sensitivity 45 to 50%.<sup>(4)</sup>

In normal individuals, portal flow is hepatopedal throughout the cardiac cycle. Mean flow velocity is about 15 to 18 cm/sec, but the flow range is wide.<sup>(4)</sup> Portal vein mean velocity is estimated by using a correction factor to calculate a true averaged mean velocity: portal venous mean velocity =  $V_{\text{dmax}} \times 0.57 / \cos \theta$ .<sup>(5)</sup>

The congestion index is the ratio between cross-sectional area and the mean flow velocity of the portal trunk. The congestion index elevation above 0.13 cm\*sec has a 67% sensitivity for PTHT.<sup>(6)</sup>

The CI was calculated using the following equation.<sup>(5)</sup>

$$\begin{aligned}
 \text{CI} &= \frac{\text{Cross-sectional area of portal vein}}{\text{Blood flow velocity of portal vein}} \\
 &= \frac{A \times B \times \pi / 4}{0.57 \times V_{\text{dmax}} / \cos \theta}
 \end{aligned}$$

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where A = short axis of the portal vein, B = long axis of the portal vein, Vdmax = maximum velocity obtained from the Doppler spectrum, and  $\theta$  = angle between the ultrasound beam and the blood vessel. The coefficient 0.57 is the ratio of mean velocity to maximum velocity obtained from experimental studies using circulation models.

The liver vascular index is more suitable for expressing hepatic artery buffer response and is calculated as.<sup>(7)</sup>

$$\text{LVI} = \frac{\text{Portal vein velocity}}{\text{HAPI}}$$

LVI less than 12 cm/sec identified cirrhosis and portal hypertension with specificity of 97% and sensitivity of 93%.<sup>(8)</sup> The HAPI varies from 1.16-1.24 in normal subjects.<sup>(7)</sup>

**STATISTICAL ANALYSIS:** Data were analysed using SPSS and EPICALC 2000 software. ANOVA test was used to compare the continuous variables. The CHI-SQUARE test was used to identify the differences between the categorical variables. 'p' values less than 0.05 was considered to indicate statistical significance.

**RESULT:** This study was conducted among the 100 cirrhotic patients and Group A included 54, Group B 21 and Group C 25 subjects. The mean age of the total subjects were 45.59 years. The mean age for males was 45.85 years and for females was 45.75 years. The male: female ratio of was 77:23. The mean duration of the total subjects was 1167.3 days, whereas in group A, group B and group C were 1207 days, 1567 days and 745.2 days respectively which had statistically significant difference among the three groups.

In cirrhotic males, the most common etiology is alcohol 62.34% and most were in the age group 36-55 years followed by hepatitis B 15.58% and etiology was unidentified in 20.78%. In cirrhotic females, etiology was unidentified in 56.52% and, most common etiology is hepatitis B 30.43 % and no females were alcoholic. 92% patients belonged to decompensated liver disease. All the females in the present study had decompensated liver disease (child B+C) as compared to 89.61% in males. Massive ascitis on ultrasound was present in 17 patients and all had varices out of which 2 had bleeding, which was statistically significant ( $p < 0.05$ ). The mean splenic size was 14.98 cm. In the group A, B and C it was 14.58, 16.96 and 14.19 cms and was statistically significant.

The mean portal vein diameter in group A was 1.42 cm, group B was 1.55 cm and in group C was 1.39cm. There was statistically significant difference among three groups ( $p$  value  $< 0.05$ ). The sensitivity of portal vein diameter value more than 1.4cm, in predicting esophageal varices was 76% ( $p < 0.05$ ) and specificity 26% ( $p < 0.05$ ) while Portal vein diameter more than 1.5 cm can detect bleeding varices in cirrhotic patients with sensitivity 55.56% and specificity 80.70%.

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| Sl. No. | Characteristics     | Group A (n=54) | Group B (n=21) | Group C (n=25) | P value                |
|---------|---------------------|----------------|----------------|----------------|------------------------|
| 1.      | Male: Female        | 39:15          | 17:4           | 21:4           | CS=1.73<br>P=0.455     |
| 2.      | Mean Age in yrs     | 46±15.9        | 45.5±14.3      | 44.5±15.5      | P=0.923                |
| 3.      | Etiology            |                |                |                | CS=7.08<br>P=0.52      |
|         | Hepatitis B         | 9              | 5              | 5              |                        |
|         | Hepatitis C         | 3              | 0              | 0              |                        |
|         | Alcohol             | 28             | 10             | 10             |                        |
|         | Alc+Hepatitis       | 0              | 0              | 1              |                        |
|         | Others              | 14             | 6              | 9              |                        |
| 4.      | Duration of illness | 1207±868       | 1567±1156      | 745.2±1081     | P=0.0205               |
| 5.      | Child pugh class    |                |                |                | CS=33.67<br>P=0.000008 |
|         | A                   | 4              | 1              | 3              |                        |
|         | B                   | 31             | 10             | 13             |                        |
|         | C                   | 19             | 10             | 9              |                        |

**Table 1: Statistical analysis of general demographic parameters among the study groups**

Table 1 showed that duration of illness and child pugh class had statistical difference between the non-bleeding (A), bleeding (B) and no varices (C) group.

| Sl. No. | Radiological findings | Group A (n=54) | Group B (n=21) | Group C (n=25) | P value            |
|---------|-----------------------|----------------|----------------|----------------|--------------------|
| 1.      | Ascites               |                |                |                | CS=13.44<br>P=0.03 |
|         | No                    | 2              | 0              | 0              |                    |
|         | Mild                  | 18             | 7              | 11             |                    |
|         | Moderate              | 19             | 12             | 14             |                    |
|         | Massive               | 15             | 2              | 0              |                    |
| 2.      | Spleen size (in cm)   | 14.58±2.42     | 16.96±3.32     | 14.19±2.62     | P=0.001            |

**Table 2: Statistical analysis of Ultrasonographic findings among the study groups**

Table 2 showed the presence of Ascites by ultrasonography has significant statistical difference between the non-bleeding (A), bleeding (B) and no varices (C) group ( $p < 0.05$ ). The mean splenic size was 14.48 cm among group A, 16.59 among group B and 14.19 cm among group B which was statistically significant ( $p < 0.05$ ).

| Sl. No. | Colour Doppler Parameter                            | group A (n=54) | group B (n=21) | group C (n=25) | ANOVA P value |
|---------|---|----------------|----------------|----------------|---------------|
| 1.      | Portal Vein Diameter (cm)                           | 1.42±0.19      | 1.55±0.25      | 1.39±0.22      | P=0.026       |
| 2.      | Portal Vein Velocity (cm/sec)                       | 12.2±3.4       | 13.6±3.44      | 13.1±3.81      | P=0.253       |
| 3.      | Portal Vein Cross-sectional Area (cm <sup>2</sup> ) | 2.1±0.8        | 2.2±1.1        | 2.1±1.3        | P=0.922       |
| 4.      | Hepatic Artery Pulsatility Index                    | 1.28±0.44      | 1.31±0.43      | 1.48±0.4       | P=0.153       |
| 5.      | Congestion Index(cm.sec)                            | 0.18±0.08      | 0.17±0.11      | 0.18±0.14      | P=0.926       |
| 6.      | Liver Vascular Index(cm/sec)                        | 10.5±4.13      | 11.5±3.92      | 9.29±3.05      | P=0.152       |

Table 3: Statistical analysis of colour doppler parameters among the study groups

Table 3 showed significant difference in portal vein diameter among non-bleeding, bleeding and no varices group. While other doppler parameters no statistically significant difference among the three groups.

**DISCUSSION:** The prevalence of esophageal varices was in cirrhotic patients was 75%, out of which had 28% had bleeding. The prevalence of gastric varices was 1.33%. A Hekmatnia<sup>(9)</sup> study 62% cirrhotic patients had esophageal varices. Filippo Schepis et al<sup>(10)</sup> reported that Esophageal varices were in 63 of the 143 patients examined (44%).

The mean duration of illness was 1167.3 days, whereas in group A, group B and group C were 1207 days, 1567 days and 745.2 days respectively which had significant difference among the three groups which is similar to Cales et al study,<sup>(11)</sup> which concluded large varices was associated with the longer duration of cirrhosis. The mean splenic size was 14.98 cm. In the group A, B and C it was 14.58, 16.96 and 14.19 cms and was statistically significant (p<0.05). The present study was consistent with most of the studies. The present study had similar finding to Mohammad K Tarzarni et al<sup>(12)</sup>, that suggests two independent situations for beginning endoscopic evaluation of compensated cirrhotic patients: Portal hypertensive index > 2.08 and spleen size > 15.05 cm. Massive ascitis (+++) was present in 17 patients and all had varices out of which 2 had bleeding, which was statistically significant (p<0.05).

The sensitivity of portal vein diameter value more than 1.4cm, in predicting esophageal varices was 76% (p<0.05) and specificity 26% (p<0.05) while Portal vein diameter more than 1.5 cm can detect bleeding varices in cirrhotic patients with sensitivity 55.56% and specificity 80.70%. Bolondi et al,<sup>(13)</sup> reported that US could only identify 42% patients with portal hypertension on the basis of size of portal vein. S Plestina et al,<sup>(14)</sup> concluded that portal vein size on ultrasound is independently associated with bleeding esophageal varices. Prihatini et al,<sup>(15)</sup> concluded that portal vein size 1.2 cm on ultrasound gives evidence of presence of esophageal varices While Feng Hua Li et al,<sup>(16)</sup> showed no difference in portal flow velocity and diameter.

There were no statistically significant difference in portal vein velocity, congestion index and liver vascular index among the three groups which is consistent with A Hekmatnia<sup>(9)</sup> study which concluded that portal vein diameter, portal vein velocity, congestion index had no acceptable predicting value for the presence of varices and Annet et al,<sup>(17)</sup> Hepatic flow parameters measured with MR imaging correlate with the severity of cirrhosis and portal hypertension and Doppler US

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parameters are only weakly correlated with portal pressure. Jeon SW et al<sup>(18)</sup> also found that doppler measurement was not helpful in distinguishing the presence of varices. Iwao T et al 1997,<sup>(19)</sup> showed that the liver vascular index is a highly sensitive and specific Doppler ultrasound parameter in the diagnosis of cirrhosis and portal hypertension. Testa et al<sup>(20)</sup> found a significant relationship between CI and EV.

**CONCLUSION:** This study showed that duration of illness, spleen size and tense ascitis and portal vein diameter are correlated with the presence of esophageal varices. The duration of illness and portal vein diameter are also correlated with bleeding manifestation. While portal vein velocity, congestion index and liver vascular index had no significant correlation with esophageal varices.

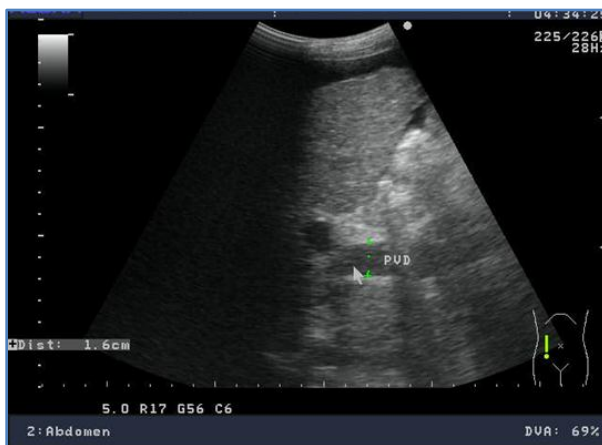


Fig. 1

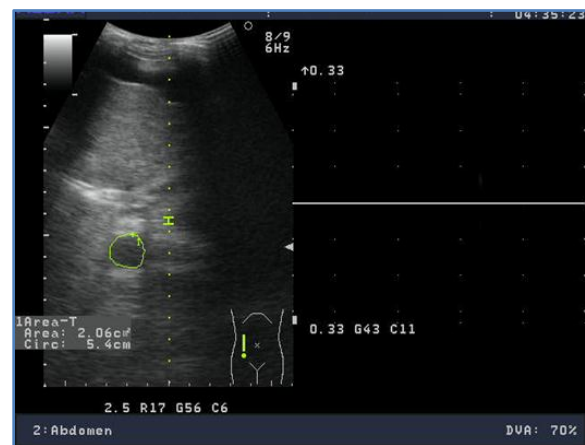


Fig. 2

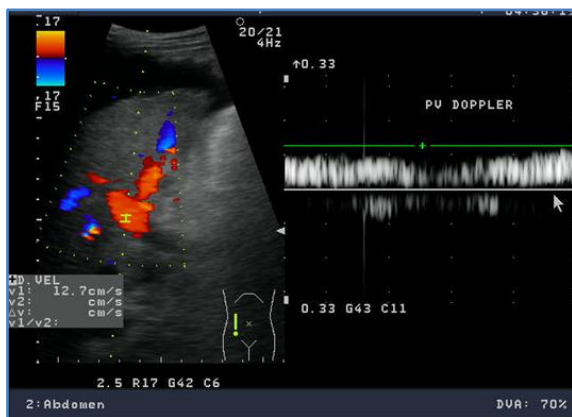


Fig. 3

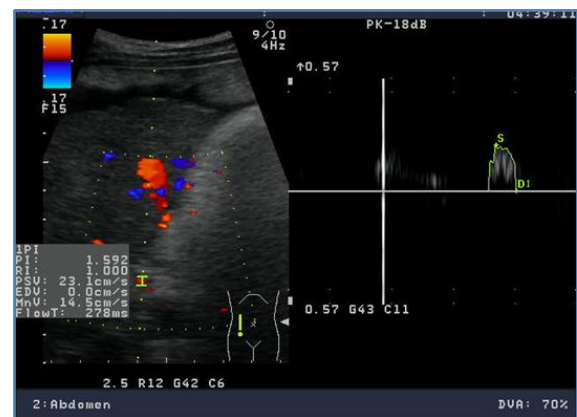


Fig. 4

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### AUTHORS:

1. Arvind Chouhan
2. Sushma Trikha
3. Sanjay Dhawle
4. Jyoti Nagwanshi
5. Subhash Chandra

### PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Medicine, G. R. Medical College, Gwalior, M. P.
2. Associate Professor, Department of Medicine, G. R. Medical College, Gwalior, M. P.
3. Associate Professor, Department of Medicine, G. R. Medical College, Gwalior, M. P.

4. Post Graduate Student, Department of Medicine, G. R. Medical College, Gwalior, M. P.
5. Post Graduate Student, Department of Medicine, G. R. Medical College, Gwalior, M. P.

### NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Arvind Chouhan,  
106-A, Sindhi Colony,  
Lashkar, Gwalior-474001, M. P  
E-mail: drarvindchouhanmd@gmail.com

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