Platelet count/splenic diameter ratio: Analysis of its capacity as a predictor of the existence of esophageal varices in liver cirrhosis

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ABSTRACT

Background: Endoscopic screening for esophageal varices (EV) is suggested for all cirrhotic patients. Patients with steady liver function should have a screening endoscopy every 2 years if no varices are found. In addition, a liver function test should be performed yearly for those with worsening liver function. **Aims and Objectives:** The study aimed to investigate non-invasive parameters' predictive efficacy, such as Platelet count/splenic diameter ratio (PC/SD ratio), by diagnosing EV in cirrhotic patients. **Materials and Methods:** A Prospective, analytical, single-center study was conducted on 50 patients admitted to Government Rajaji Hospital, Madurai, with cirrhosis between March 2021 and August 2021. Patients with cirrhosis histories and clinical characteristics were admitted to the medical ward of Government Rajaji Hospital. The ultrasonogram (for splenic diameter) and a platelet count were performed on all 50 patients. **Results:** Thirty-three of the 50 patients had EV during upper gastrointestinal endoscopy. A platelet count/splenic diameter ratio of <900 was found in 33 patients. The two remaining patients have seen a ratio of >900. Therefore, the study's total of 33 patients had a ratio of <900. Varices were absent in 2 of them. The mean platelet count/spleen diameter ratio of patients without varices was 948.98, and with varices it was 826.9. Hence, using a ratio of 870 as a cutoff, 96% of patients with varices were detected (sensitivity: 94.12% and specificity: 93.94%). **Conclusion:** This study suggests that a lower Platelet count/splenic diameter ratio (PC/SD ratio) identifies patients needing endoscopy for esophagal varices preventative therapy. Platelet count, spleen bipolar diameter, and PSR are non-invasive, cost-friendly diagnostics.

Key words: Esophageal varices; Cirrhosis; Upper gastrointestinal bleeding; Platelet count and spleen diameter ratio

INTRODUCTION

Cirrhosis is one of the most common diseases that causes severe morbidity and early death. Viral hepatitis and excessive alcohol intake are the most prevalent causes of cirrhosis. Cirrhosis develops in about 15–20% of those infected with hepatitis over a period of 5–20 years.[1] A person's risk of liver cirrhosis increases directly with the presence of hepatitis B surface antigenantigens in their blood. Patients with chronic liver disease infected with Hepatitis C are only discovered by chance. More than three-quarters of patients are susceptible to persistent infection, which results in a lack of viral clearance.[2] Aside from cirrhosis, alcohol is the second-most common risk factor for developing Chronic liver disease. Alcoholic liver disease is rising, killing over 3,000 individuals each year.[3] The average age at which a patient is diagnosed is dropping. Cirrhosis can occur if an individual consumes an average of more than 160 g of alcohol daily for 8 years. Non-alcoholic fatty liver disease (NAFLD) is a risk factor for chronic liver disease, and obese people are likelier to have NAFLD.[3]

Cirrhosis is commonly associated with portal hypertension; as many as 40–45% of all deaths are caused by variceal hemorrhage. Patients with steady liver function should have a screening endoscopy every 2 years, even if no varices are

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found.[4] A liver function test should be performed yearly for those with worsening liver function. In addition to draining medical resources, such a program may be limited by a lack of screening and surveillance requirements compliance. 60–80% of cirrhotic patients have esophageal varices (EV). Hence, starting empirical therapy for all cirrhotic patients may expose many to harmful side effects.[5] Non-invasive EV diagnosis might improve cost-benefit.[6] This reduces the number of patients undergoing unnecessary empirical treatment. Such a non-invasive method should be safe to minimize misdiagnosis in patients at risk and unnecessary endoscopy.

Platelet count/spleen diameter ratio was preferred as a non-invasive EV assessment method since it met these criteria and was based on pathophysiological criteria. Patients without EV who underwent trial endoscopy were followed up to see if this criterion accurately diagnosed them. Finally, the first data from other researchers demonstrated that the platelet or spinal count is a reliable diagnostic tool. The diameter ratio is preserved in certain people with different liver disease etiologies and treatments. This prospective experiment will monitor platelet count and spleen diameter to determine EV diagnosis in cirrhotic patients.[7]

Aims and objectives
The study aimed to investigate the predictive efficacy of non-invasive parameters such as platelet count/splenic diameter ratio in diagnosing EV in cirrhotic patients.

MATERIALS AND METHODS

A Prospective, analytical, single-center study was conducted at the Government Rajaji Hospital, Madurai. The study was conducted between March 2021 and August 2021. It was conducted among 50 patients admitted to the medical ward at Government Rajaji Hospital, Madurai, with a cirrhosis history and clinical features. First, the patients gave their signed informed consent after receiving appropriate information. Then, every patient was given an excellent, detailed questionnaire about their data and medical history.

Inclusion criteria
Age >18 years, Patients were undergoing screening endoscopy for varices at the time of the diagnosis of cirrhosis. They know cirrhotic patients who have never undergone screening endoscopy for EV.

Exclusion criteria
Active upper gastrointestinal bleeding, previous history of endoscopic sclerosis or band ligation of EV, previous surgery for portal hypertension (stents), previous history of beta-blocker treatment or prophylaxis Pediatric patients, patients unwilling to participate in the study, and individuals unable to abstain from alcoholism.

Following clearance from the Institutional Ethical Committee, patients who met the inclusion criteria and did not meet any exclusion criteria were told about the objective and method of the research and recruited after providing written informed consent. SPSS was used for the statistical analysis. Mean, standard deviation, and Chi-square with Yates' correction were used. The P-value indicated significant results. In addition, the Chi-square or Fisher exact test was used to compare categorical study parameters between groups.

RESULTS

Most of the patients were in the age group of >50 years of age. Most of the patients are male (82%). All patients in this study had stigmata of liver cell failure. In the Etiology of cirrhosis, alcohol is 74%, Hepatitis B virus is 4%, Hepatitis C virus is 6%, Metabolic-associated fatty liver disease is 10%, WILSON is 2%, and Unknown is 4%. Esophageal gastric varices are present in 66% of patients (Table 1).'

Among 50 patients, 21 (42%) were low in hemoglobin; most patients with serum bilirubin were in between 1.0 mg/dL and 2.0 mg/dL, which is 60%. In addition, 34 (68%) patients had abnormal bilirubin, 30 (60%) had low serum protein, 20 (40%) had low albumin, and 23 (46%) had abnormal prothrombin time.

Table 1: Distribution of patient characteristics		
Variable	**No. of cases**	**Percentage**
Age		
<40	13	26
41–45	9	18
46–50	9	18
>50	19	38
Gender		
Male	41	82
Female	9	18
Sign of liver cell failure		
Present	50	100
Etiology of cirrhosis		
Alcohol	37	74
HBV	2	4
HCV	3	6
MAFLD	5	10
WILSON	1	2
Unknown	2	4
Alcoholic		
Present	38	76
Esophageal gastric varices		
Present	33	66

HBV: Hepatitis B virus, HCV: Hepatitis C virus, MAFLD: Metabolic associated fatty liver disease
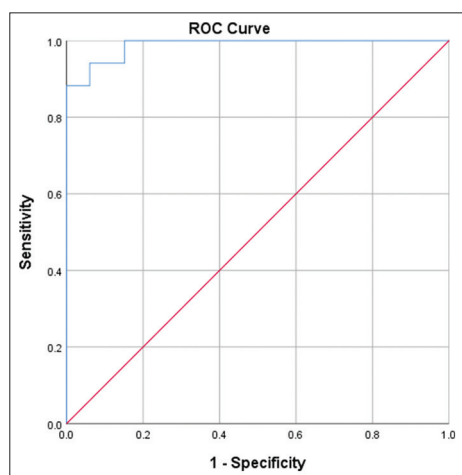
Of 50 patients, two patients had <125000 platelets, 15 had more than 125000 platelets, 33 (70%) patients had a low platelet count, and 33 patients had possible Esophageal gastric varices, which is statistically significant P<0.001 (Table 2).

Eighteen patients had <150 spleen diameters, 15 had more than 150 spleen diameters, and 17 (34%) had abnormal

Figure 1: Receiver operating characteristic curve for the platelet count/diameter of the spleen ratio in prediction of esophageal varices

Table 2: Distribution of patient's biochemical characteristics

Parameters	No. of cases	Percentage
Hb		
<9 g/dL	29	58
>9 g/dL	21	42
Sr. Bilirubin		
<1.0 mg/dL	16	32
1.0–2.0 mg/dL	30	60
2.1–3.0 mg/dL	3	6
3.1–4.0 mg/dL	1	2
Serum protein		
<5.0 g/dL	13	26
5.1–6.0 g/dL	17	34
6.1–7.0 g/dL	17	34
>7.0 g/dL	3	6
Albumin		
<2.5 g/dL	20	40
>2.5 g/dL	30	60
Prothrombin time		
<15 s	27	54
>15 s	23	46

spleen diameters. In addition, 17 patients had possible Esophageal gastric varices, which is statistically significant P<0.001 (Table 3).

Using the cutoff value, patients with negative varices were 16 with <870 PC/SD ratio (PSR), and 31 were positive with above 870 PSR (Figure 1 and Table 2).

The sensitivity to predict negative varices using a cutoff of <870 was 94.12%, specificity was 93.94%, positive predictive value (PPV) was 88.89%, negative predictive value (NPV) was 96.88%, and accuracy was 94.00% (Table 5).

DISCUSSION

This study included 50 confirmed cirrhotic patients, and the most common complaints were abdominal distension, Pedal edema, reduced appetite, and jaundice. Symptoms included leg edema and fatigue. In addition, 76% of the 50 patients were alcoholics.

Using a ratio of 870 as a cutoff, 93.94% of patients with varices were found to have sensitivity of 94.12% and specificity of 93.94%. Furthermore, the PPV was 88.89%, the NPV was 96.88%, and the accuracy was 94.00%. So, our study shows significant sensitivity and PPV strong enough to identify the presence of varices in the study group.

According to a Chen et al., study, the overall PSR specificities for every varices and high-risk varices were 0.78 and 0.67, respectively. The PSR area under the summary receiver operating characteristic curves at the cutoff of 909 was 0.8867. PSR showed great sensitivity in the diagnosis of viral liver cirrhosis.[8]

Xu et al., found that a ratio of 909 correctly predicted the incidence of EV in 123 of 141 (87.2%) individuals; however, 25.3% of patients with EV were missed due to a lack of sensitivity. The results indicated that the PSR served as a reliable diagnostic for predicting the existence of EV in individuals with hepatic cirrhosis.[9]

A study by Kim et al., liver stiffness and the platelet count/spleen diameter ratio revealed predictive factors of EV P<0.001 in a multivariate statistical analysis. However, only

Table 3: Esophageal gastric varices versus platelets and spleen diameter

Outcome	Esophageal gastric varices				P-value
	Positive		Negative		
	Mean	Standard deviation	Mean	Standard deviation	
Platelets	92424.24	17567.78	165352.94	36288.67	<0.0001
Spleen diameter (mm)	150.39	14.37	136.41	10.45	0.001
PC/SD ratio	626.88	164.76	1220.00	296.07	<0.0001

Table 4: Esophageal gastric varices ratio

Outcome	Esophageal gastric varices		Total
	Negative	Positive	
PC/SD ratio			
>870	16	2	18
<870	1	31	32
Total	17	33	50

Table 5: Prediction of esophageal varices

Findings	???
AUC	0.988
P-value	<0.0001
Cutoff value	870
Sensitivity	94.12%
Specificity	93.94%
PPV	88.89%
NPV	96.88%
Accuracy	94.00%

AUC: Area under the curves, PPV: Positive predictive value, NPV: Negative predictive value

hepatic stiffness was found to be a statistically significant predictor of the existence of high-risk varices.[10]

Karatzas et al., found that employing a platelet/spleen diameter ratio of 909 as a cutoff value resulted in 56.5% sensitivity and 35.7% specificity. Results showed a statistically significant (P=0.05) variation in specificity and sensitivity between methods.[11]

Dan et al., conducted a study showing the AUCROC (95%) of the prediction method was 0.925; the technique was associated with PLT/SD, whereas PLT/SD was associated with PLT, indicating that the modeling was superior for predicting the occurrence of EV.[12]

According to research by Valero and Olympia, a ratio of 1.86 was the most predictive of platelet count and spleen size. The PPV and NPV s were relatively high: 89% and 33%, respectively. The threshold for this cutoff was 86% sensitive. The remaining laboratory parameters also failed to provide reliable prediction values.[13]

In a study by Cho et al., LS and LS-spleen diameter to platelet ratio score (LSPS) performed better than other index values with respective area under the curves (AUCs) of 0.85 and 0.82, suggesting that LS and LSPS are the best predictors of clinically significant portal hypertension in patients with cirrhosis.[14]

Jamil et al., studied the PSR as the best predictor of the existence of varices, with the following statistics: AUC=0.9, P<0.0001; cutoff value: 1077.42; specificity: 81.43%; sensitivity: 88.75%. The AUC for platelets was 0.85, and for the splenic diameter, it was 0.77, demonstrating that both are reliable predictors. The results show that it is simple

and may be used with other indicators to help physicians identify people at high risk for having EV.[15]

According to research by Ozdil et al., patients with big EV were shown to have considerably lower P/S compared to those with minor EV (P=0.04), and a sensitivity of 82% as well as a PPV of 79% were found between P/S and significant varices. Outcomes of individuals with EV showed that P/S was associated with significant varices with a sensitivity of 82%.[16]

A meta-analysis by Ying et al., showed that the post-test likelihood for varices was 87% if the PSR ratio was <909 but only 9% if the PSR ratio was 909 or above. PSR also exhibited good EV diagnostic accuracy in individuals with compensated cirrhosis. Patients with chronic decompensated liver disease benefit from this study since it lessens the frequency with which they must undergo invasive treatment.[17]

In another study by Amin and Muhammad, patients without EV had a mean platelet count to spleen diameter ratio of 1162.41, whereas those with varices had a ratio of 704.28. EV may be predicted with a specificity valid negative case of 81.48% if a value of >909 is considered normal. The sensitivity is 92.4%, the specificity is 74.8%, and the NPV is 2.8%. The platelet count to spleen diameter ratio was lowered in all individuals with EV.[18]

In our study, patients with EV were also low in platelet count and spleen diameter ratio. All the above results indicated the PSR predicting the existence of EV in liver cirrhosis patients, similar to our study.

Limitations of the study
- The short duration of the study and the small sample size. More studies with larger and smaller sizes and longer durations are required
- Unequal gender distribution in the sample size.

CONCLUSION

A low PSR predicts the varices presence and identifies the patients' subsets who need endoscopy for effective preventative therapy of EV. This reduces the endoscopy unit workload and prevents excessive OGD screening. Platelet count, spleen bipolar diameter, and PSR are economical non-invasive diagnostics. This ratio also helps cirrhotic patients with encephalopathy when endoscopy is not possible.

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