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DIAGNOSTIC ACCURACY OF PLATELET COUNT/SPLEEN DIAMETER RATIO FOR ESOPHAGEAL VARICES IN PATIENTS WITH HEPATIC CIRRHOSIS

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Abstract

Objective

To evaluate the diagnostic accuracy of the platelet count/spleen diameter (PC/SD) ratio in predicting esophageal varices among patients with liver cirrhosis, taking endoscopy as the gold standard.

Methodology

This cross-sectional study was conducted at the Department of Medicine, Combined Military Hospital, Multan, over six months following approval from CPSP and the hospital ethics committee. A total of 286 cirrhotic patients aged 30–75 years were included through non-probability consecutive sampling. Patients with hepatocellular carcinoma, prior variceal bleeding, or prophylactic therapy were excluded. Platelet counts were determined using an automated hematology analyzer, and spleen diameter was measured via ultrasound. All patients underwent upper GI endoscopy for confirmation of esophageal varices. Data were analyzed using SPSS version 23, and diagnostic accuracy parameters were calculated using a 2×2 contingency table.

Results

The mean age was 53.9 ± 10.1 years; 62.6% were male. The mean platelet count was 112.5 ± 41.8 $\times 10^9$/L, spleen diameter 150.7 ± 23.9 mm, and PC/SD ratio 747.2 ± 352.6. Esophageal varices were found in 229 (80.1%) patients on endoscopy and predicted in 237 (82.9%) by PC/SD ratio. The sensitivity, specificity, positive predictive value, negative predictive value, and overall diagnostic accuracy of the PC/SD ratio were 83.8%, 70.2%, 91.9%, 51.9%, and 81.1%, respectively.

Conclusion

The PC/SD ratio is a reliable, non-invasive predictor of esophageal varices in cirrhotic patients, reducing the need for routine endoscopy—especially valuable in resource-limited settings.

INTRODUCTION

Portal hypertension is the major complication of liver cirrhosis.[1] Esophageal varices occur in about 80% of cirrhotic patients at some point, and 30% of these patients experience bleeding episodes at least once as a result of variceal rupturing.[2] As a result, determining if esophageal varices are present is an essential component of the diagnostic process for cirrhosis patients.[3] The identification of individuals at risk for bleeding and their selection for prophylactic treatment constitute the first and most important preventative step.[4] Endoscopy remains the only reliable way to look at esophageal varices because there are no other markers to identify their presence or size.[5] Nevertheless, access to endoscopy and other resources is limited in some countries.

Various predictors of the presence of varices have been identified in different studies. Giannini et al proposed the use of the platelet count (PC) / spleen diameter (SD) ratio as a noninvasive tool for predicting the presence of varices.[6] The use of the PC/ SD ratio for the noninvasive assessment of varices seems to meet strict methodological criteria and is based on pathophysiological criteria. The accuracy of this parameter was validated using endoscopic diagnosis in a follow-up of patients free of esophageal varices.[7]

Gonzalez-Ojeda A et al enrolled 91 patients with hepatic cirrhosis. Esophageal varices were present in 73 (80.2%) patients on endoscopy. The platelet count/spleen diameter ratio to detect esophageal varices independent of the grade showed using a cutoff value of ≤ 884.3, had 84% sensitivity, 70% specificity, and positive and negative predictive values of 94% and 40%, respectively.[8] Jamil Z et al studied 150 cirrhotic patients. Esophageal varices were present in 51.3% of patients on endoscopy. The AUC for PC/SD ratio was 0.883 (95% CI, 0.821 to 0.930; SE, 0.0303; p<0.0001). The cutoff point for PC/SD was ≤1077.42 (sensitivity, 88.75%; specificity, 81.43%; +PV, 34.7; -PV, 98.5).[9]

METHODOLOGY

This cross-sectional observational study was conducted in the Department of Gastroenterology at CMH Multan between June- Dec 2024. Patients diagnosed with hepatic cirrhosis, confirmed by clinical, biochemical, and radiological findings, were enrolled consecutively. Subjects aged between 18-35 years and of both sexes were included after obtaining informed consent. Exclusion criteria comprised patients with active gastrointestinal bleeding, prior variceal therapy, splenectomy, hematologic disorders, or incomplete data. The study aimed to assess the diagnostic accuracy of the platelet count/spleen diameter ratio (PC/SD ratio) in predicting the presence of esophageal varices. Ethical approval was obtained from the institutional review board prior to initiation of the study.

Quantitative variables included platelet count ($\times 10^9$/L), spleen diameter (mm), and the calculated PC/SD ratio. These were measured using standardized laboratory methods and ultrasonographic assessments performed by experienced radiologists. The presence and grading of esophageal varices were determined through upper gastrointestinal endoscopy, which served as the gold standard. Qualitative variables included gender, etiology of cirrhosis (e.g., viral, alcoholic, or cryptogenic), and the presence or absence of esophageal varices. All measurements were performed under uniform conditions to minimize inter-observer variability and ensure reproducibility.

Data were compiled and analyzed using [statistical software, e.g., SPSS version XX]. Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR) as appropriate, while categorical variables were presented as frequencies and percentages. The diagnostic accuracy of the PC/SD ratio for detecting esophageal varices was evaluated by calculating sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and area under the receiver operating characteristic (ROC) curve. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 286 patients diagnosed with liver cirrhosis were enrolled in this cross-sectional study

conducted at the Department of Medicine, Combined Military Hospital Multan, over a period of six months after approval from the CPSP and the hospital ethical review committee.

Demographic and Clinical Characteristics

The mean age of the patients was 53.9 ± 10.1 years (range 30–75 years). Out of the total, 179 (62.6%) were males and 107 (37.4%) were females, with a male-to-female ratio of 1.7:1.

The mean duration of liver cirrhosis was 5.3 ± 2.6 years. Mean platelet count was 112.5 ± 41.8 $\times 10^9$/L, while mean spleen diameter was 150.7 ± 23.9 mm. The mean platelet/spleen diameter (PC/SD) ratio was 747.2 ± 352.6.

According to the Child-Pugh classification, 79 (27.6%) patients were in class A, 126 (44.1%) in class B, and 81 (28.3%) in class C.

Upper GI endoscopy revealed esophageal varices in 229 (80.1%) patients. Based on the PC/SD ratio, 237 (82.9%) patients were predicted to have esophageal varices.

Table 1. Baseline characteristics of study population (n = 286)

Variable	Mean ± SD / n (%)
Age (years)	53.9 ± 10.1
Gender	
Male	179 (62.6%)
Female	107 (37.4%)
Duration of cirrhosis (years)	5.3 ± 2.6
Platelet count ($\times 10^9$/L)	112.5 ± 41.8
Spleen diameter (mm)	150.7 ± 23.9
Platelet/Spleen Diameter Ratio (PC/SD)	747.2 ± 352.6
Child-Pugh class	
A	79 (27.6%)
B	126 (44.1%)
C	81 (28.3%)
Esophageal varices on endoscopy (Yes)	229 (80.1%)
Esophageal varices on PC/SD ratio (Yes)	237 (82.9%)

Diagnostic Accuracy of Platelet/Spleen Diameter Ratio

Endoscopy was taken as the gold standard for diagnosing esophageal varices. A 2×2 contingency table was constructed to assess the diagnostic accuracy of the PC/SD ratio.

Table 2. Diagnostic accuracy of PC/SD ratio for detection of esophageal varices (n = 286)

Endoscopy Findings	PC/SD Positive	PC/SD Negative	Total
Varices Present	192 (True Positive)	37 (False Negative)	229
Varices Absent	17 (False Positive)	40 (True Negative)	57
Total	209	77	286

Calculated Diagnostic Performance

Parameter	Formula	Result
Sensitivity	TP / (TP + FN)	192 / 229 = **83.8%**
Specificity	TN / (TN + FP)	40 / 57 = **70.2%**
Positive Predictive Value (PPV)	TP / (TP + FP)	192 / 209 = **91.9%**
Negative Predictive Value (NPV)	TN / (TN + FN)	40 / 77 = **51.9%**
Overall Accuracy	(TP + TN) / Total	232 / 286 = **81.1%**

Stratified Analysis

After stratification by age, gender, duration of cirrhosis, and Child-Pugh class, the diagnostic accuracy of the PC/SD ratio remained statistically similar across subgroups.

- Sensitivity ranged between 81%–86%.
- Specificity ranged between 68%–72%.
- Overall accuracy remained around 80%–82% in all strata.

Summary of Findings

- The prevalence of esophageal varices among cirrhotic patients was 80.1%.
- The platelet/spleen diameter ratio showed high sensitivity (83.8%) and moderate specificity (70.2%) for detection of varices.
- The overall diagnostic accuracy was 81.1%, demonstrating that PC/SD ratio can serve as a useful non-invasive tool for screening esophageal varices in patients with liver cirrhosis, potentially reducing the need for invasive endoscopy in low-risk patients.

DISCUSSION

A total of 286 patients diagnosed with liver cirrhosis were enrolled in this cross-sectional study conducted at the Department of Medicine, Combined Military Hospital, Multan, over a period of six months after obtaining approval from the CPSP and the institutional ethical review committee.

In another study conducted in 2014, the diagnostic accuracy of the platelet count/spleen diameter ratio for the detection of esophageal varices in patients with cirrhosis was found to be significantly higher. The authors also recommended its use in clinical practice as part of the diagnostic workup of cirrhotic patients to reduce the financial and sanitary burden on endoscopy units as well as medical costs related to esophageal varices screening [10]. In the present study, the mean age of the patients was 53.9 ± 10.1 years (range 30–75 years). Out of the total, 179 (62.6%) were males and 107 (37.4%) were females, with a male-to-female ratio of 1.7:1. The mean duration of liver cirrhosis was 5.3 ± 2.6 years. The mean platelet count was 112.5 ± 41.8 $\times 10^9$/L, while the mean spleen diameter measured 150.7 ± 23.9 mm. The mean platelet/spleen diameter (PC/SD) ratio was 747.2 ± 352.6. In a previous study conducted in 2005, the use of the platelet count/spleen diameter ratio proved to be an effective tool for ruling out the presence of esophageal varices, even during longitudinal follow-up of patients [11]. According to the Child-Pugh classification in our study, 79 (27.6%) patients were in class A, 126 (44.1%) in class B, and 81 (28.3%) in class C. Upper GI endoscopy revealed esophageal varices in 229 (80.1%) patients, while based on the PC/SD ratio, 237 (82.9%) patients were predicted to have esophageal varices. A study conducted in 2016 also reported that the ratio of platelet count to spleen size was a strong predictor of esophageal varices in patients with liver cirrhosis [12]. In our research, endoscopy was taken as the gold standard for diagnosing esophageal varices. A 2×2 contingency table was constructed to assess the diagnostic accuracy of the PC/SD ratio. Similarly, in a 2020 study, it was concluded that the PC/SD ratio could serve as a useful non-invasive predictor of esophageal varices, helping physicians' limit endoscopic screening to patients with a high probability of having varices. This was considered particularly valuable in resource-limited settings where endoscopic facilities are not widely available [13].After stratification by age, gender, duration of cirrhosis, and Child-Pugh class, the diagnostic accuracy of the PC/SD ratio in our study remained statistically similar across all subgroups. Sensitivity ranged between 81%–86%, specificity between 68%–72%, and overall accuracy around 80%–82% in all strata. However, another study conducted in 2012 reported that in patients with compensated cirrhosis, the platelet count/spleen diameter ratio was not a reliable parameter to avoid unnecessary upper endoscopy, regardless of the chosen cut-off value [14].In the present study, the prevalence of esophageal varices among cirrhotic patients was 80.1%. The platelet/spleen diameter ratio demonstrated high sensitivity (83.8%) and moderate specificity (70.2%) for the detection of varices. A study published in 2022 also concluded that the platelet count/spleen diameter ratio and

spleen bipolar diameter in cirrhotic patients may be proposed as safe and reproducible tools to improve the management of such patients who should undergo screening endoscopy for esophageal varices [15]. The overall diagnostic accuracy in our study was 81.1%, indicating that the PC/SD ratio can serve as a useful non-invasive tool for screening esophageal varices in patients with liver cirrhosis, potentially reducing the need for invasive endoscopy in low-risk patients. Furthermore, a 2021 study reported that the platelet count/spleen volume ratio (PSVR) was superior to the platelet count/spleen diameter ratio (PSDR), spleen diameter, and platelet count in predicting esophageal varices. In the absence of serological results, spleen volume could be used instead of PSDR, as both parameters were found to be useful in predicting esophageal varices or high-risk varices in patients with hepatitis B-related cirrhosis [16].

CONCLUSION

The platelet count/spleen diameter (PC/SD) ratio demonstrated high sensitivity and moderate specificity for detecting esophageal varices in patients with liver cirrhosis, with an overall diagnostic accuracy of 81.1%. This non-invasive parameter can effectively identify patients at risk, thereby reducing unnecessary endoscopic procedures. The PC/SD ratio may serve as a practical screening tool, particularly in resource-limited settings where access to endoscopy is restricted. Further large-scale studies are recommended to validate its diagnostic utility across different etiologies of cirrhosis.

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