



## PLATELET COUNT-SPLENIC DIAMETER RATIO AS A NON-INVASIVE PREDICTOR OF ESOPHAGEAL VARICES IN CIRRHOSIS

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### ABSTRACT

**BACKGROUND:** Oesophageal varices have high mortality (40-70%) and occur 5-15% of cirrhotics per year. Cirrhotics need to be screened for Oesophageal varices with endoscopy once in 2-3years. Non-invasive predictors of varices-Fibroscan, Fibrotest, Platelet count/Splenic diameter(PC/SD) ratio reduce the burden and risk of endoscopy and make it preferable in selected patients. Of these PC/SD ratio is promising. **MATERIALS AND METHODS:** 50 patients diagnosed as cirrhosis are selected satisfying inclusion and exclusion criteria. All underwent Ultrasonography of abdomen, Upper Gastrointestinal endoscopy to confirm cirrhosis and Oesophageal varices and were divided in to two groups A&B based on with and without varices respectively. PC, splenic length(SL) and PC/SD ratio were compared between the two groups.

Mean	Group-A(30)	Group-B(20)
PC	97750	193450
SD	148.4138mm	129.4739mm
PC/SD ratio	671.2562	1540.728

Receiver operating characteristic(ROC) curve	Cut off	Sensitivity	Specificity	P value
PC	<1,35,000	96.7%	75%	<0.001
SD	>137mm	90%	60%	<0.001
PC/SD ratio	<957.14	93.3%	95%	<0.0001

**RESULTS:** Group-A is again divided in to two groups large and small varices, PC/SD ratio <683.23 was associated with large varices with sensitivity 94.1% and specificity-69.2%. **CONCLUSION:** 1) Low Platelet Count, Increased Splenic Length and low Platelet Count/Splenic Diameter ratio had high statistical significance and are independent risk factors in prediction of varices. 2) Platelet Count /Splenic Diameter ratio had high sensitivity and specificity in prediction of varices and can be used as triage to perform endoscopy first or to start beta-blocker therapy in high-risk patients.

### KEYWORDS : Oesophageal varices, platelet count/splenic diameter ratio, cirrhosis

#### INTRODUCTION

Portal hypertension results from increase in splanchnic blood flow secondary to increased resistance to the passage of blood through the cirrhotic liver and vasodilation<sup>1</sup>. Oesophageal variceal bleeding prevalence is 50-60%<sup>2</sup> and causes death in 1/3rd of patients<sup>3</sup>. Risk of initial bleeding due to varices within two years is 25-35% ; the first episode of bleeding usually occurs during first year of detection of varices and mortality due to this is 40-70%<sup>4</sup>. There is a nearly 5% increase in esophageal varices incidence in cirrhosis patients, and there is 5 to 10% progression of small varices to large varices per year.

To evaluate the progression, repeat endoscopy has to be done 2-3years without varices and 1-2yrs with varices. This approach has limitations, Majority of cirrhosis patients are below the poverty line, and cannot afford an endoscopy, an indirect tool to predict presence of esophageal varices plays an important role in such situations where it is used as a triage<sup>5</sup>. Of all non-invasive parameters platelet count/spleen diameter ratio is promising with proper validation.

The PC/SD ratio is principal noninvasive predictor of esophageal varices because it has high sensitivity and specificity in hepatic cirrhosis<sup>6,7</sup>. This ratio is an acceptable parameter of clinical relevance with portal hypertension. Identifying esophageal varices is a fundamental part of diagnostic work-up in patients with liver cirrhosis, and it is also a prognostic marker.

#### OBJECTIVES :

1. To identify the oesophageal varices correlation with platelet count, spleen size and their ratio in patients with liver cirrhosis with out any previous history of GI bleeding
2. To assess the ability of the above parameters as non invasive tools in predicting esophageal varices.

#### MATERIALS AND METHODS:

**STUDY AREA:** This study was done in medical wards of general medicine in King George Hospital.

**STUDY DESIGN:** Observational Cross-sectional study

**STUDY PERIOD:** July 2021 to June 2022

**SAMPLE SIZE:** 50 Patients who came to the king George Hospital, Visakhapatnam and are diagnosed as having cirrhosis. The study was conducted at King George Hospital, Visakhapatnam after taking written informed consent from the patients

#### INCLUSION CRITERIA:

1. All hepatic cirrhosis patients of any etiology were included
2. Diagnosis of cirrhosis was based on history, clinical findings and abdominal ultrasound.

#### EXCLUSION CRITERIA:

1. Patients with history of variceal bleed present or past.
2. Patients with history of treatment or currently using beta blockers, diuretics or anti platelet drugs
3. Patients who had band ligation/ sclerosis for varices, TIPSS or any surgery for portal hypertension
4. Patients with history of fever associated with thrombocytopenia in past or in the past 15 days
5. Patients who are on medication having definite association with thrombocytopenia.

All patients in present study with complete Clinical history and physical examination documented and Complete blood counts, Ultrasonography of abdomen, Upper Gastrointestinal endoscopy were done They were divided in to two groups Group- A & Group-B based on with and without varices respectively.

The PC/SD ratio was calculated in all patients. Platelet count, spleen diameter and PC/SD ratio were compared between patients with varices and without varices.

**DATA ANALYSIS**

**GENDER DISTRIBUTION :** Out of 50 patients, 48 (96%) were male, and 2 (4%) were female.

**AGE DISTRIBUTION:** Mean age of study participants was 46.1 years and majority were of age 41-60 years(48%) followed by 40% in 20-40 years and 12% were above age of 60 years.

**AETIOLOGY OF CIRRHOSIS:** The etiology of cirrhosis in the majority of patients in this study is alcoholism in 46 patients (92%). Cirrhosis due to Hepatitis B infection was found only in 1 patient and in 3 others cause was unidentified. For comparison, the study subjects were made into groups based on the presence or absence of varices.

Group	Varices +/-	Number (%)
Group A	with varices	30(60%)
Group B	Without Varices	20(40%)

**PLATELET COUNT:** Mean platelet count was found less in the study subjects who had varices when compared with those who had no varices. This difference is found to have statistical significance.

Platelet count(cells/mm3)	GroupA(N=30) With varices	GroupB(N=20) Without varices
Mean	97750	193450
Median	92000	183000
Standard Deviation	25335.25	55191.03
Minimum	58000	121000
Maximum	163000	350000

ROC was applied . Cut Off obtained was <1,35,000, Sensitivity - 96.7%, Specificity -95%, P value-<0.0001.

**SPLenic DIAMETER :** The mean length of spleen is 148.41 mm in the study subjects who are having oesophageal varices when compared with spleen length in those who do not have varices.

Splenic Diameter (mm)	Group A (N=30) with varices	Group B (N20) Without varices
Mean	148.4138	129.4737
Median	148	133
Standard Deviation	11.1436	20.89755
Minimum	122	96
Maximum	170	160

ROC was applied CUT OFF obtained was >137CM .Sensitivity 90.0% with Specificity 60%. P value <0.001

**PLATELET COUNT/SPLenic DAImETER:**

The descriptive analysis of the ratio obtained were mentioned below.

PC/SL Ratio	
Mean	1012.336
Median	869.57
Standard Deviation	534.1093
Minimum	374.19
Maximum	2812.5

There is a statistically significant difference between 2 groups with respect to PC/SD ratio.

PC/SD ratio	Group A(N=30) With varices	Group B(N=20) Without varices
Mean	671.2562	1540.728
Median	635.14	1463.7
Standard Deviation	177.0637	478.1216
Minimum	374.19	961.29
Maximum	1051.61	2812.5

ROC curve was plotted and the CUT OFF obtained was < 957, SENSITIVITY is 93.3%, SPECIFICITY was 95%. P value <0.0001

To study the usefulness of PC/SD ratio for grading of varices,

Group A is further divided into two groups according to Baveno consensus criteria, those who have small varices, and those who have large varices (As the management of large and medium varices is similar).

A ROC curve was applied, the cut-off obtained is < 683.23. When the Platelet count/spleen diameter ratio is less than 683.23, was associated with presence of large varices. Sensitivity - 94.1% and specificity - 69.2% . Prevalence (56.67% - large varices among Group A) adjusted PPV- 80%, NPV -90 %.

Cut Off <683.23	Large Varices	Small Varices	Total
Positive	16	4	20
Negative	1	9	10
Total	17	13	30

Platelet count/spleen diameter ratio has a statistically significant value in esophageal varices prediction. The ratio has also shown a statistically significant value in the detection of large varices.

**DISCUSSION:**

This study included 50 patients identified as cirrhosis of the liver. Patients were classified into two groups based on presence of varices to assess the variation of non-invasive parameters like PC/SL Ratio. Prevalence of varices in present study is 60%.

**PLATELET COUNT AS A PREDICTOR-**The cut-off value of <= 1,35,000 cells/cu.mm for presence of varices is obtained through ROC statistics.

Study	Platelet Count (cells/cu. mm)	SENSITIVITY (%)	SPECIFICITY (%)	PPV (%)	NPV (%)
Pilette et al <sup>33</sup>	1,60,000	80	58	-	-
Madhota et al <sup>34</sup>	68,000	71	73	-	-
Zaman et al <sup>35</sup>	88,000	-	-	43	86
Agha et al. <sup>45</sup>	149000	39	82	72	54
Present study	1,35,000	96.6%	75%	85.2%	93.7%

**SPLenic LENGTH AS A PREDICTOR-** The cut-off obtained by the ROC was < 137 mm for presence of varices.

Study	Cut-off	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Pannasamy et al. <sup>31</sup>	160 mm	86.7%	54.7%	94.6%	10%
Sarangapani et al. <sup>32</sup>	138 mm	88.5%	83%	83.3%	70.9%
VW Baig et al. <sup>42</sup>	132.9 mm	74.9%	68.2%	84.9%	52.6%
This study	137 mm	90%	60%	77.14%	80%

**PLATELET COUNT / SPLenic DIAMETER RATIO AS A PREDICTOR**

A novel parameter is required which overcomes the disadvantage of splenic sequestration of Platelets. Giannini et al. first described that Platelet Count/Spleen Length Ratio can be used as the Platelet Count corrected to the level of splenomegaly<sup>8</sup>. The sensitivity and specificity of this study 93.3% and 95% respectively. PPV and NPV is 96.55% and 90.47% respectively.

Study	Method	Cut-off Mm
Giannini et al. <sup>41</sup>	ROC curve	909
VW Baig et al. <sup>45</sup>	ROC curve	1014
<b>This study</b>	<b>ROC Curve</b>	<b>957.14</b>

Plot v/s criterion curve was drawn to know the efficiency of PC/SD Ratio for prediction of varices with a cut-off of 957.14 with an efficiency of 92.73% for a prevalence of 60 % varices among study participants.

Plot v/s criterion curve was drawn to know the efficiency of PC/SL ratio to detect large varices. Prevalence (56.67% for large varices among Group A) adjusted PPV- 80 %, and NPV -90 %.

#### SUMMARY:

- Majority were males.
- Mean age of study participants was 46.1 years
- Majority were of age group 41-60 years(48%)
- Cirrhosis etiology in most of the patients was alcoholism (92%).
- Spleen length, platelet count and PC/SD ratio had statistical significance.( $p < 0.001$ ).
- PC/SD ratio had high sensitivity, indicating its ability to detect the persons with varices correctly
- Platelet count, Spleen length and PC/SD ratio were independent predictors of Oesophageal varices in liver cirrhosis patients.

#### ADVANTAGES OF PC/SD RATIO:

1. The parameters like platelet count & spleen length can be easily obtained and routinely done while initially diagnosing liver cirrhosis.
2. These are non-invasive procedures. One can evade the invasive and costly endoscopy for varices identification, especially in developing country like India.

#### CONCLUSION:

High incidence and high grades of varices were associated with low platelet count/spleen length ratio.

Low platelet Count, increased spleen Length & low Platelet Count/Spleen Diameter ratio were independent risk factors of varices.

Platelet Count/Spleen Diameter Ratio had high sensitivity & specificity in the prediction of varices. Hence, it can be used as a triage to perform endoscopy first or to start Beta-Blocker therapy in high-risk patients.

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