

Platelet count to spleen diameter ratio in patients with chronic liver disease as a noninvasive predictor of esophageal varices at a tertiary care hospital in Mysore

¹Dr Bharath M. M., Post graduate, Department of General Medicine, Mysore Medical College and Research Institute, Mysore ,Karnataka, India

²Dr Ramesh S.S., Associate Professor, Department of General Medicine, Mysore Medical College and Research Institute, Mysore, Karnataka, India

Corresponding Author: Dr Ramesh S.S., Associate Professor, Department of General Medicine, Mysore Medical College and Research Institute, Mysore, Karnataka, India

Citation this Article: Dr. Bharath M.M, Dr. Ramesh S. S., “Platelet count to spleen diameter ratio in patients with chronic liver disease as a noninvasive predictor of esophageal varices at a tertiary care hospital in Mysore”, IJMSIR- October - 2021, Vol – 6, Issue - 5, P. No. 94 – 100.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background and Objectives: Current guidelines recommend that all patients with cirrhosis undergo screening endoscopy for the presence of varices.¹ In the future, this social and medical burden will increase due to the greater number of patients with chronic liver disease and their improved survival.²

In order to improve the compliance of patients and to reduce the burden on physicians and hospitals, invasive procedures to diagnose the incidence of esophageal varices need to be avoided and replaced with simple, easily available and reproducible screening investigation.

This study is done to analyse the predictive value for diagnosing the presence and grading of esophageal varices in the patient with chronic liver disease with a non-invasive parameter like platelet count/spleen Diameter ratio.

Methods: The study was conducted in a tertiary care teaching hospital between January 2019 to June 2020 of

the patients aged >18 years who were suffering from chronic liver disease on the basis of clinical, biochemical and USG or fibro scan of liver irrespective of cause, were included.

Results: Among the 60 patients, a total of 50 patients had esophageal varices on upper gastrointestinal endoscopy. Out of these, 43 patients had a platelet count/spleenic diameter ≤ 909 . The remaining 7 patients had a ratio of >909 . A total of 46 patients in the study had a ratio of ≤ 909 in the study. Varices were absent in 3 of them. The mean platelet count spleen diameter ratio of patients without varices was 961.98 and the mean platelet count spleen diameter ratio of patients with varices was 689.62. Hence, using a ratio of 909 as cut-off value, 86 percent of patients with varices were detected (sensitivity-93.48% , $p < 0.007$), which was more significant than using a single parameter like platelet count ,spleen diameter. The positive predictive value was 86 percent and the negative predictive value was 70 percent.

Conclusion: The presence of a lower platelet count by spleen diameter ratio determined the presence and grading of varices, identifying the subset of patients who require endoscopy for the prophylactic management of esophageal varices. Apart from being noninvasive, the platelet count, spleen bipolar diameter and the platelet count by spleen diameter ratio was found to be a relatively an-inexpensive test.

Keywords: Cirrhosis, esophageal varices, platelet count-spleen diameter ratio

Introduction

Chronic liver disease (CLD) is a progressive deterioration of liver functions for more than six months, which includes synthesis of clotting factors, other proteins, detoxification of harmful products of metabolism, and excretion of bile³.

It can be caused by using of increased levels of alcohol, chronic viral hepatitis B or C, biliary disease, autoimmune disease, metabolic disorders and others.

Chronic liver disease is a continuous process of inflammation, destruction, and regeneration of liver parenchyma, which leads to fibrosis and liver cirrhosis³.

Liver cirrhosis can lead to a number of complications which include portal hypertension, hepatic encephalopathy, spontaneous bacterial peritonitis, hepato renal syndrome, and hepatocellular carcinoma.

Portal hypertension commonly accompanies the presence of liver cirrhosis, and the development of esophageal varices is one of the major complications of portal hypertension.²The prevalence of esophageal varices in patients with liver cirrhosis may range from 60% to 80%, and the reported mortality from variceal bleeding ranges from 17% to 57%²

Materials and Methods

The study was conducted among 60 patients at a teaching hospital over 18 months from January 2019 to June 2020. Patients' aged >18 years who are suffering from chronic liver disease on the basis of clinical, biochemical and USG or fibroscan of liver irrespective of cause were included in this study. Patients with use of beta-blockers for portal hypertension, endoscopic band ligation or sclerotherapy for esophageal varices, evidence of portal vein thrombosis, haemodynamically unstable due to upper gastrointestinal bleeding, having active gastrointestinal bleeding at the time of admission, severe cardiac, pulmonary, renal or cerebrovascular disease, history of Porto systemic shunt operation, history of haematological disease were excluded from the study.

Results

A total of 60 participants were considered for the study with mean age group of 61-70 years with males predominance in the study (Table I). Among 60 patients studied 44 of the patients were found to be with significant alcohol history (Table 2).Our study portrayed, 49 on 60 patients with platelet count less than 1,50,000 developed esophageal varices constituting 81.66% (Table III).The p value is < 0.027 which is significant but was less than that of the PC/SD ratio association with esophageal varices (Table IV).Chi square test was applied with degree of freedom is 1. P value < 0.012 which was statistically significant.50 patients with spleen diameter > 110 mm developed oesophageal varices constituting 83.33% of the study with p value of < 0.012, which is significant (Table V).50 among 60 patients developed oesophageal varices, where 43 had platelet count by spleen diameter ratio of < 909 which had a significant p value < 0.007(Table VI).

Discussion

About 1/3rd of patients with chronic decompensated liver disease, face the life-threatening complication of UGI bleed. The risk of bleeding from varices increases in the subsequent years after diagnosis and thus increasing the rate of mortality. This complication can be effectively managed prophylactically by non-selective beta blockers. Hence it emphasises the need for a good screening procedure to prevent the complications.

Many studies were conducted based on platelet count-spleen diameter ratio as a noninvasive predictor of esophageal varices in patients with cirrhosis. The study reduces the social and financial burden to the patient and also improves the compliance of patients.

In this study, 60 patients of chronic liver disease were chosen based on clinical, biochemical and ultrasonographic features, irrespective of etiology of the disease. Then the patients were subjected to biochemical investigations like Hb%, serum bilirubin, serum proteins, serum albumin, SGOT, SGPT, prothrombin time, ultrasonogram for the diagnosis of liver cirrhosis.

In the first part of the study, platelet count and measurement of spleen by measuring the long axis of the spleen sonographically was done in all the patients. In the second part of the study, patients were subjected to upper GI endoscopy to look for the presence of varices. Patients with a prior history of variceal bleeding or prior documented varices or on beta blocker prophylaxis were excluded from the study.

The use of this combined parameter is of interest and this hypothesis is evidenced by clinical and other biochemical parameters. Thrombocytopenia in cirrhosis is multifactorial it may be due to decreased platelet survival, impaired production of thrombopoietin or

destruction, increased splenic sequestration due to hypersplenism.⁶

Splenic enlargement is one of the most palpable abnormalities accompanying liver cirrhosis, and frequently occurs in parallel with hypersplenism, which is thought to be a major cause of cytopenia in cirrhotic patient⁵. Clinically, splenomegaly has been associated with a poor prognosis in liver cirrhosis and used as an index for the non-invasive assessment of esophageal varices and bleeding risks⁵

The use of this platelet count/spleen diameter ratio normalises the platelet count to splenic sequestration since either platelet count or splenic diameter alone can be misleading and cannot be solely attributed to portal hypertension.

Incidence of chronic liver disease was maximum in the age group > 50 years. Mean age was 53 years with a standard deviation of 8.4. The youngest patient in our study was 30 years and oldest was 81 year. Out of the 60 patients of whom 44 were males and 16 were females. Males constituted 73.33 percent of the study population. Males predominated our study.

In our study the majority of the patients presented with complaints of jaundice, abdominal distension. Other symptoms were swelling of legs, easy fatigability. Among 60 patients studied 44 of the patients were found to be with significant alcohol history. Majority of the patients had a platelet count between 85,000 to 1,50,000/cubic mm. The mean platelet count in our study was 121360 ± 17315 . ($p < 0.027$), though it is significant as single value, the significance is less when compared to combined parameter. Spleen diameter in our patients ranged from 110 – 180 mm. The mean spleen diameter is 147 ± 12.89 . $p < 0.012$, is less significant than platelet count by spleen diameter ratio.

Among the 60 patients, a total of 50 patients had esophageal varices on upper gastrointestinal endoscopy. Out of these, 43 patients had a platelet count/splenic diameter ≤ 909 . The remaining 7 patients had a ratio of >909 . A total of 46 patients in the study had a ratio of ≤ 909 in the study. Varices were absent in 3 of them. The mean platelet count spleen diameter ratio of patients without varices was 961.98 and the mean platelet count spleen diameter ratio of patients with varices was 689.62. Hence, using a ratio of 909 as cut-off value, 86 percent of patients with varices were detected (sensitivity-93.48%, $p < 0.007$), which was more significant than using a single parameter. The positive predictive value was 86 percent and the negative predictive value was 70 percent.

E Giannini, F Botta et al., evaluated prognostic and diagnostic accuracy of the platelet/spleen diameter ratio

Table 1: Age - sex distribution.

			Sex		Total
			M	F	
ages	30-40	Count	3	0	3
		% within sex	6.8%	0.0%	5.0%
	41-50	Count	8	1	9
		% within sex	18.2%	6.2%	15.0%
	51-60	Count	15	4	19
		% within sex	34.1%	25.0%	31.7%
	61-70	Count	13	8	21
		% within sex	29.5%	50.0%	35.0%
	70+	Count	5	3	8
		% within sex	11.4%	18.8%	13.3%
		Count	44	16	60
		% within sex	100.0%	100.0%	100.0%

for the presence of varices. They included 106 cirrhotic patients without varices at initial screening endoscopy. During follow up endoscopy 27 patients (40%) developed varices. Patients with higher platelet count by spleen diameter ratio > 909 were less likely to develop varices ($p < 0.0005$). At follow up, PC/SD ratio ≤ 909 had 100% negative predictive value and 84% efficiency in identifying the presence of varices.

A meta-analysis was performed by Li ying et al., to assess the performance of PC/SD ratio for diagnosis of esophageal varices. The Fagan plot was used for calculating PC/SD for oesophageal varices. If PC/SD ratio was below 909 for varices, post-test probability was 87%, while if PC/SD ratio was at or over 909, the posttest probability was only 9%. This study emphasised on the decrease need for invasive procedure in chronic liver disease patients⁴.

Table 2: Incidence of patients with significant alcohol history

Significant alcohol history			
		Frequency	Percent
Valid	Yes	46	76.7
	No	14	23.3
	Total	60	100.0

Table 3: Hepatitis Status and Its Relation with Esophageal Varices

			Esophageal varices		Total
			+	-	
Type of hepatitis	None	Count	40	10	50
		% within egv	80.0%	100.0%	83.3%
	Hep B	Count	7	0	7
		% within egv	14.0%	0.0%	11.7%
	Hep C	Count	3	0	3
		% within egv	6.0%	0.0%	5.0%
Total		Count	50	10	60
		% within egv	100.0%	100.0%	100.0%

Table 4: platelet count and its relation to esophageal varices

			Esophageal varices		Total
			+	-	
Platelet count	<1.5 L	Count	49	8	57
		% within egv	98.0%	80.0%	95.0%
	>1.5 L	Count	1	2	3
		% within egv	2.0%	20.0%	5.0%
Total		Count	50	10	60
		% within egv	100.0%	100.0%	100.0%

Table 5: Correlation of Spleen diameter with Esophageal varices

Spleen Diameter(mm)	EGV +ve	EGV -ve
< 110	0	0
> 110	50	10
TOTAL	50	10

Table 6: Platelet Count /Spleen Diameter Ratio And Relation To The Esophageal Varices.

			Esophageal varices		Total
			+	-	
Platelet count/spleen diameter ratio	<909	Count	43	3	46
		% within egv	86.0%	30.0%	76.7%
	>909	Count	7	7	14
		% within egv	14.0%	70.0%	23.3%
Total		Count	50	10	60
		% within egv	100.0%	100.0%	100.0%

Conclusions

Our study inferred that the presence of a lower platelet count/spleen diameter ratio determined the presence of varices, hence to identify the subset of patients who require endoscopy for the prophylactic management of esophageal varices. Apart from being noninvasive, the platelet count, spleen diameter and the platelet count by spleen diameter ratio was relatively found to be an inexpensive test.

Clinical Significance

- This study method could be of help in decreasing the burden on the endoscopy units and can help in avoiding the unnecessary screening endoscopies.
- Platelet count by spleen diameter ratio can be used as noninvasive markers of presence of esophageal varices
- Apart from being non-invasive, the platelet count, spleen diameter and the platelet count/spleen diameter ratio is a relatively an inexpensive test as platelet counts and abdominal ultrasounds could be obtained on all chronic liver disease patients routinely as part of their clinical workup.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent. The patient has given his/her consent for his/her images and other clinical information to be reported in the journal. And the patient understands that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

References

1. Utilization of platelet count spleen diameter ratio in predicting the presence of esophageal varices in patients with cirrhosis by Elliot Schwarzenberger , Trinh Meyer et al.,
2. Platelet count/spleen diameter ratio: proposal and validation of a non-invasive parameter to predict the presence of oesophageal varices in patients with liver cirrhosis by E Giannini, F Botta, et al.,
3. Chronic Liver Disease by Ashish Sharma; Shivaraj Nagalli et al.,
4. Performance of Platelet Count/Spleen Diameter Ratio for diagnosis of esophageal varices in Cirrhosis: A Meta-Analysis by Li Ying, Xiao Lin et al.,

5. The spleen in liver cirrhosis: revisiting an old enemy with novel targets by Liang Li, Mubing Duan et al.,
6. The pathophysiology of thrombocytopenia in chronic liver disease Oscar Mitchell, David M Feldman et al.,