Original Research Paper | Medicine

A CROSS SECTIONAL STUDY ON PLATELET COUNT/ SPLENIC DIAMETER RATIO AS NON INVASIVE PREDICTORS OF ESOPHAGEAL VARICES IN CIRRHOTIC PATIENTS

Dr. Syed Ahmed	Senior Resident, Department of Medicine, Apollo Medical College, Hyderabad.
Dr. R.N. Tejaswini	Assistant Professor, Department of Medicine, Apollo Medical College, Hyderabad.
Dr. Mohammed Viquaruddin Hamza	Medicine Registrar
Dr. Mohammed Khizer*	Junior Resident, Department of Gastroenterology ESIC Medical College, Hyderabad. *Corresponding Author
Dr. Abdul Khaliq	Consultant Gastroenterologist & Hepatologist, Health INN Clinic, Hyderabad.
Dr. Ayesha Siddiqua	Medical Officer, TSRTC Hospital, Hyderabad.

ABSTRACT Portal hypertension commonly accompanies the presence of liver cirrhosis, and the development of esophageal varices is one of the major complications of portal hypertension. The development of esophageal varices is the most serious consequence of portal hypertension due to the risk of rupture and variceal hemorrhage. All patients in the study were evaluated with detailed history and full clinical profile. They underwent hematological and biochemical tests, like liver function tests, complete blood counts, renal function tests, prothrombin time, Ultrasonography of the abdomen to confirm the presence of cirrhosis and to record the spleen bipolar diameter, portal vein size and ascites. Upper GI endoscopy was done in all patients to confirm the presence of varices and also to grade them accordingly. The ROC curve was applied to determine the cut-off values with the best sensitivities and specificities for all the three variables. A cut-off value of 1014 was obtained for platelet count to spleen diameter ratio, which gave a sensitivity of 84.31% and a specificity of 75.00 %.

KEYWORDS : Portal hypertension, esophageal varices, splenomegaly, endoscopy

INTRODUCTION

Cirrhotic patients should undergo screening by esophageal endoscopy for detection of esophageal varices. In the future, the social and medical burden will increase due to the greater number of patients with chronic liver disease and their improved survival. Therefore, the identification of the clinical features and lab parameters that can accurately predict esophageal varices and help identify patients at the greatest risk of bleeding is quite attractive. This could thus make it possible to identify the population with a high probability of esophageal varices that requires confirmation by endoscopy, since the regular use of endoscopy is limited due to cost and discomfort, resulting in poor compliance. In order to reduce the increasing burden that endoscopy units will have to bear, some studies have attempted to identify characteristics that non-invasively predict the presence of any esophageal varices.

Research has shown that biochemical, clinical and radiological parameters alone or together have good predictive power for non-invasively predicting the presence of esophageal varices.

Aims and Objectives
1. To study the clinical profile of patients with cirrhosis of liver.
2. To analyze the hematological and biochemical profile of patients with cirrhosis of liver.
3. To assess the predictive value of platelet count/splenic diameter ratio in predicting esophageal varices in cirrhotic patients.

Methodology

Seventy five patients with cirrhosis of liver, attending the medical and gastroenterology wards and outpatient departments of a tertiary hospital in Hyderabad were selected, based on inclusion and exclusion criteria. All patients in the study were evaluated with detailed history and full clinical profile as included in the proforma.

Clinical history and physical examination findings were recorded with particular attention to present or previous hematemesis, melena, bleeding per rectum, bleeding tendencies, alcoholism, blood transfusion, intake of hepatotoxic drugs, exposure to sexually transmitted diseases, i.v drug abuse, jaundice, anaemia, oedema, stigmata of chronic liver disease, dilated abdominal veins, ascites, splenomegaly and encephalopathy. All patients underwent hematological and biochemical tests, like Liver function tests, Complete blood counts using automated cell counter renal function tests using spectrophotometric determination by jaffe's reaction, Prothrombin time, Ultrasonography of the abdomen to confirm the presence of cirrhosis and to record the spleen bipolar diameter, portal vein size and ascites. Upper GI endoscopy was done in all patients to confirm the presence of varices and also to grade them accordingly.

Statistical Analysis

Data has been entered in Microsoft excel and analysis was done using epi info version 7.2.1.0. Descriptive statistical analysis was done. Results on categorical measurements were presented as Percentages. Diagnostic ability of platelet count / splenic diameter ratio was assessed in aspects of **Sensitivity, Specificity, Positive predictive value (PPV), Negative predictive value (NPV) and Accuracy**. Continuous variables were analyzed using t test and categorical variables by chi square test. Pearson correlation was used to find the correlation between the two variables. ROC curve was drawn and area under the graph is 0.8.

DISCUSSION

Sixty three men and twelve women with cirrhosis of liver were included in the study irrespective of etiology. The males constituted 84% and females 16% of the sample. The mean age was 51 years.

Distribution of grades of varices was studied in various age groups and no significant correlation was found. No significant gender difference in the distribution of grade of varices was found.

Twenty nine (38.67%) of them had ascites, twenty one (28%) had mild and eight (10.67%) had moderate ascites. Among the 75 cirrhosis patients studied, 30 were Child A i.e. 40%, 32 were Child B i.e. 42.67% and 13 were Child C i.e. 17.33%. Seven (9.33%) patients had hepatic encephalopathy, six of them Grade I and one had Grade II. Fifty one (68.00%) of seventy five patients had esophageal varices. Among the patients with esophageal varices, 23 (30.67%) patients had Grade I varices, 22 (29.33%) had Grade II varices and 6 (8%) had Grade III varices.

Relationship between non-invasive parameters like serum bilirubin, serum albumin, platelet count, spleen bipolar diameter, to the presence of varices was studied. Among these serum albumin (P = 0.0156), platelet count (P = < 0.0001) and spleen diameter (P = 0.0004) had statistical significance.

The statistical relationship between platelet count and spleen diameter ratio and presence of varices was also significant (P=0.000004). The ROC curve was applied to determine the cut-off values with the best sensitivities and specificities for all the three variables. A cut-off value of 1014 was obtained for platelet count to spleen diameter ratio, which gave a sensitivity of 84.31% and a specificity of 75.00%. The positive and negative predictive values for the platelet count to spleen diameter ratio were 87.76% and 69.23% respectively.

Table 1: Distribution of patients according to endoscopic findings

ENDOSCOPY	Frequency	Percent	Cumulative Percent
Grade I	23	30.67%	30.67%
Grade II	22	29.33%	60.00%
Grade III	6	8.00%	68.00%
NIL	24	32.00%	100.00%
Total	75	100.00	100.00%

Table 2: Relationship between Lab Parameters and Presence of Varices

Lab parameter	Varices	Number	Mean	Standard Deviation	Student t test & P value
Serum Bilirubin	Present	51	1.7929	2.3408	T test value is 0.580, P = 0.56
	Absent	24	2.15	2.783	
	Total	75	1.9072	2.4774	
Serum Albumin	Present	51	2.9608	0.6472	T test value is 2.475, P = 0.0156
	Absent	24	3.3625	0.67336	
	Total	75	3.0893	0.6779	
Prothrombin time	Present	51	17.5961	4.2378	T test value is 1.717, P = 0.0902
	Absent	24	15.85	3.8128	
	Total	75	17.0373	4.1623	
Platelet count	Present	51	105274.5098	37692.4812	T test value is 5.648, P = < 0.0001
	Absent	24	170729.1667	62197.6127	
	Total	75	126220.0000	55742.2422	
Spleenic diameter	Present	51	156.333	31.4272	T test value is 3.678, P = 0.0004
	Absent	24	130.333	21.0066	
	Total	75	148.0133	30.8801	

Table 3 : Role of PC/SD Ratio in predicting varices

		Varices Present	Varices Absent	Total
PC/SD Ratio	<= 1014	43	6	49
	>1014	8	18	26
Total		51	24	75

Table 4 : Sensitivity, Specificity and Accuracy data

Statistic	Formula	Value	95% CI
Sensitivity	$\dfrac{a}{a+b}$	84.31%	71.41% to 92.98%
Specificity	$\dfrac{d}{c+d}$	75.00 %	53.29% to 90.23%
Positive Likelihood Ratio	$\dfrac{Sensitivity}{1-Specificity}$	3.37	1.67 to 6.81
Negative Likelihood Ratio	$\dfrac{1-Sensitivity}{Specificity}$	0.21	0.11 to 0.41
Disease Prevalence	$\dfrac{a+b}{a+b+c+d}$ (*)	68.00%	56.22% to 78.31%
Positive Predictive Value	$\dfrac{a}{a+c}$ (*)	87.76%	78.01% to 93.54%
Negative Predictive Value	$\dfrac{d}{b+d}$ (*)	69.23 %	53.35% to 81.58%
Accuracy	$\dfrac{a+d}{a+b+c+d}$ (*)	81.33%	70.67% to 89.40%

TP - True positive rate, FP - False positive rate
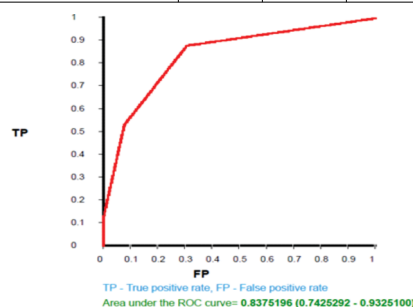Area under the ROC curve= **0.8375196 (0.7425292 - 0.9325100)**

Chart 1 : ROC Curve

Hossain et al concluded that sensitivity of hypoalbuminaemia as a marker of EV was 56% and specificity 83.8%, positive predictive value 62.06% and negative predictive value 80.2% and P value was <0.001. (Hossain, 2013)[1]

In a study by Abd-Elsalam et al a platelet count cut-off value of 149,000 was found to have specificity of 82% and sensitivity 39% for detection of presence of varices. (Sherief Abd-Elsalam, 2016)[2]

Marie Legasto et al using the platelet count/spleen diameter ratio cut off of <909, obtained a 91.3% prevalence adjusted positive predictive value and 74% prevalence adjusted negative predictive value for the presence of esophageal varices (Mona A. Abu El Makarem, 2011)[3]. This finding is in agreement with study by Gianni[4] et al done in 2006 (Edoardo G Giannini, 2006)[4]. The use of platelet count /spleen diameter ratio overcomes the fallacy of using platelet count alone in predicting esophageal varices for the reason that platelet count may decrease in chronic liver disease due to several other factors. This ratio is introduced to take into consideration the decrease in platelet count which most likely depends on hypersplenism caused by portal hypertension. Platelet spleen diameter ratio 909 had a sensitivity and specificity of 88.5%, 83% respectively in a study done by Sarangapani A (Arulprakash Sarangapani, 2010)[5]. Meta-analysis done by Chawla[6] et al yielded a pooled sensitivity of 89% and pooled specificity of 74% using PC/SD ratio, and concluded that it is elegant, simple, and inexpensive non-invasive parameter to detect esophageal varices (Saurabh Chawla, 2012)[6].

CONCLUSIONS
Among the noninvasive parameters studied, the platelet count to spleen diameter ratio had the highest accuracy for predicting esophageal varices. Using platelet count and spleen diameter ratio in patients with chronic liver disease can

increase the reliability of predicting the presence of esophageal varices. Their use in screening and follow up of esophageal varices may substantially reduce the cost of health care and discomfort for patients as well reduce the burden of endoscopy units.

REFERENCES

1. Hossain, S., Islam, Q., Siddiqui, M., Hossain, A., Jahan, N., Rahman, Y., & Iqbal, M. (2013). A Study of Hypoalbuminaemia in Chronic Liver Disease and its Correlation with Development of Esophageal Varices. *Bangladesh Journal of Medicine*, *22*(1), 17–20. https://doi.org/10.3329/bjmed.v22i1.13595
2. Abd-Elsalam, S., Habba, E., Elkhalawany, W., Tawfeek, S., Elbatea, H., El-Kalla, F., Soliman, H., Soliman, S., Yousef, M., Kobtan, A., El Nawasany, S., Awny, S., Amer, I., Mansour, L., & Rizk, F. (2016). Correlation of platelets count with endoscopic findings in a cohort of Egyptian patients with liver cirrhosis. *Medicine*, *95*(23), e3853. https://doi.org/10.1097/MD.0000000000003853.
3. Abu El Makarem, M. A., Shatat, M. E., Shaker, Y., Abdel Aleem, A. A., El Sherif, A. M., Moaty, M. A., Abdel Ghany, H. S., Elakad, A., & Kamal Eldeen, A. M. (2011). Platelet count/bipolar spleen diameter ratio for the prediction of esophageal varices: The special Egyptian situation: Noninvasive prediction of esophageal varices. *Hepatitis monthly*, *11*(4), 278–284.
4. Giannini, E. G., Zaman, A., Kreil, A., Floreani, A., Dulbecco, P., Testa, E., Sohaey, R., Verhey, P., Peck-Radosavljevic, M., Mansi, C., Savarino, V., & Testa, R. (2006). Platelet count/spleen diameter ratio for the noninvasive diagnosis of esophageal varices: results of a multicenter, prospective, validation study. *The American journal of gastroenterology*, *101*(11), 2511–2519. https:// doi. org/10.1111/j.1572-0241.2006.00874.x
5. Sarangapani, A., Shanmugam, C., Kalyanasundaram, M., Rangachari, B., Thangavelu, P., & Subbarayan, J. K. (2010). Noninvasive prediction of large esophageal varices in chronic liver disease patients. *Saudi journal of gastroenterology : official journal of the Saudi Gastroenterology Association*, *16*(1), 38–42. https://doi.org/10.4103/1319-3767.58767
6. Chawla, S., Katz, A., Attar, B. M., Gupta, A., Sandhu, D. S., & Agarwal, R. (2012). Platelet count/spleen diameter ratio to predict the presence of esophageal varices in patients with cirrhosis: a systematic review. *European journal of gastroenterology & hepatology*, *24*(4), 431–436. https://doi. org/10. 1097/MEG.0b013e3283505015