



"A STUDY OF CORRELATION OF PORTAL VEIN DIAMETER AND SPLEEN SIZE WITH GASTRO-ESOPHAGEAL VARICES IN PORTAL HYPERTENSION" – A CROSS SECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

INTRODUCTION - Cirrhosis is responsible for 1.1% of all deaths as estimated by WHO. Portal hypertension is considered an advanced complication of cirrhosis. Upper gastrointestinal endoscopy is required to detect the gastro-esophageal varices. But the procedure is invasive, painful to the patient, and is not available in all centers. To reduce the number of unnecessary endoscopies in patients with cirrhosis but without varices, several studies have evaluated possible non-invasive markers of esophageal varices in patients with cirrhosis.

STUDY DESIGN – A cross-sectional observational study.

METHOD AND MATERIAL – The patients had confirmed or suspected cases of portal hypertension were selected for study according to inclusion and exclusion criteria.

RESULT - All patient having large varices had portal vein diameter ≥ 13 mm. The all 21 patients with large varices had spleen size ≥ 14 cm. Out of 36 patients with small grade varices 30 (83.33%) had spleen size ≥ 14 cm. Out of 57 patients 49 (85.96%) who had varices, majority had platelet count less than 1,50,000.

CONCLUSION - These non-invasive parameters can significantly predict the presence of esophageal varices and can be used as surrogate markers for the presence of varices where endoscopic facilities not available.

KEYWORDS : portal hypertension, spleen size, upper gastrointestinal endoscopy

INTRODUCTION - Cirrhosis is responsible for 1.1% of all deaths as estimated by WHO¹. Commonest causes of cirrhosis worldwide are alcohol abuse and viral hepatitis B and C. More than 50% of cases of cirrhosis in India are caused by alcohol abuse. Less common causes include hemochromatosis, alpha 1-antitrypsin deficiency, and drug-induced liver disease. Portal hypertension is considered an advanced complication of cirrhosis. Once it has developed, the term "decompensated cirrhosis" is used. Portal hypertension is responsible for the development of ascites and bleeding from esophago-gastric varices, two complications that significantly affect morbidity and mortality in cirrhosis.

Esophageal varices are porto-systemic collaterals i.e., vascular channels that link the portal venous and the systemic venous circulation, that develop as a result of portal hypertension². At the time of diagnosis about 30% of cirrhotic patients have esophageal varices, reaching 90% after approximately 10 years³. Those patients with small varices at initial endoscopy, progression to large varices occurs at a rate of 10% to 15% per year and is related predominantly to the degree of liver dysfunction.³

Bleeding from varices is most serious and life-threatening complication of cirrhosis which accounts for 6-39% of all cases of upper gastrointestinal bleeding⁴. About one third of cirrhotic patients will bleed from their varices. It is essential to identify and treat those patients at highest risk because each episode of variceal hemorrhage carries a 20% to 30% risk of death, 70% of patients not receiving treatment dying within 1 year of the initial bleeding episode.⁵

It is a well-known fact that portal vein diameter is usually increased in cirrhosis of liver with portal hypertension, and spleen is also enlarged. A few previously reported studies showed that there was a definite correlation between portal vein diameter and presence of gastro-esophageal varices. Sarwar et al reported that patients with portal vein diameter more than 11 mm are more likely to have esophageal varices⁶. Another study by Dib et al showed that esophageal varices developed when portal vein diameter exceeds 13 mm⁷.

Upper gastrointestinal endoscopy is required to detect the gastro-esophageal varices. But the procedure is invasive, painful to the patient, and is not available in all centres. Whereas portal vein diameter and splenic size can be measured by an easily available, painless, and non-invasive method like ultrasonography (USG). It can be used for diagnosis as well as long-term clinical monitoring of patients with portal hypertension.

To reduce the number of unnecessary endoscopies in patients with cirrhosis but without varices, several studies have evaluated possible non-invasive markers of esophageal varices in patients with cirrhosis^{7,8}. The conclusion from most of these studies is that by selecting patients for endoscopic screening based on a few laboratory and/or ultrasonographic variables, an appreciable number of endoscopies may be avoided, while keeping the rate of undiagnosed varices which are at risk of bleeding, acceptably low.

The purpose of our study is to assess and correlate the portal vein diameter and spleen size with presence of varices, grade of varices and red color signs over varices in patients with portal hypertension. This will help in the prevention of complications and their management with consequent improvement in mortality and morbidity of the disease.

METHOD AND METARIAL:

A pretested performa meeting the objectives of study was prepared. This study was conducted in the department of medicine, Dr. S.N. Medical College and attached Hospitals, Jodhpur. This study was conducted among the 73 portal hypertension patients who were admitted in the department of medicine and department of gastroenterology, Dr. S.N. Medical College and attached Hospitals, Jodhpur. The cases for the study were selected in accordance with below mentioned inclusion and exclusion criteria, the purpose of the study was explained to the patients and informed consent was obtained.

Inclusion criteria -

1. All the patients with proven or suspected portal hypertension
2. Age between 18 to 70 years.

Exclusion criteria -

1. Patients with congestive gastropathy and bleeding disorders.
2. Patients who have already received endoscopy for surgical intervention for portal hypertension previously.
3. Patients with co-existent infection or illness that can affect platelets counts.
4. Patients with evidence of hepato-cellular carcinoma on USG.
5. Patients taking drugs that can altered liver enzyme levels.

All patients underwent haematological and biochemical work up which included measurement of haemoglobin, total leucocyte count, platelet count, prothrombin time, liver function test, HbsAg, anti HCV antibodies, serum creatinine. All patients were subjected to

ultrasonographic assessment and the following details were noted, maximum vertical span of the liver, nodularity of the liver surface, spleen size (length of its long axis), and diameter of the portal vein.

Portal hypertension and cirrhosis was diagnosed on the basis of combination of clinical, laboratory and radiographic criteria. All patients underwent upper gastro-intestinal endoscopy for assessment of esophageal varices. Olympus XG20 endoscope was used.

Esophageal varices were graded as I to IV using Japanese Research for Portal Hypertension classification as follows:

- Gr I:** small esophageal varices which flatten with insufflation or minimally protrude into the esophageal lumen,
Gr II: moderate sized varices with minimal obscuring of the gastroesophageal junction,
Gr III: large varices showing luminal proplapse substantially obscuring the gastroesophageal junction and
Gr IV: very large esophageal varices completely obscuring the gastroesophageal junction and do not flattens on insufflation.

Continuous variables included Age, Hemoglobin, Platelet count, serum Creatinine, SGPT, SGOT, serum Albumin, serum Bilirubin, Prothrombin time, Portal vein diameter and Spleen size.

METHOD OF STATISTICAL ANALYSIS

Data were analyzed using SPSS and EPICALC software, continuous variables were expressed as mean standard deviation and nominal variables were recorded as frequencies.

Statistical analysis for determining the correlation of various clinical, laboratory and ultrasonographic variables between variceal and non variceal group were performed.

ANOVA test was used to compare the continuous variables. The CHI-SQUARE test was used to identify the differences between the categorical variables. 'p' values less than 0.05 was considered to indicate statistical significance.

RESULTS

This study was conducted in the department of medicine, Dr. S.N. Medical College and attached Hospitals, Jodhpur. This study was conducted among the 73 portal hypertension patients who were admitted in the department of medicine and department of gastroenterology, Dr. S.N. Medical College and attached Hospitals, Jodhpur. All 73 patients underwent clinical, laboratory, radiological and endoscopic evaluation.

Among the 51 patients who have alcohol as etiology for portal hypertension 12(23.53%) do not have varices and majority ie 39(76.47%) have varices. Among the patients who have varices majority have grade II(38.46%) followed by grade III(35.8%). 23.07% have grade I and one patient had grade IV varices. Among the 14 patients of NAFLD 10 patients (71.42%) have varices and 4 (28.57%) do not have varices. Majority of them have grade II [n=8; 80%] followed by grade III (2 patients;20%). Among the 5 patients of other etiology 2 patients each have grade II and III varices respectively and one patient has grade I varices. Among the 2 patients with EHPVO one patient each has grade I and II varices respectively.(Table.1)

When the cut-off for the portal vein diameter taken as 13 mm 85.9% (49/57) patients with varices and all patient having large varices had portal vein diameter \geq 13 mm. (Table. 2)(Figure. 1)

When the cut-off for the spleen size taken as 14 cm 89.4% (51/57) with varices and the entire patient with large varices had spleen size \geq 14 cm. 83.33% (30/36) patients with small grade varices had spleen size \geq 14 cm. (Table.3)(Figure. 2)

Among the 16 patient who do not have varices had majority 93.75(15/16) had platelet count more than 1,50,000 whereas among those who had varices majority 85.96%(49/57) had platelet count less than 1,50,000. Majority of patient with large varices(Grade III and IV) ie 66.67%(14/21) had platelet count less than 1,00,000. (Table.4) (Figure. 3)

Portal vein diameter, Spleen size and Platelet count had statistical difference between variceal and non variceal patients. Whereas Age, Serum bilirubin, and Serum creatinine had no statistical difference between variceal and non variceal patients.(Table.5)

Spleen size showed the best sensitivity (89.5%) for prediction of esophageal varices as compared to Portal and Platelets count both having sensitivity 85.9%.

Overall looking at the positive predictive values of these non-endoscopic parameters these can be used as good positive predictors ie. Positive results allow early esophageal varices prediction. (Table.6)

DISCUSSION

Development of esophageal varices and gastrointestinal bleeding represents a serious consequence in patients with cirrhosis and portal hypertension. Because the occurrence of variceal bleeding can be prevented it is important to recognize patients who have varices and those who are at a higher risk of developing variceal bleeding and likely to benefit from such interventions. For optimal management, it is important to identify and stratify patients at highest risk for variceal bleeding. Although screening endoscopy for esophageal varices is recommended to all patients with established cirrhosis, these recommendations are not a result of evidence-based data. Furthermore, although screening endoscopy has proved to be cost-effective in patients with decompensated cirrhosis, cost-effectiveness remains elusive in patients with compensated cirrhosis. It is thus important to identify patients with compensated cirrhosis at risk for esophageal varix development who can benefit from prophylactic pharmacologic and endoscopic therapies and to avoid unnecessary endoscopy in low-risk patients.

A total of 73 cases of portal hypertension patients who were admitted in the department of medicine and department of gastroenterology at Dr. S.N. Medical College and attached hospitals during the period of June to December 2015 were included in the study. The prevalence of esophageal varices was 78.08% out of which 17.8% had bleeding. 21.92% had no varices. Out 57 patients with varices 45.61% had grade II EV, 33.33% had grade III EV, 17.54% had grade I varices. The prevalence of gastric varices was 6.85 %. In A Hekmatnia⁹ study 62% cirrhotic patients had esophageal varices. Filippo Schepis et al¹⁰ reported that Esophageal varices were in 63 of the 143 patients examined (44%).

In 69.86% of the total subjects the cause of portal hypertension was alcohol, followed by NAFLD (19.17%) then followed by others (6.84%) in whom etiology could not be found because of unavailability of cost-effective investigation, then EHPVO (2.73%), and then viral hepatitis B (1.36%).

In the present study the mean platelet count was 1.67 lakhs. The mean platelet count among patient with varices and no varices group were 1.19 lakhs and 2.14 lakhs, respectively. Among the patient who do not have varices had majority 93.75% had platelet count more than 1,50,000 whereas among those who had varices majority 78.95% had platelet count less than 1,50,000. Majority of patient with large varices (Grade III and IV) ie 66.67%(14/21) had platelet count less than 1,00,000. There was statistically significant (p<0.001) difference among the patient with varices and no varices which is consistent with findings in the previous studies like BC Kaji et al¹¹, E. Giannini et al¹² and W W Baig et al¹³. Gill et al¹⁴ reported that platelet counts 100,000 are a reliable marker for predicting esophageal varices in cirrhotic patients.

In the present study the mean serum creatinine was 0.835 whereas the mean serum creatinine in varices and no varices group were 1.04 and 0.63 respectively and was statistically insignificant. Cales et al¹⁵ reported that serum creatinine was positively correlated with bleeding risk.

In present study 78.08% (57/73) had esophageal varices and 21.92% had no varices.

Among the patient with varices 45.61% had grade II Esophageal varices, 33.33% had grade III Esophageal varices and 17.54% had grade I Esophageal varices. 21 out of 57 patients (36.85%) had large(grade III and IV) varices. Majority of patients with varices ie 73.68 % had more than or equal to two columns. 6.85 % had gastric varices in which 80% patients had bleeding episode.

Portal vein diameter on ultrasonographic examination is indirect indicator of portal pressure which is responsible for developments of varices. In the present study, the mean portal vein diameter was 14.397

mm, in patient with varices it was 16.95mm and in patients without varices it was 11.84mm. There was statistically significant difference among these groups (p value <0.001) which goes with Sarwar S et al⁶. Mean portal vein diameter in patient with Grade I, Grade II, Grade III, and Grade IV esophageal varices was 13 mm, 13.94 mm, 17.36 mm and 23.5 mm respectively. It had been found that there was a positive correlation between grading of esophageal varices and portal vein diameter (r = 0.733) and it was statistically significant (p <0.001) too which is consistent with Dr. K. V.L. Sudha Rani et al¹⁶ study.

When the cut off value for portal vein diameter taken as 13 mm 49 out of 57 patients with varices found to have portal vein diameter ≥13 mm (Sensitivity 85.9%, Specificity 81%). All the patients with large varices found to have portal vein diameter ≥13 mm, sensitivity 100%. Out of 57 patient with varices 8 patients have portal vein diameter <13 mm. All these patients have small varices which are less prone for bleeding. Filippo Schepis et al¹⁰ and Gill et al¹⁴ reported 13 mm to be significant cutoff value for the portal vein as in our study. Sudhindra D. Lakshman Kumar et al¹⁷ found in his study that portal vein diameter > 13 mm spleen size > 14 cm splenic vein > 14 mm are indicators of varices. S Plestina et al¹⁸, concluded that portal vein size on ultrasound is independently associated with bleeding esophageal varices. Prihatiniet al¹⁹, concluded that portal vein size 1.2 cm on ultrasound gives evidence of presence of esophageal varices.

Splenomegaly is recognized as one of the diagnostic signs of cirrhosis and portal hypertension. In the present study, the mean spleen size was 14.5 cm, in patient with varices it was 15.968 cm and in patients without varices it was 13.05 cm. There was statistically significant difference among these groups (p value <0.001) which goes with Chalaniet al²⁰. Mean spleen size in patients with Grade I, Grade II, Grade III, and Grade IV esophageal varices was 13.99 cm, 14.519 cm, 17.363 cm and 18 cm respectively. It had been found that there was a positive correlation between grading of esophageal varices and portal vein diameter (r = 0.694) and it was statistically significant (p <0.001) too which is consistent with Dr. K. V.L. Sudha Rani et al¹⁶ study. When the cut off value for spleen size taken as 14 cm 51 out of 57 patients with varices found to have spleen size ≥14 cm (Sensitivity 89.5%, Specificity 81.2%). All the patients with large varices found to have spleen size ≥14 cm, sensitivity 100%. These results are comparable to the study of Thomopoulos KC et al²¹ who found spleen of 13.5 cm size as predictor of varices. Sudhindra D. Lakshman Kumar et al¹⁷ and E. Giannini et al²² found spleen size of ≥15 cm as a predictor of varices. Madhotra R et al²².

In our study all three variables (Platelet count, Portal vein diameter, and Spleen size) showed strong correlation (with significant p value) with the presence of esophageal varices in patient of portal hypertension.

CONCLUSION - These non-invasive parameters can significantly predict the presence of esophageal varices and can be used as surrogate markers for the presence of varices where endoscopic facilities not available. Also help clinicians to stratify; which decompensated cirrhotic patients should undergo urgent endoscopic screening and institution of prophylactic measures like beta adrenergic antagonists or surgical interventions for preventing primary variceal bleeding.

Table No. 1: Distribution of different grades of varices in various etiologies.

DIAGNOSIS	Grade of Varices					Total
	0.	I	II	III	IV	
ALD CLD PHT	12	9	15	14	1	51
EHPVO	0	0	1	1	0	2
HBV RELATED CLD	0	0	0	0	1	1
NAFLD	4	0	8	2	0	14
Others	0	1	2	2	0	5
Total	16	10	26	19	2	73

Table No.2: Distribution of small and large grade varices according to portal vein diameter.

Grade of Varices	PV diameter		Total
	≥13mm	<13mm	
Small(Grade I & II)	28	8	36
Large(Grade III & IV)	21	0	21
Total	49	20	57

Table No. 3 : Distribution of small and large grade varices according to Spleen size.

Grade of Varix	Spleen size		Total
	≥14 cm	<14 cm	
Small(Grade I & II)	30	6	36
Large(Grade III & IV)	21	0	21
Total	51	6	57

Table No. 4 : Distribution of Platelet Count among various Grades of esophageal varices

Platelet count (per mm3)	Grade of varices					Total
	0.	I	II	III	IV	
< 50000	0	0	0	2	2	4
50000-100000	0	0	4	10	0	14
100000-150000	2	8	16	7	0	33
150000-200000	2	2	5	0	0	9
> 200000	12	0	1	0	0	13
Total	16	10	26	19	2	73

Table No. 5 : Statistical analysis of all parameters among the study patients

	Esophageal Varices present [n=57]		Esophageal Varices absent [n=16]		p value
	Mean	± SD	Mean	± SD	
AGE	43.79	10.460	49.56	6.653	0.041
SERUM BILURUBIN	2.47	1.513	2.94	1.948	0.320
PLATELET COUNT (per uL)	121526	47713.1	219312	59777.2	<0.001
P.V. DIAMETER(mm)	16.952	3.179	11.843	.447	<0.001
SPLEEN SIZE(cm)	15.968	2.295	13.05	.544	<0.001
SERUM CREATININE	1.04	.533	.63	.500	0.007

Table No.6: Sensitivity, Specificity, and predictive values of different parameters in prediction of esophageal varices.

Parameters	Cut off value	Sensitivity	Specificity	PPV	NPV	Accuracy
PV Diameter (mm)	≥13	85.9%	75%	94.3	60	83.5
Spleen size (cm)	≥14	89.5%	81.2%	94.5	72.3	86.3
Platelet count (μ/L)	<1,50,000	85.9%	87.5%	96.1	63.6	87.7

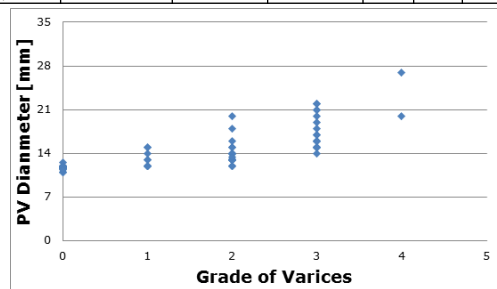


Fig 1: Correlation of portal vein diameter with grade of varices. Pearson correlation coefficient [r=0.733], p <0.001, Positive significant correlation.

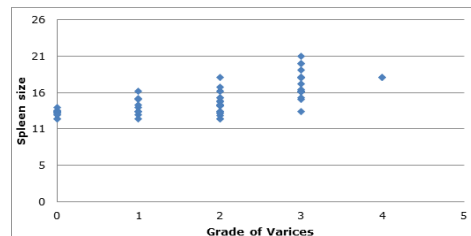


Fig. 2: Correlation of Spleen size with Grades of varices. Pearson correlation coefficient [r=0.694], p <0.001, Positive significant correlation.

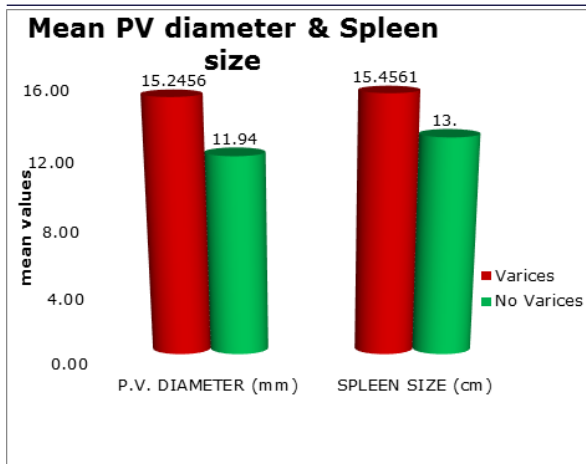


Fig.3: Distribution of mean portal vein diameter and spleen size in patients with and without varices.

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