THE ACCURACY OF LIVER STIFFNESS MEASUREMENT, PLATELET COUNT AND PLATELET COUNT/LIVER STIFFNESS MEASUREMENT RATIO IN IDENTIFYING THE PRESENCE OF ESOPHAGEAL VARICES IN PATIENTS WITH LIVER CIRRHOSIS

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Significance:

Esophageal varices (EV) are major complication of portal hypertension and detected in about 50% of cirrhotic patients. An upper endoscopy in all cirrhotic would be very expensive. Furthermore, repeated gastroscopies are often poorly accepted by patients. Noninvasive methods are needed to identify clinically significant esophageal varices in patients with cirrhosis. We looked for markers of the presence of esophageal varices in patients with cirrhosis.

Methodology:
This is a retrospective cross sectional study done in St. Luke's Medical Center – Quezon City and Global City fro 2013 to 2017 involving total of 111 cirrhotic patients who had undergone endoscopy and LSM along with PC. Diagnostic abilities and cut off values were assessed by the area under the receiver operating characteristic curve and multivariate logistic regression.

Results:
Liver stiffness measurement (LSM), platelet count (PC) and platelet count/liver stiffness measurement (PC/LSM) ratio had AUC of more than 0.70. These parameters were significantly associated with the presence of EV (P value < 0.05). The optimal cut off values of LSM in identifying EV was ≥20.66Kpa with sensitivity of 77.08% and specificity of 65.08%. The optimal value of PC was ≤150,650/mm3 with 93.75% and 74.60% sensitivity and specificity respectively. The PC/LSM ratio had an optimal cut off value of 6.87 with sensitivity of 93.75% and specificity of 71.43%.

Conclusion:
The LSM, PC and PC/LSM Ratio shown promise as predictive markers of Esophageal Varices. We can used these non-invasive parameters to identify patients who have EV and who may delay or need to undergo surveillance endoscopy.

Keywords: Retrospective Cross sectional study, Liver stiffness measurement, Platelet count, esophageal varices, liver cirrhosis

Introduction:

Significance

Esophageal varices (EV) are major complication of portal hypertension. It is detected in about 50% of cirrhosis patients. [1] New varices will develop at a rate of approximately 5% per year and progression to large varices occurs at a rate of about 10% per year and is related to the degree of liver dysfunction. [3]

Among patients with cirrhosis, those with advanced disease, with complications such as significant esophageal varices, hepatocellular carcinoma, and ascites have a shorter survival. Thus it seems reasonable to those at risk of developing such complications to start screening and interventions.[4]

Upper GI endoscopy is the most commonly used method to detect varices. The consensus is that all patients with cirrhosis of the liver should be screened for esophageal varices by endoscopy. [3]

The hemorrhage risk is related to varices' size so that primary prevention of variceal bleeding applies to patients with large esophageal varices which can be diagnosed by periodical upper digestive endoscopy as recommended by Baveno V and American Association for the study of Liver Diseases (AASLD) Consensuses. [5,6]

A program of periodical upper endoscopy in all cirrhotic would be very expensive, especially in third world countries. Furthermore, repeated gastroscopies are often poorly accepted by patients. Noninvasive methods are needed to identify clinically significant portal hypertension and esophageal varices in patients with cirrhosis. We looked for noninvasive markers that can determine the presence of esophageal varices in patients with cirrhosis.

There are several published studies regarding the value of elastographic methods for predicting the occurrence of portal hypertension. [4] Liver elasticity based imaging techniques such as Acoustic radiation force impulse imaging (ARFI) and shear wave elastography (SWE) have been developed and were used in assessing liver cirrhosis. ARFI involves mechanical excitation of tissue using short duration (~262usec) acoustic pulses that propagate shear waves and generate localized, u-scale displacements in tissue. The shear wave velocity is expressed in m/s. Shear wave elastography (SWE) is based on the combination of a radiation force induced in tissues by focused ultrasonic beams and an ultrasound imaging sequence with a very high frame rate that captures the transient propagation of resulting shear waves in real time. [15] the major advantage of ARFI and SWE is that they can be easily implemented on modified commercial ultrasound machines. [15] Both ARFI and SWE can be used as non-invasive tool in detecting liver fibrosis. [16]

Thrombocytopenia is a common complication in patients with chronic liver disease that has been observed in up to 76% of patients. Moderate thrombocytopenia (platelet count, 50,000/μL–75,000/μL) occurs in approximately 13% of patients with cirrhosis. Multiple factors can contribute to the development of thrombocytopenia one of which is the splenic platelet sequestration. [8]

Some of the published studies stated that liver stiffness measurement (LSM) values < 19 kPa were highly predictive of the absence of significant esophageal varices (EV) (≥ grade 2).[7] The cut off values for the presence of grade 2 and 3 EV ranging from 27.5 to 47.2 kPa, and the cut off value for esophageal bleeding being 62.7kPa. [7]

According to the new consensus, Baveno VI, that cirrhotic patients with a liver stiffness measurement (LSM) <20kPa and a platelet count >150000/μL can avoid screening endoscopy as their combination is highly specific for excluding clinically significant varices. [11]

This study aim to determine the accuracy of the liver stiffness measurement and platelet count in Identifying the presence of esophageal varices in patients with liver cirrhosis.

OBJECTIVES:

General Objective

To determine the accuracy of the liver stiffness measurement and platelet count in Identifying the presence of esophageal varices in patients with liver cirrhosis in St. Luke's Medical Center – Quezon City and Global City from year 2013 to year 2017.

Specific Objectives

1. To determine the sensitivity, specificity and predictive values of both LSM and Platelet count in predicting the presence of esophageal varices in patients with liver cirrhosis.
2. To determine the sensitivity, specificity and predictive values of LSM alone and Platelet count alone in predicting the presence of esophageal varices in patients with liver cirrhosis.
3. To identify a LSM cutoff value which could be able to predict the presence an esophageal varices in cirrhotic patients.
4. To identify a Platelet count cutoff value which could be able to predict the presence of an esophageal varices in cirrhotic patients.

5. To determine the cut off value of the ratio of Platelet count and LSM which could predict the presence an esophageal varices in cirrhotic patients.
6. To determine the sensitivity, specificity and predictive values of the ratio of Platelet count and LSM in predicting the presence of esophageal varices in patients with liver cirrhosis.

METHODOLOGY

Study Design

This is a retrospective cross sectional study done in St. Luke's Medical Center – Quezon City and Global City.

Inclusion and Exclusion Criteria

The inclusion criteria of this study were as follows: patients (aged $\geq$ 18 years old) with liver cirrhosis of any etiology who sought consult at St. Luke's Medical Center – Quezon City and Global City from year 2013 to year 2017 who had CBC, Liver Elastography and Underwent gastroscopy within 12 months.

Patients with conditions that could affect the Platelet count were excluded, such as acute viral infections, bacterial infections. Patients with hematologic disorders were also excluded.

Sampling and Sample size

The sample size was calculated based on the sensitivity of liver elastography and platelet count in identifying esophageal varices. The overall prevalence of esophageal varices in cirrhotic patients was also factored in the sample size calculation. Assuming that the sensitivity of the Liver stiffness measurement (LSM) <20kPa and a platelet count >150,000/µl is 87% with a maximum allowable error of 7.5% and a reliability of 90%, sample size calculated is 55. Dividing this value by the prevalence of Esophageal Varices in cirrhotic patients which is 50% [(1)] the final sample size required is 110.

Data Analysis

Data Measurement

Liver Elastography (ARFI and SWE) to measure LS, gastroscopy and complete blood count prior to gastroscopy were gathered from all patients with cirrhosis who sought consult at SLMC- Quezon City and Global City and those who were enrolled in the Liver Center data bank. Liver elastography measuring the LSM was done using either ARFI or SWE and read by registered and experienced radiotechnologist and hepatologists, respectively. ARFI values

measured as meter per second (m/s) unit were converted to kilopascal (Kpa) unit using the formula given by the manufacturer (3,240 x $(m/s)^2$ / 1000). The SWE values had both Kpa and m/s units in the report. In this study, we used Kpa unit since it is the one use internationally. The gastroscopy was done by subjects' respective consultants/endoscopists. The result of the CBC with Platelet count done before gastroscopy was gathered.

Data Collection

Upon consult, the following data were extracted from the patient and hospital medical records: age, gender, etiology of liver disease, hepatic function status (as determined by Child Pugh Score, and laboratory tests including Liver function tests and prothrombin time with INR), Liver elastography which measures the liver stiffness using the shear wave elastography (SWE) which displayed in meters per second (m/s) or Acoustic Radiation Force Impulse (ARFI) displayed in kilopascal (kPa), gastroscopy result which is the gold standard in determining presence of esophageal varices, and cbc result prior to gastroscopy.

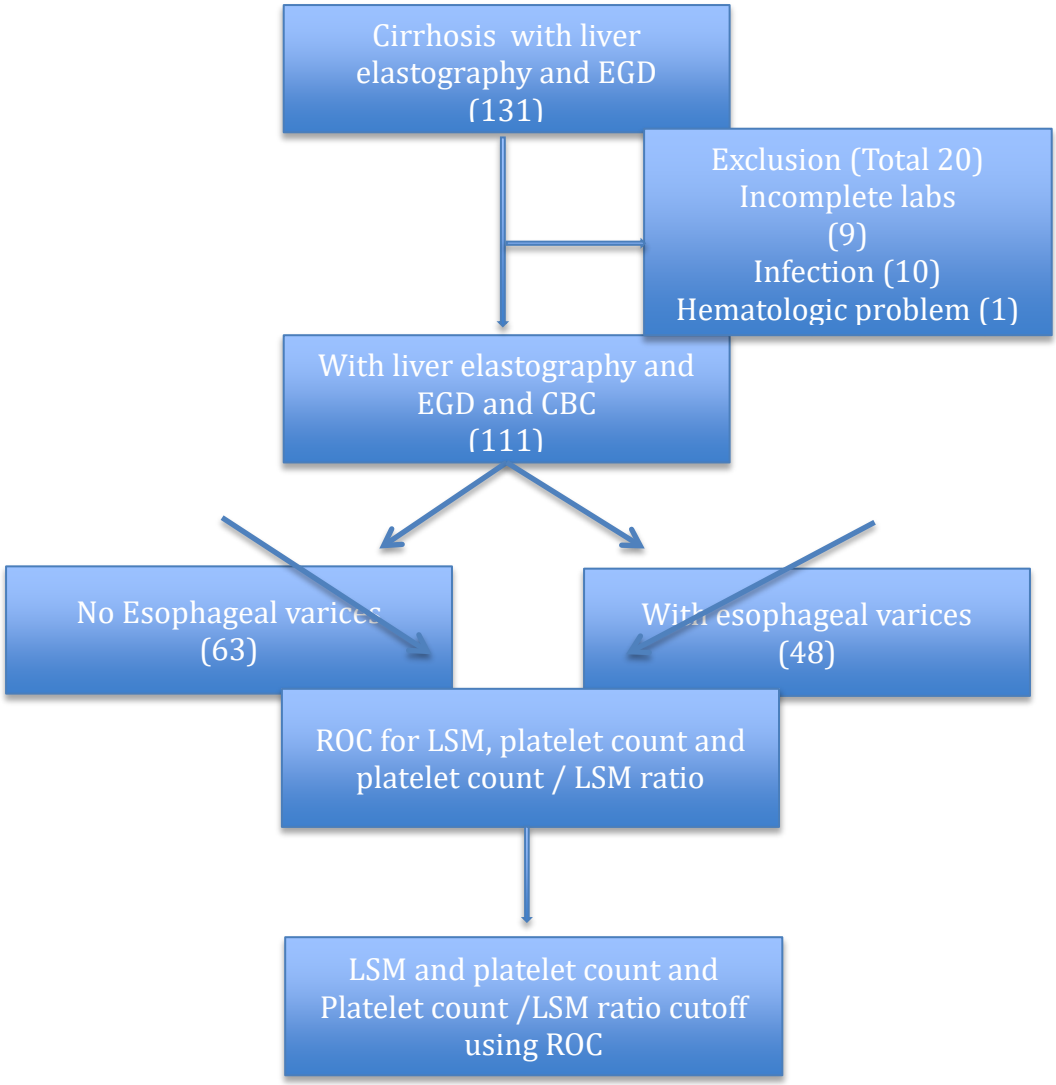


Figure 1. Systematic flow for ROC of LSM and platelet count ratio

Data Analysis

Statistics were performed using the software packages SPSS 16 and OpenEpi 2.3.

Descriptive statistics for categorical variables was reported as frequency and percentage, whereas continuous variables was reported as mean standard deviation or median and range, as appropriate. Categorical variables were compared between groups using x^2 test, and continuous variables were compared using Independent T test.

McNemar's Test was used to test if liver elastography or platelet is significantly different from endoscopy result.

Logistic regression models were used to calculate AUROCs for the prediction of Esophageal varices using the LSM and Platelet count levels. ROC curves analysis using Youden's index was also used to identify the best cutoff value of LSM and Platelet count levels and ratio of Platelet count and LSM ratio level to predict the presence of esophageal varices.

To assess the performance of the cutoff values of LSM, platelet, and Platelet count/LSM Ratio in predicting esophageal varices, the sensitivity, specificity, and positive predictive values (PPV) and negative predictive values (NPV) with corresponding 95% confidence intervals, were calculated. All statistical analyses were done by an external evaluator and were evaluated at P-value of <0.05 level of significance.

ETHICAL CONSIDERATION

The clinical Protocol and all relevant documents were reviewed and approved by the SLMC Institutional Scientific Review Committee and Institutional Ethics Review Committee. Informed consent was waived in this study since there was no intervention and the study intended to review medical charts solely.

Patient confidentiality was respected by ensuring anonymity of patient records.

All study data were recorded and investigators were responsible for the integrity of the data i.e accuracy, completeness, legibility, etc.

The manner of disseminating and communicating the study results guaranteed the protection of the confidentiality of patient's data.

The confidentiality and anonymity were ensured by not stating the names or the pin numbers of the patients. They were assigned using numbers. The data was kept by the investigator at the Liver Center and Transplant Institute and was kept until the study was finished and will be kept 3 years after publication.

RESULTS

Baseline characteristics of patients

Among 131 patients with cirrhosis with Esophagogastroduodenoscopy and Liver elastography, 19 were excluded due to incomplete laboratories (9), infection such as pneumonia (10), and hematologic problem (1). Total of 111 were included in the study (Figure 1).

Of the 111 cases that met the inclusion criteria, 62 (55.9%) were male and 49 (44.1%) were female. The mean age was 62.89. There were 72 (64.9%) child's pugh A, 33 (29.7%) child's pugh B, and 6 (5.4%) child's pugh C. The etiologies of the underlying liver disease were NASH/NAFLD 48 (43.2%), Chronic hepatitis B 42 (37.8%), Alcoholic Liver Disease 8 (7.2%), Autoimmune Hepatitis 7 (6.3%), and Chronic Hepatitis C 6 (5.4%). Among 111 cases, there were 48 (43.24%) with esophageal varices and 63 (56.76%) without esophageal varices. Among those with esophageal varices, 23 (47.93%) had small and 25 (52.08%) had large size varices. The data were summarized at table 1.

The distribution of esophageal varices according to the Child-Turcotte-Pugh class was as follows: A, 50%; B, 39.6%; and C, 10.4%. However, among the patients with Child-Turcotte-Pugh class A, 24 out of 48 (33.33%) had esophageal varices, while Child-Turcotte-Pugh class B, 19 out of 33 (57.58%) and Child-Turcotte-Pugh class C, 5 out of 6 (83.33%) had esophageal varices.

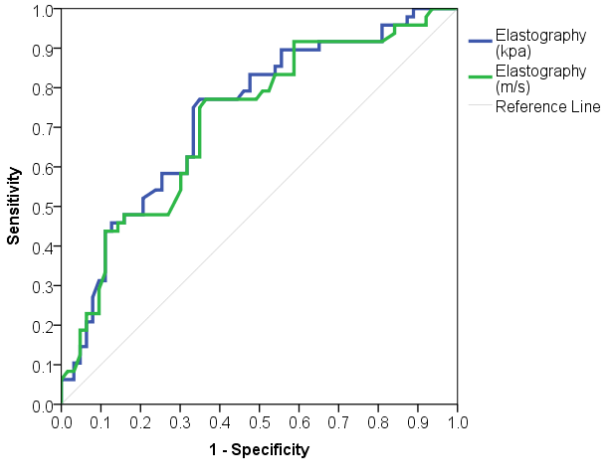
Table 1. Baseline Characteristics of 111 Cirrhotic patients and Comparison between patients with and without Esophageal Varices

Characteristic	Esophageal Varices by Endoscopy		Total N (%)	P value
	Present N (%)	Absent N (%)		
Sex				0.045
Female	16 (33.3%)	33 (52.4%)	49 (44.1%)	
Male	32 (66.7%)	30 (47.6%)	62 (55.9%)	
Elastography				0.021
ARFI	40 (83.3%)	40 (63.5%)	80 (72.1%)	
SWE	8 (16.7%)	23 (36.5%)	31 (27.9%)	
Size				
Small	23 (47.92%)		23 (47.92%)	
Large	25 (52.08%)		25 (52.08%)	
Child's Pugh				0.008
A	24 (50.0%)	48 (76.2%)	72 (64.9%)	
B	19 (39.6%)	14 (22.2%)	33 (29.7%)	
C	5 (10.4%)	1 (1.6%)	6 (5.4%)	
Underlying cause				0.006
Alcoholic liver disease	8 (16.7%)	0 (0.0%)	8 (7.2%)	
Autoimmune hepatitis	2 (4.2%)	5 (7.9%)	7 (6.3%)	
Hepatitis B	18 (37.5%)	24 (38.1%)	42 (37.8%)	
Hepatitis C	4 (8.3%)	2 (3.2%)	6 (5.4%)	
NASH	16 (33.3%)	32 (50.8%)	48 (43.2%)	
Age (years)	63.0 ± 11.3 (44.0 - 84.0)	62.5 ± 12.7 (32.0 - 86.0)	62.8 ± 12.1 (32.0 - 86.0)	0.826
LSM (kpa)	28.3 ± 11.7 (13.2 - 66.4)	20.6 ± 8.4 (8.5 - 50.3)	24.0 ± 10.6 (8.5 - 66.4)	<0.001
LSM (m/s)	2.9 ± 0.6 (2.0 - 5.0)	2.5 ± 0.5 (1.6 - 3.9)	2.7 ± 0.6 (1.6 - 5.0)	<0.001
Spleen (m/s)	3.1 ± 0.4 (2.1 - 3.9)	2.4 ± 0.4 (1.4 - 3.4)	2.7 ± 0.6 (1.4 - 3.9)	<0.001
Platelet count (x1000)	96.8 ± 34.3 (39.0 - 184.0)	220.3 ± 92.7 (99.0 - 455.0)	166.9 ± 95.5 (39.0 - 455.0)	<0.001
Platelet-kpa ratio	3.9 ± 2.0 (1.2 - 10.7)	12.7 ± 8.3 (2.5 - 37.8)	8.9 ± 7.7 (1.2 - 37.8)	<0.001
Platelet-m/s ratio	33.9 ± 13.5 (12.2 - 80.0)	92.7 ± 48.1 (32.8 - 227.5)	67.3 ± 47.3 (12.2 - 227.5)	<0.001

Diagnostic performance of liver stiffness measurement, platelet count and platelet count/liver stiffness measurement ratio for esophageal varices

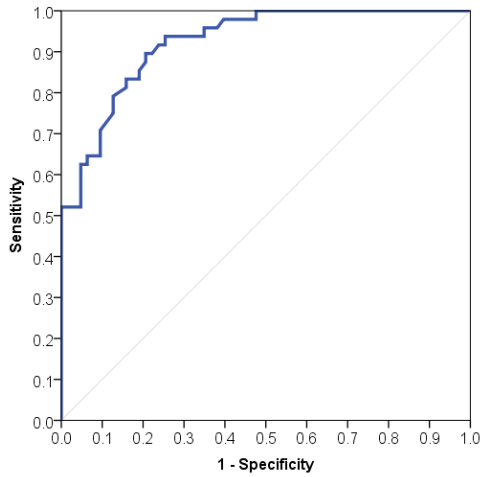
The clinical characteristics of patients with and without EV are shown at table 1. The liver stiffness measurement, platelet count and platelet count/liver stiffness measurement ratio were significantly associated with the presence of EV statistically (P value < 0.05).

As for accuracy analysis, the LSM, Platelet Count, and Platelet Count/LSM Ratio Cut off values were subjected to Area Under Curve test wherein a threshold of AUC = 0.70 and above was considered clinically acceptable diagnostic tool. As seen in Figures 2, 3, and 4, the Area under the curve using Liver Stiffness Measurement, Platelet count and Platelet count/Liver stiffness measurement ratio in identifying esophageal varices are above 0.70, shown as 0.73 (Figure 2), 0.92 (Figure 3), and 0.91 (Figure 4) respectively.



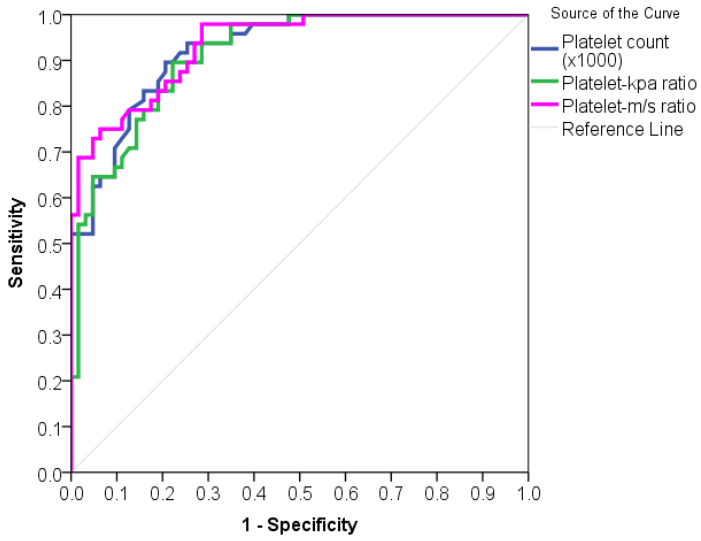
Test	Area under the curve	P value
Elastography (kpa)	0.73 (0.64-0.82)	<0.001

Figure 2. Area under the curve using liver stiffness measurements in identifying esophageal varices



Test	Area under the curve	P value
Platelet count (x1000)	0.92 (0.88-0.82)	<0.001

Figure 3. Area under the curve using Platelet count in identifying esophageal varices



Test	Area under the curve	P value
Platelet count (x1000)	0.92 (0.88-0.82)	<0.001
Platelet-kpa ratio	0.91 (0.86-0.96)	<0.001

Figure 4. Area under the curve using Platelet count/Liver stiffness measurement ratio in identifying esophageal varices

Table 2. Performance of Liver stiffness measurement for identifying Esophageal Varices

Kpa cutoff	Sensitivity	Specificity	Sensitivity + Specificity
20.17	77.08%	60.32%	137.40%
20.34	77.08%	61.90%	138.99%
20.50	77.08%	63.49%	140.58%
20.66	77.08%	65.08%	142.16%
20.82	75.00%	66.67%	141.67%
20.98	72.92%	66.67%	139.58%

The cut off value of LSM identified in our study was 20.66 kPa which has a sensitivity of 77.08%, specificity of 65.08% (Table 2).

Table 3. Performance of Platelet count for identifying Esophageal Varices

Platelet cutoff	Sensitivity	Specificity	Sensitivity + Specificity
124.90	81.25%	84.13%	165.38%
126.40	83.33%	84.13%	167.46%
127.25	83.33%	80.95%	164.29%
127.75	85.42%	80.95%	166.37%
129.00	87.50%	79.37%	166.87%
130.45	89.58%	79.37%	168.95%
133.45	89.58%	77.78%	167.36%
140.25	91.67%	76.19%	167.86%
147.25	91.67%	74.60%	166.27%
150.65	93.75%	74.60%	168.35%

The cut off value of the platelet count in our study was 150,650/mm3. Platelet count measurement is significantly lower in patients with esophageal varices than those without esophageal varices. Using the cut off ≤150,650/mm3, it has higher sensitivity at 93.75% and specificity of 74.60%. (table 3).

Table 4. Performance of platelet count/Liver stiffness measurement ratio for identifying Esophageal Varices

Platelet-kpa ratio cutoff	Sensitivity	Specificity	Sensitivity + Specificity
5.54	81.25%	80.95%	162.20%
5.67	83.33%	80.95%	164.29%
5.78	83.33%	79.37%	162.70%
5.81	83.33%	77.78%	161.11%
5.88	85.42%	77.78%	163.19%
6.06	87.50%	77.78%	165.28%
6.20	89.58%	77.78%	167.36%
6.25	89.58%	76.19%	165.77%
6.34	89.58%	74.60%	164.19%
6.47	89.58%	73.02%	162.60%
6.55	89.58%	71.43%	161.01%
6.58	91.67%	71.43%	163.10%
6.87	93.75%	71.43%	165.18%

The cut off value for the Platelet/liver stiffness measurement ratio was 6.87. It has high sensitivity of 93.75% and specificity of 71.43% as shown in table 4.

Table 5. Performance of liver stiffness measurement and platelet count/Liver stiffness measurement ratio using the previous cut off for identifying Esophageal Varices

Esophageal Varices	Endoscopy		Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Accuracy (95% CI)	LR+ (95% CI)	LR- (95% CI)
	Present	Absent							
Elastography cutoff ≥20			77.1% (63.5-86.7)	57.1% (44.9-68.6)	57.8% (45.6-69.1)	76.6% (62. 8-86.4)	65.8% (56.5-73.9)	1.8 (1.6-2.0)	0.4 (0.3-0.5)
Present	37	27							
Absent	11	36							
Platelet count cutoff ≤150x1000			93.8% (83.2-97.8)	74.6% (62.7-83.7)	73.8% (61.6-83.2)	94% (83.8-97.9)	82.9% (74.8-88.8)	3.7 (3.3-4.2)	0.1 (0.0-0.2)
Present	45	16							
Absent	3	47							
Platelet-kpa ratio cutoff ≥7.0			93.8% (83.2- 97.8)	71.4% (59.3-81.1)	71.4% (59.3-81.1)	93.8% (83.2-97.8)	81.1% (72.8-87.3)	3.3 (2.9-3.7)	0.1 (0.0-0.2)
Present	45	18							
Absent	3	45							
Platelet-kpa ratio cutoff ≥7.5			93.8% (83.2- 97.8)	66.7% (54.4-77.0)	68.2% (56.2-78.2)	93.3% (83.1-97.7)	78.4% (69.8-85.0)	2.8 (2.6-3.1)	0.1 (0.0-0.2)
Present	45	21							
Absent	3	42							

This study demonstrated that using the previous cut off of ≥20 kpa, has sensitivity of 77.1% (95% CI 63.5-86.7) and specificity of 57.1% (95% CI 44.9-68.6) with PPV 57.8% (95% CI 45.6-69.1) and NPV 76.6% (95% CI 62. 8-86.4), with accuracy of 65.8% (95% CI 56.5-73.9) and LR (+) 1.8 (95% CI 1.6-2.0) and LR (-) 0.4 (95% CI 0.3-0.5). Using the previous cut off of ≤150,000/mm3 showed 93.8% (95% CI 83.2-97.8) and 74.6% (95% CI 62.7-83.7) specificity and sensitivity respectively. The PPV was 73.8% (95% CI 61.6-83.2) with NPV of 94% (95% CI 83.8-97.9). The accuracy was 82.9% (95% CI 74.8-88.8) with LR (+) 3.7 (95% CI 3.3-4.2) and LR (-) 0.1 (95% CI .0-0.2). The Platelet-kpa ratio cutoff value of ≥7.0 has sensitivity of 93.8% (95% CI 83.2- 97.8), specificity of 71.4% (95% CI 59.3-81.1), PPV of 71.4% (CI 59.3-81.1), NPV of 93.8% (95% CI 83.2-97.8), accuracy of 81.1% (95% CI 72.8-87.3), positive likelihood ration of 3.3 (95% CI 2.9-3.7), and negative likelihood ration of 0.1 (95% CI 0.0-0.2). (Table 5)

Table 6. Performance of liver stiffness measurement **cutoff ≥20 kpa or Platelet cutoff ≤150** in identifying Esophageal Varices

Esophageal Varices	Endoscopy		Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Accuracy (95% CI)	LR+ (95% CI)	LR- (95% CI)
	Present	Absent							
Elastography cutoff ≥20 kpa or Platelet cutoff ≤150*			97.9% (89.1-99.6)	49.2% (37.3-61.2)	59.5% (48.5-69.6)	96.9% (84.3-99.4)	70.3% (61.2-78.0)	1.9 (1.8-2.0)	0.0 (0.0-0.3)
Present	47	32							
Absent	1	31							

Using the Platelet cutoff ≤150,000/mm3 or Liver stiffness cutoff ≥20 kpa, it has high sensitivity of 97.9% (95% CI 89.1-99.6) and Specificity of 49.2% (95% CI 37.3-61.2), PPV 59.5% (95% CI 48.5- 69.6), NPV 96.9% (95% CI 84.3-99.4), accuracy 70.3% (95% CI 61.2- 78.0) , LR (+) 1.9 (95% CI 1.8-2.0) and LR (-) 0 (95% CI 0.0-0.3) as shown in table 6.

DISCUSSION:

In this study, the diagnostic accuracy of the liver stiffness measurement using (ARFI and SWE), platelet count and platelet count/liver stiffness measurement ratio in determining the presence of esophageal varices compared to endoscopy among patients with liver cirrhosis of any etiology was above 0.70. The Area under the curve using Liver Stiffness Measurement, Platelet count and Platelet count/Liver stiffness measurement ratio in identifying esophageal varices are 0.73, 0.92, and 0.91 respectively. Hence, LSM, Platelet count and Platelet count/LSM ratio are clinically acceptable diagnostic tools in identifying esophageal varices. The diagnostic accuracy of these parameters as determined by the AUC in this study was similar to that of earlier published data by Maurice JB et al wherein the AUC of the combined Liver stiffness measurement and platelet count was 0.746. [9]

As seen in table 1, the liver stiffness measurement, platelet count and platelet count/liver stiffness measurement ratio were significantly associated with the presence of EV with P value of < 0.05 which demonstrated that applying the LSM, platelet count and Platelet count/LSM ratio will may determine the presence of esophageal varices and may help the physician and patient to decide if immediate surveillance endoscopy is needed or may delay the procedure.

The cut off value demonstrated in this study for the LSM was 20.66 kPa, which has a sensitivity of 77.08%, specificity of 65.08% (Table 2). Using the previous cut off ≥20 kpa used by Baveno VI has sensitivity of 77.1% and specificity of 57.1% with PPV 57.8% and NPV 76.6%, with accuracy of 65.8% and LR (+) 1.8 and LR (-) 0.4 (Table 5). We can see from the result that Liver stiffness measurement was significantly higher in patients with esophageal varices than those without esophageal varices. The cut off value of the platelet count in this study was 150,650/mm3 and has high sensitivity of 93.75% and specificity of 74.60%. (Table 3). Using the previous cut off of ≤150,000/mm3 from Baveno VI criteria, it has 93.8% and 74.6% specificity and sensitivity respectively. The PPV was 73.8% with NPV of 94%. The accuracy was 82.9% with LR (+) 3.7 and LR (-) 0.1 (Table 5). Plalelet count measurement was significantly lower in patients with esophageal varices than those without esophageal varices. The cut off value for the Platelet/liver stiffness measurement ratio in our study was 6.87, As predicted, the lower the values, the more positive for esophageal varices. This cut off has high sensitivity of 93.75% and specificity of 71.43% as shown in table 4. These parameters are good predictive markers in determining presence and absence of esophageal varices,

Using the Liver stiffness cutoff from the Baveno VI criteria ≥20 kpa or Platelet cutoff ≤150,000/mm3, there is high sensitivity of 97.9% but low Specificity of 49.2% seen in this study with PPV 59.5%, NPV 96.9%, accuracy 70.3%, positive LR 1.9 and negative LR 0. (Table 5), The result was comparative with the study done by Maurice JB et al where in they validated Baveno VI criteria which gave a sensitivity 87%, specificity 34%, positive predictive value

0.06, negative predictive value 0.98, positive likelihood ratio 1.31 and negative likelihood ratio 0.39.[9] With high sensitivity result, these parameters are good for screening esophageal varices.

It also shown in this study that the most common cause of the cirrhosis among our patients was NASH/NAFLD followed by Chronic hepatitis B. here, we can see that there is increasing trend of NASH/NAFLD becoming cirrhotic. Hence, early detection and aggressive management for NASH/NAFLD is warranted.

It demonstrated in this study that, among the patients with Child-Turcotte-Pugh class A, 24 out of 48 (33.33%) have esophageal varices, while Child-Turcotte-Pugh class B, 19 out of 33 (57.58%) and Child-Turcotte-Pugh class C, 5 out of 6 (83.33%) have esophageal varices. This means that, the higher the Child-Turcotte-Pugh classification, the higher the risk of developing esophageal varices.

According to Vijay et al., all cirrhotic patients should undergo EGD for surveillance for presence of esophageal varices.[3] Presence and absence of varices would guide the physician to the next step. It will help the care provider on the treatment and follow up. However, as mentioned above, program of upper endoscopy in all cirrhotic would be very expensive and repeated gastroscopies are poorly accepted by patients. Hence non-invasive parameters in identifying esophageal varices among patients with cirrhosis would be necessary and LSM, platelet count, platelet count/LSM ratio are parameters that can be used in identifying esophageal varices in cirrhotic patients..

However, there are limitations of this study: First, retrospective study has inherent limitations of bias. Second, Endoscopy was not performed simultaneously with the liver stiffness measurements and platelet count. Third, there is a variable distribution of patients for the etiologies of the liver cirrhosis, other causes of chronic liver disease such as non- alcoholic liver disease are often poorly represented in this field of research, and the LSM criteria for cirrhosis in non- viral etiologies is less well defined. [9] Hence, a prospective study with simultaneous performance of liver elastography, platelet count and endoscopy are recommended to give further support to the use of liver LSM, platelet count and platelet count/LSM in identifying esophageal varices. Longer follow up is required to evaluate the prediction of EV and bleeding EV.

CONCLUSIONS:

The Liver Stiffness Measurement, Platelet Count and Platelet Count/Liver Stiffness Measurement Ratio shown promise as predictive markers of Esophageal Varices. We can used these non-invasive parameters to identify

patients who have EV and patients who need to undergo surveillance endoscopy immediately or who may delay the procedure .

These are noninvasive method for predicting EV among Filipino patients with cirrhosis. Clinicians should recommend those patients with cirrhosis who show higher values of liver stiffness measurement, low platelet count and low platelet count /liver stiffness measurement ratio to undergo further endoscopic/EGD examination.

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