

# Contribution of Ultrasonic Impulse Elastometry (Fibroscan®) in the Evaluation of the Severity of Portal Hypertension (PH) in Cirrhotic Patients

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#### Abstract

Purpose: To establish a threshold value of liver elasticity for the prediction of esophageal varices in compensated cirrhotics. Methodology: retrospective and analytical study carried out in outpatient hepato-gastroenterology consultations and in the digestive endoscopy unit of the Cocody University Hospital during the period from July 2018 to July 2022. All patients with compensated cirrhosis of etiologies were included. Various, having carried out a Fibroscan and an esogastroduodenal fibroscopy (FOGD). Data were analyzed using SPSS 26 statistical software. Patients were separated into two groups with or without esophageal varices (OV) according to FOGD results. Chi 2 and Fisher's test were used to compare the two groups. The respective optimal predictive threshold for the diagnosis of esophageal varices was determined from the ROC curve. The respective diagnostic performances of this threshold were evaluated by their sensitivity (Se), specificity (Sp), positive predictive value (PPV), and negative predictive value (NPV). Results: 50 patients were retained. The mean age was  $43.7 \pm 9$  years for group I (without OV) and  $49 \pm 12.9$  years for group II (with OV). The sex ratio was 1.55 in group I and 2.85 for group II. Viral etiology B was predominant in both groups (78.3% vs 74.1%). Thrombocytopenia was present in both groups (69.6% vs 70.4%). In group II the grade II and III OV with red signs were respectively (18% vs. 14%). The median Liver Elasticity Threshold (FLS) of the two groups was (18.5 kPa vs 31 kPa). The elasticity threshold of the liver was 25.15 kPa to predict the presence of esophageal varices. The area under the AUROC curve was 0.928 (95% CI 0.82 to 1) with a P value of less than 0.001.

The Fibroscan performed well with a sensitivity of 85% and a specificity of 82.6%, a PPV of 84.6%, a VPN of 79.2%. Conclusion: Fibroscan is a powerful non-invasive test for predicting the presence of esophageal varices in compensated cirrhotics.

## Keywords

Cirrhosis, Portal Hypertension, Esophageal Varices (OV), FOGD, Fibroscan®

# **1. Introduction**

Portal hypertension is defined by an increase in portal pressure beyond 15 mmHg or an increase in the portocaval pressure gradient beyond 5 mmHg secondary to an obstacle to portohepatic circulation. The rupture of these esophageal varices represents more than 80% of the causes of hemorrhages by portal hypertension in cirrhotic patients with a fatal evolution in more than 15% of cases [1]. Primary prevention of this haemorrhage requires early screening for portal hypertension in cirrhotics, object of many studies around the world [2]. The Baveno VI criteria demonstrate that there is little risk of finding VO in a cirrhotic patient whose liver elasticity score is less than 20 kPa and whose platelet count is greater than 150,000 G/1 [3]. Aim: to establish a threshold value of liver elasticity for the prediction of esophageal varices in compensated cirrhotics. Methodology: retrospective and analytical study carried out in outpatient hepatogastroenterology consultations and in the digestive endoscopy unit of the CHU of Cocody during the period from July 2018 to July 2022. All patients with compensated cirrhosis of various etiologies and having carried out a Fibroscan and an esogastroduodenal fibroscopy (FOGD). All patients with complicated cirrhosis who had only Fibroscan or FOGD performed were excluded. The parameters studied: demographic (gender, age); clinical (history, signs of PH and IHC); biological (platelets, prothrombin level, albumin) and paraclinical (abdominal ultrasound, ultrasonic pulse elastometry, FOGD). The data were analyzed by the SPSS 26 software. The patients were separated into two groups with or without esophageal varices according to the results of the FOGD. Chi 2 and Fisher's test were used to compare the two groups. The respective optimal predictive threshold for the diagnosis of esophageal varices was determined from the ROC curve. The respective diagnostic performances of this threshold were evaluated by their sensitivity (Se), specificity (Sp), positive predictive value (PPV), and negative predictive value (NPV).

# 2. Results

578 files were examined, 50 files were selected according to the selection criteria and divided into two groups. Group I patients without varicose veins (n = 23) and group II with varicose veins (n = 27). The mean age was  $43.7 \pm 9$  years for group I and  $49 \pm 12.9$  years for group II. The sex ratio was 1.55 in group I and 2.85 for

group II. Viral B etiology was predominant in both groups with (78.3% vs 74.1%). Thrombocytopenia was present in both groups (69.6% vs 70.4%). In group II the grade II and III OV with red signs were respectively (18% vs. 14%). The average liver elasticity score was 18.5 kPa +/- 6.4 for patients without esophageal varices. Fibroscan at 31.4 kPa +/- 8.1 is predictive of the occurrence of esophageal varices. The median Liver Elasticity Threshold (FLS) of the two groups was (18.5 kPa vs 31.4 kPa). The elasticity threshold of the liver was 25.15 kPa to predict the presence of VOs. The area under the AUROC curve (Figure 1) was 0.928 (IC 95%: 0.82 - 1) with a P value of less than 0.001. The Fibroscan performed well with a sensitivity (Se) of 85% and a specificity (Sp) of 82.6%, a PPV of 84.6% and a VPN of 79.2%.





## **3. Discussion**

The average age of our patients in group I was 44 years old and that of group II was 49 years old. Saad et al. [4] had found a superimposable average age of 49.4 years. Ashish et al. [5] found a slightly higher average age of 52 years. We found a male predominance in both groups with a sex ratio of (1.55 vs 2.85). This result was consistent with that of De Lisi et al. [6] who found a sex ratio of (1.3 vs 2). Viral B etiology was predominant in both groups of our cirrhotic patients with 78.3% for group I and 74.1% for group II. On the other hand, in Egypt, Al-Hamoudi et al. [7] in their series found a predominance of hepatitis C (74.5%) and 10.6% for hepatitis B. 70.4% of our patients had a thrombocytopenia with a slight predominance in group II. This result was similar to that of Anum *et al.* [8] who found thrombocytopenia in 71.2%. In the literature, thrombocytopenia and splenomegaly are considered indirect signs of portal hypertension [9]. The median SEF was significantly different between group I and II (18.5 kPa and 31.4 kPa). This difference also existed in Asian studies carried out by Li et al. [10] and Hua et al. [11] which found a median FES in patients without and with large varices respectively of (13.6 kPa and 31.2 kPa) and (16.5 kPa and 36.75 kPa). The best threshold value of Fibroscan for the prediction of VO in our series was 25.15 kPa. This rate was superimposed on that of the Baveno VII conference which stipulates that a liver elasticity greater than or equal to 25 kPa is sufficient to confirm a diagnosis of clinically significant portal hypertension in patients with chronic hepatitis of origin. viral and/or alcoholic and in non-obese patients with NASH. Similarly, Hu *et al.* [12] in Asia in a cirrhotic population found a liver elasticity threshold value of 25.55 kPa. Other authors such as Loan et al. [13] as well as Foucher et al. [14] have found slightly higher SEF values of 26.29 kPa and 27.5 kPa respectively for the detection of large varicose veins and the risk of rupture. in cirrhotic patients. The prevention of all complications of cirrhosis, not just hemorrhage, aims to be avoided by prescribing a non-cardio-selective beta-blocker as soon as clinically significant HTP is detected, assessed by elastography greater than 25 kPa. It is therefore not advisable to perform a gastroscopy to screen for PH for this group of patients since global PH prophylaxis is in place. In accordance with the recommendations of the Baveno VI conference, the combination of a liver elasticity score of less than 20 kPa and a blood platelet level greater than 150,000 elements/mm<sup>3</sup> made it possible to exclude the presence of large esophageal varices. Other authors such as Maurice et al. [15] observed similar results in a compensated cirrhotic population with a liver elasticity threshold of 20 kPa and thrombocytopenia greater than 100,000 elements/mm3. The sensitivity of Fibroscan in predicting OV was 81.5% (95% CI) in our study. Pu et al. [16] in their meta-analysis reported a comparable rate of 84% (81% - 86% 95% CI). Similarly, Hong et al. [17] found in their series a sensitivity of 83% - 87% in cirrhotics of etiology B or C. The specificity of Fibroscan in the prediction of esophageal varices was 82.6% (95% CI ) in our study. On the other hand, Pu et al. [16] and Fan Cheng et al. [18] found in their study a lower specificity of (58% - 66% 95% CI) and (62% - 74% 95% CI) respectively. The PPV of Fibroscan in the prediction of OV was 84.6% in our study. This rate was close to that of Jung et al. [19] who reported a PPV of 89%. On the other hand, Shibata et al. [20] found a very low PPV of 30.8%. In our series, the NPV of Fibroscan in the prediction of OV was 79.2%. Our value was slightly higher than that of Fan Cheng et al. who found a VPN of 75%. Conversely, Jung et al. [19] found a lower value of 66%. The limitations of this work were the small size of our sample which was explained by the existence of missing data and the retrospective and monocentric nature of the study.

#### 4. Conclusion

A liver elasticity score of 25.15 kPa measured by Fibroscan is highly sufficient to confirm a diagnosis of clinically significant portal hypertension in patients with chronic hepatitis of viral and/or alcoholic origin and in non-obese patients with NASH.

# **Ethical Considerations**

A research authorization was obtained from the Scientific Medical Department.

Each patient was informed of the purpose of our study, and their consent sought, recorded in writing and validated by their signature. The data was collected in strict compliance with medical secrecy. The information contained in our survey sheet was confidential.

## **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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