Evaluation of the Sabadell noninvasive hepatitis C-related cirrhosis early detection index and right lobe diameter to albumin ratio in the prediction of presence of varices in Egyptian cirrhotic patients
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Introduction
Portal hypertension in cirrhosis results from progressive fibrotic remodeling of the liver, which increases the resistance to hepatic sinusoidal blood flow. Increased portal venous pressure causes esophageal and gastric varices, which contribute substantially to cirrhosis-related morbidity and mortality. The gold standard in the diagnosis of varices is esophagogastroduodenoscopy, but identification of noninvasive predictors of esophageal varices (OVs) will allow upper gastrointestinal tract endoscopy to be carried out only in a selected group of patients. Different noninvasive parameters including clinical, laboratory, and sonographic predictors are an alternative approach to perform selective screening endoscopy only in patients at high risk.

Objective
Our objective is to evaluate whether the noninvasive hepatitis C-related cirrhosis early detection (NIHCED) score and the right lobe diameter to albumin ratio can predict the presence of OVs in a group of Egyptian cirrhotic patients.

Patients and methods
Seventy-five patients with liver cirrhosis were enrolled in the study depending on the clinical evidence of stigmata of chronic liver disease (e.g. jaundice, ascites, palmar erythema, spider naevi, etc.) and ultrasonographic features of liver cirrhosis (e.g. coarse echo texture, shrunken liver, etc.).

Results
According to the esophagogastroduodenoscopy results, the patients were categorized into two groups: those with OVs (47 patients, 63%) and those without OVs (28 patients, 37%). Receiver operating characteristic curve analysis of the NIHCED score was applied to both groups with a cutoff score of more than 45. The estimation cohort study had a sensitivity of 70%, specificity of 78%, and diagnostic accuracy of 74% with an area under the receiver operating characteristic curve of 0.77 (95% confidence interval, 0.66–0.86).

Receiver operating characteristic curve analysis of the right lobe diameter to albumin ratio was applied to both groups with a cutoff score of more than 2.80. The estimation cohort study had a sensitivity of 80%, specificity of 53%, and diagnostic accuracy of 67% with an area under the receiver operating characteristic curve of 0.67 (95% confidence interval, 0.55–0.77).

Conclusion
The NIHCED score and right lobe diameter to albumin ratio are simple noninvasive predictors of the presence of varices in Egyptian patients with liver cirrhosis.

Keywords:
hepatitis C virus liver disease, liver cirrhosis, noninvasive hepatitis C-related cirrhosis early detection index, predictive index

442 Original article

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Portal hypertension results in the development of esophagogastric varices which often bleed. It also plays a role in the development of ascites, hepatorenal syndrome, and hepatic encephalopathy. Portal hypertension and the resulting portosystemic collaterals may also be responsible for the cardiopulmonary complications such as portopulmonary hypertension and hepatopulmonary syndrome [3].

Identification of noninvasive predictors of esophageal varices (OVs) will allow upper gastrointestinal tract (GIT) endoscopy to be carried out only in a selected group of patients, thus avoiding unnecessary intervention and at the same time not to miss patients at risk of bleeding [4].

To date, several predictive markers of the presence of varices in patients with liver cirrhosis including clinical, laboratory, and hepatic echographic data have been published.

The right liver lobe diameter/albumin was evaluated as a noninvasive parameter to determine the presence of OVs in patients with liver cirrhosis [5].

The Sabadell noninvasive hepatitis C-related cirrhosis early detection (NIHCED) index was originally designed to evaluate the presence of advanced fibrosis in patients with liver cirrhosis [6].

To the best of our knowledge, this index has not been previously evaluated in Egyptian cirrhotic patients.

Therefore, we conducted this study aiming to evaluate the diagnostic performance of the right liver lobe diameter/albumin and the Sabadell NIHCED index in the prediction of the presence of varices.

**Patients and methods**

Between October 2016 and September 2017, 75 patients were prospectively and consecutively recruited for the study. All patients were admitted to the Tropical Medicine and Gastroenterology Department, Sohag University Hospital.

**Inclusion criteria**

Patients with liver cirrhosis (clinically and sonographically proven) with no history of upper gastrointestinal bleeding.

**Exclusion criteria**

(1) Patients known to have OVs.

(2) Patients who refuse endoscopic examinations to evaluate the presence and degree of OVs.

(3) History of previous upper gastrointestinal bleeding.

**Ethical consideration**

We got approval of Sohag Faculty of Medicine Ethics Committee. All patients signed an informed written consent before starting data collection with respect to patient’s confidentiality.

**Methods of the study**

Each patient included in the study was subjected to the following:

(1) Complete history taking and physical examination.

(2) Laboratory investigations: aspartate aminotransferase, alanine aminotransferase, serum alkaline phosphatase, serum albumin, prothrombin time and concentration, total and differential bilirubin, hepatitis markers for HBV and HCV, blood sugar, hemoglobin level, and serum creatinine.

(3) Assessment of the severity of liver disease.

(4) Using the Child–Pugh score [7]: three laboratory tests (bilirubin, albumin, and prothrombin time), combined with the presence and severity of encephalopathy and ascites, are included in the Child–Pugh score.

(5) Abdominal ultrasonography.

(a) To evaluate liver size, the right lobe diameter in the medioclavicular line, caudate lobe diameter, echogenicity and any focal lesion, portal vein diameter, spleen, portosystemic collaterals, and detection of ascites.

(b) Right lobe diameter (right hepatic lobe atrophy is considered if longitudinal diameter <9 cm).

(c) Caudate lobe diameter (hypertrophy of the caudate lobe is considered if diameter >4 cm).

**Calculation of the Sabadell NIHCED index [6]:**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Point score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥60</td>
<td>13 points</td>
</tr>
<tr>
<td>Prothrombin time ≥1.1</td>
<td>10 points</td>
</tr>
<tr>
<td>Platelets ≤100,000</td>
<td>15 points</td>
</tr>
<tr>
<td>Aspartate aminotransferase/Alanine aminotransferase ≥1</td>
<td>10 points</td>
</tr>
<tr>
<td>Caudate lobe hypertrophy</td>
<td>6 points</td>
</tr>
<tr>
<td>Right hepatic lobe atrophy</td>
<td>15 points</td>
</tr>
<tr>
<td>Splenomegaly</td>
<td>7 points</td>
</tr>
</tbody>
</table>
Upper gastrointestinal tract endoscopy

Upper GIT endoscopy was done for all patients for detection of the number, site, and size of varices, and presence of red color sign.

Statistical analysis

Quantitative data were represented as mean, SD, median, and range. Data were analyzed using Student’s t test to compare he means of two groups. When the data were not normally distributed, Mann–Whitney test was used to compare two groups. Qualitative data were presented as number and percentage and compared using either \( \chi^2 \) test or Fisher’s exact test. Graphs were produced by using Excel or STATA program (StataCorp LLC., Texas, USA). Data were analyzed by sensitivity, specificity, positive, and negative predictive value derived from the receiver operating characteristic curve. The diagnostic accuracy of different prognostic scores were expressed as the area under the receiver operating characteristic curve. Statistical analysis was performed using MedCalc for Windows (version 11.0) and STATA (version 9.2). P value was considered significant if it was less than 0.05.

Results

The study included 51 men and 24 women. The mean age of all patients was 53.11±9.89.

Among the 75 cirrhotic patients, 47 (63%) patients had OVs diagnosed by upper GIT endoscopy (Fig. 1).

Laboratory data of the studied population are summarized in Table 1.

Sonographic data of the studied population are summarized in Table 2.

All 75 patients were categorized into two groups according to the findings in the esophagastroduodenoscopy: group A those without OVs (37%) and group B those with OVs (63%).

Splenomegaly, caudate lobe hypertrophy, right hepatic lobe atrophy, collaterals, and dilated splenic vein were significantly more common in patients with OVs (\( P=0.01, \ P=0.003, \ P\leq0.000, \ P=0.02, \ P=0.04 \)), respectively, as shown in Table 3.

Patients with OVs had significantly lower value of platelet and albumin than those without OVs (Figs 2–4 and Tables 4 and 5).

There was a significant association between right lobe diameter to albumin ratio and presence of varices as shown in Table 6 and Fig. 5.

Discussion

Liver cirrhosis is the pathologic outcome of many chronic liver diseases, in which repeated injury to the liver results in fibrosis, scarring, and ultimately functional impairment [8].
Portal hypertension commonly accompanies liver cirrhosis with the development of OVs and portal hypertensive gastropathy as major complications [9].

In Egypt, variceal causes of upper GIT bleeding are the most common, representing 70.1% of patients who are presenting with acute upper GIT bleeding. OVs alone represented 17.8% of causes of variceal bleeding, while combined esophageal and gastric varices represented 39.5% and isolated gastric varices 12.8% [10].

In this study, we evaluated the role of NIHCED score and right lobe diameter to albumin ratio in predicting the presence and grade of OVs in cirrhotic patients admitted to our hospital with no history of previous gastrointestinal bleeding.

We found that a decrease in platelet count and serum albumin level were significantly associated with the presence of OVs in cirrhotic patients (P=0.001, P=0.007). The pathogenesis of thrombocytopenia includes productive, consumptive, or distributional mechanisms. It is commonly believed to be due to pooling and destruction of platelets in the spleen, which may be mediated by platelet-associated IgG. Reduced levels of thrombopoietin either due to impaired production or rapid degradation may also add to thrombocytopenia.

The pathogenesis of low albumin level in patients with OVs is that synthesis is decreased because of the loss of hepatic cell mass. Also, the portal blood flow is often decreased and poorly distributed, leading to misdistribution of nutrients and oxygen. The flow of the substrate may affect certain functions of the liver, including protein synthesis [11].

Our results agree with Mandal et al. [12] who reported that platelet count and albumin are reliable predictors of variceal hemorrhage. These findings are in accordance with those of Farooqi et al. [13] who found that a platelet count of less than 65×103/μl and serum albumin less than 2.2 g/dl are independent predictors of OVs on endoscopy.

We found that splenomegaly was significantly associated with the presence of OVs in cirrhotic patients. The pathogenesis of splenomegaly in patients with OVs is that splenomegaly is not only caused by portal congestion, but it is mainly due to tissue hyperplasia and fibrosis. The increase in spleen size is followed by an increase in splenic blood flow, which participates in portal hypertension [14].

This finding correlates with the study carried out by Dib et al. [15] who reported that spleen length is an independent predictor of OVs.

### Table 1 Laboratory characteristics of studied population

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All patients’ summary statics (N=75)</th>
<th>Group A (N=28)</th>
<th>Group B (N=47)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBCs (x10⁹/μl)</td>
<td>3.92±1.21</td>
<td>3.78</td>
<td>4.01</td>
<td>0.42</td>
</tr>
<tr>
<td>±1.19</td>
<td></td>
<td>±1.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBCs (x10⁹/μl)</td>
<td>7.13±3.74</td>
<td>7.57</td>
<td>6.87</td>
<td>0.82</td>
</tr>
<tr>
<td>±4.47</td>
<td></td>
<td>±3.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platelets (x10⁹/μl)</td>
<td>102.69±44.98</td>
<td>123.96</td>
<td>90.02</td>
<td>0.001</td>
</tr>
<tr>
<td>±52.28</td>
<td></td>
<td>±34.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALT (IU/dl)</td>
<td>58.12±56.05</td>
<td>75.79</td>
<td>47.60</td>
<td>0.26</td>
</tr>
<tr>
<td>±80.28</td>
<td></td>
<td>±31.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AST (IU/dl)</td>
<td>73.19±55.17</td>
<td>83.89</td>
<td>66.81</td>
<td>0.71</td>
</tr>
<tr>
<td>±77.04</td>
<td></td>
<td>±36.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total bilirubin (mg/dl)</td>
<td>2.02±2.30</td>
<td>2.43</td>
<td>1.77</td>
<td>0.81</td>
</tr>
<tr>
<td>±3.05</td>
<td></td>
<td>±1.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct bilirubin (mg/dl)</td>
<td>0.90±1.45</td>
<td>1.1</td>
<td>0.78</td>
<td>0.70</td>
</tr>
<tr>
<td>±1.74</td>
<td></td>
<td>±1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>3.10±0.90</td>
<td>3.50</td>
<td>2.87</td>
<td>0.007</td>
</tr>
<tr>
<td>±0.98</td>
<td></td>
<td>±0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT (s)</td>
<td>15.08±3.73</td>
<td>15.5</td>
<td>14.83</td>
<td>0.46</td>
</tr>
<tr>
<td>±3.85</td>
<td></td>
<td>±3.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC (%)</td>
<td>66.53±19.01</td>
<td>65.18</td>
<td>67.34</td>
<td>0.64</td>
</tr>
<tr>
<td>±19.73</td>
<td></td>
<td>±18.73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data are expressed as mean±SD. ALT, alanine aminotransferase; AST, aspartate aminotransferase; PC, prothrombin concentration; PT, prothrombin time; RBC, red blood cells; WBC, white blood cells. Bold values mean significant relation p-value <0.05.

### Table 2 Ultrasonographic characteristics of studied population

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All patients’ summary statics (N=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right lobe diameter (cm)</td>
<td>Means±SD: 10.31±2.02</td>
</tr>
<tr>
<td>Median (range)</td>
<td>10 (7–17)</td>
</tr>
<tr>
<td>Right lobe atrophy [n (%)]</td>
<td>30 (40)</td>
</tr>
<tr>
<td>Caudate lobe diameter (cm)</td>
<td>Means±SD: 4.04±0.98</td>
</tr>
<tr>
<td>Median (range)</td>
<td>4 (2–6)</td>
</tr>
<tr>
<td>Caudate lobe hypertrophy [n (%)]</td>
<td>27 (36)</td>
</tr>
<tr>
<td>Splenic vein [n (%)]</td>
<td>Not dilated: 68 (90.67)</td>
</tr>
<tr>
<td>Dilated</td>
<td>7 (9.33)</td>
</tr>
<tr>
<td>Ascites (by US) [n (%)]</td>
<td>No: 50 (66.67)</td>
</tr>
<tr>
<td>Yes</td>
<td>25 (33.33)</td>
</tr>
<tr>
<td>Splenomegaly (by US) [n (%)]</td>
<td>No: 20 (26.7)</td>
</tr>
<tr>
<td>Yes</td>
<td>55 (73.3)</td>
</tr>
<tr>
<td>Collaterals [n (%)]</td>
<td>No: 67 (89.33)</td>
</tr>
<tr>
<td>Yes</td>
<td>8 (10.67)</td>
</tr>
</tbody>
</table>

US, ultrasound.
In the current study we found that ultrasonographic findings such as caudate lobe hypertrophy and collaterals were significantly associated with OVs. The pathogenesis of caudate lobe hypertrophy in patients with OVs is that the caudate lobe is anatomically distinct from the left and right lobes as

Table 3: Comparison between patients without and with varices as regards sonographic findings

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group A with no varices (N=28)</th>
<th>Group B with varices (N=47)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right lobe diameter (cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean±SD</td>
<td>10.20±2.04</td>
<td>10.38±2.03</td>
<td>0.71</td>
</tr>
<tr>
<td>Median (range)</td>
<td>10 (7–15.5)</td>
<td>10 (8–17)</td>
<td></td>
</tr>
<tr>
<td>Right hepatic lobe atrophy [%]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>20 (71.43)</td>
<td>10 (21.28)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>8 (28.57)</td>
<td>37 (78.72)</td>
<td></td>
</tr>
<tr>
<td>Caudate lobe diameter (cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean±SD</td>
<td>3.63±1.06</td>
<td>4.29±0.85</td>
<td>0.007</td>
</tr>
<tr>
<td>Median (range)</td>
<td>3.5 (2–5.5)</td>
<td>4.5 (2–6)</td>
<td></td>
</tr>
<tr>
<td>Caudate lobe hypertrophy [%]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>16 (57.14)</td>
<td>11 (23.40)</td>
<td>0.003</td>
</tr>
<tr>
<td>Yes</td>
<td>12 (42.86)</td>
<td>36 (76.60)</td>
<td></td>
</tr>
<tr>
<td>PV diameter (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean±SD</td>
<td>11.08±2.47</td>
<td>11.99±2.99</td>
<td>0.18</td>
</tr>
<tr>
<td>Median (range)</td>
<td>10 (7–17)</td>
<td>11 (7–18)</td>
<td></td>
</tr>
<tr>
<td>Collaterals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>28 (100)</td>
<td>39 (82.98)</td>
<td>0.02</td>
</tr>
<tr>
<td>Yes</td>
<td>0</td>
<td>8 (17.02)</td>
<td></td>
</tr>
<tr>
<td>Splenic vein</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not dilated</td>
<td>28 (100)</td>
<td>40 (85.11)</td>
<td>0.04</td>
</tr>
<tr>
<td>Dilated</td>
<td>0</td>
<td>7 (14.89)</td>
<td></td>
</tr>
<tr>
<td>Ascites (by US)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>21 (75.00)</td>
<td>29 (61.70)</td>
<td>0.24</td>
</tr>
<tr>
<td>Yes</td>
<td>7 (25.00)</td>
<td>18 (38.30)</td>
<td></td>
</tr>
<tr>
<td>Splenomegaly(by US)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>12 (42.86)</td>
<td>8 (17.02)</td>
<td>0.01</td>
</tr>
<tr>
<td>Yes</td>
<td>16 (57.14)</td>
<td>39 (82.98)</td>
<td></td>
</tr>
</tbody>
</table>

US, ultrasound. Bold values mean significant relation p-value <0.05.

Figure 2

Comparison between patients without and with varices as regards platelets.
it has its own portal veins, hepatic arteries, and hepatic veins. The short intrahepatic course of the caudate lobe afferent vessels, compared with the right hepatic lobe vessels, favors relatively less attenuation of caudate lobe vasculature by adjacent hepatic fibrosis. The resulting discrepancy between perfusion of the caudate lobe and right hepatic lobe may be responsible for caudate lobe enlargement [16].

Our finding of significant association between the presence of portosystemic collaterals and OVs agrees with Caletti et al. [17] who reported the prognostic value of portosystemic collaterals in patients with OVs.

Regarding the role of right lobe diameter of the liver/serum albumin as a noninvasive, inexpensive, and simple predictor of OVs, we found that there was a statistically significant difference between patients with OVs and those without OVs. We also found that a cutoff value more than 2.80 could significantly predict OVs with a sensitivity of 80.9%, specificity of 53.6%, positive predictive value of 74.5%, and negative

---

**Figure 3**

Comparison between patients without and with varices as regards albumin.

**Figure 4**

ROC curve analysis of NIHCED score in predicting varices. NIHCED, noninvasive hepatitis C-related cirrhosis early detection; ROC, receiver operating characteristic.
predictive value of 62.5%. These results are congruent with those of Alempijevic et al. [5] who found that the grades of varices tend to increase as the right liver lobe/albumin ratio increases. Considering the right liver lobe/albumin ratio cutoff value of 4.42, this had a sensitivity of 83.3% and specificity of 29.5% for patients with varices requiring prophylactic endoscopic management. On the other hand, El Ray et al. [18] found that right liver lobe diameter/serum albumin had no role in the prediction of OVs presence.

NIHCED index was originally developed by Obrador et al. [19] in order to discriminate between cirrhotic and noncirrhotic chronic hepatitis C patients. They reported that at a cut off more than 22, this index has a sensitivity of 80%, specificity of 96%, and diagnostic accuracy of 94%.

Bejarano et al. [6] reported the ability of the NIHCED score to distinguish between advanced fibrosis and absence of fibrosis or portal expansion. At a cutoff score more than 6 it has a sensitivity of 72%, specificity of 76.3%, positive predictive value of 81%, negative predictive value of 63.7%, and diagnostic accuracy of 72.5%.

Vergara et al. [20] tested the ability of NIHCED score to predict the development of liver cirrhosis in patients

**Table 4** Summarizes the laboratory and echographic data included in the noninvasive hepatitis C-related cirrhosis early detection score

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A (N=28)</th>
<th>Group B (N=47)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19 (67.86)</td>
<td>34 (72.34)</td>
<td>0.68</td>
</tr>
<tr>
<td>Yes</td>
<td>9 (32.14)</td>
<td>13 (27.66)</td>
<td></td>
</tr>
<tr>
<td>Prothrombin time ≥1.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>22 (78.57)</td>
<td>36 (76.60)</td>
<td>0.84</td>
</tr>
<tr>
<td>Yes</td>
<td>6 (21.43)</td>
<td>11 (23.40)</td>
<td></td>
</tr>
<tr>
<td>Platelets ≤100 000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15 (53.57)</td>
<td>9 (19.15)</td>
<td>0.002</td>
</tr>
<tr>
<td>Yes</td>
<td>13 (46.43)</td>
<td>38 (80.85)</td>
<td></td>
</tr>
<tr>
<td>AST/ALT≥1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>11 (39.29)</td>
<td>4 (8.51)</td>
<td>0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>17 (60.71)</td>
<td>43 (91.49)</td>
<td></td>
</tr>
<tr>
<td>Caudate lobe hypertrophy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>16 (57.14)</td>
<td>11 (23.40)</td>
<td>0.003</td>
</tr>
<tr>
<td>Yes</td>
<td>12 (42.86)</td>
<td>36 (76.60)</td>
<td></td>
</tr>
<tr>
<td>Right hepatic lobe atrophy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>20 (71.43)</td>
<td>10 (21.28)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>8 (28.57)</td>
<td>37 (78.72)</td>
<td></td>
</tr>
<tr>
<td>Splenomegaly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>12 (42.86)</td>
<td>8 (17.02)</td>
<td>0.01</td>
</tr>
<tr>
<td>Yes</td>
<td>16 (57.14)</td>
<td>39 (82.98)</td>
<td></td>
</tr>
<tr>
<td>NIHCED score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean±SD</td>
<td>30.21±20.53</td>
<td>49.43±16.34</td>
<td>0.0001</td>
</tr>
<tr>
<td>Median (range)</td>
<td>26.5 (0–76)</td>
<td>53 (10–76)</td>
<td></td>
</tr>
</tbody>
</table>

ALT, alanine aminotransferase; AST, aspartate aminotransferase; NIHCED, noninvasive hepatitis C-related cirrhosis early detection. Bold values mean significant relation p-value <0.05.

**Table 5** Area under the curve, sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of noninvasive hepatitis C-related cirrhosis early detection score ratio in predicting varices

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cut off point</th>
<th>AUC (95% CI)</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIHCED score</td>
<td>≥45</td>
<td>0.77 (0.66–0.86)</td>
<td>70.2</td>
<td>78.6</td>
<td>84.6</td>
<td>61.1</td>
<td>74.4</td>
</tr>
</tbody>
</table>

AUC, area under the receiver operating characteristic curve; CI, confidence interval; NIHCED, noninvasive hepatitis C-related cirrhosis early detection; NPV, negative predictive value; PPV, positive predictive value.

**Table 6** Area under the curve, sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of right lobe diameter to albumin ratio in predicting varices

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cut off point</th>
<th>AUC (95% CI)</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right lobe D/albumin ratio</td>
<td>&gt;2.80</td>
<td>0.67 (0.55–0.77)</td>
<td>80.9</td>
<td>53.6</td>
<td>74.5</td>
<td>62.5</td>
<td>67.3</td>
</tr>
</tbody>
</table>

AUC, area under the receiver operating characteristic curve; CI, confidence interval; NPV, negative predictive value; PPV, positive predictive value.
with chronic hepatitis C during the follow-up (4–9, 10 years). They reported that the area under the receiver operating characteristic curve for the development of cirrhosis during the follow-up was 0.79.

As regards the role of NIHCED score in predicting the presence of OVs in cirrhotic patients, to the best of our knowledge, our study is the first one that evaluate the role of the NIHCED in the prediction of OVs in cirrhotic patients. A combination of laboratory and hepatic echographic data is of value because in patients in whom laboratory parameters are within the normal range, the radiological data included in this index may be of greater value. Caudate lobe hypertrophy, splenomegaly, or right hepatic lobe atrophy would suggest, with a high degree of sensitivity and specificity, that a patient has advanced fibrosis.

In conclusion, both NIHCED score and right lobe/albumin ratio are as effective as other noninvasive indices for determining the presence of varices. The addition of hepatic echographic data introduces prognostic factors into the information obtained. NIHCED score is simple and easy to apply in any outpatient clinic.

Future studies are needed to evaluate the utility of these noninvasive methods for the long-term follow-up of patients with liver cirrhosis.

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Conflicts of interest
There are no conflicts of interest.

References


16 Mullane JF, Gliedman ML. Elevation of the pressure in abdominal inferior vena cava as a cause of hepatorenal syndrome. Surgery 1966; 59:1135.


