

Original Article

DIAGNOSTIC ACCURACY OF RIGHT LIVER LOBE DIAMETER/ ALBUMIN RATIO FOR NON-INVASIVE DETECTION OF OESOPHAGEAL VARICES IN HEPATITIS C RELATED CIRRHOSIS

Sana Ahmed, Noma Sarwar, Shahzad Hafeez, Nasir Abbas, Naz Akram and Rohma Ahmed

Objective: To determine the diagnostic accuracy of Right Liver Lobe diameter/Albumin concentration ratio as a parameter for non-invasive detection of oesophageal varices without using endoscopy in patients with liver cirrhosis due to Hepatitis C.

Methods: The study was a descriptive cross-sectional study, carried out in Medical Unit 4 of Services Hospital Lahore, over a period of 6 months. A total of 165 patients with hepatitis C related liver cirrhosis fulfilling the inclusion/exclusion criteria were enrolled. Right liver lobe diameter was seen transabdominal ultrasonography. Serum albumin levels of each patient were obtained and right liver lobe diameter/albumin ratio calculated. These patients then had diagnostic upper gastrointestinal endoscopy, which was performed by a single endoscopist and presence or absence of oesophageal varices was documented in each case.

Results: The subjects had a mean age of 49.21+10.88 years; 52.73% were male and 47.27% were females. The frequency of oesophageal varices detected by Upper GI endoscopy in these liver cirrhotics due to Hepatitis C was 41.21%. The diagnostic accuracy of right liver lobe diameter/albumin concentration ratio for detection of oesophageal varices in liver cirrhosis due to Hepatitis C, where the gold standard test was upper GI endoscopy, was calculated as sensitivity of 86.76%, specificity of 86.60%, positive predictive value of 81.94%, negative predictive value of 90.32% and accuracy rate of 86.67%.

Conclusions: The right liver lobe diameter/albumin concentration ratio is an accurate diagnostic modality for the detection of oesophageal varices noninvasively in patients of liver cirrhosis.

Keywords: esophageal varices, non-invasive detection, right liver lobe diameter/albumin concentration ratio, diagnostic accuracy

Introduction

Chronic liver disease ultimately leads to liver cirrhosis.¹ One of the major complications of liver cirrhosis is portal hypertension,² presenting mainly with hematemesis and melena due to ruptured oesophageal varices.⁵ About 20% of patients with liver cirrhosis die due to variceal hemorrhage. If left untreated there is 70% risk of rebleeding with the mortality rate being 35% in a variceal rebleeding episode.³ The current Gold Standard investigation for detecting oesophageal varices is upper GI endoscopy.^{1,6,7} Since the high mortality associated with varices can be prevented by early detection and timely treatment, current guidelines recommend screening by upper GI endoscopy for presence of varices in patients diagnosed with liver cirrhosis.^{1,4} However this places a large cost burden on endoscopic units and therefore, non-invasive methods for screening patients with high risk of varices need to be established.^{3,4,6,7} Many laboratory parameters have been studied in the past for non-

endoscopic detection of oesophageal varices.^{1,3,6,7} In a recent study conducted on 100 patients with liver cirrhosis, right liver lobe diameter / albumin ratio was studied to be a non-invasive parameter for presence of oesophageal varices. Keeping 44.22 as a cut-off value of this ratio, its sensitivity was found to be 91.46% and specificity 77.78%.⁴ Our study was conducted out to determine the accuracy of this non-invasive predictor in our local population.

Methods

The study was a descriptive cross-sectional study carried out in Medical unit 4 of Services Hospital Lahore. The study was conducted for 6 months from Jan 2017 to June 2017. Non-probability consecutive sampling technique was used. Patients included were of 18 to 80 years of age and from both genders that were admitted in the unit, and diagnosed with Hepatitis C leading to liver cirrhosis at least 6 months ago with coarse echotexture of liver parenchyma on abdominal ultrasound. Patients with a previous

episode of upper GI bleeding; or patients who had been using nitrates and/or non-selective beta blockers previously; or patients who had received intravenous albumin transfusion within the previous one month and patients who had already had endoscopic band ligation or injection sclerotherapy in the past were not included in the study.

165 patients with hepatitis C leading to liver cirrhosis fulfilling the inclusion/exclusion criteria were enrolled. Right liver lobe diameter was seen by the same single radiologist by transabdominal ultrasonography and recorded in mm. Serum albumin levels of each patient was obtained from the same laboratory in g/l and right liver lobe diameter/albumin ratio using these parameters calculated. Upper gastrointestinal endoscopy was performed in these selected patients by a single endoscopist and presence or absence of oesophageal varices was documented in each case. The data was collected, compiled in the computer and analyzed using SPSS version 16.

Results

A total of 165 cases fulfilling the inclusion/exclusion criteria were analyzed. Age distribution of patients is shown in (Table-1). Gender distribution is shown in (Table-2). The frequency of oesophageal varices in Hepatitis C related liver cirrhosis test as detected by upper GI endoscopy is shown in (Table-3). Oesophageal varices were defined as dilated submucosal veins (> 50% of normal diameter) in the oesophageal lumen on upper GI endoscopy and their presence or absence was observed. Right liver lobe diameter/Albumin ratio was calculated by dividing the Right Liver lobe diameter (as assessed by abdominal ultrasound and measured in mm) by the serum albumin concentration (g/L). A ratio ≥ 44.2 was labeled as positive for oesophageal varices. The diagnostic accuracy of Right Liver Lobe diameter/Albumin concentration ratio was labelled as follows: True Positives : When this ratio was higher than cut-off value (≥ 44.2) and oesophageal varices were present on endoscopy. True Negatives : When this ratio was lower than cut-off value (< 44.2) and oesophageal varices were absent on endoscopy. False Positives: When the ratio was higher than cut-off value (≥ 44.2) but oesophageal varices were absent on endoscopy. False Negatives: When the ratio was lower than cut-off value (< 44.2) and oesophageal varices were present on endoscopy. Sensitivity was

calculated by dividing all true positive cases by the number of patients in which oesophageal varices were present (true positives + false negatives) Specificity was calculated by dividing all true negative cases by the number of patients in which oesophageal varices were absent (true negatives + false positives) The Diagnostic Accuracy of Right liver lobe diameter/albumin concentration ratio for detection of oesophageal varices in patients with liver cirrhosis is given in (Table-4).

Table-1: Age distribution (n=165).

Age (in years)	No. of Patients	Percentage
18-50	81	49.09 %
51-80	84	50.91%
Total	165	100%
Mean±SD	49.21±10.88	

Table-2: Gender distribution (n=165).

Gender	No. of Patients	Percentage
Male	87	52.73%
Female	78	47.27%
Total	165	100%

Table-2: Frequency of oesophageal varices detected by upper gi endoscopy in hepatitis c related liver cirrhosis (n=165).

Oesophageal Varices	No. of Patients	Percentage
Yes	68	41.21%
No	97	58.79%
Total	165	100%

Table-4: Diagnostic accuracy of right liver lobe diameter/albumin concentration ratio for detection of oesophageal varices in liver cirrhosis due to hepatitis c. (n=165).

Right liver lobe diameter/ albumin concentration ratio	Oesophageal varices (Positives)	Oesophageal varices (Negative)	Total
Positive	True positive (a) 59 (35.76%)	False negative (b) 13 (7.88%)	a+b 72 (43.64%)
Negative	False positive (c) 9 (4.45%)	True positive (d) 84 (50.91%)	c+d 72 (43.64%)
Total	A+c 68 (58.79%)	b+d 97 (41.21%)	165 (100%)

$Sensitivity = a / (a + c) \times 100 = 86.76\%$

$Specificity = d / (d + b) \times 100 = 86.60\%$

$Positive\ predictive\ value = a / (a + b) \times 100 = 81.94\%$

$Negative\ predictive\ value = d / (d + c) \times 100 = 90.32\%$

$Accuracy\ rate = a + d / (a + d + b + c) \times 100 = 86.67\%$

Discussion

Development of oesophageal varices is one of major complications of liver cirrhosis, with an estimated incidence of 50%.⁸ Around 25-35% of cirrhotic patients develop oesophageal varices due to portal hypertension, out of which 80-90% develop variceal bleeding, which ultimately results in a very high mortality and morbidity rate.^{11,12} In our study 41.21%

of the cases had oesophageal varices on endoscopy. The incidence of varices reported in different studies varies a lot from 22.3% in a study by Khan and others,¹⁸ to 76.25% in a study by Akram et al.²⁰ Similar high incidences were found in studies from Egypt, Serbia, India, and Pakistan.^{13,15-18} Undergoing endoscopy repeatedly increases the cost of health care, while only half of cirrhotic patients have oesophageal varices. The diagnostic accuracy of numerous non-invasive parameters have been investigated in the past for the detection of varices, and for predicting the risk of bleeding, so that the need for endoscopy as a screening tool is reduced.^{3,4,6,7} The right liver lobe diameter/albumin and platelet count/spleen diameter ratios have proved to be accurate noninvasive parameters for determination of presence of oesophageal varices, and their grading in liver cirrhotic patients.^{1,4,7}

In our study, mean age was 49.21 ± 10.88 years, 52.73% (n=87) were male and 47.27% (n=78) were females. The diagnostic accuracy of right liver lobe diameter/albumin concentration ratio as a non-invasive parameter for detection of oesophageal varices in liver cirrhosis due to Hepatitis C was calculated as 86.76%, 86.60%, 81.94%, 90.32% and 86.67% respectively for sensitivity, specificity, positive predictive value, negative predictive value and accuracy rate. In a study⁴ conducted in Egypt on 100 patients with liver cirrhosis, right liver lobe diameter / albumin ratio was studied, at a cut-off value of 44.22 its sensitivity was found to be 91.46% and specificity 77.78%.

In another study⁹ right liver lobe/albumin ratio was correlated to the presence and size of esophageal varices. With a cut-off value of 44.25, it gave a sensitivity of 83.1% and specificity of 73.9%. In a recent study by Akram et al.²⁸, the sensitivity was 83.1% and the specificity was 73.9%. The findings of these studies correspond to our results. Other studies^{10,14} compared platelet count/spleen

diameter ratio and right liver lobe diameter/albumin ratio as non-invasive predictors of varices. In the study of Mostafa et al.¹⁰, for right liver lobe diameter/albumin ratio, the sensitivity was 93%, the specificity was 95% and the accuracy was 96.5%. These ratios may help to screen that may require more frequent endoscopic surveillance.¹⁵ Endoscopy is still the gold standard investigation for detecting oesophageal varices and it is recommended that patients with cirrhosis but without varices should undergo a screening endoscopy every two to three years.^{14,19} Although the Right liver lobe diameter/albumin concentration ratio appears to be promising as a noninvasive method to predict presence of varices, it cannot yet replace endoscopy. The use of such noninvasive predictors, may however help physicians to detect patients with a high probability of having oesophageal varices. This will especially be useful in clinical settings where endoscopic facilities are not widely available.

Our study has the strength of being a cross-sectional study. Our results may not be generalized to the entire Pakistani population due to a small sample size and limited time period; however our results are similar to other national and international studies. Further studies are therefore necessary with larger sample size to corroborate our results.

Conclusion

The use of Right liver lobe diameter/albumin concentration ratio for detection of oesophageal varices in patients with liver cirrhosis due to hepatitis C is an accurate diagnostic modality, which can thus be used to restrict the use of upper GI endoscopy only in high risk patients.

*Department of Medicine Medical Unit-IV
SIMS/ Services Hospital, Lahore.*

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