



ORIGINAL ARTICLE / *Digestive*

Doppler ultrasonography helps discriminate between cirrhotic and non-cirrhotic patients with viral B and C hepatitis



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KEYWORDS

Cirrhosis;
Doppler
ultrasonography;
Portal flow;
Hepatic artery;
Hepatic veins

Abstract

Objective: The aim of this study was to define the cutoff values between compensated cirrhosis and non-cirrhotic patients with viral hepatitis B and C, using the criteria of the Doppler parameters of liver vascularity.

Materials and methods: Seventy non-cirrhotic patients with viral hepatitis B and C and 30 cirrhotic patients were included in this prospective study. The diagnostic decisiveness properties of the Doppler values in the pre-determination of liver cirrhosis were evaluated using receiver operating characteristics curve analysis.

Results: Taking the cutoff value for hepatic vein waveform index as 0.605, a sensitivity of 80% and a specificity of 77.1% were obtained. The sensitivity was 80%, and the specificity was 68.6% for a mean max portal velocity cutoff value of 18.25 cm/s. When the hepatic artery resistivity index cutoff value was taken as 0.705 for the diagnosis of cirrhosis, the sensitivity was 82.5% and the specificity 72.1%. For a hepatic artery pulsatility index cutoff value of 1.295, a sensitivity of 82.5% and a specificity of 72.1% were found.

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Conclusion: It is not possible to diagnose cirrhosis with only hemodynamic changes. However, the cutoff values may be helpful in the selection of patients to undergo the procedure of liver biopsy.

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The prognosis of chronic liver disease is primarily dependent on the stage of fibrosis. The distinction of cirrhotic from non-cirrhotic patients with viral hepatitis B and C is of crucial importance in the determination of therapy for chronic liver disease due to viral hepatitis. The current method of choice for the diagnosis and staging of hepatic fibrosis is the histologic evaluation of the liver tissue. This necessitates liver biopsy, which has some limitations such as invasiveness, complications, and sample error [1–6]. A non-invasive method to help decide which patients should undergo liver biopsy would be useful [4–6].

The aim of this study was to define the cutoff values between compensated cirrhosis and non-cirrhotic patients with viral hepatitis B and C, in terms of the criteria of the Doppler parameters of liver vascularity. In this study, Doppler parameters from the hepatic artery, hepatic vein, and portal vein were evaluated in patients belonging to two groups, one consisting of patients with compensated cirrhosis and the other consisting of non-cirrhotic patients with viral hepatitis B and C. Differences between these two groups were investigated in terms of hepatic artery resistivity index (HARI), hepatic artery pulsatility index (HAPI), mean of the max portal velocity (MMPV), and hepatic vein waveform index (HVWI). Hepatic venous flow was also qualitatively evaluated in terms of phase characteristics. As a unique characteristic of the study, it aimed to achieve a cutoff value between these two groups in terms of all Doppler parameters studied. The changes in hepatic venous flow were quantitatively investigated.

Materials and methods

Patients

The study was approved by our institutional review board and was carried out in accordance with the provisions of the Declaration of Helsinki and Good Clinical Practice guidelines. Informed consent was obtained from all individuals in both non-cirrhotic and cirrhosis groups. A total of 100 patients were included in this controlled prospective study. The patients were categorized into two groups, one consisting of patients with chronic viral hepatitis, and the other consisting of patients with cirrhosis. The diagnosis was based on persistent or fluctuating high serum aminotransferase levels for more than six months, the presence of hepatitis B surface antigen with hepatitis B virus DNA or hepatitis C antibodies and hepatitis C virus RNA in the serum, and chronic hepatitis with or without cirrhosis at liver biopsy.

All patients had undergone a liver biopsy within six months of entry into the study. Liver histology was graded using the histological activity index (HAI) according to the criteria of Ishak et al. [7]. According to the staging table developed by Ishak et al., those patients with stages 1–4 fibrosis were evaluated as non-cirrhotic patients with viral hepatitis B and C, while those with stages 5–6 fibrosis were classified with cirrhosis. The following groups of patients were excluded from the study: those with chronic liver disease due to etiologies other than viral hepatitis, those with cardiac and pulmonary diseases that can affect liver hemodynamics, those on prescriptions that may alter hepatic blood flow, those with habitual alcohol intake of over 20 gm/day, those having stage 2 or 3 hepatic steatosis, those presenting with a history of decompensated liver disease, those with liver tumors, and those who did not accept to be included in the study.

Methods

All patients from the three groups were examined by three radiologists with 7, 10, and 12 years' experience, who did not have any information about the liver biopsy results. These examinations were performed on a Mindray DC-7 ultrasonography device (Medical International Limited, Shenzhen, China), and a 3.5 MHz abdominal transducer was utilized for this purpose. US examinations were performed following a fasting period of a minimum of six hours, and a resting period of 20 minutes, prior to the examination. Initially, a B-mode abdominal US examination was performed. This was followed by three successive Doppler examinations by each radiologist, in which quantitative measurements were made and their averages were obtained. Then, recordings were made, concerning the liver function tests and patients' ages and genders. Liver biopsy results were recorded and held in the gastroenterology department, and they were drafted after the decision to terminate the study. Hepatic artery peak systolic velocity (HAPSV), hepatic artery end-diastolic velocity (HAEDV), HARI, and HAPI measurements were obtained from the sub-costal regions during breath holding sessions, with Doppler angles between 30°–60°. Hepatic artery Doppler measurements were performed at the distal end of the hepatic artery, near the bifurcation site, and preferably from the right or left intrahepatic branch. After obtaining the HAPSV and HAEDV values, the HARI and HAPI values were extracted automatically from the manually drawn spectral wave forms, according to the following formulas, respectively: HAPSV-HAEDV/HAPSV, and HAPSV-HAEDV/mean velocity of

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