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ORIGINAL ARTICLE

Diagnostic Value of Conventional and Doppler Ultrasound Findings in Liver Fibrosis in Patients with Chronic Viral Hepatitis

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Background: The main outcome of virus-related hepatitis is progression to liver fibrosis. Therefore, early diagnosis is very important in the treatment and management of patients. Although liver biopsy is the gold standard test for assessment of liver fibrosis, it is expensive and has some disadvantages such as sampling errors, interobserver variability, and a significant mortality and morbidity rate. Moreover, this method is invasive and has side effects, especially if it needs repeated sampling. In order to come up with a reliable noninvasive modality in place of biopsy, we studied the value of grayscale ultrasonography (US) and Doppler ultrasonography (DS) for the diagnosis of liver fibrosis in patients with chronic viral hepatitis.
Patients and methods: Sixty patients, 43 with chronic hepatitis B and 17 with chronic hepatitis C, were enrolled in this study. Grayscale US and DS were performed for all patients in the week prior to liver biopsy. Ultrasonographic findings were recorded according to a US scoring system, and they were compared with histological findings after liver biopsy.
Results: A total of 35 male (mean age: 36.1 ± 10.1 years) and 25 female (mean age: 36.1 ± 10.4 years) patients were studied. Forty-three patients had chronic hepatitis B and the others had chronic hepatitis C. The overall grayscale US score was abnormal (ranged from 1 to 7) in 63.3% of patients and normal (0) in the other patients. The mean portal vein velocity ranged from 8.1 cm/s to 31.7 cm/s (mean: 17.1 ± 5.1 cm/s). The right hepatic vein diameter ranged from 2.8 mm to 8 mm (mean: 5.1 ± 1.2 mm). The total DS score was abnormal (1 or 2) in 66.7% of patients. Quantitative US parameters that were related more significantly to the histopathological staging scores of liver fibrosis were mean portal vein velocity, right hepatic vein diameter, and gallbladder wall thickness. The total grayscale US score, DS score, and

Conflicts of interest: The authors declare that there are no conflicts of interest.

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accumulation of US and DS scores (US—DS score) were significantly different between patients with liver fibrosis and those without fibrosis ($p = 0.03$, $p = 0.03$, and $p < 0.001$, respectively). We found that the total grayscale US score, DS score, and US—DS score are significantly correlated with liver fibrosis stages.

Conclusion: Based on these findings, one can conclude that US may be an accurate, noninvasive alternative modality for the diagnosis of liver fibrosis, with fewer side effects than biopsy. It may be especially useful for repetitive follow-up of patients.

Introduction

Chronic viral hepatitis is a common cause of hepatic fibrosis and cirrhosis [1—3]. Accurate determination of the amount of fibrosis has significant therapeutic and prognostic roles in the management of patients with chronic viral hepatitis [4]. Although liver biopsy is the gold standard test for the assessment of liver fibrosis [5], it is invasive and has a significant mortality and morbidity rate. The complication rate of hepatic biopsy ranges from 1% to 5%, and its mortality ranges from 1 in 1000 to 1 in 10,000 [6—8]. In addition, liver biopsy is associated with significant sampling error and interobserver variability [9,10]. It is estimated that liver biopsy leads to false-negative results in 20—30% of patients [11—13]. Therefore, finding a reliable, noninvasive procedure that can be used repeatedly in follow-up for differentiation between liver fibrosis and cirrhosis seems to be important. Ultrasonography (US) is considered a noninvasive and inexpensive method for the diagnosis of focal and diffuse parenchymal diseases of the liver. Although US can detect liver cirrhosis in patients with decompensated liver function, it is not a suitable method for detecting acute changes [14—16]. These findings led to the study of several noninvasive laboratory and imaging methods for accurate determination of the amount of liver fibrosis in recent years. However, the diagnostic value of US and grayscale findings has not been fully investigated in a large series of patients. In this study, we assessed the value of the combination of grayscale and Doppler ultrasonographic findings in the diagnosis of liver fibrosis in patients with chronic viral hepatitis.

Materials and methods

Patients

In this cross-sectional study, conducted from June 2011 to February 2013, 60 patients with chronic viral hepatitis who were candidate for liver biopsy in the Gastroenterology Department of Imam Reza Hospital, hospital were enrolled according to the purposive sampling technique. Based on Hung et al's [14] study, using the formula:

$$N = z_{(1-\alpha/2)^2} \times P(1-p)/d^2,$$

we chose a sample size of 30 patients. Inclusion criteria were positive serum hepatitis B virus surface antigen (HBsAg) or antihepatitis C virus antibody along with abnormal serum alanine transaminase level in the past 6 months. Patients were excluded if they had any clinical and/or biochemical evidence of decompensated hepatic function or portal hypertension, known hepatic diseases of other etiology, and a history of oral contraceptive pills or other drugs known to be hepatotoxic, or any drugs with hemodynamic changes that may affect Doppler results.

This study was approved by the Ethical Committee of Mashhad University of Medical Sciences, Mashhad, Iran (no.: 87543). All patients had a signed informed consent form.

US examination

Grayscale and Doppler ultrasonography (DS) were performed by a Hitachi EUB 525 for all patients during the week prior to liver biopsy, with a 7.5 MHz linear and 3.5 MHz curved probes for grayscale US and a 3.5 MHz curved probe for DS.

The patients fasted for 6 hours prior to examination, and then were studied in supine and left posterior oblique positions. The radiologist who was blinded about the pathological results of the patients performed the examination.

Spleen and liver sizes; diameters of portal vein, intrahepatic veins, and splenic vein; and gallbladder wall thickness were measured in millimeters. Liver surface and hepatic parenchyma echogenicity were also recorded during grayscale US. Doppler parameters such as portal and hepatic vein blood velocities and directions, and wave patterns of blood flow were studied.

These variables were scored according to the ultrasonographic scoring system that has been summarized in Table 1 [14,17—19]. The total grayscale US score and DS score were calculated by the summation of individual scores for different variables that had been measured. Similarly, the total US—DS score was calculated from the sum of grayscale US and DS scores.

Percutaneous liver biopsy

Liver biopsy of the anterior segment of right lobe was performed by a hepatologist using a 16-gauge Tru-cut biopsy needle. Specimens were processed, and serial paraffin-embedded sections were prepared.

After staining with hematoxylin and eosin, an experienced hepatopathologist who was blinded to the ultrasonographic findings of the patients reviewed the specimens.