Kaohsiung Journal of Medical Sciences (2012) 28, 641–648

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: http://www.kjms-online.com

ORIGINAL ARTICLE

Liver stiffness measurement in cirrhotic patient — Implications of disease activity and treatment efficacy

Huang-Wei Xu [a], Sheng-Nan Lu [b], Chao-Hung Hung [b], Kuo-Chin Chang [b], Tsung-Hui Hu [b], Jing-Houng Wang [b,*]

[a] *Division of Gastroenterology, Department of Internal Medicine, Chang Gung Memorial Hospital, Chiayi, Taiwan*
[b] *Division of Hepato-Gastroenterology, Department of Internal Medicine, Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Kaohsiung, Taiwan*

Received 20 July 2011; accepted 20 December 2011
Available online 1 August 2012

KEYWORDS
Antiviral therapy;
Hepatitis activity;
Hepatic cirrhosis;
Liver stiffness measurement

Abstract Liver stiffness measurement (LSM) is a noninvasive method for the diagnosis of hepatic fibrosis. The aim of this study was to evaluate the effects of hepatitis activity and antiviral therapy on LSM in cirrhotic patients. Consecutive patients with compensated hepatic cirrhosis were enrolled for LSM. The medical records of hepatitis activity and antiviral therapy before enrollment were reviewed. Patients were stratified into inactive, fluctuating, and active groups by serial change of alanine transaminase level. For chronic hepatitis C, patients were stratified into sustained virological response (SVR) and non-SVR (NSVR) by effect of antiviral treatment. LSM results were compared among different groups. A total of 163 patients (mean age = 57.2 ± 11.0 years) were enrolled. The median (range) LSM values were 9.6 (4.2–20.6), 10.25 (3.9–49.6), and 15.75 (4.8–61.5) kPa in the inactive, fluctuating, and active groups, respectively. Patients in the active group had significantly higher LSM values. For chronic hepatitis C, median (range) LSM values were 16.6 (8.1–61.5), 22.9 (11.1–37.4), and 11.2 (3.9–27.0) kPa in patients without antiviral therapy, in NSVR, and in SVR groups, respectively. Patients with SVR had significantly lower LSM values. For chronic hepatitis B, median (range) LSM values were 11.8 (5.1–46.6), 16.85 (4.2–48), and 10.6 (4.3–46.4 kPa) kPa in patients without oral nucleos(t)ide analogue (NA) therapy, with NA < 12, and ≧ 12 months, respectively. There was a significantly lower LSM value in patients with NA therapy ≧ 12 months. There were low LSM values in cirrhotic patients without hepatitis activity, as well as with SVR in chronic hepatitis C and long-term NA therapy in chronic hepatitis B.

* Corresponding author. Division of Hepato-Gastroenterology, Department of Internal Medicine, Kaohsiung Chang Gung Memorial Hospital, 123 Ta Pei Road, Niao Sung District 833, Kaohsiung City, Taiwan.
E-mail address: wajing@adm.cgmh.org.tw (J.-H. Wang).

1607-551X/$36
doi:10.1016/j.kjms.2012.04.032

Introduction

Chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infections are the major causes of chronic liver disease. Cirrhosis is a late stage of hepatic fibrosis, which occurs in response to chronic liver injury. Therefore, hepatic fibrosis and cirrhosis evaluation is highly important in the management of patients with chronic viral hepatitis [1,2]. Liver biopsy is the gold standard for the diagnosis of hepatic cirrhosis. To avoid patient discomfort and possible fatal complications of liver biopsy, noninvasive measures are valuable in the diagnosis and monitoring of the severity of chronic liver disease.

Liver stiffness measurement (LSM) by transient elastography is a noninvasive, painless, rapid, and objective method for the evaluation of fibrosis or cirrhosis [3]. Systemic reviews and meta-analyses have demonstrated the high sensitivity and specificity of LSM in the diagnosis of hepatic cirrhosis [4–7]. LSM, however, was affected by not only inherent hepatic disease, but also hemodynamic change and comorbidities [8, 9]. Studies have suggested that liver stiffness value has been shown to increase with increasing necroinflammatory scores at histology and in biochemical flares of hepatitis [10–12]. For patients with chronic HBV or HCV infection, effective antiviral therapy also decreased liver stiffness in long-term follow-up studies [13,14]. The purpose of this study was to evaluate the effects of hepatitis activity and antiviral therapy on LSM in patients with hepatic cirrhosis.

Patients and methods

Between November 2008 and December 2009, consecutive patients with compensated hepatic cirrhosis by ultrasonography (US) and/or histology were enrolled. The definition of compensated cirrhosis included patients with liver function reserve in Child–Pugh A without histories of hepatic encephalopathy, ascites, and varices bleeding. Patients with implanted pacemakers or who were pregnant were excluded. The study was approved by the ethics committee in this hospital and conformed to the Helsinki Declaration. All patients signed an informed consent form before enrollment.

We reviewed all medical records of the enrolled patients in the 2-year period before enrollment. Baseline clinical characteristics and demographics including age, sex, body mass index, etiology of cirrhosis, platelet count, and prothrombin time, as well as aspartate aminotransferase, alanine aminotransferase (ALT), albumin, and total bilirubin levels were recorded. At least three ALT data were recorded for each patient. Normal ALT level was defined as $<$40 IU/L. A patient with persistent normal ALT level was defined as inactive activity of hepatitis. Those with episodic ALT elevation and persistent abnormal ALT level were defined as fluctuating and active activity of hepatitis, respectively. The treatments of chronic HCV and HBV infection and their effects were recorded. For chronic hepatitis C patients under antiviral therapy, sustained virological response (SVR) was defined as undetectable HCV-RNA at 6 months after completion of standard treatment. On the other hand, non-sustained virological response (NSVR) was detectable HCV-RNA at 6 months after the completion of standard treatment. US with a reliable scoring system was used in the diagnosis of hepatic cirrhosis and evaluation of fatty change according to the criteria proposed by the Asian Pacific Association for Study of the Liver [15,16]. Ultrasonographic splenomegaly was defined as spleen size index $>$20 cm^2 [15].

LSM evaluation

LSM was performed with a FibroScan system (Echosens, Paris, France), which is a device based on the one-dimensional transient elastography technique. LSM was performed according to the manufacturer's instructions. Details of the LSM technique have been described in a previously published paper [13]. The LSM result was reliable only when 10 successful shots, a success rate of at least 65%, and an interquartile range lower than 30% were obtained. LSM results were compared among different groups.

Statistical analysis

LSM results were expressed as a median value with an interquartile range in kilopascal (kPa). Other results were

Table 1 Demographics and clinical characteristics of the enrolled patients.

Groups	n = 163 (%)
Age (y)	57.2 ± 11.0
Sex	
Male	93 (57.1)
Female	70 (42.9)
BMI (kg/m^2)	25.6 ± 3.7
Histology cirrhosis	51 (31.3)
Etiology	
Hepatitis B virus	90 (55.2)
Hepatitis C virus	47 (28.8)
Hepatitis B and C virus	18 (11.0)
Others	8 (5.0)
Platelet count (10^9/L)	125.1 ± 52.3
Prothrombin time (INR)	1.06 ± 0.10
AST (UI/L)	47.1 ± 35.6
ALT (UI/L)	49.4 ± 50.4
Albumin (g/dL)	4.2 ± 0.4
Total bilirubin (mg/dL)	1.1 ± 0.5
Fatty change	
No/mild/	126 (77.3)/27
moderate/severe	(16.6)/1 0 (6.1)/0 (0)
Splenomegaly	
Yes	90 (55.2)
No	73 (44.8)
Liver stiffness (range, kPa)	12 (3.9–61.5)

ALT = alanine aminotransferase; AST = aspartate aminotransferase; BMI = body mass index; INR = international normalized ratio.