RESEARCH ARTICLE

APPLICATION OF MR DIFFUSION WEIGHTED IMAGING ADC IN LIVER CIRRHOSIS IN THE NORTH-EAST CHINA POPULATION

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ABSTRACT

Objective: To investigate the diagnostic value of DWI (diffusion-weighted imaging) value of ADC (apparent diffusion coefficient) in early diagnosis of liver cirrhosis.

Methods: From 2015 October to 2016 June this study investigated in 60 patients underwent diffusion-weighted imaging (DWI) with 3.0-T MRI, 30 liver cirrhosis patients and 30 healthy controls (control group). DWI was performed with b values of 0 s/mm2, 500 s/mm2 and 800 s/mm2. ADCs of liver were measured using in the right posterior lobe, right anterior lobe and left lobes of the liver. The data was entered into the computer and analyzed using the Statistical Package for Social Sciences (version 20.Inc. Chicago, USA) for analysis ADC value.

Result: The ADC mean values of two groups had significant differences cirrhotic group b=500 s/mm2 mean value is 1.27 .b=800 s/mm2 mean value is 1.26, control group b=500 s/mm2 mean value is 1.33 0. b=800 s/mm2mean value is1.5. ADCs liver cirrhosis lower than control group.

Conclusion: DWI at 3.0 T magnetic resonance in examination of liver could synthetically and quantitatively analyze the rule of ADC values in liver cirrhosis

INTRODUCTION

Liver cirrhosis is defined as the occurrence of inflammation and regeneration of liver cells and fibrosis after the injury and necrosis of hepatocytes, which eventually leads to the remodeling of liver structure, abnormal blood circulation, portal hypertension and cholestasis. Clinically, we can understand the nature and degree of liver parenchyma damage by measuring the change of laboratory examination indexes. The evaluation of liver function in liver cirrhosis by imaging methods is not much (ShaoXiangQiang and XiaoHuaSheng, 2011). Diffusion weighted magnetic resonance imaging (diffusion weighted, imaging, DWI) is the only way to detect cirrhosis, the apparent diffusion coefficient (apparent diffusion, coefficient, ADC) objective and quantitative values can reflect the pathological change, through the study of DWI and ADC were used to determine the apparent diffusion coefficient in patients with liver cirrhosis. There are currently no studies in the North-East China population. The purpose of this study was to investigate to understand the problem in a geographic location and help them in the planning of treatment as well as awareness and preventive.

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MATERIALS AND METHODS

A total of 60 patients in First Affiliated Hospital of Jiamusi University from October 2015 to June 2016 were collected. Among them, the normal control group and the patients with liver cirrhosis (n =30) were aged from 35-70 years old. All patients received MRI abdominal plain scan and DWI scan with fasting 6-8h before the scan and breath training is done before examination. The scanning method uses GE HDX 3.0T MR whole body magnetic resonance scanning system, selects the 8 channel body phased array coils, and parallel sampling space sensitive coding (ASSET) technology. Conventional T1WI, T2WI sequence and ASSET calibration scan, and then DWI scan. Patients take supine position, advanced head, arms. In the upper and lower parts of the liver, the saturated zone is used to eliminate the artifacts caused by the air and heart beat and gastrointestinal peristalsis. Elimination of chemical shift artifacts caused by fat using fat grafting. Taking the liver door as the center to determine the scanning field and scan. B=0, 500, 800s/mm2. Scanning parameters: TR9230ms, TE 64.5ms, layer thickness 5mm, layer spacing 1.5mm, FOV 38cm * 40cm * 40cm * 49,4cm, matrix 128 x 160, the number of times the excitation of 2 times, the number of scanning layers of 8 ~ 10, scanning time 15s.Scan all the data automatically into the

AW4.4 workstation, using Functool 2 software in the ADC chart directly measured ADC value. The region of interest was selected at the liver level; the region of interest (ROI) was round or circular, with more than 150 pixels. Try to avoid the occurrence of bile ducts and blood vessels in the area of interest, copy the size of the same ROI, select three areas of interest in different locations and measured three times, calculate and record the average. The measured data were statistically analyzed by spss20.0 software package, and the ADC value was M + SD. Under the same b value and ADC comparison between the normal control group and the liver cirrhosis group, the ADC values of two independent samples were compared with Wilcoxon rank sum test, and the results showed that there was a significant difference between the P<0.05 values. Ethical approval was not received from Jiamusi University for the retrospective study because patients were not exposed to additional radiation and not subjected to additional treatment. But an approval consentment was obtained from the Department of MRI, First Affiliated Hospital of Jiamusi University by patients for to use their medical record data.

RESULTS

In this study, three different b values (b=0 s/mm2, b=500s/mm2, b=800 s/mm2) were selected to compare the ADC values of normal liver and liver cirrhosis. The experimental results showed that ADC value of b=500 and b=800 s/mm2 in liver cirrhosis group was significantly lower than that of normal control group (s/mm2). With an average age of 54.6 years.

Table 1. ADC values of normal liver and liver cirrhosis under two b values (M + SD) * 10_3 s/mm2

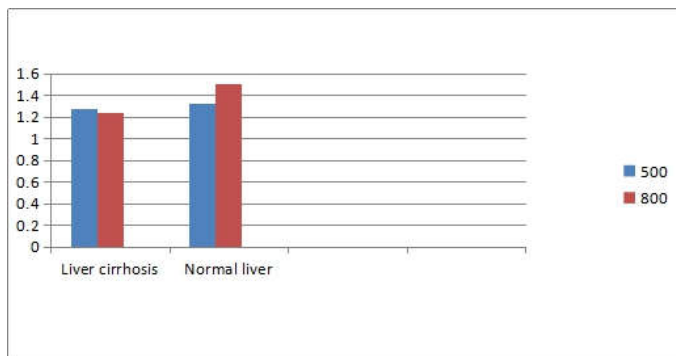|	500	800
Liver cirrhosis	1.27±0.09	1.24±0.15
Normal liver	1.33±0,11	1.51±0,19

Figure 1. Mean value of normal liver and liver cirrhosis

DISCUSSION

In this study, according to the MRI Department of First Affiliated Hospital of Jiamusi University scanner hardware and software conditions and practical needs, b=500 s/mm2 and b=800 normal liver s/mm2 ADC measured value range, namely b=500 s/mm2, ADC = (1.33 + 0,11) * 10-3 s/mm2, b=800 s/mm2, ADC = (1.51 + 0,19) * 10-3 s/mm2, can provide a reference for the ADC value of liver cirrhosis group, so as to objectively evaluate the lesions. The results of the study showed that the liver cirrhosis group: b=500 s/mm2, ADC = (1.27 + 0.09) * 10-3 s/mm2, b=800 s/mm2, ADC =

(1.24 + 0.15) * 10-3 s/mm2 at different b values had no significant difference between liver cirrhosis group ADC value, but the value of ADC was significantly lower than that in cirrhosis group the normal liver group, which is the basis for DWI to be used in the liver cirrhosis. With the increase of B value, DWI imaging of liver TE longer, have a certain impact on the quality of the image, is not conducive to liver imaging, and the most important in clinical diagnosis is to improve the detection rate of lesions, so a number of domestic and foreign studies suggest that the b value was 500s/mm^2 and (Shao XiangQiang and Xiao HuaSheng, 2011) for more qualitative detection liver disease (Zoubiao *et al.,* 2013). The results showed that the ADC value of liver cirrhosis was significantly lower than that of normal tissues, and there was significant difference between the two groups. Cirrhosis is a normal liver cell degeneration, necrosis, liver fibrosis. Because of the existence of these reasons, the movement of water molecules inside and outside the liver cells is limited, and the diffusion rate of the water molecules in the liver is limited. With the severity of liver cirrhosis, the diffusion of water molecules is correspondingly more obvious. Most experts also believe that the ADC value is lower than the normal liver cirrhosis; Aube *et al* (Kanematsu *et al.,* 2012) study found that the right lobe of the liver ADC value is higher than the left lobe of the liver ADC value has significant difference between the two groups, consistent with the literature (Aube *et al.,* 2006). In addition, there is a large number of fibrous connective tissue in liver cirrhosis; the diffusion of water molecules is limited, so that the ADC value is also one of the reasons to reduce the normal. Yang Zhenghan *et al.,* 2002 In China, the ADC value of liver cirrhosis is low, which may be caused by the damage of fiber to microcirculation and the decrease of hepatic blood flow. In conclusion, the value of DWI in the diagnosis of liver cirrhosis is currently controversial. The discussion of this issue was reported by NImoto 1997 and Yamada *et al.,* 1999; Yang Zhenghan *et al.,* 2002 people believe that DWI signal is significantly higher than the normal liver.

Conclusion

The change of ADC value of DWI is an important method for clinical diagnosis of liver cirrhosis and liver cirrhosis.

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