INTRODUCTION

Ultrasound (US) in follow-up of cirrhotic patient is a valuable and noninvasive method in the differential diagnosis of various pathologic conditions, such as hepatocellular carcinomas (HCCs) and dysplastic nodules (DNs). A specific diagnosis of the liver tumor can hardly be established on the grayscale US. Power Doppler US is more sensitive to detecting the tumor vascularity for differentiating hepatic focal lesions than color Doppler US and has the advantages of high sensitivity to slow flow, no angle dependency and no aliasing.

In addition, contrast-enhanced US study to accentuate the vascular flow signals improves the quality of vascular Doppler study in the hepatic focal lesion. However, the potential diagnostic benefit of contrast-enhanced US in the differential diagnosis of liver tumors is not yet well established. Therefore, we prospectively evaluated the usefulness and characteristics of contrast-enhanced power Doppler US and pulsed Doppler US on the aspect of tumor vascularity to differentiate HCC from DN in patient with liver cirrhosis.

MATERIALS AND METHODS

21 patients with liver cirrhosis and a focal lesion were included. All the focal lesions were pathologically confirmed by US-guided needle biopsy, including 12 DNs and 9 HCCs. Patients with DN included 5 men and 7 women (age range, 43-70 years; mean age, 60 years) and patients with HCC included 6 men and 3 women (age range, 46-79 years; mean age, 63 years).

All the patients were prospectively examined with Acuson Computed Sonography 128XP/10 (Acuson Mountain View, CA, USA) and 4MHz vector transducer. Region expansion system was used to magnify the focal lesion. Initially, grayscale US was done to assess the echogenicity and size of the focal lesion. Vascular flow signals on power Doppler US and flow pattern on pulsed Doppler US were compared between DN and HCC before and after injection of US contrast agent. Color gain was manipulated until noise disappeared and fixed at 35dB. 7ml of a 300mg/ml suspension of Levovist® (Schering AG, Berlin, Germany) as an US contrast agent was injected at 1ml/sec via a 24-20 gauge cannula placed in an antecubital vein. US images were obtained within 5 minutes.

In grading of vascular flow signals on power Doppler US, dot pattern was considered as mild, less than 3 linear vascular pattern as moderate, and more than 3 linear vascular pattern as severe grade.

On pulsed Doppler US, the distribution of arterial and/or venous flow in the focal lesion was evaluated. Statistical analysis was used chi-square method between DN and HCC groups.

RESULTS

Mean diameter of 12 DNs was measured about 1.8cm (range; 1.3-3.0cm) and 10(83.3%) showed hyperechoic and 2(16.7%) showed hypoechogenic. Mean diameter of 9 HCCs was measured about 2.3cm (range; 1.5-3.4cm). 7(78%) were hypoechoic and 2(22%) were hyperechoic. There was no significant difference in the echogenicity and size between two groups.

On power Doppler US, all 12 cases(100%) of DNs had no vascular flow signal. Of 9 HCCs, 5 cases(56%) revealed no vascular flow signal, 3 cases(33%) were mild and 1 case(11%) had moderate grade(Table1). On contrast-enhanced power Doppler US, 8 cases(66%) (Fig. 1) of 12 DNs revealed mild, 2(16%) moderate, 1(8%) absent and severe grade(Fig. 2) of vascular flow signals respectively.

DISCUSSION

Dysplastic nodule is defined as nodular hepatocellular proliferation of at least 1mm in diameter supplied by portal and arterial flow, while HCC is generally supplied by hepatic arterial neovasculature, which is larger than that of normal artery and reveals irregular tortuosity.

In a previous report, an arterial pulsating afferent tumor vessel and a constant-flow efferent tumor vessel could be characteristic findings of HCC and this constant wave might have been produced when the outflow route from the sinusoidal space to the hepatic venous system was blocked by some cause related to the tumor, thereby producing outflow over portal system.

The characteristics of blood flow within hepatic tumors are helpful for the differential diagnosis. Contrast-enhanced power Doppler US is superior to conventional power Doppler US in depiction of tumor vascularity. In contrast to the standard contrast medium used in CT or MRI, the US contrast medium is based on microbubbles does not diffuse out of the vascular system but remains within the vascular bed until it disintegrates or is phagocytized. This blood pool agent has the potential for making the distribution of blood within parenchymal organs and amplifies the signals of blood flow.

In our study, the majority of HCCs(78%) showed moderate or severe vascular flow signals on contrast-enhanced power Doppler US, whereas the majority of DNs(84%) showed absent or mild vascular flow signals, although not only DN but also HCC showed more increased vascular flow signals on contrast-enhanced power Doppler US. These findings suggest even though US contrast agents amplify equally the vascular flow signals in DN as well as HCC, HCC has more vascularity than DN. On the contrast-enhanced pulsed Doppler US, the majority of HCCs(89%) revealed pulsatile arterial blood flow, whereas only 2 cases of DNs(16%) showed arterial blood flow. This finding means HCC has abundant arterial neovasculature, as compared with normal artery of DN.

In conclusion, it is higher probability of HCC that a focal lesion in cirrhotic patient has moderate or severe grade of vascular flow signals on contrast-enhanced power Doppler US and arterial flow on pulse Doppler US.

REFERENCES