

# Is diffusion-weighted imaging helpful for detection of small hepatocellular carcinoma in cirrhosis or chronic hepatitis: preliminary quantitative study at 3-T

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**Purpose:** To explore whether diffusion-weighted imaging was helpful for detection of small hepatocellular carcinoma (HCC) in patients with cirrhosis or chronic hepatitis by comparing with T2-weighted imaging at 3-T.

**Materials and Methods:** Nine patients with 19 small hypervascular HCCs (less than 3 cm in diameter) were included in the study. Chronic hepatitis or cirrhosis was related to hepatitis B viral infection (n=7) and alcohol abuse (n=2). The diagnosis of HCC was made as follows: Two lesions in two patients were confirmed by operation. One lesion in one patient was confirmed by biopsy. Sixteen lesions in 6 patients were confirmed by at least two imaging modalities among CT during arterial portography (CTAP), CT during hepatic arteriography (CTHA), and iodized-oil CT after transcatheter arterial chemo-embolization. Diffusion-weighted imaging with single-shot echo planar imaging and transverse T2-weighted imaging with respiratory triggering and fat saturation were performed on a 3-T MR unit using an 8-channel torso phased-array coil. Diffusion-weighted imaging was acquired with parallel imaging technique, and the phase acceleration was 2 Ph. Parameters were as follows:  $b=800$  and  $0 \text{ sec/mm}^2$ ; TR/TE, 2300/56 ms; slice thickness, 6 mm; intersection gap, 1 mm; FOV 38×38 cm; matrix, 128×128; NEX 2. Parameters of T2-weighted imaging were as follows: TR/TE, 6600-8600/102 ms; echo train length 17; bandwidth 62.5 kHz; slice thickness, 6 mm; intersection gap, 1 mm; FOV 38×38 cm; matrix, 288×224; NEX 2. The signal intensity (SI) and apparent diffusion coefficient (ADC) values of HCCs and liver were measured at workstation. Contrast-to-noise ratio (CNR) and contrast ratio (CR, the ratio of SI of lesion/liver) were calculated. CNRs and CRs obtained with diffusion-weighted and T2-weighted images, and ADCs of HCC and liver were compared using Mann-Whitney test.

**Results:** Diagnostic images were obtained in all patients (Fig. 1-2). Two lesions were excluded because of artifacts on diffusion-weighted images. Thus 17 lesions were analyzed. The CNRs obtained with T2-weighted images ( $27.94\pm16.56$ ) were significantly higher than those with diffusion-weighted images ( $17.61\pm14.26$ ). There were no significantly different ( $p>0.05$ ) between the CRs obtained with T2-weighted images ( $1.81\pm0.53$ ) and diffusion-weighted images ( $1.99\pm0.71$ ). There were no significantly different ( $p>0.05$ ) between the mean ADCs of HCCs ( $1.14\pm0.27$ ) and liver ( $1.20\pm0.18$ ), either.

**Discussion:** HCC is the most common primary hepatic malignant tumor and develops predominantly in patients who have underlying chronic hepatitis or cirrhosis. Early reports suggested that diffusion-weighted imaging was useful for increased detection of HCCs<sup>[1]</sup>. However, Perfusion effects usually cause larger signal attenuation than diffusion effects on images with a small gradient b-factor. On the basis of this theory, the ADC value calculated from images with small gradient b-factors is thought to be the value most strongly influenced by flowing spins rather than molecular diffusion. Investigators have reported the mean D-value differences between HCC, cirrhotic liver and noncirrhotic liver were insignificant<sup>[2]</sup>. The results of our study using large gradient b-factor with high field strength MR unit suggested that the diffusion-weighted imaging was not superior to T2-weighted imaging for detection of small hepatocellular carcinoma in cirrhosis or chronic hepatitis.

**Conclusion:** Diffusion-weighted imaging may be little helpful for detection of small hepatocellular carcinoma in cirrhosis or chronic hepatitis.

**References:** [1] Ichikawa T, et al. AJR 1998; 170: 397-402. [2] Moteki T, et al. JMRI 2006; 24: 637-645.

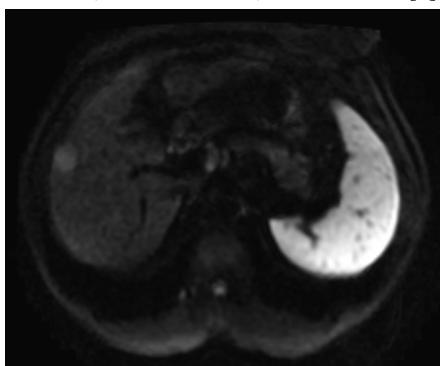


Fig. 1 Diffusion-weighted image ( $b=800 \text{ sec/mm}^2$ )

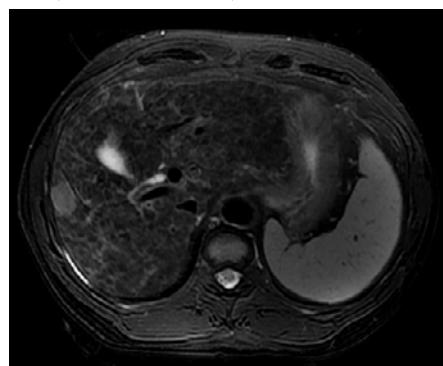


Fig. 2 T2-weighted image