Evaluation oEvaluation of hepatic fibrosis at Diffusion weighted liver MRI with intravoxel incoherent motion model

Jeong-Hee Yoon[1], Jeong Min Lee[2], Olivier de Andre[3], Mun young Paek[3], MiHye Yu[2], Joon Ku Han[2], and Byung Ihn Choi[2]
[1]Seoul National University Hospital, Seoul, Seoul, Korea, Republic of, [2]Seoul National University Hospital, [3]Siemens Healthcare

PURPOSE

To obtain parameters (true diffusion, pseudodiffusion, perfusion fraction, Apparent Diffusion Coefficient (ADC)) in normal liver parenchyma and liver cirrhosis at diffusion weighted liver MR (DWI) with intravoxel incoherent motion (IVIM) model, and to assess reproducibility of parameters and to determine those parameters differ in normal liver from liver cirrhosis.

MATERIALS AND METHODS

663 patients underwent liver MR from June 2010 to May 2011. Diffusion weighted sequence using IVIM model was performed with multiple b factors (b=0, 25, 50, 75, 100, 200, 500, 800) at 3.0 T. In 9 patients, DWI was obtained with both free breathing (FB) and respiratory triggering (RT) technique; the data was compared with each other to access difference between two techniques. To estimate the influence of contrast media, the data of patients who underwent DWI before contrast media injection and after contrast media injection. To access reproducibility of parameters of DWI with IVIM model, data of 29 patients who underwent MR twice during the period were analyzed. In hepatic fibrosis analysis, 77 patients with liver cirrhosis (M: F=56:21) and 42 patients with normal liver parenchyma (M: F=27:15) were included. At DWI, true diffusion coefficient (Dslow), pseudodiffusion coefficient (Dfast), perfusion fraction (f) and ADC in liver parenchyma and spleen parenchyma were calculated using post-processing program and compared with each other. In addition, normalized Dslow, Dfast, f and ADC were calculated by dividing those values in liver by those values in spleen. Finally we analyzed parameters to access their diagnostic performance.

RESULTS

In comparison of FB and RT, all parameters in liver and spleen showed no significant difference ($p>.05$). There was no significant difference values obtained before contrast media injection and values obtained after contrast media injection ($p>.05$). As for reproducibility of parameters, all parameters in liver were reproducible but Dfast ($p<.05$). In spleen, only perfusion fraction was reproducible ($p=.998$). In comparison of ADC and Dslow, ADC was significantly higher than Dslow in cirrhotic group and non-cirrhotic group. In comparison of normal liver parenchyma and liver cirrhosis, Dslow, Dfast, f and ADC were significantly higher in non-cirrhotic group (1.15±.13, 5.03±1.41, 27.82±5.61, 1.26±.14, respectively) than liver cirrhosis (1.03±.22, 3.77±1.51, 23.1±7.53, 1.12±.17, respectively) ($p<.01$). Normalized values were not statistically significant between non-cirrhotic group and liver cirrhosis group, except normalized ADC ($p=.001$). As for diagnostic performance, ADC showed good diagnostic performance (AUC= .687) than Dslow, Dfast and f, but no statistical significance among the values except ADC and Dslow ($p<.005$).

CONCLUSION

Higher ADC values than Dslow supported the effect of perfusion at diffusion weighted images. The seperation of Dslow and Dfast will be useful in the evaluation of hepatic fibrosis as well as morphologic evaluation using contrast media.