(様式4)（Form4）

学 位 論 文 の 内 容 の 要 旨
Dissertation Abstract

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（学位論文のタイトル） Title

Reliability of ultrasound hepatorenal index and magnetic resonance imaging proton density fat fraction techniques in the diagnosis of hepatic steatosis, with magnetic resonance spectroscopy as the reference standard

（超音波肝腎コントラスト指数（ultrasound hepatorenal index；US-HRI）とMRI proton density fat fraction (MRI-PDFF)による脂肪肝診断の信頼性: MRS proton density fat fraction (MRS-PDFF)を指標とした検討）

（学位論文の要旨）2,000字程度、A4判 （approx.800 Words in English /A4 size)

Background: Nonalcoholic fatty liver disease (NAFLD) is the most common liver disorder. Its prevalence in Japan is said to be about 30%. While generally asymptomatic, it is considered an important cause of fibrosis progression, nonalcoholic steatohepatitis (NASH), and hepatocellular carcinoma (HCC). There are many modalities to quantify the liver fat content such as liver biopsy, magnetic resonance (MR) imaging and ultrasound. Liver biopsy is still described as the reference standard for quantifying liver fat content. However, it is an invasive method with risk of bleeding and other miscellaneous complications. Ultrasound (US) is a widely used noninvasive method of assessing fatty liver disease, and hepatorenal index (US-HRI) has been commonly used to estimate the degree of steatosis. However, US-HRI has limitations such as variation of HRI values among machines and operators. MR imaging provides additional noninvasive alternatives for hepatic steatosis measurements by directly quantifying fat content fraction based on the difference between water protons and fat protons. Magnetic resonance spectroscopy (MRS) technique requires the addition of a special software

package usually not available by default and is time-consuming. Magnetic resonance imaging proton density fat fraction (MRI-PDFF) a newer technique in the diagnosis of hepatic steatosis. With shorter examination time, easier implementation and wider availability on conventional MRI units, this technique is a potential first line tool for diagnosis and management of hepatic steatosis.

Purpose: The purpose of this study was to evaluate the reliability of ultrasound hepatorenal index (US-HRI) and magnetic resonance imaging proton density fat fraction (MRI-PDFF) techniques in the diagnosis of hepatic steatosis, with magnetic resonance spectroscopy proton density fat fraction (MRS-PDFF) as the reference standard.

Materials and methods: Fifty-two adult volunteers (30 men, 22 women; age, 31.5 ± 6.5 years) who had no history of kidney disease or viral/alcoholic hepatitis were recruited to undergo abdominal US, MRI, and MRS examinations. US-HRI was calculated from the average of three pairs of regions of interest (ROIs) measurements placed in the liver parenchyma and right renal cortex. On MRI, the six-point Dixon technique was employed for calculating proton density fat fraction (MRI-PDFF). An MRS sequence with a typical voxel size of 27ml was chosen to estimate MRS-PDFF as the gold standard. The data were evaluated using Pearson's correlation coefficient and receiver operating characteristic (ROC) curves. 15 randomly selected subjects repeated the examination within 100 days of the initial data acquisition. Reproducibility was assessed by Bland-Altman analysis.

Results: The Pearson correlation coefficients of US-HRI and MRI-PDFF with MRS-PDFF were 0.38 (p=0.005) and 0.95 (p<0.001), respectively. If MRS-PDFF ≥ 5.56% was defined

as the gold standard of fatty liver disease, the areas under the curve (AUCs), cut-off values, sensitivities and specificities of US-HRI and MRI-PDFF were 0.74, 1.54, 50%, 91.7% and 0.99, 2.75%, 100%, 88.9%, respectively. The intraclass correlation coefficients (ICCs) of US-HRI and MRI-PDFF were 0.70 and 0.85.

Conclusion: MRI-PDFF was more reliable than US-HRI in diagnosing hepatic steatosis. MRI-PDFF can be performed on clinical MRI units in current use with a short examination time. Its clinical utility can be said to be equal to that of MRS-PDFF. Further investigation in patients with more severe NAFLD is needed to confirm this tendency is consistent.