Nonenhanced Spin-labeling MR Angiography of Hepatic Arteries: Comparison of 3.0-T and 1.5-T Imaging

M. Akahane[1], J. Sato[1], I. Matsuda[1], S. Komatsu[1], Y. Watanabe[2], Y. Satake[2], N. Takei[3], and K. Ohtomo[1]

[1]Radiology, University of Tokyo, Bunkyo-ku, Tokyo, Japan, [2]Clinical Radiology, University of Tokyo, Bunkyo-ku, Tokyo, Japan, [3]Japan Applied Science Laboratory, GE Healthcare Japan, Hino-shi, Tokyo, Japan

Introduction

Nonenhanced magnetic resonance angiography (MRA) using spin-labeling technique in order to distinguish arteries from veins and to suppress the background signals has been applied clinically to renal and hepatic arteries at 1.5 T [1,2]. Nonenhanced MRA at 3.0 T is promising because of improved signal-to-noise ratio, but the influence of changes in T1 and T2 relaxation times and field inhomogeneity on the image quality is not well assessed. The purpose of this study was to compare 1.5 T and 3.0 T imaging of hepatic arteries by means of nonenhanced spin-labeling MR angiography (MRA) with steady-state free precession.

Material and Methods

Eighteen volunteers (15 male, 3 female; age range, 25-61 years; mean age, 37.6 years) underwent nonenhanced MRA of the hepatic arteries. All the examinations were performed with both Signa HDx 1.5T and Signa HDx 3.0T (GE Healthcare, Milwaukee, WI). Hepatic MRA was obtained by respiratory gated 3D balanced steady-state free precession sequence in coronal plane with investigational version of the Inhance Inflow IR (IFIR) pulse sequence. Selective inversion pulse for spin-labeling and background suppression was placed on the liver parenchyma. Four different inversion times (TI: 1000, 1200, 1400, 1600ms) were applied. Signal intensity of the proper hepatic artery (PHA) and the liver parenchyma was measured by region of interest (ROI). Contrast between PHA and the liver parenchyma was calculated as follows: ((signal intensity of PHA) - (signal intensity of liver)) / (signal intensity of liver). Anatomical variations of the hepatic arterial branches were examined with both maximum intensity projection (MIP) and source images. Homogeneity of fat suppression was assessed by a three-point scale. Statistical analysis for difference in the contrast between PHA and the liver was conducted by paired t-test.

Results

Contrast between PHA and the liver parenchyma was significantly higher at 3.0T than 1.5T (Fig 1). Fat suppression was more homogeneous at 1.5T than 3.0T. Major anatomical variations of the hepatic arterial branches were able to be evaluated sufficiently on both 3.0T and 1.5T images (Fig 2). In case of median arcuate ligament syndrome, depiction of peripheral branches was deteriorated because of a long way around of inflow blood.

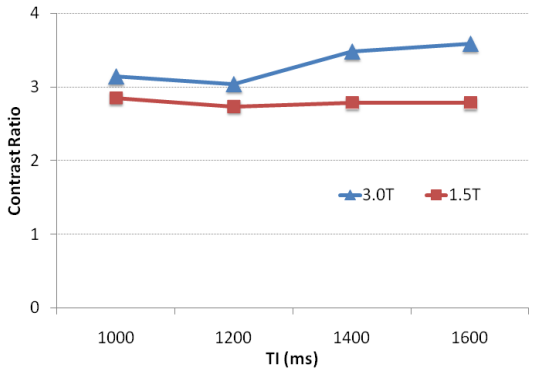

Figure 1. Contrast between PHA and liver parenchyma.

Conclusion

Nonenhanced hepatic MRA can be obtained by both 1.5T and 3.0T scanners. Nonenhanced MRA at 3.0T is promising because of its superior contrast between arteries and the background, but homogeneity of fat suppression should be improved.

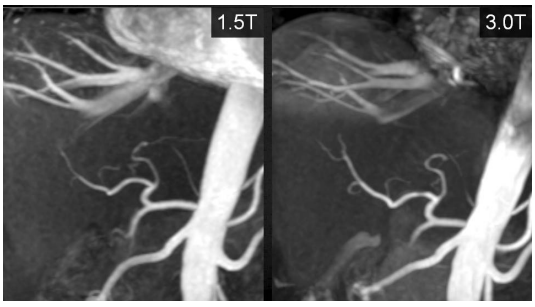

Figure 2. Comparison of spin-labeling MRA at 1.5 T and 3.0 T. Note that background signal of liver parenchyma is lower at 3.0 T than 1.5 T.

Reference

1. Shonai T, et al. J Magn Reson Imaging. 2009 Jun;29(6):1471-7.
2. Shimada K, et al. Eur J Radiol. 2009 Apr;70(1):111-7.