Inflow Inversion Recovery MR Angiography of Renal Arteries at 3.0 T: A Feasibility Study

H. Onishi[1], T. Kim[1], M. Hori[1], T. Tsuboyama[1], A. Nakamoto[1], H. Higashihara[1], M. Tatsumi[1], K. Tomoda[1], M. Uike[2], and S. Nakagami[2]

[1]Department of Radiology, Osaka University Graduate School of Medicine, Suita, Osaka, Japan, [2]MR Sales & Marketing Department, GE Healthcare Japan, Hino, Tokyo, Japan

Purpose

Noncontrast MR angiography for the imaging of the renal vasculature at 1.5 T has been reported in several studies (1, 2). In recent years, 3.0-T MR systems are being used clinically because of the great advantage in signal-to-noise ratio. The aim of the present study was to evaluate the feasibility of noncontrast MR angiography of the renal arteries using an Inflow Inversion Recovery (IFIR) sequence in healthy volunteers at 3.0 T.

Materials and Methods

Ten healthy volunteers were enrolled in this study. MR examinations were performed with a 3.0-T system (Signa HDx 3.0 T; GE Healthcare, Milwaukee, WI) using an 8-channel torso phased array coil. For noncontrast MR angiography of the renal arteries, a respiratory-triggered IFIR sequence with the parallel imaging technique (ASSET) was used. Scan parameters were as follows; TR = 4.9 ms, TE = 2.5 ms, TI = 1200 ms, flip angle = 70°, band width = 125 kHz, FOV = 340 x 272 mm, matrix size = 320 x 192, slice thickness = 2.0 mm, slice interval = 1.0 mm, slice number = 58 x 2 (ZIP 2), acceleration factor = 2. Maximum intensity projection (MIP) images and volume rendering three-dimensional images of the renal arteries were generated from the acquired MR angiography image data on a workstation (Advantage Workstation 4.2; GE Healthcare). The image quality of MIP images, delineation of the renal arteries, the presence or albescence of anatomic variation, the degree of the signal suppression of the inferior vena cava were evaluated visually by one radiologist.

Results

In nine of 10 cases, MR angiography with excellent image quality was obtained and both sides of renal arteries were finely delineated including peripheral branches. In four of 10 cases, two left renal arteries were observed (Figure). In addition, in one of four, two right renal arteries were also observed. As for the signal suppression of the inferior vena cava, the signal was completely suppressed in six of 10 cases, but inferior vena cava was partially demonstrated in the remaining four cases.

Discussion

Some drawbacks associated with an ultlahigh-field can be expected at 3.0 T, such as susceptibility artifacts and increase of specific absorption rate (SAR). However, the fine image data were acquired without deterioration by the susceptibility artifacts. There was not interruption in scan due to the limitation of SAR.

In conclusion, the renal arteries were finely delineated by means of noncontrast MR angiography using an IFIR sequence at 3.0 T. The results suggest that noncontrast MR angiography using an IFIR sequence at 3.0 T may apply to the preoperative evaluation of the renal arteries anatomy for the renal transplantation donors.

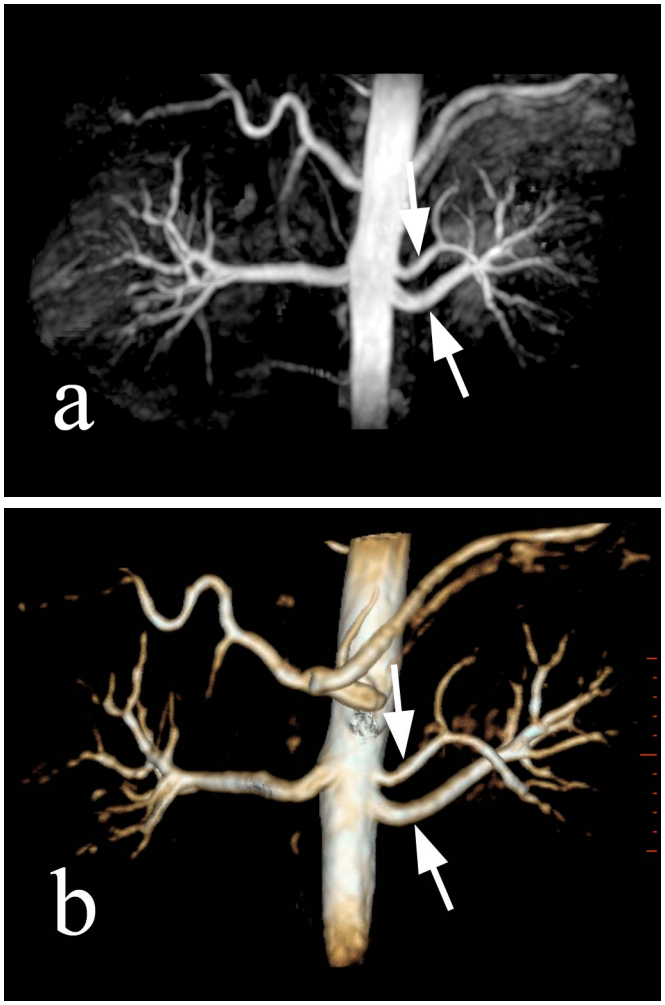

Figure: A 35-years-old male. Maximum intensity projection image (a) and volume rendering three-dimensional image (b) of the noncontrast MR angiography of the renal arteries at 3.0 T. Two left renal arteries were delineated clearly (arrows).

References

1. Kenneth L. et al. High-Spatial-Resolution 3D Balanced Turbo Field-Echo Technique for MR Angiography of the Renal Arteries: Initial Experience. Radiology 2004; 231:237-242.
2. Wyttenbach R, et al. Renal Artery Assessment with Nonenhanced Steady-State Free Precession versus Contrast-enhanced MR Angiography Radiology 2007; 245:186-195.