Supraaortic MRA and vessel wall enhancement with a blood pool contrast agent at 3.0T: Preliminary results in carotid artery disease and intraindividual comparision with Gd-DTPA

D. R. Hadizadeh[1], G. M. Kukuk[1], J. Gieseke[1], A. Koscielny[2], F. Verrel[2], J. Boschewitz[1], U. Fahlenkamp[1], H. H. Schild[1], and W. A. Willinek[1]

[1]Radiology, University of Bonn, Bonn, NRW, Germany, [2]Vascular surgery, University of Bonn, Bonn, NRW, Germany

Aim of the study

To intraindividually and prospectively assess the enhancement of atherosclerotic plaque immediately and 24h after supraaortic MRA at 3.0T with the blood pool contrast agent gadofosveset trisodium and Gadopentatate dimeglumine (Gd-DTPA) in patients with asymptomatic carotid artery disease.

Introduction

In the recent years, emphasis was shifted from luminal narrowing to vessel wall composition for assessment of the potential risk for acute ischemic attacks (1,2). Vessel wall enhancement has been suggested as a potential marker for the identification of high-risk atherosclerotic plaques and has been associated with proinflammatory cardiovascular risk factors (3-7). Gadofosveset trisodium is a Gadolinium-based contrast agent with prolonged intravascular enhancement due to albumin-binding in the plasma and enables prolonged imaging with high vascular contrast (8). The current study was carried out to analyze the level of plaque enhancement at 3.0 Tesla with gadofosveset trisodium as compared with that with Gd-DTPA.

Methods

After approval of the IRB, an intra-individual comparative study was initiated. Imaging was performed at a 3 Tesla whole body MRI system and included both a gradient echo T1-weighted 3D MRA sequence (TR, TE, FA, Voxel size; 4.5, 1.5, 25°, 0.68x0.68x0.49mm³) after contrast agent administration performed with an eight channel head coil and a T1-weighted spin echo plaque imaging sequence (TR, TE, FA, Voxel size; 857, 22, 90°, 0.146x0.146x0.49mm³) before, immediately after and 24h after contrast administration performed with a 2-element synergy surface coil. Imaging was performed on the day of injection of each contrast medium and 24h later. 5 patients were included in the trial. Two readers independently judged image quality of 3D CE MRA with both contrast agents and contrast enhancement was measured in atherosclerotic plaques and non-diseased vessel walls.

Results

3D MRA with both contrast agents allowed for excellent image quality in all cases (figure 1). The mean enhancement of both, atherosclerotic plaques and non-diseased vessel walls, after injection of Gd-DTPA was 7%. After injection of Gadofosveset Trisodium, the average signal increase of atherosclerotic plaques measured 14%, whereas the signal of the non-diseased vessel walls in average increased by 11%. After 24h, no remaining vessel wall enhancment after injection of Gd-DTPA was observed, whereas there was a remaining vessel wall enhancement of 10% in atherosclerotic plaque and 2% in the non-diseased vessel walls after injection of Gadofosveset Trisodium (figure 2).

Conclusion

Initial results demonstrate that simultanous first-pass 3D MRA and steady state plaque imaging of the vessel wall can successfully be performed after injection of a blood-pool contrast agent. Residual enhancement of the vessel wall 24h after injection of the blood pool contrast agent may reflect neo-vessel density: This may be a predictor for future ischemic events but needs further studies.

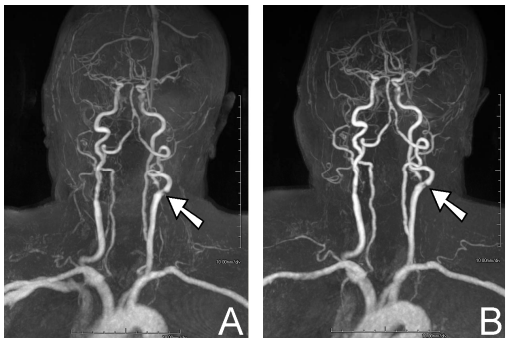

Fig. 1: High-grade asymptomatic carotid artery stenosis (arrows) in 3D MRA of the supraaortic arteries at 3.0T with Gd-DTPA (A) and Gadofosveset Trisodium (B).

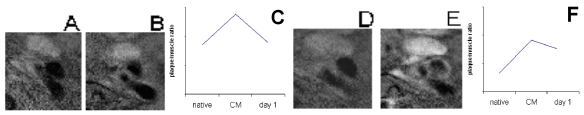

Fig. 2. Plaque enhancement in a 65-year old female patient immeadiatly after and 24h after injection of Gd-DTPA (A-C) and Gadofosveset Trisodium (D-F).

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