ECG Triggered Acquisition Non-Contrast Enhanced (TRANCE) MRA at 3.0Tesla in peripheral MRA

T. Ishimoto[1], T. Ikeda[1], N. Yamamoto[1], M. Kawakami[1], M. Ishihara[2], E. Okamoto[3], and T. Okuaki[4]

[1]Radiology and Clinical Laboratory, Hyogo Brain and Heart Center, Himeji, Hyogo, Japan, [2]Radiology and Clinical Laboratory, Hyogo Prefectural Kakogawa Hospital, Kakogawa, Hyogo, Japan, [3]Philips Electronics Japan, LTD., Osaka, Osaka, Japan, [4]Philips Electronics Japan, LTD., Minato-ku, Tokyo, Japan

Introduction:

Recently, non-contrast enhanced MRA techniques were clinically useful and widely use in routine examination, rapidly gaining in clinical importance. The purpose of this study was to evaluation the technical feasibility and clinical utility of ECG triggered acquisition Non-Contrast Enhanced (TRANCE) MRA at 3.0Tesla in patients with peripheral vascular disease.

Materials and Methods:

The concept of TRANCE MRA is the signal change of arteries during a cardiac cycle. Subtraction of the diastolic bright-blood arteries from the systolic black-blood arteries allows visualization of the arteries, while the veins are cancelled out, as they are depicted as bright-blood throughout the cardiac cycle. Five healthy volunteers were performed TRANCE MRA at a 3.0Tesla clinical imager (INTERA Achieva 3.0T, Philips Medical Systems, the Netherlands) and a 1.5Tesla clinical imager (INTERA 1.5T, Philips Medical Systems, the Netherlands), using a QD body coil. All data were acquired in coronal plane using a conventional 3D Turbo SE with non-selective RF excitation pulse and ECG triggering. Acquisition parameters are TEeff / TR: 60msec/1R-R interval, TSE factor:35, ETS:5.3msec, matrix of 256x512(3.0Tesla), 304 x 512(1.5Tesla), FOV of 380mm(3.0Tesla), 450mm (1.5Tesla). Both diastolic and systolic ECG triggered images were acquired, which were subtracted and underwent maximum intensity projection. For data analysis, scores of image quality (5 point grading score: 0point for non-diagnostic image quality to 4 points for excellent image quality) were assessed at 3.0Tesla and 1.5Tesla. In addition, five patients with arteriosclerosis obliterans (ASO) were evaluated to study the feasibility of TRANCE MRA at 3.0 Tesla. Each individual gave written informed consent prior to the study.

Results:

In five healthy volunteers, the score of image quality were equal at 3.0Tesla and 1.5Tesla (2.9±1.3 at 3.0T vs. 3.1± 0.8 at 1.5T), particularly the score of 3.0Tesla at distal artery were high grades than at 1.5Tesla (3.8± 0.5 at 3.0T, 2.8 ± 1.2 at 1.5T, Fig.1). In five patients with ASO, TRANCE MRA at 3.0Tesla provided diagnostic images comparable with those of CTA and DSA. Fig.2 shows TRANCE MRA and DSA of an ASO patient with stenosis at the left common iliac artery. Fig.3 shows TRANCE MRA of a patient with stenosis of the bilateral superficial femoral artery.

Conclusion:

In peripheral MRA, TRANS MRA at 3.0Tesla provided significant promise for high resolution without the administration of contrast agent. This technique will be noninvasive standard examination in the diagnosis of peripheral vascular disease as well as 1.5Tesla. Further investigation is needed for this technical improvement, clinical evaluation and limitation.

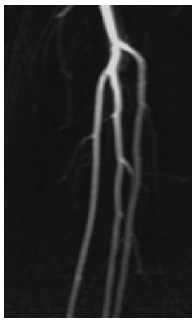

Fig.1 MIP images of TRANCE MRA 1.5 tesla a) and 3.0 tesla b)

Fig.2 65y.o.female with stenosis to the left common iliac artery DSA a) and TRANCE MRA b)

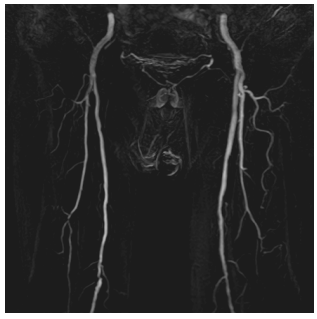

Fig.3 63y.o.female with stenosis of billateral surperficial artery

References: [1] Miyazaki M, Sugiura S, et al., JMRI 12:776-783,2000. [2] Miyazaki M, Takai H, et al., Radiology 227:890-896,2003. [3] Nakamura K, Kuroki A, et al., ISMRM 1929,2006.