3D TOF MRA of Healthy Volunteers and Patients with Moyamoya Disease: Comparison of 3.0-T Imaging and 1.5-T Imaging.

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Introduction: 3.0-T imaging provides better SNR and prolonged T1 relaxation time compared with 1.5-T imaging, which improves the quality of MRA [1]. In order to compare MRA between 3.0- and 1.5-T imaging, visualization of perforating artery in the basal ganglia was assessed among healthy volunteers and patients with moyamoya disease (MMD).

Materials and Methods: A prospective study was performed with eight normal healthy volunteers (5 males, 5 females, 21-41 years, mean 29 years) and four patients diagnosed as moyamoya disease (1 male, 9 females, 32-61 years, mean 42 years). All the subjects underwent 3D TOF MRA with 8-channel phased-array coil using parallel imaging (iPAT) both at 3.0-T (Magnetom Trio, Siemens) and 1.5-T imaging (Magnetom Symphony, Siemens). MRA sequence at 3.0-T imaging are as follows: TR 22 msec, TE 3.7 msec, flip angle of 20 degrees, one slice acquisition, slice thickness 0.8mm, a matrix of 512 x 208, acquisition time of 4 minutes 8 seconds. MRA at 1.5-T imaging are as follows; TR 35 msec, TE 7 msec, 0.8mm slice thickness, flip angle of 20 degrees, one slice acquisition, a matrix of 512 x 208, acquisition time of 6 minutes 21 seconds. Particle-counting method was applied for source images of MRA by using ImageJ software (http://rsb.info.nih.gov/ij/index.html). For healthy volunteers, bright signal spots in basal ganglia in the source images of MRA correspond to perforating arteries from anterior circulation. The number and the summation of cross sectional areas of perforating arteries were semi-automatically counted and calculated, then the data were compared between 3.0-T and 1.5-T imaging. The same method was applied for patients with MMD, namely, moyamoya vessels in the basal ganglia were studied.

Results: In healthy volunteers more perforating arteries were visualized in number and in cross sectional area at 3.0-T imaging than at 1.5-T ($p < 0.001$) (Figure 1, 2). In the patients with MMD, more moyamoya vessels were visualized in number and in cross sectional area at 3.0-T imaging than 1.5-T imaging (Figure 3, 4).

Discussion and Conclusion: 3.0-T MRA imaging revealed more perforating arteries than 1.5-T MRA imaging. 3.0-T MRA may add further information about pathophysiology involving perforating artery such as lacunar infarction, branchatheromatous disease. In adult MMD, intracerebral hemorrhage may occur due to rupture of moyamoya vessels [2-4]. 3.0-T MRA will provide more information about moyamoya vessels, which may reveal emergent moyamoya vessels.

References: [1] Radiology 2003; 229:913-920. [2] Arch Neurol 1969; 20:288-299. [3] AJR 2000; 174:195-200. [4] Neurosurgery 2003; 52:1049-1054.

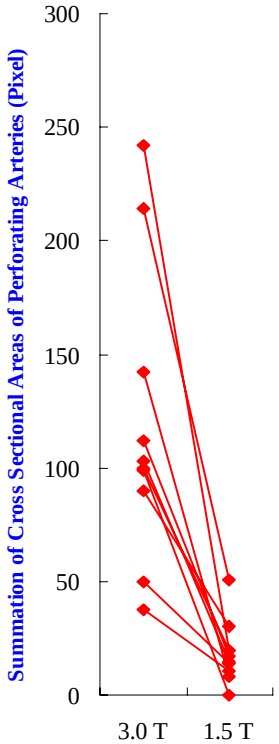

Figure 1.

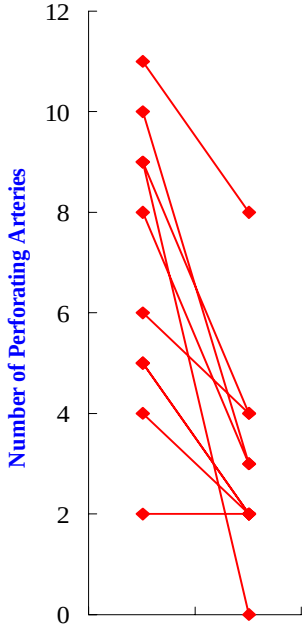

Figure 2.

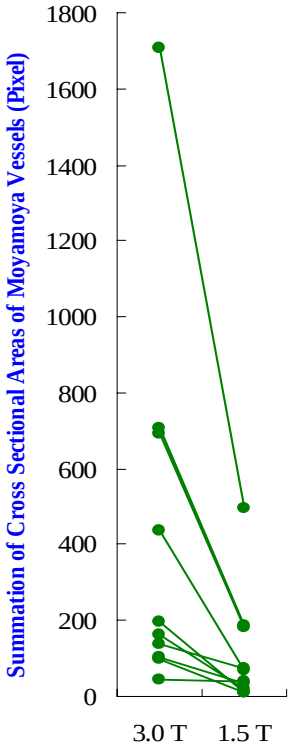

Figure 3.

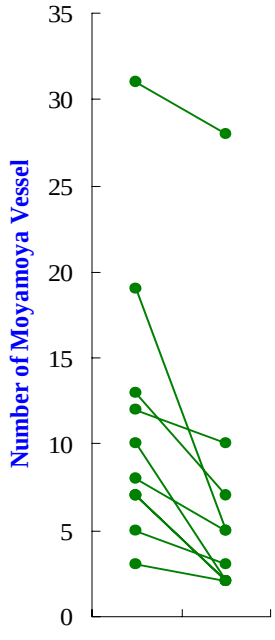

Figure 4.