Preliminary results of evaluating feasibility of T1 SPACE to detect intracranial atherosclerosis

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Purpose : Intracranial atherosclerosis is one of causes of stroke. Its prevalence is much higher in Asian population than in western population. Because MR angiography cannot demonstrate vessel wall, vessel wall imaging is important to detect vulnerable atherosclerotic plaque. T1 SPACE is a 3D T1-weighted black blood sequence, therefore we hypothesized this can be useful to evaluate intracranial arterial wall. The goal of this study was to evaluate feasibility of T1 SPACE to detect intracranial atherosclerosis in nonsymptomatic patient.

Methods: Twenty nonsymptomatic patients who underwent both TOF and T1 SPACE using 3.0 Tesla MR system were enrolled between September 2012 and November 2013. The mean age was 58.5±10.5 years. Their clinical and imaging findings were unrelated to vasculitis, moyamoya disease, and dissection except for atherosclerosis. TOF-source was considered as a reference standard for lumen of intracranial arteries. We measured luminal area of basilar artery (BA) and both cavernous internal carotid arteries (ICAs) on T1 SPACE and TOF source respectively (figure1). We measured vessel wall thickness by subtracting luminal diameter on TOF-source from outer diameter on T1-SPACE as follows: BA, both supraclinoid ICAs and M1 segment of both middle cerebral arteries(figure2). Atherosclerotic risk factors such as previous stroke, ischemic heart disease, smoking, hypertension, diabetes mellitus, age, body mass index, sex, lipid profiles were correlated with intracranial vessel wall thickness.
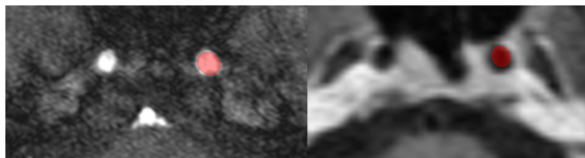

Figure1: (Lt) Luminal area of left cavernous ICA in TOF, (Rt) Luminal area of left cavernous ICA in T1 SPACE
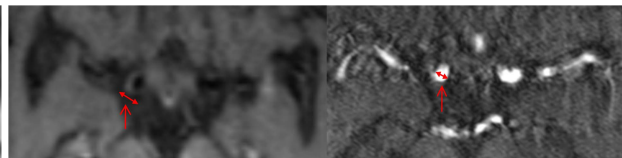
Figure 2: (Lt) Outer diameter of right supraclinoid ICA in T1 SPACE,(Rt) Inner diameter of right supraclinoid ICA in TOF

Results : Vessel areas measured from TOF-source and T1 SPACE showed significant linear correlation (figure3). Correlation coefficient was as high as 0.936. However, there was tendency of underestimation of luminal areas from T1 SPACE compared with those of TOF-source. There was no correlation between atherosclerotic risk factors and vessel wall thickness (figure4).
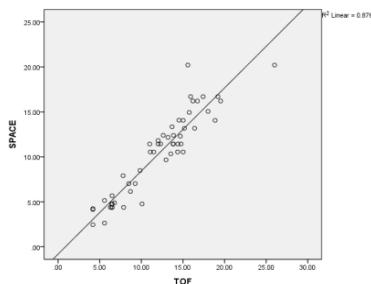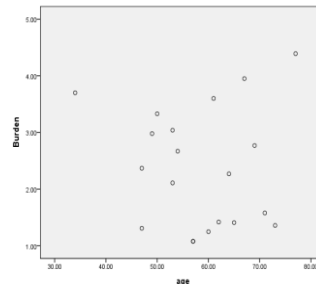

Figure3

Figure4

Discussion : In patients with asymptomatic atherosclerotic disease, vessel wall thickness is not correlated to atherosclerotic risk factors. Further evaluation with large symptomatic population is needed.

Conclusion : T1 SPACE showed outer margin of intracranial arteries and good correlation of luminal area with TOF-source.

References:
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