Cerebral Amyloid Angiopathy and VCI

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Introduction: Cerebral amyloid angiopathy (CAA) is frequently found in the brain with Alzheimer's disease and known to contribute cognitive decline. Amyloid deposition in the cerebral small vessels may result in microhemorrhage and ischemic changes in the elderly; i.e. cortical superficial siderosis (cSS), lobar microbleeds (MBs) and cortical microinfarct (CMI). Recent advance of MR imaging has enabled us to reveal these microvascular lesions in high prevalence rates in the brains with dementia. However, there has been no comprehensive study on the correlation between cSS, lobar MBs and CMI, and their contribution to cognitive impairment.

Subjects and methods: Consecutive 215 patients with cognitive impairment (86 male, mean age 75.8y, mean MMSE 22.2) visited our memory clinic between 2009-2013. These patients were examined with3 Tesla MRI (Achieva, Philips Medical System) and have been retrospectively analyzed in terms of prevalence and their distribution of cSS, lobar MBs and CMI. Each of these microvascular lesions were defined as follows; cSS is gyriform pattern of low signal on susceptibility weighted images (SWI) in the superficial layers of the cerebral cortex. MBs are small round foci ($\leq$ 5mm) of low signal on SWI. CMI is intracortical high signal foci ($\leq$ 5mm) on double inversion recovery (DIR) and 3D-FLAIR, gapless imaging (according to the protocol by Ii et al, J Neuroimaging, 2013). In another cohort of 109 patients from the same clinic, cognitive burden of each type of microvascular lesions was assessed by a panel of neuropsychological tests including trail making test (TMT) and Raven color matrices (RCPM).

Results: A total of 36 cSS was detected with prevalence rate of 15 of 215 patients (7%). cSS was observed in 7 of 15 (43%) patients with subcortical hemorrhage and 11 of 15 (73%) with strictly lobar MBs. Distribution of cSS was concordant with the lobes with the most dense accumulation of MBs in 10 of 15 patients with cSS, indicating that both cSS and strictly lobar MBs are attributable to common etiology. CMI with cSS was associated with strictly lobar MBs, and therefore, indicates amyloid-related mechanism, whereas CMI without cSS was with hypertensive small vessel disease (SVD). Out of the 109 patients, MBs and CMI were found in 68 (62%) and 17 (16%), respectively, and worsened cognitive function in the frontal lobe.

Conclusion: In the elderly, cSS and strictly lobar MBs were amyloid-related, while CMIs may be attributable to either CAA or hypertensive SVD. These microvascular lesions may additively worsen cognitive function, especially in the frontal lobe.