Post-mortem morphological imaging in neurodegenerative and vascular dementia syndromes.

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**Background and purpose:** 7.0-tesla magnetic resonance imaging (MRI) can be used as an additional tool to examine post-mortem brains of patients with neurodegenerative and vascular dementia syndromes. It shows the extension and the distribution of the cerebral atrophy. It detects lesions that can be selected for histological examination. Small cerebrovascular lesions can be quantified and the iron load in the deep brain nuclei evaluated.

**Patients and methods:** Hundred-seventy five post-mortem brains, composed of 37 with pure Alzheimer’s disease (AD), 12 with AD associated to cerebral amyloid angiopathy (AD-CAA), 38 with frontotemporal lobar degeneration (FTLD), 12 with amyotrophic lateral sclerosis (ALS), 16 with Lewy body disease (LBD), 21 with progressive supranuclear palsy (PSP), 18 with vascular dementia (VaD) and 21 controls were examined. Three up to 6 serial sections of a cerebral hemisphere were submitted to a spin echo T2 and a T2*-weighted gradient-echo MRI. In addition to the small samples used for histological diagnostic purposes a separate standard coronal section of a cerebral hemisphere was used to quantify neuropathological lesions.

**Results:** Comparison of 3.0-tesla to 7.0-tesla MRI, performed in a few cases with large haemorrhages showed a larger extension of the lesions in the latter. The degree of atrophy correlated well with the severity of histological lesions. Due to the blooming effect, not only micro-bleeds could be detected but also mini-bleeds, who were not visible on naked eye examination. They predominated to a different degree in the frontal areas of all neurodegenerative disease groups and also the controls. The highest incidence was found in CAA brains. In VaD they were more prominent in the postcentral regions. Cortical micro-infarcts were by far most frequent in VaD and to a lesser degree in LBD brains. Lacunes and white matter changes were mainly observed in VaD brains. The latter were also frequently seen in AD-CAA and FTLD. Superficial
siderosis was not only due to small cortical bleeds but also as frequently associated to small cortical infarcts. Iron deposition in the deep grey nuclei was significantly more observed in FTLD than in the other neurodegenerative diseases and in VaD.

Conclusions: 7.0-tesla MRI is indeed a useful additional tool in neuropathology of dementia syndromes. Not only the impact of small cerebrovasular lesions can be assessed but also other degenerative changes.