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Pathological changes in the cerebellum of patients with Multiple System Atrophy and Parkinson's disease

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Multiple System Atrophy (MSA) and Parkinson's disease (PD) are synucleinopathies characterized by aggregation of α -synuclein in brain cells. Recent studies have shown that morphological changes in terms of cerebral nerve cell loss and increase in glia cell numbers, the degree of brain atrophy and molecular and epidemiological findings are more severe in MSA than PD.

In the present study, we used Cavalieri's method, optical disectors and the rotator to quantify cerebellar volumes, the total number of granule- and Purkinje cells, and the mean volume of Purkinje cell perikarya and nucleus in cerebellar subregions of nine patients diagnosed with MSA, 10 PD patients and 15 age-matched control subjects.

Only brains from MSA patients displayed a reduction in the total number of Purkinje cells and Purkinje cell volumes (perikaryons and nuclei volume), while a reduction in the white matter volume was observed in both MSA and PD brains, compared to controls. The number of granule cells was unaffected in both diseases. Analyses of cell type-specific mRNA expression supported our structural data.

This study of the cerebellum is in line with previous findings in the cerebrum and demonstrates that the degree of morphological changes is more pronounced in MSA than PD. Further, our results support an explicit involvement of cerebellar Purkinje cells and white matter connectivity in MSA and points to the potential importance of white matter alterations in PD pathology.