

THREE DIMENSIONAL IMAGING OF NEURONAL INCLUSIONS IN PICK'S DISEASE, MULTIPLE SYSTEM ATROPHY, AND DEMENTIA WITH LEWY BODIES

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Objectives: The aim of this study was to compare morphology, ultrastructure, 3D structure and immunohistochemical localization of the components of three types of neuronal inclusions observed in various types of neurodegenerative diseases. Pick-body-like and ring shaped inclusions in the dentate gyrus are hallmarks of atypical form of multiple system atrophy (MSA), Pick bodies are tau-positive inclusions characteristic of a subtype of frontotemporal lobar degeneration and Lewy bodies are hallmarks of Parkinson's disease and dementia with Lewy bodies.

Methods: We analyzed formalin fixed and paraffin embedded specimens of 2 cases of neuropathologically confirmed aMSA, 2 cases of Pick disease and 2 cases of dementia with Lewy bodies. We compared immunoreactivity of neurodegeneration-related proteins in these three types of inclusions. Antibodies against alpha-synuclein, hyperphosphorylated tau and neuronal and glial markers were used for immunohistochemistry and immunofluorescence. 3D reconstruction of neuronal inclusions was performed using confocal laser microscopy. Additionally, we performed electron microscopy of fixed human brain tissues.

Results: The immunohistochemical profile of aMSA inclusions was similar to Lewy bodies, but the confocal laser microscopy showed that their morphological features resembled Pick bodies. Pick bodies are usually round or oval, but 3D reconstruction showed that they might display parachute-like, crescent-like or doughnut-like morphology too. Interestingly, the latter were reminiscent of ring shaped inclusions of aMSA. In contrast, Lewy bodies were usually round or oval displacing most of the neuronal cytoplasm.

Conclusions: 3D reconstruction of Pick-like inclusions of aMSA confirms their morphological similarity to Pick bodies despite their different protein composition. Moreover, in 3D confocal laser microscopy we observed ring or doughnut-shaped Pick bodies which also bore resemblance to the ring-like inclusions of aMSA.