UNMYELINATED AXONS ARE MORE VULNERABLE TO DEGENERATION THAN MYELINATED AXONS OF THE CARDIAC NERVE IN PARKINSON’S DISEASE

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Introduction: We previously demonstrated that degeneration of the cardiac sympathetic nerve is profound in Parkinson's disease (PD), which accounts for the reduced cardiac meta-iodobenzylguanidine (MIBG) uptake on [123I] MIBG myocardial scintigraphy in PD.

Aims: We recently demonstrated that in PD α-synuclein aggregates accumulate in the cardiac sympathetic nerve, which is basically an unmyelinated axon. To determine whether there is a difference in the degenerative process between myelinated and unmyelinated axons of the cardiac nerve in PD.

Methods: We immunohistochemically examined cardiac tissues from 4 pathologically verified PD patients, 9 patients with incidental Lewy body disease (ILBD) and 5 control subjects, using antibodies against neurofilament, myelin basic protein (MBP) and α-synuclein. First, we counted the number of neurofilament-immunoreactive axons not surrounded by MBP (unmyelinated axons) and those surrounded by MBP (myelinated axons). Next, we counted the number of unmyelinated and myelinated axons with α-synuclein aggregates.

Results:

1) The percentage of unmyelinated axons in PD (77.5±9.14%) and ILBD (80.4±9.54%) were significantly lower compared to that in control subjects (91.6±2.36%).

2) The ratio of unmyelinated axons with α-synuclein aggregates to total axons with α-synuclein aggregates ranged from 94.4 to 100 (98.2±2.18%). Among axons with α-synuclein aggregates, unmyelinated axons were the overwhelming majority, comprising 98.2%.

Conclusions: These findings suggest that unmyelinated axons are more vulnerable to degeneration than myelinated axons of the cardiac nerve in PD, because α-synuclein aggregates accumulate much more abundantly in unmyelinated axons.