Investigation of brain aging caused by a dysfunction of "nuclear-axon crosstalk" machinery

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In this study, we focused on the Axon Initial Segment (AIS), which plays a central role in the regulation of neuronal activity, and the Linker of Nucleoskeleton and Cytoskeleton (LINC) complex, which is important for cytoskeletal regulation, to elucidate a "new regulatory system of neuronal activity via the nucleus. We first showed that the nuclear membrane LINC complex is essential for the regulation of AIS and for the control of neural activity through AIS. We also found that disruption of "LINC complex-mediated AIS regulation" induced behavioral abnormalities in young mice. Furthermore, we showed that in the aged brain, a marked down-regulation of the LINC complex and structural abnormalities of AIS occur in neurons in a wide range of brain regions. These findings suggest that "LINC complex-mediated AIS regulated AIS regulation" is essential for normal brain function and that its disruption may be involved in physiological brain aging.