iMedPub Journals

Acta Rheumatologica

2020
Vol.7 No.3

Granulovacuolar Degenerations in Relation to Hippocampal Phosphorylated Tau Accumulation in Various Neurodegenerative Disorders

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Granule-containing vacuoles in the cytoplasm of hippocampal neurons are a neuropathological feature of Alzheimer's disease. Granulovacuolar degeneration (GVD) is not disease-specific and can be observed in other neurodegenerative disorders and even in the brains of non-demented elderly people. However, several studies have reported much higher numbers of neurons undergoing GVD in the hippocampus of Alzheimer's disease cases. Recently, a neuropathological staging system for GVD has facilitated neuropathological assessment.

Granulovacuolar degeneration (GVD) is one of the pathological features long associated with Alzheimer's disease (AD) and normal aging. We investigate the frequency of GVDs in AD, other neurodegenerative diseases, and normal aging, with attempt to determine whether the GVD has preponderance in any particular neurodegenerative disease other than AD *Materials and Methods*

Data obtained by electron microscopy and immunolabeling suggest that GVD inclusions are a special form of autophagic vacuole. GVD frequently occurs together with pathological changes of the microtubule-associated protein tau, but to date, the relationship between the two lesions remains elusive. Originally identified in hematoxylin- and silver-stained sections, immunolabeling has shown that the granules are composed of a variety of proteins, including those related to tau pathology, autophagy, diverse signal transduction pathways, cell stress and apoptosis. Several of these proteins serve as markers of GVD. Most researchers and authors have interpreted the sequestration of proteins into GVD inclusions as either a cellular defense mechanism or one that leads to the impairment of important cellular functions. This review provides a detailed overview of the various aspects of GVD and focuses on the relationship between tau pathology and GVD.

Neurodegenerative diseases affect millions of people worldwide. Alzheimer's disease and Parkinson's disease are the most common neurodegenerative diseases. In 2016, an estimated 5.4 million Americans were living with Alzheimer's disease. An estimated 930,000 people in the United States could be living with Parkinson's disease by 2020.Neurodegenerative diseases occur when nerve cells in the brain or peripheral nervous system lose function over time and ultimately die. Although treatments may help relieve some of the physical or mental symptoms associated with neurodegenerative diseases, there is currently no way to slow disease progression and no known cures.

The risk of being affected by a neurodegenerative disease increases dramatically with age. More Americans living longer means more people may be affected by neurodegenerative diseases in coming decades. This situation creates a critical need to improve our understanding of what causes neurodegenerative diseases and develop new approaches for treatment and prevention.

Scientists recognize that the combination of a person's genes and environment contributes to their risk of developing a neurodegenerative disease. That is, a person might have a gene that makes them more susceptible to a certain neurodegenerative disease. But whether, when, and how severely the person is affected depends on environmental exposures throughout life.Key research challenges are identifying and measuring exposures that may have occurred before an individual is diagnosed and disentangling the effects of these exposures. Neuro degenerative diseases and brain associated diseases are major concerns among aging populations across the world. Alzheimer's and Parkinson's diseases are more prevalent neuronal diseases in aging populations. Alzheimer's disease is characterized by amyloid plaques and neurofibrillary tangles that lead to enhancing oxidative stress and neuroinflammation. Likewise, Parkinson's disease is associated with dopaminergic neuronal death and Lewy bodies formation due to the alpha-synuclein proteins activation and phosphorylation. Therapeutic approaches to treat neurodegenerative diseases are limited due to the protective nature of the blood–brain barrier (BBB) that hinders drug targeting towards neurons.

Nervous system science is a part of medication managing issues of the sensory system. Nervous system science manages the determination and treatment of all classes of conditions and malady including the focal and fringe sensory systems (and their regions, the autonomic and physical sensory systems), including their covers, veins, and all effector tissue, for example, muscle.[1] Neurological practice depends intensely on the field of neuroscience, the logical investigation of the sensory system.

This work is partly presented at 13th world congress on Rheumatology, Orthopedics And Sports Medicine