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Glaucoma as a Neurodegenerative Disease

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Abstract

Primary open-angle glaucoma (POAG) remains one of the most controversial eye diseases. Ophthalmologists do not have a consensus on the etiology and pathogenesis of POAG. It is obvious that glaucoma is no longer considered as an exclusively ocular disease associated with impaired hydrodynamics. The search for the causes of the inexorable progression of optic neuropathy has taken researchers far from the eyeball. According to modern concepts, glaucoma is considered as a neurodegenerative disease, located on the border of the professional interests of neurologists and ophthalmologists. Experimental and clinical studies reveal degenerative processes in glaucoma not only in the retina and optic nerve, but throughout the entire visual pathway. Structural changes in the brain in POAG are similar to those in a number of neurodegenerative diseases, for example, Alzheimer?s and Parkinson?s diseases. These changes correlate with clinical characteristics and severity of glaucoma. More recent studies have shown that neurodegeneration in glaucoma is also associated with neuroinflammatory processes affecting both the retina and brain. Characteristic signs of central nervous system (CNS) degeneration may precede the death of optic nerve fibers. Can neurodegeneration in glaucoma be considered a top-down process, or do events begin to unfold in the retina and gradually move into the brain?

Index terms— glaucoma, retinal ganglion cells, neurodegenerative disease, neuroinflammation, neuroimaging.

1 V.E. Korelina ? & I.R. Gazizova ?

Abstract-Primary open-angle glaucoma (POAG) remains one of the most controversial eye diseases. Ophthalmologists do not have a consensus on the etiology and pathogenesis of POAG. It is obvious that glaucoma is no longer considered as an exclusively ocular disease associated with impaired hydrodynamics. The search for the causes of the inexorable progression of optic neuropathy has taken researchers far from the eyeball. According to modern concepts, glaucoma is considered as a neurodegenerative disease, located on the border of the professional interests of neurologists and ophthalmologists. Experimental and clinical studies reveal degenerative processes in glaucoma not only in the retina and optic nerve, but throughout the entire visual pathway. Structural changes in the brain in POAG are similar to those in a number of neurodegenerative diseases, for example, Alzheimer's and Parkinson's diseases. These changes correlate with clinical characteristics and severity of glaucoma. More recent studies have shown that neurodegeneration in glaucoma is also associated with neuroinflammatory processes affecting both the retina and brain. Characteristic signs of central nervous system (CNS) degeneration may precede the death of optic nerve fibers. Can neurodegeneration in glaucoma be considered a top-down process, or do events begin to unfold in the retina and gradually move into the brain? [31,41,54].

2 Keywords

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