

Pathogenesis of Glaucoma

Subjects: Ophthalmology

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Glaucoma, a neurodegenerative disease, has a varied pathogenesis scenario, including elevated intraocular pressure (IOP), and hypoxic conditions in the retina. Consequently, degenerating optic axons at the optic nerve head are observed clinically when extensive damage has already occurred. Following elevated IOP, changes in retinal ganglion cells lead to apoptosis immediately followed by degeneration of their optic axons. Degradation of axons leads to cupping of the optic nerve head and visual field losses. Here we emphasize that it is the retinal ganglion cells that are initial targets of elevated IOP, and, together with hyperactivity of retinal astrocytes, create the ischemic conditions which represent the earliest sign in the pathogenesis of glaucoma.

Keywords: elevated IOP ; reactive astrocytes ; apoptosis ; retinal ganglion cells ; glaucoma

Glaucoma is a group of progressive eye disorders that is characterized by damage to the optic nerve head because of the breakdown of retinal ganglion cells and their axons which merge to form the optic nerve. Glaucoma is the leading cause of irreversible blindness, with more than 80 million people estimated to be affected by the disease worldwide. This number is projected to exceed 110 million by 2040 ^[1].

Glaucoma is associated with numerous risk factors including, but not limited to, age, gender, smoking history, race, and elevated intraocular pressure. Reports show a 36% greater prevalence of glaucoma in males than in females ^[2]. Risk of developing glaucoma has also been shown to increase with age ^[3]. Of individuals aged 40 years and above, 5.7% of Blacks have glaucoma whereas only 2.2% of white people do ^[4]. It is worth noting that, perhaps due to lack of access to glaucoma screening and to treatment, glaucoma is often undiagnosed. Previous reports have indicated that more than 50% of people with glaucoma are undiagnosed ^{[5][6]}. In an effort to address this public health crisis, it is important to establish methods for screening patients for risk factors of glaucoma worldwide.

Glaucoma is strongly associated with increased intraocular fluid pressure (IOP), as the aqueous humor exerts increased force per area than usual on the internal surface of the eye. This may occur in glaucoma because of blockages in the trabecular meshwork (TM) of the eye, which normally functions to drain aqueous humor from the anterior chamber. Poor drainage results in the accumulation of aqueous humor and causes IOP elevation. Glaucomatous eyes with elevated intraocular pressure have been shown to exhibit abnormalities in both the extracellular matrices of the retina and lamina cribrosa, which result in decreased function of the optic nerve and therefore lower visual acuity ^[7].

References

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