REVIEW OF RODENT HYPERTENSION GLAUCOMA MODELS

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Background: Hypertension is a major risk factor for glaucoma, a leading cause of irreversible blindness. Elevated intraocular pressure (IOP) is central to glaucoma pathology, often causing optic nerve damage and retinal ganglion cell (RGC) death. Rodent models, particularly in rats and mice, have been widely used to study hypertension-induced glaucoma, offering valuable insights into disease mechanisms and potential therapies.
Materials and Methods: Various rodent models of hypertension-induced glaucoma are created through systemic administration of hypertensive drugs (e.g., angiotensin II, deoxycorticosterone acetate), salt-loading, or surgical interventions such as episcleral vein ligation. IOP is typically measured using tonometry, and retinal and optic nerve changes are assessed through histology, electroretinography (ERG), and optical coherence tomography (OCT). PubMed was searched for relevant studies using terms like "hypertension glaucoma rodent models," "IOP elevation in rodents," and "optic nerve damage in rodent models" to identify peer-reviewed articles published in the last two decades. Studies were selected based on their relevance to hypertension-induced glaucoma and IOP measurement techniques.
Results: Hypertensive rodent models exhibit key features of glaucoma, including elevated IOP, retinal ganglion cell loss, and optic nerve damage. These models show increased oxidative stress, inflammation, and ischemia, all contributing to glaucomatous damage. Histologically, they exhibit retinal ganglion cell loss and thinning of the retinal nerve fiber layer. Studies have demonstrated the potential for neuroprotective treatments, such as antioxidants and anti-inflammatory agents, to reduce retinal damage and IOP elevation in these models.
Conclusions: Rodent models of hypertension-induced glaucoma are invaluable for studying the pathophysiological mechanisms of glaucoma and testing therapeutic approaches. These models provide insights into neuroinflammation, ischemia, and oxidative stress in hypertensive glaucoma. While they replicate many aspects of human disease, they do not fully mimic the chronicity of IOP elevation seen in humans. Nonetheless, these models are crucial for advancing glaucoma research and developing effective treatments for hypertension-related glaucoma.
Keywords: glaucoma, iop, rodent models.