OPEN-ANGLE GLAUCOMA: ORIGINS, DIAGNOSIS, AND MODERN CLINICAL DIAGNOSTICS

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https://doi.org/10.5281/zenodo.14886216

Relevance of the problem: The cribriform plate of the sclera consists of several parts, the last of which is the thickest and most rigid in the back. The holes in each individual plate form channels through which bundles of nerve fibers pass. When tilted back under the influence of increased IOP, the displacement of the layers of the cribriform plate relative to each other leads to damage (compression) of the network of vessels passing through the nerve fibers and tubules.

Peripheral nerve fibers are more affected, since the displacement of the plates relative to each other is more pronounced in the periphery. Thus, when IOP increases in the posterior part of the eye, the nerve fibers suffer from direct mechanical damage and impaired blood microcirculation in this area. A leading factor in the pathogenesis of open-angle glaucoma is partial blockage of the scleral sinus by the trabeculae displaced under the influence of increased IOP.

Research methods and materials: Metabolic mechanisms involved in the pathogenesis of glaucoma can be divided into primary and secondary. Primary mechanisms precede the increase in IOP and continue to function after the normalization of ophthalmotonus. Secondary metabolic disorders occur as a result of the direct mechanical effect of high IOP on the hemodynamics of the eye. The causes of metabolic shifts include circulatory disorders leading to ischemia and hypoxia.

Metabolic disorders leading to the onset and development of glaucoma also include pseudoexfoliative dystrophy, lipid peroxidation, and disorders of glycosaminoglycan metabolism in the anterior segment of the eye. Age-related decrease in the activity of the ciliary muscle, which is involved in the nutrition of the avascular trabecular meshwork, negatively affects the state and metabolism of the drainage system of the eye. The existence of two main mechanisms of the glaucomatous process has determined two main approaches to its drug treatment. One of them is aimed at reducing IOP, while the other is aimed at correcting hemocirculation and metabolic changes.

Conclusions: Since the level of IOP that is safe for the optic nerve in patients with glaucoma is often reduced, its optimal value should be considered to be 3-5 mm Hg. Art. below the upper limit of the norm.

Therefore, one of the principles of glaucoma treatment should be a dosed and controlled effect on the hydrodynamics of the eye. It is recommended to adhere to another principle of glaucoma treatment. There are various mechanisms that regulate the circulation of aqueous humor, blood microcirculation and metabolic processes in the eye. The therapeutic effect should not overly depress them for a long time. Antihypertensive drugs include miotics (pilocarpine), beta- blockers (timolol maleate, betaxolol), α- adrenergic agonists (clonidine, apraclonidine, brimonidine), adrenaline drugs (epinephrine bitartrate, dipivalyl epinephrine), prostaglandin-anhydrin inhibitors (lamid hydrochloride). The main advantage of miotics is the pathogenetic substantiation of their effect on intraocular pressure. By narrowing the pupil and pulling the root of the iris away from the angle of the anterior chamber, they improve the access of aqueous humor to the drainage system of the eye. At the same time, the trabecular diaphragm is stretched, its permeability increases, and Schlemm's canal expands. Currently, the first choice drugs are beta-blockers. The latter are divided into non-selective, blocking both types of β-adrenergic receptors, and selective, primarily β-2-adrenergic receptors. Of the drugs of the first group, timolol maleate is most often used, and betaxolol from the second group. Of other agents that reduce the production of aqueous humor, alpha-adrenergic agonists have become widely used. This group includes clonidine, apraclonidine, and brimonidine. In terms of the severity of their hypotensive effect, these drugs are similar to timolol. Significant progress has been made in the creation of drugs that inhibit carbonic anhydrase when applied topically. In terms of the severity of its effect on the secretion of aqueous humor and IOP, dorzolamide is comparable to β-blockers and acetazolamide. Among ocular hypotensive drugs, adrenaline occupies a special place. Adrenaline reduces the production of aqueous humor for a short time, but mainly improves its outflow. Currently, the most widely used solution is 0.1% epinephrine dipivalate, which is 17 times more bioavailable than adrenaline.

This made it possible to reduce the concentration of the active substance in eye drops from 1.2 to 0.1% and, accordingly, reduce the frequency and severity of side effects.

Discussion: Among the recent advances in ophthalmopharmaceuticals, it is worth noting the introduction of prostaglandin F2α derivatives latanoprost and unoprostone. These drugs, which are unique in their mechanism of action, activate the uveoscleral pathway of fluid outflow from the eye, have virtually no side effects and have a high hypotensive effect. Currently, the first-choice drugs are β-blockers, but even with their complete normalization of IOP, instillation of one of the cholinomimetics in a minimum concentration 1-2 times a day should be added.

This improves the outflow of aqueous humor from the eye without causing a permanent and complete spasm of the ciliary muscle. To reduce the negative effects of the drug phenomenon, it is recommended to change the drug every 2-3 months.

Conclusion: The main type of intervention for open-angle glaucoma is laser trabeculoplasty, which is a traction method aimed at improving the outflow of intraocular fluid through natural drainage pathways. Laser cauterization of the structures of the anterior chamber angle of the eye leads to tissue retraction, stretching of the trabecular apparatus, opening of the scleral sinus, and improved outflow of intraocular fluid. In addition, hydrodynamic activation of the extraction operation (HAO) is currently used. Unlike trabeculoplasty, it is performed using a pulsed laser with a piercing effect - a YAG laser. GAO leads to an expansion of the intertrabecular spaces, removes pigment and exfoliation from the thickness of the trabeculum, and also partially thins it. The effect of the operation is also manifested in cases where repeated argon laser interventions did not have a hypotensive effect. Laser interventions are also used to combat postoperative complications and correct surgical defects. These include goniospasm in functional blockade of the anterior chamber angle, reperforation in non-penetrating coloboma of the iris, plastic surgery of the filtration site in excessive external filtration, and hyphema coagulation in the development of postoperative hemorrhage into the anterior chamber of the eye.

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