

Original article



ANALYSIS OF THE VARIETY OF EYE IMPAIRMENTS IN GLAUCOMA CASES IN CHILDREN AND ADULTS

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ABSTRACT:

Glaucoma is a disease, which results in definitive vision reduction. The aim of this study is an analysis of the differences in eye impairments in connection with the progression of glaucoma in different age groups (children and adults). A documentary method of investigation of scientific sources, based on clinical practice, is applied. The methodology of the study comprises investigation of causes and manifestations of the disease and its typology. The specific variety in the manifestation of glaucoma is established in children and adults. Excavation of the optic nerve occurs in the adult persons, because the eyeball is already thickened, and collagen is dense. The eye begins to swell in children because the tissues are more loose; the eyeball becomes bigger, and enlargement of cornea and sclera occurs. Children and adults with the diagnosis of glaucoma have a different way of eye impairment. The early establishment and identification of symptoms prevent from the progression of the losses in the visual field, and from blindness, by means of appropriate treatment.

Keywords: glaucoma, children, adults, distinguishing characteristics

INTRODUCTION

Glaucoma is a disease, which results in definitive vision reduction. In adults, it begins to manifest most frequently after the age of 40 years. In children, glaucoma may manifest as early as the first year of their life and has more different progression.

MATERIALS AND METHODS

The aim of this study is an analysis of the variety of eye impairments in the progression of glaucoma in different age groups (children and adults). A documentary method of investigation of scientific sources, based on the clinical practice, is applied. The methodology of the study comprises investigation of the causes and manifestations of the disease and its typology.

STUDY RESULTS

Having knowledge of the etiology and pathogenesis of each disease is important for its effective treatment. [1] The analysis of the available literature sources shows that

the causes for the occurrence of glaucoma remain unclarified. There are multiple theories for the occurrence of the disease, which may be systematized in the following way:

1. The increased intraocular pressure (IOP) impairs the nerve cells of the retina and of optic nerve due to mechanical compression.

2. The increased intraocular pressure (IOP) compresses the blood vessels, which feed the retina and optic nerve, and the compression causes changes related to the disturbed blood supply.

3. The presence of low blood pressure and high IOP and a number of vascular diseases disturb the vascular regulation of eye.

4. Increased levels of exchange products, which are not metabolized, have a toxic effect on the cells of the retina.

5. Presence of mutations in several genes.

6. Changes in the content of intraocular fluid with the presence of proteins, hormones, and growth factors, which have a toxic effect on the cells of the retina.

7. Autoimmune theory - formation of antibodies against one's own tissues. [2, 3]

Regarding glaucoma in children, three genetic loci for the inheritance of glaucoma are identified, while the association is definitively proved only in CYP1B1. [3, 4, 5]

The disease is characterized with increased IOP, which results in impairment of the optic nerve. The unusually high pressure is due to resistance of the flow of movement of the intraocular fluid. It ensures maintenance of normal IOP and serves for the supply of nutritional substances to the internal parts of the eye. In a healthy eye, the intraocular fluid drains away through a meshwork of cells and tissues, which function as a small system, serving for substitution of that fluid and for maintenance of normal pressure in the eye, i.e. there is a balance between the fluid draining away, and the incoming fluid. In glaucoma, that balance is disturbed. In most of the cases the draining of fluid is disturbed, which results in its accumulation, and subsequently to increase of the IOP. [5, 6, 7]

The glaucomas in children and in adults are referred to different groups. The glaucomas are divided into three big groups: "open-angle" glaucoma, "closed-angle" glau-

coma, and childhood glaucoma. Each group is subdivided into primary (idiopathic), and secondary (as a result of the eye or systemic diseases) glaucoma.

The primary "open-angle" glaucoma is the most frequently met glaucoma with frequency from 0.2% to 2% depending on the population studied and the ethnic distinguishing characteristics. Typical for the latter glaucoma is that the chamber angle is open, and there is lack of symptoms especially in the early stages of the disease. The first subjective symptom - narrowing of the visual field - occurs at a late stage, and usually manifests after significant progression of the disease. That fact also contributes to late subjective manifestation because of overlapping of the visual fields and domination of the eye less impaired. Besides an open angle, changes in the disc of the optic nerve, and nerve fiber layer are objectively observed in connection with the primary "open-angle" glaucoma, as well as corresponding to those changes droppings of the visual field. One of the most important risk factors is the increased IOP. It normally varies within the range from 10 to 20 mm Hg. The risk of development of glaucoma significantly increases upon the presence of IOP of more than 25 mm Hg. The wide twenty-four hours amplitude of IOP may also contribute to the development of glaucoma. The increased IOP impairs the ganglion cells of the retina and causes deformation of the disc of optic nerve and lamina cribrosa. The fact, however, that people with normal IOP may develop glaucoma shows that IOP is not the only risk factor. [8, 9, 10, 11]

Secondary "open-angle" glaucoma is due to a number of eye conditions related to decreasing of drainage of the anterior chamber of eyeball fluid upon the preservation of the open angle. Typical examples are the pseudoexfoliation, pigmentary, hemorrhagic, and inflammatory glaucoma, in which the trabecular meshwork gets choked up respectively by pseudoexfoliations, pigment, erythrocytes, or inflammatory detritus. Upon inspection the angle is open. However the above-mentioned matters may be observed between the trabecules. The secondary "open-angle" glaucoma has more rapid progression and requires complex treatment. A particularly important form of secondary "open-angle" glaucoma is the corticosteroid induced glaucoma. It is provoked by application of systemic and local corticosteroids and subsides in connection with the discontinuing of their administration. [4, 6, 7]

Primary "closed-angle" glaucoma is an idiopathic condition, which is observed more frequently in eyes, the structures of which are morphologically preconditioned to the closure of the angle, and it has a course of abrupt and sudden increase of IOP to high values. The subjective complaints are a sudden severe pain in the area of the eye, radiating to the temple and forehead, diminished vision, seeing of aureoles of color circles around light sources, nausea, vomiting, confusion, bradycardia, and arrhythmia. [3, 8, 9]

Severely increased IOP - more than 50 mm Hg - is measured objectively, as well as finding of edema of the the cornea, narrow or absent anterior chamber of eyeball, wide, rigid, non-reacting to the light pupil, dilated venous

blood vessels of the conjunctive and ciliary injection. There are sometimes found pigmentary deposits over the endobodies of the cornea and subcapsular areas of cloudiness of the lens. The following forms of primary "closed-angle" glaucoma are differentiated: intermittent, acute, subacute, and chronic form. [1, 11, 12, 13]

The secondary "closed-angle" glaucoma is due to a number of eye conditions, related to the mechanical closure of the chamber angle, mainly by means of two mechanisms - pulling of the iris forward or pushing of the iris forward. Typical examples are the inflammatory, phacomorphic, and neovascular secondary "closed-angle" glaucoma, which require treatment of the main disease.

The primary congenital glaucoma is due to anomalies in the chamber angle, frequently identified with the so called Barkan membrane. We differentiate primary congenital and primary infantile glaucoma. Primary congenital glaucoma manifests immediately after birth or by the second year of the child, while boys are more frequently affected. Photophobia, lacrimation, blepharospasm, hyperemic conjunctive, buphthalmos with diameter of the cornea of more than 11 mm are clinically observed. Different by intensity edema of the cornea is reported, with ruptures of the descemet membrane and others glaucomatous changes. [10, 13, 14, 15]

The primary infantile glaucoma manifests from the third to the fifth year after birth. IOP is moderately increased, but there is no buphthalmos. No edema of the cornea is found. Glaucomatous excavation of the optic nerve disc is observed.

The secondary congenital glaucoma is due to eye or systemic diseases as aniridia, Axenfeld syndrome and anomaly, Peters' anomaly, neurofibromatosis, Marfan syndrome, homocystinuria, etc.

Under the heading of congenital glaucoma are included: buphthalmos, hydrophthalmos, primary juvenile glaucoma, keratoglobus, macrophthalmia, macrocornea, megalocornea. [12, 14, 16]

Buphthalmos is a condition in connection with which extension of the eyeball is observed. It is most frequently observed in babies and small children, and it is usually related to the presence of glaucoma. The condition may be due to the unusually narrow angle between the cornea and iris, which blocks the draining away of the intraocular fluid. That, on its part, causes an increase in the IOP and dilatation of the eyeball. The small angle of closure may occur in connection with anomalies in the development of the eye, as well as in connection with the presence of abnormal structures in the vitreous body. [15, 17, 18, 19]

The hydrophthalmos is a form of congenital glaucoma. It is characterized by widening and swelling of the fibrotic tissue of eyeball.

The keratoglobus in connection with congenital glaucoma is characterized with generalized thinning of cornea and occurrence of the globe-shaped protrusion. Besides, upon glaucoma, that condition is also observed in other eye diseases, and diseases affecting the connective tissue.

The macrophthalmia is a condition, in which increase of the size of the eyeball is observed. It is bigger

than normal. The macrophthalmia is usually related to congenital glaucoma. [1, 11, 17]

The macrocornea is a condition in which the cornea has a diameter of more than 13 mm. The megalocornea is also a condition in which the cornea is bigger than normal. Both conditions are met in congenital glaucoma, and in some diseases of the connective tissue.

The clinical picture of congenital glaucoma (glaucoma congenitum infantum) depends on the severity of disease, and, respectively, on the values of the intraocular pressure. The first manifestations of the disease are injection with no secretion, photophobia, and restless behavior of the newborn or the suckling. Enlargement of the cornea is observed later (a child with big eyes), and its transparency decreases due to edema of the epithelium and stroma. Diffuse opalescence of the cornea occurs and spotted areas of cloudiness develop. The size of eyeball gradually increases more and more, which is related to the etymology of the name buphthalmos. The anterior chamber is deep and spontaneous luxation of the lens may occur. There are changes in the size of an eyeball, and areas of cloudiness of the cornea, only in the cases in which glaucoma occurs in infancy and up to three years of age when the corneo-sclera is still susceptible to extension by the increased IOP. Beyond that age, the course of glaucoma does not include any changes of the eyeball. Early affecting of the optic nerve occurs. [7, 9, 12, 19]

The symptoms of childhood glaucoma include enlargement of the size of an eyeball, cloudiness of the cornea, excessive lacrimation, and sensitivity to light.

Specific difference in the manifestation of glaucoma in children and in adults is the swelling of the eye in children due to increased IOP. That difference is due to bal-

ance disturbance between the fluid which is found in the eye, and the fluid which outflows the eye. When there is an obstruction in the outflow and no obstruction in the production, the pressure in the visual organ subsequently increases. That disbalance results in impairment of the finest structures of the eye that are responsible for vision. In adults excavation of the optic nerve occurs, because the eyeball is already thickened, and collagen is dense. Swelling of the eye occurs in children because the tissues are more loose. The eyeball becomes bigger, and enlargement of cornea and sclera occur. If the pressure is higher than the eye is able to tolerate, it becomes not only big but also grey. Those children have a disturbing cosmetic view, and their vision catastrophically worsens. [14, 18, 19]

The diagnosis of glaucoma is made by an ophthalmologist by means of performing of some examinations: IOP measurement, ophthalmoscopy, biomicroscopy, etc.

CONCLUSIONS AND DISCUSSION

The causes for the occurrence of glaucoma remain unclarified.

Delay of diagnosis specification of the disease in every age group is possible.

Children and adults, who have the diagnosis glaucoma, have a different type of eye impairment.

Final Statement

Glaucoma is a serious eye disease, which sets slowly in and may result in significant loss of vision. The early finding and identification of symptoms prevent from the progression of losses in the visual field and from blindness by means of appropriate treatment.

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