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INTERRELATION OF FUNCTIONAL AND ANATOMICAL AND OPTICAL PARAMETERS OF THE EYE IN CONGENITAL MYOPIA

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Abstract

The magnitude of corrected visual acuity in patients with congenital myopia did not correlate with the degree of myopia. Between the value of visual acuity, on the one hand, and the patient's age, on the other, a high positive correlation was revealed (ζ =0.54, p<0.001).

The most intensive increase in the length of the CA of the eye occurs at the age of 12-15 years. Then the rate of increase in the PZO of the eye decreases significantly even with further progression of myopia. The weakening of the magnitude of physical refraction in congenital myopia occurs due to a decrease in the refraction of the lens, there is a high negative correlation between an increase in the length of the lateral lens of the eye and a decrease in the refractive power of the lens (h = -0.545). Unfavorable prognostic factors for the progression of congenital myopia are: a relatively small length of the eye axis, its irregular shape and the presence of astigmatism.

Keywords: astigmatism, congenital myopia, eye.

The Urgency of the Problem

Congenital progressive complicated myopia continues to be one of the urgent problems of modern ophthalmology, often leading to limited professional choice, disability and blindness [1,2,3,7,8]. According to Yusupov A.A. (2004) congenital myopia in children of the first year of life averages 1.4%-4.0%, among children of primary school age ranges from 0.1%-3% [2.4]. Information concerning visual acuity and its influence on the dynamics of the anatomical and optical parameters of the eyes and the course of congenital myopia have not been sufficiently studied [1,4,7,6,9,11]. Visual acuity in congenital myopia with correction is most often low, as it is combined with pathology of the retina and optic nerve. Low visual acuity could occur both with high myopia and with low myopia [8].

It is known that according to the clinical course, it can reach very high degrees already in early childhood. However, there are often cases of mild and moderate congenital myopia even in adult patients [5]. It has now been established that the course of congenital myopia differs from acquired myopia both in the final result of the process and in the nature of its development [8]. A periodic and constant increase in the degree of congenital myopia characterizes its unfavorable course, which requires more attention from ophthalmologists. The influence of visual acuity on age-related changes in the anatomical and optical elements of the eye in congenital myopia and x correlation dependence have not been sufficiently studied.

Purpose of the Study

To study parallelism of functional and anatomical-optical parameters of the eye in congenital myopia, and factors influencing this process .

Material and Research Methods

In the 1st clinic of the Samarkand State Medical Institute, the eye department, we studied 180 patients (345 eyes) with congenital myopia at the age of 3 to 20 years. We have attributed to congenital myopia any myopia detected at the age of 2-4 years.

To differentiate congenital myopia from early acquired myopia, the technique proposed by Yusupov A.A. was used. (1992).

Standard ophthalmological research methods were carried out: visual acuity was determined, the degree of myopia was determined by cycloplegia , skiascopy under conditions of atropine cycloplegia and autorefractometry , determination of corneal refraction and radius of curvature on an ophthalmometer , ultrasound biometrics, as well as determination of the shape of the eyeball, total refraction of the optical system of the eye and refraction of the lens, the state of the fundus was studied by

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ophthalmoscopy on a fundus camera, and an OST study of the retina was also carried out.

Research Results

We have studied the visual acuity in congenital myopia, and the factors influencing this process. The main factors influencing the state of visual acuity in patients with congenital myopia were found out. For this purpose, 154 eyes of patients with congenital myopia aged from 3 to 20 years were examined. All patients were assigned a complete correction based on objective data. The refraction was determined skiscopically after a three-day atropinization and by refractometry. It should be noted that, as a rule, all patients, regardless of the degree of myopia, easily tolerated spectacle correction. Some patients noted slight dizziness and discomfort in the area of the superciliary arch, which we eliminated by reducing the spectacle correction by 1-2-D less than the true degree of myopia.

Table 1

Distribution of patients with congenital myopia in terms of visual acuity (with full spectacle correction).

The number of patients with a particular visual acuity								Total Eyes Examined
0.04-0.1		0.2-0.3		0.4-0.7		0.8-1.0		
Abs.	%	Abs.	%	Abs.	%	Abs.	%	
eight	5.2	52	33.7	94	61	-	-	154

As can be seen from the table, none of the examined patients had high visual acuity (0.8-1.0). In a significant number of diseased eyes (61%), visual acuity was in the range of 0.4-0.7 those. within the limits that slightly limit the professional opportunity. A decrease in visual acuity of a high degree (from 0.04 to 0.1) was noted only in 5.2% of the eyes. In 33.7% of the eyes, the value of visual acuity corresponded to moderate amblyopia (0.2-0.3).

The average value of visual acuity in the general group of patients was 0.519± 0.02.

Contact correction contributed to a relatively greater increase in visual acuity than spectacle correction. The influence of contact correction on the state of visual acuity was traced by us in 62 eyes of 31 patients. In 34.5% of the eyes, in which visual acuity with glasses did not exceed 0.6, correction with a contact lens contributed to the restoration of visual acuity to 0.8-1.0.

The number of patients with visual acuity of 0.2-0.3 significantly decreased when contact lenses were prescribed. The average corrected visual acuity in patients with contact correction was 0.719±0.06. The high effect of contact correction can probably

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be explained by the elimination of eye aberration by correcting the nonsphericity of the cornea, as well as by increasing the image on the retina.

In order to find out the causes that affect the state of visual acuity in patients with congenital myopia, we conducted a correlation analysis of the dependence of visual acuity on anatomical and optical parameters and the clinical condition of the eyes.

table 2

The degree of influence of various factors on the state of visual acuity in patients with congenital myopia

Factors affecting the magnitude of visual acuity	Statistical indicators			
	Degree of freedom (K)	Correlation coefficient and (ح)	Student's t - test score	Significance level (p)
Eye Shape	Thirty	-0.685	-4.099	0.001
Patient's age	Thirty	0.54	5.441	0.001
The degree of myopia in diopters.	Thirty	-0.304	-5.385	0.001
The degree of astigmatism in diopters.	Thirty	-0.282	-5.385	0.001
PZO length in mm.	Thirty	-0.085	-5.385	0.001

As can be seen from the table, the most significant factor influencing the state of visual acuity in patients with congenital myopia is the shape of the eyeball. The correction coefficient between the value of visual acuity and the shape of the eye was -0.685, p <0.001. This means that as the shape of the eye changes from a compressed ellipse to an elongated ellipse, the value of visual acuity decreases. As noted above, the shape of the eye was judged by the ratio of the ACL length to the arithmetic mean of the horizontal and vertical diameters of the eye. Eye shape - PZO:$\frac{ГД+ВД}{2}$

The degree of influence of the length of the lateral eye on the state of visual acuity, contrary to our expectations, turned out to be minimal (ح= -0.085 , p < 0.001).

The second most important factor influencing the state of visual acuity is the age of the patient. Between the value of visual acuity, on the one hand, and the patient's age, on the other, a high positive correlation was revealed (ح=0.54, p<0.001). This correlation indicates that corrected visual acuity in patients increases with age. The results obtained suggest that the formation of visual functions in patients with congenital myopia is completed somewhat later than normal.

This fact can be explained as follows. Congenital myopia is known to be characterized by significant polymorphism. There are cases where significant changes in the retina are present with a relatively low degree of myopia and vice versa, cases of high myopia with a relatively favorable condition of the fundus. Obviously, the state of the retina in congenital myopia is influenced not only by the absolute length of the ASO and, accordingly, the degree of myopia, but also by the magnitude of the deformation of the eyeball from a spherical shape to an ellipsoid. It should also be borne in mind that there is a lower correlation between the length of the eye axis and the degree of ametropia in congenital myopia (ς= 0.5) than in all myopia in adults (according to the literature, in these cases it varies from 0.8 to 0.97).

A significant factor affecting visual acuity was the degree of astigmatism. Between this parameter and the magnitude of visual acuity, a negative correlation relationship was revealed (ς= - 0.282 , p <0.001), i.e. the higher the degree of astigmatism, the lower the visual acuity.

The table shows that the level of significance of correlations for all the studied factors turned out to be quite high (p < 0.001).

The study of the anatomical and optical elements of the eyes in patients of different age groups showed that the degree of congenital myopia is not directly dependent on the age of the patient. If in the group of patients aged 3-7 years the average degree of myopia was 8.38±0.70 diopters , then in the age group (8-11 years) it was 7.23±0.59 diopters . In subsequent groups of patients, there is an increase in the average static refraction. When studying refraction according to the "longitudinal section" data, it was noted that during the observation period (3-6 years) refraction remained stable in 127 eyes (36.8%), and in the remaining eyes it changed more often to the side of enhancement (11 eyes - 32.4 %). Although in some cases there was even some weakening (107 eyes - 31.0%), which is not observed in patients with acquired myopia. The process of weakening refraction was mainly observed in patients of younger age groups (from 3 to 11 years), which is associated with a decrease in lens refraction.

The average value of the length of the anteroposterior axis of the eyes undergoes changes in the direction of amplification with age, regardless of the course of the process.

The refraction of the optical system of the eye in patients with congenital myopia under the age of 12-15 undergoes changes in the direction of weakening. After 15 years, it intensifies [7]. This change is associated with a change in the refraction of the lens. A high negative correction was found between an increase in the lateral optic tract of the eyes, on the one hand, and a decrease in the refractive power of the lens, on the other hand (h = -0.545 for non-progressive , and low h = -0.24 - for progressive).

The average increase in the length of the AEC over the observation period depends on its initial value, i.e. the smaller the initial value of the PZO, the greater the degree of its increase. Thus, with an initial length of the AP of up to 24 mm, its average increase over 3 years was 1.52 ± 0.28 mm, with an initial length of the AP of 24-26 mm - 0.87 ± 0.17 mm and with an initial length of the AP of 27 mm or more – only 0.35±0.08 mm.

With congenital myopia, all 3 forms of the eye are observed, and at weak and moderate degrees, the forms of a compressed ellipse and ball prevail, at high degrees, the most common form of the eye becomes an elongated ellipsoid, although a spherical shape is also often found.

In order to study the effect of astigmatism on the course of congenital myopia, we traced the dynamics of refraction in 96 patients (170 eyes) aged 7 to 16 years for 3-6 years. During the observation period, the progression of myopia was noted in 98 (57.6%) eyes. Refraction was stable in 72 (42.3%) eyes.

The average degree of astigmatism was higher in patients with a progressive course of the disease (2.98 ± 1.46 diopters) than in patients with a non-progressive course (1.94 ± 1.02 diopters).

Analyzes showed a high correlation between the degree of astigmatism and the rate of progression of myopia: h = 0.64. A high correlation was found between the degree of astigmatism on the one hand and the length of the ACL on the other: h = 0.67.

A uniform increase in refraction in the main meridians of the eye was noted in 27.1% of cases; in these patients, the degree of astigmatism did not change. In 62.7% of the eyes, there was an increase in the degree of astigmatism due to increased refraction of the strong meridian of the eye, and in 10.2% of the eyes, the progression of myopia was accompanied by a decrease in the degree of astigmatism, which was associated with a predominant increase in the refraction of the weak meridian of the eye.

With congenital myopia, an uneven stretching of the eyeball occurs, the horizontal meridian of the eye increases, as indicated by a predominant increase in refraction along the vertical meridian of the eye.

Echobiometric measurement showed that in patients with progressive myopia, the average value of the horizontal diameter of the eye was greater than the vertical diameter. Thus, if the average value of the horizontal meridian of the eye in the patients examined by us was 25.8 ± 0.24 mm, then along the vertical it was 24.8 ± 0.11 mm. In patients with a non-progressive course, 25.6 ± 0.31 mm and 25.7 ± 0.33 mm, respectively.

The relatively small length of the eye axis, its irregular shape and astigmatism in congenital myopia are among the prognostic tests for an unfavorable course of the process.

Findings

1. The magnitude of corrected visual acuity in patients with congenital myopia did not correlate with the degree of myopia. Between the value of visual acuity, on the one hand, and the patient's age, on the other, a high positive correlation was revealed (r =0.54, $p<0.001$).
2. With congenital myopia, three types of dynamics are observed: in 1/3 patients (36.8%), the degree of myopia does not change - it stabilizes, in 1/3 patients (32.4%) it increases - it progresses , in 1/3 patients (31.1%) - on the contrary, it weakens - regresses , which is never observed with acquired myopia.
3. Factors leading to worsening of the course of congenital myopia, according to our data, are: a relatively small initial length of the ACL, an irregular shape of the eyeball, and the presence of astigmatism.

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