PECULIARITIES OF ORBITAL PARAMETERS IN CHILDREN WITH MYOPIA

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Abstract. *Myopia, commonly known as nearsightedness, is a refractive error that affects a significant portion of the global population, particularly children. While the etiology of myopia is multifactorial, recent research has suggested a potential association between myopia and orbital parameters. This abstract aims to provide a brief overview of the peculiarities of orbital parameters in children with myopia. Several studies have investigated the relationship between myopia and orbital parameters such as axial length, orbital volume, and globe position. Findings suggest that children with myopia tend to exhibit longer axial lengths, which refers to the distance between the anterior and posterior poles of the eye. This elongation of the eye may contribute to the development and progression of myopia.*

Keywords: *myopia and orbital parameters, morbidity, biorbital width, mesocranial shape.*

Relevance.

According to foreign authors, the prevalence of myopia in Russia is more than 10% of the population is myopic, in the USA and Europe myopia is detected in 25%, in the countries of South-East Asia it reaches 74-84% [5, 6, 8]. According to forecasts by 2050 - up to 5 billion people, which entails significant clinical and economic consequences [4, 6, 7]. The urgency of this problem is associated not only with the increase in morbidity, but also with the fact that uncorrected myopia has a significant impact on the quality of life, leads to a sharp decrease in the ability to work, and can cause disability at a young age [2, 9].

One of the most important factors in the harmonious development of a child is full vision. Due to the widespread prevalence of myopia among children and adolescents, the possibility of its progression and complications, often leading to visual disability, the study of this disease is of particular relevance [1].

Over the last century, a large number of works devoted to the relationship between constitutional features of the organism and the development of certain diseases have appeared. The study of the skull using the craniometry method in modern science is reflected in a significant number of publications by both domestic and foreign authors [3, 10].

The above-mentioned aspects indicate that in order to determine the prognosis of the course of myopia to conduct studies using anthropometry methods of cranial bone structures (craniometry) in children.

Objective.

To study the anatomical features of orbital parameters in different degrees of myopia in children during the second childhood.

Material and Methods.

The study included 216 children aged from 7 to 13 years (pupils of 1-6 classes of 44-, 45-, 46-grade secondary schools of Andijan region), who were comprehensively ophthalmologically examined and divided into 3 main groups (according to the recommendation of E.T.Martirisov): 1 group consisted of 74 children with mild degree of myopia, 2 group with average degree of myopia - 98, 3 group with high degree of myopia - 44, and the control group consisted of 30 children of similar age.

The clinical and morphologic examinations of the children were performed in compliance with all necessary norms, including the mandatory written consent of the parents for their participation in the studies.

To determine the anatomical parameters of the skull and orbit, an anthropometric examination was performed using standard instruments according to the methods developed by H.G. Butaev, V.V. Bunak [3], Ya. Bunak [3], J.J. Roginsky and M.G. Levin [3]. Craniometry made it possible to calculate the following basic parameters of the whole skull: the ratio of transverse and longitudinal diameters and the horizontal circumference of the head. Special attention was paid to the study of craniometric parameters of the eye socket: transverse and vertical diameters, ocular index, biorbital width, and anterior interorbital width.

Standard ophthalmologic examination was performed in all children, including clinical, paraclinical, subjective visometry and autorefractometry.

The obtained results were subjected to statistical processing using the program "Statistica 10.0 for Windows". The type of distribution of series of quantitative signs was determined by Shapiro-Wilk, Kolmogorov-Smirnov and Lilliefors criteria. The statistical significance of differences for two unrelated samples was analyzed using the Mann-Whitney test [3].

Results. In the course of the study, skull shapes were determined in patients with myopia and in children of the control group. The study of the transverse longitudinal head index showed that the dolichocranial form of the skull prevails significantly among healthy and children with mild degree of myopia in comparison with other variants. In II degree myopia no significant differences were registered by this criterion, but among the examined children the number of children with mesocranial shape of the skull slightly prevailed over the others and amounted to 46.9%.

In children with a high degree of myopia, the mesocranial shape of the skull was dominant (exceeding other indicators 3 times) and reached 61.4%.

When determining the craniometry parameters, it was found that the values of horizontal head circumference in the 1st, 2nd and control groups (myopia I, myopia II, control) were practically at the same level, in the third group of children with myopia III degree, a reliable increase in the index up to 51.4±2.2 cm was revealed. A similar trend was noted for other craniometric parameters - transverse and longitudinal diameters of the head.

Anatomical variants of skull shapes in children with myopia

Analyzed indicators	Control group (n=30)	Myopia severity degrees		
		I (n=74)	II (n=98)	III (n=44)
Horizontal head circumference, sm	48,2±2,1	48,6±1,7	48,4±2,3	51,4±2,2*
Transverse diameter of the head, sm	136,3±1,6	136,4 ± 4,1	136,6± 2,3	139,8±2,6*
Longitudinal diameter of the head, sm	177,5 ± 3,3	178,2 ± 3,4	178,4 ± 4,2	182,5 ± 3,6*

* - differences are statistically reliable ($p \leq 0.05$)

Analysis of orbitometric studies revealed that children with III degree of myopia have the highest values ($p \leq 0.05$) of transverse orbital diameter, biorbital and interorbital width with average values of longitudinal orbital diameter and orbital index. A slight predominance of longitudinal orbital diameter was found in children with moderate myopia, and the orbital index was predominant in the comparison group. The anthropometric values are summarized in Table 2.

Analysis of orbitometry parameters in children with myopia

Analyzed indicators	Control group (n=30)	Myopia severity degrees		
		I (n=74)	II (n=98)	III (n=44)
Transverse orbital diameter, mm	35,8±2,0	35,3 ± 1,1	36,2 ±1,6	40,4 ±1,4*
Orbital longitudinal diameter, mm	23,1±1,6	22,6 ±0,8	23,6 ±1,1	22,8 ±1,3
Orbital index, mm	62,1 ±2,4	61,2 ±1,4	61,7 ±3,2	60,3 ±3,3
Biorbital width, mm	92,8± 2,8	94,5 ±1,6	97,8±1,9*	99,6± 3,6*
Interorbital width, mm	18,2 ±1,8	17,8 ±1,4	18,2 ±0,6	20,1 ±1,5*

* - differences are statistically reliable ($p \leq 0.05$)

Analysis of the relationship between the obtained data of clinical and instrumental studies and anthromorphometric parameters revealed their correlation of average strength with head circumference, orbital width, biorbital width and anterior interorbital width.

The results of the conducted study of relationships of morphometric parameters of the head showed that dolichocephalic head shape is the most common in children with myopia of weak degree and in the control group. In patients with medium and high degree myopia, the mesocephalic head shape was the most common.

The most significant changes in cranio- and orbitometry parameters were observed in patients of children with high degree myopia compared to the control group ($p \leq 0.05$).

The relationship of medium severity was determined between the parameters of myopia severity and craniometric parameters such as head circumference, orbital width, biorbital width and anterior interorbital width.

Within this age period (7-12 years) of the studied children, sex differences in anatomometric parameters were not pronounced. Therefore, the data of analysis of measurement parameters in the gender aspect were not introduced in this work.

Thus, in children with myopia, the more pronounced the clinical and ophthalmologic signs of the pathologic process, the more negative shifts in the osteoarchitectonics of the normal topography of the eye socket are observed. This situation may serve as one of the important prognostic criteria for predetermining possible complications in growing myopia.

Conclusion:

In sick children with myopia at the age of 7-13 years (period of the second childhood) only beginning elements of skull deformation are determined.

Characteristic anatomical parameters are an increase in the horizontal circumference of the head, orbital width, biorbital width and interorbital width in combination with the mesocranial shape of the skull.

The analysis of the obtained data of morphometric evaluation of the topographic zones of the skull at myopia, in different age periods, can serve as a basis for measures for early detection, prevention and correction of myopia progression in schoolchildren, will prevent the growth of various complications in the younger generation.

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