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# Description of the Dependence of Craniometric Parameters on the Severity of Myopia in Children with Myopia

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**Abstract:** According to the World Health Organization (WHO), myopia has spread to 1.6 billion people in recent years and is predicted to reach 5 billion by 2050. Carrying out a number of studies in case of dysfunction of a particular organ allows us to determine changes in special topographic areas of the musculoskeletal system against the background of diseases. Craniometry is considered one of the important sections of anthropometry, and the determination of anatomical changes in craniometric parameters is of great importance for theoretical and practical medicine. Today, craniometric studies are actively used in scientific research in otorhinolaryngology, neurology, dentistry and ophthalmology and help find reasonable solutions to the problems of these areas. One of these tasks is to find a solution for studying the formation of the eyeball with varying degrees of severity of myopia, which is the most common refractive anomaly in a growing body. There is a need in the world to determine the theories of cooperative development of organs and the topographical areas in which they are located and which of them are the main ones. In recent years, the incidence of myopia has been increasing worldwide, reaching 96% among the young population of some countries. However, in children born with myopia, little has been studied about the formation processes in the organs and systems of the growing organism, in particular, what obstacles arise in the development and growth of the orbit. Establishing parallels in the development of the organ of vision and the eyeball helps to develop measures aimed at preventing developmental defects that can be observed in postnatal ontogenesis. The prevalence of myopia among children and not always timely diagnosis can negatively affect the child's quality of life, lead to retinal detachment and disability from childhood or early working age.

**Keywords:** myopia, refraction, eyeball, craniometric, eyeball, orbital, cephalometric.

**The purpose of the study** is to conduct a comparative analysis of craniometric indicators of the head, especially the eyeball, and physical development in children diagnosed with myopia by age and gender.

**Materials and methods:** The study was conducted on 216 children diagnosed with myopia aged 4 to 7 years and students in grades 1-6 of 44, 45, 46 secondary schools of 4 preschool educational institutions in Andijan region aged 7 to 13 years. . When examining these patients in the above institutions, that is, out of 2112 children, refractive problems were observed in 427 (20.22%) children as a result of a comprehensive ophthalmological examination, and 216 patients selected for the study were divided into 3 groups (Martirisova E.T. .). Children with other congenital and chronic diseases were not included in the study groups.

Group 1 included 74 children with the least severe mild myopia;

Group 2 - 98 patients diagnosed with moderate myopia;

The 3rd group included 44 students with severe myopia;

80 children without problems with visual acuity of the same age as the children of the main group were selected as a control group.

**Results of the study:** Initially, the shape of the skull was determined in patients with myopia and in children of the same age in the control group. A study of transverse-longitudinal parameters of the skull showed that among healthy children with weak myopia, the dolichocranial shape of the skull is more common than other options (Table 6).

In case of second degree myopia, the results according to this criterion did not differ significantly from the results of children in the control group, however, the number of meocranial forms of the skull among the examined children was slightly higher than among the rest, i.e. 33%. In children with severe myopia, the mesocranial shape of the skull was dominant (3-4 times higher than other indicators) and reached 60% (Table 6).

Table 6. Relative frequency of occurrence of the shape of the cerebral part of the skull according to the transverse-longitudinal index in children with myopia, %.

| Monitoring groups | Skull shapes | | |
|---|---|---|---|
| | Dolichocrania | Mesocrania | Brachiocrania |
| Control | 40 | 36 | 24 |
| myopia 1st degree | 52 | 35 | 11 |
| myopia II degree | 26 | 33 | 18 |
| myopia III degree | 25 | 60 | 15 |

Note * - results were considered reliable at r<0.05.

When determining craniometric indicators, it was found that the values of the horizontal head circumference in groups 1, 2 and 4 of subjects (myopia I, myopia II, control) were practically at the same level. In the third group, a convincing increase in this indicator to 54.6 cm was noted in children diagnosed with third degree myopia. A similar trend was observed for other craniometric parameters, including the transverse and longitudinal diameters of the head (Table 7).

Table 7. Average value of craniometry indices in observation groups

| Monitoring groups | Skull parameters, cm | | |
|---|---|---|---|
| | Horizontal circumference of the skull | Transverse diameter of the skull | Longitudinal diameter of the skull |
| Control | 52 | 143.2 | 180.5 |
| myopia I degree | 52.8 | 141.4 | 184.3 |
| myopia II degree | 52.5 | 143.6 | 181.5 |
| myopia III degree | 54.6 | 146.5 | 188.8 |

Note * - results were considered reliable at r<0.05.

According to the results of the orbitometric study, the transverse diameter of the eyeball, bioorbital and width between the eyeballs compared with the average values of the longitudinal diameter of the eyeball and the eyeball index were high (significant difference).

It was found that with an average degree of myopia, the longitudinal diameter of the eyeball increased slightly (the difference is not statistically significant), and the eyeball index was higher in the control group (Table 8).

Table 8. Average value of orbitometry indices in observation groups

| Monitoring groups | Eyeball indicators, mm | | | | |
|---|---|---|---|---|---|
| | Transverse diameter | Longitudinal diameter | Eyeball index | Biorbital width | Width between the eyeballs |
| Control | 38.1 | 25.1 | 66.1 | 97.8 | 20.2 |
| myopia I degree | 37.9 | 24.6 | 64.2 | 95.6 | 19.8 |
| myopia II degree | 38.6 | 25.6 | 65.7 | 100.8 | 20.2 |
| myopia III degree | 43.7 | 24.8 | 64.3 | 103.8 | 22.1 |

Note * - results were considered reliable at r<0.05.

When analyzing the correlation between the severity of myopia and craniometric and orbitometric indicators, it was found that there is a moderate correlation between the size of the head circumference, the width of the orbits, the bioorbital width and the anterior width between the orbits.

The results of studying the relationship between morphometric parameters of the head showed that the dolichocephalic shape of the head is most common in children with mild myopia and in the control group (52% and 40%). It was found that the mesocephalic head shape is most common in patients with moderate and high myopia (33% and 60%, respectively).

In patients with high degree myopia (III), changes were observed with the most convincing difference in cranio- and orbitometric indices compared to the control group.

The correlation coefficient between autorefractometry parameters and craniometric parameters such as head circumference, orbital width, bioorbital width and anterior interorbital width was statistically determined.

Taking into account the anatomical features of the head and face in adult patients, a combination of the most important biomarkers of myopia with the mesocranial shape of the horizontal head circumference, orbital width, bioorbital and interorbital width was identified. Based on data on age-related ossification of the bones that form the eyeball and our own data on the eyeball, an algorithm has been developed that reflects the dynamics of age-related changes in the eyeball and visual organ in myopia.

According to the developed algorithm, if changes in the eyeball in early childhood affect the formation of the eyeball in patients diagnosed with myopia, then with age, on the contrary, the eyeball, the formation of which is almost complete, also affects the shape of the eyeball and, ultimately, visual acuity.

Summary. In the first and second periods of childhood, all parameters of the head and orbit have age and gender differences, and the main growth in the first period of childhood was observed in the size of the head, especially in the size of the orbits. The height and width of the eyeball entrance are higher than the control indicators.

In the second period of childhood, physical development indicators for myopia decreased by 3.6% in height dimensions (standing and sitting position). On the other hand, it was found that other parameters were higher in myopia (body weight - 5.2% (<0.05), chest circumference at rest - 0.9%, respiration - 6.5% (<0.01), exhalation - 2.1%). When analyzing craniometric indicators depending on the severity of myopia (myopia I, myopia II, control), the values of the horizontal head circumference change to almost the same level, and in the third group of children with grade III myopia this indicator significantly increased to 54.6 cm A similar trend was observed for other craniometric parameters, including the transverse and longitudinal diameters of the head. Indicators of physical development of children and morphometric parameters of the

craniofacial region change in inverse proportion to the degree of myopia and the duration of the disease with this pathology. On the contrary, as the childhood period increases, the progression of myopia increases, which is associated with the almost complete ossification of the eyeball.

**Literature review**


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