International Journal of Pediatrics and Genetics
Vol. 1 No. 3 (2023)
ISSN: XXXX-XXXX

Disorders of Accommodation and Biomechanical Indicators of Scleromalacia in Progressive Myopia in Adolescents

D. L. Jaloliddinov, A. F. Ikramov
Andijan State Medical Institute

Annotation: Violation of biomechanical indicators in the development of scleromalacia at a higher level of myopia developing in adolescents in this scientific makole, the mechanics of the influence of internal pressure of the eye on the development of the disease and violation of biomechanics, risk factors, their origin, etiology, pathogenesis, clinic, diagnosis, complications and much more. Methods of Hamda treatment in a broad modern direction.

Key words: UBM, refractometry, CIB, scleromalacia, tanometry, Fredinvaldo tonometry.

Introduction

One of the most urgent problems of modern ophthalmology is the development of scleromalacia as a complication of myopia among adolescents. The prevalence of myopia is associated with its early manifestation and development - the deterioration of vision up to the limitation of professional choice, the onset of blindness and the occurrence of primary disability.

The prevalence of myopia in the world is 1.6 billion people, and its increase will be 2.5 billion people until 2020, and by 2050 - this indicator will be 4758 million people, i.e. - 49.8% of the world's population. (Tarutta E.P. et al., 2018; B. A. Holden et al., 2016). While it is 30-55% in developed countries, myopia among students in Taiwan is 95.9%, in China - 95.5% (Fan D. S., Lam D. S., 2004; Wang T. J., Chiang T. H ., Wang T. H., Lin L. L. et al., 2009) 79.3% of myopia occurs in Singapore; In the United States, it is 41.6%. (Vitale S., Sperduto R. D., Ferris F. L., 2009).

An important aspect of the complications of myopia in the Russian Federation is the steady growth of myopia and low vision. Myopia takes the 3rd place (18%) and 2nd place among children. If myopia is not timely and fully controlled at school age, amblyopia develops, refractive error occurs, and binocular vision is impaired (Markova E. Yu., 2015; 2018; Proskurina O. V. et al., 2018). According to the results of the All-Russian medical examination, the number of children and adolescents with myopia increased 10 times in 1.5 years (Katargina L. A., Tarutta E. P., 2012). Among graduates, the rate of myopia at the end of school is 26%, gymnasiums and lyceums - 50%, and high myopia is 10-12%. Insufficient visual acuity in childhood leads to social adaptation, reduces the quality of life of the child, and myopia in adulthood can affect the choice of future profession and work (Petukhov V. M., Medvedov A. V., 2004; Strakhov V. V., 2007). Epidemiological nature of the prevalence of myopia shows the sufficient effectiveness of prevention, treatment and rehabilitation measures. In this regard, the attention of ophthalmologists around the world is now focused on the further search for the causes of the appearance and development of myopia (Avetisov E. S., 2002; Lutskevich E. E., Plexova L. Yu. Borodina N. V., 2002; Volkova E. . G., 2011; Fedorishcheva L. E., Eremenko K. Yu., Alexandrova H. Kh., 2014; Akhmad M. et al., 2017; Chinava N. E., A. O., Chukwuka I. O. , 2017), it is necessary to take therapeutic and preventive measures to prevent possible complications. (Brusakova E. V. et al., 2007; Obrubov S. A. et al., 2007; Brzheskiy V. V. et al. 2008; Pashtaev N. P., Arsyutov D. G., 2009; Fabrikantov O. L., Matrosova Yu.V., 2014; Markova E. Yu. 2015; Tarutta E. P., Tarasova N. A., 2015). The main risk factors for the occurrence and development of myopia are a weakened fibrous cap, hereditary predisposition and weakening of the properties of the sclera,

Vol. 1 No. 3 (2023)
ISSN: XXXX-XXXX

as well as increased intraocular pressure. (Avetisov E. S., 2002; Tarruta E. P., 2005; Iomdina E. H. et al. 2010; Markova E. Yu. 2012; Starikova D. I., 2014; Strakhov V. V. et al. , 2018; Rada J. A., Shelton S., Norton T. T., 2006; Chinawa N. E., Adio A. O., Chukwuka I. O., 2017). Among the types of retinal disorders in myopia, three forms are distinguished: retinal weakness, spasmodic asthenopia, and hyperactivity. At the same time, the types of retinal disorders in stationary and developing myopia, the level of intraocular pressure, the biomechanical properties of the sclera, and the retina in the pathogenesis and prognosis of the development of myopia questions about the relationship between veil disorders have not been studied.

All of the above made it possible to formulate the goals and objectives of this study.

Purpose and mission. Development of a complex modified technology of clinical and functional diagnosis, monitoring and forecasting of developing myopia in adolescents based on the study of the biomechanical parameters and shape disorders of the corneoscleral membrane.

1. To study the biomechanical properties of the corneoscleral membrane in relation to the level of intraocular pressure in patients with stationary and progressive myopia.
2. Determination of the main types of retinal disorders in patients with stationary and progressive myopia in relation to the degree of ophthalmotonus.
3. To study the tension of the sclera in stationary and progressive myopia, its importance in assessing the state of myopia based on the study of the level of intraocular pressure measured taking into account the biometric indicators and the hardness of the corneoscleral membrane.
4. Carrying out a multifactorial correlational analysis of retinal changes, indicators of the biomechanical properties of the cornoscleral membrane, determining the exact diagnostic criteria for the level of intraocular pressure and the progressive course of myopia in children with stationary and progressive myopia

Materials and methods: Scientific research was conducted in the eye diseases department of Andijan State Medical Institute clinic in 2020-2021. 142 patients (142 eyes) (41.8%) with progressive myopia in adolescents were examined - group 1. Group 2 included 152 patients (44.7 eyes) with stationary myopia (152%). Group 3 included 46 individuals (46 eyes) with emmetropia (13.5%) - the control group. A total of 340 patients (340 eyes) were examined. The age of the patients was between 12 and 18 years. The average age is 15.26 years. 294 patients with progressive and stationary myopia (294 eyes) were divided according to the degree of myopia: mild (89 eyes -30.3%), moderate (116 eyes - 39.4%) and high (89 eyes - 30.3%). Patients with a clinical refraction value of -5.0 to -8.0 dptr, an average level of -5.25 to -6.0 dptr, and a high degree of myopia of -6.25 dptr and above were referred to mild myopia. All patients underwent a comprehensive ophthalmological examination: Visiometry, refractometry, ultrasound biometry, pachymetry, tonometry, measurement of the hardness of the corneoscleral membrane by computer differential tonometry according to Friedenwald. Visual acuity was measured using a Reichert AP 250 marker projector (Reichert Inc., USA), measuring uncorrected (NCOS) and maximum corrected visual acuity (MCOS). The study of clinical refraction against the background of cycloplegia, as well as with dynamic observation of patients, was carried out using an autorefractometer "Canon RK-F1" (Canon, Japan). Biomicroscopy of the anterior segment of the eye was performed under a 30x magnification single-slit lamp TAKAGI SEIKO CO (SM-16N), LTD (Japan). Gonioscopy and retinal biomicroscopy were performed using Goldmann lenses.

The method of differential tonometry according to Friedenwald was used to study the biomechanical properties of the corneoscleral membrane of the eye in the examined individuals. This method made it possible to determine the value of intraocular pressure (P0E) taking into account the hardness index of the corneoscleral membrane (E0), which increased the accuracy of tonometry taking into account the individual characteristics of the eye: the thickness of the cornea in the central optical zone and the anteroposterior size of the eyeball were measured (OOO'). The study of the hardness of the corneoscleral membrane of the eye was carried out on the computer tonograph "Glautest-60"

(Russia). To evaluate the viscoelastic properties of the cornea, the analyzer of biomechanical properties of the eye ORA (ocular analyzer, Reihert, USA) was used. Scleral thickness measurement was performed using UBM of the eye in the projection of the ciliary part of the ciliary body (Ts1) and at the border of the transition of the flat part of the ciliary body to the choroid (Ts2). The thickness of the sclera measured in the transition projection of the flat part of the TC2-ciliary body to the choroid (mm) was studied.

Inspection results. In order to study the influence of the main risk factors on the development of myopia, the relationship between the biomechanical properties of the sclera, the level of intraocular pressure and the position of the eye was studied. In 142 patients with progressive myopia (142 eyes), the average value of the annual progression gradient of myopia with a change in refractive index was -0.764. 0.24 dptr/year (from -0.48 dptr/year to -2.3 dptr/year), with an anteroposterior eye size change of 0.259 xnumx mm/year (0.13 mm/year to 0.74 mm/year), which is confirmed the progressive course of myopia in the group of patients. The average value of the refractive index of group 1 was equal to -5.97 at 4.75 dptr (in M), and the average value of the eye's OOO': 27.5 at 1.0 mm (in M).

It should be noted that in patients with mild progressive myopia, in contrast to individuals with emmetropia, there was not only a significant increase in the anteroposterior size of the eyeball, but also a significant decrease in the thickness of the sclera (TC2) measured in the transition projection of the ciliary plane body for choroiditis ($t=3.1$; $p< 0.01$).

Reduction of scleral thickness (TC2) in patients with mild myopia, emmetropia ($t=4.3$; $p<0.01$), in contrast to the average value of corneal hysteresis (Ch), there was a significant decrease in the average value of the stiffness of the eye corneoscleral membrane, ($t = 3.75$; $p <0.01$) and considering the stiffness of the corneoscleral membrane (P0E), ($t=3.1$; $p<0.05$) and considering the viscoelastic properties of the cornea (P0 CC), ($t=6.1$; $P<0.01$) intraocular pressure is measured taking into account the high average values were determined.

In adolescents with developing myopia, the elongation of the eye OOO' and the decrease in scleral thickness were accompanied by a significant increase in the scleral tension index, in contrast to patients with emmetropia. In 142 patients with progressive myopia (142 eyes), taking into account the stiffness of the corneoscleral membrane when measuring ophthalmotonus, the actual KIB values were found in the lower normal range. In 3 eyes - 2.1%, the average norm (from 14 to 18 mm of ICP wire above) in 60 eyes - 42.3%, high norm (from 18 to 21 mm of ICP wire above) in 49 eyes - 34.5% of cases. In 30 eyes (21.1%), ophthalmotonus (KIB) was above 21 mm above the wire - from 21.1 to 24.4 mm above the wire. In patients with myopia, the detection of ophthalmotonus above the upper limit of the average norm (0>21 mm Hg) was considered as a manifestation of ophthalmohypertension. An increase in the degree of myopia was characterized by an increase in the scleral tension index. In patients with stationary myopia (152 eyes), the maximum values of the scleral stress index were determined taking into account the degree of myopia, which was considered as the upper limits of its norm: for mild myopia, 299 mm Hg, for moderate myopia, 336 mm Hg and for high myopia, 390 mm wire top. The development of myopia was predicted for each patient, taking into account the degree of myopia, when the obtained values of scleral stress of the control indicators exceeded. In patients with stationary myopia (152 eyes), in contrast to patients with emmetropia (46 eyes), sclera (TC2), ($t=4.7$; $p<0.001$) thickness and corneoscleral membrane stiffness index decreased significantly ($t=9.7$; $p<0.001$).), a decrease in intraocular pressure ($t=2.2$; $p<0.05$) and an increase in scleral tension index ($t=4.27$; $p<0.001$) were detected, taking into account the hardness index of the corneal membrane of the eye. Exceeding the actual IOP values by 21 mm was observed only in 6 patients (6 eyes) with stationary myopia (3.9% of cases). In adolescents with progressive myopia (142 eyes), in contrast to patients with stationary myopia (152 eyes), a significant decrease in the thickness of the sclera (TC2) was found ($t=4.7$; $p<0.001$), the increase in the level of intraocular pressure is measured taking into account the rigidity. increase in corneal scleral membrane index ($t=9.37$; $p<0.001$) and scleral stress index ($t=10.9$; $p<0.001$). The difference

between the average values of the stiffness index of the corneoscleral membrane of the eye between progressive and stationary myopia was also statistically significant ($t = 3.2$; $p<0.01$),

In patients with progressive and stationary myopia, the average value of the retinal response coefficient (CAO <0.5) was significantly reduced, which indicated the weakness of the retina and its role in the pathogenesis of myopia. Normal values of accommodation indices were noted in patients with emmetropia (46 eyes): the retinal response coefficient (CAO) exceeded 0.5 dptr and the microfluctuation coefficient (CMF) was less than 1 reduction in 62 minutes.

Summary

1. Combined types of retinal disorders were identified in patients with progressive myopia in adolescents: a combination of OOO' and retinal weakness, as well as a combination of OOO' and retinal weakness spasmodic astepopia. Combined types of retinal disorders were observed in 62% of patients with adolescent-onset myopia. In stationary myopia, combined types of retinal disorders were recorded only in the form of a combination of OOO' and retinal weakness, and occurred in 21% of cases against the background of normal values of ophthalmology. It is also known as ophthalmic retinal hypertension syndrome, which is more common in adolescents with progressive myopia (5.4% of cases), combined types of retinal diseases with increased real intraocular pressure (above 21 mm of wire).
2. A significant relationship was found between developing myopia and tension of sclera and ocular OOO', thickness of sclera (Ts2) measured in the transition projection of the flat part of the ciliary body to the choroid, and the level of actual KIB. Consider the hardness of the corneoscleral membrane of the eye and the hardness index of the corneoscleral membrane. High values of scleral tension in patients with stationary myopia were determined taking into account the degree of myopia: low - 299 mm Hg, medium - 366 mm Hg and high - 390 mm Hg; when these values are exceeded, the development of myopia is predicted.
3. A comprehensive technology of clinical and functional diagnosis and monitoring of children with developing myopia in adolescents has been developed, which includes a diagnostic algorithm for assessing the values of biometric indicators and the condition of the biomechanical properties of the corneoscleral membrane, and for determining accommodation disorders in relation to the level of ophthalmotonus. A mathematical model developed to predict the progressive course of myopia in 94.4% of cases.

References:

1. Иомдина Е.Н. Современные направления фундаментальных исследований патогенеза прогрессирующей миопии //Вестник РАМН.-2014.-№2-3.-С.44-49.
2. Иомдина Е.М. Современный взгляд на проблему миопии //Рефракция-2014: сборник докладов конференции.-Самара, 2014.-С. 4-8.
3. Тарутта Е.П. Возможности профилактики прогрессирующей и осложненной миопии в свете современных знаний о ее патогенезе //Вестник офтальмологии.-2006.-Т.122.-№1.-С.43-46.
4. Юрковский О.И.,Грицюк А.М. Общеклинические анализы в практике врача / - Москва, 1998. 128 С.
5. Аветисов Э.С., Винецкая М.И. Роль биохимических исследований патогенеза миопии. В кн.: Миопия. Сб. научн. работ под ред. Э.С.Аветисова. Рига, 1979, 5-