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Biomechanical patterns of stress distribution in various topographic sclera areas in children with axial myopia

Statement of the Problem: A wealth of facts confirms the involvement of sclera in the pathogenesis of progressive myopia. The question of the adequacy of the results obtained with the use of isolated scleral specimens to the characteristic of the functioning eye remains relevant. It was believed that lifetime assessment of the biomechanical properties of eye tissues is an almost impossible task due to deformities of various type of eye tissue and the necessity to take into account a large number of parameters characterizing eye functioning.

Aim: Aim of this study is to reveal the biomechanical properties of the pre-equatorial area of sclera and to investigate the relationship between the severity of changes in eye fundus and biomechanical characteristics of the sclera in children with axial myopia.

Methods: 130 children (260 eyes) aged 12 to 16 are studied. The biomechanical properties of the sclera are measured by a three-track sensor modification of the acoustic tissue analyzer in 8 areas of the pre-equatorial area of sclera in scanning direction both along equatorial and meridional direction. Acoustic range measurements are 5-6 kHz.

Results: With an increase in magnitude of myopia and the anteroposterior size of the eyeball in sclera the tensile stress in the meridian direction increases and the compression stress in the equatorial direction is formed. Periphery eye fundus changes and optical coherence tomography appearance of macular area add to the picture of biomechanical changes in pre-equatorial area of sclera and revealed subtle morphological changes of retina in children with myopia.

Conclusion: The increase in tension stress together with the increase in the magnitude of myopia is explained by the morphological immaturity of fibroblasts in children and by the insufficient functioning of mechanism of mechanical stress destruction, which consists in the isolation of proteases for destruction of the adhesive bonds.

Recent Publications

1. Obrubov S A, Stavitskaya G V, Khamnagdaeva N V, Boginskaya O A, Semenova L Yu, Poryadin G V and Chinenov I M (2016) Ultra-structural features of the sclera in the simulation of the initial myopia in the experiment. Russian Children's Ophthalmology N2: 49-56.
2. Obrubov S A, Sidorenko E I, Voronkov V N, Molotkov A P and Fedorova V N (1995) Method of *in vivo* assessment of biomechanical properties of eye tissues (an experimental study). Vestn Oftalmol. 111(4):27-30.
3. Curtin B J (1969) Physio-pathologic aspects of scleral stress-strain. Trans Amer Ophthalmol Soc. 67:447-461

Biography

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