

## **Myopia: A New Approach to Controlling Progression**

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Myopia significantly increases the risk of many debilitating eye diseases. There are currently no ways to prevent myopia. Modern methods of myopia control (atropine drops, multifocal glasses and contact lenses, orthokeratology) do not give an absolute result, because the causes of myopia are not fully understood. The author proposes the concept of etiopathogenesis of myopia. According to this concept, the trigger of the myopic process is the small distance between the equator of the lens and the ciliary body (less than the age norm), which causes a weak accommodation and triggers further pathological changes in the eye.

According to the author, it is possible to stop myopization by surgical expansion of the ciliary body ring (impenetrable sclerectomy) and, as a consequence, increase the distance "equator of the lens - ciliary body". This should restore the eye's accommodation capacity and stabilize myopia.

**Topicality:** The myopia pandemic is a serious medical and social problem. The number of patients with myopia is expected to increase from 2 billion in 2010 to 5 billion in 2050 [1,5]. Myopia significantly increases the risk of debilitating eye diseases such as glaucoma, cataract, retinal detachment, and macular degeneration, so it is important to find ways to stabilize and prevent myopia progression. Modern methods of myopia control include: atropine drops, multifocal glasses and contact lenses, orthokeratology. None of them gives an absolute result. There is an effect of "refraction rebound" after the abolition of these methods. Thus, to date, there is no method that can completely stop the progression of myopia [4].

In our opinion, this is due to the fact that many theories have been proposed for the causes of myopia of the human eye, but the true trigger of the process, which could be influenced, has not been found [3]. It is known that an early symptom of eye myopization is accommodation weakness. Existing concepts do not explain the reason for its emergence. We propose the following concept of the etiopathogenesis of myopia [6].

We propose the following concept of the etiopathogenesis of myopia. For the normal functioning of the accommodation apparatus, the distance between the ciliary body and the equator of the lens must meet age standards. Then the accommodation muscle through the system of Zinn's ligaments adequately affects the curvature of the lens surfaces, changing the optical power of the eye if necessary. If the heredity is burdened or if the visual load is too close, the distance "equator of the lens - ciliary body" becomes less than the age norm, Zinn's ligaments sag slightly, their effect on the lens configuration weakens, the volume of accommodation decreases. Weakness of accommodation develops.

Accommodation (the ability to scan danger at different distances) has played an extremely important role in human survival as a species in the process of evolution. When accommodation is weakened, the organism has developed compensatory mechanisms to restore it. Eye diseases in the early stages are protective compensatory reactions aimed at restoring the accommodation capacity of the eye. Consider this situation on the example of the occurrence of myopia.

The etiopathogenesis of myopia is as follows. If, due to a decrease in the distance “equator of the lens - ciliary body” accommodation is weakened, the blood supply to the ciliary body decreases by 2 times. Accommodation muscle ischemia results in the formation of cytotoxic factors that cause obliteration of the drainage apparatus, increased ophthalmotonus, decreased scleral resistance, and distension of the eye capsule. The compensatory mechanism of this reaction is aimed primarily at stretching the anterior segment of the eye, which should lead to an increase in the distance “equator of the lens - ciliary body” and the normalization of the accommodation apparatus. If the decrease in the efficiency of the accommodation muscle (due to ischemia) is compensated by an increase in the tension of the Zinn’s ligaments, accommodation is restored (stabilized myopia). Otherwise, a vicious circle (malignant myopia) develops. In light of the proposed concept, it becomes clear why existing methods of control of myopia do not solve the problem of its progression: atropine, addiction for close range in multifocal glasses and contact lenses - temporarily disable accommodation. But the muscle that is not working is weakened even more, and after the course of treatment, the progression of myopia continues, especially since these methods do not affect the distance between the lens and the ciliary body.

For the same reason, hardware treatment of myopia (accommodation muscle training) is ineffective. In our opinion, the partial success of orthokeratology in stabilizing of myopia can be explained as follows: modeling the surface of the cornea (flattening its central zone) changes the configuration of the entire anterior part of the eye, including increasing the diameter of the sclera in the projection of the ciliary body and the distance “equator of the lens - ciliary body”. This improves the tension of the Zinn’s ligaments and increases the volume of accommodation, which inhibits the progression of myopia. But because this effect is temporary, it is not always enough to stop the growth of myopia.

We offer the following steps to address the progression of myopia: 1. Conduct OCT studies of the anterior segment of the eye (measuring the distance “equator of the lens - ciliary body”) in children of the same age with progressive and non-progressive myopia. If the difference in the parameters of the specified distance is statistically significant - to conduct an experimental study on animals with induced myopia, namely: 2. Surgically expand the ring of the ciliary body by forming in the projection of the ciliary body round impenetrable sclerectomies (imitation of scleral staphylomas). This should increase the distance “equator of the lens - ciliary body” and, accordingly, restore the function of the accommodation muscle, stabilize myopia. The parameters of sclerectomies (location, depth, area) should be established experimentally. 3. After processing the long-term results of this intervention, in the case of a positive long-term effect, it will be possible to offer this operation in clinical practice. Of the available methods of prevention of myopia, it is advisable to use walks in the fresh air, sports (a distance vision activates the sympathetic nervous system - increases the distance “equator of the lens - ciliary body”, improves accommodation). Given the above, incomplete correction of myopia has advantages over complete - there is stimulation of the sympathetic nervous system (remote accommodation works).

### Conclusion

1. Existing methods of control of myopia do not solve the problem of its progression. 2. Many concepts of etiopathogenesis of myopia have been proposed, but the trigger of the process is not fully understood. 3. Author’s concept: the trigger of myopia is a small distance between the equator of the lens and the ciliary body (less than the age norm), which causes a weak accommodation and triggers further pathological changes in the eye. 4. It is proposed to surgically expand the ring of the ciliary body (non-penetrating sclerectomy). This should increase the distance “equator of the lens - ciliary body” and, accordingly, restore the accommodation capacity of the eye and stabilize myopia.

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