

## Pterygium: A Modern View of the Problem

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### Abstract

There is no single theory of pterygium. The trigger of the disease is unknown. The author's concept: the pterygium trigger is a genetically programmed small distance between the equator of the lens and the ciliary body (less than the age norm) at a certain, often presbyopic, age. This causes the weakness of accommodation and triggers the growth of the pterygium. In patients with recurrent pterygium after its surgical removal, it is proposed to form a simple myopic direct type of astigmatism up to 1.5 diopters to deepen the focal area of the eye and restore the volume of accommodation. For the same purpose, non-penetrating supraciliary sclerectomies can be formed in the horizontal meridian of the eye.

**Keywords:** *Pterygium; Weak Accommodation; Direct Simple Myopic Astigmatism Up to 1.5 Diopters; Non-Penetrating Supraciliary Sclerectomy*

Pterygium is an ingrowth of the conjunctiva into the cornea, which leads to reduced vision and, in the final stage, to blindness. Although the first mention of pterygium dates back to the time of Hippocrates, the etiopathogenesis of this disease remains unclear. It is believed that pterygium is a multifactorial disease of the conjunctiva. Heredity is important in this process. Since among many factors the main role is played by excessive ultraviolet radiation and the older age of patients - conditions characterized by a narrow pupil - we offer our view on the etiopathogenesis of pterygium.

When the pupil is too constricted, the ring of the ciliary body also constricts (synergistic innervation). In anatomically inclined eyes (that is genetically programmed) with a "tight" anterior segment, the distance between the equator of the lens and the ciliary body becomes smaller than the age norm. Zinn's ligaments begin to sag somewhat, which weakens the effect of the ciliary muscle on the lens, the muscle partially works "idle". Weakness of accommodation develops.

Accommodation (scanning for danger at different distances) played an important role in the survival of humans as a species in the process of evolution. Therefore, the human body has developed adaptive reactions to restore accommodation.

Most eye diseases in the initial stages are accompanied by an increase in the volume of accommodation. The brain monitors the work of the accommodation system and in case of "breakdown" calculates the most ergonomic ways to restore this important function of the organ of vision.

Example: An initial cortical cataract is accompanied by a double increase in accommodation volume [2]. Hydration of the lens increases its elasticity, which facilitates the work of the accommodation apparatus and restores accommodation. It is established that the initial cataract remains in a stabilized state for many years in most cases [1]. In our opinion, this happens because accommodation in such eyes is not weakened, and there is no need for further cataractogenesis (the brain does not stimulate the progression of lens opacification).

How can the pterygium contribute to the work of the accommodation apparatus? - Formation of direct corneal astigmatism.

Our studies of patients with artiphakia and astigmatism [3] showed that eyes with simple direct myopic astigmatism up to 1.5 diopters (pupil diameter - 3 mm) have the largest volume of pseudoaccommodation (3 - 4 diopters) and the best visual functions at a distance (0.8 - 0.9) and close to (0.4 - 0.5).

We formed the specified astigmatism using keratotomy in eyes with a monofocal IOL. This refraction deepened the focal area of the artificial eye, which made it possible for patients to perform visual work at a distance and near without additional correction with glasses.

Growing into the cornea along the horizontal meridian, the pterygium flattens it and causes an increase in the curvature of the vertical meridian, i.e. it forms direct astigmatism in the cornea. If a sufficiently deep focal area is formed and the work of the accommodation apparatus is restored - the pterygium is stabilized. Otherwise, a vicious circle is formed and the pterygium progresses.

In light of the above, the high risk of pterygium recurrence in the postoperative period - up to 68 - 82% [4] - becomes clear. Since the pterygium contributes to the work of the accommodative apparatus, forming a direct astigmatism of the cornea, its removal changes the configuration of the cornea and reduces the depth of the focal area, which leads to a drop in the volume of accommodation. Hence, there is a high risk of recurrence of the disease.

It is not surprising that complications of operative treatment of pterygium include scleromalacia and necrotizing scleritis. These processes in the initial stages can be considered as adaptive reactions of the eye aimed at restoring accommodation. Thinning of the sclera as a result of malacia increases the "tight" front segment of the eye, the distance between the ciliary body and the equator of the lens increases slightly, the zinn ligaments sag less, which improves the work of the accommodation apparatus (compare with anterior staphylomas of the sclera in myopia and glaucoma - diseases whose trigger is also there may be weakness of accommodation [5]).

### What are the ways to solve the problem of pterygium?

1. Prevention: Healthy lifestyle, sunglasses, proper correction of presbyopia, absence of excessive visual stress.
2. In patients with recurrent pterygium after its removal: a. formation of simple direct myopic astigmatism up to 1.5 diopters using a femtosecond laser; or b. formation of non-penetrating supraciliary sclerectomies in the horizontal meridian of the eye. In our opinion, these methods of treatment will reduce the cosmetic defect of pterygium, increase the visual acuity of patients and prevent or significantly delay the development of pterygium and other eye diseases in the presbyopic age.

### Conclusion

There is no single theory of the development of pterygium, the trigger of the disease is unknown.

The author's concept of the etiopathogenesis of pterygium: the trigger for conjunctival ingrowth into the cornea is a genetically programmed small distance between the equator of the lens and the ciliary body (less than the age norm) in the presbyopic period of life, which causes the weakness of accommodation and triggers pathological changes in the eye:

1. Prevention of pterygium: Healthy lifestyle, sunglasses, proper correction of presbyopia, absence of excessive visual stress.
2. The following treatment of patients with recurrent pterygium after its removal is proposed: a). formation of simple direct myopic astigmatism up to 1.5 diopters using a femtosecond laser; or b). formation of supraciliary non-penetrating sclerectomies in the horizontal meridian of the eye.
3. The indicated methods of treatment can prevent or significantly delay the development of pterygium and other eye diseases in the presbyopic age.

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