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Visual Function and Refraction in Pterygium Before and After Xenoplasty

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Abstract *Objective. In* recent years, the number of patients with pterygium has been growing in the Republic of Uzbekistan, especially in the southern regions. The purpose and objectives of the study To evaluate visual functions in pterygium at different stages of development before and after xenoplasty. To determine the functional states of the eye at different degrees of pterygium development. *Material and Methods.* The study was conducted in 34 cases with grades I and U of pterygium development before and after xenoplasty. *Results and Discussion.* As the pterygium grew towards the optic part of the cornea, astigmatism increased and a decrease in visual functions was noted. Due to destructive changes and fibrovascular tissue at the site of growth, the sphericity of the cornea was disrupted, which in turn caused astigmatism, reducing visual acuity.

Keywords Pterygium, Xenoplasty, Refraction, Astigmatism, Visual acuity

1. Introduction

In recent years, in the Republic of Uzbekistan, particularly in the southern regions, the number of patients with pterygium has been increasing. Due to the desiccation of the Aral Sea and the frequent occurrence of dust storms, constant exposure to solar radiation provokes the growth of pterygium and aggravates its course, often leading to visual impairment [5].

According to various sources, the incidence of pterygium ranks fifth among eye diseases in countries with hot climates. When the pterygium extends to the optical zone of the cornea, visual functions decrease sharply due to astigmatism and dystrophic changes in the deeper layers of the cornea [4].

Therefore, the problem of pterygium remains highly relevant and continues to stimulate further in-depth research [1]. With the progression of pterygium, the main complications, apart from cosmetic defects, include impairment of visual functions and, in severe cases, a marked reduction in visual acuity. For this reason, a detailed assessment of visual functions is considered one of the key criteria in determining whether surgical or conservative treatment should be selected for pterygium [6,7,8].

From 1950 to 2008, continuous scientific studies have been conducted to investigate the problem of pterygium. This is evidenced by the research carried out by regional scientists and neighbouring researchers, including Bushueva N.N. in the Kurgan-Tyube region of Tajikistan, Ismailov B.I. (1978), Saliev M.S. (1969) in the Samarkand region of Uzbekistan, Karanov K.S. (1976) in Turkmenistan, and Medvedev M.A. (1998) in Kyrgyzstan. Their studies were mainly aimed at investigating the aetiology and pathogenesis of pterygium as well as preventing its recurrence. One of the most recent works by Bilolov E.N. (2008, Uzbekistan) was devoted to analysing the biochemical composition of tear fluid in pterygium and the histological structure of excised pterygium tissue [1].

Aim of the Study

To evaluate visual functions in patients with pterygium at different stages of development before and after xenoplasty.

Research Objectives

To determine the functional condition of the eye at different stages of pterygium development.

2. Materials and Methods

The study included 34 cases of pterygium with varying degrees of progression. The age of the patients ranged from 32 to 54 years. Among them, 15 were men and 19 were women.

All examined cases were divided into three groups:

- Grade II pterygium – 10 cases;
- Grade III pterygium – 11 eyes;
- Grade IV–V pterygium – 13 cases.

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All patients underwent biomicroscopy. A detailed examination of the nasal segment of the cornea, the limbus, and the bulbar conjunctiva was performed. Particular attention was paid to the configuration of the pterygium head, the presence and severity of the avascular zone within the head of the pterygium, its localisation, and the degree of pterygium growth towards the pupillary margin of the cornea.

Refraction was also assessed in all patients. Emmetropia was observed in 3 patients (5 eyes). Hypermetropic astigmatism ranging from 1.5 to 3.0 dioptres was detected in 21 patients.

3. Results and Discussion

In all 34 cases of pterygium with stage II–V progression, astigmatism of varying degrees was detected, predominantly of hypermetropic and mixed types. As the pterygium progressed and astigmatism developed, accompanied by dystrophic changes in the layers of the cornea, a decrease in visual acuity was observed, ranging from 0.04 to 0.7.

From the presented table, it can be observed that astigmatism in all cases was of a hypermetropic nature. In grade II pterygium, hypermetropic astigmatism was within the range of approximately 0.5 dioptres. In grade III pterygium, astigmatism increased to about 1.5 dioptres of hypermetropia.

With the progression of pterygium to grades IV and V, astigmatism advanced to approximately 3.0 dioptres and significantly reduced visual acuity. Patients strongly experienced a marked decrease in vision and blurred vision.

This phenomenon can be explained by the deep penetration of fibrovascular tissue not only into the superficial epithelium of the cornea but also into the deeper layers of the Bowman's membrane. These fibrovascular formations not only caused pronounced astigmatism but also led to severe, and in some cases irreversible, dystrophic changes not only in the superficial structures of the cornea but also in its deeper layers.

In such cases, surgical intervention produced only a minimal effect, and visual functions were not fully restored, as corneal opacification had already developed and required keratoplastic intervention.

Table 1. Refraction Before and After Xenoplasty

No.	Degree of Pterygium Development	Astigmatism Before Xenoplasty	Astigmatism After Xenoplasty	Total (abs.)	%
1	Grade II pterygium (10 eyes)	0.5 ±0.2–1.0 D hypermetropia	No astigmatism	10	29.4%
2	Grade III pterygium (12 eyes)	1.5 ±0.1 D hypermetropic horizontal astigmatism	No astigmatism	12	35.2%
3	Grade IV–V pterygium (12 eyes)	3.0 ±0.1 D	No astigmatism	12	35.2%

Differences compared with the indicators of healthy individuals are statistically significant ($P < 0.05$).

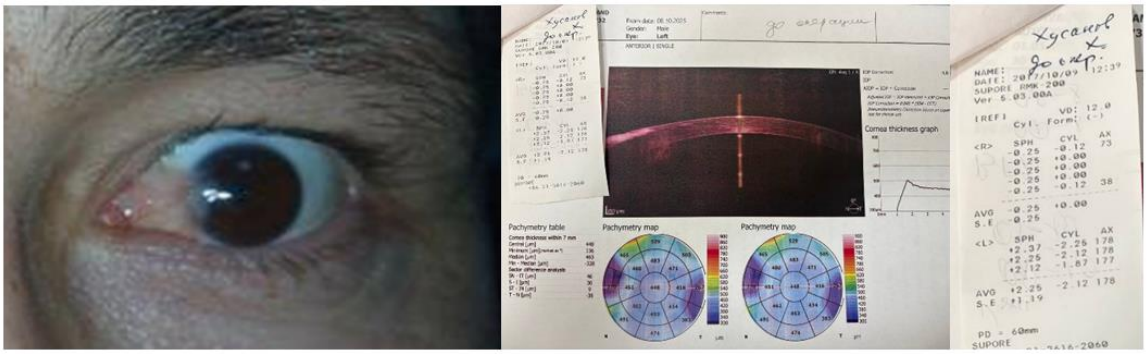

Figure 1. **A.** Grade III pterygium before surgery. **B.** Refraction showing astigmatism of +2.0 D before surgery; uncorrected visual acuity 0.5

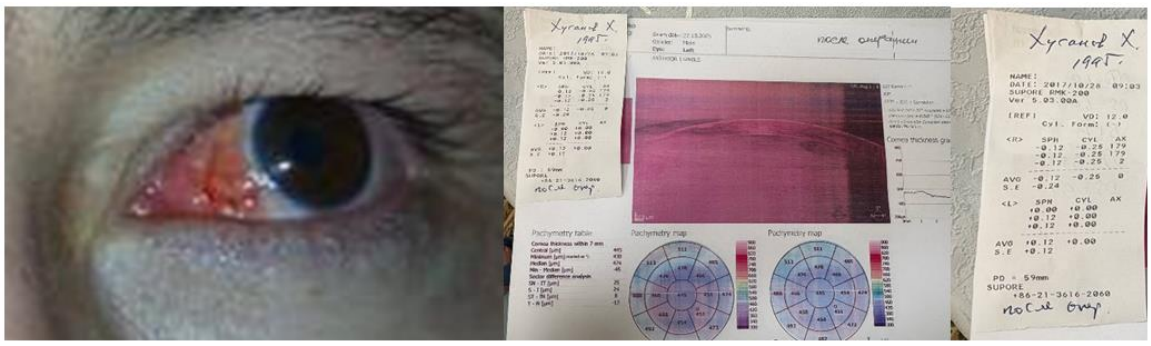

Figure 2. **A.** The same patient after surgery. **B.** Refraction shows emmetropia; visual acuity 1.0

Table 2. Visual Functions Before and After Xenoplasty

No.	Degree of Pterygium Development	Visual Acuity (Before)	Visual Acuity (After)	Visual Field (Before)	Visual Field (After)	Total (eyes)	%
1	Grade II pterygium (10 eyes)	0.8 ±0.05	1.0 ±0.05	No change	No change	10	22.8%
2	Grade III pterygium (12 eyes)	0.4 ±0.04	0.9 ±0.04	Nasal side narrowed 10 ±1 °	Normalised	12	30.4%
3	Grade IV–V pterygium (14 eyes)	0.08 ±0.1	0.8 ±0.1	Nasal side narrowed 20 ±0.1 °	Normalised	14	35.2%

**Differences compared with healthy individuals are statistically significant (P < 0.05).*

From the presented table, it can be seen that visual acuity began to decrease in patients with grade III, IV, and V pterygium. A marked reduction in visual acuity was observed in grades IV and V, when the fibrovascular tissue deeply penetrated the corneal layers and obscured the optical zones of the pupil. The visual field on the nasal side began to narrow: by approximately 10 °in grade III pterygium and up to 20 °in grades IV–V pterygium.

4. Conclusions

In the advanced stages of pterygium, deep penetration into the corneal layers leads to destructive changes, and the growth of fibrovascular tissue significantly disrupts the sphericity of the cornea, which in turn induces astigmatism. Astigmatism is most often hypermetropic or mixed in nature. This is explained by traction exerted by fibrovascular tissue from the epithelium to the deeper layers of Bowman's membrane.

As the pterygium progresses, astigmatism intensifies, further reducing visual acuity. Specifically, in grade II pterygium, hypermetropic astigmatism averaged ±0.5 D; in grade III, it was ±1.5 D; and in grades IV–V, it reached ±3.0 D. In the postoperative period, astigmatism was eliminated in all studied groups. Visual acuity, which had decreased to between ±0.08 and ±0.8 before surgery, improved to between ±0.8 and ±1.0 after surgery. The visual field on the nasal side, which was narrowed by approximately 10–20 °in grade III and IV–V pterygium, returned to normal limits postoperatively.

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