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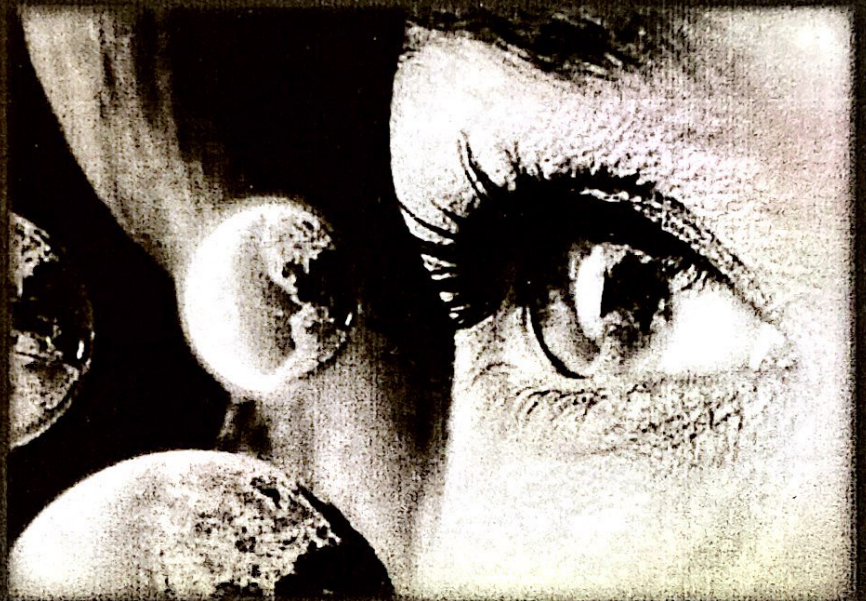
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ИСТОРИЯ И РАЗВИТИЕ НА СПИСАНИЕ БЪЛГАРСКИ ОФТАЛМОЛОГИЧЕН ПРЕГЛЕД  
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ИЗДАНИЕ НА БЪЛГАРСКОТО ДРУЖЕСТВО ПО ОФТАЛМОЛОГИЯ  
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## РАЗМЕР НА ПТЕРИГИУМА И РЕФРАКТИВЕН КОРНЕАЛЕН АСТИГМАТИЗЪМ

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### Pterygium size and refractive corneal astigmatism

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#### Резюме

**Цел:** Да се определи зависимостта на астигматичните промени във връзка с големината на първичен птеригиум, както и да се определи точното време за оперативно лечение преди да са се появили значителни астигматични промени.

**Материали и методи:** Анализирани са: зрителната острота, корнеален астигматизъм и рефракция на 60 очи на 60 възрастни пациента с първичен птеригиум преди и след хирургично лечение.

Тези 60 пациента бяха разделени в две групи в зависимост от разрастването на птеригиума върху роговицата измерено от лимба към върха на роговицата чрез „шпалта“ на High Streit 900 биомикроскоп.

Група 1 – 30 пациента: статичен птеригиум. Птеригиум с дължина под 3.0 мм измерен от лимба към върха на роговицата

Група 2 – 30 пациента: прогрессиращ птеригиум. Птеригиум от 3.0 мм и повече измерен от лимба към върха на роговицата.

Птеригиумите бяха оперирани чрез метода на ексцизия и конюнктивална автотрансплантация чрез графт от долно-темпоралната булбарна конюнктива.

**Резултати:** Значимо по-високият астигматизъм се свързва с групата от пациенти с птеригиум с дължина над 3 мм и повече (прогресиращ птеригиум), в сравнение с другата група от пациенти с дължина на птеригиума по-малка от 3мм (статичен птеригиум) ( $p < 0.01$ ). При следоперативното наблюдение зрителната острота показва подобрение и в двете групи пациенти. При следоперативното наблюдение астигматизмът показва спад и в двете групи на птеригиума. Подобряване на зрителната острота, т.е. намаляване на астигматизма е валидна индикация за хирургична ексцизия.

**Заключение:** Успешното хирургично лечение на птеригиум значително намалява топографски установения астигматизъм и оплоскостяването на роговицата. Всичко това предполага ранна хирургична намеса, при птеригиум по-дълъг от 1.0 мм измерен от лимба към върха на роговицата. Птеригиум с дължина от 3.00 мм или повече е препоръчителен за хирургия без отлагане.

**Ключови думи:** Птеригиум, астигматизъм, конюнктивална автотрансплантация

#### Abstract

**Aims:** To determine the association of the astigmatic changes connected to the size of the primary pterygium, as well as to determine the right time for surgery before any significant astigmatic changes occur.

**Materials and methods:** The visual acuity, corneal astigmatism and refraction on 60 eyes of 60 adult patients with primary pterygium were analyzed before and after the surgery. These 60 patients were grouped in two equal groups depending on the pterygium's overgrowth of the cornea that was measured from the limbus to the apex cornea with the beam of High Streit 900 slit-lamp:

Group 1 - 30 patients: stationary pterygium. Pterygium length less than 3,00 mm from the limbus to the apex

of the cornea.

Group 2 - 30 patients: progressive pterygium. Pterygium length of 3,00 mm and more from the limbus to the apex of the cornea.

The patients' pterygium was operated with the excision and conjunctival autotransplantation method using the graft from the inferior-temporal bulbar conjunctiva.

**Results:** Significantly higher astigmatismus was related to the group of patients with pterygium length of 3,00 mm or more (progressive pterygium), compared to the other group of patients with pterygium length less than 3,00 mm. (stationary pterygium) ( $p < 0.01$ ). The postoperative observation of the visual acuity showed improvement in both groups of patients. The postoperative observation of the astigmatism showed decrease in both groups of pterygium. The visual acuity improvement, i.e. reduction of astigmatism is a valid indication for surgical pterygium excision.

**Conclusion:** Successful pterygium surgery significantly reduces topographic astigmatisms and corneal flattening. All this suggests early surgical intervention, when pterygium is more than 1,0mm in length measured from the limbus to the apex cornea. Pterigium with or exceeding 3,00 mm of length should be considered for urgent surgery.

**Key Words:** Pterygium, astigmatism, conjunctival autotransplantation procedures

### Introduction.

Pterygium is an ocular disease with a multifactorial etiology having prevalence rates' range from 0,7% to 31% in different countries around the world. However, this condition is more common in warm, dry climates. It has been considered in theory, that the local deficiency of limbal stem cells allows the abnormal conjunctival tissue to invade the adjacent corneal.

Pterygium leads to a considerable effect on corneal refractive status which has been previously measured in various studies by refraction<sup>2</sup>, keratometry<sup>3</sup> and corneal topography<sup>4</sup>.

This study examines pre and postoperative visual acuity, corneal astigmatisms and refraction on each patient aiming to determine the association of the astigmatic changes connected to the size of the primary pterygium and to determine the right time for surgery before any significant astigmatic changes occur.

### Material and methods

The visual acuity, corneal astigmatism and refraction on 60 eyes of 60 patients with primary pterygium were analyzed. These 60 patients were

grouped in two equal groups depending on the pterygium's overgrowth of the cornea that was measured from the limbus to the apex cornea with the beam of High Streit 900 slit-lamp:

Group 1 - 30 patients: stationary pterygium. Pterygium length less than 3,00 mm from the limbus to the apex of the cornea.

Group 2 - 30 patients: progressive pterygium. Pterygium length of 3,00 mm and more from the limbus to the apex of the cornea.

The visual acuity before the surgery and 3 months post operatively was compared using Snellen optotips. Also, keratometry was used to measure the corneal astigmatisms before the surgery and 3 months postoperatively.

The patients' pterygium was operated with the excision and conjunctival autotransplantation method using the graft from the inferior-temporal bulbar conjunctiva (Figure 1. and Figure 2).

### Results

The study included 60 eyes with primary pterygium in 60 adult patients. 41 patients (68,3%) had the pterygium on one eye and the other 19 patients (31,6%) had the pterygium on both

eyes. Although this study came across patients with pterygium on both eyes, only one of each patient's eyes was examined for the purposes of this study. In terms of whether pterygium occurs more often on the right (21/41 or 51,2%) or the left eye (20/41 in 48,7%), there is no significant statistical difference.

Most of the observed subjects for this study had nasal localization of the pterygium (57 eyes or 95%). The temporal localization was observed in very small percentage (3 eyes or 5%).

The average age of patients is 57 years with a standard deviation (SD) of min 18 years - max 22 years. From the total number of patients (60), 32 patients were male (53,3%), and 28 patients were female (46,6%). In the group of patients with progressive pterygium, men/female ratio was 20/10 or 66,6% versus 33,3%. In the group of patients with stationary pterygium, male/female ratio was 19/11 or 63,3% versus 36,6%. There is no significant statistical difference regarding sex between the groups ( $p > 0.05$ ).

The average time of postoperative monitoring was 12 months with SD ( $\pm 3.27$ ) in both pterygium groups. There is no statistically significant difference ( $p > 0.05$ ) in the postoperative monitoring period of the two groups of patients (table 1).

Significantly higher astigmatism was related with the group of patients with pterygium length of 3,00 mm or more (progressive pterygium), compared to the other group of patients with pterygium length less than 3,00 mm. (stationary pterygium) ( $p < 0.01$ )

The postoperative observation of corrected visual acuity showed improvement in both groups of pterygium. Namely, improvement was observed among 80% of the patients in the group with progressive pterygium (group 2), i.e. from 1 to 5 lines of Snellen optotips. The rest of the patients from this group (20%) showed no improvement at all. (Table 2 and Chart 2)

In the group with stationary pterygium (group

1), improvement was observed among 76,6% of the patients, i.e. from 1 to 4 lines of Snellen optotips. No improvement was observed among 23,3% of the patients in this group (Table 3 and chart 3).

The postoperative observation of the astigmatism showed decrease in both groups of pterygium. Namely, decrease was observed among 83,3% of the patients in the group with progressive pterygium (group 2), while 16,6% of the patients showed no decrease at all.

In the group with stationary pterygium (group 1), decrease of astigmatism was observed among 85% of the patients, while no decrease was observed among the rest 15% of patients (Table 4 and Chart 4).

In group 1, the postoperative decrease of astigmatism, in diopter was 18% -0,5 diopter, 31,8% -1,0 diopter, 9,0% -1,5 diopter, 22,7% -2,0 diopter, 9,0% -2,5 diopter, 9,0% -3,0 diopter. In group 2, the postoperative decrease of astigmatism, in diopter was 24% -0,5 diopter, 12% -1,0 diopter, 12% -1,5 diopter, 28% -2,0 diopter, 12% -2,5, 12% -3 diopter. (Table 5 and Chart 5)

### Discussion

A pterygium may reduce the visual acuity because of blurring and overlapping the visual axis or by direct astigmatism, caused by distortion of cornea and its flattening. Flattening of the cornea was seen in the horizontal meridian, which was associated with astigmatism. The exact mechanism of flattening is not clear. It is thought to be caused by the formation of tear meniscus between the corneal apex and the elevated pterygium.

The pterygium significantly influence the visual acuity and corneal refraction including spherical power, astigmatism, asymmetry and irregularity with the larger pterygium exerting the greater influence. Increasing distance of the pterygium head from the limbus results

in increased amount and irregularity of preoperatively induced corneal astigmatism. When the primary pterygium occupies 1.0 mm. and more of the limbus to the apex cornea, it causes a direct, substantial astigmatism at list of (1.0 dioptre). When pterigium covers more than 45% of corneal radius, or 3.2 mm from visual axis, it causes a high degree of direct or induced irregular astigmatism<sup>6</sup>. Tomidokoro et al. evaluated the percentage extension of pterygium on cornea and found larger pterygia to adversely affect astigmatism, asymmetry and irregularity of the cornea<sup>7</sup>.

Our results show that topographic astigmatism tends to decryes, after a successful excision of pterygium with graft autotransplantation from the inferior-temporal bulbar conjunctiva. Corneal topographic changes caused by the pterygium are almost reversible after surgical treatment.

The latest time Lynn and Stern, confirmed this observation, noting that all the visual and topographic results are significantly improved after the successful excision of the pterigium<sup>8</sup>. They reported that since all of the visual and topographic indices were significantly improved by successful surgery, this improvement is a valid indication for surgical excision of the pterygium. They concluded that surgery should be considered when the pterygium begins to induce significant degrees of hemi astigmatism<sup>8</sup>.

The visual acuity improvement, i.e. reduction of astigmatism is a valid indication for surgical pterygium excision. On other hand, significant degree of hemi astigmatism is indication for urgent surgical removal of pterigium.

The results of our study indicate that significant astigmatism is induced by pterygium of more than 1mm from the limbus. Significantly higher astigmatismus was related with the group of patients with pterygium length of 3,00 mm or more (progressive pterygium), compared to the other group of patients with pterygium length less then 3,00 mm.(stationary pterigium) ( $p < 0.01$ )

Increased astigmatism in patients with pterygium caused a decrease in visual acuity. Therefore, early surgical intervention in pterygium may be indicated when the size of the lesion is more than 1.0 mm from the limbus (stationary pterygium).Pterygia exceeding 3.0 mm of length (progressive pterygium) should be considered within the urgent surgery to prevent significant corneal astigmatism changes.

### Conclusion

Successful pterygium surgery significantly reduces topographic astigmatisms and corneal flattening. All this suggests early surgical intervention, when pterigium is more than 1.0 mm. in length measured from the limbus to the apex cornea.

Pterygia exceeding 3.0 mm of length should be considered within the urgent surgery.

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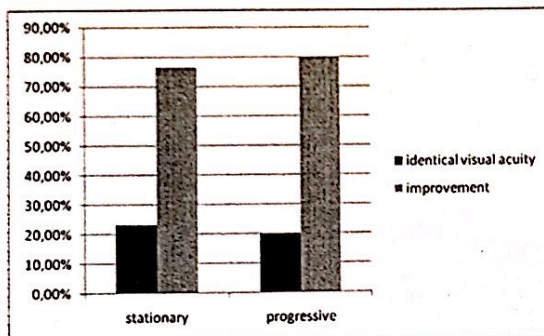
**Table 1. Characteristics of operated patients**

Characteristics		pterygium ≥3mm	pterygium <3mm
Age	average age	55	59
	range	37-77	39-79
Gender	male	19	20
	female	11	10
Postop. Monitoring	months	11	13

**Table 2. Postoperative visual acuity**

	Postoperative visual acuity	
	primary pterygium	
	stationary	progressive
identical visual acuity	23,30%	20%
improvement	76,60%	80%

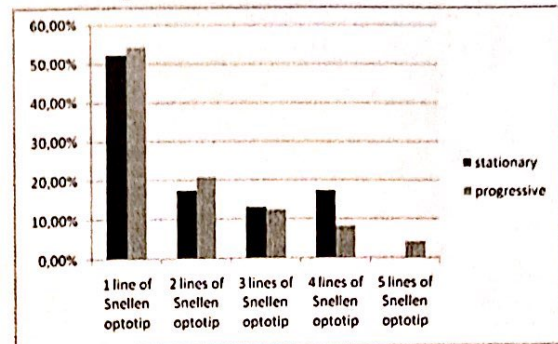
**Chart 2. Postoperative visual acuity**



**Table 3. Postoperative improvement of the visual acuity**

	Postoperative improvement of the visual acuity	
	primary pterygium	
	stationary	progressive
1 line of Snellen optotip	52,20%	54,20%
2 lines of Snellen optotip	17,40%	20,80%
3 lines of Snellen optotip	13,04%	12,50%
4 lines of Snellen optotip	17,30%	8,30%
5 lines of Snellen optotip	0	4,20%

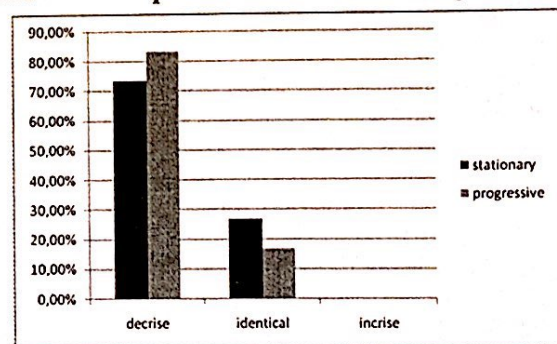
**Chart 3. Postoperative improvement of the visual acuity**



**Table 4. Postoperative decrease of astigmatism**

	Postoperative decrease of astigmatism	
	primary pterygium	
	stationary	progressive
decrease	73,30%	83,30%
identical	26,60%	16,60%
increase	0	0

**Chart 4. Postoperative decrease of astigmatism**



**Table 5. Postoperative decrease of astigmatism in diopter**

	Postoperative decrease of astigmatism in diopter	
	primary pterygium	
	stationary	progressive
0,5 diopter	18,00%	24%
1,0 diopter	31,80%	12%
1,5 diopter	9,00%	12%
2,0 diopter	22,70%	28%
2,5 diopter	9,00%	12%
3,0 diopter	9,00%	12%

Charter 5. Postoperative decrease of astigmatism in diopter

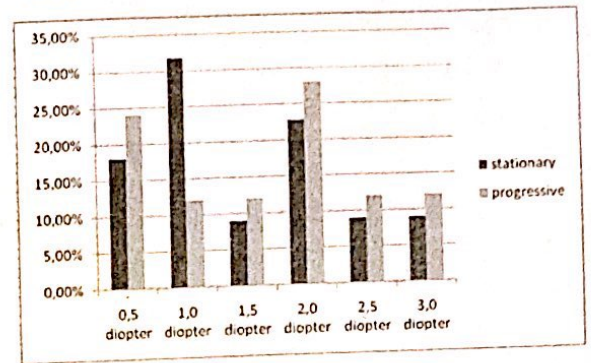


Figure 1. and Figure 2. A schematic illustration and a picture of pterigium excision and conjunctival autotransplantation with graft from inferior-temporal bulbar conjunctiva

Figure 1.

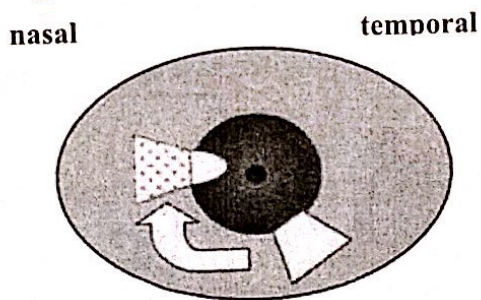


Figure 2.

