



EVALUATION OF PTERYGIUM INDUCED ASTIGMATISM AND ITS OUTCOME FOLLOWING PTERYGIUM EXCISION

Ophthalmology

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ABSTRACT

Pterygium is a common growth of ocular surface which is characterized by chronic inflammation, enhanced angiogenesis, and proliferative activity. Age, gender, and UV radiation exposure are the various risk factors for pterygium. In the present study the relationship between pterygium and astigmatism was evaluated. Outcomes after the excision of pterygium were also evaluated. This was a prospective observational study conducted at BRD Medical College, Gorakhpur, for a period of one year with a sample size of 90 patients. Conjunctival autograft excision was performed on all patients. They were examined before and after the pterygium excision procedure. Results of the present study showed that most cases of pterygium occurred in individuals aged between 30 and 40 years (83.3%), and males (54%) were slightly more affected than females (46%). The degree of astigmatism was found to increase significantly with both pterygium length and width ($p < 0.05$). A statistically significant reduction in both mean corneal and subjective astigmatism was noted postoperatively ($p < 0.002$). Improvement in visual acuity was recorded in 25% of patients. It was observed that large size of pterygia were associated with greater corneal astigmatism. The study concluded that pterygium excision with conjunctival autograft reduces astigmatic distortion and enhances visual function.

KEYWORDS

Astigmatism, Keratometry, Pterygium, Refraction

INTRODUCTION

Pterygium is a common growth of ocular surface which is characterized by chronic inflammation, enhanced angiogenesis, and proliferative activity. This results in structural remodeling of the affected tissue [1]. In the Indian subcontinent, pterygium is a degenerative disease that is quite common. Pterygium surgery is indicated when- the pterygium invades or threatens the visual axis, astigmatism causes visual impairment, irritative symptoms and inflammation, mobility is limited and cosmesis occurs [2,3].

In recent years, a number of novel approaches to treating ocular pterygium have been developed and put into practice. Management for primary and recurrent pterygium is most commonly performed by excision and adjunctive therapy with mitomycin C or conjunctival autograft [4]. Although the pathophysiology of pterygia, a frequent conjunctival degeneration, is unknown, the risk factors are well established. A greater awareness of the pathophysiology of pterygium may result in better surgical results and a lower rate of postoperative recurrence [5]. Higher-order aberrations, astigmatism, and corneal deformation are caused by pterygium, an aberrant development of fibrous conjunctival tissue which penetrates the cornea [6].

A refractive disorder that is frequently seen in the clinical practice is astigmatism [7]. The variation in the eye's refractive strength along various meridians results in astigmatism. The prevalence of astigmatism varies with age in various populations. It alters how emmetropization occurs [8]. It is one of the most prevalent refractive defects treated in clinical ophthalmology. The substantial functional and visual effects of astigmatism highlight how crucial it is to have reliable professional treatment [9].

Assessing the length and vascularity of pterygium affecting the cornea allows for the prediction of pterygium-induced astigmatism [10]. The present research was conducted with the aim of evaluating the relationship between pterygium's size and astigmatism, and to evaluate how surgical removal influences visual acuity and the characteristics of astigmatic alteration.

MATERIAL AND METHODS

Study Design And Sample Size

Present study was a prospective observational study, which was carried out at BRD Medical College, Gorakhpur, for a period of one year extending from March 1, 2024, to February 28, 2025. It includes the sample size of 90 patients.

Inclusion Criteria

- Participants of either sex aged between 20 to 70 years.
- Clinically confirmed true pterygium extending to or beyond the limbus.

Exclusion Criteria

- Past intraocular surgical history or history of ocular trauma injuries.
- There is noticeable corneal opacity.
- Individuals who squint.
- Cases of temporal pterygium or double-headed pterygium.
- Patients whose conjunctival-limbal grafting is not practical due to prior eye procedures.
- Pterygium obstructs the visual axis, making keratometric evaluation impossible.
- Individuals having a history of autoimmune disorders or scleritis.
- Recurrent pterygium cases or inflammatory pterygium cases.

The study received board of research review and institutional ethical approval. The goals of the study were explained to each participant, and formal informed permission was obtained. Information on detailed histories of patients including presenting symptoms, duration, previous treatments, occupation, and socioeconomic status were obtained. Comprehensive eye evaluation was also conducted which included slit-lamp examination for the assessment of pterygium site, size, and type, along with BCVA, keratometry, and refraction. Preoperative tests i.e., CBC, coagulation profile, blood sugar, HIV, and HBsAg were performed on the patients.

Surgical excision of Pterygium was done using the conjunctival autograft technique. The lesion was carefully removed, and a superior conjunctival graft was sutured with 10-0 Ethilon. Post-operatively, antibiotic ointment was applied, and the eye was bandaged for 24 hours. Follow-up after 6-8 weeks included keratometry and refraction to assess residual astigmatism.

Data Analysis

Data was analyzed to find out the relation between the size of pterygium and induced astigmatism by using SPSS version 26.0, applying Chi-square and Fisher's exact tests to determine the level of significance. Analysis of postoperative astigmatic changes, and visual improvement was also done. P-value < 0.05 was considered statistically significant.

RESULTS

In the present study, pterygium occurred predominantly among middle-aged individuals (30-50 years), accounting for 83.3% of cases. Males (54%) were slightly more affected than females (46%). The condition was observed more frequently in urban areas (56.6%) and among low-income groups (49.3%). Occupationally, 56.6% were outdoor workers, 33.3% had indoor exposure, and 10% had minimal exposure. A foreign-body sensation was experienced by 53.4% of the participants.

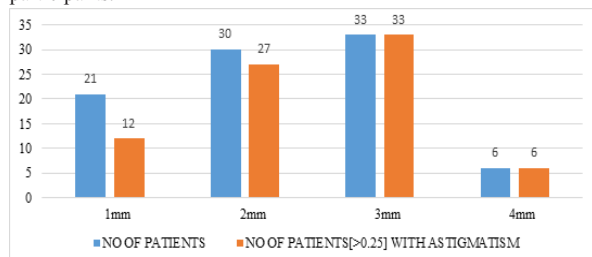


Figure 1: Relation Of Pterygium Length With Corneal Astigmatism

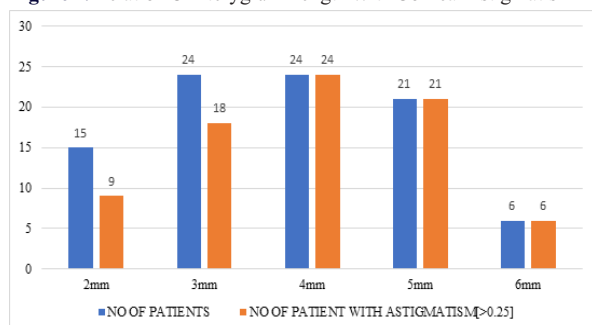


Figure 2: Relation Of Pterygium Width With Corneal Astigmatism

Among patients, 57% with 1 mm, 90% with 2 mm, and 100% with 3 mm and 4 mm pterygium showed astigmatism, indicating increasing astigmatism with greater pterygium length (Fig. 1). The relationship between length and induced astigmatism was statistically significant (p value < 0.05). Astigmatism (>0.25 D) was present in 60% of patients with 2 mm, 75% with 3 mm, and 100% of those with 4 mm, 5 mm, and 6 mm wide pterygium (Fig. 2). A statistically significant relationship exists between width and induced astigmatism (p value < 0.05).

Table 1: Relation Of Pterygium Length And Width With Amount Of Astigmatism

Length of Pterygium	Mean Corneal Astigmatism [D]	Mean subjective Astigmatism [D]	Width of Pterygium	Mean Corneal Astigmatism [D]	Mean subjective Astigmatism [D]
1mm	0.53	0.21	2mm	0.60	0.30
2mm	1.20	0.92	3mm	1.53	0.50
3mm	1.59	1.04	4mm	1.59	1.43
4mm	3.50	2.75	5mm	1.69	1.78
-	-	-	6mm	3.25	2.88

Table 2: Axis Of Astigmatism (Pre and post-operative)

Axis of Astigmatism	Pre-operative		Post-operative	
	No. of patients with subjective >0.25 D Astigmatism	%	No. of patients with subjective Astigmatism >0.25]	%
With the rule	48	53.3	39	43.3
Against the rule	18	20	24	26.6
Oblique	12	13.3	12	13.3
No astigmatism	12	13.3	15	16.6

An increase in pterygium length and width corresponded with higher mean corneal and subjective astigmatism. Corneal astigmatism rose from 0.53 D at 1 mm to 3.50 D at 4 mm length and 3.25 D at 6 mm width, showing significant increase (p value < .001) (Table 1). Preoperatively, 53.3% had with-the-rule, 20% against-the-rule, and 13.3% oblique astigmatism. Postoperatively, with-the-rule reduced to 43.3%, against-the-rule rose to 26.6%, and 16.6% showed no astigmatism (Table 2).

Keratometric analysis showed 86.7% of patients had K1 (vertical axis) greater than K2 (horizontal axis), while 13.3% had K2 greater than K1. Post-operative results showed mean corneal and subjective astigmatism increased with pterygium length, from 0.17 D at 1 mm to 1.00 D and 1.25 D at 4 mm. As the width of the pterygium increased, both mean corneal and subjective astigmatism showed a progressive rise, from 0.30 D and 0.20 D at 2 mm to 1.125 D at 6 mm.

Table 3: Post-operative Reduction In Astigmatism And Its Correlation With Length And Width Of Pterygium

Length	Mean corneal reduction in Astigmatism	%	Mean subjective reduction in Astigmatism	%	Width	Mean corneal reduction in Astigmatism	%	Mean subjective reduction in Astigmatism	%
1mm	0.36	67.91	0.07	33.3	2mm	0.30	50	0.10	33
2mm	0.50	41	0.47	51	3mm	1.03	67.3	0.16	32
3mm	0.66	41.5	0.18	17	4mm	0.21	57.2	0.84	58
4mm	2.50	71.4	1.5	54.5	5mm	0.52	30.07	0.75	42.1
-	-	-	-	-	6mm	2.13	65.5	1.76	61.1

A significant post-operative reduction in both mean corneal and subjective astigmatism (p < 0.002) was noted (Table 3). Post-operative acceptable astigmatism was highest in patients with smaller pterygium width and length. All patients with 2 mm width or 1 mm length achieved 100% acceptable astigmatism, while success rate decreased gradually with increasing size, reaching 0% in larger pterygia. Post-operatively, vision improved in 25% of patients, while 75% showed no change, and none experienced decreased visual outcomes.

DISCUSSION

Pterygium is characterized as a wing-shaped fibrovascular proliferation of the conjunctival tissue extending onto the cornea, often resulting in optical axis obstruction, astigmatism-induced reduction in visual acuity, and aesthetic concerns [11,12]. In the current study, the condition was found predominantly among middle-aged adults (30-50 years), accounting for 83.3% of the cases, with a slightly higher prevalence in males (54%) than in females (46%).

The length, breadth, and area of the pterygium might be used to anticipate the changes in optical characteristics that are linked with it [6]. The study by Maheshwari (2003) [3] confirms that the quantity of induced astigmatism grows directly proportional to the size of the pterygium. A similar trend was observed in the present study among the patients where 57% with 1 mm, 90% with 2 mm, and 100% with 3 mm and 4 mm pterygium showed astigmatism. This indicates increasing astigmatism with increase in pterygium length. Comparable outcomes were reported by Han et al. (2016) [10], higher pterygium-induced astigmatism was linked to longer lengths and higher vascularity. The size and vascularity of pterygium affecting the cornea can be used to predict pterygium-induced astigmatism. Surgery is recommended once the pterygium surpasses 2.2 mm in extension, 5 mm in width, or 6.25 mm² in total area. Research of Garg et al. (2019) [13], confirms that as the size of the pterygium rises, so does the degree of induced astigmatism. Surgical excision can considerably improve astigmatism caused by pterygium. Additionally, this leads to an improvement in visual acuity. According to the various pterygium surgery types i.e., bare sclera, amniotic membrane graft, and conjunctival autograft techniques there was a notable decrease in corneal astigmatism. In order to improve visual results and avoid long-term corneal deformation, early surgical intervention is essential when a pterygium grows on the cornea by more than 2 mm [14].

The effect of pterygium on refractive astigmatism and visual quality has been well documented. Excision of the pterygium significantly decreased corneal astigmatism [15]. Jain & Pandey (2020) [16] and Yadav et al. (2025) [17], also reported that there is improvement when an autologous conjunctival graft used for pterygium. In the present study, a statistically significant (p < 0.002) reduction in mean corneal and subjective astigmatism was observed. This correlates positively with both length and width of pterygium. There was a notable decrease in astigmatism following pterygium excision. This results in enhancement of visual acuity. For the purpose of lowering the astigmatism, surgical methods like amniotic membrane graft and

conjunctival autograft are superior [13]. According to the results of the present study, visual acuity improved in 25% of the cases, 75% of the patients show no change, and no postoperative visual deterioration occurred. By reducing corneal deformation and restoring corneal topography, surgical excision lessens the functional and cosmetic burden of pterygium while simultaneously improving visual acuity [14].

CONCLUSION

Present study recorded a statistically significant relationship between length and width with induced astigmatism. An increase in pterygium length and width corresponded with higher mean corneal and subjective astigmatism. A significant post-operative reduction in both mean corneal and subjective astigmatism ($p < 0.002$) was noted. It is recommend from the present study that early surgical intervention prevents progressive corneal distortion, restore normal curvature, and can enhance visual acuity.

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