

Improvement of Astigmatism after Pterygium Surgery: A Hospital based Prospective Study

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Abstract:

Background: Visual impairment is frequently caused by a refractive shift brought on by a pterygium. There is a direct relationship between the size of pterygium on the cornea and the astigmatic effect. Surgery is the major treatment for pterygium. This study aimed to assess the improvement of astigmatism after pterygium surgery.

Material and Method: 50 eyes from 50 patients who underwent pterygium excision and autologous conjunctival graft throughout a 6-month period were included in this hospital-based prospective study. Surgeries were done by single surgeon. All patients were assessed with regular post op examination on day 1, day 7, 15th day, 1 Month Special Emphasis on uncorrected and best corrected visual acuity, corneal astigmatism (comparison), any granuloma formation were considered during the thorough ocular examination. The corneal astigmatism was measured using keratometer.

Results: The mean UCVA (uncorrected visual acuity) logMar was improved from 0.70 ± 0.25 (preoperative) to 0.50 ± 0.35 ($p = 0.005$) at the 3rd months after surgery. The mean logMar BCVA (best corrected visual acuity) was also improved from 0.35 ± 0.25 to 0.01 ± 0.05 ($p < 0.0001$).

Conclusion: Astigmatism increases with the grade of Pterygium and considerably decreases with pterygium surgery.

Key word: Astigmatism, Pterygium, Induced Astigmatism, Pterygium Surgery, Conjunctival autografting, Visual Acuity.

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Introduction

Pterygium represents as a wing-shaped fibrovascular proliferation of the bulbar conjunctiva, which encroaches onto the cornea¹. It is located in the interpalpebral area, the nasal part of the bulbar conjunctiva is more affected than temporal part. It may occur in both sides actively (Double pterygium)². Both eyes are frequently involved but often asymmetrically. At times 4 pterygia may be present in an individual. Nasal part of bulbar conjunctiva is more affected because, it is more exposed to direct irritation than the temporal conjunctiva, the normal flow of tears is from temporal to nasal side towards puncti and carries dust particles of the conjunctival sac and accumulates it on sulcus lacrimalis, these concentrated dust particles may cause greater irritation of nasal conjunctiva, greater exposure of nasal interpalpebral conjunctiva to ultraviolet radiation², greater bowing of lateral 2/3rd of upper lid and consequent protection by longer lashes, greater curvature of nasal fibers of Orbicularis oculi

causing a greater squeezing effect upon nasal subconjunctival tissue (Sugar 1949) and presence of two anterior ciliary arteries on nasal side and only one on temporal side. It is also considered due to this fact that any irritant shall lead to greater hyperemia on the nasal side and may play an important role in production of nasal pterygium. Its occurrence is strongly correlated with ultraviolet-exposure, conjunctival dryness, inflammation and exposure to dust, wind and many other irritants. It may occur double sides actively, the isolated temporal pterygia are rare³. Pterygia are mostly preceded by pinguecula⁴. Pterygium causes ocular surface discomfort, inflammation, a feeling of a foreign body sensation, and aesthetic issues⁵. Due to induced astigmatism or direct invasion of the pupillary area and visual axis, it impairs the vision. Visual impairment is frequently caused by a refractive shift brought on by a pterygium⁶. There is a direct relationship between the size of pterygium on the cornea and the astigmatic effect⁷. These changes are localized and cannot be measured

accurately either by keratometry or refraction. Pterygium impairs visual function by altering refractive as well as ocular surface characteristics⁸. Wavefront aberrations in the cornea have also known to be significantly increased⁹. Astigmatism based on the meridian, it can be with the rule, against the rule, oblique and bi-oblique astigmatism and it can also be subdivided as simple, compound, and mixed. Astigmatism symptoms may include blurry vision or areas of distorted vision, eyestrain, headache, squinting to try to see clearly and eye discomfort¹⁰.

Surgery is the major treatment for pterygium and the propensity for recurrence is the primary issue with its surgery¹¹. Several techniques have been advocated for the excision of a pterygium: bare sclera, conjunctival flaps, free conjunctival graft, and labial mucous membrane graft¹². Conjunctival autografting after pterygium excision is the gold standard treatment since it has a low recurrence and complication rate¹³. Conservative treatment could be adopted for temporary relief of symptoms such as the use artificial tears or lubricants and topical anti-inflammatory agents³.

Numerous studies have investigated the effect of different sizes of pterygium on corneal refractive status measured by refraction, keratometry, and corneal topography. These studies revealed that larger sizes of pterygium have stronger correlations with corneal astigmatism¹⁴. In multiple studies, the surgical technique used for primary pterygium removal is proven as an important risk factor for pterygium recurrence. Simple bare sclera resection alone has the highest rate of recurrence and was associated with 6 times higher odds of pterygium recurrence^{15,16}.

There is no known recent study in India which has quantified the improvement of astigmatism after Pterygium surgery. Our study aimed to assess the improvement of astigmatism after pterygium surgery.

Material and Method

- **Settings:** All the examination was conducted at the Department of Ophthalmology in Shalinitai Meghe Hospital & Research Center, Wanadongri, Nagpur.
- **Research Design:** Prospective interventional study.
- **Duration :** 6 months
- **Sample Size :** A total of 50 eyes of 50 patients of primary pterygium undergoing surgery were enrolled in this study.

- The study was adhered to the tenets of the declaration of Helsinki, and it was approved by the institutional ethics committee of SMHRC.
- Informed consent will be obtained from all subjects after the nature and possible consequences of the study is explained to them.

Inclusion criteria:

1. Age more than 18 years.
2. Both sexes
3. Progressive pterygium

Exclusion criteria:

1. Recurrent pterygium
2. Pseudopterygium
3. Malignant Pterygium

Following pterygium excision, all patients received an autologous conjunctival graft from the superior or inferior bulbar conjunctiva. Inferior conjunctival grafting has an advantage of leaving superior conjunctiva for future glaucoma or cataract surgery¹⁷. Those graft was secured in position by using autologous serum of the patient, and a follow-up regimen was created for 1st day, 1 Week, 1 month and 3 months following surgery. Statistical analysis was measured using student t test and P value <0.05 was considered significant. The visual acuity and corneal astigmatism results from 3rd month readings were considered to evaluate the post-operative stability of refraction¹⁸.

Preoperative evaluation:

After clinical diagnosis, demographic information, occupation, and prior medical, surgical, and ocular history were gathered from all patients. The examination includes a visual acuity assessment, a detail slit lamp examination, and determination of the presence or absence of dellen. Keratometry i.e. Corneal curvatures were measured using keratometer. Calculating corneal astigmatism involved comparing K1 and K2 with respect to K1's axis. During slit-lamp examination slit beam was focused on the nasal limbus, pterygium were graded depending on the extent of corneal involvement^{5,19}.

Grade I – tissue involvement upto the limbus

Grade II- tissue just on the limbus

Grade III- head of the pterygium present between a point midway between limbus and pupillary margin and pupillary margin (nasal papillary margin in case of nasal pterygium and temporal margin in case of temporal pterygium)

Grade IV- tissue central to the papillary margin

Table 1: Indication of Pterygium Surgery

Complaints of Patient	No. of Patients	Percentage
Foreign body sensation	16	32%
Cosmesis	8	16%
Decreased vision	20	40%
Others like ocular discomfort, redness	6	12%
Total	50	100%

All the 50 eyes of 50 patients with primary nasal pterygium underwent pterygium excision with conjunctival autograft. The patients received topical antibiotic, steroid, and lubricant drops following surgery. Following each case for a period of six months, the results of the pterygium surgery were compared to the preoperative findings in terms of astigmatism and improvement in vision.

Results

In the current study, we investigated 50 eyes of 50 patients (32 males, 18 females). The mean age of the participants was 61.2 years. All eyes had primary nasal pterygium. We investigated 23 (26.00%) right eyes and 27 (54.00%) left eyes.

Table 2: Patient's Profile

Sex	N	%	Mean
Male	32	64.00	60.4
Female	18	36.00	62.6
Total	50	100 %	61.2

Table 3: Grading the pterygia into two grades

Pterygium size (mm)	N	%
< 2mm	16	32.00
≥ 2mm	34	68.00
Total	50	100 %

Depending on the size (corneal involvement) of the pterygium, we separated the studied eyes into two groups : grade I for pterygium sizes less than 2 mm and grade II for pterygium sizes equal to or higher than 2 mm. In our study, 16 eyes (32.00%) had grade I pterygia and 34 eyes (68.00%) had grade II pterygia (Table 3).

The mean preoperative astigmatism in the eyes with grade I pterygium was 0.65 ± 0.62 (range 0.00D - 2.25 D) and in eyes with grade II pterygium, 1.50 ± 1.30 D (range 0.00 - 5.00 D).

A series of tests including retinoscopy, slit lamp evaluation examination, keratometry were used to compare the pre- and post-operative values of corneal astigmatism and visual acuity. The mean preoperative refractive cylinder was 1.50 ± 1.00 D (range 0.00D–5.00D), which improved to mean 0.60 ± 0.75 D (range 0.00D–3.00D) ($p < 0.0001$) postoperatively.

The mean UCVA (uncorrected visual acuity) logMar preoperatively was 0.70 ± 0.25 and improved to 0.50 ± 0.35 ($p = 0.005$) 3 months after surgery. The mean logMar BCVA (best corrected visual acuity) preoperatively was 0.35 ± 0.25 and improved to 0.01 ± 0.05 postoperatively ($p < 0.0001$).

The visual acuity remained the same in 16 eyes ,34 showed 1- or 2-line improvement in vision. No

complications or recurrences developed during the follow-up period.

Discussion

Pterygium is more common in some Indian states than others, with a range of 0.75% to 10.42%²⁰. A pterygium-induced refractive change often leads to visual impairment. These changes are localized and cannot be measured accurately either by refraction or keratometry²¹. The above study demonstrates that as pterygium grade rises, the amount of astigmatism it causes rises in proportionally as well, and that successful pterygium excision reduces the astigmatism it causes²². Sejal Maheshwari reported a similar observation¹⁴. From the Singapore National Eye Center, Fong KS, Balkrishnan V, Chee SP, and Tan DT also confirm that pterygium removal causes reversal of pterygium-related corneal flattening²³. The visual improvement following successful pterygium surgery was also evaluated, and it was shown that all grades of pterygium saw a considerable visual improvement²⁴. The improvement was statistically significant ($p < 0.001$) in grade II and grade III pterygium and substantial ($p < 0.05$) in grade IV²⁵. Pterygium excision with conjunctival autograft is a widely performed surgery for pterygium^{26,27}. The complications that have been noted include intra-operative complications like perforation of the globe, thinning of sclera or cornea from dissection,

intraoperative bleeding, muscle injury, buttonholing, graft tear. Early postoperative complications like dellen, Haematoma beneath the graft/subconjunctival hemorrhage, graft edema, graft retraction/loss of graft, granuloma. Late postoperative complications include recurrence, corneoscleral necrosis, scleritis, endophthalmitis

There were no significant complications found in this study. Minor side effects included conjunctival inclusion cyst in 1 patient, and subconjunctival hemorrhage in 8 patients²⁸.

Conclusion:

An eye surface lesion called pterygium flattens the cornea, causing with-the-rule corneal astigmatism. Based on the findings and analysis, we draw the conclusion that the quantity of induced astigmatism directly correlates with the size of the pterygium encroaching on the cornea. Conjunctival autografting proved effective in preventing the recurrence of pterygium. It also provides visual and cosmetic improvement.

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