Indian Journal of Clinical and Experimental Ophthalmology 2021;7(2):381–384

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Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: www.ijceo.org

Original Research Article

# Evaluation of changes in the keratometric values after pterygium excision with conjunctival autografting in different grades of pterygium

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ARTICLE INFO

*Article history:*
Received 20-01-2021
Accepted 15-02-2021
Available online 30-06-2021

*Keywords:*
Keratometric values
Pterygium excision
Pterygium induced astigmatism

ABSTRACT

**Purpose:** To study the changes in keratometric values after pterygium excision with conjunctival autograft in different grades of pterygium.

**Materials and Methods:** A retrospective, comparative study was done on 75 patients of various grades of pterygium who underwent excision surgery with conjunctival autograft. Preoperative and postoperative details of all the patients on $1^{st}$, $7^{th}$ and $30^{th}$ day were taken into account including detailed ocular examination, best-corrected visual acuity, slit-lamp biomicroscopic examination, keratometric details and posterior segment examination. Net astigmatism was calculated preoperatively and on post-op examinations. Mean of difference in preoperative and post operative net astigmatism is calculated and compared in different grades of pterygium.

**Results:** Our study showed that there are significant changes in net astigmatism after pterygium excision mainly in grade 3 pterygium. Difference in mean net astigmatism at the end of 1 month from preoperative values was 2.39±0.73 in Group C, 1.45±0.5 in Group B and 0.49±0.24 in group C and this difference is significant.

**Conclusion:** The amount of keratometric astigmatism is proportional to grades of pterygium (size of pterygium) and pterygium excision reduces the induced astigmatism and it varies according to grades.



## 1. Introduction

Pterygium, a word derived from "pterygos" (ancient Greek for a wing), it is a degenerative condition of the subconjunctival tissue; there is proliferation of vascularized granulation tissue invading the cornea, destroying superficial layers of cornea (stroma and Bowman's membrane). Pterygium can vary from a small atrophic quiescent lesion to a large aggressive, rapidly growing fibro vascular lesion that can distort the corneal topography and in advanced cases they can obscure the optical center of the cornea.[1] Patients complains majorly about visual complaints, including decreased visual acuity, glare sensitivity and monocular diplopia.[2] Visual complaints are due to astigmatism and sometimes mechanical obstruction when it encroaches the pupillary margin. Causing significant amount of astigmatism, either 'with-the-rule' (WTR) or 'against-the-rule' (ATR) astigmatism.

The mechanisms of induced astigmatism in pterygium are the tractional force of contractile elements leads to mechanical distortion and causes flattening of the cornea in its horizontal meridian resulting in hypermetropic WTR astigmatism. The pooling of tears at the progressing edge-head of the pterygium is also the reason behind flattening of the cornea.[2,3] Pterygium inducing high corneal astigmatism, which can be decreases after its surgical excision.[4] Early or late surgical intervention for excision of pterygium surgery leads to reduction in astigmatism which leads to significant improvement in vision.[5,6] Exact pathogenesis of pterygium is still clouded but there are several environmental factors known to cause pterygium such as ultraviolet ray (UV)

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https://doi.org/10.18231/j.ijceo.2021.075

exposure, dry and dusty climate, chronic inflammations, and dry eye among others. Advancing age and male are also related risk factors.[7] The surgical excision is indicated in cases who are progressive, involving visual axis, and induced astigmatism. Corneal astigmatism is also one of the major factors affecting postoperative visual function.[8,9] Apart from the benefits received by the patients after excision, this information may have relevance when cataract coexists with pterygium. Now one step versus two stage surgeries has always been a debatable issue and every decision has its pros and cons but this information may help us in deciding about the choice of procedure for the better visual outcome. Now in the era of refractive surgeries, expectation in terms of visual outcome after cataract surgery is changing especially in young patients or when toric IOLs are planned. Therefore, correct and specific management of corneal astigmatism is one of the key factor for a successful and satisfactory cataract surgery.

## 2. Materials and Methods

A retrospective, comparative study was done on 75 patients of various pterygium grades who underwent excision surgery with conjunctival autograft, from June 2019 to march 2020.

### *2.1. Inclusion criteria*

Patient with primary nasal pterygium.

### *2.2. Exclusion criteria*

Secondary pterygium or other surgical procedures done.

On slit-lamp examination with slit beam focused on the nasal limbus, pterygium was graded depending on the extent of corneal involvement:

Grade I – Just touching the limbus

Grade II - Head of the pterygium present between a point midway between limbus and pupillary margin (nasal pupillary margin in case of nasal pterygium)

Grade III - Touching pupillary margin

On the basis of grades of pterygium 3 groups were made.

Group A – 25 cases, grade 1 pterygium

Group B - 25 cases, grade II pterygium

Group C – 25 cases grade III pterygium

All patients underwent detailed preoperative ocular examination including best-corrected visual acuity, slit-lamp biomicroscopic examination, keratometric details were noted and posterior segment examination. All the surgeries were performed under peribulbar block using 4 ml of 2% lignocaine with adrenaline and 1ml of 0.5% bupivacaine mixed with hyluronidase. A delineation mark is done on cornea 1 mm ahead of the head of pterygium with the help of 15 number blade and pterygium is excised. Head of the pterygium is excised with gentle dissection and avulsion of pterygium from the corneal surface. Neck and body of pterygium are dissected and subconjunctival tissue is excised and separated from overlying conjunctiva and underlying sclera. For conjunctival autograft, excised area is measured with the help of calipers and conjunctival autograft of size 1 mm more than the measured area in both dimensions is taken from superotemporal quadrant and secured at the site by autologous blood. Topical betadine eye applied followed by pad and bandage for 24 hours. In postoperative period, patients were examined, best corrected visual acuity and slit lamp examination was done. Keratometric readings were recorded. These measurements were done on day 1 post-operative, day 7 post operative (1 week follow up) and day 30 post-operative (1 month follow up). Mean net astigmatism was calculated at every pre-operative and post-operative examination. Comparison was done in mean difference in keratometric values or mean keratometric astigmatic changes preoperatively and postoperatively.

### *2.3. Statistical analysis*

The collected data was entered in excel sheet. All statistical analysis was carried out using SPSS version 20 and appropriate statistical tools were used.

## 3. Results

We conducted this study to evaluate the outcome of pterygium excision on pterygium induced astigmatism postoperatively on $1^{st}$, $7^{th}$ and $30^{th}$ day. Preop and post operative mean net astigmatism is calculated and compared.

**Table 1:** Demographic details of patients (n = 75)

| | |
|---|---|
| **Age group** | |
| 25-35 | 17 |
| 36-45 | 27 |
| 46-55 | 21 |
| 56-65 | 10 |
| **Gender** | |
| Male | 37 |
| Females | 38 |
| **Laterality** | |
| Right eye | 44 |
| Left eye | 31 |
| **Grade of pterygium** | |
| Grade 1 | 25 |
| Grade 2 | 25 |
| Grade 3 | 25 |

(Table 1) In our study the mean age was 41.3± 6.7 years. Among 75 patients there were 49.3% male and 50.6% female. Out of total eyes operated 58.6% were right eye and 41.3% were left eye. All cases were having nasal pterygium. Most common symptoms was foreign body sensation (75%) followed by, watering (61.3%), itching (52%), difficulty of vision (33%) and grittiness (30%).

**Table 2:** Mean of net astigmatism (preoperative and post operatively)

| Group | Pre-op | Post-op day 1 | Post-op day 7 | Post-op day30 |
|---|---|---|---|---|
| A | 0.7±0.2 | 0.35±0.22 | 0.33±0.22 | 0.21±0.22 |
| B | 1.51±0.44 | 0.66±0.51 | 0.33±0.46 | 0.06±0.21 |
| C | 2.51±0.61 | 1±0.8 | 0.24±0.51 | 0.12±0.32 |

Table 2 showing mean of net astigmatism preoperatively and postoperatively. There was significant change in net astigmatism in Grade 3 i.e. from 2.51±0.61 preoperatively to 0.21±0.32 at 1 month postoperative.

**Table 3:** Mean of difference of net post operative astigmatism from preoperative values

| Group | Day 1 | Day 7 | Day 30 |
|---|---|---|---|
| A | 0.35±0.24 | 0.37±0.23 | 0.49±0.24 |
| B | 0.85±0.4 | 1.14±0.55 | 1.45±0.5 |
| C | 1.51±0.74 | 2.27±0.81 | 2.39±0.73 |

Table 3 showing the significant difference of mean of postoperative net astigmatism. Difference between preoperative mean net astigmatism and 1 month post operative in group A was 0.49±0.24, in Group B was 1.45±0.5 and 2.39±0.73 in group C which is significant. More is the size of pterygium, more is the mean astigmatism and significant change is noticed after excision.

## 4. Discussion

Pterygium is an ocular surface disease causing a wing-shaped fibrovascular tissue growth of the bulbar conjunctiva and underlying subconjunctival tissue encroaching the cornea.[10] It is more common within the 'pterygium zone'—a geographical latitude 40° north and south of the equator and in people with more outdoor activites or hobbies suggesting the role of UV rays in the pathogenesis of pterygium[10,11] Apart from chronic irritation or inflammation in the peripheral cornea and limbus caused by dust, low humidity, smoke or sand, human papilloma virus infection and genetic factors have also been considered as risk factors.[10] Pterygium has been found to have a remarkable impact on the surface of cornea, reducing the corneal surface regularity index and increasing the astigmatism and surface asymmetry index.[12,13]

In our study we found the statistically significant results in difference of mean of net astigmatism from preoperative to postoperative values. The difference of net astigmatism from preoperative value increases on subsequent follow up postoperatively. Similarly, study done by Gupta R showed, mean astigmatism changed from preoperative 5.94 ± 3.82 Diopters (D) to 1.30 ± 1.07 D at 1 month follow-up showing 4.64 ± 2.75 D of change in astigmatism.[14] A study by Vadodaria B et al. showed the significant difference in mean keratometric values pre-operatively and 1$^{st}$ post operative day. There was a significant reduction in astigmatic error after pterygium excision with conjunctival autograft with or without suture (p = 0.000).[15]

Xu G, et al. in their study on "Pattern of corneal astigmatism induced by primary pterygium in patients with cataract in a secondary hospital in Southern China: a cross-sectional study." Showed that the mean corneal astigmatism was significantly higher in the primary pterygium (PT) group than without pterygium (NPT) group. There was significantly higher corneal astigmatism in PT than the NPT group in almost every age group, except patients more than 90 years.[16] Also, Popat KB, et al. in their study found the mean astigmatism preoperatively was 6.20 ± 3.58 Diopters (D) which subsequently decreased to 1.20 ± 1.27 D on 45th post operative day-showing 5.09 ± 3.32 D of change in astigmatism which was statistically significant.[17]

Lin and Stern also showed the significant correlation between the grade of pterygium and corneal astigmatism.[2] Another study by Maheshwari S. also found reduction in astigmatism following surgical excision.[3] It was suggested that pterygium encroaching more than 45 percent of corneal diameter results in increasing degrees of astigmatism[18] Alison L and George AS also co-related the grade of pterygium, extension of pterygium over cornea and degree of astigmatism caused by it.[19] Mohammad-Salih and Sharif evaluated corneal astigmatism in 77 patients with unilateral primary pterygium and showed that the mean difference in corneal astigmatism between pterygium-affected eyes and control eyes was 0.60±0.7D.[20]

In today's era of refractive surgery, cataract surgery also being considered as a part of it, accurate management of corneal astigmatism has become crucial particularly when both the conditions coexists. With the increasing demand of postoperative visual quality, accurate preoperative measurement of corneal astigmatism and precise intraoperative astigmatism correction are important in patients undergoing cataract surgery,[21] especially for patients with pterygium, which may affect the corneal astigmatism and its management protocol. Because pterygium induced corneal astigmatism, eyes with coexisting cataracts usually need to undergo pterygium excision prior to cataract surgery, if its causing significant change in corneal astigmatism. A study done by Pujol et al. showed that the best threshold of preoperative corneal astigmatism of indicating astigmatism reduction after pterygium surgery was 1.05D, with 82.5% sensitivity and 80.5% specificity.[22] After pterygium excision, the timing for cataract surgery also needed to be considered. Tomidokoro et al. showed that refractive status of the cornea was remarkably changes but stabilise 1 month after pterygium excision, and suggested that cataract surgery should be performed after 1 month or more of pterygium surgery.[4] Few studies also showed that after pterygium

excision, the residual corneal astigmatism can be controlled by limbal relaxing incisions, femtosecond laser-assisted astigmatic keratotomy or toric IOL implantation during cataract surgery.[23,24]

## 5. Conclusion

In conclusion, in our study we tried to show that the change in corneal astigmatism is a major clinical issue which cannot be ignored if we are planning for combined pterygium surgery with cataract surgery, as now-a-days they are considered as refractive surgery. The pterygium induced astigmatism is directly proportional to grades of pterygium (size of pterygium) as more the grade of pterygium the higher the astigmatism. Surgical excision of pterygium with conjunctival autograft reduces the induced astigmatism and provide better visual outcome.

## 6. Conflict of Interest

Nil.

## 7. Acknowledgement

Am thankful to Department of Ophthalmology and all the patients for their cooperation.

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**Cite this article:** Damle V, Laad S, Agarwal PC. Evaluation of changes in the keratometric values after pterygium excision with conjunctival autografting in different grades of pterygium. *Indian J Clin Exp Ophthalmol* 2021;7(2):381-384.