



TO EVALUATE THE CHANGES IN INDUCED ASTIGMATISM AND CORNEAL CURVATURE BEFORE AND AFTER PTERYGIUM SURGERY.

Ophthalmology

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ABSTRACT

BACKGROUND: Pterygium is a degenerative condition of the subconjunctival tissue which proliferates as a vascularised granulation tissue.³ It generally causes localized flattening central to the apex of the pterygium and results in Astigmatism.⁴

MATERIAL AND METHODS: The study was carried out on 40 eyes with primary nasal pterygium willing for pterygium excision with conjunctival autograft at KIMS Hospital, Bangalore during period of JANUARY 2016 to JULY 2017.

All patients underwent visual acuity and keratometry 1 week before and 1 month after the surgery. The results were analysed using Paired t-test.

RESULTS: The mean pre op astigmatism was 2.656 ± 1.364 D reduced to 0.850 ± 0.632 D post operatively with $P < 0.001$, which is statistically significant.

CONCLUSION: There was a significant reduction in the induced astigmatism and corneal curvature reverted towards to normal following successful pterygium excision.

KEYWORDS

Pterygium, Keratometry, Astigmatism, Pterygium excision.

INTRODUCTION

The prevalence of Pterygium in India ranges from 0.075% - 10.42%.⁷

Pterygium is a degenerative condition of the subconjunctival tissues which proliferates as a vascularized granulation tissue encroaching upon the cornea destroying the superficial layers of the Stroma and Bowman's membrane".¹

Etiological factors like dry, dusty climate, UV B light, genetic predisposition, decrease of basic lacrimal secretions contribute to pterygium.

It can be asymptomatic or can cause eye irritation, foreign body sensation, dryness, photophobia, epiphora, redness, blurring of vision etc.

Histology- The abnormal collagen tissue is aggregated into a coiled and fibrillated pattern, similar to elastic tissue and stained with elastic tissue stains. Unlike elastic tissue, it is not digested by elastase and therefore is called elastotic degeneration.⁵

Nasal pterygium is by far the most common type. It represents about 60% of total pterygium.

Current Hypothesis Of Pterygium Pathogenesis:^{12,13}

It occurs in two stages:

- Initial and progressive destruction of the limbal corneal-conjunctival epithelial barrier.
- Progressive active "conjunctivalisation" of the cornea by tissue characterized by extensive cellular proliferation, inflammation, connective tissue remodelling and angiogenesis.

Several mechanisms have been suggested to explain the induced astigmatism and corneal curvature abnormalities. These includes-²

- a) Mechanical traction exerted by the pterygium on the cornea.
- b) Pooling of the tear film at the leading edge of the pterygium.

Pterygium generally causes localized flattening central to the apex of the pterygium and this flattening is along the Horizontal meridian, and it usually causes with the Rule Astigmatism.⁴ The regularity of corneal surface improves and asymmetry of the cornea reduces 1 month after the surgery.

In 2003, Sejal Maheshwari's conducted a study on pterygium and reported that, as the size of pterygium increases, the amount of induced astigmatism also increases in direct proportion and reduction in the pterygium-induced refractive astigmatism with improvement of the visual acuity after surgery.¹⁴

MATERIAL AND METHODS

STUDY DESIGN

This is a prospective interventional study.

SOURCE OF DATA

Patients with primary pterygium attending Ophthalmology OPD at Kempegowda Institute of Medical Science and Research Centre, Bangalore.

STUDY PERIOD

JANUARY 2016 to JULY 2017.

SAMPLE SIZE

A total of 40 patients with primary nasal pterygium.

SELECTION CRITERIA

INCLUSION CRITERIA :

- 1) Patients with primary pterygium willing for surgery in the age group between 20-70 years.
- 2) Unilateral or Bilateral Nasal pterygium patients.

EXCLUSION CRITERIA :

- 1) Patients with history of - Ocular Trauma, Ocular Surgery, Corneal infection or Scarring
- 2) Patients with-Recurrent pterygium, Pseudopterygium, and other anterior segment pathology

METHOD OF COLLECTION OF DATA

After ethical clearance and informed written consent, patients were asked about the complaints and the findings were recorded on a predesigned proforma.

PRE OPERATIVE EVALUATION:

Ocular examination included recording of best corrected visual acuity with Snellen's chart, and slit lamp biomicroscopy.

Pterygium will be graded depending on the extent of corneal involvement as

- Grade 1- Apex crossing the limbus
- Grade 2- Apex midway between the limbus and pupil
- Grade 3- Apex reaching upto pupillary margin
- Grade 4- Apex crossing pupillary margin

Astigmatism values and Keratometry values were obtained using an automated keratorefractometer.

SURGICAL TECHNIQUE:

Under peribulbar block anaesthesia, eyes were painted and draped. A small incision is made in the conjunctiva just medial to the head of

pterygium and is peeled from the limbus and its cut. The conjunctiva was progressively dissected from the body of the pterygium towards the caruncle. The wings of the pterygium separated from the overlying conjunctiva.

The corneal epithelium 2 mm ahead of pterygium was scraped off with took's knife.

The body of the pterygium with the involved tenon's capsule and cicatrix was then excised.

The size of conjunctival graft required to resurface the exposed sclera surface was determined using callipers, the measured dimensions marked on the superotemporal conjunctiva and the graft was excised. Once limbus is reached the graft was flipped over onto the cornea and tenon's attachments at the limbus were meticulously dissected. the graft was slid onto the cornea. It is rotated and moved onto its sclera bed. A limbus-limbus orientation was maintained. The graft was smoothened out in its bed. The graft was secured using 9-0 ethilon sutures.

Postoperatively topical antibiotic-steroid eye drops were used for 5-6 weeks in reducing dosage along with lubricating drops. Any retained sutures were removed after 2 weeks.

FOLLOW-UP

At 1 month follow up patients underwent,

- Visual acuity
- Auto-keratometry

OBSERVATION AND RESULTS

The present study on 40 patients with primary pterygium were studied. The data was analysed using paired 't' test with P value <0.05 was taken statistically significant.

Table 1: Age distribution of subjects

Age	Frequency	Percent
25-35 yrs	10	25.0
36-45 yrs	13	32.5
46-55 yrs	13	32.5
56-65 yrs	4	10.0
Total	40	100.0

Table 1: In the present study 10(25%) subjects were of age between 25-35yrs, 13(32.5%) between 36-45yrs, 13(32.5%) between 46-55yrs and remaining 4(10%) between 56-65yrs with a mean age value of 44.4 years

Table 2: Gender distribution of the subjects

Gender	Frequency	Percent
Male	12	30.0
Female	28	70.0
Total	40	100.0

In the present study 70% of subjects were females and 30% were

Table 3: Distribution of subjects according to Eye

Eye	Frequency	Percent
Left	15	37.5
Right	25	62.5
Total	40	100.0

In this study, most of the patients (62.5%) had pterygium in right eye than left eye (37.5%).

Table 4: Distribution of subjects according to Pterygium Grade

Pterygium Grade	Frequency	Percent
Grade I	2	5.0
Grade II	29	72.5
Grade III	5	12.5
Grade IV	4	10.0
Total	40	100.0

In the present study, out of 40 subjects, 2 (5%) were of grade I, 29 (72.5%) were of grade II, 5 (12.5%) were grade III, 4 (10%) were of grade IV pterygium. With maximum were of grade II.

Table 5: Comparison of VA among subjects Pre and Post Operatively

Pre Op VA	Post Op VA		Total
	6/6-<=6/12	>6/12 -<=6/24	
6/6-<=6/12	15	0	15
	100.0%	.0%	100.0%
>6/12 -<=6/24	14	0	14
	100.0%	.0%	100.0%
>6/24- 6/60	7	4	11
	63.6%	36.4%	100.0%
Total	36	4	40
	90.0%	10.0%	100.0%

Table shows change in VA post operatively. In which 37.5% cases had VA <=6/12 and remaining 62.5% had VA >6/12 pre operatively and VA improved to <=6/12 in 90% cases and remaining 10% with VA >6/12 post operatively.

Table 6: Mean Pre and Post Operative Astigmatism

	N	Mean	SD	Mean Diff	SE of Diff	P value*
Post Op	40	0.850	0.632	-1.806	0.123	<0.001
Pre Op	40	2.656	1.364			

Table shows mean preoperative astigmatism among the study group was 2.656±1.364D. In one month follow up mean astigmatism showed a statistically significant reduction to 0.850±0.632D (P<0.001).

Table 07: Comparison of mean Astigmatism Pre and Post Operatively according to Grades of Pterygium

Pterygium Grade		N	Mean	SD	Mean Diff	SE of Diff	P value*
Grade I	Post Op	2	0.250	0.000	-	-	-
	Pre Op	2	1.000	0.000			
Grade II	Post Op	29	0.586	0.252	-1.500	0.051	<0.001
	Pre Op	29	2.086	0.440			
Grade III	Post Op	5	1.450	0.371	-2.700	0.267	0.001
	Pre Op	5	4.150	0.802			
Grade IV	Post Op	4	2.313	0.239	-3.438	0.213	0.001
	Pre Op	4	5.750	0.289			

In the present study, a significant decrease in astigmatism was noted after pterygium excision one month post operatively. In grade II, it decreased from 2.086±0.440D to 0.586±0.252D. In grade III, from 4.150±0.802D to 1.450±0.371D. In grade IV from 5.750±0.289D to 2.313±0.239D, which was statistically significant(p<0.001)

Table 08: Mean Keratometry reading (K1) among subjects Pre and Post Operatively

	N	Mean	SD	Mean Diff	SE of Diff	P value*
Post Op	40	42.938	0.877	1.587	0.137	<0.001
Pre Op	40	41.350	1.441			

The mean preoperative K1 value was 41.350±1.441D. One month follow up showed a statistically significant (P<0.001) increase of mean K1 value to 42.938±0.877D.

Table 09: Mean Keratometry reading (K2) among subjects Pre and Post Operatively

	N	Mean	SD	Mean Diff	SE of Diff	P value*
Post Op	40	43.813	0.676	-0.294	0.066	<0.001
Pre Op	40	44.106	0.843			

The mean preoperative K2 value was 44.106±0.843D. One month follow up showed a statistically significant (P<0.001) reduction of mean K2 value to 43.813±0.676D.

DISCUSSION

Pterygium is a worldwide disease which is particularly common in tropical and sub-tropical region.⁸

The development of a pterygium can lead to significant corneal distortion and astigmatism. Pterygium generally causes localized flattening central to the apex of the pterygium. As this flattening is along the horizontal meridian, it usually causes with the rule corneal astigmatism.

Several mechanism have been suggested to explain the induced

astigmatism. These includes

- Pooling of tear film at the leading edge of the pterygium
- Mechanical traction exerted by the pterygium on the cornea

Pterygium excision usually induces a reversal of pterygium related corneal flattening. Consequently, successful pterygium surgery should reduce pterygium induced refractive astigmatism and improve VA.⁶

Similarly the present study was conducted to explain the changes in induced astigmatism and corneal curvature after pterygium excision.

In the present study, the mean age of the subjects was 44.4 ± 9.257 , 70% were females and 62.5% RE pterygium. Most of them were of grade II pterygium (72.5%).

In the present study, there was a significant drop in the VA among subjects due to pterygium, which increases as the grade of pterygium increases.

We found that Pre op VA of $\leq 6/12$ in 37.5% of subjects, out of total 40 subjects and post operatively VA of $\leq 6/12$ was found in 90% of subjects, out of total 40 subjects. These observations were similar to the studies carried out by Eknath Shelke et al.⁹

Eknath Shelke et al studied the effect of pterygium excision on pterygium induced astigmatism and found that, as the grade of pterygium increases, the amount of induced astigmatism increases and significant decrease in induced astigmatism following pterygium excision.⁹

Similar results were observed in the present study where the mean pre-op astigmatism was $2.656 \pm 1.364D$, which decrease to mean astigmatism of $0.850 \pm 0.632D$ one month postoperatively, which was statistically significant and reduction in the amount of astigmatism post operatively in each grade of pterygium was also statistically significant.

Prakriti Chowrasia et al in their study found no much difference between the mean post operative astigmatism measured at 1 month, 3 month and 6 month of pterygium excision.⁶

Another study by Propat KB et al, found that the regularity of corneal surface improved and asymmetry of the cornea reduced one month after the pterygium excision.¹⁰

Hence the present study compared the pterygium induced changes before and one month after the pterygium surgery.

The study conducted by Muhammad Imran Saleem et al, to study the effect of pterygium excision on corneal curvature found that pterygium surgery effectively decreases the cylindrical error and reverts corneal curvature towards normality, thus improving subjective VA.⁷

A study by Dr Rashmi Kujur et al, found that pterygium excision resulted in an increase in the mean refractive power one month post operatively, which indicates steepening of flattened cornea.¹¹

Similar results were found in the present study in which the mean pre op keratometry reading along horizontal meridian (K1) was $41.350 \pm 1.44D$, increased to $42.938 \pm 0.877D$ one month post operatively.

The mean pre op keratometry reading along vertical meridian (K2) was $44.106 \pm 0.843D$, decreased to $K2 = 43.813 \pm 0.676D$ one month post operatively, which was statistically significant and thus corneal curvature reverted towards normality following pterygium excision.

CONCLUSION

In cases with pterygium, early intervention in the form of pterygium excision effectively brings corneal curvature towards normal, thus reducing the amount of refractive cylinder and so leads to an improvement in visual acuity.

The present study showed that the pterygium induces astigmatism, which increases with increase in the grade of pterygium and as well pterygium induces corneal curvature changes. There was a significant reduction in the induced astigmatism and corneal curvature reverted towards to normal following successful pterygium excision with conjunctival auto grafting.

SUMMARY

A prospective interventional study was done to evaluate the changes in induced astigmatism and corneal curvature before and one month after pterygium excision.

A total of 40 patients who fulfilled the criteria were included.

With the help of automated keratorefractometry, astigmatism and corneal curvature readings were measured before and one month after pterygium excision.

In the present study of the 40 patients, age varied from 25- 65 years with a mean age value of 44.4 ± 9.25 years. 70% were females.

Most of the patients (62.5%) had pterygium in right eye than left eye (37.5%).

Out of 40 subjects, 2 (5%) were of grade I, 29 (72.5%) were of grade II, 5 (12.5%) were grade III, 4 (10%) were of grade IV pterygium, with maximum were of grade II.

In the present study, 37.5% cases had VA $\leq 6/12$ and remaining 62.5% had VA $> 6/12$ pre operatively and VA improved to $\leq 6/12$ in 90% cases and remaining 10% with VA $> 6/12$ post operatively.

The mean preoperative astigmatism among the study group was $2.656 \pm 1.364D$. In one month follow up mean astigmatism showed a statistically significant reduction to $0.850 \pm 0.632D$ ($P < 0.001$).

According to the present study the mean preoperative K1 value was $41.350 \pm 1.441D$. One month follow up showed a statistically significant ($P < 0.001$) increase of mean K1 value to $42.938 \pm 0.877D$. While the mean preoperative K2 value was $44.106 \pm 0.843D$. One month follow up showed a statistically significant ($P < 0.001$) reduction of mean K2 value to $43.813 \pm 0.676D$.

In view of the observations made in the previous studies, the present study was conducted to evaluate the effect of pterygium excision on the pterygium induced Astigmatism and Corneal curvature changes.

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