ORIGINAL RESEARCH PAPER

Volume-8 | Issue-8 | August - 2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# A STUTY OF REFRACTIVE CHANGES AFTER PRIMARY PTERYGIUM SURGERY

Ophthalmology

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## ABSTRACT

**INTRODUCTION:** Pterygium is fibrovsacular degeneration of the subconjuctival tissue encroaching cornea induces with the rule astigmatism which causes diminission of vision. After removal of pterygium, induced astigmatism is reveresed and improving in vision is noted.

**AIMS AND OBJECTIVE:** To assess amount of astigmatism before and after pterygium surgery,
to find correlation of postoperative refractive outcome with size of pterygium at time of surgery, and to assess duration of postoperative recovery time after pterygium surgery.

**METHOD:** The present study is a hospital based prospective observational study of patients attending the outdoor patient department of Ophthalmology and those who were admitted in ophthalmic ward. All the patients in study were evaluated and operated during study period of 18 months from April 2017 to September 2018 which were 46 patients. The patient's personal identification information was recorded with registration number. All patients were evaluated for best corrected visual acuity by illuminated Snellen's chart for 6-meter distance, near vision was measured with Roman's near vision chart. Slit lamp bio microscopy was performed with Haag-Streit BQ 900 and Nippon slit lamp. Pterygium encroaching cornea measured with horizontal slit of the slit lamp in mm and graded.
Refraction and keratometry was done with autorefractokeratometer and Bausch and Lomb keretometer. Detailed fundus examination was done with direct ophthalmoscope and Slit lamp biomicroscopy with 90D lens (volk). Than after blood and urine examination necessary for pterygium surgery under local anaesthesia, patient admitted in ward posted for surgery. All the patients had same preoperative, operative and post-operative work up. The patients were operated using the same technique. Biomicroscopic, refractive and fundoscopic examinations, keratometry readings were performed on all patients postoperatively and at 1st month and 3rd month. All findings were recorded in detailed proforma.

**OBSERVATION:** Study population consisted of individuals in mean age group of 52.5+16 years, in which 61-70 years had 32.60% followed by 31-40 years (23.91%). Females were 25(54.35%) out of 46 as compared to male were 21(45.65%), were more as compared to male for which cosmesis may be a driving factor. In present study, 19(41.30%) out of 46 patients had left eye involvement and 18(39.13%) out of 46 patients had right eye involvement. 9(19.57%) out of 46 patients had bilateral eye involvement. Most of patients had nasal side of pterygium which was in 45(97.83%) out of 46 and only 1 patient had temporal pterygium. BCVA improves from 0.787+0.23 pre-operatively to post-operative 0.86+0.16. The size was affecting the change in astigmatism as well as postoperative degree of astigmatism. Mean pterygium size was 3.73+0.88 mm. pterygium was graded according to corneal encroachment in which maximum were in grade 3-26(39.16%), grade 2-18(39.16%) and in grade 4-2(4.35%).Mean pre-operative pterygium induced astigmatism was 4.04+0.15 D which was reduced to 1.69+0.94 D post-operative at the end of 3 months. 2.1-3.00 mm induced 1.92+0.62 D which was reduced to 0.62+0.34 D, 3.1-4.00 mm induced 3.66+1.03 D which was reduced to 1.51+0.60 D, 4.1-5.00 mm induced 4.98+0.59 D which was reduced to 2.15+0.74 D and 5.1-6.0 mm induced 7.5+1.76 D which was reduced to 3.62+0.53 D at the end of 3 months. The refractive components were demonstrated to stabilize at 1 month following pterygium surgery. However, in present study, we included the postoperative 3rd months' results to make sure that refraction was stabilized. The conventional keratometry evaluates the corneal refractive power from 3 or 4 data points.

**CONCLUSION:** Pterygium induces with-the- rule astigmatism which reverses after primary excision.

## KEYWORDS

### INTRODUCTION :

Pterygium is essentially a triangular ecncroachment of bulbar conjunctival tissue on the cornea. It's a degenerative condition of subconjuctival tissue which proliferate as a vascular granulation tissue to invade cornea, destroying superficial layers of stroma and bowmen's membrane, which induces with the rule astigmatism which have a significant impact on vision[1].

Pterygium is often prevalent in developing countries with scarce health resources and in this setting can be a blinding disease.[2,3] In biological terms, if conjunctival/limbal autografting is performed, 50% of the limbus and associated stem cells can be affected. Given the importance of stem cells in long-term corneal maintenance, pterygium is a condition of great significance.

Fong et al[4] and other studies shows that pterygium excision results in significant reduction in astigmatism by inducing a reversal of pterygium induced corneal flattening. By doing this study, one can assess the post-operative refractive outcome, the correlation between the size of pterygium and induced astigmatism and time required for total visual recovery after pterygium surgery.

### AIMS OF STUDY

- To assess amount of astigmatism before and after pterygium surgery.
- To find correlation of postoperative refractive outcome with size of pterygium at time of surgery.
- To assess duration of postoperative recovery time after pterygium surgery.

### MATIRIALS AND METHODS

The present study is a hospital based prospective observational study of patients attending the outdoor patient department of Ophthalmology and those who were admitted in ophthalmic ward. All the patients in study were evaluated and operated during study period of 18 months from April 2017 to September 2018 which were 46 patients.

#### Inclusion criteria

All Patients with primary pterygium who underwent surgery were included in study.

#### Exclusion criteria

- Patients below the age of 18.
- Patients who do not give consent to be involved in the study.
- Pseudopterygium, recurrent pterygium, corneal scarring from any cause and any previous ocular surgery.
- History of ocular trauma, ocular surgery, and presence of corneal abnormalities.

## METHODOLOGY

- The patient's personal identification information was recorded with registration number.
- Complete ocular history including key signs and symptoms at the time of presentation was recorded.
- Complete medical history regarding systemic diseases like Diabetes mellitus, Hypertension, Tuberculosis etc. was noted.
- All patients were evaluated for best corrected visual acuity by illuminated Snellen's chart for 6-meter distance, near vision was measured with Roman's near vision chart.
- Slit lamp biomicroscopy was performed with Haag-Streit BQ 900 and Nippon slit lamp. Pterygium encroaching cornea measured with horizonal slit of the slit lamp in mm and graded as follows:

Grade 0 – Posterior to limbus (Pinguenculum)
Grade1 - Apex crossing limbus
Grade 2 - Apex midway between limbus and pupil
Grade 3 - Apex reaching up to papillary margin
Grade 4 - Apex crossing papillary margin[5]

Refraction and keratometry was done with autorefractokeratometer and Bausch and Lomb keretometer. Detailed fundus examination was done with direct ophthalmoscope and Slit lamp biomicroscopy with 90D lens (volk).

Than after blood and urine examination necessary for pterygium surgery under local anaesthesia, patient admitted in ward posted for surgery.

All the patients had same preoperative, operative and post-operative work up. The patients were operated using the same technique. Biomicroscopic, refractive and fundoscopic examinations, keratometry readings were performed on all patients postoperatively and at 1st month and 3rd month. All findings were recorded in detailed proforma.

## OBSERVATION AND DISCUSSION

### Age Distribution:

**Table-1**

| Age Distribution | | |
|---|---|---|
| **Age** | **No. of Patients** | **Percentage** |
| 11-20 years | 1 | 2.17% |
| 21-30 years | 3 | 6.52% |
| 31-40 years | 11 | 23.91% |
| 41-50 years | 6 | 13.04% |
| 51-60 years | 5 | 10.87% |
| 61-70 years | 15 | 32.60% |
| 71-80 years | 5 | 10.87% |
| | 46 | |

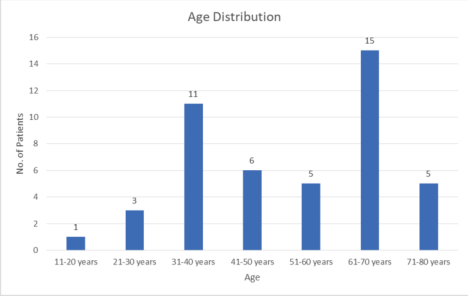



**Chart-1 Age Distribution**

Mean age of the study was 52.5+16 years. In a study done by **Riordan-Eva et al (1993)**,[6] ages of patients range from 25-77 years. Mean age in that study was 47 years. In another study done by **Philip Chen et al (1995)**,[7] ages of patients range from 23-79 years. Mean age in that study was 45.6 years. This correlates with the present study.

### Gender Distribution

**Table No-2**

| Sex | | |
|---|---|---|
| Male | 21 | 45.65% |
| Female | 25 | 54.35% |
| Total | 46 | 100% |

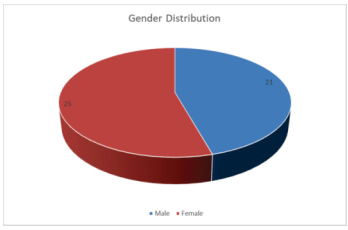



**Chart No-2. Gender Distribution**

There were total 46 patients from which female were 25(54.36%) and male were 21(45.65%). In a study done by **Riordan-Eva et al (1993)**,[6] 66 cases (61%) was males and 42 cases (38.89%) were females.

### Distribution according to Occupation:

**Table-3**

| Occupation | No. of patients | Percentage |
|---|---|---|
| Outdoor worker | 29 | 63.05% |
| Indoor worker | 17 | 36.95% |

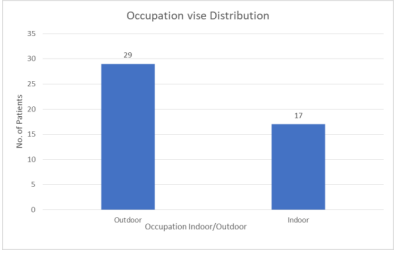



**Chart-3 occupation vise distribution**

Out of 46 patients under study maximum 29(63.05%) patients were outdoor worker and 17(36.95%) patients were indoor workers.

**Priyali Sarakar et al**[8] study had shown that pterygium was more common in outdoor workers than indoor workers, it was 23(57.50%) out of 40 patients.

### Pterygium Location:

Eye Involvement:

**Table- 4**

| Eye | No. of patients | Percentage |
|---|---|---|
| Right | 18 | 39.13% |
| Left | 19 | 41.30% |
| Bilateral | 9 | 19.57% |
| Total | 46 | |

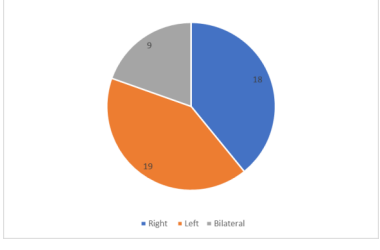



**Chart-4 Laterality**

Out of 46 patients 18(39.13%) patients had right eye, 19(41.30%) patients had left eye and 9(19.57%) patients had bilateral involvement. **Priyali Sarakar et al**[8] study had shown that 2 cases (5%) of pterygium bilateral and 38(95%) cases of pterygium were unilateral. 20 cases (50%) operated in right eye and 20 cases (50%) operated in left eye. In a study done by **Riordan-Eva et al (1993)**,[6] 65 cases (60.19%) operated in right eye and 52 cases (48.15%) operated in left eye.

### Site of pterygium:

**Table-5**

| Site of Pterygium | No. of patients | Percentage |
|---|---|---|
| Nasal | 45 | 97.83% |
| Temporal | 1 | 2.17% |

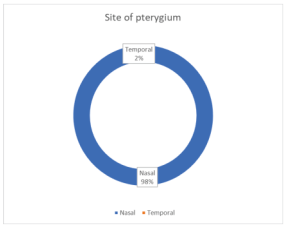



**Chart-5 Site of pterygium**

Out of 46 patients only 1 (2.17%) patient had temporal pterygium and rest 45(97.83%) had nasal pterygium. **Karthik Srinivasan et al**[9] study shown that 98% patients had nasal pterygium. **Yumnam Chingsuingamba Meitei et al**[10] study shows that 57(95%) out of 60 cases were nasal side and 2(3.33%) were on temporal side and 1 was nasal and temporal side. **D'Ombrains et al**[11] reported that nasal pterygium is most common.

**Size of Pterygium encroaching cornea:**
**Table-6**

| Size (in mm) | No. of patients | Percentage |
|---|---|---|
| 0-1 | 0 | 0 |
| 1.1-2.0 | 0 | 0% |
| 2.1-3.0 | 10 | 21.73% |
| 3.1-4.0 | 14 | 30.43% |
| 4.1-5.0 | 20 | 43.48% |
| 5.1-6.0 | 2 | 4.35% |
| | 46 | |

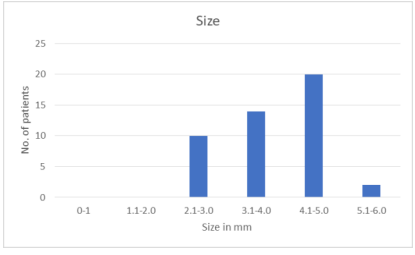



**Chart-6 Size of pterygium encroaching cornea**

Maximum 20(43.48%) out of 46 patient had pterygium size between 4.1-5.0mm, 14(30.43%) had pterygium size between 3.1-4.0mm and 10(21.73%) patients had size between 2.1-3.0mm. 2(4.35%) patients had size of 5.7mm. Mean pterygium size encroaching cornea underwent surgery was 3.73+0.88 mm.

**Distribution of patients according to Grading of Pterygium:**
**Table-7**

| Grade | No. of Patients | Percentage |
|---|---|---|
| 1 | 0 | 0% |
| 2 | 18 | 39.14% |
| 3 | 26 | 56.52% |
| 4 | 2 | 4.35% |
| Total | 46 | |

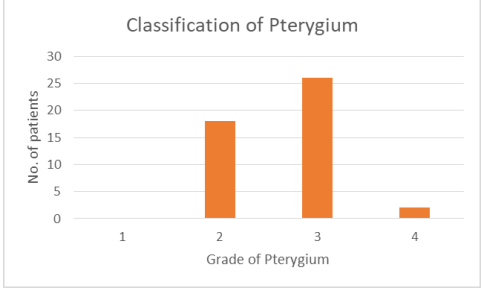



**Chart-7 Classification of pterygium**

Out of 46 patients, 26(56.52%) patients had grade 3 pterygium, 18(39.14%) patients had grade 2 pterygium, 2(4.35%) patients had grade 4 pterygium and no patient had grade 1 pterygium.

**Patient distribution according to visual acuity:**
**Table-8**

| Visual acuity | Preop patients | Preop patient percentage | Post op patients at 3 months | Postop patient percentage |
|---|---|---|---|---|
| <6/60 | 5 | 10.86% | 0 | 0% |
| 6/60-6/24 | 30 | 65.21% | 8 | 17.39% |
| 6/18-6/9 | 11 | 23.91% | 25 | 54.34% |
| 6/6p-6/6 | 0 | 0% | 6 | 13.04% |

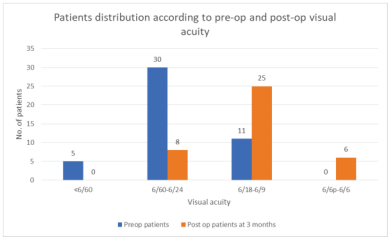



**Chart-8 Patients distribution according to pre-op and post-op visual acuity**

Maximum 30 (65.21%) of preop patients had visual acuity of 6/60-6/24. 11(23.91%) patients had 6/18-6/9 and 5(10.86%) patients had <6/60 visual acuity.

In patients after pterygium excision at 3 months follow-up maximum 25(54.34%) patients gained 6/18-6/9 visual acuity. 8(17.39%) patients gained 6/60-6/24 and 6(13.04%) patients gained 6/6p-6/6 vision.

**Yumnam Chingsuingamba Meitei et al**[10] study shows conjunctival autografting the percentage of patients having best corrected visual acuity of 6/6 rose from 3% or less pre operatively to 67% or more at 12 weeks post operatively. In both the study groups there was a significant decrease in number of patients having astigmatism of 0.5 D or more.

**Comparison of Pre-op and Post-op BCVA at 3 months according to size of pterygium:**
**Table-9**

| Grade of Pterygium According to size | Size(mm) | No. of patients | Pre-op BCVA | Post-op BCVA at 3 months | P value |
|---|---|---|---|---|---|
| A | 2.1-3.0 | 10(21.73%) | 0.8372+0.187 | 0.877+0.165 | 0.638 |
| B | 3.1-4.0 | 14(30.43%) | 0.793+0.234 | 0.877+0.168 | 0.198 |
| C | 4.1-5.0 | 20(43.47%) | 0.784+0.219 | 0.866+0.164 | 0.040 |
| D | 5.1-6.0 | 2(4.35%) | 0.672+0.356 | 0.88+0.164 | 0.351 |

Paired t-test applied, p value <0.05 is significant.

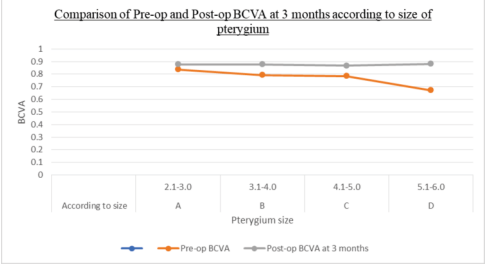



**Chart-9 Comparison of Pre-op and Post-op BCVA at 3 months according to size of pterygium**

Maximum 20(43.47%) out of 46 patients had 0.784+0.219 pre-op BCVA which was increased to 0.866+0.164 had size of pterygium 4.1-5.0mm.
14(30.43%) out of 46 patients had BCVA of 0.793+0.234 which was increased to 0.877+0.168 post-operatively with pterygium size of 3.1-4.0mm.
10(21.73%) patients had BCVA of 0.8372+0.187 which increased to 0.877+0.165 with pterygium size of 2.1-3.0mm.

2(4.35%) patients had BCVA of 0.672+0.356 which increased to 0.88+0.164 with pterygium size of 5.1-6.0mm.

Total mean pre-operative BCVA of 0.787+0.23 increases post-operatively at 3 months to 0.86+0.16

**Pterygium size and induced astigmatism:**
**Table-10**

| Group | Size of Pterygium | No. of patients | Percentage | Mean Induced Astigmatism(D) | P value |
|---|---|---|---|---|---|
| A | 2.1-3.0 | 10 | 21.74% | 1.92+0.615 | <0.0001* |
| B | 3.1-4.0 | 14 | 30.43% | 3.66+1.03 | |
| C | 4.1-5.0 | 20 | 43.48% | 4.60+0.95 | |
| D | 5.1-6.0 | 2 | 4.35% | 7.5+1.96 | |
| | Total | 46 | | | |

*ANOVA test is applied

**Chart-10 Pterygium size and Induced Astigmatism**

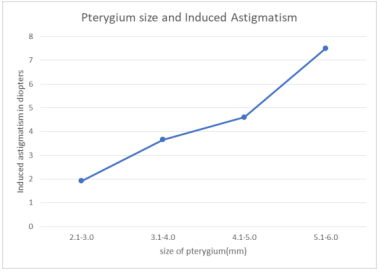
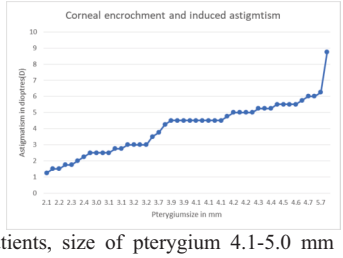



**Chart-11 Corneal encroachment and induced astigmatism**




Out of 46 patients, size of pterygium 4.1-5.0 mm induced mean astigmatism of 4.60+0.95 D. Corneal encroachment of 3.1-4.0 mm induced 3.66+1.03 D, Corneal encroachment 2.1-3.0 mm induced 1.92+0.615 D and Corneal encroachment 5.1-6.0 mm induced 7.5+1.96 D astigmatism. As the size of pterygium increases amount of astigmatism induced by it significantly increases.

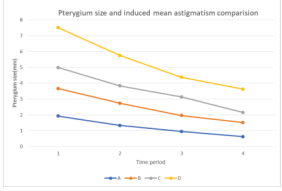
**R. Avisar et al**[11] shown that astigmatism of more than 1.00 diopter was present in 16.6% of eyes with a lesion extending from 0.2-1.00 mm (Group A), in 45.5% of eyes with lesion extending from 1.1 to 3.0 mm (Group B, p<0.002 as compared to Group A), in 93.33% of eyes with lesion extending from 3.1 to 5.0 mm (Group C, p<0.0004 as compared to Group A), and in 100% of 3 eyes with lesion extending more than 5.1 mm from the limbus (Group D, p=0.0005 as compared to group A).

**Comparison of Pterygium induced mean astigmatism and post-op astigmatism according to size of pterygium:**
**Table-11**

| Group | Pterygium size(mm) | Pre-op mean induced astigmatism | Post-op mean astigmatism | | |
|---|---|---|---|---|---|
| | | | 1 week | 1 month | 3 months |
| A | 2.1-3.0 | 1.92+0.62 D | 1.325+0.48 D | 0.95+0.36 D | 0.62+0.34 D |
| B | 3.1-4.0 | 3.66+1.03 D | 2.732+0.88 D | 1.96+0.75 D | 1.51+0.60 D |
| C | 4.1-5.0 | 4.98+0.59 D | 3.825+0.72 D | 3.13+0.54 D | 2.15+0.74 D |
| D | 5.1-6.0 | 7.5+1.76 D | 5.75+1.06 D | 4.37+0.17 D | 3.62+0.53 D |

1-pre-op, 2-post-op at 1 week, 3-post-op 1 month, 4-post-op 3 months

**Chart-12 pterygium size and induced mean astigmatism comparison**




P value calculated by paired t-test.

Group A with 2.1-3.0mm size of pterygium induced astigmatism of 1.92+0.62 D which was reduced post-op at 1 week to 1.325+0.48 D which was statistically significant (p-value <0.001), to 0.95+0.36 D at 1 month which is statistically significant (p value <0.001) and 0.62+0.34D at the end of 3 months.

Group B with 3.1-4.0mm size of pterygium induced astigmatism of 3.66+1.03 D which was reduced post-op at 1 week to 2.732+0.88 D statistically significant (p value<0.001), to 1.96+0.75 D statistically significant (p value<0.001) at 1 month and 1.51+0.60 D statistically significant (p value<0.001) at the end of 3 months.

Group C with 4.1-5.0mm size of pterygium induced astigmatism of 4.98+0.59 D which was reduced post-op at 1 week to 3.825+0.72 D statistically significant (p value<0.001), to 3.13+0.54 D at 1 month statistically significant (p value<0.001) and 2.15+0.74 D statistically significant (p value<0.001) at the end of 3 months.

Group D with 5.1-6.0 mm size of pterygium induced astigmatism of 7.5+1.76 D which was reduced post-op at 1 week to 5.75+1.06 D statistically significant (p value<0.001), to 4.37+0.17 D at 1 month statistically significant (p value<0.001) and 3.62+0.53 D statistically significant (p value<0.001) at the end of 3 months.

**The mean astigmatic changes before and after pterygium surgery:**
**Table-12**

| | Preop | Post-operative | | |
|---|---|---|---|---|
| | | 1 week | 1 month | 3 months |
| Astigmatism (Mean + SD in diopters) | 4.04+1.57 | 3.03+1.34 | 2.35+1.12 | 1.69+0.94 |

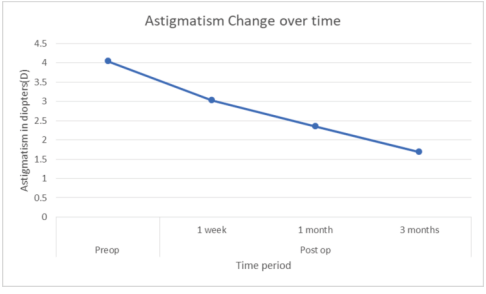



**Chart-13 Astigmatism Change over time**

The mean induced astigmatism due to pterygium encroaching cornea preoperatively is 4.04+1.57 D. Post operatively after 1-week astigmatism is 3.03+1.34 D, after 1 month is 2.35+1.12 D and after 3 months astigmatism is 2.35+1.12 D.

**Lin and Stern** found a significant correlation between the size of pterygium and corneal astigmatism.[12] It was also suggested that pterygium extending more than 45% of corneal diameter results in increasing degrees of astigmatism.[13] **Mohammad-Salih and co-workers** studied the pterygium extension, width, and total area and investigated their relationship with corneal astigmatism. Among the 3, an extension had the strongest and the most significant correlation with the astigmatism.[14] The authors reported that pterygium with larger than 2.2 mm extension might contribute to corneal astigmatism >2 D. It was reported that significant astigmatism increases with an increasing size of the pterygium.[15]

In present study, we compared the size of the pterygium with the change in astigmatism and found a significant correlation (P < 0.001). Main difference in change of astigmatism was between the sizes of 2 mm and 5 and 6 mm. Thus, we agree with previous reports that it is better to remove the pterygium when it measures nearly 2 mm in horizontal length.

**Comparison of mean pre-op and post-op astigmatism:**
**Table-13**

| Mean Astigmatism | Astigmatism + SD |
|---|---|
| Pre –Operative mean | 4.04+1.57 |
| Post-operative mean | 1.69+0.94 |
| p-value | <0.001 |

In this study mean astigmatism following pterygium surgery reduced from 4.04+1.57 D to 1.69+0.94 D which was statistically significant (p value<0.001).

**Yasar T et al**[16] study shows that 2.30 + 2.08 D (0.2 - 7.63) preoperatively and 0.82 + 0.74 D (0.06 - 2.79) postoperatively. The difference between these two values was statistically significant (t = -3.46, P = 0.002)

**Keratometry changes before and after surgery at 3 months:**
**Table-14**

| Group | Size of pterygium | Keratometry | Pre-op | Post-op | P value* |
|---|---|---|---|---|---|
| A | 2.1-3.0 | K1 | 44.8+3.58 | 44.175+2.86 | 0.076 |
| | | K2 | 44.9+2.34 | 44.375+2.17 | 0.026 |
| B | 3.1-4.0 | K1 | 45.25+2.66 | 43.89+1.83 | 0.015 |
| | | K2 | 45.07+2.57 | 44.07+1.66 | 0.047 |
| C | 4.1-5.0 | K1 | 44.47+3.56 | 42.81+2.43 | 0.0002 |
| | | K2 | 43.88+2.54 | 42.5+1.87 | 0.004 |
| D | 5.1-6.0 | K1 | 40.75+3.53 | 40.375+2.65 | 0.066 |
| | | K2 | 48.75+1.414 | 44.37+1.23 | 0.018 |

*paired t -Test applied (p value <0.05 is significant)

In this study keratometry changes were significantly reduced after pterygium surgery which is shown in table.

Group A with size of pterygium 2.1-3.0 mm with pre-op K1 44.8+3.58 and K2 44.9+2.34 which is reduced to post-op K1 44.175+2.86 and K2 44.375+2.17.

Group B with size of pterygium 3.1-4.0 mm with pre-op K1 45.25+2.66and K2 45.07+2.57 which is reduced to post-op K1 43.89+1.83and K2 44.07+1.66.

Group C with size of pterygium 4.1-5.0 mm with pre-op K1 44.47+3.56 and K2 43.88+2.54 which is reduced to post-op K1 42.81+2.43 and K2 42.5+1.87.

Group A with size of pterygium 5.1-6.0 mm with pre-op K1 40.75+3.53 and K2 48.75+1.414 which is reduced to post-op K1 40.375+2.65 and K2 44.37+1.23.

**The mean Keratometry changes Before and after Pterygium excision:**
**Table-15**

| | Preoperative | Post-operative | | | Difference at 3 months after surgery |
|---|---|---|---|---|---|
| | | 1st week | 1 month | 3 months | |
| Horizontal (K1) | 44.77+3.41 | 44.19+2.86 | 43.84+2.69 | 43.40+2.47 | 1.37+1.01 |
| Vertical (K2) | 44.55+2.51 | 43.99+2.18 | 43.66+2.02 | 43.5+1.95 | 1.05+0.56 |

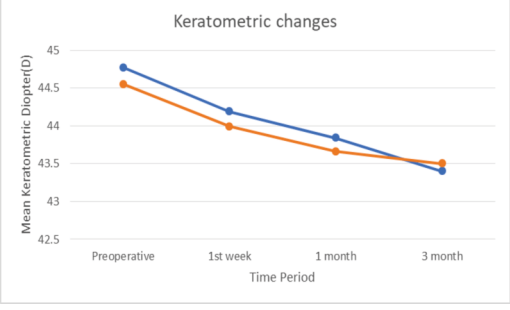



**Chart-14 Keratometry changes before and after pterygium surgery**

Preoperatively mean K1 was 44.77+3.41 D and K2 was 44.55+2.51 D. Post-operatively K1 was 44.19+2.86 D and K2 was 43.99+2.18 D, after 1 month mean K1 was 43.84+2.69 D and K2 was 43.66+2.02 D and after 3 months mean K1 was 43.40+2.47 D and K2 was 43.50+1.95 D. Total Difference in K1 was 1.37+1.01 D and K2 was 1.05+0.56 D. There were reduction in corneal astigmatism after pterygium surgery.

**Yumnam Chingsuingamba Meitei et al**[17] study shows that mean dioptric power of the cornea at the horizontal axis (K1) changed from 43.13±1.47 D to 41.87±1.15 D after 12 weeks of surgery showing a mean difference of 1.26±0.32 D. The mean dioptric power of the cornea at the vertical axis (K2) changed from 42.10±1.58 D to 41.27±1.20 D after 12 weeks of surgery showing a mean difference of 0.83±0.38 D, which is similar to present study.

## OBSERVATION AND DISCUSSION

Pterygium induced astigmatism can often be the cause of subjective visual complaints. Pterygium may cause flattening of the cornea to the leading apex[12]. An induced astigmatism was explained by several mechanisms: Pooling of the tear film at the leading edge of the pterygium, and mechanical traction exerted by the pterygium on the cornea.[18]

Study population consisted of individuals in mean age group of 52.5+16 years, in which 61-70 years had 32.60% followed by 31-40 years (23.91%). In a study done by Riordan-Eva et al (1993),[6] ages of patients range from 25-77 years. Mean age in that study was 47 years. In another study done by Philip Chen et al (1995),[7] ages of patients range from 23-79 years. Mean age in that study was 45.6 years. This correlates with the present study. Females were 25(54.35%) out of 46 as compared to male were 21(45.65%), were more as compared to male for which cosmesis may be a driving factor. In present study, 19(41.30%) out of 46 patients had left eye involvement and 18(39.13%) out of 46 patients had right eye involvement. 9(19.57%) out of 46 patients had bilateral eye involvement. Most of patients had nasal side of pterygium which was in 45(97.83%) out of 46 and only 1 patient had temporal pterygium. Visual acuity rose from pre-operatively 6/18-6/6 24.00% to post-operatively 67.38% at the end of 3 months. BCVA improves from 0.787+0.23 pre-operatively to post-operative 0.86+0.16. As reported earlier, pterygium results in high corneal astigmatism, which decreases following an excision.[19] Accordingly, in present study, we found that the degree of astigmatism decreased significantly following excision, and this decrease was related to the size of the pterygium. The size was affecting the change in astigmatism as well as postoperative degree of astigmatism. Mean pterygium size was 3.73+0.88 mm. pterygium was graded according to corneal encroachment in which maximum were in grade 3-26(39.16%), grade 2-18(39.16%) and in grade 4-2(4.35%).

In present study mean pre-operative pterygium induced astigmatism was 4.04+0.15 D which was reduced to 1.69+0.94 D post-operative at the end of 3 months. 2.1-3.00 mm induced 1.92+0.62 D which was reduced to 0.62+0.34 D, 3.1-4.00 mm induced 3.66+1.03 D which was reduced to 1.51+0.60 D, 4.1-5.00 mm induced 4.98+0.59 D which was reduced to 2.15+0.74 D and 5.1-6.0 mm induced 7.5+1.76 D which was reduced to 3.62+0.53 D at the end of 3 months.

The refractive components were demonstrated to stabilize at 1 month following pterygium surgery.[19] However, in present study, we included the postoperative 3rd months' results to make sure that refraction was stabilized. The conventional keratometry evaluates the corneal refractive power from 3 or 4 data points. Hence, many authors suggested using corneal topography in evaluating the change in astigmatism following pterygium surgery. Since limitation of resources we were unable to perform corneal topography in all cases, we have chosen to include refraction and keratometry values.

In present study, mean horizontal (K1) changes significantly from 44.77+3.41 D to 43.40+2.47 D, the difference was 1.37+1.01 D at the end of 3 months and vertical (K2) changes from 44.55+2.51 D to 43.5+1.95 D, which shows that pterygium excision significantly changes horizontal astigmatism of cornea.

Lin and Stern found a significant correlation between the size of pterygium and corneal astigmatism.[12] It was also suggested that pterygium extending more than 45% of corneal diameter results in increasing degrees of astigmatism.[13] Mohammad-Salih and co-workers studied the pterygium extension, width, and total area and investigated their relationship with corneal astigmatism. Among the 3, an extension had the strongest and the most significant correlation with the astigmatism.[14] The authors reported that pterygium with larger than 2.2 mm extension might contribute to corneal astigmatism >2 D. It was reported that significant astigmatism increases with an increasing size of the pterygium.[15] Kampitak concluded that the amount of induced corneal astigmatism and timing for pterygium excision are related to

the pterygium size, and reported that 2.25 mm pterygium resulted in astigmatism of 2 D, and should be considered in the limits of surgery.[20] Accordingly, Seitz et al. concluded that with the size of pterygium from 2.5 mm, the preoperative astigmatism increases, therefore, the authors believed that the surgery should be performed before it reaches beyond this point.[21] In present study, we compared the size of the pterygium with the change in astigmatism and found a significant correlation ($P < 0.001$). Main difference in change of astigmatism was between the sizes of 2 mm and 5 and 6 mm. Thus, we agree with previous reports that it is better to remove the pterygium when it measures nearly 2 mm in horizontal length.

## CONCLUSION

In present study significant correlation between the preoperative and postoperative astigmatic values was found as well as the changes in astigmatism with surgery. Pterygium size more than 2 mm from limbus induces significant amount of astigmatism, it tends to rise with increase in size. Increased astigmatism in patients with pterygium caused a decreased in visual acuity. Therefore, early surgical intervention in pterygium may be indicated when the size of lesion is more than 2.00mm.

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