

## Effects of Pterygium Excision on Corneal Curvatures

Muhammad Imran Saleem<sup>1</sup>, Muhammad Saleem Channar<sup>2</sup>,  
Muhammad Farhan Saleem<sup>3</sup>

### ABSTRACT

**Objective:** To determine the difference in mean corneal curvatures before and after pterygium excision, by using automated refraction and keratometry.

**Methodology:** This quasi-experimental study was conducted at Eye Unit-I, Bahawal Victoria Hospital, Bahawalpur, from March 2010 to August 2010. Thirty patients with primary pterygium were analyzed before and after pterygium surgery for corneal curvature changes. Automated refraction and Automated keratometry were used to calculate the cylindrical error and the corneal surface power respectively. The mean and standard deviation were calculated for the corneal **curvatures** and the refractive cylinder before and after the operation. Paired sample t-test was used to compare the corneal curvatures and refractive cylinder before and after *pterygium* excision. P-value<0.05 was considered significant.

**Results:** The preoperative cylindrical error decreased from 4.32+ 1.88 D to 2.11 +1.96D postoperatively. Similarly, before surgery, the keratometry readings were 43.71 + 1.12 D in horizontal meridian and 44.94+ 1.41 D in vertical meridian. One week after the pterygium surgery these values were 44.45+0.85 D in horizontal meridian and 45.23 + 0.78 D in vertical meridian.

**Conclusion:** Pterygium excision brings a statistically significant change in corneal curvatures which leads to a decrease in cylindrical correction needed. This causes an improvement in subjective visual acuity in patients who have undergone pterygium surgery.

**KEY WORDS:** Keratometry, Pterygium, Pterygium excision, Refraction

Pak J Med Sci April - June 2011 Vol. 27 No. 2 325-328

### How to cite this article:

Saleem MI, Channar MS, Saleem MF. Effects of Pterygium Excision on Corneal Curvatures. Pak J Med Sci 2011;27(2):325-328

1. Dr. Muhammad Imran Saleem, MBBS  
Postgraduate Resident,
2. Dr. Muhammad Saleem Channar, MBBS, MCPS, DCH, FCPS,  
Assistant Professor,  
Department of Community Medicine,  
Quaid-E-Azam Medical College, Bahawalpur.
3. Dr. Muhammad Farhan Saleem, MBBS,  
House Surgeon,
- 1,3: Department of Ophthalmology, Eye Unit-II,  
Bahawal Victoria Hospital,  
Bahawalpur, Pakistan.

Correspondence:

Dr. Muhammad Imran Saleem,  
15-Bahawal Victoria Hospital Colony,  
Bahawalpur, Pakistan.  
E-mail: imransaleemchannar@yahoo.com

- \* Received for Publication: February 1, 2011
- \* 1<sup>st</sup> Revision Received: April 16, 2011
- \* 2<sup>nd</sup> Revision Received: April 19, 2011
- \* Final Revision Accepted: April 20, 2011

### INTRODUCTION

Pterygium is a benign fibro vascular proliferation of the conjunctiva onto the cornea.<sup>1</sup> Pterygium is known to occur more frequently in areas with UV light, in hot dry windy and dusty environment.<sup>2,3</sup> There is also a hereditary factor for its causation.<sup>4</sup> Occurrence of pterygium also varies with the geographical location. Prevalence rate varies from 5-15% in different areas of the world depending upon the proximity of a location to the equator.<sup>5,6</sup> Pterygia are reported to occur more frequently in the males as compared to the females. Incidence is highest between the ages of 20-24 year.<sup>6</sup> Patients with pterygium have a variety of complaints ranging from no symptoms to significant redness, itching, ocular motility disturbance and blurred vision.<sup>7</sup> The visual disturbance in patients having pterygium is thought to be due to corneal

curvature abnormalities resulting either due to the pooling of tears over the apex of the lesion or due to the mechanical traction of the pterygium over the cornea.<sup>8</sup> The patients with pterygium can be observed until the lesion exhibits growth towards the cornea. Indications of pterygium excision include visual deterioration, disturbed ocular motility and cosmesis.<sup>9</sup> Multiple options have been advocated in treating a pterygium. These range from simple excision to the conjunctival or amniotic membrane grafts, external beta irradiation and the use of topical chemotherapeutic agents such as intraoperative or postoperative mitomycin-C.<sup>10-12</sup>

The curvature abnormalities seen in patients with pterygium, have been measured in previous studies by using corneal topography, manual keratometry and automated refraction.<sup>14-16</sup> According to these studies, the pterygium excision brings a significant improvement in vision by reverting the corneal curvatures towards normality. According to one study preoperative refractive cylinder decreased from 1.94±2.24 diopters to 0.78±1.07 diopters postoperatively (p=0.00001). Improvement in vision due to pterygium removal was seen in about 42% of the patients in this study.<sup>14</sup>

Pterygium is a common eye disease in patients presenting to the outdoor patient department of our hospital. Most of these patients are poor. Once they become visually handicapped due to the growth of the pterygium over the cornea, they are not able even to earn their livelihood as result of their visual disability. Early intervention in the form of pterygium excision, brings corneal curvatures back to the normal, and so effectively improves the vision. In this way, the patients again become productive members of the society and once again start performing their routine activities of life.

Present study was conducted to highlight this effect of the pterygium excision on the corneal curvatures and astigmatism by using automated keratometry and automated refraction.

### METHODOLOGY

Approval of study was taken from the local ethical committee. Study population consisted of patients with a primary ocular pterygium. Only the patients having > 1.5D with the rule astigmatism (as measured by automated refraction), were included in the study. Patients with recurrent pterygium, double pterygium, acutely inflamed pterygium on slit lamp examination and the patients not consenting for pterygium excision were excluded. Informed written consent was taken from each patient before conducting the study.

All patients were thoroughly examined preoperatively for visual acuity using Snellen’s chart, slit lamp examination of anterior segment, extra ocular movements, automated keratometry, automated refraction and fundus examination.

Pterygium was then graded depending upon the extent of corneal invasion as seen on slitlamp examination. Grade-I, crossing the limbus but not reaching the pupil margin. Grade-II, crossing the limbus and reaching upto the pupil margin. Grade-III, reaching beyond the pupil margin (involving the visual axis). Corneal curvatures were measured using Bausch and Lomb keratometer while refraction was performed using Cannon autorefractometer. Corneal curvature values were recorded separately for horizontal and vertical meridian by the authors. All patients underwent automated refraction to assess the power of refractive cylinder.

After performing the examination and documenting the findings, pterygium excision was performed under topical anesthesia using 0.5% proparacaine drops (Alcaine). All surgeries were performed by the author himself. Area of pterygium was sterilized by instilling two drops of 5% povidone-iodine. Ocular speculum was then applied to the lids. After irrigating the ocular surface with copious amount of Ringer’s solution, the head and neck of the pterygium covering the cornea were removed by D-Ombrein’s Bare-sclera technique. The pterygial tissue was detached from corneal surface taking care not to damage the Bowman’s membrane during the removal of fibrous tags. The rough corneal surface was made regular and smooth by using fine dissection and polishing the corneal surface with the help of No.15 surgical blade. Care was taken not to expose the Tenon’s capsule during the conjunctival excision so as to minimize the risk of postoperative granuloma formation. Hemostasis was achieved by cauterizing the large bleeding vessels. After completion of the surgery, a pad was applied to the operated eye for 24 hours. On the next morning, all patients were examined on slit lamp. Topical antibiotic-steroid combination eye drops (Spersadexoline) and oral analgesics (Tablet Paracetamol) were prescribed to all the patients and they were discharged from the hospital. All patients

Table-I: Age and sex of patients.

Age (Years)	Male	Female	Total
31-40	16	4	20
41-50	5	3	8
51-60	2	0	2
Grand Total	23	7	30

Table-II: Grade of Pterygium and Refractive Cylinder.

Grade	No. of Patients	Pre-op cyl	Post op cyl	Pre-op mean cyl±SD	Post-op mean cyl±SD
I	15(50%)	1.76 ± 0.52 D	0.92 ± 0.63 D		
II	13(43%)	2.46 ± 0.74 D	1.44 ± 1.23 D	4.32 ± 1.88D	2.11 ± 1.96D*
III	2(7%)	3.57 ± 1.48 D	1.46 ± 1.19 D		

Cyl=Cylinder.

\*P&lt;0.05

followed up on day 07 when their visual acuity, slitlamp examination, keratometry and refraction were again performed. The postoperative values of refractive cylinder and corneal surface curvatures were recorded. The Pre and postoperative values were then compared. Paired t-test was used to compare the corneal curvatures and refractive cylinder. P-value<0.05 was considered statistically significant.

### RESULTS

Our study included thirty patients of primary ocular pterygium. All eyes had nasal pterygium. Most of the patients in this study were Males in their third decade of (Table-I). Grade-I and grade-II pterygium was seen in majority of the patients presenting to our outdoor patient department, while grade-III lesion was seen in very few patients (Table-II). It was observed in our study that the magnitude of refractive cylinder increased in direct proportion to the grade of the pterygium. All grade-II and III lesions were observed to induce a greater cylindrical error as compared to a grade-I lesion (Table-II). Another important observation made in our study was that pterygium excision brought a significant decrease in cylindrical error postoperatively (Table-II). Similar findings were also made during measurements of keratometry readings. A greater variability in keratometric readings was observed with an increasing grade of the pterygium (Table-III). It can be seen from the Table-III that pterygium excision also brought a significant change in the keratometric readings. These results were considered statistically significant at p<0.05.

### DISCUSSION

Pterygium causes a decreased visual acuity which is thought to be due to an alteration in tear film or by mechanical effects of the lesion.<sup>1-3</sup> Lin et al report that a significant degree of astigmatism occurs when pterygium covers upto 45% of corneal surface from limbus to the visual axis.<sup>4</sup> This phenomenon was also observed in our study.

Mahashewari and Yousuf using keratometer, corneal topography and automated refraction, found that the cornea became more regular following removal of the pterygium.<sup>14,15</sup> In their studies, an observation was made that the pterygium causes serious corneal astigmatism (4.31±1.91 D), and this astigmatism reduces (2.19±1.55 D) following pterygium excision.<sup>15</sup> Similar effect was also noted in our study. Once the pterygium had been excised from the corneal surface, there was a significant subjective improvement in visual acuity, mainly due to a decrease in astigmatism and removal of pterygium from visual axis specially in Grade-II and III lesions (p<0.05).

In another study, Gumus et al used corneal topography and wavefront analysis to evaluate the ocular refractive error induced by pterygium. Their study verified that pterygium induces a change in the toric-spheric shape of the cornea, thus leading to an ocular astigmatic aberration. Additionally they also showed that the astigmatic error seen in these patients was a function of the size of the Pterygium.<sup>16</sup>

Many similar studies have also been done nationally to assess the effects of pterygium on visual acuity and the refractive changes associated with it.<sup>17-20</sup> In

Table-III: Corneal curvatures before and after Pterygium Excision.

Pre-Op K-values (Mean ± SD)	Post Op K-values (Mean ± SD)	Difference according to grade			
		G-I	G-II	G-III	Mean
K1 43.71 ± 1.12 D	44.45 ± 0.85 D	0.38 ± 0.32D	0.85 ± 0.56D	1.38 ± 0.47D*	0.74 ± 0.53D
K2 44.94 ± 1.41 D	45.23 ± 0.78D	0.26 ± 0.27D	0.29 ± 0.48D	0.34 ± 0.75D	0.30 ± 0.26D

K1= Corneal curvature in horizontal meridian(Diopters)

K2= Corneal curvature in vertical meridian(Diopters)

D= Diopters

\*= statistically significant(p&lt;0.05)

one such study, Salman and coworkers have recently used video keratoscope to correlate the pterygium size and the induced astigmatism. According to their study, pterygium size has direct effect on the induced astigmatism and the correlation is strongest in patients with advanced pterygia.<sup>17</sup> The findings of our study are exactly in line with the observations made by these researchers.

Astigmatism seen in patients with pterygium is mostly induced by the pterygium itself and most of the time it is with-the rule. Pterygium surgery effectively decreases this cylindrical error and reverts corneal curvatures towards normality, thus improving subjective visual acuity.<sup>14-17</sup> Results of our study support these findings.

The present study verifies that as the size of pterygium increases, amount of astigmatism also increases in direct proportion. A successful pterygium surgery reduces this induced astigmatism.

### 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.

### REFERENCES

1. Coroneo MT, Di Girolamo N, Wakefield D. The pathogenesis of pterygia. *Curr Opin Ophthalmol* 1999;10:282-288.
2. Elliott R. The aetiology of pterygium. *Trans Ophthalmol Soc NZ* 1961;13:22.
3. Kheirkhah A, Casas V, Sheha H, Raju VK, Tseng SC. Role of conjunctival inflammation in surgical outcome after amniotic membrane transplantation with or without fibrin glue for pterygium. *Cornea* 2008;27(1):56-63.
4. Stern G, Lin A. Effect of pterygium excision on induced corneal topographic abnormalities. *Cornea* 1998;17:23-7. [Pub Med]
5. Blum HF. *Carcinogenesis by ultraviolet light*. Princeton University Press; 1959.
6. Threlfall TJ, English DR. Sun exposure and pterygium of the eye: A dose response curve. *Am J Ophthalmol* 1999;128(3):280-7.
7. Starck T, Kneyon KR, Serrano F. Conjunctival autograft for primary and recurrent pterygia: Surgical technique and problem management. *Cornea* 1991;10(3):196-202.
8. Uy HS, Reyes JM, Flores JD, Lim-Bon Siong R. Comparison of fibrin glue and sutures for attaching conjunctival autografts after pterygium excision. *Ophthalmology* 2005;112(4):667-71.
9. Yao YF, Qiu WY, Zhang WM, Tseng SC. Mitomycin-C, amniotic membrane transplantation and limbal conjunctival autograft for treating multi recurrent pterygia with symblepharon and motility restriction. *Graefes Arch Clin Ex Ophthalmol* 2006;244(2):232-6.
10. Srinivasan S, Slomovic AR. Eye rubbing causing conjunctival graft dehiscence following pterygium surgery with fibrin glue. *Eye* 2007;21:865-7.
11. Miyai T, Harar R, Neijima R, Miyata K, Yonemura T, Amano S. Limbal allograft, amniotic membrane transplantation and intraoperative mitomycin-c for recurrent pterygium. *Ophthalmology* 2005;112(7):1263-7.
12. Saw SM, Tan D. Pterygium, demography and risk factors. *Ophthalmic Epidemiol* 1999;6(3):219-28.
13. Elkington AR, Frank HJ, Greaney MJ. *Clinical Optics* 3rd ed, Blackwell Science; 1999.
14. Mahashewari S. Effects of pterygium excision on pterygium induced astigmatism. *Indian J Ophthalmol* 2003;51:187-8.
15. Yousuf M. Role of pterygium excision in pterygium induced astigmatism. *JK-Practitioner* 2005;12(2):91-2.
16. Gumus K, Erkilic K, Topaktas D, Collin J. Effect of pterygia on refractive indices, corneal topography, and ocular aberrations. *Cornea* 2011;30(1):24-9.
17. Jaffar S, Dukht U, Rizvi F. Impact of pterygium size on corneal topography. *Rawal Med J* 2009;34: 145-47.
18. Baig MA, Asghar S, Ishaq M. Sliding conjunctival flap in the surgical management of pterygium: A better approach. *Pak Armed Forces Med J* 2007;57(3):206-11.
19. Rahman A, Yahyah K, Hasan SK. Recurrence rate of pterygium following surgical excision with intraoperative versus postoperative Mitomycin-c. *J Coll Physicians Surg Pak* 2008;18(8):489-92.
20. Ahmad M, Khan N, Iqbal M, Iqbal Z. Recurrence in primary pterygium excision with amniotic membrane grafts. *J Med Sci* 2008;16(1):43-45.