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Original Article

The Impact of A Successful Pterygium Excision on Corneal Astigmatism and Topography

Waseem Yousaf, Fakhar Humayun, Sadaf Mumtaz*, Ijlal Taimoor, Muhammad Usman Ghani, Taimoor Ashraf Khan

Department of Ophthalmology, Armed Forces Institute of Ophthalmology/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, *Department of Gynae/Obs, Pak Emirates Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To determine the impact of successful excision of pterygium on corneal astigmatism and topography.
Study Design: Quasi-experimental study.
Place and Duration of Study: Armed Forces Institute of Ophthalmology, Rawalpindi Pakistan, from Feb 2021 to Jul 2021.
Methodology: All 52 patients of pterygium who underwent surgical excision of the pterygium during the study period were included. The size of pterygium was measured in millimeters. Pre-operative automated keratometry and corneal topography was done, and changes in astigmatism, surface asymmetry index, surface regularity index, uncorrected visual acuity and best corrected visual acuity were measured postoperatively on the 7th day. Paired sample t-test was applied between pre- and post-operative astigmatism, surface asymmetry index, surface regularity index, uncorrected visual acuity and best corrected visual acuity.
Results: The mean age of participants was 42.02±13.3 years, with 22(42.3%) females and 30(57.7%) males. The male to female ratio is 1.36:1. The highest frequency of cases was noted in the age group, 31-50 years (42%), followed by 18-20 years (21%). Pterygium size was 2.25 to 4.10 mm, with a mean of 3.16±0.54mm. Pain and photophobia were noted in 5 cases. Pre- and post-operative comparison of astigmatism and corneal topography revealed a significant reduction in Surface Asymmetry Index and Surface Regularity Index values (p-value<0.001). Uncorrected Visual Acuity (p=0.002) and Best Corrected Visual Acuity also improved significantly after surgery (p=0.006).
Conclusions: This study concluded that pterygium excision brings a significant decrease in astigmatism and reversible corneal topography changes.

Keywords: Astigmatism, Corneal topography, Pterygium surgery.

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INTRODUCTION

Pterygium is a tissue growth of bulbar conjunctiva and underlying subconjunctival tissue onto the cornea.[1] Pterygium is fibrovascular growth and damages the limbal stem cells. In various studies worldwide, prevalence noted is 0.7-31%, with males being affected twice than females.[2] Other studies reported a worldwide prevalence varying from 1 to 25 %, depending on the population studied.[3] In India prevalence of pterygium ranges from 8.4-42%.[2] In a regional study conducted in Pakistan prevalence of pterygium noted was 7.4%.[4]

It is noted more commonly in the younger population involved in outdoor activities, usually associated with ultraviolet exposure, exposure to dry, dusty and windy environments. As one observation, pterygium can grow over time, over months or even years.[5] Patients usually ignore symptoms initially and seek treatment only when symptoms worsen, or visual impairment is to the degree that interferes with routine activities. Some patients don't have symptoms, and they report a change in eye appearance or pterygium, which may be sometimes an incidental finding on physical examination.[6]

Pterygium also causes distortion of the corneal surface and leads to a significant amount of astigmatism. Pterygium affects corneal refractive status, measured by keratometry, refraction, and corneal topography. Computerized video keratoscopy has been used extensively to study the effect of the size of the pterygium and its excision on corneal topography, including astigmatism and corneal spherical power during the early and late post-surgical period.[7]

The efficacy of preventive measures like avoidance of ultraviolet light exposure is not well known. However, some population-based studies documented use of hats and sunglasses help prevent primary pterygium.[8]

Medical treatments are available for symptomatic relief but have not shown to stop the progression of pterygium. Symptomatic treatment includes topical lubricants in the form of drops, gels, and ointments, and they are readily available over the counter.

Correspondence: Dr Waseem Yousaf, Department of Ophthalmology, Armed Forces Institute of Ophthalmology, Rawalpinid Pakistan
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However, as the case progresses, surgery becomes a necessity. In our country, the most widely used tool for decision-making in pterygium surgery is automated keratometry. Inflammation recurrence, reduction in ocular motility, aesthetic issues, changes in the refractive state of the eye, and corneal curvature are the main reasons to remove a pterygium surgically.[9-10] Our study was aimed to use keratometric readings of an automated keratometer to measure a change in pterygium-induced astigmatism and corneal topography after pterygium excision in the local population.

METHODOLOGY

A total of 52 pterygium cases during a period of a 6 months (Feb 2021 to July 21) were recruited in this quasi-experimental study after taking approval from Institutional Review Board (IRB), Armed Forces Institute of Ophthalmology (267-ERC AFIO Rawalpindi Dated 22 Dec 2020). Sample size of 46 was calculated using WHO calculator taking population proportion as 7.4%, precision or margin of error 0.05% and confidence interval as 80.4 Sampling technique was non-probability consecutive sampling.

Inclusion Criteria: Patients aged between 18 to 70 years with pterygium sizes greater than 2.2mm were included in our study.

Exclusion Criteria: Patients with recurrent pterygium, double-headed pterygium, pseudo pterygium, pterygiums with anterior or posterior segment pathologies, corneal scarring, and ocular surgery in the past were excluded.

Written informed consent from all the patients was obtained and confidentiality of the patients was ensured at all levels. A single investigator took a detailed ocular and systematic histories and performed Ocular examinations; including slit-lamp examination. The size of pterygium was measured using Haag Streit Slit Lamp Biomicroscope. The length of pterygium was documented in millimeters. An automated keratometry was performed with Canon Auto Refracto-keratometer. To further standardized the results, surgeries were performed by the same surgeon. On the seventh day, patients were called for post-operative measurements. A systematic analysis of preoperative and postoperative astigmatism, Surface Asymmetry Index (SAI), Surface Regularity Index (SRI), Uncorrected Visual Acuity (UCVA) and Best Corrected Visual Acuity (BCVA) were documented. Data was entered and analyzed using Microsoft Excel SPSS version 22 Software (IBM-Illinois) and a paired sample t-test was applied between pre- and post-operative cases, and *p*-values ≤0.05 were considered significant.

RESULTS

In our study, preoperative and postoperative astigmatism, SAI, SRI, UCVA) and BCVA was recorded after pterygium excision. A statistically significant reduction in astigmatism was noted in our study after the excision of pterygium. Pre-operative astigmatism in our study was 3.78±0.41 (Diopters), and post-operative was 2.32±0.28 (Diopters). The change was statistically significant with a *p*-value<0.001. SAI, SRI had also decreased postoperatively. SAI reduced from 1.16±0.04 to 0.74±0.05 and SRI from 1.35±0.57 to 1.13±0.03. UCVA and BCVA also improved in our cases after the excision of pterygium (0.32±0.04 to 0.53±0.03 Diopters) and (0.74±0.03 to 0.87±0.03 Diopters) respectively.

The mean age of participants was 42.02±13.391 years, with 22(42.3%) females and 30(57.7%) males. None of the cases has any intraoperative or postoperative complication. Post-operative pain and photophobia was reported in n=5 (9.6%) of cases. Cases were divided into four age groups (18-20 years, 31-50 years, 50-65 years and group four was with cases greater than 65 years. Frequency distribution among four age groups is shown in Figure-1.

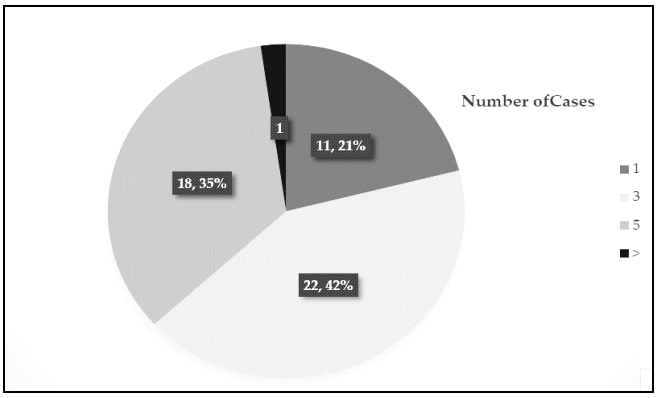

Figure-1: Distribution of cases in various age groups

Pterygium size was 2.25 to 4.10 mm, with a mean of 3.16±0.54mm. Pre-and post-operative comparison of astigmatism, SAI, SRI, UVA, and BCVA was done and shown in Table-I.

Pre-operative astigmatism in our study was 3.78±0.41 (Diopters), and post-operative was 2.32 ±0.28 (Diopters). The change was statistically signi-ficant with a *p*-value <0.001. SAI, SRI had also decreased postoperatively. SAI had reduced from 1.16±0.04 to 0.74±0.05 and SRI from 1.35±0.57 to 1.13±0.03. UCVA

and BCVA had also improved in our cases after the excision of pterygium (0.32±0.04 to 0.53±0.03 Diopters) and (0.74±0.03 to 0.87 ±0.03 Diopters) respectively as shown in Table-II.

Table-I: Pre- and Post-Operative Comparison of Astigmatism and Corneal Topography (n=52)

Parameters Measured	Mean±SD
Pre-operative Astigmatism	3.78±0.41(Diopters)
Post-operative Astigmatism	2.32±0.28(Diopters)
Pre-operative SAI	1.16 ± 0.04(Degrees)
Post-operative SAI	0.74±0.05(Degrees)
Pre-operative SRI	1.35±0.57
Post-operative SRI	1.13±0.03
Pre-operative UCVA	0.32±0.04 (Diopters)
Post-operative UCVA	0.53±0.03 (Diopters)
Pre-operative BCVA	0.74±0.03 (Diopters)
Post-operative BCVA	0.87±0.03 (Diopters)

Table-II: Pre- and post-operative astigmatism, Surface Asymmetry Index, Surface Regularity Index, Uncorrected Visual Acuity and Best Corrected Visual Acuity (n=52)

Parameters	(Mean±SD)		*p*-value
	Pre-operative	Post-operative	
Astigmatism	3.78±0.41	2.32±0.28	<0.001
Surface Asymmetry Index	1.16±0.04	0.74±0.05	<0.001
Surface Regularity Index	1.35±0.05	1.13±0.03	<0.001
Uncorrected Visual Acuity	0.32±0.04	0.53±0.03	0.002
Best Corrected Visual Acuity	0.74±0.03	0.87±0.03	0.006

DISCUSSION

Subjective visual complaints are caused by pterygium due to its astigmatic impact, including changes in visual acuity, diplopia, and glare.[9] Mean age noted in our study was 42.02±13.39 years which is similar to findings in a local study (mean age was 37.60±11.11 years).[11] Frequency among males was high in their study (64.71%), which is similar to that observed in ours (57.7% were males). The male to female ratio in their study was 1.8: 1 and was 1.36:1 in our study. In a study done by Supanii *et al*.[12] in Indonesia, out of a total of 227 patients, 151(66.5%) were females, and 76(33.5%) were males. These findings of gender distribution are contrary to that of ours.

In our study, 42% of cases were in the age group 31-50 years, and the least were in the group >65 years. Shastry *et al*.[13] in the year 2019, also noted similar results. They documented 45% of patients in the age group 31-50 years out of a total of 40 cases. In our study, pain and photophobia was noted in 9.6% of cases (5 cases) which is in conjunction to similar studies done at other centres.[4]

Compared to other instruments, an automated keratometer is readily available to ophthalmologists in Pakistan. Its use in analyzing the astigmatic effects of pterygium and then deciding whether to excise it or not is very suitable and opportune.[4] A statistically significant reduction in astigmatism was noted in our study after the excision of pterygium. Pre-operative astigmatism in our study was 3.78±0.41 (Diopters), and post-operative was 2.32±0.28 (Diopters). The change was statistically significant with a *p*-value<0.001. In 2019, Pragya *et al*.[14] conducted a study in India, which also noted a statistically significant change in astigmatism after the excision of pterygium. The *p*-value noted in their study was <0.0001, which is similar to results of our study. Shastry *et al*. also reported similar results.[12]

In our study SAI and SRI also decreased postoperatively. SAI reduced from 1.165±0.04 to 0.745±0.05 and SRI from 1.35±0.57 to 1.139±0.03, and such findings were also noted by Gutay A *et al*.[15] and Chopra *et al*.[16] They also noted that increasing pterygium height and area resulted in a highly significant elevation of the pre-operative SAI and SRI values which reduced significantly after excision of pterygium. A decrease in SAI and SRI after pterygium excision indicates the better optical quality of a corneal surface.[15] UCVA and BCVA also improved in our cases after the excision of pterygium. This was also reported by Kaur M *et al*.[17] and Chu WK *et al*.[18] in their studies. This could be explained by better optical quality associated with corneal astigmatism reduction. Intra-operative complications of pterygium removal are rare as the procedure is extraocular. Rare complications noted are ocular perforations, extraocular muscle damage, retinal detachment and endophthalmitis. As complications are rarely seen, an improvement in astigmatism and visual acuity makes pterygium surgery a very safe procedure.[19] No intraoperative or postoperative complication was noted in any of our cases. Our study was done to see the impact of a successful pterygium excision on corneal astigmatism and topography in local population. Recurrence rates of pterygium are very high, varying between 30 to 80% cases. In specific subpopulations recurrence rate reported is 88%. The high rate of recurrence is noted even when surgical excision is aided with other adjunctive measures.[20] We didn't include recurrent cases of pterygium in our study.

LIMITATIONS OF STUDY

We excluded recurrent cases. Further studies are recommended in recurrent cases, and post-operative effects on astigmatism and corneal topography should be studied in such cases as well. This was a single-centered study with a limitation of study duration.

CONCLUSIONS

In our study, pre- and post-operative comparison of astigmatism and corneal topography revealed a significant reduction in Surface Asymmetry Index and Surface Regularity Index values. Uncorrected Visual Acuity and Best Corrected Visual Acuity also improved significantly after surgery.

Conflict Of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

WY & FH: Supervision, Conception, Study design, analysis and Interperitation of data, Critically reviewed manuscript & approval for the final version to be published.

SM & IT: Co-supervision, Data entry, analysis and interpretation, manuscript writing & approval for the final version to be published.

MUG & TAK: Critically reviewed, Drafted manuscript & approval for the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investi-gated and resolved.

REFERENCES

1. Fonseca EC, Rocha EM, Arruda GV. Comparison among adjuvant treatments for primary pterygium: a network meta-analysis. Br J Ophthalmol 2018; 102(6): 748-756.
2. Alpay A, Uğurbaş SH, Erdoğan B. Comparing techniques for pterygium surgery. Clin Ophthalmol 2009; 3(1): 69-74.
3. Viso E, Gude F, Rodríguez-Ares MT. Prevalence of pinguecula & pterygium in a general population in Spain. Eye (Lond) 2011; 25(3): 350-357. https://doi: 10.1038/eye.2010.204
4. Haq I, Durra M, Tahir M. Prevalence of Pterygium among Welders in Okara District. Ophthalmol Update 2020; 18(2): 25-27.
5. Yagmur M, Özcan AA. Visual acuity and corneal topographic changes related with pterygium surgery. J Refract Surg 2005; 21(2): 166-170. https://doi: 10.3928/1081-597X-20050301-12.
6. Hernandez EO, Córdoba A, Corona A, Miranda A. Practice patterns in the management of primary pterygium: a survey study. Cornea 2019; 38(11): 1339-44.
7. Pesudovs K, Figueiredo FC. Corneal first surface wavefront aberrations before and after pterygium surgery. J Refract Surg 2006; 22(9): 921-925. https://doi: 10.3928/1081-597X-21101-17.
8. Lu P, Chen X, Kang Y, Ke L. Pterygium in Tibetans: a population-based study in China. Clin Exp Ophthalmol 2007; 35(9): 828-833. https://doi: 10.1111/j.1442-9071.2007.01630.x.
9. McGlacken-Byrne AB, Drinkwater JJ, Mackey DA, Turner AW. Gender and ethnic differences in pterygium prevalence: an audit of remote Australian clinics. Clin Exp Optom 2021; 104(1): 74-77. https://doi: 10.1111/cxo.13081.
10. Kanclerz P, Khoramnia R, Wang X. Current Developments in Corneal Topography and Tomography. Diagnostics (Basel) 2021; 11(8): 1466. https://doi: 10.3390/diagnostics11081466.
11. Bano S, Khan S, Waqar M, Iqbal M, Bhatti HW, Raza A. Effect of pterygium excision on mean corneal curvature. Professional Med J 2021; 28(04): 568-571.
12. Supanji S, Purbonegoro T, Dianratri A, Jati KDP, Saputro A. Age and gender distribution of pterygium cases from the pterygium surgery social service program. J. Community Empowerment Health 2021; 4(2): 133-139.
13. Shastry KP, Sharma N, Singh D, Singh P, Kumar K. Preoperative and postoperative evaluation of corneal astigmatism after pterygium operation using diamond Burr. Int J Ocul Oncol Oculoplasty 2019; 5(4): 171-175.
14. Garg P, Sahai A, Shamshad MA, Tyagi L, Singhal Y, Gupta S. A comparative study of preoperative and postoperative changes in corneal astigmatism after pterygium excision by different techniques. Indian J Ophthalmol. 2019; 67(7): 1036-1039. https://doi: 10.4103/ijo.IJO_1921_18.
15. Seitz B, Gütay A, Küchle M, Kus M. Impact of pterygium size on corneal topography and visual acuity-a prospective clinical cross-sectional study. K Klin Monbl Augenheilkd 2001; 218(9): 609-615. https://doi: 10.1055/s-2001-17639.
16. Chopra RK, Singh A, Chauhan A. To compare the changes in corneal astigmastism and topography pre and post surgically in patients with different grades of pterygium undergoing pterygium excision with autoconjunctival grafting surgery. IOSR J Dental Med Sci 2020; 19 (14):4-7.
17. Kaur M, Rathi A. Management of Corneal Opacity after Pterygium Surgery. Textbook of Pterygium Management 2017:117.
18. Chu WK, Choi HL. Pterygium: new insights. Eye (Lond). 2020; 34(6): 1047-1050. https://doi: 10.1038/s41433-020-0786-3.
19. Jain AK, Pandey DJ. Evaluation of change in pterygium induced keratometric astigmatism in patients following pterygium excision with autologous graft surgery. Nepalese J Ophthalmol 2020; 12(2): 191-200. https://doi: 10.3126/nepjoph.v12i2.28287.
20. Kaufman SC, Jacobs DS, Lee WB, Deng SX, Rosenblatt MI, Shtein RM. Options and adjuvants in surgery for pterygium: a report by the American Academy of Ophthalmology. Ophthalmol 2013; 120(1): 201-218. https://doi: 10.1016/j.ophtha.2012.06.066.