

Pre-Operative and Post-Operative Evaluation of Corneal Astigmatism after Pterygium Operation Using Crescent Knife

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ABSTRACT

BACKGROUND

Smoothing of the corneal surface after primary pterygium excision is a cost-effective, time saving technique to treat anterior corneal scars and high corneal astigmatism related to pterygium. We wanted to compare the visual acuity and astigmatism before and after pterygium operation using crescent knife.

METHODS

This prospective follow up study was conducted on a total of 40 patients with primary pterygium inducing visually significant astigmatism. Visual acuity, K reading, astigmatism were recorded before surgery and at 1 week, 6 weeks and 12 weeks following surgery whereas corneal clarity was assessed post operatively. The pterygium remnant tissue over cornea was polished using a crescent knife. Data was compiled using MS Excel and analysed using SPSS version 2.0.

RESULTS

Mean age of patients was 48.88 ± 11.72 years and about 30 (75%) of study population was composed of females and only 25% patients were male. Mean Best Corrected Visual Acuity (LogMAR) preoperatively was 0.22 ± 0.16 , whereas that at 12th week was 0.11 ± 0.09 and the improvement was statistically significant. Also a significant improvement in flat K and K average and corneal clarity at various follow up was observed ($p < 0.01$) the mean astigmatism also reduced significantly ($p < 0.01$).

CONCLUSIONS

There is a significant improvement in vision and corneal clarity following pterygium excision and corneal polishing using crescent knife. Also, corneal polishing led to significant reduction in astigmatism and improvement in flat and average K readings.

KEYWORDS

Visual Acuity, Cornea, Keratometry, Corneal Clarity

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BACKGROUND

Pterygium is a degenerative condition of the subconjunctival tissues that usually proliferates as granulation tissue which is vascular and invades the cornea.¹ The pterygium is progressive in nature and the extent and growth of pterygium may vary from atrophic and quiescent to aggressive, and rapidly growing fibro-vascular degenerative. As the pterygium progress, it tends to distort the corneal topography. The prevalence in India varies 0.3% to 37.46%.² The visual problems associated with pterygium may be due to induced corneal astigmatism or direct encroachment onto the visual axis. The occurrence of astigmatism in pterygium may be due to: (a) the pooling of the tear film and (b) the mechanical traction exerted on cornea and (c) the size of pterygium, especially the double-headed pterygium.³ Corneal astigmatism can be reduced by pterygium excision surgery. A pterygium surgery if not effectively performed can lead to a remnant pterygium tissue which is responsible for corneal scarring, high astigmatism, and reduced visual function. Corneal polishing with crescent knife significantly decreases the corneal astigmatism and corneal aberrations which would result in visual improvement.⁴ Smoothing of the corneal surface after primary pterygium excision is a cost-effective, time saving technique to treat anterior corneal scars and high corneal astigmatism related to pterygium.⁴

We wanted to compare the visual acuity and astigmatism before and after pterygium operation using crescent knife.

METHODS

The present study was designed as a prospective follow up study which was conducted at tertiary care centre, Coimbatore. The study was conducted for a period of one year from 1st December 2015 to 30th November 2016 40 eyes of 40 patients attending the Eye OPD and fulfilling the inclusion and exclusion criteria. All the patients were selected using systematic random sampling.

Inclusion Criteria

All the patients more than 18 years of age with primary pterygium (nasal or temporal) inducing visually significant astigmatism, causing recurrent irritation, cosmetically bothersome to the patient and pterygium encroaching upon the cornea leaving ≥ 2 mm of clear uninvolved zone from the visual axis were included in the study.

Exclusion Criteria

Patients with ocular surface infections, history of ocular trauma, history of any bleeding abnormalities, patients on anti-coagulant therapy, patients with double headed or recurrent pterygium and patient with corneal opacity, degeneration, dystrophy, lens changes or any posterior segment pathology affecting the vision were excluded from the study. After obtaining clearance from the Ethical Committee, written informed consent for surgery was

obtained from all the patients. A detailed information regarding socio-demographic data, history of presenting illness and ocular complaints were obtained and entered in pretested questionnaire. Uncorrected and best corrected visual acuity (BCVA) for distance (converted into Log MAR) along with anterior chamber examination with Slit Lamp Bio microscopy was done for the diagnosis of pterygium and characteristics such as grade, type and site were recorded. The grading of pterygium was done according to Tan et al classification⁵ as: T1 (atrophic)- episcleral vessels under the body of the pterygium not obscured and clearly distinguishable; T2 (intermediate)- episcleral vessels under the body of the pterygium obscured partly and indistinguishable and T3 (fleshy)- episcleral vessels totally obscured. Intraocular pressure (using non-contact tonometry) and lacrimal sac patency (using sac syringing) were also assessed. Keratometry to assess cornea was also conducted using Automated Keratometry (Topcon ARK). This was followed by surgical excision of pterygium under all aseptic precautions. The pterygium remnant tissue over cornea was polished using a crescent knife (Aurolab-Aravind eye hospital, Madurai). After excising the pterygium, the conjunctival-limbal graft was slid onto the cornea. A blob of Viscoelastic (Appavisc PFS Hydroxypropyl Methylcellulose) was put over the cornea at the end of the surgery. Two drops of antibiotic drops was instilled in the conjunctival cul-de-sac and the eye was firmly patched. All patients were followed-up regularly for a minimum period of 12 weeks (1st week, 6th weeks and after 12 weeks).

Statistical Analysis

The data was compiled using Ms Excel and analysed using SPSS 20. ANOVA was used to compare improvement in visual acuity and keratometry reading. T test was used to assess the improvement in astigmatism. A p-value of < 0.05 was taken as being of significance for all statistical tests.

RESULTS

A total of 40 patients with primary pterygium were enrolled in the study. Mean age of patients in present study was 48.88 ± 11.72 years. Majority of patients belonged to 51 to 60 years of age (32.5%) followed by 27.5% and 17.5% patients in 41 to 50 and 31 to 40 years of age respectively. Only 7.5% patients were less than 30 years of age. About 75% of study population was composed of females and only 25% patients were male. (Table 1). Pterygium affected right eye in 70% patients whereas left eye was only involved in 30%. (Figure 1). In the present study, pterygium was of progressive type in 100% patients. Pterygium was present on nasal side in 90% patients and maximum had grade T2 pterygium (55%) followed by grade T3 and T1 in 27.5% and 17.5% patients respectively. (Table 2). Mean BCVA (Log MAR) preoperatively was 0.22 ± 0.16 whereas that at 1st, 6th and 12th weeks was 0.16 ± 0.11 , 0.12 ± 0.10 and 0.11 ± 0.09 . Test of significance (ANOVA) observed statistically significant improvement in mean visual acuity at various

follow up as compared to preoperative visual acuity ($p < 0.01$). (Table 3). In present study, we observed statistically significant improvement in flat K and K average at various follow up as compared to pre-operative values ($p < 0.01$) whereas no significant improvement in steep K was observed ($p > 0.05$). (Table 4).

Demographic Variables (n=40)		Frequency	Percentage
Age group (years)	≤30	3	7.5
	31-40	7	17.5
	41-50	11	27.5
	51-60	13	32.5
	>60	6	15
Gender	Male	10	25
	Female	30	75

Table 1. Distribution According to Demographic Variables

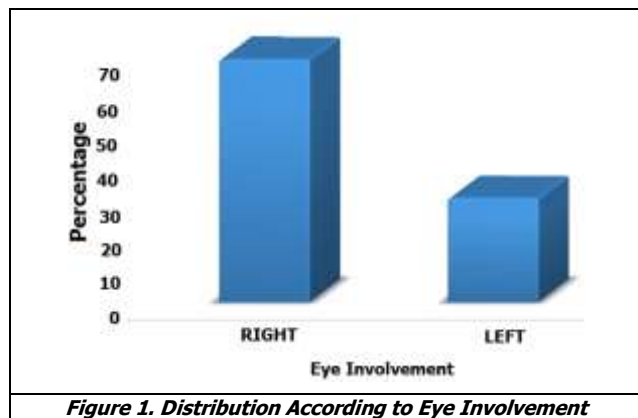


Figure 1. Distribution According to Eye Involvement

Characteristics of Pterygium (n=40)		Frequency	Percentage
Site	Nasal	36	90
	Temporal	4	10
Grade	T1	7	17.5
	T2	22	55
	T3	11	27.5

Table 2. Characteristics of Pterygium

Timing	Mean	S.D.	ANOVA	p value
Pre operatively	0.22	0.16		
1 st week	0.16	0.11		
6 th week	0.12	0.10		
12 th week	0.11	0.09		

Table 3. Comparison of Best Corrected Visual Acuity (Log MAR) during Follow Up

K	Timing	Mean	S.D.	ANOVA	p
Flat K	Pre operatively	43.39	1.57		
	1 st week	44.87	1.60		
	6 th week	45.30	1.61		
	12 th week	45.37	1.63		
Steep K	Pre operatively	46.27	1.67	0.006	0.99
	1 st week	46.27	1.67		
	6 th week	46.26	1.66		
	12 th week	46.23	1.69		
K Average	Pre operatively	44.82	1.41	3.41	0.02
	1 st week	45.57	1.59		
	6 th week	45.78	1.61		
	12 th week	45.80	1.64		

Table 4. Comparison of Keratometry (K) Findings

Pterygium Grade	Pre-Operatively		Post-Operatively		T Test	p Value
	Mean	SD	Mean	SD		
T1	-0.94	0.38	-0.69	0.24	3.47	0.008
T2	-2.39	1.01	-0.80	0.35	9.41	0.001
T3	-4.20	0.45	-0.90	0.58	10.54	0.001

Table 5. Comparison of Pre-and Post-Operative Corneal Astigmatism (with Grade of Pterygium)

Mean preoperative astigmatism of patients in patients with T1 grade of pterygium was -0.94 ± 0.38 which improved to -0.69 ± 0.24 at 3 months post-operatively. Similarly, mean preoperative astigmatism of patients in with T2 grade of pterygium was -2.39 ± 1.01 which improved to -0.80 ± 0.35 at 3 months post-operatively. Mean preoperative astigmatism of patients with T3 grade of pterygium was -4.20 ± 0.45 which improved to -0.90 ± 0.58 at 3 months post-operatively. The observed improvement in all the grade of pterygium was statistically significant ($p < 0.05$). (Table 5).

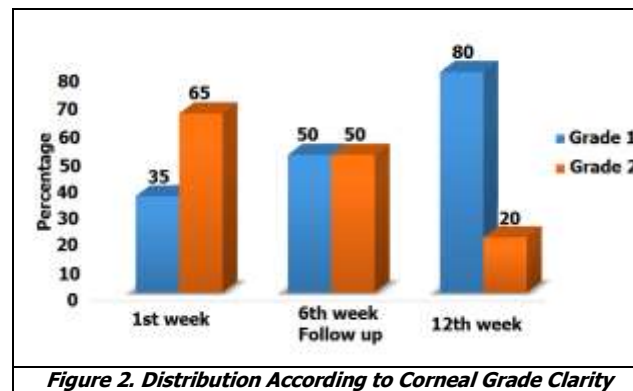


Figure 2. Distribution According to Corneal Grade Clarity

In present study, at 1st week post operatively, corneal clarity of grade 1 and 2 were observed in 14 (35%) and 26 (65%) eyes. Corneal clarity of grade 1 and 2 were observed in 20 (50%) patients each at 6th week whereas corneal clarity grade 1 was observed in 32 (80%) and grade 2 was observed in only 8 (20%) patients at final follow up. The improvement in corneal clarity was statistically significant ($p < 0.05$). (Figure 2)

DISCUSSION

Pterygium is a ocular disease with a worldwide prevalence which is particularly more common in tropical and sub-tropical areas.^{6,7} Pterygium causes visual impairment either directly by mechanical traction on the cornea or simply by involving the visual axis. The mean age of patients in present study was 48.88 ± 11.72 years and maximum patients presented between 51-60 years (32.5%). In this study there was a female preponderance with male to female ratio being 1:3. The mean age of patients in a study by Garg P et al was 39.69 years.³ Wu KL et al has reported 5.2% prevalence in people aged 50.⁸ Makkar B et al observed mean age of 50.48 years amongst patients presenting with pterygium and observed higher incidence of pterygium in males as males are more exposed to outdoor activity and hence the occurrence of pterygium is nearly twice as often in men than in women.⁹ Though the literature suggest male preponderance, our study showed female preponderance which may be due to the fact that quite majority of patients come with cosmetic disfigurement for treatment. Also as most women in our study were from rural background more exposure to sunlight might point towards etiological factors

in development of pterygium. In our study, pterygium was of progressive type in 100% patients and majority of patients had pterygium on nasal side (90%) whereas only 10% patients had pterygium on temporal side. Srinivas K Ret al also observed similar findings i.e. about 86.8% pterygium on nasal side.¹⁰ However Sevel D et al in their study on 100 temporal pterygia has cautioned about an underlying malignancy in patients with temporal pterygium.¹¹ Hence careful observation of a temporal pterygium in terms of its growth and vascularity should be done which may help in early diagnosis of an underlying conjunctival malignancy. The present study observed statistically significant improvement in visual acuity, Flat and average K reading as well as astigmatism. Zaida HE et al in their study observed the mean changes of spherical error from 2.2 ± 1.7 preoperatively, to 0.8 ± 0.59 postoperatively and the difference was statistically significant whereas the mean (average) keratometric power of the cornea changed from 42.6 ± 1.33 SD to 43.77 ± 0.95 SD, which was statistically insignificant.¹² Olturu R and Cinal et al also observed statistically significant improvement in visual acuity and reduction in astigmatism postoperatively.^{13,14} Pterygium excision brings a statistically significant change in corneal curvatures which lead to a decrease in cylindrical correction needed. This causes an improvement in subjective visual acuity in patients who have undergone pterygium surgery. Yasar et al postulated that tears pooling at the pterygium apex are the main factor responsible for corneal topographic changes. Beside this, the sub epithelial fibrosis underlying the pterygium head can cause flattening by its direct traction effect.¹⁵

In present study, corneal clarity significantly improved to grade 1 from 32.5% patients to 80% patients at final follow up. Corneal bed clarity depends on which instrument is used to scrape off the remnant pterygium tissue after the excision of the pterygium. Cornea is clearer if anterior stroma and bowman's membrane is not damaged during the polishing.

CONCLUSIONS

Smoothing with crescent knife following pterygium surgery is associated with good visual outcome and corneal clarity. Also corneal polishing helped in significant reduction in astigmatism and improvement in flat and average K readings.

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