

A Comparative Prospective Study of Astigmatism before & After Pterygium Excision

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Conflict of interest: Nil

Abstract

Introduction: Pterygium is a common ocular degenerative disorder seen in tropical regions. It threatens the visual axis & cause a significant loss of visual acuity, flattening of corneal curvature & astigmatism.

Aims & objectives- This prospective study was undertaken to evaluate the Visual acuity, corneal refractive status & astigmatism preoperatively & postoperatively after surgical excision of the pterygium & its relationship with length of pterygium.

Material & Methods: The study recruited 60 eyes of 54 patients who came to the Department of Ophthalmology of our Hospital with primary pterygium. Patients having Visual loss from proximity to visual axis or threatened visual axis, restricted eye movement, irritation & cosmetic concerns were included in the study. Patients with pseudopterygium, Glaucoma, Cataract, Macular degeneration, History eye trauma, Corneal opacity & Previous eye surgery were excluded from the study. At baseline, the length of the pterygium encroaching the cornea was recorded. The patients were divided into three groups on the basis of length of pterygium.

Parameters assessed preoperatively & postoperatively (At baseline, at the end of 1st week, 4th week and 9th week) were Visual acuity, keratometry, Refraction with subjective correction for astigmatism assessment. Each eye underwent bare sclera pterygium excision. The pre and postoperative parameters were compared, tabulated and analysed.

Results: 79% cases having primary pterygium belonged to 25-50 yrs age range. It is more prevalent in males (55.67%) than females (44.33%). 75.35% of cases were from rural areas than 24.65% in urban areas. 84.01% patients working in outdoor had pterygium. Progressive pterygium was noted in 72.67% of patients while atrophic pterygium was noted in 27.33%. The length of pterygium ranged between 1.4 mm and 5.0 mm. The mean pterygium size was 3.25 ± 0.73 mm. 55.83% patients belonged to Group III, 25.17% patients in Group II and 19% patients in Group I. There was a statistically significant improvement in the Visual acuity up to 1-3 lines Snellen's visual acuity after the excision. There was a statistically significant reduction of Keratometry values postoperatively at 9 weeks, which signifies reduction of corneal astigmatism after pterygium excision & as measured by subjective correction.

Conclusion: Surgical excision of the pterygium results in improvement of visual acuity, reduction of astigmatism postoperatively. Early seeking of surgical treatment can result in better clinical benefits in all the three grades of pterygium. Residual astigmatism is more in cases with advanced pterygium Group III as compared to Group I and II cases.

Keywords: Pterygium, Astigmatism, Keratometry, Visual Acuity.

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Introduction

Pterygium is considered to be the commonest ocular surface disorders. It is derived from two Greek words, pteryx meaning wing & pterygion meaning fin. It was first described in 1000 BC by Sushruta. Pterygium is defined as bulbous overgrowth of fibrovascular connective tissue of bulbar conjunctiva towards and onto the cornea.[1] The prevalence is highest in “Pterygium belt” between the latitudes 37° north and south of the equator.[2] In India the prevalence ranges 9.5% to 13%. It is more common in rural than urban areas.[3] Ang M et al in a multiethnic population study in Asians found 10.1% prevalence in Singapore & 30.8% in Japanese population.[4]

The risk factors are environmental, genetic predisposition and immunological. Prolonged exposure to ultraviolet rays, hot, dry & dusty weather is the commonest etiological factor.[5]

Traditionally, simple excision of the pterygium was done leaving bare sclera bed but the recurrence rates were higher & ranged from 30-80%.[6]

After reaching a particular size, pterygium causes corneal distortion, diplopia & threatening of visual axis results in corneal astigmatism. Astigmatism can occur due to pooling of the film at advancing edge of the pterygium & mechanical traction exerted by the pterygium on the cornea. [7] Astigmatism can be treated by surgical excision of the pterygium. Various approaches have been undertaken like bare sclera & amniotic membrane transplantation & conjunctival autograft. [8]

Shenoy et al 2019, observed astigmatism reversal after pterygium excision, which was statistically significant in Grade 2 as compared to grade 1 pterygia cases. Thus an early indication for excision to prevent

astigmatism would be nasal pterygia 2mm or greater in horizontal diameter from limbus. In advanced pterygium, incomplete visual correction occurs & corneal distortion does not normalize completely, alterations may persist if the lesion has reached the paracentral cornea. [9]

Thus this prospective study was undertaken to evaluate the Visual acuity, corneal refractive status & astigmatism preoperatively & postoperatively after surgical excision of the pterygium & its relationship with length of pterygium.

Material & Methods

This prospective comparative study recruited 60 eyes of 60 patients who came to the Department of Ophthalmology of our Hospital with primary pterygium. Patients having Visual loss from proximity to visual axis or threatened visual axis, restricted eye movement, irritation & cosmetic concerns were included in the study. Patients with pseudopterygium, Glaucoma, Cataract, Macular degeneration, History eye trauma, Corneal opacity & Previous eye surgery were excluded from the study.

At baseline the length of the pterygium encroaching the cornea was recorded. The patients were divided into three groups on the basis of length of pterygium.[10]

Group I – wherein the length of pterygium was 1 to 2 mm

Group II – wherein the length of pterygium was 2 to 3 mm

Group III – wherein the length of pterygium was >3 mm

Other parameters assessed preoperatively & postoperatively (At baseline, at the end of 1st week, 4th week and 9th week) were

1. Visual acuity using Snells Chart

2. Keratometry (corneal curvature measurement)- using auto keratometer.
3. Refraction with subjective correction (astigmatism assessment)

Each eye underwent bare sclera pterygium excision. The pre and postoperative parameters were compared, tabulated and analysed.

Statistical analysis: The recorded data was tabulated & analysed at baseline, at the end of the 1st week, 4th week and 9th week using paired t-test. P value < 0.05 was considered statistically significant.

Results

The majority of the patients i.e. 79% having primary pterygium belonged to 25-50 yrs age range. After 50 yrs of age incidence gradually declines. It is more prevalent in males (55.67%) than females (44.33%). 75.35% of cases were from rural areas than 24.65% in urban areas. Patients working in outdoor occupations like

farmers, labourers etc. had pterygium was more prevalent as 84.01%. Progressive pterygium was noted in 72.67% of patients while atrophic pterygium was noted in 27.33% of patients. The length of pterygium ranged between 1.4 mm and 5.0 mm. The mean pterygium size was 3.25 ± 0.73 mm. 55.83% patients belonged to Group III, 25.17% patients in Group II and 19% patients in Group I. Visual acuity in all the three groups varied. There was a statistically significant improvement in the Visual acuity up to 1-3 lines Snellen's visual acuity after the excision. (Table 1) There was a statistically significant reduction of Keratometry values postoperatively at 9 weeks, which signifies reduction of corneal astigmatism after pterygium excision (Table 2). There was a statistically significant reduction of corneal astigmatism postoperatively at 9 weeks, as measured by subjective correction. (Table 3)

Table 1: Preoperative & postoperative (9 weeks) visual acuity

Group	Length of Pterygium	Uncorrected visual acuity		Improvement in visual acuity	P value
		Preoperative	Postoperative 9th week		
Group I	1.1.-2mm	0.472 \pm 0.18	0.78 \pm 0.23	1-2 lines	<0.05
Group II	2.1 – 3mm	0.45 \pm 0.15	0.75 \pm 0.22	1-2 lines	<0.05
Group III	>3mm	0.36 \pm 0.21	0.72 \pm 0.24	2-3 lines	<0.05

Table 2: Preoperative & Postoperative (9 weeks) Keratometry values

Group	Preoperative Keratometry	Postoperative Keratometry	Reduction	p-value
I		0.51 \pm 0.35D	1.21 \pm 0.71D	<0.05
II		0.27 \pm 0.26D	1.19 \pm 0.61D	<0.05
III	2.36 \pm 0.79D	0.69 \pm 0.71D	1.69 \pm 0.72D	<0.05

Table 3: Astigmatism as measured by subjective correction

Group	Length of Pterygium	Preoperative Astigmatism	Postoperative Astigmatism	Reduction	P value
I	1.1.-2mm	0.67 \pm 0.18D	0.246 \pm 0.19D	0.34 \pm 0.18D	<0.05
II	2.1 – 3mm	0.96 \pm 0.38D	0.451 \pm 0.27D	0.58 \pm 0.28D	<0.05
III	>3mm	1.53 \pm 0.74D	0.48 \pm 0.41D	1.03 \pm 0.52D	<0.05

Discussion

Pterygium can cause clinical conditions as reduced vision/ corneal distortion & astigmatism since it encroaches on the visual axis. There occurs a localized

flattening central to the apex of the pterygium which causes corneal astigmatism since this flattening is along the horizontal meridian. [11,12] This corneal astigmatism can be corrected with

surgery, but corneal distortion does not completely corrected in higher grades of pterygium. [13]

In the present study, majority of the patients i.e. 79% having primary pterygium belonged to 25-50 yrs age range. After 50 yrs of age incidence, pterygium gradually declines. It is more prevalent in males (55.67%) than females (44.33%). More incidences in males could be attributed to the higher outdoor activity exposing them to the risk factors for pterygium. Similarly, Bajantri et al 2017, noted 30% patients in age range of 30-39 years, 27.1% patients in 40-49 years, 24.3% patients in <30 years & 10% patients in 50-59 years. Males were affected slightly more than the females, 38 (54.29%) patients being males and 32 (45.71%) patients being females.[10] Tejaswi et al 2021, reported the mean age to be 39.04 ± 9.91 years in the age range 19-60 years. Most patients were of 30-40 years i.e. 32.2%. Pterygium was observed more commonly in females i.e.71%. [14]

In the present study, 75.35% of cases were from rural areas than 24.65% in urban areas. Pterygium was more prevalent (84.01%) in patients working in outdoor occupations like farmers, labourers etc. Similarly in Bajantri et al 2017 study, pterygium was more prevalent in rural areas i.e. 74.29%. This can be explained by the fact that rural population is more occupied in outdoor occupations & field work thus they are more exposed to dust, heat & sunlight in comparison to urban population. Also, rural people do not use protective eye shields / sunglasses against environmental exposures. [10]

In the present study, Progressive pterygium was noted in 72.67% of patients while atrophic pterygium was noted in 27.33% of patients. The length of pterygium ranged between 1.4 mm and 5.0 mm. The mean pterygium size was 3.25 ± 0.73 mm. 55.83% patients belonged to Group III, 25.17% patients in Group II

and 19% patients in Group I. The Pterygium may be either stationary and progressive. A stationary pterygium has minimal progression over a long period while progressive pterygium advances aggressively with the advancing margin showing grayish opacification and tissue hyperemia. When the peripheral cornea gets involved it results in corneal distortion and loss of visual acuity. In accordance, Bajantri et al 2017 observed mean size of pterygium to be 3.19 ± 0.87 mm. About 45% patients came for medical treatment at early stages as pterygium is mainly asymptomatic when its size is small. 10

In the present study, visual acuity in all the three groups varied. There was a statistically significant improvement in the Visual acuity up to 1-3 lines Snellen's visual acuity after the excision. (Table 1) Reduction in the corneal astigmatism occurs after surgical excision of pterygium which is greater in eyes with greater preoperative astigmatism. Residual astigmatism remains in higher grades of pterygium.

Accordingly, Chourasia et al study 2014 observed near improvement of visual acuity in Grade I & Grade II pterygia as compared to improve to near normal after pterygium excision but some amount of diminution in vision remained in Grade III. [15] Similar findings observed by Tomikodoro A. et al. [13]

There was a statistically significant reduction of Keratometry values postoperatively at 9 weeks, which signifies reduction of corneal astigmatism after pterygium excision. (Table 2). Similarly, Bajantri et al 2017 observed significantly more reduction in Grade III i.e. $1.74 \pm 0.75D$ as compared to Grade I group where reduction was $1.14 \pm 0.68D$. [10] In contrast, Chourasia et al study 2014 reported no statistically significant difference in keratometric readings preoperative & 1 month, 3 months and 6

months postoperatively.[15] Similar observations noted by Avisar R et al 2000. [16]

Also a statistically significant reduction of corneal astigmatism postoperatively at 9 weeks, as measured by subjective correction.(Table 3) In accordance with these findings, Walkow et al [13] reported statistically significant reduction in astigmatism from mean of $1.15 \pm 0.05D$ to $0.72 \pm 0.56D$ ($p < 0.05$).[17] Bajantri et al 2017, reported statistically significant difference between pre and postoperative astigmatism which was $1.14 \pm 0.684D$ in Grade I, $1.15 \pm 0.667D$ Grade II and $1.74 \pm 0.755D$ in Grade III ($p < 0.0001$). [18] Thus signifies greater the preoperative astigmatism, greater the reduction in astigmatism. [10]

Conclusion

The study concludes that pterygium causes significant loss of visual acuity, altered corneal curvature & astigmatism. Surgical excision of the pterygium results in improvement of visual acuity, reduction of astigmatism postoperatively. Early seeking of surgical treatment can result in better clinical benefits in all the three grades of pterygium. Residual astigmatism exists in cases with advanced pterygium Group III as compared to Group I and II cases. Thus, Grade I pterygium in spite of being distant from the visual axis is indicated for surgical excision.

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