Original Research Article

Effectiveness of pterygium surgery on corneal astigmatism

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Abstract

Background: Pterygium is known to affect refractive status of the eye and cause astigmatism, which can have significant impact on vision. Several mechanisms have been suggested to explain this induced astigmatism. These include, pooling of tear film at leading edge of pterygium and mechanical traction exerted by the pterygium on cornea. **Amis and Objective:** To study the effect of pterygium surgery on pterygium induced astigmatism. **Materials and Method:** Total 76 cases diagnosed with the nasal primary pterygium were enrolled in the present study during the study duration. All the patients selected were evaluated in detail. The detailed ocular examination was carried out. Which include Uncorrected and corrected visual acuity by Snellen's chart. Refraction was performed with Topcon Autorefractometer. Keratometry i.e. Corneal curvatures were measured using Bausch and Lomb keratometer. Corneal astigmatism was calculated taking the difference of K1 and K2 with regard to axis of K1. Manifest refraction, Anterior segment examination, Fundus examination, Tonometry and Slit lamp examination was also performed. All patients underwent pterygium excision with conjunctival autograft using non absorbable suture. All the cases were followed up for the period of six months and outcome of the pterygium surgery with respect to astigmatism and improvement in vision was compared with the preoperative findings. **Results:** The mean age of patients was 47.85 + 10.69 years. Male to female ratio was about 1.375:1. The preoperative mean refractive astigmatism (3.12 ± 1.236D) was significantly reduced to 1.536±0.642D which was statistically significant ($p< 0.001$). Preoperative mean keratometric astigmatism (3.046±1.20D) was significantly reduced to 1.486±0.63D postoperatively, which was statistically significant ($p< 0.001$). Preoperative mean visual acuity (BCVA) was 0.424±0.30 which improved to 0.587±0.267 postoperatively. This change is statistically significant ($p<0.001$). Preoperative unaided visual acuity was compared with 3 months postoperative visual acuity on Snellen's chart. Visual acuity was improved by two or more lines of Snellen's chart in 52.63% of cases while by 1 line of Snellen's chart in 17.1% cases. The visual acuity was unchanged in 30.26% of cases. Minor complications like congestion, chemosis, subconjunctival haemorrhage and wound dehiscence were seen. No other major complications were detected. **Conclusion:** We conclude that as the size of pterygium encroaching on cornea increases, the amount of induced astigmatism also increases in direct proportion. We also observed that successful pterygium surgery reduces the pterygium induced refractive and keratometric astigmatism and thus improves the visual acuity.

Key Words: Pterygium surgery, corneal astigmatism, visual acuity.

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INTRODUCTION

Pterygium, a word derived from,, pterygos" (ancient Greek for wing) is a wing shaped, fibro vascular overgrowth arising from subconjunctival tissue extending across the limbus on to the cornea. It is a degenerative condition of the subconjunctival tissue which proliferates as a vascularized granulation tissue to invade cornea, destroying superficial layers of stroma and Bowman"s membrane, the whole being covered by conjunctival epithelium[1]. Etiology of pterygium is obscure. The prevalence of pterygium has been directly related with proximity to equator; the nearer to the equator, the greater

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the prevalence and to a lesser and milder degree in colder climates. Most commonly seen on either side of the equator, pterygium has been endemic in the Indian subcontinent, Southeast Asia, Mexico, Caribbean and other places. Cameron"s world map summarizes the prevalence rates of pterygium[2]. Pterygium is known to affect refractive status of the eye and cause astigmatism, which can have significant impact on vision. Several mechanisms have been suggested to explain this induced astigmatism. These include, pooling of tear film at leading edge of pterygium and mechanical traction exerted by the pterygium on cornea[3]. Vision may be reduced either due to direct invasion of the visual axis or astigmatism induced by the Pterygium[4]. The only effective treatment for pterygium is surgery. Despite the various surgical procedures that have been described for the treatment of pterygium, recurrence remains a significant problem after surgical excision. Recurrence rates range from 24% to 89% after simple excision with bare sclera technique[5].

MATERIALS AND METHOD

The present prospective study was conducted in the department of Ophthalmology of ABC medical college for a period of two years. Following inclusion and exclusion criteria was used to select the study patients.

Inclusion Criteria

- All the consecutive patients diagnosed with the nasal primary pterygium.

Exclusion Criteria

- **Recurrent pterygia**
- Pseudopterygium
- Conjunctival cicatrisation or other Ocular surface disorders.
- Patients with history of trauma and previous ocular surgery.
- Any autoimmune disorder in the patient
- Patients with difficult keratometry e. g keratoconus, corneal dystrophy etc.

Thus total 76 cases of primary nasal pterygium were selected by Consecutive type of Non-probability Sampling method during the study period. All the patients selected were evaluated in detail. In preoperative assessment, all the patients after clinical diagnosis were interviewed for demographic factors, occupation, and previous medical, surgical and ocular history. The collected information was recorded in a prestructured proforma. Following that detailed ocular examination was carried out. Which include Uncorrected and corrected visual acuity by Snellen's chart. Refraction was performed with Topcon Autorefractometer. Keratometry i.e. Corneal curvatures were measured using Bausch and Lomb keratometer. Corneal astigmatism was calculated taking the difference of K1 and K2 with regard to axis of K1. Manifest refraction, Anterior segment examination, Fundus examination, Tonometry and Slit lamp examination was also performed. All The 76 eyes of 76 patients with primary nasal pterygium underwent pterygium excision with conjunctival autograft using non absorbable suture. To reduce inter-observer bias one investigator evaluated all the cases preoperatively, and all surgical procedures were performed by one surgeon under the operating microscope. Final results of all patients were evaluated and graded by the same investigator who had done the preoperative evaluation. All the cases were followed up for the period of six months and outcome of the pterygium surgery with respect to astigmatism and improvement in vision was compared with the preoperative findings.

RESULTS

The present study was carried out on 76 eyes of 76 patients in Department of Ophthalmology, of a Tertiary Care Hospital.

Table 1: Sex and Age-wise distribution of patients

Variable		No. of Cases	Percentage (%)
Sex	Male	44	57.9
	Female	32	42.10
Age(Yrs.)	21-30	4	5.26
	31-40	19	25
	41-50	26	34.21
	51-60	20	26.31
	61-70	6	7.9
	71-80	1	1.32
Total		**76**	**100**

It was seen that 57.9% of cases were male and 42.1% were females with Male to female ratio of 1.375: 1. It was observed that 59.21% of patients belonging to age group 31-50 years, which was younger group and pterygium tissue was fleshy and vascular. 9.22% of patients were from older age group and 5.26% from the very young age.

Table 2: Distribution according to grades and type of Pterygium

Grade and type		No. of patients	Percentage (%)
Grade	II	52	68.42%
	III	18	23.68%
	IV	6	7.90%
Type	With the rule (WTR)	59	77.63
	Against the rule (ATR)	6	7.9
	Oblique	11	14.47
	Total	**76**	**100**

It was seen that 68.42% of patients were having grade II pterygium, while 23.68% were having grade III pterygium and 7.90% were having grade IV pterygium which covers the visual axis of eye. Preoperatively 59 (77.63%) patients had with the rule astigmatism, 6(7.9%) had against the rule astigmatism and 11(14.47%) had oblique astigmatism.

Table 3: Effect of pterygium surgery on refractive astigmatism and keratometric astigmatism

Astigmatism	Grade of pterygium	Preoperative astigmatism (mean ±SD)	Postoperative astigmatism (mean ±SD)	P value
Refractive astigmatism	II	2.49±0.65D	1.23±0.41D	P<0.001*
	III	3.93±0.505D	1.88±0.523D	P<0.001*
	IV	6.125±0.64D	2.95±0.534D	P<0.001*
Keratometric astigmatism	Grade II	2.47±0.73D	1.22±0.36D	P <0.001*
	Grade III	3.80±0.66D	1.83±0.52D	P<0.001 *
	Grade IV	5.75±0.69D	2.79±0.75D	P<0.001 *

*Statistically significant

The amount of astigmatism varied with the surgical procedure was measured and compared with the pre operative astigmatism. The change in astigmatism was analyzed statistically using paired t- test. In 52 patients (68.42%) of grade II pterygium, the preoperative mean astigmatism was 2.49±0.54D. Postoperatively the astigmatism reduced to 1.23±0.27D and the change in astigmatism was statistically significant (p<0.001). In 18 patients (23.68%) of grade III, the mean preoperative astigmatism was 3.93±0.505D, after surgery it reduced up to 1.88±0.523D. This change was statistically significant (p<0.001). In grade IV, preoperative mean astigmatism was 6.12±0.64D, after surgery it reduced up to 2.95±0.53D and the change was statistically significant (p<0.001). The changes preoperative and post operative keratometric astigmatism was compared by using paired t- test. Among the 52 patients (68.42%) of grade II pterygium, the preoperative mean keratometric astigmatism was 2.47±0.73D and postoperatively the astigmatism was reduced to 1.22±0.36D. The change was statistically significant (p<0.001). Among the grade III patients the mean preoperative keratometric astigmatism was 3.80±0.66D and it was reduced up to 1.83±0.52D and the change was statistically significant (p<0.001). In grade IV, preoperative mean keratometric astigmatism was 5.75±0.69D, after surgery it reduced up to 2.79±0.75 D. This change was statistically significant (p<0.001).

Table 4: Effect of pterygium surgery on visual acuity

Grade of pterygium	Preoperative visual acuity (BCVA) (mean ±SD)	Post-operative visual acuity (BCVA) (mean±SD)	P value
Grade II	0.532±0.29	0.69±0.233	P<0.001 *
Grade III	0.24±0.182	0.43±0.146	P<0.001*
Grade IV	0.058±0.008	0.14±0.067	P<0.05 *

*Statistically significant

The change in visual acuity after pterygium excision and the results were analyzed and it was seen that among the grade II pterygium patients, the preoperative mean visual acuity was 0.532±0.29 which improved to 0.69±0.233 postoperatively. In grade III pterygium patients, the preoperative mean visual acuity was 0.24±0.18 which improved to 0.43±0.146 postoperatively. In grade IV pterygium patients, the preoperative mean visual acuity was 0.058±0.008 which improved to 0.142±0.067 postoperatively. The changes observed in visual acuity were statistically significant among the all grades of pterygium.

Table 5: Effect of pterygium surgery on Astigmatism and visual acuity following pterygium excision

	Preoperative mean±SD	Postoperative mean±SD	P value
Refractive astigmatism	3.12 ± 1.236	1.536 ± 0.642	P<0.001*
Keratometric astigmatism	3.046 ± 1.20	1.486 ± 0.63	P<0.001 *
Visual acuity(BCVA)	0.424 ± 0.30	0.587 ± 0.267	P<0.001 *

*Statistically significant

The above table shows the total change in refractive and keratometric astigmatism and change in visual acuity postoperatively in 76 patients. Preoperative mean refractive (Autorefractometry) astigmatism was 3.12±1.236D and it was reduced to 1.536±0.747D postoperatively and this change was statistically significant (p<0.001). Preoperative mean keratometric astigmatism was 3.046±1.20D and after surgery it reduced up to 1.486±0.63D and the difference was statistically significant (p<0.001). Preoperative mean visual acuity (BCVA) was 0.424±0.30 which improved to 0.587±0.267 postoperatively. This change was statistically significant (p<0.001).

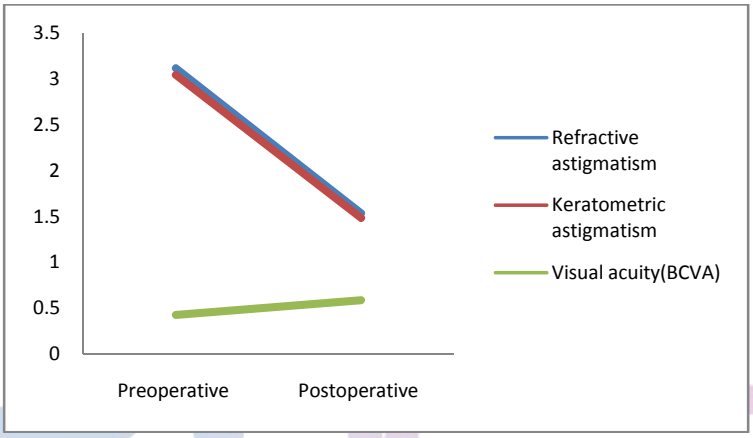

Figure 1: Effect of pterygium surgery on Astigmatism and visual acuity

Table 6: Postoperative visual acuity (unaided)

Postoperative vision	No. of patients	Percentage(n=76)
Improved	53	69.73%
Unaltered	23	30.26
Deteriorated	0	0%
Total	**76**	**100%**

Preoperative unaided visual acuity was compared with 3 months postoperative visual acuity on Snellen's chart. Visual acuity was improved by two or more lines of Snellen's chart in 52.63% of cases while by 1 line of Snellen's chart in 17.1% cases. The visual acuity was unchanged in 30.26% of cases.

Table 7: Postoperative complications

Complications	No of patients	Percentage
Chemosis /Graft oedema	09	11.8%
Subconjunctival haemorrhage	08	10.52%
Wound dehiscence	05	6.5%
Graft necrosis	0	0
Conjunctival cyst	01	1.3%
Tenon's granuloma	0	0
Recurrence	01	1.3%

All the patients were followed for a maximum period of 6 months postoperatively and the complications encountered during postoperative follow up period were studied.. All the patients were having congestion, which reduced after inflammation subsided. 9 (11.8%) patient had graft edema, which responded well to topical steroids. Subconjunctival haemorrhage was seen in 8 (10.52%) patient that subsided gradually. Wound dehiscence was noted in 05 (6.5%) patient but no any active surgical management required. Conjunctival cyst was noted in 1 (1.3%) patient postoperatively which was subsequently excised. Recurrence was noted in 1 (1.3%) patient.

DISCUSSION

Pterygium is a worldwide disease which is particularly common in tropical and subtropical regions such as India. The prevalence of pterygium in different states of India ranges from as low as 0.75% to as high as 10.42%[6]. The preent study was conducted in the department of ophthalmology of ABC medical College with the aim to

study the effect of pterygium surgery on pterygium induced astigmatism. In the present study out of the total 76 Patients, 44(57.1%) were male and 32(42.1%) were female patients. R.M. Youngson *et al*[7] also reported male predominance (62%) in their study. Similar observations were made by Hilgers JH *et al*[8], Shelke *et al*[9]. It was seen that 59.21% of patients belonging to age group of 31-50 years, which is younger group. 26.31% of the patients belong to age group of 51-60 years. 9.22% of patients were from extreme age group and 5.26% from the very young age group. Mean age of the patients was 47.85±10.69 years (Range 23-72). R.M.Youngson *et al*[7] also observed that pterygium was more common in younger age group (54%) i.e. 30 – 50 years and rare in extremes of age. Similar results were reported by Zauberman *et al*[10]. In present study majority of the patients (70eyes) belonged to grade II and grade III pterygium (92.1%). 7.9% of cases were having grade IV pterygium. This observation was also encountered by Sejal Maheshwari[11]. She studied 36 eyes with primary pterygium in which maximum number of patients belonged to grade II and grade III pterygium. Similar observations were made by Chaurasia *et al*[12] and Shelke *et.al*[9]; patients belonged to grade II and grade III were 84% and 89.2% respectively. It was observed that preoperative mean refractive astigmatism was maximum in grade IV type pterygium i.e. 6.125±0.64D and postoperatively it was found to decreased significantly up to 2.95±0.534D (p<0.001). In grade III type of pterygium, preoperative mean astigmatism was 3.93±0.505D and postoperatively it was found to decrease significantly up to 1.88± 0.523 Diopter (p < 0.001). In grade II type of pterygium, preoperative mean astigmatism was 2.49± 0.65D which was reduced postoperatively up to 1.23±0.41 D (p<0.001). Thus it shows that as grade of pterygium increases the amount of induced astigmatism also increases in same proportion and successful pterygium excision decreases the pterygium induced astigmatism. Similar observation were reported by Sejal Maheshwari[11]. Fong KS, Balkrishnan V, Chee SP, Tan DT[13] from Singapore National Eye Center, Singapore also confirms that pterygium excision induces reversal of pterygium related corneal flattening. A strong correlation was also found between the horizontal extension of pterygium encroachment and astigmatic changes following surgery. Avisar R, Loya N, Yassur Y, Weinberger D[14] from Rabin Medical Center, Israel also found similar result. They observed that astigmatism tends to increase with increase in size of lesion and early surgical intervention reduces pterygium induced corneal astigmatism. Similar observations were also reported by Shelke *et.al*[9], Mohd.Yousuf[15] and Saleem MI *et.al*[16]. The mean preoperative astigmatism was 3.12±1.236D and postoperatively it was found to decreased significantly up to 1.536 ± 0.642D (p<0.001). Our results were comparable studies of Maheshwari S[11], Mohd Yousuf *et al*[15], Dr. Anwar hussain *et.al*[17] and popat B *et.al*[18]. The preoperative mean keratometric astigmatism was maximum in grade IV type pterygium (5.75±0.69 D) and postoperatively it was found to decreased significantly (p <0.001) to 2.79±0.75D. In grade III type of pterygium, preoperative mean astigmatism was 3.80±0.66D and postoperatively it was found to be decreased significantly (p<0.001) to 1.83±0.52D. In grade II type of pterygium, preoperative mean astigmatism was 2.47±0.73D which was reduced postoperatively up to 1.22±0.36D significantly (p<0.001). Thus it was observed that as grade of pterygium increases the amount of keratometric astigmatism also increases in same proportion and successful pterygium excision decreases the pterygium induced keratometric astigmatism. Results of our study are comparable with the studies of Popat KB *et.al*[11], Chourasia P *et al*,[12] and FA Khan *et.al*[19]. The visual improvement after surgical excision of pterygium was also assessed and it was observed that significant visual improvement occurred in all the grades of pterygium after successful pterygium surgery. The improvement was highly significant in grade II and grade III pterygium (p < 0.001) and was also significant in grade IV (p < 0.05). The Mean preoperative visual acuity (BCVA) was 0.424 ± 0.30 and it was improved to 0.587 ± 0.267(p<0.001) postoperatively. These observations were comparable with the studies carried out by Maheshwari S[11], Mohd Yousuf[15], Dr. Anwar hussain et.al[17] and popat B *et.al*[18]. We also compared preoperative unaided visual acuity with postoperative visual acuity and found that 53 cases (69.73%) reported improved visual acuity on Snellen's chart, while 23 cases (30.26%) showed unaltered visual acuity. Deterioration in visual acuity was not noted in any patient. Similar observation was made in 1993 by Allan, Short, Crawford, Barett and Constable[20]; they compared preoperative unaided visual acuity with 3 months postoperative unaided visual acuity on Snellen's chart in 93 eyes. They found unaided visual acuity was either unchanged or improved in 86 out of 93 cases, while 7 eyes showed decline in visual acuity on Snellen's chart. The decline in visual acuity was not related to surgery, but was either due to astigmatism, cataract or retinal pathology. No major complications were observed in the present study. Minor complications like subconjunctival haemorrhage in 8 patient (10.52%), graft edema in 9 patients (11.8%), wound dehiscence 5 patients (6.5%), conjunctival inclusion cyst in 1patient (1.3%) and recurrence was noted in 1 patient (1.3%). Simple excision of the conjunctival cyst was done; active surgical intervention was not required for other complications.

Allan, Short, Crawford, Barett, Constable[20] studied 93 eyes of 85 patients for pterygium excision with conjunctival Autografting. They encountered 3 cases of wound dehiscence, one case of conjunctival cyst and one case of Tenon's granuloma, which were all corrected by minor surgical revision without any sequelae. David Hui-Kang ma, Lai–Chu See, Su-Bin Liau, Ray Jui-Fang Tsai[21] studied 80 eyes of 71 patients. They found no major complications, only two cases of pyogenic granuloma and four cases of conjunctival inclusion cysts. These were treated by minor surgical procedure. Thus the findings were comparable with the present study.

CONCLUSION

Thus from the above results and discussion we conclude that as the size of pterygium encroaching on cornea increases, the amount of induced astigmatism also increases in direct proportion. We also observed that successful pterygium surgery reduces the pterygium induced refractive and keratometric astigmatism and thus improves the visual acuity.

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