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Original Research Article

Pre & Post-Op Assessment Refractive Alterations and Recurrence of Pterygium after Pterygium Removal

Ranjeet Kumar[1], Amit Raj[2], Bhawesh Chandra Saha[3]

[1]Senior Resident, Department of Ophthalmology, AIIMS, Patna, Bihar, India

[2]Professor & head, Department of Ophthalmology, AIIMS, Patna, Bihar, India

[3]Associate professor, Department of Ophthalmology, AIIMS, Patna, Bihar, India

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Corresponding Author: Dr. Ranjeet Kumar
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Abstract

Aim: To investigate the refractive alterations and recurrence of pterygium after pterygium removal using the bare sclera method and conjunctival limbal autografting.

Materials and Methods: This study was conducted in the department of Ophthalmology, AIIMS, Patna, Bihar, India. All patients underwent a complete ophthalmological examination, including slit lamp examination and keratometry. Pterygium was graded according to its encroachment on cornea: Pterygium < 2mm was Grade 1, Pterygium 2-4 mm was Grade 2 and Pterygium > 4 mm was Grade 3 Pterygium. Each patient was randomly assigned to Group A (pterygium excision with bare sclera technique with cauterisation) and Group B (Pterygium excision with conjunctival limbal autografting secured with sutures). Group A patients underwent pterygium excision in which the tenon's and subepithelial fibrovascular tissue was carefully and completely dissection. The sclera was left bare. Group B patients underwent pterygium excision with conjunctival autografting. Conjunctival autograft was harvested from superotemporal quadrant of bulbar conjunctiva.

Results: Maximum patients in our study belonged to age group of 40-49 years. Out of total 60 patients, 34 patients i.e. 56.67 % people were of age group 40-49 years. In our study, it was found that in Group A patients (Patients operated by Pterygium excision with Bare sclera technique with cauterization) the uncorrected visual acuity improved from 0.66 ± 0.26 to 0.93 ± 0.19 in Grade 1 Pterygium, 0.52 ± 0.23 to 0.85 ±0.20 in Grade 2 Pterygium and from 0.36 ± 0.21 to 0.70 ±0.18 in Grade 3 pterygium which was statistically highly significant ($P < 0.01$). In our study, when the improvement in the mean uncorrected visual acuity after pterygium excision was compared between the two groups (Group A and Group B), it was found that the difference was not statistically significant ($P > 0.05$); suggesting that improvement in the visual outcome following pterygium excision by these two techniques was similar. In our study, out of 60 patients, 54 patients (90%) had With the Rule Astigmatism, 5 patients (8.33%) had against-the-rule astigmatism and 1 patient (1.67%) had oblique astigmatism preoperatively. In our study, in Group A (Patients operated by Pterygium excision with Bare sclera technique with cauterisation) preoperative mean keratometric astigmatism was maximum in grade 3 i.e. 4.05 ± 1.79 Diopter and postoperatively it was found to decrease significantly ($p < 0.001$) to 1.4 ± 0.63 Diopter. In grade 2 pterygium, preoperative mean astigmatism reduced from 2.85 ± 1.74 Diopter to 1.08 ± 0.57 Diopter and in grade 1 pterygium, it reduced from 1.54 ± 1.09 Diopter to 0.93 ± 0.35 Diopter which were statistically significant ($p < 0.001$).

Conclusion: Pterygium leads to significant astigmatism which affects the vision of the patient. In our study, pterygium excision itself significantly reduces astigmatism and improves the visual acuity. But the type of surgery performed does not seem to have effect on improvement in the visual acuity and the amount of decrease in postoperative astigmatism.

Keywords: Refractive alterations, Recurrence , Pterygium, Bare sclera.

Introduction

Pterygium is a common ocular surface disorder characterized by a wing-shaped fibrovascular growth of conjunctival tissue extending onto the cornea. This condition can cause significant visual impairment due to its encroachment onto the visual axis, inducing refractive changes, and contributing to astigmatism. Surgical removal is often necessary, but recurrence rates are a significant concern, particularly when different surgical techniques are employed. Two widely used methods are the bare sclera technique and conjunctival limbal autografting. [1,2] Pterygium can induce various refractive changes, including astigmatism, hyperopia, and myopia, primarily due to the

mechanical distortion of the cornea. Studies have demonstrated that the extent of induced astigmatism correlates with the size and extent of pterygium growth. The induced astigmatism is typically with-the-rule, where the steepest corneal meridian is oriented vertically. [3,4] This alteration can lead to significant visual discomfort and blurred vision, necessitating surgical intervention. The bare sclera technique involves excising the pterygium and leaving the scleral bed exposed. This method is favored for its simplicity and shorter surgical time. However, it has been associated with high recurrence rates, reported to range between 30% and 70%. Recurrence is often attributed to the lack of conjunctival tissue covering the exposed sclera, which allows for fibrovascular proliferation. [5,6] Moreover, recurrence following the bare sclera method is often more aggressive and rapid. Conjunctival limbal autografting (CLAU) has emerged as a more effective alternative to the bare sclera technique. In CLAU, a graft of conjunctival and limbal tissue is harvested from the patient's superior or inferior conjunctiva and transplanted to the site of pterygium excision. This technique aims to restore the ocular surface integrity and provide a barrier to conjunctival proliferation. Studies have shown that CLAU significantly reduces recurrence rates, with reports ranging from 2% to 10%. The inclusion of limbal stem cells in the graft is thought to play a crucial role in maintaining the epithelial barrier and preventing pterygium regrowth. [7]

Materials and Methods

This study was conducted in the department of Ophthalmology, AIIMS, Patna, Bihar, India from December 2020 to November 2021. All patients underwent a complete ophthalmological examination, including slit lamp examination and keratometry. Pterygium was graded according to its encroachment on cornea:Pterygium < 2mm was Grade 1,Pterygium 2-4 mm was Grade 2 and Pterygium > 4 mm was Grade 3 Pterygium. Each patient was randomly assigned to Group A (pterygium excision with bare sclera technique with cauterisation) and Group B (Pterygium excision with conjunctival limbal autografting secured with sutures). Group A patients underwent pterygium excision in which the tenon's and subepithelial fibrovascular tissue was carefully and completely dissection. The sclera was left bare. Group B patients underwent pterygium excision with conjunctival autografting. Conjunctival autograft was harvested from superotemporal quadrant of bulbar conjunctiva. The limbal side of the graft was oriented to the limbal side of the defect and the graft was secured with sutured using 10-0 nylon sutures. Both groups had a similar postoperative regimen and were followed up on 3rd and 7th day, 1 month and 3 months.

Results

The results of this study are as follows :34 of the 60 patients (56.67%) enrolled in the study belonged to the age group of 40-49. 45 patients out of the 60 were female (75%) while 25% were males. The male to female ratio was 1:3. 43 patients (71.67%) out of 60 did outdoor work.

Table 1: Characteristics of patients included in the study

Age (Years)	**Number of Patients**
20-29	4
30-39	18
40-49	34
50-60	4
Total	60
Gender	**Number of patients**
Male	15
Female	45
Total	60
Occupation	**Number of patients**
Outdoor	43
Indoor	17
Total	60
Grade of Pterygium	**Number of eyes**
Grade 1	13
Grade 2	37
Grade 3	10
Total	60
Type of astigmatism	**Number of eyes**
With the rule	54
Against the rule	5
Oblique	1
Total	60

Table 2: Comparison between Mean Preoperative and Post-operative Uncorreced Visual Acuity in Group A: Pterygium excision with Bare sclera technique with cauterization

Grades	Number of eyes	Mean Pre-operative Visual Acuity	Mean Post-operative Visual Acuity	Difference	P value
Grade 1	7	0.66 ± 0.26	0.93 ± 0.19	0.27 ± 0.21	P < 0.01
Grade 2	18	0.52 ± 0.23	0.85 ± 0.20	0.33 ± 0.22	P < 0.01
Grade 3	5	0.36 ± 0.21	0.70 ± 0.18	0.33 ± 0.22	P < 0.01

Table 3: Comparison between Mean Preoperative and Post-operative Uncorrected Visual Acuity in Group B: Pterygium excision with Conjunctival Limbal Autografting secured with sutures

Grades	Number of eyes	Mean Pre-operative Visual Acuity	Mean Post-operative Visual Acuity	Difference	P value
Grade 1	6	0.86 ± 0.22	0.94 ±0.13	0.083 ± 0.20	P > 0.05
Grade 2	19	0.44 ± 0.12	0.85 ± 0.18	0.41 ± 0.15	P < 0.01
Grade 3	5	0.32 ± 0.16	0.73 ± 0.25	0.40 ± 0.08	P < 0.05

Table 4: Comparison between change in visual acuity in two groups: Group A (Pterygium excision with Bare sclera technique with cauterisation) and Group B: (Pterygium excision with Conjunctival Limbal Autografting secured with sutures)

Grades	Change in UCVA in Group A (mean ± SD)	Change in UCVA in Group B (mean ± SD)	P value
Grade 1	0.26 ± 0.20	0.08 ± 0.20	P > 0.05
Grade 2	0.32 ± 0.21	0.41 ± 0.15	P > 0.05
Grade 3	0.33 ± 0.19	0.40 ± 0.08	P > 0.05

Table 5: Axis of Pre-operative Astigmatism in both the groups

Type	Number of eyes	Percentage
With the rule	54	90
Against the rule	5	8.33
Oblique	1	1.67
Total	**60**	100

Table 6: Type of astigmatism in both the groups

Type of astigmatism	Number of eyes	Percentage
Simple myopic astigmatism	35	58.33
Simple hypermetropic astigmatism	2	3.33
Compound myopic astigmatism	13	21.67
Compound hypermetropic astigmatism	1	1.67
Mixed astigmatism	9	15
Total	60	100

Table 7: Difference between Pre-operative and Post-Operative Keratometric astigmatism in Group A : Pterygium excision with Bare sclera technique with cauterization

Grade of Pterygium	Number of Patients	Pre-operative mean Keratometric astigmatism	Post -operative mean keratometric astigmatism	Difference	P* value
Grade 1	7	1.54 ± 1.09	0.93 ± 0.35	0.61 ± 1.04	P > 0.05
Grade 2	18	2.85 ± 1.74	1.08 ± 0.57	1.77 ± 1.46	P < 0.01
Grade 3	5	4.05 ± 1.79	1.4 ± 0.63	2.65 ± 1.29	P < 0.01

Table 8: Difference of between Pre-operative and Post-Operative Keratometric astigmatism in Group B Pterygium excision with Conjunctival Limbal Autografting secured with sutures

Grade Pterygium	Number of Patients	Pre-operative mean keratometric astigmatism	Post -operative mean keratometric astigmatism	Difference	P* value
Grade 1	6	1.73 ± 0.54	0.88 ± 0.30	0.85 ± 0.75	P < 0.05
Grade 2	19	2.44 ± 1.37	1.28 ± 0.58	1.16 ± 1.25	P < 0.01
Grade 3	5	3.3 ± 1.51	1.09 ± 0.27	2.21 ± 1.60	P < 0.01

Table 9: Comparison between Mean Keratometric astigmatic change (Reduction) by the two techniques: Group A (Pterygium excision with Bare sclera technique with cauterisation) and Group B (Pterygium excision with Conjunctival Limbal Autografting secured with sutures)

Group	Number of eyes	Number of eyes with Recurrence	Percentage
Group A	30	4	13.33
Pterygium excision with Bare sclera technique with cauterisation			
Group B	30	1	3.33
Pterygium excision with Conjunctival Limbal Autografting secured with sutures			

Z test was applied to compare the incidence of recurrence in each group and it was seen recurrence was higher in Group A (Pterygium excision with Bare sclera technique with cauterisation) than in Group B (Pterygium excision with Conjunctival Limbal Autografting secured with sutures) and was highly statistically significant ($P < 0.01$)

Discussion

Pterygium causes impairment of vision by inducing corneal astigmatism. A tear meniscus develops between the corneal apex and elevated pterygium, causing apparent flattening of normal corneal curvature. This study was conducted on 60 eyes in an attempt to establish refractive changes following pterygium excision, comparison of refractive outcome after treatment using two different methods: pterygium excision using bare sclera surgery with cauterisation and pterygium excision with conjunctival limbal autografting secured with sutures, and to compare recurrence following two methods. Females were predominant in our study (75%). Our findings are not similar to other studies in which there is more incidence of pterygium in males than in females as they are involved more in outdoor work. Our study population consisted of the people coming from low socioeconomic conditions and maximum were females involved in outdoor occupation (especially farming). This may account for the increased number of female pterygium cases in our study. Maximum patients in our study belonged to age group of 40-49 years. Out of total 60 patients, 34 patients i.e. 56.67 % people were of age group 40-49 years. These findings in our study agree to that of R.M. Youngson [6], Zauberman [7], Dr. Rao S.K et.al [8], etc. In our study, it was found that in Group A patients (Patients operated by Pterygium excision with Bare sclera technique with cauterisation) the uncorrected visual acuity improved from 0.66 ± 0.26 to 0.93 ± 0.19 in Grade 1 Pterygium, 0.52 ± 0.23 to 0.85 ± 0.20 in Grade 2 Pterygium and from 0.36 ± 0.21 to 0.70 ± 0.18 in Grade 3 pterygium which was statistically highly significant ($P < 0.01$). Similarly it was found that in Group B patients (Patients treated by Pterygium excision with Conjunctival limbal autografting, secured with sutures) the uncorrected visual acuity improved from 0.86 ± 0.22 to 0.94 ± 0.13 in Grade 1 Pterygium, 0.44 ± 0.12 to 0.85 ± 0.18 in Grade 2 Pterygium and from 0.32 ± 0.16 to $0.73 \pm$

0.25 in Grade 3 pterygium which was statistically highly significant ($P < 0.01$). Pterygium excision surgery reverses pterygium induced astigmatism is thus improves visual acuity. The observations of our study were comparable with the studies carried out by Maheshwari S [10], Mohd Yousuf [11], Dr. Anwar hussain et.al and Popat B et.al [12] and other similar studies undertaken previously. In our study, when the improvement in the mean uncorrected visual acuity after pterygium excision was compared between the two groups (Group A and Group B), it was found that the difference was not statistically significant ($P > 0.05$); suggesting that improvement in the visual outcome following pterygium excision by these two techniques was similar. In our study, out of 60 patients, 54 patients (90%) had With the Rule Astigmatism, 5 patients (8.33%) had against-the-rule astigmatism and 1 patient (1.67%) had oblique astigmatism preoperatively. The findings in our study are similar to those of other studies like that of Avisar et al. [9], FA Khan et al., Popat et al. [12] and others. In our study, in Group A (Patients operated by Pterygium excision with Bare sclera technique with cauterisation) preoperative mean keratometric astigmatism was maximum in grade 3 i.e. 4.05 ± 1.79 Diopter and postoperatively it was found to decrease significantly ($p < 0.001$) to 1.4 ± 0.63 Diopter. In grade 2 pterygium, preoperative mean astigmatism reduced from 2.85 ± 1.74 Diopter to 1.08 ± 0.57 Diopter and in grade 1 pterygium, it reduced from 1.54 ± 1.09 Diopter to 0.93 ± 0.35 Diopter which were statistically significant ($p < 0.001$). Similarly, in Group B patients (Patients treated by Pterygium excision with Conjunctival limbal autografting, secured with sutures), the preoperative mean keratometric astigmatism was maximum in grade 3 i.e. 3.3 ± 1.51 Diopter and postoperatively it was found to decrease significantly ($p < 0.001$) to 1.09 ± 0.27 Diopter. In grade 2 pterygium, preoperative astigmatism decreased from 2.44 ± 1.37 Diopter to 1.28 ± 0.58 Diopter and in grade 1 pterygium, from 1.73 ± 0.54 Diopter to 0.88 ± 0.30 Diopter postoperatively which was statistically significant ($p < 0.001$). The above findings of our study, correlating the size of

pterygium and the amount of induced astigmatism are comparable to that in literature and similar studies undertaken by Maheshwari et al., Kampitak [13], Mohd. Salih, Chourasia P, FA Khan et. al. Popat et al. and others. In our study, when the mean difference in the decrease in astigmatism according to respective grades were compared between the two groups Group A and Group B, the difference was not found to be statistically significant ($P > 0.05$). It means that the reduction in corneal astigmatism after pterygium excision by the two surgical techniques were similar. Popat et al. found that reduction in astigmatism was more in patients operated for Pterygium excision with conjunctival limbal autografting, whereas Yilmaz et al. [14] found that reduction of astigmatism was more in patients operated with bare sclera technique. In our study, recurrence of pterygium in patients operated with bare sclera technique was 13.33% (in 4 eyes out of 30) which was significantly more ($P<0.01$) than patients operated with a conjunctival autografting secured with sutures was 3.33% (in 1 eye out of 30). The findings of our study correlate with findings in the studies of Cameron, RM Youngson, Maheshwari et al. and others which conclude that conjunctival limbal autografting results in decreased incidence of recurrent pterygium as compared to pterygium excision with bare sclera technique.

Conclusion

Pterygium leads to significant astigmatism which affects the vision of the patient. In our study, pterygium excision itself significantly reduces astigmatism and improves the visual acuity. But the type of surgery performed does not seem to have effect on improvement in the visual acuity and the amount of decrease in postoperative astigmatism. From our study, it is observed that Pterygium excision with conjunctival limbal autografting has a lower recurrence rate as compared to that of bare sclera technique and hence pterygium excision with conjunctival autografting is the most preferred technique.

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