

A Comparative Study of Refractive Changes Following Pterygium Surgery with Bare Sclera Technique and Conjunctival Autografting

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Abstract

Background: Pterygium is a triangular, fibrovascular, connective tissue overgrowth of bulbar conjunctiva onto the cornea. Surgery is indicated for the visual impairment caused by the astigmatism induced by the pterygium and its progression into the pupillary area or for patient's cosmetic needs.

Aims: To determine the amount of refractive changes following pterygium surgery and to compare the refractive changes between bare sclera technique and conjunctival autografting.

Materials and methods: A prospective comparative study was conducted on a total of 60 eyes of 59 patients with primary pterygium. The study cases were randomly distributed into two groups of 30 eyes each. One group was treated with Pterygium excision with bare sclera technique while the other with Pterygium excision with conjunctival autografting. Patients were observed for three follow up visits which were done at second, fourth and twelve weeks after the surgery. Visual acuity, keratometry and refraction with acceptance were recorded at each follow up.

Result: Majority of patients were in the age group of 51 to 60 years. Females (63%) outnumbered males (37%) in this study probably because they seek surgical treatment for cosmetic reasons. 95% of pterygia under study were on the nasal side. It was found that the corneal astigmatism reduced progressively and significantly in both the study groups after two weeks, four weeks and twelve weeks post operatively. No significant differences between bare sclera technique and conjunctival autografting group concerning post operative astigmatism were found.

Conclusion: Pterygium excision induces a reversal of pterygium related corneal flattening. A significant decrease in astigmatism and improvement in visual acuity is observed post operatively. However further studies need to be conducted to compare the effect of different surgical approaches on post operative astigmatism.

Keywords: Pterygium excision, bare sclera technique, conjunctival autografting, astigmatism.

I. Introduction

Pterygium is a triangular, fibrovascular, connective tissue overgrowth of bulbar conjunctiva onto the cornea. It proliferates as vascularised granulation tissue to invade the cornea, destroying the Bowman's membrane and the superficial layers of the stroma, the whole being covered by the conjunctival epithelium. The thick vascularised conjunctiva appears to be drawn to the cornea from the canthus and is loosely adherent in its whole length to its sclera, the area of adherence being always smaller than its breadth so that there are folds at the upper and the lower borders.^{1,2}

Pterygia are more commonly seen in tropical climates³ and most of them develop on the nasal limbus⁴ thus implicating direct sunlight and ultraviolet radiation. Pterygium is known to affect refractive astigmatism, which can have a significant impact on vision. Several mechanisms have been suggested to explain the induced astigmatism like pooling of tear film at the leading edge of the pterygium⁵ and mechanical traction exerted by the pterygium on the cornea⁶, these theories have been supported well by keratometry, corneal topography and refractive findings. Pterygium induced astigmatism can be the cause of subjective visual complaints including, but not limited to, decreased visual acuity, glare sensitivity and monocular diplopia. A pterygium generally causes localised flattening central to the apex of the pterygium. As this flattening is along the horizontal meridian, it usually causes with-the-rule astigmatism.

Surgery is indicated for the visual impairment caused by the astigmatism induced by the pterygium and its progression into the pupillary area or for patient's cosmetic needs.

There have been previous studies which have reported varying degrees of astigmatism with different techniques^(7,8,9) but none of them have been able to help us choose a better technique. Hence this study is undertaken to throw some light on this grey area.

II. Materials And Methods

A prospective comparative study was conducted on a total of 60 eyes of 59 patients with primary pterygium who were operated at Department of Ophthalmology, RIMS, Imphal. The study cases were randomly distributed into two groups of 30 eyes each. One group was treated by Pterygium excision with bare sclera technique while the other by Pterygium excision with conjunctival autografting. Patients were observed for three follow up visits which were done at second, fourth and twelve weeks after the surgery. All the cases were examined preoperatively to exclude any contraindication of surgery. Syringing was performed to confirm the patency of the nasolacrimal system. Assessment of astigmatism was done by objective refraction, subjective refraction and keratometry. Visual acuity was recorded using Snellen's chart/ E-chart or Landolt's C-ring chart. Objective refraction was done by retinoscopy at 1m distance with streak retinoscope after cycloplegic dialation of the pupil. Best corrected visual acuity and subjectively tolerated cylinder in which patient is comfortable was noted. Keratometry was done using Bausch and Lomb type keratometer. Corneal astigmatism was calculated taking the difference of K1 and K2 readings (horizontal and vertical respectively). A cylindrical lens at $180^{\circ} \pm 20^{\circ}$ was reported as astigmatism at horizontal meridian and a cylindrical lens at $90^{\circ} \pm 20^{\circ}$ was reported as astigmatism at vertical meridian.

The *bare-sclera technique* involves surgical dissection of the pterygium, with lamellar keratectomy leaving behind the bare sclera which is slightly larger than the dissected pterygium. By excising the conjunctival tissue at the limbus the conjunctiva is allowed to become adherent to underlying sclera, preventing its migration over the cornea. The conjunctival healing process after the bare sclera technique is usually very invasive. In *conjunctival autografting* after pterygium excision, a free conjunctival graft from the superotemporal bulbar conjunctiva (*Fig.1*) is used to resurface the exposed sclera. The graft is oriented such that the limbal side still corresponds to the limbus on the acceptor site. The donor site is left to reepithelialise on its own, which usually occurs in the next seven days.

III. Results And Observations

Most of the patients (41.67%) were in the age group of 51 to 60 years. The mean age of the patients in this study was 51.21 ± 10.92 years. Females constituted 63% of cases while 37% of cases were males. In 57 out of 60 cases (95%) the pterygia were on the nasal side of the limbus, two cases (3.33%) had temporal and one of cases had both nasal and temporal pterygia. On analysis of the pterygium preoperatively, it was found that 53 out of 60 cases had with-the-rule astigmatism confirming the finding that pterygium causes flattening of the horizontal meridian of the cornea. In the group which was to be treated by the bare sclera technique 22 cases had with-the-rule astigmatism of 0.6 D or more preoperatively which was as high as 2 to 3 D in seven cases. In the group which was to be treated by conjunctival autografting 19 cases had with-the-rule astigmatism of 0.6 D or more preoperatively which was as high as 2 to 3 D in five cases.

Significant difference in keratometric findings was observed before and after pterygium excision with bare sclera technique (*Table 1*), where the mean dioptric power of the cornea at the horizontal axis (K1) changed from 43.13 ± 1.47 D to 41.87 ± 1.15 D after 12 weeks of surgery showing a mean difference of 1.26 ± 0.32 D. The mean dioptric power of the cornea at the vertical axis (K2) changed from 42.10 ± 1.58 D to 41.27 ± 1.20 D after 12 weeks of surgery showing a mean difference of 0.83 ± 0.38 D. Similar difference in keratometric findings was also observed before and after pterygium excision with conjunctival autografting (*Table 2*), where the mean dioptric power of the cornea at the horizontal axis (K1) changed from 43.13 ± 1.47 D to 41.87 ± 1.15 D after 12 weeks of surgery showing a mean difference of 1.26 ± 0.32 D. The mean dioptric power of the cornea at the vertical axis (K2) changed from 42.10 ± 1.58 D to 41.27 ± 1.20 D after 12 weeks of surgery showing a mean difference of 0.83 ± 0.38 D. Thus an important observation made in this study was that pterygium excision brought a significant decrease in refractive astigmatism post operatively (*Fig.2*). On post operative refraction in the bare sclera group done at 12 weeks, 21 out of 30 cases had with-the-rule astigmatism of only 0.5 D or less and only 6 out of 30 cases were left with astigmatism of 0.6 D or more (*Fig. 3*). Similar findings were noted in the group treated with conjunctival autografting where at 12 weeks 22 out of 30 cases had with-the-rule astigmatism of only 0.5 D or less and only 7 out of 30 cases were left with astigmatism of 0.6 D or more (*Fig. 4*). This signifies effective decrease in with-the-rule astigmatism post operatively after pterygium excision. The visual acuity significantly improved in both the groups post operatively. In the bare sclera group the percentage of patients having best corrected visual acuity of 6/6 rose from zero pre operatively to 67% at 12 weeks post operatively, similarly in the group treated with conjunctival autografting the percentage of patients having best corrected visual acuity of 6/6 rose from 3% pre operatively to 70% at 12 weeks post operatively. The analysis of pre and post operative follow up findings at 12th week in the bare sclera group shows that there is significant change in with-the-rule astigmatism ($p < 0.001$) but the change in against-the-rule astigmatism was not statistically significant ($p > 0.5$), while the changes in both with-the-rule ($p < 0.001$) and against-the-rule ($p < 0.01$)

astigmatism were statistically significant in the group treated with conjunctival autografting. No statistically significant difference in astigmatism was seen on any follow up visits among the two groups ($p>0.05$).

IV. Discussion

Study population consisted of individuals in the age group of 51-60 years, mostly females for which cosmesis may be a driving factor. Nasal pterygium is most common as reported by D'Ombrains et al¹⁰. Pterygium usually induces with-the-rule astigmatism which is one of the main causes of visual disturbance in pterygium cases as similarly reported by Tomidokoro et al¹¹ and Kampitak et al¹². Pterygium excision results in significant reduction in astigmatism by inducing a reversal of pterygium induced corneal flattening as seen by Fong et al¹³ which is confirmed by refractive findings, keratometry and improvement in visual acuity in our study also. In both the study groups treated with the bare sclera technique and conjunctival autografting the percentage of patients having best corrected visual acuity of 6/6 rose from 3% or less pre operatively to 67% or more at 12 weeks post operatively. In both the study groups there was a significant decrease in number of patients having astigmatism of 0.5 D or more. In the present study we found a significant change between preoperative and postoperative astigmatic values with both the surgeries but no significant difference in the post operative astigmatic changes among the two groups.

V. Conclusion

Pterygium excision induces the reversal of pterygium related corneal flattening. A significant decrease in astigmatism and improvement in visual acuity is observed post operatively. However to our knowledge there are limited studies comparing the effect of different surgical techniques on post operative astigmatism. In our study, no significant differences between pterygium excision with bare sclera technique and conjunctival autografting concerning post operative astigmatism were found. A more extensive study could provide us with a more conclusive insight.

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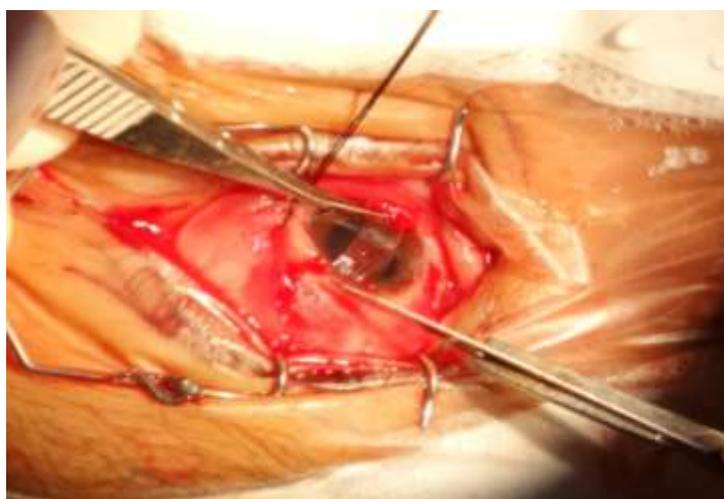


Fig.1 Preparation of the donor graft in conjunctival autografting

Table 1: The keratometric findings before and after the bare sclera technique (Mean ± SD in Dioptres)

	Preoperative	Post operative			Difference at 12 wks after surgery
		2 nd week	4 th week	12 th week	
Horizontal (K1)	43.13±1.47	42.59±1.50	42.24±1.43	41.87±1.15	1.26±0.32
Vertical (K2)	42.10±1.58	41.75±1.39	41.70±1.38	41.27±1.20	0.83±0.38

Table 2: The keratometric findings before and after conjunctival autografting (Mean ± SD in Dioptres)

	Preoperative	Post operative			Difference at 12 wks after surgery
		2 nd week	4 th week	12 th week	
Horizontal (K1)	43.37±1.24	42.76±1.16	42.55±1.01	42.15±0.96	1.22±0.28
Vertical (K2)	42.49±1.38	42.00±1.16	41.87±1.10	41.51±0.94	0.98±0.44

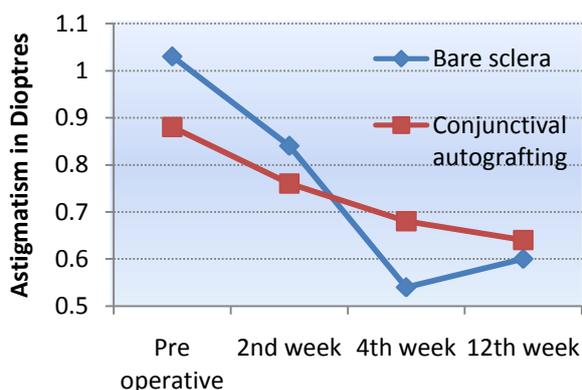


Fig 2: Chart showing overall transition of keratometric astigmatism at different time intervals between the two groups.

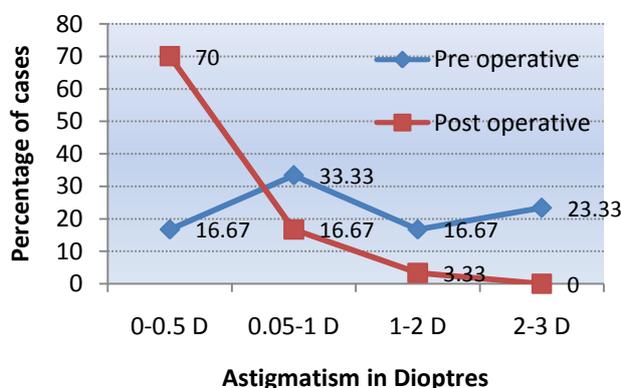


Fig. 3: Comparison of Refractive astigmatism in pre and post operative follow up at 12 weeks among the bare sclera group.

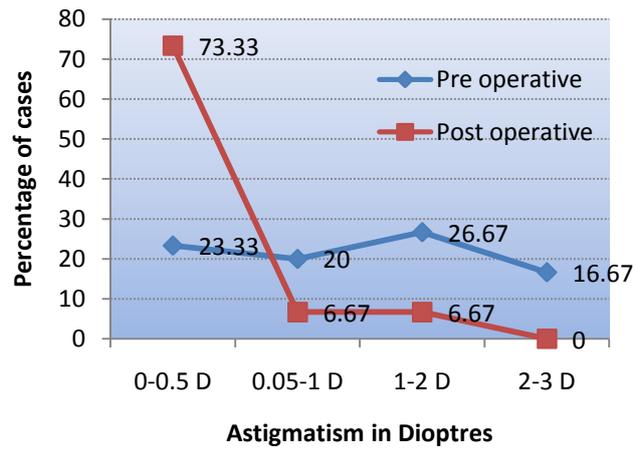


Fig. 4: Comparison of Refractive astigmatism in pre and post operative follow up at 12 weeks among the conjunctival autografting group.