The Astigmatic Effect of Pterygium in a Tertiary Hospital in Kano, Nigeria

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Abstract

Aim: This study aims to determine the effect of pterygium excision on the degree of corneal induced astigmatism and visual acuity.

Patients and Methods: This was a prospective interventional study conducted between September 2012 and June 2013. Consecutive patients with pterygium who met the inclusion criteria were recruited into the study. They had a basic eye examination, and those with existing comorbidity were excluded. Selected patients had pterygium excision using the bare sclera technique with intraoperative application of Mitomycin C. Detailed pre- and post-operative evaluation and refraction was done. Results: There were 45 eyes of 33 patients aged 28–75 years. The mean age was 56.12 ± 12.38 years. Six eyes had Grade I, 29 eyes had Grade II and 10 eyes had Grade III pterygium. The mean value for preoperative astigmatism was 2.12 ± 1.09 diopter cylinder (DC) while that for postoperative astigmatism was 0.72 ± 0.50 DC (P = 0.000). Surgery was associated with statistically significant increase in postoperative visual acuity (P = 0.000).

Conclusion: This study has shown that the degree of pterygium-induced astigmatism reduces significantly following surgical excision. Pterygium excision was associated with improvement in visual acuity.

Keywords: Astigmatism, pterygium, visual acuity

Introduction

A pterygium is a triangular fibrovascular degenerative bulbar conjunctival growth occurring in the palpebral fissure and extending onto the cornea.[1] However, there...
is some evidence suggesting that it may be a proliferative condition. Pterygium is commoner in hot climates and may be a response to persistent dryness and exposure to sun (ultraviolet) light.

Most pterygia are asymptomatic, but symptoms may include redness, pain, discomfort, and reduced vision, which could be attributed to induced astigmatism or occlusion of the visual axis. A significant degree of corneal astigmatism can be induced by encroachment of pterygium onto the cornea. There is a direct relationship between the size of pterygium on the cornea and the astigmatic effect. Pterygium leads to significant changes in corneal refractive status, which increase with the grade of pterygium and improves after surgery.

The definitive treatment for pterygium at present is surgical excision, for which there are various techniques. These include the bare sclera, excision with conjunctival autografting or amniotic membrane transplantation and beta irradiation. Conservative treatment could be adopted for temporary relief of symptoms such as the use artificial tears or lubricants and topical anti-inflammatory agents. The effect of pterygium on corneal refractive status may be measured by refraction, keratometry, corneal topography, and computerized video-keratoscopy. The aim of this study was to determine the effect of pterygium excision on the degree of corneal-induced astigmatism and visual acuity.

**Patients and Methods**

The study adhered to the tenets of the Helsinki Declaration. Ethical approval was obtained from the Ethics Review Board of Aminu Kano Teaching Hospital. This prospective observational intervention study was carried out from September 2012 to June 2013. Consecutive patients that fulfilled the inclusion criteria were recruited. Criteria for inclusion include consent to participate, age above 20 years, the presence of a primary pterygium with astigmatism of at least 1 Diopter cylinder (DC) and normal fundus on direct ophthalmoscopy. Participants that did not give consent, those aged 20 or less, evidence of previous ocular surgery, those with a recurrent pterygium, involvement of the pupillary area (Grade IV pterygium), participants known to be using spectacle correction, and other ocular surface diseases were excluded from the study.

Information obtained included age, sex, occupation, visual acuity before and after surgery, laterality of disease, position of pterygium on the cornea (nasal, temporal, or both) and retinoscopic findings before and after surgery. Patients had unaided and pinhole visual acuity tested at a distance of 6 m using Snellen’s or tumbling “E” charts. Anterior segment examination was done using a slit lamp biomicroscope.

The pterygium was graded based on the extent of corneal involvement. Grade I: crossing the limbus, Grade II: midway between the limbus and the pupil, Grade III: at the pupillary margin and Grade IV: crossing the pupillary margin. All patients had streak retinoscopy at a working distance of two-thirds of a meter preoperatively and 6 weeks after surgery.

Pterygium excision was done using the bare sclera technique with the application of 0.2 mg/ml Mitomycin C soaked in a cotton pledget for 5 min and the eye irrigated with 50 ml of normal saline. The same surgeon performed all the surgeries. Pre- and post-operative visual acuity with subjective refraction was recorded to detect if there was any demonstrable change in astigmatism.

**Data analysis**

Data were analyzed using the statistical software Minitab version 12.0, Minitab Inc, Pennsylvania, United States of America. Paired t-test was used to compare the mean values of visual acuity and change in cylindrical power before and after surgery. P < 0.05 was considered statistically significant.

**Results**

There were 45 eyes of 33 patients aged 28–75 years with a mean age of 56.42 ± 12.38 years. There were 21 males (63.6%) and 12 females (36.4) (M:F = 1.75:1). The age and gender and occupation of the patients studied are shown in Table 1. The patients were predominantly outdoor workers. Six eyes had Grade I, 29 eyes had Grade II and 10 eyes had Grade III pterygium. Pterygium was unilateral in 19 eyes of which 11 were in the right eye and 8 in the left eye. It was bilateral in 26 eyes. The astigmatism was with the rule in 31 eyes,

| Table 1: Age, gender, and occupation of patients |
| Age (years) | Sex | n (%) |
|------------|-----|-------|
| Male       | Female |     |
| 20-29      | 1    | 0     | 1 (3.0) |
| 30-39      | 2    | 1     | 3 (9.1) |
| 40-49      | 5    | 1     | 6 (18.2) |
| 50-59      | 4    | 3     | 7 (21.2) |
| ≥60        | 9    | 7     | 16 (48.5) |
| Total      | 21   | 12    | 33 (100) |

| Occupation | n (%) |
|------------|-------|
| Farming    | 13    | (39.4) |
| Trading/artisan | 8 | (24.2) |
| Commercial motorcyclist | 1 | (3.0) |
| Civil servant | 4 | (12.1) |
| Mechanic | 2    | (6.1) |
| Homemaker | 5    | (15.2) |
| Total | 33 | (100) |

| Table 2: Pre- and post-operative visual acuity of patients |
| Visual acuity | Before surgery | After surgery |
|---------------|----------------|---------------|
| 6/6           | 2              | 16            |
| 6/9           | 5              | 11            |
| 6/12          | 14             | 9             |
| 6/18          | 12             | 5             |
| 6/24          | 5              | 3             |
| 6/36          | 5              | 1             |
| 6/60          | 2              | 0             |
| Total         | 45             | 45            |
against the rule in 13 eyes and mixed in one eye. The change in visual acuity after surgery is shown in Table 2 and Figure 1. The mean value of cylindrical correction was 2.12 ± 1.09 DC preoperatively, while that for the best corrected visual acuity of all the patients was 4.82 ± 2.37. Table 3 shows the mean values of pre- and post-operative visual acuity and refractive astigmatism.

**DISCUSSION**

The presence of a pterygium can induce astigmatism which may be associated with reduced visual acuity and other symptoms such as irritation, redness, diplopia and glare.[9] A pterygium flattens the cornea along the horizontal meridian thereby leading to with the rule astigmatism. The vertical corneal meridian is steep in younger adults. This reduces with age and tends to give rise to against the rule astigmatism in later years.[10] The study consisted of older patients, and this might explain the presence of against the rule astigmatism. The length of pterygium on the cornea has a statistically significant relationship with the amount of refractive astigmatism.[14] There is the possibility that some of the patients although not using spectacle correction could have had against the rule astigmatism not related to the pterygium. Surgical excision reduces astigmatism, leading to improvement in visual acuity and also ameliorates other associated symptoms.[11] The prevalence of pterygium was found to be higher with increasing age of participants similar to findings reported in studies carried out in Saudi Arabia and Indonesia.[12-14] This may be attributable to prolonged exposure to risk factors associated with pterygium in older individuals.[15] Our study showed that the number of male patients was almost twice that of females similar to other studies.[14,16-19] This could be explained by the fact that males tend to engage in more outdoor activities compared to females.[2] Ultraviolet light exposure in addition to hot, dry and dusty environmental conditions has been found to play a role in the development of pterygia. Farmers and laborers and other outdoor workers with increased exposure are at a higher risk of developing this condition.[20,21] The highest prevalence of cases of pterygium in this study was seen in farmers and other outdoor workers; this is similar to that reported in other studies.[2,20] Evidence has shown that most cases of pterygium result in with the rule astigmatism as shown in our study and other similar studies.[7,11] Our study demonstrated improvement in visual acuity and reduction in induced astigmatism after pterygium excision. These findings were found to be statistically significant. Surgical excision of pterygia has been shown to have significant effects on corneal refractive status with improvement in spherical power, astigmatism, and irregularity of the surface of the cornea. These lead to a significant improvement in visual acuity.[8] Improvement in pterygium induced astigmatism following surgical excision was seen in a study carried out in Pakistan.[9] A study that assessed the effect of pterygium excision on induced astigmatism showed that surgical excision reduces pterygium-induced astigmatism with improvement in visual acuity.[10] A study using videokeratography showed reduction in corneal astigmatism from 4.4 ± 3.64 to 1.55 ± 1.63 diopters (P < 0.001) following surgery.[11] A study that investigated the effect of the technique of surgery on postoperative astigmatism in pterygium surgery concluded that pterygium results in high corneal astigmatism which decreases significantly following excision.[22] Findings of this study support other studies which have shown that surgical excision of pterygium leads to improvement in pterygium induced astigmatism and visual acuity.[5,23,24] Surgical excision of pterygia is recommended in view of the associated benefits of improvement in vision and other associated symptoms. A limitation of this study includes the possibility that some patients have preexisting uncorrected astigmatism and lack of long-term follow-up which would have helped determine recurrence and change in astigmatism over time.

**CONCLUSION**

The degree of pterygium induced astigmatism reduces significantly following surgical excision. Pterygium excision was associated with improvement in visual acuity.

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**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**

1. Kanski JJ, Bowling B. Conjunctiva. In: Clinical Ophthalmology: A Systematic Approach. 7th ed. Edinburgh: Elsevier Saunders; 2011. p. 163-4.
2. Makkar B, Agrawal I, Ahuja A, Shah HK. Comparison of preoperative and postoperative astigmatism following pterygium excision with conventional conjunctival graft and amniotic membrane graft. Sch J Appl Med Sci 2015;3:1477-82.
3. Lindsay RG, Sullivan L. Pterygium-induced corneal astigmatism. Clin Exp Optom 2001;84:200-3.
4. Ashaye AO. Refractive astigmatism and size of pterygium. Afr J Med Med Sci 2002;31:163-5.
5. Maheshwari S. Pterygium-induced corneal refractive changes. Indian J Ophthalmol 2007;55:383-6.
6. Mohammed I. Treatment of pterygium. Ann Afr Med 2011;10:197-203.
7. Ayanniyi AA, Badmos KB, Olatunji FO, Owoeye JF, Sanni TO. Blindness caused by pterygium - A case report. Sierra Leone J Biomed Res 2011;3:60-2.
8. Khan FA, Khan Niazi SP, Khan DA. The impact of pterygium excision on corneal astigmatism. J Coll Physicians Surg Pak 2014;24:404-7.
9. Maheshwari S. Effect of pterygium excision on pterygium induced astigmatism. Indian J Ophthalmol 2003;51:187-8.
10. American Academy of Ophthalmology. Basic and Clinical Science Course. Sec. 3. San Francisco: American Academy of Ophthalmology; 2013. p. 114-7.
11. Shelke E, Kawalkar U, Wankar R, Nandedkar V, Khaire B, Gosavi V. Effect of pterygium excision on pterygium induced astigmatism and visual acuity. Int J Adv Health Sci 2014;1:1-3.
12. Liu L, Wu J, Geng J, Yuan Z, Huang D. Geographical prevalence and risk factors for pterygium: A systematic review and meta-analysis. BMJ Open 2013;3:e003787.
13. Alqahtani JM. The prevalence of pterygium in Alkhobar: A hospital-based study. J Family Community Med 2013;20:159-61.
14. Tan CS, Lim TH, Koh WP, Liew GC, Hoh ST, Tan CC, et al. Epidemiology of pterygium on a tropical island in the Riau Archipelago. Eye (Lond) 2006;20:908-12.
15. Monsudi KF, Azonobi IR, Olatunji FO, Saka ES. Prevalence of pterygium in a tertiary hospital in North-Western Nigeria. J Chitwan Med Coll 2015;5:46-51.
16. Cajucom-Uy H, Tong L, Wong TY, Tay WT, Saw SM. The prevalence of and risk factors for pterygium in an urban Malay population: The Singapore Malay Eye Study (SiMES). Br J Ophthalmol 2010;94:977-81.
17. Liang QF, Xu L, Jin XY, You QS, Yang XH, Cui TT, et al. Epidemiology of pterygium in aged rural population of Beijing, China. Chin Med J (Engl) 2010;123:1699-701.
18. Shiroma H, Higa A, Sawaguchi S, Iwase A, Tomidokoro A, Amano S, et al. Prevalence and risk factors of pterygium in a Southwestern Island of Japan: The Kumejima study. Am J Ophthalmol 2009;148:766-10.
19. Sherwin JC, Hewitt AW, Kearns LS, Griffiths LR, Mackey DA, Coroneo MT, et al. The association between pterygium and conjunctival ultraviolet autofluorescence: The Norfolk Island Eye Study. Acta Ophthalmol 2013;91:363-70.
20. Rohatgi S. Pterygium: An epidemiological study in India. Intern J Heathc Biomed Res 2013;4:297-301.
21. Mackenzie FD, Hirst LW, Battistutta D, Green A. Risk analysis in the development of pterygium. Ophthalmology 1992;99:1056-61.
22. Altan-Yaycioglu R, Kucukerdonmez C, Karalezli A, Corak F, Akova YA. Astigmatic changes following pterygium removal: Comparison of 5 different methods. Indian J Ophthalmol 2013;61:104-8.
23. Popat KB, Sheth HK, Vyas VJ, Rangoonwala MM, Sheth RK, Shah JC. A study on changes in keratometry readings and astigmatism induced by pterygium before and after pterygium excision surgery. J Res Med Dent Sci 2014;2:37-42.
24. Yousuf M. Role of pterygium excision in pterygium induced astigmatism. JK Pract 2005;12:91-2.