European Journal of Ophthalmology / Vol. 10 no. 3, 2000 / pp. 212-214

Analysis of the pterygium size inducing marked refractive astigmatism

F.H. ONER, B. KADERLI, I. DURAK, G. CINGIL

Department of Ophthalmology, Dokuz Eylul University School of Medicine, Izmir - Turkey

PURPOSE. *Astigmatic changes induced by the pterygium and their relation to its size and morphology were analysed to establish the critical size for surgery before significant astigmatism occurs.*

MATERIALS AND METHODS. *We evaluated the refraction in 148 eyes of 108 adult patients with primary pterygia. We grouped the astigmatic values according to the keratometric results correlating with the maximal length, width and the approximate total area of the pterigium encroaching on the corneal surface.*

RESULTS. *Pterygia with length or width ≥ 3.00 mm were related to significantly higher astigmatism than other groups ($p<0.01$). The effect of the pterygium morphology on corneal astigmatism was not significant.*

CONCLUSIONS. *Pterygia exceeding 3.00 mm of length or width should be considered within the limits of surgery. (Eur J Ophthalmol 2000; 10: 212-4)*

KEY WORDS. *Astigmatism, Pterygium size*

Accepted: September 6, 1999

INTRODUCTION

A pterygium is a triangular, fibrovascular connective tissue overgrowth of bulbar conjunctiva onto the cornea. It may grow into the visual axis and obstruct vision. It may also have an effect on corneal curvature and cause irregular astigmatism or formation of dellen, so sometimes surgical removal becomes necessary before the lesion has advanced close to the visual axis. High-grade corneal astigmatism is considered an indication for pterygium surgery (1, 2). This astigmatism may occur either due to traction generated by the pterygium, pulling on and distorting the cornea, or by tears pooling in advance of the pterygium, or both (3).

We conducted a study in patients with primary pterygia to analyse astigmatic changes induced by the pterygium and their relation to pterygium size and morphology.

MATERIALS AND METHODS

We evaluated 148 eyes of 108 adult patients with primary pterygia. The astigmatic values were grouped according to the maximal length and width of the pterugium encroaching on the corneal surface, and the results of the study population were compared with a control group of 92 eyes without pterygium. We used a TopCon EOS-1 Auto-refractometer for refractive and keratometric analysis. We measured the pterygium on the corneal surface using the millimetric scale of the TopCon EOS-2 biomicroscope. We compared the astigmatism induced by the inflamed pterygia (edematous pterygium with marked vascularization) to non-inflamed ones. Patients had no other eye pathology that could obscure visual acuity.

1120-6721/212-03$01.50/0

RESULTS

The mean age of the 68 male and 40 female patients was 52.3 ± 12.4 years (range 32-79). The mean duration of the pterygium was 11.3 ± 3.6 years. The control group consisted of 92 eyes of 46 patients with mean age 54.6 ± 9.6 years (range 27-73). The mean magnitude of astigmatism was 1.66 ± 0.84 Diopter (D), with-the-rule in 88.4% of the eyes with pterygium whereas in the control group it was 0.72 ± 0.20 D and with-the-rule in 86.3%. The difference was statistically significant between the two groups (p=0.027). In patients with pterygia vectorial analysis revealed significant flattening of the cornea in the horizontal meridian (mean 39.76 ± 1.78 D) compared with the mean corneal power (43.64 ± 1.66 D) and the power of the flattest cornea (41.33 ± 1.57 D).

The mean astigmatism values in relation to the maximal length of the pterygium on the cornea are shown in Table I. Pterygia 3.0 mm long or more created significantly more astigmatism (mean 2.22 ± 1.14 D) than shorter pterygia (mean 1.10 ± 0.53 D) ($p<0.05$). No significant difference was found between the groups ≥ 3.0 - < 4.0 mm and ≥ and ≥ 4.0 mm (Tab. I).

The mean astigmatism values in relation to the maximum width of the pterygium are shown in Table II. Pterygia 3.00 mm wide or more had significantly higher astigmatism than the other groups ($p<0.01$) (Tab. II).

When the mean astigmatic values for pterygium between ≥ 3.0 - < 4.0 mm (2.18 ± 1.02 D) long were compared with the pterygium ≥ 3 mm wide (2.78 ± 1.17 D), astigmatism was significantly higher in the latter group ($p < 0.05$). Although there was no significant difference between inflamed pterygia with marked edema and non-inflamed ones ($p > 0.05$), the astigmatism was higher in the latter (Tab. III).

DISCUSSION

There is significant association between refractive astigmatism and the presence of pterygium (1-9). Soriano et al (1) found that mean preoperative astigmatism in eyes with pterygium was 2.41 D in the horizontal meridian. Astigmatism was with-the-rule in most patients. Surgical removal reduced the refractive astigmatism. Fong et al (7) showed that astigmatism was with-the-rule in 85.7% of their pterygium-affected eyes and the overall degree of astigmatism was 1.56 D. In another study, examination of eyes with pterygium revealed increased with-the-rule astigmatism (greater than 0.5 D in 46%, 4 D or more in 13%) with impairment of vision (4). Lin et al (8) also found that before invasion of the visual axis, pterygia typically induce with-the-rule astigmatism. We also found significant corneal flattening in the horizontal plane compared with the mean corneal power. The mean magnitude of astigmatism was 1.66 ± 0.84 D with-the-rule in 88.4% of the eyes.

Although the efficacy of surgery to reduce pterygium-induced corneal astigmatism has been established, the critical size of the pterygium justifying surgery has not yet been determined clearly (1, 7). Fong et al (7) noted astigmatism of 1.00 D or more when the

TABLE I - MEAN REFRACTIVE ASTIGMATISM IN RELATION TO THE MAXIMAL LENGTH OF THE PTERYGIUM

Max. length (mm)	No. of eyes	Astigmatism (Diopter)
< 2.0 mm	56	0.88 D ± 0.31
≥ 2.0 – < 3.0 mm	44	1.32 D ± 0.76
≥ 3.0 – < 4.0 mm	31	2.18 D ± 1.02
≥ 4.0 mm	17	2.26 D ± 1.27
Total	148	1.66 D ± 0.84

TABLE II - MEAN REFRACTIVE ASTIGMATISM IN RELATION TO THE MAXIMUM WIDTH OF THE PTERYGIUM

Max. width (mm)	No. of eyes	Astigmatism (Diopter)
< 2.0 mm	63	0.82 D ± 0.61
≥ 2.0 – < 3.0 mm	51	1.42 D ± 0.74
≥ 3.0 mm	34	2.78 D ± 1.17
Total	148	1.66 D ± 0.84

TABLE III - MEAN REFRACTIVE ASTIGMATISM IN INFLAMED AND NON-INFLAMED PTERYGIA

Pterygium morphology	No. of eyes	Astigmatism (Diopter)
Inflamed	83	1.54 D ± 0.74
Non-inflamed	65	1.78 D ± 0.94
Total	148	1.66 D ± 0.84

pterygium extended 3.5 mm beyond the limbus. There was no significant difference according to morphology. Another study found that pterygia extending to > 45% of the corneal radius or within 3.2 mm of the visual axis produce increasing degrees of astigmatism (8). Tomidokoro (9) reported that surgery for removal of the pterygium normalized the amount of regular astigmatism regardless of the size of the pterygium, but irregular astigmatism of eyes with large pterygia (the apex reaching to within the central 2 mm cornea) remained significantly higher than normal. In this study pterygia 3.0 mm long or more beyond the limbus created significantly more astigmatism than pterygia less than 3.0 mm long ($p<0.05$). Besides, a pterygium with 2.0 mm corneal length but 3.0 mm width can create as much as 2.50 D or more corneal astigmatism. So, the length of corneal encroachment alone is not enough to explain pterygium-induced astigmatism and the width of corneal encroachment is equally important. This study showed that pterygium having 3.0 mm or more corneal width beyond the limbus can result in high values of astigmatism. Although the difference was not significant, the non-inflamed pterygia had higher astigmatism (1.78 ± 0.94 D) than inflamed ones (1.54 ± 0.74 D). This might be due to different contractile strengths of the elastic and collagenous fibers in the inflamed and non-inflamed pterygia creating traction on the corneal surface.

The critical pterygium size for surgery can therefore be decided before significant astigmatism occurs. Especially non-inflamed pterygia ≥ 3.00 mm wide can create significantly more astigmatism ($p<0.01$), and should be considered within the limits of surgery.

Reprint requests to:
F. Hakan Oner, MD
915 Sok No: 126
35030 Bornova
Izmir, Turkey
e-mail: nihal@unimedya.net.tr

REFERENCES

1. Soriano JM, Janknecht P, Witschel H. Effect of pterygium operation on preoperative astigmatism. Prospective study. Ophthalmology 1993; 90: 688-90.
2. Stern GA, Lin A. Effect of pterygium excision on induced corneal topographic abnormalities. Cornea 1998; 17: 23-7.
3. Oldenburg JB, Garbus J, McDonnell JM, McDonnell PJ. Conjunctival pterygia. Mechanism of corneal topographic changes. Cornea 1990; 9: 200-4.
4. Hansen A, Norn M. Astigmatism and surface phenomena in pterygium. Acta Ophthalmol 1980; 58: 174-81.
5. Walkow T, Anders N, Wollensak J. Corneal astigmatism after pterygium excision and subsequent phototherapeutic keratectomy with the excimer laser (193 nm). Klin Monatsbl Augenheilkd 1996; 209 (4): 199-204.
6. Pavilack MA, Halpern BL. Corneal topographic changes induced by pterygia. J Refract Surg 1995; 11: 92-5.
7. Fong KS, Balakrishnan V, Chee SP, Tan DT. Refractive change following pterygium surgery. CLAO J 1998; 24: 115-7.
8. Lin A, Stern G. Correlation between pterygium size and induced corneal astigmatism. Cornea 1998; 17: 28-30.
9. Tomidokoro A, Oshika T. Quantitative evaluation of corneal irregular astigmatism using computed corneal topography. Nippon Ganka Gakkai Zasshi 1995; 99: 296-301.