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Pterygia as cause of post-cataract with-the-rule astigmatism

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ABSTRACT

Pterygia often induce with-the-rule astigmatism as they invade the cornea. Significant amounts of astigmatism occur long before a pterygium encroaches on the visual axis. We present an example in which a 3.3-mm pterygium resulted in 9 diopters (D) of with-the-rule astigmatism. Six weeks after the pterygium removal, the patient's cornea became spherical, but by three months the pterygium had recurred 2.2 mm onto the cornea and induced 4 D of with-the-rule astigmatism. Since the second removal and the application of beta irradiation, there has been no recurrence. The final correction was −1.00 + 1.00 × 127° with a visual acuity of 20/20 +3. Characteristic keratoscopic photographs are shown and contrasted with surgically induced with-the-rule astigmatism.

Key Words: keratoscopic photographs, pterygia, surgically induced astigmatism, with-the-rule astigmatism

As techniques in cataract surgery continue to improve, surgeons are beginning to concentrate on refinements such as minimizing the amount of postoperative astigmatism.[1,2] This surgically induced astigmatism is most often the result of a change in corneal curvatures, but other causes such as a tilted or astigmatic intraocular lens (IOL) are possible.[3]

When the astigmatism is a result of wound closure, the curvature of the vertical meridian is steepened by a tight corneoscleral suture(s) centered about 12 o'clock, compressing the wound and producing with-the-rule astigmatism.[1–6] In a patient with a pterygium and a cataract, preoperative determination of the astigmatism by routine measurements is often impossible because the keratometric readings are distorted and refraction is inaccurate because of the cataract. We present a case in which the astigmatism was due to the

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pterygium and demonstrate how it can be differentiated, using keratoscopic photographs, from other types of with-the-rule astigmatism.

CASE REPORT

A 57-year-old white male with a best corrected visual acuity of 20/200 was examined. The refraction was equivalent to his nine-year-old glasses, $-1.50 + 1.75 \times 160°$. He had a 3.3-mm pterygium and a cataract consistent with his visual acuity. An extracapsular cataract extraction was performed with insertion of a posterior chamber IOL.

Ten weeks after the cataract surgery, the patient was best corrected to 20/40 with a refraction of $-2.25 + 9.00 \times 110°$. Keratometric readings were 36.00 at 20 degrees and 44.50 at 110 degrees. We felt that the excessive astigmatism was secondary to one or more tight, interrupted polypropylene sutures. Over a two-week period, all the sutures were removed, but there was no change in the refractive error or the visual acuity. Keratoscopic photographs were taken; these revealed regular and irregular astigmatism secondary to the pterygium (Figure 1A).

Fourteen weeks following cataract removal, the pterygium was removed and the corneoscleral surface was polished using a diamond burr. No beta-irradiation was applied. Three weeks later the patient's visual acuity was 20/25 with a -0.50 sphere and the keratoscopic photograph demonstrated a nearly spherical central cornea (Figure 1B). One month later the visual acuity was 20/20 with a -0.75 sphere.

The patient was given prednisolone acetate 1% to be used four times daily and asked to return in one month. He did not use the drops and failed to keep his scheduled follow-up visit. Three months later, five months after the pterygium removal, the patient returned complaining of reduced vision. The best corrected vision was 20/25 with a $-0.50 + 3.50 \times 104°$. The pterygium had recurred, but had only extended 2.2 mm onto the cornea. The recurrent pterygium was excised and the bed treated with beta-irradiation.

The patient recovered without complications, and one month after the second pterygium removal, his keratometric readings were 41.25 at 90 degrees and 43.50 at 180 degrees with a refraction of -1.00 sphere and a visual acuity of $20/20^{-1}$. Seven months after the second pterygium removal, his visual acuity was $20/20^{+3}$ with a correction of $-1.00 + 1.00 \times 127°$. He had not been using ophthalmic medications for three months and there was no evidence of recurrence.

DISCUSSION

Pterygia most commonly occur at the nasal limbus and extend onto the cornea.[7] As a pterygium grows, it exerts a pulling force along the horizontal meridian of the cornea, flattening the 180-degree axis and inducing with-the-rule astigmatism as shown in Figure 1A. The amount of astigmatism is proportional to the pulling force, which in turn is related to the length, depth, and width of the pterygium.[8] As the pterygium begins to encroach on the entrance pupil, it no longer creates regular astigmatism, which can be corrected by spectacles, but induces irregular astigmatism and distortion. It is important to note that the regular with-the-rule astigmatism induced by a pterygium occurs long before the pterygium encroaches on the entrance pupil and certainly before it reaches the visual axis.

Differentiating between astigmatism caused by tight sutures at 90 degrees and that caused by a pterygium can be done with a Placido's disc or photokeratoscope.

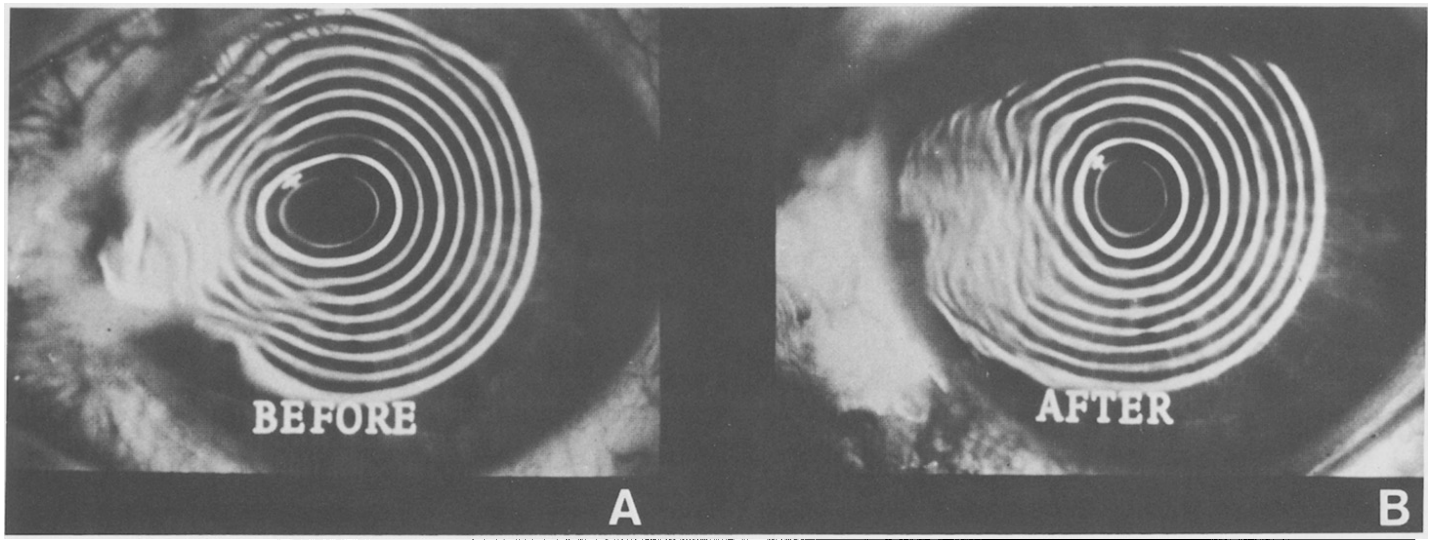

Fig. 1. (Holladay) Keratoscopic photographs of a cornea with a 3.3-mm pterygium. (A) *Before* the pterygium removal the mires are egg-shaped, pointing to the pterygium. (B) *After* the pterygium removal the mires are more spherical, demonstrating the 9-D reduction in corneal astigmatism.

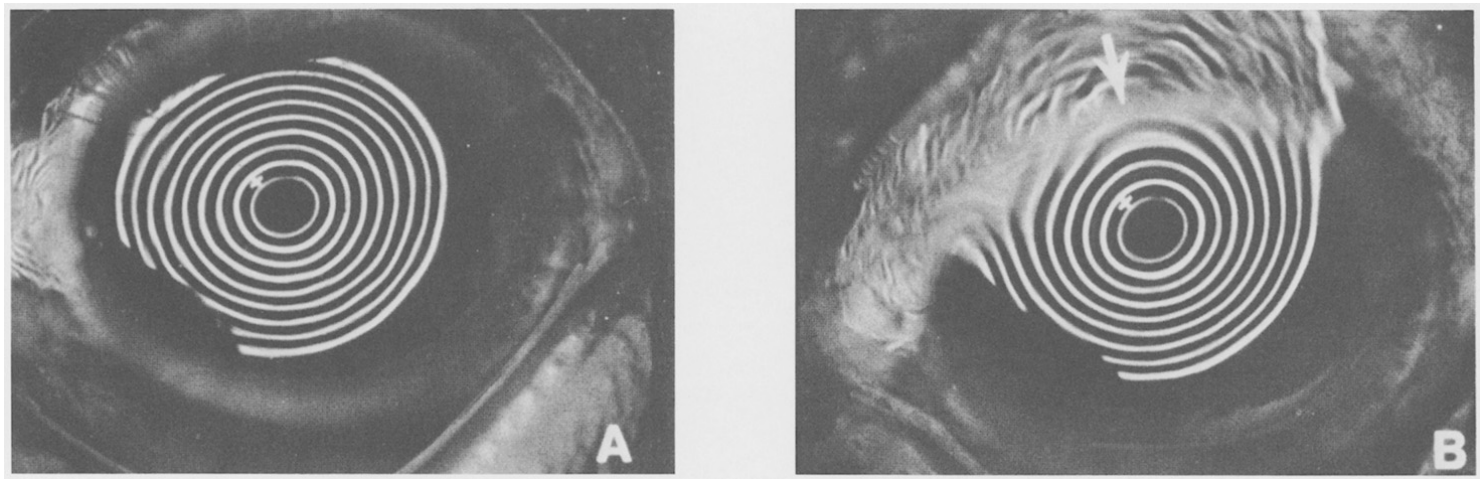

Fig. 2. (Holladay) Keratoscopic photographs illustrating 6 D of surgically induced corneal astigmatism, axis 110 degrees. (A) Normal photograph with the patient in primary gaze. Notice the regularity of the horizontally elliptical mires. (B) The same patient in 25-degree down-gaze, demonstrating a protrusion or bulge of the most peripheral mires pointing at the 110-degree tight suture (shown by arrow).

Each problem creates with-the-rule astigmatism, which is characterized keratoscopically by mires shaped as horizontal ellipses, i.e., shorter vertically and longer horizontally.[8] Tight corneoscleral wound closure centered about 12 o'clock will appear as shown in Figure 2A. Notice that because the compressive force is peripheral, at the limbus, the mires are changed more regularly, revealing very little distortion, even superiorly. If the patient is asked to gaze approximately 25 degrees downward, the mires will approach the corneoscleral wound, and irregularity from the tightest suture can be detected by a protrusion or bulge (compressive force vector) in the peripheral mires as shown by the arrow in Figure 2B.

In contrast, the distortion of the mires with the pterygium is much more irregular and appears almost egg-shaped, with the narrow end pointing toward the pterygium, as shown in Figure 1A. The central egg-shaped distortion (irregular astigmatism) is a result of the pterygium pulling more centrally with a broader insertion on the cornea compared to peripheral corneoscleral sutures. In the keratoscopic photograph taken after the pterygium removal (Figure 1B), the central egg-shaped distortion has been eliminated while the irregular bed of the pterygium is still visible.

In our case, the astigmatism was not secondary to tight corneoscleral sutures because all sutures had been removed, yielding no change in corneal topography. In addition, the keratoscopic mires were not regular ellipses but egg-shaped, typical of a pterygium. The fact that there were 9 D of astigmatism, even though the 3.3-mm pterygium was well out of the entrance pupil, proved that the astigmatism was indeed a result of a pulling force on the cornea and not encroachment on the entrance pupil by the head of the pterygium. This was reinforced by the fact that 3.5 D of astigmatism returned with the 2.2-mm regrowth of the pterygium. And finally, the original and recurrent astigmatism were eliminated by the removal of the respective pterygia.

We recommend that in cataract patients with a pterygium for which keratometric readings are not accurate, careful keratoscopic photographs that show the peripheral cornea be taken. Evaluation of the central and peripheral rings should then be made to determine whether a significant amount of astigmatism is induced by the pterygium, using the distinguishing characteristics previously described. If the keratoscopic photograph demonstrates, as in our case, that the astigmatism is secondary to the pterygium, the pterygium should be removed.

A reduction of astigmatism occurs immediately after removal of the pterygium. Surgeons should be aware of pterygia as a cause of with-the-rule astigmatism, and should be proficient in the use of the Placido's disc or keratoscope to assure that the pterygium is the cause. Removal of the pterygium is the definitive treatment and the procedure can be done prior to, or combined with, the cataract operation.

CONCLUSION

Pterygia may cause significant with-the-rule astigmatism long before encroachment on the entrance pupil.[8] Proving the astigmatism is secondary to the pterygium is easily done with a Placido's disc or, preferably, with a photokeratoscope. Removal of the pterygium will reduce the with-the-rule astigmatism and may be combined with the cataract extraction.

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Causes and management of posterior chamber lens displacement

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ABSTRACT

Posterior chamber lens implantation, although satisfactory in almost 95% of cases, can result in lens dislocation. Whereas serious dislocations such as the sunset and windshield-wiper syndromes are less frequent since the introduction of highly flexible loops, posterior vaulting of the pseudophakos may cause problems, eventually provoking a posterior capsule rupture and a secondary sunset syndrome. The iris-capture syndrome can be almost entirely prevented by using angulated loops. If it occurs, it can usually be corrected easily. Small decentrations as well as oblique malpositions of the pseudophakos are usually less important but should be recognized, analyzed, and prevented.

Key Words: anterior or posterior vaulting, iris capture, oblique position, posterior chamber lens displacement, sunset syndrome, vertical or horizontal decentration, windshield-wiper syndrome

Currently, posterior chamber lens implantation with sulcus fixation is a widely accepted way to correct aphakia in elderly patients. However, even this relatively safe procedure, satisfactory in about 95% of cases, may produce some dissatisfaction. One unsatisfactory postoperative finding is the observation that the pseudophakos does not correspond to the position of the natural lens but has become displaced. Six types of posterior chamber lens displacement are presented in Table 1. While the first categories are serious dislocations, causing visual disturbances and requiring surgical intervention in most cases, the others are usually harmless and do not demand surgical correction.

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