Original Article

Impact of pterygium size on corneal topography

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ABSTRACT

Objectives

To correlate pterygium size and induced corneal astigmatism using a computerized corneal topographic analysis system.

Patients and Methods

This study was conducted at Al-Shifa Eye Trust Hospital, Rawalpindi from May 2004 to November 2004. In one eye of 60 patients with primary pterygium, size of Pterygium was measured in millimeters from the limbus (horizontal length) by the beam of a Hag-Streit 900 Slit Lamp Microscope. Corneal astigmatism (diopters) was measured with the help of Video Keratoscope model: HS-Keratograph CTK 992 (HAAG-STREIT).

Results

There were 48 (80%) males and 12 (20%) females. In Group A, the mean size of pterygium was 1.24mm±0.379 and mean astigmatism was –1.165D±0.849 SD (p=0.076). In Group B, the mean pterygium size was 2.84mm±0.557 and mean astigmatism was –3.46D±1.441 SD (p=0.01). In Group C, the mean pterygium size was 4.833mm ±0.586 and mean astigmatism was –5.9D±0.265 SD (p=0.05). There were 37 eyes (61.7%) in Group A, 20 eyes (33.3%) in Group B and 3 eyes (5%) in Group C.

Conclusion

Pterygium size has direct correlation to the amount of induced astigmatism. The correlation is stronger in the pterygia of moderately advanced group (Group B, 2.1-4mm) as in this group the pterygium starts encroaching on the visual axis.

Keywords

Pterygium, Astigmatism, Corneal Topography.

INTRODUCTION

Cornea must remain transparent to refract light properly. Astigmatism is a condition in which the uneven curvature of the cornea blurs and distorts both distant and near objects.[1] Corneal topography is a computer assisted diagnostic technique, which represents a significant advance in the measurement of corneal curvature over keratometry, as it provides both a qualitative and quantitative evaluation of corneal curvature. Pterygium is one of the commoner corneal disorders seen in tropical and sub-tropical areas.[2] The progression of the pterygium on to the cornea can lead to both significant corneal distortion and the development of large amounts of corneal astigmatism.[3] The induced astigmatism may become significant to cause visual distortion and decrease visual acuity even though the pterygium remains somewhat distant from the visual axis.[4] This abnormality can be measured by Keratometry, corneal topography and refraction.[5] The aim of this study was to evaluate whether pterygium induced corneal astigmatism is an indication for surgical intervention.

PATIENTS AND METHODS

This correlational descriptive study was carried out in Al-Shifa Trust Eye Hospital, Rawalpindi from April 2004 to November 2004. One eye of 60 patients having primary pterygium, between the ages of 30-60 years, was selected by non-probability convenience sampling from the out-patient departments. Patients having pterygia but with history of corneal disease, eye trauma or previous intraocular surgery, contact lens wearers, having evidence of current intraocular inflammation on slit lamp examination and eyes with recurrent pterygium were excluded from the study. The patients were divided into three groups on the basis of the size of their pterygium as measured in millimeters from the limbus (horizontal length) by the beam of Haag Streit slit-lamp microscope (Table 1).

Group A: Pterygium size up to 2mm (Early).
Group B: Pterygium size of 2.1-4mm (Moderately advanced).
Group C: Pterygium size of 4.1-6mm (Advanced pterygium).

Table 1. Pterygium size.

Corneal astigmatism was measured in Diopters with the help of HS-Keratograph CTK 992 (Haag-Streit). Correlation of parameters of horizontal pterygium size with induced corneal astigmatism was measured using Haag-Streit windows software.

Descriptive statistics were used to calculate frequency; means and standard deviation. Cross tabulation was done to asses the associations between pterygium size and corneal astigmatism. Pearson correlation coefficient was used to calculate the p values. P value of less than 0.05 was considered significant. The data was analyzed using SPSS version 10.

RESULTS

In total of 60 eyes with pterygium, 48 (80%) were males and 12 (20%) were females. There were 37 eyes in Group A, that made up 61.7% of the total eyes examined. Group B consisted of 20 (33%) and group C had only three eyes (5%).

Groups	Number	Pterygium size (mean ±SD) in mm	Corneal astigmatism (mean ±SD) Diopters
Group A	37	1.24±0.379	-1.165±0.849
Group B	20	2.84±0.557	-3.46±1.441
Group C	3	4.83±0.586	-5.9±0.265

Table 2. Pterygium size and astigmatism.

Mean pterygium size and corneal astigmatism is shown in table 2.

Groups of Pterygium	Correlation coefficient	P value (2 tailed sig.)
Group A	0.295	0.076
Group B	0.752	>0.01
Group C	1.000	>0.05

Table 3. Correlation between Pterygium size and Corneal Astigmatism.

Correlation of parameters of horizontal pterygium size with induced corneal astigmatism is shown in table 3.

DISCUSSION

Pterygium induced astigmatism can often be the cause of subjective visual complaints, which include decreased visual acuity or visual aberrations such as glare or diplopia. Previous studies have shown increased 'with the rule' astigmatism in patients with pterygia by both refraction and Keratometre.[3] In this study, we found direct relationship of topographical cylinder with pterygium size with weak correlation between pterygium size and astigmatism in cases of early pterygium (0-2mm), as the correlation coefficient was 0.295 (p=0.076) and the correlation was strongest at the moderately severe pterygium (Group B) with correlation coefficient of 0.752 (p=>0.01). Therefore, the amount of induced topographic astigmatism in Group A correlated minimally with pterygium size. In many cases, this is probably because the peripheral cornea normally becomes increasingly flatter, and patients with small pterygia may exhibit moderate to large degrees of peripheral flattening.

The amount of astigmatism measured in our patients represents the naturally occurring astigmatism plus the induced effect of the pterygium. Astigmatism can also be induced by other causes such as intra ocular surgery[4] but such patients were excluded from our study to reduce the bias. The study also revealed that in patients with advanced pterygia (Group C), there was not very strong correlation with the degree of refractive astigmatism, correlation coefficient of 1.00 (p=>0.05). This may be because of the hemi-astigmatic nature of the induced astigmatism, more so in advanced cases. Other explanation of weaker correlation in advanced disease is that the process of generating a topographic corneal map begins with a Keratoscope image, which is a visual image of concentric circles created by the cornea's reflection of the Keratoscope illuminated target. Keratoscope images are formed by a reflection that occurs at the tear film layer. Tear film may not be problematic if it is uniform over the entire corneal surface, but it can create difficulties if the patient is tearing sufficiently to cause lacrimal lakes at the upper or lower lid margins or if focal tear film breaks up leads to digitization errors.[5] The cause of astigmatism in advanced pterygium appears to be an alteration of the tear film, rather than traction on the cornea by the pterygial lesion.[6]

A Video Keratoscope projects 22 placido rings for a total of 22000 points. This allows the system to be more sensitive in revealing asymmetric and irregular astigmatism. In the case of pterygia, the nature of flattening is localized phenomenon, which in most cases is restricted to the nasal cornea and, therefore, this may not be measured readily by either refraction or keratometry. A Keratometre is limited in that it only measures the central cornea and the optical zone it measures is dependent on the steepness of the cornea. Keratometre makes the assumption that the cornea is symmetrical and averages the nasal and temporal hemi meridians.[7] In cases where there is underlying pathology or corneal asymmetry, as in patients with pterygia, these readings are less reproducible because the nasal area of the cornea will be significantly flatter. Based on the results of this study, we believe that corneal-topography analysis is an invaluable aid in the evaluation of the patient with pterygium, allowing the measurement of optical changes in the cornea that are not measured by other methods.

Astigmatism of eyes with pterygium was found to be significantly greater than that of normal human controls.[3,8-10] Lin and Stern[8] recently also reported that pterygium extending to >45% of the corneal radius or within 3.2 mm of the visual axis produced increasing degrees of induced astigmatism. They concluded that since all of the visual and topographic indices were significantly improved by successful surgery, it should be considered when the pterygium begins to induce significant degrees of hemi-astigmatism.[8]

CONCLUSION

Pterygium size has significant correlation to the amount of induced astigmatism. The correlation is stronger in the pterygia of moderately severe degree (2.1-4mm) as in this group the pterygium starts encroaching on the visual axis. Corneal topography analysis is an important component for evaluating patients with pterygium, revealing significant abnormalities that indicate the need for surgical intervention.

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