INTRODUCTION

Pterygium is a fibroelastic degeneration of the conjunctiva with encroachment onto the cornea.1 Pterygia cause corneal distortion and induce a significant amount of astigmatism.2,3 This astigmatism may occur either due to pooling of tears in advance of the pterygium or by traction generated by the pterygium mechanically pulling on and distorting the cornea, or both.4

The effect of pterygium on the corneal refractive status has been measured by refraction, keratometry and corneal topography.5-9 Recently, computerized video keratoscopy has been used extensively to study the effect of the size of pterygium and its excision on corneal topography which includes the corneal spherical power, and astigmatism during the early and late postoperative period.10,11

In Pakistan, the automated keratometer is still the most widely available tool for decision-making in pterygium surgery. The aim of this study was to use keratometric readings of the automated keratometer to determine the change in pterygium induced astigmatism following pterygium excision and also to determine the relationship between pterygium size and corneal astigmatism after it is removed from the corneal surface.

METHODOLOGY

This interventional study was conducted at the Eye Department of Combined Military Hospital, Abbottabad. Thirty eyes of 30 patients were selected for the study. The duration of study extended from May 2009 to March 2010. Patients aged 25 - 65 years with nasal primary pterygium and a length of 2.5 mm or more were included in the study. The exclusion criteria were pseudopterygium, recurrent pterygium, corneal scarring from any cause and any previous ocular surgery. The study was approved by the institutional Ethical Committee.

A written informed consent was obtained from all the patients. After obtaining ocular and systemic history, ocular examination was done which included Snellen visual acuity, manifest refraction and slit lamp examination. The size of the pterygium was measured using the Haag Streit slit lamp biomicroscope by projecting a horizontal slit lamp beam from the limbus to the apex. All the pterygium were equal to or greater than 2.5 mm. Keratometry was performed with an automated keratometer. Keratometric data was recorded pre-operatively and at 28 days postoperatively. Wilcoxon signed rank test was used for comparing the pre-operative and the postoperative corneal astigmatism. Spearman’s rank order was calculated to observe correlation of pterygium size with the postoperative astigmatism.

RESULTS

The median (mean rank) pre-operative astigmatism of 2.25 (15.50) reduced to a median (mean rank) postoperative astigmatism of 1.30 (14.96). This decrease in the postoperative astigmatism was statistically significant (p < 0.001). There was a statistically non-significant correlation between the postoperative astigmatism and the pterygium size (r_s = -0.29, p = 0.12).

CONCLUSION

Pterygium excision caused significant reduction in corneal astigmatism.

Key Words: Corneal astigmatism. Corneal topography. Pterygium. Pterygium surgery.
the pterygium. A drop of 10% phenylephrine was instilled for hemostasis. The pterygium head was dissected from its corneal edge using no.15 Bard Parker blade till the limbus. The pterygium was separated with blunt dissection from the underlying sclera till the insertion of the medial rectus muscle and also separated from the overlying bulbar conjunctiva. Then the pterygium was excised along with its accompanying tenon's fascia. The bare scleral defect was measured with calipers and a free limbal conjunctival graft was harvested from the superotemporal conjunctiva of the same eye and sutured into the receptor bed with approx. eight conjunctival (graft)-episceral-conjunctival 7 - 0 vicryl interrupted sutures. The conjunctival graft was placed 2 mm from the limbus with care taken to maintain the limbal orientation of the graft towards the cornea and also not to turn the epithelial side down. A tobramycin / dexamethasone ointment was applied and the eye was padded. The eye pad was removed on the first postoperative day and tobramycin/dexamethasone eye drops three times daily were prescribed for 04 weeks. All the patients were followed-up on day 6, 15 and 28 and then monthly for 6 months. Keratometric data was obtained on day 15 and 28 with the same automated keratometer used pre-operatively. Patients were followed up for 06 months postoperatively.

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 16.0 for windows. Descriptive statistics were used to describe the clinico-demographic data. Frequency and percentages were calculated for qualitative variables. Median and mean rank were used for numerical data. Wilcoxon signed rank test was selected for comparing the preoperative corneal astigmatism and the postoperative corneal astigmatism. Spearman’s rank order was calculated to observe correlation of pterygium size with the postoperative corneal astigmatism. Mean ± standard deviation was used for description of age statistics. A p-value < 0.05 was considered statistically significant.

**RESULTS**

Average age of the patient was 43.43 ± 14.3 years and male to female ratio was 3:1. Pterygium length ranged from 2.5 to 4.5 mm with a median of 3.05 ± 0.11 mm. The median (mean rank) pre-operative astigmatism was 2.25 (15.50) which reduced to a median (mean rank) postoperative astigmatism of 1.30 (14.96) as mentioned in Table I. This decrease in the postoperative astigmatism was statistically significant (p < 0.001).

Pre-operatively 23 (76%) patients had with the rule astigmatism, 6 (20%) had oblique astigmatism and 01 (3.3%) patient had against the rule astigmatism. Pterygium size correlated negatively with the postoperative corneal astigmatism (r_s = -0.29) but this was statistically non-significant (p = 0.12) as mentioned in Table II. Only one patient (3.3%) out of 30 had recurrence of pterygium.

**DISCUSSION**

Pterygium is a worldwide disease which is particularly common in tropical and sub-tropical regions such as Pakistan. Through its astigmatic impact it is often the cause of several subjective visual complaints, which include decreased visual acuity or visual aberrations such as glare or diplopia.

In Pakistan, the automated keratometer is readily available to the Ophthalmologist as compared to the other instruments. Its utility in analyzing the astigmatic effects of pterygium and then deciding whether to excise it or not is very convenient. At the national level, although many similar studies have correlated the size of pterygium with the pre-operative astigmatism, but none have attempted to determine the influence of pterygium size on postexcisional corneal astigmatism.

The type of astigmatism that pterygium causes in the majority of cases is with the rule. This astigmatism occurs by mechanical pull which causes localized flattening of horizontal meridian of the cornea occurring up to the leading apex of the pterygium. However, pterygium also induces against the rule and oblique astigmatism. In this study, the majority of the patients (76%) had with the rule astigmatism; 20% had oblique astigmatism and 3.3% had against the rule astigmatism which agrees with the published literature.

Large pterygium is associated with a greater amount of astigmatism. There is a statistical correlation between pterygium size and induced corneal astigmatism.

Among the three parameters which include length, width and area of the pterygium, it is the length of pterygium on the cornea and its total area that have the strongest correlation with the induced astigmatism. Various authors have reported variable amount of astigmatism by comparing the length of pterygium using corneal topography. Pterygium which are less than 2.5 mm induce less astigmatism of 1.25 D compared to those greater than 2.5 mm which induce on average 3.94 D of astigmatism. Hansen et al. reported that pterygium greater than 3.0 mm induced 1.97 D of astigmatism versus 1.11 D in less than 3 mm. Kampitak reported a 2 D or more of astigmatism with length greater than 2.25 mm. Recently, Jaffar et al. found a strong correlation with a mean size of 2.84 ±

**Table I: Comparison of keratometric astigmatism before and after pterygium excision (n=30).**

<table>
<thead>
<tr>
<th>Keratometric astigmatism (Diopter)</th>
<th>Before excision (n=30)</th>
<th>After excision (n=30)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median (mean rank)</td>
<td>2.25 (15.50)</td>
<td>1.30 (14.96)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

**Table II: Correlation between postoperative astigmatism and pterygium size (n=30).**

<table>
<thead>
<tr>
<th>Pterygium size (mm)</th>
<th>Postoperative astigmatism (Diopter)</th>
<th>r_s</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.05 ± 0.11</td>
<td>1.30 ± 0.22</td>
<td>-0.29</td>
<td>0.12</td>
</tr>
</tbody>
</table>
0.557 mm and inducing a 3.46 ± 1.441 D (p=0.01) of astigmatism.13 On the contrary, Fong et al. results did not accord with other studies who found that pterygium had to be greater than 3.5 mm to induce 1 D of astigmatism.20 Based on the findings of the published literature, the authors operated upon only those pterygia whose length exceeded 2.5 mm. In this study, the median pterygium size was 3.05 mm which induced a median astigmatism of 2.25 D.

Pterygium surgery significantly reduces corneal astigmatism.21 After removal, there is a significant influence on the corneal refractive parameters which includes spherical power, astigmatism, asymmetry and irregularity.22 This decrease in corneal astigmatism is statistically significant when measured either with automated keratometer or computerised videokeratoscope.5,6,21 In this study, the authors used the conventional automated keratometer and found a statistically significant reduction in the magnitude of corneal astigmatism (p < 0.001).

Postoperatively, how will the size of pterygium affect the magnitude of refractive changes is difficult to predict even with the use of corneal topography.22 Nohutcu reported that pterygium whose length exceeds 2.5 mm from the limbus has a significantly higher influence in decreasing the amount of postoperative astigmatism.17 Contrary to that, Vives operated upon pterygia whose mean length was 2.0 ± 0.6 mm but found no statistically significant correlation between the length of pterygium and postsurgical astigmatism at 01 month (p=0.11) and even at 03 months postoperatively (p=0.09).23 Pterygium with a length of 2.0 mm but with a width of 3.0 mm can create as much as 2.50 D or more of corneal astigmatism. So not only the length of corneal encroachment but the width is equally important in determining the postsurgical astigmatism.24 Additionally, measuring postoperative astigmatism with automated keratometer and computerized videokeratoscope also produces different results. The conventional keratometer evaluates the corneal refractive power from just 03 or 04 data points, so many authors suggest using corneal topography in evaluating the postoperative changes following pterygium excision.25 In this study, the role of the pterygium length was analyzed and found that it did not correlate statistically with the postexcisional corneal astigmatism. Other parameters like width and total area of the pterygium were not included that may influence the postoperative astigmatism. Moreover, we used the automated keratometer in analyzing the postexcisional cornea.

What should be the length of pterygium at which surgery should be done is a question that has still not been answered satisfactorily. Various authors recommend varying lengths. Kampitak suggests that a pterygium exceeding 2.25 mm of length should be considered within the limits of surgery.19 Salih considered surgical intervention at 2.2 mm length.15 On the contrary, Oner et al. recommended that pterygia whose length exceeds 3.0 mm or width exceeds 3.0 mm should be considered within the limits of surgery.24 Based on the results of this study, it is suggested that if excision is to be decided only on the pterygium size than the length alone should not be the sole criteria. The width and total area of the pterygium should also be considered.

CONCLUSION

Pterygium removal from the corneal surface caused significant improvement in astigmatism.

REFERENCES

17. Nohutcu AF, Oner S. Early postoperative results of the


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