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Corneal Astigmatism and Intraocular Lens Power Calculation before and after Pterygium Surgery

Ophthalmology

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ABSTRACT

Background: Pterygium can interfere with vision by causing corneal astigmatism or by directly encroaching on the visual axis. Pterygium excision surgery, which employs multiple approaches, can lessen corneal astigmatism.
Aim of The Work: To evaluate astigmatism of the cornea and to calculate intraocular lens (IOL) power before and after pterygium surgery in patient with coexistent cataract and primary pterygium.
Patients and Methods: This study was a clinical trial which carried out on 20 patients of both gender. All patients had cataract and primary pterygium and undergo pterygium excision operation. All patients undergo preoperative and postoperative IOL power calculation by IOL master 500 and assessed stigmatism of the cornea by the Pentacam HR.
Results: In our study, we found that there was no statistically significant difference in K1 in pre and post operative assessment. Also our study illustrated that there was highly statistically significant difference in K2 in pre and post-operative assessment. As regarding IOL power calculation, there was highly statistically significant difference between pre and post-operative assessment by IOL master.
Conclusion: Pterygium excision using the conjunctival autografting technique is associated with postoperative increased keratometric readings and decreased corneal astigmatism. Stable corneal and refractive parameters are achieved one month postoperatively. Consequently, intraocular lens power calculation and cataract surgery should be postponed for at least one month post pterygium surgery in patients suffering from pterygium and cataract.

Keywords: *Pterygium; Cataract; Astigmatism; Intraocular lens power.*

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INTRODUCTION

Pterygium is an elastotic degeneration that occurring firstly in the bulbar conjunctiva and spread to the surface of the cornea. It may impair patients' quality of life and vision by resulting in discomfort, corneal abnormalities, and aesthetic problems.[1]

Pterygium prevalence was estimated to range from 10.2% to 12% globally, with greater rates in tropical areas. Pterygia has been linked to a number of risk factors, including geographic latitude, living in rural areas, aging, race, gender, sun exposure, chronic irritation, and inflammation.[2]

After pterygium surgery, corneal irregularity is a crucial factor in preserving good visual acuity and function, and it takes time to restore the corneal surface[3]. According to Nejima et al. [3], a larger sized pterygium requires 6 to 12 months to stabilise corneal irregularity. They have also demonstrated that the major pterygium's size affects how well post-operative corneal topographical anomalies are restored.

One of the clinical issues with pterygium surgery is the recurrence, and it occurs at high incidence rate in the patients who undergo surgery[4]. Degradation of the Bowman's layer and invasiveness are two difficulties in pterygium surgery that make it challenging to distinguish proliferative tissue from the corneal stroma, with the challenge being more obvious in recurrent-pterygium surgery.[5]

Pterygium is a widespread condition affecting the ocular surface. It might happen simultaneously with cataract because both diseases are very common in elderly persons [6]. The precision of the calculated intraocular lens power can be impacted by a large pterygium, which can cause substantial corneal astigmatism[7]. Numerous studies have found a connection between pterygium size and pterygium-induced astigmatism, and they also projected that IOL power would raise in pterygium-affected eyes.[7]

The current study was designed to study astigmatism of the cornea and to calculate IOL power pre and post-operative pterygium excision in patient with coexistence cataract and primary pterygium.

PATIENTS AND METHODS

Patients

This is a clinical trial study involved adult patients (48-62 years) of both genders. All patients exhibited the following inclusion criteria: simultaneous cataract and primary pterygium, limbus conjunctival autograft and pterygium excision surgery.

Patients with recurring pterygium, previous trauma or operation, corneal disorders that can compromise the regularity of the cornea, keratoconus, keratitis, and uveitis were excluded from the study.

All patients gave a written consent after explaining the purpose and the procedure of the study.

Methods

All patients had ptergyium surgery excision with limbus conjunctival autograft that conducted as follow: The head of Pterygium was removed from the cornea and its body was trimmed to be nearly 4 mm away from the corneal limbus under subconjunctival anaesthetic. The corneal damaged area was carefully polished after the subconjunctival tissue was removed. Conjunctival autograft tissue was then applied over the damaged area, limbus-to-limbus overlapped, and 8-0 absorbable vicryl sutures were used for the stitching.

Prior to and following pterygium surgery, the corneal astigmatism was assessed by the Pentacam HR (Oculus Inc., Wetzlar, Germany).

Prior to and following pterygium surgery, the IOL power was determined using the IOL master 500 (Carl Zeiss Meditec, Germany). Many patients could not utilise the IOL master preoperatively to achieve an appropriate corneal curvature because the pterygium had infiltrated the cornea. Therefore, we computed the IOL power using the corneal curvature data from Pentacam.

Data analysis

Statistical analysis was done by SPSS software statistical computer package version 21.

Mean, standard deviation, range, and IQR are used to describe quantitative variables. Qualitative variables analyzed by Independent t-test and Wilcoxon signed ranks test. Independent t-test was used in comparing parametric data (when SD<50% mean). Wilcoxon signed ranks test was used in comparing non parametric data (when SD>50% mean). Cut off point of significant p value <0.05.

RESULTS

Demographic data of the studied patients are presented in Table 1. The study showed that 9 (45.0%) of the studied cases were males and 11 (55.0%) were females. there mean age was 54.95 ± 4.74 SD with range (48.0 – 62.0). Table 2 showed that 17 (85.0%) of the studied cases were OS (left eye) and 3 (15.0%) were OD (right eye).

	No.	%
Sex		
Male	9	45.0
Female	11	55.0
Age		
Min. – Max.	48.0 – 62.0	
Mean ± SD.	54.95 ± 4.74	
Median (IQR)	54.0 (51.50 – 59.50)	

IQR: Inter quartile range SD: Standard deviation

Table 1: Distribution of the studied cases according to demographic data (n = 20)

	No.	%
OS/OD		
OS	17	85.0
OD	3	15.0

Table 2: Distribution of the studied cases according to OS/OD (n = 20)

As regarding K1 measurement, mean and SD of pre-operative measurement was 42.55 ± 2.61 D while, it was 42.51 ± 2.19 D in post-operative assessment. So there was no statistically significant difference between pre and post-operative assessment as regard K1 by Independent sample t-test as shown in table 3.

	Pre	Post	t	*P*
K1				
Min. – Max.	38.25 – 45.52	38.75 – 44.75	0.262	0.793
Mean ± SD.	42.55 ± 2.61	42.51 ± 2.19		
Median	44.27	44.0		
IQR	(40.30 – 44.65)	(40.75 – 44.38)		

IQR: Inter quartile range, SD: Standard deviation, t: Independent sample t-test. Cut off point of significance p value<0.05

Table 3: Comparison between pre and post-operative assessment according to K1 (n = 20)

Another important finding was the significant change of K2 in post-operative assessment as Mean and SD was 44.84 ± 1.20 D in pre-operative assessment, while it changed to 44.06 ± 1.21 D in post-operative assessment as shown in table 4.

	Pre	Post	t	*P*
K2				
Min. – Max.	41.59 – 46.0	41.50 – 45.0	3.705*	<0.001*
Mean ± SD.	44.84 ± 1.20	44.06 ± 1.21		
Median (IQR)	45.01 (44.93 – 45.50)	44.75 (43.0 – 45.0)		

IQR: Inter quartile range, SD: Standard deviation, t: Independent sample t-test. Cut off point of significance p value<0.05

Table 4: Comparison between the pre and post-operative assessment according to K2 (n = 20)

Table 5 shows that IOL power was 18.50 ± 8.24 D in pre-operative assessment while in post-operative assessment it was 18.98 ± 8.15 D. So there was highly statistically significant difference between pre and post-operative assessment as regard IOL power.

	Pre	Post	Z	P
IOL				
Min. – Max.	2.50 – 28.0	3.0 – 28.50	3.755*	<0.001*
Mean ± SD.	18.50 ± 8.24	18.98 ± 8.15		
Median (IQR)	20.50 (13.0 – 24.50)	21.0 (14.0 – 24.50)		

IQR: Inter quartile range, SD: Standard deviation, Z: Wilcoxon signed ranks test. Cut off point of significance p value <0.05

Table 5: Comparison between the pre and post-operative assessment according to IOL (n = 20)

DISCUSSION

A pterygium-affected eye with corneal astigmatism may be a result of both naturally occurring and pterygium-induced astigmatism. Some of the hypothesised pathways for pterygium-induced astigmatism include the ones listed below: The mechanical flattening and deformation of the cornea caused by the pterygium's contractile elements first. Next, the keratometric observation of corneal flattening results from the localised tears pooling at the apex of the pterygium [3]. Welson et al.[8] reported that pterygium excision operation increased refractive power mean at one month after the procedure, demonstrating a steepening of the cornea's flattened shape.

According to Ozdemir and Cinal [9] the mean refractive power of the cornea was 42.5±1.9 D during the pre-operative period, 43.9±1.5 D during early post-operative period, and 43.8±1.8 D during late postoperative period.

In our study we demonstrated that there were 9 (45.0%) of the studied cases were males and 11 (55.0%) were females. The mean age was 54.95 ± 4.74 SD with range (48.0 – 62.0).

Abo Al-Majd et al. [10] compared the topographic alterations following pterygium surgery and discovered that three patients had bilateral pterygia, the left eye was pterygial in 13 cases, and the right eye was pterygial in seven. Their mean ages were 46.2±13.2 years with more affection of female (52.9%). Some research, however, failed to differentiate between men and women. In a hospital-based investigation, women were shown to have a greater incidence. It was clarified that women are more worried about the condition and its aesthetic effects [11].

In our study, we found that there was no statistically significant difference as regard K1. These results matched with Kam et al.[12], even one week after pterygium removal, the mean astigmatism and keratometry determined by Scheimpflug tomography were steady. According to them, interventions like prescription eyeglasses, laser keratometry, or intraocular lens measuring before to achieving keratometric stability following pterygium surgery could result in residual refractive error as well as a generally subpar visual outcome.

On the hand, Kamiya et al.[13] found that the average keratometric reading considerably improved preoperatively from 43.6 1.8 D to 44.2 1.7 D postoperatively. The variations in the mean keratometry and the prediction errors were discovered to be significantly correlated.

In our study we illustrated that there was highly statistically significant difference between pre and post-operative assessment s as regard K2. Our results agree with the study reported by Sharma et al.[14] who found keratometric and corneal astigmatic stability at one month post pterygium excision. They reported statistically significant change in keratometric power and corneal astigmatism at one to three months after the operation.

Also our results coincide with Hassan [15] who found that as regards k2, its mean + SD preoperatively was 44.81D + 2.26. One month postoperatively, it was 44.42D + 2.15. Three months postoperatively it was 44.38D + 2.68. Six months postoperatively it was 44.40D + 2.44. The mean k2 decreased during all the follow up period. Statistically, differences between pre and postoperative mean k2 at one, three months and six months were significant (P values were 0.032, 0.038 and 0.041 respectively). While, Sharma et al.[14] found that corneal keratometry mean

increased preoperatively from 43.8± 1.7 D to 44.2 ± 1.7 D postoperatively.

We cleared that there was highly statistically significant difference between the two studied groups as regard IOL and our results are consistent with Kamiya et al.[13] whose calculate IOL power after pterygium excision by the conjunctival grafting procedure and phacoemulsification surgery. Three months following surgery, they observed a considerable enhancement in BCVA, lower apparent astigmatism, and higher mean keratometry. They found that post pterygium removal; there was a postoperative myopic shift owing to corneal steepening, as pterygium has a tendency to flatten the cornea.

Joshi et al.[16] assessed IOL power in combined and sequential pterygium and cataract surgery, they found that the postoperative K values and IOL power were significantly higher than the preoperative values, while no significant change was detected in the axial length. Additionally, the astigmatism of the cornea was dramatically lowered from 2.43±2.0 preoperatively to 1.25±1.0 postoperatively.

The explanation of the decreased IOL power calculation following pterygium excision surgery was due to the steepening effect of pterygium that releases the flattening effect of pterygium head on the cornea.

CONCLUSION

In our study we concluded that Pterygium excision utilizing the conjunctival autografting approach is linked to increased postoperative keratometric readings and decreased corneal astigmatism. One month after surgery, stable corneal and refractive parameters are achieved. Therefore, in patients with pterygium and cataract, intraocular lens power calculation and cataract surgery should be delayed for at least one month following pterygium surgery.

Conflict of interest : none

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