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Observation on the effect of combined surgery in cataract patients with pterygium

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白内障合并翼状胬肉患者行联合手术后的疗效观察

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摘要

目的:观察白内障合并翼状胬肉患者行联合手术后的疗效。

方法:对22例(平均年龄:59.05±8.70岁)并发白内障和翼状胬肉(长度2-5mm)患者进行前瞻性单中心研究,随访时间为3mo~1a。测定术前和术后3mo的平均角膜曲率(K_{mean})、平均散光和最佳矫正视力(LogMAR)。观察术前角膜曲率和翼状胬肉大小与预测误差的关系。

结果:共18例(81.8%)患者PE<±0.50D,4例(18.2%)患者PE为±0.50D~±1.00D,没有PE>1.00D的患者。手术前后眼轴长度无差异($P=0.77$)。K_{mean}从术前42.994±1.536增加到术后43.324±1.479($P=0.105$)。术后角膜散光由术前2.09±0.789D降至术后0.523±0.277D($P<0.05$)。BCVA(LogMAR)从术前1.007±0.402显著提高到术后0.024±0.062($P<0.05$)。角膜曲率变化与预测误差无相关性($r=-0.29$,$P=0.19$)。翼状胬肉大小与预测误差无相关性($r=0.2997$,$P=0.17$)。

结论:超声乳化与折叠式人工晶状体植入联合自体结膜移植术的应用是一种安全有效的手术方法。

关键词:并发白内障和翼状胬肉;人工晶状体屈光度计算;超声乳化联合自体结膜移植术的应用

Abstract

• AIM: To observe the effect of combined surgery in cataract patients with pterygium.

• METHODS: A prospective single centered study was performed on 22 patients (mean age: 59.05±8.70 years) of concurrent cataract and pterygium (size 2-5 mm in length), who attended the outpatient department during the study period of one year, and the minimum follow up was 3mo-1a for all patients. Mean keratometry (K_{mean}), mean astigmatism, best corrected visual acuity (LogMAR), preoperatively and 3mo postoperatively had been determined. The corneal curvature, pterygium size and the prediction error (PE) were observed.

• RESULTS: The amount of PE was <±0.50 D in 18 patients (81.8%) and ±0.50 D to ±1.00 D in 4 patients (18.2%). None of the patients had PE of >1.00 D. The mean axial length did not change significantly ($P=0.77$) postoperatively. The mean keratometric reading increased from 42.994±1.536 preoperatively to 43.324±1.479 postoperatively but this was not significant ($P=0.105$). The corneal astigmatism decreased significantly from 2.09±0.789 D preoperatively to 0.523±0.277 D postoperatively ($P<0.05$). BCVA (LogMAR) significantly improved from 1.007±0.402 preoperatively to 0.024±0.062 postoperatively ($P<0.05$). No correlation was found between changes in keratometry and PE ($r=-0.29$, $P=0.19$). And, there was no correlation was found between pterygium size and PE ($r=0.2997$, $P=0.17$).

• CONCLUSION: Combined phacoemulsification+foldable intraocular lens (IOL) implantation and conjuctival autograft (CAG) application was safe and effective procedure.

• KEYWORDS: concurrent cataract and pterygium; intraocular lens power calculation; combined phacoemulsification with CAG application
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INTRODUCTION

Pterygium is triangular fibrovascular conjunctival encroachment over the limbus onto the cornea. It occurs in interpalpebral area, more often nasally than temporally. It is a degenerative lesion. UV radiation has been linked to both cataract and pterygium[1-4]. India is a country where cataract blindness is still very high and patient presenting with concurrent cataract and pterygium is very common[5]. Pterygium affects the corneal curvature and tear film (as first refractive surface) even before it invades the visual axis[6-7].

Hence a concurrent cataract and pterygium, would require adjustments in intraocular lens (IOL) power[8-9].

In this clinical condition, combined phacoemulsification and conjunctival autograft (CAG) application, or CAG application followed by phacoemulsification can be done. Latter procedure has advantage over former, because the keratometry stabilizes after 6wk of pterygium excision with CAG application. Stable keratometry provides accurate IOL power calculation providing lesser postoperative refractive error. Whereas combined phacoemulsification with CAG application contributes to lesser number of hospital visits for the patient and is also less costly[10-11,14]. Prediction of change in keratometry readings based on preoperative pterygium size is difficult and may lead to surprises in the postoperative refraction after a combined surgery[12-14]. Near accurate IOL power calculation is prerequisite for better visual outcomes in combined phacoemulsification and CAG application.

SUBJECTS AND METHODS

This study was conducted in the Regional Institute of Ophthalmology (M.D. Eye Hospital, Prayagraj, India) for a period of one year. The study was conducted in accordance with the Declaration of Helsinki, and written informed consent was obtained from all the patients. Inclusion and exclusion criteria used to select the study patients are given as follows.

Inclusion Criteria Cataract with pterygium of size more than 2 mm. Grading of pterygium were grade Ⅰ (size <2 mm), grade Ⅱ (size 2-4 mm), and grade Ⅲ (size 4-5 mm). We excluded pterygium > 5 mm, because it hampers with keratometry. Patients of both sexes with concurrent cataract and pterygium were included; only with the rule astigmatism were selected for study.

Exclusion Criteria History of ocular trauma and surgery; pterygium size >5 mm; pterygium involving central 3 mm of pupillary area; corneal scarring; against the rule astigmatism; retinal abnormalities; glaucoma; patients on anticoagulants; pseudopterygium; patients who were not willing to follow up; any coexisting ocular disease.

Twenty-two eligible patients were interviewed for demographic factors, occupation, and previous medical, surgical and ocular history. Eye was examined on slit-lamp, with special note regarding presence of cataract and grade of pterygium. Best corrected visual acuity (BCVA) was recorded.

Corneal curvature measurements were done preoperatively by Bausch and Lomb keratometer. Corneal astigmatism was calculated by taking the difference of vertical keratometry (KV) and horizontal keratometry (KH). During IOL power calculation, target refraction was recorded. It was termed as Calculated Refractive Error. Anterior segment examination, fundus examination and tonometry were also performed. All patients underwent pterygium excision by PERFECT (Pterygium Extended Removal Followed by Extended Conjunctival Transplant). A CAG was taken from superior bulbar conjunctiva to cover the excised area and graft was fixed in place by using 10-0 nylon suture.

Cataract surgery was done with phacoemulsification. Incision was made on steep axis. In all patients graft was harvested away from the incision site. The surgical technique of phacoemulsification consisted of capsulorrhexis, nucleus and cortex extraction, and a foldable monofocal IOL placement. The power of IOL implanted, was 0.50 D less than the calculated power. All surgeries were performed uneventfully by single experienced surgeon using same technique. At 6wk follow up, refractive error of patient was recorded, converted to its spherical equivalent. This was termed as Actual Refractive Error. Prediction error (PE) was calculated by subtracting actual refractive error from calculated refractive error. Minimum follow up for all patients was 3mo (Table 1).

Table 1 Pterygium size and calculation of prediction error

S.N.	Pterygium size(mm)	CRE(D)	ARE(D)	CRE-ARE(D)
1	3.5	-0.34	-0.25	-0.09
2	4	-0.1	+0.50	-0.6
3	4.5	-0.37	-0.25	-0.12
4	4	-0.25	+0.50	-0.75
5	3.5	-0.30	+0.25	-0.54
6	3	+0.32	-0.25	0.57
7	3.5	+0.15	-0.25	0.4
8	5	-0.15	+0.50	-0.65
9	2.5	-0.33	+0.25	-0.58
10	3.5	-0.05	+0.25	-0.3
11	4.5	+0.13	-0.5	0.63
12	3	-0.02	-0.25	0.23
13	3	-0.38	-0.25	-0.13
14	3.5	-0.24	-0.25	0.01
15	4.5	-0.19	-0.5	0.31
16	5	-0.25	-0.75	0.5
17	2.5	-0.13	+0.25	-0.38
18	2.5	-0.3	+0.25	-0.55
19	4.5	-0.17	-0.25	0.08
20	3	-0.1	-0.25	0.15
21	3	-0.3	-0.25	-0.05
22	3.5	-0.12	-0.25	0.13

CRE: Calculated refractive error; ARE: Actual refractive error.

Table 2 Demographic characteristics of patients

Variables	Values
Patients, *n*	22
Age, y	59.05±8.70
Male : Female	6 : 16
Urban : Rural	8 : 14
Right : Left	11 : 11

Statistical Analaysis Data was analyzed and statistically evaluated by using paired and unpaired student *t*-test. Spss version 20, Karl Pearson's correlation coefficient at 5% level of significance 95% confidence interval. *P* value of <0.05 were considered statistically significant.

RESULTS

Total patients were 22, 6 were males and 16 were females. According to demography, 8 were urban and 14 were rural; and distribution of disease among right and left eye of patients was equal. The mean age of patients was 59.05±8.70 years (Table 2). Visual and refractive outcomes: the mean axial length did not

Table 3 Various parameters preoperatively and postoperatively $\bar{x}\pm s$

Parameters	Preoperative	3mo postoperative	*P*
Axial length (mm)	23.061±0.977	23.083±0.919	0.77
K_{mean} (D)	42.994±1.536	43.324±1.479	0.105
Corneal astigmatism (D)	2.09±0.789	0.523±0.277	<0.05
BCVA (LogMAR)	1.007±0.402	0.024±0.062	<0.05

Table 4 Various parameters preoperatively and postoperatively $\bar{x}\pm s$

Pterygium grade	*N*	Preoperative astigmatism (KV-KH), D	Postoperative astigmatism (KV-KH) at 1mo, D	Postoperative astigmatism (KV-KH) at 3mo, D
Ⅱ	16	1.922±0.663	1.281±0.605[a]	0.563±0.296[a]
Ⅲ	6	2.542±0.797	1.125±0.586[a,b]	0.417±0.204[a,b]

[a]*P*<0.05 preoperative *vs* postoperative at 1 and 3mo; [b]*P*>0.05 grade Ⅱ *vs* grade Ⅲ at 1 and 3mo.

Table 5 Correlation between various parameters

Independent variable (X axis)	Dependent variable (Y axis)	*r*	*P*
Changes in keratometry	Prediction error	−0.29	0.19
Pterygium size	Prediction error	0.2997	0.17

change significantly ($P = 0.77$) postoperatively. The mean keratometric reading increased from 42.994±1.536 preoperatively to 43.324±1.479 postoperatively but this was not significant ($P = 0.105$). The corneal astigmatism decreased significantly from 2.09±0.789 D preoperatively to 0.523±0.277 D postoperatively ($P<0.05$). LogMAR BCVA significantly improved from 1.007±0.402 preoperatively to 0.024±0.062 postoperatively ($P<0.05$). PE was < ±0.5 D of refractive error for 81.8%, and < ± 1 D for 100% of the patients. Its correlation was determined with change in keratometry and pterygium size (Table 3).

The Table 4 shows that in both grade Ⅱ and grade Ⅲ pterygium there is significant reduction in mean keratometric astigmatism postoperatively when compared to preoperative value with $P < 0.05$ both at 1 and 3mo postoperatively. However, the difference between grade Ⅱ and grade Ⅲ, changes in keratometric astigmatism after surgery both at postoperative 1mo and postoperative 3mo were not found to be statistically significant.

No correlation was found between changes in keratometry and prediction error ($r = -0.29$, $P = 0.19$). And, there was no correlation between pterygium size and prediction error ($r = 0.2997$, $P = 0.17$) (Table 5).

DISCUSSION

In present study, mean age of the patients was 59.05±8.70 (range: 45 - 75) years. In the present study, higher proportion of the patients was 72.73% females and 27.27% males. Mohammad-Salih *et al*[15] found that mean age of patients was 55.2±12.39 (range: 25-77) years. They also reported 54.55% participants were males and 45.45% were females. Koc *et al*[14] reported 40.6% females and 59.4% males and mean age was 63.31±7.18 years which is slightly higher than that in the present study. Kamiya *et al*[13] reported mean age 73.5±7.0 which is much higher than mean age of present study. Garg *et al*[16] reported 56.34% patients were men and 43.66% were women and mean age was 39.69 years. In the present study, 63.64% patients belong to the rural areas and 36.36% to urban areas. Since our hospital is government institution so the overall percentage of rural patients presenting to our hospital is higher. Beside that pterygium is disease which is common in rural population because of outdoor work. Marmamula *et al*[17] also reported significantly higher proportion among rural population. In the present study equal proportion, *i.e.* 50% of the diseased eyes were left and right sided. Mohammad-Salih *et al*[15] reported 57.1% of patients were pterygium affected in left eye while 42.9% in right eye and Oltulu *et al*[18] reported 65% pterygium in right eye and 35% in left eye. Both the findings slightly differ from present study.

Mean axial length (23.48±1.129) in the present study did not change significantly. Koc *et al*[14] also reported no significant change in mean axial length of their patients.

$K_{Average\ mean}$ in the present study, increased postoperatively but the changes were statistically not significant, at 3mo ($P > 0.05$) as compared to preoperative $K_{Average\ mean}$. Kam *et al*[19] reported insignificant change in $K_{Average\ mean}$ which is similar to finding in our study ($P = 0.639$, $P = 1$) whereas Koc *et al*[14] reported significant increase in $K_{Average\ mean}$ postoperatively at 3mo ($P = 0.022$). Kamiya *et al*[13] also reported significant increase in $K_{Average\ mean}$ postoperatively at 3mo ($P<0.001$). The variation in results could be due to different grades of pterygium. In our study, the change of $K_{Average\ mean}$ in postoperative period as compared to preoperative period was statistically significant in grade Ⅲ pterygium but not in grade Ⅱ pterygium.

In the present study, mean astigmatism (K_{mean}) significantly decreased from 2.09±0.789 D preoperatively to 0.523±0.277 D postoperatively ($P < 0.05$). Kamiya *et al*[13] and Negima *et al*[20] reported similar finding in their study. Tomidokoro *et al*[12] reported significant decrease in astigmatism from preoperative value of 3.8±2.8 D to value of 1.2±1.0 D, 1.1±0.9 D and 1.0±0.6 D at 1, 3 and 6mo respectively ($P<0.01$).

Prediction error was ≤0.50 D in 81.82% of patients, *i.e.* the

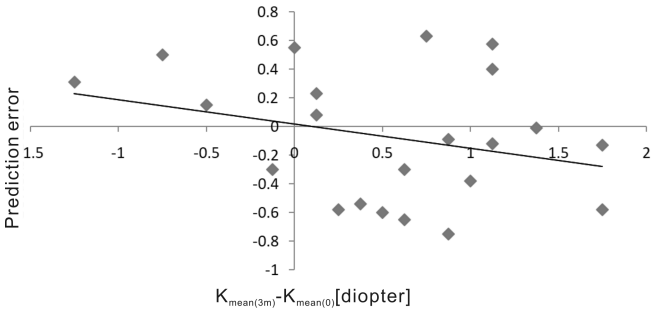

Figure 1 Correlation between ($K_{mean(3m)}-K_{mean(0)}$) and prediction error.

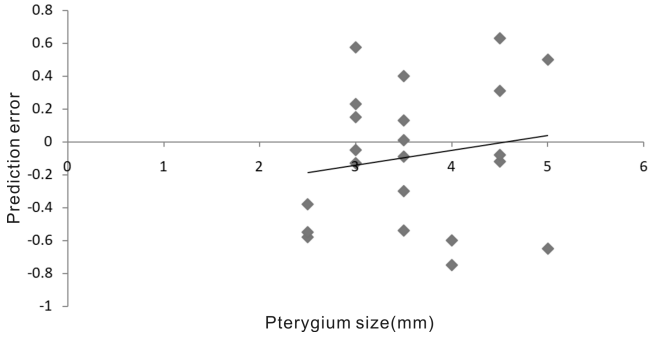

Figure 2 Correlation between pterygium size and prediction error.

decision to subtract 0.5 D from the implanted IOL power was correct and the implanted IOL power should be at least 0.5 D smaller than the calculated power. Koc *et al*[14] reported that pterygium larger than 2.4 mm length creates at least equal or more than 0.50 D decrement in the IOL power calculations. Kamiya *et al*[13] implanted IOL to render patients emmetropic or slightly myopic but they found final refraction was more myopic than the target refraction.

Choosing on IOL power less by 0.5 D for implantation, rendered majority of our patients (81.82% of the patients) with <±0.5 D of refractive error and 100% of the patients <±1 D. The point to be noted was that all pterygia in this study, ranged from 2 - 5 mm, we excluded very small pterygium as well as those invading the pupillary zone.

In this study BCVA significantly improved from 1.007±0.402 preoperatively to 0.139±0.074 postoperatively at 3mo ($P<0.05$), vision improved significantly postoperatively. The improvement of vision was related to cataract removal with IOL implantation as well as pterygium excision.

Kamiya *et al*[13] performed simultaneous cataract and pterygium surgery and implanted the IOL emmetropic/slightly myopic target refraction without any correction factor to the calculated IOL power. They noted significant myopic shift postoperatively. Only 48% patients and 82% of 60 eyes were within ±0.50 D and 1.0 D of the target correction respectively. No correlation was found between changes in keratometry and prediction error ($r=-0.29$, $P=0.19$) depicted in Figure 1. And there was no correlation was observed between pterygium size and prediction error ($r=0.2997$, $P=0.17$) in our study, depicted in Figure 2.

Contrary to this, Kamiya *et al*[13] reported modest correlation between pterygium size and prediction errors. He suggested that a myopic shift occurred due to combined surgery, because removal of pterygium made the cornea steeper. Discrepancy of finding between Kamiya *et al*[13] and our study could be due to use of correction factor, and also may be because of use of different machine for biometry in these two studies, due to different study population, different age group or due to different placement of surgical incision. This study adds to our knowledge that in concurrent cataract and pterygium of grades Ⅱ and Ⅲ, under correcting the IOL power by 0.5 D is predictable in majority of cases. Limitations of this study is small sample size, and the fact that only length of pterygium was considered.

For a perfect refractive outcome in cataract surgery-sequential surgeries are a must in all concurrent disorders. But considering the fact that, cataract is one of the leading causes of blindness, we can't perform sequential surgeries in all cases due to many reasons. For the eradication of blindness, these patients have to be taken up for combined surgery as soon as possible. Taking the myopic shift into account (that occurs postoperatively) in cases of concurrent cataract with pterygium, we can decrease uncorrected refractive errors, hence decreasing the load of refractive errors. Combined phacoemulsification + foldable IOL implantation and CAG application surgery was safe and effective, and the accuracy of implanting an IOL less by 0.5 D was predictable in majority of patients. Hence it should be practiced routinely in areas, where burden of cataract surgery or grade of cataract prevents the surgeon from performing sequential surgeries.

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