Refractive Results After Combined Cataract-pars Plana Vitrectomy Surgery in Patients with Macula-off Rhegmatogenous Retinal Detachment in Whom the Intraocular Lens is Implanted Using the Biometric Measurements of the Healthy Eye

Hakan Baybora[1]

ABSTRACT

Purpose: Cataract with macula-off retinal detachment may prevent the surgical field. Combined surgery may be required. It is difficult to measure axial length in cases involving the macula. Therefore, it will not be possible to obtain an accurate biometry Different methods are used for accurate measurement in the affected eye. We wanted to show the results of cases in which biometric measurements were of the healthy eye, which is an alternative method, were used.

Materials and methods: Thirty- two patients who had underwent combined phacoemulsification pars plana vitrectomy silicone injection surgery was included in the study. The healthy eye biometrics were used for intraocular lens power selection. Refraction results were obtained after silicone oil removal. Mann-Whitney U test was used to compare the expected refraction values in healthy eye measurements and the resulting refraction values of the operated eye.

Results: There was a significant increase in visual acuity after surgery (1.2 ± 0.48 logMar, 0.6 ± 0.41, p = 0.001, p <0.05). There was no significant difference in terms of keratometry values before and after the operation (43.12 ± 2.25, 43.84 ± 1.19, p = 0.24, p> 0.05). There was no significant difference between the expected refraction value of the healthy eye and the result refraction value of the operated eye (p = 0.35, p> 0.05).

Conclusion: Biometric values of the healthy eye can be used for IOL implantation in the presence of a cataract with macula-off retinal detachment.

Keywords: Vitrectomy, phacoemulsification, cataract, silicones, biometry.

INTRODUCTION

Cataracts can often be seen together with retinal detachment. It may obscure the visualization of the surgical field[1]. Therefore, combined cataract-pars plana vitrectomy surgery may be required.

Combined surgery will avoid the need for subsequent surgery, which can be more complicated in a vitrectomized eye[2].

Several studies report that a combined vitreoretinal procedure is a safe and effective way to manage cases with vitreoretinal disease and cataract, with the functional outcomes comparable to those of sequential surgery[3-5].

Today, small-incision cataract surgery and foldable intraocular lens (IOL) implantation techniques are improved, visual and refractive results are better, and surgeries are safer than before[6]. Advances in vitrectomy devices have enabled less inflammation, less pain, rapid visual recovery, and decreased refractive changes with vitreoretinal surgery[7]. However, the IOL power calculation in patients with macula-off rhegmatogenous retinal

1- MD, Ophthalmologist, Nisa Eye Hospital, Istanbul Turkey

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Correspondence Adress:
Hakan Baybora
Nisa Eye Hospital, Istanbul Turkey
Phone: +90 532 621 5561
E-mail: byretin@gmail.com

detachment seems to be problematic and may cause important postoperative refractive changes[8-9]. Calculating the IOL power is challenging in patients undergoing a combined operation of retinal detachment surgery and IOL implantation. The axial length (AL) is overestimated by the waveform of the detached retina, which will cause errors in the IOL power calculation. A preoperative error in the AL measurement of 0.3 mm results in a postoperative 0.75 D refractive error, which is significant[10]. Standard biometric measurements of the affected eye are generally used for this group of patients.[11-12] In this study, we aimed to show the results of an alternative method that uses the biometry of the other eye.

MATERIALS AND METHODS

Thirty-two patients who underwent combined phacoemulsification for cataract and pars plana vitrectomy-silicone oil injection for rhegmatogenous retinal detachment between 2014 and 2016 were included in the study. The study adhered to the tenets of the Declaration of Helsinki and was approved by the local ethical committee. Informed consent was obtained from all patients. Exclusion criteria included any previous cataract surgery, refractive, corneal, or vitreoretinal surgery in both eyes. Refractive errors of measured eye, myopic or hyperopic, greater than 6 diopters, astigmatism greater than 2 diopters were also excluded. Biometric measurements of healthy eyes were obtained by using Aladdin low-coherence interferometry (Topcon, Tokyo, Japan) and all these eyes were phakic. SRK II formula was used for IOL calculation by the device. All surgeries were performed by the same surgeon (İbrahim Koçak, MD). Keratometric values of the operated eye were also obtained using the same device. Under retrobulbar anesthesia, the cataract was removed with phacoemulsification surgery, and a hydrophobic acrylic IOL was implanted in the bag. Corneal wounds were temporarily sutured with Nylon 10/0 sutures. After that, a 25-gauge pars plana vitrectomy with fluid-air exchange was performed. Then, 1000 cs silicone oil was injected. The temporary sutures were then removed. After three months, the silicone oil was removed. One week later, refraction was measured using a KR-880 autorefractometer (Topcon, Tokyo, Japan). At this visit, the ALs of the operated eyes were also measured using the Aladdin low coherence interferometer (Topcon, Tokyo, Japan).

Statistical Analysis

A Shapiro-Wilks test was used to test the normality of the numerical results. The mean preoperative expected values and the mean refraction values were not normally distributed (p= 0.45, p>0.05). Preoperative measured, expected refractive results of the other eye and results of the operated eye compared using the Mann Whitney U test (SPSS Version 16, IBM, NY, USA). Preoperative and postoperative keratometric values, visual acuity of the operated eye comparison made by using Wilcoxon Rank Sum test and postoperative axial length (AL) and AL values of the other eye were compared using t-test.

RESULTS

The mean age of the patients was 57.45 ± 9.2 (48-75) years. Fifteen patients were female, and 17 were male. Visual acuity and keratometric changes are shown in Table 1. In seven patients, transient intraocular pressure elevation (>21mmHg) was seen and controlled with topical medication. One patient was treated with intravitreal vancomycin + ceftriaxone intravitreal injection because of the suspicion of endophthalmitis. Intraocular lenses were implanted in the bag in all patients. During postoperative three months period, no recurrence of detachment was seen. The operated eyes mean refraction was few myopic (Min.: -1.5 diopters, Max.:1.25 diopters) but not significantly different from the measurements of the other eye (Table 2).

CONCLUSION

In some previous studies, the researchers found that axial changes were detected only after scleral buckling surgery of the retinal detachment as a result of the squeezing effect[13-14]. However, Abou-Shousha et al found significantly longer AL measurements after pars plana vitrectomy in cases with macula-off rhegmatogenous retinal detachment when obtained by IOLMaster and A-Scan Ultrasound[15] This will affect ocular biometric measurements. Although we implanted the IOL using the measurement of the

Table 1: *Comparison of preoperative and postoperative visual acuity and keratometry of the operated eyes. Maximum and minimum measurements are given in parenthesis.*

	Preoperative	Postoperative	p
Mean Visual Acuity*	1.2±0.48 (1.3- 0.7)	0,6±0,41(1.0- 0.6)	0,001**
Mean Keratometry	43,1±2,2(38.75-46.75)	43,84±1,19 (39-46.5)	0,24***

* logMAR; ** p<0,05, *Wilcoxon Rank Test;* ***p>0,05, *Wilcoxon Rank Test.*

Table 2: *Comparison of postoperative refraction and axial length of the operated eye and the healthy eye. Maximum and minimum levels are written in parentheses.*

	Measured Eye	Operated Eye	p value
Mean Refraction***	-0.18 (0.05 - -0.25)	-0,24D (0.25 - -0.75)	0.35*
Mean Axial Length****	23.9±1,8 (22.11-25.83)	24.2±1,8 (22.8-25.98)	0.53**

* p> 0.05, *Mann Whitney U test;* ** p< 0.05, *t-test;* *** Diopters; **** Milimeters

other eye, we also found a postoperative myopic shift when we compared the AL of the other eye, but this was not significant. Pangsacheoronmont found that IOL measurements using the IOL master in eyes with macula-off retinal detachment underestimates AL[16]. This finding is the opposite of the results reported above, but again, it will affect the power of the IOL. Pangsacheoronmont also reported that in cases without macular involvement, the pre- and postoperative AL measurements obtained by IOL master and immersion A-scan ultrasound were not significantly different and did not significantly affect the IOL power calculation. They found that the immersion A-scan ultrasound appears to be more accurate in eyes with macular involvement and that the overestimation of IOL power using IOL master was greater than 2 D. On the other hand, they recommend using both modalities and that care should be taken if there is no correlation between AL measurements. Rahman and colleagues evaluated the user-adjusted AL measured by optical biometry for IOL calculations in eyes undergoing combined phacovitrectomy with macula-off rhegmatogenous retinal detachment. They used the posterior peak wave of the fellow eye ultrasonic biometer for the adjustment and and found no difference between postoperative biometric AL values[17]. Kim found that large temporal retinal detachment measurements of the affected eyes may provide false results and recommended delayed surgery or using the biometry of the other eye[18]. Delayed surgery is an alternative if it does not interrupt the clarity of the surgical field.

There are also conflicting results obtained from this method. Some authors have reported more accurate results using a partial interferometry device as compared with ultrasonic biometry in eyes filled with silicone oil[19-20]. On the other hand, Suk found some cases of overestimations of greater than 2 D after removal of silicone oil and implantation of a secondary IOL using IOL master[21]. In eyes with AL values longer than 27 mm, underestimations of IOL power can be seen. [22] We found that myopic results greater than 2 D were seen more frequently in eyes with relatively longer AL.

Optical biometers uses new generation SRK/T formulas and with this formula prediciton of effective lens position. More precise results were obtained using this formula, especially in longer ALs.[23]

As a result, we believe that the use of biometric measurements of the other eye for IOL implantation provides results that are comparable with other methods and that it can be used as an alternative to combined phaco-pars plana vitrectomy surgery.

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