Evaluating the Refraction Results of Patients who had Combined Phacoemulsification-pars Plana Vitrectomy and Internal Limiting Membrane Peeling for Idiopathic Macular hole or Idiopathic Epiretinal Membrane

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ABSTRACT

Purpose: Although cataracts can be seen after pars plana vitrectomy, also be seen with vitreomacular interface pathologies such as a macular hole and epiretinal membrane. Since this may cause difficulties in imaging the surgical field, cataract surgery combined with surgery for primary pathology may be required. With the development of small incision microsurgical techniques and more precise biometric measurements, results close to emmetropic can be obtained today. Since internal limiting membrane peeling is performed together in hole and ERM surgery, we planned this study to investigate whether there is a significant difference between the final refraction and the refraction of non -complicated phacoemusification performed control group. Also, we wanted to find any difference between expected and final refraction in our study group

Materials and methods: Retrospective combined phacoemulsification - Pars plana vitrectomy-internal limiting membrane peeling 33 macular holes and 10 epiretinal membrane patients and 43 control patients with the only phacoemulsification were included in the study. Intraocular lens power to be implanted was measured by low coherence interferometry. Comparison of expected postoperative refraction with result refraction Wilcoxon test and comparison with the control group was performed with the Mann-Whitney U test.

Results: There was no significant difference between the combined surgery group and the control group refraction results ($p = 0.41$, $p > 0.05$) and also between expected refraction and final refraction in the surgery group ($p = 0.16$, $p > 0.05$).

Conclusion: In such vitreoretinal interface problems requiring combined surgery, the expected refraction after surgery is similar to routine phacoemulsification surgery.

Keywords: Macular holes, Epiretinal membrane, Vitrectomy, cataract.

INTRODUCTION

Pars plana vitrectomy and internal limiting membrane (ILM) peeling surgery with gas tamponade is an effectice surgery for idiopathic macular hole and epiretinal membrane treatment (ERM).[1,2] Cataract is a frequent complication seen after vitreous surgery.[3] However, it can also be seen together with vitreoretinal interface pathologies and may impair the visibility of the surgical field[4]. Advances in small incision cataract surgery increased successive refractive results and is also safer than before.[5] Most of the ocular biometry devices measure the axial length from the apex of the cornea to the internal limiting membrane. At the same time, after ILM peeling patients may be more myopic.[6,7] Therefore, in this study, our goal was to compare the final refractions with standard non complicated cataract surgery group and the macular hole and ERM patients who underwent combined cataract-pars plana vitrectomy and ILM peeling surgery whose intraocular lens (IOL) measurements were made using low coherence interferometry based biometry device.

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MATERIALS AND METHODS

Retrospectively, 43 patients, 33 of them diagnosed as the macular hole and 10 of them were idiopathic ERM, were included in the study. For the control group, 43 cataract patients who were had standard phacoemulsification and in the bag hydrophobic acrylic intraocular lens implantation performed were included in the study. All the holes were in Grade III (250-400 microns) or Grade IV (400microns or more). Holes presented after macular edema, trauma, and ERMs which presented after vein occlusion or diabetic retinopathy were excluded. The study has adhered to the tenets of the Declaration of Helsinki. Permission was obtained from the local ethical committee (358/07.05.2020). Informed consent was obtained from all patients before surgery. All the surgeries were performed by the same surgeon (İbrahim Koçak MD) under local anesthesia. IOL power measurements were made with Aladdin interferometer (Topcon, Tokyo, Japan) Phacoemulsification and hydrophobic acrylic intraocular lens implantations were performed for all patients before vitrectomy. Corneal incisions sutured with 10/0 nylon suture temporarily. 25G peripheral and core vitrectomies were performed first. Then posterior hyaloid was dissected using a high vacuum suction cutter. Brillant blue was applied for 3 minutes. After that, from the superior temporal side, the ILM was grasped with forceps and peeled. Peripheral retina checked for iatrogenic holes and treated if needed. Fluid-air exchange was performed. C3 F8 12% gas was used for tamponade. For macular hole patients, prone face position was advised for a week (Figure1 and Figure2).

After almost three weeks, the gas disappeared, refraction measurements were made by using the Topcon KR-8000 auto refractometer. Preoperative IOL measurements and postoperative refraction measurements were also done by the same devices for control group. Spherical equivalent measurements were obtained. As postoperative refractions,axial lengths and postoperative astigmatic measurements were numerical results, first we performed the Shapiro-Wilks normality test. Due to they were not normally distributed, the Wilcoxon rank test was used for comparison of expected refractions and postoperative results of surgery group and Mann Whitney U test to compare them with the control group refractions. For comparison of the ages of both groups t-test and for sex distribution comparison, chi-square test was used. Mann whitney U test was used for axial lengts and postoperative corneal astigmatism comparison of both groups.

RESULTS

Temporary intraocular pressure elevation was observed in two of them and was controlled by medication. Corneal epithelium of a subject was scrapped because of edema during vitrectomy and treated with a bandage contact lens after the surgery. Postoperative corneal edema was seen in 6 patients. Retinal detachment and endophthalmitis were not seen in any patients.

The keratometric values were preoperatively 43,67D in the combined surgery group and 43,51D in the control group. The mean expected refraction before surgery was -0,09D and the mean refraction after surgery was 0,25D in vitrectomy group. This difference was not significant ($p=0.16$, $p>0.05$). The demographics, comparison of axial lengths corneal astigmatism, and post-operative refraction of combined surgery and control group are shown in Table1.

CONCLUSION

It was found in previous studies that axial length was an important factor that effects post operative refraction in

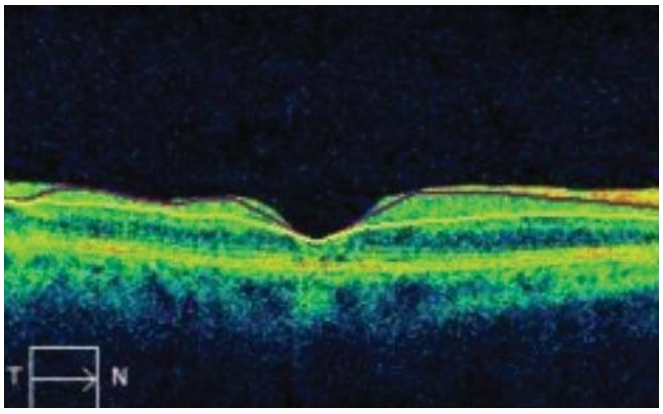

Figure 1: *Preoperative optical coherence tomography image of a macular hole.*

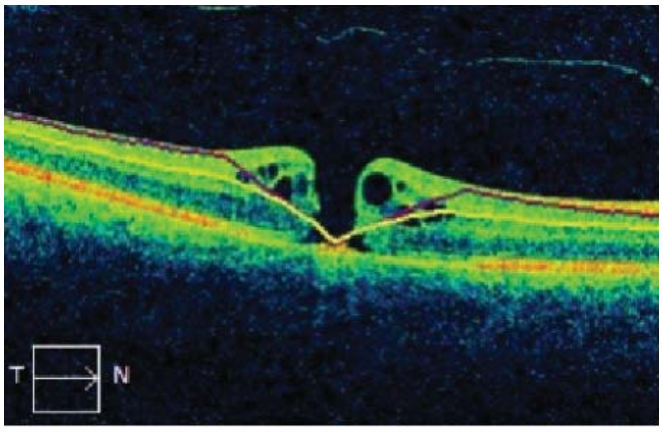

Figure 2: *Postoperative image of the same patient after1 month.*

Table 1: *The mean values of age,sex, corneal astigmatism (CA), axial length (AL) and Postoperative Refraction (PR) of surgery group and control group.*

	Age	Sex (F/M)	CA	AL	PR
Surgery group	66,8±7,79	22/21	-0,36±0,79	23,61±0,79	0,27±0,26
Control group	66,61±6,74	23/20	-0,38±0,67	23,24±0,80	0,22±0,46
P value	0,32*	0,82**	0,13***	0,16***	0,4***
*t-test, **Chi-square test, ***Mann Whitney U					

cataract patients.[8,9] These studies were made using ultrasonic biometry. Today, partial coherence interferometer device is generally used. In our study low coherence interferometry was used. This devices makes almost exact measuremetns and they measure AL from corneal apex to retinal pigment epithelium[10,11]. This may be one of the reasons that why our mean postoperative result was not myopic. .(In our patients, the results that we found greater than -0.50 D were having ALs greater than the mean value that we found. IOL position is an important factor for postoperative refraction. If IOL moves forward 1mm above effective lens position that will give a result of myopia greater than 1.5D.[12]

In pseuduphakics, vitrectomy may result posterior displacement of IOL and it was found that this was more than patients who had cataract surgery only.[13,14,15] This may explain our small amount of hypermetropia.

However, Patel and colleagues found the opposite that this displacement was anteriorly after combined cataract-macular hole surgery. Their results range was between +1,64D and - 2,5D, used C_2F_6 gas for tamponading agent and mean postoperative refraction was slightly myopic[16]. Schweitzer and Hwang found similar results with the previous researcher[17,18]. But they were used ultrasonic biometry. Manvikar found small amount of hypermetropia after combined cataract-vitrectomy surgery in ERM patients[19]. The number of cases in the studies told above were smaller than ours. Some of them were made using ultrasonic biometry and it was found that these biometries were giving more myopic results than optical biometries[20,21]. Optical biometries 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[22].

Our biometry measurements were also made using SRK/T formula. There is not a spesific biometry formula for vitrectomised and gas tamponade used eyes. Replacing aqueous humor instead of vitreus body may also induce myopia and it was adviced to consider this while calculation of the power for combined phaco-vitreus surgeries[23]. If the IOL is not implanted into the capsular bag, implanted into the scleral sulcus, this will also effect the refraction. For all of our subjects, IOL was implanted into the capsular bag. Some of the studies showed that one-piece IOLs moves axially greater than three-piece IOLs [24]. The IOLs that we were used were one piece lenses but as we told before, our mean refraction result was not myopic like previous studies. It's a reality that sutureles microsurgery techniques induces smaller amounts of astigmatism[25]. 25G vitrectomy has no effect on corneal astigmatism[26] Temporary corneal sutures in our subjects were removed at the end of the surgery

As a result, in combined phaco-vitrectomy and ILM peeling surgery for idiopathic macular hole and idiopathic epiretinal membrane, postoperative refraction was not different from expected and control group refractions. Low coherence interferometer IOL calculations can be used for these subjects.

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