

Anterior Chamber Depth and Central Corneal Thickness Changes After Pars Plana Vitrectomy in Phakic and Pseudophakic Patients

Fakik ve Psö dofakik Hastalarda Pars Plana Vitrektomi Sonrası Ön kamara Derinliği ve Santral Kornea Kalınlığı Değişiklikleri

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ABSTRACT

Purpose: To evaluate the changes in anterior chamber depth (ACD) and central corneal thickness (CCT) after pars plana vitrectomy (PPV).

Materials and methods: A total of 64 eyes of 64 patients having 23 gauge (G) PPV without endotamponate were enrolled in this study. Group I consisted of 32 phakic patients and Group II consisted of 32 pseudophakic patients. By using an optical biometry approach, ACD and CCT values were measured preoperative as well as postoperative 1st and 6th months following uncomplicated PPV.

Results: In Group I, mean preoperative ACD was 2.82±0.41mm, mean postoperative 1st month ACD was 2.72±0.37 mm; mean postoperative 6th month ACD was 2.61± 0.35 mm. In Group II, mean preoperative ACD was 3.53±0.25 mm, whereas the mean postoperative 1st month and 6th month ACD values were 3.51±0.31 mm and 3.39± 0.27 mm, respectively. In both groups; decrease in ACD measurements were significant at postoperative 1st month and 6th months with respect to preoperative ACD (p<0.05). Group II had higher ACD values at each measurement time (p<0.05). In both groups, there was not a significant change of CCT in preoperative, postoperative 1st and 6th months measurements (p>0.05). There was not a significant CCT difference between two groups at each measurement time (p>0.05).

Conclusion: ACD measurements decreased and CCT measurements did not change significantly at the 1st and 6th months measurements with respect to the preoperative measurements. But further studies are required for more information.

Key words: Anterior chamber depth, central corneal thickness, lens thickness, optical biometry, pars plana vitrectomy.

ÖZ

Amaç: Pars plana vitrektomi (PPV) sonrası ön kamara derinliği (ÖKD) ve santral kornea kalınlığı (SSK) değişikliklerini incelemek.

Gereç ve yöntem: Endotamponat kullanılmadan, komplikasyonsuz, 23 gauge (G) PPV uygulanan toplam 64 kişinin 64 gözünü çalışmaya dahil edildi. Grup I, 32 fakik hasta; Grup II, 32 psö dofakik hastadan oluştu. Optik biyometri kullanılarak ÖKD ve SKK değerleri ameliyat öncesi ile PPV ameliyatı sonrası 1. ve 6. aylarda ölçüldü.

Bulgular: Grup I'de ortalama ÖKD ameliyat öncesi 2.82±0.41mm, ameliyat sonrası 1. ayda 2.72±0.37 mm; 6. ayda 2.61± 0.35 mm idi. Grup II'de ortalama ÖKD ameliyat öncesi 3.53±0.25 mm, ameliyat sonrası 1. ayda 3.51±0.31 mm; 6. ayda 3.39± 0.27 mm idi. Her iki grupta da ameliyat öncesine göre ameliyat sonrası 1. ay ve 6. ayda ÖKD değerinde anlamlı azalma vardı (p<0.05). Tüm ölçümlerde Grup II'deki ÖKD'nin daha büyük olduğu saptandı (p<0.05). Her iki grupta da, tüm ölçümlerde SKK'da anlamlı fark saptanmadı (p>0.05).

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Sonuç: Komplikasyonsuz, 23 G PPV sonrası 1. ay ve 6. ay ölçümlerinde, ameliyat öncesine göre, ÖKD'nin azaldığı ve SSK'nın anlamlı olarak değişmediği görüldü. Daha kesin sonuçlar için ileri çalışmalara ihtiyaç vardır.

Anahtar kelimeler: Ön kamara derinliği, santral kornea kalınlığı, lens kalınlığı, optik biyometri, pars plana vitrektomi.

INTRODUCTION

Anterior chamber depth (ACD) and central corneal thickness (CCT) values are not always consistent. They change with the state of the ocular structures like lens, cornea and the vitreous body.¹ Pars plana vitrectomy (PPV) has effects on state of these ocular structures. Better understanding of these changes in anterior segment parameters following PPV is helpful to select the appropriate surgical candidates and techniques. The evaluation of these structures are important for the risk assessment of glaucoma, surgical planning and the investigation of refractive disorders.²⁻⁶

In the literature there are controversial and limited reports about anterior segment parameters following the PPV. There are reports that ACD decreases following the PPV.^{7, 8} However, there are other studies reporting that anterior segment parameters, especially ACD, show slight insignificant changes after PPV.⁹⁻¹¹ In those studies, factors such as fluid-air exchange, gas or silicone-oil endotamponate were not excluded and ultrasonic biometry techniques were used. But now, it is possible to measure anterior segment parameters by using non-contact optical biometry which has significantly higher consistency and repeatability than ultrasonic biometry.¹² Therefore, there is a need to investigate the sole effect of PPV on ACD and CCT.

In this study, we investigated the effect of PPV on ACD and CCT in phakic and pseudophakic patients by using optical biometry.

METHODS

A total of 64 eyes of 64 patients, having 23 G PPV in 2012-2013, were included in this study. Patients were divided into 2 groups. Group I consisted of 32 phakic patients and Group II consisted of 32 pseudophakic patients. This study was conducted in accordance with the tenets of the Declaration of Helsinki. The consent forms were given to, explained to and signed by all participants. Indications for PPV were proliferative epiretinal membrane, synkisis sintilans, asteroid hyalosis and vitreous floaters. Patients with a history of previous ocular trauma, intraocular surgery (other than phacoemulsification intraocular lens implantation) or scleral buckle surgery, air-fluid exchange during PPV, gas or silicone-oil endotamponate injection after PPV were not included in this study. Also patients with corneal opacity, glaucoma, laser iridotomy, laser iridoplasty or those using topical or systemic medication that might affect anterior segment parameters were excluded.

All patients underwent a complete ophthalmic examination

preoperatively. Best-corrected visual acuity (BCVA) using a Snellen chart was recorded. The anterior segment and lens were examined with slit-lamp biomicroscopy. Intraocular pressure (IOP) was measured by using non-contact pneumatic tonometry. The fundus was examined using a 90 D lens and all pathologic retinal findings were documented. Posterior segments of the patients were also evaluated by optical coherence tomography. ACD and CCT were evaluated with an optical biometer (Lenstar, Haag-Streit, Switzerland) before pupillary dilatation.

Pupillary dilatation was achieved by administration of cyclopentolate hydrochloride and tropicamide. After retrobulbar block, the periorbital skin and ocular surface were cleaned with povidone-iodine. A standard 3 port 23 G PPV was performed. Standard intraocular irrigating solution (BSS PLUS, Alcon, Texas, USA) was used. Posterior hyaloid, anterior hyaloid and anterior vitreous were tried to be removed as much as possible. The epiretinal membranes were stained with trypan blue (MembraneBlue; 0.15% trypan blue ophthalmic solution, Dutch Ophthalmic, Netherlands) and excised using microsurgical instruments. The internal limiting membrane was stained with Brilliant blue G (Brilliant Peel, 0.25 g/l triphenylmethane ophthalmic solution, Geuder, Germany) and removed using microsurgical instruments. Sclerotomy ports were not sutured at the end of surgery. Prophylactic subconjunctival antibiotic and steroid were administered.

The patients were examined with an optical biometer before as well as 1 and 6 months after the surgery. The changes in ACD and CCT were compared in Group I and Group II.

STATISTICAL ANALYSIS

The SPSS programme was used for the statistical analysis. Descriptive statistics were given as mean, standard deviation, minimum and maximum. Normally distributed parameters with 3 or more follow up measurements were evaluated with using Friedman Test and comparison of two measurements were evaluated by means of independent t test. Significance was assessed at the levels of $p < 0.05$.

RESULTS

The mean age of Group I was 65.41 ± 7.84 years and mean age of Group II was 68.94 ± 7.29 years. There was not a significant difference between two groups for age ($p=0.067$). In Group I; 12 (37.5 %) patients had epiretinal membrane, 14 (43.75 %) patients had vitreous haemorrhage and 6 (9.38 %) patients had vitreous opacities. In Group II; 17 (53.12 %)

patients had epiretinal membrane, 10 (31.25 %) patients had vitreous haemorrhage and 5 (15.15 %) patients had vitreous opacities.

Preoperative, postoperative 1st month and postoperative 6th months ACD measurements were presented in Table 1 and CCT measurements were presented in Table 2.

In Group I, the mean preoperative ACD was 2.82±0.41mm, mean postoperative 1st month ACD was 2.72±0.37 mm and mean postoperative 6th month ACD was 2.61± 0.35 mm. In Group II, the mean preoperative ACD was 3.53±0.25 mm, whereas mean postoperative 1st and 6th months ACD values were 3.51±0.31 mm and 3.39± 0.27 mm, respectively. In both groups; the decrease in ACD measurements were significant at postoperative 1st month and at postoperative 6th months with respect to the preoperative ACD (p<0.05). Group II has higher ACD values at each measurement time (p<0.05).

In both groups, there was not a significant change of CCT in preoperative, postoperative 1st and 6th months measurements (p>0.05). There was not a significant CCT difference between two groups at each measurement time (p>0.05).

DISCUSSION

In this study we found that ACD measurements decreased and CCT measurements did not changed significantly at the 1st and 6th months following the uncomplicated 23 G PPV.

Watanabe et al. evaluated whether the type of intraocular lens (IOL) used in phacovitrectomy and IOL implantation affects the changes in ACD over time.⁸ They reported that in the IOL with 7 mm optic group, no differences in ACD were

found between eyes with and without fluid-gas exchange at any time point after surgery. Whereas in the IOL with 6.5 mm optic group, eyes undergoing fluid-gas exchange showed an increase in ACD between 1-week and 1-month after surgery.⁽⁸⁾

Park et al. compared the anterior segment morphologic changes of 30 proliferative diabetic retinopathy patients having phacovitrectomy with 30 patients having only PPV by using ultrasound biomicroscopy.⁹ They found that ACD was decreased in both groups and this decrease was more prominent in phacovitrectomy group.⁹ Park et al. explained the decrease in ACD with supraciliary effusion. The frequency of supraciliary effusion was higher in the phacovitrectomy group than in the PPV-only group. Intraocular surgery can result in the destruction of the blood-aqueous barrier and is responsible for the anatomical changes around ciliary body like supraciliary effusion.⁹

Li et al. investigated the ACD changes following PPV with A-scan ultrasonography in 29 patients.¹³ They reported that 3 months after PPV, ACD significantly decreased in patients with epiretinal membrane, but ACD did not change in patients with vitreous haemorrhage.¹³ Li et al. explained the ACD changes by the pulling effect of epiretinal membrane.

Kim et al. studied 10 patients having PPV without crystalline lens extraction, and 12 weeks after PPV, there was not a significant change of ACD.¹⁴ Calik et al. reported that in silicone oil-injected eyes, ACD increased in the first week and this increase was maintained throughout the first month.¹⁵ Calik et al. also reported statistically significant increases in the CCT of silicone oil-injected eyes in the first week after PPV which returned to pre-operative levels after 1 month.

Table 1: Anterior chamber depth (ACD) (millimeter) values measured preoperative, postoperative 1st and 6th months following pars plana vitrectomy in Group I (Phakic patients) and Group II (Pseudophakic patients).

ACD	Preoperative	Postoperative 1 st month	Postoperative 6 th month	p*
Group I	2.82 ± 0.41	2.72 ± 0.37	2.61 ± 0.35	0.046
Group II	3.53 ± 0.25	3.51 ± 0.31	3.39 ± 0.27	0.028
p**	0.001	0.001	0.001	

Group II (Pseudophakic patients).
p*: Independent t test p**: Friedmann ANOVA test

Table 2: Central corneal thickness (CCT) (micron) values measured preoperative, postoperative 1st and 6th months following pars plana vitrectomy in Group I (Phakic patients) and Group II (Pseudophakic patients).

CCT	Preoperative	Postoperative 1 st month	Postoperative 6 th month	p*
Group I	539.06 ±22.63	540.31 ±23.45	539.38 ±24.52	0.748
Group II	532.19±25.96	535.16± 23.94	533.28 ±25.89	0.178
p**	0.263	0.387	0.337	

p*: Independent t test p** : Friedmann ANOVA test

Increases in CCT can be related to the corneal edema occurred during more complicated surgeries in silicone-injected eyes. Corneal edema was documented upon biomicroscopical examination in patients with increased CCT.¹⁵ Seymenoglu et al. reported no significant change of CCT at the 1st and 3rd months following 23 G PPV in 29 patients measured with ocular response analyzer.¹⁶ Bouheraoua et al. reported corneal epithelial thinning at the 6th month following PPV with 360-degree laser retinopexy for retinal detachment measured by use of anterior segment optical coherence tomography.¹⁷

Penha et al. compared the ultrasonic and optical biometry in chicken eyes. The absolute measurements were different from measurements of both techniques. They found a high correlation between both techniques for ACD, but not for LT measurements. They reported that consistency and repeatability of optical biometry were better than ultrasonic biometry.⁽¹²⁾

It was thought that in vitrectomy, the Weiger's ligament is removed with anterior vitreous. The adhesion on the posterior aspect of the lens posterior capsule disappears and iris-lens plane becomes more flexible. In this study, it was tried to remove posterior hyaloid, anterior hyaloid and anterior vitreous, as much as possible. But it is difficult to standardize the technique of lens sparing PPV and amount of removed vitreous, which may be the reason for the different results obtained by different studies on this subject.

There were some limitations of the present study. It was difficult to standardize factors like patient characteristics, preoperative diagnosis, intraoperative procedures which may be effective on the results. The correlations between ACD and CCT variations and other oculometric parameters such as axial length, anterior segment volume, and posterior segment volume may give more information.

In our study, ACD measurements decreased and CCT measurements did not changed significantly at the 1st and 6th months measurements with respect to the preoperative measurements. But further studies are required for more information.

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