Optical Coherence Tomoghraphic Evaluation of Macula After Uncomplicated Phacoemulsification Surgery

Komplikasyonsuz Fakoemulsifikasyon Cerrahisi Sonrasında Makulanın Optik Koherens Tomografi ile Değerlendirilmesi

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ABSTRACT

Purpose: Macular edema is sight-threatening complication of cataract surgery, therefore a prompt diagnosis should be made with appropriate technique. Evaluation of ME can be done with optical coherence tomography (OCT).In this study, the effect of uncomplicated phacoemulsification surgery in macula evaluated with OCT.

Materials and Methods: 35 eyes of 34 cases with uncomplicated phacoemulsification surgery evaluated. Standard phacoemulsification surgeries were made by different surgeons. Spectral domain OCT measurements of the central macular region were taken preoperatively and post-operative fist day and three months.

Results: The preoperative best corrected visual acuity (BCVA) with log MAR was measured 2 at the lowest, 0.2 at the highest (mean 0.7). At the third month, BCVA was found between 0.2 and 0. BCVA was increased significantly at the post-operative third month (p =0.009). When preoperative OCT measurements compared with the third month OCT measurements there was 30.22 μm increase in mean OCT and this alteration was found statistically significant (p=0.00).

Conclusion: OCT is a sensitive method to detect ME and it can show macular thickness increment from early periods of follow-up. Due to significant improvement in BCVA of the patients, every increase in central macular thickness detected with OCT may not need urgent treatment.

Key Words: Cataract, phacoemulsification, macular edema, optical coherence tomography.

ÖZ

Amaç: Maküler ödem (MÖ), katarakt cerrahisinin görmeyi tehdit eden bir komplikasyonudur, bu nedenle uygun bir teknikle erken teşhis konulması önemlidir. MÖ tanısı optik koherens tomografi ile konulabilir (OKT).Bu çalışmada, OKT cihazı kullanılarak komplikasyonsuz fakoemülsifikasyon cerrahisinin makuladaki etkileri değerlendirilmiştir.

Gereç ve Yöntem: Komplikasyonsuz fakoemulsifikasyon cerrahisi geçirmiş olan 34 hastanın 35 gözü değerlendirilmiştir. Farklı cerrahlar tarafından standart fakoemülsifikasyon cerrahileri yapılmıştır. Merkezi makula bölgesinin OKT ölçümleri operasyon öncesi, post-operatif birinci günde ve post-operatif üçüncü ayda yapılmıştır.

Bulgular: Operasyon öncesi en iyi düzeltilmiş görme keskinliği (EDGK) LogMar ile 2 ile 0.2 arasında bulunmuştur (ortalama 0.7).Hastaların üçüncü ay EDGK 0.2 ile 0 arasında bulundu (0.008). Hastaların operasyon sonrası üçüncü ay EDGK anlamlı şekilde artmış bulundu (p=0.009). Preoperatif OKT ölçümleri ile post operatif üçüncü ay OKT ölçümleri karşılaştırıldığında ortalama 30.22 μm'lik bir artış vardı ve bu değişiklik istatistiksel olarak anlamlı bulundu (p=0.00).

Sonuç: MÖ tespit etmede OKT hassas bir metoddur ve maküler kalınlık artışını takibin erken dönemlerinden itibaren gösterebilir. Hastaların EDGK deki anlamlı iyileşme nedeniyle, OKT ile tespit edilen her merkezi makula kalınlık artışı acil tedavi gerektirmeyebilir.

Anahtar Kelimeler: Katarakt, fakoemülsifikasyon, maküler ödem, optic koherens tomografi.

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INTRODUCTION

Macular edema (ME) seen after cataract surgery is a well-known complication.[1] Although, modern surgical techniques decrease the occurrence of macular edema, It is still a sight-threatening and challenging problem 2,5.[2,3] The ophtalmoscopic examination can reveal ME in the small percentage of the cataract surgeries. However, angiography and optic coherence tomography (OCT) may show up to 10-20% of occurrence after cataract surgery.[4]

OCT is a useful method for the evaluation of the topographic anatomy of retinal structures.[5] Among different kind of devices, spectral domain OCT is widely used and reliable method.[6] It uses two beams of light. As one beam of the light wave passes trough ocular media another light wave acts as a reference. A camera captures images after reflectance of light from ocular media. Retinal layers show their own reflectance. This results in high-quality anatomic information comparable to histologic sections.

In this study, we present our results of the uncomplicated cataract surgery performed with phacoemulsification in central macular thickness (CMT) which was evaluated with OCT.

MATERIAL AND METHODS

General Information: A prospective cross-sectional study was designed in the ophthalmology department of Haseki Training and Education Hospital. An informed consent form was secured from all participated patients. We adhered to the tenets of Declaration of Helsinki. Local ethic committee approval was obtained. Patients were accepted for study after a detailed ophthalmologic examination between October 2008 and January 2009. Patients who were older than 40 years of age, previously untreated patients included. Patients who were having any ophthalmologic disease decreasing visual acuities such as degeneration of cornea and glaucoma were excluded. Any retinal disease and diabetes mellitus were considered as exclusion criteria. Uncomplicated phacoemulsification procedure was a rule. Detailed ophthalmologic examinations were performed preoperatively, one week, one month and three months after surgery. The best corrected visual acuities (BCVA) were obtained with Snellen chart and later converted to LogMAR equivalent for statistical purposes.[7, 8] Phacoemulsification Procedure: A standard phacoemulsification surgery was performed after a peribulber anesthesia with an equal mixture of 2% lidocaine and 0.5% bupivacaine. Divide and conquer or chip and flip techniques were selected according to patient or surgical conditions. Ultrasound energy was used in the continuous mode with changing parameters at different levels of surgery. An intraocular lens was delivered from a 3.2 mm corneal incision to the intracapsular bag. 0.1 ml cefuroxime at 10 mg/ml concentration was given intracamarally at the end of the surgery. Patients were received 1% dexamethasone and 0.3% lomefloxacin eye drops four times a day for three weeks. Surgeries were performed by different experienced surgeons.

Spectral Domain OCT Technique: All patients were evaluated with a spectral domain OCT (Copernicus, Optopol Technology) one day before the surgery and each control examination. This device uses 840 nm wavelength light source. It gathers approximately 25000 A-scans, near 6 μm axial resolution. A fovea centered macular map with diameters of 1mm, 3 mm, 6 mm was gained after mydriasis with 1% cyclopentolate or 1% tropicamide eye drop installation. Image qualities were given automatically by the device. Only the good quality images (score of ≥5/10) were considered for the study. All measurements were performed by the same surgeon (KA).

Statistic Analysis: The normality of the data was checked with Kolmogorov-Smirnov. Paired sample student t-test was used for analysis of quantitative differences of different measurements. When more than two groups were needed to be analyzed, one way ANOVA was used. A software was used for computation (SPSS 11.5). A p value less than 0.05 was considered significant.

RESULTS

35 eyes of 34 patients were suitable for this research. The number of male and female patients were 18 (51.4%) and 17 (48.6%), respectively. The ages of patients were ranging between 42 to 90 years (mean 65.9). Expert doctors operated 9 of the patients (25.7%). Assistant doctors operated 26 patients (74.3%) with the guidance of expert doctors. The BCVA of the patients were ranging from 2 to 0.2 (mean 0.7± 0.42) preoperatively. Post-operative first-day measurements of the BCVA were found between 1to 0 (mean 0.3±0.2). The third-month measurement of the BCVA of patients was in the range of 0.2 to 0 (mean 0.008 ± 0.03). BCVA of patients were found significantly increased at first postoperative day and third-month examinations (p=0.000 and p=0.009 respectively).

The OCT measurements of the patients were given in Table 1. The mean CMT measurements were found statistically significantly increased at postoperative first day and post-operative third months (p= 0.00 and p= 0.00 respectively).

The CMT alterations were also analyzed as the percentage change. Any of the patients showed more than 40% increase in CMT at postoperative first day. Only three patients (8.5%) showed more than 40% increase in CMT at 3 months after the operation. The results were summarized in Table 2.

DISCUSSION

Despite there are numerous improvements present in the surgical treatment of the cataract, macular edema is still a common challenging problem.[9,10] The OCT is a new and significantly improving technique for evaluation of various structures of the eye such as retina.[11] This study was to present our uncomplicated phacoemulsification surgery results in terms of the central macular thickness analysis. We have found a significant increase in central macular thickness of the patients at the post-operative period. However, this increase did not resulted in visual deterioration.

Table 1: *Table presents the preoperative and post operative central macular thickness measurements of the patients measured by OCT.*

	N	Minimum (μm)	Maximum (μm)	Mean (μm)	Std. Deviation
Preoperative OCT	35	130	192	153.74	14.360
Post-operative First Day OCT	35	133	207	164.37	19.344
Post-operative Third Month OCT	35	140	230	183.97	23.708

Table 2: *The percentage alteration in the CMT of patients measured with OCT.*

	N	Minimum(%)	Maximum(%)	Mean	Std. Deviation
Preoperative and first postoperative day OCT percentage change	35	-5.59	36.43	7.13	10.82
Preoperative and post-operative third month OCT percentage change	35	– 4.76	41.25	19.79	11.96

The incidence of the ME is reported at varying rates.[4] It can be seen after post operative period mainly six to eight weeks after treatment. As OCT is a sophisticated method for detection ME it may show very early alterations. However, every ME developing after phacoemulsification may not be so severe for considering clinically as significant.[12-14] There are some suggestions in the literature for the evaluation of CMT for detection of ME. One of the most logical one is the percentage change in CMT. Kim et al offered a definition of ME if there is more than 40% increase in CMT (34). In our study, we found an increment in CMT but this was less than 40% in most of the cases (p=0.85)

Perente et al show a decrease in CMT one day after the surgery.[13] They associate this to the preoperative limitations of the OCT measurements. Kim et al suggested routine OCT measurements for the early detection of ME in the high-risk patients such as diabetes mellitus. They also underline that OCT evaluation may not be cost effective for every cataract patient32. We did our research on patients only with cataract complaint. We found a clinically insignificant increment in CMT. Therefore, we also think that follow-up with OCT may not be cost effective for every cataract patient.

There were some limitations of this study. Firstly, small sample size is one of them. Secondly, BCVA increased after surgery but, we also found an increment in CMT. This increment may alter contrast sensitivity or microperimetry characteristics of the patients.

CONCLUSION

Macular edema may be detected with OCT in the early periods of cataract surgery. This is important for the management of the patients.

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