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ALTERATIONS IN CENTRAL MACULAR THICKNESS AFTER UNCOMPLICATED PHACOEMULSIFICATION CATARACT SURGERY AND INTRAOCULAR LENS IMPLANTATION

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Abstract

Evaluation of central macular thickness changes with optical coherence tomography (OCT) in patients with uncomplicated phacoemulsification cataract surgery and intraocular lens implantation. 44 eyes of 30 patients who underwent uncomplicated phacoemulsification cataract surgery and intraocular lens (IOL) implantation were included in this study. Central macular thickness measurements were performed preoperatively and postoperative 2nd week, 1st and 3rd months with OCT. Central macular thickness values were measured at the central 1x1 mm area obtained from fovea centered 6x6 mm macular map in the OCT measurements. Preoperative values were compared with the values in the postoperative period. The mean age of the patients was 66.7 ± 8.7 years. The mean central macular thickness values were $268.5 \mu\text{m}$ preoperatively, $269.3 \mu\text{m}$ 2 weeks after surgery, $275.9 \mu\text{m}$ 1 month after surgery and $274.9 \mu\text{m}$ 3 months after surgery. There was no statistically significant change in the postoperative two weeks period compared with the preoperative measurements. ($p=0.536$). Compared to the preoperative values, central macular thickness significantly increased 1 month and 3 months after the surgery.

There was a statistically significant change in central macular thickness measurements at 1st month ($p < 0.001$) and 3rd months ($p < 0.001$) compared with the preoperative values. Our data indicate that an increase in central macular thickness is not rare after uncomplicated phacoemulsification cataract surgery. Compared to the preoperative measurements we have demonstrated an increase in central macular thickness in the postoperative period.

Key Words: Macular thickness, Optical coherence tomography (OCT), Phacoemulsification

Özet

Komplikasyonsuz fakoemulsifikasyon katarakt cerrahisi ve göz içi lens implantasyonunun santral makula kalınlığına etkisinin optik koherens tomografi (OKT) ile değerlendirilmesi. Çalışmaya komplikasyonsuz fakoemulsifikasyon katarakt cerrahisi ve göz içi lens (GİL) implantasyonu uygulanan 30 hastanın 44 gözü dahil edildi. Santral makula kalınlığı preoperatif, postoperatif 2. hafta, 1. ay ve 3. ayda OKT ile ölçüldü. Santral makula kalınlığı 6x6 mm'lik fovea merkezli OKT ölçümlerinin 1x1 mm'lik santral kısmı değerlendirilerek belirlenmiştir. Preoperatif değerler postoperatif dönemdeki değerlerle kıyaslanmıştır.

Hastaların ortalama yaşı 66.7 ± 8.7 yıldır. Ortalama santral makula kalınlığı değerleri preoperatif dönemde $268.5 \mu\text{m}$, postoperatif 2. haftada $269.3 \mu\text{m}$, 1. ayda $275.9 \mu\text{m}$ ve 3. ayda 274.9 olarak tespit edildi. Santral makula kalınlığı değerleri postoperatif 2. haftada preoperatif döneme kıyasla 14 gözde azaldı, 7 gözde değişmedi, kalan 23 gözde ise artmış olarak izlendi. Postoperatif 2. hafta ölçümleri preoperatif döneme kıyaslandığında istatistiksel olarak anlamlı bir fark bulunamadı ($p = 0,536$). Santral makula kalınlığı postoperatif 1. ay ve 3. ayda preoperatif döneme kıyaslandığında ise artmış olarak izlendi. Postoperatif 1. ay ve 3. ay ölçümleri preoperatif döneme kıyaslandığında istatistiksel olarak anlamlı fark tespit edildi (postoperatif 1. ay $p < 0.001$, 3. ay $p < 0.001$). Sonuçlarımız, komplikasyonsuz fakoemulsifikasyon katarakt cerrahisinden sonra santral makula kalınlığında artış gelişmesinin nadir olmadığını göstermektedir. Santral makula kalınlığında postoperatif dönemde preoperatif döneme kıyasla artış olduğu çalışmamızda tespit edilmiştir.

Anahtar Kelimeler: Fakoemulsifikasyon, Makula kalınlığı, Optik koherens tomografi (OKT)

1. Introduction

The development of modern surgical techniques in cataract surgery has led to a decrease in postoperative complications (Linebarger, 1999). The macular edema is one of the complications after cataract surgery (Kessel, 2014). There are some reasons associated with formation of macular edema such as preoperative physiological and pathological characteristics of the patient, the surgical method used, the medications used during the operation, posterior capsule integrity, intraocular lens (IOL) placement (Rossetti, 2000).

Phacoemulsification (Phaco) is one of the cataract surgery techniques which is mostly performed currently. Although macular edema formation is observed less frequently with phaco, it is still an important postoperative complication because it reduces visual acuity of the patients and treatment efficacy is limited (Sönmez, 2007). Macular edema is seen in approximately 1% of patients with no other ocular or systemic disease who had undergone uncomplicated phaco surgery (Quillen, 2002). Previous studies showed that macular edema could be seen 10% - 20% with ophthalmic examination, optical coherence tomography (OCT) and fundus fluorescein angiography (FFA) [Fu, 2004]. Macular edema formation generally occurs approximately 1-3 months after the surgery or less frequently years later the surgery.

Ophthalmic examination with direct and indirect ophthalmoscopes has limited efficacy to diagnose macular edema quantitatively. OCT is a fast, non-invasive, reliable and reproducible method to diagnose macular pathologies like macular edema, choroidal neovascularization, epiretinal membranes (Liu, 2014).

In our study, we aimed to evaluate the effects of uncomplicated phaco cataract surgery and IOL implantation on central macular thickness in patients with cataract.

2. Material and Methods

In this prospective study, 44 eyes of 30 patients were evaluated with biomicroscopic examination and OCT measurements. All patients underwent a complete ophthalmic examination including visual acuity assessment with Snellen chart, intraocular pressure measurement, slit lamp biomicroscopy and fundus examination. Subjects with an ophthalmic disease other than cataract and a history of ocular surgery and systemic disease were excluded. The study was approved by the Ethics Committee of Necmettin Erbakan University Meram Faculty of Medicine

in accordance with principles with the Declaration of Helsinki. Written informed consent was obtained from all patients included in this study.

OCT measurements were performed with a spectral domain OCT (Spectralis®, Heidelberg Engineering, Heidelberg, Germany). All phaco cataract surgeries were performed under topical anesthesia by experienced surgeons. Medications that were used pre and postoperative period and parameters of the phaco machine were not different among the study participants. Phaco and in the bag IOL surgeries completed uneventfully. OCT measurements performed by the same examiner. Preoperative central macular thickness measurements compared with the postoperative second week, first month and third month values.

Statistical analysis was performed with the SPSS (Statistical Package for Social Science, SPSS Inc. Chicago, IL) 17.0 package program. In our study normalisation tests performed with kolmogorov smirnov test. Parametric study variables were compared with t-test for two independent groups and one-way ANOVA test for more than two independent groups. Dependent variables were compared with paired sample t-test. Friedman's test also performed for non-parametric results. A P value of less than 0.05 was considered as statistically significant.

3. Results

44 eyes of 30 patients (30 male and 14 female) were included. The mean age of the study participants was 66.7 ± 8.7 years.

All preoperative and postoperative best corrected visual acuity (BCVA), intraocular pressure (IOP) and central macular thickness values are demonstrated in Table 1. A statistically significant increase was detected in BCVA with comparison of preoperative and postoperative 2nd weeks, 1st month and 3rd months measurements (postoperative 2nd weeks $p < 0.001$, postoperative 1st month $p < 0.001$, postoperative 3rd months $p < 0.001$). The difference in BCVA showed no statistical significance between the postoperative 1st month and 3rd month examinations ($p = 0.836$).

Preoperative and postoperative comparisons of IOP values showed that there is no statistically significant difference between preoperative and postoperative 2nd week values ($p = 0.365$). Comparisons of the IOP measurements between preoperative and postoperative first and third months showed that there are statistically significant differences between the groups (preoperative vs. 1st month, $p = 0.008$; preoperative vs. 3rd month $p < 0.001$). Postoperative 2nd week and 1st month measurements were also significantly different ($p < 0.001$).

Table 1. Preoperative and postoperative measurements of best corrected visual acuity, intraocular pressure and central macular thickness in patients who underwent cataract surgery.

	Best Corrected Visual Acuity, logMAR (mean±SD)	Intraocular pressure, mmHg (mean±SD)	Central macular thickness, µm (mean±SD)
Preoperative	0.60 ± 0.26	15.5 ± 2.6	268.6 ± 29.9
Postoperative 2 nd week	0.19 ± 0.22	16 ± 3.6	269.3 ± 25.6
Postoperative 1 st month	0.05 ± 0.12	13.5 ± 3.2	275.8 ± 33.7
Postoperative 3 rd month	0.04 ± 0.14	12.1 ± 2.6	274.8 ± 37
P values*			
Preop. vs. Postop. 2 nd week	<0.001	0.365	0.536
Preop. vs. Postop. 1 st month	<0.001	0.008	0.001
Preop. vs. Postop. 3 rd month	<0.001	<0.001	<0.001
Postop 2 nd week vs. Postop. 1 st month	<0.001	<0.001	0.006
Postop 2 nd week vs. Postop. 3 rd month	<0.001	0.153	0.001
Postop 1 st month vs. Postop. 3 rd month	0.836	0.506	0.483

*Friedman's Test

Central macular thickness was increased in postoperative 2nd week compared to the preoperative measurements, whereas there was no statistically significant difference between preoperative and postoperative 2nd week values (P=0.536). Central macular thickness at 1st and 3rd month did not show any statistically significant difference (P=0.483).

Correlation analysis revealed no significant correlations between central macular thickness and age, postoperative IOP and BCVA change.

4. Conclusion

Macular alterations after modern cataract surgery may still be observed despite all the development of technologies in ocular surgery. The incidence of macular edema after cataract surgery varies between 0.2% and 20% in different studies (Flach, 1998). In this study we observed an increase in central macular thickness up to three months in postoperative period especially at the 1st and 3rd months. Studies also showed that after uncomplicated cataract surgery macular thickness increases from postoperative first week until 6 months after surgery (Šiško, 2015). In a study conducted by Gharbiya et al., 2013, It was detected that the central macular thickness increased after the first week of uncomplicated phaco cataract surgery.

Kemer Atik et al., 2021, compared 36 patients with pseudoexfoliation syndrome and 51 patients without pseudoexfoliation syndrome after uncomplicated cataract surgery. It was indicated that there was no statistically significant difference between these groups in macular thickness measurements throughout the 6 months follow-up period. In this study none of the patient's have pseudoexfoliation syndrome. Central macular thickness values were increased in postoperative first and third month measurements compared to preoperative values similar to the results of the non-pseudoexfoliation group in the above study.

In a study by Jurecka et al., 2007, increase in retinal thickness was observed after cataract surgery and peaked at the first and second months. Our study showed similar results with this study in the postoperative period. We found that central macular thickness reached the highest level at postoperative first and third month measurements. Lobo et al., 2004, showed that increase in retinal thickness persists in 22% of patients until thirty weeks after surgery. Our study has no long-term period results after three months to detect the long-term effect of cataract surgery on macular thickness.

Ayyala et al., 1998, evaluated macular thickness after uncomplicated cataract surgery and showed that the increase in macular thickness started at the first day and persisted until one month after surgery. Similar results were published by Binder et al., 2004, showing an increase in macular thickness especially at the postoperative first month.

In this study, we aimed to evaluate the central macular thickness change in patients who underwent uncomplicated phaco cataract surgery and IOL implantation. Our study contributes previous studies about increasing macular thickness as result of uncomplicated phaco cataract surgery. These results also contributes to understand the effects of surgery on macular regions structure. Limited number of patients and short follow-up period are the main limitations of our study. Larger prospective randomized studies are needed to investigate the effects of all these variables.

Conflicts of interest

The authors declare that there are no potential conflicts of interest relevant to this article.

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