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Assessment of Cystoid Macular Edema after Phacoemulsification (One week and One Month Post Operative) by Optical Coherence Tomography (OCT)

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Abstract

Background and objectives: Following a successful cataract surgery with intraocular lens implantation, cystoid macular oedema can be one of the leading causes to visual impairment. We aimed to evaluate the postoperative thickness and alteration of the central macular thickness in healthy patients with senile cataract and diabetics following uneventful phacoemulsification surgery using Optical Coherence Tomography.

Methods: A retrospective analysis was conducted between April and September,2022, at the public Duhok Eye Hospital in Duhok city. Data were collected from patients who were undergoing simple uneventful phacoemulsification and intraocular lens implantation. Every patient was prepared to be enrolled for cataract surgery with the preoperative assessment of central macular thickness and then to be reassessed and compared after a week then one month postoperatively.

Results:

The post operative comparison between the mean central macular thickness values in group 1, at week one, and after one month, with the group 2's mean revealed statistically significant differences. Group 1's mean age was 55.30 ± 5.66 years while group 2's mean age was 60.20 ± 10.74 years. There were 45 (41%) females and 75 (59%) males in total for the study group1 consisted of 48.5% females and 51.5% males, while group 2 had 33.3% females and 66.7% males.

Conclusion: After a safe and uneventful phacoemulsification surgery, there was a trivial variation in the central macular thickness between normal nondiabetic people and diabetic persons without complication, before and after operation.

Keywords: Cystoid macular edema, Coherence Tomography, Macular thickness, Optical, Uneventful phacoemulsification

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Introduction:

A cataract is a vision-impairing opacification or alteration in the homogeneity of the lens within the eye.[1] In developed countries, it affects only 5% of the population, whereas in middle- and low-income countries, it accounts for 50% of blindness. As of right now, intraocular lenses (IOLs) made of synthetic material are implanted and the cataract is removed using small-incision phacoemulsification.[2]A frequent pathologic outcome of the retina, cystoid macular edema CME can result from unlimited pathological conditions, like diabetic retinopathy, intraocular inflammation, central or branch retinal vein occlusion and most frequently after cataract extraction.[3] According to histological studies, the macular region shows clinically detectable radially orientated cystoid spaces filled with fluid that is visible under a microscope. These cysts appear to be regions of the retina where the cells have moved. This review evaluates the various diagnostic methods for determining the condition, gives a brief synopsis of the pathophysiology and etiology of CME, and then evaluates treatment strategies for the illness.[2,4] Diabetic patients were found to have the highest incidence of CME among a wide range of local, systemic, and surgery-related conditions. Cystoid macular edema is a major cause of vision loss after cataract surgery and OCT is an excellent method with high-resolution, cross-sectional imaging that directly measures macular thickness.[5] In the initial postoperative week to a month following surgery, both diabetic and nondiabetic patients were included in this prospective comparative study to evaluate the impact of a safe phacoemulsification technique with IOL implantation on central macular thickness. The central macular thickness CMT, which was utilized to compare the study subjects among themselves, coincided the average thickness of each spot in the 1-mm-diameter central macular subzone of the Early Treatment of Diabetic Retinopathy Study.[4] Prior to surgery, as well as one week and one month afterward, the central macular thickness was measured with OCT, and the measurements of the two sets were compared.[1,5]Following surgery, the macular thickness in the normal healthy people and those with diabetes was increased at the end of the first week and one month, compared to post surgical data.[6] This study showed that, even in healthy eyes, the influence of cystoid macular edema is frequently seen following phacoemulsification surgery.[7,8] In general, the average cystoid macular edema following phacoemulsification is estimated to be 0.1 to 2% even in healthy eyes. The incidence of cystoid macular edema depends on the type of surgery.[9] The use of anti-inflammatory medications, steroids, prior and after operation has shown to be effective in reducing the incidence of postoperative cystoid macular edema. According to a theory, diabetic patients who already have diabetic macular edema involving the center have higher rate to develop CME postoperatively.[10] Others suggested that pre-existing DME is not a must for the development of postoperative cystoid macular edema, but those reports were made before optical coherence tomography (OCT) technology was accessible. Follow-objective and subjective OCT-based data. In our study the assessment of macular changes in subjects with and without diabetes at one week and one month following simple phacoemulsification with posterior capsular lens implantation.[10]

Patients and methods

A retrospective cross-sectional analysis was done on data from patients after cataract extraction by uneventful phacoemulsification with intraocular lens implantation between April and September 2022 on 120 patients (120) eyes with history of diabetes in one group and nondiabetic senile cataract in the

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other group. The research protocol ethics committee, and the Duhok Eye Hospital, all granted their ethical approval and this involved all of the carefully chosen patients who were preparing for cataract surgery. All patients were selected at the public Duhok Eye Hospital in Duhok City and were ready to be enrolled for cataract surgery in this study. Based on the following inclusion and exclusion criteria, the patients were separated into two groups: 60 patients with senile cataracts were scheduled to have a foldable intraocular lens implanted after phacoemulsification and the other 60 patients with well-controlled blood sugar levels who did not have diabetic retinopathy or diabetic complications were scheduled to have a foldable intraocular lens implanted in a similar setting. The 1st group had two inclusion criteria: uncomplicated cataract, and age over than 40. Individuals who underwent complex cataract surgery, had intraocular pressure greater than 21 mmHg, had a dense white cataract for which OCT was not possible, or possessed any eye diseases, such as glaucoma, uveitis, or age-related macular degeneration, that may have an impact on central macular thickness were not allowed to participate in the research. Additionally, patients who had previously undergone eye surgery or who had a history of macular edema in the other eye were disqualified as well. Similar inclusion criteria applied to the 2nd group (well-controlled blood sugar diabetic patients), who were diagnosed with diabetes mellitus of any duration, had their blood sugar levels equal or below 200 mg and a HbA1C equal or below 7%, and showed no signs of diabetic retinopathy on fundoscopic examination and OCT. Apart from the same exclusion standards for group 1, pregnancy, is also excluded. Pre-and postoperative central macular thickness of the central 1000-µm diameter area was measured using OCT at the first- and fourth-weeks following surgery. All patients were thanked for their participation and cooperation in this study and performing OCT on regular time for a precise assessment. Each of them signed a written informed consent form. The Kurdistan Higher Council of Medical Specialties Ethics Committee accepted the study protocol. The data were 1st entered into an Excel spreadsheet before being transferred to a statistical package for social sciences file version 24(SPSSv24) for analysis. Mean and standard deviations serve to represent continuous variables, whereas numbers and percentages serve to represent discrete variables. The T test for two independent samples was used to investigate the significance of the link between discrete variables. The data were subjected to multiple matched correction and repeated measure analysis. Statistics were deemed significant if P value is 0.05 or less.

Results

One hundred twenty patients were enrolled in this study and divide into two groups Group 1's mean age was 55.30 ± 5.66 years while group 2's mean age was 60.20 ± 10.74 years (P = 2.50). There were 45 (41%) females and 75 (59%) males in total for the study Group1 consisted of 48.5% females and 51.5% males, while Group 2 had 33.3% females and 66.7% males (P = 2.15) as shown in Table (1). Table 2 illustrates the macular thickness during the preoperative time then at week one, and at month one postoperatively, the mean central macular thickness CMT values in group 1 were 250.02 ± 20.800, 260.75 ± 18.010, and 265.20 ± 23.075 µm, respectively. Group 2's mean central macular thickness CMT changes were statistically significant (both P-values above 0.001) when compared to preoperative, postoperative periods of first week and one month. There was a significant difference (p-value below 0.001) in the mean central macular thickness changes at week 1 and one month postoperatively.

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Table (1): This table describes the age and gender classification of research participants between the two sample

Age-Groups (Years)	Group 1 Non diabetics with senile cataract		Group 2 Controlled diabetics with cataract	
Gender	Men	Women	Men	Women
41–50	7	4	3	2
51–60	18	13	20	8
61–70	7	5	10	5
> 70	3	3	7	5
Total	35	25	40	20
	60		60	

Table (2): The difference in mean macular edema from baseline to the 1st week and 1st month after surgery was shown using NOVA and multiple matched corrections

Patients	Group 1 Non diabetics with senile cataract	Group 2 Controlled diabetics with cataract
Pre-op CMT	250 ± 20	255 ± 17
1st week post-op ME	260 ± 18	259 ± 16
One-month post-op ME	265 ± 23	266 ± 18
Difference between the pre-op baseline and the mean post-op ME in 1st week.	6.850 ± 10.324	2.795 ± 7.066
Difference between the mean ME at the first postoperative week and the preoperative baseline	9.130 ± 10.056	11.730 ± 8.740
Differences in the mean ME between the 1st week and one month after surgery	2.850 ± 8.990	7.950 ± 6.250
ME, macular edema measurement in pre and postoperative periods		

Discussion

Early postoperative phase effects of cystoid macular edema in participants with and without diabetes were evaluated in a planned cross-sectional study of a safe, uncomplicated phacoemulsification operation with IOL implantation.[10] Every site in the 1-mm-diameter central macular area had an average thickness that matched the cystoid macular edema, which was used to compare each patient with one another .[11] The cystoid macular edema was measured using OCT by the end of the first week after operation and then one month later . [12]A comparison was made between the results of the two study sets. In both groups, after the 1st week and then one month postoperatively, the macular thickness was considerably higher than the preoperative value.[13] This swelling persisted in all participants in both for up to two months after surgery.[14] These findings demonstrated that the influence of central macular thickness in well-controlled diabetes individuals without diabetic retinopathy did not alter statistically from that of healthy non-diabetic participants after a safe successful phacoemulsification. That is to say, at the first week and one month after simple phacoemulsification, patients who were not diabetic and well-controlled diabetics without DR had a similar intergroup thickening of the central macular area, and there was no statistically significant difference between the two groups.[15,16,17] After cataract surgery, the incidence of macular edema in diabetics (with or without diabetic retinopathy) ranges from 31% to 81%. Subclinical CME and retinal leakage are two modest changes in the retina that might appear even after a successful cataract surgery. These subclinical changes in macular thickness after cataract surgery are easily detected with fluorescein angiography and optical coherence tomography. According to some research, diabetic people who also possess a history of diabetic

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macular edema may be more susceptible to cystoid macular edema after cataract surgery.[19,20] Conversely, number of academics have discovered that macular edema following surgery is possible without prior diabetic macular edema. Although these studies were done prior to the development optical coherence tomography technology and fluorescein angiography for precise diagnosis of cystoid macular edema. For the following reasons, OCT is the chosen investigative modality for our observational investigation. The results of many studies suggesting that patients with diabetes who undergo cataract surgery do not experience an increase in central macular thickness or diabetic macular edema are not totally consistent.[19] An observational trial with more than 4,500 diabetics who did not have macular edema prior to surgery revealed that macular edema following surgery was more common in diabetics than in non-diabetics (P below 000.1).[20] Those researchers also discovered that diabetic people without diabetic retinopathy were more likely to develop retinal edema than non-diabetic patients. But after a conventional cataract surgery, diabetics without diabetic retinopathy had thicker maculae after all follow-ups for up to one year after the procedure, with regard to baseline values or a group of patients who were not operated.[19,20] Compared to the eyes of healthy controls, individuals with diabetes who do not have diabetic retinopathy had higher central macular thickness and an increased risk of cystoid macular edema after cataract surgery, which might have affected the patients' poor visual acuity.[20]There was no substantial rise in CMT readings to be recorded following phacoemulsification at the 1st up to 6th months after the procedure in a recent systematic review of diabetes individuals without diabetic retinopathy. Several studies are suggesting a link between cataract surgery and the development of diabetic retinopathy, while other studies have failed to find any evidence of an actual linkage and have explained the changes in the diabetic retina as an inevitable consequence of the condition.[17,18] In accordance with OCT, the preoperative central macular thickness for the two groups in our research was the exact same. These findings are in line with research by Massin et al. that revealed the same in retinal thickness between people who were healthy and diabetics without cystoid macular edema.[19]Furthermore, despite the fact our study was unable to identify a significant statistical difference between the two groups, a small number of other studies have found an increase in the CMT postoperatively in well-controlled diabetics without DR.[17,19,20] That is why in order to precisely define the impact of proper control of blood sugar and the effect of diabetic retinopathy on the visual outcome of the patients after having a safe phacoemulsification, surely more studies with additional prolonged aftercare are needed. In the final analysis, the duration of the patients' evaluation period, which ranges between 1st week till one month after operation, constrains this research's scope and limits any solid clinical results from being drawn from the data.[20]

Conclusion

As a comparison between the controlled diabetic patients as well as healthy nondiabetic individuals, there is a rise in the central macular thickness after a safe phacoemulsification at the1st week and then one month later in both patients group but effective control of diabetes is thought to be required after an uncomplicated, successful phacoemulsification procedure in as to avoid an increase in central macular thickness and postoperative macular edema. Nevertheless, long-term follow-up studies may be required to create the management algorithm that will direct our surgical approaches. The preoperative OCT-

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measured CMTs in the two groups are nearly identical, according to our research.

Conflict of interest

The authors report no conflicts of interest.

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