Evaluation of macular changes after uneventful phacoemulsification surgery in diabetic patients using fluorescein angiography and optical coherence tomography.

Magdy E. Khallaf, Younis E. Abd-Elhafez, Mohamed Z. Eid and Ezz Eldin R. Ezz Eldin.

Ophthalmology Department, Faculty of Medicine, Al-Azhar University, Egypt.
drezzstar84@gmail.com

Abstract: Background: Macular edema (ME) is a major cause of vision loss after cataract surgery in diabetic patients. Proper and early diagnosis of post-cataract complications is of utmost importance. **Aim:** to evaluate the influence of uncomplicated phacoemulsification on macular thickness and macular changes in the postoperative period in diabetic patients. **Patients and methods:** This study included 100 eyes of cataractous patients attending the outpatient ophthalmology clinic of Al-Azhar University hospital. The included patients were classified into 2 groups: the first included 50 eyes of diabetic patients with no clinical fund us changes, and the second included 50 eyes of normal patients. All patients were submitted to full history taking, clinical and ophthalmological examination. All were evaluated preoperatively and postoperatively at one day, one weak, one month, 3 and 6 months. **Results:** There was significant decrease in study group when compared to control group as regard to preoperative BCVA (0.95±0.12 vs 0.86±0.17 respectively). There was significant improvement of BCVA postoperatively when compared to corresponding preoperative values in both groups, while IOP revealed that, there was no significant difference at 1, 3 and 6 months when compared to corresponding values at 1 week. Postoperative fundus examination revealed that, there was no abnormality detected at 1 week postoperative; while at 1 month, 5 eyes (10.0%) in diabetic group and 3 eyes (6.0%) in non-diabetic group showed lost foveal depression and macular thickening. CSFT (Central Subfield Foveal Thickness) revealed that, there was no significant difference between diabetic and non-diabetic groups preoperatively; but at 1, 3 or 6 months postoperatively, there was significant increase of CSFT in diabetic group when compared to non-diabetic group. In addition, there was significant increase of CSFT at 1, 3 and 6 months PO when compared to corresponding preoperative values in each group separately. **Conclusion:** There is a subclinical increase in central retina thickness in diabetic and non-diabetic patients after uncomplicated phacoemulsification, which may be detected clinically and by FFA also can be quantified by OCT.

1. Introduction

Macular edema (ME) is a major cause of vision loss after cataract surgery in patients with diabetes **(Gharbiya *et al*., 2013)**. Identifying predisposing risk characteristics to stratify diabetic patients would aid in early detection, treatment and prophylaxis **(Kim *et al*., 2007).** Preexisting maculopathy was found to be an independent risk factor for failure to achieve good postoperative vision **(Tsai *et al*., 2008).** Posterior vitreous detachment (PVD) progression has been described during phacoemulsification because of the entrance of liquefied vitreous into the subhyaloidal space and subsequent dissection remaining adhesions between the posterior vitreous cortex and internal limiting membrane. Furthermore, after cataract surgery, the progression of PVD is accelerated by the increased anterior posterior traction force combined with accelerated vitreous liquefaction attributable to light-induced reactive oxygen species and decrease of protein concentration **(Ivastinovic *et al*., 2012).** Subtle macular pathologies can be identified by non-invasive tests such as OCT which is usually adequate for identification of the problem. A retinal referral is usually needed for management and counseling, with the notable exceptions of cystoid macular edema and diabetic maculopathy developing de novo after cataract surgery, which can be treated with steroids and nonsteroidal anti-inflammatory drugs for 6-8 weeks and referral considered only if the condition is not resolving **(Loewenstein and Zur, 2010).**

Fundus fluorescein angiography (FFA) is a very useful procedure for the actual diagnosis and for the management and control of various ocular conditions. It is also very important in studying the evolution and treatment of numerous retinal, choroidal, and optic nerve pathologies, being essential to delineate the abnormal areas in situations like choroidalneovascular membrane **(Escaravage *et al*., 2006).** Optical coherence tomography (OCT) is a method for high-resolution cross-sectional imaging that directly measures retinal thickness. It uses light to detect relative changes in reflection at optical interfaces and

has a theoretical axial resolution of 10 to 14 μm (**Kusbeci *et al*., 2012).** In diabetics, macular edema can be cystoid or not, but when associated with clinical macular thickening of specified parameters, it is defined as clinically significant macular edema (CSME) **(Escaravage *et al*., 2006).** CSME is an important risk factor for decreased vision after cataract surgery. Thus, after cataract surgery, angiographic ME in diabetics may be from pseudophakic cystoid macular edema (CME) or from diabetic ME and by itself may not be clinically useful in predicting visual acuity; however, macular thickening may be clinically important **(Gharbiya *et al*., 2013)**.

The aim of this study is to evaluate the influence of uncomplicated phaco-emulsification on macular thickness and macular changes in the postoperative period in diabetic patients.

2. Patients and methods

This is a prospective study that included 100 eyes of cataractous patients attending the outpatient ophthalmology clinic of Al-Azhar University hospital (Damietta branch) during the period from June 2014 to January 2016. The included patients were classified into 2 groups: the first included 50 eyes of diabetic patients with no clinical fundus changes, and the second included 50 eyes of normal patients.

Exclusion criteria: patient with one of more of the following was excluded from the study: 1) Patients who refuse to participate in the study, 2) Media opacity that interfere with preoperative evaluation, 3) Congenital cataract, 4) Traumatic cataract, 5) Macular edema and/or diabetic retinopathy, 6) Previous intraocular surgery, 7) Topical glaucoma medications, 8) Intraoperative or postoperative complications (e.g. posterior capsular rupture, bleeding, vitreous loss…etc.), and 9) History of uveitis, glaucoma and amblyopia.

Preoperative evaluation included history taking, general examination, and laboratory investigations (fasting blood glucose, 2hour postprandial blood glucose, Glycosylated hemoglobin (HbA 1C), Coagulation profile, and Liver and Kidney function tests). In addition, preoperative ophthalmological examination was done and included the following: uncorrected visual acuity (UCVA), pupil reaction, refraction using Nidek automated refractometer, best corrected visual acuity (BCVA), slit lamp biomicroscopy to assess corneal clarity, depth of anterior chamber, state of pupil dilatation, lens morphology, intraocular pressure (IOP), fundus examination: slit lamp biomicroscopy, assessment of ocular motility in all direction of gaze, and examination of ocular adnexa. Preoperative investigation included calculation of IOL power and

axial length by Sonomed Biometry model 5500, fundus fluorescein angiography (FFA) by Topcon TRC 50 Digital fundus camera, and optical coherence tomography (OCT) by Topcon 3D 2000 OCT.

Surgical Technique: Phacoemulsification was done by Constellation machine (Alcon, Forte Worth, TX, USA). Before surgery, all pupils were dilated with 1% Cyclopentolate and 10%Phenylephrine, also ocular sterilization with a drop of povidine iodine 5% was used. Cataract surgery was performed under local anesthesia or general anesthesia, Anterior limbal scratch incision using keratome (2.4, 2.8, 3 and 3.2mm), formation of the anterior chamber by viscoelastic materials (sodium hyaluronate10%, hydroxypropyl methyl-cellulose20%), anterior continuous circular curvilinear capsulorrhexis performed under viscoelastic material, two side ports was made by MVR or Superblade, hydro-dissection, hydrodelineation, then Phacoemulsification of the nucleus by standard technique (Stop and Shop and Carousel techique), irrigation aspiration, and implantation of intraocular lens in the bag, finally hydration of the wound and the 2 paracentesis ports. Recording the phaco power and time to exclude cases with prolonged phaco power and time. Eyes that had any intraoperative or postoperative complications were excluded from the study. Then all patients will receive the same standard medications for 4 weeks, consisting of a combination of steroid (Prednisolone acetate 1%) and antibiotic (Moxifloxacin 0.5%) eye drops beginning with four times daily, which will be tapered by 1 drop daily each week. Postoperative examinations were done at one day, one weak, one month, three months and six months after surgery. At one day after surgery, slit lamp biomicroscopy was done for state of main incision, cornea for clarity, edema and ulcers, anterior chamber (depth and contents), any iris abnormality, and intraocular lens regarding its position and any deposits on its surface. Subsequent visits evaluated BCVA, slit lamp biomicroscopy as in the first day, IOP measurement and fundus examination.

Statistical analysis:

Data were analyzed using Statistical Program for Social Science (SPSS) version 18.0. Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage. The following tests were done: Independent-samples t-test of significance was used when comparing between two means. Chi-square (X^2) test of significance was used in order to compare proportions between two qualitative parameters. P-value <0.05 was considered significant.

3. Results

The present study included 55 patients; 28 in diabetic group and 27 in non-diabetic group and there was statistically non-significant difference between both groups as regard to sex distribution (males represented 32.1% and 40.7% of diabetic and non-diabetic groups respectively). In addition, age ranged from 45 to 67 years with a mean age of 57.58 years; and there was no significant difference between diabetic and non-diabetic patients (the mean age in diabetic group was 56.50 years and 58.70 years in non-diabetic group). Ten patients had unilateral cataract and 45 patients had a bilateral cataract. Thus, 100 eyes were included in the study. In diabetic group there was 6 unilateral eyes and 22 bilateral eyes (50 eyes total); while in non-diabetic group, there was 4 unilateral eyes and 23 bilateral eyes (thus 50 eyes total); and there was statistically non-significant difference between both groups. In diabetic group, treatment was in the form of insulin therapy in 8 patients (28.6%) and non-insulin anti-diabetic drugs in 20 patients (71.4%) (Table 1). Preoperative IOP ranged from 15 to 20 with a mean of 17.84; and there was no significant difference between study and control groups. In addition, axial length ranged from 19.34 to 25.11 mm with a mean of 22.63 and there was no significant difference between both groups (22.55±1.16 vs 22.71±1.22 respectively). Preoperative best corrected visual acuity ranged from 0.6 to 1.1 with mean of 0.91 and standard deviation of 0.15; and there was significant less in study group when compared to control group (0.95±0.12 vs 0.86±0.17 respectively). Preoperative CSFT ranged from 199 to 237; with a mean of 221.61± 9.44; and there was no significant difference between study and control groups (222.12±9.80 vs 221.10±9.12 respectively). In addition, preoperative inner circle ranged from 251 to 290 with a mean of 263.47±7.48; and there was no significant difference between diabetic and non-diabetic groups (264.42±8.02 vs 262.52±6.85 respectively). Finally, preoperative outer circle ranged from 219 to 260; with a mean of 233.87±6.12, and there was no significant difference between both groups. Preoperative TMV ranged from 6.60 to 7.40 with a mean of 6.78±0.15; and there was no significant difference between study and control groups (6.81±0.16 vs 6.76±0.13 respectively) (Table 2).

As regard to BCVA, there was significant less preoperatively in diabetic group when compared to non-diabetic group. On the other hand, there was no significant difference between both groups postoperatively at 1 week, 1, 3, and 6 months. Furthermore, there was significant improvement postoperatively when compared to corresponding preoperative values in both groups. Postoperative PCO revealed that, there were no reported cases at 1 weeks and 1 month postoperatively; but at 3 months, 3 patients (6.0%) in diabetic group and 2 patients (4.0%) in non-diabetic group had PCO; and 6 months postoperatively, 7 patients (14.0%) in diabetic group and 2 patients (4.0%) in non-diabetic group had faint PCO; and there was no significant difference between study and control groups at any time (Table 3).

As regard to postoperative IOP, there was no significant difference between diabetic and non-diabetic groups at 1 week, 1, 3 and 6 months. In addition, there was no significant difference at 1, 3 and 6 months when compared to corresponding values at 1 week. Postoperative fundus examination revealed that, there was no abnormality detected at 1 week postoperative; while at 1 month, 5 eyes (10.0%) in diabetic group and 3 eyes (6.0%) in non-diabetic group showed lost foveal depression and macular thickening. At 3 months, 4 eyes in diabetic group and 3 eyes in non-diabetic group were properly managed by topical non-steroidal anti-inflammatory drugs, topical steroids and systemic carbonic anhydrase inhibitors; while at the same time 1 eye in diabetic group was properly managed by intravitreal injection of steroid. Postoperative FFA at 1 month, angiographic ME was reported in 4 eyes in diabetic group and 3 eyes in non-diabetic group, while clinical significant ME was reported in 1 eye in diabetic group only. At 3 months, 5 eyes in diabetic group and 3 eyes in non-diabetic group were properly managed at time of diagnosis (at 1 month); while at 6 months, 5 eyes in diabetic group and 3 eyes in non-diabetic group were properly managed. There was no significant difference between both groups at any time.

As regard CSFT (Central Subfield Foveal Thickness), there was no significant difference between diabetic and non-diabetic groups preoperatively; but at 1, 3 or 6 months postoperatively, there was significant increase of CSFT in diabetic group when compared to non-diabetic group. In addition, there was significant increase of CSFT at 1, 3 and 6 months PO when compared to corresponding preoperative values in each group separately. Inner circle examination revealed that, there was significant increase in diabetic when compared to non-diabetic groups at 1, 3 and 6 months postoperatively. In addition, there was significant increase of inner circle at 1, 3 and 6 months postoperatively when compared to corresponding preoperative values in each group (Table 4).

As regard to outer circle, there was no – significant difference between diabetic and non-diabetic groups preoperatively and at 1, 3 and 6 months postoperatively. On the other hand, there was significant increase of outer circle at 1, 3 and 6

months postoperatively, when compared to corresponding preoperative values in each group. Fundus TMV revealed that, there was no significant difference between both groups preoperatively. However, there was significant increase of fundus TMV in diabetic group when compared to non-diabetic group at 1, 3 and 6 months postoperatively. In addition, there was significant increase of fundus TMV postoperatively at 1, 3 and 6 months when compared to corresponding preoperative values in each group I (Table 5).

Table (1): Patients characteristics in diabetic and non-diabetic groups.

Variable		Diabetic (n=28)	Non diabetic (n=27)	Test	P value
Sex	Male	9(32.1%)	11(40.7%)	0.43	0.50(ns)
	Female	19(67.9%)	16(59.3%)		
Age		56.50±5.37	58.70±5.48	1.50	0.14(ns)
Laterality	Unilateral	6(21.4%)	4(14.8%)	0.40	0.53(ns)
	Bilateral	22(78.6%)	23(85.2%)		
Treatment	Insulin	8(28.6%)			
	NI	20(71.4%)			

Table (2): Preoperative visual examination in diabetic and non-diabetic groups.

Variable	Diabetic (n=50)	Non diabetic (n=50)	Test	P value
IOP	17.6±1.49	18.08±1.39	1.65	0.10(ns)
Axial length	22.55±1.16	22.71±1.22	0.67	0.51(ns)
BCVA	0.95±0.12	0.86±0.17	2.92	0.004*
CSFT	222.12±9.80	221.10±9.12	0.53	0.59(ns)
Inner circle	264.42±8.02	262.52±6.85	1.27	0.21(ns)
Outer circle	234.28±7.24	233.46±4.79	0.67	0.51(ns)
TMV	6.81±0.16	6.76±0.13	1.42	0.16(ns)

Table (3): Comparison between study (diabetic) and control (non-diabetic) groups as regard to postoperative BCVA.

	BCVA			PCO		
	Diabetic	Non diabetic	p	Diabetic	Non-diabetic	P value
Preoperative	0.95±0.119	0.864±0.169	*0.004**	-	-	-
PO 1 week	0.088±0.071[#]	0.090±0.073[#]	0.89	0(0.0%)	0(0.0%)	-
1 month	0.080±0.121[#]	0.062±0.060[#]	0.34	0(0.0%)	0(0.0%)	-
3 months	0.072±0.053[#]	0.058±0.053[#]	0.19	3(6.0%)	2(4.0%)	0.64
6 months	0.082±0.062[#]	0.062±0.060[#]	0.12	7(14.0%)	2(4.0%)	0.18

= significant increase when compared to corresponding preoperative values in each group separately (paired t test);.

Table (4): Comparison between study and control groups as regard to fundus CSFT and inner circle at different times.

	CSFT			Inner circle		
	Diabetic	Non-diabetic	p	Diabetic	Non-diabetic	p
Preop.	222.12±9.809	221.10±9.12	0.592	264.42±8.02	262.52±6.85	0.21(ns)
1 month	246.02±22.94[#]	237.74±17.58[#]	0.046*	292.98±27.79[#]	281.32±23.75[#]	*0.026**
3 months	235.70±7.876[#]	231.38±8.71[#]	0.011*	286.62±16.74[#]	270.48±5.92[#]	*<0.001**
6 months	232.24±8.666[#]	227.82±6.82[#]	0.006*	276.4±10.22[#]	268.34±5.32[#]	*<0.001**

 # = significant increase when compared to corresponding preoperative values in each group separately.

Table (5): Comparison between study and control groups as regard to fundus outer circle and fundus TMV at different times.

		Diabetic		Non-diabetic		t	p
		Mean	SD	Mean	SD		
Inner circle	Preop. outer circle	234.28	7.24	233.46	4.79	0.67	0.506(NS)
	At 1-month PO	250.86[#]	20.20	245.68[#]	17.46	1.37	0.173(NS)
	At 3 months PO	245.32[#]	12.45	241.74[#]	15.09	1.29	0.19(NS)
	At 6 months PO	239.10[#]	6.08	236.98[#]	5.519	1.82	0.071(NS)
Fundus TMV	*Preoperative TMV*	6.81	0.16	6.76	0.13	1.41	0.16(NS)
	At 1 month PO	7.09[#]	0.46	6.91[#]	0.31	***2.28***	***0.025****
	At 3 months PO	6.98[#]	0.18	6.80[#]	0.14	***5.18***	***<0.001****
	At 6 months PO	6.92[#]	0.17	6.80[#]	0.14	***3.81***	***<0.001****

= significant increase when compared to corresponding preoperative values in each group separately (paired t test); NS=non-significant.

4. Discussion

In the present study, preoperative BCVA was ranged from 0.6 to 1.1 (Log MAR) with mean of 0.91 and standard deviation of 0.15; and there was significant less in study group when compared to control group (0.95±0.12 vs 0.86±0.17 respectively) because the density of cataract was more in diabetic group. This finding shows that impairments in the osmoregulation may render the lens susceptible to even small increase of Aldose Reductase stress potentially leading to progressive cataract information. According to a study made by **Khedr (2014),** preoperative BCVA was 0.12±0.003 by decimal fraction in diabetic patients while in nonnondiabetic patients 0.15±0.16 and p=0.1487. As regard postoperative BCVA in diabetic patients were 0.79±0.03 while in non-diabetic patients 0.87±0.02 and p=0.069. **Maaly *et al* (2016)** showed that preoperative BCVA and postoperative BCVAhas no statistically significant correlation with age and duration of DM.

In the present work, there was significant improvement post-operatively when compared to corresponding preoperative values in both groups. There was no significant difference of postoperative BCVA between both groups postoperatively at 1 week, 1, 3, and 6 months. Furthermore, postoperative PCO, showed that, there no reported cases at 1 weeks and 1 month postoperatively; but at 3 months, 3 patients (6.0%) in diabetic group and 2 patients (4.0%) in non-diabetic group had PCO; and 6 months postoperatively, 7 patients (14.0%) in diabetic group and 2 patients (4.0%) in non-diabetic group had PCO; and there was no significant difference between study and control groups at any time and no significant affection on BCVA and fund us examination in both groups. **Biro *et al* (2008)** found also that postoperative BCVA increased significantly from postoperative

value of 0.5 in the first postoperative day to 0.86 by the end of the second month postoperatively. **Kusbeci *et al* (2012)**observed correlation between BCVA and OCT measurements at postoperative 12th and 24th weeks, whereas BCVA and OCT measurements were not correlated at postoperative 1st and 4th weeks. **Maaly *et al* (2016)** demonstrated that improvement of BCVA from 0.6 to 0.2 postoperatively in all patients of group 1 and 2 at 2nd week postoperative. Despite there was no statistically significant difference in BCVA recorded in diabetic patients at two week, one month and two months postoperatively, statistically significant difference was noted in group 2 as BCVA improved to 0.2 in 2nd week then show one line improvement in 1st month and 2nd month postoperatively.

In the present study, CME was reported at1 month in 5 eyes (10.0%) in diabetic group and 3 eyes (6.0%) in non-diabetic group. Angiographic CME was reported in 4 eyes in diabetic group and 3 eyes in non-diabetic group, while clinical CME was reported in 1 eye in diabetic group only. At 3 months, all cases of angiographic CME (4 eyes in diabetic group and 3 eyes in non-diabetic group) were properly managed by topical non-steroidal anti-inflammatory drugs (ketorolac 0.4%), topical steroids (prednisolone acetate 1%) and systemic carbonic anhydrase inhibitors (acetazolamide 250mg); The only one case of clinical CME was managed by single dose of intravitreal injection of steroid (triamcinolone acetonide 4mg/0.1ml). Against our study, **Mirachtsis *et al* (2016)** reported that the incidence of postoperative cystoid macular edema after uncomplicated phacoemulsification was statistically significant difference between 2group (15.8% in diabetic group versus 6.9% in control group, p=0.03<0.05). **Ayse *et al* (2016)** recorded CME in 8 cases out of 120 patients (6.6%). 6 of them in diabetic

group and 2 of them in non-diabetic group. Clinical CME observed only in 3 cases out of 8 all of them were in diabetic group.

Central subfield foveal thickness (CSFT) represents the average thickness in the central 1mm diameter circle of ETDR Grid. In the present study, The preoperative CSFT was ranged from 199 to 237; with a mean of 221.61± 9.44; and there was no significant difference between study and control groups (222.12±9.80 vs 221.10±9.12 respectively). In addition, preoperative inner 3mm zone thickness (inner circle) ranged from 251 to 290 with a mean of 263.47±7.48; and there was no significant difference between diabetic and non-diabetic groups (264.42±8.02 vs 262.52±6.85 respectively). Finally, preoperative outer 6mm zone thickness (outer circle) ranged from 219 to 260; with a mean of 233.87±6.12, and there was no significant difference between both groups. Preoperative TMV, it ranged from 6.60 to 7.40 with a mean of 6.78±0.15; and there was no significant difference between study and control groups (6.81±0.16 VS 6.76±0.13 respectively). In agreement with our study, **Kai and Cheng (2014)** demonstrated that there is no difference in preoperative central macular thickness between the two groups, the non-diabetic and diabetic group without diabetic retinopathy. According to study made by **Ayse *et al* (2016)** demonstrated that mean preoperative CFT was 220.29±14.59 (minimum was 188 um- maximum was 262 um) in all patients that was 218.4±12 um in diabetic group and 222.1±16.6 um in nondiabetic group thus preoperative CFT was not statistically different between two groups (p=0.168).

In the present study, CSFT increased significantly in diabetic group from (222.12±9.8) preoperative to (246.02± 22.94),(235.70±7.87) and (232.24 ± 8.66) at1 month, 3 months and 6 months postoperative respectively. Although diabetic group showed resolving of macular edema after 3 and 6 months postoperative, but it still higher in thickness than preoperative thickness. While in control group; the mean preoperative CSFT of the patients was (221.10±9.12) and then (237.74 ± 17.58), (231.38 ± 8.71) and (227.82±6.82) at1 month, 3 months and 6 months postoperative respectively. **Maaly *et al* (2016)** recorded that preoperative and postoperative MFT (two week, one month and three month) was higher in diabetic patients than control with statistically significant difference. In diabetic group, MFT of 64%, 68% and 60% of eyes were stable in two week, one month and three month postoperatively. 5 eyes (20%) showed one step deterioration in 2nd month. Only one showed three steps deterioration in 1st and 2nd month postoperatively. In control group, MFT of 84%, 76% and 80% of eyes were stable in two week, one month

and three month postoperatively. 3 eyes (12%) showed one step deterioration in 1st month postoperatively. No one showed two or three step deterioration in 1st or 2nd month postoperatively. **Sefi *et al* (2016)** recorded that postoperative CMT was higher than before only at 1 month in non-diabetic group while in diabetic group it was higher at third and six month postoperatively. Several clinical studies investigated the role of phacoemulsification cataract surgery on the progression of diabetic retinopathy. One year after cataract surgery, the progression rate of diabetic retinopathy ranges between 21% and 32%.

In the present study, there was a significant increase of CSFT at 1month postoperative in both groups. Also, starting to resolve in almost all patients after 3 months postoperative and these results suggest that the change in macular thickness postoperative is transient. Our data indicated that, although in each group; there is a significant increase in CSFT postoperatively. However, Postoperative CSFT was increased significantly in diabetic group when compared to non-diabetic group. In addition, there was significant increase of CSFT at 1, 3 and 6 months PO when compared to corresponding preoperative values in each group separately. In the our study, There was significant increase of inner circle thickness in diabetic group from (264.42±8.02) preoperative to (292.98± 27.79), (286.62±16.74) and (276.4± 10.22) at1 month, 3 months and 6 months postoperative respectively. While in control group; inner circle thickness of the patients was (262.52±6.85) and then (281.32 ±23.75), (270.48 ±5.92) and (268.34 ±5.32) at1 month, 3 months and 6 months postoperative respectively. There was significant increase inner circle thickness in diabetic group when compared to non-diabetic groups at 1, 3 and 6 months postoperatively. In addition, there was significant increase of inner circle at 1, 3 and 6 months postoperatively when compared to corresponding preoperative values in each group. Our study supported by similar study which performed by **Ayse *et al* (2016)** and showed that postoperative CFT was increased significantly in diabetic group than control group by 30.3 um VS 13.1 um and 12.5 um VS 4.6 UM at 1 and 3 monthes respectively. The results of another study conducted by **Khedr (2014),** he showed that CMT increased in diabetic patients after uncomplicated phacoemulsification by 20% and 12% in nondiabetic. This may explained by pseudophakic CME caused by cytokines which released from blood ocular barrier after cataract surgery.

In the present study, there was a significant increase in TMV in diabetic group from (6.81±0.16) preoperative to (7.09±0.46), (6.98±0.18) and (6.92±0.17) at1 month, 3 months and 6 months

postoperative respectively. While in control group; the TMV of the patients was (6.67±0.13) and then (6.91±0.31), (6.80±0.14) and (6.80±0.14) at1 month, 3 months and 6 months postoperative respectively. There was no significant difference between both groups preoperatively as regard to TMV. However, there was significant increase of fundus TMV in diabetic group when compared to non-diabetic group at 1, 3 and 6 months postoperatively. In addition, there was significant increase of fundus TMV postoperatively at 1, 3 and 6 months when compared to corresponding preoperative values in each group. As regard to outer circle, there was no –significant difference between diabetic and non-diabetic groups preoperatively and at 1, 3 and 6 months postoperatively. On the other hand, there was significant increase of outer circle at 1, 3 and 6 months postoperatively, when compared to corresponding preoperative values in each group. **Golebiewska *et al* (2014)** detected a significant increase in central macular thickness and foveal macular volume value on postoperative day 7, 30, 90 and 180 as compared with baseline value. These values are higher in diabetic patients. Against our study, **Eriksson *et al* (2011)** reported that the thickness of the central macula increased significantly between the preoperative measurements and the 6-weeks follow up in both diabetics and controls. And there was no significant difference between the two groups.

Also, perifoveal macular thickness at superior, inferior, temporal, and nasal macular quadrants were 264.9 um, 226.1 um, 255.0 um, 272.0 um, respectively at first postoperative month (p<0.001). The change in The mean central foveal retinal thickness was insignificant at first postoperative day (p>0.05), and significant at first week, first month, third month and six months postoperatively (p<0.05) for all measurement. A statistically significant increase in macular thickness was detected at postoperative early periods, after the first week after uncomplicated cataract operation. Longer follow-up of the patients was required for the macular consequences. **Lobo *et al.,* (2004)** studied retinal leakage after micro incisional cataract surgery, leakage sites were primarily perifoveal vascular structures and leakage accumulates later on in fovea that has less tissue tension and more places. **Kusbeci *et al.,* (2012)** detected an increase in perifoveal and central macular thickness (CMT) at postoperative early period and peaked at postoperative 12th weeks. And the measurements of macular thickness were not decreased to preoperative values at the last postoperative visits (24th weeks).

In conclusion, we found a subclinical increase in central retina thickness in diabetic and non-diabetic patients after uncomplicated phacoemulsification, which may be detected clinically and by FFA also can be quantified by OCT.

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