

CENTRAL MACULAR THICKNESS AFTER CATARACT SURGERY IN PATIENTS WITH DIABETES MELLITUS AND WITHOUT DIABETES MELLITUS

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ABSTRACT

Objective: To determine the mean change in central macular thickness after cataract surgery and to compare the mean change in central macular thickness after cataract surgery in patients with diabetes and without diabetes.

Study Design: Cross sectional comparative study.

Place and Duration of Study: Ophthalmology Department, Pakistan Ordinance Factory Hospital, Wah, from Apr to Sep 2019.

Methodology: Patients were divided into two groups; Group A (patients with diabetes) and group B (patients without diabetes). All the patients underwent phacoemulsification and observed after 4 weeks for macular thickness measurement using optical coherence tomography before and after surgery.

Results: Total 60 patients were included. Mean age of patients was 65.31 ± 7.63 years. There were 35 (58.3%) males and 25 (41.7%) female patients in the study. We found a significant increase in central macular thickness in Group A and Group B [(223.10 \pm 15.86 μm vs 227.26 \pm 17.90 μm , $p < 0.001$) and (221.20 \pm 12.16 μm vs 226.28 \pm 16.78 μm , $p = 0.001$)] before and after phacoemulsification in Group A and Group B respectively. However, no significant difference was found between the groups ($p = 0.486$).

Conclusion: There is no significant difference in central macular thickness after uncomplicated phacoemulsification in both groups.

Keywords: Central macular thickness, Diabetes mellitus, Phacoemulsification.

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INTRODUCTION

Globally, the diabetic population is on the rise as the number of cases is expected to inflate up to 9642 million by the year 2040.¹ Cataract is considered one of the significant problems that affects the diabetic patients. The incidence and progression of cataract are higher in diabetic patients.² Worldwide, phacoemulsification with foldable intra-ocular lens (IOL) implantation has been adopted as a gold standard treatment for cataract extraction. With the dawn of recent advances, cataract surgery has become a safe day care procedure with minimal pre-operative preparation and post-operative precautions.³ Irvine-Gass syndrome is a term defined by A. Ray Irvine Jr., MD in 1953 as post-operative macular edema and then further explained by J. Donald M. Gass, MD, in 1969.⁴ In spite of excellent skills and advanced approach in phacoemulsification for removal of cataract, post-operative macula edema is still a common reason of diminished vision after uneventful surgery.⁵

Increased retinal thickness is observed after

uneventful cataract extraction in diabetics as compared to non-diabetics,^{6,7} while some of the studies have depicted that central macular thickness has been increased in both diabetics and non-diabetics after uncomplicated cataract surgery.⁸

The data available on this topic is not enough to reach any conclusion in Pakistan. We believe this data is of substantial value to the ophthalmic community. Our study aims to determine the mean change in central macular thickness after cataract surgery and to compare the mean change in central macular thickness after phacoemulsification in patients with diabetes and without diabetes. The outcomes of this study will provide the data that will enable ophthalmic community to generate evidence-based guidelines that will allow to further minimize the risk factors.

METHODOLOGY

A cross sectional comparative study was carried out at Ophthalmology department, POF Hospital, Wah Cantt, from April to September 2019. A sample size of 60 patients was calculated using Open-epi software (using latest study parameters in which central macular thickness in the diabetic group increased from 202 \pm 23 μm preoperatively to 267 \pm 25 μm after one month

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of cataract surgery, 95% confidence interval and 5% level of significance).⁹ Patients were selected through process of non-probability consecutive sampling. We took official ethical approval from Internal Review Board (IRB No: 23-4-113) of respective hospital. Participating patients signed written consent before conduction of study.

Inclusion Criteria: Patients of age 50-80 years, both gender, having translucent enough cataract to allow the pre-operative fundus examination, patients requiring cataract surgery and baseline OCT showing <250 μm were included in the study.

Exclusion Criteria: Patients with diabetic retinopathy, any pre-existing ocular pathology that could affect the macular thickness, patients who have had complicated cataract surgery, history of any previous ocular intervention, had high refractive error (greater than +6 or -6 Diopters), deranged HbA1C levels, media opacities other than cataract and patients with central macular thickness >250 μm prior to surgery, were excluded.

After taking detailed history and measurement of visual acuity, refraction (objective and subjective), and dilated fundus examination was performed on slit lamp biomicroscope by a consultant ophthalmologist. We divided patients into two groups; Group A patients were defined as patients diagnosed with diabetes while Groups B were defined as non-diabetic patients. Optical coherence tomography (OCT) examination using Heidelberg Engineering OCT was also performed on both groups 1 day prior to surgery and the retinal thickness of central 1mm diameter area was recorded for analysis. All Patients underwent phacoemulsification cataract surgery by the same surgeon using Alcon Laureate phacoemulsification unit. The operation was done under topical anesthesia and topical povidone iodine disinfection. A clear corneal small incision, capsulorrhexis, phacoemulsification and implantation of a foldable posterior chamber IOL was performed. Post operatively, topical antibiotic and steroid combination were prescribed for three weeks. OCT was performed to measure central retinal thickness after four weeks of surgery. Data analysis was done using Statistical Package for Social Sciences (SPSS) version 20. Categorical variable like gender was analyzed as frequency and percentages and continuous numerical variables like age and central macular thickness before and after cataract surgery were analyzed as mean and standard deviation. Paired sample t-test was used to compare the mean pre and post-operative central macular thickness. Independent sample t-test was used to com-

pare the post-operative central macular thickness between two groups. The *p*-value of ≤0.05 was considered significant.

RESULTS

Total 60 patients were included. All patients unilaterally underwent cataract surgery. Mean age of patients was 65.31 ± 7. 63 years. There were 35 (58.3%) males and 25 (41.7%) female patients in the study. 27 (45%) right eyes and 33 (55%) left eyes became a part of this study.

We found a significant increase in central macular thickness (227.26 ± 17.90μm) after phacoemulsification from baseline measurements 223.10 ± 15.86μm (pre-operative macular thickness) in group A *p*<0.001, group B also showed the same trend (*p*=0.01) as shown in Table-I. We did not find any significant difference in post-operative mean central macular thickness in cases and controls (228.90 ± 17.78 μm vs 225.63 ± 18.31 μm, *p*=0.486) as shown in Table-II. Hypertension, gender and age showed insignificant association with macular thickness (*p*=0.973) as shown in Table-III.

Table-I: Comparison of pre- and post-operative central macular thickness.

Study Groups	Central Macular thickness (μm)		<i>p</i> -value
	Pre-operative	Post operative	
Group A (n=30)	23.10 ± 15.80	227.26 ± 17.90	<0.001
Group B (n=30)	221.20 ± 12.16	226.28 ± 16.70	0.001

Table-II: Comparison of post-operative mean central macular thickness in cases and controls.

Interventional Groups	Post-Operative Mean Central Macular Thickness (μm)	<i>p</i> -value
Group A	228.90 ± 17.70	0.486
Group B	225.63 ± 18.31	

Table-III: Comparison of post-operative mean central thickness in both interventional groups with respect to hypertension and gender.

Parameters	Interventional Groups	n	Post-operative Mean central macular thickness (μm)	<i>p</i> -value
Hypertension	Group A	13	227.08 ± 15.90	0.453
	Group B	13	232.38 ± 19.30	
Non hypertensive	Group A	17	230.29 ± 19.40	0.119
	Group B	13	227.08 ± 15.90	
Gender				
Male	Group A	18	227.50 ± 21.30	0.198
	Group B	17	218.59 ± 18.50	
Female	Group A	12	231.00 ± 10.92	0.119
	Group B	13	234.85 ± 13.80	

DISCUSSION

Cystoid macular edema is one of the devastating complications of cataract surgery which causes poor postoperative visual outcome.¹⁰ Several mechanisms

are involved in the pathogenesis of macular edema in patients with and without diabetes after cataract surgery which include disruption of blood retinal barrier, prostaglandins release which induce inflammation, inflammation induced by surgically damaged tissue and release of vascular endothelial factor.¹¹

Our study did not find any significant difference in post-operative macular edema in diabetic and non-diabetic patients. Ameri *et al.* reported that there is no significant difference in cystoid macular thickness patients without diabetes and patients with diabetes after 6 weeks ($265.15 \pm 20.078 \mu\text{m}$ vs $266.09 \pm 18.844 \mu\text{m}$, $p=0.313$)⁹. Development of macular edema following cataract surgery in patients with diabetes varies from 31-81%.¹² Abdul Haleem and co-workers in a prospective study also had reported that cystoid macular edema was observed in both patients with diabetes and without diabetes after uncomplicated cataract surgery.¹³ Liu *et al.*, reported a significant increase in subclinical retinal thickening in diabetic patients having moderate NPDR undergo uncomplicated phacoemulsification at postoperative 1, 3 and 6 months. while retinal thickening was not observed in patients with diabetes having no DR.¹⁴ Stunff *et al.*, reported that mean retinal thickness in the patients with diabetes changed from $238.6 \mu\text{m}$ before surgery to $255.2 \mu\text{m}$ ($p=0.02$) after 6 months of cataract extraction. In patients without diabetes, the mean retinal thickness increased from $247.6 \mu\text{m}$ pre-operatively to $261.7 \mu\text{m}$ ($p=0.03$) after 6 months of cataract surgery.¹⁵ Katsimpris and co-workers obtained data of 98 patients (49 patients with diabetes and 49 non-diabetics) who have undergone phacoemulsification. They reported that before cataract surgery, mean Central foveal thickness (CFT) in diabetics was $202 \pm 23 \mu\text{m}$ and in non-diabetics mean CFT was $205 \pm 18 \mu\text{m}$. There was no significant difference in central foveal thickness between the two groups pre-operatively.¹⁶ Eriksson *et al.*, published a study in which he compared the postoperative macular thickness and visual recovery between diabetics and diabetics having mild to moderate diabetic retinopathy by using OCT and FFA. Although there was fluorescein leakage was observed on FA in the eyes with diabetic retinopathy than the normal controls (76% vs. 23% respectively) but no significant increase in central macular thickness was reported for up to 6 months period.¹⁷

Further studies with longer follow-up periods and consideration of patient driven factors are needed to ascertain further horizons in the betterment of visual outcome after surgery.¹⁸

A wider macular area must be assessed along with the central macular thickness, and visual acuity testing must be done to evaluate the macular sensitivity, which were not analyzed in our study. Well-designed studies with longer follow-up periods and larger sample sizes are required for further research and development.

CONCLUSION

Central macular thickness was increased after uncomplicated phacoemulsification in both diabetics and non-diabetics without retinopathy for up to a follow-up period of 4 weeks but the thickness did not differ between the two groups. Therefore, it is concluded that macular edema is common after cataract surgery and diabetes does not affect the surgical outcome.

Conflict of Interest: None.

Authors' Contribution

MS: Data collection & analysis, MAK: Data interpretation, YL: Study write-up, AA: Critical review, MHS: Study designing & acquisition.

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