

MEAN CHANGE IN CENTRAL MACULAR THICKNESS IN DIABETIC PATIENTS WITH AND WITHOUT DIABETIC RETINOPATHY AFTER PHACOEMULSIFICATION

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ABSTRACT

Objective: To compare the mean change in central macular thickness (CMT) of type 2 diabetic patients with and without diabetic retinopathy after phacoemulsification. Quasi experimental study at ophthalmology department of Lahore General Hospital, Lahore, from 06-11-2021 to 06-05-2022.

Methods: A total of 126 patients diagnosed with Type 2 diabetes were recruited from the outpatient department through convenient sampling. Complete history and examination were done and diabetic retinopathy was diagnosed with slit lamp using +78D lens. CMT was measured by OCT before phacoemulsification and one month after surgery. Change in CMT was compared between patients with and without diabetic retinopathy.

Results: Mean age of patients was 59.52±8.81 years and mean HbA1c was 7.70+ 1.27 mg/dl. Mean pre-operative, post-operative and change in CMT were 240.80±16.54, 271.19±41.28 and 30.39±34.57µm respectively. There were 52.4% males and 47.6% females. Patients with DR had higher CMT as compared to patients without DR (p=0.000).

Conclusion: There is a significant increase in CMT of patients with DR who undergo phacoemulsification. Strict diabetic control is needed before surgery and intravitreal injection of anti-VEGF may be given in high risk patients.

Keywords: central macular thickness, Diabetic retinopathy, Phacoemulsification, cataract.

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INTRODUCTION

Diabetic retinopathy is a microvascular disease, which leads to increased vascular permeability resulting in macular edema. Literature shows that severity of

retinopathy has effect on the final visual outcome of uncomplicated phacoemulsification in patients with diabetes.¹ On the other hand, diabetics have higher risk of developing cataract.² Phacoemulsification may result in increase in central macular thickness which can be measured with the help of OCT. The reasons include; postoperative inflammation secondary to surgical trauma, breakdown of the blood retinal barrier, release of vascular endothelial growth factors and prostaglandins.^{3,4} Pseudophakic Cystoid Macular Edema (CME) has been reported in healthy individuals as well as diabetic patients after un-eventful

phacoemulsification.¹ It has been observed that there is increase in clinically significant macular edema associated with visual impairment in diabetic patients. It is more significant in patients with severe diabetic retinopathy before phacoemulsification.

A study from Italy showed that out of 3657 patients with cataract, 745 had diabetes and 13.5% had NPDR.⁵ Another study reported mean preoperative CMT of $275.09 \pm 19.75 \mu\text{m}$ in patients with diabetes and $271.62 \pm 27.00 \mu\text{m}$ in patients without diabetes. In both groups, CMT increased after surgery. The increase was statistically significant when compared to preoperative values. It was more in patients with diabetes.⁶

The rationale of the study is to compare the change in CMT between diabetic patients with and without DR. This will add to the local data for reference.

METHODS

We conducted a quasi-experimental study in type 2 diabetics with and without diabetic retinopathy. The study was conducted at Ophthalmology department of Lahore General Hospital from November 2021 to May 2022. After approval from the institutional review board, sample size of 126 cases was taken using 95% confidence interval and margin of error of 6%. Expected percentage of diabetic retinopathy in patients of DM undergoing phacoemulsification was 13.5%.⁵ Patients with 40-80 years of age, either gender and suffering from type 2 diabetes with senile cataract and consenting for phacoemulsification were included. Patients with other ocular diseases that could affect CMT, glaucoma, epiretinal membrane, uveitis, proliferative diabetic

retinopathy (PDR) and clinically significant macular edema (CSME) were excluded.

After history and complete ocular examination including fundoscopy on slit lamp with +78D lens, OCT was performed for macular thickness. After informed consent, all the patients underwent phacoemulsification. Post-operative CMT was measured at one month after surgery. Statistical analysis was done with SPSS version 22.0. Continuous variables, such as age, HbA1c level, and macular thickness were presented as means \pm SD. Whereas categorical variables like gender and DR were presented as frequency and percentage. Independent t-test was used to compare change in CMT after surgery between the two groups. A p-value less than 0.05 was considered statistically significant. Data was stratified for gender, age, duration of diabetes and treatment.

RESULTS

Out of 126 patients, there were 61.9% (n=78) with 40-60 years of age and 38.1% (n=48) with 6s1-80 years. Mean age was 59.52 ± 8.81 years. Mean HbA1c was 7.70 ± 1.27 mg/dl. Mean pre-operative, post-operative and change in CMT was $240.80 \pm 16.54 \mu\text{m}$, $271.19 \pm 41.28 \mu\text{m}$ and $30.39 \pm 34.57 \mu\text{m}$ respectively.

There were 52.4% (n=66) males and 47.6% (n=60) were females. Non-proliferative diabetic retinopathy (DR) was present in 30.2% (n=38) and 69.8% (n=88) were without any DR. Comparison of mean change in CMT between the two groups was statistically significant (p=0.000). The data was stratified for age, gender, duration of diabetes and treatment for diabetes (Table 2).

Table no. 1: Mean increase in CMT after surgery in patients with DR and without DR

Groups	N	Mean change in CMT	p value
With DR	38	78.7368 \pm 23.34	
Without DR	88	9.5227 \pm 4.96	0.000

Table no. 2: Stratification for mean change in CMT in both groups with respect to age, gender, duration of diabetes, treatment for diabetes mellitus

	Groups	N	Mean	p value
Age Groups	40-60 years	With DR	20	76.8 \pm 20.09
		Without DR	58	9.79 \pm 4.91
	61-80 years	With DR	18	80.88 \pm 26.92
		Without DR	30	9.00 \pm 5.11
Gender	Male	With DR	19	81.84 \pm 25.13
		Without DR	47	9.80 \pm 5.18
	Female	With DR	19	75.63 \pm 21.62
		Without DR	41	9.19 \pm 4.73
Duration of Diabetes Group	1-10 years	With DR	25	71.16 \pm 21.68
		Without DR	88	9.52 \pm 4.96
	>10 years	With DR	13	93.31 \pm 19.73
		Without DR	87	9.42 \pm 4.9

DISCUSSION

Cystoid macular edema (CME) is one of the main causes of decreased vision after cataract surgery. It is seen in patients after cataract surgery irrespective of the presence of diabetes.⁷ Literature shows that diabetic macular edema increases in patients after cataract surgery often associated with visual impairment. It is more severe in patients with PDR even after un-eventful phacoemulsification.⁸ There is a significant effect on visual acuity which is related with the severity of retinopathy before phacoemulsification. The worsening of vision is more in patients who have uncontrolled diabetes and diabetic macular edema.⁹

Liu J, et.al, revealed that there was a significant improvement in best corrected visual acuity (BCVA) after uncomplicated phacoemulsification at one month and 6 months in patients NPDR and without any retinopathy.¹⁰

In surgical trauma, there is an inflammatory response, which causes increase in CMT. This increase in CMT could also be due to Irvine-Gass syndrome, which is commonly associated with release of cytokines and growth factors including prostaglandins and VEGF. They are released because of damage to blood-ocular barrier associated with cataract surgery.¹¹

This trauma can present itself in the form of postoperative subclinical retinal swelling or thickening of CMT leading to decreased BCVA after cataract surgery in patients with DR.¹² Much work has been done to find out other factors leading to increased CMT after uncomplicated phacoemulsification. Some of the risks for progression of diabetic macular edema, reported in literature include; younger age, poor glycemic control and also treatment of diabetes.¹³

Increase in CMT in patients with diabetic retinopathy as compared to patients without retinopathy is because of the defective blood-aqueous barrier in diabetic patients with retinopathy.¹⁴ There is also some evidence that surgical trauma is more in patients with long standing diabetes and DR with already existing macular edema.¹⁴

In cases of sub-clinical macular thickening as a result of phacoemulsification, there is no effect on visual acuity and the only evidence is leakage on fundus fluorescein angiogram. Release of prostaglandin is also considered to play an important role in such cases.¹⁵

Increased CMT poses a question as how to differentiate between CMT caused by cataract surgery or the one caused by diabetic retinopathy. One possible answer is that CMT due to surgical trauma improves while diabetic edema is aggravated over time.¹⁶ In this particular study the follow up was only for one month and hence the progression of edema could not be evaluated. There is also some role of light toxicity and vitreomacular traction on the CMT of patients with or without diabetic retinopathy.¹⁷

Another aspect of CMT was studied by some researcher, according to which, there was no statistically significant difference in CMT between the non-diabetics and diabetics without diabetic retinopathy after un-eventful phacoemulsification.⁷ Literature shows that different frequency of pseudophakic CME in different reports may be due to variety of methods used to measure CMT.¹⁸

Various prophylactic treatments have also been suggested to reduce the chance of postoperative increase in CMT in patients with diabetic retinopathy. Non-steroidal anti-inflammatory drugs and steroids have been tried to reduce post-operative macular edema.¹⁸ This can be especially helpful in patients who have pre-operative diabetic retinopathy with macular edema. Thus, preventing further increase in CMT.¹⁹ The controversy is still there whether progression of CMT is caused by surgical trauma or it is a part of natural disease course.^{20,21}

The limitations of this study are single center study and less strict selection criteria for patients.

CONCLUSION

Phacoemulsification is associated with a significantly higher frequency of CMT in patients with diabetic retinopathy. Prophylactic use of anti-inflammatory agents can be helpful in reducing CMT related with phacoemulsification.

CONFLICT OF INTEREST:

Authors declare no conflict of interest.

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AUTHOR'S CONTRIBUTIONS

MF, TG, ZS, HT, MS: Conception, study design, manuscript writing and Revision

ALL AUTHORS: Approval of the final version of the manuscript to be published

ETHICAL APPROVAL

Ethical approval was granted by the Institutional Review Board of Postgraduate Medical Institute, Ameer-ud-Din Medical College, Lahore General Hospital, Lahore. Dated 10/08/2023

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