ORIGINAL RESEARCH

To assess progression of macular edema after cataract surgery in diabetic patients using OCT

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ABSTRACT

This study aimed to investigate the progression of macular edema in diabetic patients after cataract surgery. The inclusion criteria comprised of diabetic patients with or without various grades of retinopathy of both sexes between age 30-80 years with visual acuity less than 6/18.

Exclusion criteria includes preexisting retinopathy other than diabetic retinopathy, primary glaucoma, patient having severe retinopathy with fluid retention or on dialysis and Patients with uncontrolled hypertension, severe anemia.

It was Prospective observational study conducted in RIO, GMCH from Jan 2023 to dec 2023 involving thorough examination and imaging studies of patients undergoing cataract surgery. Sixty patients were included in the study who underwent optical coherence tomography testing within 4 weeks before surgery and 1 and 3months postoperative visits. Best corrected visual acuity was recorded during each visit. Macular edema was defined as an increase of center point thickness on OCT>30% from preoperative baseline. Main outcome measures changes in foveal thickness and BCVA.

Conclusion- Diabetic eyes have high incidence of increased center point thickness on OCT after cataract surgery, associated with deterioration of vision.

INTRODUCTION

Diabetes mellitus is a global epidemic and diabetic individuals are at risk of developing DR. Approximately 1 in 10 diabetic patients suffers from DME, which is the commonest cause of vision-threatening DR at primary-care screening.The prevalence of cataract in diabetic patients is 5 times higher than in the nondiabetic population,[1–3] and in cataract patients below the age of 40, the prevalence of diabetes that is 15 to 25 times higher than that in the general population has been reported.[4]

Hyperglycemiainduced elevation of intracellular glucose levels generates chronic oxidative stress through the flux of glucose through the polyol pathway, leading to the release of proinflammatory cytokines, recruitment of leukocytes, loss of endothelial cells, breakdown of tight junctions, and an increase in vascular endothelial growth factor.[5] All of these phenomena result in a significant increase in cell permeability, with the consequent formation of edema within the macula.[5]

The effect of cataract surgery on the progression of retinopathy is not fully defined, although cataract surgery is associated with an increased risk of postsurgical edema or worsening of the preexisting edema due to postsurgical inflammation that is increased by preexisting diabetic retinopathy [6,7]

Clinically significant cystoid macular edema (CSME) has a reported incidence of 1% to 2% after cataract surgery [8]. The incidence of macular edema on optical coherence tomography (OCT) was 22% in diabetic eyes undergoing cataract surgery [9]. The macular edema after cataractsurgery in diabetic patients could be caused by the cataract surgery or diabetes itself, but it might be hard to differentiate between these two causes. Baker *et al*[14] indicated that pre-operative macular status and history of DME treatment might be associated with the increased risk

OCT has been shown to be highly reproducible in measuring macular thickness in normal individuals and diabetic patients [15,16]. For detecting macular edema,OCT is superior to contact lens biomicroscopy and as effective as fluorescein angiography (FAG) [17].

DME commonly involves microaneurysms, exudate and cystic intraretinal fluid. Based on its distribution in the macula, you can describe DME as focal or

diffuse. As defined by the ETDRS, clinically significant macular edema involves either:

1. Retinal thickening within 500 microns of the foveal center;
2. Exudates within 500 microns of the foveal center and with adjacent retinal thickening or
3. Retinal thickening at least one disc diameter in size and within one disc diameter of the foveal center.

Many OCT patterns of morphological macular changes associated with DME have been described, include diffuse retinal thickening, cystoid macular edema, posterior hyaloidal traction, serous retinal detachment and tractional retinal detachment. These patterns are not exclusive of each other and may co-exist with one another.

MATERIALS AND METHODS

The study was conducted for period of 12months from January 2023 to December 2023. Itwas a prospective observational study conducted in Regional Institute of Ophthalmology, Gauhati Medical College and Hospital, Guwahati. A total of 60 patientswere includedin the study. A detailed history, local andsystemic examination including laboratory investigations were done in all cases fulfilling the criteria after taking informed consentfrom patient and or the attendant

Ophthalmic evaluation consisted of the following-

- Elicitation of proper history with importance of type and duration of DM, treatment history and other associated diseases.
- Thorough external ocular examination, visual acuity, IOP, detailed slit lamp examination.
- Posterior segment evaluation with slit lamp biomicroscopy with +90D lens and indirect ophthalmoscopy
- OCT imaging performed preoperatively within 4 week of surgery and postoperatively after 1 and 3 months of surgery.

Following Laboratory investigations were done-

- Routine examination of blood
- Routine examination of urine for sugar, albumin, pus cells, casts and RBCs
- Serum separation for estimation of fasting blood glucose, post prandial blood glucose, serum creatinine and glycosylated haemoglobin.

All were done preoperatively.

INCLUSION CRITERIA

- diabetic patients with or without various grades of retinopathy
- both sexes were included
- age 30-80 years
- visual acuity less than 6/18.

RESULTS AND OBSERVATIONS

60 patients were included in this study who were divided into 3 groups based on their diabetic status and if diabetic, based on presence of retinopathy

Group 1- included 20 patients who were non diabetic

Group 2- included 20 diabetic patients who didn't have diabetic retinopathy

Group 3- included 20 diabetic patients who had diabetic retinopathy

Table-1: AGE DISTRIBUTION

AGE GROUP	GROUP 1	GROUP 2	GROUP 3
31-40	-	6(30%)	-
41-50	3(15%)	6(30%)	3(15%)
51-60	5(25%)	3(15%)	9(45%)
61-70	8(40%)	2(20%)	4(20%)
71-80	2(20%)	3(15%)	4(20%)

Table-2: SEX DISTRIBUTION

	GROUP 1	GROUP 2	GROUP 3
MALE	10(50%)	13(65%)	10(50%)
FEMALE	10(50%)	7(35%)	10(50%)

Table-3: TYPE OF DIABETES MELLITUS

	GROUP 1	GROUP 2	GROUP 3
Type 1	-	2	2
Type 2	20	18	18

Table-4: DURATION OF DIABETES MELLITUS

Duration of diabetes	GROUP 2	GROUP 3
<10	13(65%)	5(25%)
>10	7(35%)	15(75%)

Table-5: PRESENTING AND ASSOCIATED FEATURES

Presenting Symptom	GROUP 1	GROUP 2	GROUP 3
DOV	12(60%)	14(70%)	12(60%)
Distorted Images	2(10%)	3(15%)	1(5%)
Headache	3(15%)	2(10%)	5(25%)
Routine examination	3(15%)	1(5%)	2(10%)

Table-6: ASSOCIATED SYSTEMIC DISEASE

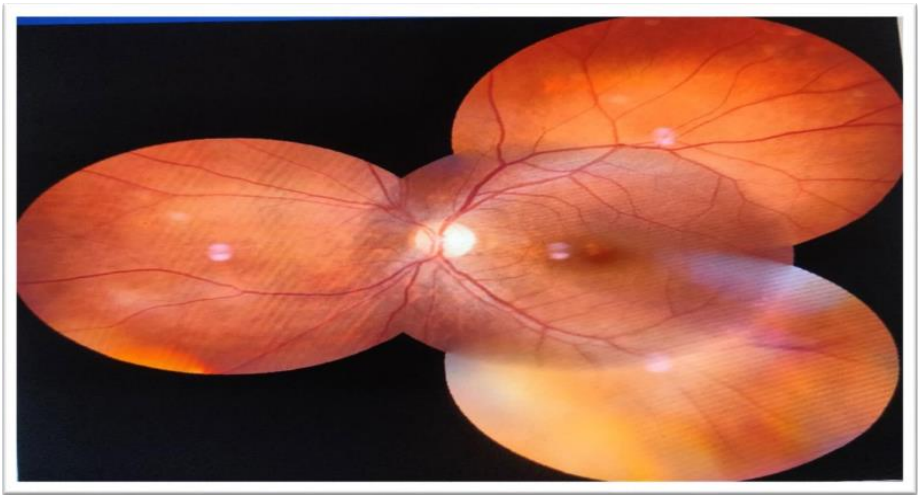
Systemic disease	GROUP 1	GROUP 2	GROUP 3
HTN	4(20%)	10(50%)	10(50%)
Neuropathy	-	5(25%)	10(50%)
Ischemic heart disease	-	6(30%)	12(60%)
CVA	-	1(5%)	7(35%)

Table-7: TREATMENT PROFILE

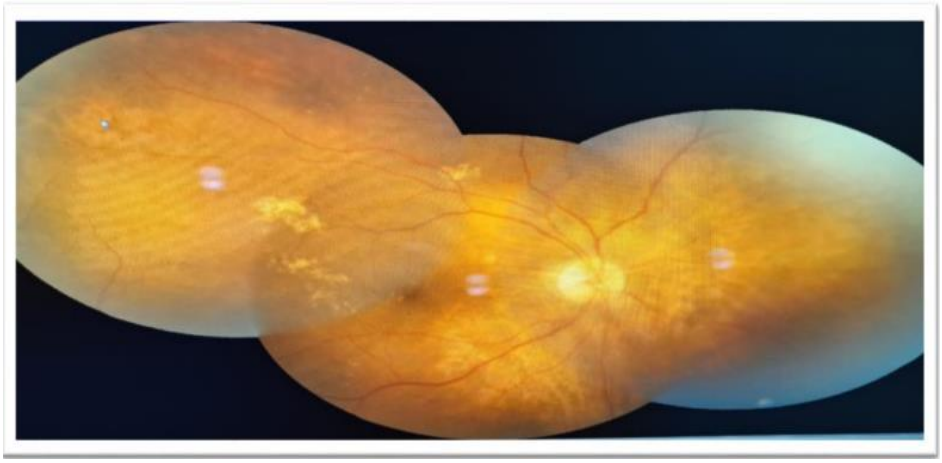
Drugs	GROUP 1	GROUP 2	GROUP 3
Diet + Exercise	-	5(25%)	2(10%)
Insulin	-	-	5(25%)
OHA	-	5(25%)	8(40%)
OHA+ Insulin	-	-	5(10%)
Anti-hypertensive	4(20%)	10(50%)	10(50%)

Table-8: GRADES OF RETINOPATHY

	MILD	MODERATE	SEVERE
No. of patients	10(50%)	7(35%)	3(15%)

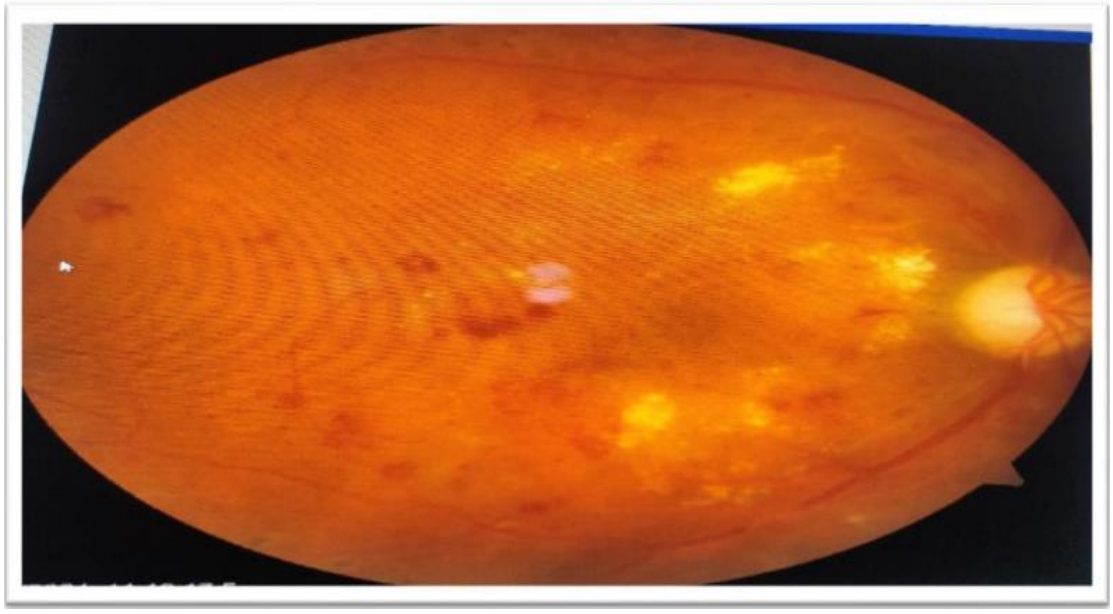


Fundus picture showing normal findings of posterior segment



Fundus picture showing Mild NPDR

Fundus picture showing Moderate NPDR



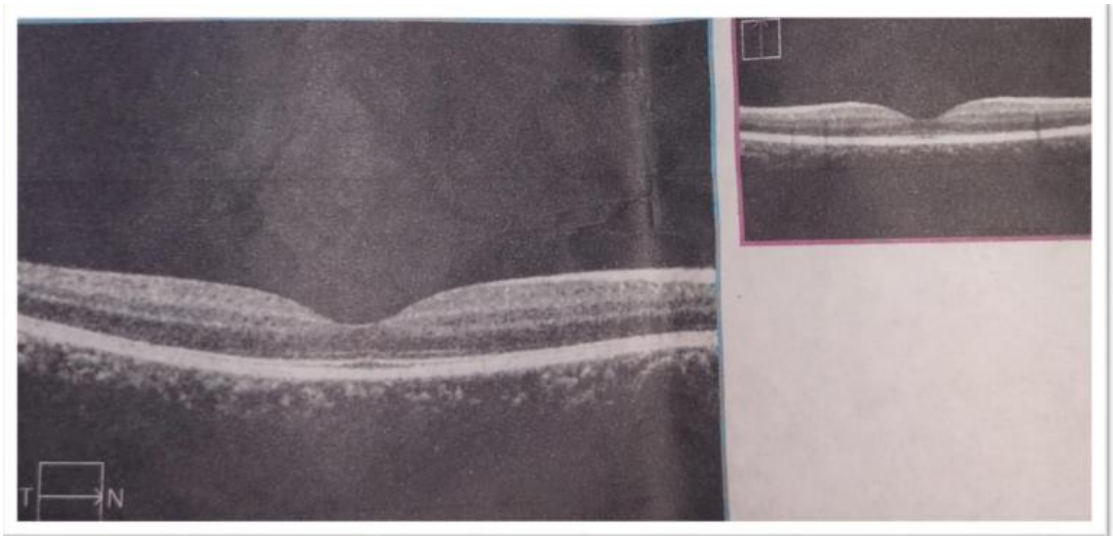
Fundus picture showing ModerateNPDR

PROGRESSION OF RETINOPATHY AFTER CATARACT SURGERY

Results from preoperative examination might have been less reliable because of obscuring cataract. So, findings of Day1 postop taken as baseline for grading of retinopathy.

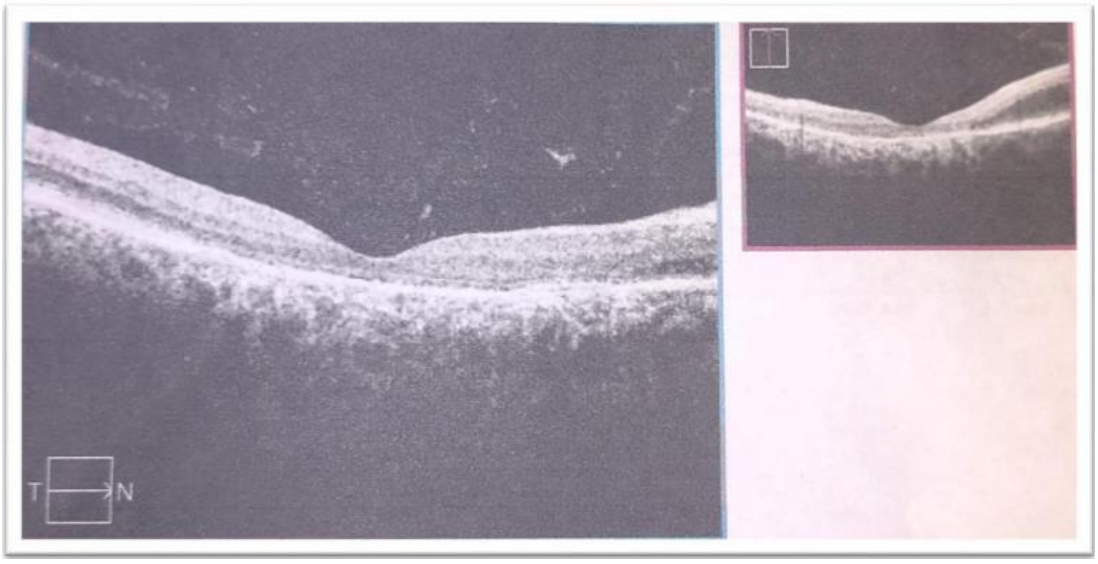
Table-9: CHANGES IN FOVEAL THICKNESS(mum) in POST-OP PERIOD

	Day 1	**2nd week**	**6th week**	**12th week**
GROUP 1	178	188	196	184
GROUP 2	202	228	240	220
GROUP 3	308	430	560	556

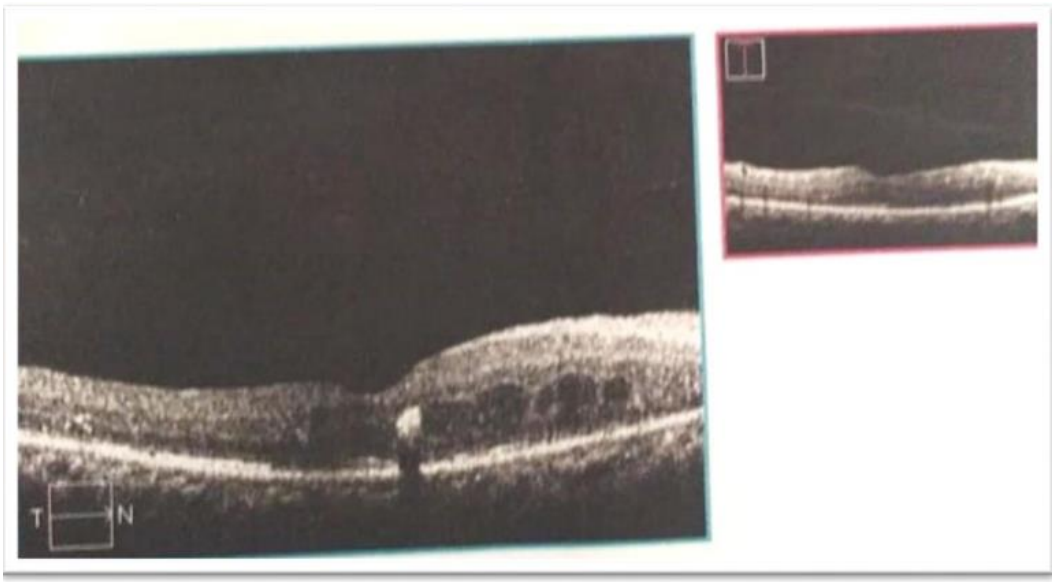


Preoperative OCT scan in Group 1

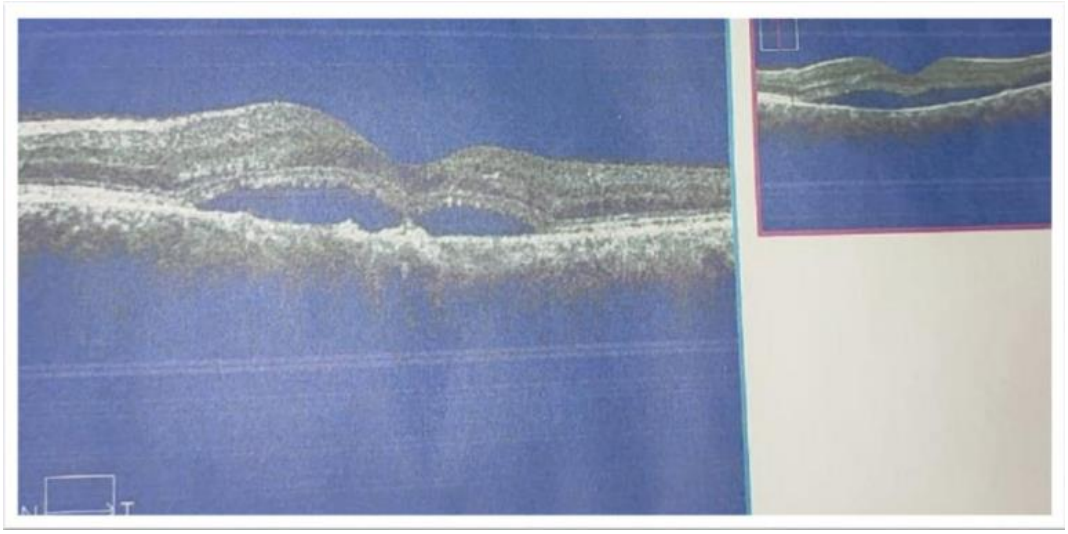
Postoperative OCT scan after 4weeks in Group 1



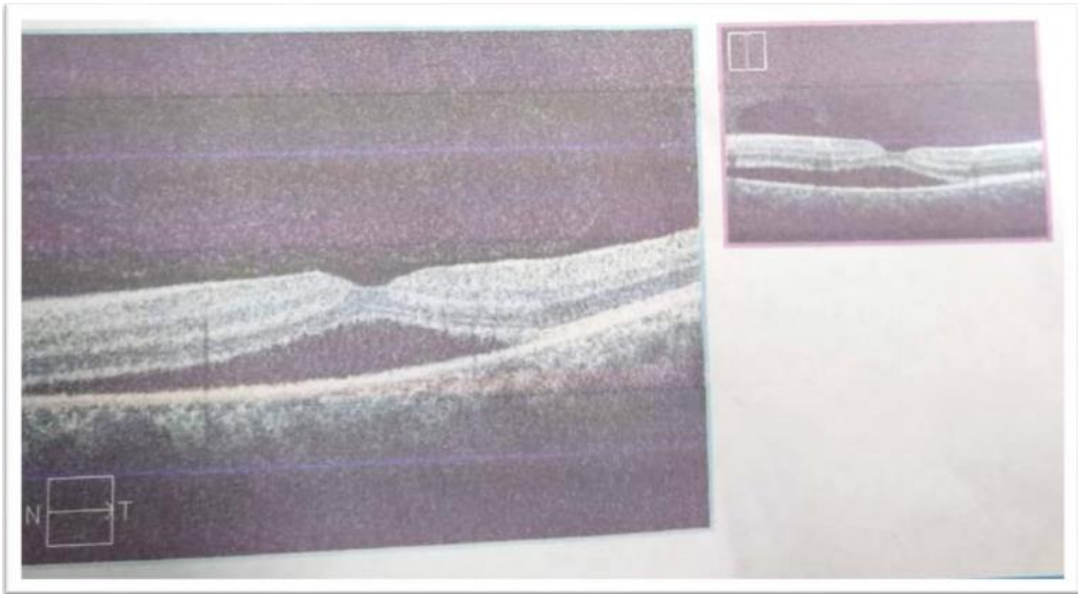
Postoperative OCT scan after 12 weeks in Group 1



Preoperative OCT scan in Group 2

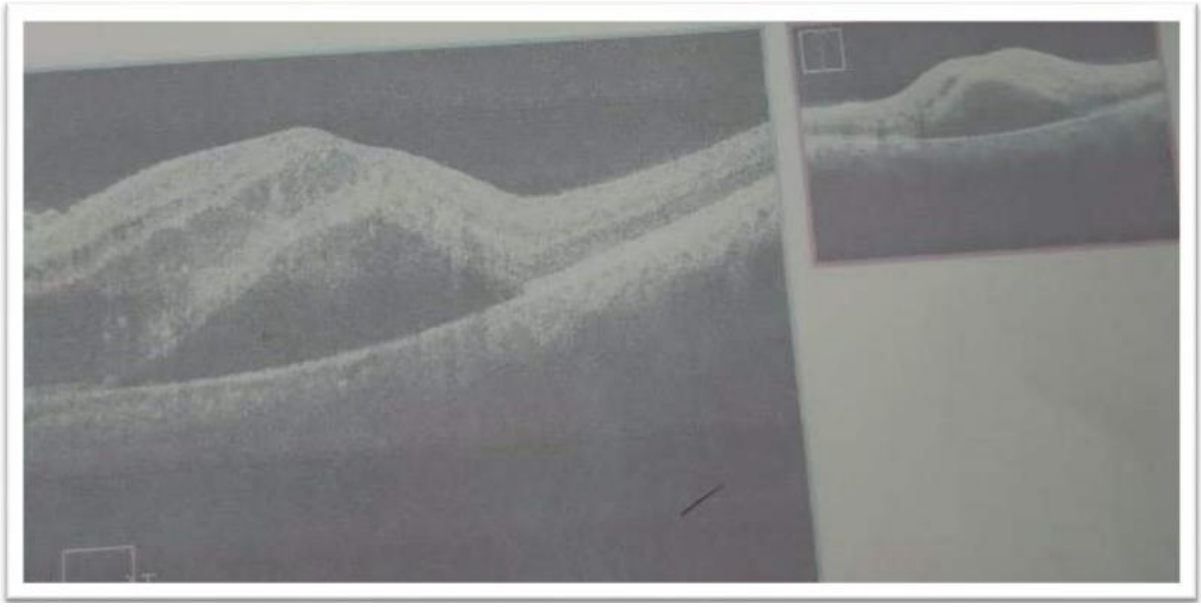


Postoperative OCT scan after 4weeks in Group 2



Postoperative OCT scan 12weeks in Group 2

Preoperative OCT scan in Group 3



Postoperative OCT scan after 4 weeks in Group 3

Postoperative OCT scan after 12 weeks in Group 3

Table-10: PREVALENCE OF MACULAR EDEMA

	GROUP 1	GROUP 2	GROUP 3
No. of patients	2(10%)	7(35%)	12(60%)

Table-11: CHANGES IN BEST CORRECTED VISUAL ACUITY

	Preoperative	2nd week	6th week	12th week
GROUP 1	6/24	6/12	6/9	6/6
GROUP 2	6/36	6/12	6/12	6/9
GROUP 3	6/60	6/36	6/24	6/24

DISCUSSION

- In our study we found that majority of the patients were between age group 61-70years.
- Males were highest in no. In our study and were maximum in group 2.
- 2(10%) in group 2 and 2(10%) in group 3 had type I DM out of 60 patients rest had type II DM
- In group 3 maximum no. of patients had longest history of diabetes.
- Duration of diabetes>10years was associated with increased foveal thickness at 6 week
- 10 participants (50%) had mild NPDR, 7(35%) had moderate NPDR, 3 (15%) had severe NPDR. Those with moderate to severe NPDR as compared to mild NPDR increase in foveal thickness were directly translated into poorer visual acuity outcomes.
- Change in foveal thickness from day 1 till 12 weeks postop in group 1 was 6mum, 24mum in group B and 48mum in group 3. There was significant increase in foveal thickness in diabetics with retinopathy as compared to those without retinopathy and controls.
- Visual acuity improved from 6/24 to 6/6 in group 1, 6/36 to 6/9 in group 2 and 6/60 to 6/24 in group 3 at the end of 12 weeks.
- In our study 19(47.5%) out of 40 diabetic patients as compared to 2 (10%) patients in control developed macular edema postoperatively. Prevalence of macular edema was more in diabetic as compared to non-diabetics.
- **Jaffe and Burton** and later **Schatz et al** had reported that cataract causes progression of retinopathy. They had reported 70% increase in progression of retinopathy postoperatively.
- **Henricsson et al**in theirstudy Diabetic retinopathy before and after cataract surgery reported that progression of retinopathy following cataract surgery was significantly related to degree of glycaemic control as assessed by average level of HbA1c before surgery and during follow up period. Progression was also related to presence of retinopathy at baseline and duration of diabetes.

CONCLUSION

The results of this suggested that duration of diabetes more than 10 years and level of diabetic retinopathy predict poorer visual outcomes at 12 weeks.

Diabetic eyes have a high incidence of increased center point thickness on OCT after cataract surgery, associated with a loss of vision at 1 month, with limited visual recovery at 3 months.

OCT may be effective means of detecting postsurgical CME or exacerbation of DME at 6 weeks after cataract surgery in diabetic patients.

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