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A STUDY TO ANALYSE THE OPTICAL COHERENCE TOMOGRAPHY PATTERNS OF DIABETIC MACULAR EDEMA IN PATIENTS ATTENDING TERTIARY CARE CENTRE

Ophthalmology

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ABSTRACT

Background: With 69.2 million people living with Diabetes Mellitus, Diabetic Retinopathy is a leading cause of blindness in India.Diabetic macular edema (DME) is the commonest cause of visual morbidity in Diabetic Retinopathy. This study aims to describe the various Optical Coherence Tomography (OCT) patterns of structural changes in Diabetic Macular Edema. **Methodology:** OCT scans were done in 60 eyes of 30 patients, pattern of DME,Central Foveal Thickness(CFT) was analysed and its correlation with visual acuity,severity of Diabetic Retinopathy(DR) and duration of diabetes was studied. **Results:** Majority of the participants were males(63%) and elderly(77%) more than 50 years. The most common type of diabetic macular edema OCT pattern was cystoid type(47%) followed by spongy type(30%) and cystoid with SRD(17%). Majority of the patients had severe NPDR(35%) with duration of diabetes more than 5 years(77%). Worse visual acuity correlates with CME with SRD pattern. **Conclusion:** Diabetic macular edema is the major cause of blindness in Diabetic Retinopathy. OCT helps in early diagnosis and quantitative assessment of Diabetic Macular Edema at an early stage with timely intervention helps to prevent permanent vision loss.

KEYWORDS

Diabetic Retinopathy,diabetic macular edema,OCT

INTRODUCTION

About 4 percent of world population is estimated to be affected by Diabetes Mellitus almost half of them have some degree of Diabetic Retinopathy (DR) at any given time.About 86% of type 1 and 33% of type 2 DM patients in western population suffered visual loss due to Diabetic Retinopathy[1].

With 69.2 million people living with Type 2 DM, India is the world's second-largest country, following China[1]Thus,with high prevalence rates of Diabetic Retinopathy,associated complications such as diabetic macular edema (DME) is a serious health concern .It is the commonest cause of loss of visual acuity in diabetes.DME may occur at any stage of Diabetic Retinopathy (DR), either mild, moderate, or severe nonproliferative DR, or at progressed stages of DR. DME deveops secondary to collection of subretinal and intraretinal fluid in the outer and inner plexiform layers owing to dysfunction of outer and inner retinal barriers.Review of literature shows that 24% of eyes with DME will lose at least three lines of vision within 3 years[2].

In recent times, Optical Coherence Tomography (OCT) had greatly impacted the diagnosis and follow-up of DME. It is noninvasive,gives reliable cross-sectional images of the retina and the vitreoretinal interface and permits quantitative measurements of the thickness of the retina . In addition, OCT proved vital in the diagnosis, progression and monitoring the response to treatment of Diabetic Retinopathy. OCT is indispensible for classification of the morphological pattern of DME.

Several OCT-based DME patterns include Sponge-like diffuse retinal thickness (SLDRT), Cystoid Macular Edema (CME), the presence of Sub Retinal Fluid (SRF) and vitreomacular interface abnormalities like posterior hyaloid traction(PHT) and Vitreomacular Traction (VMT)[8]. OCT is essential to identify and classify the different patterns of DME, to define indications of treatment modality (focal lasers,intravitreal Anti-VEGF/steroids,vitrectomy) as well as for post-treatment followup

AIMS AND OBJECTIVES:

- To analyze the patterns of structural changes in diabetic macular edema in patients with Diabetic Retinopathy by optical coherence tomography.
- To quantitatively assess the central foveal retinal thickness by optical coherence tomography in patients with diabetic macular edema.
- To study the clinical and tomographic profile of diabetic patients with diabetic macular edema

Methodology:

This Cross-sectional study was carried out in our hospital from January 2022 to December 2022 in Patients aged above 40 years with Type 2 Diabetes Mellitus with clinically significant macular edema (CSME).A total of 30 patients were enrolled in the study based on the inclusion and exclusion criteria.Optical Coherence Tomography (OCT) scans were performed and diabetic macular edema was categorized and quantified.

Inclusion criteria:

All patients with type 2 Diabetes Mellitus aged more than 40 years with clinically significant macular edema (according to ETDRS criteria) with retinal thickening within 500 microns of centre of macula,exudates within 500 microns of centre of the macula if associated with retinal thickening ,Retinal thickening of one disc diameter any part of which is within one disc diameter of centre of the macula.

Exclusion Criteria:

- Patients with macular edema due to any other cause
- Patients with Diabetic Retinopathy who had undergone Grid /PRP laser
- diabetic nephropathy,systemic hypertension,media opacities
- Patients not capable of giving consent and not willing to participate in the study

Data Analysis And Statistics:

Data obtained from the study has been entered in excel sheets and analyzed using SPSS software version 2.0 and has been presented as descriptive statistics in the form of tables,figures and graphs.

RESULTS:

During the one year study period ,a total of 30 patients and 60 eyes were examined in the ophthalmology OPD of our hospital.Patient's age ranged from 40 year to 72 years with the average age at 52 years and majority of the population were above 50 years(77%).Gender distribution showed male predominance with 19 (63%) male patients and 11 (37%) female patients.

Based on the duration of Diabetes Mellitus 2 (7%) patients had duration of diabetes less than 5 years,23 patients (77%) had more than 5 years duration while5(17%) patients had more than 10 years duration.

Based on the severity of Diabetic Retinopathy (DR),DME was associated mild NPDR in 3 eyes (5%), 19 eyes (32%) in moderate NPDR,21eyes (35%) in severe NPDR and 17eyes (28%) PDR. Visual acuity of > 6/12 was seen in 5 eyes (8%), Visual acuity between 6/18 -

6/36 in 20 eyes (33%), 21 eyes (35%) had VA between 6/60 -4/60, 14 eyes (23%) had VA of less than 2/60.

On performing OCT spongy pattern of DME was noted in 18 eyes (30%), cystoid pattern(fig1) in 28 eyes (47%), cystoid pattern with serous retinal detachment(fig1) was noted in 10 eyes (17%), Vitreomacular traction(fig1) was seen in 3 eyes(5%) and taut posterior hyaloids was identified in one eye(2%) (table 1)

In our study mean central foveal thickness was 477 microns. 20 eyes (33%) had central foveal thickness in the range of 200-350, 10 eyes (17%) had thickness in the range of 351-500, 24 eyes (40%) had central foveal thickness in the range of 501-650, and 6 eyes (10%) had central foveal thickness in range of 651-800 microns(table 2)

In the group with spongy pattern of DME 11 eyes (46%) had a central foveal thickness in range of 200 -350, 2 eyes (8%) in range of 351-500, 8 eyes (33%) in the range of 501 – 650, 3 eyes (13%) in 651-800 micron range.In the group with cystoid pattern of CSME, 7 eyes (33%) had a central foveal thickness in range of 200- 350 microns, 6 eyes(29%) in 351-500 range, 7 eyes(33%) in 501-650 range and 1(5%) in 651-800 micron thickness range.1eye (34%) in group of cystoid with serous detachment pattern 1 patient(9%) had central foveal thickness in range of 351-500 microns,8 eyes (73%) in range of 501-650 microns and 2 eyes(18%) in range of 651-800.One eye with VMT pattern had a central foveal thickness 351-500 range and 2 eyes in 501-650microns range.one eye with taut posterior hyaloids had foveal thickness of 492 microns.

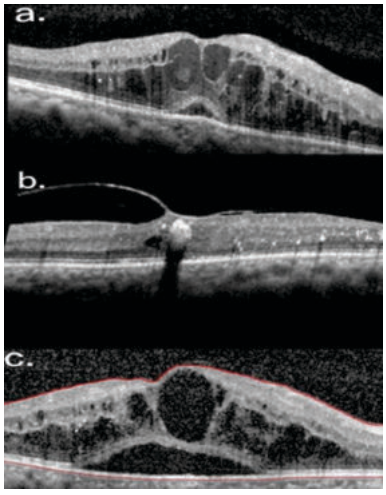

Figure 1: a)cystoid macular edema b)vitreomacular traction c)cystoid macular with subretinal detachment

Spongy pattern of DME was found to be the commonest pattern in all groups of patients who were classified depending on duration of DM. Eyes with DM of 5 years all had spongy pattern.Eyes with DM of 5-10 years spongy type was seen in 14 eyes (31%), CME in 19 eyes (42%),8 eyes (13%) had CME with SRD,3 eyes (5%) with VMT and 1 eye(1%) with TPH.Eyes with DM more than 10 years,7 eyes(11%) had spongy type,2 eyes(3%) with cystoid type and 2 eyes(3%) with CME with SRD(fig 2)

Table 1: Distribution Of Pattern Of Oct

OCT TYPES		
TYPE	NUMBER	%
SPONGY	18	30%
CYSTOID MACULAR EDEMA (CME)	28	47%
CME WITH SRD	10	17%
VITREOMACULAR TRACTION(VMT)	3	5%
TAUT POSTERIOR HYALOID	1	2%

Table2: Distribution Of Central Foveal Thickness

CENTRAL FOVEAL THICKNESS (CFT)		
CFT (in µ)	Number	percentage%
200-350	20	33%
351-500	10	17%
501-650	24	40%
651-800	6	10%

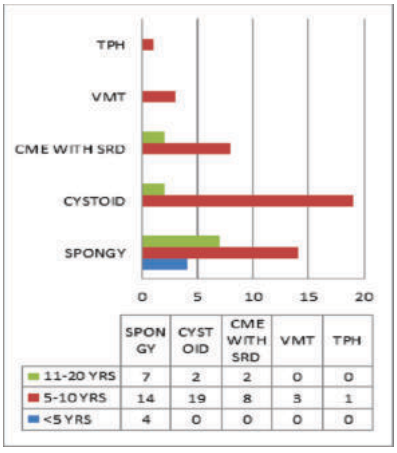

Figure 2 : Correlation Between

Duration Of Diabetes Mellitus And Dme Pattern Of Oct Mild NPDR was seen only in one eye(1%) with spongy type.Moderate NPDR was seen in 36 eyes(60%), 16 eyes (26%) of spongy pattern, 12 eyes (20%) with CME 4 eyes (6%) of CME with SRD,3 eyes(5%) with VMT and 1(1%) eye with TPH. Severe NPDR was present in 23 eyes(38%), 8 eyes (13%) were of spongy pattern, 11 eyes (18%) of CME pattern and 4 eye (6%) CME with SRD. PDR was seen in 17 eyes(28%), 11(18%) were of spongy pattern, 4 eyes (6%) CME pattern and 2 eyes (3%) CME with SRD (fig 3).

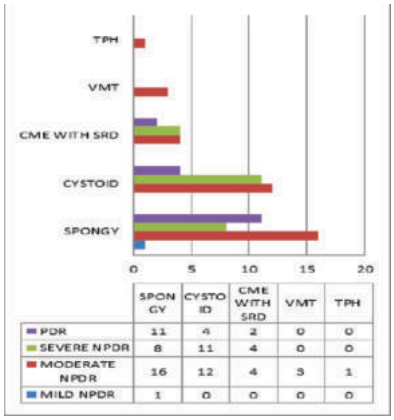

Figure3: Correlation Between Severity Of Dr And Oct Pattern

On correlation of visual acuity with OCT type, in eyes with visual acuity >6/12 ,2 eyes (40%) had spongy pattern,1(20%) with cystoid pattern and 2(40%) CME with SRD. In eyes with visual acuity 6/18 - 6/36 8 eyes (40%) had spongy pattern,8(40%) cystoid pattern, 2 each(10%) for CME with SRD and VMT. In eyes with visual acuity 6/60 -2/60 ,10 eyes(50%) had spongy pattern,5(25%) cystoid pattern,3(15%) CME with SRD and 2(10%) with VMT. In visual acuity <2/60, 3 eyes(20%) had spongy pattern,3(20%) cystoid pattern,8 eyes(53%) CME with SRD and 1(6%) with TPH (fig 4)

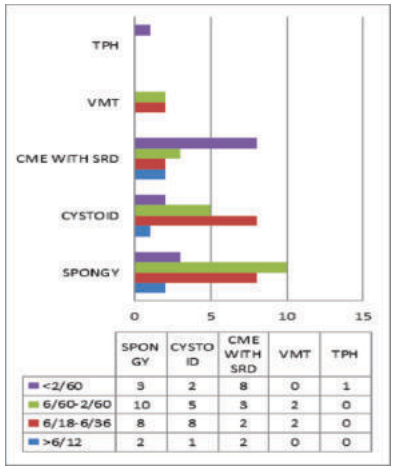

Figure 4 : Correlation Between Visual Acuity And Oct Pattern

DISCUSSION:

Our study included 60 eyes of 30 diabetic patients with DME and varying degrees of severity of Diabetic Retinopathy.

In our study mean age of the population was 58years and majority of the patient were in the age group of above 50 years (77%).The Wisconsin Epidemiological study of Diabetic Retinopathy revealed that middle aged population are more affected by DR and have a higher prevalence of Dr[2].

Males were the predominant sex to be affected in our study (63 %) which correlates with the findings of the Wisconsin Epidemiological study of Diabetic Retinopathy which suggested a male to female ratio of 1.5:1[2]. Also Maalej et al and Acan D et al studies showed similar male predominance[13,16].

In our study majority of patients had severe NPDR (35%) followed by moderate NPDR(32%),PDR(28%) and mild NPDR(6%). According to Acan D et al DME prevalence was 72% in patients with severe NPDR[13].

In our study majority had duration of diabetes 5 -10 years (77%) and had severe NPDR(35%).According to Wisconsin Epidemiological study of Diabetic Retinopathy the prevalence rate of macular edema is increased to 29 % in those who has duration of diabetes more than 20 years[2].

In our study spongy pattern of DME was noted in 18 eyes (30%), cystoid pattern in 28 eyes (47%), cystoid pattern with serous retinal detachment was noted in 10 eyes (17%), Vitreomacular traction was seen in 3 eyes(5%) and taut posterior hyaloids was identified in one eye(2%). In study done by Al – Sharkawy and Alkuraya H etal spongy pattern was found to be the most common oct pattern followed by cystoid pattern[10,11].while study conducted by Maalej et al and luxmi S et al found cystoid type of macular edema to be the most common pattern in age group of 40- 50 years[14,16].

Based on the duration of Diabetes Mellitus and diabetic macular edema diabetes with 5 years ,5-10 years and >10 years duration the most common oct pattern was spongy pattern(100%),cystoid pattern(42%) and spongy pattern(63%) respectively. According to Luxmi S et al 63.5% with duration of diabetes 10-20 years had spongy pattern[14].

Based on the diabetic macular edema pattern and CFT, in patients with spongy pattern majority (46%) had 200-350µ CFT,while in cystoid pattern 33% had 501-650µ. In CME with SRD 72% had 501-650µ CFT.

Based on the correlation of visual acuity and diabetic macular edema patient with visual acuity <2/60 ,53% had CME with SRD , spongy pattern(20%) and cystoid pattern(20%).But the common pattern in eyes with >6/12,6/18- 6/36 and 6/60-2/260 vision was spongy pattern. According to Alkuraya H etal SRD patterns were associated with high central retnal thickness and hence worse visual acuity[10]. In another study by Kim BY et al CME and PHT was related to worse visual acuity[12].

Regarding the correlation of visual acuity with diabetic macular edema spongy pattern is the earliest manifestation of DME associated with fluid accumulation in outer retinal layers which later coalesce to form cysts with interstitial septa and further increase in vessel leakage can lead to fluid accumulation in the subretinal space and neurosensory detachment[10].

Hence longstanding diabetic macular edema can lead to death of muller cells forming large cysts with less inner and outer retinal bridges, hyper reflective wall. The presence of neurosensory detachment is suggestive of ELM disruption,more hyperrefective foci. Hence chronic macular edema, increased CFT,cystoid pattern,SRD pattern,vitreomacular inrterface abnormalities and poor presenting visual acuity are poor visual prognostic indicators[12].

SUMMARY AND CONCLUSION

In this hospital based study conducted in our tertiary care hospital,we found that majority of the participants were males in the age group of more than 50 years. The most common type of diabetic macular edema OCT pattern was cystoid type followed by spongy type and cystoid with SRD. Majority of the patients had severe NPDR with duration of diabetes more than 5 years. Worse visual acuity was correlated with CME with SRD pattern.

Hence diabetic macular edema being the major cause of progressive vision loss and blindess in patients with Diabetes Mellitus , OCT seems to be the technique of choice for the early diagnosis of macular edema which can be missed on slit lamp examination. Quantitative assessment and macular thickness mapping provides thickness at any point of macular area. Early detection and timely intervention is essential to prevent permanent vision loss. Also strict control of diabetes ,hyperetension and dyslipidemia should be emphasised which plays a crucial role in the treatment and prevention of DME progression.

Limitatons Of Study:

Limited sample size and various OCT parameters like IS-OS layer,ELM layer and choroidal thickness not evaluated.Also FFA wasnot done to look for macular ischemia.

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Conflict of interest - None.

Ethical approval - approved by Institutional ethics committee

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