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COMPARISON OF RETINAL NERVE FIBER THICKNESS BETWEEN NORMAL POPULATION AND PATIENTS WITH TYPE 2 DIABETES MELLITUS USING OPTICAL COHERENCE TOMOGRAPHY.

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ABSTRACT

Objective: To evaluate effect of type 2 diabetes mellitus on Retinal Nerve Fiber Layer(RNFL) thickness using Optical Coherence Tomography(OCT) and compare it with normal population as control. To correlate retinal nerve fiber layer thickness with duration of diabetes mellitus.

Method: The RNFL thickness of 76 eyes of diabetic patients with no diabetic retinopathy or mild non proliferative diabetic retinopathy and 70 eyes of normal patients were measured using SD-OCT. Average RNFL thickness, along with RNFL of each quadrant was noted and compared between two groups. RNFL thickness also compared with duration of diabetes mellitus.

Results: A significant correlation was found when average RNFL was compared (p value < 0.05) in diabetics vs normal patients. A significant correlation was also found in superior and inferior RNFL quadrants (p value <0.05). Loss of RNFL was not in significant correlation with duration of Diabetes (p value >0.05)

Conclusion: A significant RNFL thinning occurs in patients with diabetes mellitus and should be considered sight threatening and important prognostic factor for development and progression of diabetic retinopathy.

KEYWORDS : Retinal nerve fibre layer thickness, Optical coherence tomography, Diabetes mellitus.

INTRODUCTION:

Diabetes mellitus (DM) is a global epidemic. Diabetic Retinopathy (DR) is the leading cause of blindness in middle aged adults. The prevalence of DR among diabetics came out to be 16.9%, a reasonably high figure in a National Diabetic Retinopathy Rapid Assessment of Avoidable Blindness (RAAB) Survey 2015–2019.[1]. Diabetic retinopathy (DR) is not only a microangiopathy but also leads to direct damage to the nerve fiber layer, glial cells or neuronal metabolism which directly impact neurotransmission and may lead to apoptosis of retinal neuron. Thus, measurement of RNFL thickness in patients with DM can be utilized to diagnose patients with, or at risk for development of diabetic neuropathy. Optical Coherence Tomography (OCT) is the most precise method to measure retinal thickness in vivo[2]. It is an advantageous tool which helps in acquiring data at high speed, reconstructs in a three dimensional formal and shows the different retinal layers.

AIMS AND OBJECTIVES:

The aim of this study is to assess retinal nerve fibre layer thickness (RNFL) in type 2 diabetic patients without DR and patients with mild non proliferative diabetic retinopathy (NPDR) and compare it with normal population using Spectral domain Optical coherence Tomography (SD-OCT).

MATERIALS AND METHODS:

This Cross-sectional study was conducted at Smt. Kashibai Navale Medical College and General Hospital, Narhe, Pune with proper permission from Ethical committee of same college during July – October 2021. One hundred and forty six eyes of 73 patients in the age group of 45 – 60 years were evaluated. Patients were divided into two groups: Group A- 38 Patients with type 2 Diabetes mellitus with No DR or mild NPDR with no maculopathy and Group B- 35 patients Control group.

Inclusion Criteria-

1. Type 2 DM with no DR or mild Non Proliferative Diabetic Retinopathy.
2. Age between 45 to 60 years.
3. Duration of diabetes more than 5 years.
4. Clear view of retina.

Exclusion Criteria-

1. Eyes with ocular pathologies such as high refractive errors, optic neuropathy, Maculopathy, Uveitis.
2. Cases of diabetic retinopathy with previous history of laser, previous history of vitreoretinal surgery, diabetic retinopathy with diabetic macular edema and other retinopathy due to hypertension or vascular diseases.
3. Ocular conditions causing hazy fundus view as advanced cataract, cloudy media.
4. Patients with Glaucoma or Glaucoma suspects (cup disc ratio more than 0.5 or intraocular pressure more than 21 mmHg).

All patients in the control group were evaluated for undiagnosed DM. Patients were subjected to full ophthalmological examination including measurement of visual acuity aided and unaided, refraction, anterior segment examination using slit lamp biomicroscopy to detect any opacity or any other abnormality intraocular pressure measurement, and posterior segment examination using Indirect Ophthalmoscope and slit lamp with +90 D lens. Optical coherence tomography performed with SD OCT (Tocpon) using retinal nerve fiber layer thickness through 3D disc protocol measuring strategy after pupil dilation with 1% tropicamide. All quantitative variables were compared using Independent T test and a p value of < 0.05 was considered statistically significant.

RESULTS:

One hundred and forty six eyes of 73 patients in the age group of 45 – 60 years were analysed. Out of 38 patients in group A, 20 patients were male and 18 were female with average age of 54.2 years. In group B, out of 35 participants, 19 were males and 16 were female with average age of 53.7 years. Thus both groups were matched in terms of age and gender.

Table 1. Group Wise Distribution Of Peripapillary (four Quadrants) RNFL Thickness In Micro Meter (n=146)

Quadrant	Group A (n=76)	Group B (n=70)	p-value
Average (mean+/- SD)	97.37 +/- 14.03	104.87 +/- 9.88	0.0003*
Superior (mean+/-SD)	120.24 +/- 18.87	129.03 +/- 15.20	0.0026*
Inferior (Mean+/-SD)	120.26 +/- 20.75	130.06 +/- 19.46	0.0041*
Nasal (Mean+/-SD)	79.54 +/- 14.84	79.50 +/- 13.00	0.986**
Temporal (Mean+/-SD)	67.50 +/- 12.87	70.77 +/- 8.89	0.080**

*marked values have p-value <0.05, statistically significant. **marked values are not statistically significant

The difference in Average RNFL thickness as well as RNFL thickness at superior and inferior quadrants were statistically significant between group A and group B. The difference in RNFL thickness at nasal and

temporal quadrants were not statistically significant between two groups.

Table 2. Duration Wise Distribution Of Peripapillary RNFL Thickness (in Micrometer) In T2DM Patients

	Group 1 (n=42)	Group 2 (n=34)	p-value
Average RNFL (Mean +/- SD)	99.67+/- 15.14	94.53 +/- 11.92	0.115* NS

Group 1- Duration of T2DM 5-8 years, Group 2 – Duration of T2DM >8 years.

There is linear but Not significant correlation between RNFL thickness and duration DM.

DISCUSSION:

Our study shows that the RNFL thickness measured by OCT is significantly thinner in diabetics as compared to normal controls. The results indicate an early neurodegenerative effect on the RNFL even when the vascular component of DR remains minimal. Chihara et al[3] in 1993 detected nerve fiber layer defects in 20% of diabetics without microaneurysms, and 57% with microaneurysms using red-free photography. A study by Oshitari T et al found that at early stage of DR, the macula and RNFL thickness were altered.[4] Several recent publications have shown that retinal neurodegeneration precedes clinically detectable microvascular damage.[5,6]

Our study also showed that RNFL thickness in diabetic patients was significantly less at superior and inferior quadrants, but not at nasal and temporal quadrants. A study by Sugimoto M et al showed that only superior quadrant peripapillary RNFL thickness was slightly less in diabetic patients than normal subjects.[7] Outcome of some previous studies have demonstrated that RNFLT was decreased in patients with preclinical DR in all 4 quadrants, but the difference was significant only at the superior quadrant.[8,9]

There is linear but No significant correlation between RNFL thickness and duration DM found in our study. Alexandros Takis et al demonstrated that RNFL thickness is independent of duration of diabetes.[10] In another study by Araszkiewicz A et al showed that neurodegeneration in diabetic retinopathy is significantly associated with disease duration.[11]

Limitations Of Study:

The sample size was small and glycemic control (HbA1c) was not taken into consideration.

CONCLUSION:

The RNFL thickness is reduced in patients with DM, as compared to age matched controls. The thinning of RNFL is indirect evidence of neurodegeneration due to DM, which may precede the development of diabetic retinopathy.

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