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Original Research Paper

Ophthalmology

ASSESSMENT OF RETINAL NERVE FIBRE LAYER THICKESS IN TYPE II DIABETIC PATIENTS WITHOUT DIABETIC RETINOPATHY BY OPTICAL COHERENCE TOMOGRAPHY

Dr. Sanjeevani Ambekar M.S. Ophthalmology Professor and Head Department of Ophthalmology B.J. Government medical college ,Pune

Dr. Apurva Puranik MBBS Post Graduate student in M.S Ophthalmology B. J. Government Medical College ,Pune

ABSTRACT

In diabetic retinopathy, neuronal loss occurs earlier than microvascular abnormalities. Loss of neuronal tissue will lead to a decrease in RNFL .Any loss of neuronal tissue will lead to a decrease in retinal thickness .. Optical Coherence Tomography (OCT) is the most precise method to measure RNFL. Objective assessment of RNFL will help in developing neuroprotective therapeutic regimens. so that in future, a preventive rather than interventional approach can be applied in its treatment.

AIM To assess RNFL thickness by OCT in type 2 diabetic patients without DR and compare it with healthy volunteers to detect any nerve fibre loss. To correlate RNFL loss with Hb1Ac.

Material &Methods : This is a cross sectional ,observational, descriptive study done on 100 eyes of type 2 diabetic patients without DR and compared with healthy volunteers matched for age and sex

Results : When avg RNFL thickness of cases was compared with controls significant correlation noted (p-value < 0.05). Significant correlation was also noted in superior, inferior nasal and temporal quadrants .(p-value < 0.05) .No significant correlation found between RNFL thickness and HB1Ac.

CONCLUSION : RNFL thinning noted in Type II diabetes patients . Assessment of RNFL thickness can serve as an important tool for early detection and treatment of Retinopathy

KEYWORDS : RNFL, Diabetic retinopathy ,OCT

Introduction

India with more than 62 million diabetic individuals currently diagnosed with the disease. Diabetic retinopathy is a result of microvascular changes which include pericyte loss, microaneurysm,capillary leakage and capillary vascular occlusion. Till now diabetic retinopathy was considered as microangiopathy ,however many functional changes in the retina can be identified before vascular pathology develops, suggesting that they result from a direct effect of diabetes on the neural retina. The neuronal apoptosis begins very early in the course of diabetes. Several clinical tools optical coherence tomography (OCT), multifocal electro-retinogram (mfERG), flash ERG, and short-wavelength automated perimetry have shown functional deficit in the neurological component in the early stages of diabetes Diabetic retinopathy is thus perceived as a neurodegenerative disease. Any loss of neuronal tissue will lead to a decrease in retinal thickness . Neurodegeneration cannot be reversed Diabetic retinopathy is an appropriate target for screening: it is an important health problem with a recognisable presymptomatic state, the screening procedure is considered acceptable, an appropriate treatment is available, and screening is cost effective Current screening techniques rely on visual inspection of photographic images and are therefore labour intensive) Computerised image analysis may be a cost effective means of grading these images. Optical coherence tomography is more sensitive than clinical examination or stereoscopic fundus photography for the detection of retinal thickening 2

Aim &Objectives :- The aim of this study is to assess retinal nerve fiber layer (RNFL) thickness (as determined by Optical coherence tomography (OCT) in type 2 diabetic patients without clinical nerve manifestations of diabetic retinopathy and compare it with healthy volunteers to detect any nerve fiber loss.

1. The aim of study is to assess retinal nerve fibre loss and correlate it with blood sugar control by measuring Hb1ac,

Materials and Methods

This was a cross sectional ,observational, comparative descriptive study that was be done on 100 eyes of type 2 diabetic patients without diabetic retinopathy .and compared with healthy volunteers matched for age and sex visiting Sassoon hospital in the period from February 2017 up to April 2017. A thorough workup of the patient was carried out . Detailed clinical history was taken .Patients were subjected to slit lamp examination and funduscopic examination (Direct and Indirect fundus examination. Blood samples were drawn to determine HB1Ac.

Following patients were included in the study: 1) TYPE 2 Diabetic Mellitus For at least 10 years (to allow enough time for the development of diabetic retinal disease) 2) Absence of any endocrine, hepatic, metabolic, or cardiovascular disease (determined by a history of cardiovascular disease if there was a physician verified history of angina, heart attack, or stroke, or if the patient was taking cardiovascular medications) or of hypertension and non-diabetic renal disease.

Following patients were excluded from the study 1 Patients with blood pressure measurements above 140/90 mm Hg 2 Patients with any degree of diabetic retinopathy 3 High myopia, chorioretinitis scars, posterior uveitis, ocular hypertension (intraocular pressure (IOP) higher than 21 mm Hg), or glaucoma and who had undergone previous ocular surgery be excluded, since such events may influence the development of diabetic retinopathy25 or damage the RNFL.

CARL ZEISS SD-OCT 2014 Meditec model 500 was utilized to take optic disc scans of the cases The methodology adopted was spectral domain OCT with optical source – superluminescent diode (SLD) with wavelength 840 nm. The scan speed was 27,000 A-scan per second. A-scan depth 2mm in tissue,1024 points.Axial resolution 5 micron in tissues with 15 micron transverse resolution in tissues.

Patients were dilated with tropicamide and phenylephrine before taking scans.Optic disc cube scans 200 x200 were taken for all cases .The optic disc OU analyses revealed average Right eye and Left eye RNFL thickness and Re And LE average RNFL thickness in superior ,inferior ,nasal and temporal quadrant

Results

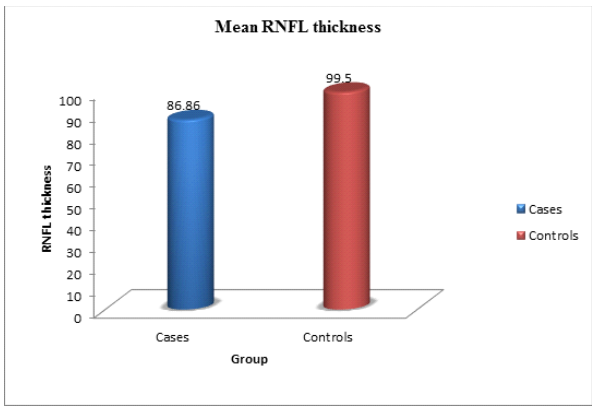
DEMOGRAPHICS

In total 50 patients were included in the study.26 males (52 %) and

24 females(48%) partipated in the study. Cases from 46 to 76 years of age were included the study. Average age of the cases was 53 .91 with standard deviation -+ 8.56.

1 When 100 eyes of Type II diabetic patients without Retinopathy (CASES) were compared with age and sex matched control the average RNFL thickness in cases was 86.86 micron (+/-12.80)while amongst controls was 99.50 (+/-18.16) p value was significant (<0.05)

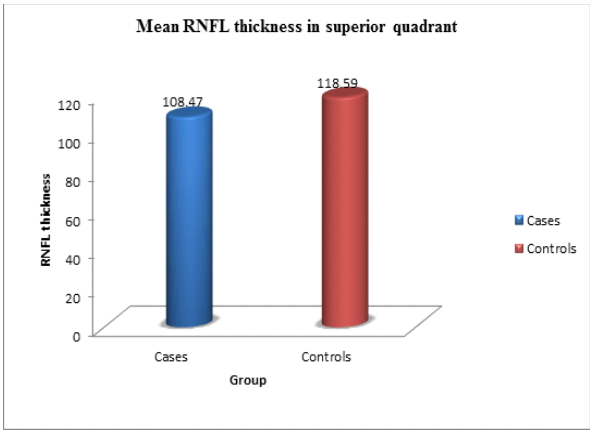
Group	Number of eyes	RNFL in micron		p-value
		Mean	SD	
Cases	100	86.86	12.80	< 0.001
Controls	100	99.50	18.16	



2 When 100 eyes of Type II diabetic patients without Retinopathy (CASES) were compared with age and sex matched control the average RNFL thickness in superior quadrant in cases was 108.47 micron (+/-19.22)while amongst controls was 118.59 (+/-19.19) p value was significant (<0.05)

Group	Number of eyes	Superior Quadrant in micron		p-value
		Mean	SD	
Cases	100	108.47	19.22	< 0.001
Controls	100	118.59	19.99	

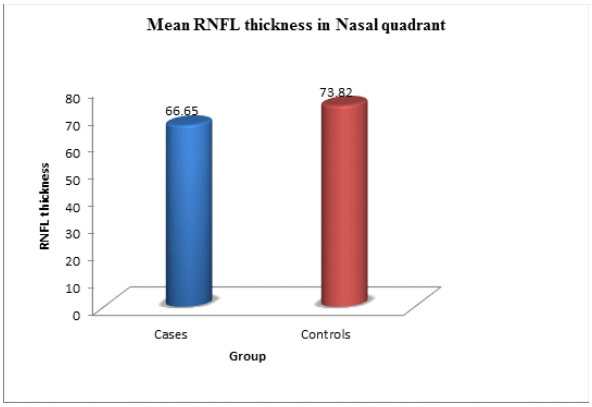
Significant (p-value < 0.05) 2 independent sample t-test used



3 When 100 eyes of Type II diabetic patients without Retinopathy (CASES) were compared with age and sex matched control the average RNFL thickness in nasal quadrant in cases was 66.65 micron (+/-15.19)while amongst controls was 73.82 (+/-15.67) p value was significant (<0.05)

Group	Number of eyes	Nasal quadrant in in micron		p-value
		Mean	SD	
Cases	100	66.65	15.19	< 0.001
Controls	100	73.82	15.67	

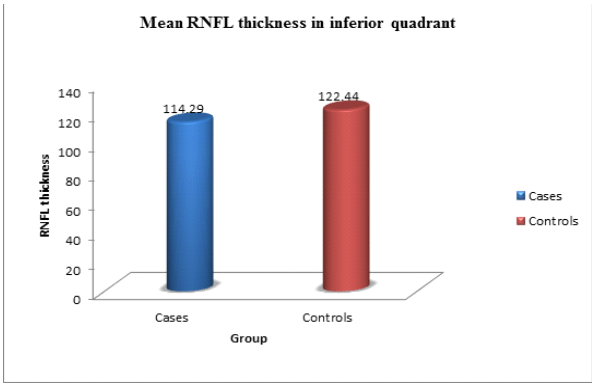
Significant (p-value < 0.05) 2 independent sample t-test used



4 When 100 eyes of Type II diabetic patients without Retinopathy (CASES) were compared with age and sex matched controls the average RNFL thickness in inferior quadrant in cases was 114.29 micron (+/-22.28)while amongst controls was 122.44 (+/-19.21) p value was significant (<0.05)

Group	Number of eyes	Inferior quadrant in micron		p-value
		Mean	SD	
Cases	100	114.29	22.28	< 0.001
Controls	100	122.44	19.21	

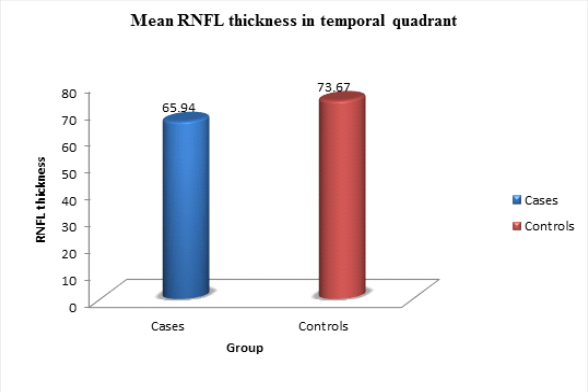
Significant (p-value < 0.05) 2 independent sample t-test used



5 When 100 eyes of Type II diabetic patients without Retinopathy (CASES) were compared with age and sex matched controls the average RNFL thickness in temporal quadrant in cases was 65.94 micron (+/-12.80)while amongst controls was 73.67 (+/-12.64) p value was significant (<0.05)

Group	Number of eyes	Temporal quadrant in micron		p-value
		Mean	SD	
Cases	100	65.94	12.80	< 0.001
Controls	100	73.67	12.64	

Significant (p-value < 0.05) 2 independent sample t-test used



6 When 100 eyes of Type II diabetic patients without Retinopathy (CASES) were compared with age and sex matched controls the average RNFL thickness in various quadrants showed negative but no significant correlation as regards HB1Ac

		RNFL in micron	SUP Q in micron	NASAL Q in micron	INF Q in micron	TEMP Q RE in micron
HBAIC	Pearson Correlation coefficient (r)	-0.130	-0.039	-0.157	-0.005	-0.172
	p-value	0.198	0.698	0.119	0.962	0.087
	Number of eyes	100	100	100	100	100

No Significant correlation with hbA1c

7 When average RNFL thickness in various quadrants amongst cases was correlated with duration of diabetes significant negative correlation was found

		RNFL in micron	SUP Q in micron	NASAL Q in micron	INF Q in micron	TEMP Q RE in micron
Duration of DM in CASES	Pearson Correlation coefficient (r)	-0.236	-0.188	-0.064	-0.168	-0.185
	p-value	0.018*	0.061	0.526	0.095	0.065
	Number of eyes	100	100	100	100	100

Significant negative correlation between RNFL thickness with Duration of DM

Conclusion

When average RNFL thickness of cases was compared with controls significant correlation noted (p-value < 0.05). Significant correlation was also noted in superior, inferior nasal and temporal quadrants .(p-value < 0.05) .No significant correlation found between RNFL thickness and HB1Ac

Discussion.

Diabetic retinopathy is considered as a vasculopathy. However,recent work by American Diabetic Associatiation suggest neurodegeneration as cause of diabetes. Even though Microvascular lesions form integral part of retinopathy, Retina is a vascularised neural tissue and not just a network of vessels. The outpatient clinic of the Department of Ophthalmology at the Academic Medical Centre (University Hospital, Amsterdam, The Netherlands) conducted a study of type II diabetes and no or minimal DR.The results of this study demonstrated that the inner retinal layers—RNFL, GCL, and IPL—in the macula were thinner in patients with minimal DR compared to controls in an unselected population of patients with type 2 diabetes The other retinal layers did not show a significant difference in layer thickness. Patients with diabetes but no DR showed no significant difference in any layer thickness in both areas compared to normal controls.

Alexandros Takis et al demonstrated that there was a statistically significant reduction of RNFL in both diabetics without retinopathy and diabetics with mild retinopathy using scanning laser polarimetry or gdxThe multivariate analysis in this study showed that RNFL thickness is independent of duration of diabetes and the HbA1c levels In 2014 Rudrajit Paul et al studied RNFL thickness in type II diabetic patients without Retinopathy by 3-Dimensional Optical Coherence Tomography from Eastern India.Their small pilot study included 10 diabetic cases (20 eyes) and 11 controls (22 eyes). There was significant thinning of RNFL in 6 (60%) diabetic cases and none of the controls. Two of the diabetics had severe thinning around optic nerve head. 83% of the patients had thinning on temporal side and 50% on nasal side. Mean blood glucose levels were higher in those with RNFL thinning To summarize our study supports that diabetes has a neurodegenerative component.Our study paves way for utilizing optical coherence tomography as a screening modality for early detection of neural damage in type II diabetic patients.

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