



CENTRAL MACULAR THICKNESS-A PROSPECTIVE STUDY

Ophthalmology

Dr Rakesh Kumar M S Ophthalmology, Civil Hospital, Palampur. District-Kangra H.P., INDIA-176061.

Dr Smriti Sharma* M S Ophthalmology, Civil Hospital, Palampur. District-Kangra H.P., INDIA-176061.

*Corresponding Author

ABSTRACT

Aims: To measure the central macular thickness on optical coherence tomography in diabetic retinopathy to predict the development of sight threatening retinopathy.

Materials And Methods: 154 patents were enrolled and all the subjects underwent comprehensive ophthalmic evaluation including spectral domain optical coherence tomography. Central macular thickness was calculated automatically using an inbuilt topographic mapping software Central subfield thickness (CSFT).

Results: Total 154 patients were enrolled, out of which 94(61%) were male and 60(39%) were females. Central macular thickness of right eye for various categories were as follows: central thickness of patients with no Diabetes was 209 ± 22.3 , with NO DR was 204 ± 20.94 , with NSTDR was 238 ± 30 and with STDR was 382 ± 121.44 . Central thickness of Left eye with no Diabetes was 211 ± 24.13 , with NO DR was 204 ± 18.98 , with sNSTDR was 234 ± 27.85 and with STDR was 372 ± 104.68 . In our study it was found that central thickness was found to be progressively increased with increase in the severity of diabetes. This was found to be true for both right and left eye. On comparison of central thickness of STDR with other categories: NO Diabetes, No DR, NSTDR and STDR it was found to be statistically significant ($p = .000$).

Conclusion: Central thickness was found to be progressively increased with increase in the severity of diabetes in both right and left eye. It was found to be statistically significant ($p = .000$). Central thickness can be used as a good indicator to monitor diabetic individuals. Besides this, vision-threatening macular oedema can be detected earlier.

KEYWORDS

INTRODUCTION

Diabetes is a global epidemic and already showing its devastating human, social and economic consequences. According to the International Diabetes Federation, 61.3 million people in India had diabetes in 2011. That figure is projected to rise to 101.2 million by 2030.¹ Diabetic retinopathy (DR) is one of the most common micro vascular complication seen in type 1 and type 2 diabetes. Visual functions of the patient are usually impaired when macula of more precisely fovea is involved. Variation in foveal shape is related to the structural alterations of the retinal layers. Various parameters of the foveal structure have been found to be altered in subjects with diabetic retinopathy (DR)^{2,3,4} and age-related macular degeneration.⁵ It is known that the foveal avascular zone (FAZ) diameter enlarges in DR and further increases with severity of retinopathy due to the capillary dropout.^{3,4} Macular oedema is one of the important sign in patients with diabetic retinopathy which progresses to complete blindness. Therefore, early diagnosis of the disease can prevent the progression of disease.⁶ The incidence of macular oedema is high and present in about 10% of diabetics. The main factors which control visual acuity are central foveal involvement, peri-foveal capillary blood flow velocity, severity of peri-foveal capillary occlusion and retinal thickness at the central fovea. A new non-invasive imaging modality Optical Coherence Tomography (OCT) has been used in the diagnosis and treatment of a variety of macular diseases.⁷ This technique shows strong correlation between central foveal thickness and visual acuity. OCT is used to quantitatively measure macular thickness for diagnosis and management of macular oedema and also to detect subclinical macular thickening in Diabetic Retinopathy.⁸ The study was done to assess the central macular thickness with type 2 diabetes and to correlate central macular thickness with severity of diabetes.

MATERIALS AND METHODS

It was a prospective study of diagnosed patients of type 2 Diabetes mellitus attending eye OPD from July 2016 to June 2017. All diabetic patients attending eye OPD meeting the American Diabetes Association (ADA) criteria were examined and patient having history of previous ocular surgery, macular pathology like AMD, hereditary maculopathy or opaque ocular media were excluded from the study. The patients were subjected to various biochemical investigations and detailed ophthalmological examination. DR was graded clinically using Klein's Classification (modified early treatment DR study (ETDRS) scales) and the subjects were further divided as no DR, as non sight-threatening DR (non-STDR) and as STDR. Non STDR subjects included cases of mild and moderate non proliferative DR and those with STDR included severe non proliferative DR, proliferative and clinically significant macular edema. Retinal

photographs were obtained after pupillary dilatation using fundus camera (KOWA'S FUNDUS CAMERA VX-10, Tokyo Japan), Retinal thickness was measured using 3D OPTICAL COHERENCE TOMOGRAPHY 3D OCT-1 PC SOFTWARE EDITION Version 8.1X. Retinal thickness was calculated automatically using an inbuilt topographic mapping software. Central subfield thickness (CSFT) was noted. The patient at the time of registration filled out a standard consent form.

Statistical Analysis:

Data collected during the study was tabulated and analysed by using Chi-square test and Anova test. Continuous variables are presented as a mean $\pm$ standard deviation and categorical variables were presented as absolute numbers and percentage. The p-value was calculated and a value of < 0.05 was implied to be statistically significant at 95% confidence interval.

RESULT

Total 154 patients were enrolled, out of which 94(61%) were male and 60(39%) were females. Table-1 shows mean value of central thickness of right eye for different categories. Right eye mean central thickness of patients with NO Diabetes was 209.47 ± 22.34 , mean central thickness of patients with No DR was 204.71 ± 20.94 , mean central thickness of patients with NSTDR was 238 ± 30 and mean central thickness of patients with STDR was 382 ± 121.44 .

Table-2 shows mean of central thickness of left eye for different categories. Left eye mean central thickness of patients with No diabetes was 211.71 ± 24.13 , mean central thickness of patients with No DR was 204.26 ± 18.98 , mean central thickness of patients with NSTDR was 234.83 ± 27.85 and mean central thickness of patients with STDR was 372.64 ± 104.682 .

Right eye: On comparison of central thickness of STDR with other categories: STDR with No diabetes there was mean difference of 172.548, STDR with No DR there was a mean difference of 177.315, STDR with NSTDR there was a mean difference of 144.021. All being statistically significant ($p = .000$).

Left eye: On comparison of central thickness of STDR with other categories: STDR with No diabetes there was a mean difference of 160.928, STDR with No DR there was a mean difference of 168.374, STDR with NSTDR there was a mean difference of 137.810. All being statistically significant ($p = .000$).

Table-1 Shows Mean Value Of Central Thickness Of Right Eye For

Different Categories

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
R. Central thickness	No diabetes	38	209.47	22.342	3.624	202.13	216.82	145	280
	No DR	34	204.71	20.941	3.591	197.40	212.01	157	247
	NSTD	35	238.00	30.038	5.077	227.68	248.32	172	338
	STD R	47	382.02	121.449	17.715	346.36	417.68	219	663

Table-2 Shows Mean Of Central Thickness Of Left Eye For Different Categories

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
L. Central thickness	No diabetes	38	211.71	24.136	3.915	203.78	219.64	154	290
	No DR	34	204.26	18.981	3.255	197.64	210.89	168	247
	NSTD	35	234.83	27.854	4.708	225.26	244.40	171	323
	STD R	47	372.64	104.682	15.269	341.90	403.37	230	608

DISCUSSION

Total of 154 patients were taken of which 61% were male (n=94) and 39% were females (n=60). Patients were grouped according to the ETDRS classification and there were 38 (25%) of patients with No diabetes, 34 (22%) of patients of NO DR, 35 (23%) of NSTDR patients and 47 (30%) of STDR. Maximum patients presented to us were in sight threatening group (47 patients). In present study central foveal thickness of right eye for various categories were as follows: central thickness of patients with no Diabetes was 209±22.3, with NO DR was 204±20.94, with NSTDR was 238±30 and with STDR was 382±121.44. Central thickness of Left eye with no Diabetes was 211±24.13, with NO DR was 204±18.98, with NSTDR was 234±27.85 and with STDR was 372±104.68. On comparison of central thickness of right eye of STDR with No Diabetes, the mean difference was of 172.548, for No DR the mean difference of 177.315, for NSTDR with mean difference of 144.021. All were being statistically significant (p=.000).

On comparison of central thickness of left eye with STDR with No Diabetes patients the mean difference was of 160.928, No DR with mean difference of 168.374, NSTDR with mean difference of 137.810. All were being statistically significant (p=.000).

In our study it was found that central thickness was found to be progressively increased with increase in the severity of diabetes. This was found to be true for both right and left eye. On comparison of central thickness of STDR with other categories: NO Diabetes, No DR, NSTDR and STDR it was found to be statistically significant (p=.000).

GOEBEL et al. studied retinal thickness in diabetic retinopathy: The study was done by using Optical Coherence Tomography (OCT) and the study was published in the year 2002. This study was in tune with our study in which central macular thickness increases with increase in severity of diabetes and macular thickness was more in diabetic than non diabetic. Lattanzio R et al studied Macular thickness measured by optical coherence tomography (OCT) in diabetic patients. The study was published in 2002. They found MT was greater in diabetics than controls and tended to increase with DR and ME severity. This study was also in concordance with our study in which also macular thickness increases with increase in severity of diabetes and also macular thickness was more in diabetics than non diabetic. Hortensia Sánchez-Tocino et al studied Retinal Thickness with Optical Coherence Tomography in Patients with Diabetes. The study was

published in 2002. They found that Diabetic eyes with CSME had a statistically significant greater thickness in each of the areas compared with the other groups. This study was also in tune with our study in which macular thickness increases with increase in severity of diabetes.

CONCLUSION

Central thickness was found to be progressively increased with increase in the severity of diabetes in both right and left eye. It was found to be statistically significant (p=.000). Central thickness can be used as a good indicator to monitor diabetic individuals. Besides this, vision-threatening macular oedema can be detected earlier.

REFERENCES

1. International Diabetic Federation annual report 2011.
2. Bresnick GH, Condit R, Syrjala S, Palta M, Groo A, Korth K. Abnormalities of the foveal avascular zone in diabetic retinopathy. Arch Ophthalmol 1984;102:1286-93.
3. Byeon SH, Chu YK, Lee H, Lee SY, Kwon OW. Foveal ganglion cell layer damage in ischemic diabetic maculopathy: Correlation of optical coherence tomographic and anatomic changes. Ophthalmology 2009;116: 1949-59.
4. Conrath J, Giorgi R, Raccach D, Ridings B. Foveal avascular zone in diabetic retinopathy: Quantitative vs qualitative assessment. Eye (Lond) 2005;19: 322
5. Raman R, Lahane S, Gupta A, Sandeep D, Sharma T. Foveal slope measurements in subjects with high-risk of age-related macular degeneration. Indian J Ophthalmol 2013; 61:507-10.
6. Congdon N, O'Colmain B, Klaver CC, et al. Causes and prevalence of visual impairment among adults in the United States. Arch Ophthalmol 2004;122(4):477-485.
7. Klein R, Klein BE, Moss SE, et al. The Wisconsin epidemiologic study of diabetic retinopathy. XV. The long term incidence of macular edema. Ophthalmology 1995;102(1):7-16.
8. Gardner TW, Larsen M, Girach A, et al. Diabetic macular edema and visual loss: relationship to location, severity and duration. Acta Ophthalmol 2009;87(7):709-713.
9. Goebel W, Kretzschmar-Gross T. Retinal thickness in diabetic retinopathy: a study using optical coherence tomography (OCT). Retina. 2002 Dec;22(6):759-67.
10. Lattanzio R, Brancato R, Pierro L, Bandello F, Iaccher B, Fiore T, Mastranzi G. Macular thickness measured by optical coherence tomography (OCT) in diabetic patients. Eur J Ophthalmol. 2002 Nov Dec;12(6):482-7.
11. Hortensia Sánchez-Tocino, Aurora Alvarez-Vidal, Miguel J. Maldonado, Javier Moreno-Montañés, Alfredo García-Layana. Retinal thickness with Optical Coherence Tomography in Patients with Diabetes. Investigative Ophthalmology & Visual Science May 2002; Vol.43, 1588-1594.