Relation between Morphological Features of Retinal Layers on SD-OCT and Best Corrected Visual Acuity in Diabetic Macular Oedema

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Abstract: _Introduction: Diabetic retinopathy is one of the most frequent complication of diabetes. Diabetic macular oedema (DME) is the largest cause of visual acuity loss in nonproliferative diabetic retinopathy. So study was done to study the relation betwwen morphological features of retinal layers and best corrected visual acuity in diabetic macular oedema. Material and method: It was a hospital based descriptive observation study done in Anand Hospital and Eye Centre, Jaipur over a period of one year. Detailed history, examination, investigation were made.Chi square test of independence, correlation coefficient, univariate and multivariate analysis were used for statistical analysis. Result: Statistical relation between Visual Acuity with status of ELM and IS/OS was found highly significant (p< 0.0010). Conclusion: There exists a positive correlation between the morphological features of retinal layers (External limiting membrane and photoreceptor layer IS/OS junction) on SD-OCT v/s best corrected visual acuity in diabetic macular oedema._

Keywords: Diabetic macular oedema,External limiting membrane, Photorecepter,Visual acuity

1. Introduction

Diabetic retinopathy is one of the most commom complications of diabetes.It is a major public health issue with high socioeconomic implications. It affects approximately 50% of diabetic subjects, and remains the leading cause of blindness.

Diabetic macular edema (DME) is the largest cause of visual acuity loss in non-proliferative diabetic retinopathy[1]·Early detection and quantification of macular edema is therefore of major importance in evaluation of any diabetic patient.Ocular computerized tomography in DME is used for morphological classification of macular edema.

The study was conducted to know relation between the morphological features of retinal layers (External limiting membrane and photoreceptor layer IS/OS junction) on SD-OCT and best corrected visual acuity in diabetic macular edema.

2. Material and method

This was a hospital based descriptive observational study, done in Anand Hospital and Eye Center, Jaipur,Rajasthan over a period of 10 months from Jan-2014 to Oct-2014.Institutional ethics committee approval was obtained ahead of study.

Sample size was of 60 patients was calculated at study power of 90% and alpha error 0.01 assuming expected correlation coefficient 0.471 between Visual acuity (log MAR) and COST (as per seed article) .Assuming attrition total 90 eyes were included in the study. Patients who had DME in both eyes, only right eye was considered.Patients withNPDR and PDR with macular edema were included in the study. Patients with evidence of edema clinically, FFA leakage, or OCT thickening from DME were also included in the study.

Patients with macular edema from other causes, with concurrent macular diseases and with any glaucomatous or neurological disc pathology were excluded from the study.

Patients with significant cataracts, graded at more than N03 (nuclear opalescence) or NC3 (nuclear color) according to the Lens Opacity Classification Scheme III and those who have received prior treatment in the form of laser or anti VEGF injection were also excluded in the study.

After applying inclusion, exclusion criteria and taking informed written consent detailed history and examination was done. Visual acuity was assessed using Snellen visual acuity chart at a distance of 6 meters. Uncorrected (UCVA), best corrected (with spectacle or contact lenses) and pin hole visual acuity was assessed. Snellen visual acuity was then converted to Log MAR for the purpose of statistical analysis.

Next, the photoreceptor IS/OS layer was evaluated 500 μm in either direction of the fovea. The IS/OS junction disruption was graded from 0 to 2. Grade 0 was given when an intact IS/OS layer was found, grade 1 was assigned for focal disruption of the IS/OS junction of 200 μm or less, and grade 2 was assigned for more than 200 μm of disruption. Grades from each patient's horizontal and vertical scan were added to yield a global disruption scale.

Lastly the status of the foveal ELM on each image was categorized into three groups (complete, disrupted and absent) within this area. The complete group included patients who had 100% preservation of structures in ELM status. The disrupted group included patients who had disrupted structures from nearly 100% loss to almost 100%

preservation. The absent group included patients who had 100% loss of these structures.

Detailed anterior and posterior segment examinations was also done.

All data was recorded and analyzed.Chi-square test of independence was used to evaluate associations between qualitative variables and diabetic macular edema classification groups. Correlation coefficient was calculated between various continuous variables. Visual acuity recorded as the best corrected visual acuity is used as the outcome variable in univariate and multivariate analysis, whereas test predictors included global disruption scale of outer retina, percentage disruption of the outer retina, central macular thickness, presence of hard exudates and serous retinal detachment.

Table 1: Characteristics of patients studied

Charactersic	observation	
Average age	57.9±9.5 yrs.	
Sex	Male-63	Female-27
Average Visual Acuity(log mar)	0.5962±0.4328	

**Table 2:** Distribution of cases according to Visual Acuity (log mar) and IS/OS

Log mar	Complete	Disrupted	Absent	Total
0-0.5	34 (37.78)	13 (14.44)	0 (0.00)	47 (52.22)
0.6-1.0	3 (3.33)	23 (25.56)	3 (3.33)	29 (32.22)
1.1 -1.5	1 (1.11)	5 (5.56)	8 (8.89)	14 (15.56)
Total	38 (42.22)	41 (45.56)	11 (12.22)	90 (100.00)

Chi-square = 60.954 with 4 degrees of freedom; P = 0.000(significant).Figures in parenthesis shows percentage

Table 3: Distribution of cases according to Visual Acuity (log mar) and Status of ELM

Visual acuity (Log mar)	Complete	Disrupted	Absent	Total
0-0.5	41 (45.56)	6 (6.67)	0 (0.00)	47 (52.22)
0.6-1.0	4 (4.44)	23 (25.56)	2 (2.22)	29 (32.22)
1.1 -1.5	0 (0.00)	2 (2.22)	12 (13.33)	14 (15.56)
Total	45 (50.00)	31 (34.44)	14 (15.56)	90 (100.00)

Chi-square = 105.657 with 4 degrees of freedom; P = 0.000(significant).Figures in parenthesis shows percentage.
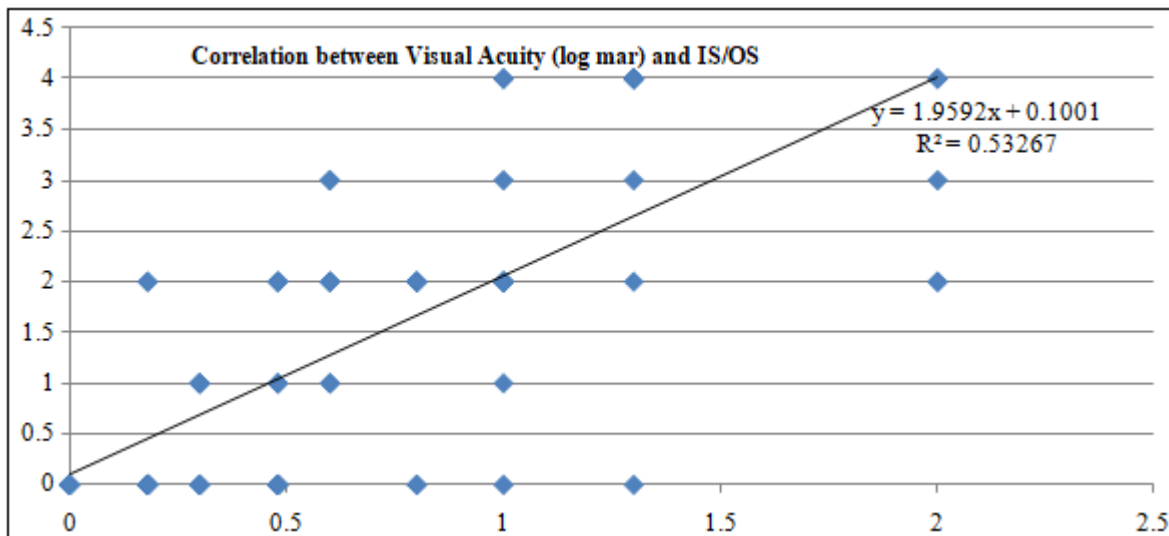
Figure 1: Correlation between Visual Acuity (log mar) and IS/OS
P value for correlation<0.001(significant)

3. Result

After performing the study the following observations were made. Tithe average age of the study population was 57.91±9.5yrs. Out of total 90 patients 63 were male and 27 females. The mean visual acuity observed was 0.5962±0.4328. We observed that statistical relation between Visual Acuity and IS/OS was highly significant (p< 0.0010). (Table 2). Patients with complete IS /OS layer had good visual acuity as compared to the groups with disrupted and absent IS/OS.However, limitation to our study was that patients in group with absent IS/OS were less as compared to the other two groups.It was also observed that statistical relation between Visual Acuity and status of ELM wasalso highly significant. (p< 0.0010). (Table 3) Group with complete ELM had maximum patients with good visual acuity and patients with least visual acuity belonged to the absent group.Correlation between visual acuity and the status of IS/OS junction was found statistically highly significant. (p<0.001) (Figure -1).

4. Discussion

In our studyELM status and IS/OS status are important multivariate predictors of VA. Maheshwary AS[2] et alalso found that disruption of the photoreceptor IS/OS junction is an important predictor of visual acuity among DME patients. Uji A et al [3] also concluded that presence of hyper-reflective foci in the outer retina is closely associated with a disrupted ELM and IS/OS line on SD-OCT images and decreased VA in DME. Similiary Ito S et al [4]and Shin H J et al[5]also observed that in DMO, the ELM status may be as closely related to VA as the IS/OS status.

5. Conclusion

We concluded that there exists a positive correlation between the morphological features of retinal layers (External limiting membraneand photoreceptor layer IS/OS junction) on SD-OCT v/s best corrected visual acuity in diabetic macular oedema.

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