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Research Article

The Impact of HBA1C on Diabetic Macular Edema

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Abstract

Purpose: We aimed to reveal the relationship between HbA1c and diabetic macular edema.

Materials and Methods: The study evaluated 79 eyes of 57 patients who have not yet received treatment due to DME. All patients had type 2 diabetes mellitus and were treatment-naive. The patients were selected according to macular edema related to diabetes mellitus and central macular thickness (CMT) measurements higher than 260 µm. Patients with a history of glaucoma, phakic eyes, any vitreomacular interface pathologies detected by spectral domain optical coherence tomography (SD-OCT), other vitreoretinal diseases, and retinopathies, a history of vitrectomy were excluded. Patient data including age, gender, duration of diabetes, baseline glycated haemoglobin (HbA1c) level. We formed groups according to 8, which is the average HbA1c value of our patients. The patients with HBA1c levels above and below 8 were divided into two groups and the correlation between CMT and best corrected visual acuity (BCVA) was evaluated.

Results: HbA1c values of less than 8.0% were named Group-1, and HbA1c values of 8.0% or more were named Group-2. Group-1 consists of 42 eyes, Group-2 consists of 37 eyes. When the demographic and clinical features of the patients were examined in all groups and subgroups, there was no statistically significant difference between the groups ($p > 0.05$). Group-1 mean CMT values were 458 ± 128.17 µm, Group-2 mean CMT values were 415 ± 74.18 µm ($p = 0.089$). Group-1 mean BCVA was 0.46 ± 0.25 logMAR, Group-2 mean BCVA was 0.45 ± 0.29 logMAR ($p = 0.896$). Factors affecting BCVA in patients were evaluated statistically. CMT (beta coefficient: 0.504, $p < 0.001$) was found effective on BCVA. Factors affecting CMT in patients were statistically evaluated. It was found to be HbA1c (beta coefficient: - 0.102, $p = 0.370$) on CMT.

Conclusion: Systemic parameters should also be used in the treatment of our diabetic macular edema patients. HbA1c is one of these parameters.

Keywords: Diabetic Macular Oedema; HbA1c; Diabetic Retinopathy

Introduction

The main risk factor of diabetic retinopathy (DR) is hyperglycemia, which increases reactive oxygen species and oxidative stress [1]. Blood sugar control remains important in people with diabetes to prevent the development of DR and stop its progression [2]. Diabetic patients need to check their blood glucose regularly. However, these measurements indicate short-term glycemic control. HbA1c concentration is currently used as an index of long-term glycemic control and as a risk marker [3].

The eye is considered the primary target of chronic hyperglycemic damage in type 1 and type 2 diabetes [4]. The most significant and common cause of visual impairment in patients with DR is diabetic macular edema (DME) [5]. Caused by the impaired glycemic index blood-retinal barrier dysfunction, inflammation contributes to DME pathogenesis [6]. Therefore, HbA1c values are considered to be important in the prognosis in the follow-up of retinopathy and macular edema in diabetic patients. With this study, we aimed to reveal the correlation between HbA1c levels and central macular thickness (CMT) in DME patients who have not yet received treatment.

Materials and Methods

Ethics

This retrospective study was approved in accordance with the Declaration of Helsinki. All necessary authorizations were obtained from the Institutional Ethical Board of the the Okmeydani Research & Training Hospital (approval ID: 2017/753) in Istanbul, Turkey.

Patients

The study evaluated 79 eyes of 57 patients who have not yet received treatment due to DME at the Health Sciences University, Okmeydani Research and Training Hospital, Retina Unit of the Department of Ophthalmology. All patients had type 2 diabetes mellitus and were treatment-naive. The patients were selected according to macular edema related to diabetes mellitus and central macular thickness (CMT) measurements higher than 260 µm. Patients with a history of glaucoma, phakic eyes, any vitreomacular interface pathologies detected by spectral domain optical coherence tomography (SD-OCT), other vitreoretinal diseases, and retinopathies, a history of vitrectomy were excluded. Patient data including age, gender, duration of diabetes, baseline glycated hemoglobin (HbA1c) level. In a previous study, Although there was no direct statistical correlation between HbA1c levels and DME, a significant increase in DME frequency was observed, especially in those with HbA1c values of 7.0% and above [7]. Taking this study as a reference, we formed groups according to 8, which is the average HbA1c value of our patients. The patients with HBA1c levels above and below 8 were divided into two groups and the correlation between CMT and best corrected visual acuity (BCVA) was evaluated.

OCT (Cirrus SD-OCT Model 4000, Carl Zeiss Meditec, Dublin, California, USA) was used to determine DME and the mean value of CMT.

All the patients underwent standard ophthalmic examinations. The examinations included BCVA, slit-lamp biomicroscopy, tonometry, fundoscopy, and SD-OCT. The BCVA was measured with a Snellen chart, and the decimal visual acuity was converted to the logarithm of the minimal angle of resolution (LogMAR) units for statistical analyses.

Statistical analyses

The Statistical Package for Social Sciences (SPSS) for Windows version 21 software was used to evaluate the data obtained in the study. In addition to the descriptive statistical methods, a paired t-test was used for intragroup comparisons of the parametric parameters and a Wilcoxon sign test was used if the parameters were nonparametric for intragroup comparisons. To compare the distributions of two or more variables related to each other the Friedman test was used. Spearman correlation test was used for intergroup correlation analysis. A p-value of less than 0.05 was considered a statistically significant result.

Results

A total of 79 eyes of 57 patients were included in this study. 30 of the patients were female and 27 were male. The mean age of the patients was 62.71 years, mean HbA1c 8 ± 1.7%, mean BCVA 0.48 ± 0.26 logMAR, mean CMT 436,5 ± 101,17 µm, mean duration of diabetes 13.7 ± 5.2 years.

HbA1c values of less than 8.0% were named Group-1, and HbA1c values of 8.0% or more were named Group-2. Group-1 consists of 42 eyes, Group-2 consists of 37 eyes. When the demographic and clinical features of the patients were examined in all groups and subgroups, there was no statistically significant difference between the groups (p > 0.05).

	Group-1	Group-2	P
Gender (female/male)	18 / 11	16 / 11	0.217
Duration of DM (years ± SD)	13 ± 5.16	14.8 ± 5.07	0.190
Hypertension	12	16	0.112

Table 1: Demographic characteristics of the patients.

Group-1 mean CMT values were 458 ± 128.17 µm, Group-2 mean CMT values were 415 ± 74.18 µm (p = 0.089). Group-1 mean BCVA was 0.46 ± 0.25 logMAR, Group-2 mean BCVA was 0.45 ± 0.29 logMAR (p = 0.896).

Factors affecting BCVA in patients were evaluated statistically. CMT (beta coefficient: 0.504, p < 0.001) was found effective on BCVA. The beta coefficients and p values of the predictive values are summarized in table 2.

Predictive factor	Beta Coefficient	P values
CMT	0,504	< 0,001*
HbA1c	-0,009	0,935
Hypertension	0,62	0,373

Table 2: Predictive factors affecting BCVA (Spearman correlation analysis). BCVA: Best Corrected Visual Acuity CMT: Central Macular Thickness.

Factors affecting CMT in patients were statistically evaluated. It was found to be HbA1c (beta coefficient: - 0.102, p = 0.370) on CMT. The beta coefficients and p values of the predictive values are summarized in table 3.

Predictive factor	Beta Coefficient	P values
HbA1c	-0,102	0,370
Hypertension	0,262	0,317

Table 3: Predictive factors affecting CMT (Spearman correlation analysis). BCVA: Best Corrected Visual Acuity CMT: Central Macular Thickness.

Discussıon

Diabetic macular edema is one of the causes of preventable vision loss. We know that there are changeable factors in the treatment of diabetic retinopathy. In our study, we aim to reveal how effective these factors can be in our treatment success. We know the importance of HbA1c levels in the diagnosis and treatment follow-up of diabetes mellitus (DM). It is also very important for us ophthalmologists to know the relationship between HbA1c and DME.

In a previous study, although there was no direct statistical significance between HbA1c and DME, a significant increase in DME frequency was observed, especially in those with HbA1c values of 7.0% and above (p = 0.037) [7]. These results show that it may be important for us to monitor HbA1c levels in DME monitoring. In our study, a negative correlation was found between CMT and HbA1c level, although it was not statistically significant. This shows that we have obtained a result that is compatible with the literature. In our daily practice, it will be possible to predict the prognosis from the course of the HbA1c values of our patients. Again, in the same study, DME was found to be significant in patients with DM duration of 10 - 20 years. In our study, the mean duration of DM was between 10 - 20 years and it supports the literature.

The most important indicator affecting our treatment success and the daily life of the patient is BCVA. We make all our treatments and follow-ups to reduce vision loss. Knowing the effect of HbA1c on visual prognosis will be useful in the follow-up and treatment of DME. A previous study showed that those with HbA1c > 7% had worse improvement in BCVA despite anti-VEGF therapy [8]. In our study, a negative correlation was observed between BCVA and HbA1c, although it was not statistically significant.

Conclusion

In conclusion, according to the data of our study, we should also use systemic parameters in the treatment follow-up of our diabetic macular edema patients.

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