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ABSTRACT ARVO

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Title

Diurnal fluctuations in higher-order aberrations in patients with Diabetes Mellitus

Purpose:

The purpose of this study was to investigate diurnal fluctuations in aberrations and blood glucose levels (BGLs) in diabetic patients and control subjects.

Methods:

Twenty-one type 2 diabetic subjects (age 56 ± 11 years), 20 type 1 diabetic subjects (age 38 ± 15 years) and 20 non-diabetic controls (age 49 ± 23 years) took part in the study. Aberrations were measured with an OPD autorefractometer (NIDEK) and analysed for a 5mm pupil diameter. BGLs were measured using a finger stick test (Hemocue). All measurements were taken between 8AM and 8PM at approximately two-hourly intervals.

Results:

The coefficients of third order coma, fourth order spherical aberration, and higher-order RMS error were found to be higher in the diabetic compared to the control group. The mean variation in the third and fourth order aberrations over the twelve-hour period was found to be higher in the diabetic when compared to the control group; however, these differences were not statistically significant. The higher-order RMS error showed a negative correlation with time in the diabetic group compared to a positive correlation in the control group (gradient: -6.4×10^{-3} in type 2 diabetes, -24.4×10^{-3} in type 1 diabetes and 74.9×10^{-3} in control group; ANOVA $p=0.025$). In diabetic patients, the third order horizontal coma and fourth order spherical aberration coefficients showed a negative correlation with increasing BGLs ($p>0.05$), while the third order vertical coma and higher order RMS showed a positive correlation with BGLs. These correlations, however, did not reach statistical significance.

Conclusions:

Ocular aberration coefficients varied modestly during the day, with fluctuating BGLs. The variance in fourth order spherical aberration and third order coma was increased in patients with DM when compared to control subjects. The variation in ocular aberration coefficients is possibly due to the effect of large fluctuations in BGLs on the optics of the diabetic crystalline lens.

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