GLYCEMIC VARIABILITY IS ASSOCIATED WITH ORTHOSTATIC HYPOTENSION IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

Ioanna Eleftheriadou, Konstantinos Makrilakis, Stavroula Kalopita, Chrysoula Stathi, Christos Kapelios, Petros Thomakos, Stavros Liatis

First Department of Propaedeutic and Internal Medicine, Medical School, National and Kapodistrian University of Athens, Athens, Greece

Introduction

Orthostatic hypotension is a common manifestation of cardiac autonomic neuropathy (CAN) in patients with type 2 diabetes (T2D). Recent studies have reported an association between CAN and glycemic variability assessed by continuous interstitial tissue glucose monitoring (CGM).

The aim of our study was to investigate the association between orthostatic hypotension (decrease in systolic blood pressure >20mmHg or in diastolic blood pressure >10 mmHg within 3 min of standing) and indices of glycemic variability in a cohort of patients with T2D.

Materials and Methods

A total of 90 participants were examined. Diagnosis of CAN was based on the battery of the 4 classic autonomic function tests proposed by Ewing and Clarke.

• A commercially available device was used for the continuous interstitial glucose monitoring (GlucoDay Menarini Diagnostics).

The following indices of glycemic variability were calculated:

- mean interstitial glucose values
- standard deviation of the mean interstitial glucose values (SDMG)
- mean amplitude of glycemic excursions (MAGE)
-M-value (logarithmic transformation of the deviation of glycemia from an arbitrary assigned Ideal glucose value)

Table 1
Demographic and clinical characteristics of the study participants

Age (years)	62.8 ± 9.9
Gender (male) n (%)	49 (54.4)
Diabetes duration (years)	11.3 ± 9.0
BMI (kg/m^2)	30.6 ± 5.1
Systolic blood pressure (mmHg)	130.0 ± 16.8
Diastolic blood pressure (mmHg)	75.1 ± 10.8
Smoking n (%)	25 (27.8)
Fasting glucose (mg/dl)	137.3 ± 39.7
HbA1c (%)	7.2 ± 1.1
Total cholesterol (mg/dl)	178.3 ± 37.0
HDL cholesterol (mg/dl)	46.9 ± 10.7
LDL cholesterol (mg/dl)	100.8 ± 34.3
Triglycerides (mg/dl)	151.8 ± 109.4

Results

Twenty two participants (24.4%) had CAN and 45 participants (50.0%) orthostatic hypotension. Nineteen of the 45 patients with orthostatic hypotension (42.2%) had CAN.

Table 2
Indices related to glycemia as obtained from GCM in participants with and without orthostatic hypotension

	Participants with orthostatic hypotension	Participants without orthostatic hypotension	p
Mean glucose (mg/dl)	152.2 ± 33.0	136.9 ± 26.0	**0.021**
SDMG (mg/dl)	43.5 [29.3, 70.3]	37.0 [32.8, 42.3]	0.137
MAGE	118.0 [85.9, 159.8]	92.1 [74.6, 112.5]	**0.026**
M-value	72.3 [30.6, 218.9]	47.7 [37.2, 75.1]	0.135

Table 3
Univariate logistic regression analysis for parameters associated with orthostatic hypotension

	OR	95% CI	p
Age	0.994	0.953-1.036	0.772
Gender	0.711	0.304-1.662	0.431
Diabetes duration	1.039	0.989-1.092	0.128
Systolic blood pressure	1.016	0.988-1.046	0.267
Diastolic blood pressure	0.999	0.958-1.042	0.970
HbA1c	1.234	0.829-1.836	0.301
Mean glucose	1.018	1.002-1.034	**0.026**
SDMG	1.040	1.002-1.079	**0.038**
MAGE	1.012	1.001-1.023	**0.030**
M-value	1.006	1.001-1.012	**0.021**

Table 4
Multivariate logistic regression analysis for parameters associated with orthostatic hypotension

	OR	95% CI	p
Age	0.960	0.912-1.012	0.127
Diabetes duration	1.035	0.982-1.091	0.202
HbA1c	0.932	0.560-1.551	0.786
Mean glucose	1.009	0.989-1.030	0.385
MAGE	1.012	1.001-1.023	**0.037**

Conclusions

Blood glucose fluctuations as assessed by MAGE are associated with orthostatic hypotension, irrespective of mean interstitial glucose values and long term glycemic control in patients with T2D.

References

Relationship between autonomic nervous system function and continuous interstitial glucose measurement in patients with type 2 diabetes. Kalopita S, Liatis S, Thomakos P, Vlahodimitris I, Stathi C, Katsilambros N, Tentolouris N, Makrilakis K. J Diabetes Res. 2014;2014:835392.