

Continuous Subcutaneous Glucose Monitoring Shows a Close Correlation between Mean Glucose and Time Spent in Hyperglycemia and Hemoglobin A1c

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Abstract

Background:

The Diabetes Control and Complications Trial and United Kingdom Prospective Diabetes Study highlighted hemoglobin A1c (HbA1c) as the main predictor of diabetic complications. Currently, diabetes is managed by frequent capillary spot glucose measurements, but continuous monitoring systems may have the capacity of improving diabetic control. The SCGM 1 system is microdialysis based and allows for monitoring of changes in interstitial fluid glucose levels every minute. The aim of this study was to evaluate the correlation between HbA1c and short-term glucose excursions in patients with type 1 diabetes.

Material and Methods:

We investigated 91 patients with type 1 diabetes (mean \pm standard deviation (SD); age 34 ± 10 years, body mass index 24.2 ± 4.1 kg/m²) with a duration of diabetes of 17 ± 11 years for 4.8 ± 0.4 days. The average HbA1c was $7.9 \pm 1.4\%$. From the monitoring profiles we determined individual mean glucose, the SD of glucose, and the relative time spent in hyperglycemia and hypoglycemia calculated as the area under the curve (AUC) with arbitrary cutoffs of 180 and 70 mg/dl, respectively.

Results:

Mean glucose, SD glucose, and hyperglycemic and hypoglycemic AUC all correlated with HbA1c, but with decreasing statistical power. In multiple linear regression analysis, mean glucose was the sole independent variable ($r = 0.626$, $p < 0.0001$). A close correlation between HbA1c and various measures of short-term hyperglycemic values was observed. There was a close correlation between mean glucose and SD glucose, pointing toward increased variability with increasing mean glucose.

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Abbreviations: (AUC) area under the curve, (BMI) body mass index, (CGM) continuous glucose monitoring, (DCCT) Diabetes Control and Complications Trial, (HbA1c) hemoglobin A1c, (MARE) mean absolute relative error, (PG) plasma glucose, (PRESS) predictive error sums of squares, (SD) standard deviation

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Abstract cont.

Conclusion:

Mean glucose generated after short-term continuous monitoring is the main predictor of HbA1c and reveals increased lability of glucose with increasing mean glucose and HbA1c.

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