

Control/Tracking Number: 07-A-213-AACC

Activity: Abstract

Current Date/Time: 1/12/2007 8:30:10 AM

Comparative Analysis of Three Glycemic Assays - A1C, 1,5-Anhydroglucitol, and Fructosamine

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Abstract:

We have previously reported that 1,5-anhydroglucitol (1,5-AG, GlycoMark) reflects glycemic excursions, often in the postprandial state, more robustly than A1C or fructosamine. The objective of this particular analysis was to determine the driving components of three commonly used glycemic assays in patients with diabetes (A1C, fructosamine, and 1,5-AG). Thirty-four patients were recruited with type 1 or type 2 diabetes with stable glycemic control. A CGMS (Continuous Glucose Monitoring System) monitor was worn for two consecutive 72-hour periods. Mean glucose (MG), fasting glucose (FG), and area under the curve for glucose above 180 mg/dL (AUC-180), were compared to 1,5-AG, fructosamine and A1C at baseline, day 4 and 7.

Multiple regressions were performed whereby MG, FG, and AUC-180 (a measure of glycemic excursions) were defined as independent variables and the glycemic assays (A1C, 1,5-AG, and fructosamine) were defined as dependent variables. Results are presented below.

Independent Values	A1C Dependent Value Coefficient Beta	R ² = 0.29 p = 0.02 P-level	1,5-AG Dependent Value Coefficient Beta	R ² = 0.45 p = 0.0006 P-level	Fructosamine Dependent Value Coefficient Beta	R ² = 0.19 p = 0.11 P-level
FG	0.005	0.04*	-0.033	0.02*	0.394	0.09
MG	0.006	0.48	0.123	0.02*	0.002	0.99
AUC-180	0.012	0.52	-0.395	0.0006*	1.606	0.36

*Statistically significant p< 0.05

The three independent variables were most predictive of 1,5-AG and least predictive of fructosamine. The only significant correlation with A1C was fasting glucose (FG). All three independent variables were significantly correlated to 1,5-AG, while there were no significant correlations to fructosamine.

It has been recognized that the utility of fructosamine as a short-glycemic marker in clinical practice is somewhat limited, and the results presented here confirm that this assay is not a robust indicator of short-term glycemia. As A1C is a measure of average glucose over 2-3 months, A1C may not change rapidly enough to indicate glycemic excursions in the short term, or may simply not be as good an indicator of glycemic excursions as is 1,5 AG. As 1,5-AG correlates significantly to all independent variables, this appears to be indicative of its utility as a marker of short-term glycemia and glycemic excursions.

Topic (Complete): Endocrinology/Hormones

Keyword (Complete): diabetes ;glycemic ;1,5-Anhydroglucitol

Division Awards (Complete):

Status: Complete
