Analysis of glycemic variability and metabolic control in type 1 diabetes

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Abstract

Objectives: The Diabetes Control and Complications Trial (DCCT) demonstrated that tight metabolic control reduces the risk of complications in type 1 diabetes, but there is little consensus on the importance of glucose variability. Our aim was to identify factors related to glycemic instability and evaluate the association between glucose fluctuation and metabolic control.

Methods: Six indices of glucose variability (MBG: mean blood glucose, SD: standard deviation of mean glucose concentrations, MAGE: mean amplitude of glycemic excursions, CONGA: continuous overlapping net glycemic action, LBGI: low and HBGI: high blood glucose index) were calculated based on CGM by 119 patients with type 1 diabetes (66 males vs. 53 females, age 14.98±8.86 years, diabetes duration 6.85±6.87 years, treatment: 76 with analog intensified conventional therapy [ICT] vs. 43 with continuous subcutaneous insulin infusion [CSII]). The indices were correlated with clinical parameters and treatment regimes.

Results: The glycemic variability was associated with fasting serum C-peptide, BMI, specific insulin dose, annual average and current metabolic status ($p<0.05$); and it tended to be related to type of treatment, seasonal effect and total daily insulin dose ($p<0.1$). Higher annual mean HbA_{1c} was shown in females, in cases of longer diabetes duration, lower fasting serum C-peptide and higher BMI levels ($p<0.05$); and a trend was observed for indices of glucose variability ($p<0.1$). However, the main features of patients (age, diabetes duration, fasting serum C-peptide, BMI, total daily and specific insulin doses, and proportion basal/bolus) were different in the two groups (ICT vs. CSII), the type of treatment did not influence the metabolic control.

Conclusions: Type 1 diabetic patients with HbA_{1c} 7.5-10%, higher BMI and higher specific insulin dose appear to show higher glycemic variability. The BMI and specific insulin dose may indicate the effect of insulin resistance. The glucose fluctuation could increase in the summer-autumn period. However, lower glycemic variability could be observed due to higher residual beta-cell function and perhaps pump therapy may result in the same.