

Use of Continuous Glucose Monitoring to Estimate Insulin Requirements in Patients with Type 1 Diabetes Mellitus During a Short Course of Prednisone

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Abstract

Background:

Insulin requirements to maintain normoglycemia during glucocorticoid therapy and stress are often difficult to estimate. To simulate insulin resistance during stress, adults with type 1 diabetes mellitus (T1DM) were given a three-day course of prednisone.

Methods:

Ten patients (7 women, 3 men) using continuous subcutaneous insulin infusion pumps wore the Medtronic Minimed CGMS[®] (Northridge, CA) device. Mean (standard deviation) age was 43.1 (14.9) years, body mass index 23.9 (4.7) kg/m², hemoglobin A1c 6.8% (1.2%), and duration of diabetes 18.7 (10.8) years. Each patient wore the CGMS for one baseline day (day 1), followed by three days of self-administered prednisone (60 mg/dl; days 2–4), and one post-prednisone day (day 5).

Results:

Analysis using Wilcoxon signed rank test (values are median [25th percentile, 75th percentile]) indicated a significant difference between day 1 and the mean of days on prednisone (days 2–4) for average glucose level (110.0 [81.0, 158.0] mg/dl vs 149.2 [137.7, 168.0] mg/dl; $p = .022$), area under the glucose curve and above the upper limit of 180 mg/dl per day (0.5 [0, 8.0] mg/dl·d vs 14.0 [7.7, 24.7] mg/dl·d; $p = .002$), and total daily insulin dose (TDI), (0.5 [0.4, 0.6] U/kg·d vs 0.9 [0.8, 1.0] U/kg·d; $p = .002$). In addition, the TDI was significantly different for day 1 vs day 5 (0.5 [0.4, 0.6] U/kg·d vs 0.6 [0.5, 0.8] U/kg·d; $p = .002$). Basal rates and insulin boluses were increased by an average of 69% (range: 30–100%) six hours after the first prednisone dose and returned to baseline amounts on the evening of day 4.

Conclusions:

For adults with T1DM, insulin requirements during prednisone induced insulin resistance may need to be increased by 70% or more to normalize blood glucose levels.

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Abbreviations: (CSII) continuous subcutaneous insulin infusion, (GAA₁₈₀) glucose area above the upper limit of 180 mg/dl, (G_{ave}) average glucose per day, (TDI) total daily insulin dose, (STAI) State-Trait Anxiety Inventory, (SD) standard deviation, (T1DM) type 1 diabetes mellitus

Keywords: continuous glucose monitoring, insulin requirements, prednisone, stress, type 1 diabetes mellitus

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