Risk of Type 2 Diabetes Mellitus in Patients with a Prior History of Corticosteroid-Induced Hyperglycemia

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Purpose/Background: Corticosteroids are the main cause of drug-induced hyperglycemia due to insulin resistance in fat and muscle cells, increased gluconeogenesis in the liver, and reduction of insulin synthesis in the pancreas. The resulting hyperglycemia is likely dose-related (both daily and cumulative). It is not known if such hyperglycemia during short-term, high-dose systemic corticosteroid administration is predictive of subsequent development of type two diabetes mellitus (T2DM).

Objectives: Our primary objective was to compare the incidence of new-onset T2DM between hospitalized patients receiving short-term, high-dose corticosteroids who developed corticosteroid-induced hyperglycemia versus those who did not. Our secondary objective in this population was to assess the association of new diagnoses of T2DM with the following risk factors: age, sex, race, ethnicity, cumulative corticosteroid dose using equivalent prednisone dose for comparison, and duration of corticosteroid use.

Methods: This single-center, retrospective cohort study was approved by the Duke University Hospital (DUH) IRB and included patients admitted to DUH between January 1, 2007 and October 31, 2011, who were at least 18 years old, with a record of administration of 3 to 30 days of consecutive high-dose, systemic corticosteroids, and at least 5 years of patient follow-up documentation. Patients with a history of prediabetes, diabetes, gestational diabetes, or hyperglycemia, and/or concurrent administration of other select medications known to cause hyperglycemia were excluded. Corticosteroid-induced hyperglycemia was identified using ICD-9 codes and/or blood glucose values ≥ 200mg/dL during the corticosteroid course. The primary endpoint of new diagnoses of T2DM was identified using ICD-9 or ICD-10 codes, and/or hemoglobin A1c values ≥ 6.5% within 5 years after corticosteroid course. A multivariable logistic regression model was constructed to evaluate the association between T2DM and corticosteroid-induced hyperglycemia, adjusting for covariates of interest.

Results: 1,263 patients were included in this study. On average [±s.d.], patients were 49.2 [±16.6] years old and received a cumulative corticosteroid dose of 650.2 [± 1184.4] mg for 5.6 [± 5.7] days. Corticosteroid-related hyperglycemia was reported in 334 (26.4%). T2DM within 5 years was reported among 192 (57.5%) and 111 (11.9%) of patients with and without corticosteroid-induced hyperglycemia, respectively (OR 9.88 [95% CI 7.27-13.42; P<0.0001]). Of patients 18 to 44 years old, 78 (15.9%) developed T2DM, compared to 146 (28.6%) of patients 45 to 64 years old (OR 0.54 [95% CI 0.38-0.77; P=0.0006]). Females were less likely to develop T2DM than males (OR 0.74 [95% CI 0.55-1.00; P=0.0484]). There was no significant association between new diagnoses of T2DM and race, ethnicity, cumulative corticosteroid dose, or length of corticosteroid course.

Conclusion: The development of hyperglycemia during the time of short-term, high-dose systemic corticosteroid administration was associated with a subsequent diagnosis of T2DM within five years. Females and individuals 18 to 44 years old may have a lower risk of developing T2DM.