Euglycemic diabetic ketoacidosis secondary to SGLT2 inhibitors with a low-carbohydrate diet

George Yeung, MD. Nhi Duong, MD. Akshaj Pole, DO. Benjamin Larsen, DO.
Faculty Mentor: Syed Ahmed, DO

Introduction

- Diabetic ketoacidosis (DKA) is a life-threatening acute complication of diabetes mellitus (DM), characterized by the triad of anion gap metabolic acidosis, ketonemia, and hyperglycemia.[1]
- Euglycemic DKA is a rare DM complication, defined as ketoacidosis with normoglycemia or mild elevated glucose,[2] with an incidence ranging between 2.6% to 3.2% of DKA admissions.[3]
- Euglycemic DKA associated with the use of sodium-glucose cotransporter-2 inhibitors (SGLT2i) has been reported with an overall incidence of approximately 0.1%.[4]
- It is unclear if a low carbohydrate diet increases the risk of DKA with SGLT2i use

Case Presentation

- 68 gentleman with DM type 2, hypertension, coronary artery disease status-post stent, presented with polyuria, nausea and vomiting.
- He was on Metformin and Glimepiride for many years, but switched to empagliflozin with a low-carbohydrate diet 4 days ago.
- He started with polyuria for 3 days, then nausea and vomiting for 1 day. First time with these symptoms.
- HbA1c 9.2 one week ago. Compliant to home medications. (Empagliflozin 25 mg qd, Lisinopril 20 qd, Clopidogrel 75 mg qd)
- Initial presentation at the ED
    - BP 94/57, HR 112 RR 20 SpO2 99% room air
    - Physical exam unremarkable
    - Normal saline 1000 bolus given
- About an hour later,
    - Anion gap: 21. (Na 133. Cl 104. HCO_3 8. K 4.1)
    - B-hydroxybutyrate 46
    - Blood glucose 159
- Three hours later,
    - VBG: pH 7.0. PCO_2 24.
    - ED suspected Euglycemic DKA and consulted ICU

Hospital course

- Pt received IV fluid and potassium repletion.
- The next day, anion gap closed. Insulin transitioned from IV to SQ
- The following day, Patient's symptoms improved and was discharged with insulin glargine
- Recommended patient to discontinue Empagliflozin and follow up with PCP about transitioning insulin glargine back to oral diabetic medication.

Discussion

- This case report suggests that the combination of SGLT2i use with a low-carbohydrate diet can enhance ketosis further, causing euglycemic DKA.
- SGLT2i block glucose reabsorption from the proximal convoluted tubule but increase ketone reabsorption. This creates a state of carbohydrate starvation and ketosis.[5]
- Low-carbohydrate diet can induce nutritional ketosis but not metabolic ketoacidosis.[6]
- Because euglycemic DKA is uncommon, delayed diagnosis and management can lead to other complications, such as respiratory failure, myocardial infarction, and death.[7]
- SGLT2i should be discontinued as soon as euglycemic DKA is diagnosed.
- Physicians should be cautious to prescribe SGLT2i when the patient is on a low-carbohydrate diet

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