

## Euglycaemic diabetic ketoacidosis after bariatric surgery: A Near-Miss!!!

Sir,

Diabetic ketoacidosis is a well-recognised complication of diabetes, classically defined as a triad of blood glucose level more than 250 mg/dL, metabolic acidosis and ketosis.<sup>[1]</sup> However, perioperative euglycaemic diabetic ketoacidosis (EuDKA) is a rare but serious adverse effect of sodium glucose co-transporter inhibitors (SGLT2Is) with proven improved cardiovascular and renal outcomes.

EuDKA is a relatively uncommon subset of ketoacidosis with less marked hyperglycaemia and, hence, easily missed by both, the patients as well as the physicians. Bariatric surgery patients on a very low-calorie ketogenic diet and continuing SGLT2I without establishing adequate oral intake are prone to EuDKA.<sup>[2]</sup> This case highlights the importance of preoperative assessment for early detection of EuDKA and withholding SGLT2Is preoperatively in these patients.

A 42-year-old female patient, a known case of type II diabetes, hypertension, and hypothyroidism,

controlled on medications, was posted for laparoscopic hiatal cruroplasty with sleeve gastrectomy. She was on insulin and oral hypoglycaemic agents (OHA) including empagliflozin (SGLT2I) 25 mg twice daily. She had a STOP-BANG score of 3/8, body mass index of 36 kg/m<sup>2</sup>, neck circumference of 41 cm, and a large tongue.<sup>[3]</sup> Laboratory investigations were within normal limits with traces of sugar and ketones in urine. All OHAs were withheld on the day of surgery and insulin was started as per blood sugar levels (BSLs).<sup>[4]</sup> Anaesthesia was induced and maintained following standard general anaesthesia protocols.

Intraoperatively, the patient was kept on pressure-controlled ventilation with volume guaranteed mode with a minimum volume of 400 mL and respiratory rate 12-16/min titrated as per end-tidal carbon dioxide (EtCO<sub>2</sub>) values between 35–40 mmHg with positive end expiratory pressure of 3–8 cm H<sub>2</sub>O and regular intermittent recruitment. Intraoperative arterial blood gas analysis done just before extubation was suggestive of high anion-gap metabolic acidosis [pH- 7.2, Bicarbonate (HCO<sub>3</sub>) 5 mEq/L, partial pressure of carbon dioxide (pCO<sub>2</sub>) 23.8 mmHg, anion gap (AG)- 26.2] and BSL 212 mg% [Table 1]. Intravenous sodium bicarbonate (NaHCO<sub>3</sub>) 100 mEq bolus followed by 20 mEq/h infusion along with insulin (1 IU/mL @ 2 mL/h) infusion was started. As there was no respiratory element contributing to

**Table 1: Arterial blood gas values**

Time point	pH	HCO <sub>3</sub> (mEq/L)	pCO <sub>2</sub> (mmHg)	AG
Intraoperative (before extubation)	7.21	5	23.8	26.2
Postoperative (immediate)	7.24	4.7	23.9	26.2
Postoperative (24 h)	7.29	10.7	27.6	26.7
Postoperative (72 h)	7.34	17.9	32.2	20.6

HCO<sub>3</sub>:Bicarbonate; pCO<sub>2</sub>:Partial pressure of carbon dioxide; AG: Anion gap

the acidosis, the patient was extubated, weighing it against the anticipated risks associated with continued mechanical ventilation.

In the intensive care unit, the patient was pain-free, comfortable, and stable. Saturation was maintained on 0.4 fraction of inspired oxygen (FiO<sub>2</sub>) through Hudson's mask. However, EuDKA was persistent. Two hourly BSL charting was done with continuous insulin infusion titrated as per BSL, NaHCO<sub>3</sub> (20 mEq/h) infusions, adequate hydration (100 mL/h) with Ringer's lactate, along with strict input-output charting. The patient was kept on liquid diet (100 mL/h). The acidosis was corrected over 72 h.

SGLT2Is cause glucosuria and with increased glucagon-to-insulin ratio result in increased lipolysis and fatty acid oxidation and ketone production by the liver.<sup>[5]</sup> EuDKA typically presents with minimal hyperglycaemia and dehydration, resulting in a delay of the appropriate diagnosis in over 50% of cases. It occurs in the setting of a precipitating event like decreased oral intake, dehydration, infection, surgery, and changes in insulin dosage.<sup>[6]</sup>

This case highlights the importance of withholding SGLT2Is perioperatively. If EuDKA is missed perioperatively, it can lead to haemodynamic instability and the use of unindicated vasoactive agents and postoperative ventilation. SGLT2Is should be resumed only after the patient accepts a balanced diet with adequate fluids.<sup>[1]</sup>

To summarise, withholding SGLT2Is before planned bariatric surgery, ensuring early diagnosis and the prompt management of EuDKA are required for a successful outcome.

### Conflicts of interest

There are no conflicts of interest.

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**Submitted:** 24-May-2022

**Revised:** 04-Nov-2022

**Accepted:** 04-Nov-2022

**Published:** 18-Nov-2022

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Access this article online	
Quick response code	Website: www.ijaweb.org
	DOI: 10.4103/ija.ija_448_22

**How to cite this article:** Rathi SN, Patil KN, Swami SS, Konnur SL. Euglycaemic diabetic ketoacidosis after bariatric surgery: A Near-Miss!!! *Indian J Anaesth* 2022;66:812-3.

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