Case Report

Euglycemic diabetic ketoacidosis (EDKA)and lactic acidosis following coronary artery bypass graft surgery requiring hemodialysis in a patient on SGLT2 inhibitors[SGLT2i]

Ajeetha P K[1], Shankar Geeniga[2*], Balasubramaniam[3]

[1]Consultant Cardiac Anaesthesist, [2]Senior Consultant Cardiac Anaesthesist, [3]Senior Consultant Cardiac Surgeon, Vijaya Heart Foundation, Chennai, Tamil Nadu, INDIA.
Email: shankar_gee@yahoo.co.in

Abstract

Background: Euglycemic diabetic ketoacidosis is well known serious adverse effect associated with SGLT2 inhibitors and presents as a diagnostic challenge especially in postoperative setting because of its atypical presentation, resulting in delayed recognition, inapproiate treatment and potentially life-threatening acidosis. Associated lactic acidosis in post coronary artery bypass graft surgery delayed the diagosis of euglycemic diabetic ketoacidosis SGLT2 inhibitors comprise a new class of oral hypoglycemic agents approved for treatment in type II diabetes mellitus. They are associated with serious life threatening euglycemic diabetic ketoacidosis[EDKA] which is more common in postoperative setting. We report a case of postoperative euglycemic diabetic ketoacidosis with concomitant lactic acidosis in a patient who had discontinued SGLT2 inhibitors 24hrs before surgery leading to delayed diagnosis subsequently requiring reintubation and hemodialysis which led to early recovery of our patient. We recommend stopping SGLT2i atleast 72 hours before surgery and to anticipate euglycemic diabetic ketoacidosis in addition to other causes of metabolic acidosis.
Key words: SGLT2 inhibitors, euglycemic diabetic ketoacidosis, lactic acidosis, hemodialysis.

[*]**Address for Correspondence:**
Dr Shankar Geeniga, Senior Consultant Cardiac Anaesthesist, Vijaya Heart Foundation, Chennai, Tamil Nadu, INDIA.
Email: shankar_gee@yahoo.co.in
Received Date: 05/06/2021 Revised Date: 12/07/2021 Accepted Date: 17/08/2021
DOI: https://doi.org/10.26611/10152016

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 10 October 2021

CASE REPORT

57years old female with type 2 diabetes mellitus and coronary artery disease on treatment with metformin, jardiance (SGLT2 inhibitor) and insulin for 10 years with no other comorbidities underwent elective coronary artery bypass graft surgery which was uneventful and shifted to ICU for elective ventilation. Her preoperative investigation were within normal limits except for HbA_1C 10.1. Her oral hypoglycemics were stopped 24 hours before surgery and changed to regular insulin. Postoperatively she was hemodynamicly stable and extubated on next day as per institution protcol. She developed mild metabolic acidosis with PH 7.31 PCO_2 28mmHg, HCO3 15 lactates 4 mmol/L which was corelated to polyuria and volume replacement done for hypovolemia. Subsequent ABG showed increase in lactates with high anion gap a differential diagnosis of metformin induced lactic acidosis was considered and volume resusctitation along with sodium bicarbonate was given to correct acidosis. Her blood sugars and renal parameters were within normal limits except for polyuria. Inspite of these measures there was progressive worsening of acidosis with ABG of ph 7.18 pco2 17 mmHg hco3 9.4 anion gap 32 lactates 12mmol/L Other causes of metabolic acidosis like myocardial failure and sepsis was ruled out

How to site this article: Ajeetha P K, Shankar Geeniga, Balasubramaniam. Euglycemic diabetic ketoacidosis (EDKA)and lactic acidosis following coronary artery bypass graft surgery requiring hemodialysis in a patient on SGLT2 inhibitors[SGLT2i]. *MedPulse International Journal of Anesthesiology.* October 2021; 20(1):25-27. http://medpulse.in/Anesthsiology/index.php

and diagosis of euglycemic diabetic ketoacidosis was considered. Urine ketones was checked which was large and serum beta hydroxybutyrate levels were high 3.2 which confirmed the diagnosis of euglycemic diabetic ketoacidosis. Treatment with insulin dextrose was started but patient subsequently required reintubation because of severe respiratory decompensation. Considering immediate postoperative status and severe persistant combined lactic and ketoacidosis with high anion gap hemodialysis was started after consulting with endocrinologist and nephrologist. Treatment with insulin dextrose was continued and 2nd hemodialysis was done on next day based on serum ketone level. The patient condition improved and was extubated on 3rd post operative day. Insulin dextrose infusion was continued with monitoring the serum ketone levels. Patient was transferred to ward on 5th post operative day for on going care. SGLT 2 inhibitors was withheld and was converted to insulin as per advice of endocrinologist. No further metabolic abnormalities were noted during the remaining of the hospital stay.

DISCUSSION

SGLT2 inhibitors are newer class of oral hypoglycemic agents approved for treatment of type II diabietic mellitus. They reduce blood glucose by promoting glycouria through inhibition of sodium glucose co-transporter 2 channels in epitheum of proximal renal tubules. Studies.[9,10] have showed that SGLT2 inhibitors Empagliflozin and Canagliflozin reduce risk of major cardiac events in type II diabetes mellitus. However their tendency to cause euglycemic diabetic ketoacidosis is attributed to direct effects on pancreatic alpha cells which increase glucagon release and decrease insulin release from beta cells. The combined insulin deficiency and hyperglucagonemia promote glycolysis, ketogenesis and ketoacidosis .Moreover the insulin requirements necessary to suppress ketosis /metabolic acidosis may be underestimated due to the effect of glycosuria causing near normal blood sugar level. In our case metabolic acidosis was initially attributed to hypovolemia since the blood sugars were normal and metformin as a causes of lactic acidosis was considered after ruling sepsis and myocardial failure which are more common post cardiac surgery. Although it is uncommon metformin associated lactic acidosis can occur acutely in drug overdose and in patients with hepatic and renal dysfunction. But in our case none of the above features to suggest metformin associated lactic acidosis were present, hence volume resusitation was done as there was polyuria. Euglycemic diabetic ketoacidosis was overlooked because of overlap of clinical signs and symptoms in immediate post operative period such as tachypnoea, tachycardia, hypovolumia, nausea, vomiting with increased lactates which is usually not associated with SGLT2i. Hence we suggest checking serum ketone levels and urine ketones in such patients irrespective of blood sugar levels. Development of euglycemic diabetic ketoacidosis remains a possibility for post opertive patients till the patient resumes adequate diet.In our case there was delayed diagonsis of euglucemic diabetic ketoacidosis because of the above factors and though treatment was started, patient subsequently required intubation and two cycles of hemodialysis even though renal parameters were normal. Numerous factors precipitate $SGLT_2$ inhibitor associated euglycemic diabetic ketoacidosis post operatively which include major surgery, relative or absolute insulin deficit, poor carbohydrate intake and role of counter regulatory hormones. Hence simple perioperative interventions like stopping the drug 72 hours before surgery, optimization of adquate analgesics, maintaince of euvolemia , early insulin dextrose infusion until patients resumes adequate oral intake and diabetic medications may reduce the risk of developing Euglucemic Diabetic KetoAcidosis (EDKA). If EDKA occurs, treatment includes adequate volume resuscitation, correction of electrolytes abnormalities, continuation of insulin dextrose infusion. In our case hemodialysis was mainstay of treatment in enhancing early patient recovery even though diagonsis was delayed.

CONCLUSION

Pre operative patients on $SGLT_2$ inhibitor are at risk of life threatening euglycemic diabetic ketoacidosis with various precipitating factors. Given the undisputed cardiovascular and renal benefits of $SGLT_2$ inhibitors increase usage of these drugs can be anticipated. Anesthesiologist as peri operative physicians pay a key role in diagnosis and management of these complications. Increased awareness and early recognition of involved factors together with serum ketone monitoring irrespective of blood sugar levels can safely restore normal acid base balance with simple measures leading to better patient outcome. Hemodialysis may be beneficial in patients with respiratory decompensation secondary to severe EDKA leading to faster recovery.

REFERENCES

1. B.Chaco,M.Whitley,U.Beckmann,K.Murray,M.Rowley.Postoperative euglycemic diabetic ketoacidosis with sodium-glucose cotransporter -2 inhibitors{gliflozins}:a report of two cases and review of literature.Anaesth Intensive Care 2018 / 46:2
2. Lau A,Bruce S,Wang E, Ree R,Rondi K,Chau A.Perioperative implications of sodium-glucose co-transporter -2 inhibitors: a case series of euglycemic diabetic ketoacidosis in three patients after cardiac surgery.Can J Anesth {2018}65:188-193; https://doi:org/10.1007/s12630-017-1018-6

3. Sharon C. Peacock,Julie A. Lovshin .Sodium –glucose cotransporter-2 inhibitors [SGLT -2i] in the perioperative setting.Can J Anesth[2018]65:143-147 doi.org/10.1007/s12630-017-1019-5
4. Deborah A,Osafehinti,Ogochukwu J,Okoli,Jocelyne G,Karam.Acase of SGLT2 inhibitor –associated euglycemic diabetic ketoacidosis following coronary artery bypass surgery.AACE clinical case reports. https://doi.org/10.1016/j.aace.2020.11.014
5. Kameda Y, Kato M,Inoue B,Yamazaki S.Euglycemic diabetic ketoacidosis caused by a sodium glucose cotransporter 2 inhibitor after coronary artery bypass grafting.JACC March 12,2019 vol 73,issue 9.
6. Blough B,Moreland M, Mora A.Metformin induced lactic acidosis with emphasis on the anion gap.Proc{Bayl Univ Med Cent}2015;28{1}:31-33
7. Cox K,Michael N,Justin D ,Carney E, Howell M, Donnino W.Prevalence and significance of lactic acidosis in diabetic ketoacidosis.J Crit Care.2012 April;27{2}: 132-137. https:// doi: 10.1016/j.jcrc.2011.07.071.
8. Katherine M. Wang and Robert T. Isom. SGLT2 Inhibitor–Induced Euglycemic Diabetic Ketoacidosis: A Case Report. Kidney Med 2020 Mar-Apr; 2(2): 218–221 doi: 10.1016/j.xkme.2019.12.006
9. Cardiovascular benefits of sodium-glucose cotransporter 2 inhibitors in diabetic and nondiabetic patients. Boyang Xiang, Xiaoya Zhao and Xiang Zhou Cardiovascular Diabetology volume 20, Article number: 78 (2021)
10. Cardiovascular and Renal Benefits of SGLT2 Inhibitors: A Narrative Review Int J Endocrinol Metab. 2019 Apr; 17(2): e84353.

Source of Support: None Declared
Conflict of Interest: None Declared