

Perioperative Management of the Diabetic Patient: A Brief Review

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Abstract

As the worldwide prevalence of diabetes in the general population continues to rise, an increasing number of patients with poorly controlled diabetes are scheduled for surgery. Management of these patients in the perioperative period is one of the most important safety issues that clinicians confront. There is a significant amount of evidence in the literature that shows an association between perioperative hyperglycemia and adverse clinical outcomes. Primary Care Physicians can play a pivotal role in optimizing blood glucose control in patients prior to surgery, thereby positively impacting perioperative morbidity and mortality. These ten facts summarize “best practices” in the management of blood glucose in the diabetic patient scheduled for surgery to improve perioperative outcomes. While they do not replace individual clinical judgment, they provide a framework to optimize the care of diabetic patients and their surgical outcome.

Keywords: Perioperative Diabetes; Diabetes and surgical patients; Intra-operative management of diabetes.

Introduction

An increasing number of patients with diabetes are presenting for surgery and management of these patients in the perioperative period is one of the most important safety issues that clinicians confront. There is a significant amount of evidence in the literature that shows an association between perioperative hyperglycemia and adverse clinical outcomes.^{1, 2, 3}

Primary Care Physicians can play a pivotal role in optimizing blood glucose levels in patients before surgery, thereby positively impacting perioperative morbidity and mortality.

This article summarizes key factors that every physician should be aware of about blood glucose control in diabetic patients scheduled for surgery.

1. Metabolic effects of surgical stress and anesthesia leads to a relative state of insulin resistance during days following surgery.

Surgical stress leads to the loss of the finely regulated balance between hepatic glucose production and glucose utilization in peripheral tissues. There is an increase in the secretion of counter-regulatory hormones (catecholamines, cortisol, glucagon, and growth hormone) which increases hepatic glucose production, stimulates protein catabolism, and promotes gluconeogenesis, resulting in elevated blood glucose levels.⁴ Rising catecholamine levels increase glucagon secretion and inhibit insulin release by pancreatic β -cells.⁵ Enhanced lipolysis and high free fatty acid (FFA) concentrations inhibit insulin-stimulated glucose uptake and limit the intracellular signaling for glucose transport activity.⁶

- 2. Optimizing preoperative blood glucose (HbA1c < 7) has been shown in the literature to improve perioperative surgical outcomes.**

HbA1c is a good indicator of glycemic control over the previous 3-4-month period and hence should be checked preoperatively in all diabetic patients. Poorly controlled serum glucose levels as reflected by an elevated HbA1C are associated with increased perioperative complications including major adverse cardiac events (MACE), leading to increased perioperative mortality. Dronge et al ⁷ reported that among 490 diabetic patients who underwent major non-cardiac surgery, HbA1c level >7% was significantly associated with increased infectious complications with an adjusted odds ratio of 2.13 (95% confidence interval, 1.23-3.70) compared to patients with HbA1c < 7%. Consider deferring elective surgery if HbA1c > 8%, so that diabetic treatment can be intensified prior to surgery.

- 3. All oral antidiabetic agents and noninsulin injectables should not be taken on the day of surgery and until normal food intake is resumed.⁸ However, GLP1 receptor agonists which are dosed weekly need to be held for a week prior to surgery.**

Withholding oral and parenteral antidiabetic medications on the day of surgery is done to reduce the risks of perioperative hypoglycemia, as the usual signs of hypoglycemia are masked under anesthesia making it particularly difficult to diagnose. In procedures of longer duration or in those involving the use of IV contrast dye and in patients with renal dysfunction, Met form in is discontinued when the preoperative fasting begins and resumed postoperatively with the start of a normal diet.⁹ The American Society of Anesthesiologists (ASA) recently published a consensus-based guidance on holding once weekly dosed GLP1 receptor agonist for a week prompted by multiple case reports of a higher incidence of pulmonary aspiration in these patients due to delayed gastric emptying.¹⁰

- 4. Diabetic patients should be scheduled for surgery as early as possible in the morning.**

Prolonged fasting should be avoided in diabetics as this can increase the risk of ketoacidosis in type 1 diabetes and hypoglycemia in patients on insulin therapy.¹¹ Hypoglycemia can cause functional brain failure and can lead to brain death, if it is profound or prolonged.¹²

- 5. Type 1 diabetic patients undergoing surgery require insulin during the perioperative period.**

Insulin is required for normal metabolic function and type 1 diabetics are insulin deficient. Stress of surgery can result in hyperglycemia and diabetic ketoacidosis particularly in the perioperative period.¹³

- 6. Hyperglycemia in the perioperative period increases morbidity and mortality.**

In patients with well-controlled diabetes, intraoperative blood glucose levels should be maintained <180 mg/dl (10.0 mmol/L).¹¹ The goal is to reduce hyperglycemia instead of maintaining normoglycemia, which can increase the risk of hypoglycemia. The Society for Ambulatory Anesthesia (SAMBA) ⁸ and The Society of Thoracic Surgeons Practice guidelines recommend maintaining intraoperative blood glucose levels less than 180 mg/dl.¹⁴

- 7. Chronically elevated blood glucose levels should not be decreased acutely to normalize it in the perioperative period.**

In poorly controlled diabetic patients, hypoglycemic symptoms can occur at varying levels based on their prior glycemic control. They also have an altered counter-regulatory response which may contribute to their hypoglycemic symptoms at normal blood glucose levels, increasing perioperative morbidity and mortality.⁸

8. Consultation with endocrinology or other resources should be sought to help with continuous subcutaneous insulin infusion (CSII) pump operation in the perioperative period in patients with insulin-requiring diabetes.

These pumps fundamentally provide continuous insulin to meet basal requirements with the ability to manually bolus additional insulin. The presence of the insulin pump should be documented on admission and the pump inspected regularly throughout the hospital stay by nursing staff to ensure proper functioning. If the use of the insulin pump is to be discontinued during surgery, the patient should be managed with an alternate source of insulin therapy.¹⁵

9. IV insulin infusion therapy greater than 2 units/hour should not be stopped abruptly except in the presence of hypoglycemia.

IV infusion of regular insulin is recommended in patients undergoing surgical procedures involving major fluid shifts or significant hemodynamic perturbations and in critically ill patients, as opposed to subcutaneous rapid acting insulins in non-critically ill and ambulatory patients.

Abrupt withdrawal of IV insulin infusion without prior transitioning to subcutaneous insulin can lead to rebound hyperglycemia.¹²

10. Peri-procedural euglycemic diabetic ketoacidosis associated with sodium-glucose cotransporter 2 inhibitor (SGLT2i) therapy.

Glucosuria induced by SGLT2 inhibitors in the presence of carbohydrate restriction in the perioperative period can increase the risk of SGLT2 induced euglycemic diabetic ketoacidosis. Hence holding it for 3-4 days prior to surgery is recommended. Ketoacidosis can present either with elevated blood glucose levels (BGL) or with near-normal BGL (250 mg/dl), termed euglycemic diabetic ketoacidosis (EDKA). Interventional

gastroenterology procedures, in particular colonoscopy, pose risk due to cathartic bowel preparation, fluid-only dietary restriction, and fasting.¹⁶ The U.S. Food and Drug Administration (Silver Spring, Maryland) has recently approved a label change to sodium-glucose cotransporter-2 inhibitor interruption before elective surgery. It recommends a 3-day cessation for Canagliflozin, Dapagliflozin, and Empagliflozin, and 4 days for Ertugliflozin.¹⁷

Conclusion

These 10 facts summarize “best practices” in the management of blood glucose in the diabetic patient scheduled for surgery to decrease both perioperative morbidity and mortality.

They do not replace individual clinical judgment but further emphasize the need for a multidisciplinary collaborative approach between primary care physicians, anesthesiologists, proceduralists/surgeons and endocrinologists, to optimize the perioperative care of the diabetic patient.

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