

Diabetes is Complicated: Your Anesthesia plan is not

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Abstract

Diabetes is a disease that affects many of the patients seen in Anesthesia. The consequences of diabetics can lead to affects on the endocrine, renal, cerebrovascular, cardiovascular, and respiratory systems. The role of an Anesthesia provider is not to control these issues chronically but acutely facilitate the surgery in such a way that these issues do not present problems perioperatively. Anesthetics given during the surgery do indeed affect insulin levels and glucose levels and this can not be avoided because anesthetic is needed. However, a good anesthetist knows how to work with these changes while the patient is in a pharmaceutical coma and prevent more issues from arising. This review attempts to characterize the changes associated with diabetes over the long term and how the patient may present to surgery. It discusses the risks and benefits of using various types of anesthetics as well as the reasoning behind their use. The paper uses meta-analysis to corroborate information so that the reader may find the most unbiased information possible for their decision on how to best deliver anesthesia to diabetic patients.

Introduction

- Diabetes is a disease that affects many of the patients seen in Anesthesia
- The consequences of diabetics can lead to affects on the endocrine, renal, cerebrovascular, cardiovascular, and respiratory systems.
- Diabetes? It is classified as a system disease or syndrome that is associated with increased glucose concentrations in the blood that are accustomed with an all around lack or decrease in insulin in the body.
- The types of Diabetes includes Diabetes Insipidus, Diabetes Mellitus, and Gestational Diabetes.
- It is important to note that the extreme thirst of these patients will sometimes influence them to need to eat or drink before surgery and affect their NPO status.
- History of the patient should include regular things like their social history, previous experiences of anesthesia, allergies, medicine list, and their comorbid conditions but should also include a detailed ROS which checks for heart ischemia, renal function, and the mobility of their joints. If patients are experiencing GERD, delayed gastric emptying or diarrhea it is important to not that these patients will need multi-modal antiemetics and will be at a risk for aspiration and will need a rapid standard induction (RSI).
- In blood reports, providers should be on the lookout for protein in the urine, elevated K⁺ levels, and excessive amounts of urea.⁴
- It is important to note that the release of catecholamines from stress and the inhalation of anesthetics leading to decreased insulin production are all very pertinent factors to pay attention to.⁴

Relevant Figures

Table 1

Broad management goals across the perioperative timeline. Overall goals: (i) reduce patient morbidity and mortality, (ii) avoid clinically significant hyper- or hypoglycemia, (iii) maintain acid/base, electrolyte, and fluid balance, (iv) prevent ketoacidosis, and (v) establish blood glucose measurements less than 180 mg/dL in critical patients and less than 140 mg/dL in stable patients.

Preoperative management key points	Intraoperative management key points	Postoperative management key points
(i) Verify target blood glucose concentration with frequent glucose monitoring	(i) Aim to maintain intraoperative glucose levels between 140 and 170 mg/dL	(i) Target postoperative glycemic range between 140 and 180 mg/dL
(ii) Use insulin therapy to maintain glycemic goals	(ii) Physicians must take length of surgery into account when determining an intraoperative glucose management strategy	(ii) In the event a patient is hypoglycemic after surgery, begin a dextrose infusion at approximately 5–10 g/hour
(iii) Discontinue biguanides, alpha glucosidase inhibitors, thiazolidinediones, sulfonylureas, and GLP-1 agonists	(iii) For minor surgery, preoperative glucose protocols may be continued	(iii) Ensure basal insulin levels are met, especially in type 1 diabetic patients
(iv) Consider cancelling nonemergency procedures if patient presents with metabolic abnormalities (DKA, HHS, etc.) or glucose reading above 400–500 mg/dL	(iv) IV insulin infusion is being promoted as a more efficient method of glycemic control for longer or more complex surgeries	(iv) Postprandial insulin requirements should be tailored according to the mode in which the patient is receiving nutrition
		(v) Supplemental insulin can be used to combat hyperglycemia and restore blood glucose values back to target range

Figure 1b: Number of individuals with diabetes²

Table 1b. Estimated number of adults aged 18 years or older with diagnosed diabetes, undiagnosed diabetes, and total diabetes, United States, 2018

Characteristic	Diagnosed diabetes Number in Millions (95% CI)	Undiagnosed diabetes Number in Millions (95% CI)	Total diabetes Number in Millions (95% CI)
Total	26.8 (24.4–29.1)	7.3 (6.3–8.4)	34.1 (31.6–36.6)
Age in years			
18–44	3.6 (3.0–4.1)	1.4 (0.8–1.9)	4.9 (4.0–5.8)
45–64	11.7 (10.3–13.1)	3.1 (2.3–3.9)	14.8 (13.4–16.3)
≥65	11.5 (10.1–12.8)	2.9 (2.1–3.6)	14.3 (12.7–15.9)
Sex			
Men	14.0 (12.4–15.6)	3.9 (2.8–5.0)	17.9 (16.2–19.6)
Women	12.8 (11.4–14.1)	3.4 (2.7–4.1)	16.2 (14.8–17.6)
Race/ethnicity			
White, non-Hispanic	15.4 (13.8–17.0)	4.1 (3.1–5.2)	19.5 (17.9–21.2)
Black, non-Hispanic	4.2 (3.8–4.7)	0.9 (0.6–1.3)	5.2 (4.7–5.7)
Asian, non-Hispanic	1.6 (1.3–2.0)	0.7 (0.4–1.0)	2.3 (1.9–2.8)
Hispanic	4.9 (4.1–5.6)	1.5 (1.0–1.9)	6.4 (5.4–7.3)

Acute Diabetic concerns

- Diabetic ketoacidosis is defined as the serum glucose reaching levels of being more than 250 mg/ dL of blood, with pH levels being below 7.30 (normal levels of blood glucose are 7.35-7.45), or having a sodium bicarbonate level less than 18 mEq.
- DKA itself in type 1 patients will lead to death in roughly 3-5% of patients while in type 2 patients 15%³. Effects of DKA also include increased amounts of growth hormone, epinephrine, and glucagon.

DISCUSSION

- Some problems with not successfully managing the patient's diabetes perioperatively can lead to delayed wound healing, and even death.
- One of the best things to do for the patient is give them regional anesthesia alongside general anesthesia and keep the patient's glucose levels in check while also doing timely arterial blood gasses.
- Minor surgery leads to an increase in the blood glucose levels 1.12 mmol/L on average while major surgery can increase it by as much as 2.05-4.48mmol/L⁵
- With any anesthetic given, there will be change in the metabolic function as well as systemic function and as such keeping a watchful eye on monitors (especially EKG) can serve to keep the patient safe

Adhering to guidelines on fluid loss, insulin replacement, and giving the patient regional anesthesia in conjunction with general anesthesia can help the patient in making sure they are kept safe.

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