

# Treatment of Preoperative Hypoglycemia

## OBJECTIVES

- Identify the causes and patients at risk of hypoglycemia
- Understand the risks hypoglycemia presents
- Understand the treatment of hypoglycemia

## PATIENT PRESENTATION

A 73 year old woman presented for a right IJ AV fistula creation. Her past medical history included end stage renal disease scheduled for MWF hemodialysis, hypoparathyroidism, subclavian steal syndrome, hypertension, atrial fibrillation and sick sinus syndrome s/p pacemaker (AAIR interrogated within the last six months), type 1 diabetes mellitus, and COPD.

Previous anesthetic history was unremarkable.

Anesthetic plan for general anesthesia with an endotracheal tube due to surgical location and need for maintenance muscle paralysis. A magnet was available for the case, pacing the patient's pacemaker in DDDR.

## CASE REPORT

On arrival to preop, the patient was found to be on a Humalog insulin pump. Her point of care blood glucose level was measured at 45 mg/dl. This low blood glucose was accompanied by hypotension with systolic pressures in the 80s. With these vitals, the anesthesia team was called before taking the patient back to the operating room.

On the anesthesia team's arrival, the patient was found to be responsive and asymptomatic despite her vitals.

For treatment of the patient's hypoglycemia, Methodist Hospital protocols were followed. The patient was given 25 mL of D50. To treat the patient's hypotension, a 500 ml bolus of normal saline was given. The patient was also placed in slight Trendelenburg. The case was delayed to allow for treatment of both the hypotension and hypoglycemia.

Per Methodist protocol, another point of care blood glucose was taken fifteen minutes later. The patient's glucose level increased to 116 mg/dl. The patient's blood pressure also later increased with systolic pressures in the 100s.

## CASE REPORT CONT.

There was discussion of cancelling the patient's case over fears of her tenuous vitals. However, the procedure was ultimately deemed necessary due to the patient's need for hemodialysis access.

The patient's preoperative status then caused slight adjustments to the anesthetic plan. It was decided that the patient would receive an awake arterial line due to fears of further hypotension.

The patient was brought into the operating room two hours after her scheduled case start. An awake arterial line was placed with ultrasound guidance. After arterial line placement, the patient was induced with an intravenous anesthetic. The patient was intubated using a McGrath to allow for a more hemodynamically stable induction.

Intraoperatively, the patient remained relatively stable. Boluses of phenylephrine were given periodically to support the patient's blood pressure. The majority of the case was overall uneventful and the patient was extubated without issue. The patient was transported to PACU without issue. Her labs and vitals were within normal limits postoperatively.

## DISCUSSION

Type 1 diabetes, or insulin dependent diabetes, is an autoimmune disorder in which the beta cells of the pancreas are destroyed and thus cause a decrease in insulin production. Insulin normally serves to facilitate anabolic processes within the body. This includes glucose uptake into muscles and adipose tissue, glycogen formation, and protein synthesis. Without adequate levels of insulin, type 1 diabetics are susceptible to hyperglycemia which can cause vascular complications, neuropathy, gastroparesis, hypertension, and silent cardiac ischemia.

To help treat type 1 diabetes, patients can use exogenous insulin. Exogenous insulin can be classified by which the speed it takes to have an effect. Rapid acting insulins include Lispro, Aspart, and Glulisine. NPH is considered intermediate acting. Regular insulin is short acting and Glargine is long acting. Exogenous insulin can be administered subcutaneously either by bolus or an insulin pump. Insulin pumps make use of rapid acting insulin for ease of titration. In this case, our patient was treating their type 1 diabetes with a Humalog (Lispro) insulin pump.

As was witnessed preoperatively, patients can experience hypoglycemia from excessive insulin uptake. Symptoms of hypoglycemia typically occur once a patient's blood sugar drops below 70 mg/dL. As blood glucose decreases, pancreatic alpha cells begin to secrete glucagon and the adrenal medulla releases epinephrine. Both of these combined stimulate the liver to release stored glucose. Furthermore, when the brain is deprived of glucose it activates the sympathetic nervous system causing symptoms such as diaphoresis, confusion, anxiety, tachycardia, and hunger. These symptoms are thought to stimulate the individual to ingest food and further increase their glucose levels. Should the hypoglycemia persist, these neurological symptoms can progress into conditions such as long term neurological deficits, seizures, coma, and eventual death.

## DISCUSSION CONT.

Hypoglycemia can be treated with the fast acting carbohydrates. For fasting or unconscious patients, glucagon or glucose can be used. Table 1 includes the Methodist Hospital Hypoglycemia Protocol which was followed.

Should hypoglycemia occur intraoperatively, its symptoms are largely masked by general anesthesia. For this reason, preoperative evaluation of a diabetic patient should include an understanding of their recent trend in blood glucose and the medication they use for treatment. Given this information, anesthesia practitioners can tailor their intraoperative management to account for euglycemia. In our case, we were able to utilize our arterial line to check intraoperative blood glucose. Hypoglycemia should be included in the differential diagnosis for all diabetic patients who experience delayed emergence.

## CONCLUSION

Hypoglycemia can lead to severe neurological deficits and patient death if left untreated. While this was a case of preoperative hypoglycemia, if such low blood sugar were to occur in the perioperative period it may be hidden by general anesthesia. For this reason, all anesthesia providers should take extra precaution with diabetic patients.

The anesthesia care team should be aware of their diabetic patient's starting blood glucose and pharmacological treatment. Euglycemia is the intraoperative goal for all diabetic patients. Concerns for hypoglycemia do not end after the intraoperative period. Given the length of surgical procedure are emergence conditions, hypoglycemia should continue to be monitored postoperatively.

## REFERENCES

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Blood glucose level	IV Access	No IV access and able to take PO	No IV access and NPO or nonresponsive
	Give Dextrose 50%	Give apple juice or clear soda	Give glucagon based on weight for calculation
70 mg/dL	12 mL	90 mL	• Give 0.5 mg of Glucagon IM for a patient less than 45 kg
60-69 mg/dL	16 mL	120 mL	
50-59 mg/dL	20 mL	150 mL	• Give 1 mg Glucagon IM for a patient equal to or more than 45 mg
40-49 mg/dL	24 mL	180 mL	
40-39 mg/dL	28 mL	210 mL	
20-29 mg/dL	32 mL	240 mL	
Less than or equal to 10-19 mg/dL	36 mL	270 mL	

Table 1: Methodist Hospital Hypoglycemic Protocol Treatment Guide