
PERIOPERATIVE DIABETES MANAGEMENT

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INTRODUCTION

Diabetes is the most common metabolic disorder in the United States affecting 8% of the population. Twenty percent of patients who are undergoing surgery have diabetes and the comorbidities related to diabetes increase the need as well as the risks associated with surgical intervention. Perioperative morbidity and mortality are higher in the diabetic patient and require close monitoring. Careful assessment prior to surgery is necessary because of the complexity of glucose control and the inherent risk for coronary heart disease, which may be asymptomatic in the diabetic. A multi-specialty approach to perioperative control can substantially reduce the risks related to surgery.

GLYCEMIC CONTROL

One key aspect of the perioperative management is glycemic control. Glycemic control helps to prevent ketoacidosis. Avoidance of extreme hyperglycemia or hypoglycemia and maintenance fluid and electrolyte balance contributes to patient health. Insulin requirements generally lengthen the perioperative period, most patients with diabetes will require adjustments to their insulin regimen while in the hospital. A reasonable target to maintain would be a glucose level between 140-180 mg/dL (1).

Studies show that 30% of hospitalized patients with diabetes have inappropriate management of their diabetes. Sliding scale insulin is no longer the standard of care (2). Despite its convenience, its inconsistencies in the serum glucose have precluded its use as a sole method. In fact, this method delays administration of insulin until hyperglycemia is present, which cause wide fluctuations in the glucose serum. In order to deliver insulin in a physiologic manner and eliminate those variations in the glucose serum, it is now recommended to use 3 different types of insulin. Each of these types of insulin can be adjusted based on whether the patient is NPO or on a diabetic diet (3).

The basal insulin is a long acting insulin preparation administered regardless of the patient's oral intake status. It covers the body's need for insulin between meals and during the night which correlates with the hepatic glucose production. The most common basal insulin is Insulin

Glargine. The prandial insulin includes short-acting human insulin and the new rapid-acting insulin analogs. It is generally administered before breakfast, lunch, and dinner to cover nutritional needs and respond to glucose intake during meals. The supplemental or correctional insulin will correct blood glucose values that exceed the glycemic target. It should be given when glucose levels are greater than 150.

PREOPERATIVE PHASE

Laboratory

Preliminary evaluation on a patient with diabetes should include EKG and a renal function panel. Risk factors for a major postoperative cardiac event include EKG abnormalities, such as abnormal Q waves or wide QRS intervals, and abnormal Creatinine and BUN levels indicative of kidney disease. Preoperative evaluation should also include hemoglobin A1C, baseline glucose, serum electrolytes, urine analysis, and a complete blood count (4). These tests in combination with a thorough history and physical, may help identify patients who are likely to require special attention and variation from standard protocols.

Outpatient Medications

During the preoperative evaluation, a plan should be made for managing the blood glucose intraoperatively and post-operatively. This is an important part of the perioperative management since it will determine if any modifications in the patient's home insulin or oral hypoglycemic agents are required. The physician prescribing should also be involved in any decisions regarding glucose control.

Several strategies exist to maintain target range glucose levels, but there is no consensus as to the optimal strategy. Ideally, patients with diabetes should have their surgery in the morning to minimize the disruption of their management while they are NPO. Patients with diabetes who take oral hypoglycemic drugs are advised to stop their medication the evening before the procedure. It is recommended to stop metformin 24 hours before surgery because there is a risk for lactic acidosis. In fact, metformin is contraindicated in conditions that increase the risk of renal hypoperfusion, tissue hypoxia, and lactate

accumulation. Failure to excrete the medication can produce high blood and tissue levels that could stimulate lactic acid overproduction. Sulfonylureas increase the risk of hypoglycemia when a patient is NPO. It is recommended that second generation sulfonylureas should be stopped one day before surgery. Chlopropramide should be stopped two to three days prior to the procedure. In general, patients with diabetes will take their prandial insulin as usual before dinner and will decrease their basal insulin by 20% the night before the procedure. The morning of the surgery, prandial insulin will be held and only half to one-third of the basal insulin will be given to the patient if blood glucose levels are greater than 120 mg/dL. Patients who are on an insulin pump will simply decrease basal rate by 20% at midnight (5).

Minor Versus Major Procedure

To aid in this decision-making process, surgery will be classified as minor or major based on the length of the procedure and the type of anesthesia the patient is to receive. Generally, a minor case will be less than two hours, while a major case is greater than two hours and more likely to be performed under general anesthesia. For the well-controlled patient who is to undergo minor surgery, insulin therapy should be started with regular insulin via a subcutaneous route of administration. Dosage may be determined with a sliding scale formula. Dosing may be repeated every four hours as needed for good control.

If the patient is unstable and has a significant elevation of the blood sugar, he or she should be started on an insulin drip. For the non-insulin dependent diabetic patient having a major procedure, the protocol is the same as for minor surgery. Once again, if the blood sugar is uncontrolled, the patient is started on an IV insulin infusion. For the insulin dependent diabetic patient, an insulin drip should be started preoperatively.

INTRAOPERATIVE PHASE

Intraoperatively, the patient's glucose should be monitored hourly. The importance of monitoring of glucose is crucial due to the risk of cardiac complications and hypoglycemia. The first signs of abnormal glucose may only be seen in the form of arrhythmias on EKG and ultimately lead to seizures. Neuroglycopenia occurs when there is insufficient glucose allowing the central nervous system to function. This state in addition to an electrolyte imbalance may lead to irreversible brain damage.

POSTOPERATIVE PHASE

Most patients can resume their normal diabetic medication regimen when they are stable and can tolerate food. For patients who are on a sliding scale normally and have undergone surgery and on a sliding scale subcutaneous administration of insulin, the scale may be continued for 24 to 48 hours. When stable, these patients may resume their routine. For patients who were on an insulin drip, the drip should be continued through the first meal. The drip should be discontinued before the next meal and patient can resume inpatient protocol or home medication regimen. Metformin can be resumed 48 hours after surgery if renal function is adequate. However, if the patient is to remain in the hospital, oral diabetic medications are seldom used and insulin therapy is preferred.

SUMMARY

Perioperative management of glucose levels is paramount for achieving the most optimal surgical outcome. It is important to understand the medications as well as the methods of administration to keep the patient safe through the entire surgical course. There are multiple protocols for managing diabetes and the physician should be familiar with practices in place at the hospital. As podiatrists and surgeons, the key features of diabetic management include adequate preoperative testing, closely monitored glucose control, and modifications to medications to prevent hypoglycemic events. Clinical judgment remains the key component in good perioperative treatment of the patient with diabetes mellitus

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