REVIEW ARTICLE

PERIOPERATIVE MANAGEMENT OF DIABETIC PATIENT

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ABSTRACT:
The prevalence of diabetes mellitus (DM) is increasing rapidly. In 2011, it was estimated that 366 million people worldwide had DM with a projected increase to 522 million by 2030. Diabetes is one of the most common non-communicable diseases and is ranked as one of the top five global causes of premature death. It is well established that diabetic patients undergoing major surgery, cardiac and non-cardiac, are at increased risk of mortality and morbidity. Furthermore, the relationship between inadequate preoperative glucose control and adverse outcomes has also been found in several surgical specialities: orthopaedics, colorectal, spinal, vascular, and cardiac. In conclusion, maintaining good glycaemic control during the peri-operative period results in improved outcomes following surgery. In order to keep blood glucose levels within the target range, diabetes medications often need to be altered immediately before and following surgical and radiological procedures. There may be great individual variation in the impact of surgery and the adjustments to therapy required, depending on the pre-existing diabetes status of the patient, the nature of the surgery and the presence of post-operative complications.
Key words: Diabetes, Type I & II, Surgery, Perioperative care

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INTRODUCTION

Over the next decade the exponential rise in obesity is predicted to increase the prevalence of diabetes by more than 50%. This has major implications for health services, with particular impact on inpatient care. A recent audit has shown that the prevalence of diabetes in the UK inpatient population now ranges from 10-28%, exceeding previous estimates by at least 50% and this figure is certain to rise in the future. Because diabetes related comorbidities increase the need for surgical and other operative procedures, it is not surprising that at least 10% of patients undergoing surgery have diabetes and this percentage is also likely to rise.[1]

HIGH-RISK SURGICAL PATIENT AND IMPACT OF DIABETES

The high-risk surgical population is made up of elderly patients with co-existing medical conditions undergoing complex or major surgery, often as an emergency. The most important co-morbid diseases include ischaemic heart disease, heart failure, respiratory disease, impaired renal function and diabetes mellitus. There is clear evidence that such diseases are strongly associated with poor outcomes after major surgery.[2]

GENERAL PREOPERATIVE ASSESSMENT

The foundation of the preoperative assessment is a comprehensive history and physical examination. Because estimates suggest that one quarter of diabetic patients are unaware of their disease, it may be prudent to screen all patients undergoing intermediate or major surgery by checking glycosylated hemoglobin (HbA1c or A1C). In patients with known DM, the standard preoperative documentation should be expanded to include the following details of current diabetes management: duration of treatment, specific medication regimen, and issues with insulin resistance or hypersensitivity.[3]

HISTORY

The history should assess for symptoms of cardiac, retinal, renal, neurologic, and peripheral vascular disease. Because the mortality rate from heart disease is 2-4 times greater in diabetic patients

than non diabetic individuals, a comprehensive cardiac history should be completed for patients undergoing intermediate or major non cardiac surgery.[1]

GENERAL PHYSICAL EXAMINATION

The physical examination includes assessment for orthostatic hypotension, a potential sign of autonomic neuropathy. A funduscopic examination may provide insight into the patient's risk of developing postoperative blindness, especially following prolonged spinal surgery in the prone position and cardiac surgery requiring cardiopulmonary bypass.[4]

Type 1 DM is associated with a "stiff joint" syndrome, which poses a significant risk during airway management at the time of general anesthesia. The temporomandibular, atlantooccipital, and other cervical spine joints may be affected. These patients also tend to have short stature and waxy skin, related to chronic hyperglycemia and nonenzymatic glycosylation of collagen and its deposition in joints.[4]

Further airway evaluation should include assessment of thyroid gland size, as patients with type 1 DM have a 15% association of other autoimmune diseases, such as Hashimoto thyroiditis and Graves disease.[5] To summarize, the physical examination should include the following: Blood pressure (including orthostatic measurements), Funduscopic examination, Airway examination, Thyroid palpation, Cardiac examination, Abdominal examination (hepatomegaly), Evaluation of pulses by palpation and with auscultation, Feet examination, Skin examination (insulin-injection sites), Neurologic examination.

GENERAL PREOPERATIVE MANAGEMENT

Given that patients with DM are treated with a variety of regimens and are scheduled for surgery at varying times of the day, there is no established consensus for optimal perioperative management.[6] However, using general management principles to minimize the likelihood of hypoglycemia and to limit the incidence of excessive hyperglycemia should guide decision making. Patients should communicate specifics of their surgical procedure to their endocrinologist or internist and, in conjunction with their anesthesiologist, be advised on modifications to their current regimen.[7]

In general, on the day of surgery, patients on oral regimens should be advised to discontinue these medications. Secretagogues (eg, sulfonylureas, meglitinides) have the potential to cause hypoglycemia. In addition, sulfonylureas may interfere with ischemic myocardial preconditioning and may theoretically increase the risk of perioperative myocardial ischemia and infarction.[8] Patients taking metformin should be advised to discontinue this drug preoperatively because of the risk of developing lactic acidosis. For these patients, short-acting insulin may be administered subcutaneously on a sliding scale or as a continuous infusion, to maintain optimal glucose control, depending on the type and duration of surgery.[9]

Patients who are insulin dependent are typically advised to reduce their bedtime dose of insulin the night before surgery to prevent hypoglycemia while nil per os (NPO). Maintenance insulin may be continued, based on the history of glucose concentrations and the discretion of the advising clinician. Patients may be advised to consult with their anesthesiologist and diabetes-managing practitioner for individualized recommendations regarding their diabetes plan. Additionally, patients should be monitored preoperatively to assess for hyperglycemia and hypoglycemia.[10]

GOALS OF PERIOPERATIVE GLYCEMIC CONTROL

he goals for glycemic control are tailored to each patient based on a number of factors, such as the nature of the surgery, severity of the underlying illness, modality used to achieve glycemic control, patient age, and sensitivity to insulin. Numerous clinical trials have involved various patient populations and examined the implications of perioperative hyperglycemia. Based on data derived from these studies, the American Diabetes Association made recommendations for managing blood glucose levels in hospitalized patients with DM.[11]

An elevated HbA1c immediately before surgery may provide insight to a patient's risk for postoperative diabetic-related complications. Before elective surgery, an HbA1c value of less than 6% would be ideal. It is unknown whether tighter glycemic control may further reduce complications; however, tighter control comes at the cost of an increased risk of hypoglycemia. Less intensive glycemic control may be indicated in patients with severe or frequent episodes of hypoglycemia. Special populations of diabetic patients, such as pregnant women and the elderly, may require additional considerations. In addition, a plan for hypoglycemia should be delineated for individual patients.[12]

METHODS OF ACHIEVING GLYCEMIC CONTROL

Because of the numerous potential perioperative complications in diabetic patients, close monitoring is imperative to maintain glycemic control, while minimizing hypoglycemia. After assessment, patients who were taking oral agents before surgery may be able to restart their previous regimen postoperatively. However, the appropriateness of oral agents needs to be reassessed because of potential complications. Intravenous insulin is the most flexible and readily titratable agent, making it an ideal modality for perioperative use.[13]

The length of surgery, the type of surgery, and the degree of glycemic dysregulation dictate the amount of supplemental insulin. For patients with type 1 DM, it is recommended to schedule elective surgeries as the first case of the day to minimally disrupt their DM regimen. Depending on the length and extent of surgery, patients may be advised to administer one half of their daily dose of long-acting insulin and to arrive at the preoperative admitting area early enough to have their serum glucose monitored and to determine whether they need intravenous dextrose until the time of surgery.

EARLY PERIOPERATIVE PHASE[14]

Several strategies exist to maintain target range glucose levels perioperatively, but there is no consensus as to the optimal strategy. There are limited data on the optimal strategy has been well studied for the prevention of important outcomes such as DKA/NKH, neuroglycopenia, wound infections, or postoperative myocardial infarction. However, the strategies presented by one review, which are the focus of discussion here, reflect practical and seemingly safe protocols for perioperative glucose management.

Ideally, all patients with diabetes mellitus should have their surgery as early as possible in the morning to minimize the disruption of their management routine. In addition, patients should be cautioned about symptoms of hyper/hypoglycemia and on appropriate strategies for dealing with these problems prior to leaving the hospital.[15]

Type 2 diabetes treated with diet alone - Generally, patients with type 2 diabetes managed by diet alone do not require any therapy perioperatively. Supplemental short-acting insulin (eg, regular or lispro) may be given as a subcutaneous sliding scale in patients whose glucose levels rise over the desired target (see "Sliding scale development" below). Blood glucose should be checked preoperatively and soon after the surgery. Intravenous solutions do not require dextrose if insulin is not given.

Type 2 diabetes treated with oral hypoglycemic agents — Patients with type 2 diabetes who take oral hypoglycemic drugs are advised to continue their usual routine of oral antidiabetic medications until the morning of surgery. On the morning of surgery, they should hold their oral hypoglycemic drugs (including alpha glucosidase inhibitors, biguanides, sulfonylureas or thiazolidinediones). Previously, biguanides (metformin) were discontinued 48 hours prior to surgery because of concerns regarding lactic acidosis, but current practice is to discontinue on the day of surgery.

Type 1 or type 2 diabetes treated with insulin — Generally patients who use insulin can continue with subcutaneous insulin perioperatively (rather than an insulin infusion) for procedures that are not long and complex. Some clinicians switch their patients taking long-acting insulin (eg, glargine) to an intermediate-acting insulin one to two days prior to surgery because of a potential increased risk for hypoglycemia with the former. However, if the basal insulin is correctly calibrated in a patient with type 1 diabetes, it is reasonable to continue their long-acting insulin while the patient is NPO and on intravenous dextrose. There are no available data to support one approach over the other.

TIMING OF PROCEDURE

For short, early morning procedures where breakfast is likely only delayed, patients may delay taking their usual morning insulin until after the surgery and before eating.

Long and complex procedures for type 1 or type 2 diabetes requiring insulin

Intravenous insulin is usually required for long and complex procedures (eg, coronary artery bypass graft, renal transplant, or prolonged neurosurgical operations). Studies comparing subcutaneous insulin administration versus intravenous infusion have found a marked increase in variability of the glucose concentration when using the subcutaneous route. This variability in plasma insulin has been attributed to the varying degrees of tissue perfusion associated with long and complex procedures.

POSTOPERATIVE MANAGEMENT

In the foot and ankle surgical setting, patients typically resume their preoperative diets after surgery, especially after minor procedures. The

postoperative glucose and potassium levels should be determined in the postanesthesia care unit and normalized before sending outpatients home. For outpatients placed on intravenous infusion intraoperatively, the patient should be stabilized and oral intake should be tolerated prior to discontinuing the drip. After discontinuing the drip, blood sugar should be normalized and the patient's regular insulin or OHA regimen may be resumed with the next meal. For inpatients, the drip may be continued until the patient tolerates their first postoperative meal, after which it may be discontinued prior to the next meal. At this point, the patient may resume their regular regimen, whether it consists simply of diet control, OHA, a combination of OHA/ insulin, or insulin sliding scale.

CONCLUSION

Hyperglycemia is a well-recognized risk factor for increased morbidity and mortality in hospitalized patients. According to current guidelines, BG levels should be regulated at a starting threshold of 180 mg/dL. The glycemic targets considered most appropriate are still controversial, especially in the perioperative setting. Tight glucose control (BG target level of 80-110 mg/dL) is not supported by sufficient evidence. A glycemic target of 140- 180 mg/dL appears safe and acceptable for the majority of critically ill patients in the perioperative setting. We propose a practical flowchart for perioperative glycemic management in our institution, focusing on the delicate postoperative transition phase to SC insulin.

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