

PERIOPERATIVE MANAGEMENT OF SURGICAL PATIENTS WITH DIABETES MELLITUS

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INTRODUCTION

In many patients long standing diabetes Mellitus leads to a number of complications that require surgical intervention, Furthermore they are subject to the same operations required by non-diabetic patients.

There are several reasons to attempt to stabilize plasma glucose concentrations in the preoperative period. In the case of insulin dependent diabetes mellitus (IDDM) inadequate control of blood glucose levels can lead to ketosis and acidemia. All patients with glucose intolerance are susceptible to electrolyte imbalance and volume depletion from osmotic diuresis.¹ There is impaired wound strength and wound healing when plasma glucose levels are greater than 200 mg/dl. Moreover hyperglycemia interferes with leukocyte chemotaxis opsonization and phagocytosis.² Hyperglycemia also exacerbates Ischaemic brain damage.³

AIMS OF TREATMENT

Surgery must be planned and managed carefully in the diabetic patient with particular emphasis on metabolic control.

The aim should be to:

1. Avoid keto acidosis,

hypoglycemia.
excessive hyperglycemia.
electrolyte imbalance and
prolonged hospitalization.

2. Achieve wound sepsis and mortality rates, as in non diabetics.

PRINCIPLES OF MANAGEMENT

Management can be divided into treatment of IDDM and NIDDM patients. Those patients taking insulin must be assumed to have no endogenous insulin reserves. To combat the catabolic swings of surgical trauma and associated starvation, they must have continuous provision of insulin and glucose irrespective of the grade and severity of surgery.

NIDDM have some insulin reserves which are usually sufficient to withstand safely minor or moderate degrees of trauma. These patients are insulin resistant and can not respond normally to major trauma. So major surgery should be managed as in IDDM with insulin and glucose therapy.

PREOPERATIVE ASSESSMENT AND MANAGEMENT

Prolonged hospitalization before surgery is not necessary but where possible admission 2 days preoperatively is helpful.⁵ Blood Glucose levels should be regularly monitored and treatment adjusted accord-

ingly. Long acting insulin should be stopped as their effect may prolong perioperatively. In NIDDM long acting sulphonylureas such as chlorpropamide should be stopped. Metformin should be avoided because of risk of lactic acidosis.

Perioperative assessment should include basic renal and cardiovascular testing (e.g Urinalysis, Serum Creatinine, Electrolytes and ECG). Diabetic patients should be screened for autonomic neuropathy since they are at risk of developing perioperative hypotension. This can be done by measuring variation in R-R interval on ECG during deep breathing, heart rate response to Valsalva maneuver and blood pressure and heart rateresponse to standing⁶ changes will be great in patients with diabetic neuropathy as compared to normal persons.

PATIENTS WITH IDDM

- Admit 2-3 days before operation
- ECG and careful cardiovascular examination
- Assess for neuropathy and renal function
- Stabilize on short or intermediate acting insulin
- Blood glucose monitoring at least 4 times daily
- Stop long acting insulin

PATIENTS WITH NIDDM

- Admit 2 days before operation for major surgery
- ECG and careful cardiovascular examination
- Assess for neuropathy and renal function
- Stop metformin and long acting sulfonyl urea
- If fasting blood level exceeds 150mg/dl treat with short acting insulin
- treat as IDDM on operation day if undergoing major surgery

PERIOPERATIVE MANAGEMENT

IDDM PATIENTS

Use of continuous intravenous infusion is the most appropriate way to manage a patient with IDDM.

There is clear improvement in plasma glucose and ketone body concentration with glucose insulin potassium (GIK) infusion compared to S/C insulin.⁷

Currently there are two accepted regimens for initiating I/V insulin infusion.

1. G.I.K (Glucose, Insulin, Potassium) infusion.
2. Variable rate infusion.

G.I.K INFUSION⁷

This is greatly simplified mode of delivery. Insulin and glucose are combined in a single infusion. It is independent of electronic pumps that may fail or be misused. If the drip speeds up, slows down or even stops there will be no immediate crisis as both insulin and glucose are delivered together in fixed proportions. Potassium is added to prevent hypokalemia. The standard GKI infusion contain 15 units of soluble insulin and 10 milli mole of KCL in 500 ml of 10% glucose solution, infused at a rate of 100 ml/hour.

VARIABLE RATE INFUSION⁸

Two separate intravenous lines are needed. One delivers 10% dextrose at a rate of 100 ml/hour and other one is for insulin pump delivering 50 units of regular insulin in 500 ml of normal saline (1.0 unit/hour=10ml/hour).

The infusion is started at 0.5-1.0 u/hr and can be varied according to blood glucose levels. (Fig. 1)

Glucose level	Rate
Less than 80 mg/dl	Turn infusion off give 25 ml 50% glucose recheck in 30 minutes.
80–120 mg/dl	Decrease infusion by 0.3 units/hour.
120–180 mg/dl	No change in infusion rate.
180–240 mg/dl	Increase infusion by 0.3 units/hour.
More than 240 mg/dl	Increase infusion by 0.5 units/hour.

Fig. 1. Glucose infusion rate

NIDDM

NON-MAJOR SURGERY

Observe blood glucose. If patient is taking Oral hypoglycemic agents, omit on the morning of surgery and restart with the first meal. The long acting chlorpropamide should be stopped 2–3 days before surgery.

MAJOR SURGERY

Treat as IDDM

Excessive attention has been paid to the problem of absorption of insulin to the plastic tubing and bag of the infusion set. The amount absorbed is relatively small and constant and can be minimized by flushing a small amount of insulin containing infusion through the tubing before attachment to the patient.⁹

If fluids need to be restricted the volume of infusion can be halved by using 20% glucose. The infusion rate should also be halved (50ml/hr).

Insulin infusion should be stopped and replaced with short acting insulin three times daily when the patient begins to eat again. Once the patient is eating normally and there are no major postoperative complications then the usual therapy can be started. This applies both to IDDM and NIDDM undergoing major surgery.

EMERGENCY SURGERY

Occasionally diabetic patients need urgent and emergency surgery. There should be complete evaluation of patients metabolic status. Plasma glucose electrolytes and PH should be measured and urine ketones estimated. Saline infusion should be started. If diabetic ketoacidosis is confirmed, surgery should be delayed while standard treatment is being done with I/V fluids, insulin and potassium. It has been found that most of the patients presenting with diabetic ketoacidosis and severe abdominal pain, had disappearance of the pain after diabetic ketoacidosis was adequately treated.¹⁰

CONCLUSION

The care of patients with diabetes mellitus during surgery is easy although the approach needs to be simple, clear and logical. By understanding basic physiologic and endocrinology principles rational decisions can be made regarding the metabolic care of the diabetic patient. Frequent intraoperative measurement of blood glucose is essential for any regimen to be effective.

REFERENCES

1. McMurray JF. Wound healing with diabetes mellitus. Better glucose control for better healing in diabetes surg Clin North Am 64: 769.

2. Rafield EJ, Ault MJ, Keush GT, Brothers MJ, Nechomias Smith-II, Infection and diabetes: The case for glucose control. *Am J Med* 1982; 72: 439.
3. Pulsinelli WA, Waldmen S, Rawlinson D, Plum F. Moderate hyperglycemia augments ischaemic brain damage. A neuro pathological study in the rat. *Neurology* 1983; 32: 1239.
4. Gill GV0, Albert KGMM. Hospital update 1989; 327.
5. Albert KGMM, Gill GV, Elliot MJ. Insulin delivery during surgery in the diabetic patient. *Diabetes care* 1982; 5(5): 65.
6. Ewing DJ, Clarks BF. Diagnosis and management by diabetic autonomic neuropathy. *Br Med J* 1982; 285: 916.
7. Albert KGMM, Thomas DJB. The management of diabetes during surgery. *Br J Anaesthesia* 1979; 51: 693.
8. Watts NB, Gebhart SP, Clark RV, Phillips LS. Perioperative management of diabetes mellitus. Steady state glucose control with bedside algorithm for insulin adjustment. *Diabetic care* 1987; 10: 722.
9. Albert KGMM, Marshal SM. Diabetes and surgery. *The diabetes Annual*, Vol 4, Edited by Albert KGMM, Kroll LP, Amsterdam 1988; 246.
10. Compbell EW, Duncan LJP, Innes JA, MacCvish Ac, Nuro JF. Abdominal pain in diabetic metabolic decompensation; Clinical significance *JAMA* 1975; 233: 165.