

Preoperative Care of diabetes Mellitus Patients.

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Summary

People with diabetes present unique challenges for surgery because of their delicate metabolic balance between insulin and its counter regulatory hormones. The complications related to diabetes present further challenges, especially with regard to cardiac risk assessment. The medical history, physical examination, application of the cardiac risk indexes, and the appropriate ancillary tests would be help for risk-stratify patients. Diabetes must be controlled tightly preoperatively. This will improve coagulation time of blood and wound healing, also will decrease the chance of postoperative infections. Careful preoperative assessment and planning by clinicians can help diabetic patients to ensure the difficult surgical period.

الخلاصة

يبيدي مرضى السكري تحدياً كبيراً للجراحة بسبب أملاكهم توازن أبيض ضعيف بين الإنسولين والهرمونات المنظمة. فالتعقيدات المرتبطة بمرض السكري تبدي تحدي أكبر خصوصاً عندما يتعلق بتقييم خطر الأمراض القلبية. و تاريخ المريض الطبي والفحص الفيزيائي وتحديد خطر الأمراض القلبية وتطبيق الاختبارات المختبرية المساعدة بصورة صحيحة سوف يساعد في تقليل خطر المرض. كما ان مرض السكري يجب أن ينظم بأحكام قبل العملية ، وهذا سوف يؤدي إلى تنظيم تخثر الدم وشفاء الجروح، وتقليل التلوث بعد العملية الجراحية. والتقييم الجيد قبل العملية والتخطيط من قبل الطبيب يساعد مرضى السكري على تحمل الفترة العصبية للعملية الجراحية.

Introduction:-

Pre operative care is the care of the patient with major surgical problem as the ultimate outcome will be largely dependent on measures taken as a result of the preoperative assessment. Pre operative assessment is an overall assessment and evaluation of the patient general health ,operative risk ,and fitness for general anaesthesia that might influence recovery. Preoperative care begins as soon as a patient agrees to undergo an operation. It involves history taking, clinical examination, appropriate investigations and risk assessmentand. Diabetes mellitus is a common endocrine disease affecting at least one hundred million people worldwide, There are two main forms of diabetes. Type 1 generally known as insulin-dependent diabetes mellitus(1DDM), is caused by destruction of insulin producing β - cells of the pancreas leading to deficiency or lack of insulin secretion, It presents before the age of 30 years. Treatment is invariably by regular insulin injections. Type 2 diabetes is known as non- insulin- dependent diabetes mellitus (NIDDM), result from lack of sensitivity to the effect of insulin ,It usually presents in middle age(>40 year) or in the elderly and is often of slow onset but it is more common, representing about 80% of cases. Most of patient with type 2 diabetes are obese. Treatment may initially involve modification of the patient's diet or administration of oral hypoglycemic agents(1,2).

In the surgical population, it act with diabetes as both a coincidental disease and as also associated with end organ damage, which may require surgical intervention(1). Diabetes is associated with increased requirement for surgical procedures and increased postoperative morbidity and mortality. The stress response to surgery and the resultant hyperglycemia, osmotic diuresis, and hypoinsulinemia can lead to perioperative ketoacidosis or hyperosmolar syndrome. Hyperglycemia impairs leukocyte function and wound healing. The management goal is to optimize metabolic control through close monitoring, adequate fluid and caloric repletion, and judicious use of insulin. Patients with diabetes undergo surgical procedures at a higher rate than do nondiabetic people.(1,2) Major surgical operations require a period of fasting during which oral antidiabetic medications cannot be used. The stress of surgery itself results in metabolic perturbations that alter glucose homeostasis, and persistent hyperglycemia is a risk factor for endothelial dysfunction (3)

postoperative sepsis impaired wound healing (4,5) and cerebral ischemia.(6,7) The stress response itself may precipitate diabetic crises (diabetic ketoacidosis [DKA], hyperglycemic hyperosmolar syndrome [HHS]) during surgery or postoperatively, with negative prognostic consequences (8) HHS is a well known postoperative complication following certain procedures, including cardiac bypass surgery, where it is associated with 42% mortality(9).

Risk for diabetes is determined by certain factors, including genetic, physiological, and behavioral. Certain ethnic groups have higher rates of diabetes, suggesting a genetic predisposition to the disease. Age also plays a major role in

diabetes prevalence. The CDC estimates that nearly 1 in 5 adults over the age of

65 years has diabetes. Furthermore, nearly 80% of diabetes is diagnosed in overweight(10)

and obese individuals, suggesting a strong link between lifestyle behaviors and the development of diabetes. Physical inactivity and poor diet are crucial factors then in the prevention of the disease. While not all risk factors are modifiable, those that are contribute greatly to the high prevalence of diabetes and provide the key to public health efforts aimed at reducing diabetes prevalence.

Uncontrolled diabetes is associated with serious complications and premature death; however, much of this burden could be prevented with early detection, improved delivery of care, and better education on diabetes self-management.

The following are examples of diabetes-related complications that could be prevented or reduced: The actual treatment recommendations for a given patient should be individualized, based on diabetes classification, usual diabetes regimen, state of glycemic control, nature and extent of surgical procedure, and available expertise. Some general rules can be applied, however. Whenever possible, ketoacidosis, hyperosmolar state, and electrolyte derangements should be searched for and corrected preoperatively, and the surgery itself should be scheduled early in the day, to avoid protracted fasting(9,10).

This high-risk group will undergo cardiovascular and ophthalmological procedures at a greater rate than will their nondiabetic peers. They may also require a transplant associated with diabetes, such as a kidney transplant in the setting of renal failure or a pancreas transplant. Furthermore, diabetic complications may require penile prosthesis implantation, ulcer debridement. During the postoperative period, diabetic patients face poor wound healing, increased incidence of acute renal failure, and increased infection rates(8). When diabetic patients enter the surgical arena, they face several challenges that are not present in nondiabetic patients. Many of the problems arise because diabetic patients are not able to maintain a balance between insulin and its counterregulatory hormones. On one side of the equation, insulin acts as the primary anabolic hormone that promotes glucose uptake by the muscle and fat cells while decreasing glucose production by the liver. This occurs because insulin suppresses gluconeogenesis and glycogenolysis. The net effect is to lower blood glucose levels. The counterregulatory hormones, including epinephrine, glucagon, cortisol, and growth hormone, have the opposite effect. They raise blood glucose by stimulating glycogenolysis and gluconeogenesis in the liver; by increasing lipolysis and ketogenesis; and by inhibiting glucose utilization by muscle and fat. Surgery and anesthesia provoke a neuroendocrine stress response, which releases these counterregulatory hormones and causes hyperglycemia and increased catabolism. The magnitude of the response depends on the severity of surgery and on complications such as sepsis, hypotension, hypovolemia, and acidosis(9,10). . Nondiabetic patients can increase insulin secretion and maintain glucose homeostasis throughout a surgical procedure. Diabetic patients are unable to compensate, which results in hyperglycemia. People with type 1 diabetes will be susceptible to diabetic ketoacidosis (DKA). Those with type 2 diabetes will be susceptible to hyperglycemic hyperosmolar nonketotic syndrome (HHNK) and may also be susceptible to DKA if they have very poor metabolic control. Hyperglycemia has many other adverse effects. It can impair wound healing by hindering collagen production, resulting in decreased tensile strength of surgical wounds. Hyperglycemia can increase infection because glucose levels above 250 mg/dl are thought to impair leukocyte chemotaxis and phagocytosis (2).

Goal:

Maintain a glycemia While Minimizing risk for hypoglycemia and other drug related Complication
-Decrease Length of Stay and risk of infection ,Poor glycemic control due to: Increase dehydration and Electrolyte abnormalities .Impairs collagen formation and decrease Surgical risk Complication
*Medication for diabetes Management associated risk

Materials and methods:

The study was conducted on 40 patients from Al Hussain Hospital males having different types of diabetes (type 1 and type 2) intended to have operations. These patients were divided into 4 groups .group 1 unknown with Diabetes mellitus, group 2 patient with cardiovascular disease ,group 3 with Respiratory disease ,group 4 with Renal Failure .all groups take history of patients which include, Suggestive symptoms (eg, polyuria/polydipsia, blurred vision).Eating patterns, nutritional status, exercise history, and weight history. Current treatment of diabetes, including medication regimen, diet, exercise, and glucose monitoring results. Frequency, severity, and etiology of acute complications (eg, ketoacidosis, hypoglycemia). Previous or current infections (eg, skin, foot, dental, genitourinary). Symptoms and treatment of chronic microvascular or macrovascular complications (eg, eye; kidney; nerve; genitourinary, bladder, and gastrointestinal function; heart; peripheral vascular; foot; and cerebrovascular complications) .Nondiabetic medications that may affect blood glucose levels (eg,corticosteroids). Risk factors for atherosclerosis (eg, smoking, hypertension, obesity , dyslipidemia, family history). History and treatment of other conditions (eg, endocrine and eating disorders). Family history of DM and endocrine disorders. Lifestyle, psychosocial, and economic factors that might influence DM management. Tobacco, alcohol, and controlled substance use. the physical examination to these 20th patients were made, 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.

The physical examination should include the following:- Full .blood .count(F.B. C), Urine Examination ,Electro Cardio Graphy. (E.C.G) all patient ≥ 40 Year, chest X. Ray all Patient ≥ 30 years ,Liver Function Test(L.F.T) all Patient, Echocardiogram:-Abnormal E.C.G ischemic heart .heart Failure ,clotting screen ;anticoagulant abnormal L.F.Ts. Calcium ;Thyroid and laryngectomy ,Pulmonary Function ;abnormal chest X, ray partial Larygectomy ,Oesophagectomy 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,After that, some instructions are given to these patients about there operations and there medications and what they must to eat before and after operation,For patients with type 1 diabetes mellitus:-

Pre-surgical Evaluation

Physicians and patients can take several practical steps to help minimize problems during surgery and in the postoperative period. Before surgery, a physical exam should be performed and a complete diabetic history taken to prepare the anesthesiologist and surgeon. Clinicians should provide anesthesiologists with details regarding patients' current level of metabolic control and diabetic complications, including renal function, heart disease, presence of autonomic neuropathy, and any history of DKA or HHNK. Evaluation of metabolic control should begin with an examination of patients' blood glucose logbooks and HbA1c or fructosamine results. Logbooks should be examined for episodes of hypoglycemia and extreme hyperglycemia. Patients' pharmacological regimen, dosages, and timing of medication ingestion should be examined. This will aid in making recommendations about withdrawal of medication before the perisurgical period, when patients will be fasting.Patients' usual dietary intake, including carbohydrate content and timing of meals, should also be noted

On the day before operation:-The patients must eat and drink normally and take their usual doses of insulin before meals. They must not eat or drink anything from midnight, except for water; But they must take their usual snack before going to bed. On the day of surgery:-They should not take their breakfast. They should stop their usual subcutaneous dose of insulin and convert it to intravenous regimen. After surgery:-After surgery the patients should eat well and take a dose of insulin prescribed by the doctor. The patients should take their usual insulin injection before bed. For patients with type 2 diabetes mellitus:-On the day before surgery:

-They must eat and drink normally and take their usual doses of insulin and tablets (anti diabetic drug) before meals. Do not eat or drink anything from midnight, except for water. They must have their usual snack before going to bed. The day of surgery:-They should not take their breakfast. They should stop their morning insulin and anti diabetic drugs.

Results :-

Group 1 with unknown of D.M. the patient have complication with wound infection, abdominal pain, Fever, not respond for treatment and delayed wounds healing but the other groups which controlled on D.M. There is no risk Factor of post operative.

Post operative complications can range from minor, self limiting problems to major life threatening ones depending on the nature of the surgery and the organ operated upon. Complication can be due to anesthesia or surgery or a reaction to the stress of surgery itself. Some complications are general and apply to all procedures and some are specific that apply to only that procedure. But group 1 which surgery with Common complications include fever, chest infection, pneumonia, wound infection, bleeding or deep vein thrombosis. Most of the complications manifests after the first few days of surgery – usually 1 to 3 days. Some diabetic patients who have atherosclerotic vascular disease they develop myocardial infarction after operation. In Diabetic ketoacidosis patients that not respond to treatment, abdominal pain and vomiting, with the vomiting usually preceding the pain present after operation. In diabetic nephropathic patients, they have a worse outcome (complications and mortality) even accounting for the increased risk of associated conditions hypertension and peripheral vascular disease. Increase the rate of delay wounds healing and then increase incidence of wound infection (surgical site infection) occur in poor control diabetic patients after surgery.

Discussion:-

All patients with type 1 diabetes undergoing minor or major surgery and patients with type 2 diabetes undergoing major surgery are considered appropriate candidates for intensive perioperative diabetes management. The management approach in these categories of patients always includes insulin therapy in combination with dextrose and potassium infusion. Major surgery is defined as one requiring general anesthesia of ≥ 1 h. Type 2 diabetic patients undergoing minor surgery are managed based on their usual diabetes regimen, their state of glycemic control, the nature and extent of the surgical procedure, and available expertise. People whose diabetes is well controlled by a regimen of dietary modification and physical activity may require no special preoperative intervention for diabetes. Fasting blood glucose should be measured on the morning of surgery, and intra operative blood glucose monitoring is desirable if the surgical procedure is lengthy (>1 h). If surgery is minor, no specific therapy is required. If surgery is major or if diabetes is poorly controlled (blood glucose >200 mg/dl), an intravenous infusion of insulin and dextrose should be considered (see below), and hourly intra operative glucose monitoring is recommended. For patients treated with Anti Diabetic Agents, Second-generation sulfonylureas should be discontinued 1 day before surgery, with the exception of chlorpropamide, which should be stopped 2–3 days before surgery. Other oral agents can be continued until the operative day. Although metformin has a short half-life of ~ 6 h, it is prudent to temporarily withhold therapy 1–2 days before surgery, especially in sick patients and those undergoing procedures that increase the risks for renal hypoperfusion, tissue hypoxia, and lactate accumulation. At a minimum, blood glucose should be monitored before and immediately after surgery in all patients. Those undergoing extensive procedures should have hourly glucose monitoring during and immediately following surgery. Bedside capillary blood

glucose meters are adequate for these monitoring requirements. However, extremely high or low values should immediately be repeated before instituting remedial action, and a simultaneous blood specimen should be sent for laboratory corroboration. For minor surgery, perioperative hyperglycemia (>200 mg/dl) can be managed with small subcutaneous doses (4–10 units) of short-acting insulin. Care must be taken to avoid hypoglycemia. After minor procedures, most usual antidiabetic medications can be restarted once patients start eating. Patients treated with metformin should withhold the drug for ~72 h following surgery or iodinated radiocontrast procedures. Metformin therapy can be restarted after documentation of normal renal function and absence of contrast-induced nephropathy. The recommended treatment for patients undergoing major surgery and for those with poorly controlled type 2 diabetes is intravenous insulin infusion, with glucose, using one of two standard regimens. For patient treated with Insulin:-

*** Minor surgery**

Patients treated with long-acting insulin (e.g., ultralente, glargine, protamine zinc insulin) should be switched to intermediate-acting forms 1–2 days before elective surgery. Close perioperative blood glucose monitoring is crucial to avoid extremes of glycemia. Intravenous insulin/glucose/potassium should be commenced before surgery. Blood glucose levels should be monitored hourly intraoperatively and immediately after surgery. The infusion should be stopped and usual insulin treatment resumed once oral intake is established. There should be a 1-h overlap between stopping intravenous insulin and re-instituting subcutaneous insulin.

*** Major surgery**

Insulin-treated patients undergoing major elective surgery should preferably be admitted 2–3 days before surgery, if glycemic control is suboptimal (hemoglobin A1c >8%). If admission is not feasible, a physician or diabetes nurse practitioner should work with the patient to optimize self-monitoring of blood glucose (SMBG) values in the days preceding the planned surgery. In such circumstances, SMBG should be performed at least before each meal and at bedtime, with target preprandial values of 80–120 mg/dl and bedtime values of 100–140 mg/dl. (11)

The preoperative evaluation should include a thorough physical examination (with particular focus on autonomic neuropathy and cardiac status), measurement of serum electrolytes and creatinine, and urine ketones. The presence of autonomic neuropathy mandates increased surveillance for hypotension, respiratory arrest, and hemodynamic instability during surgery. (12) Gross metabolic and electrolyte abnormalities (e.g., hyponatremia, dyskalemia, acidosis) should be corrected before surgery. Intravenous infusion of insulin, glucose, and potassium is now standard therapy and has replaced subcutaneous insulin therapy for the perioperative management of diabetes, especially in type 1 diabetic patients and patients with type 2 diabetes undergoing major procedures. Several reports have emphasized the advantages of the insulin infusion regimen over subcutaneous delivery. (4,13) It is not necessary to add albumin to the insulin infusion to prevent nonspecific adsorption of insulin to the infusion apparatus; flushing ~50 ml of the insulin infusion mixture through the tubing will accomplish the same purpose. Adequate fluids must be administered to maintain intravascular volume. Fluid deficits from osmotic diuresis in poorly controlled diabetes can be considerable. The preferred fluids are normal saline and dextrose in water. Fluids containing lactate (i.e., Ringer's lactate, Hartmann's solution) cause exacerbation of hyperglycemia. (13)

Insulin:-

Two main methods of insulin delivery have been used: either combining insulin with glucose and potassium in the same bag (the GIK regimen) or giving insulin separately with an infusion pump.

The combined GIK infusion is efficient, safe, and effective in many patients but does not permit selective adjustment of insulin delivery without changing the bag. The glucose component can be either 5 or 10% dextrose. The latter provides more calories.

Regardless of whether separate or combined infusions are given, close monitoring is required to avoid catastrophe during these infusion regimens. These recommendations must be interpreted flexibly, given the individual variability in insulin requirements and metabolic profiles. In the

absence of strict evidence-based guidelines, the consensus approach is to avoid extremes of glycemia (aiming for 120–180 mg/dl) and to tailor therapies to individual patients based on feedback from glucose monitoring.

The initial insulin infusion rate can be estimated as between one-half and three-fourths of the patient's total daily insulin dose expressed as units/h. Regular insulin, 0.5–1 unit/h, is an appropriate starting dose for most type 1 diabetic patients. Patients treated with oral antidiabetic agents who require perioperative insulin infusion, as well as insulin-treated type 2 diabetic patients, can be given an initial infusion rate of 1–2 units/h. An infusion rate of 1 unit/h is obtained by mixing 25 units of regular insulin in 250 ml of normal saline (0.1 unit/ml) and infusing 10 ml/h. Alternatively, 50 units of regular insulin is made up to 50 ml with saline and given by syringe pump at 1–2 ml/h. Adjustments to the insulin infusion rate are made to maintain blood glucose between 120 and 180 mg/dl. The duration of insulin (and dextrose) infusions depends on the clinical status of the patient. The infusions should be continued postoperatively until oral intake is established, after which the usual diabetes treatment can be resumed. It is prudent to give the first subcutaneous dose of insulin 30–60 min before disconnecting the intravenous line.

Glucose:-

Adequate glucose should be provided to prevent catabolism, starvation ketosis, and insulin-induced hypoglycemia. The physiological amount of glucose required to prevent catabolism in an average non-diabetic adult is ~120 g/day (or 5 g/h). With preoperative fasting, surgical stress, and ongoing insulin therapy, the caloric requirement in most diabetic patients averages 5–10 g/h glucose. This can be given as 5 or 10% dextrose. An infusion rate of 100 ml/h with 5% dextrose delivers 5 g/h glucose. If fluid restriction is necessary, the more concentrated 10% dextrose can be used. Many now prefer to give 10% dextrose at a starting rate of ~100 ml/h. The usual range of perioperative blood glucose that clinicians are comfortable with is ~120–180 mg/dl. The insulin and glucose infusion rates should be adjusted accordingly if blood glucose monitoring shows marked deviation from the acceptable range. The convention is to administer ~0.3 units of insulin/g glucose in most otherwise stable patients. However, insulin requirements are higher in septic, obese, or unstable patients and in those treated with steroids or undergoing cardiopulmonary bypass surgery. If the GIK regimen is to be used, then 15 units of insulin in 500 ml 10% dextrose containing 10 mEq potassium is the usual starting solution given at 100 ml/h. Potassium The infusion of insulin and glucose induces an intracellular translocation of potassium, resulting in a risk for hypokalemia. In patients with initially normal serum potassium, potassium chloride, 10 mEq, should be added routinely to each 500 ml of dextrose to maintain normokalemia if renal function is normal. Hyperkalemia (confirmed with repeat measurement and electrocardiogram) and renal insufficiency are contraindications to potassium infusion. For emergency surgery, approximately 5% of people with diabetes will require emergency surgery over their lifetime.¹ The commonly performed surgeries include general procedures (laparotomy, appendectomy, cholecystectomy, and so forth) and diabetes-related procedures, such as abscess drainage, ulcer care, and lower-extremity amputation. By definition, the time of occurrence of these emergencies cannot be predicted, and appropriate surgical care must not be unduly delayed. Nonetheless, particular care must be taken to exclude DKA and other conditions that are likely to be mistaken for surgical emergencies. Many patients with DKA and prominent abdominal symptoms have undergone needless surgical exploration for a nonexistent acute abdominal emergency.⁽¹⁴⁾ Functional syndromes due to diabetic autonomic neuropathy of the gastrointestinal tract (gastroparesis, gastroenteropathy, intractable or cyclical vomiting) may mimic anatomical surgical emergencies. Similarly, the rare diabetic pseudotabes syndrome, characterized by sharp neuropathic pain along thoracolumbar dermatomes, can be confused with visceral disorders. Patients with pseudotabes typically have pupillary and gait abnormalities from associated cranial and peripheral neuropathy. The initial evaluation of a diabetic patient with a suspected surgical emergency must, therefore, include a thorough medical history and physical examination directed at excluding the aforementioned diagnostic pitfalls⁽¹⁵⁾. Unfortunately, many patients who require emergency surgery will have suboptimal glycemic

control. However, this is not necessarily a contraindication to the timely performance of potentially life-saving surgery. An intravenous access should be secured and immediate blood specimens should be sent for glucose, electrolyte, and acid-base assessment. Gross derangements of volume and electrolytes (e.g. hypokalemia, hypernatremia) should be corrected.

Surgery should be delayed, whenever feasible, in patients with DKA, so that the underlying acid-base disorder can be corrected or, at least, ameliorated. Patients with HHS are markedly dehydrated and should be restored quickly to good volume and improved metabolic status before surgery. Blood glucose should be monitored hourly at the bedside, and insulin, glucose, and potassium infusion should be administered, as appropriate, to maintain blood glucose in the 120–180 mg/dl range. Serum potassium should be checked frequently (every 2–4 h), and potassium supplementation should be adjusted to ensure that the patient remains eukalemic throughout surgery and postoperative (16,17,18).

The recommendation of pre operative care of glycemic control

- *improved leukocyte function, response of endothelium dependent vasodilatation normal skin fibroblast proliferation

- *improved immunoglobulin complement fixation , increase blood flow to wound s, wounds healing ,less thrombotic complications.

- *Nutrient delivery , Normalization of coagulation , oxygen delivery and elevated free fatty acids and Cardio toxicit.

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