

# **Perioperative Management of Diabetes**

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# Diabetes in Nepal

- 19.0% above the age of 40 have diabetes in urban area Shrestha Diabet Med 23 (2006)1130
- 25.9% above the age of 60 have diabetes Chhetri Nepal Med Coll J 11 (2009) 34
- More than half of these were newly diagnosed on screening

# Surgery in DM very common

- 20% of surgical patients have diabetes (Clement, Diabetes Care 2004)
- 50% of DM need surgery in their life time (Root, Postgrad Med 1966)
- Number of diabetic subjects increasing

# Perioperative problems

- Stress response to surgery with catabolic hormone secretion
- Interruption of food intake, pre- and perhaps post-surgery (also Post Operative Nausea & Vomiting)
- Altered consciousness, masking the symptoms of hypoglycaemia
- Circulatory disturbance that may alter the uptake of s.c. insulin
- The altered physiological state resulting from end organ pathology

# **DM is associated with**

- Increased risk of perioperative infection
- Perioperative MI
- Postoperative Acute kidney injury
- Postoperative cardiovascular morbidity and mortality
- Prolonged hospital stay

# Problems in glycaemic control

- Operative procedure
- Anesthesia
- Disrupted meal schedules
- Altered nutritional intake
- Postoperative factors such as sepsis and emesis

# Cardiac Risk

- Coronary heart disease is common in individuals with diabetes
- Patients with diabetes have an increased risk of silent ischemia
- Higher risk of peri-operative MI
- Need to focus on cardiopulmonary risk assessment and modification before planned surgery.

# **Other Risks for Anaesthesia and Postoperative Care.**

- Hypertension
- Obesity
- Chronic kidney disease
- Cerebrovascular disease
- Autonomic neuropathy

Need to assess these before planned surgery



# History and Examination

- Determination of the type of diabetes as type 1 have risk of DKA.
- Long-term complications of diabetes
- Assessment of glycemic (HbA1C)
- Assessment of hypoglycemia
- Detailed history of diabetes and other therapy

# **Many patients have other end organ damage**

- Chronic Renal Failure
- Congestive Cardiac Failure
- Cardiac Autonomic Neuropathy
- Ischaemic heart disease

**Consider cardiac investigations & coronary reperfusion before elective surgery**

# Background

- No evidence based perioperative management
- Good glycaemic control reduces mortality in critically ill patients by 50% (NEJM, 2001)
- Different hospitals have own management protocol
- No RCT on different protocols



# Perioperative goal

- Minimize morbidity
- Avoiding hyperglycaemia and its associated lipolysis, ketogenesis, protein catabolism and electrolyte disturbances
- Avoiding hypoglycaemia

# How?

- Provide adequate insulin to counteract the catabolic processes in response to surgery
- Glucose needs to be provided to meet the increased metabolic needs, caused by surgical stress, as well as basal metabolic requirements
- A simple regimen that is immune to error

# **Factors that need to be considered**

- Glucose
- Insulin
- Potassium
- Fluids

# Need Standard Protocol

- Agreed by surgeons, Anaesthetists & Physicians
- Simple, Short & Comprehensive
- Readily available
- Accessible in electronic format



# Once Surgery Planned

- Screen for diabetes
- Remember to check HbA1c along with routine bloods
- Ask patient to contact their diabetes care provider to improve their control
- Use of prophylactic beta blocker is controversial

**Diabetes control can be improved within 3 months with intensive treatment**

# Principle of management

- Choose a treatment regime from the table.
- Check U&E before IV infusion in the morning
- Start IV insulin infusion as needed
- Adjust infusion rate & potassium content if abnormal
- Monitor blood glucose regularly
- Maintain blood glucose between 4 to 9 mmol/l
- Contact on call medical team if any problem



# Choice of regimen

| Types of surgery              | Diet only         | Tablets           | Insulin           |
|-------------------------------|-------------------|-------------------|-------------------|
| Not eating < 12 hours         | <b>Regime 1</b>   | <b>Regime 2</b>   | <b>Regime 3/X</b> |
| Not eating 12 – 48 hours      | <b>Regime 1</b>   | <b>Regime 3/X</b> | <b>Regime 3/X</b> |
| Not eating > 48 hours         | <b>Regime 3/X</b> | <b>Regime 3/X</b> | <b>Regime 3/X</b> |
| Emergency and/or poor control | <b>Regime 3/X</b> | <b>Regime 3/X</b> | <b>Regime 3/X</b> |

# Regime 1

## (Observation only)

- Use only in diet controlled diabetic subjects
- Monitor blood glucose 4 hourly
- If blood glucose consistently  $>11$  mmol/l on two or more occasions consider **regime X** or **regime 3**

# Regime 2

## (Omission of Oral Hypoglycaemic agents)

- Use only in tablet controlled diabetic subjects
- Stop drugs 6 – 12 hours pre-operatively
- Take 4 hourly blood glucose measurements
- Recommence tablets after patient has tolerated a full meal
- Consider regime X or regime 3 if any problem

# Regime X (GIK Infusion) 1

- Discontinue usual insulin / tablets on the day of surgery
- Ideally commence infusion 4 hours preoperatively via a dedicated canula
- **500ml 10% glucose + 10mmol KCl + 10 units insulin. Run at 10 drops/min (= 0.6 U/Hr)**  
**(20 drops = 1 ml)**
- Check blood glucose hourly
- Adjust the infusion as needed

# Regime X (GIK Infusion) 2

| Blood glucose mmol/l     | Action  |
|--------------------------|---|
| <4 (< 72mg/ml)           | Change bag to normal saline   |
| 4 - 9<br>(72 – 162mg/ml) | Continue same   |
| > 9<br>(> 162mg/ml)      | Increase rate to 20 drops per min and measure again in one hour. Increase progressively to reach up to 50 drops per minute by increment of 10 drops |
| > 9 after 50 drops/min   | Change bag with 20units of insulin and start at 30 drops per minute and increase as before  |
| BG <4 after increase     | Reduce to previous dose   |

Consider regime 3 if available or develop any problem



## **Regime X (GIK infusion) 3**

- Strength of insulin needs to be doubled after 50 drops per minute to avoid fluid overload (3.5 L per day maximum) and start at 30 drops per minute
- Infusion to be continued till patient tolerates full meal.
- Discontinue infusion and recommence usual treatment before next meal.

## **Regime X (GIK infusion) 4**

- If patient already on insulin and takes  $> 100$  units of insulin start with 20 Units of insulin in 500ml of 10% Glucose & 10mmol KCl.
- Continue process as before

# **Regime 3 (Insulin sliding scale) 1**

- Discontinue usual insulin / tablets on the day of surgery
- Ideally start infusion 4 hours preoperatively via a dedicated canula. Use other line for N. Saline.
- Use 10% glucose with 20mmol KCl. Run at 50ml/hour
- 50 units human soluble or fast acting analogue insulin in 50ml saline (1unit/ml) to run via syringe driver
- Check blood glucose hourly
- Start the infusion at sliding scale A (Scale B if daily insulin requirement > 100 units)

## Regime 3 (Insulin sliding scale) 2

|  |           | Insulin infusion rates<br>(units/hour) |    |    |    |
|--|-----------|--|----|----|----|
| Sliding scale regime                       |           | A                                      | B  | C  | D  |
| Blood glucose<br>concentration<br>(mmol/l) | 0 - 3.9   | 0                                      | 0  | 0  | 0  |
|  | 4 – 6.9   | 1                                      | 2  | 3  | 4  |
|  | 7 – 8.9   | 2                                      | 4  | 6  | 8  |
|  | 9 – 10.9  | 3                                      | 6  | 9  | 12 |
|  | 11 – 12.9 | 4                                      | 8  | 12 | 16 |
|  | >12.9     | 6                                      | 12 | 18 | 24 |

# Anaesthetic considerations

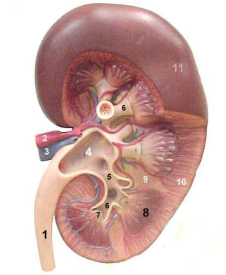
- Preferably first case in the morning to minimize the starvation period
- The stress imposed by the anaesthetic is usually minor compared to the stress of the surgery.
- The challenge is to give the most stable anaesthesia possible and limit the hyper & Hypoglycaemia

# NG feeding after surgery

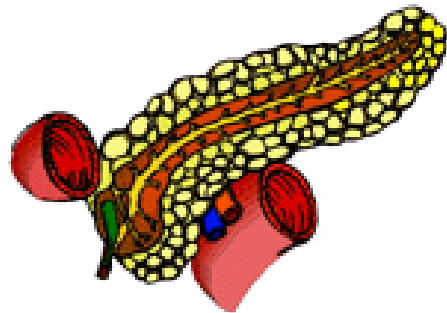
- Monitor blood glucose before, after 4 hours and after the feed
- If patient on oral medications, can give crushed tablets before feeding
- If patient on insulin, give s/c isophane insulin before overnight feed

# Transplant Surgery

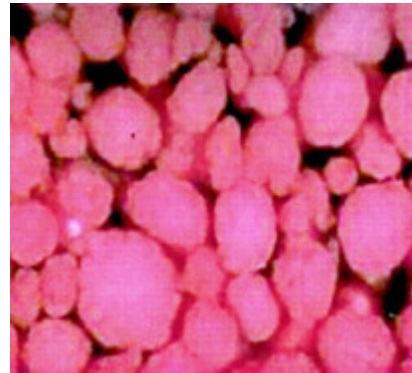
KIDNEY



WHOLE  
PANCREAS



ISLET CELL



# Diabetes Complications Following Transplant

- Insulin Resistance
  - Steroid complications
  - Inter current Infection
  - Malignancy
- 
- Insulin independence may be achieved in about 75% of Pancreas transplant
  - Insulin or OHA requirement may increase in renal transplant subjects on steroid



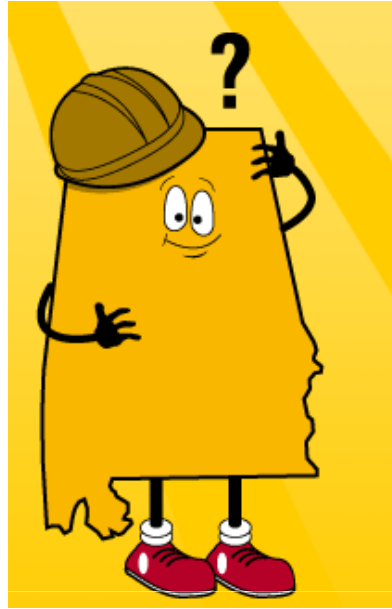
# Post operative decubitus ulcer

- Common in Heel
- Neuropathy and PVD contribute to this
- 100% preventable
- Need to provide adequate off loading in post-operative period.



# Summary

- The most important factors are good control of the patient's perioperative blood glucose concentrations to prevent the acute complications of hyperglycaemia
- The strict avoidance of any hypoglycaemia
- The complications of diabetes should be sought out and the affected organs protected, especially the heart, brain and kidneys
- An aggressive approach to glycaemic control will result in better wound healing, lower mortality and shorter hospital stays



Any Questions ???