

Endocrinology

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## Diabetes

### Classification

#### Type I

Autoimmune disease, 40-50% concordance,  $\beta$ -cell destruction, ? viral or environmental trigger, insulin deficiency

Prone to diabetic ketoacidosis

Presents at an early age

Require insulin replacement

#### Type II

100% genetic concordance, increased in obese, insulin resistance

Not prone to DKA, but may develop hyperglycaemic hyperosmolar coma

Presents in middle aged or elderly (except MODY)

Initial therapy often with diet, exercise, oral agents, later insulin

### Insulin

Synthesized in endocrine pancreas (islets of Langerhans) by  $\beta$ -cells

$\alpha$ -cells secrete glucagon,  $\delta$ -cells secrete somatostatin, F cells secrete pancreatic polypeptide

Normal secretion 1 U/kg/day, peaks after meals,  $t_{1/2}$  5 min

Release stimulated by

Plasma glucose and fructose, amino acids, glucagon, gastrin, secretin, CPK, ACh, catechols via  $\beta$  receptors

GH increases insulin responsiveness

Release inhibited by

Somatostatin, catechols via  $\alpha$ -receptors

### Perioperative management

#### Evidence

Diabetics are at increased risk of complications

Due to secondary effects of diabetes (IHD, renal disease...) **not** due to hyperglycaemia

Tight control of blood sugar

Reduces chronic complications of diabetes

Benefits foetus in pregnancy

Less macrosomia

Beneficial during cardiopulmonary bypass

More responsive to inotropes

Stress response produces hyperglycaemia

Hypothermia diminishes insulin sensitivity

Beneficial during cerebral ischaemia

Lower risk of neurological damage

Otherwise little evidence for advantages in tight perioperative control

Major risks in the diabetic patient

Cardiovascular: IHD, PVD, microvascular disease

Renal impairment

Neuropathies

Impaired cellular immunity

Joint collagen abnormality (jaw stiffness, poor deep wound healing)

Resuscitation of the DKA patient for emergency surgery

Usually time for fluid replacement, electrolyte correction

Fluid deficit 3-10 l (Saline 5-10 ml/kg plus 1-4 l/h)

Potassium deficit 3-10 mmol/kg (KCl 10-20 mmol/l fluid)

Insulin deficit

Correct  $K^+ < 3$  mmol/l first

10 U bolus plus 5-10 U/h titrated against blood sugar

- Add 5% dextrose to fluids when glucose < 15 mmol/l
- Hourly ABG and glucose
- Aim for glucose 10-14 mmol/l, pH > 7.35, Na<sup>+</sup> < 155 mmol/l, K<sup>+</sup> 3-5 mmol/l
- Also phosphate, magnesium deficient
- Classic “non-tight control” regimen
  - Fast from midnight for morning surgery
  - 5% dextrose 125 ml/h IV from 6am
  - Half normal morning dose of insulin
  - Check BSL 1-4 hourly
  - Sliding scale insulin from recovery until return to normal diet
- “Tight” regimen
  - Check fasting glucose day before surgery
  - 5% dextrose 50 ml/h IV
  - Initial insulin IV rate (U/h) = BSL/8.3 (mmol/l) (or BSL/5.5 if on steroids)
  - Titrate insulin rate to BSL 5.5-11.1 mmol/l
  - Check BSL at start of surgery and every 1-2 h for 24 h
- Other perioperative concerns
  - Autonomic neuropathy
    - ↑ gastric emptying time, risk of aspiration
    - Painless myocardial ischaemia
    - Signs include hypertension, lack of sweating, lack of R-R variability, postural hypotension, peripheral neuropathy
  - Microvascular disease
    - ? ↑ risk of neuropraxia with regional

## Perioperative corticosteroid supplementation

### Evidence

- Few patients with adrenocortical suppression have problems even without steroid cover: documented cases are rare
- Acute adrenal insufficiency is life-threatening
- Perioperative steroid cover carries minimal risks
- Primate study found no difference between physiologic and supraphysiologic doses

### Physiology

- Maximum adrenal cortisol output 200-500 mg/d
- Normal 25 mg/d

### Risks of supplementation

#### Possible

- Minor impairment of wound healing (antagonized by vitamin A)
- Impaired immune function
- Hypertension, fluid retention, stress ulcers, psychosis
- Aseptic necrosis of head of femur

### Recommended regimen

- Indicated for all patients receiving steroids within past year
- Not less than usual preoperative dose equivalent
- Hydrocortisone 200 mg/d for 70 kg adult (100 mg for minor procedures)
- Reducing 25% per day until oral steroids resumed