

Episode 6 - Anaesthesia for the Obese Patient

Body Mass Index

Underweight	< 18.5 kg/m ²
Healthy	< 25 kg/m ²
Overweight	> 25 kg/m ²
Obese	> 30 kg/m ²

Note: BMI does not distinguish between muscle mass and adipose tissue.

Epidemiology

1:2 adults in the UK are overweight.

1:5 adults in the UK are obese.

1:100 adults in the UK have a BMI > 40 kg/m² or BMI > 35 kg/m² with associated comorbidities.

Adjusted body weight

$$ABW = IBW + [0.4 \times (TBW - IBW)]$$

Lean body mass is about 80% of total body weight in normal individuals. In obese individuals 40% of excess weight is made up of lean body mass. LBM has a maximum of 100 kg in men and 70 kg in women.

Airway and Breathing

Obstructive sleep apnoea (<i>airway</i>)	Airway obstruction during sleep (5% of obese individuals)
Obesity hypoventilation syndrome (<i>breathing</i>)	Chronic hypoventilation throughout day and night (1% of obese individuals)

Both result in chronically raised arterial carbon dioxide levels with renal compensation and reduced CNS sensitivity. Obesity hypoventilation syndrome is due to changes in the mechanics of breathing arising from obesity. It leads to chronic hypoxia and hypercapnia.

Mechanics of breathing

Restrictive lung disease.	Thoracic bulk and abdominal pressure on the diaphragm lead to hypoventilation. Reduction in functional residual capacity (FRC). An otherwise normal closing capacity (dictated by properties of the bronchiolar walls). FRC close to or under closing capacity leading to premature airway closure during normal tidal respiration. V/Q mismatch (shunt - perfused but not ventilated). Chronic hypoxia and hypercapnia.
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Cardiovascular

Increased absolute blood volume (relative blood volume may be lower).

Increased oxygen consumption and basal metabolic rate (greater lean body mass)

Increased cardiac output (i.e. increased cardiac work)

Associated comorbidities: diabetes mellitus, coronary artery disease, hypertension

The net effect of the respiratory and cardiovascular changes is that there is a discrepancy between total body (and particularly cardiac) oxygen supply and demand.

Hepatic and renal systems

Increased total body water. Increased blood flow to liver and kidneys. Increased pharmacokinetic clearance (metabolism and excretion). Steatohepatitis or chronic kidney disease.

Conduct of anaesthesia

- Risk assessment (based on general condition, no scoring systems, no CPET)
- Postoperative planning (e.g. HDU, monitoring, CPAP, analgesia)
- Monitoring and equipment (e.g. large size NIBP cuffs)
- Facemask ventilation (head up positioning, two-handed technique)
- Gastro-oesophageal reflux (intubation, rapid sequence induction)
- Intravenous access (ultrasound, long-length peripheral cannulas)
- Drug dosing (adjusted or ideal body weight)
- Positioning (pressure sores, nerve injuries, venous thromboembolism)