Respiratory Failure and Oxygen Therapy

Type 1 respiratory failure

• Impaired gaseous exchange-O2 to RBC
• Low pO2 with normal or low pCO2
• Ventilation perfusion mismatch- blood perfusing part of lungs is not oxygenated
• Or airflow obstruction with normal respiratory drive
• Increasing respiratory rate lowers pCO2 but cannot compensate for low pO2
• Well ventilated parts yield fully saturated Hb and cannot saturate further to compensate for area of mismatch

Causes Type 1 failure

• Asthma, Pneumonia, Pulmonary oedema, Pulmonary embolus
• Be generous with oxygen eg 35% mask
• Monitor saturations with pulse oximetry
• pO2 of 8.5 kPa equivalent to SpO2 93% - always abnormal

Type 1 to Type 2 failure

• Any cause of type 1 failure can also lead to type 2 failure if patient becomes tired or if sedative drugs are given
• Here respiratory drive is depressed
• Respiration slows down and pCO2 rises
• Low pO2 with high pCO2 (>6.5)
• Ventilatory failure or “alveolar hypoventilation”

Type 2 respiratory failure

• COPD with chronic hypercapnia (?mechanism)
• Body attenuates to high levels and no longer responds to changes in pCO2
• Change to abnormal respiratory drive- patient becomes dependent on hypoxia
• O2 therapy can “release the hypoxic respiratory drive”
• Check respiratory rate, measure gases and use 24%-28% oxygen initially

Signs of hypercapnia

• Tremor
• Warm peripheries with dilated veins
• Bounding pulse- tachycardia
• Restlessness progressing to confusion and coma
• Papilloedema

Causes type 2 failure

• Any cause of type 1 with respiratory depression
• COPD with “alveolar hypoventilation”
• Drugs causing respiratory depression
• Neuromuscular causes of ventilatory failure-myasthenia, Guillain Barre
Summary

- pO2 less than 8kPa = respiratory failure
- pCO2 <6.5kPa= type 1- v:q mismatch / normal respiratory drive
- pCO2 >6.5= type 2- ventilatory failure usually with hypoxic respiratory drive
- In type 2, danger of hypoxic cardiac arrest must be balanced against the danger of CO2 narcosis
- In type 2, aim to maintain SpO2 at around 90-92% (pO2 around 8kPa)
- This represents the start of the flat part of the O2 dissociation curve
- Check conscious level, respiratory rate and gases when giving oxygen