PULMONARY HAEMORRHAGE

Pulmonary haemorrhage can be life threatening and associated with high mortality. Inform on-call consultant at the earliest opportunity

RECOGNITION AND ASSESSMENT

Definition

- Acute onset of bleeding from trachea or ETT or from the larynx and mouth in a non-intubated baby associated with cardiorespiratory deterioration and changes on chest X-ray
- Significant pulmonary haemorrhage is most likely to represent haemorrhagic pulmonary oedema. Differentiate from minor traumatic haemorrhage following endotracheal suction

Risk factors

- Prematurity (higher risk if <32 weeks' gestation)
- Respiratory distress syndrome (RDS)
- Large patent ductus arteriosus (PDA)
- Excessive use of volume (>20 mL/kg) in first 24–48 hr in babies ≤28 weeks' gestation
- Coagulopathy
- Early onset sepsis
- IUGR
- Grade 3 hypoxic ischaemic encephalopathy (HIE)

Signs

- Apnoeas, gasping respirations, desaturations
- Tachycardia >160 bpm, bradycardia, hypotension, shock, PDA, signs of heart failure
- Widespread crepitations, reduced air entry
- Pink/red frothy expectorate, or frank blood from oropharynx or ETT if intubated

Investigations

- Blood gas (expect hypoxia and hypercapnia with mixed acidosis)
- FBC, clotting
- Chest X-ray (usually shows classic white-out with only air bronchogram visible but may be less striking and resemble RDS)

IMMEDIATE TREATMENT

- Basic resuscitation, ABC

Respiratory

- Intubate and ventilate
- if already intubated do not remove ETT unless blocked – may be very difficult to reintubate
- Sedate and give muscle relaxant
- Increase PEEP to 6–8 cm to control haemorrhage by tamponading pulmonary capillaries
- PIP and tidal volumes to be guided by chest expansion and blood gases
- Long inspiratory times (0.5 sec may be needed)
- Cautious endotracheal suction of haemorrhagic fluid (try to avoid but consider in extreme cases to reduce risk of ETT blockage)
- Ensure adequate humidification
- Chest physiotherapy contraindicated until active bleeding stopped and platelets >50 [see **Airway clearance (intubated babies)** guideline]
- Establish arterial access
- If requiring high PIP or persistent hypoxia and respiratory acidosis, consider HFOV

Fluid management

- If hypovolaemic, restore circulating volume over 30 min with 10 mL/kg sodium chloride 0.9% or Group O RhD negative packed cells if crystalloid bolus already given. Beware of overloading (added volume can be detrimental to LV failure)
- If not hypovolaemic and evidence of LV failure, give furosemide 1 mg/kg IV
- Correct acidosis (see **Neonatal Formulary**)
- If PDA present, restrict fluids to 60–80% in acute phase
- Further blood transfusion, vitamin K administration and FFP to be guided by Hb concentration, PT and APTT (see **Transfusion of red blood cells** and **Coagulopathy** guidelines). Coagulopathy is not usually seen before pulmonary haemorrhage but DIC can occur afterwards

Hypotension/cardiac dysfunction

- If still hypotensive or evidence of cardiac dysfunction after fluid resuscitation, treat hypotension with inotropes (see **Hypotension** guideline)

Infection

- Request septic screen and start antibiotics

SUBSEQUENT MANAGEMENT

Once baby stable

- Update parents
- Document event in case notes
- Consider single extra dose of surfactant in babies with severe hypoxaemia or oxygenation index (OI) >20

$$\text{OI} = \frac{\text{mean airway pressure (cm } H_2O) \times \text{\% oxygen}}{\text{postductal } PaO_2 \text{ (kPa)} \times 7.5}$$

- If PDA suspected, arrange echocardiogram (see **Patent ductus arteriosus** guideline)
- Perform cranial ultrasound scan to exclude intracranial haemorrhage as this is often associated with pulmonary haemorrhage and may influence management (see **Cranial ultrasound scans** guideline)