Recognition

Pulmonary haemorrhage (PH) is characterised by acute cardiorespiratory collapse accompanied by moderate-to-large volumes of fresh bloody secretions from the airway. Differentiate PH from small volume streaks of bloody secretions aspirated during airway suction, which may be trauma-related.

Key points in management

1. Intubate if self-ventilating. Avoid removing endotracheal tube (ETT) if ventilated. Ensure a clear airway but avoid unnecessary suction.

2. Increase mean airway pressure to provide tamponade to bleeding by increasing:
   i. PEEP ≥ 6-7 cm H$_2$O
   ii. Ti 0.4-0.5 seconds
   iii. PIP according to chest expansion, often ≥ 30 cm H$_2$O, as accumulated lung fluid decreases lung compliance

3. Obtain IV access and ensure cross-match sent. May need O negative blood if circulatory shock present.

4. If O negative blood not available and circulatory shock present give 10ml/kg normal saline bolus

5. Give a dose of vitamin K IV

6. Correct anaemia and deranged clotting with blood, FFP, platelets

7. For persistent hypotension after circulating volume restoration, consider inotropes. See ‘Management of hypotension’ guideline

8. Once stabilised, consider:
   i. Surfactant
   ii. Fluid restriction and/or diuretics
   iii. Sedation and muscle relaxation
Causes and risk factors
Pulmonary oedema is thought to arise from increased pulmonary blood flow and left heart failure.\(^2\)

PH is seen more commonly in premature babies. Risk factors include.\(^2,3\)
- Intra-uterine growth restriction
- Inadequate antenatal steroids in prematurity
- Post surfactant treatment (although surfactant may be of benefit after a pulmonary haemorrhage to correct secondary surfactant denaturation)
- Large patent ductus arteriosus (PDA) with left-to-right shunting
- Hypoxia: including meconium aspiration syndrome, HIE, sepsis
- Fluid overload
- Hydrops
- Coagulopathy

The incidence of PH varies from 1 to 12 per 1000 neonates. In preterm babies the median age of onset is between day 2-4. PH may occur sooner in term babies.\(^1,2\)

Clinical features
These may include:
1. Fresh blood from the airway typically seen after worsening clinical status.\(^3\)
2. Reduced air entry and crackles on auscultation +/- hypoxia
3. Hypotension, shock, features of a PDA and heart failure including murmur, hepatosplenomegaly and peripheral oedema.\(^1,3\)
4. Blood gases show hypercapnoea and metabolic acidosis.\(^1\)
5. Chest x-ray reveals features of pulmonary oedema with diffuse granular opacification, or may show complete white out with massive PH.\(^3\)
6. Reduced responsiveness
7. Intraventricular haemorrhages associated with PH in premature infants.\(^2\)

References