

NEONATAL MAJOR HAEMORRHAGE

Background

- Catastrophic haemorrhage is a rare but potentially fatal neonatal event leading to serious cardiovascular and neurological effects.
- Routine administration of vitamin K has reduced the incidence of haemorrhagic disease of the newborn, but abnormal bleeding can occur in babies from many other causes. Babies in NICU more commonly have abnormal bleeding or conditions that increase the risk of bleeding.
- The circulating blood volume of a neonate varies between 80 and 100 ml/kg depending on gestation, weight for gestation and cord management at birth.
- Blood loss of >40% of the total blood volume (i.e. >30ml/kg) is immediately life-threatening.

Causes

- **Transfusion**
 - Foetal to maternal
 - Twin to twin
- **Placenta**
 - Placenta praevia, abruption
 - Vasa praevia
 - Umbilical cord damage/injury
- **Baby**
 - Intracranial haemorrhage (e.g. IVH)
 - Cephalhaematoma, subgaleal haemorrhage
 - Pulmonary haemorrhage
 - Gastrointestinal bleeding

Clinical Features

- Can present as cardiovascular or respiratory instability at birth or later, with signs of hypovolaemia
- **Hypovolaemia**
 - High/increasing heart rate
 - Low/falling Hb or haematocrit (late sign)
 - Poor peripheral perfusion with slow central capillary refill (>3 sec)
 - Low or falling blood pressure
 - Presence of, or worsening, metabolic acidosis, especially rising lactate

Investigations

- Crossmatch
- FBC (Hb can be normal due to lack of dilutional effect)
- PT, APTT and INR
- Fibrinogen and D-dimers
- U&Es
- Blood gas, including iCa and lactate

Management

Key principles of management:

- Timely recognition of actual/suspected major haemorrhage
- Understand when to intervene and seek specialist assistance as appropriate
- Active resuscitation and control of bleeding
- Rapid provision of O D-negative or group-specific red cells
- Initial immediate transfusion of 20 ml/kg RBCs should be given. O negative blood can be given if clinically unable to wait for cross match. Otherwise cross matched ABO and D-specific blood should be used
- Emergency platelets are adult irradiated CMV neg– these last 30 minutes out of the fridge
- Avoid hypothermia, hypocalcaemia, acidosis and hyperkalaemia
- Anticipate and treat coagulopathy and thrombocytopenia
- Consider cryoprecipitate then fresh frozen plasma
- Fibrinogen concentrate if bleeding is uncontrollable

See flowchart below for management.

All large volume transfusions should be given via a blood warmer to avoid the development of hypothermia. Core temperature should be monitored.

Transfusions:

- Initially give 20ml/kg of packed red cells (O negative if needed immediately) over 10 – 30 minutes depending on urgency
- Give another 20ml/kg packed red cells if still bleeding
- Then give cryoprecipitate 10mls/kg over 10 mins
- Then FFP 20ml/kg over 30 minutes
- If you have given 40ml/kg PRCs and neonate is still bleeding – give 20ml/kg of platelets over 30 minutes

Maintain stability:

- Repeat blood gas (including Hb, ionised Ca, Na, K, glucose, lactate) and basic lab bloods every 30 minutes
- Important to monitor electrolytes, specifically calcium (hypocalcaemia secondary to citrate overload) and potassium
- Correct electrolyte disturbance and acidosis with bicarbonate
- Monitor HR, BP, capillary refill, saturation, temperature, urine output

Aims of treatment:

- Hb >80 – 100* - * Hb target is a range, so keep >80 and possibly up to 100. Risk of TACO (transfusion related circulatory overload) and TRALI (transfusion related lung injury) with large volumes of blood products. We are not aiming for normal values in the immediate situation.
- Thresholds in major haemorrhage differ from the usual transfusion thresholds on NICU
 - Platelets >75 x 10⁹/L
 - Fibrinogen >2 g/L
 - PT/APTT ratio <1.5 (1.8 pre-term)

- Ionised Ca²⁺ >1.0 mmol/L
- Normokalaemia
- Normothermia
- pH >7.35 (on ABG)
- Mean blood pressure ≥gestational age

Tranexamic acid

- Consider if bleeding continues after emergency blood products have been given
- Tranexamic acid is an antifibrinolytic agent and is used in a number of indications including reducing blood loss during surgery, to treat bleeding episodes in patients with congenital and acquired bleeding disorders.
- Tranexamic acid is of proven benefit in adults and may be of benefit in children.
- Tranexamic acid is contraindicated if:
 - renal tract bleeding (risk of obstruction from clots)
 - intravascular thrombosis in DIC.
- Intravenous tranexamic acid can be given by continuous infusion or by bolus doses.
- Bolus dosing is 10-15 mg/kg, 8 hourly.
- Oral tranexamic acid doses are 15-20mg/kg 8 hourly.
- For continuous infusion give 15mg/kg tranexamic acid loading dose (max 1g) over 10 minutes followed by 2mg/kg per hour infusion for 8 hours or until bleeding stops.

Fibrinogen Concentrate

- If there is on-going bleeding despite the above measures, fibrinogen concentrate can be used.
- If fibrinogen level is <2g/L, then give a bolus dose of 50 – 70 mg/kg.
- This can be repeated 2 hourly if required to increase the level further.
- Fibrinogen is the final protein in the common coagulation cascade.
- Fibrinogen concentrate administration may increase plasma fibrinogen levels more easily than FFP and may produce a greater increase in fibrinogen levels more rapidly than both FFP and cryoprecipitate.

Recombinant activated factor seven (rFVIIa) is NOT recommended due to the lack of evidence in the literature of its efficacy in this situation. There is also a FDA black box warning for its association with thrombosis.

**Actual/suspicion of blood loss with haemodynamic instability:
Call 2222 and state NEONATAL MAJOR HAEMORRHAGE and your location**

(automatically fast bleeps haematology tech 8286/porter/ NICU sister/ NICU Reg and LW SHO– haem will automatically release O neg blood and the porter will bring this to your location)

Initiate Resuscitation

- ABC, apply oxygen
- Identify source of bleeding and stop with manual pressure if able
- Continuous monitoring – invasive BP if available

Assessment

- Secure IV/UVC/IO access
- **Give 20 mls/kg O negative PRC (if unable to wait for crossmatch)**
- Urgent bloods – cross-match, FBC, INR, APTT, fibrinogen, U&E, blood gas – iCa, lactate
- Request blood products (bleep 8286)- CRYO /FFP/Platelets/Fibrinogen concentrate (NB platelets come from London & can take 2 hours to arrive)

Reassess

- Reassess, if still bleeding give another 20ml/kg of PRC

Ongoing bleeding

- Give **cryoprecipitate 10ml/kg** (before FFP as more effective)
- **FFP 20ml/kg**
- If received 40ml/kg PRC, give **platelets 20ml/kg**
- **Tranexamic acid** (contraindicated in renal bleeding)– 15mg/kg over 10 mins loading dose, if ongoing bleeding – infusion of 2mg/kg/hr over 8 hrs or until bleeding stops

Monitor

- Constantly assess extent of bleeding and response to treatment
- Repeat baseline bloods every 30 mins if on-going bleeding
- Correct electrolytes
- Correct acidosis with bicarbonate

Bleeding controlled?

YES

NO

Maintain stability
Ongoing NICU care
Return unused blood products

Fibrinogen concentrate

- if fibrinogen <2, give bolus dose 50-70mg/kg, can be repeated 2 hourly if required to increase the level further (the use of novo 7 is not recommended)

Aims

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