Polycythaemia

Polycythaemia, defined as venous haematocrit ≥ 65%, is a relatively common finding in the neonatal period but only a small proportion of babies develop clinical signs attributable to hyperviscosity.

At risk infants

- Intrauterine growth retardation
- Infant of diabetic mother
- Infants with congenital syndromes (e.g. Trisomy 21, 13, and 18)
- Twin-twin transfusion
- Delayed cord clamping (relative)

Signs of polycythaemia

These will often evolve over the first 24 hours as the haematocrit rises with the physiological decrease in plasma volume.

Possible features include:

- Plethora
- May become cyanosed, particularly when active
- Lethargy
- Poor suck
- Vomiting
- Irritability
- Tachypnoea
- Tachycardia
- Jaundice
- Hypoglycaemia

Blood viscosity increases exponentially with haematocrit above 65%.

Hyperviscosity can result in sludging and microthrombi formation in small vessels, leading to:

- Cerebral vascular occlusion: convulsions, permanent neurological sequelae
- Renal vein thrombosis: haematuria, oliguria
- Intestinal vascular occlusion: NEC
- Platelet consumption: Thrombocytopenia

Investigation

- Check a FBC on infants who have risk factors ***and*** felt on clinical grounds to be polycythaemic. Infants with Trisomy 21 and twin-to-twin transfusion syndrome should have a FBC checked routinely. Other infants without risk factors should have a FBC checked if there is plethora and other clinical signs of polycythaemia (see above).
- Use free flowing blood from venous stab or from indwelling catheter.
- If capillary haematocrit >65%, confirm with a repeat sample before acting on it.
- Consider also checking U&E, SBR, and blood Glucose.

Treatment

Treatment depends on haematocrit:

- **Haematocrit ≥ 75% -** perform a partial exchange transfusion with around 20ml/kg of 0.9% saline. This will usually reduce the haematocrit to below 60%, **see exchange formula below**.
- **Haematocrit 70-74%** - optimise fluids and repeat free-flowing sample in 6 hours if asymptomatic.
- **Haematocrit 65-69%** - do not treat unless symptomatic. Ensure adequate fluid intake (e.g. give total fluid a day ahead of daily volume) and repeat haematocrit after 24 hours to make sure there is no significant rise.
- **Haematocrit < 65%** - no need to repeat FBC if baby remains clinically well.

- Treatment of polycythaemia with PET remains controversial. While it may improve symptoms, there is no evidence that it improves long-term outcome in either asymptomatic or symptomatic polycythaemic infants.

Formula for volume of blood to exchange:

$$\frac{[\text{Observed Hct} - \text{desired Hct (0.55)}] \times 85}{[\text{Observed Hct}]} = \text{Volume to be exchanged in ml/kg}$$

Ideally the exchange should be done through peripheral lines (an artery and a vein) but if this is not possible there may be an indication to use the umbilical vessels (UVC) - ask for senior advice.

References

1. Partial exchange transfusion to prevent neurodevelopmental disability in infants with Polycythaemia (Review), Özek E, Soll R, Schimmel MS. Cochrane database of systematic review 2010
2. Polycythaemia audit; RIE 2010
3. Neonatology: Management, procedures e.t.c, 6th edition by Tricia Gomella et al.
4. Polycythaemia in neonates | Safer Care Victoria