Neonatal Cardiovascular Care
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Cardiovascular system (CVS) assessment

- Colour
- Heart rate
- Capillary refill
- Skin perfusion
- Blood pressure
- Urine output
The Neonatal CVS

- Heart rate increases in response to compromise (as for respiratory rate), pain, stress, temperature.
- In the preterm neonate, bradycardia can be related to brainstem immaturity (<32-34 weeks) as well as apnoea (apnoea / bradycardia of prematurity)
- *Mean* blood pressure is observed.
- Neonates have a low absolute circulating blood volume which is easily depleted with blood sampling
- Hypotension is treated initially with volume (normal saline) with caution followed by consideration of inotropic support

(Dasgupta and Gill (2003); Dempsey and Barrington (2007); Dempsey and Barrington (2006), Fanaroff and Fanaroff (2006); Gupta (2012); Johnstone and Smith (2008); Kent AL et al. (2009); Knight (2012)}
The haematological system

- This system is closely related to the cardiovascular system

- Features of the neonatal blood; some examples –
  - High haemoglobin (Hb) & packed cell volume (PCV) in first days of life. Fetal Hb is broken down over next 4-6 months of life when adult Hb is formed
  - Hb can be lowered by regular blood sampling – sick neonates may need ‘top-up’ blood transfusions
  - Clotting factors can be low initially due to liver immaturity, esp. in the preterm neonate – Vitamin K is given at birth.
Cardiac defects

- Congenital cardiac defects in the neonate can be diagnosed antenatally (anomaly scan) or post-natally when clinical signs indicate compromise (e.g. breathlessness on feeding, cyanosis)
- Such defects can lead to cardiac failure

- Leach, 2012; Tidy, 2012
CAUSES of HEART FAILURE

- Structural heart defects – e.g. Patent Ductus Arteriosus, Hypoplastic left heart, coarctation of the aorta, Atrial septal defect (ASD)/ventricular septal defect (VSD), aortic stenosis (Leach, 2012)

- Non-structural – myocardial ischaemia, myocarditis, polycythaemia, Hydrops, fluid overload, hypertrophic stenosis of the heart (diabetic mother), hypoglycaemia
Atrial Septal Defect (ASD)

RA. Right Atrium
RV. Right Ventricle
LA. Left Atrium
LV. Left Ventricle
SVC. Superior Vena Cava
IC. Inferior Vena Cava
MPA. Main Pulmonary Artery
Ao. Aorta
MV. Mitral Valve
TV. Tricuspid Valve
Patent Ductus Arteriosus (PDA)

- Can be seen in the preterm neonate
- A persistence of fetal vascular channel between the left pulmonary artery and the aorta. Normally, there is spontaneous closure by day 4 of life
- The left to right shunt causes an increase of blood flow to the lungs
- Between 30-40% of ventilated infants less than 1.5kg develop a persisting patency of the ductus, significant enough to interfere with respiratory management
Signs

- Tachycardia
- Bounding pulses
- Heart murmur or gallop
- Low diastolic BP
- Wide pulse pressure
- Enlarged heart
- Increased oedema
- Left ventricular hypertrophy
- Decreased cardiac output and pulmonary venous congestion
Management

- Diagnosis by listening, echocardiogram, clinical signs
- Fluid restriction
- Diuretics
- Ibuprofen or Indomethacin – beware side effects
- Surgical ligation if medical intervention is not effective
Heart Failure

- A clinical syndrome characterised by the inability of the heart to pump blood to meet the metabolic requirements of the tissues
- Results in inadequate perfusion of vital organs resulting in cardiovascular collapse or shock
- Causes – Structural OR non-structural (see previously)
Clinical Features

- Feeding & / or respiratory difficulties
- Excessive sweating
- Failure to thrive
- Tachypnoea, recession
- Enlarged liver
- Cardiomegaly
- Tachycardia, gallop rhythm / murmours
- Oedema
- Cyanosis
Treatment – Heart Failure

- Diuretics
- Oxygen therapy
- Avoid stress
- Fluid restriction
- Calories
- CHRONIC verses ACUTE
- ACUTE – stabilisation, ventilate, correct acidosis, volume replacement, inotropes, refer to specialist centre
SHOCK

- A MEDICAL EMERGENCY WHERE PROMT ACTION IS VITAL
- A generalised inadequacy of blood flow and tissue perfusion resulting in tissue damage
- Compensation followed by decompensation
- CAUSE – Septic, hypovolaemic, cardiogenic, anaphylactic and neurogenic
- However, features are similar for all types
Clinical features

- Pallor
- Cold peripheries
- Poor capillary refill
- Weak or absent pulses
- Tachycardia and hypotension
- Mottled & cyanosis
- Tachypnoea / laboured
- Acidosis
- CNS depression
Management

- Improve oxygen delivery to tissues
- Improve cardiac performance
- Determine & treat the likely cause – infection, cardiac, pulmonary
Further Reading