

Perioperative Stabilisation

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Introduction

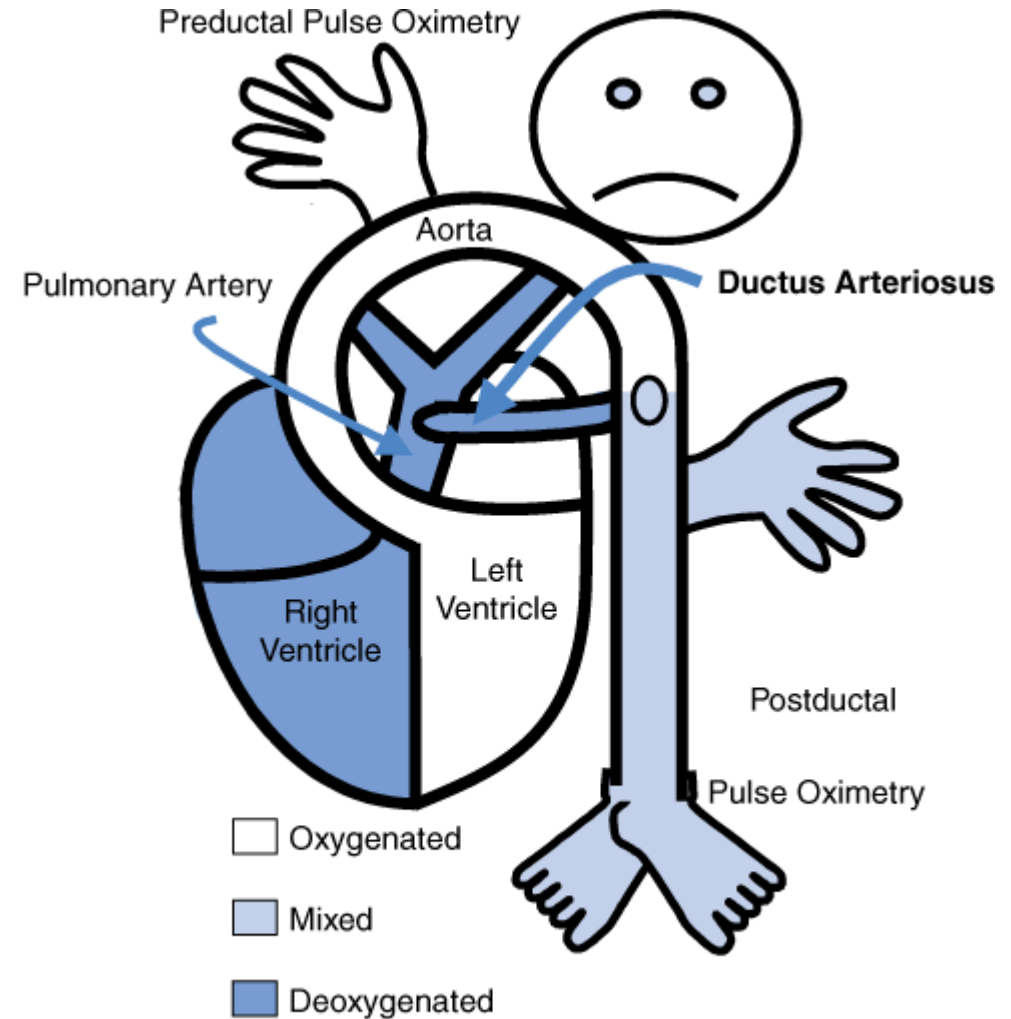
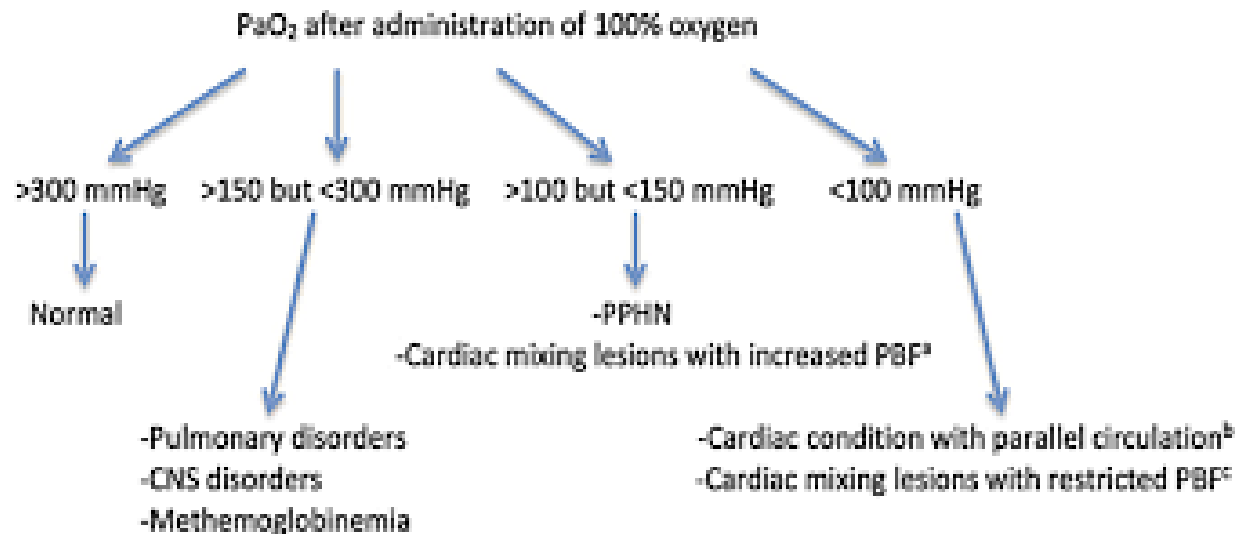
- 8-10/1000 live births → CHD
- About 1/3 – 1/5 may require some form of surgical or intervention within the 1st year of life
- Stable patient prior to surgery ensures best outcome for the patient
- Stabilisation will depend on type of lesion and type of surgery

Neonatal Presentation

- Heart murmur
- Central Cyanosis
- Poor pulses → Sudden collapse
- Respiratory distress → Heart failure
- Arrhythmia

Diagnostic measures

- SPO2 – preductal/postductal
- 4 limb BP/pulse
- ABG → Hyperoxic test
- Echocardiography



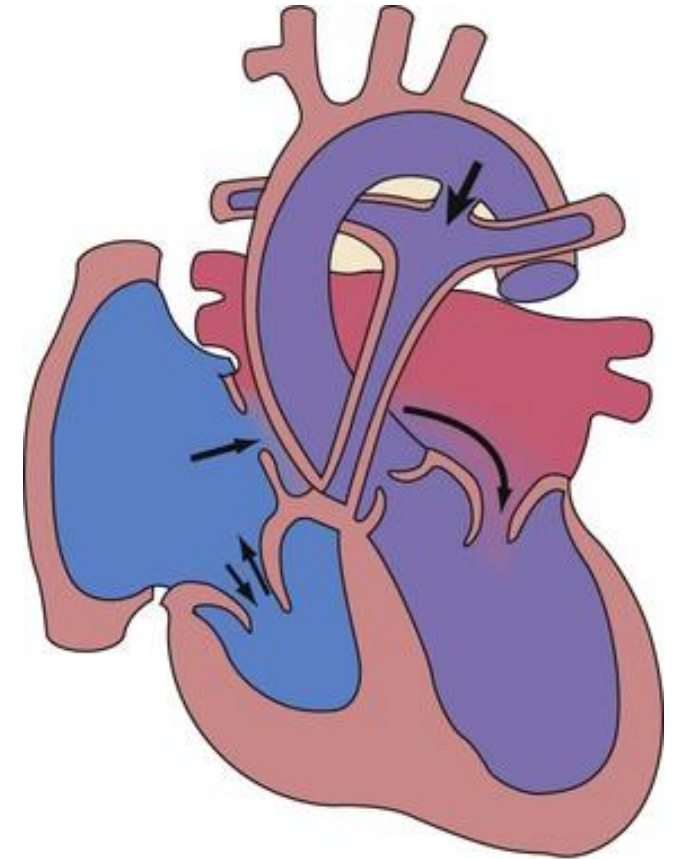
Source: Lowry AW, Bhakta KY, Nag PK: *Texas Children's Hospital Handbook of Pediatrics and Neonatology*: www.accesspediatrics.com
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Haemodynamic groups

- Cardiac defect with ductal-dependent pulmonary circulation (right heart obstructions)
 - Critical PS, PAIVS, PAVSD, TOF, severe Ebstein's anomaly, TA with PA/PS
- Cardiac defects with ductal-dependent systemic circulation (left heart obstructions)
 - Critical AS, HLHS, IAA, critical CoA
- Cardiac defects with parallel circulation
 - Simple TGA
- Cardiac defects with complete intracardiac mixing of blood
 - TAPVD, single ventricle hearts
- Cardiac defects with a large left-to-right shunt
 - Large VSD, complete AVSD, large PDA, AP window, Truncus arteriosus, Single ventricular hearts with unobstructed PBF

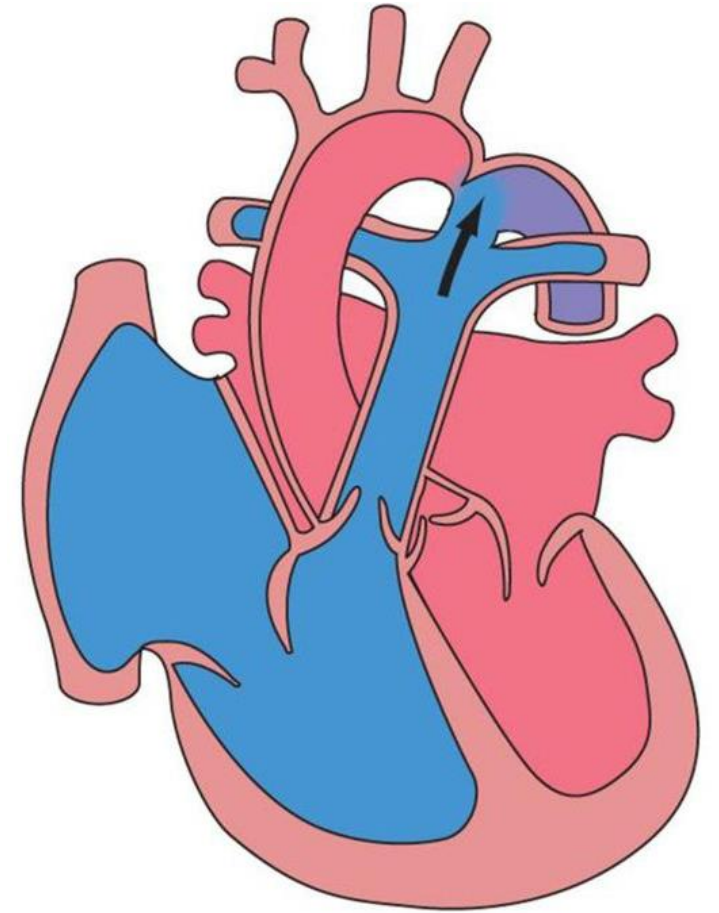
Cardiac defect with ductal-dependent pulmonary circulation (right heart obstructions)

- Start Prostaglandin (Initial dose 20-50 ng/kg/min, may increase to 100 ng/kg/min briefly to open PDA)
- Lower PVR
 - Aim for mild metabolic alkalosis (pH 7.45-7.5)
 - Allow mild hyperventilation (pCO₂ = 30-40 mmHg)
 - Increase FiO₂
- Increase SVR → Increase BP
 - Use volume more generously
 - May start Noradrenaline, Adrenaline
 - Avoid Dobutamine/Milrinone



Cardiac defects with ductal-dependent systemic circulation (left heart obstructions)

- Start Prostaglandin (Initial dose 20-50 ng/kg/min)
- Increase PVR → Increase PAP
 - Avoid intubation, extubate early
 - Avoid O₂ (SPO₂ 75-85% lower limb)
 - Allow mild metabolic acidosis (pH 7.3-7.35)
 - Aim for hypoventilation (pCO₂ = 50-60 mmHg)
- Lower SVR
 - Dobutamine/Milrinone, avoid Noradrenaline
- In case of pulmonary overflow
 - IV Diuretics (Frusemide)
 - Provide PEEP (ventilate if necessary)
 - Lower Prostaglandin (but don't off it)



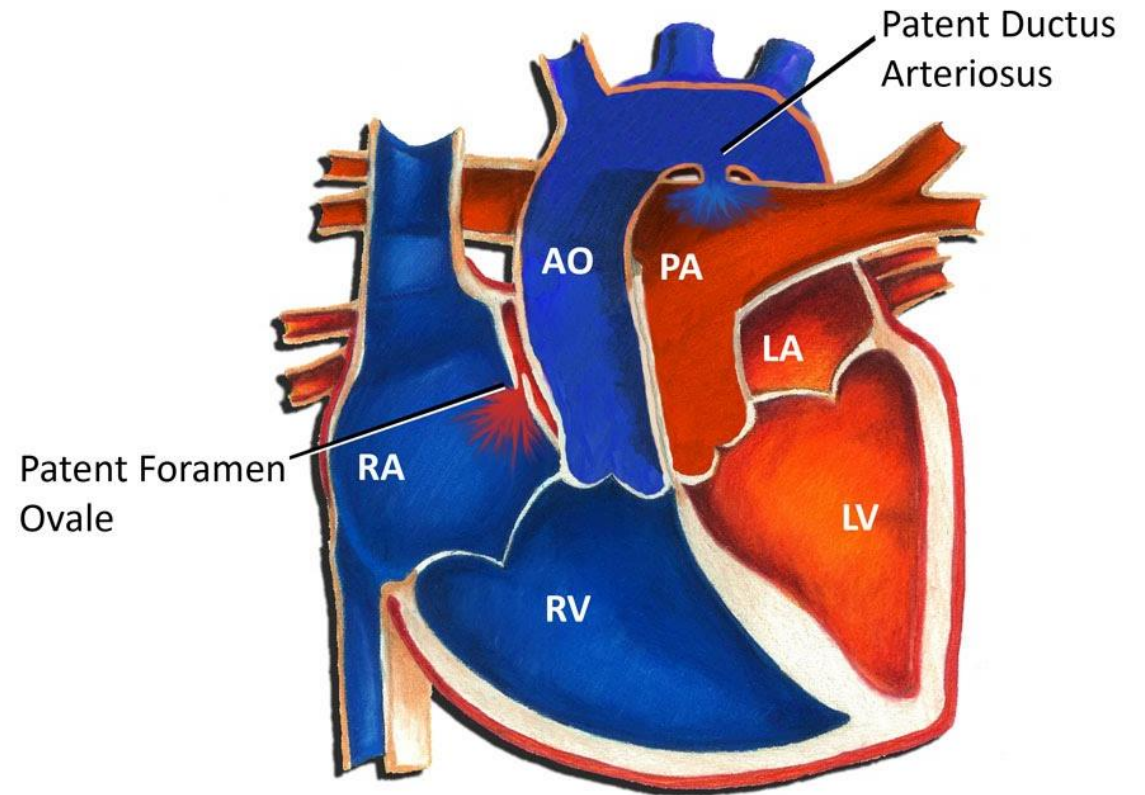
Prostaglandin

- Who should it be given to?
 - Unwell + (Cyanosis + murmur) or (Acyanotic + abnormal pulse)
- Contraindication?
 - TAPVD
- Ideal dose?
 - Just enough to keep PDA open (5-10 ng/kg/min)
- Common side effects?
 - Apnoea, bradycardia, vasodilatation → hypotension, fever, oedema, cortical hyperostosis (prolonged usage)
- Try to run it on a single line

Cardiac defects with parallel circulation

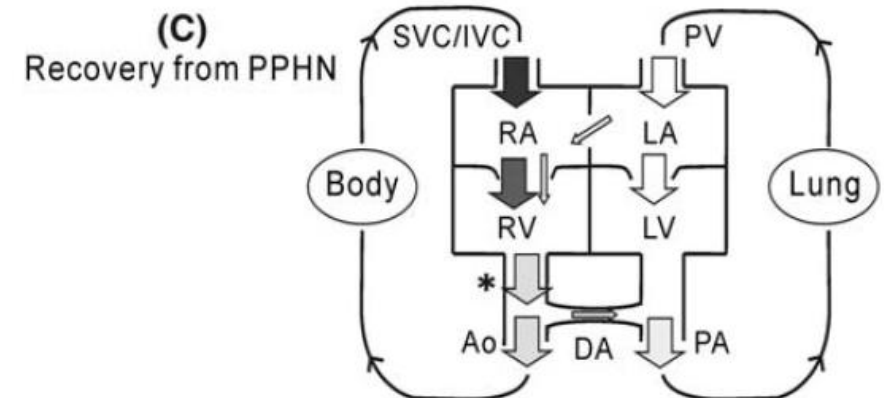
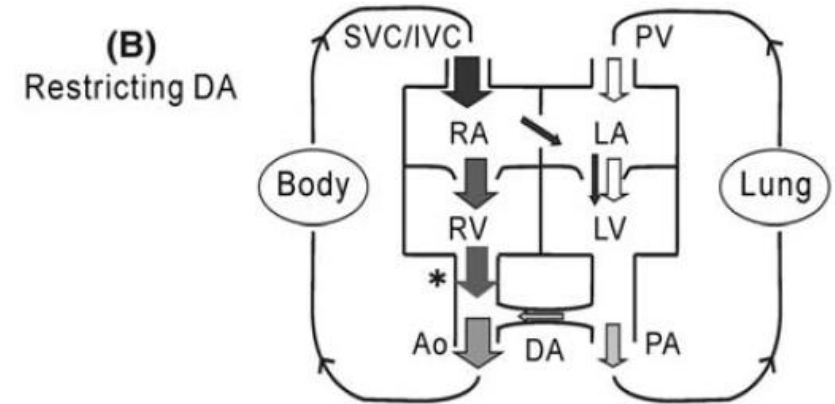
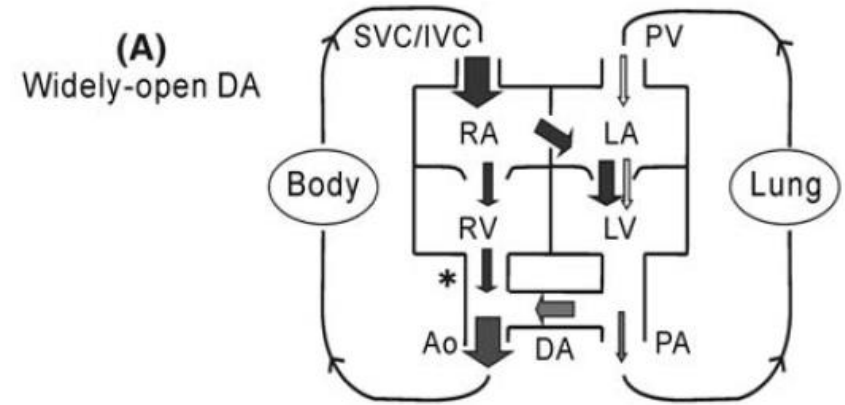
- Assess PFO, if inadequate → BAS
- Start Prostaglandin if cyanosed
- Rule out pulmonary hypertension of newborn
- Generous volume therapy
- Aim for mild metabolic alkalosis (pH 7.45-7.5)
- Oxygen therapy (avoid ventilation if possible)
- Treat anaemia
- If required, consider Dobutamine/Milrinone

Transposition of the Great Arteries



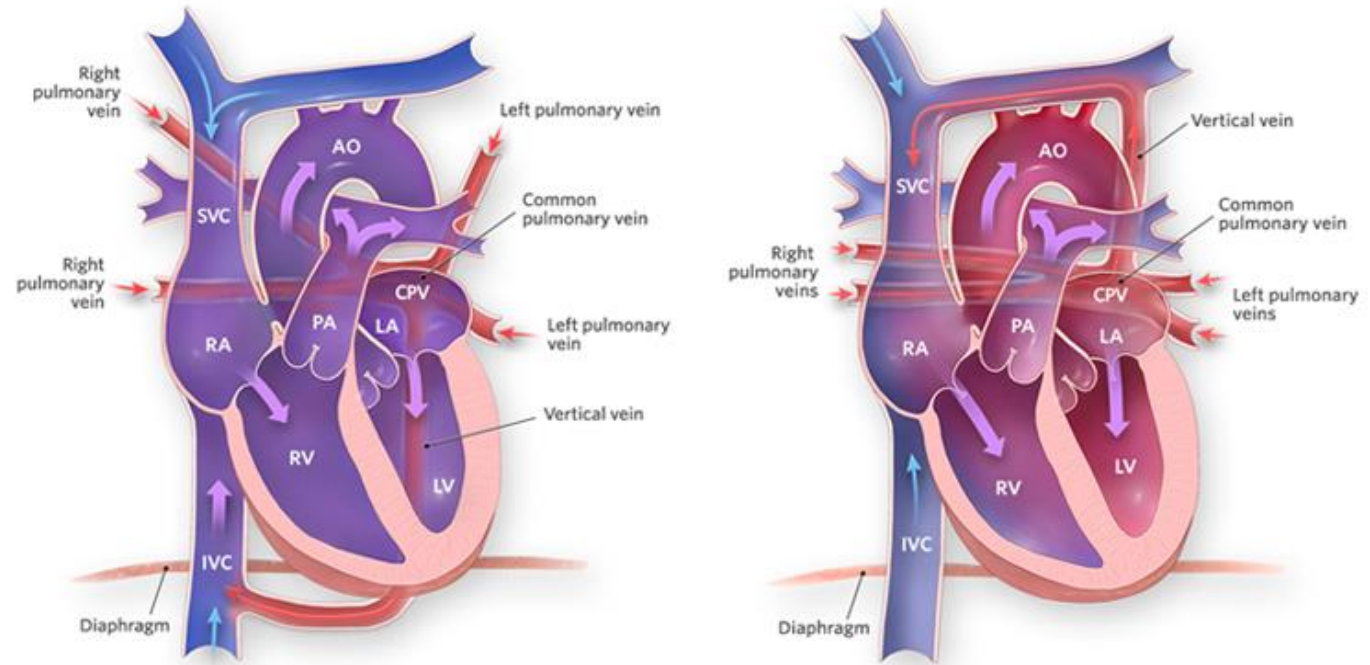
TGA with PPHN

- High mortality
- Look out for risk factors
- Treat hypoxia early and aggressively
- Intubate and ventilated with high FiO_2 , low pressures, tidal volume \rightarrow iNO
- Sedate and paralyse
- Start Prostaglandin
- Ensure good PFO \rightarrow BAS
- Correct metabolic acidosis
- Correct anaemia



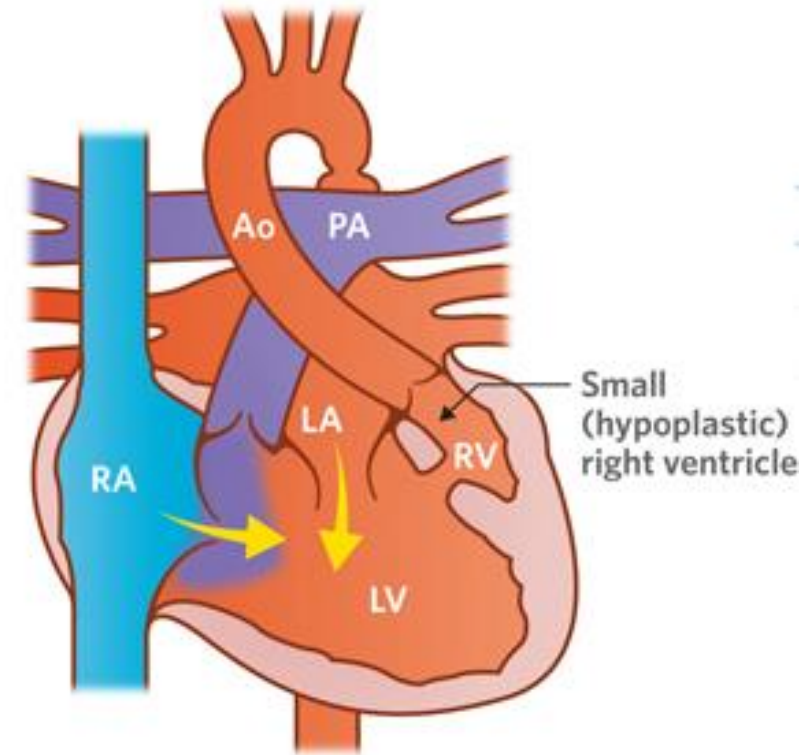
Cardiac defects with complete intracardiac mixing of blood (TAPVD)

- May be difficult to differentiate from severe RDS with PPHN if obstructed
- Unremarkable cardiac examination
- Echocardiography
- Positive pressure ventilation, inotropes, diuretics
- Correct metabolic acidosis
- BAS, Stenting of obstructed veins
- Surgical repair → TAPVD repair



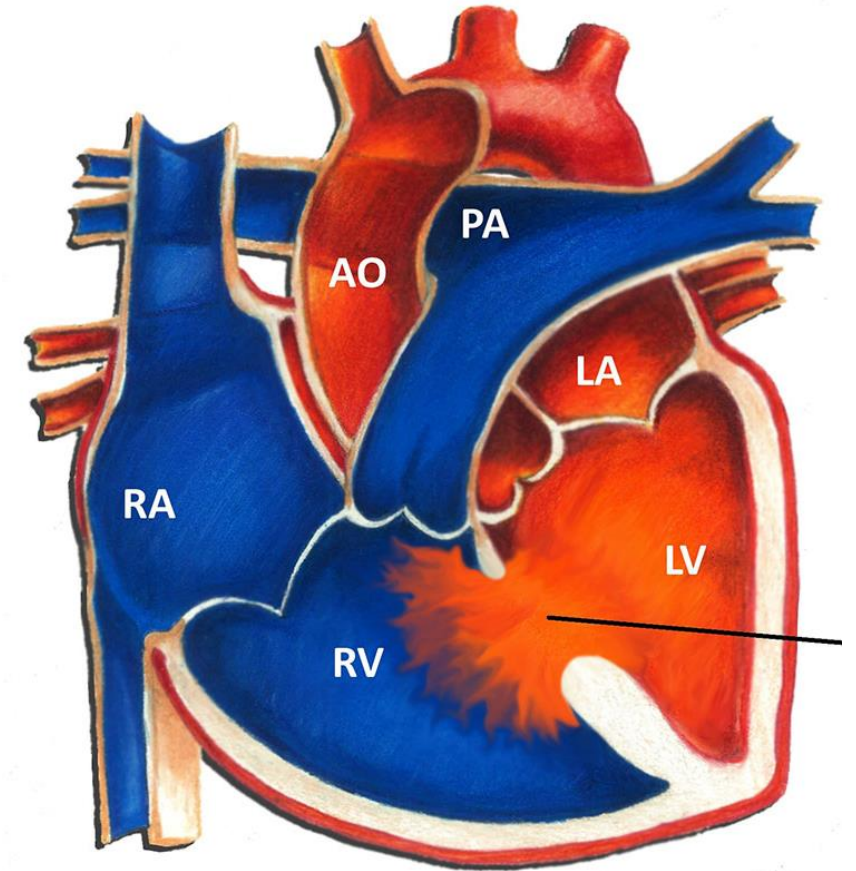
Cardiac defects with complete intracardiac mixing of blood (Single ventricle heart)

- May require Prostaglandin
- Assess PFO
 - BAS
- Assess RVOT
 - Obstructed → PDA stenting or BT shunt
 - Overflow → PA banding
- Assess LVOT
 - Obstructed → Damus Kaye Stansel surgery/arch repair
- SPO2 75-85%



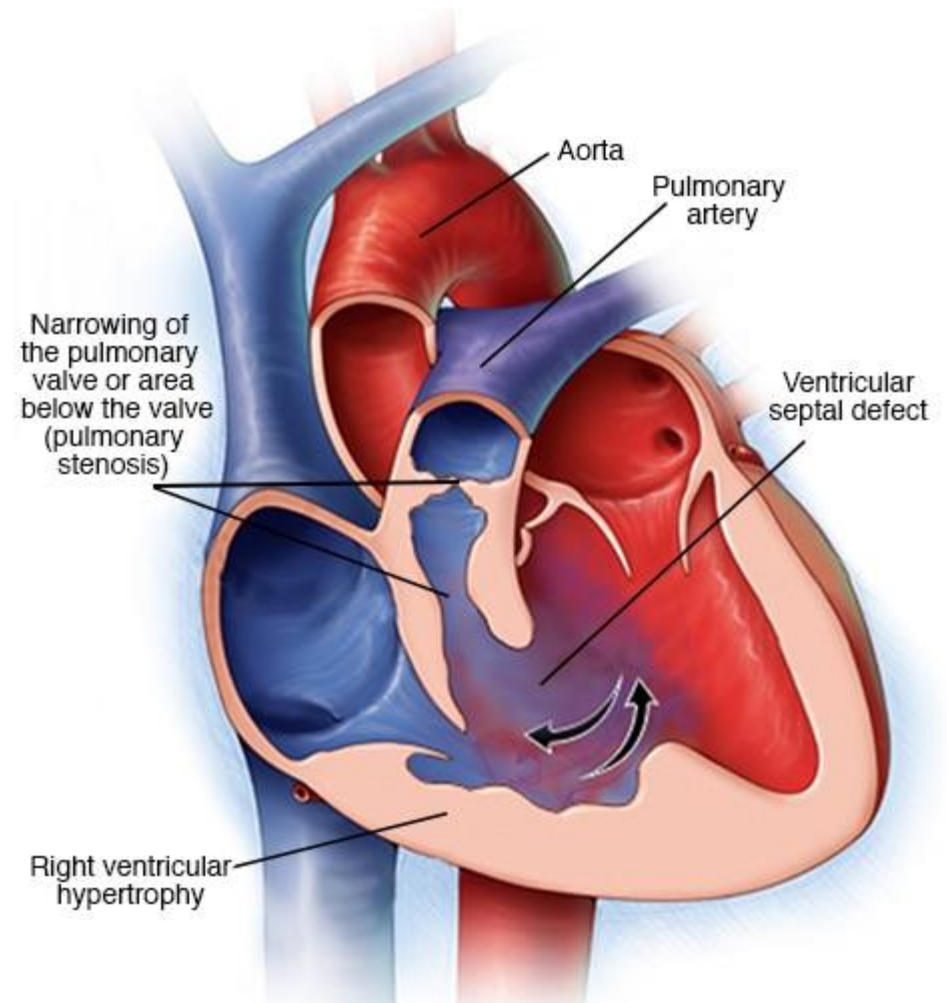
Cardiac defects with a large left-to-right shunt

- Frequently presents with respiratory distress → heart failure > 4-6 weeks
- Treat with Diuretics (Frusemide, Spironolactone, Captopril, Digoxin) + inotropes (Dobutamine/Milrinone)
- Positive pressure ventilation (BIPAP/CPAP on room air)
- Avoid oxygen if possible
- Aim SPO 90-95%
- Optimise nutrition (Ryle's tube feeding)



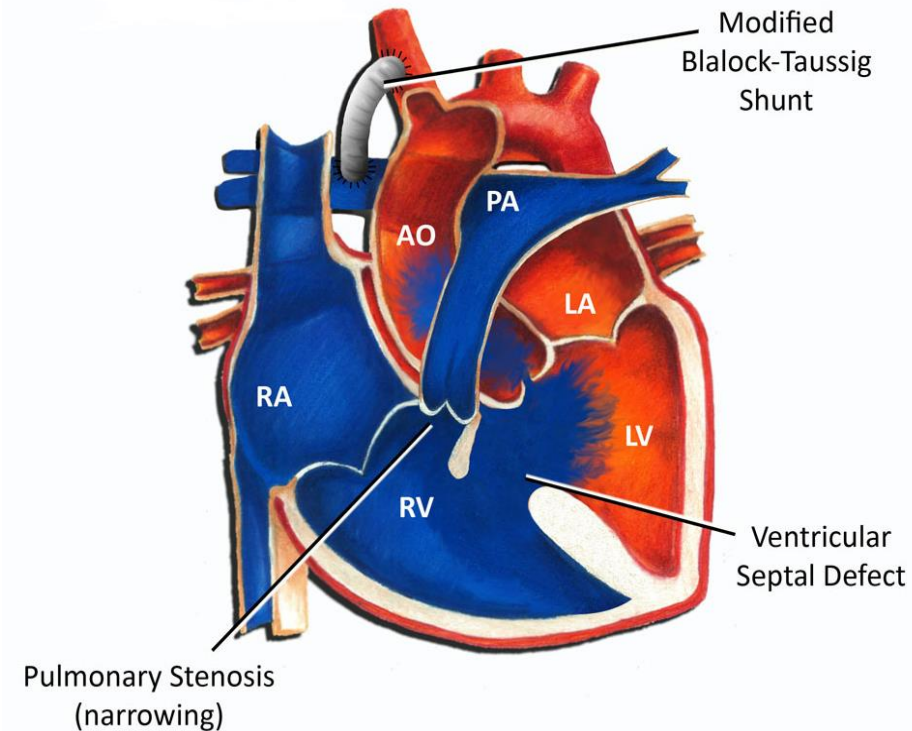
Tetralogy of Fallot

- Sudden increase in cyanosis 2' reduction in pulmonary blood flow due to infundibular spasm/reduction in systemic vascular resistance → more right to left shunt
- Medical emergency
 - Knee-chest/squatting position (increases SVR)
 - Administer 100% oxygen
 - Rapid Volume expander (20-50 ml/kg)
 - Give IV/IM/SC morphine 0.1 – 0.2 mg/kg to reduce distress and hyperpnoea
 - Propranolol/Esmolol
 - Correct metabolic acidosis (NaHCO₃)
 - Sedation/Analgesia/Muscle relaxation/mechanical ventilation
 - Noradrenaline
 - BT Shunt/RVOT stenting/PDA stenting



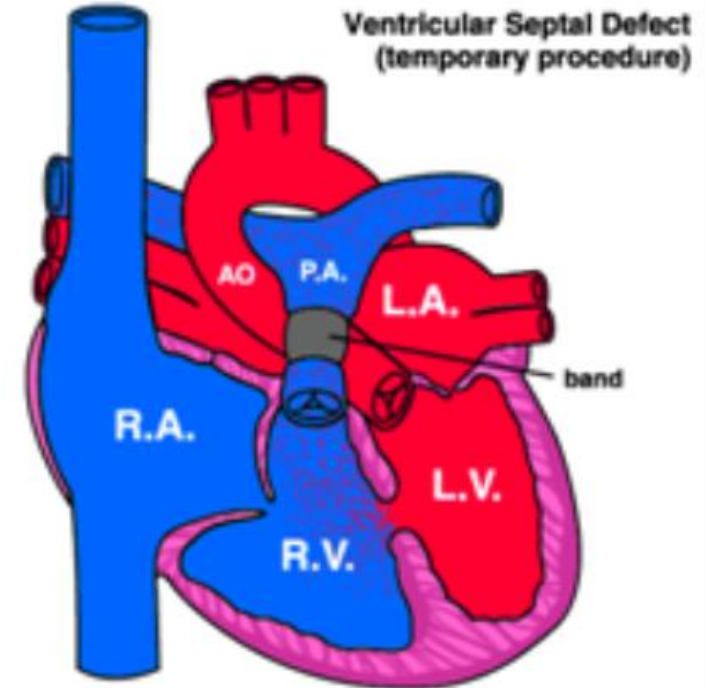
BT shunt

- To provide adequate pulmonary blood flow – single ventricle or biventricle, to augment pulmonary artery growth
- Flow depends on multiple factors: size of shunt, size of proximal vessel, size of PA, location of insertion, PA stenosis, PVR, SVR, lung expansion, blood viscosity, Heparin/Aspirin etc
- Targets : SPO₂ 75-85%, paO₂ 40-50 mmHg, pCO₂ 35-45 mmHg
- Overflow situation:
 - Increase PVR (Higher PEEP, low FIO, hypoventilation), lower SVR (Milrinone), increase antifailures
- Blocked shunt:
 - Reduce PVR (Lower PEEP, high FIO, hyperventilation), increase SVR (Noradrenaline), start Heparin, transfuse blood
- When child is unwell, ensure good hydration and compliance to Aspirin



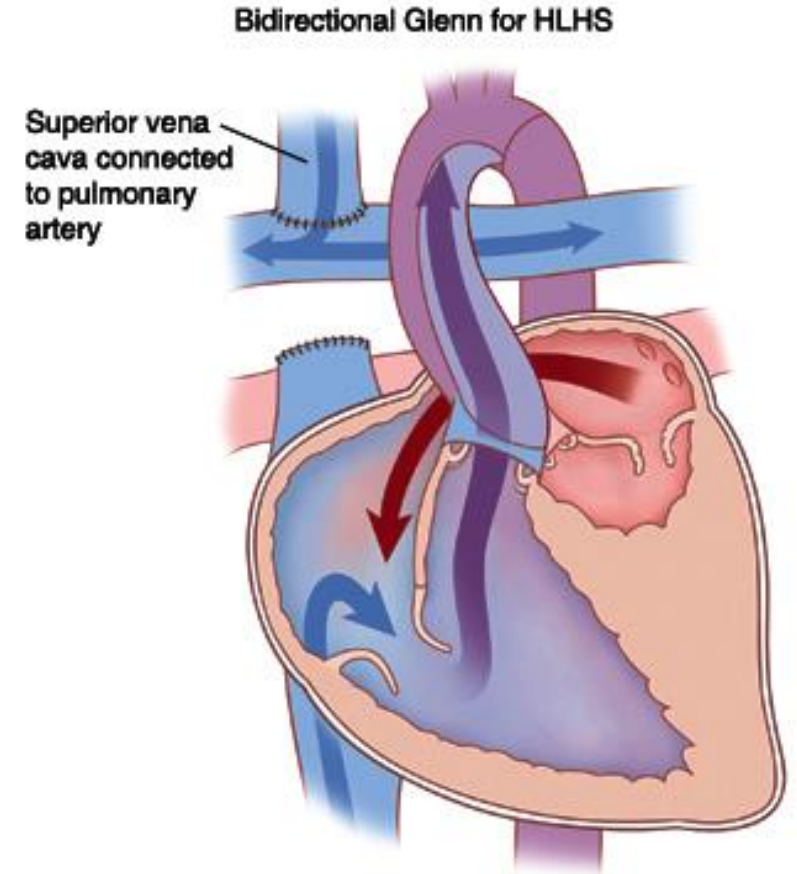
PA Banding

- Uses : to control heart failure (both single ventricle and biventricle)
- SPO₂ 75-85% (paO₂ 40-50 mmHg) in single ventricle, SPO₂ 90-95% (paO₂ 60-70 mmHg) in biventricle
- If not tight enough → control heart failure with PPV, antifailures, inotropes
- Band will get tighter as child grows
- If too tight → will need to request for early surgical correction



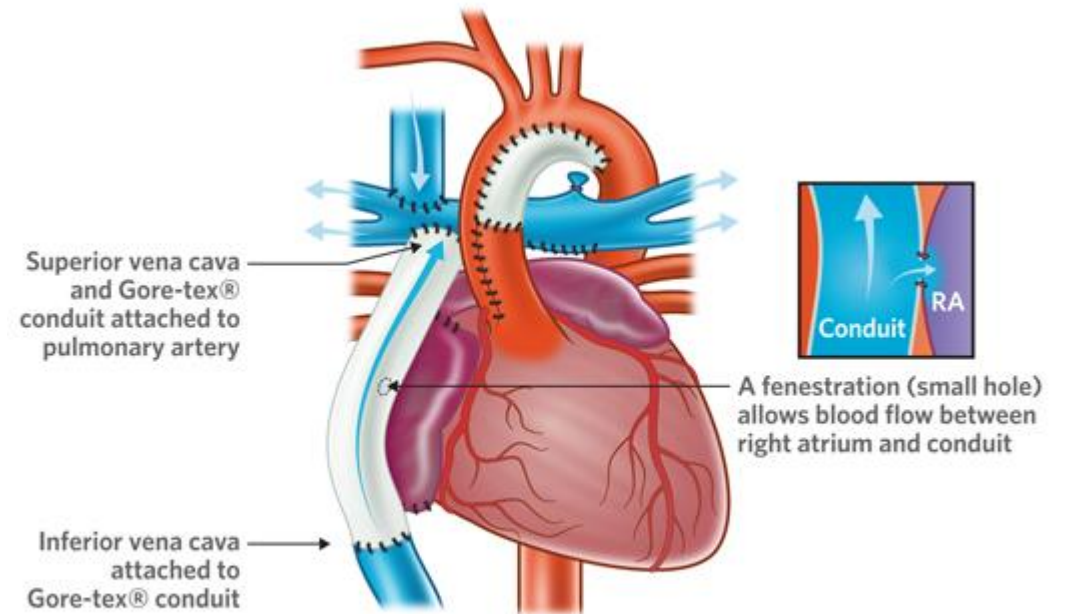
Glenn shunt

- 2nd stage in single ventricle palliation
- Tips for management:
 - Target : SPO₂ 80-90%, paO₂ 50-60 mmHg
 - Ensure adequate hydration
 - Keep head elevation 30-45'
 - Avoid ventilation if possible
 - If ventilated : Keep low PEEP 3-5 mmHg, hypoventilation, pCO₂ 45-50 mmHg
- If patient is hypertensive, and show signs of upper body oedema → review for Glenn obstruction



Fontan operation

- 3rd stage in single ventricle palliation
- Long term complications
 - Protein losing enteropathy
 - Atrial/ventricular arrhythmias
- Tip for management:
 - Target : SPO₂ 85-95%, paO₂ > 60 mmHg
 - Ensure adequate hydration
 - Allow spontaneous breathing if possible
 - Avoid muscle relaxant
 - If ventilated : Keep low PEEP 3-5 mmHg, hypoventilation, pCO₂ 45-50 mmHg
 - Anticoagulation - Heparin



Common post operative complications

- Chylothorax
 - Maintenance of low fat milk for 4-6 weeks
- Chronic lung disease
 - May require slow weaning from PPV and steroids
- Vocal cord palsy
 - Ryle's tube feeding + antireflux, gradual reestablishment of oral feeding based on serial assessment of vocal cord function
- Diaphragmatic paralysis
 - Even though it may be plicated, patient's breathing pattern will not be normal
- Neurological deficit
 - Rehabilitation + developmental follow-up

General measures

- Nutrition → Growth and Development
- Treating infection (Cyanotic patients)
- Medication compliance (Aspirin, Penicillin etc)
- Psychosocial support
- Education on lesion
- SBE prophylaxis
- Dental Hygiene
- Vaccination

Thank you 😊