

Children with heart disease for non cardiac surgery

Carl Groves

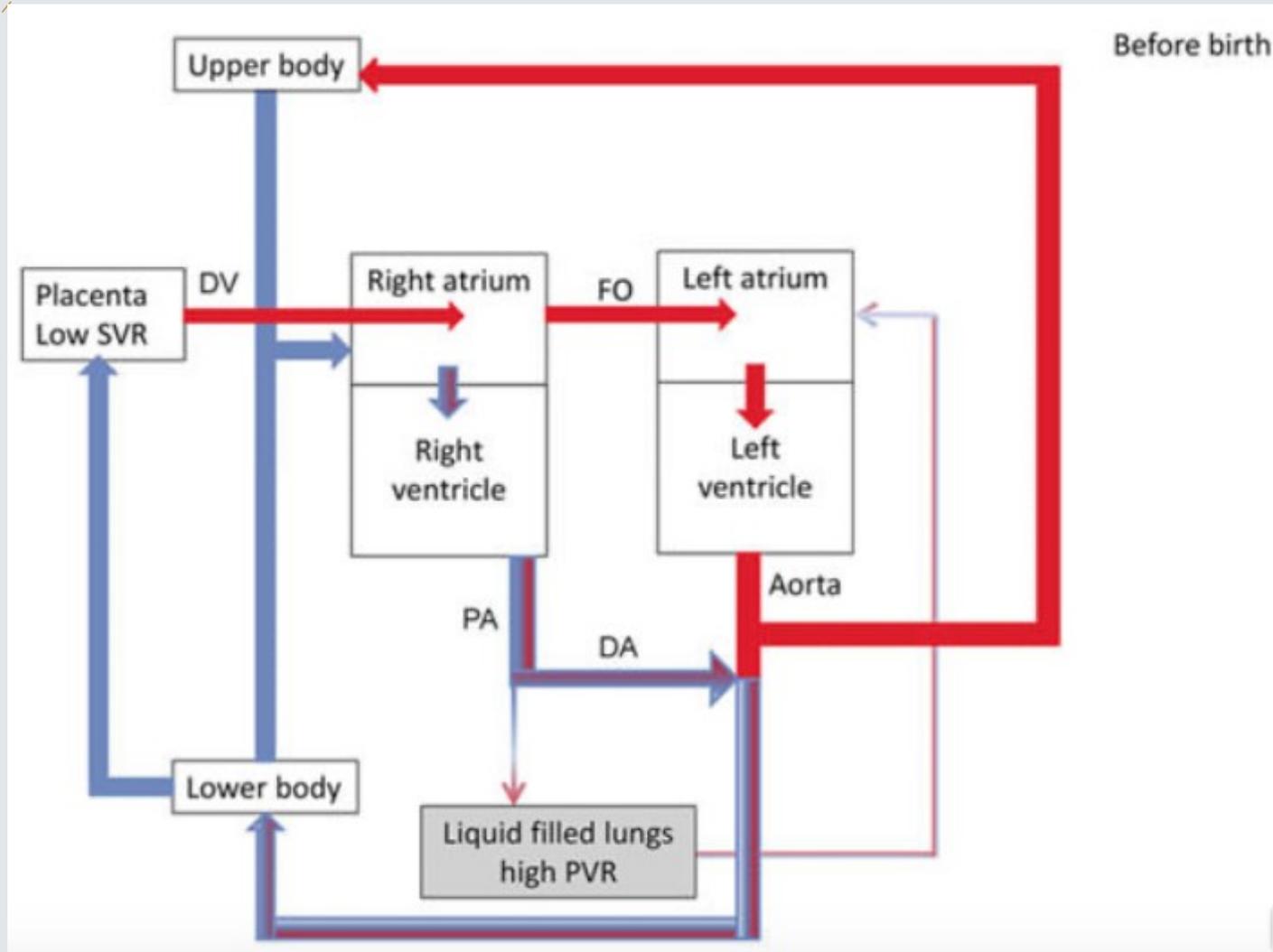
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Outcomes

- + Classify congenital heart disease
- + Review and understand anaesthetic implications
- + Discussion of clinical cases
- + Touch on grown up (adult) congenital heart disease

Transitional circulation



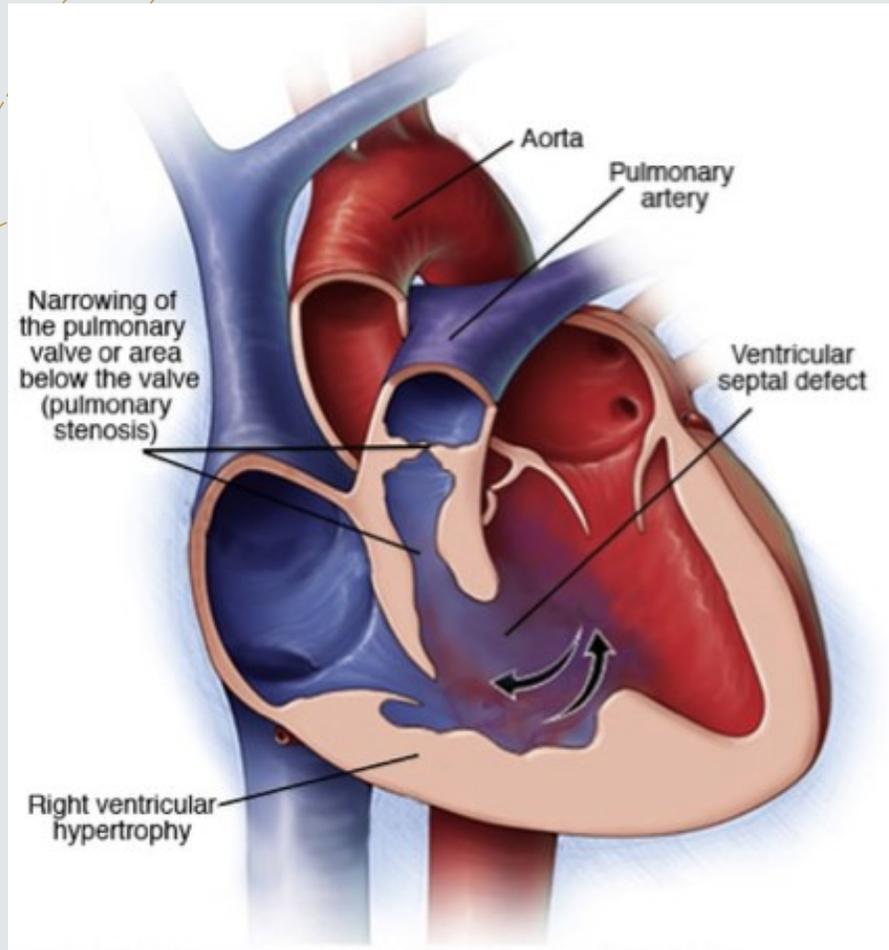
Classifications

1. Left to right shunts
 - Atrial level: ASD, TAPVC
 - Ventricular level: VSD
 - Great artery level: PDA, AP window, Truncus arteriosus
 - Coronary level: ALCAPA, coronary fistula
2. Right to left shunts
 - TOF physiology
 - TGA physiology
3. Left heart obstructive lesions
 - Obstructed veins
 - Mitral stenosis
 - Aortic stenosis
 - Coarctation
 - Interrupted aortic arch
 - Hypoplastic left heart syndrome
4. Right heart obstructive lesion
 - Pulmonary stenosis / atresia
 - Tricuspid stenosis
 - Hypoplastic right heart
5. Single ventricle
6. Others
 - Vascular rings
 - Venous anomalies
 - Arteriovenous fistulae

Classifications

| Acyanotic | Cyanotic |
|---------------------------|------------------------|
| VSD | ToF |
| ASD | TGA |
| PDA | TAPVC |
| AVSD | Tricuspid atresia |
| PS | Truncus arteriosus(TA) |
| AS | Pulmonary atresia |
| Co-arctation of the Aorta | Ebstein's anomaly |

Tetralogy of Fallot

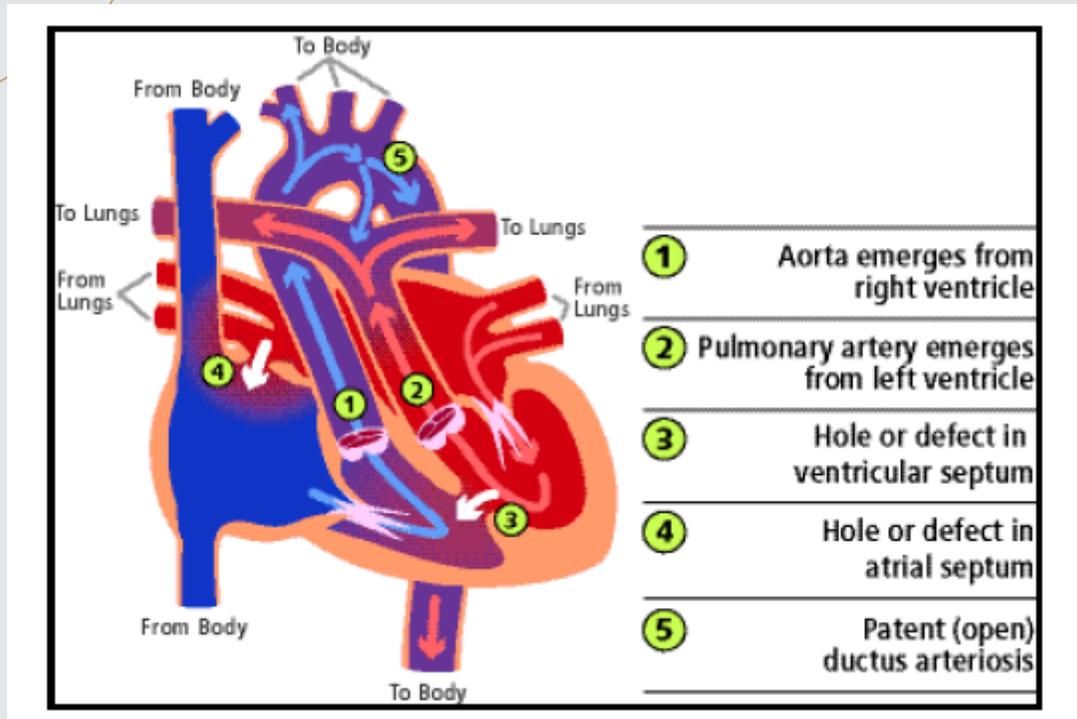


+ Classical features

- + Ventricular septal defect
- + RV outflow tract obstruction
- + Overriding aorta
- + RV hypertrophy

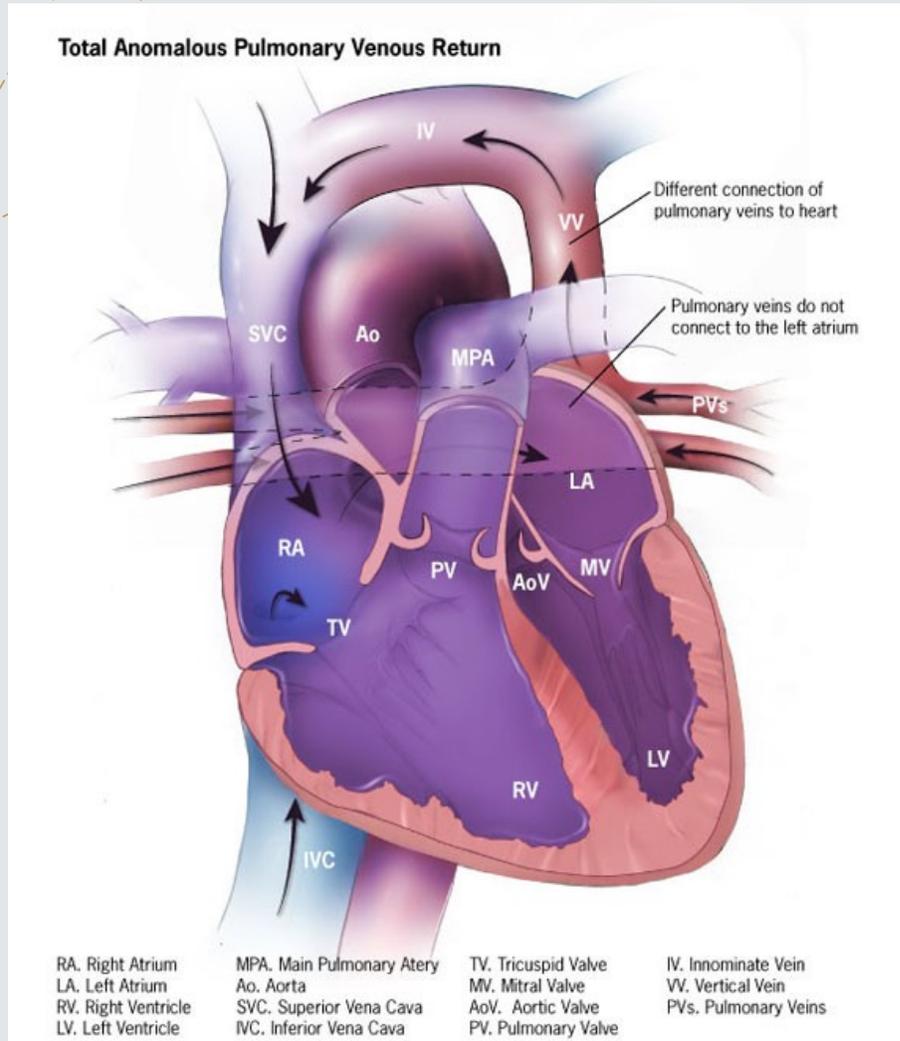
Prone to 'spelling' or 'cyanotic spells'

Transposition of the Great Arteries



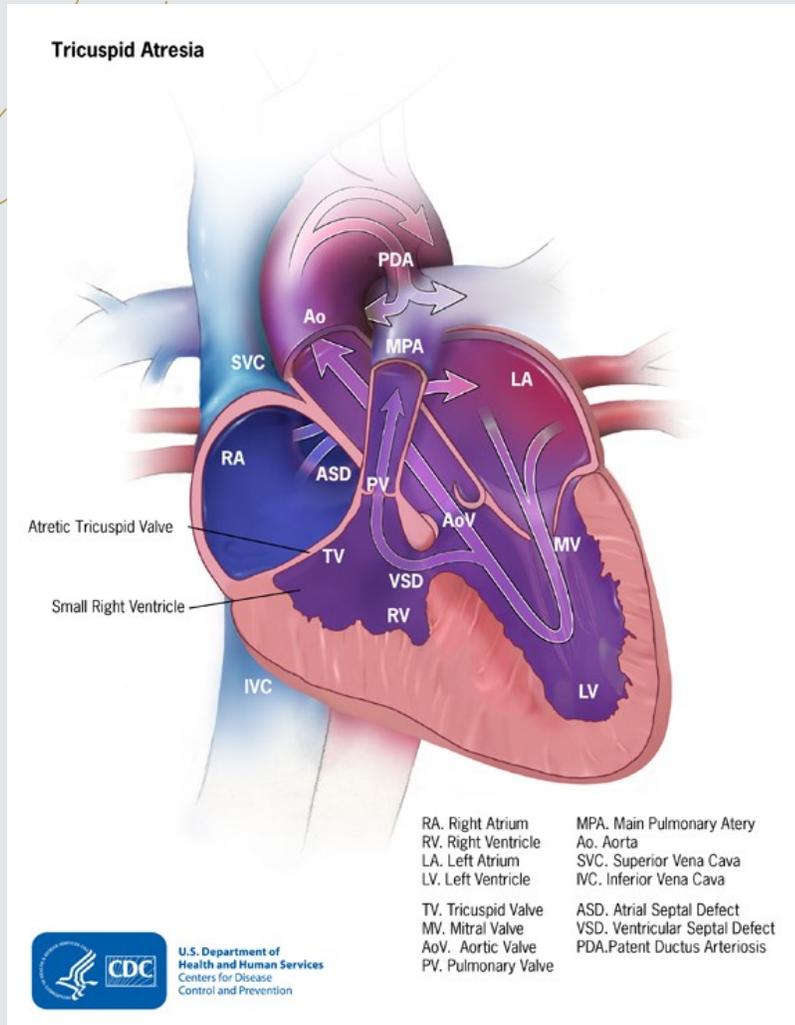
- +Ventriculo-arterial discordance
- +RV connected to aorta
- +LV connected to pulmonary artery
- +Only survive if another shunt exists to connect circulations

TAPVC



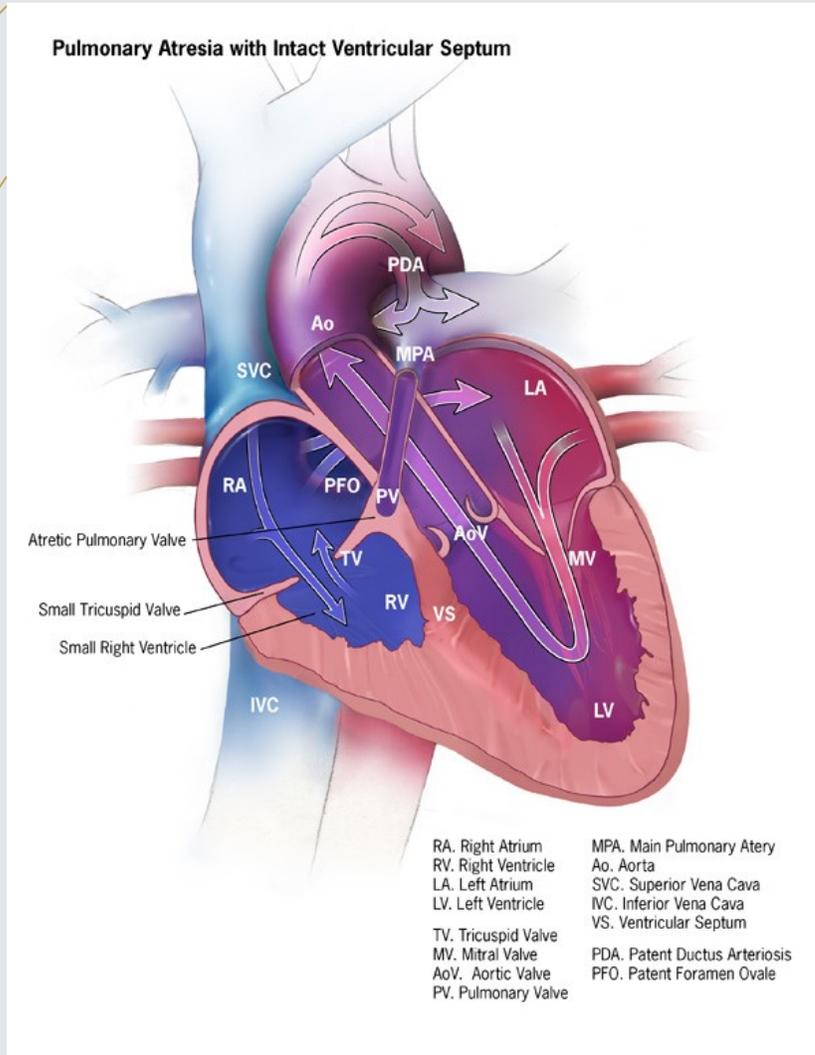
- + Pulmonary veins connect to systemic circulation instead of LA
- + Fatal unless other shunts exist

Tricuspid Atresia



- + Tricuspid valve does not form, no connection between RA and RV
- + ASD / VSD is required to allow oxygenation
- + Essentially single ventricle
- + Blalock – Taussig’s shunt can be used

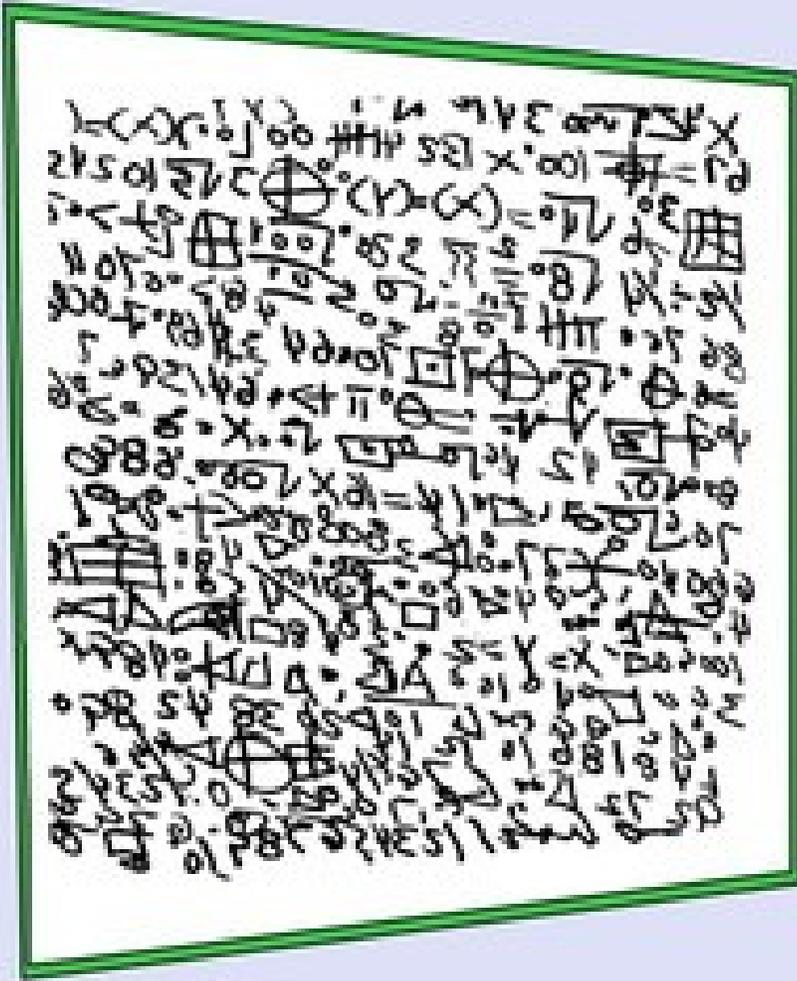
Pulmonary Atresia



- + Absence of pulmonary valve
- + Obstructed flow into pulmonary circulation
- + Duct dependent
- + Can occur with VSD

Cyanotic Congenital Heart Disease

- + Deoxygenated blood distributed to systemic circulation
- + Usually duct-dependent, need prostaglandin infusion e.g. alprostadil
- + Usually have right to left shunt but other pathology can occur
- + Chronic hypoxia leads to polycythaemia – risk of hyperviscosity
- + Avoid dehydration, keep fasting to a minimum



“When you put it like that, it makes complete sense.”

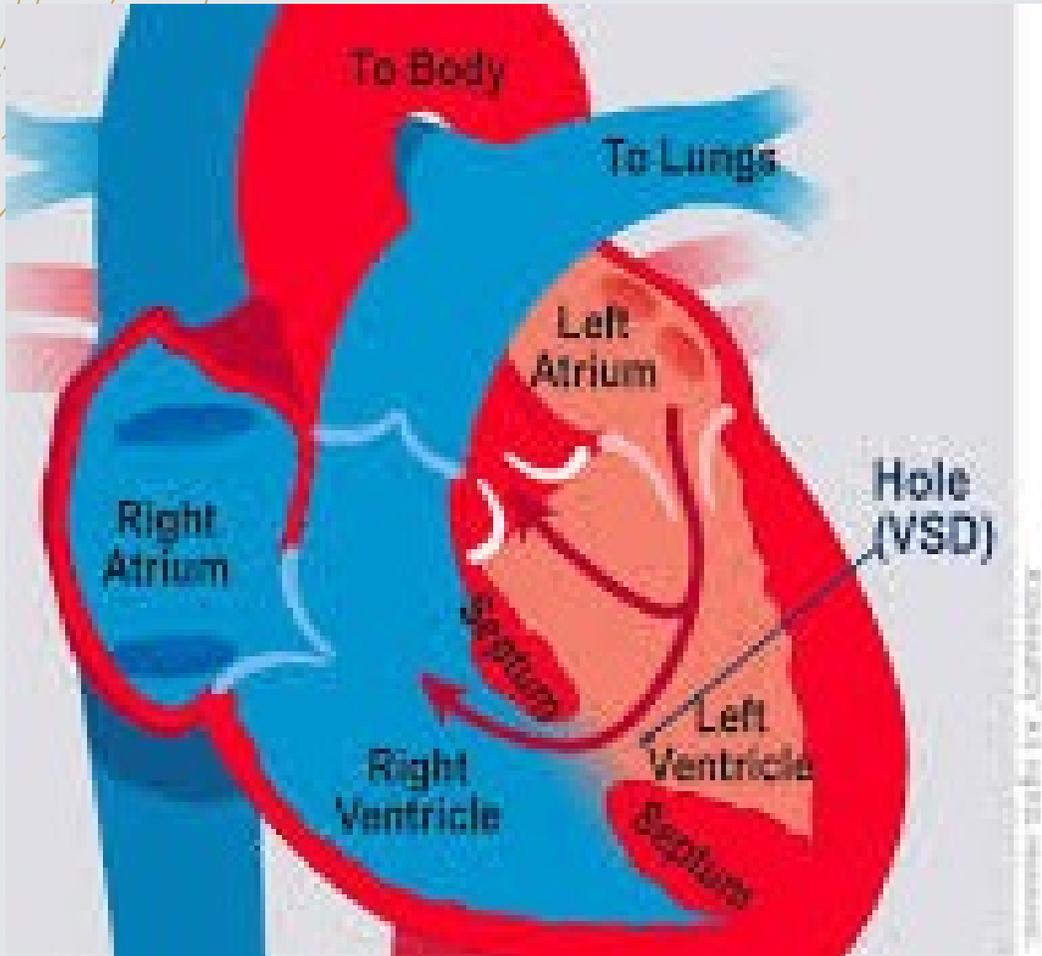
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Acyanotic Congenital Heart Disease

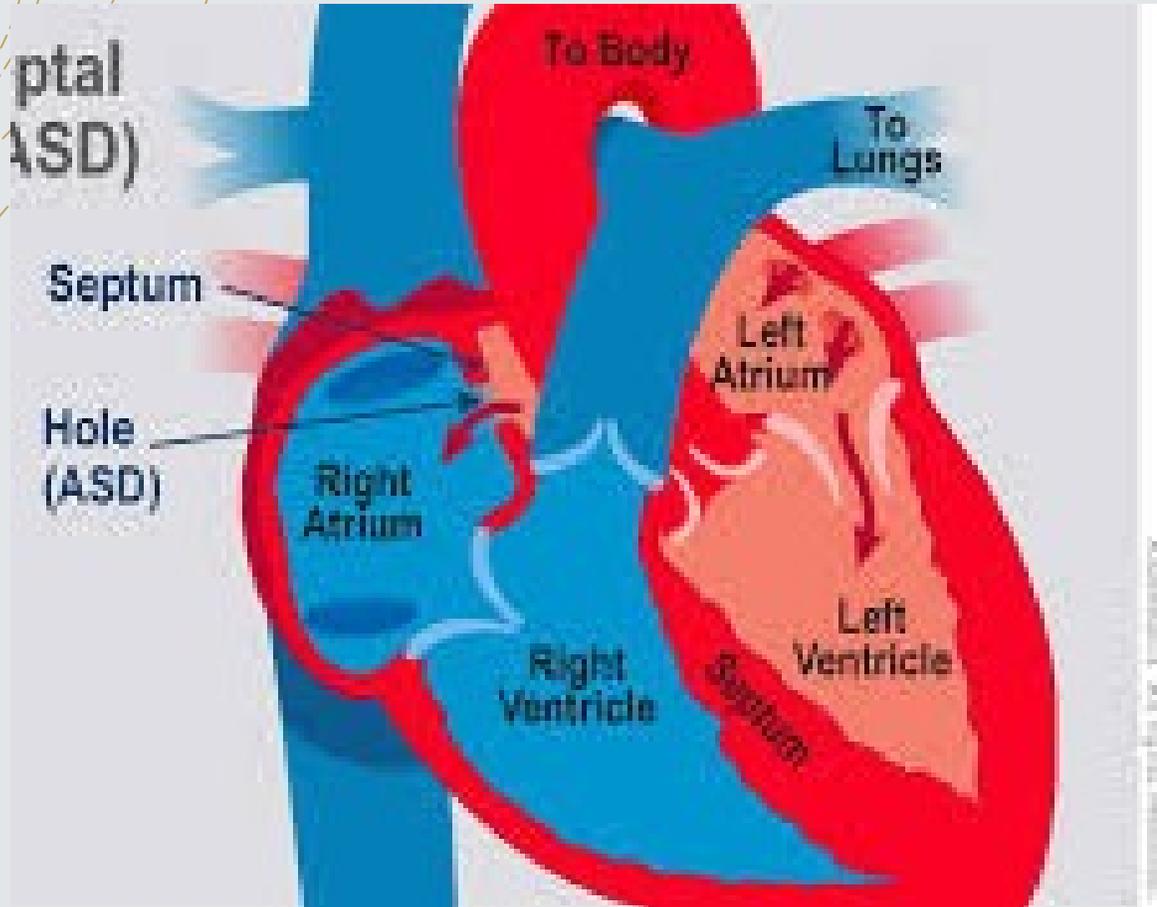
- + Left to right shunt
- + Over time, pulmonary hypertension and right heart hypertrophy
- + Usually not diagnosed until later infancy or childhood
- + Single lesions or associated with others +/- syndromes

Ventricular Septal Defect



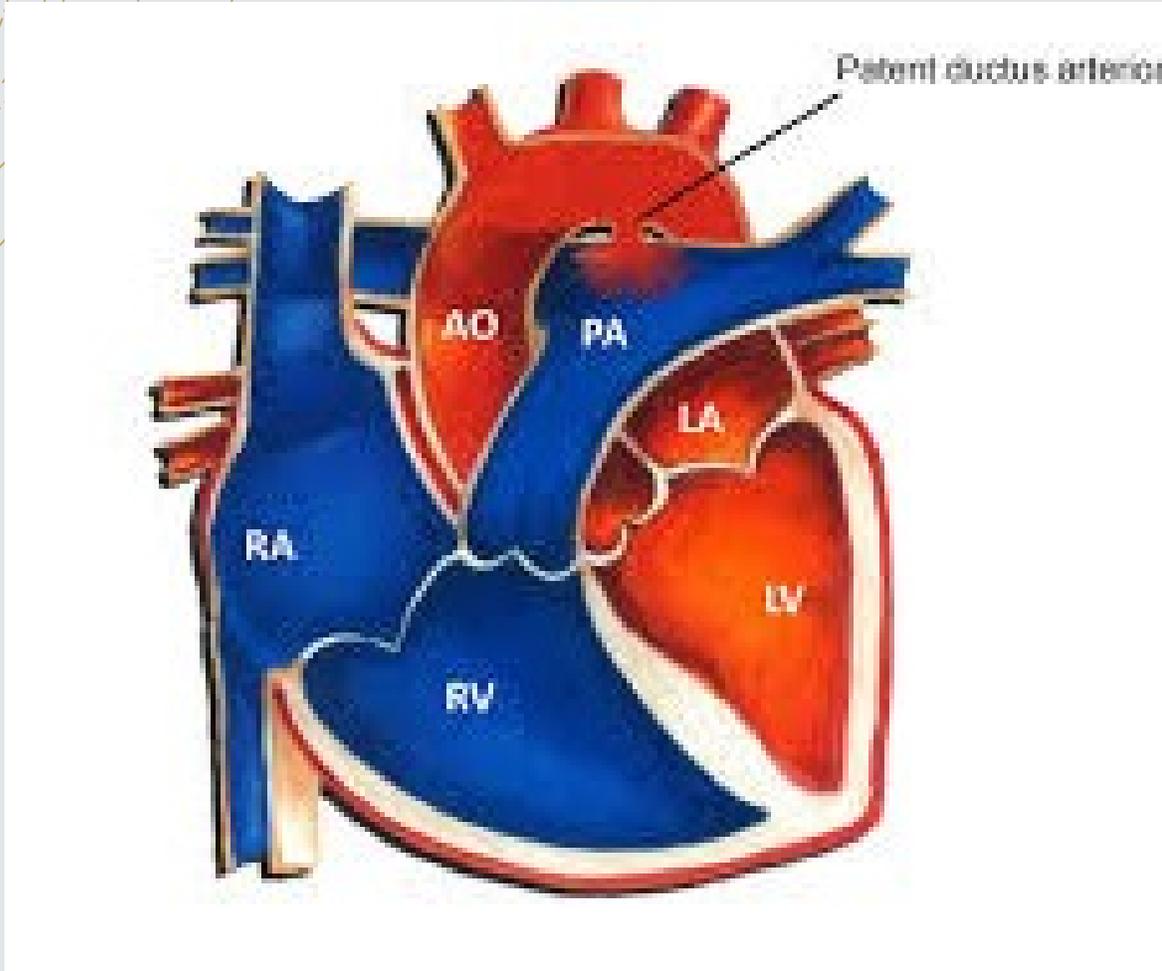
- + Most common
- + Left to right shunting
- + Pulmonary hypertension
- + Heart failure due to volume overload

Atrial Septal Defect



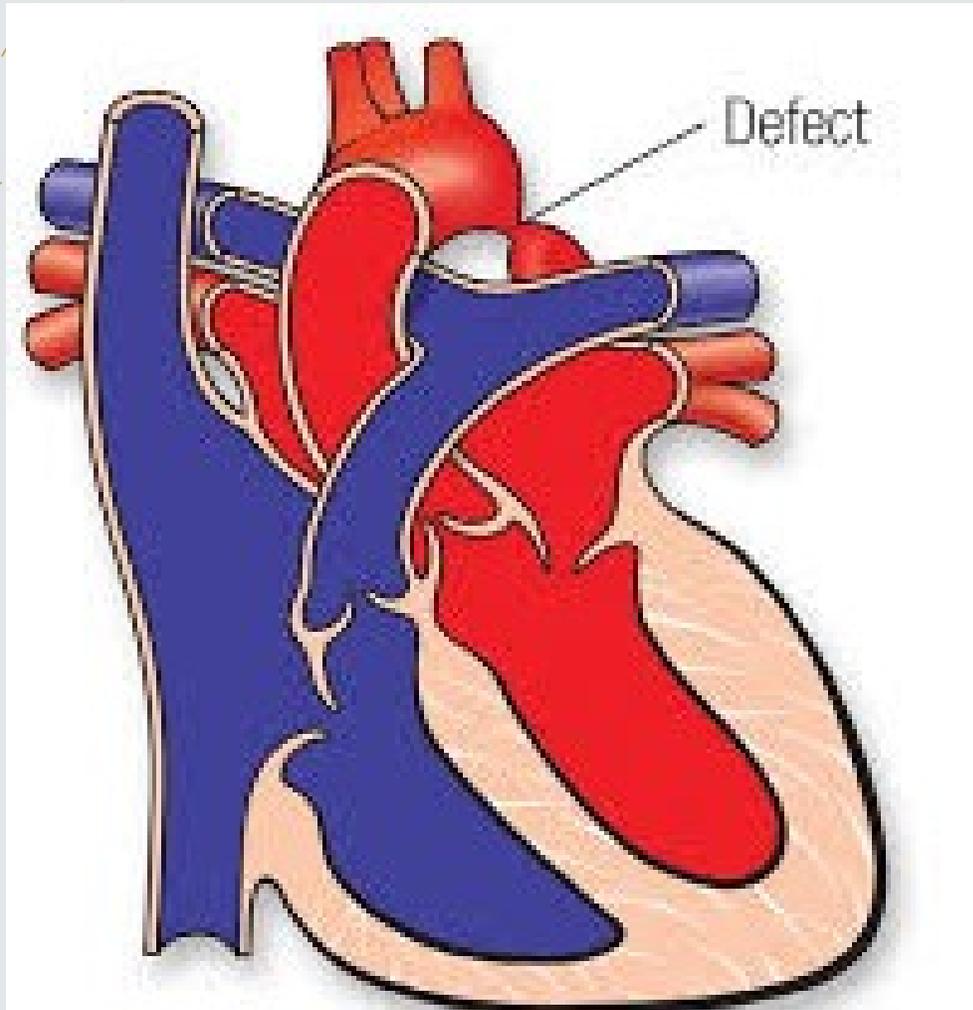
- +Left to right shunting
- +Pulmonary hypertension
- +Frequently undetected

Patent ductus arteriosus

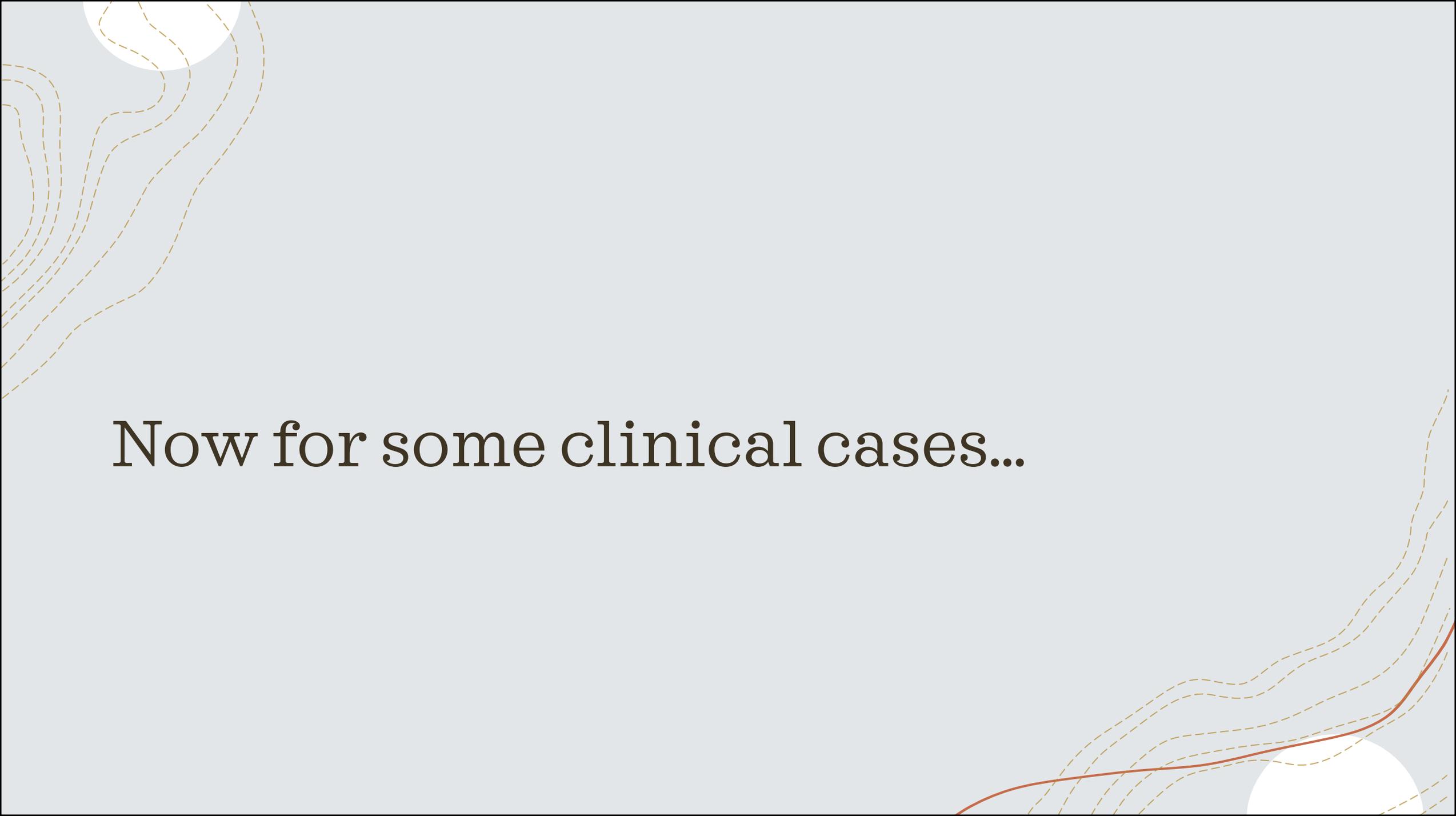


- + Normally closes shortly after birth
- + Aorta – PA – lungs
- + Left heart failure
- + Asymptomatic or poor feeding, SOB

Coarctation of aorta



- + Critical congenital heart disease
- + Narrowing of aorta
- + Impaired systemic blood flow
- + Associated with other cardiac anomalies and with congenital syndromes



Now for some clinical cases...

Case 1

6 month old with an unrepaired VSD presenting for emergency surgery for a scrotal swelling

What do we need to know?

- How to risk stratify
- Salient points for preoperative assessment

Risk stratifying CHD having non cardiac surgery

- +Low, intermediate or high risk
- +Physiological status
- +Disease complexity (post corrective surgery)
- +Type of surgery
- +Young age

Children with CHD for non-cardiac surgery

Table 1 Risk classification of children with heart disease undergoing non-cardiac surgery

| High risk | Intermediate risk | Low risk |
|---|---|--|
| <p>Physiologically poorly compensated and/or presence of major complications</p> <ul style="list-style-type: none"> (a) Cardiac failure (b) Pulmonary hypertension (c) Arrhythmias (d) Cyanosis | <p>Physiologically normal or well compensated</p> | <p>Physiologically normal or well compensated</p> |
| <p>Complex lesions (single-ventricle or balanced circulation physiology, cardiomyopathy, aortic stenosis)</p> <p>Major surgery (intraperitoneal, intrathoracic, anticipated major blood loss requiring transfusion)</p> <p>Under 2 yr old</p> <p>Emergency surgery</p> <p>Preoperative hospital stay more than 10 days</p> <p>ASA physical status IV or V</p> | <p>Simple lesions</p> <p>Major surgery (intraperitoneal, intrathoracic, anticipated major blood loss requiring transfusion)</p> <p>Under 2 yr old</p> <p>Emergency surgery</p> <p>Preoperative hospital stay more than 10 days</p> <p>ASA physical status IV or V</p> | <p>Simple lesions</p> <p>Minor (or body surface) surgery</p> <p>Over 2 yr old</p> <p>Elective surgery</p> <p>Preoperative hospital stay less than 10 days</p> <p>ASA physical status I–III</p> |

Case 1

6 month old with an unrepaired VSD presenting for emergency surgery for a scrotal swelling

Physiology- compensated, on diuretics, feeding well, gaining weight

Lesion- simple

Risk category- intermediate (minor but em surgery, <2yrs)

Anaesthetic strategy?

Case 2

6 year old with a repaired Tetralogy of Fallot presenting for dental extraction due to caries

Physiology- compensated (good ET, no failure, RBBB no VEs)

Lesion- simple

Risk category- low (simple lesion, minor surgery, >2yrs, el surgery)

Anaesthetic strategy?

Case 3

8 year old with a Fontan circulation presenting for emergency surgery for reduction and fixation of a supracondylar fracture with neurovascular compromise

Physiology- compensated working single-ventricle

Lesion- complex, univentricular

Risk category- high (complex lesion, em surgery)

Anaesthetic strategy

Adult (grown up) congenital heart disease

- + Classified by complexity

- + Simple - ASD, VSD

- + Moderate – TOF, Coarct, Ebstein's

- + Severe – any cyanotic CHD, single ventricle physiology, TGA, truncus arteriosus, Eisenmenger's syndrome

Summary

- + Classify congenital heart disease
- + Review and understand anaesthetic implications
- + Discussion of clinical cases
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Any questions?