RAMA UNIVERSITY

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FACULTY OF NURSING

DISORDERS OF CARDIOVASCULAR SYSTEM

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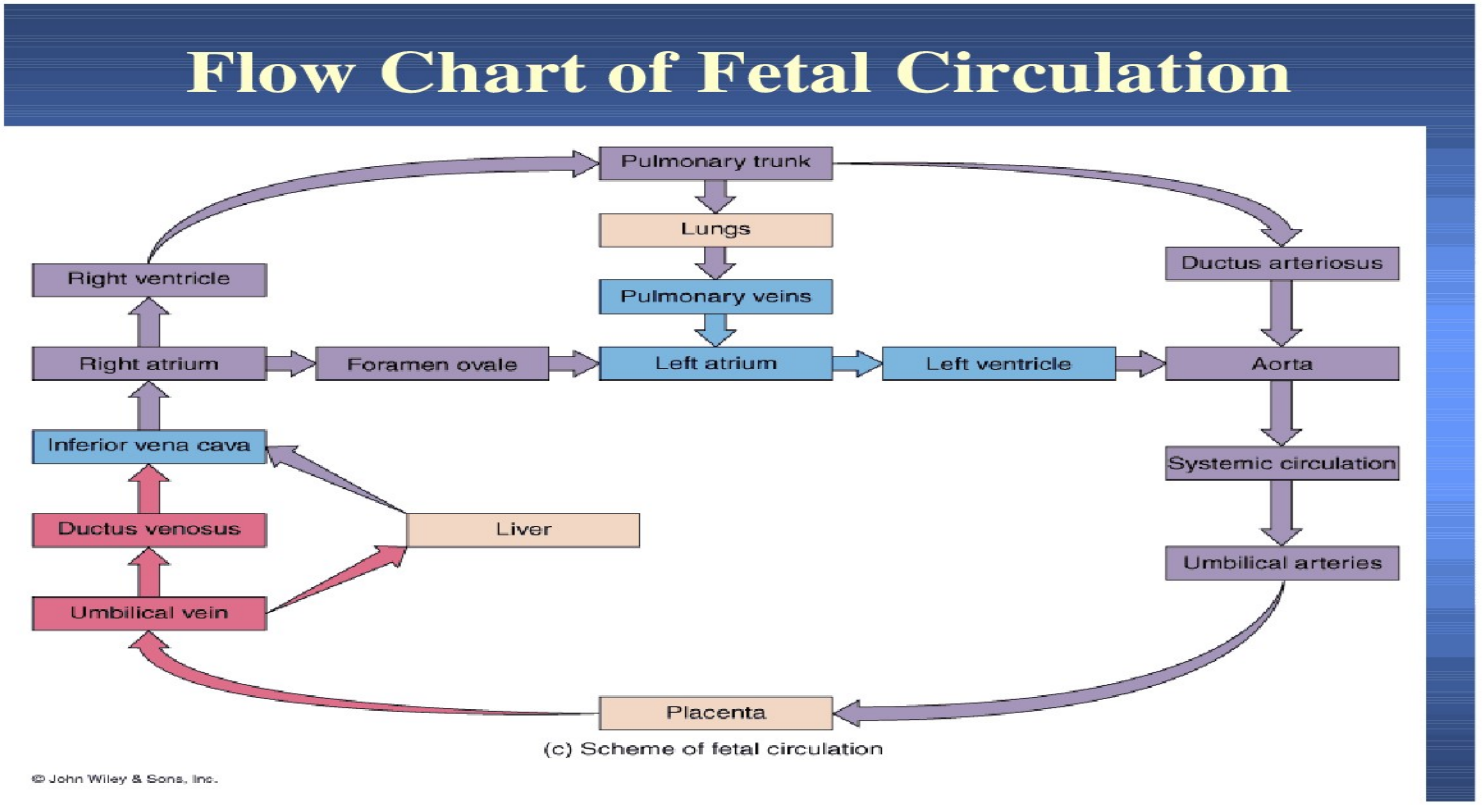
Fetal Circulation



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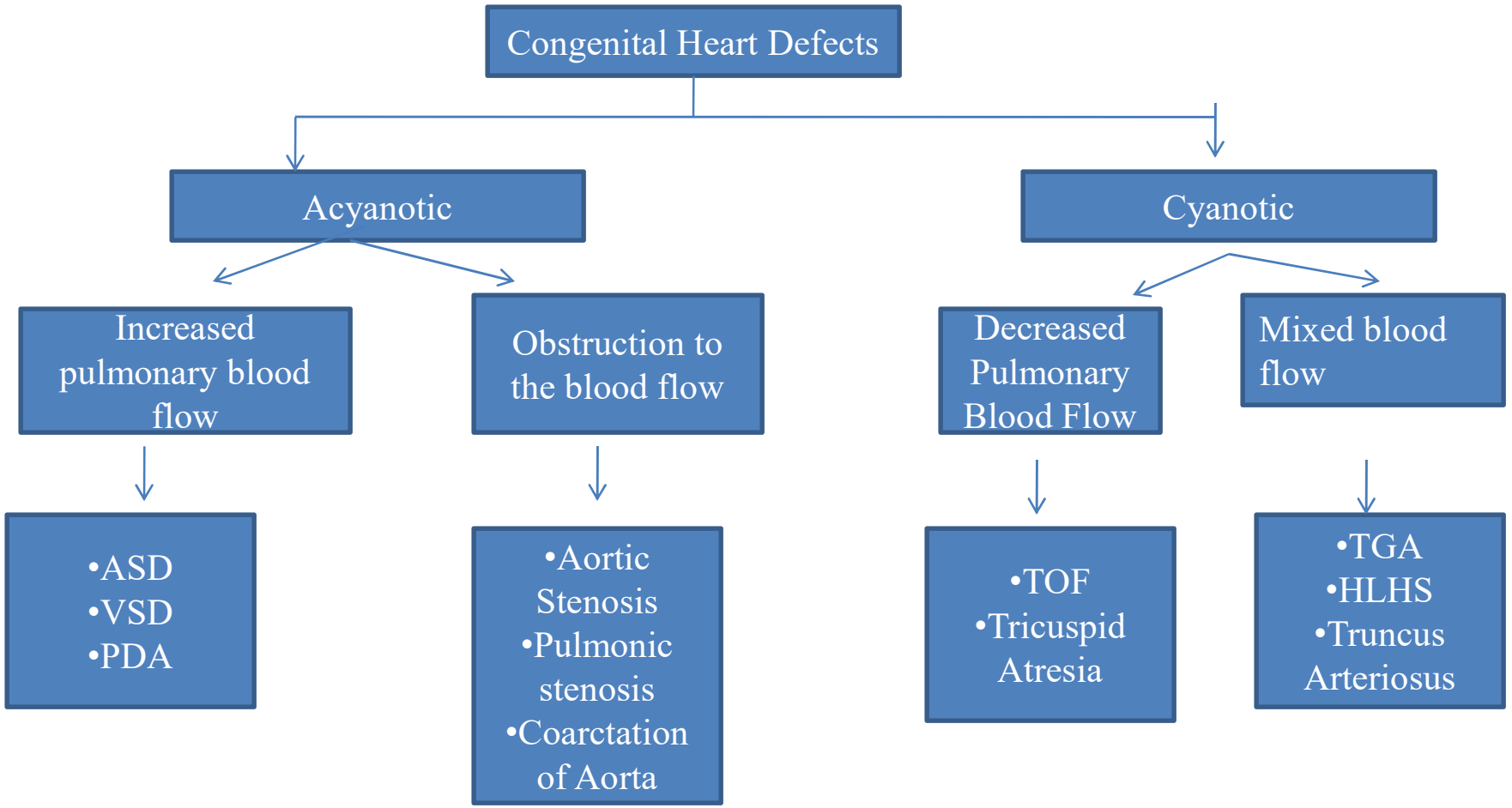
DEFINITION

Congenital heart defects are one of the most common congenital anomalies that involve chambers, valves and great vessels arising from the heart.

TYPES OF CONGENITAL HEART DEFECTS



Acyanotic Heart Disease

Definition

There is no abnormal communication between systemic and pulmonary circulation.

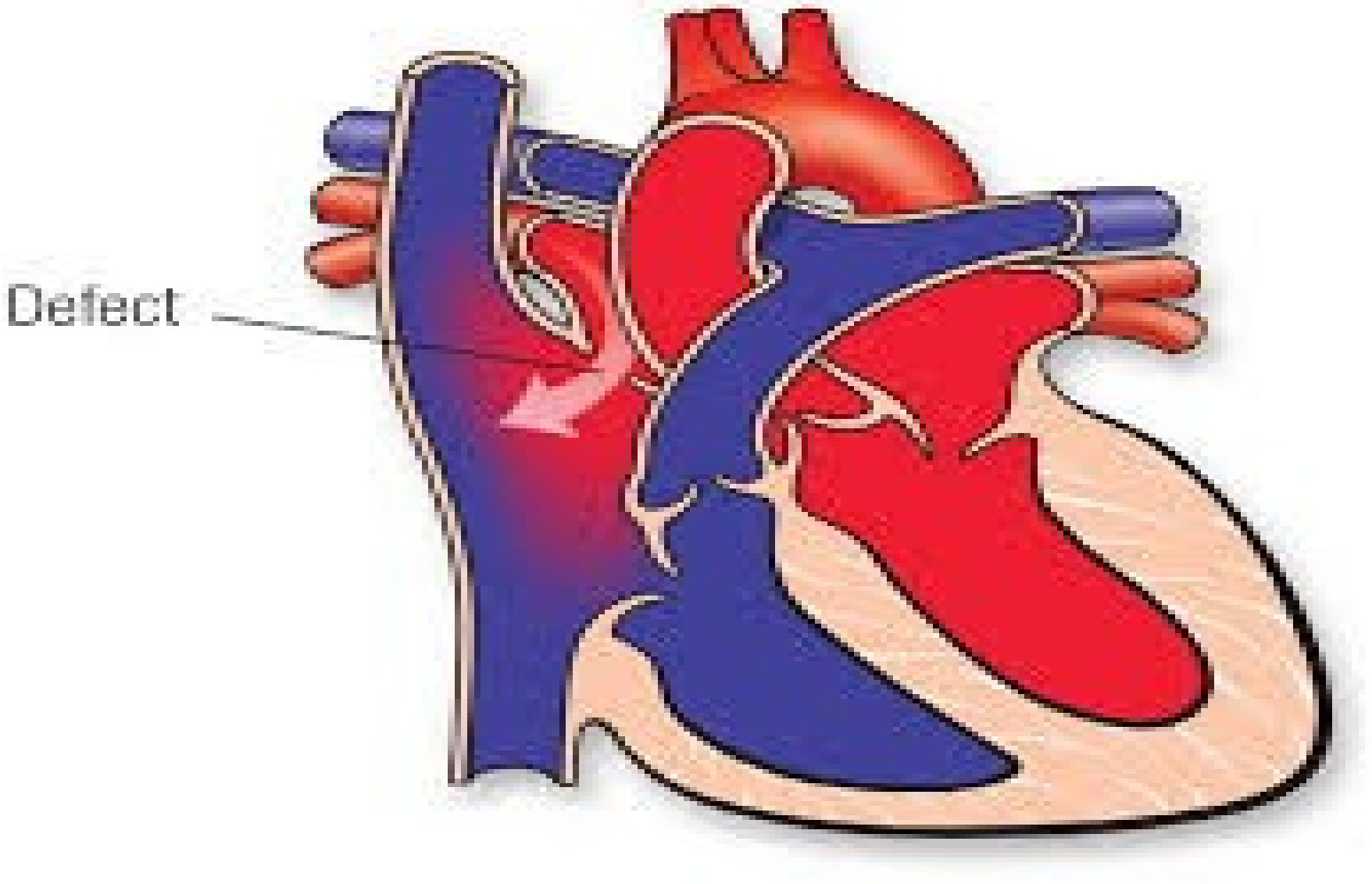
The blood supplied in the body is therefore oxygenated and cyanosis does not occur.

1. ATRIAL SEPTAL DEFECT

- ASD is an abnormal opening in the wall separating the right and left atria.
- Types:

1. **Ostium secundum-** abnormal opening is present in the middle of the atrial septum.
2. **Ostium primum:** it is located just in the septum just above the tricuspid valve.
3. **Sinus venosus:** abnorml opening at the top of the atrial septum.

Atrial Septal Defect



Pathophysiology

Due to ASD

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Oxygented blood which is high in left atrium is forced through defect in right atrium

↓

Increased pulmonary blood flow

↓

Pulmonary congestion and right ventricular enlargement

Clinical features

- Usually asymptomatic
- Decreased exercise tolerance and dyspnea.

Diagnostic Evaluation

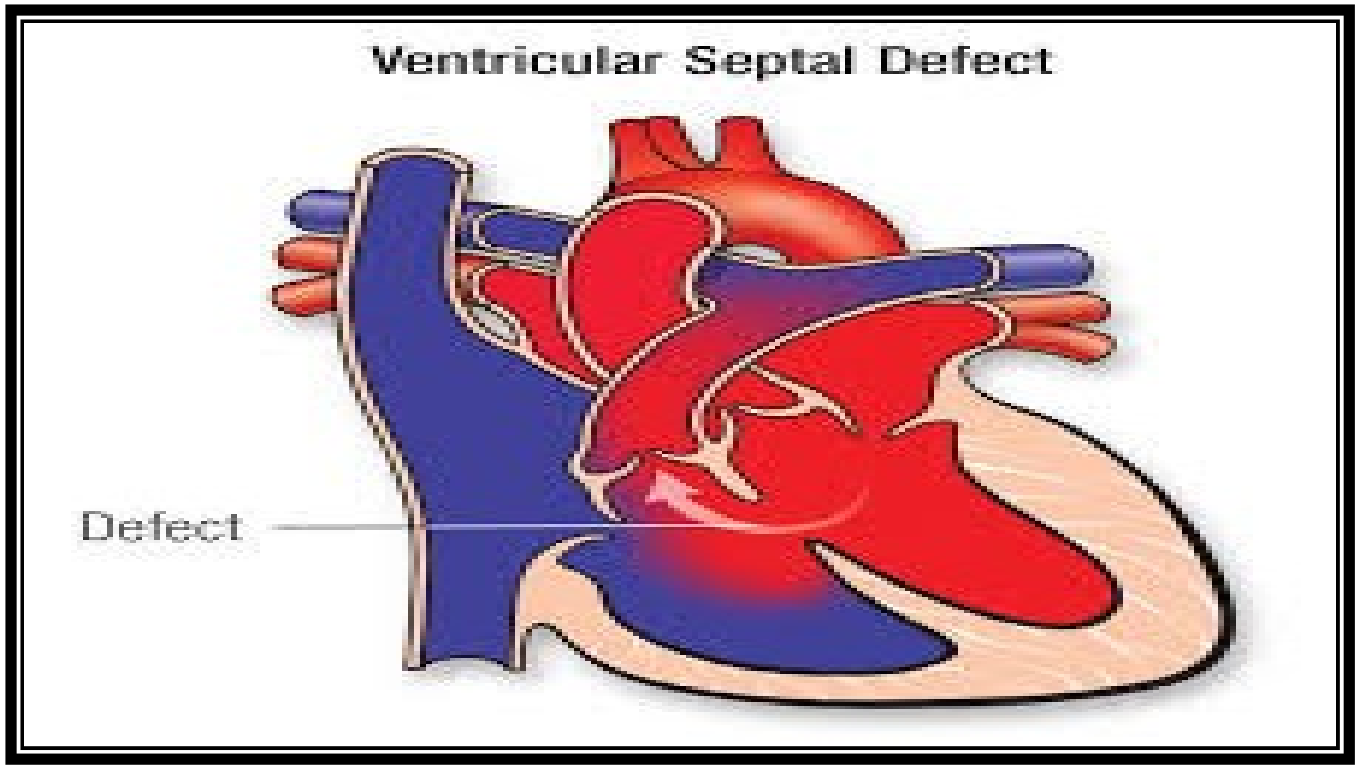
1. Cardiac examination- systolic ejection murmur
2. ECG
3. Chest radiograph- heart enlargement and pulmonary vascular markings.
4. Echocardiography

Management

- Small ASD will close spontaneously
- Surgical corrections to be done between 2 to 4 yrs of age.
- Small ASD- purse string closure done by stitching nd pulling closed.
- Large defects- knitted dacron patch is sewn over the defect.

Ventricular Setal Defect (VSD)

- It is an abnormal opening between the right and left ventricles.



Pathophysiology

Due to VSD

↓

Blood from left ventricle crosses VSD and enters right ventricle

↓

Blood returns to pulmonary circulation

↓

Increased blood in right ventricle

↓

Right ventricular hypertrophy

Clinical features

- Small VSD- Usually asymptomatic
- Large VSD- Failure to thrive and CHF
- Medium VSD- dyspnea, tachypnea, feeding difficulties and pulmonary infection

Diagnostic Evaluation

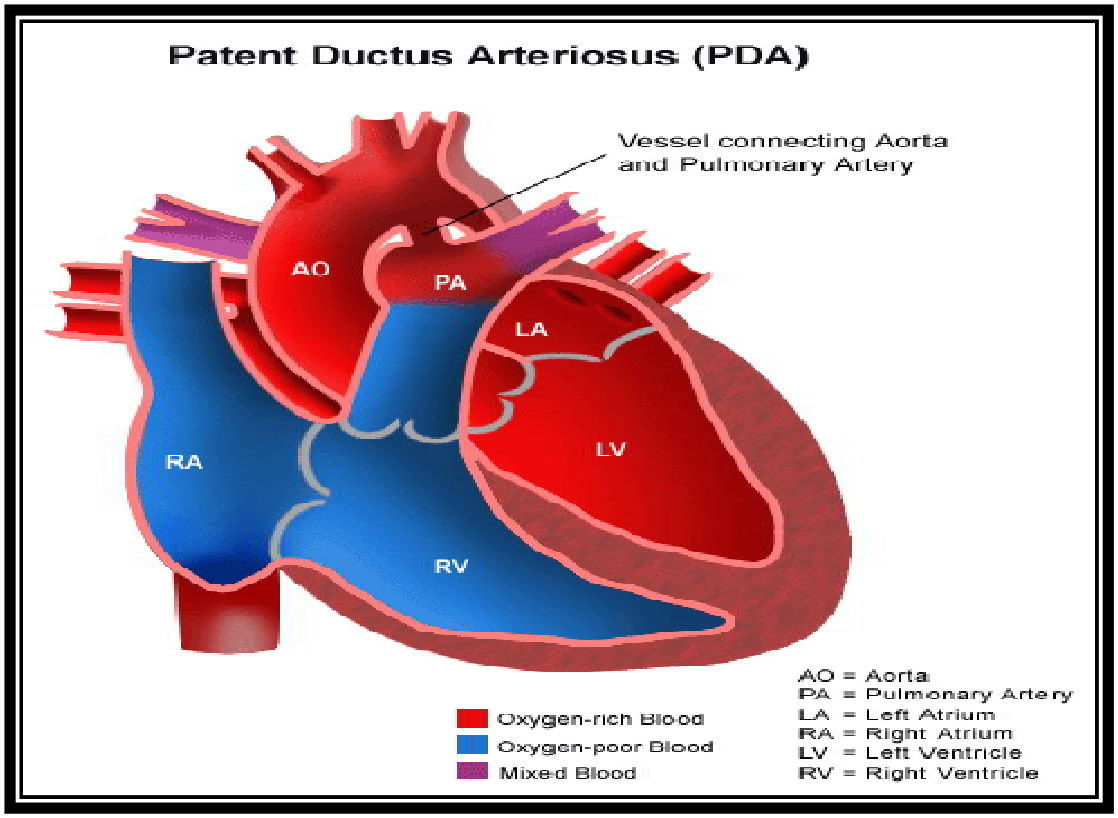
1. Cardiac examination- systolic murmur
2. ECG
3. Chest radiograph- heart size and pulmonary vascular markings increase
4. Echocardiograph

Management

- Small VSD- no surgery only antibiotics to prevent endocarditis
- For CHF and FTT- administer Digoxin and Diuretic
- Moderate to small VSD- purse string closure
- Large VSD- Synthetic Dacron patch is used to close the opening.

Patent Ductus Arteriosus (PDA)

- If the closure of ductus arteriosus does not occur even after 2 to 3 weeks of age it is known as PDA.



Pathophysiology

Due to PDA

↓

Shunting of blood from high pressure Aorta to low pressure pulmonary artery

↓

Increased blood flow to pulmonary artery

↓

Increased blood return to left side of heart

Loaded left ventricle

Clinical Features

- Asymptomatic
- Growth retardation and easy fatigability

Diagnostic Evaluation

1. Cardiac examination- systolic murmur
2. Chest Radiograph- normal or increased heart size and pulmonary vascular markings
3. Echocardiogram

Management

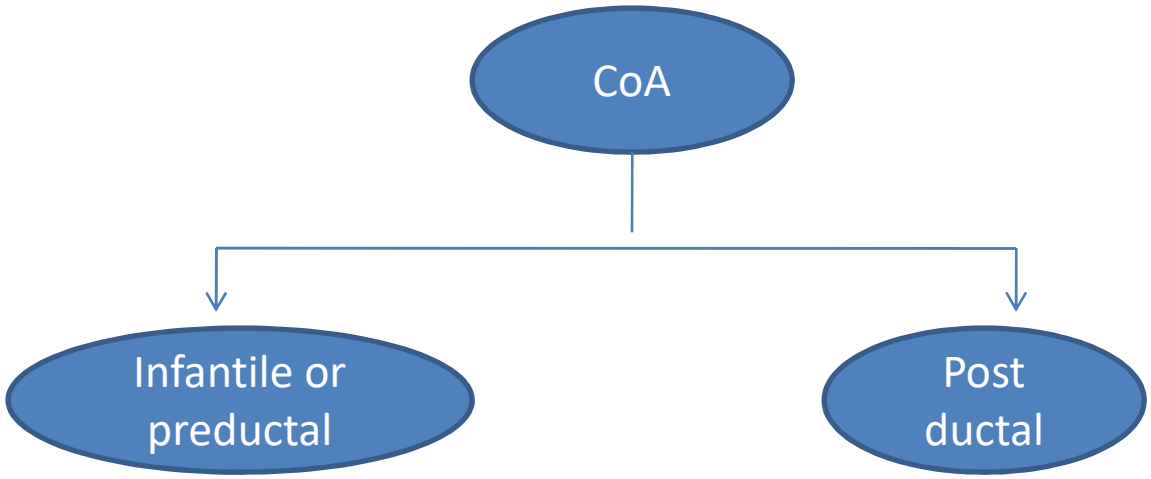
Medical Management:

- Administration of Indomethacin, prostaglandin inhibitor. It is administered before the age of 10 days.
- Dose is 0.2 mg/kg repeated up to 3 times at an interval of 12-24hrs.
- **Surgical intervention** includes ligation of PDA and divided completely.

1. Coarctation of Aort (CoA)

- It is the narrowing of aortic arch in juxtaductal region.

Types



Constriction of Aorta between left subclavian artery and DA

Constriction at or distal to DA

Pathophysiology

Due to CoA

↓

Obstruction in blood flow to the lower portion of the body

↓

Increased pressure in upper part of the body as compared to the lower part

Clinical features

1. Increased BP- headache, dizziness, fainting, epistaxis
2. Low BP in lower part of the body.
3. Weakness or pin in lower legs on exercise.
4. FTT and CHF- respiratory distress, poor weight gain, feeding problems, irritability.

Diagnostic evaluation

1. Echocardiogram
2. MRI and Cardiac catheterization

Management

1. **End to End anastomosis-** narrowed portion of aorta is removed and two normal parts are joined.
2. **Subclavian Flap Aortoplasty-** longitudinal incision is made in aorta across the coarctated site. Left subclavian artery is used as flap to increase the diameter of the aorta.
3. **Balloon Aortoplasty-** balloon catheter is placed inside the aorta and site is inflated to relieve obstruction.

Aortic Stenosis

- Narrowing of the aortic valve, which controls blood flow between left ventricular and aorta, is known as aortic stenosis.

Types:

i. Valvular: it is the stricture of aortic valve.
ii. Subvalvular: narrowing below the valve resulting from thin membrane or thick fibrous ring below the valve.
iii. Supravalvular: stenosis is above the aortic valve.

Pathophysiology

AS

↓

Obstruction to the flow of blood from left ventricle

↓

Thickening or hypertrophy of left ventricle

↓

Increased left atrial pressure

↓

Backflow of blood to lungs

↓

Pulmonary edema

Clinical Features

- Asymptomatic
- Fatigue and exercise intolerance
- Exertional dyspnea
- Chest pain
- syncope

Diagnostic Evaluation

1. Cardiac examination: systolic murmur
2. ECG
3. Chest radiographs- dilatation of ascending aorta
4. Echocardiogram
5. Cardiac catheterization

Management

- Aortic Balloon Valvuloplasty for valvular stenosis.
- Konno procedure for subvalvular stenosis.

Pulmonary Stenosis

Narrowing of the pulmonary valve which controls the outflow of blood from right ventricle to the pulmonary artery is known as PS.

Types:

i. Subvalvular
ii. Valvular
iii. supravalvular

Pathophysiology

PS

↓

Obstruction of blood from right ventricle into the pulmonary artery

↓

Right ventricular pressure increases

↓

Hypertrophy of right ventricle

Clinical Features

- In severe stenosis:

1. Poor exercise tolerance
2. Fatigability
3. Exertional dyspnea
4. syncope

Diagnostic Evaluation

- Cardiac examination: systolic murmur
- Chest radiograph
- Echocardiogram

Management

- Balloon Valvuloplasty

CYANOTIC HEART DEFECTS

Tetralogy of Fallot

- It is the most complex congenital heart defect with decreased pulmonary blood flow. It includes combination of 4 defects:

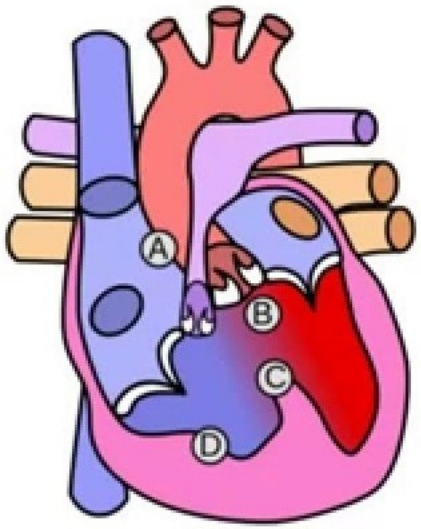
✓ VSD

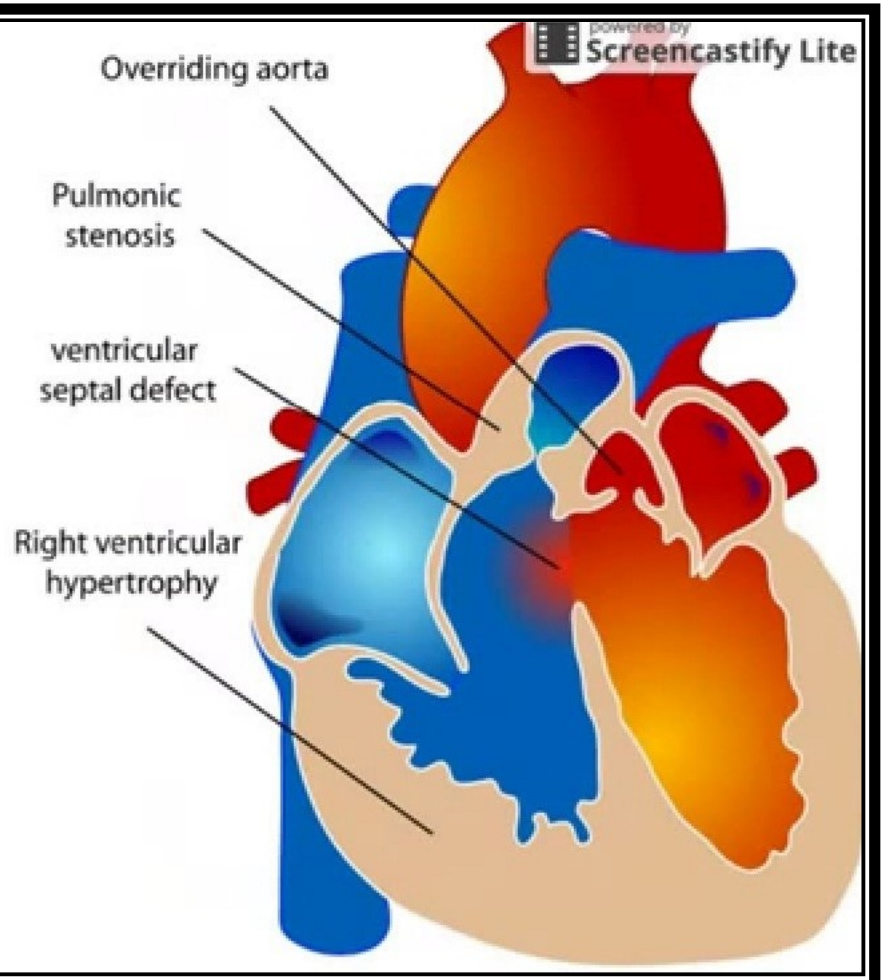
✓ Overriding Aorta

✓ Pulmonary stenosis

✓ RVH

Tetralogy of Fallot





Pathophysiology

In TOF

↓

Outflow of blood from the right ventricle to lungs is restricted by PS

↓

RVH

↓

Pressure in right ventricle increases

↓

Blood starts shunting from right to left through VSD

↓

Amount of unoxygenated blood reaching the systemic circulation increases(through overriding aorta)

↓

Cyanosis

Clinical Features

- Cyanosis
- Clubbing of finger and toe nails by 1-2 yrs of age
- Exercise causes dyspnea
- Tett spells- infant becomes dyspneic, restless, cyanotic and may gasp for breath.

Diagnostic Evaluation

- Cardiac examination
- Chest radiograph- boot shaped heart due to RVH.
- Echocardiography
- Cardiac catheterization

Management

- In TETT spell
- Place infant in knee chest position
- Propanolol is administered in a dose of 1 mg/kg up to 4 times a day.
- PGE1 therapy.

Surgeries- palliative

- **Blalock-Taussing Shunt**: an artificial ductus is created by connecting right or left subclavian artery to the pulmonary artery of same side.
- **Pott's procedure**: upper descending aorta is anastomosed with left pulmonary artery.
- **Waterston procedure**: side to side anastomosis with left pulmonary artery.
- **Brock's procedure**: pulmonary valvotomy is done.

Surgeries- corrective

- Patch closure of VSD and pulmonary valvotomy

Tricuspid Atresia

- The tricuspid valve fails to develop and no communication exists between the right atrium and right ventricle.

Pathophysiology

Due to TA

↓

Right ventricle is hypoplastic (small) and ASD is present

↓

Blood passes through right atrium to left atrium

cyanosis

Clinical features

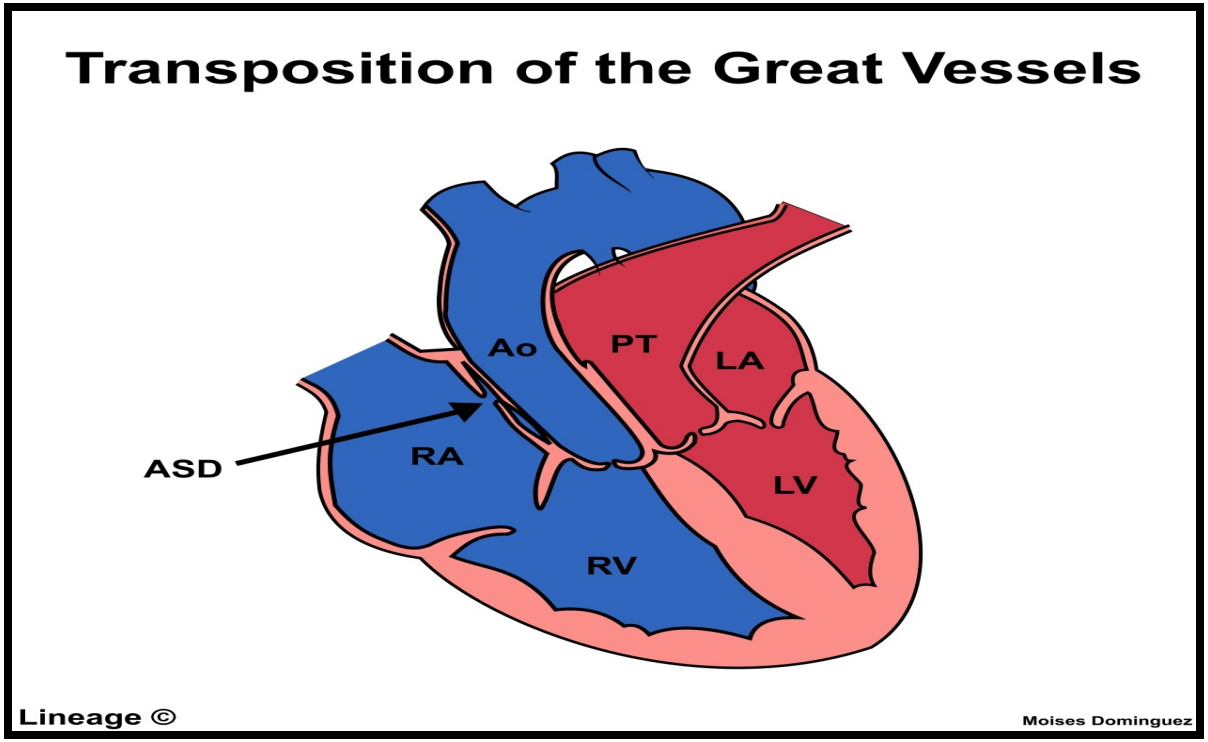
- Profound cyanosis
- Hypoxic spells
- Tachypnea
- Delayed growth
- Acidosis
- Clubbing of nails
- CHF

Management

- PGE1therapy
- Palliative surgery: blalock taussing shunt and balloon atrial septostomy
- Corrective surgery: fontan procedure- creation of communication between RA and PA or RV by direct anastomosis. ASD or VSD are closed. Done at 4 to 5 yrs of age.

Transposition of Great arteries (TGA)

In this aorta arises from RV and PA arises from LV resulting in two separate and parallel circulation.



Pathophysiology

Due to TGA

↓

Oxygenated blood returns to the LA and then to the LV

↓

Blood again reaches PA and then to the pulmonary circulation

↓

Similarly the deoxygenated blood returns to RA and then to the RV

↓

It circulates in systemic circulation

Clinical features

- Cyanosis
- Hypoxic spells during crying or exertion
- clubbing

- Corrective surgery:

1. Arterial switch procedure: PA and aorta are transected above the respective valves and switched back to appropriate ventricles.
2. Mustard procedure: a new atrial septum is created by using pericardium to make a baffle.it alters the blood flow by redirecting unoxygenated blood from RA to LV and out to lungs via PA.
3. Senning procedure: creates same redirection of blood flow but without the use of pericardial patch. The atrial septum and a portion of atrial wall are used to reroute the blood flow.

TRUNCUS ANOMALOUS PULMONARY VENOUS CONNECTION(TAPVC)

- It is defect where in pulmonary veins fail to join the LA. Instead they are abnormally connected to the systemic venous circuit via the right atrium.

- TAPVC is classified according to the point of attachment:
  1. Supracardiac- above the diaphragm such as svc.
  2. Cardiac- direct attachment to the heart
  3. Infradiaphragmatic- below diaphragm with IVC.

PATHOPHYSIOLOGY

Due to TPVC

↓

Blood from PV flow into the RA

↓

Hypertrophy of right side of heart and smaller left side

↓

Blood shunts from RA to LA via ASD
Mixing of blood

↓

cyanosis

Management

- IV infusion of PG to keep the ductus open
- Oxygen therapy
- Palliative surgery

1. Rashkind procedure- enlargement of interatrial communication by atrial balloon septostomy.
2. Blalock hanon procedure- creation or enlargement of ASD through surgery.

Clinical features

- Cyanosis
- Signs of CHF

Surgical Management

- PV is anastamosed with back side of LA.
- ASD is closed
- Anomalous venous connection is ligated

HLHS

- Underdevelopment of the left side of the heart resulting in hypoplastic left ventricle and aortic atresia.

Pathophysiology

Blood from LA flows into the RA via ASD

It reaches the RV and out in the PA

Blood flow to the lungs and also through DA in to the aorta

Clinical features

- Signs of CHF
- Cyanosis

PGE1 therapy

Norwood procedure-anastamosis of PA to the aorta and creation of large ASD.

TRUNCUS ARTERIOSUS

- Failure of normal sepration and division of embryonic trunk into Aorta and PA. which results in single overriding vessel in both ventricles.

P/P

- Due to TA
- Blood ejected from the LV & RV enters the common trunk
- Mixing of blood
- cyanosis

CLINICAL FEATURES-

- Cyanosis
- Poor growth
- Activity intolerance

- Closing of VSD
- Excising PA from Aorta & attaching them to the RV by means of homograft.

THANK YOU