CONGENITAL HEART DEFECTS

Objectives

- By the end of the lesson, the learner will be able to:
- Describe the congenital abnormalities and their management

Definition

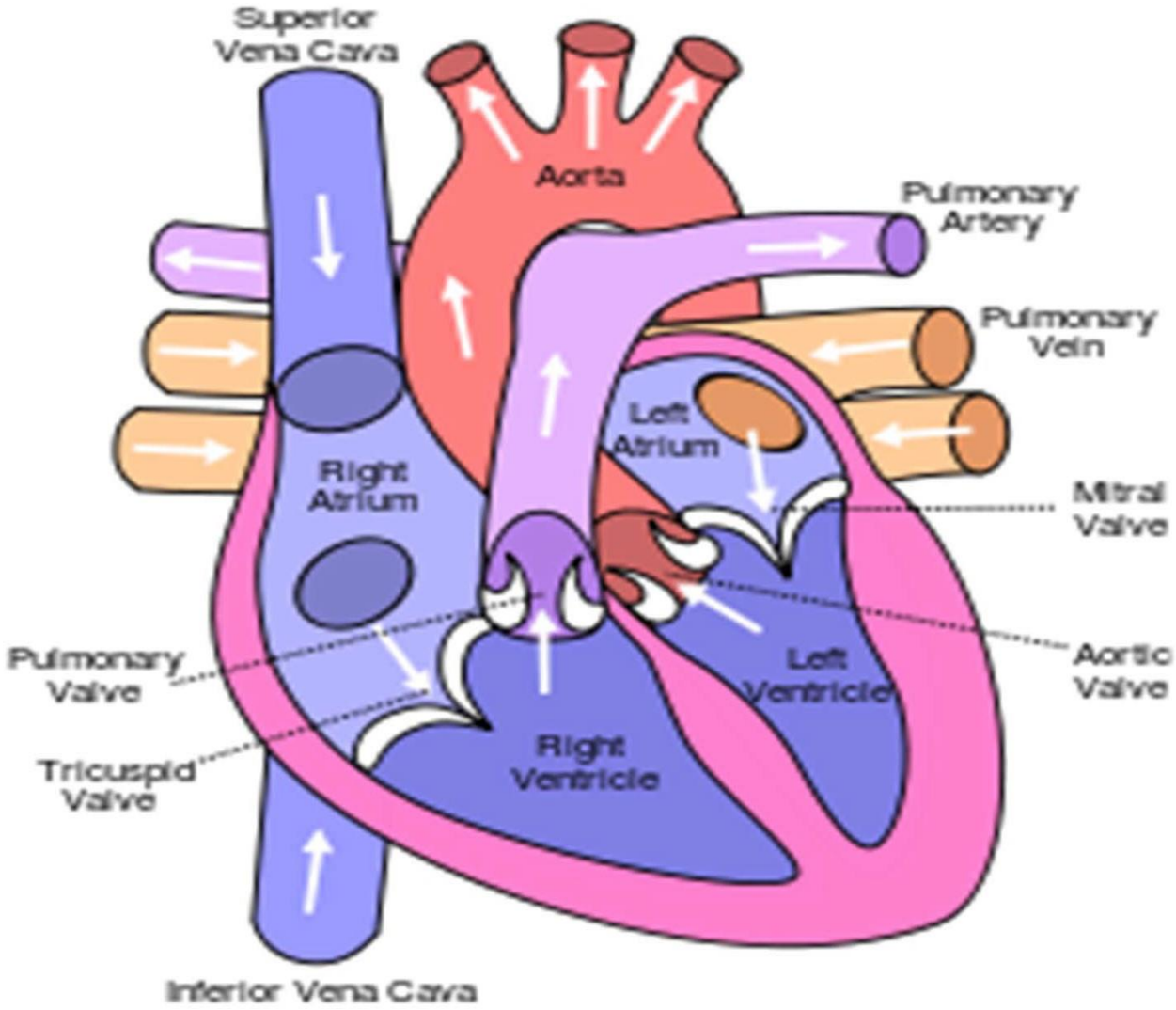
- Congenital heart defects (CHD) are as a result of malformations of the heart or its associated blood vessels which are present at birth

Introduction

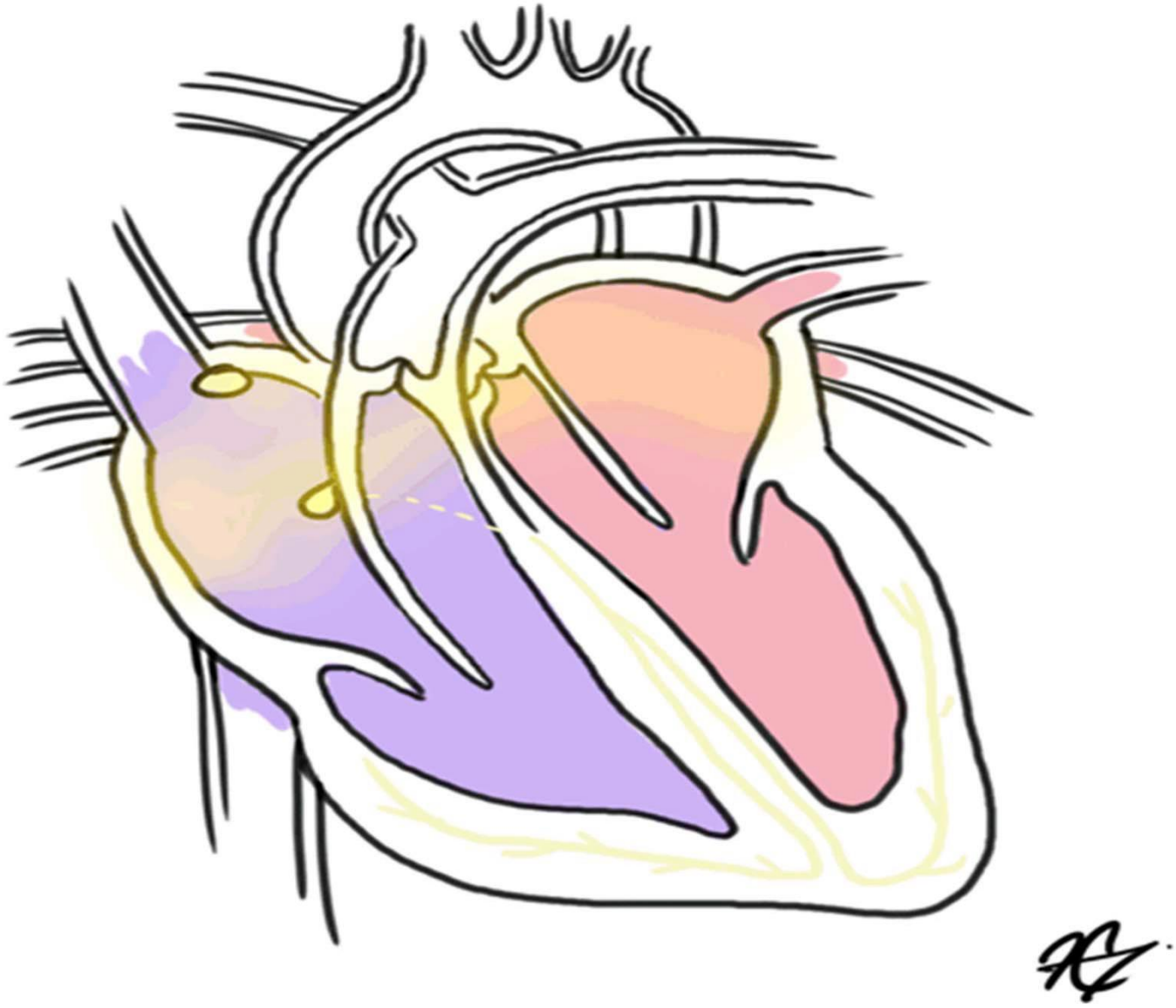
- The majority of congenital anomalies of the heart are present 6 weeks after conception & most anomalies compatible with 6 months of intrauterine life permit live offspring at term

- Number of children reaching adulthood with congenital heart disease has increased over the last 5 decades due to advances in diagnosis, medical, critical and surgical care

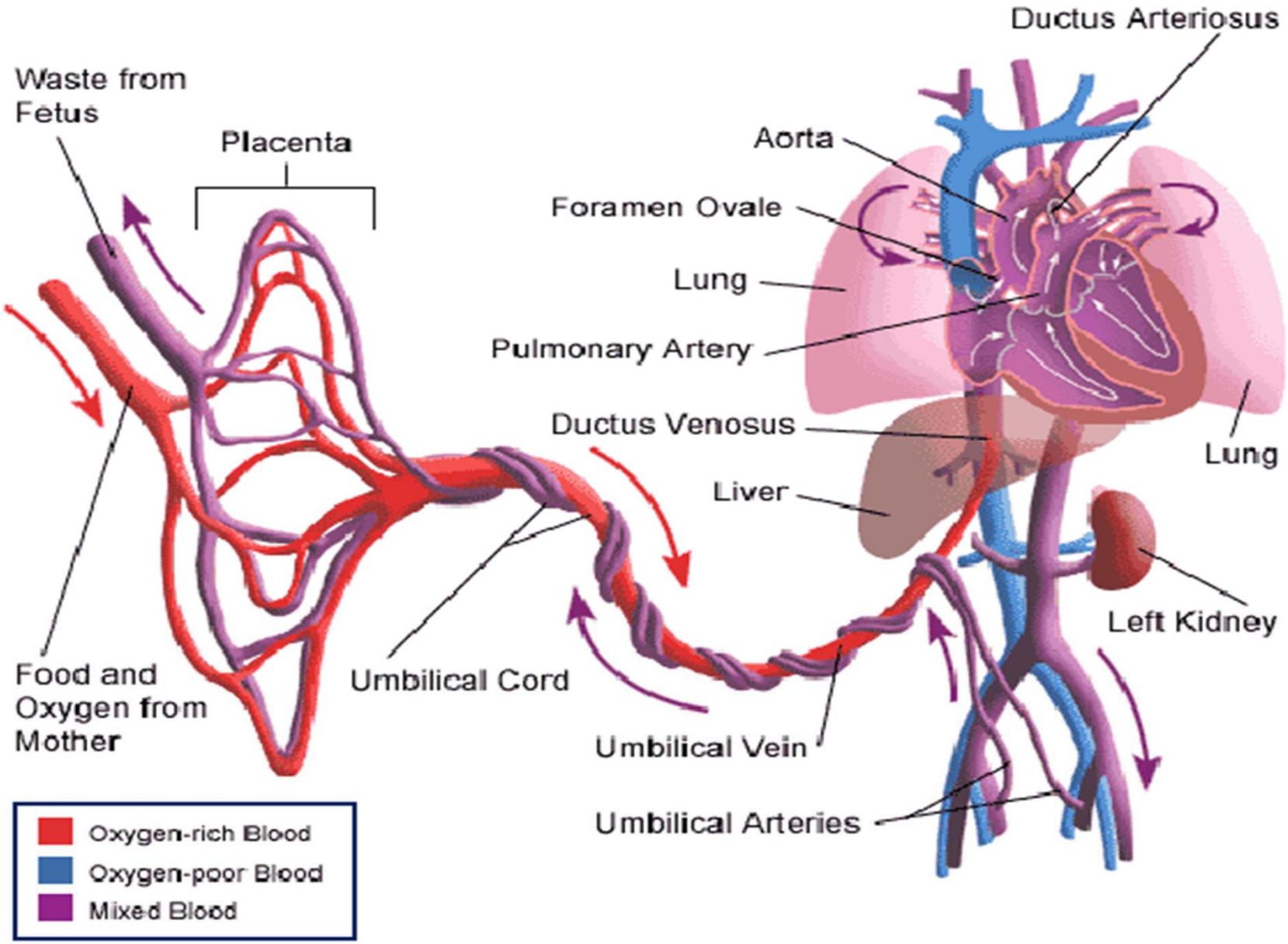
NORMAL HEART



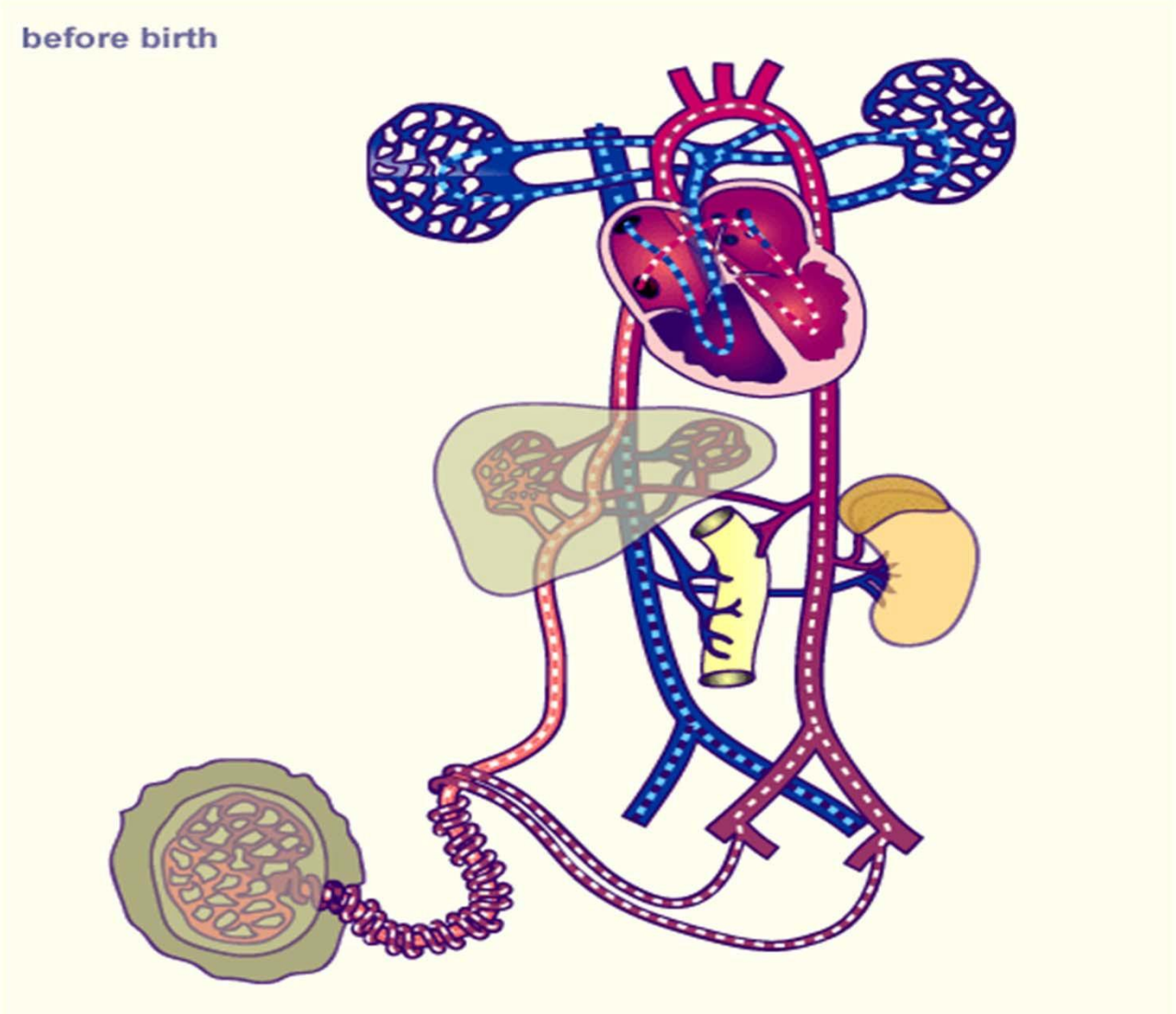
Blood flow through the normal heart



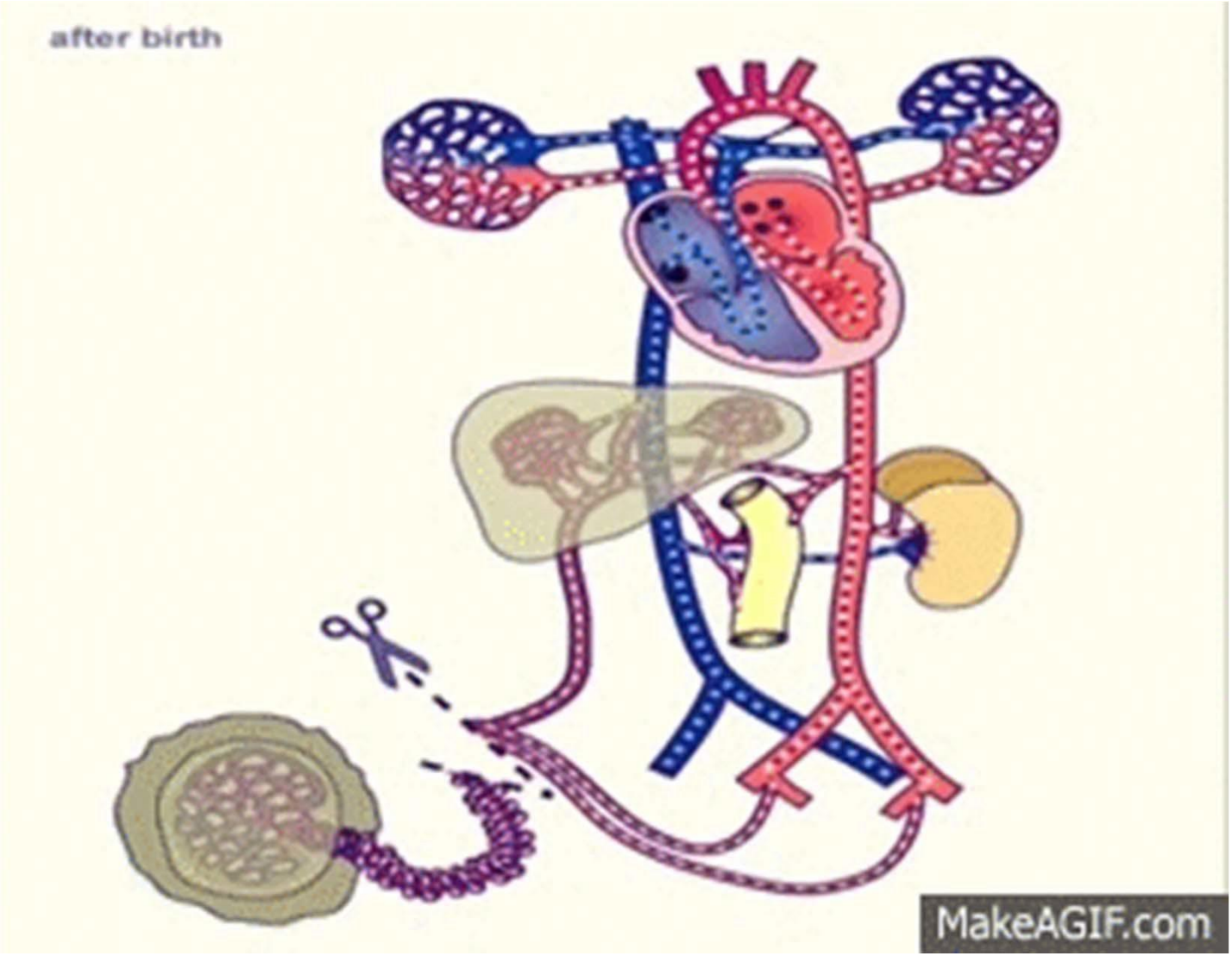
Fetal Circulation



Fetal circulation



Circulation after birth



Fetal Circulation

- There are 4 shunts in fetal circulation:
- **Placenta**- Oxygen and nutrients from the mother's blood are transferred across the placenta to the fetus
- **Foramen ovale**- bypass the lungs and moves blood from the right atrium to the left atrium
- **Ductus arteriosus** - moves blood from the pulmonary artery to the aorta
- **Ductus venosus-** passes highly oxygenated blood through the liver to the inferior vena cava and then to the right atrium of the heart.

Fetal Circulation

- Oxygenated blood enters the fetus via the umbilical vein
- The blood bypasses the liver via the ductus venosus and mixes with deoxygented blood from the inferior and superior venacava
- The blood drains into right atrium
- Blood is shunted from the right to left atrium via the foramen ovale due to difference in pressure

Fetal Circulation

- Most of the blood flows into the left atrium via the foramen ovale
- Blood in the left atrium flows to the left ventricle then to the aorta and the rest of the body
- Some blood flows from the right atrium to the right ventricle
- From right ventricle to the pulmonary artery where it is shunted away from the lungs by the ductus arteriosus into the aorta
- Deoxygenated blood flows back to the mother via the umbilical arteries

CARDIOPULMONARY CHANGES AT BIRTH

- Cessation of blood flow in the umbilical vein results in closure of the ductus venosus and becomes **ligamentum venosum**
- Right Atrial Pressure (RAP) pressure falls as a result of closure of the ductus venosus
- Closure of the foramen ovale is as a result of ↑ Left Atrial Pressure (LAP) in excess of Right Atrial Pressure (RAP) and becomes **fossa ovalis**

CARDIOPULMONARY CHANGES AT BIRTH

- Ductus arteriosus closure is due to ↑ arterial oxygen saturation which decreases prostaglandins circulation
- The ductus arteriosus becomes the **ligamentum arteriosum**

Cardiac Defects

- Patent Ductus Arteriosus
- Atrial Septal Defect
- Ventricular Septal Defect
- Tetralogy of Fallot
- Transposition of the Great Arteries
- Coarctation of the Aorta
- Anomalous Venous Return
- Pulmonary stenosis
- Aortic stenosis

AETIOLOGY

- **Genetic causes**; interaction of several genes- Risk of recurrence if 1st degree relative is affected
- **Chromosomal abnormalities** e.g. Downs syndrome is associated with (AVSD) and Turners syndrome associated with coarctation of aorta
- **Environmental factors or adverse maternal conditions** e.g. Congenital rubella syndrome associated with PDA, drugs like lithium associated with pulmonary or aortic stenosis

Presenting complaints/signs

- Failure to thrive
- Exercise intolerance
- Easy fatigability
- Chest in drawing
- Sweating during feeding
- Bluish spells/Cyanosis
- Fever
- Fast breathing
- Oedema
- Hepatomegaly,
- spleenomegaly
- Clubbing
- Palpitation
- Convulsions

Classification of congenital heart disease

- **Congenital Heart diseases have 2 types:**
- Acyanotic congenital heart diseases (68%)
- Cyanotic congenital heart diseases (22%)

Acyanotic congenital heart diseases

- Occurs when blood flows from the left side of the heart to the right side of the heart due to a structural defect (hole) in the interventricular septum
- Patients retain normal levels of oxyhemoglobin saturation in systemic circulation hence acyanotic
- Also referred to as left to right shunting

Common Acyanotic lessions

- Ventricular septal defects (VSD)
- Atrial septal defects (ASD)
- Atrio-ventricular septal defects (AVSD)
- Patent ductus arteriosus (PDA)
- Pulmonary stenosis (PS)
- Aortic stenosis (AS)
- Coarctation of aorta

Common Cyanotic lessions

- Tetralogy of fallot (TOF)
- Tricuspid Atresia
- Transposition of great vessels
- Truncus arteriosus

ACYANOTIC CONDITIONS

Common Acyanotic lessions

- Ventricular septal defects (VSD)
- Atrial septal defects (ASD)
- Atrio-ventricular septal defects (AVSD)
- Patent ductus arteriosus (PDA)
- Pulmonary stenosis (PS)
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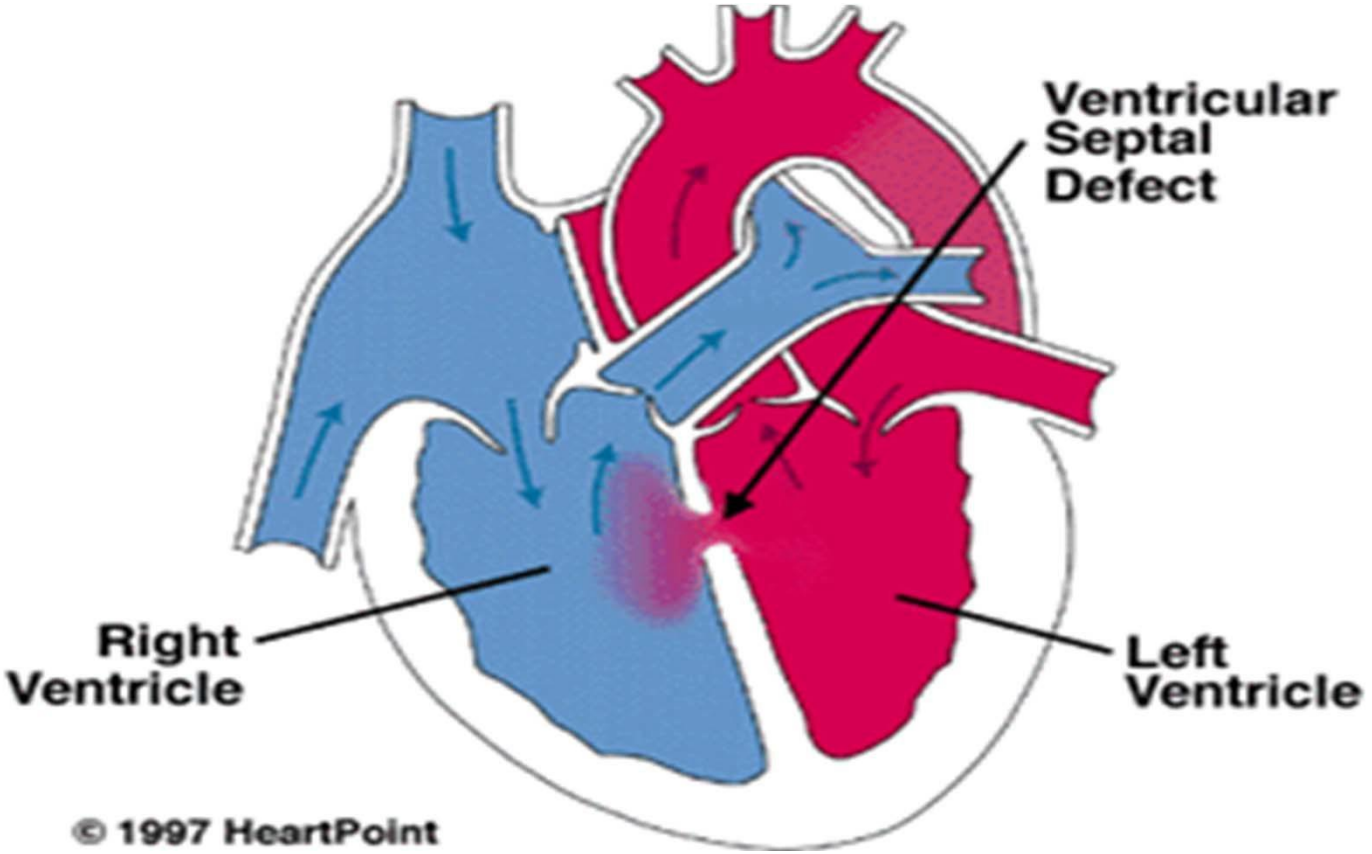
- Coarctation of aorta

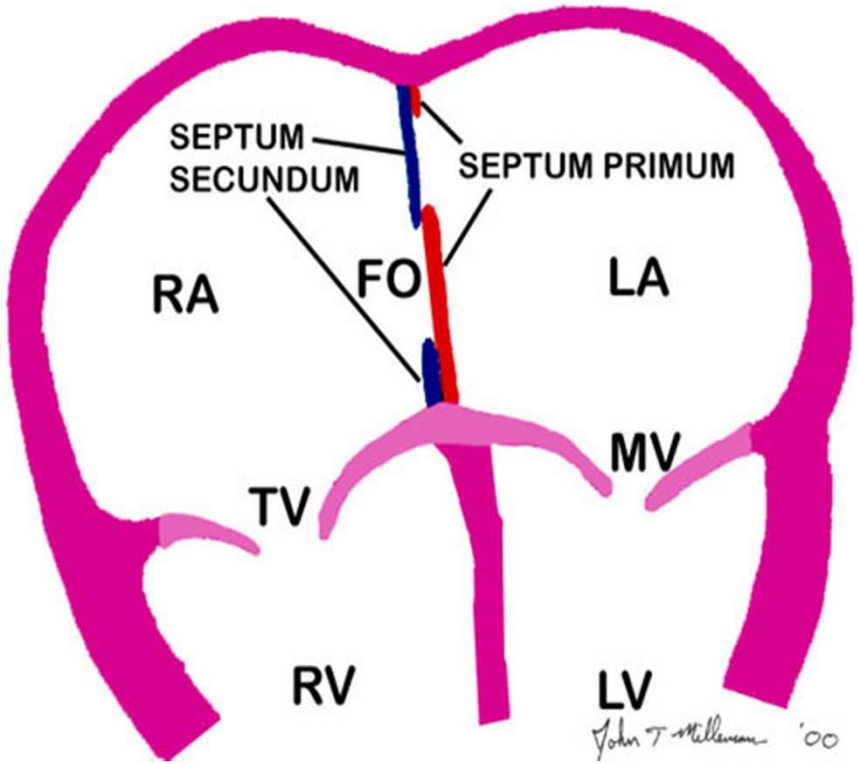
Ventricular Septal Defect

- **VSD** – is an abnormal opening in the ventricular septum, which allows free communication between the Rt & Lt ventricles



Atrial Septal Defect

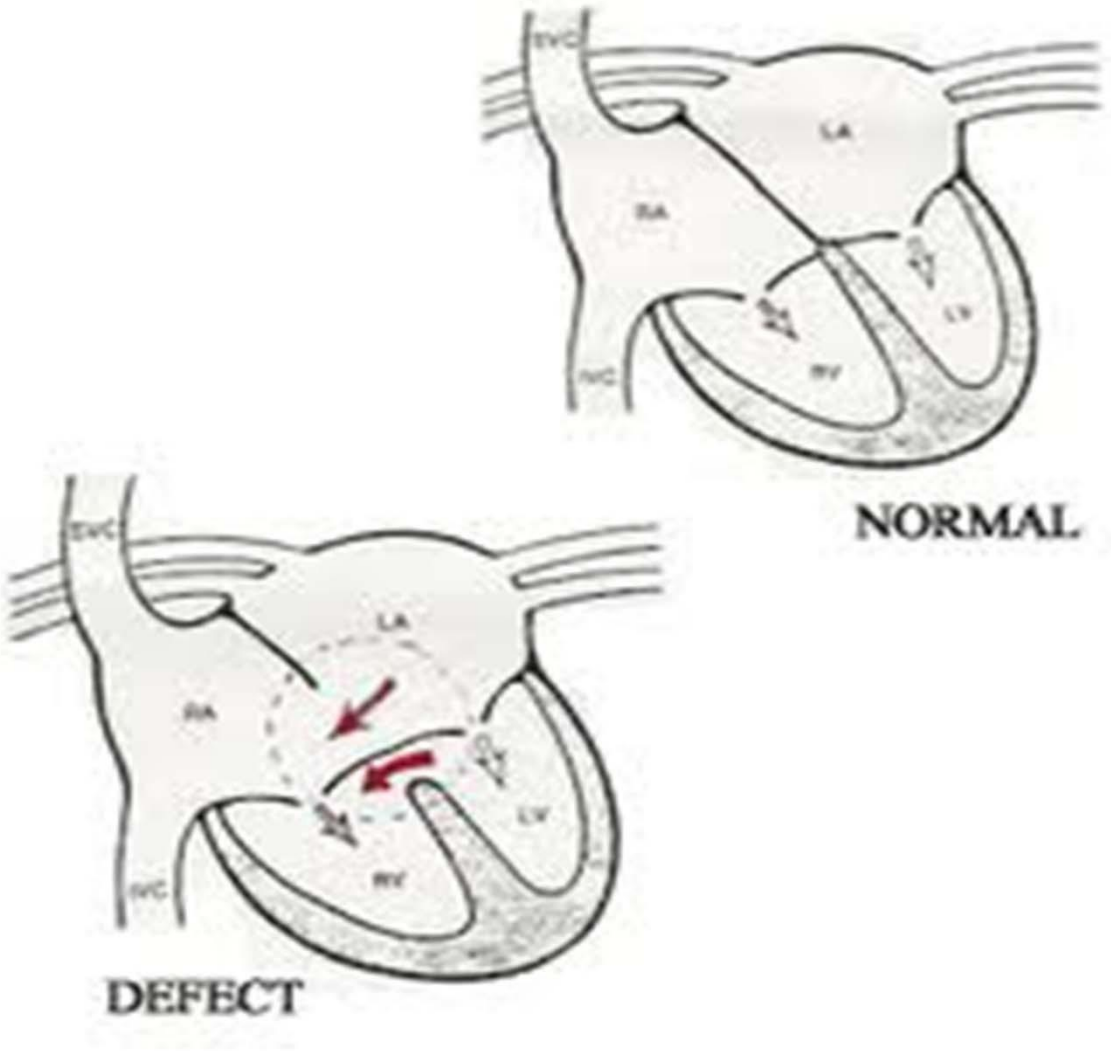
- **ASD** is an opening in the atrial septum permitting free communication of blood between the atria.



Atrioventricular Septal Defect

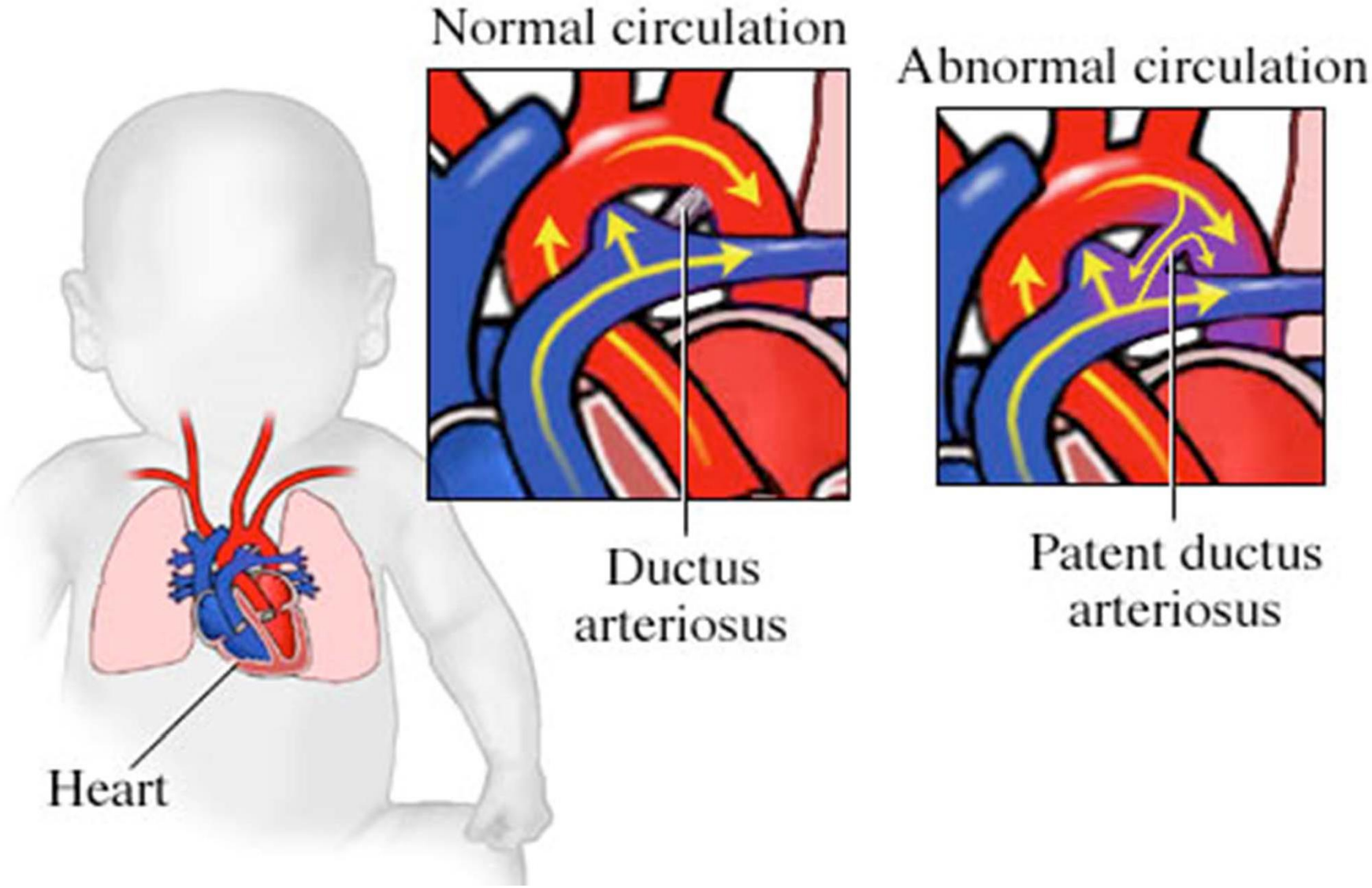
- It results from incomplete fusion of the endocardial cushions, which help to form atrial septum, the ventricular septum and the septal leaflets of the tricuspid and mitral valves
- Treatment is via surgery

Complete Atrioventricular septal defect

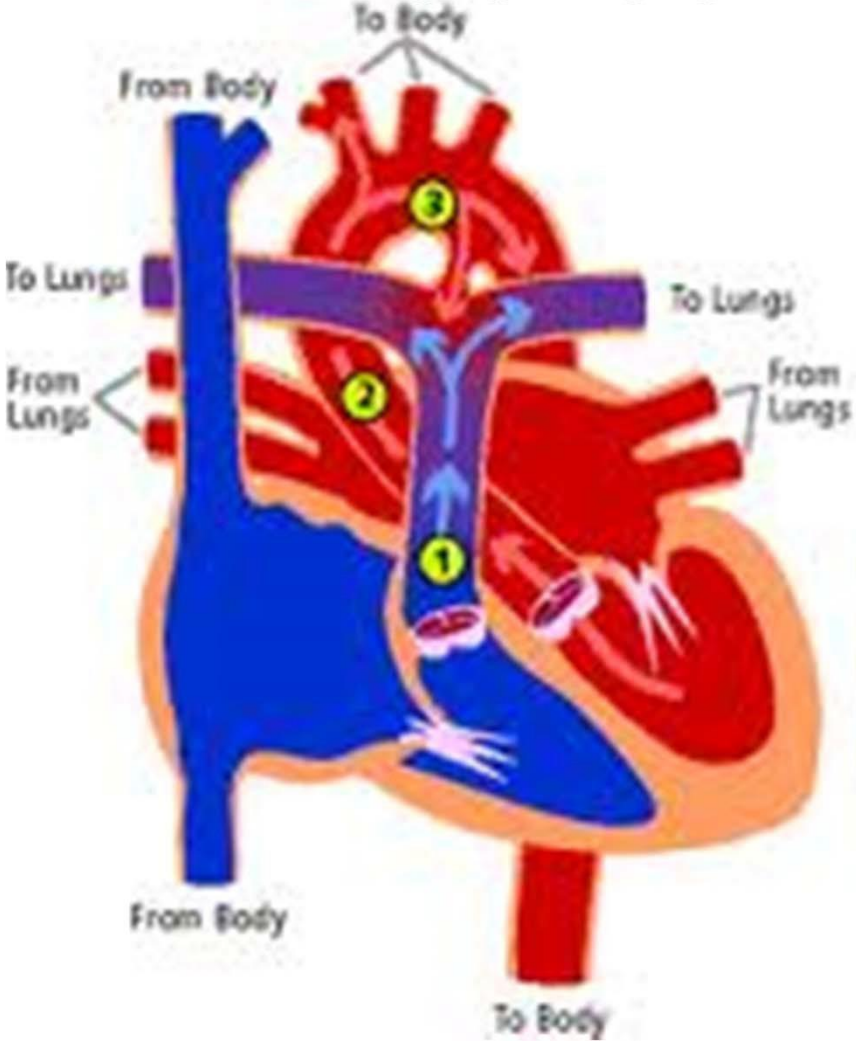


Patent Ductus Arteriosus

- Occurs due to persistence of the ductus arteriosus
- Normally closes in the 1st wk of life
- As a result of higher aortic pressure, blood shunts L to R through the ductus from Aorta to PA (pulmonary artery)


Normal circulation
Abnormal circulation
Ductus arteriosus
Patent ductus arteriosus
Heart

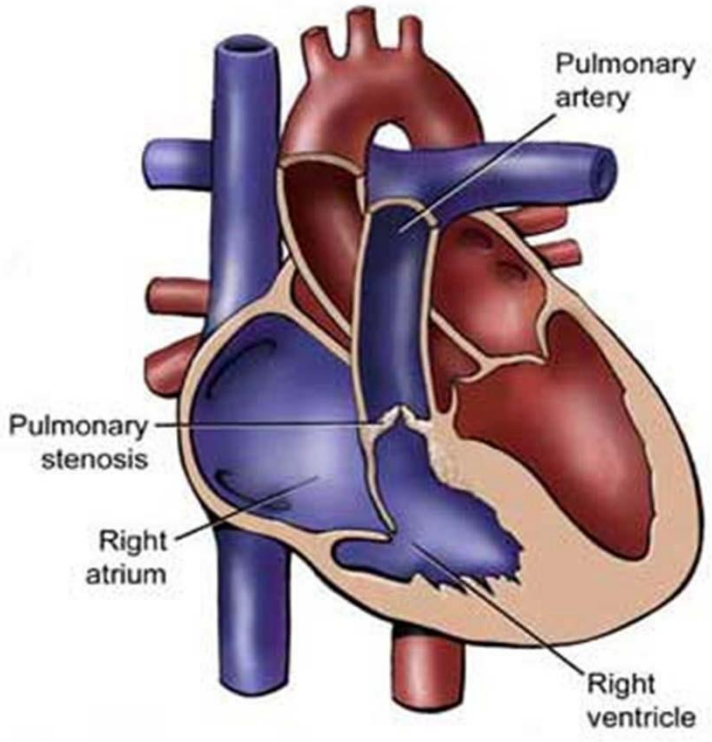
PATENT DUCTUS ARTERIOSUS



1	Pulmonary artery
2	Aorta
3	Patent (open) ductus arteriosis

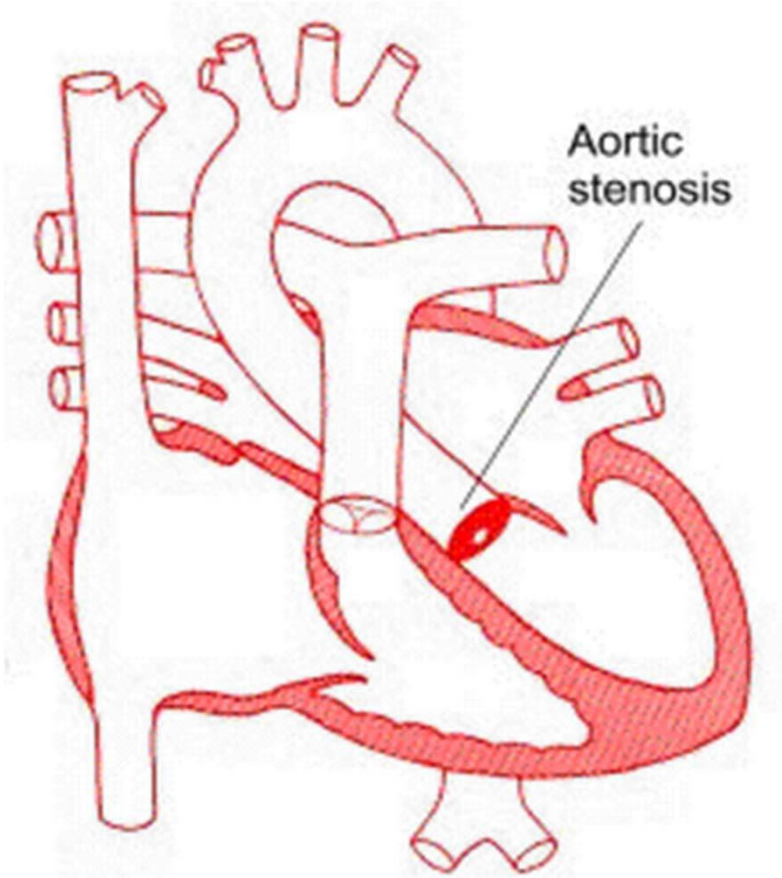
Pulmonary Stenosis

- Pulmonary Valve Stenosis is a rare acyanotic congenital heart defect that involves a defect in the pulmonary valve



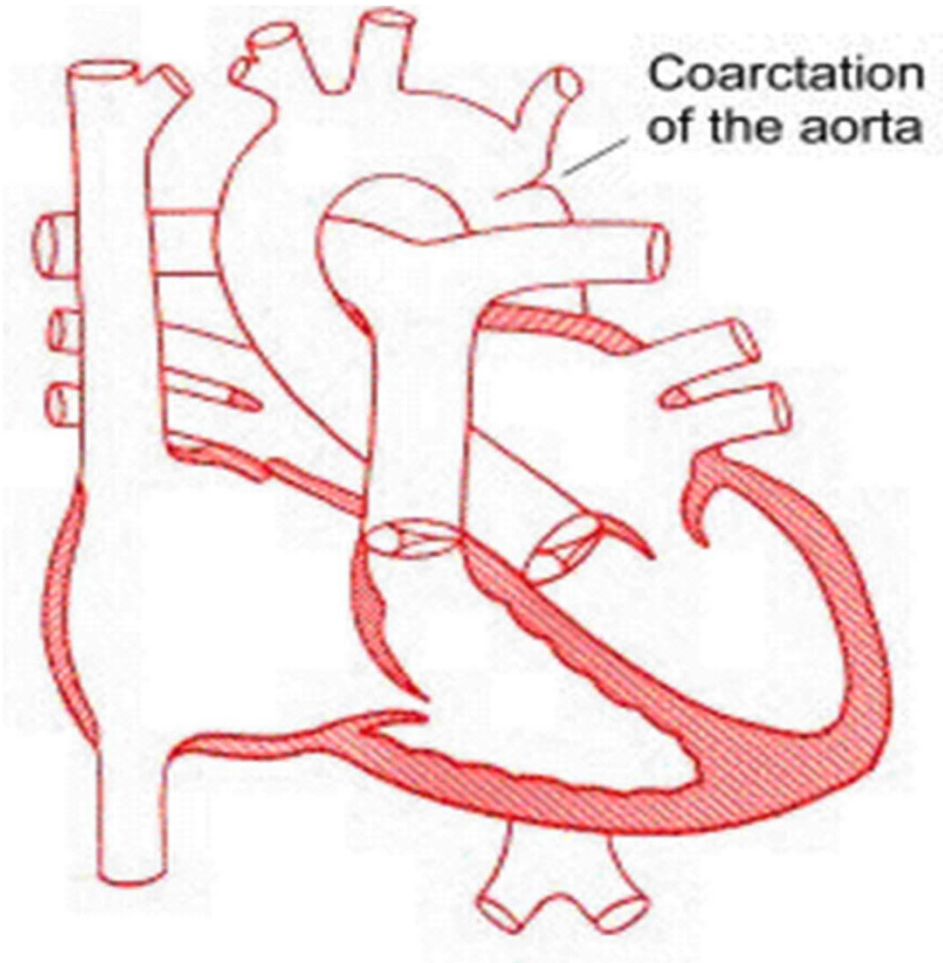
Aortic Stenosis

- Aortic Stenosis is an obstruction to the outflow from the left ventricle at or near the aortic valve



Coarctation of the Aorta

- Coarctation- refers to narrowing
- Coarctation of aorta is when a section of the aorta is narrowed to an abnormal width resulting in severely reduced blood flow



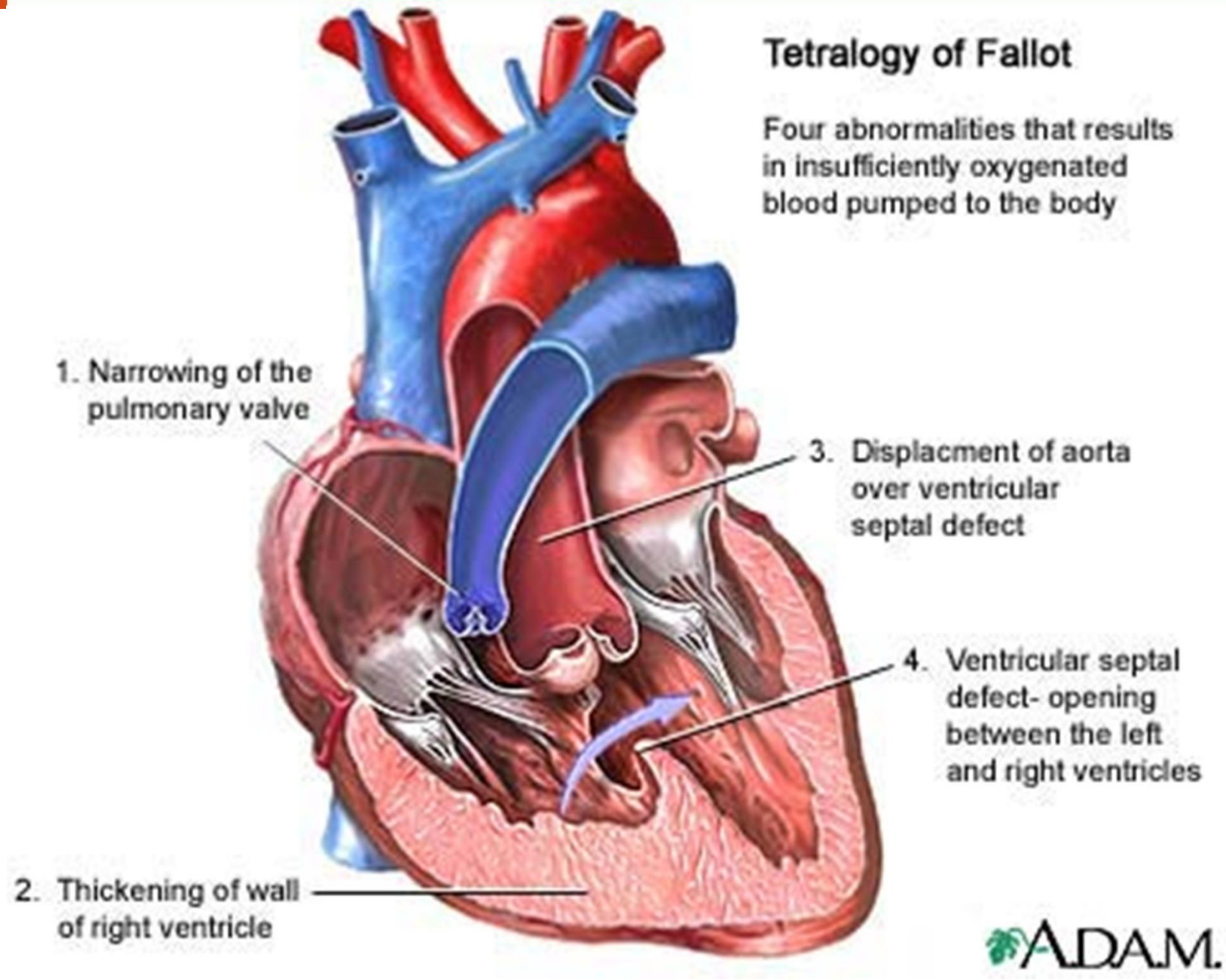
CYANOTIC CONDITIONS

Cyanotic congenital heart diseases

- Occurs when a mixture of oxygenated and deoxygenated blood enters the systemic circulation
- Common cyanotic conditions include:
- Tetralogy of fallot (TOF)
- Tricuspid Atresia
- Transposition of great vessels
- Truncus arteriosus

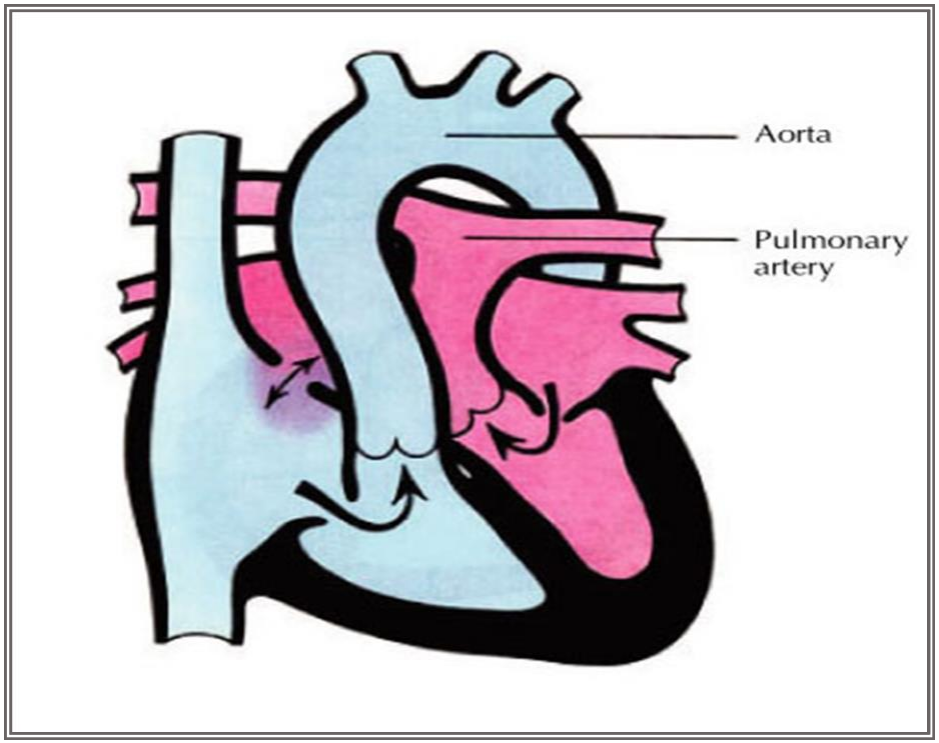
Tetralogy of Fallot

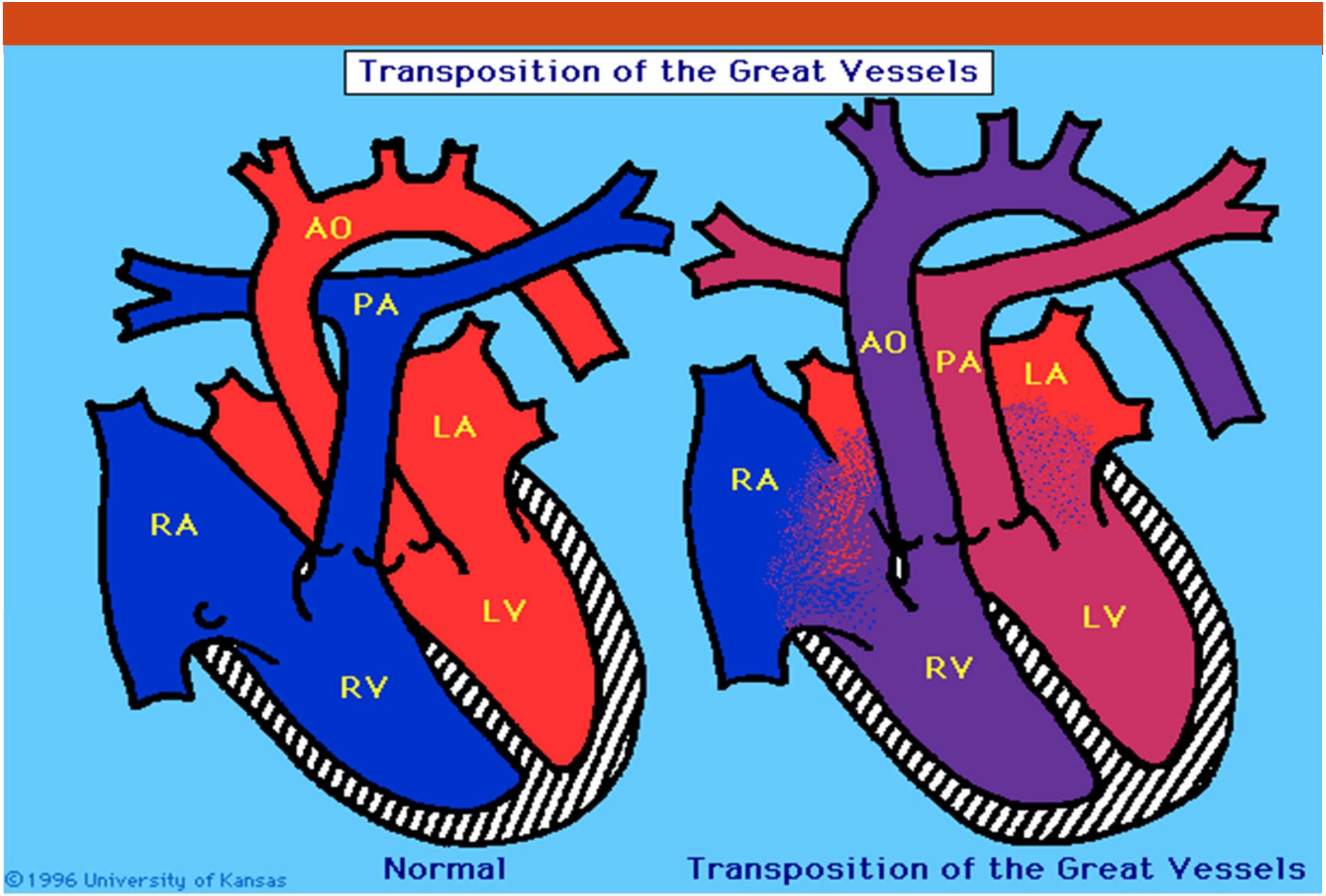
- TOF involves four heart malformations which present together:
  - Pulmonary stenosis
  - Overriding aorta (displacement of the aorta)
  - VSD (ventricular septal defect)
  - Right ventricular hypertrophy- The right ventricle is more muscular than normal to deal with the increased obstruction to the right outflow tract


Tetralogy of Fallot
Four abnormalities that results in insufficiently oxygenated blood pumped to the body
1. Narrowing of the pulmonary valve
3. Displacment of aorta over ventricular septal defect
4. Ventricular septal defect- opening between the left and right ventricles
2. Thickening of wall of right ventricle
A.D.A.M.

Transposition of the Great Arteries

- Aorta arises from RV and Pulmonary Arteries from LV
- Without an abnormality, life would not be possible
  - ASD
  - VSD
  - PDA




Transposition of the Great Vessels
AO
PA
LA
RA
LV
RV
AO
PA
LA
RA
LV
RV
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Normal
Transposition of the Great Vessels

TOTAL ANOMALOUS PULMONARY VENOUS RETURN (TAPVR)

Anomalous Venous Return

- All four pulmonary veins drain to the right side.
- Return of pulmonary venous blood to the right atrium instead of the left
- ASD is present to sustain life
- Surgical correction is via re-implantation of pulmonary veins

Summary

- **Described the congenital anomalies**:
- Patent Ductus Arteriosus
- Atrial Septal Defect
- Ventricular Septal Defect
- Tetralogy of Fallot
- Transposition of the Great Arteries
- Coarctation of the Aorta
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