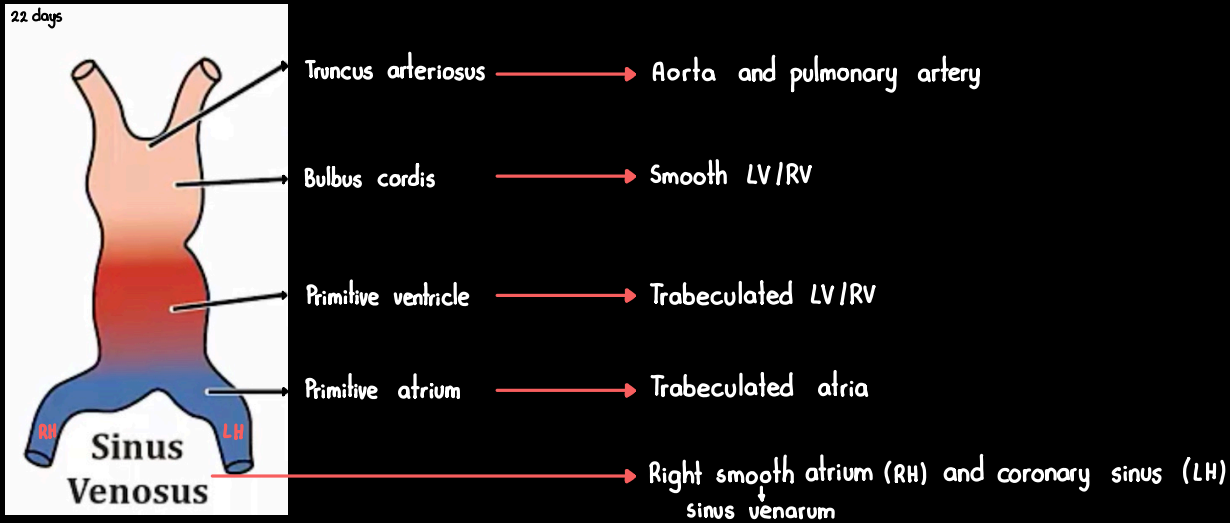
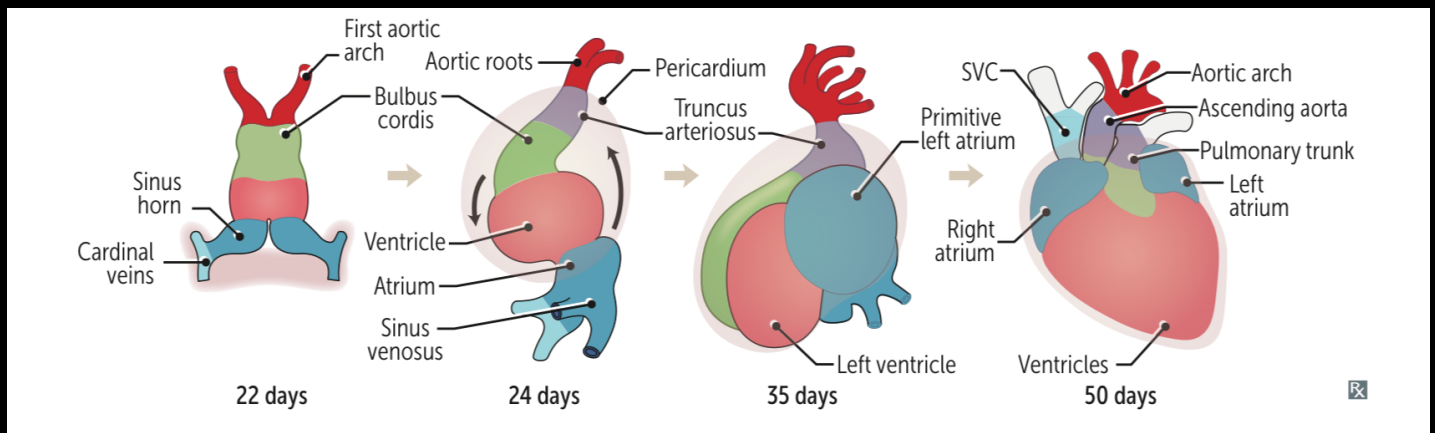


# Cardiac embryology

- First functional organ (beats by week 4)

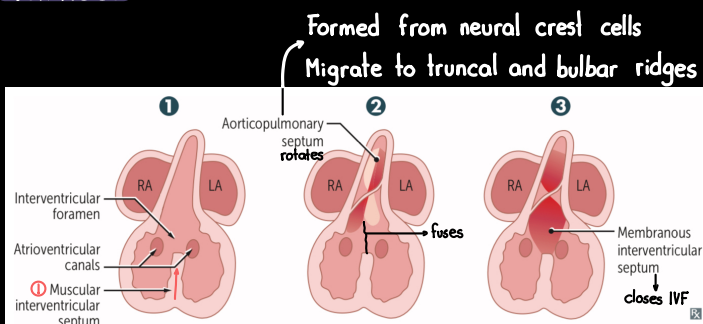


- Right common and anterior cardinal veins → SVC
- Posterior, subcardinal, supracardinal veins → IVC
- Endocardial cushion → Atrial septum, membranous interventricular septum, valves
- Primitive pulmonary vein → Smooth part LA



- Looping (4th week) → establishes left-right orientation
  - Requires cilia and dynein
  - Dextrocardia seen in Kartagener (primary ciliary dyskinesia)

## Ventricles



→ Opening: interventricular foramen

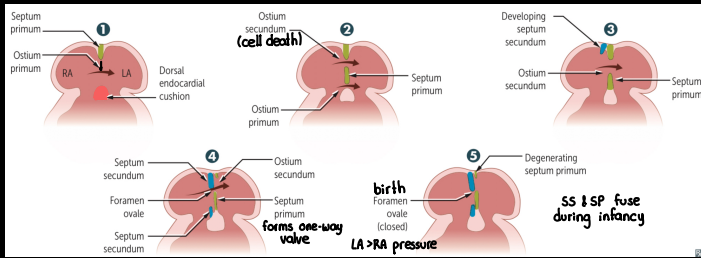
- ④ Growth of endocardial cushions
  - Separate atria from ventricles
  - Contributes to atria septation and MIVS
  - Contributes to valves
- Defects common in Down syndrome

Ventricular septal defect  
most common congenital anomaly  
Usually in MIVS

Conotruncal abnormalities associated with failure of neural crest cells to migrate:

- Transposition of great vessels. (failure to spiral)
- Tetralogy of Fallot. (Skewed septum development)
- Persistent truncus arteriosus. (Partial/incomplete septum development)

## Atria

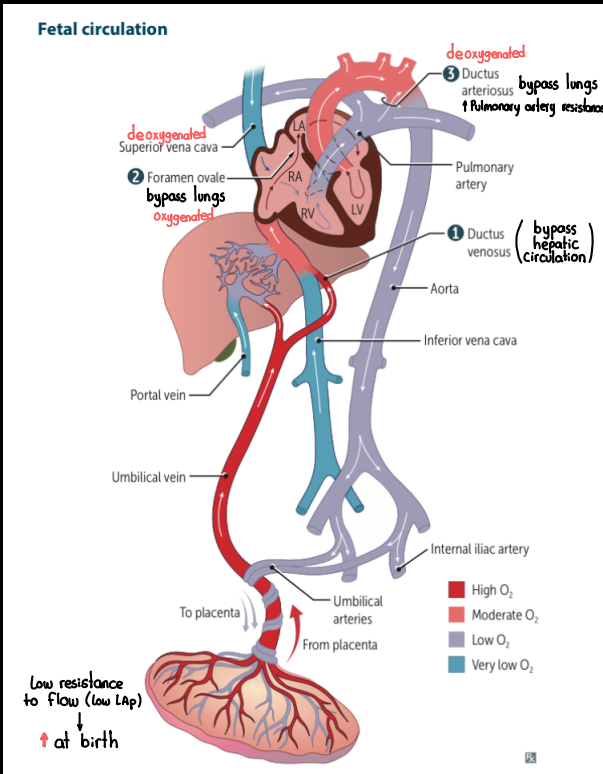


Patent foramen ovale (25% adults)

- Failure of SP + SS to fuse
- Can lead paradoxical emboli (R-L shunt)

## Valves

- Aortic/pulmonary - From endocardial cushions of outflow tract
- Mitral/tricuspid - From fused endocardial cushions on AV canal
- Anomalies: stenosis, regurgitation, atresia, displaced (Ebstein)



- High resistance to flow in lungs
- Umbilical vein:  $PO_2 \approx 30 \text{ mmHg}$ ;  $SatO_2 \approx 80\%$  (HbF)
- Umbilical arteries low  $O_2$  sat

## Birth

- Pulmonary resistance ↓
- LA pressure > RA pressure
- Foramen ovale closes (fossa ovalis)
- Ductus arteriosus closes
  - ↑ $O_2$ ; ↓ PG (loss of placenta)
  - Indomethacin closes patent ductus arteriosum
  - Prostaglandin E<sub>1</sub>/E<sub>2</sub> keep PDA open

### Fetal-postnatal derivatives

FETAL STRUCTURE	POSTNATAL DERIVATIVE	NOTES
Ductus arteriosus	Ligamentum arteriosum	Near the left recurrent laryngeal nerve
Ductus venosus	Ligamentum venosum	
Foramen ovale	Fossa ovalis	
Allantois → urachus	Median umbilical ligament	Urachus is part of allantois between bladder and umbilicus
Umbilical arteries	Medial umbilical ligaments	
Umbilical vein	Ligamentum teres hepatis (round ligament)	Contained in falciform ligament

### Aortic arch derivatives

Develop into arterial system.

- 1st** Part of maxillary artery (branch of external carotid). 1st arch is maximal.
- 2nd** Stapedial artery and hyoid artery. Second = stapedial.
- 3rd** Common carotid artery and proximal part of internal carotid artery. C is 3rd letter of alphabet.
- 4th** On left, aortic arch; on right, proximal part of right subclavian artery. 4th arch (4 limbs) = systemic.
- 6th** Proximal part of pulmonary arteries and (on left only) ductus arteriosus. 6th arch = pulmonary and the pulmonary-to-systemic shunt (ductus arteriosus).

