

- L 50: Development of Heart I
- Dr. Mohammad Rehan Asad
- ***By the end of this session, the student should be able to:***
 - Describe formation and position of the heart tube.
 - Discuss formation of cardiac loop.
 - Discuss formation of sinus venosus.
 - Correlate this knowledge to clinical conditions.
- Primary Heart field
 - Progenitor heart cells lies in epiblast
 - Primary heart field appears cranial to neural folds from PHCs
 - PHF give rise to atria, left ventricle and all most all of right ventricle
 - PHF appears around 16-18 days
- Secondary Heart field
 - Rest of right ventricle and out flow tract (conus cordis and truncus arteriosus) derives from SHF.

- PHF induce pharyngeal endoderm to form cardiac myoblast and blood islands
- They will unite to form horse shoe shaped endothelial tube surrounded by myoblast.
- Formation of heart tube
- In early days, cardiogenic area is ant. to oropharyngeal membrane and neural plate.
- With rapid growth of brain and cephalic folding, the heart and pericardial cavity move to cervical region and then in thorax.
- Caudal region of the paired heart tube merge
- Central part of the tube forms
- Formation of heart tube
- Heart become continuous tube, lined by endothelial layer and outer myocardial layer

- Receives venous drainage at caudal pole.
- Starts pumping blood from first aortic arch in dorsal aorta

- Formation of heart tube
- Heart tube bulge in pericardial cavity
- Dorsal mesocardium breaks to form the cavity
- It will form future transverse pericardial sinus.

- Layers of heart tube
- Three layers appears in the heart tube
- Endocardium forming internal endothelial lining
- Myocardium forming muscle wall
- Epicardium or visceral pericardium: responsible for the formation of coronary arteries
- Formation of the heart tube

- Heart tube elongates with addition of cells from secondary heart field to cranial end
 - This elongation is necessary for the formation of right ventricle and outflow tract region (conus cordis and truncus arteriosus)
 - Formation of the cardiac loop
 - Cardiac tube starts bending on 23rd day
 - Cephalic portion of tube bends ventrally and caudally to the right
 - Atrial portion shift dorsocranially and to the left
 - Leads to the formation of cardiac loop
 - Completed by 28 days
-
- Formation of the cardiac loop
 - Atrial portion get merged in pericardial activity

- Atrioventricular canal connects common atrium and embryonic ventricle
- The proximal one third of bulbus cordis will form trabeculated portion of right ventricle
- The mid portion, conus cordis forms outflow tract of both ventricles
- The distal part of bulbus will form roots and proximal part of aorta and pulmonary trunk.
- Formation of the cardiac loop
- Primitive trabecule appears proximal and distal to the primary interventricular foramen
- Primitive ventricle form left ventricle
- Trabeculated proximal one third of the bulbus cordis forms primitive right ventricle
- Conotruncal portion on each side of bulbus cordis give rise to atrium
- Development of sinus venosus

- During middle of 4th week, sinus venosus receive blood from right and left sinus horns
- Each horn receive blood from vitelline vein, umbilical vein and common cardinal vein
- During 5th wks, RUV and LVV obliterates.
- LCCV obliterates at 10th wks
- Oblique vein of left atrium and coronary sinus is left on left sinus horn
- Development of sinus venosus
- Right horn get incorporated in right atrium
- Its entrance sinuatrial orifice is bounded by right and left venous valves
- Septum spurium
- Inf. Part of right venous valve develops in valve of inf. Vena cava, valve of coronary sinus

- Crista terminalis form demarcating line between smooth and trabeculated part of right atrium
- Clinical correlation
- Abnormalities in cardiac looping:
- Dextrocardia: presence of the heart on the right side
- Defect can happen either during gastrulation, or during cardiac looping.
- Dextrocardia with situs inversus

- References
- **Langman's Medical Embryology: T.W. Sadler, 12th ed., CH. 13, P. 164-171.**