* 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: resonsible 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 trunucus 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.**