

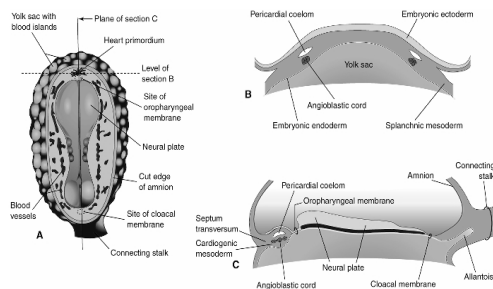
Heart and Circulatory System I

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Outline

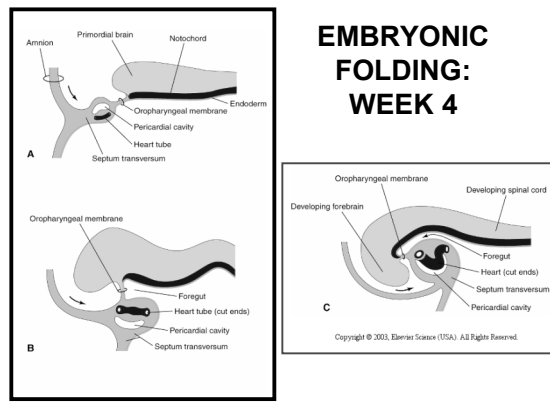
- Vasculogenesis
- Embryonic Folding
- Formation of the Primary Heart Tube
- Looping
- Atrial Septation
- Primitive Ventricular Septum
- Atrioventricular Canal/Endocardial Cushions
- Conotruncal Septation
- Ventricular septation
- Congenital Heart Defects

CARDIOVASCULAR SYSTEM: EARLY DEVELOPMENT: WEEK 3



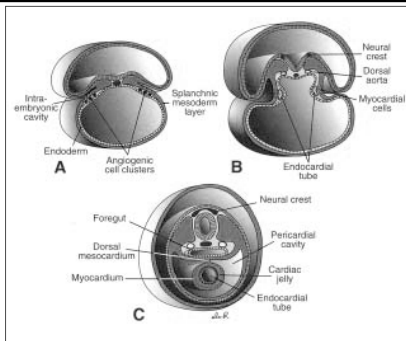
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EMBRYONIC FOLDING: WEEK 4

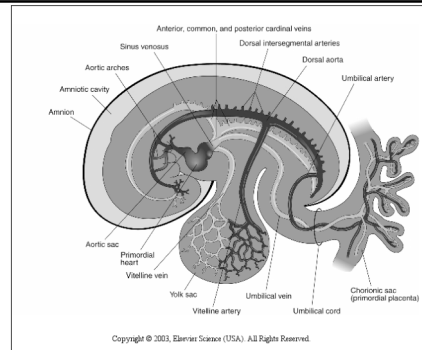


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Formation of Heart Tube (17-22 days)

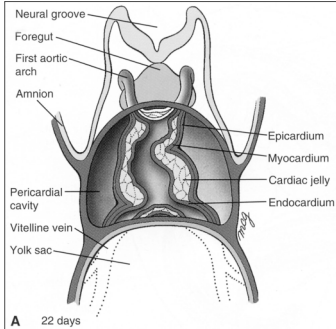


Heart Development: 26 days



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PRIMITIVE HEART TUBE: WEEK 4



Cardiac Loop (8-16 somites)

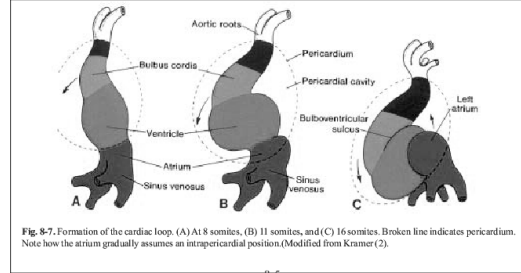
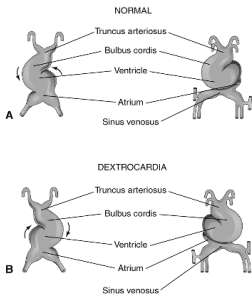


Fig. 3-7. Formation of the cardiac loop. (A) At 8 somites, (B) 11 somites, and (C) 16 somites. Broken line indicates pericardium. Note how the atrium gradually assumes an intrapericardial position. (Modified from Kramer (2).)

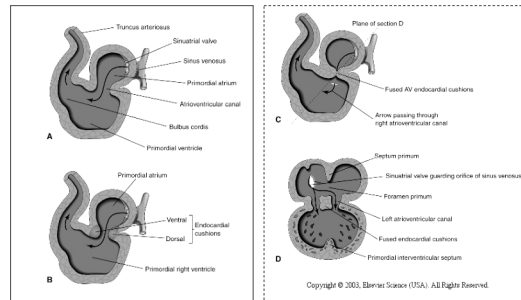
VENTRICULAR LOOPING END WEEK 4



NORMAL : Loop to the RIGHT: Levocardia!

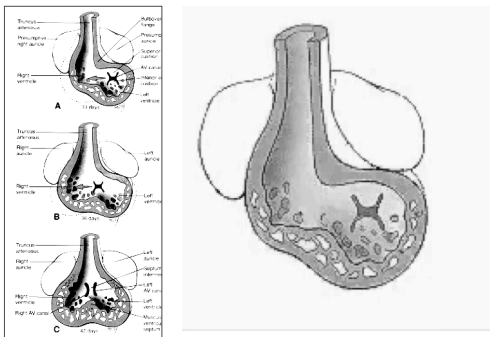
ABNORMAL: Loop to the LEFT: Dextrocardia!

FROM TUBE TO FOUR CHAMBERS INTERNAL VIEW

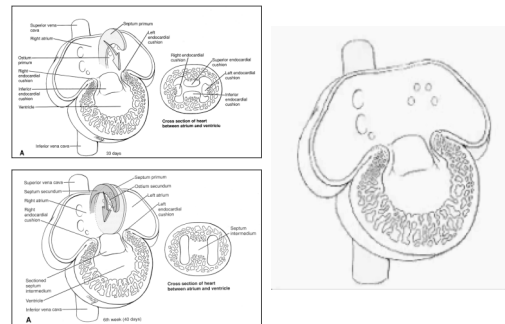


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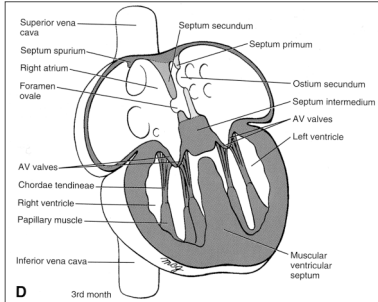
Formation of Primitive Ventricles



Atrial Septation: 3 Septums Primum, Secundum, Intermedium



Endocardial Cushion: 80 days



Endocardial Cushions

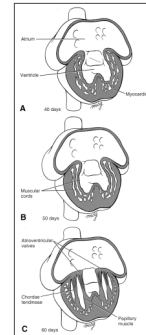
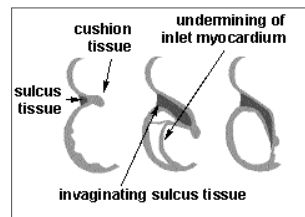
- **Atrioventricular Canal: Divide between the atria and ventricles**
- **Endocardial Cushions: Four tissue expansions found in periphery of AV canal**
 - Atrial septation
 - Atrioventricular valve formation: Mitral and Tricuspid Valves
 - Ventricular septation

Endocardial Cushions

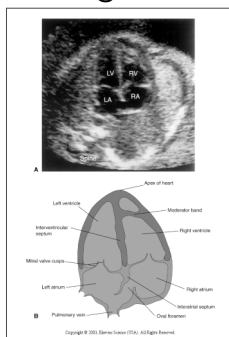
- **Superior-Inferior cushions**
 - Septum Intermedium
 - Inferior atrial septum
 - Posterior/superior ventricular septum
- **Right and Left Cushions**
 - Ventricular myocardium
 - Mitral valve
 - Tricuspid valve

Atrioventricular Valve Formation

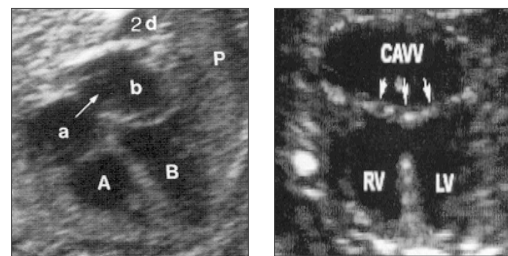
- **Left and Right Endocardial Cushions**



FOUR CHAMBERS- ULTRASOUND VIEW @ 20 wks



Congenital Heart Defect: Endocardial Cushion Defect



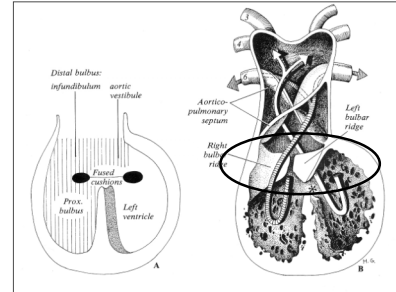
Normal

Endocardial Cushion Defect

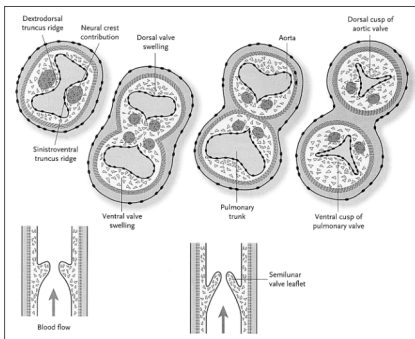
Ventricular Outflow Tracts and Great Arteries

- **Truncus Arteriosus:** common arterial trunk from the primitive ventricle
- **Conus (Bulbus) Cordis:** outflow portion of the primitive ventricle
- **Bulbar Ridges:** Tissue ridges at junction of the conus and truncus
 - Conotruncal septum
 - Semi-lunar valves (aortic and pulmonic)
- **Truncal Ridges:** Within Truncus
 - Septation of the Aorta and Pulmonary arteries

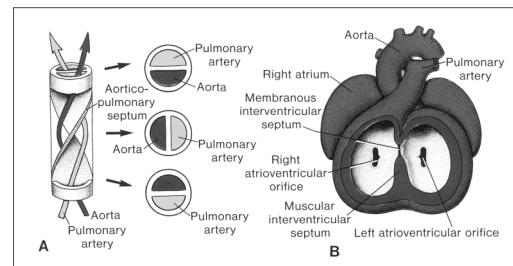
Formation of the Conotruncal Septum



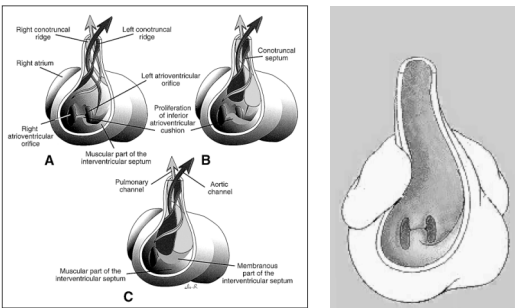
Semilunar Valve Formation



Formation of the Aorta and Pulmonary Artery



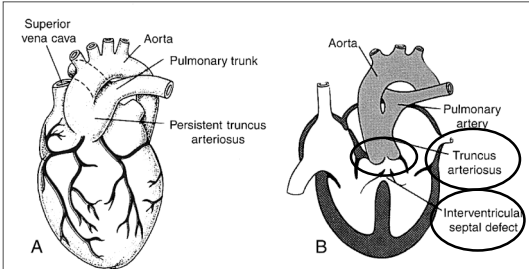
Conotruncal Formation



Defects of Conotruncal Septation

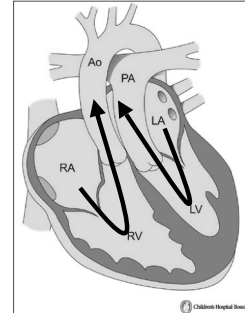
- **Persistent Truncus Arteriosus**
 - Failure of conotruncal septation
- **Transposition of the Great Arteries**
 - Failure of helical twisting during truncal septation
- **Tetralogy of Fallot**
 - Malalignment of conoventricular septum

Persistent Truncus Arteriosus

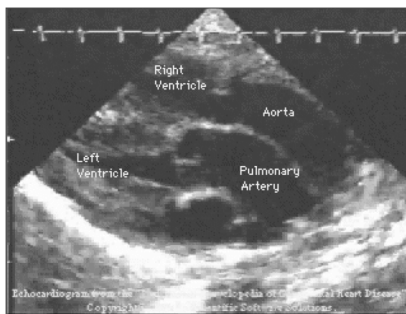


Transposition of the Great Arteries

- Failure of helical twisting during truncal septation
- Aorta arises from RV
- Pulmonary artery arises from LV
- VSD in 20% of cases

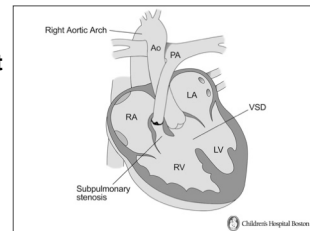


Transposition of the Great Arteries



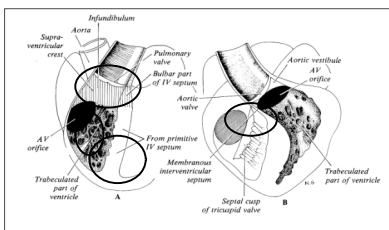
Tetralogy of Fallot

- Malalignment of conoventricular septum
1. Ventricular septal defect
 2. Aortic valve override
 3. Pulmonary stenosis
 4. Right ventricular hypertrophy

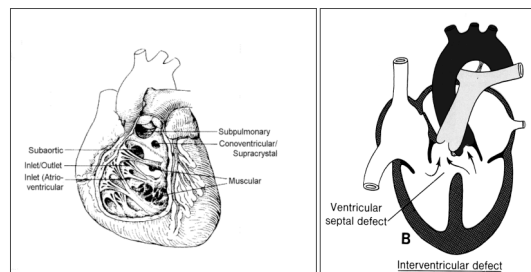


Ventricular Septum

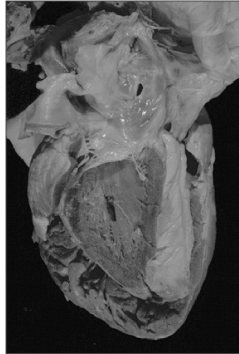
Primitive Septum **Conotruncus**
Endocardial Cushion **Membranous**



Ventricular Septal Defect (VSD)



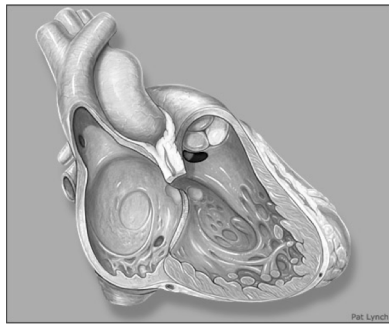
Muscular VSD



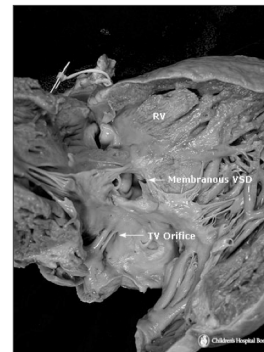
Endocardial Cushion (Inlet VSD)



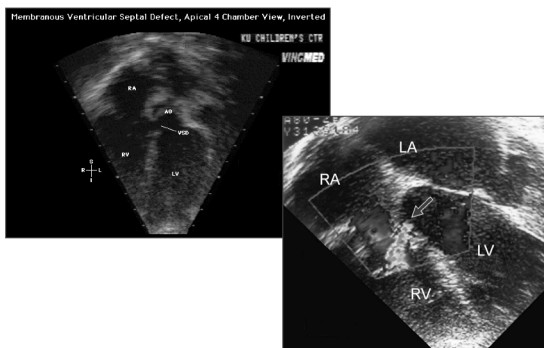
Supracristal VSD



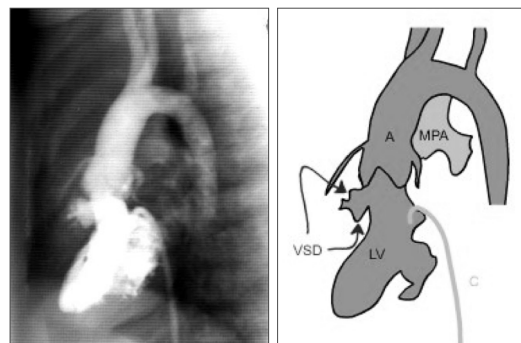
Membranous VSD



Echocardiogram: Membranous VSD



Angiogram: VSD



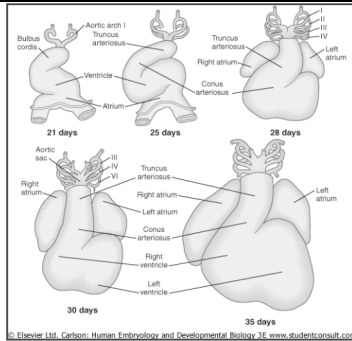
Heart Formation

- Heart structures form completely by week 12
- Week 3-4: Vitelline Stage
 - Heart tube forms
 - “Looping” occurs
 - Venous system starts to form
- Week 5
 - Placenta provides nutrients and liver takes of hematopoiesis

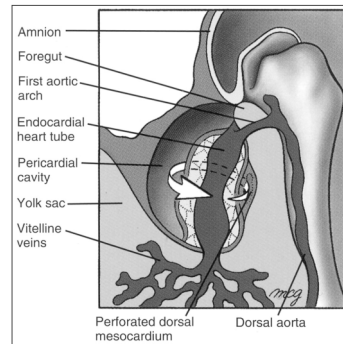
Heart Formation con't

- Weeks 5-8
 - SVC, IVC form
 - Right and Left Atrium divide
 - Ventricles start to form
 - Aorta and pulmonary arteries
- Weeks 8-12
 - Ventricles and mitral and tricuspid valves
 - Aorta and pulmonary artery, aortic arch
- Week 12: Fetal Circulation begins

From Primitive Heart Tube to Four Chambers: External View



HEART AND ITS NEIGHBORHOOD: WEEK 4



Multiple Defects: Bilateral Left-Sidedness

- Systemic Veins
 - Interrupted IVC
 - Bilateral SVC
- Common Atrium
- Common Ventricle
 - VSD: endocardial cushion
- Pulmonary veins:
 - Ipsilateral
- Pulmonary Stenosis

