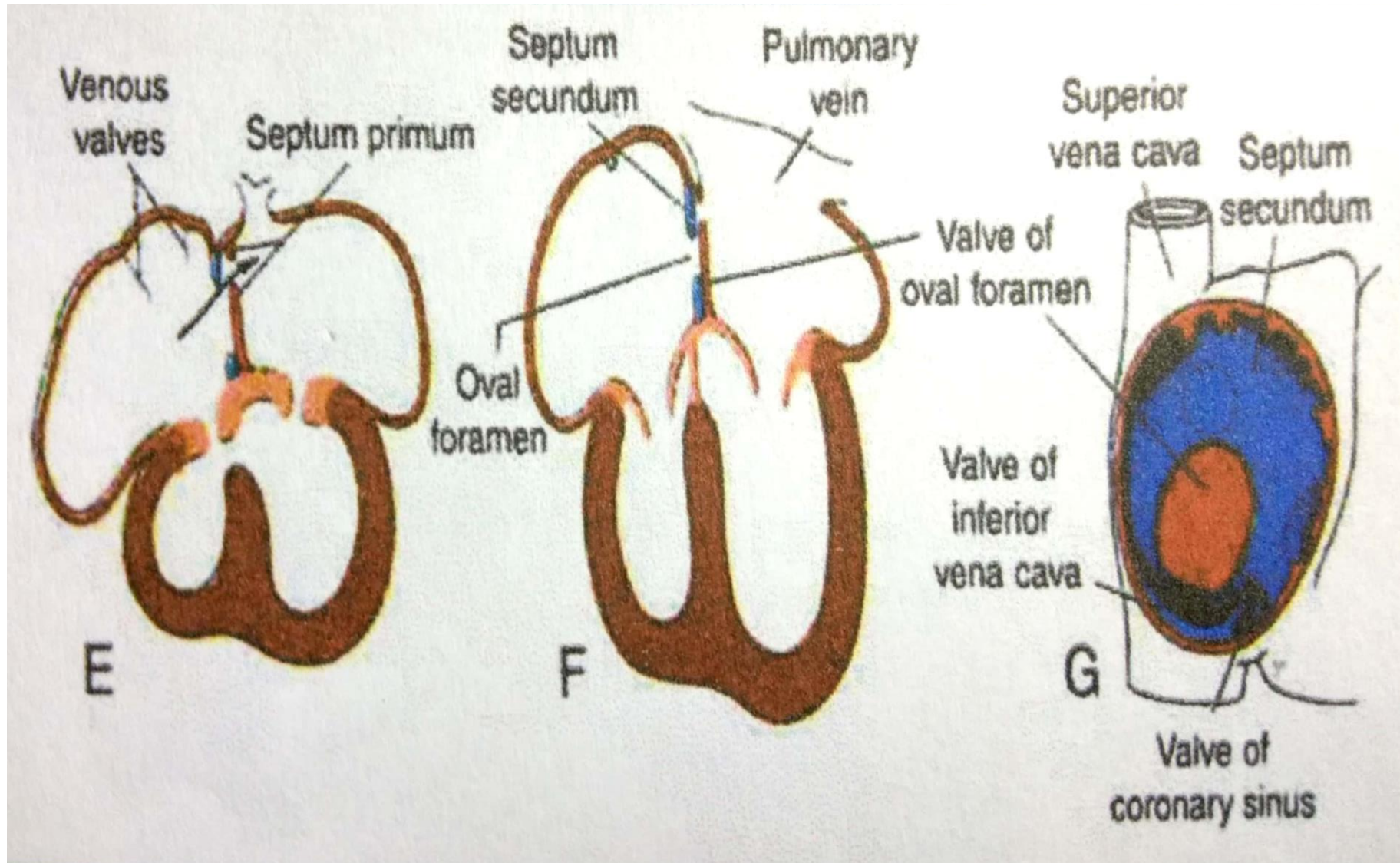


# Cardiovascular System 2

Development of sinus venosus  
Inter atrial septum formation  
Inter ventricular septum formation  
Clinical implications

# Atrial septum in 38 days embryo & new born



Superior vena cava

Aorta

Pulmonary artery

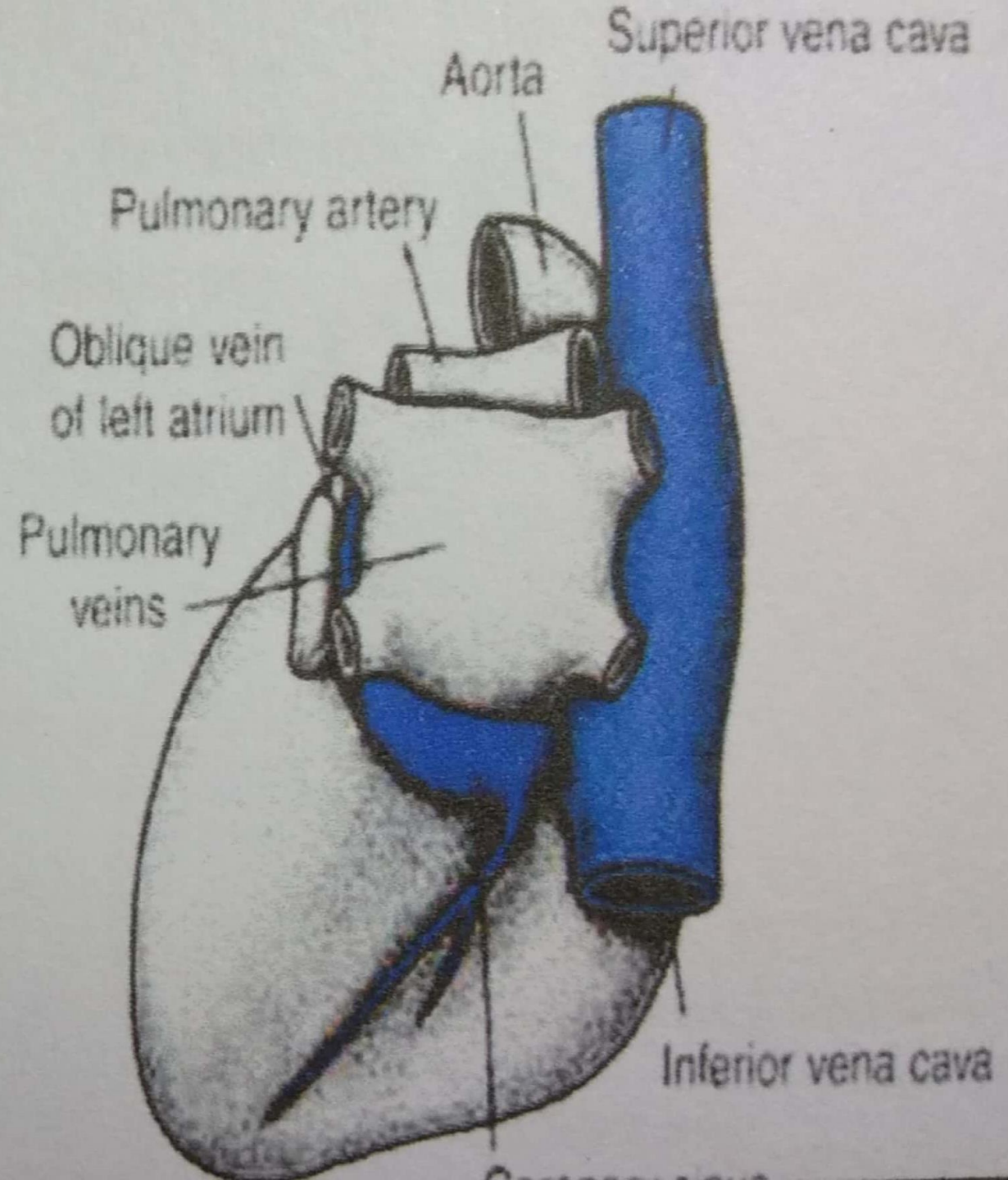
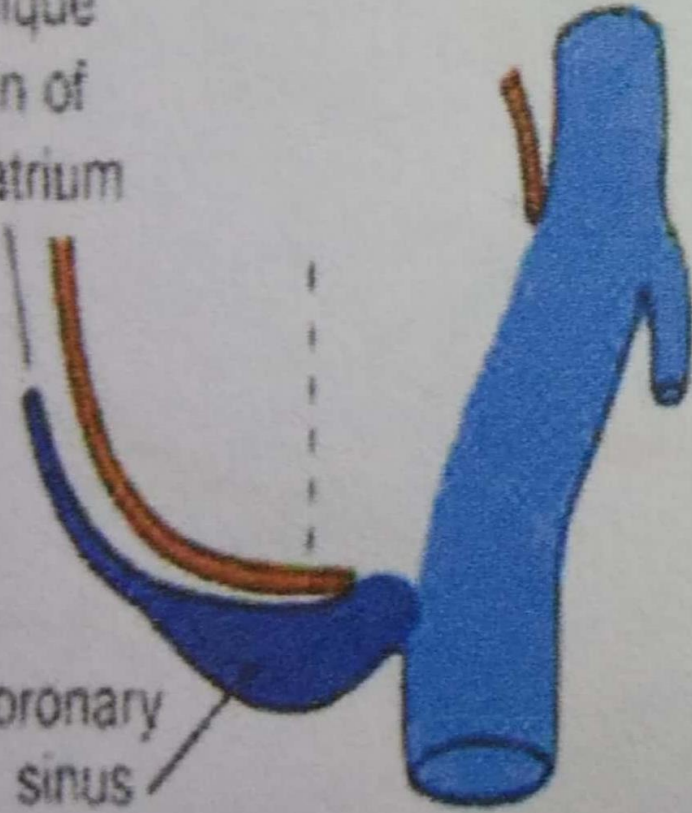
Oblique vein  
of left atrium

Pulmonary  
veins

Inferior vena cava

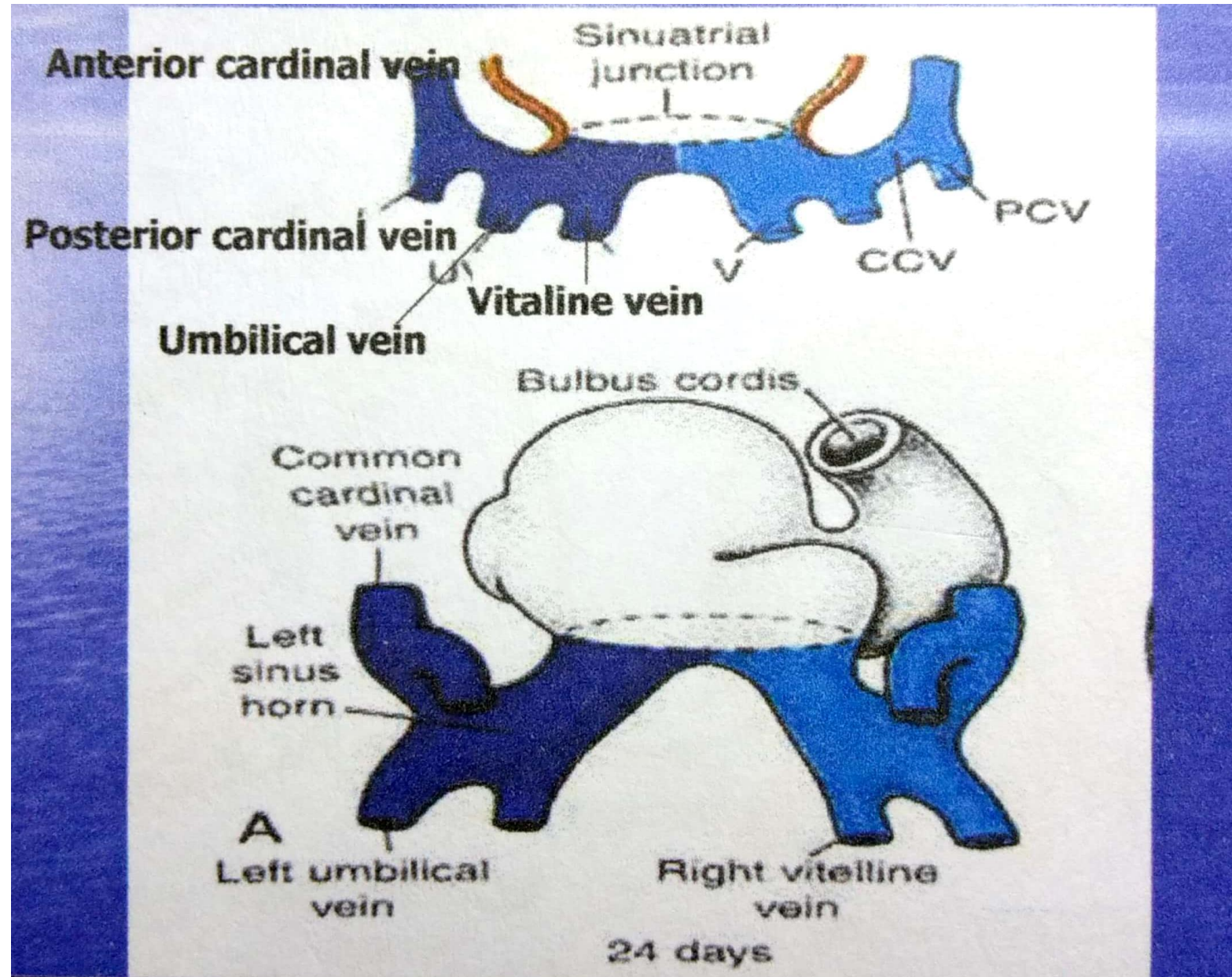
Oblique  
vein of  
left atrium

Coronary  
sinus





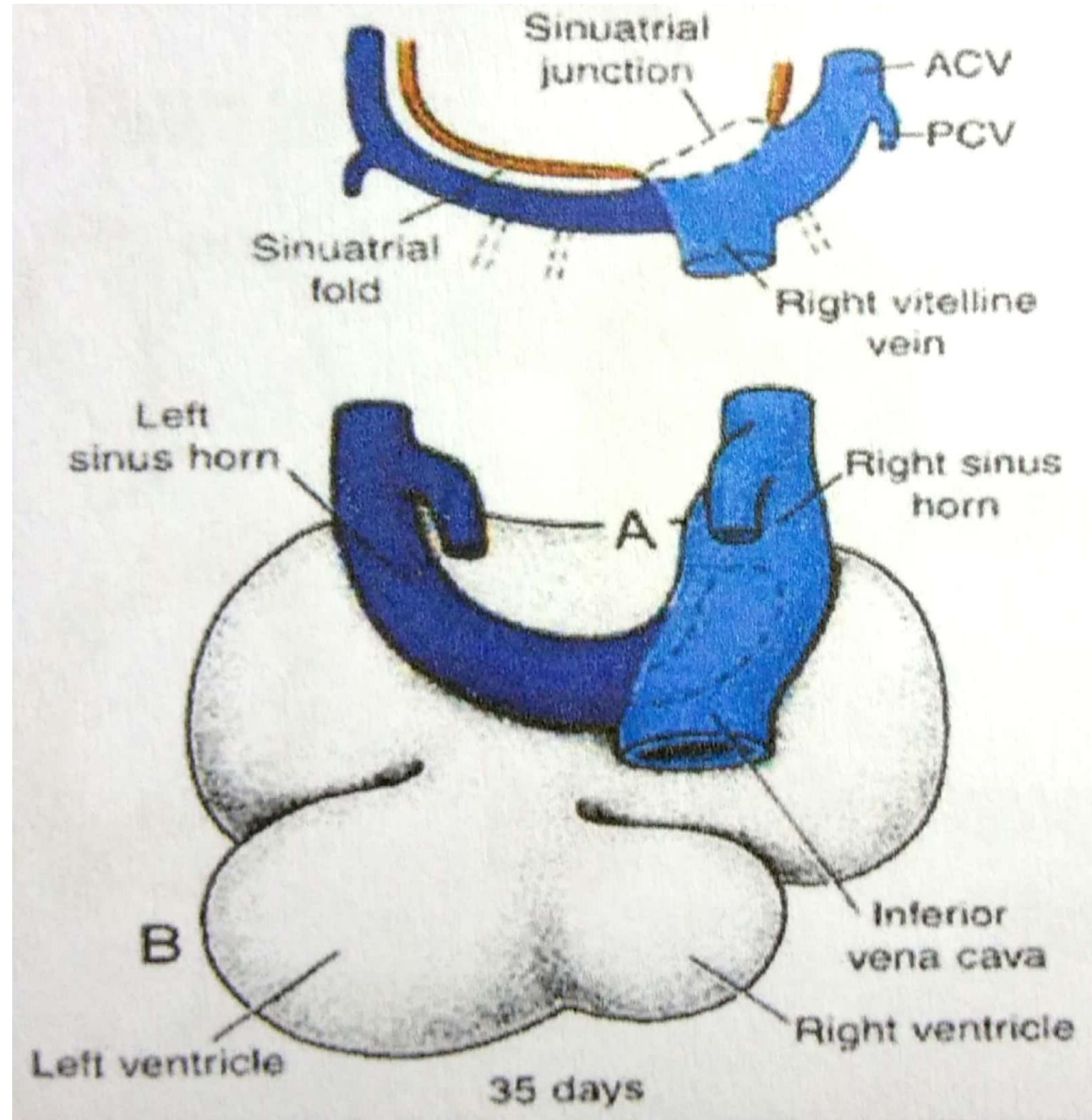
# Development of sinus venosus



- Sinus venosus receives blood from
  - Right sinus horn
  - Left sinus horn
  
- Each sinus horn receives blood from
  - Vitelline (Omphalomesenteric) vein
  - Umbilical vein
  - Common cardinal vein
    - Anterior cardinal vein
    - Posterior cardinal vein

- Beginning the sinus has a wider communication with atrium.
- Then the entrance of sinus shifts to right due to left to right shunting of venous blood.

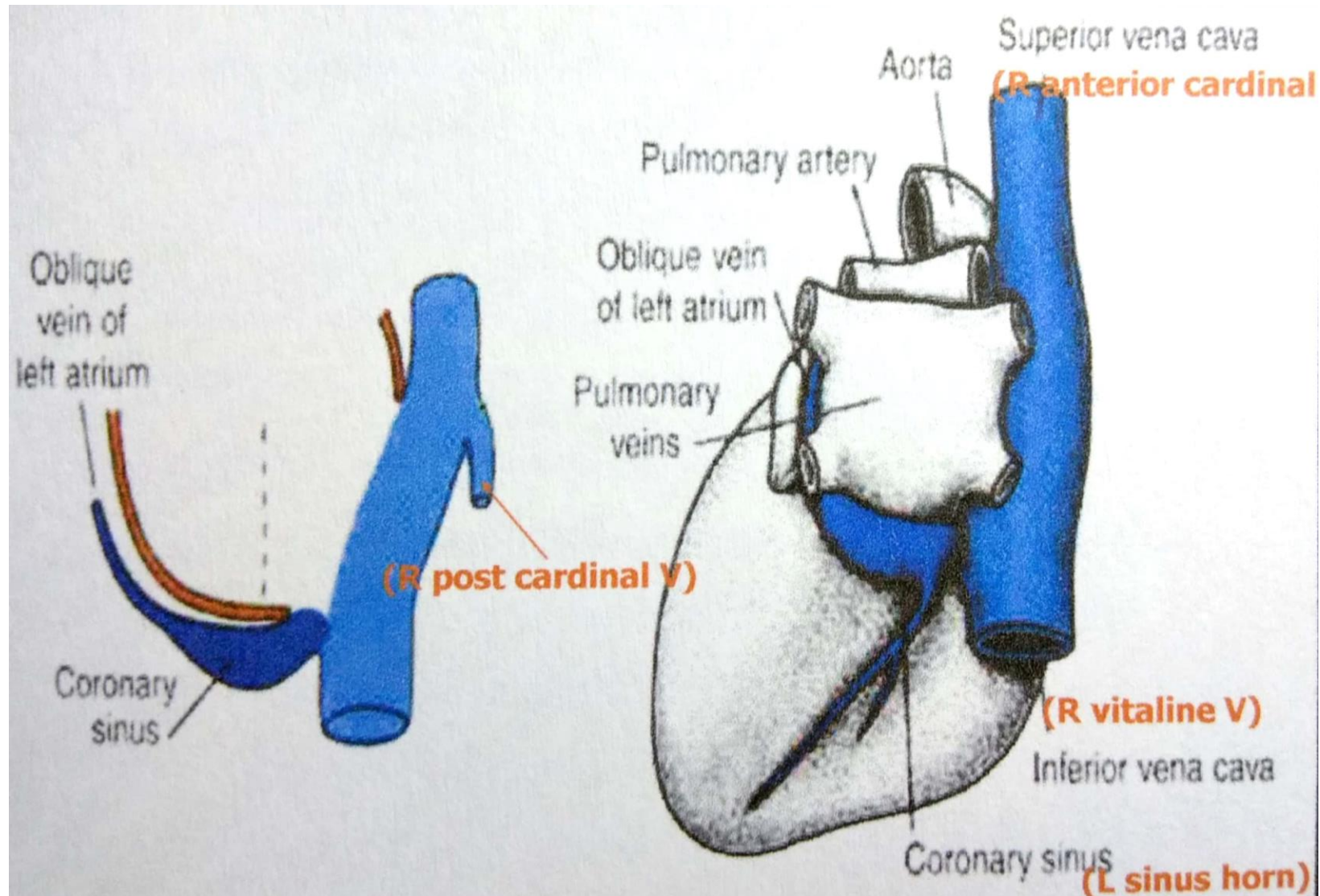
- Fate of sinus horns



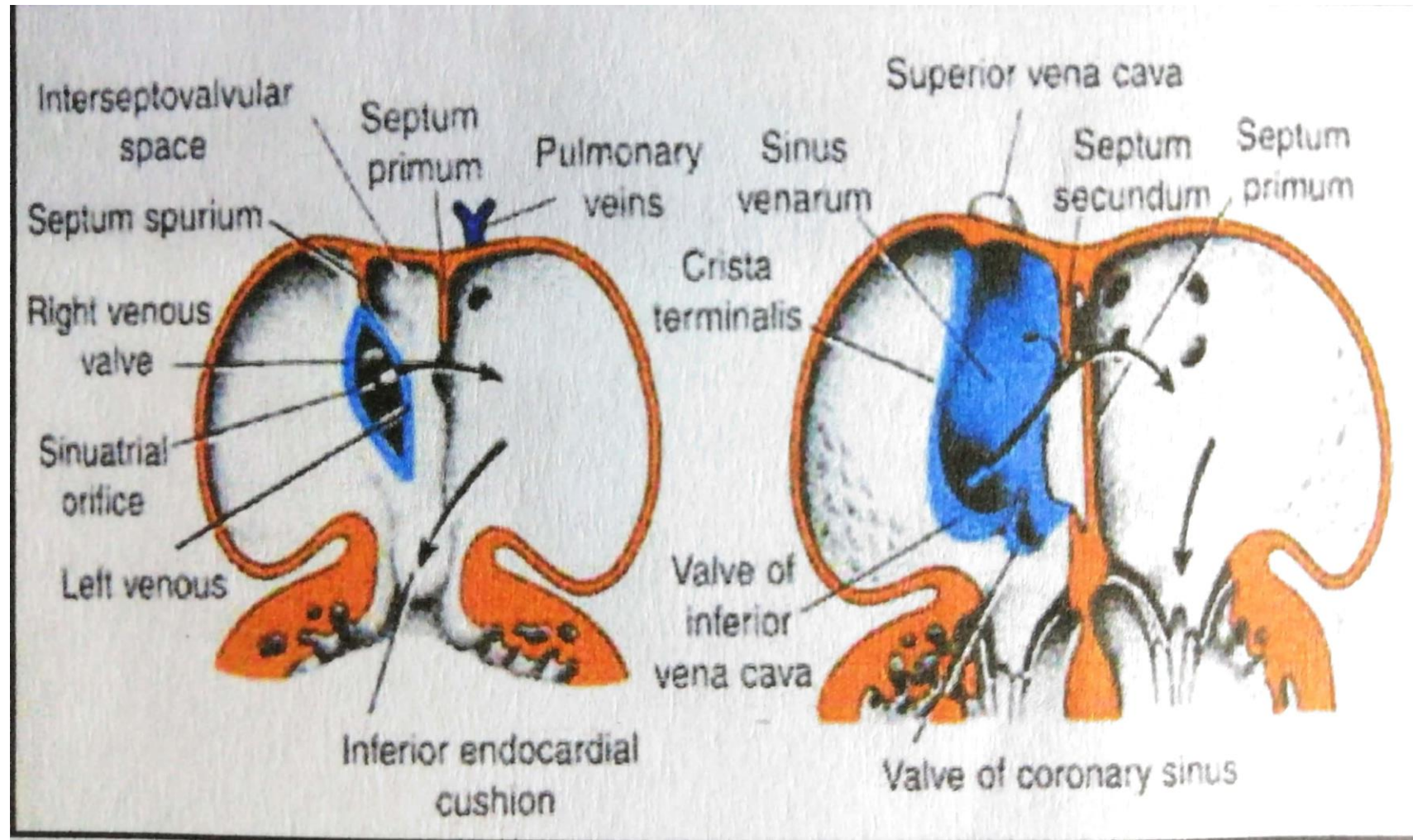
- Left to right shunting of venous blood due to
  - Obliteration of right umbilical vein at 5<sup>th</sup> week. (proximal end of left umbilical vein also obliterated)
  - Obliteration of left vitelline vein at 5<sup>th</sup> week.
  - Obliteration of left common cardinal vein at 10<sup>th</sup> week.
- Due to left to right shunting right horn enlarges



- Final stage

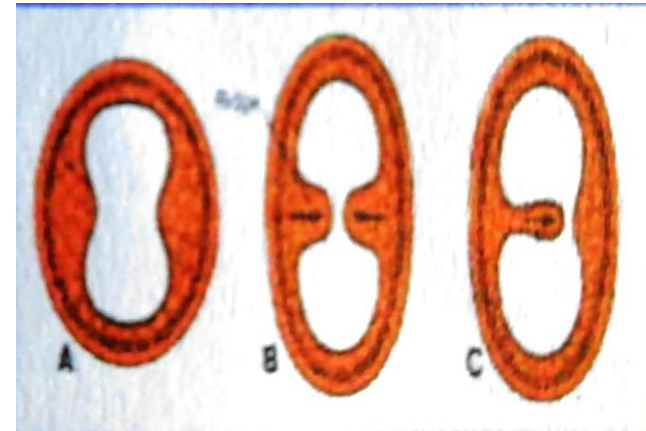


Right sinus horn is incorporated into the right atrium (smooth walled)



# Methods of cardiac septa formation

- Two methods
  - Growth of opposite ridges  
Atrio-ventricular region  
Conotruncal region
  - Uneven expansion of cardiac wall  
Inter atrial septum  
inter ventricular septum

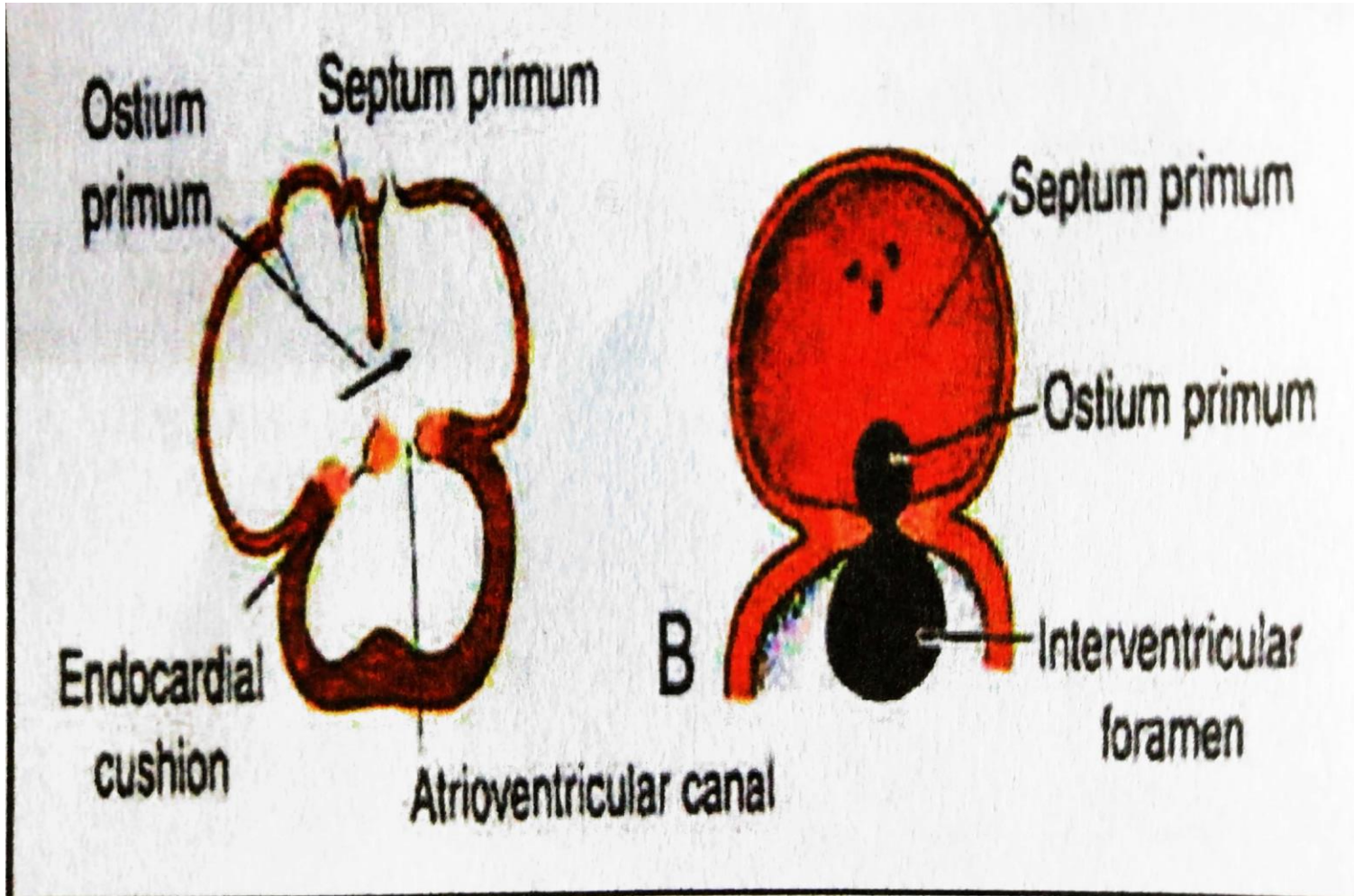


# Inter atrial septum formation

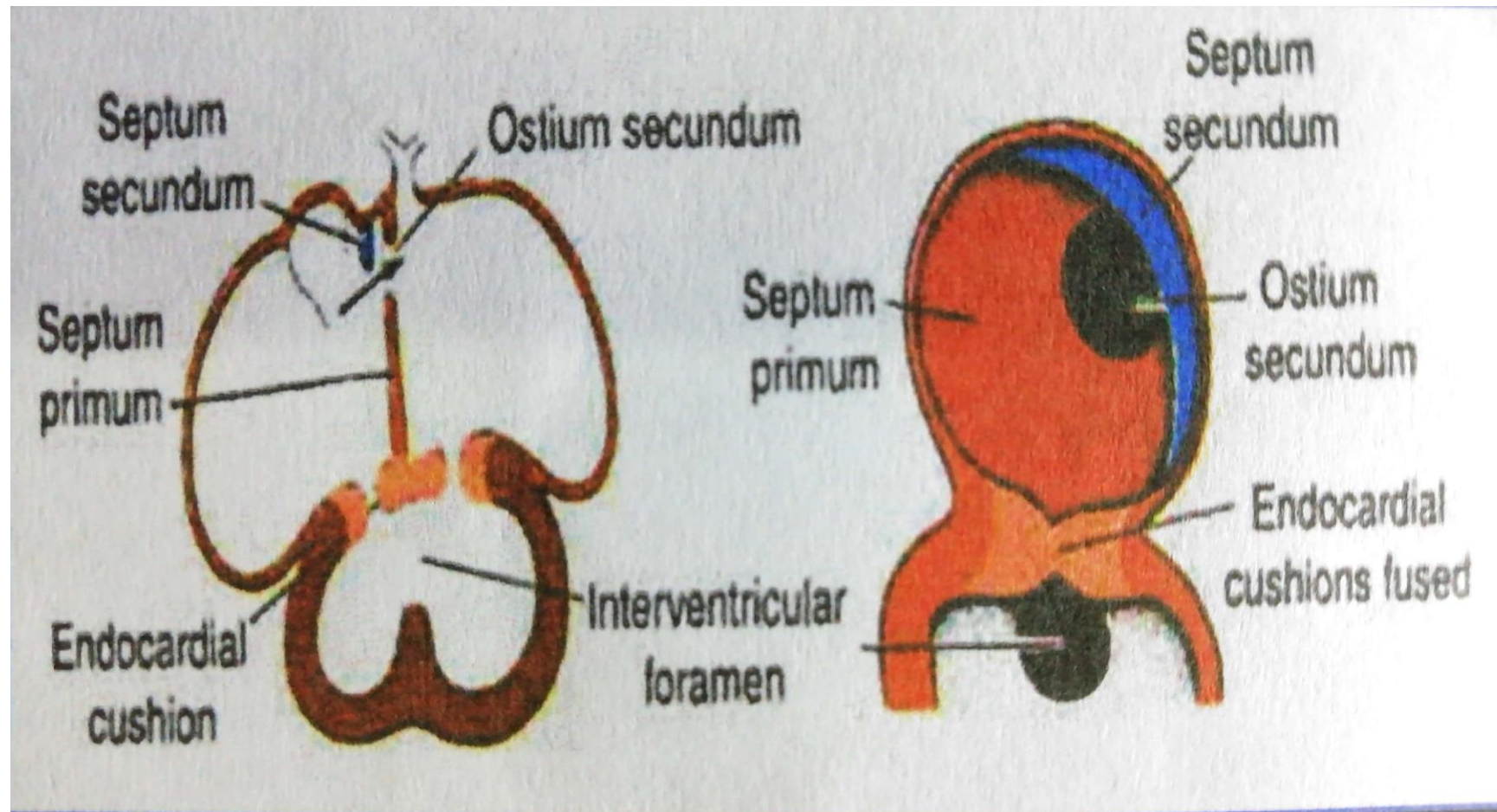
- Begins at end of 4<sup>th</sup> week.
- A crest grows from (dorsocranial part) of atrial cavity.
- Two limbs of the crest grow towards endocardial cushions of atrio-ventricular canal.



# 30 Days Septum Primum



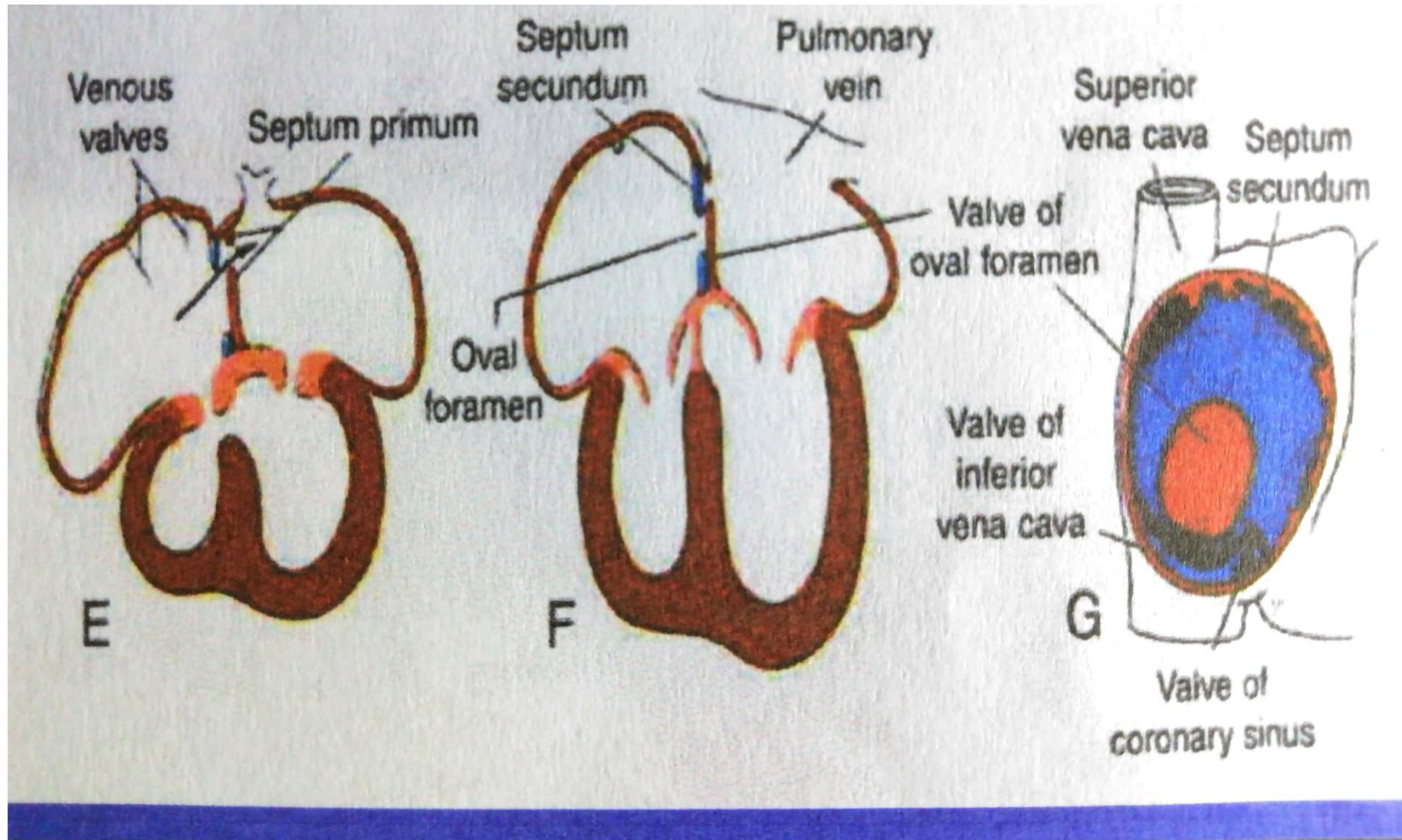
- Extensin from endocardial cushion close the ostium premium
- 33days – septum secundum



- Before complete closure of Ostium primum, perforation appear in upper part of septum primum (due to cell death)
- *Why this is necessary?*
- Perforation coalesce to form ostium secundum
- Septum secundum (crest shape) appear due to incorporation of sinus horn to right atrium.
- Left ventricle valve, septum spurium joins with septum secundum and closes ostium secundum.



# Atrial septum in 38 days embryo & new born





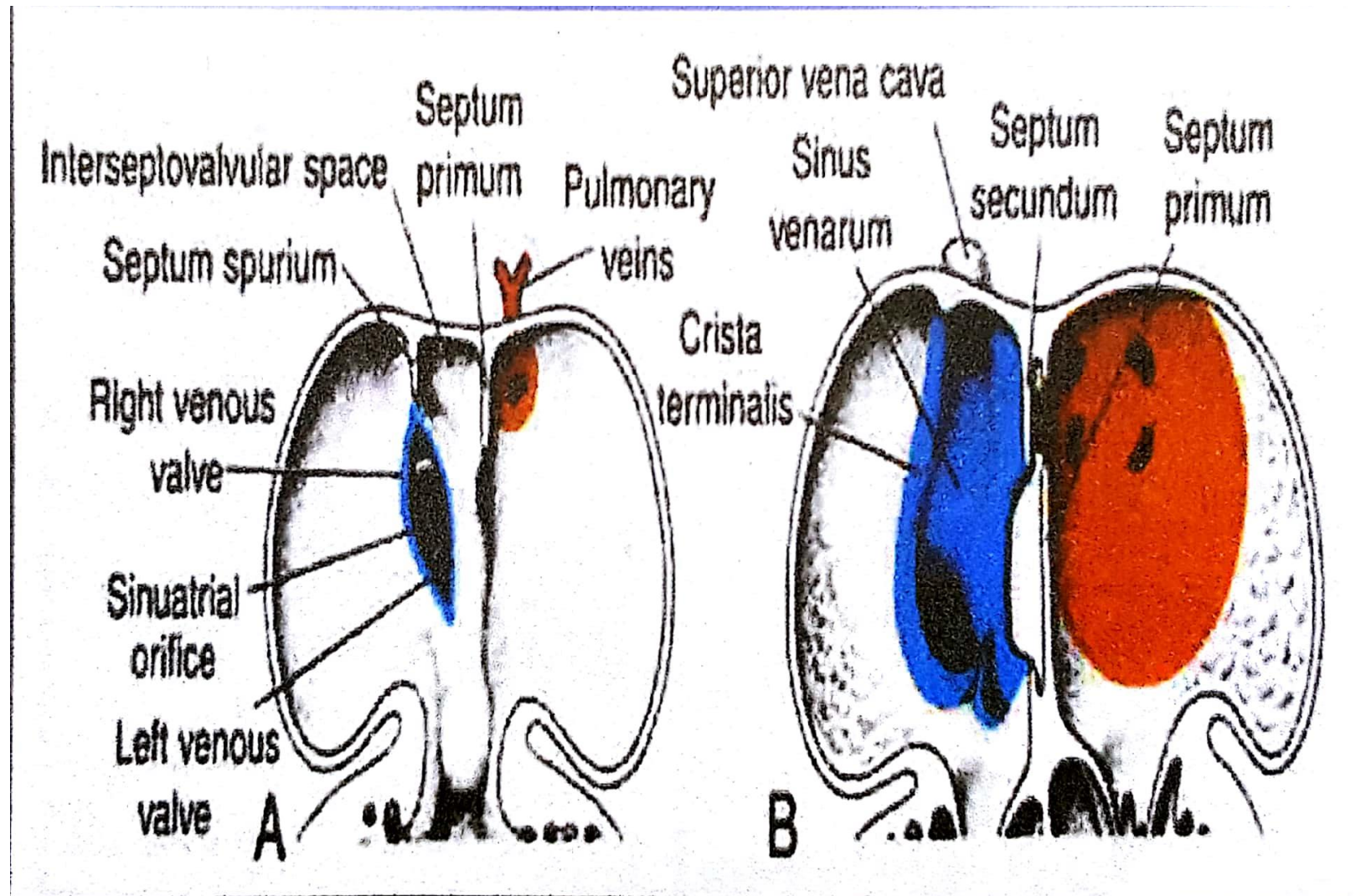
- Foramen ovale
  - opening of sepum secundum
  - upper part of septum primum disappears and remaninig part called valve of foramen ovale.
- During fetal life blood flows from right atrium to left atrium

What happens to inter-atrial sepum after birth?

## Right atrial development

- Right sinus horn is incorporated ( sinus venarum)
- Primitive atrium forms trabeculated atrial appendage
- Smooth walled sinus venarum forms larger part

## Right and left atrial development



# Left atrial development

- Initially a single pulmonary vein develops from posterior wall
- Pulmonary vein divides into four branches
- These four branches are incorporated to the posterior wall of primitive atrial wall
- Smooth wall- pulmonary vein wall
- Trabeculated atrial appendage Atrial- primitive part



# Septum formation in the ventricles

- Muscular inter ventricular septum

Due to ventricular myocardial growth

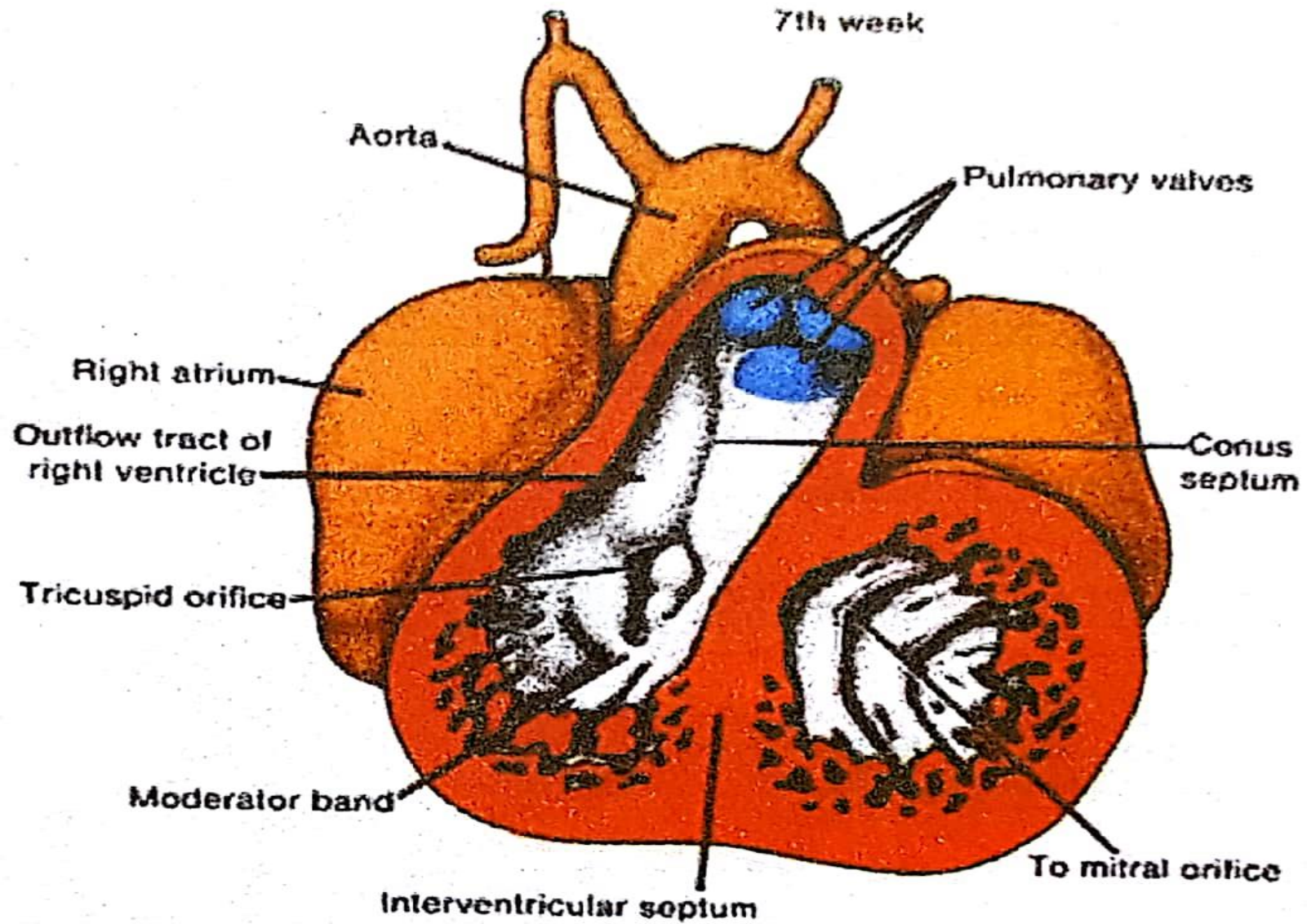
Medial walls of both ventricles grow towards each other and together

Inter ventricular foramen is above the muscular interventricular septum

# Membranous interventricular septum

- Downward proliferation of tissue from inferior myocardial cushion up to muscular interventricular septum closes interventricular foramen.
- Upward proliferation of tissue from inferior endocardial cushion attaches to conus swellings to close inter ventricular foramen completely.

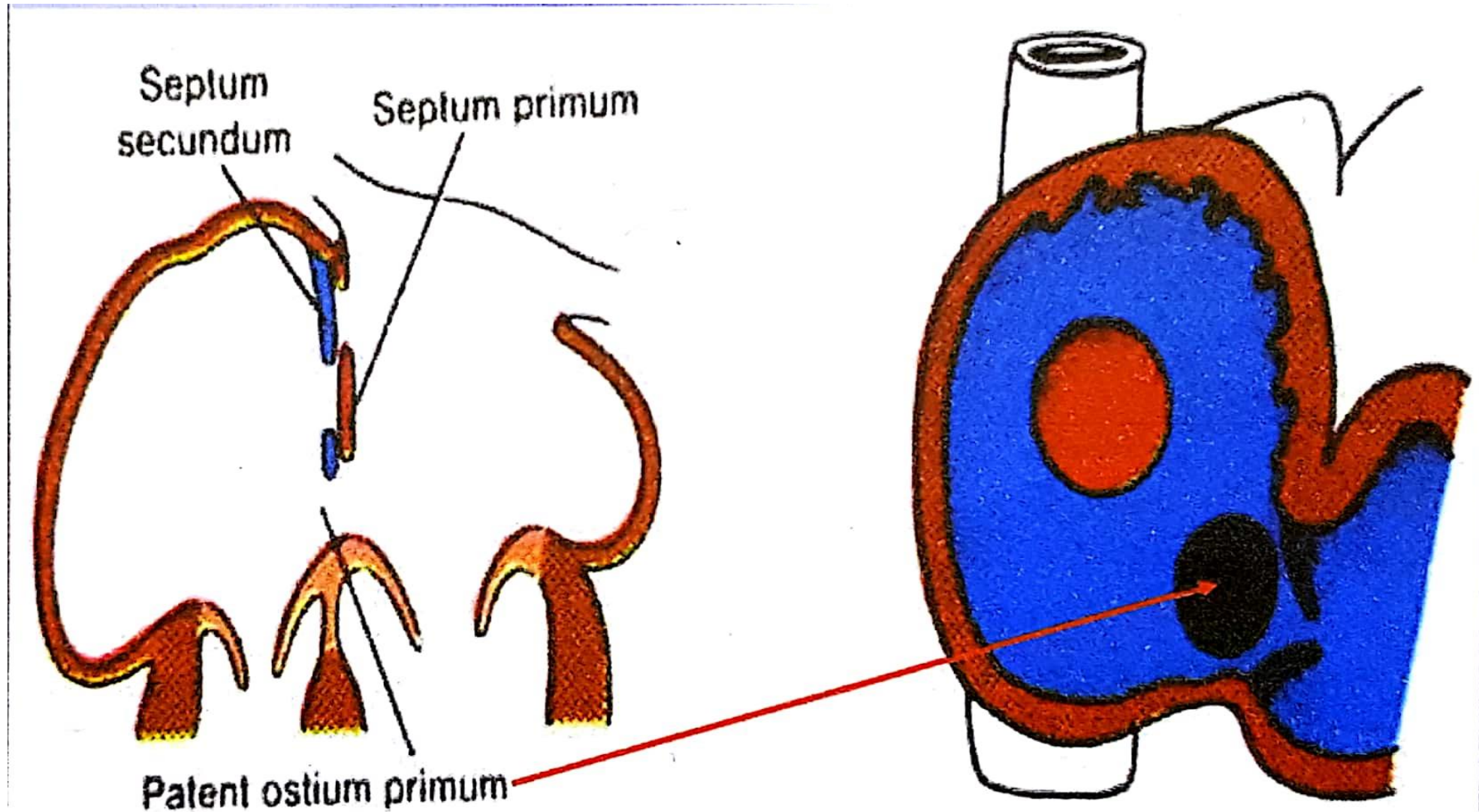
## 7 weeks embryo



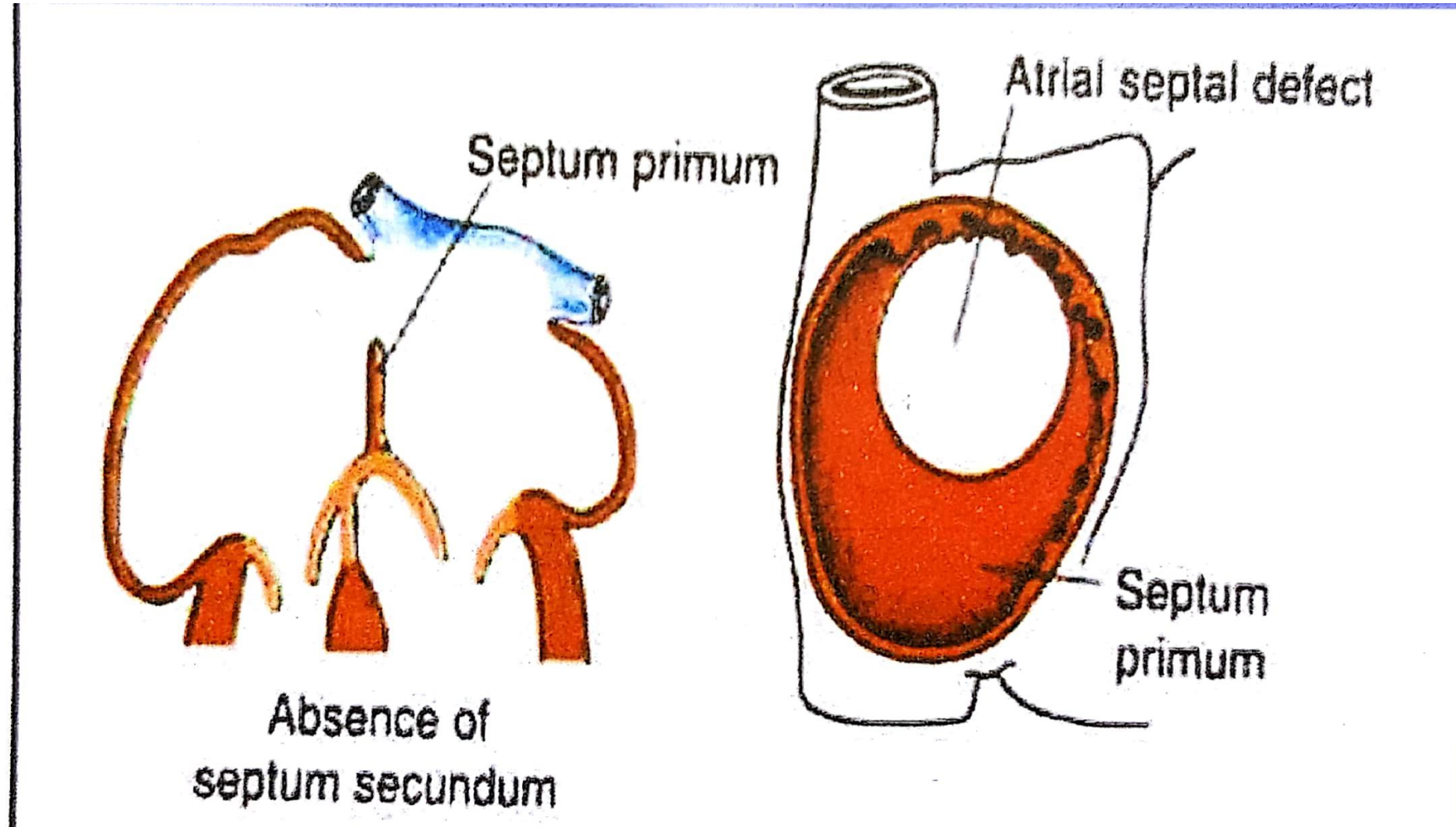
# Atrial septal defects



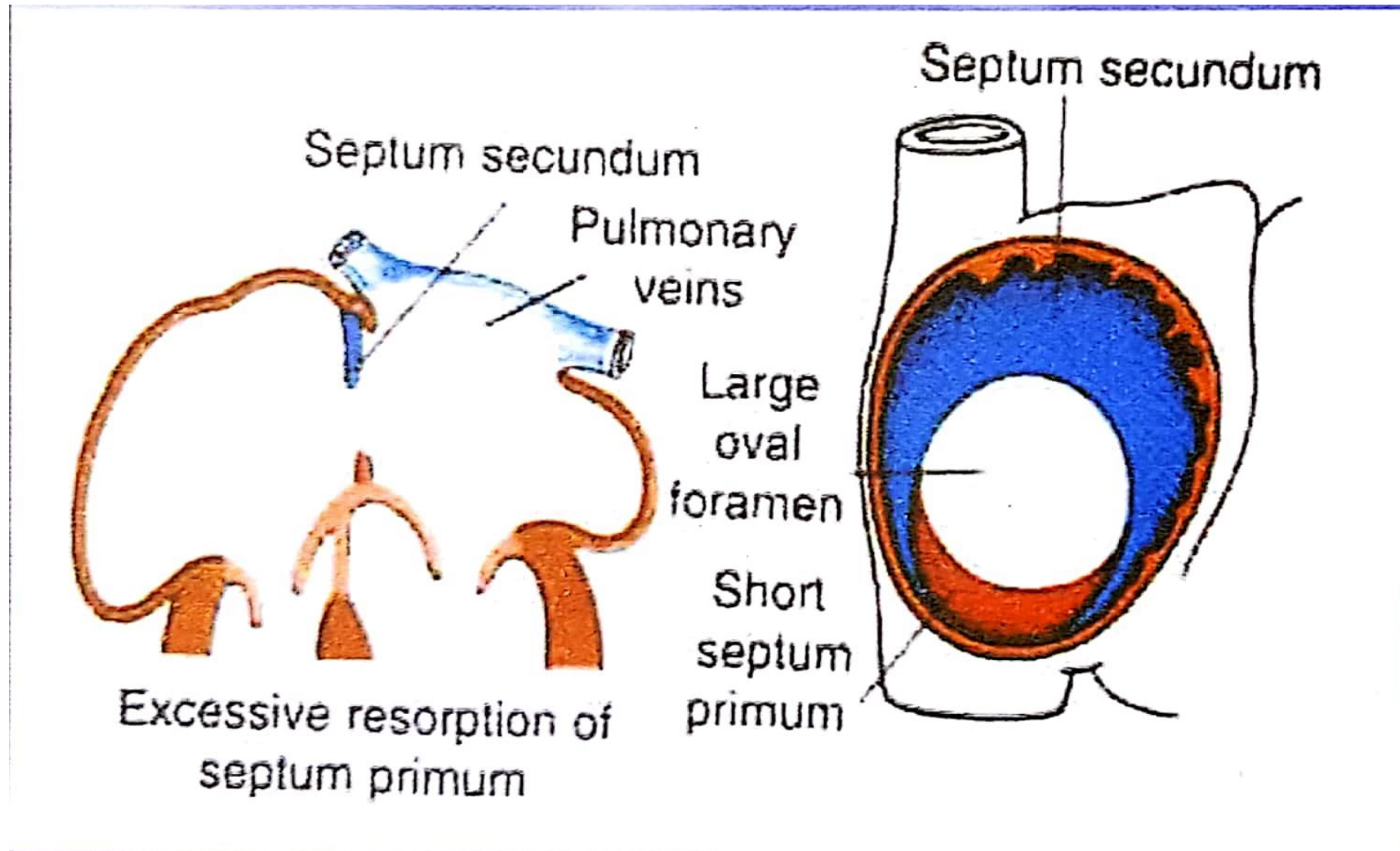
## Ostium primum type



Ostium secundum type  
-absence of septum secundum



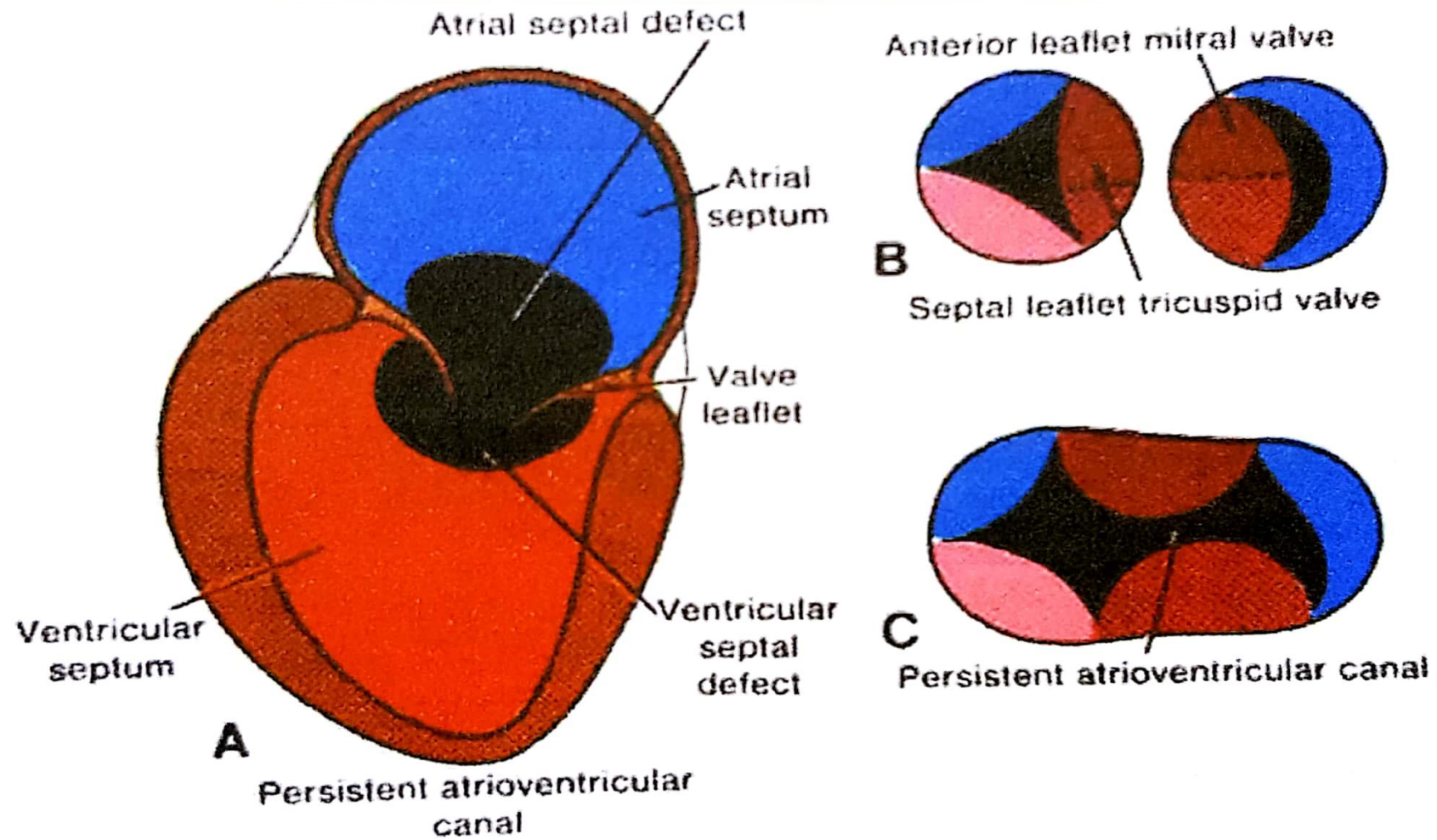
Ostium secundum type  
-excessive resorption of septum primum



Ventricular septal defects

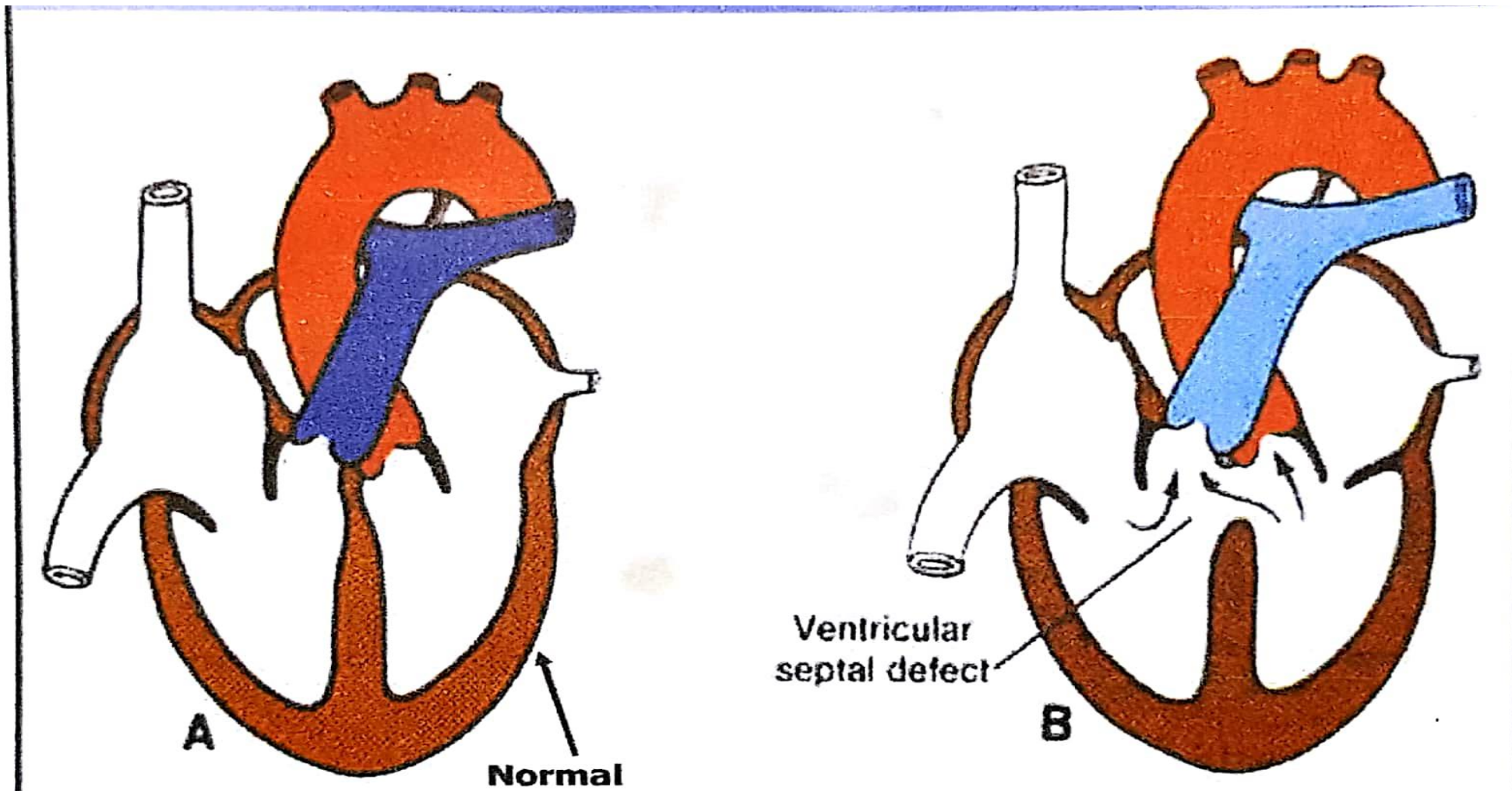


# Common atrio-ventricular canal





defect in membranous part



# Summery

- We discussed

Fate of sinus venosus

How the atrial septum is formed

How the inter ventricular septum is formed

The formation of left and right atria

Clinical implications relaed to septum formation

Watch these links

-<https://www.youtube.com/watch?v=5DIUk9IXUaI>

- <https://www.youtube.com/watch?v=p2Q5kl8uXIs>