Early Heart Development

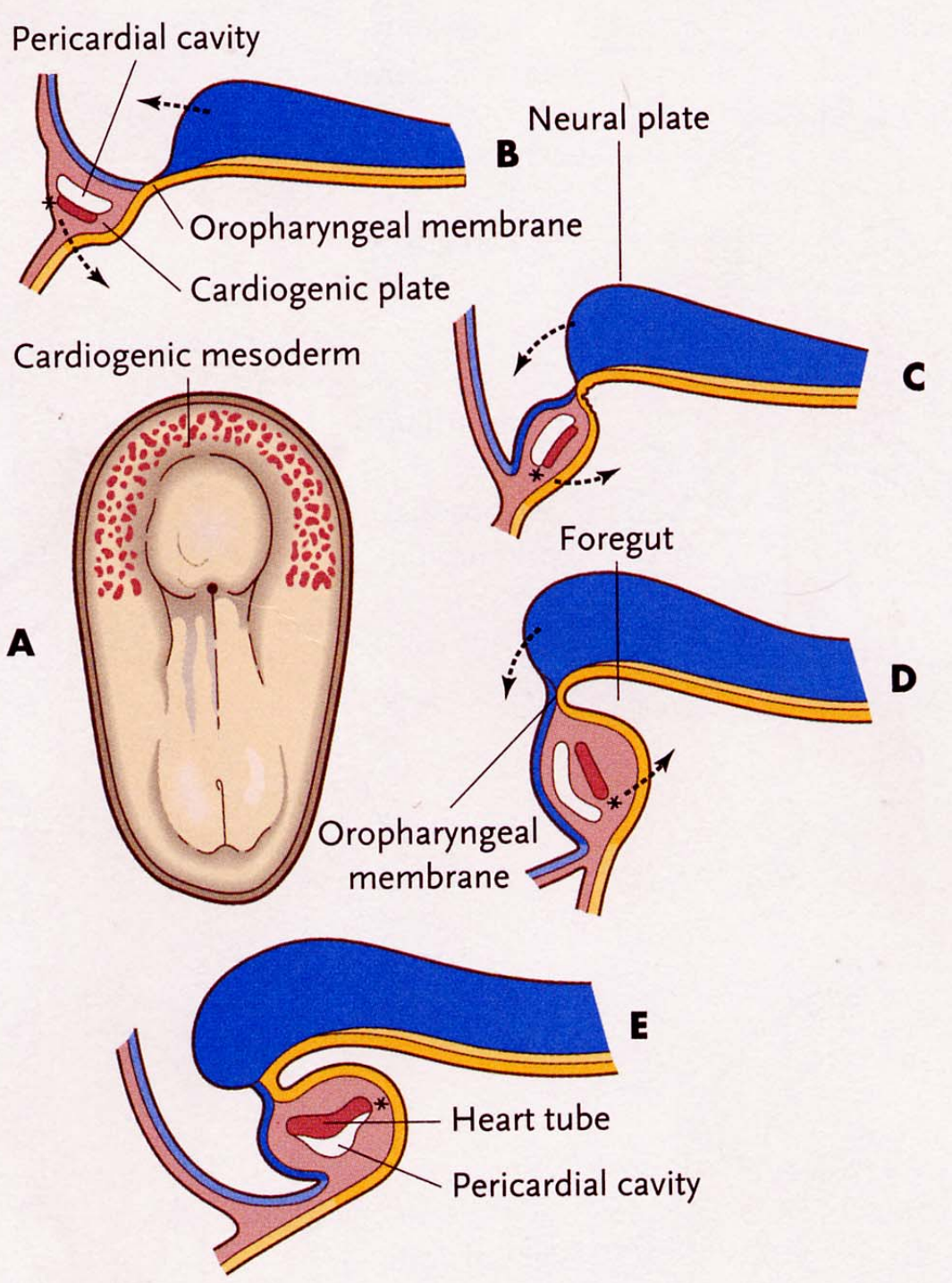
Precardiac mesoderm – horseshoe shaped extending back on both sides of the foregut

Endoderm induces early heart tissue

Mesoderm splits → somatic and splanchnic, cardiogenic plate is splanchnic and anterior to the oropharyngeal membrane

Space between somatic and splanchnic mesoderm will form pericardial cavity

180o rotation of the anterior embryo places the heart posterior to the oropharyngeal membrane


Pericardial cavity
B
Neural plate
Oropharyngeal membrane
Cardiogenic plate
Cardiogenic mesoderm
C
A
Foregut
D
Oropharyngeal membrane
E
Heart tube
Pericardial cavity

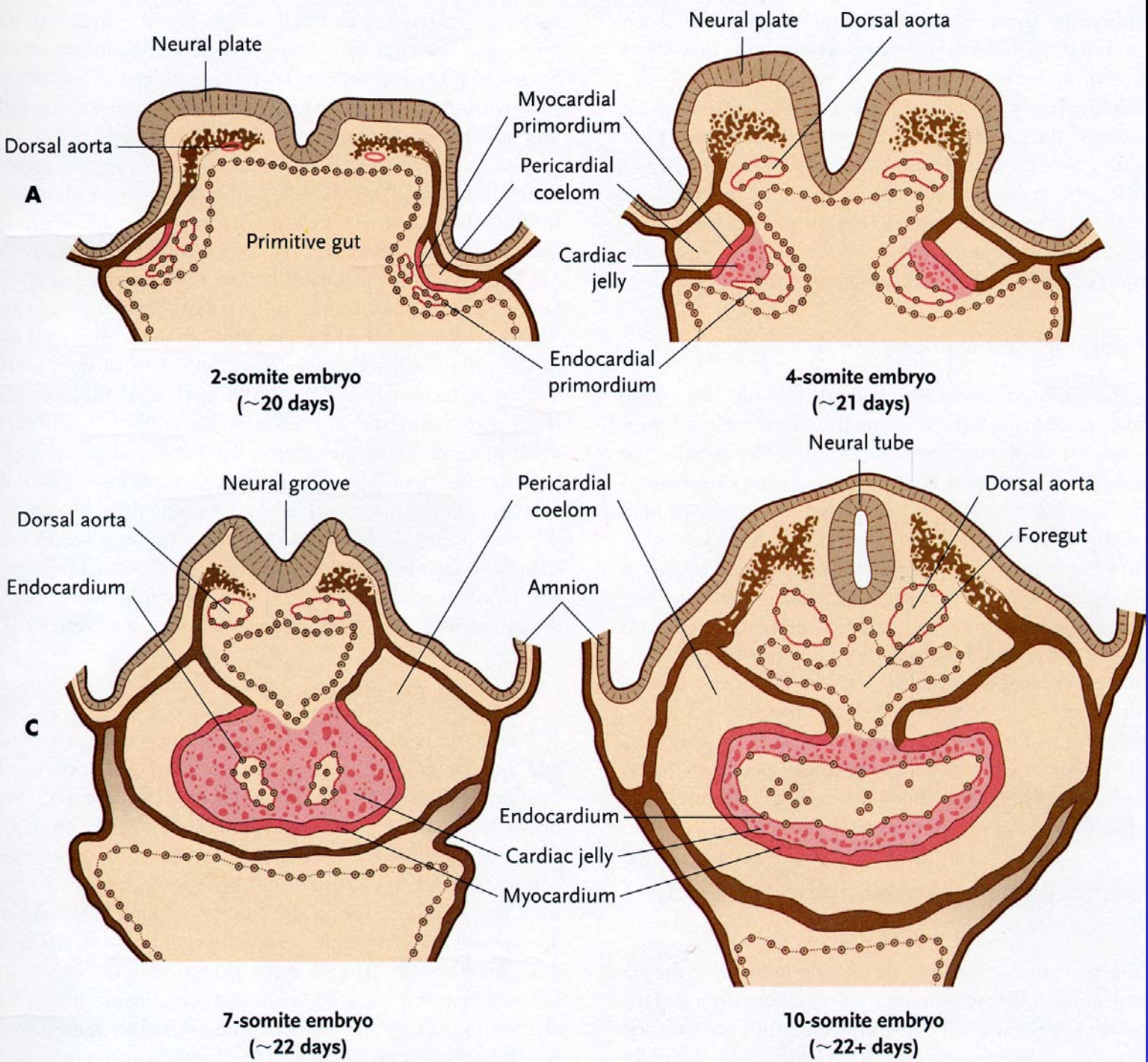
Heart Formation

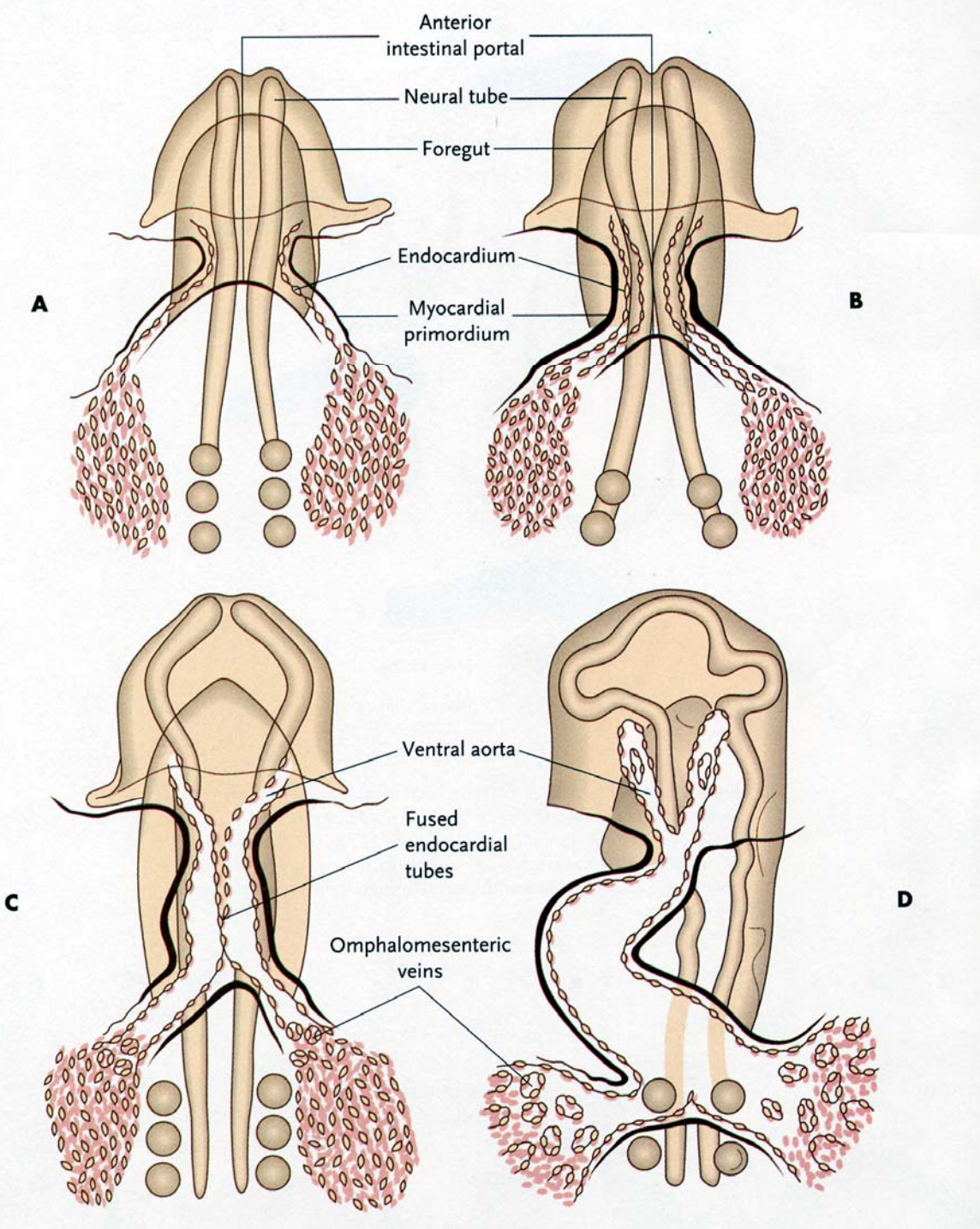
Vesicles in the pre-cardiac splanchnic mesoderm fuse to form paired endocardial primordia on both sides of the foregut

Endocardial primordia fuse along the midline to form the primitive tubular heart

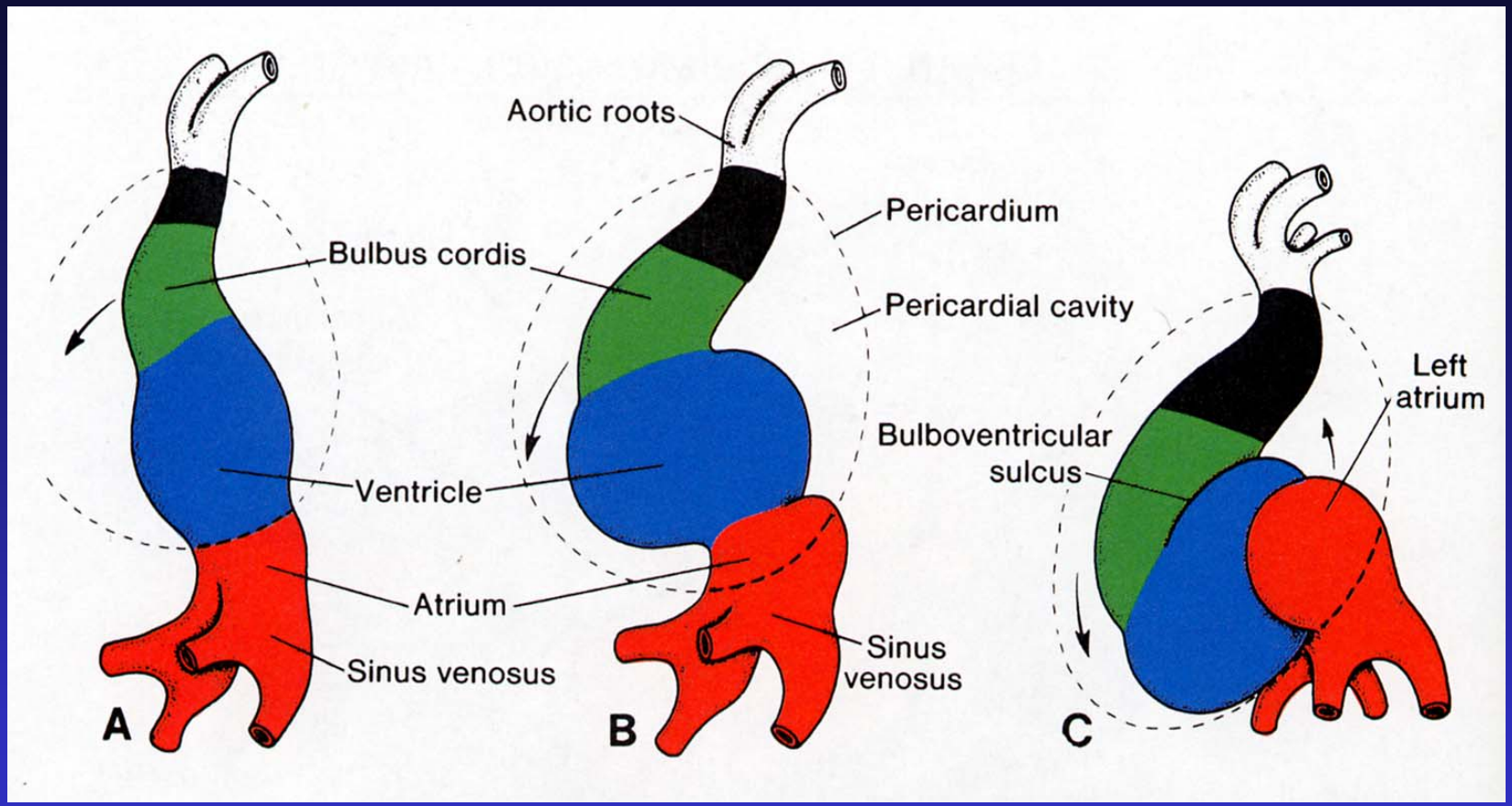
Inner endocardial lining becomes the endocardium, surrounded by matrix called cardiac jelly

Myocardium surrounds the cardiac jelly

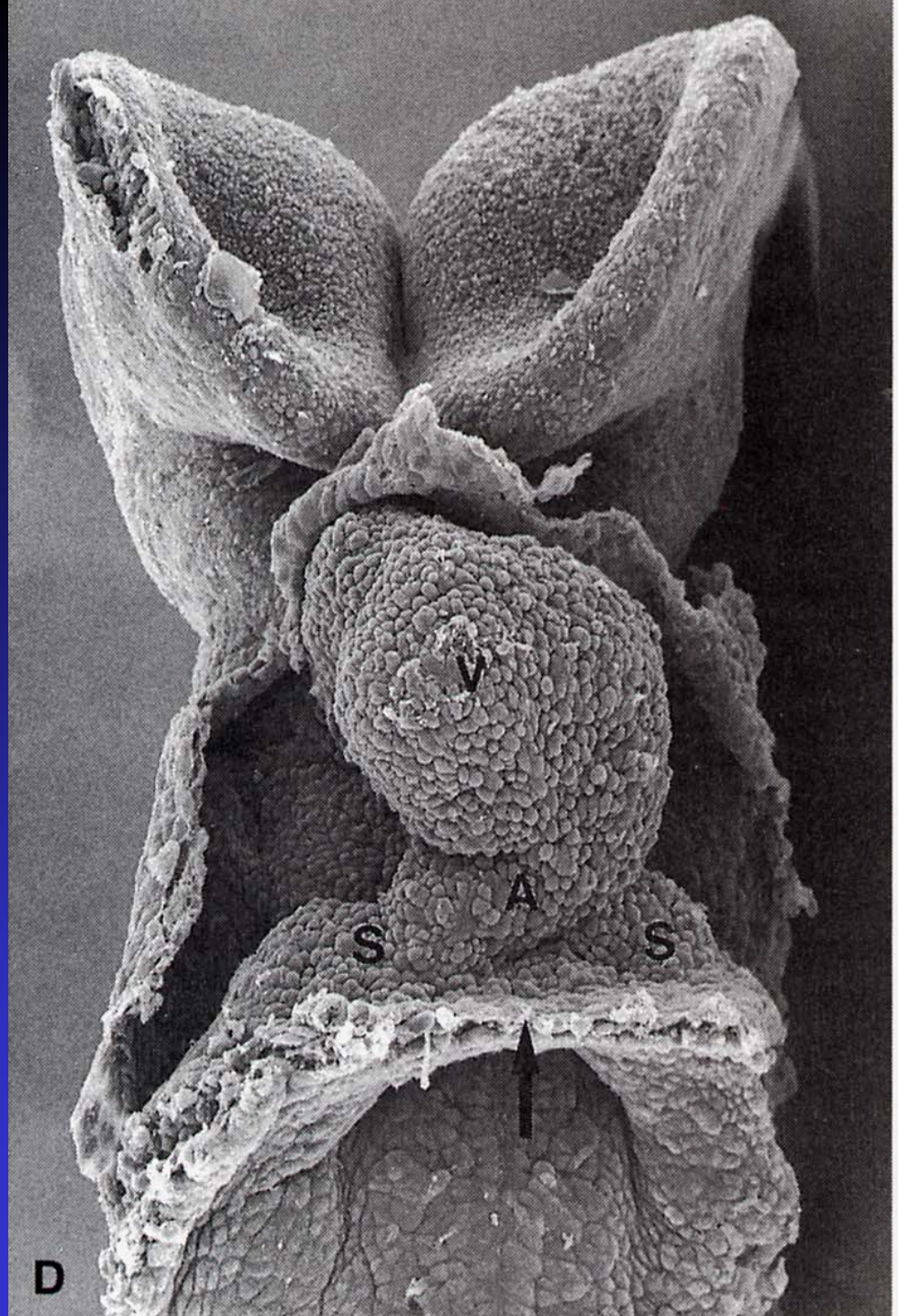

Neural plate
Dorsal aorta
A
Primitive gut
Myocardial primordium
Pericardial coelom
Cardiac jelly
Endocardial primordium
2-somite embryo (~20 days)
Neural plate
Dorsal aorta
4-somite embryo (~21 days)
Neural groove
Dorsal aorta
Endocardium
C
Pericardial coelom
Amnion
Endocardium
Cardiac jelly
Myocardium
7-somite embryo (~22 days)
Neural tube
Dorsal aorta
Foregut
10-somite embryo (~22+ days)


Anterior
intestinal portal
Neural tube
Foregut
Endocardium
Myocardial
primordium
A
B
Ventral aorta
Fused
endocardial
tubes
Omphalomesenteric
veins
C
D

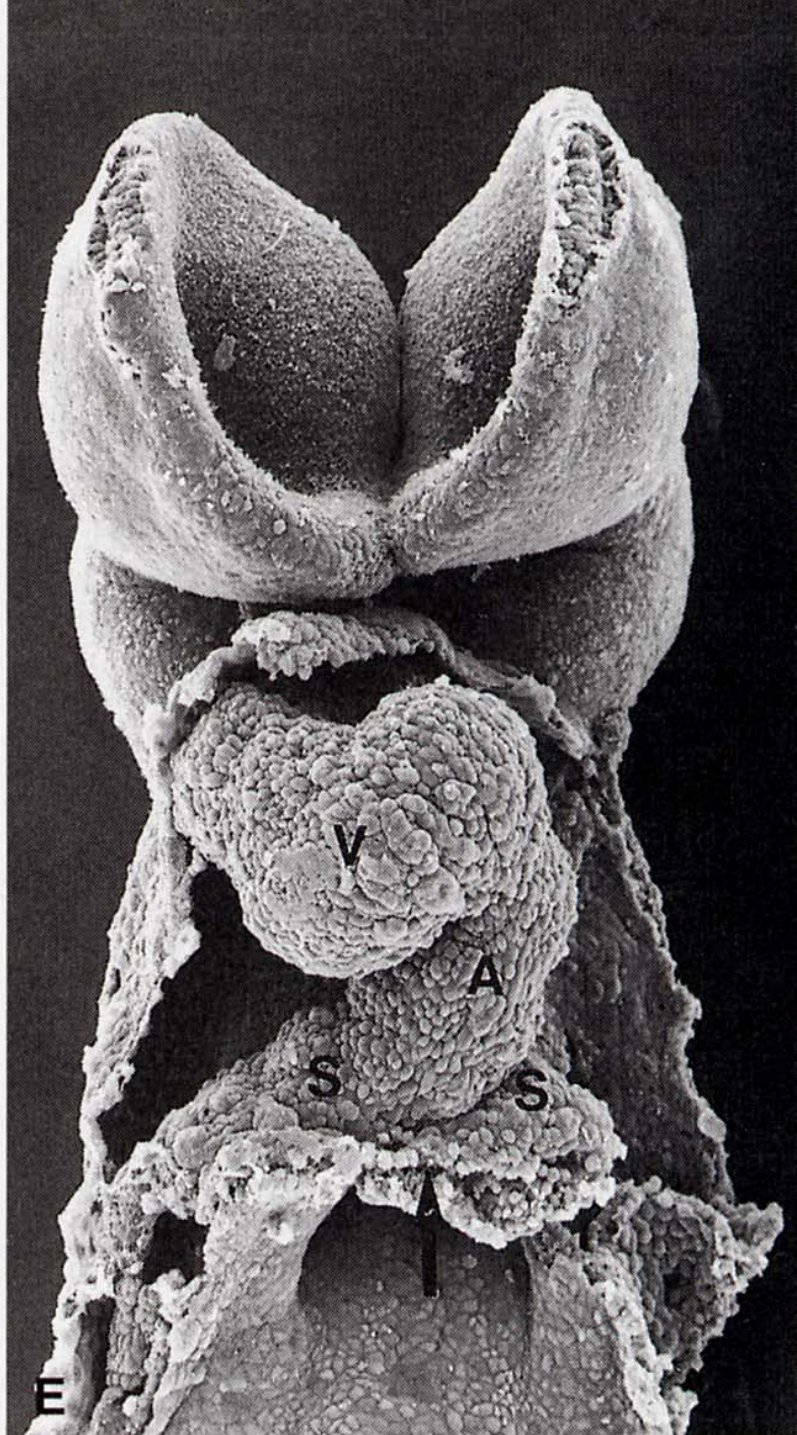
Heart Formation



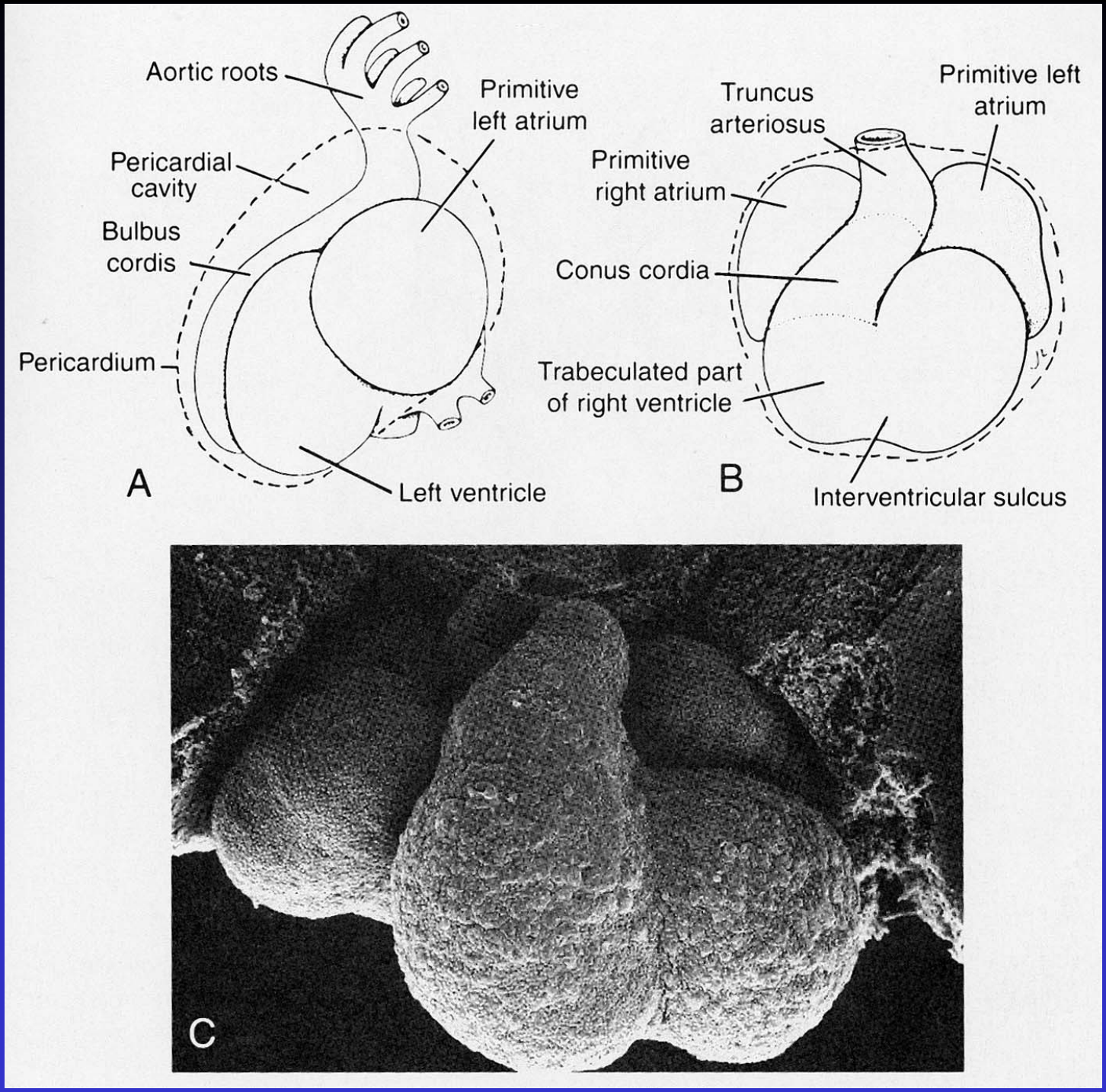
Tubular heart forms an S-shaped loop



D



E


Aortic roots
Primitive left atrium
Pericardial cavity
Bulbus cordis
Pericardium
Left ventricle
A
Truncus arteriosus
Primitive left atrium
Primitive right atrium
Conus cordia
Trabeculated part of right ventricle
Interventricular sulcus
B
C

Blood and Vessels

Blood forms from blood islands in the Yolk Sac

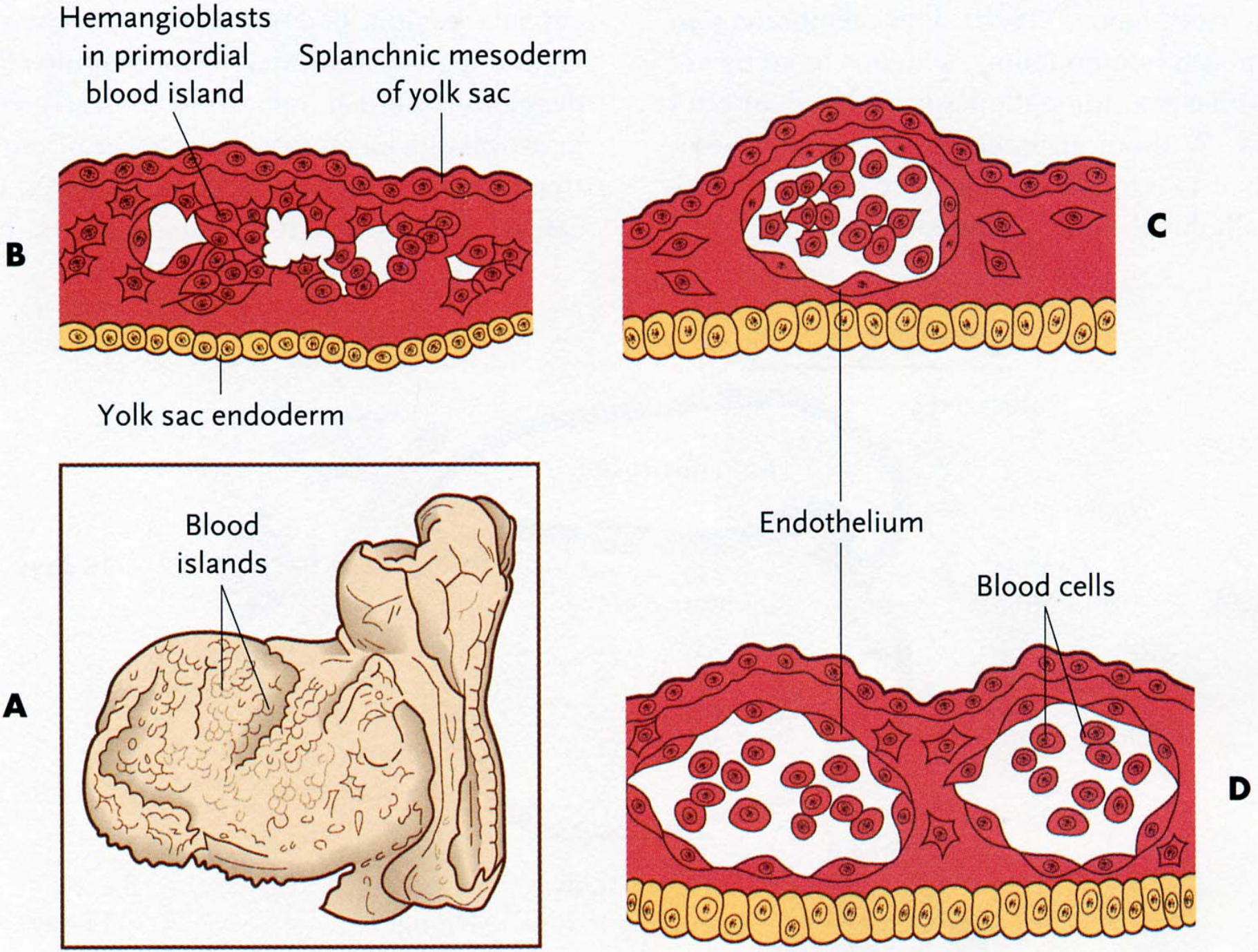
Extraembryonic splanchnic mesoderm

Induced by extraembryonic endoderm

Stem cell = hemangioblasts in the blood islands

Blood-forming cells = hemocytoblasts

Vessel forming cells = endothelial cells


Hemangioblasts in primordial blood island
Splanchnic mesoderm of yolk sac
B
Yolk sac endoderm
C
Endothelium
Blood cells
D
Blood islands
A