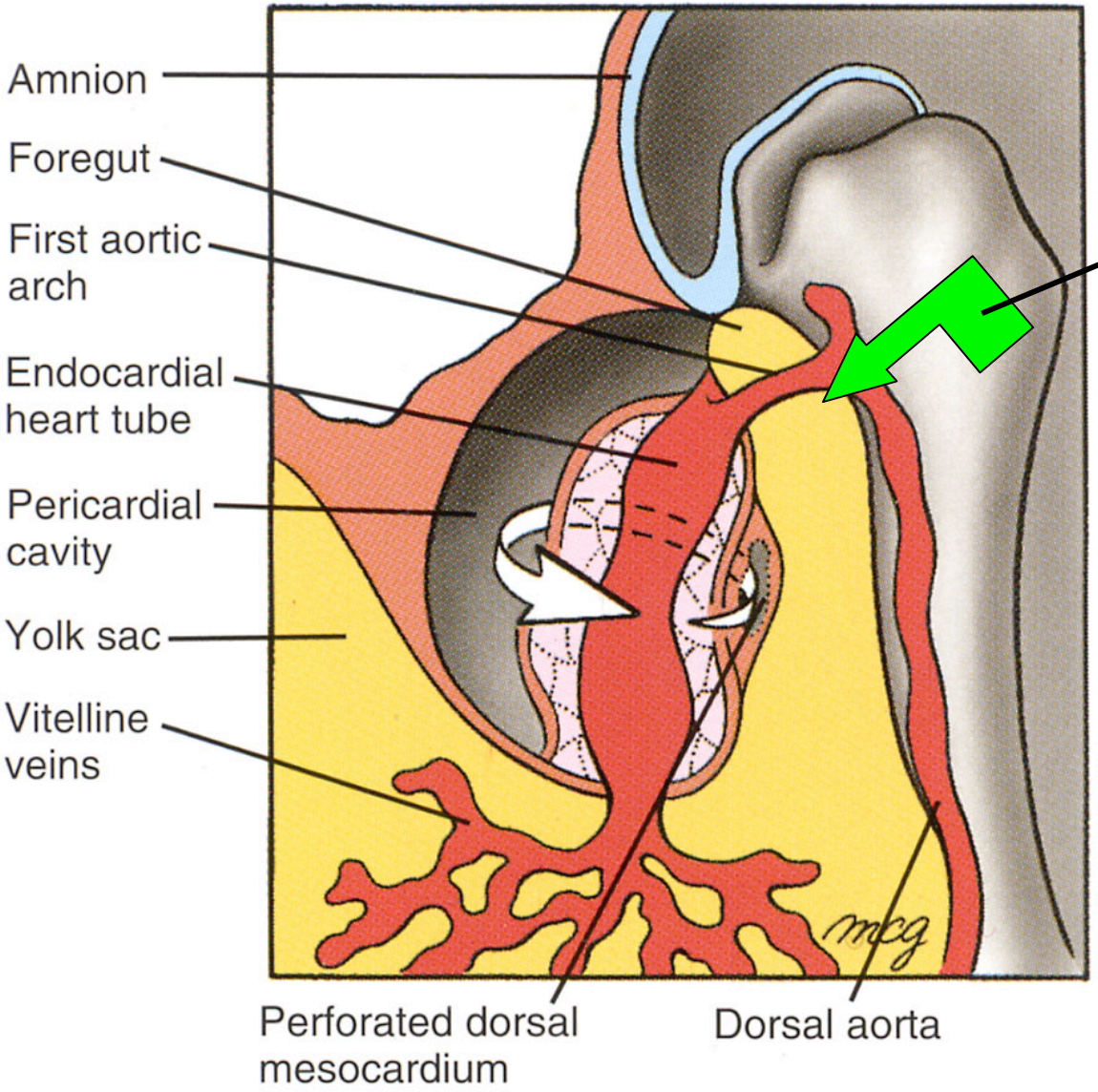
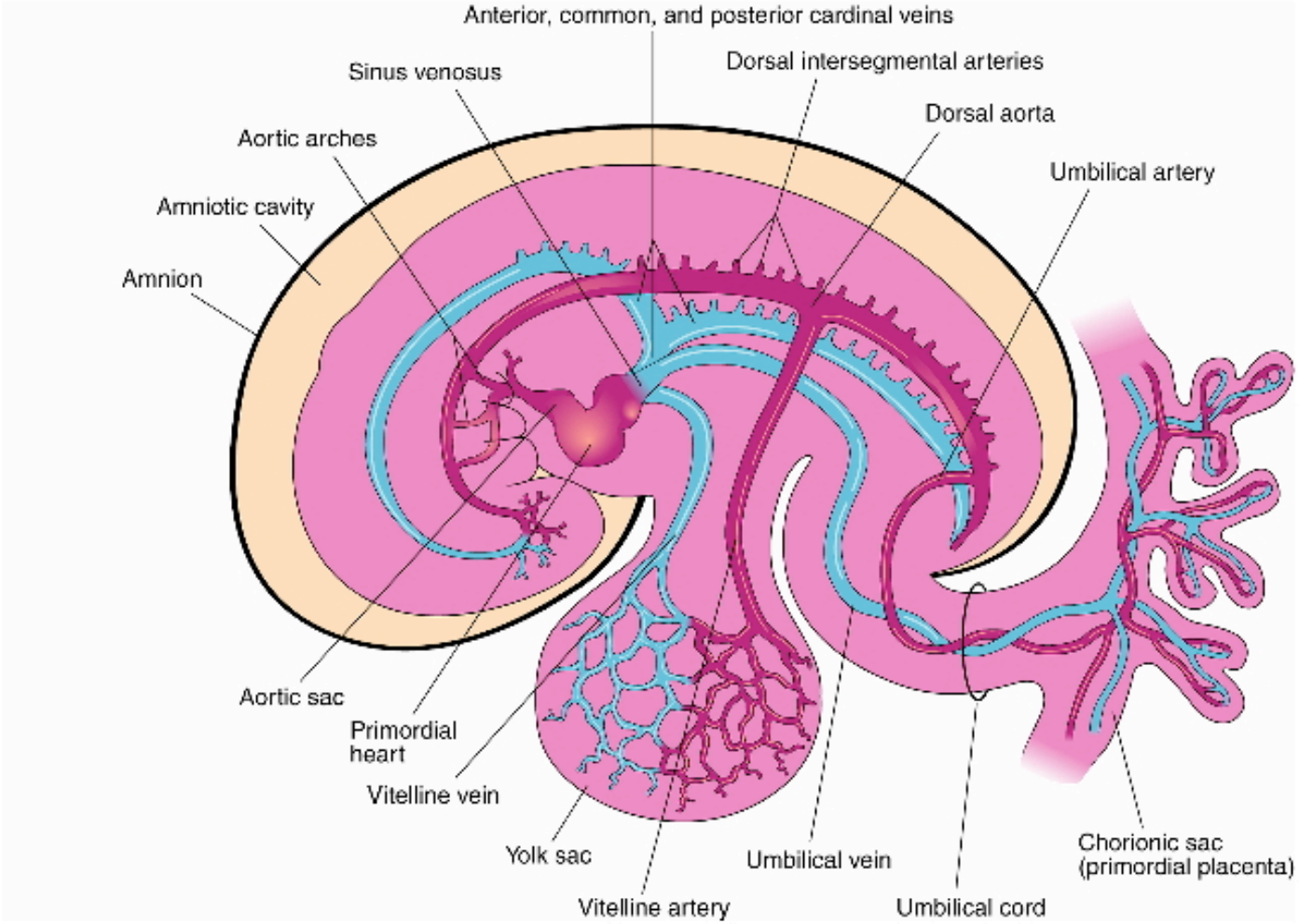
HEART AND ITS NEIGHBORHOOD



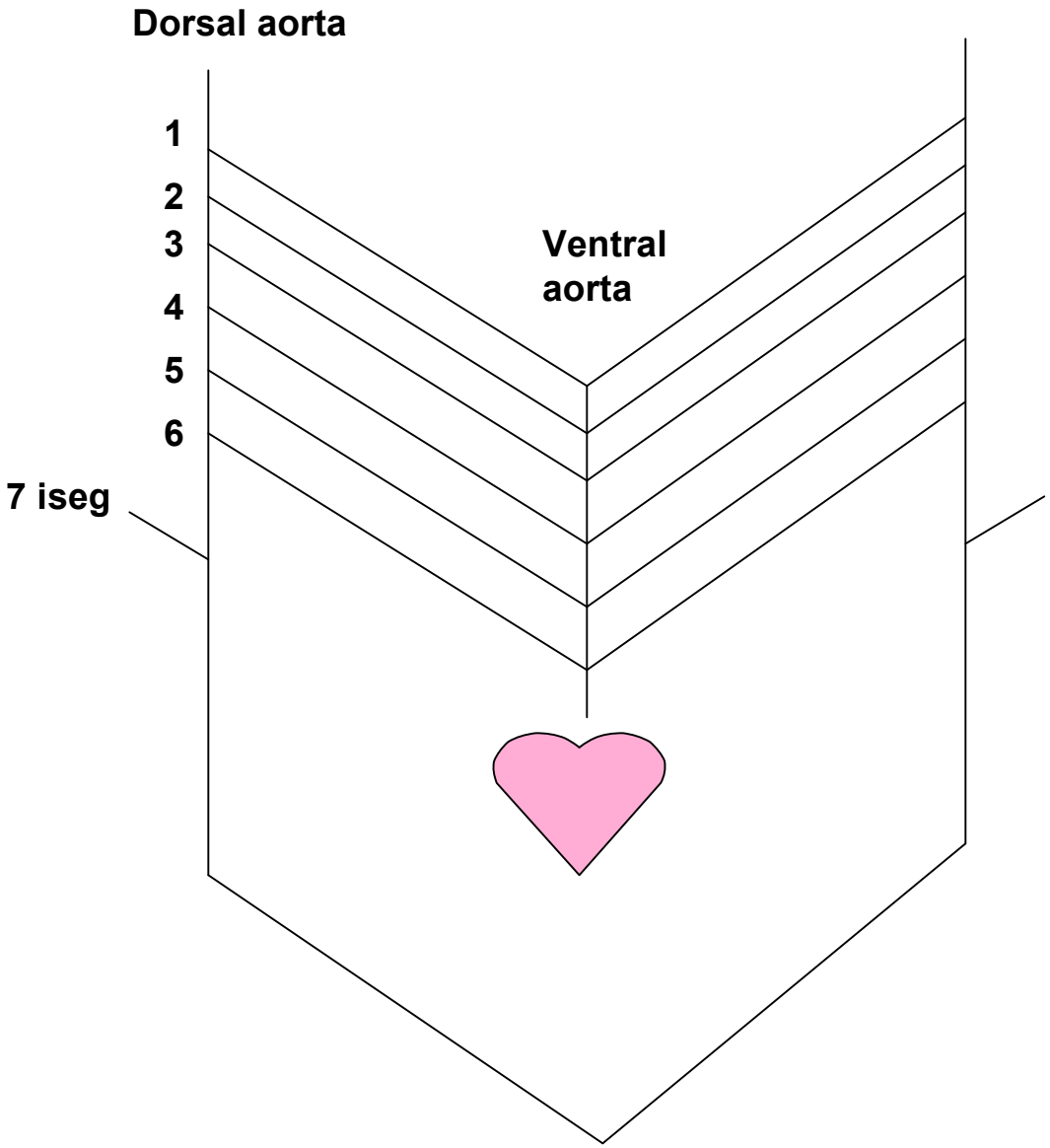
NEURAL CREST CELLS migrate from hindbrain region via pharyngeal arches to conotruncal region of heart.

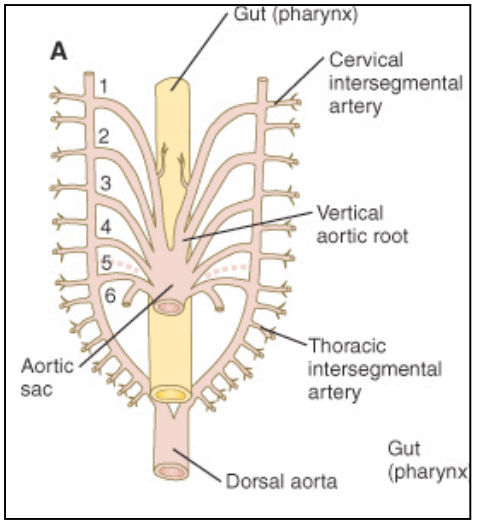
BLOOD VESSELS OF THE EMBRYO

(at 26 days)

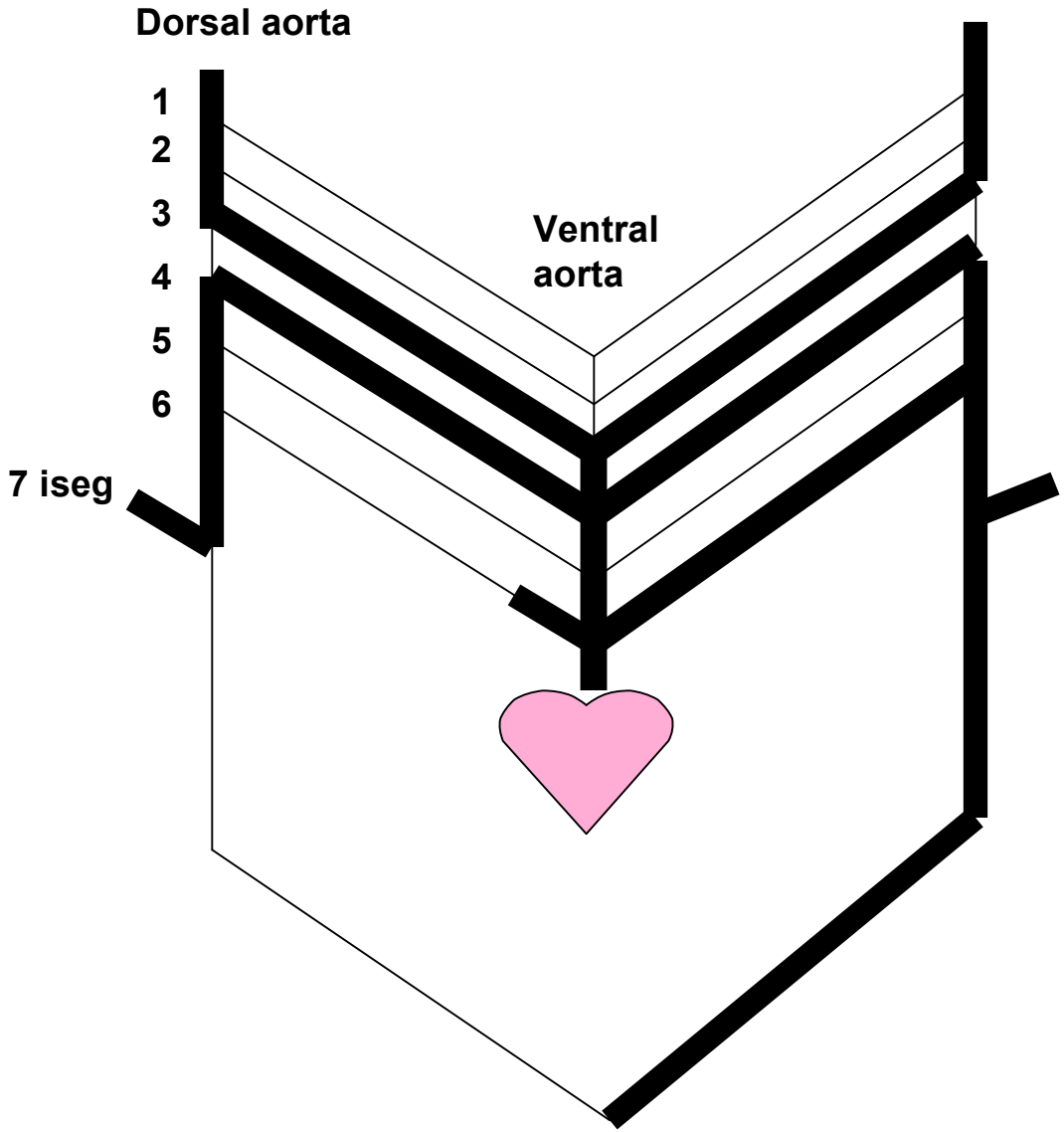


AORTIC ARCHES SCHEMATIC

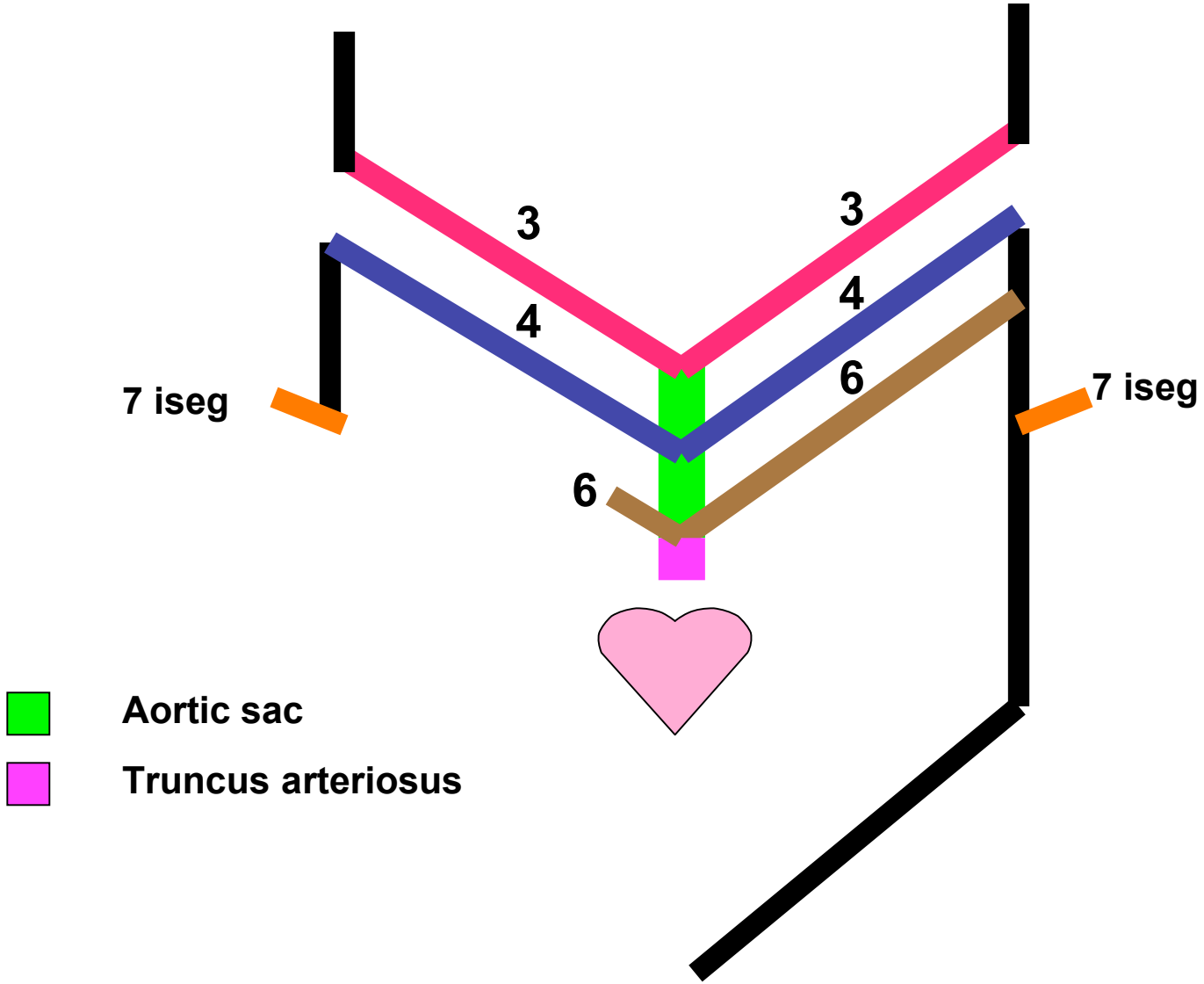




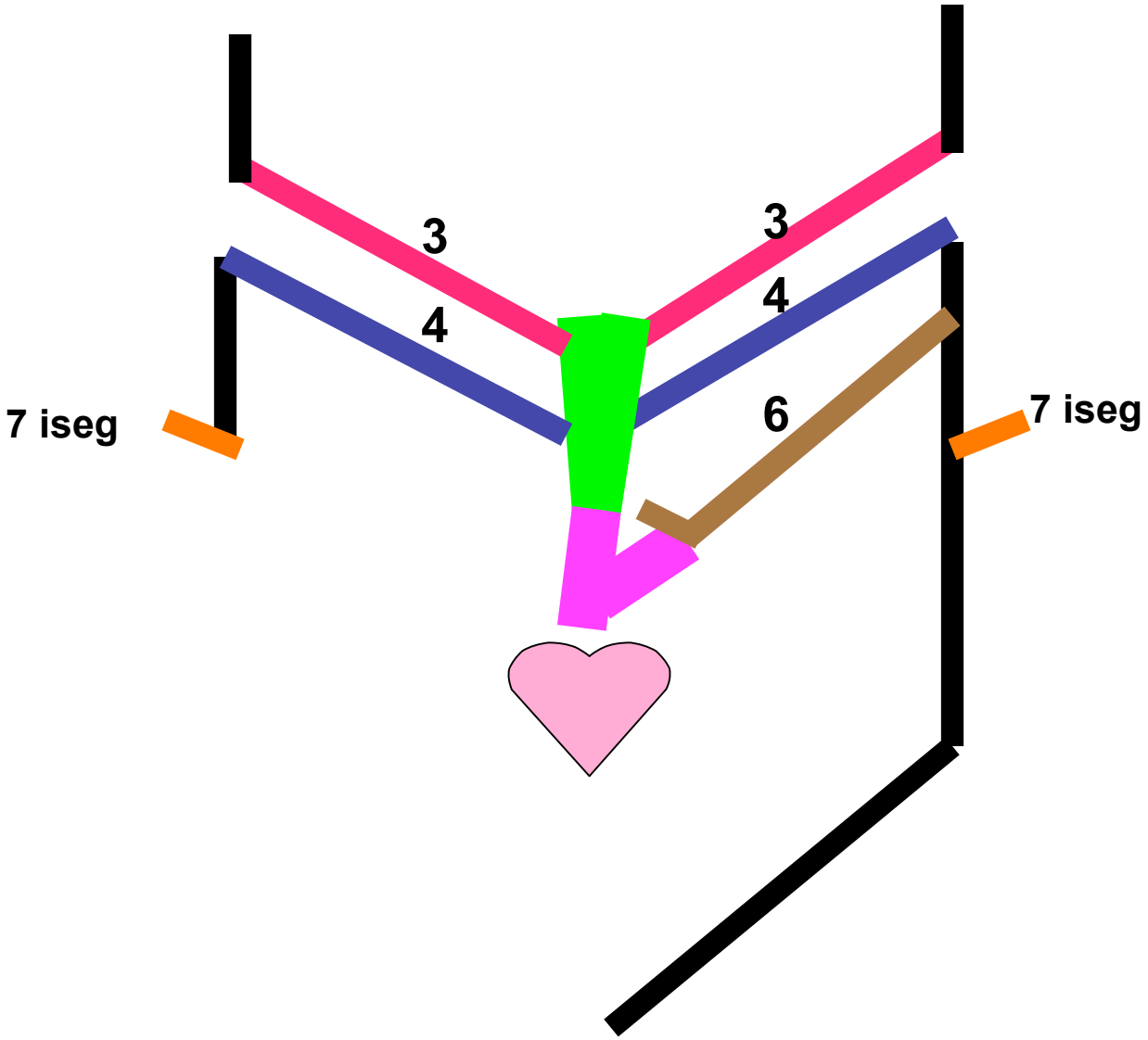
AORTIC ARCHES SCHEMATIC



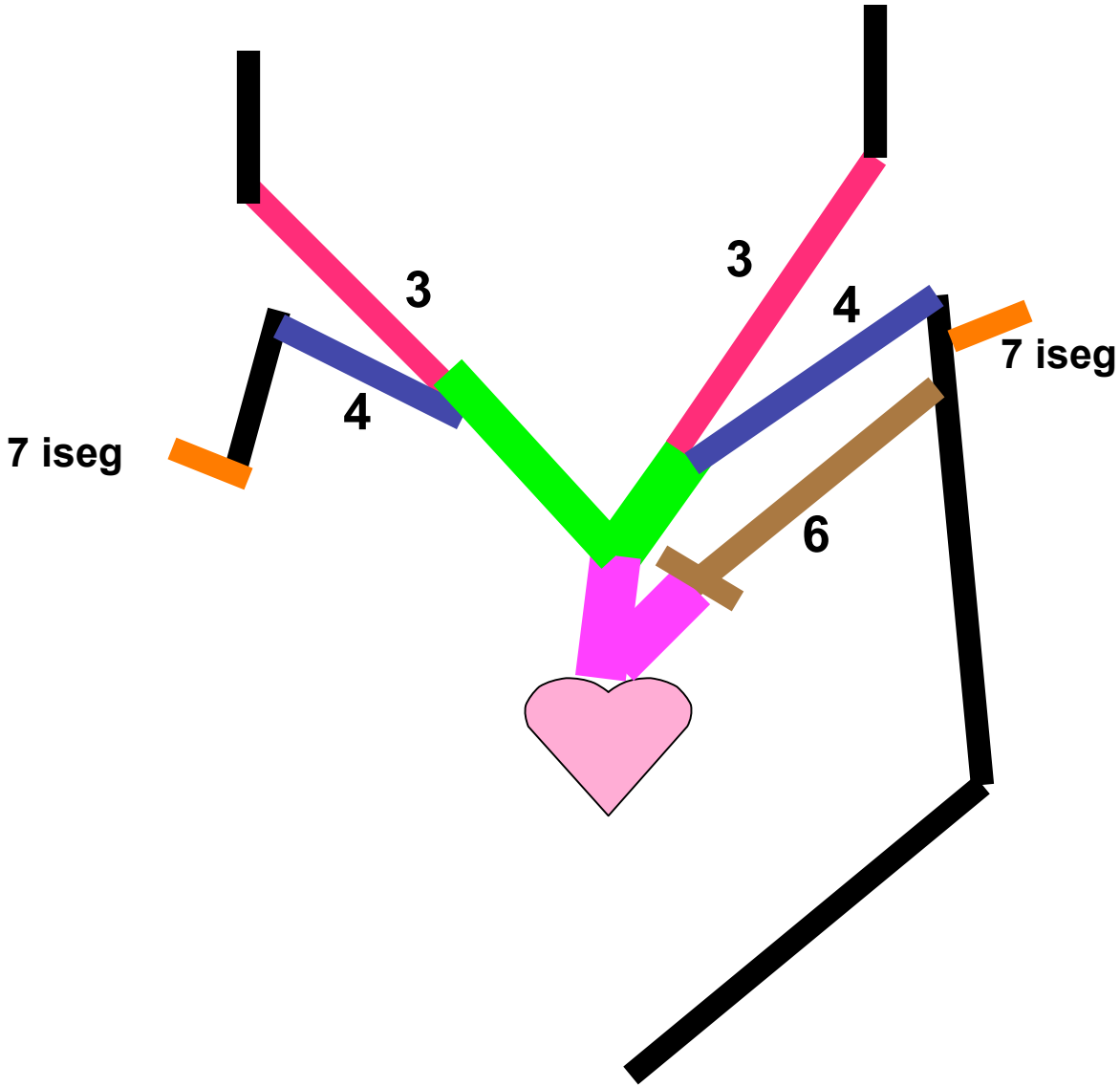
AORTIC ARCHES AND DERIVATIVES



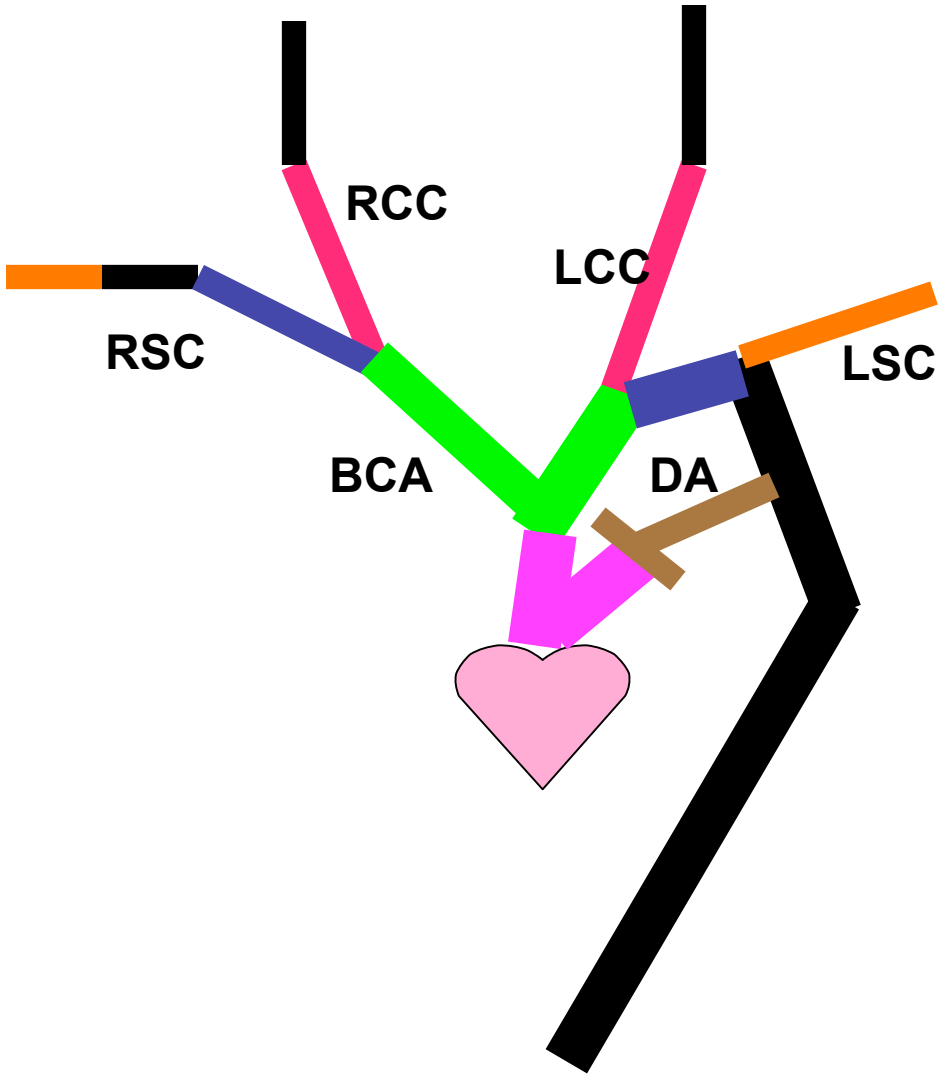
AORTIC ARCHES AND DERIVATIVES



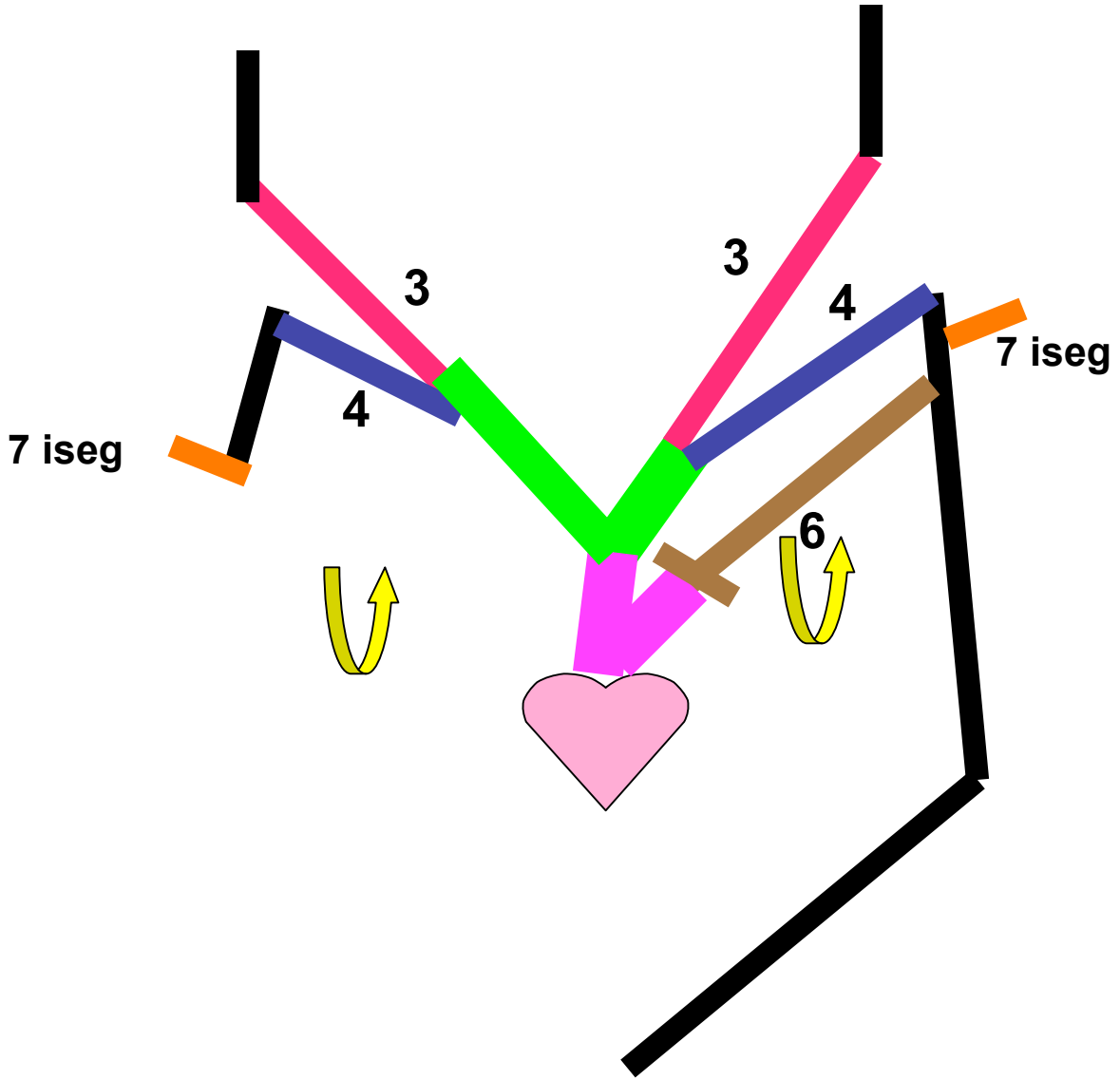
AORTIC ARCHES AND DERIVATIVES



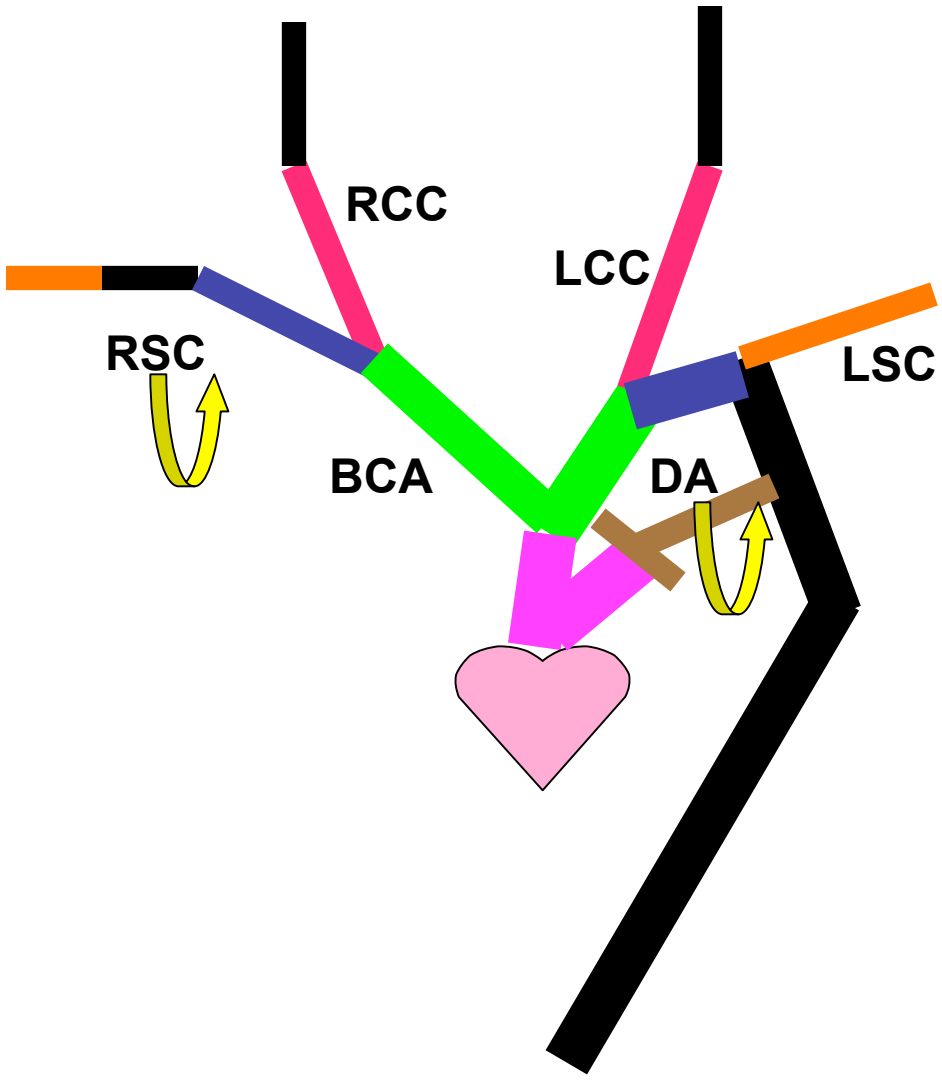
AORTIC ARCHES AND DERIVATIVES



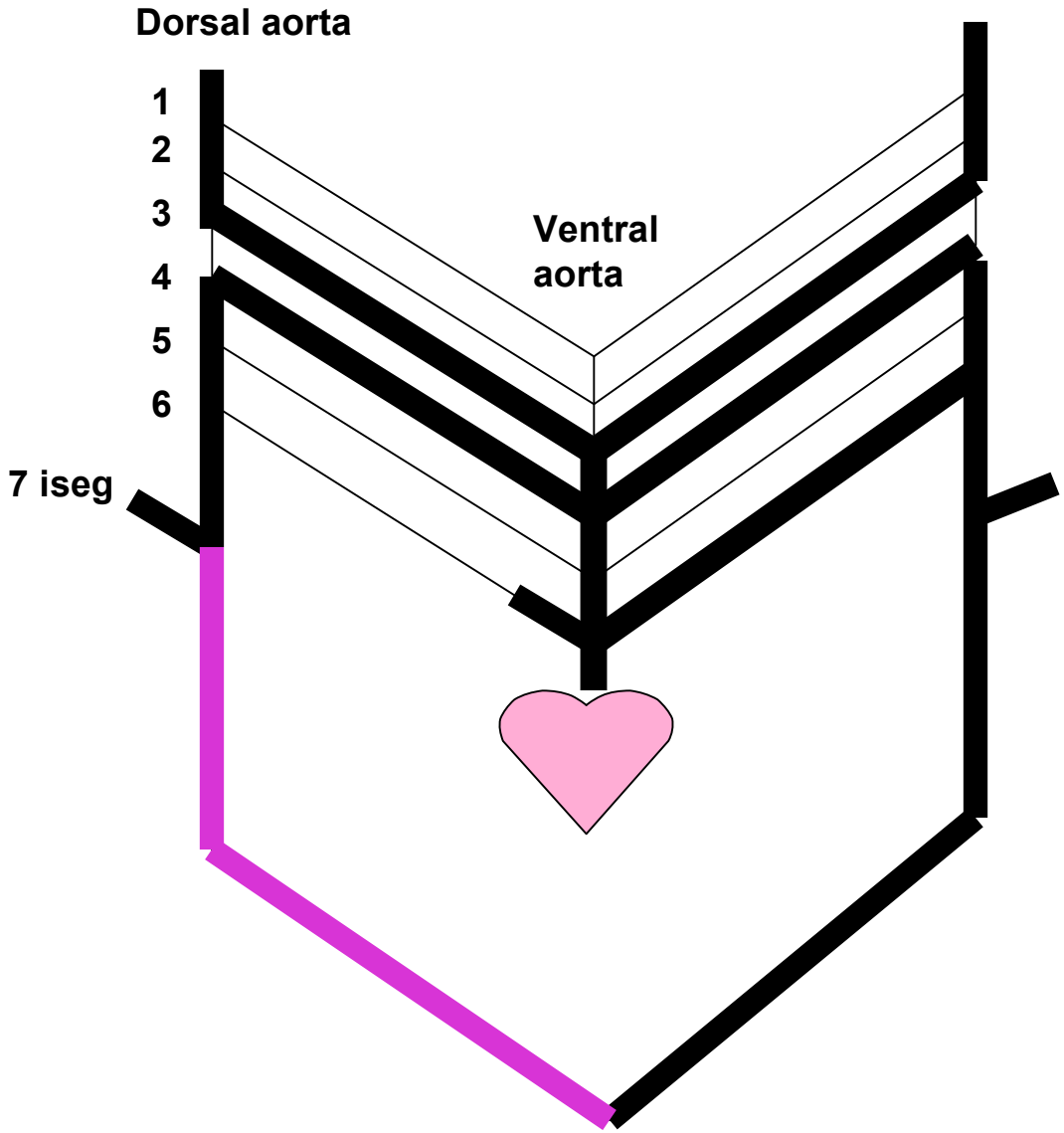
RECURRENT LARYNGEAL NERVES



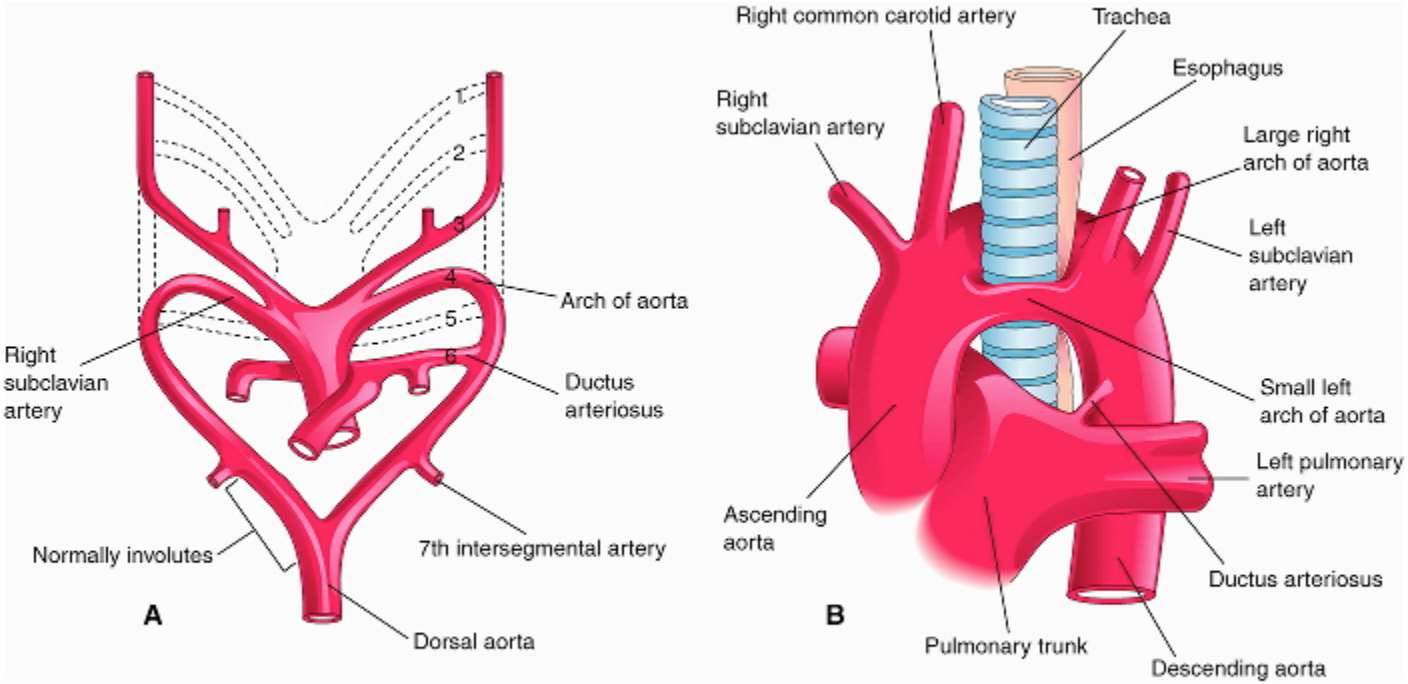
RECURRENT LARYNGEAL NERVES



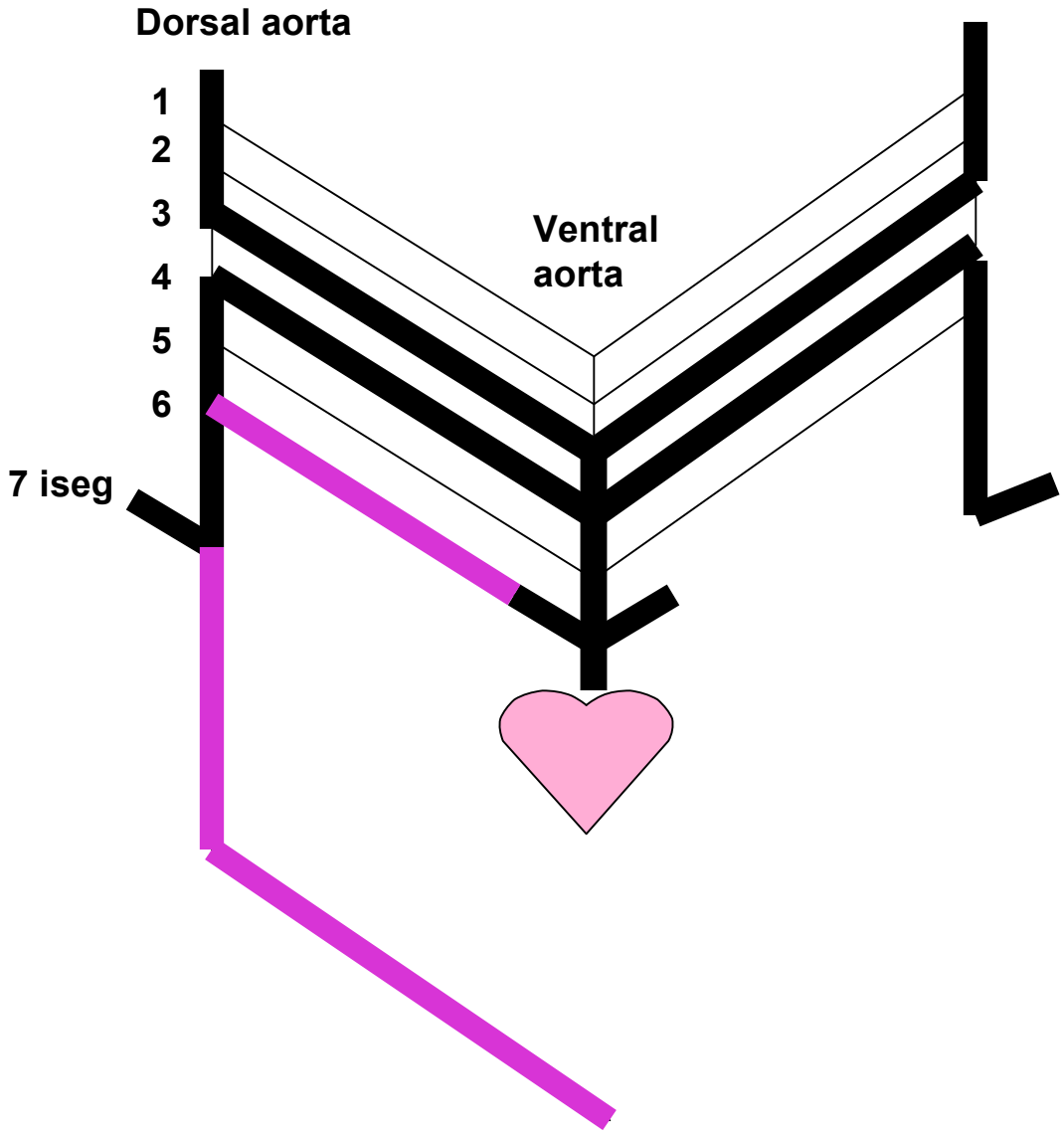
DOUBLE AORTIC ARCH



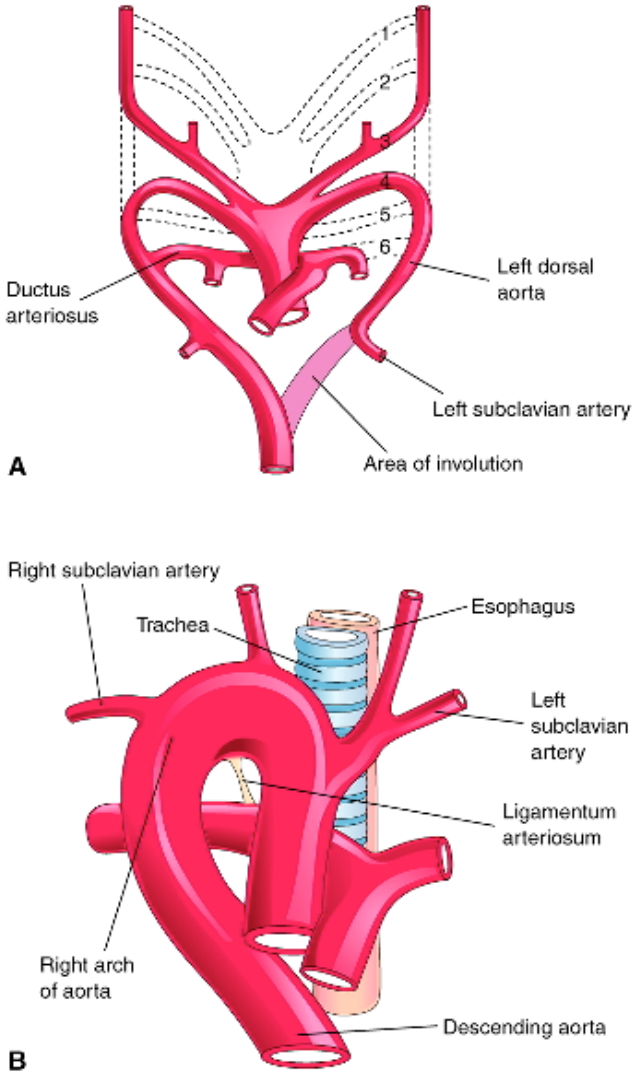
DOUBLE AORTIC ARCH: “Vascular ring”
Causes airway obstruction, stridor in infancy.



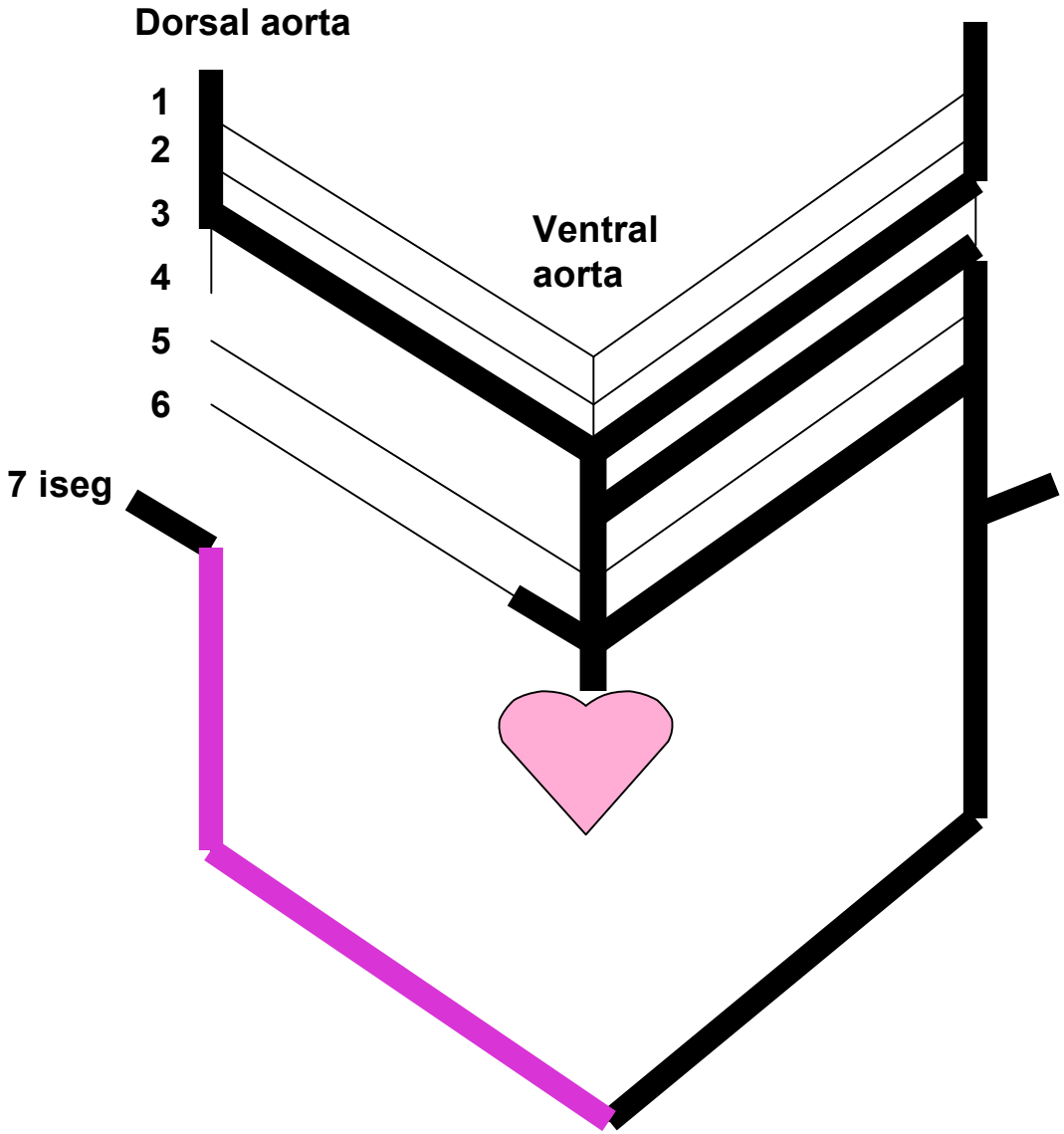
RIGHT AORTIC ARCH



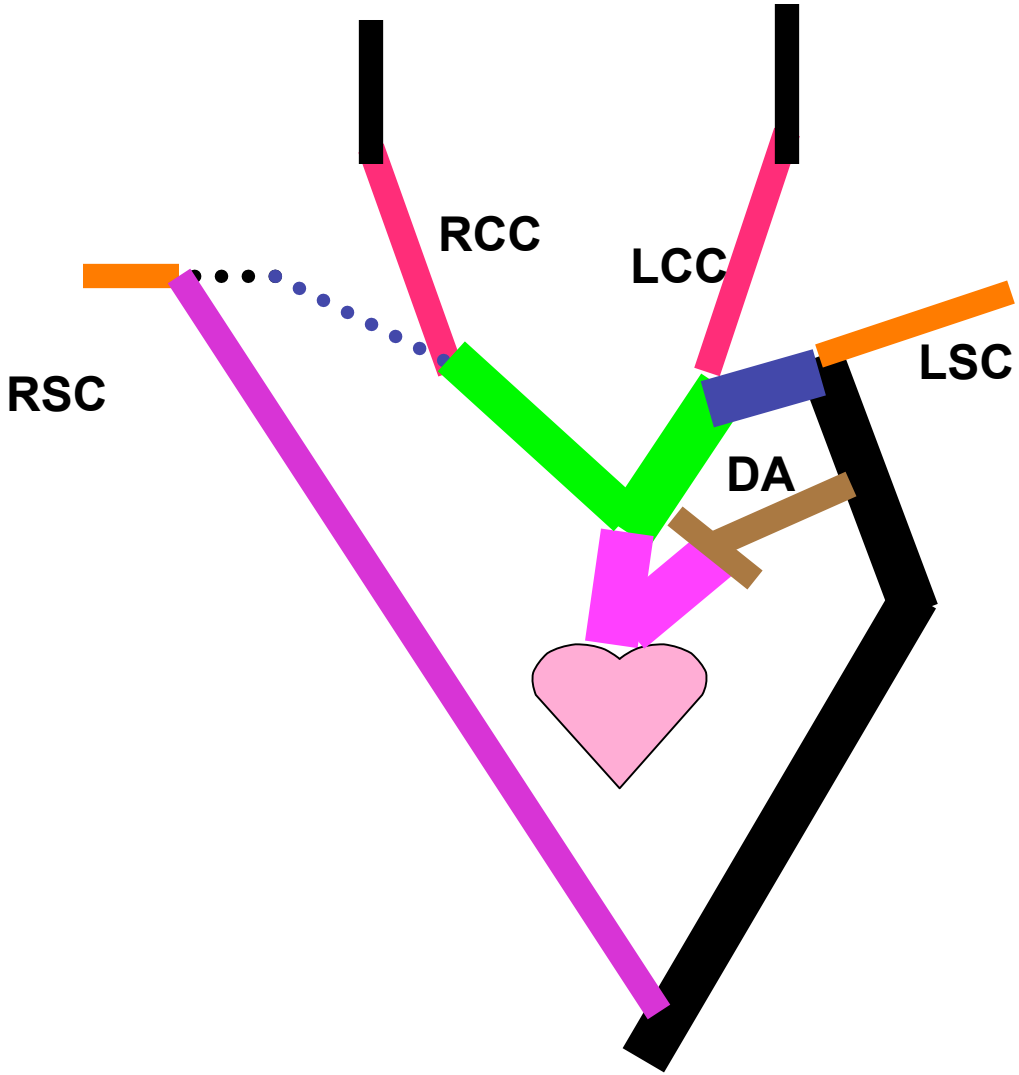
RIGHT AORTIC ARCH: Mirror image branching



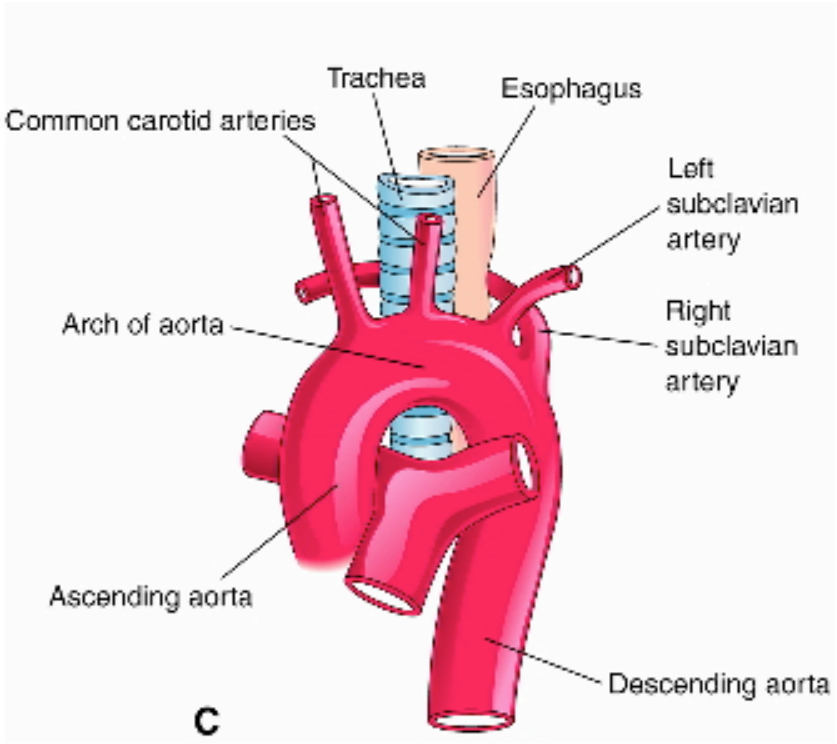
ABERRANT RIGHT SUBCLAVIAN ARTERY



ABERRANT RIGHT SUBCLAVIAN ARTERY

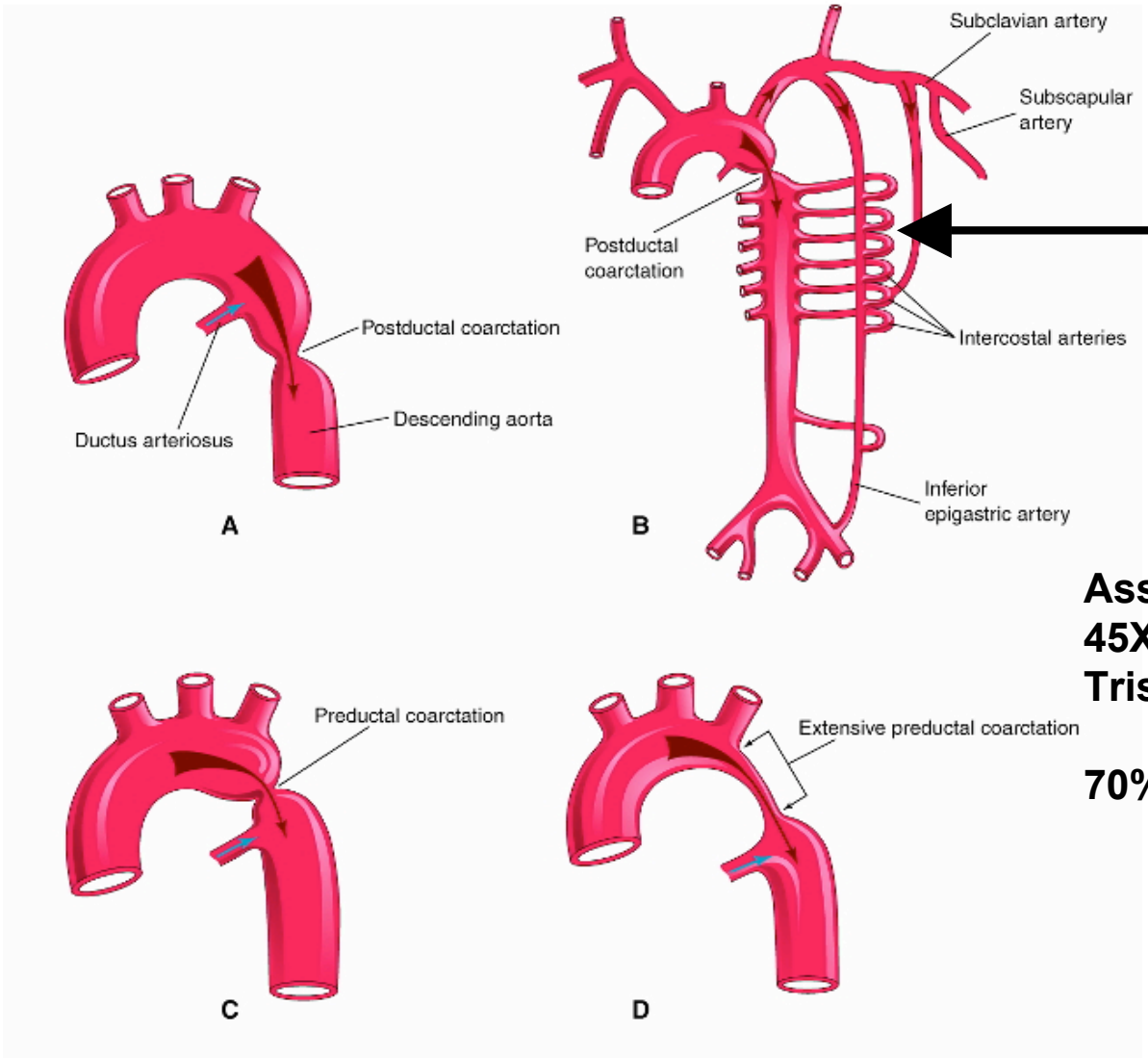


ABERRANT RIGHT SUBCLAVIAN ARTERY



Occurs in 0.5% of people.
Frequently asymptomatic, it may cause obstructive symptoms.

COARCTATION OF THE AORTA



>90% post (juxta) ductal

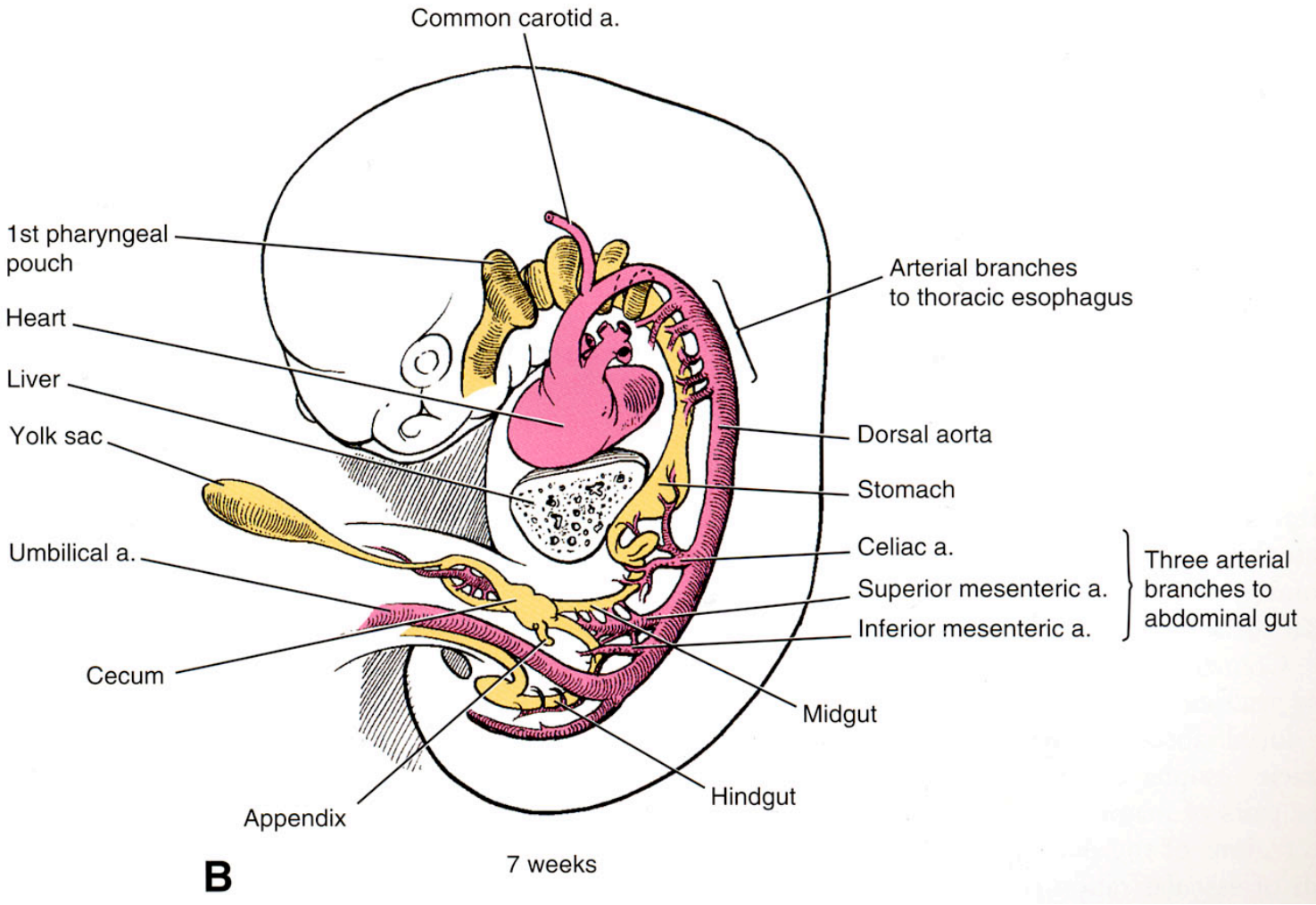
Notching of ribs on X-ray

Blood pressure difference
Upper extr >>Lower extr.

Associated with:
45X: Turner's synrome
Trisomy 21: Down's syndrome

70% have bicuspid aortic valve

ABDOMINAL ARTERIES

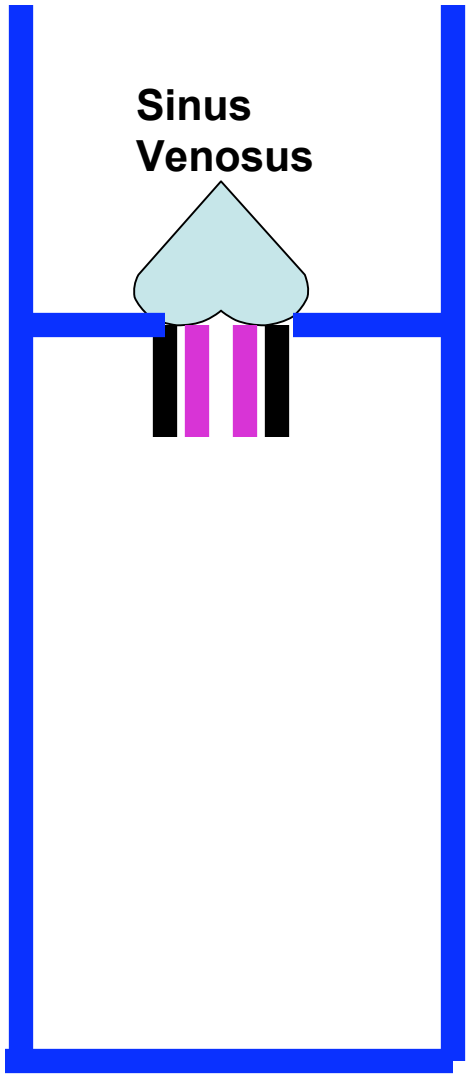


VENOUS SYSTEM SCHEMATIC

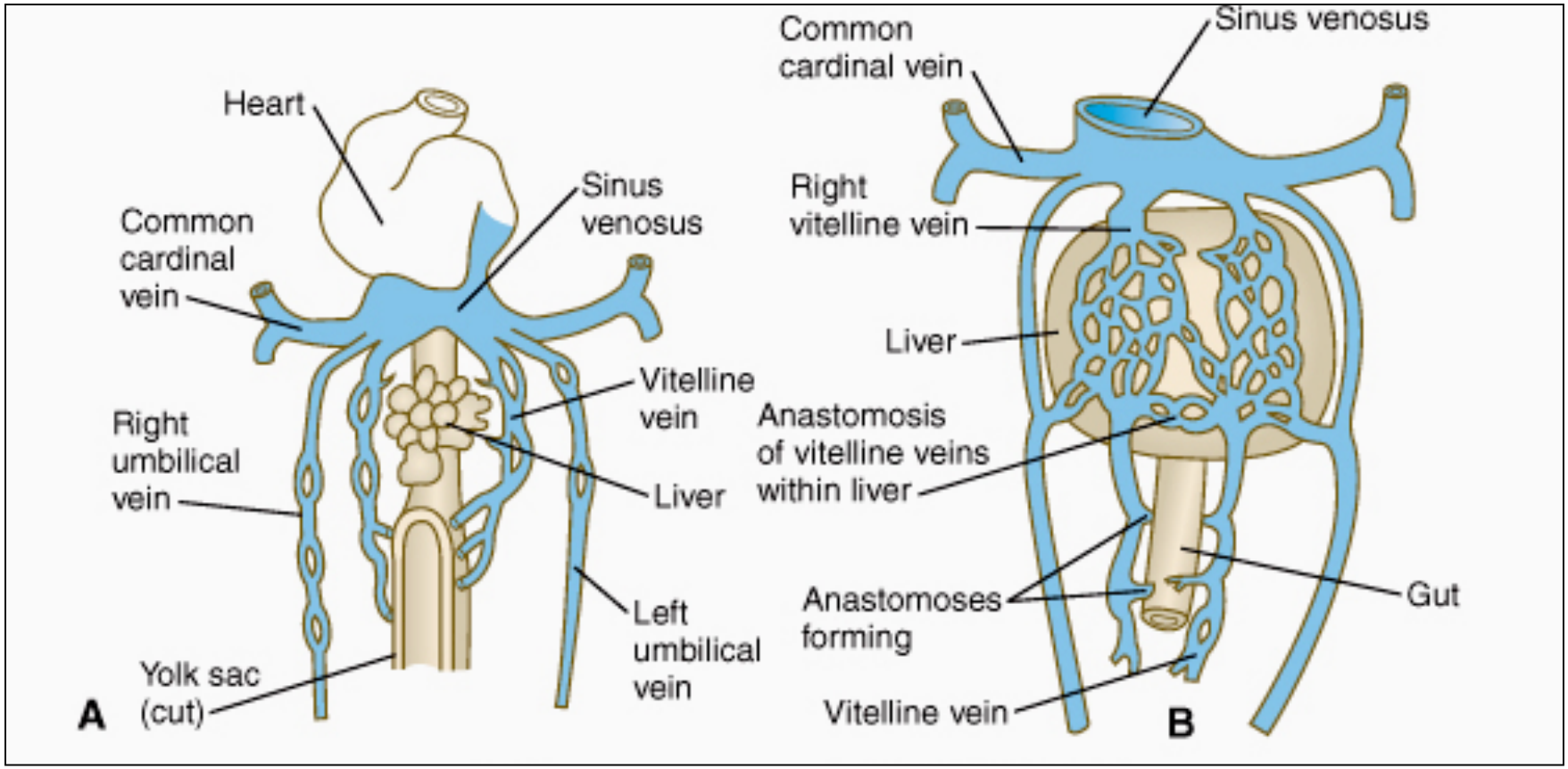
Vitelline

Umbilical

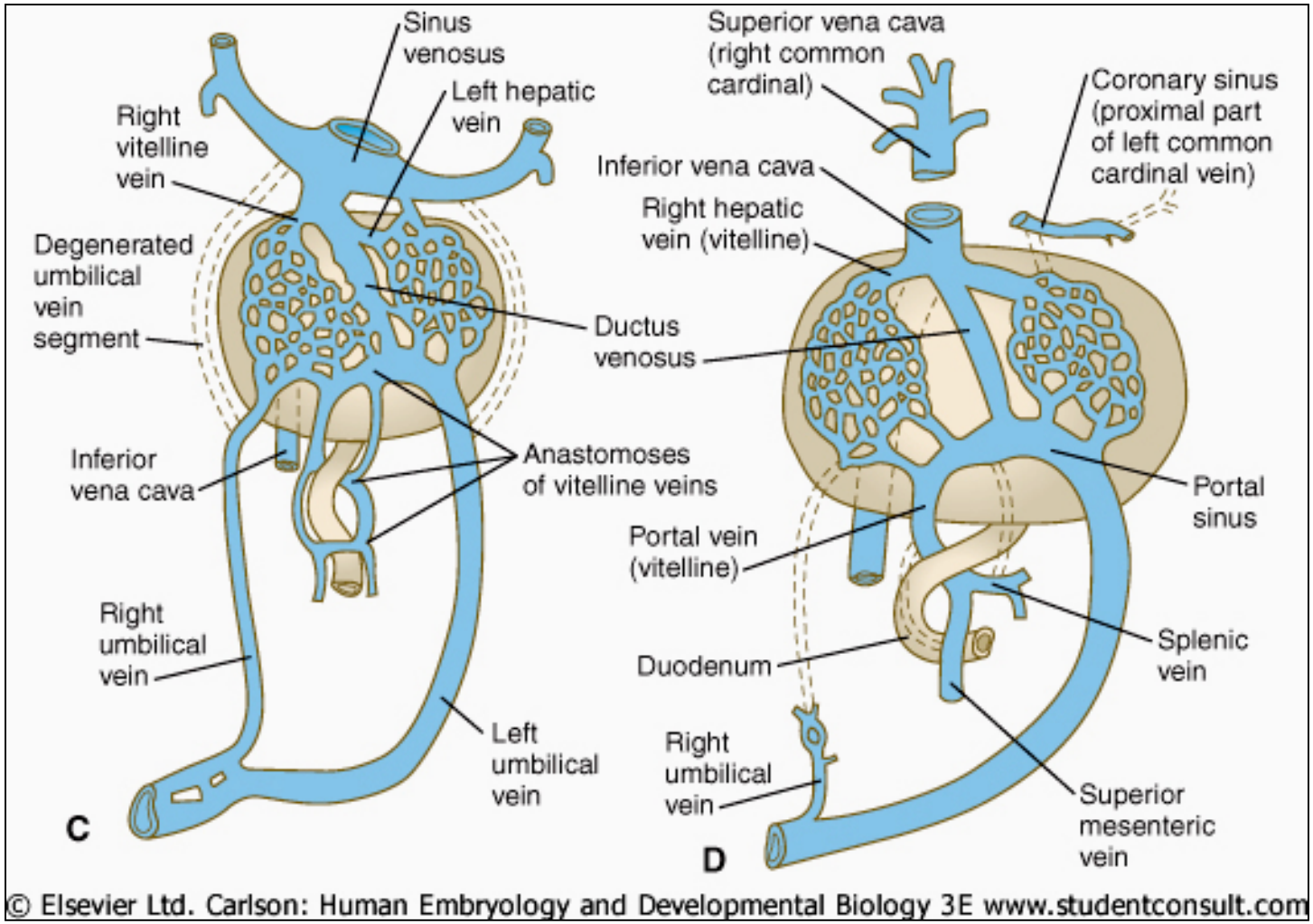
Cardinal



UMBILICAL AND VITELLINE VEINS- I: Liver, portal vein and ductus venosus.



UMBILICAL AND VITELLINE VEINS- II: Liver, portal vein and ductus venosus.



VENOUS SYSTEM SCHEMATIC

Vitelline

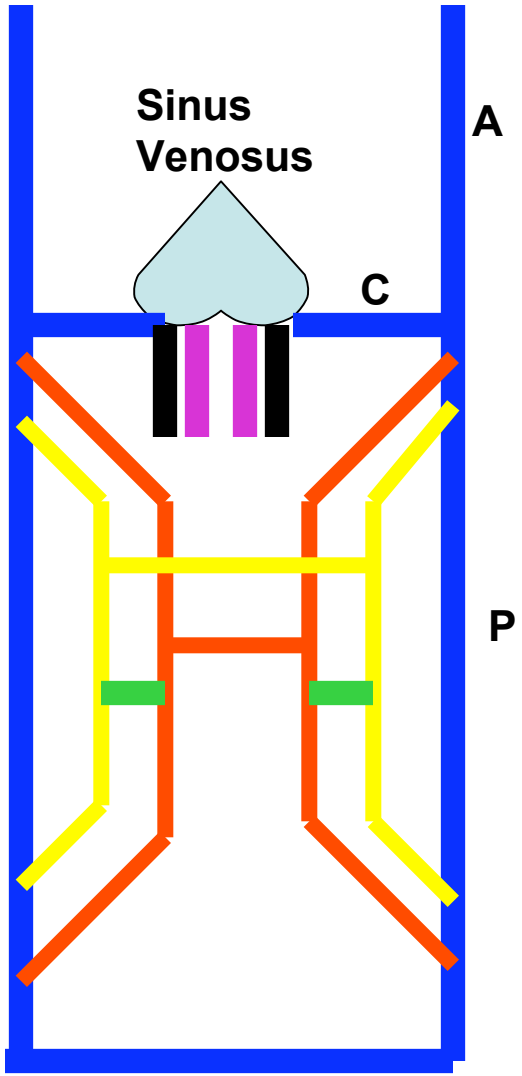
Umbilical

Cardinal

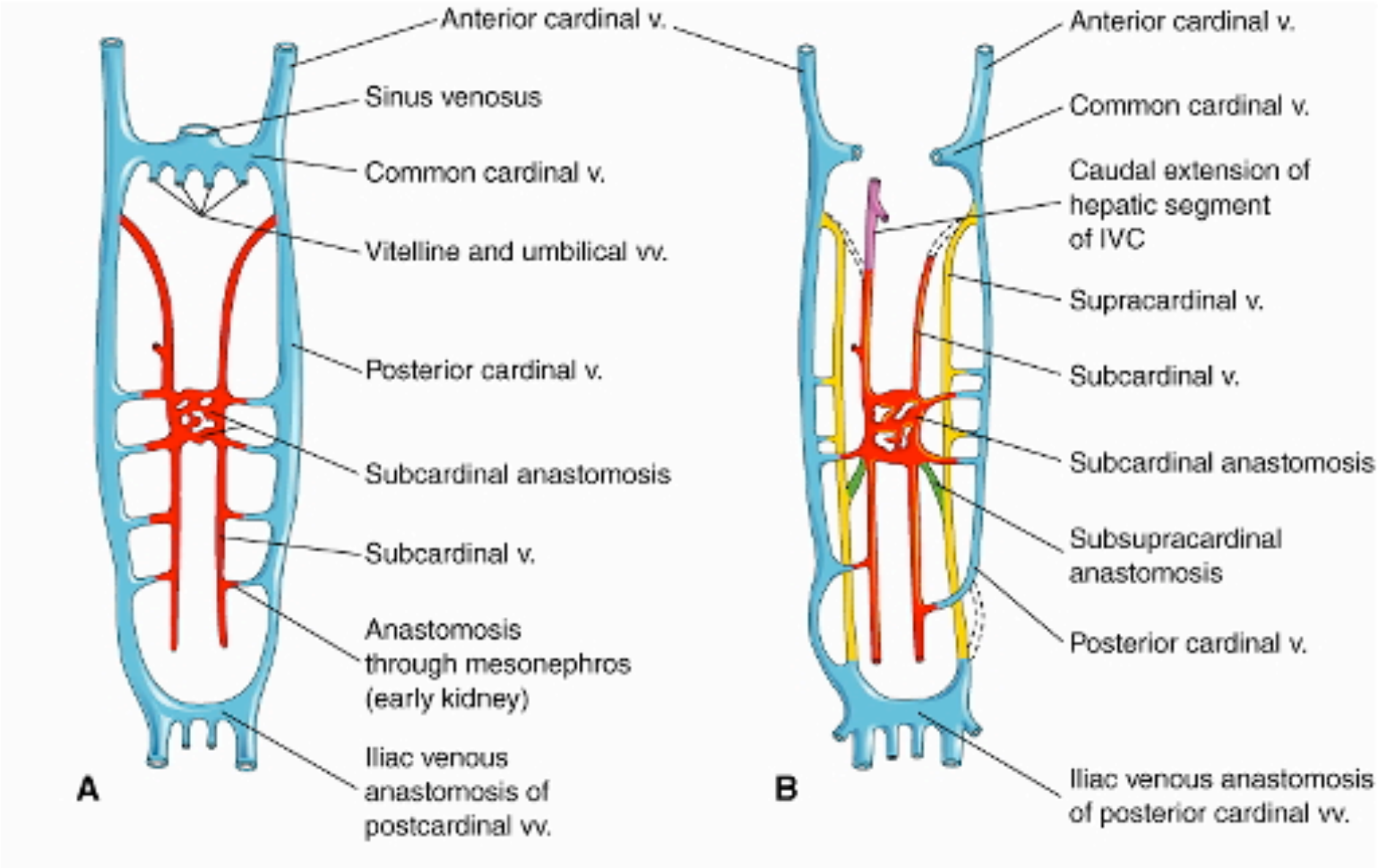
Subcardinal

Supra cardinal

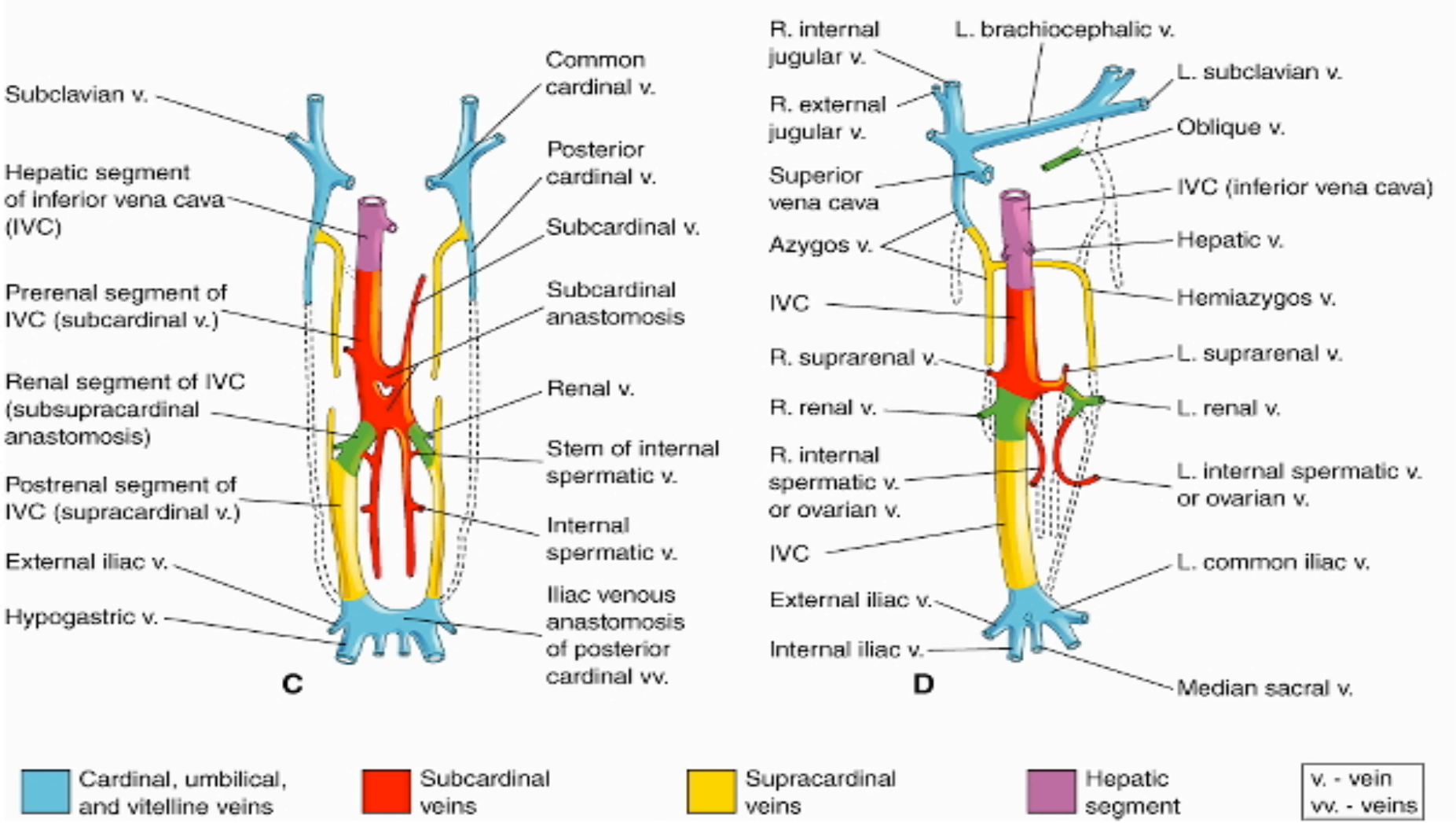
Supra-Subcardinal Anastomosis



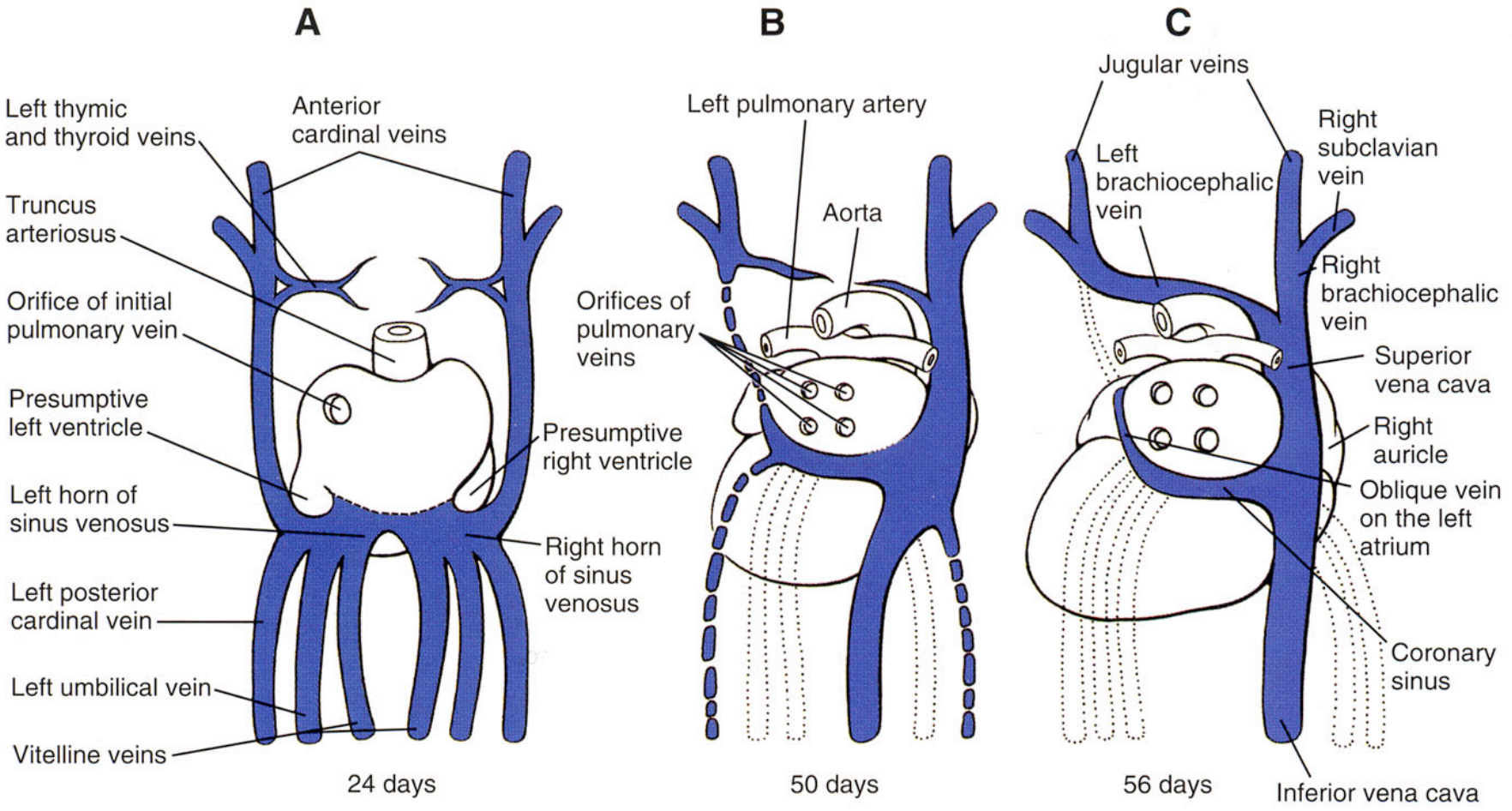
THE CARDINAL VEINS AND THE VENAE CAVAE



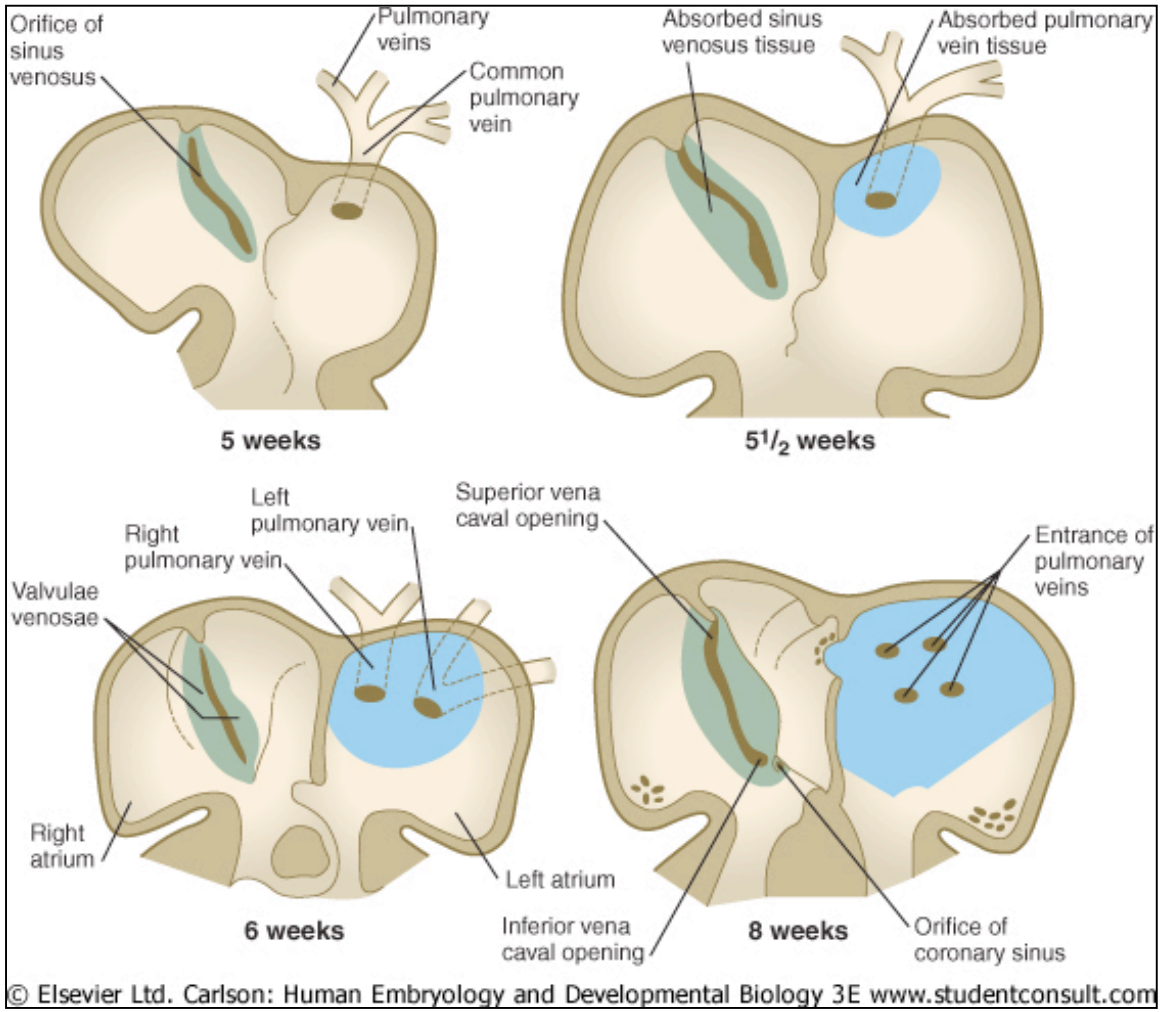
THE CARDINAL VEINS AND THE VENAE CAVAE

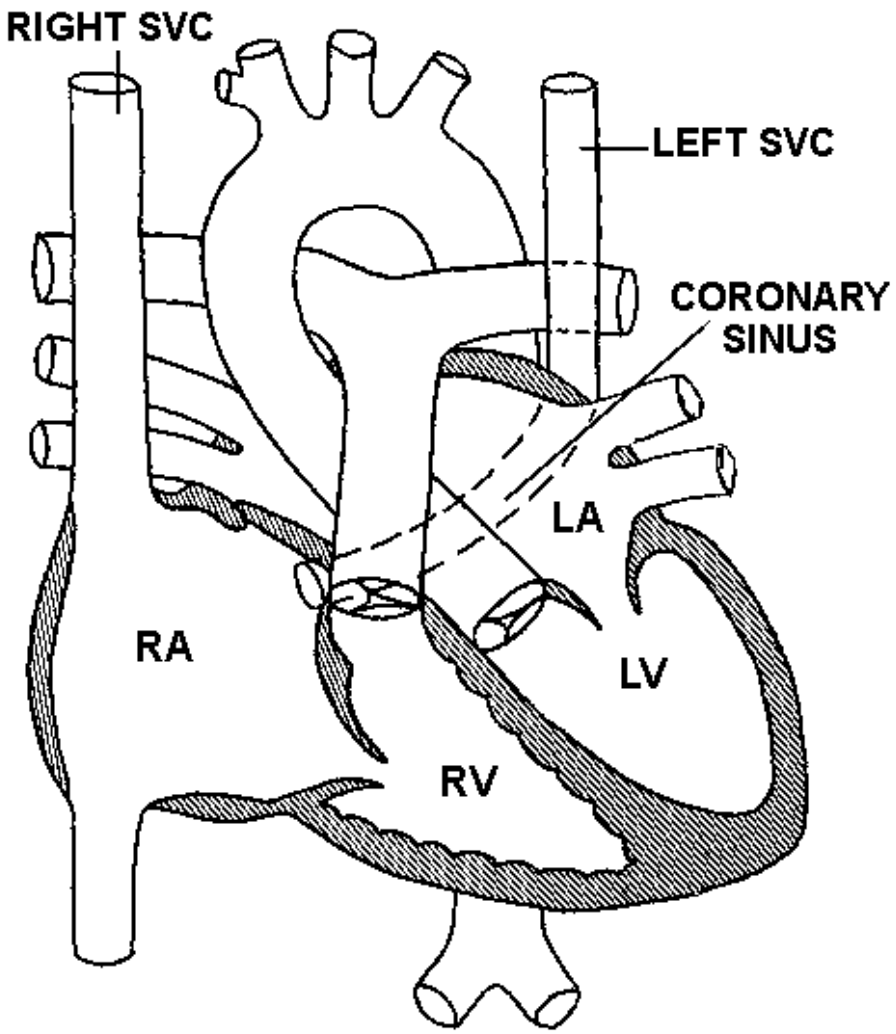


SINUS VENOSUS AND THE CORONARY SINUS



VENOUS (SMOOTH WALLED) PART OF ATRIA





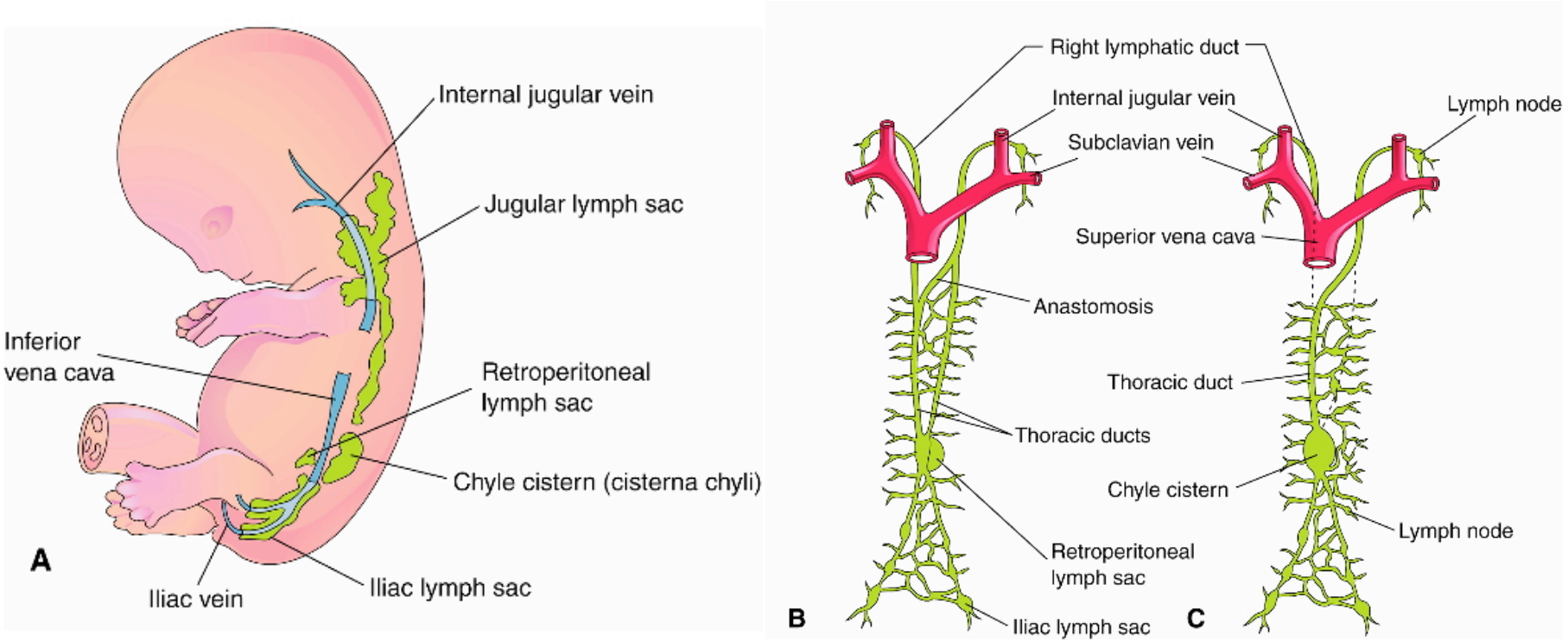
PERSISTENT LEFT SVC

0.3% of general population.
4 % of patients with Cong. Ht Dis.

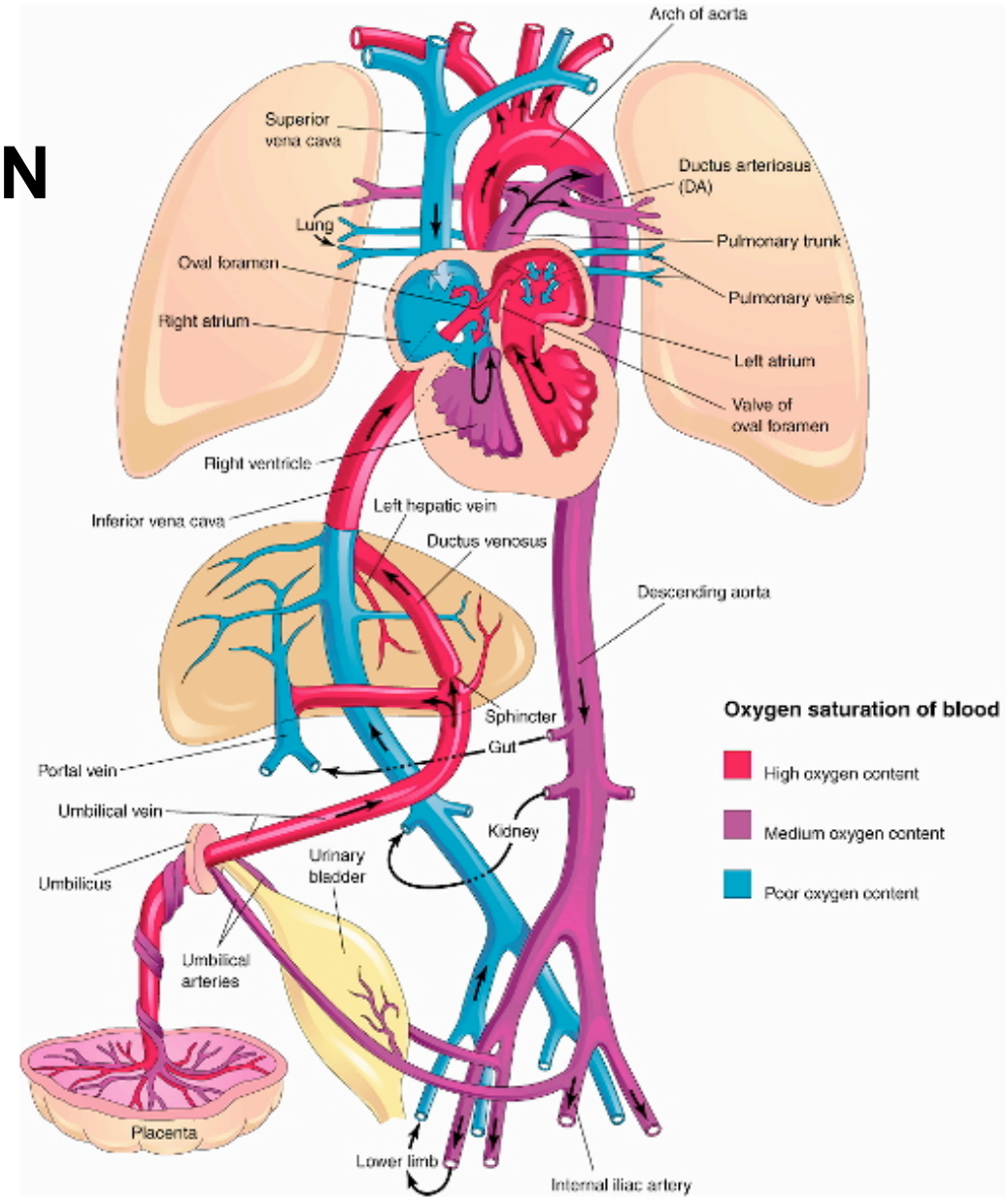
Usually drains to Coronary sinus.
Usually asymptomatic.

Enlarged coronary sinus is a clue.

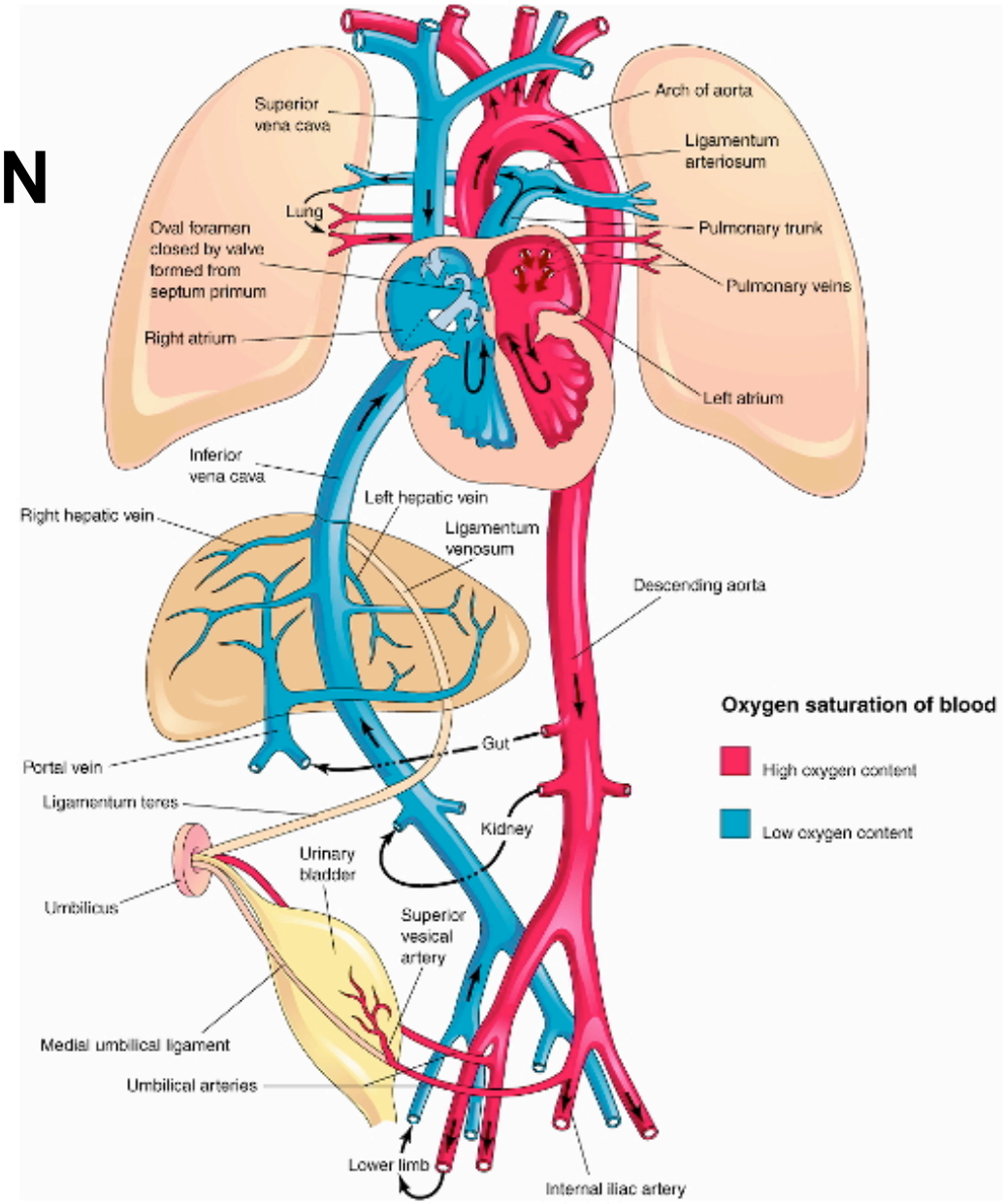
LYMPHATIC SYSTEM



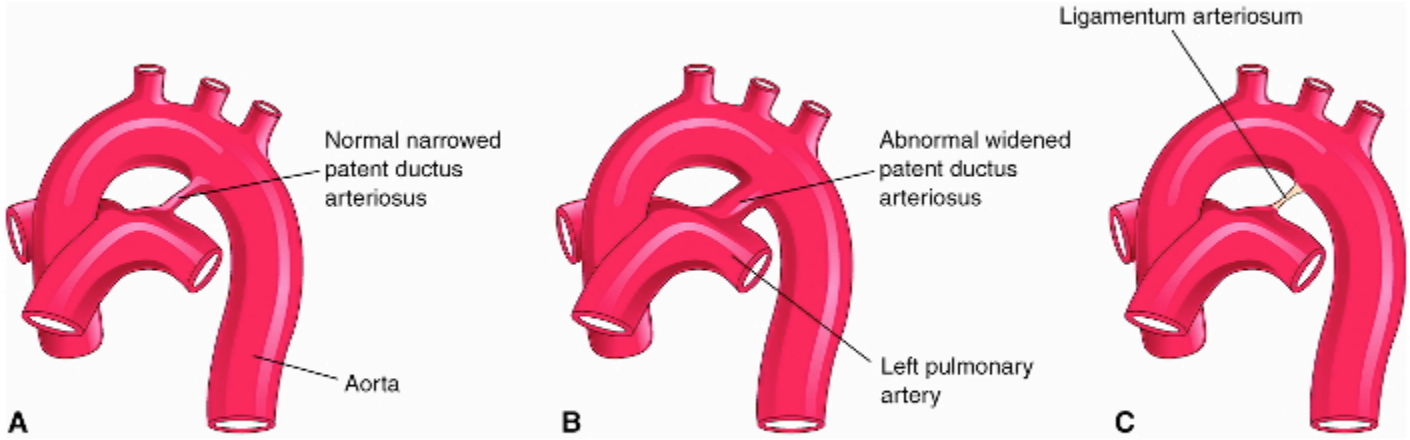
FETAL CIRCULATION



POSTNATAL CIRCULATION



PATENT DUCTUS ARTERIOSUS

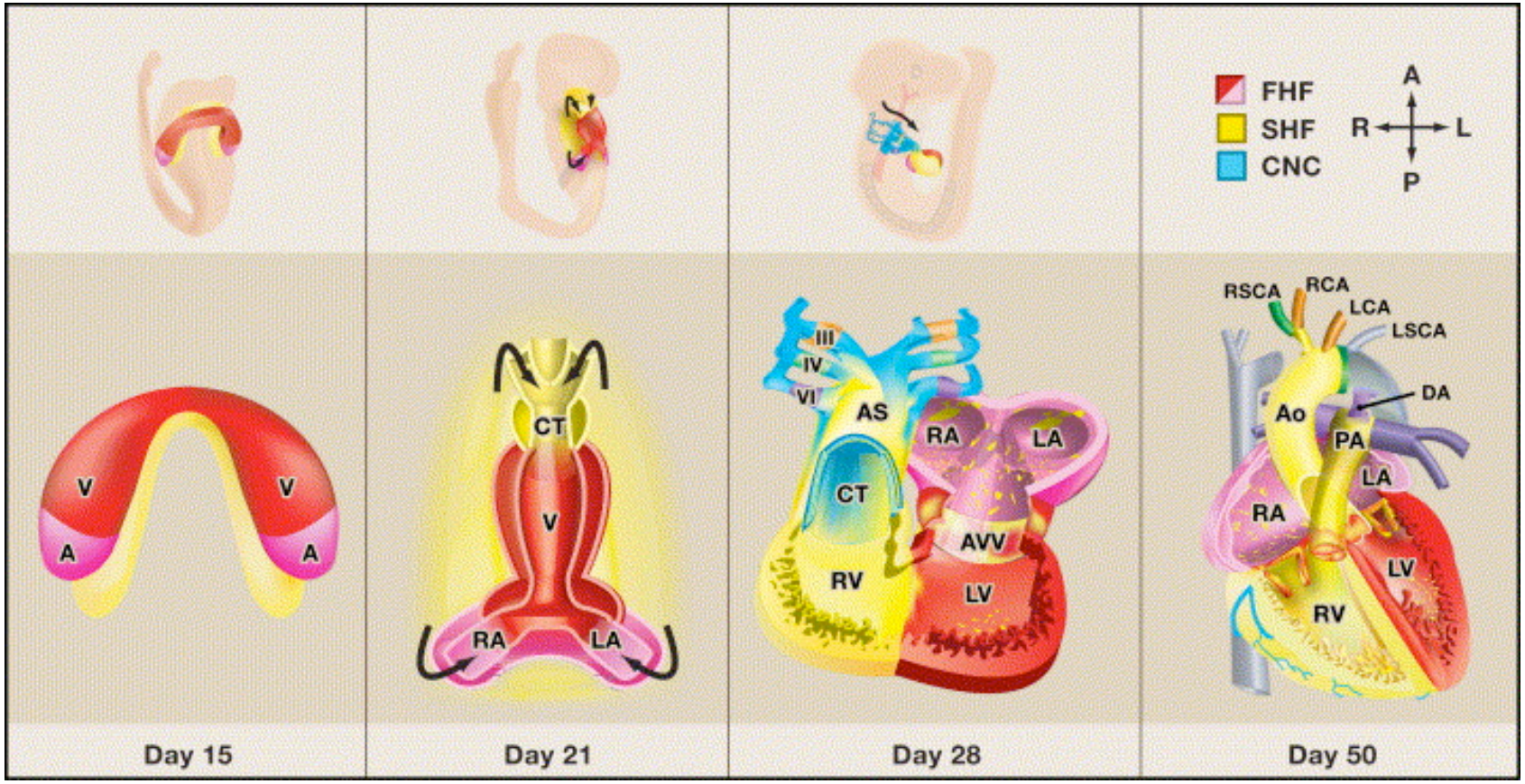


Prostaglandins: Keep the ductus Patent
Indomethacin: Closes the ductus.

Physiologic closure: Normally 82% by 48hrs, 100% by 4 days.
Anatomic closure: 12 weeks.

Patent Ductus : -prematurity.
-neonatal hypoxic states.
-maternal Rubella infection

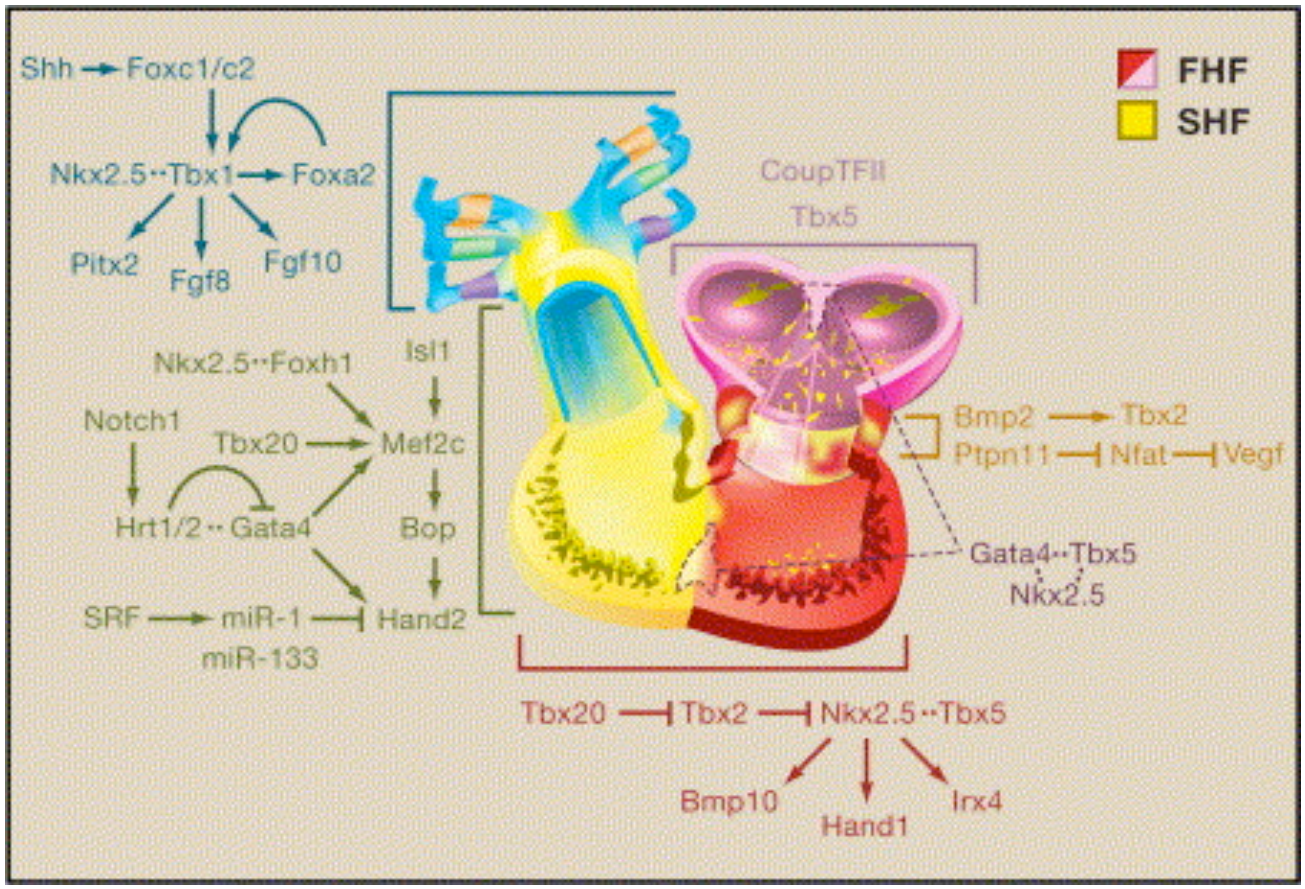
CELL LINEAGES IN HEART DEVELOPMENT



FHF = First Heart Field; SHF = Second Heart Field; CNC: Cardiac Neural Crest

Ref: Srivastava, D. Making or Breaking the Heart: From Lineage Determination to Morphogenesis.Cell 126, Sep. 22, 2006 p1037-1048.

MOLECULAR PATHWAYS IN HEART DEVELOPMENT



Ref: Srivastava, D. Making or Breaking the Heart: From Lineage Determination to Morphogenesis.Cell 126, Sep. 22, 2006 p1037-1048.

Genetic Mutations in Congenital Heart Disease

Genetic Mutation	Syndrome Name	Cardiac Disease
Nonsyndromic		
NKX2-5	—	Atrial septal defect, ventricular septal defect, electrical conduction defect
GATA4	—	Atrial septal defect, ventricular septal defect
MYH6	—	Atrial septal defect
NOTCH1	—	Aortic valve disease
Syndromic		
TBX5	Holt-Oram	Atrial septal defect, ventricular septal defect, electrical conduction defect
TBX1	**DiGeorge**	Cardiac outflow tract defect
TFAP2β	Char	Patent ductus arteriosus
JAG1	Alagille	Pulmonary artery stenosis, tetralogy of Fallot
PTPN11	Noonan	Pulmonary valve stenosis
Elastin	William	Supravalvar aortic stenosis
Fibrillin	Marfan	Aortic aneurysm

Ref: Srivastava, D. Making or Breaking the Heart: From Lineage Determination to Morphogenesis.Cell 126, Sep. 22, 2006 p1037-1048.

MOVIE!