

- **Blood Vessels Formed By :**

Vasculogenesis : – vessels arise from blood islands

Angiogenesis: – sprouting from existing vessels

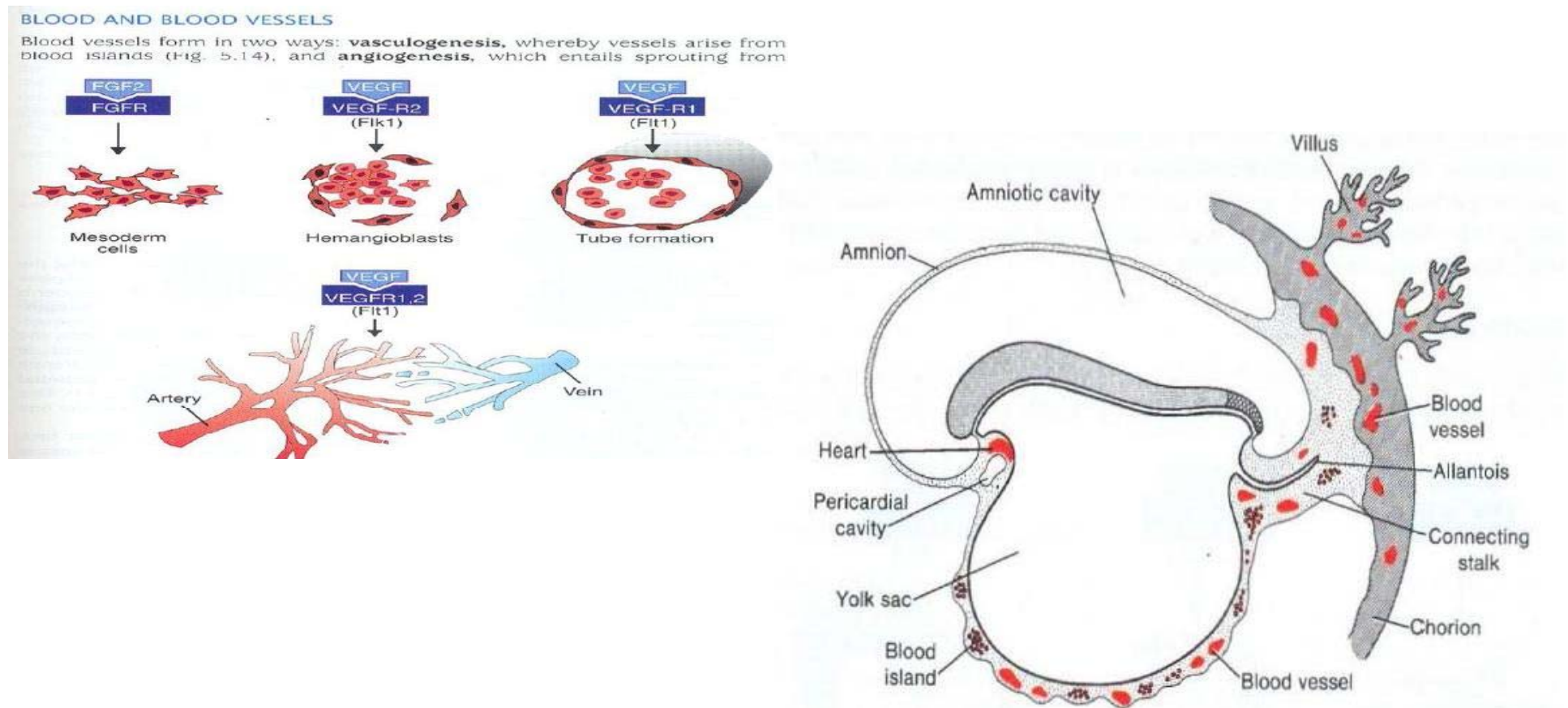
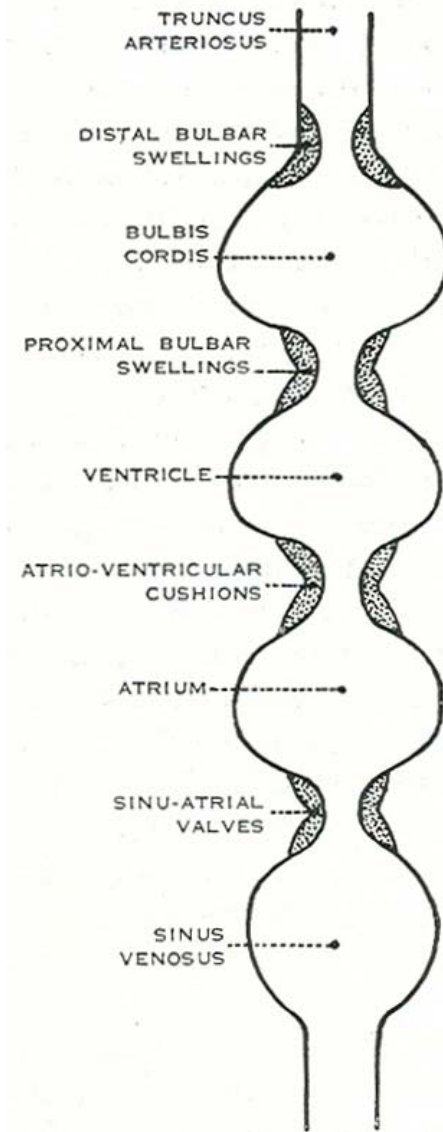
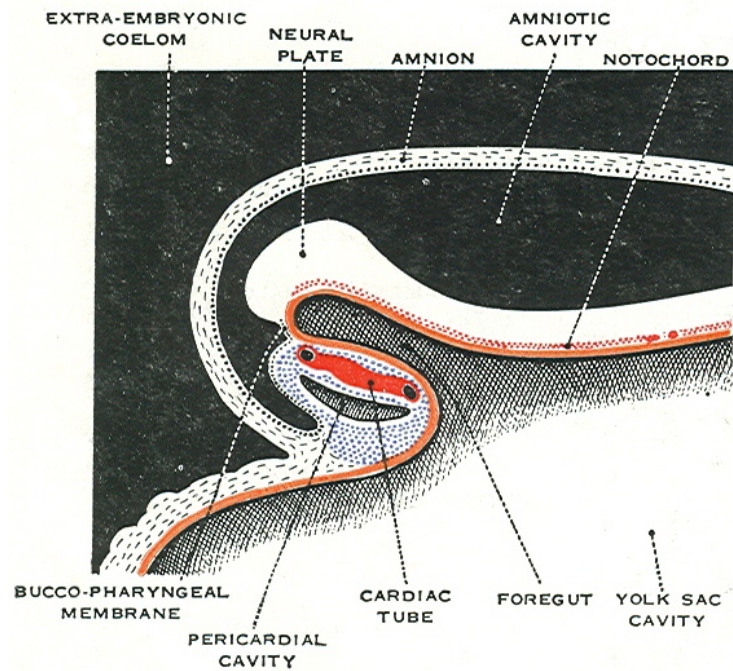
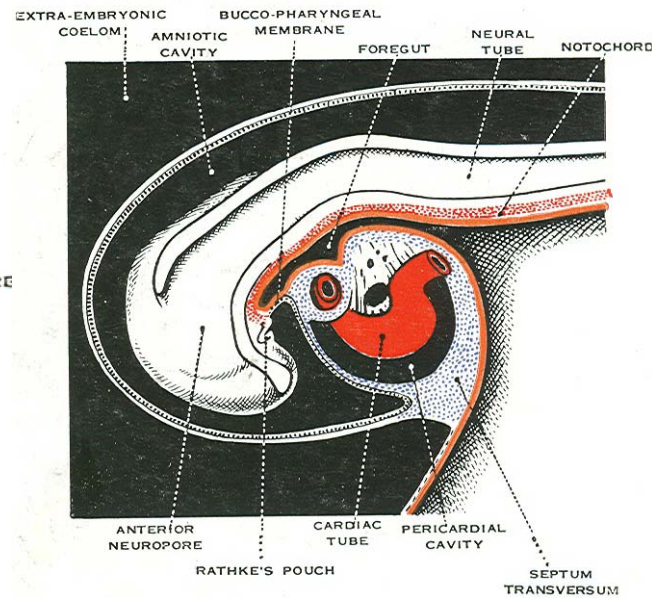
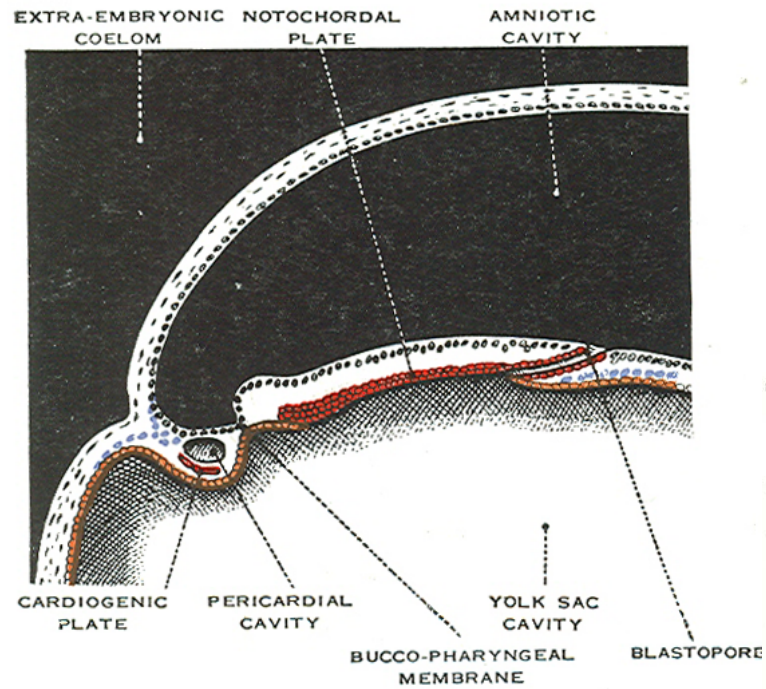
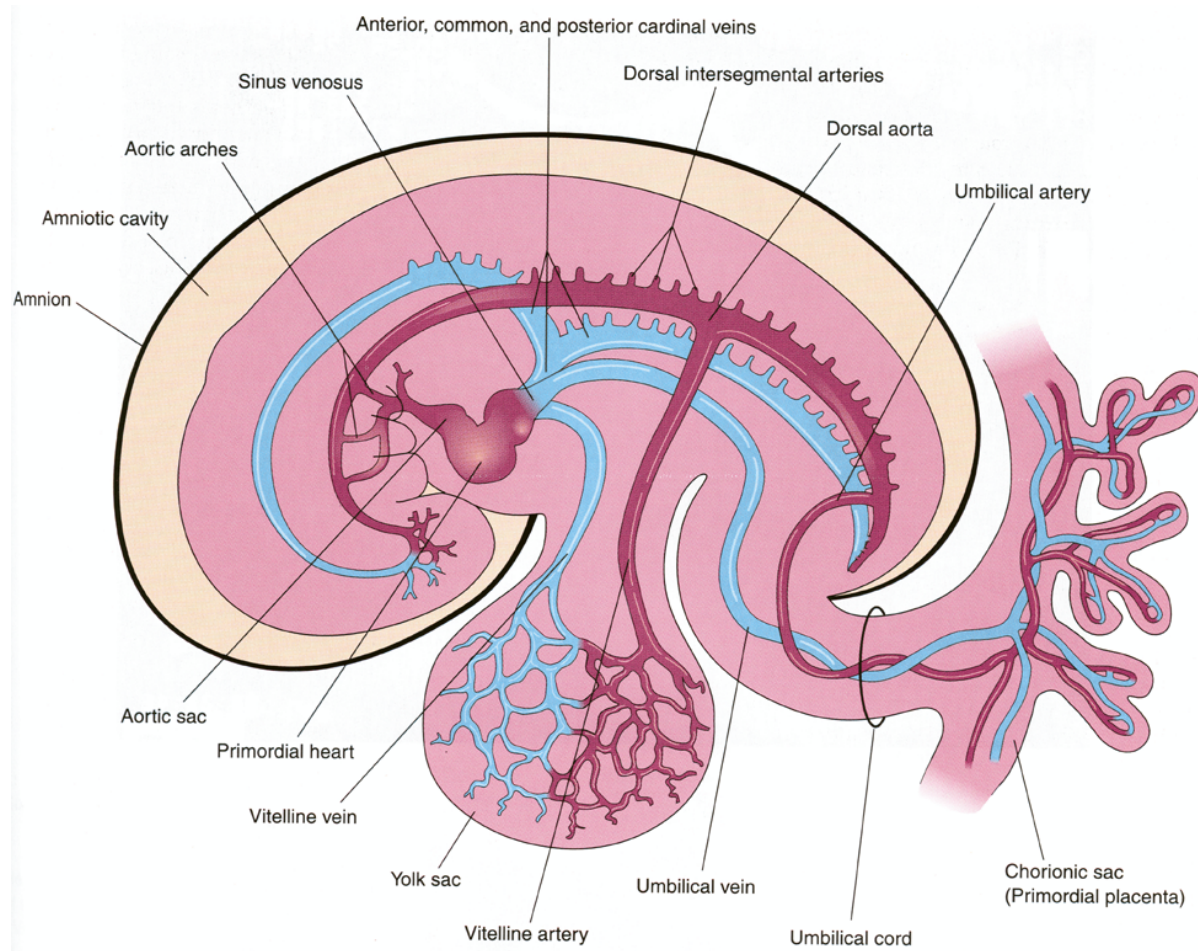


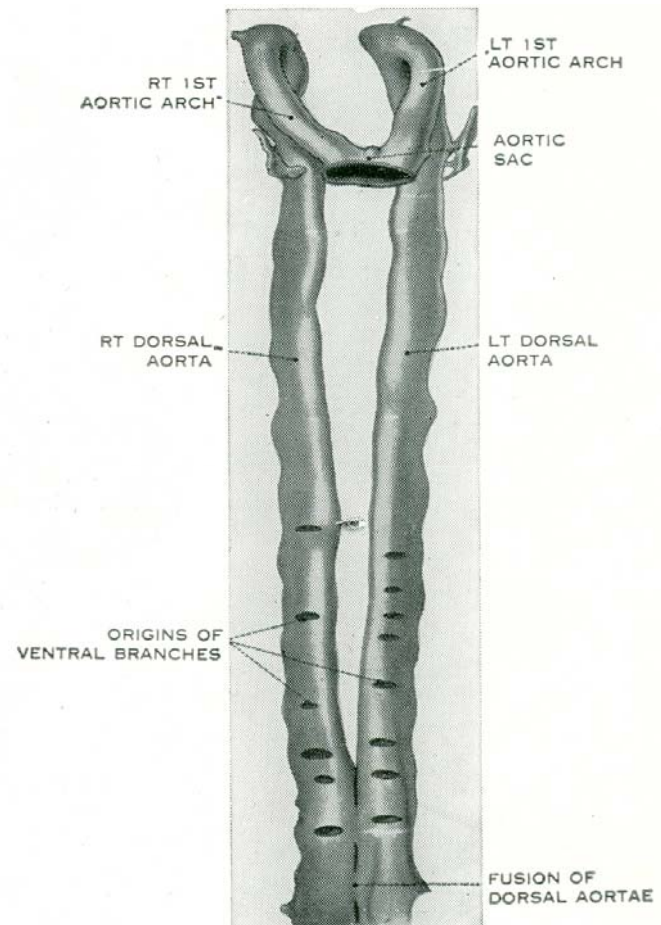
Figure 5.15 Extraembryonic blood vessel formation in the villi, chorion, connecting stalk, and wall of the yolk sac in a presomite embryo of approximately 19 days.

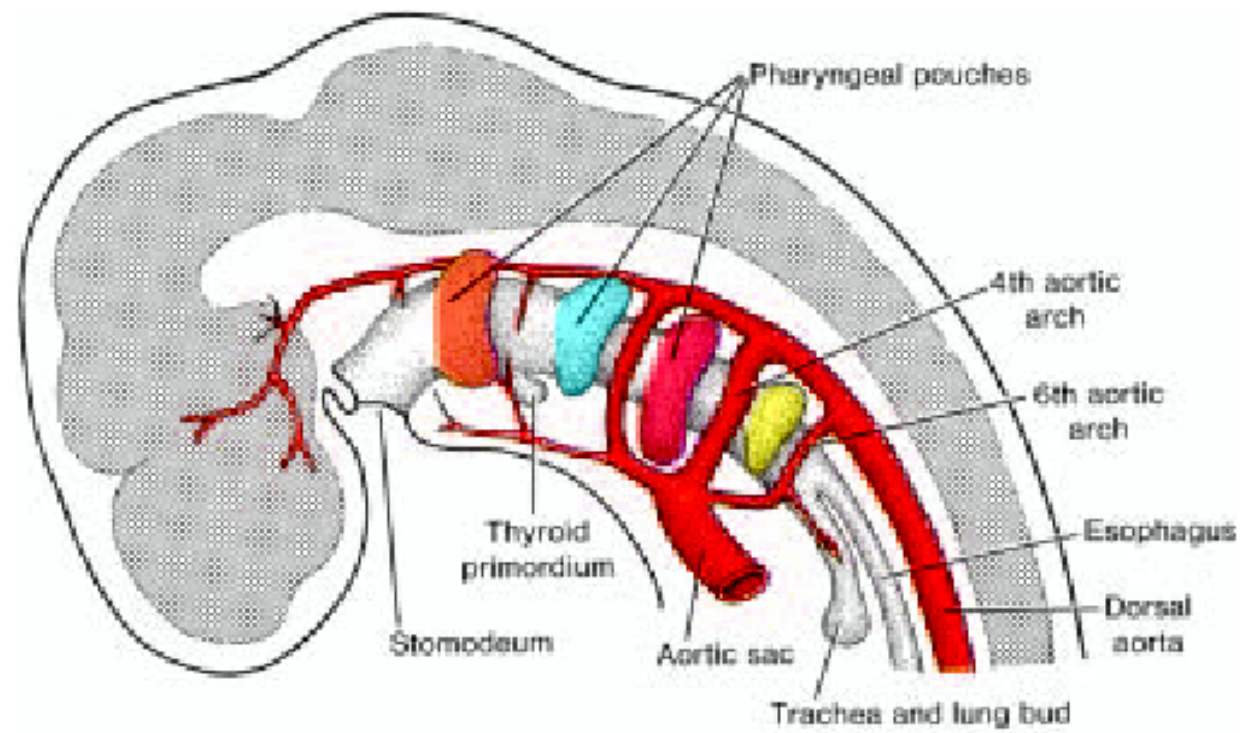




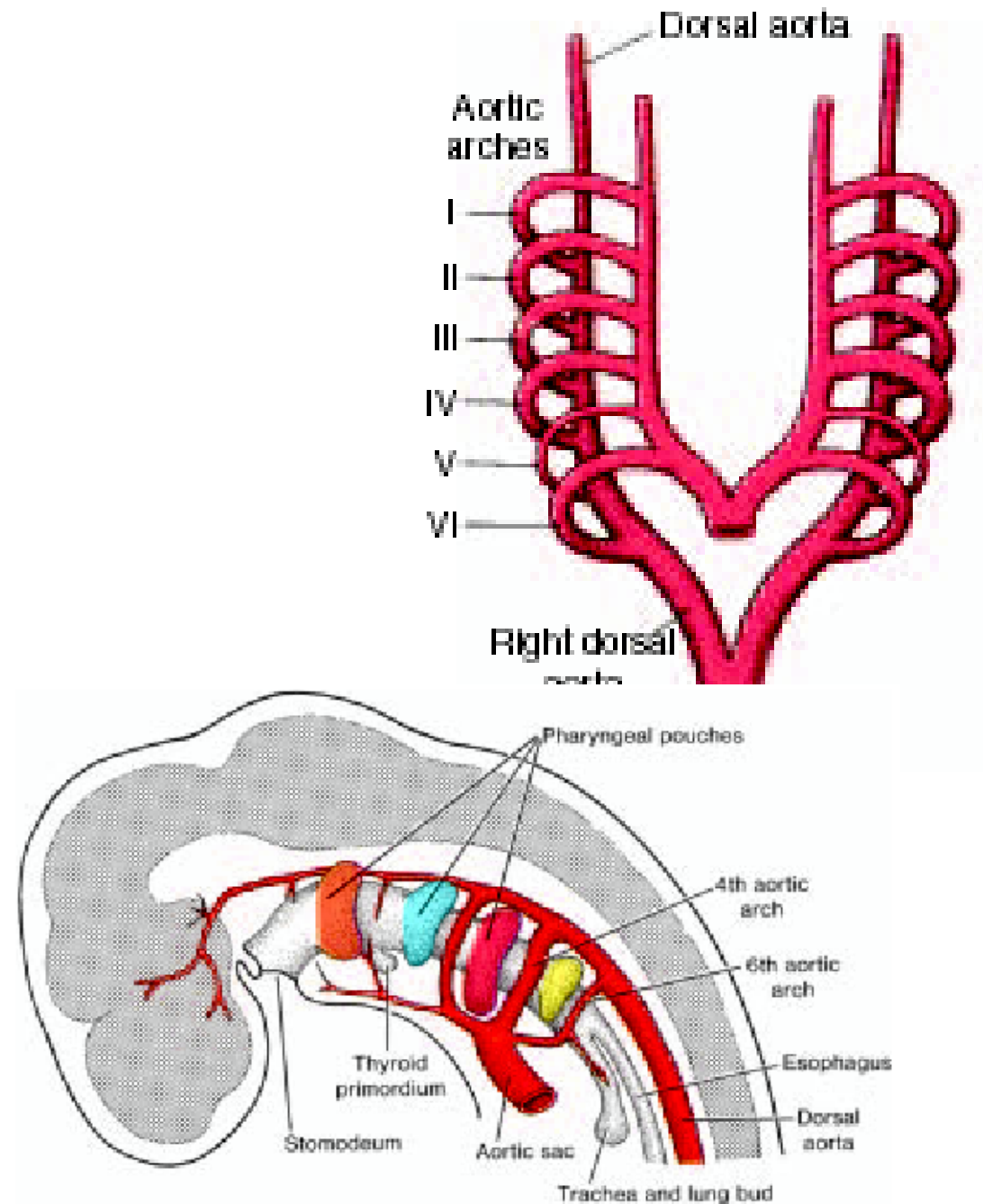
General Pattern

- In the head & Neck region- Aortic Arches
- In rest of Body- right and left dorsal aortae
- The two aortae fuse to form the dorsal aorta from which sprouts various branches.
- Vitelline and umbilical arteries also get incorporated in aorta.
- Development of aortic sac as the most distal part of the truncus arteriosus)



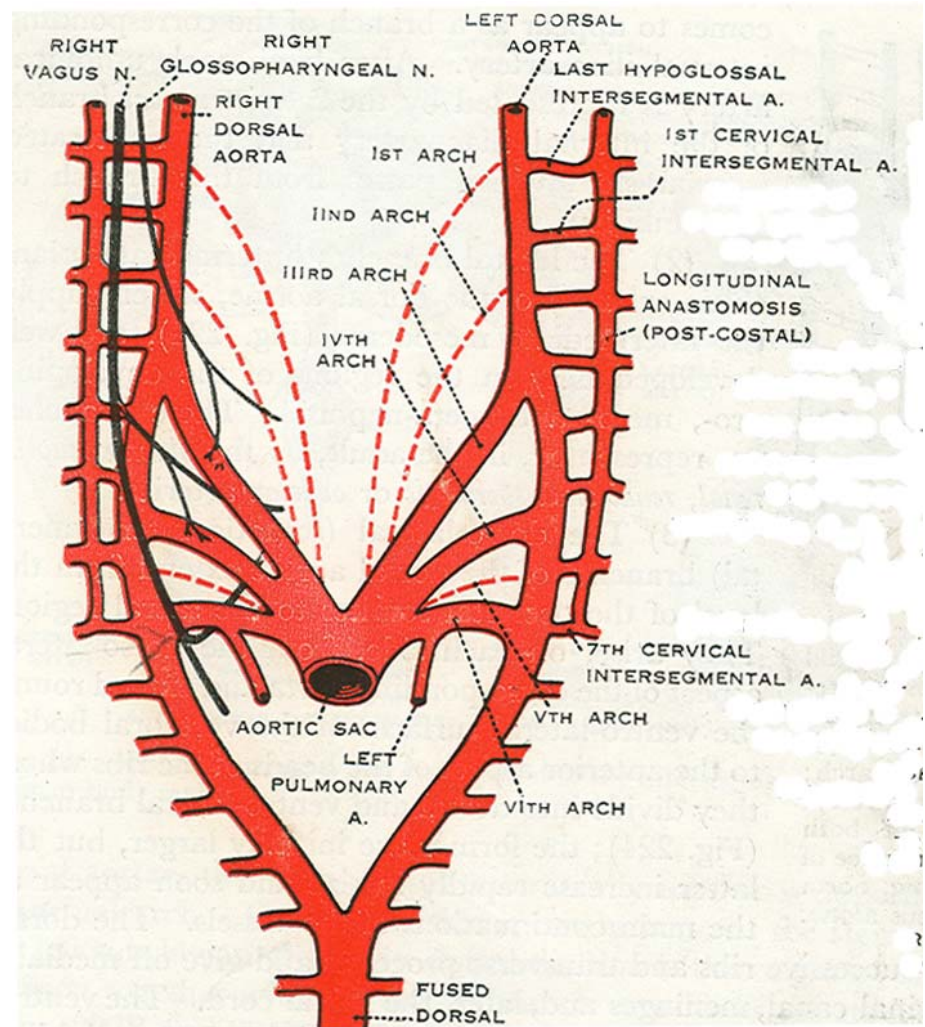


- Successive arterial arches appear in the second to sixth pharyngeal arches , each connected ventrally to right & left horn of aortic sac & dorsally to dorsal aorta
- One such arterial arch lies in each pharyngeal arch
- In subsequent development , the arrangement of these arteries become modified



Fate of arch arteries

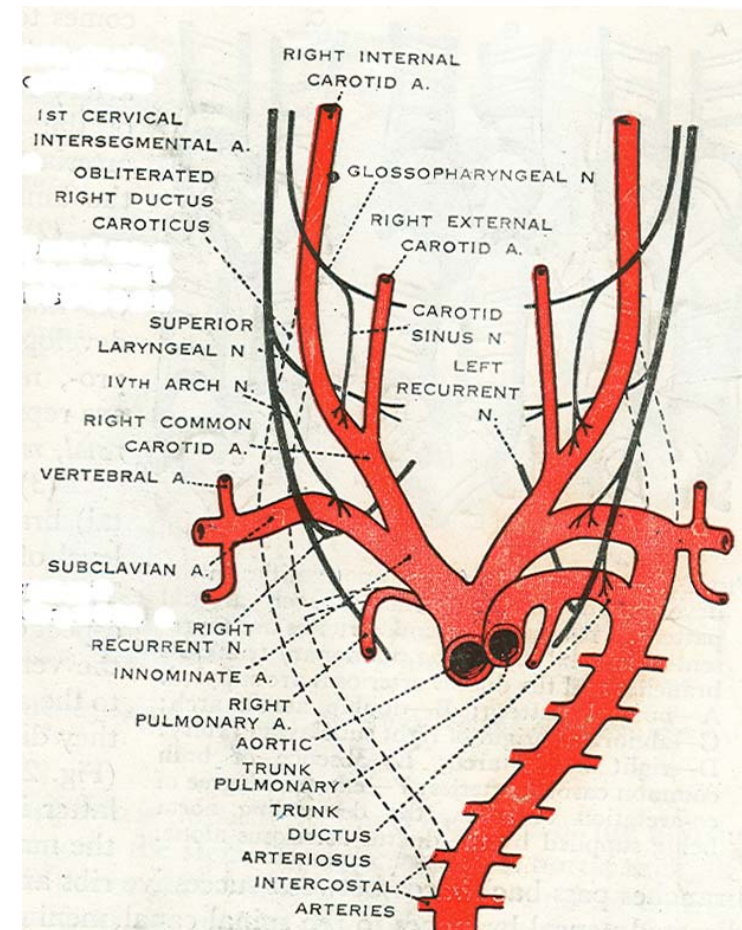
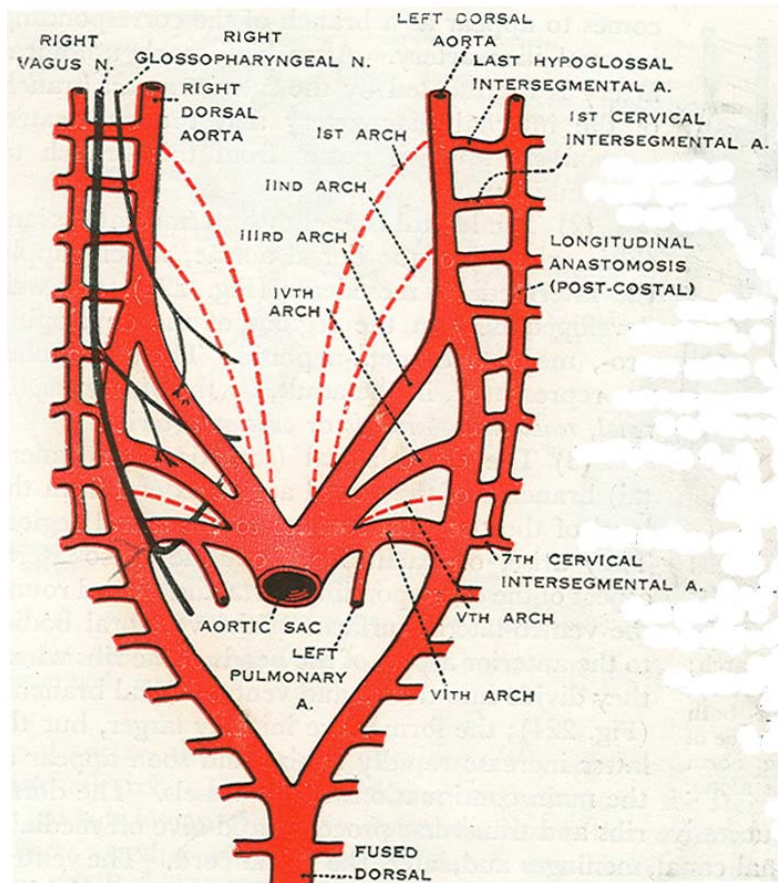
- The majority part of the first & second arch artery disappear
- In adult life – the **first arch artery** is represented by maxillary artery
- **The second arch artery** – persist for some part of fetal life as the stapedial artery
- **The fifth arch artery** also disappears
- Only 3rd, 4th & 6th arch artery remains



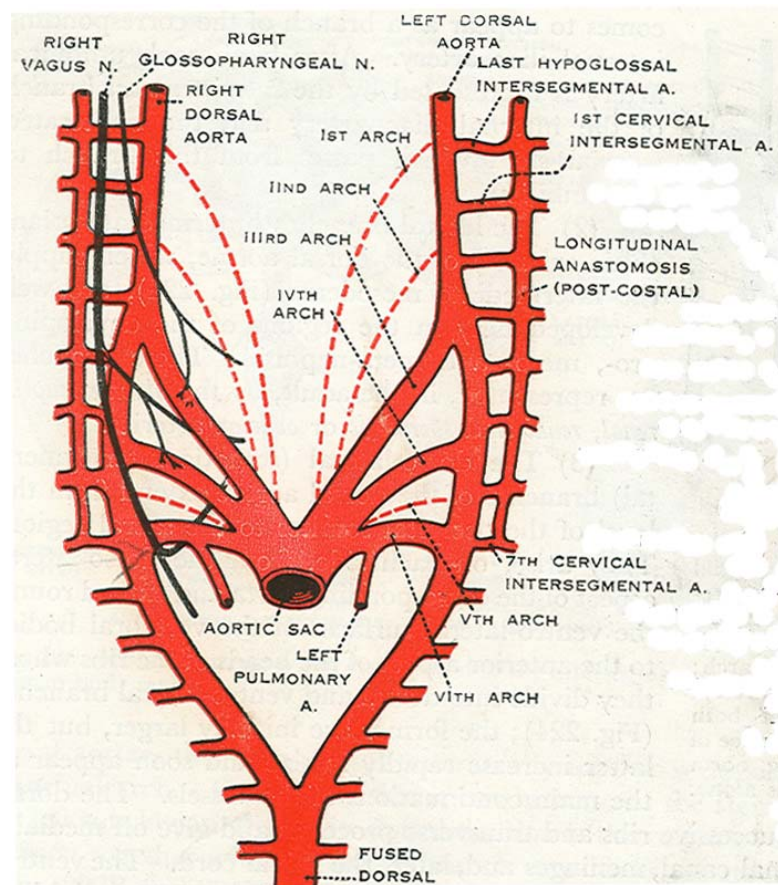
Division -Aortic sac

- is now connected only with the arteries of the 3rd , 4th & 6th arches.
- The 3rd & 4th arch arteries open into the ventral part ,
- 6th arch artery into the dorsal part of aortic sac.
- The spiral septum, that is formed in the truncus arteriosus , extend into the aortic sac & fuses with its post wall
- in such a way that blood from the pulmonary trunk passes only into the 6th arch artery , while that from the ascending aorta passes into the 3rd & 4th arch arteries
- The ascending aorta & pulmonary trunk are formed from the truncus arteriosus

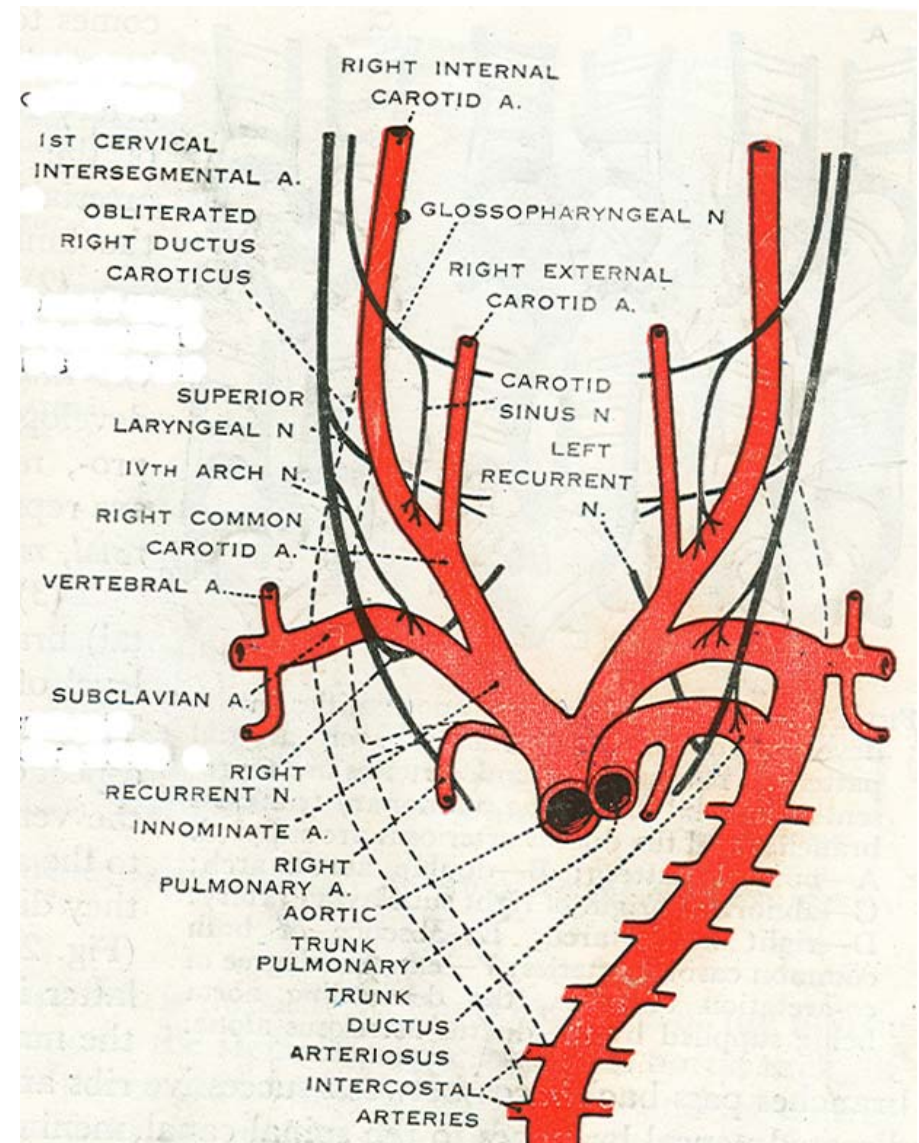
- 2. The portion of dorsal aorta , between the attachment of the 3rd & 4th arch arteries (**ductus caroticus**) , disappear on both sides
- 3. The portion of the Rt dorsal aorta , between the point of attachment of the 4th arch artery and the point of fusion of the two dorsal aortae disappears



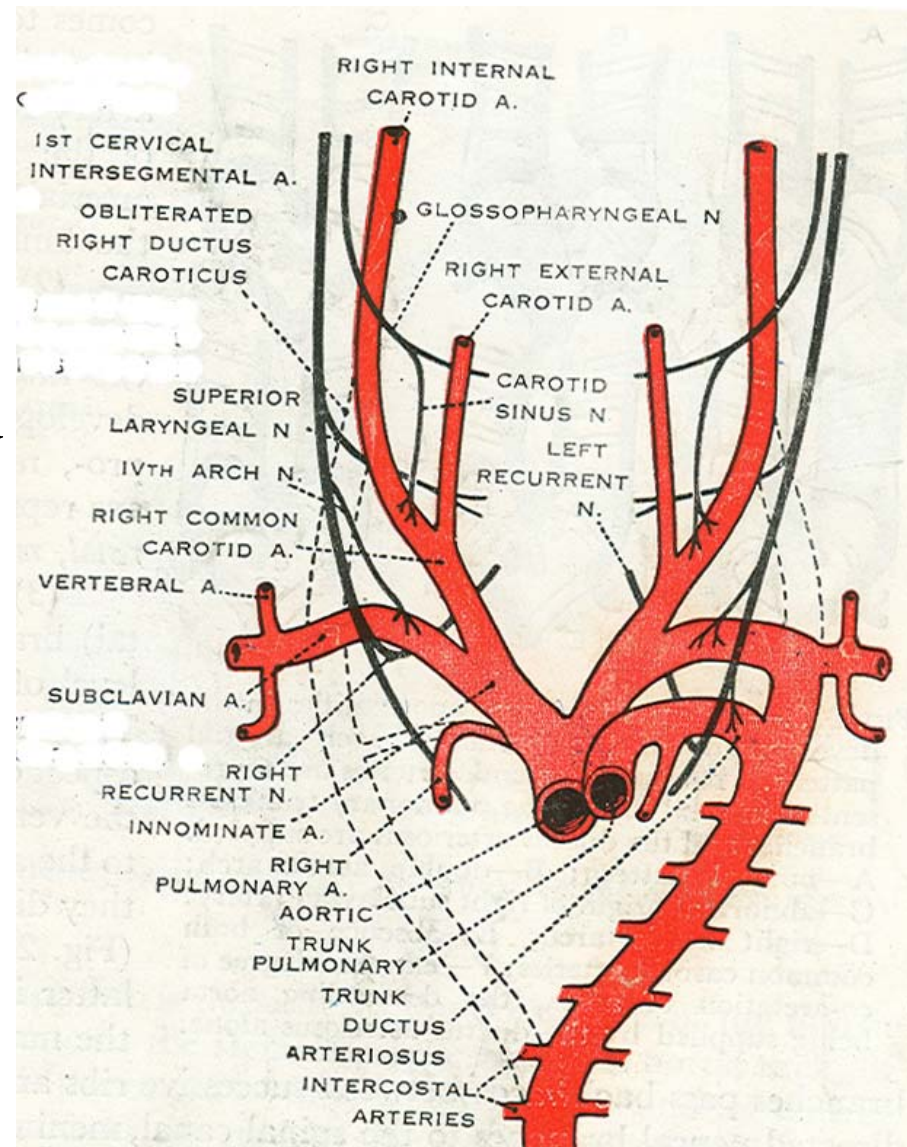
- 4. Each sixth arch artery gives off an artery to the developing lung bud



- 5. On the Rt side , the portion of the 6th arch artery between this bud and the dorsal aorta disappears
- 6. On Lt side , this part remains patent & forms the ductus arteriosus .
- The duct arteriosus carries most of the blood from the right ventricle to the dorsal aorta. It is obliterated after birth and is seen as the ligamentum arteriosum

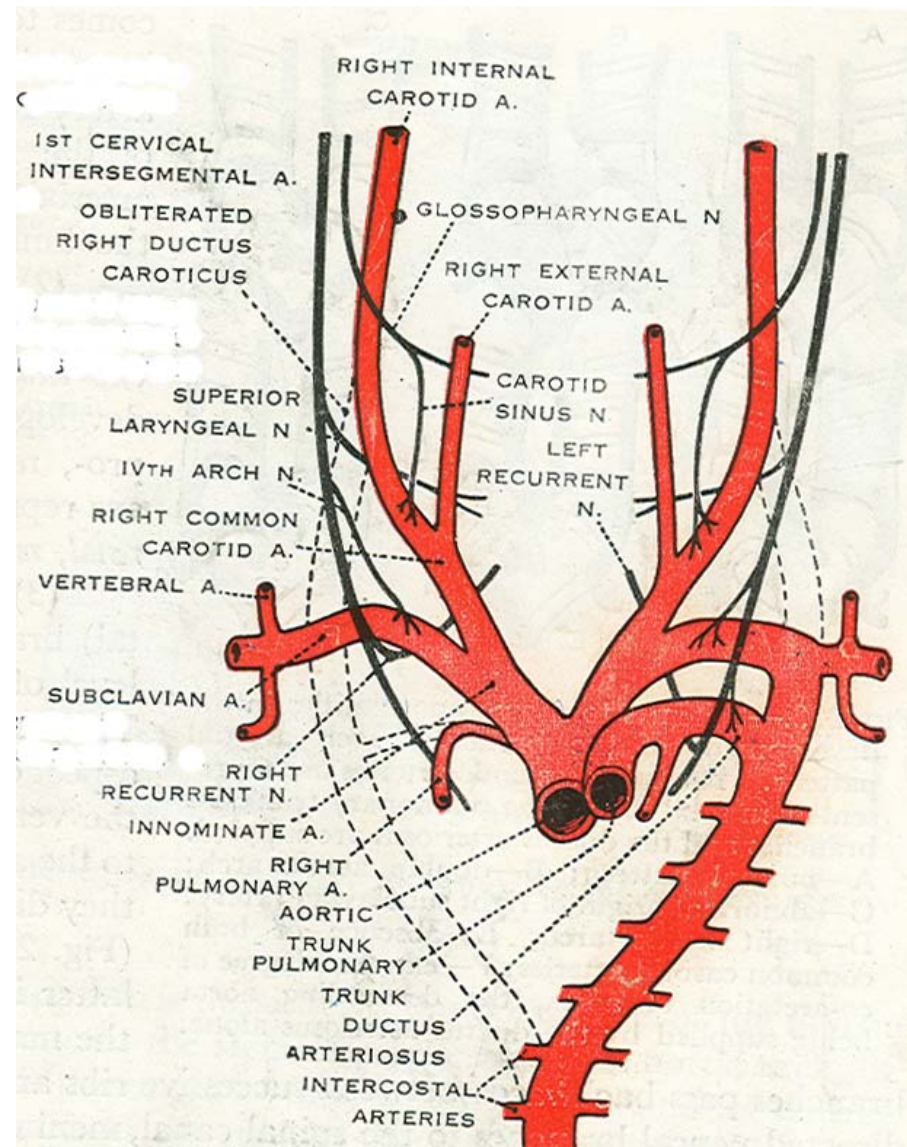


- 7. Each third arch artery gives off a bud that grows cranially to form the **external carotid artery**



FATE OF AORTIC ARCHES

1. **First aortic arch - disappears**
(except a small portion which forms part of maxillary artery).
2. **Second arch artery - disappears**
(except the stapedial artery which also disappears after birth).
3. **Third aortic arch forms :**
 - a. Common carotid artery from its proximal part.
 - b. Internal carotid artery from its distal part.



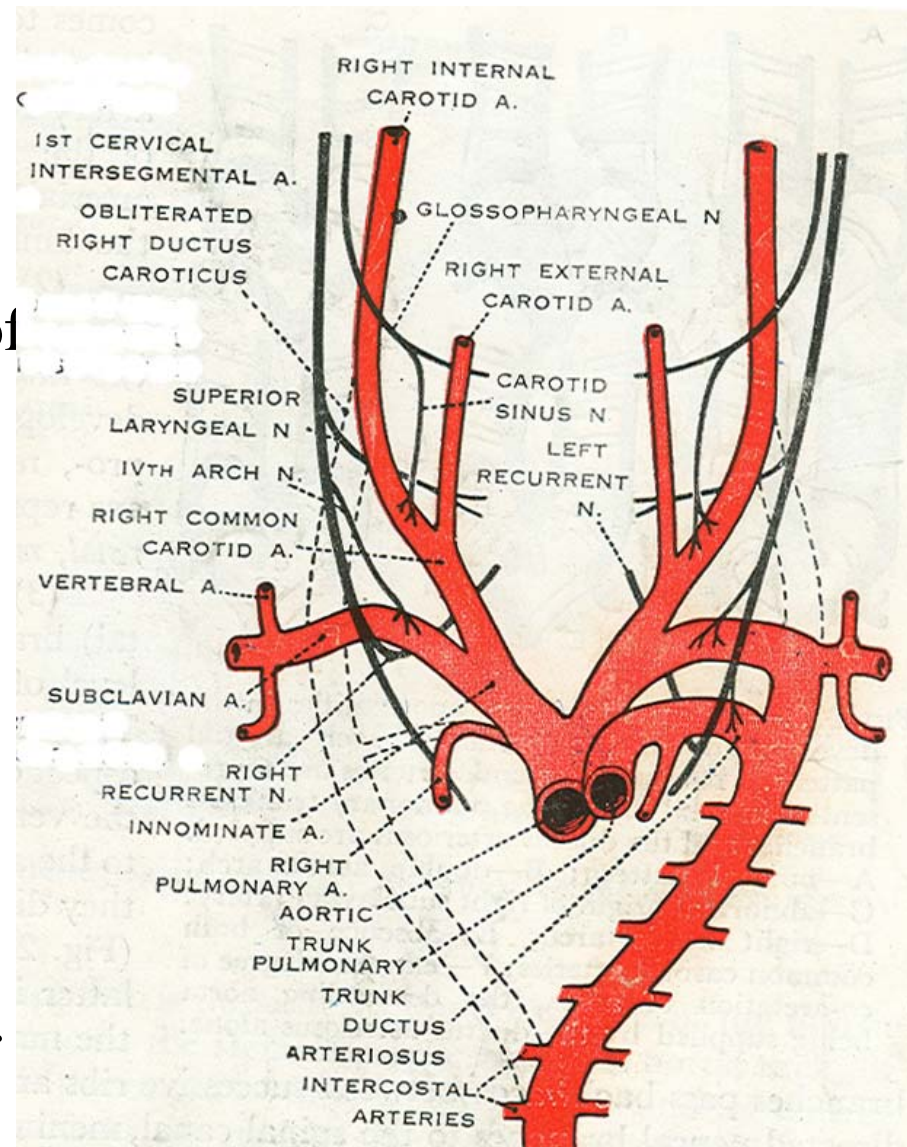
4. Fourth aortic arch :

- a. On the right side forms proximal part of right subclavian artery.
- b. On the left side forms part of arch of aorta

5. Fifth aortic arch - disappears.

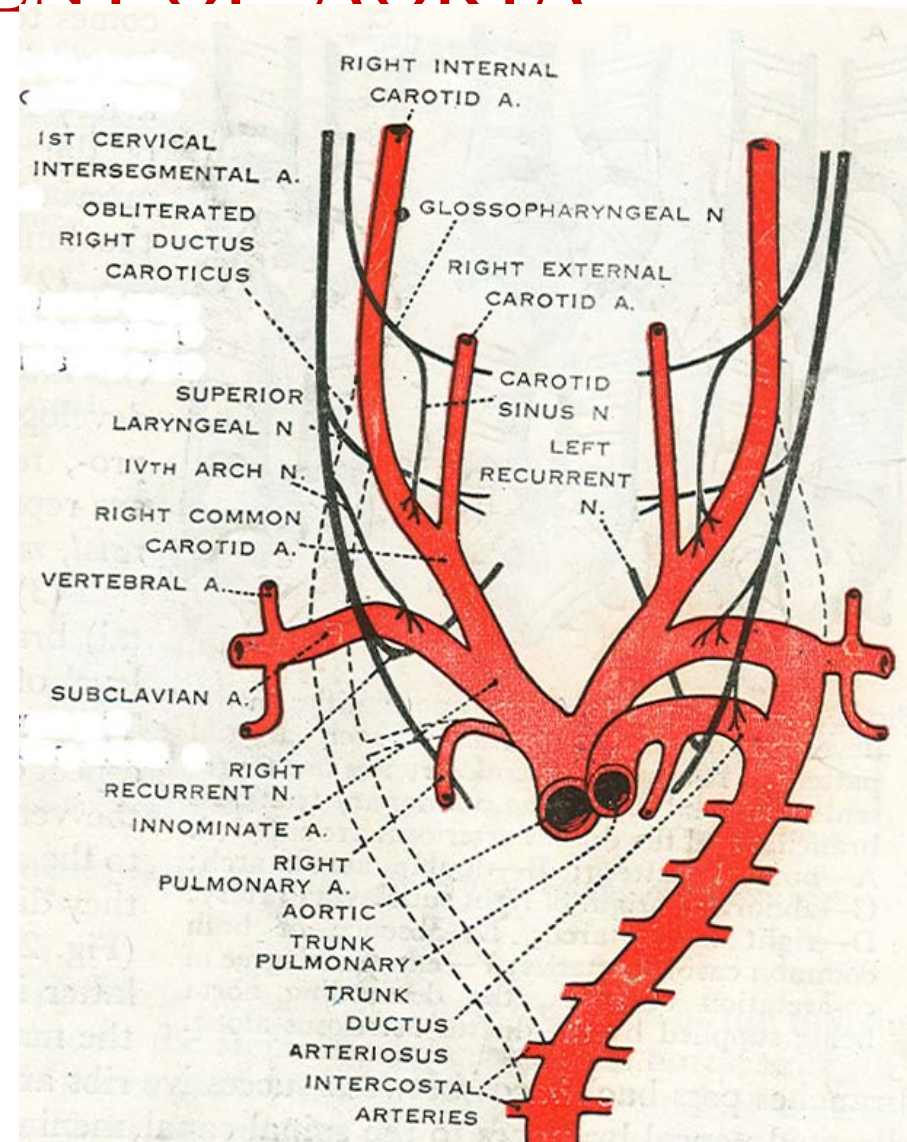
6. Sixth aortic arch:

- a. Proximal part forms pulmonary artery
- b. Distal part –
 - i) Disappears on right side.
 - ii) Forms ductus arteriosus



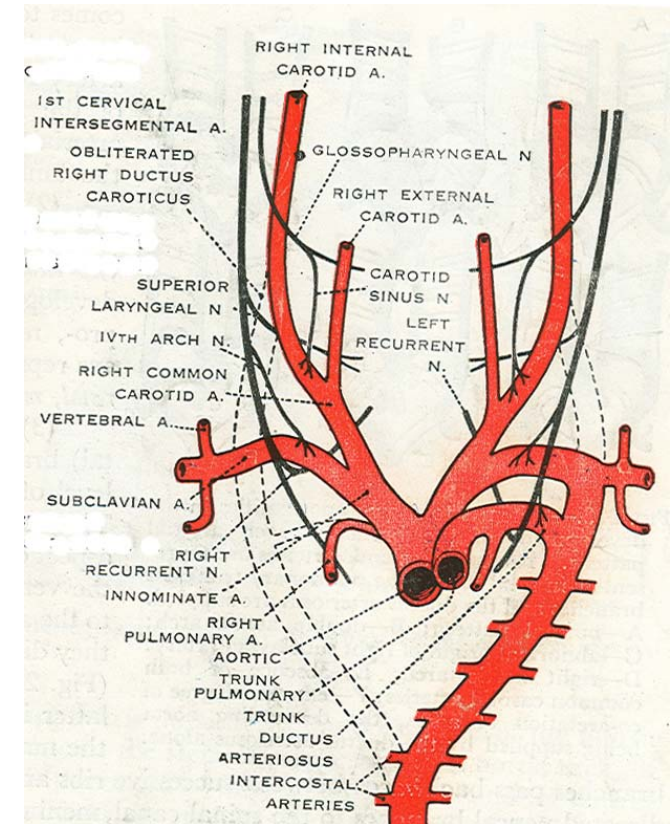
DEVELOPMENT OF AORTA

- Ascending aorta is formed by aortic sac.
- The Rt horn of the aortic sac forms the brachiocephalic artery



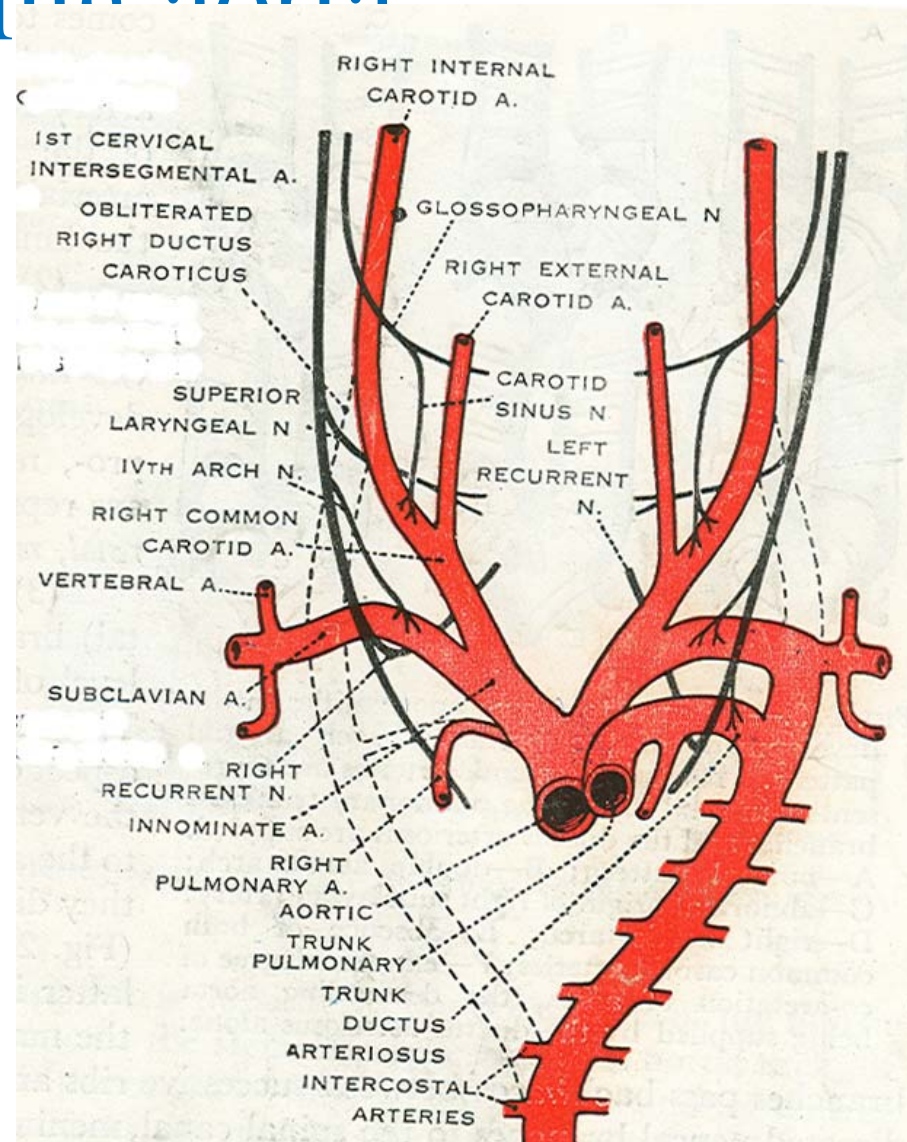
Arch of aorta

2. Part of arch of aorta between brachiocephalic and left common carotid arteries is formed by **left horn of aortic sac**.
3. Part of arch of aorta between left common carotid and left subclavian arteries is formed by **left 4th aortic arch**.
4. **Remaining part** is formed by **left dorsal aorta** up to the level of the future lower border of 4th thoracic vertebra.



descending aorta

- 1. The left dorsal aorta below the attachment of 4th arch artery
- 2. along with fused median vessels

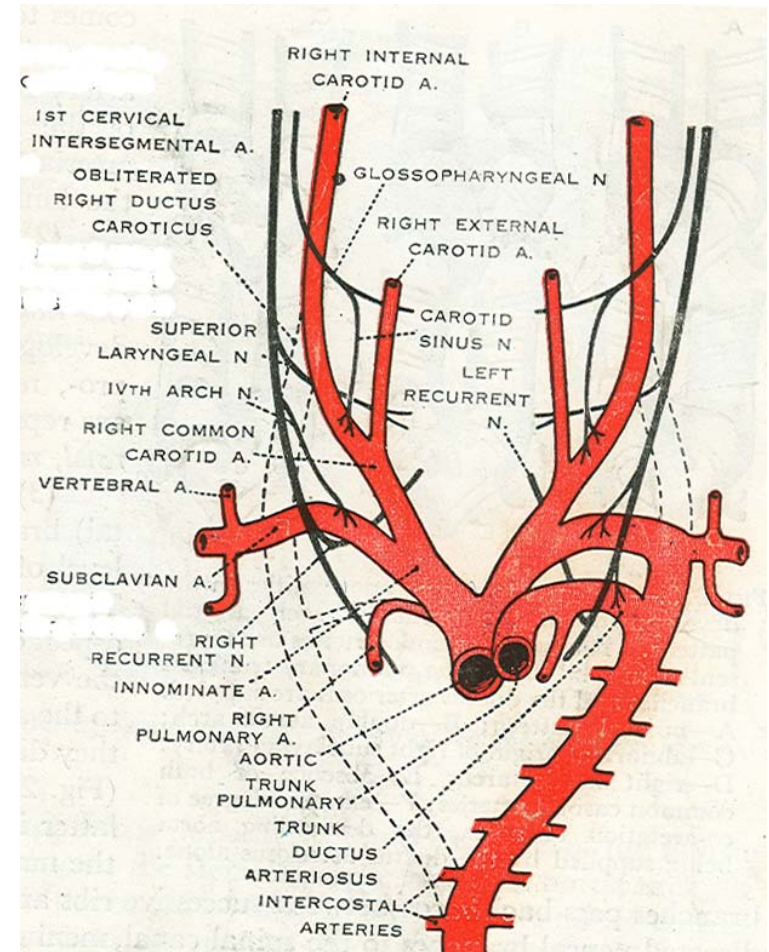


Development of common carotid artery

1. Formed by proximal part of 3rd aortic arches.

Development of internal carotid artery

1. Proximal part is formed by distal part of 3rd aortic arch
2. Distal part is formed by cranial part of dorsal aorta.



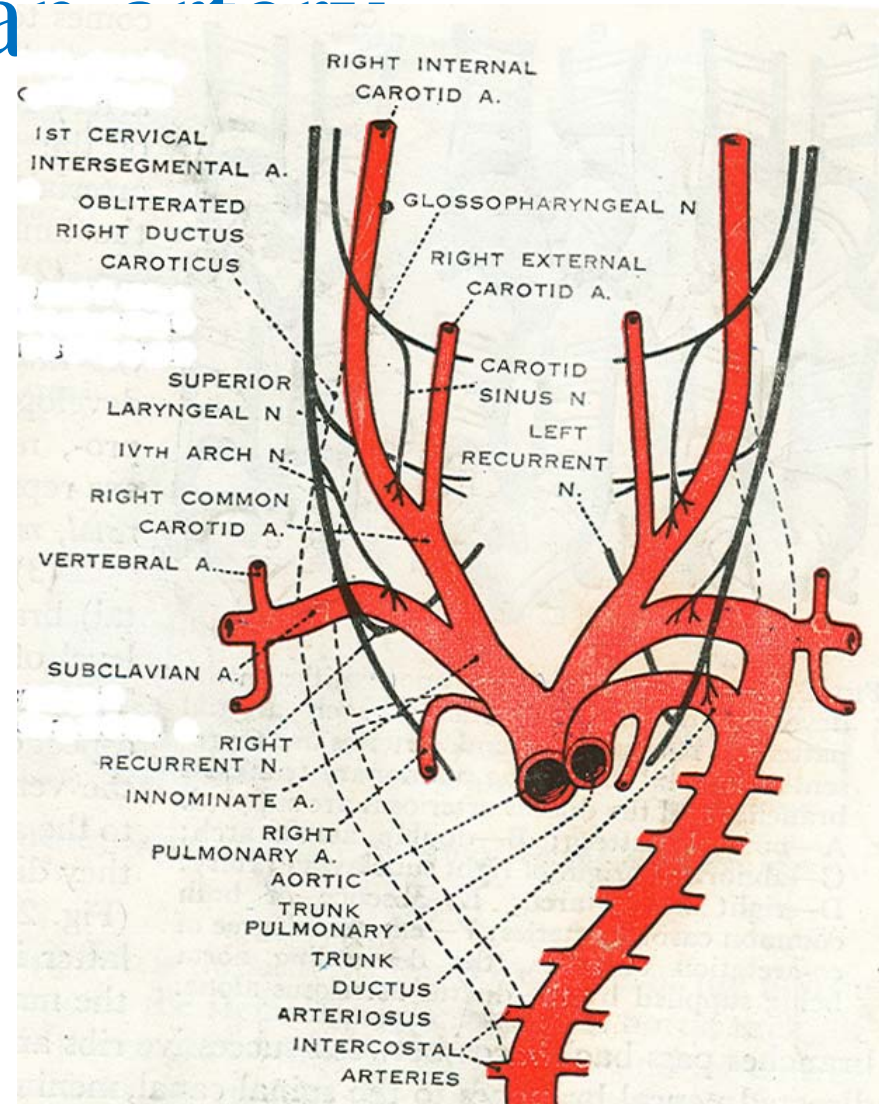
subclavian artery

Rt side

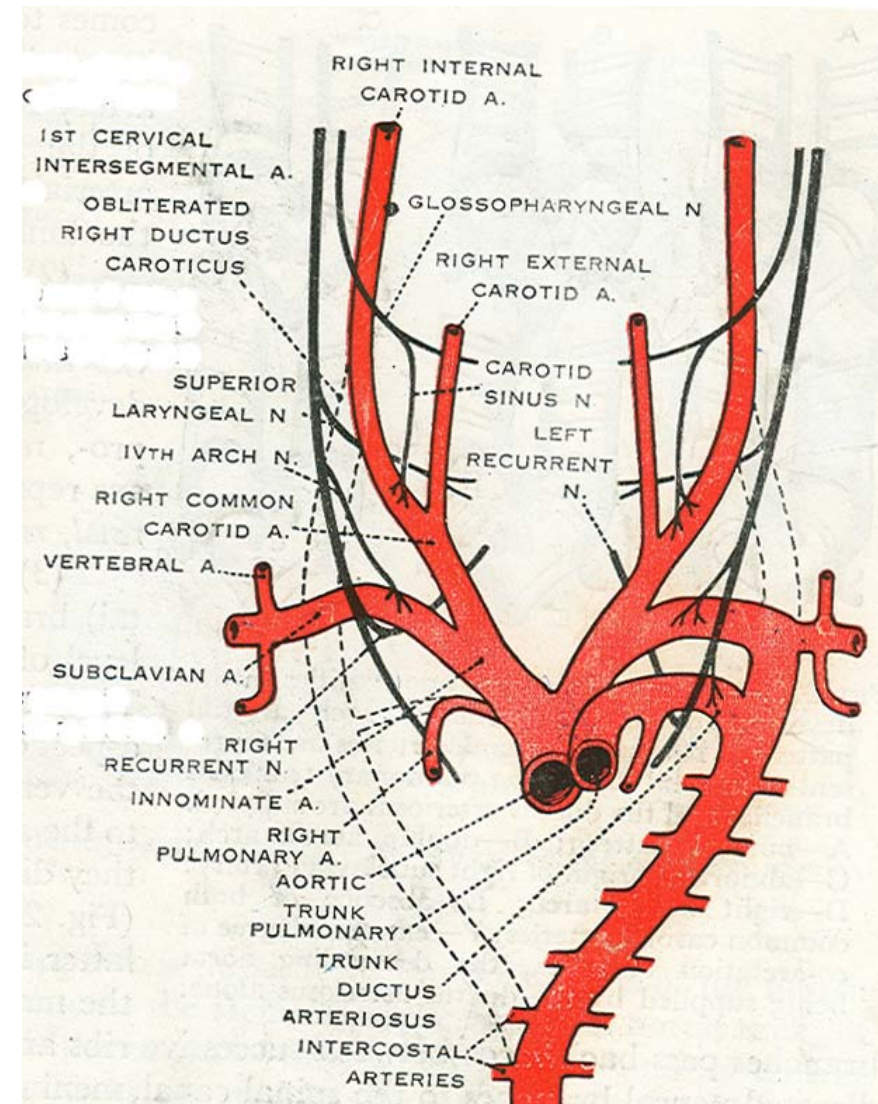
- The Rt 4th arch artery forms the proximal part of the Rt subclavian artery
- The remaining part of the artery being derived from the seventh cervical intersegmental artery

Lt side ,

- the subclavian artery is derived entirely from the 7th cervical intersegmental artery , which arises from the dorsal aorta opposite the attachment of 4th arch artery

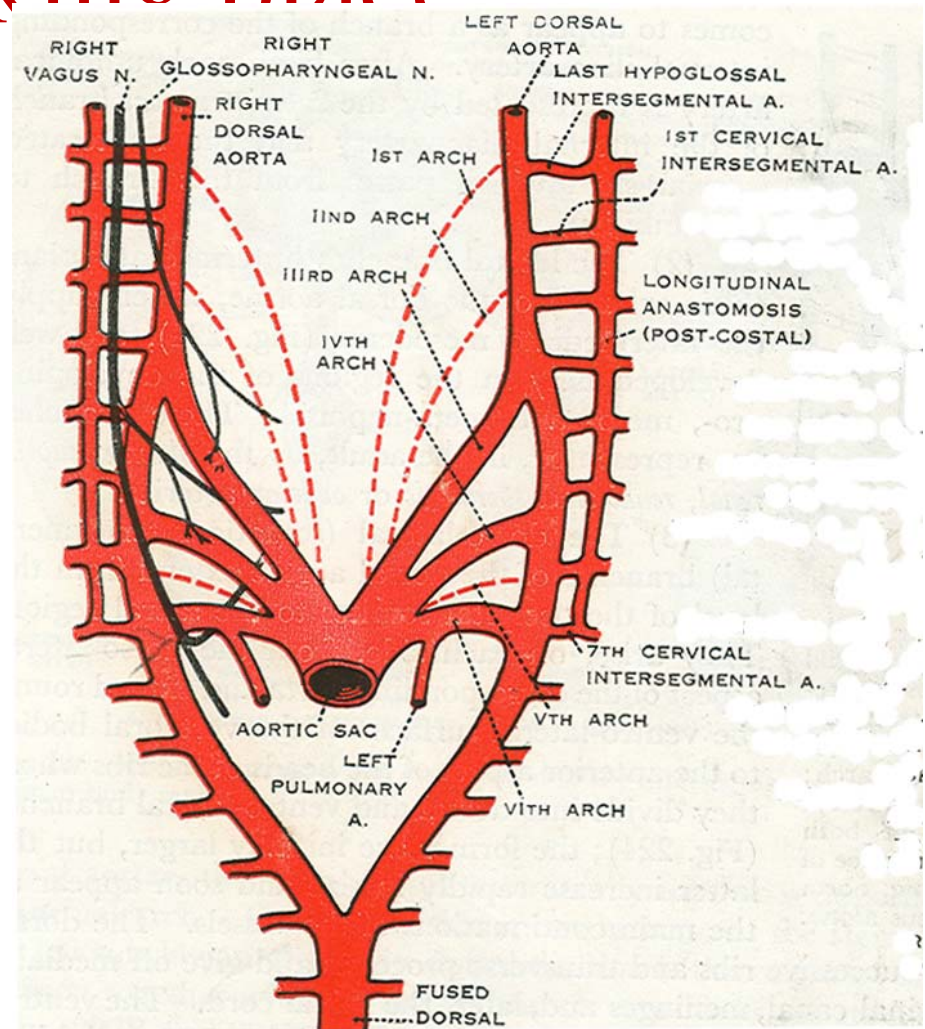


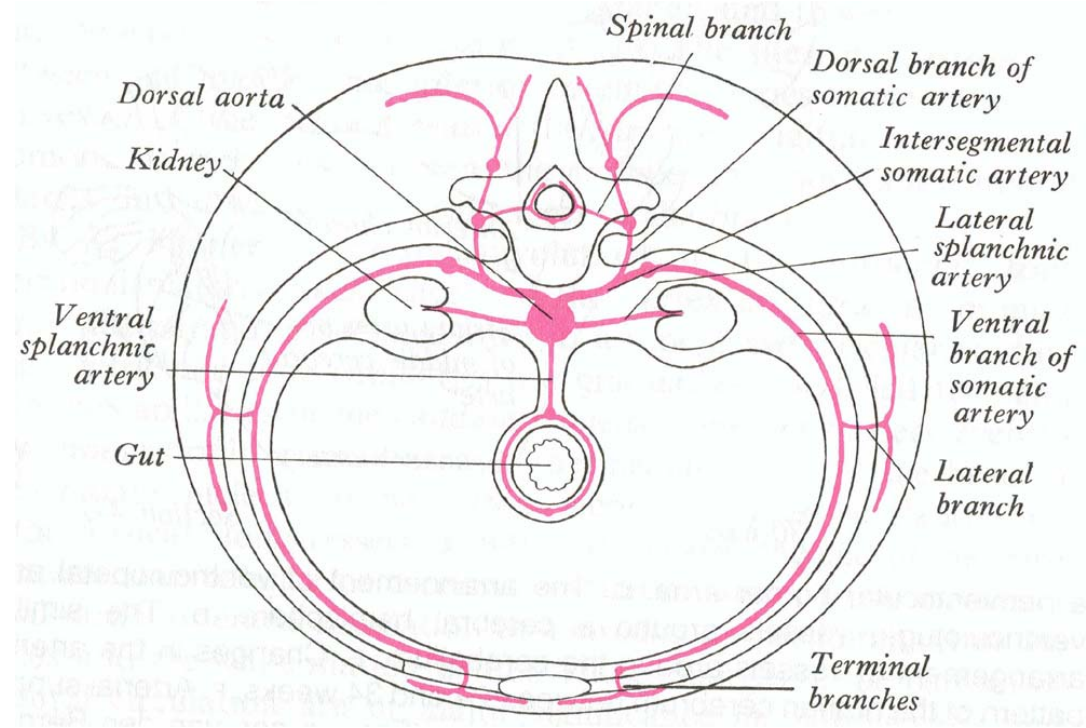
- With the formation of the neck , and the descent of the heart into the thoracic cavity ,
- the point of origin of the subclavian artery from the aorta gradually shifts upwards and comes to lie close to the origin of the Lt common carotid artery

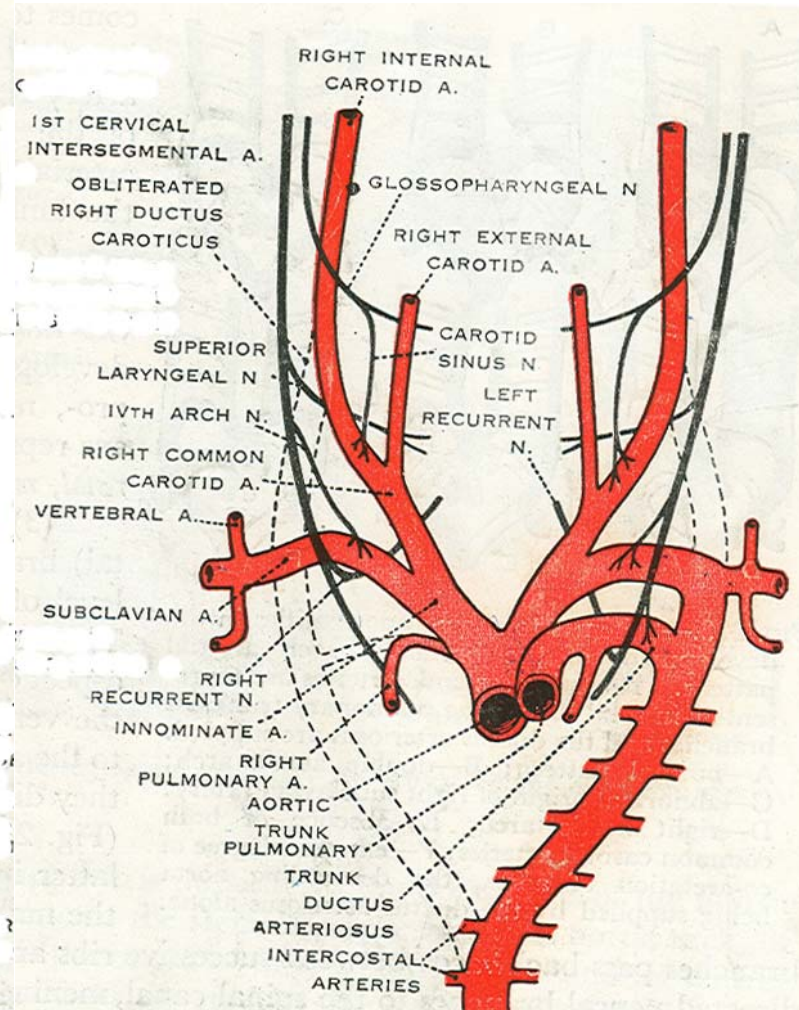
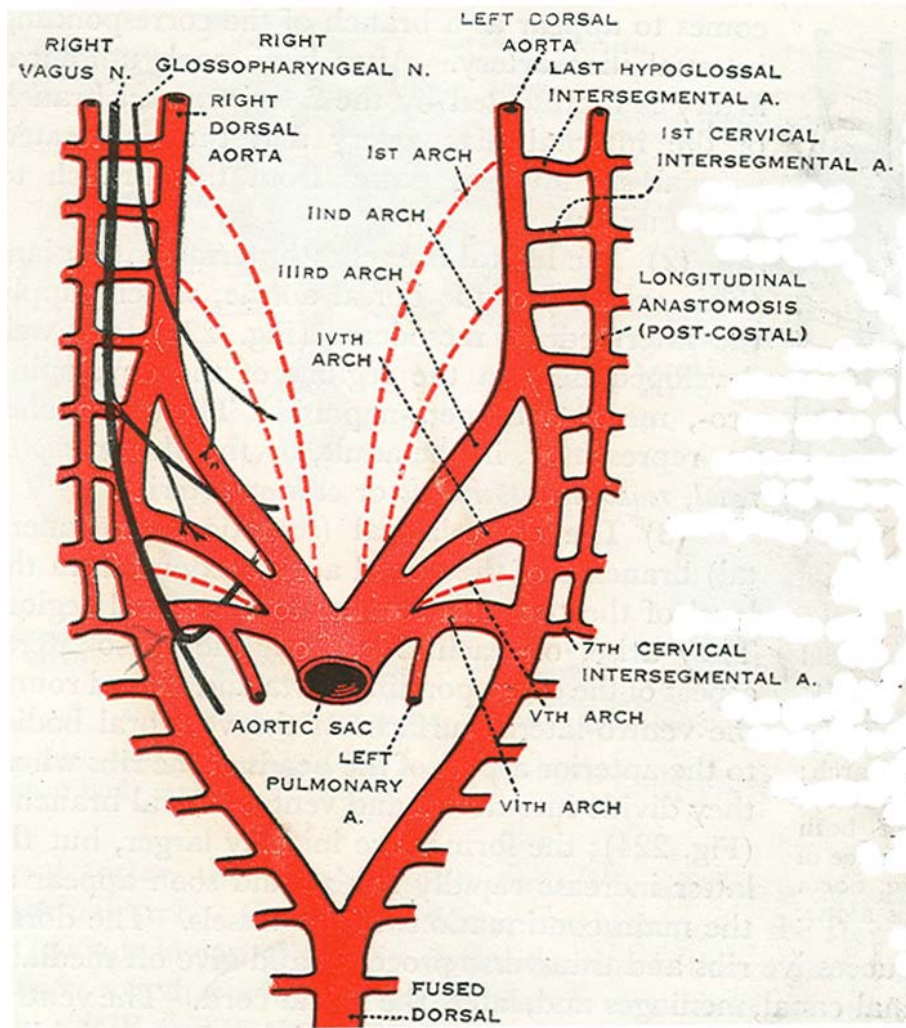


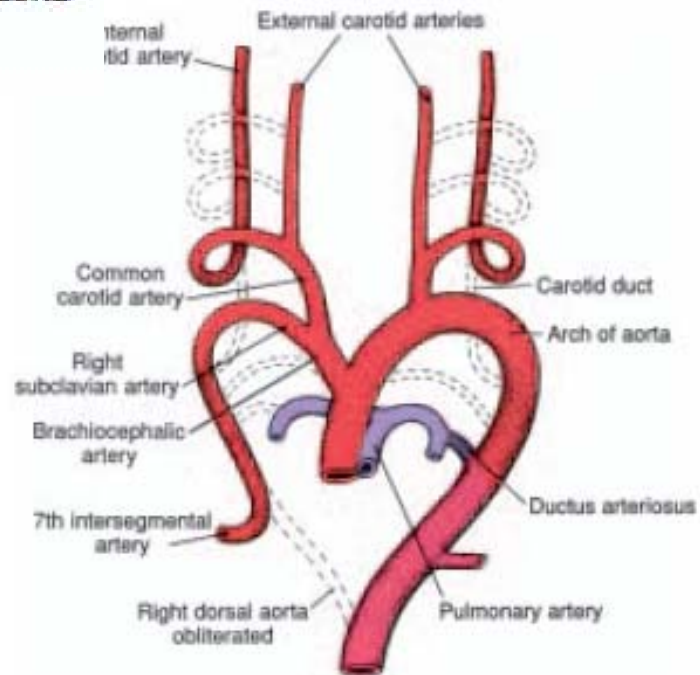
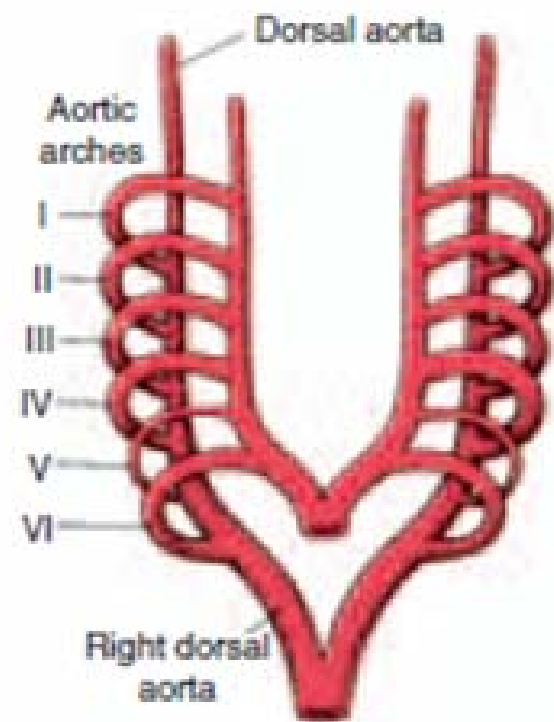
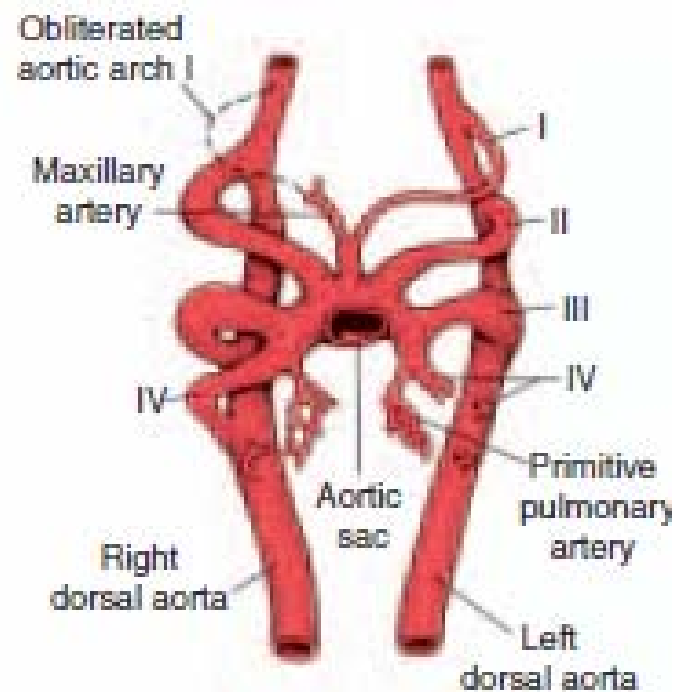
Changes taking place

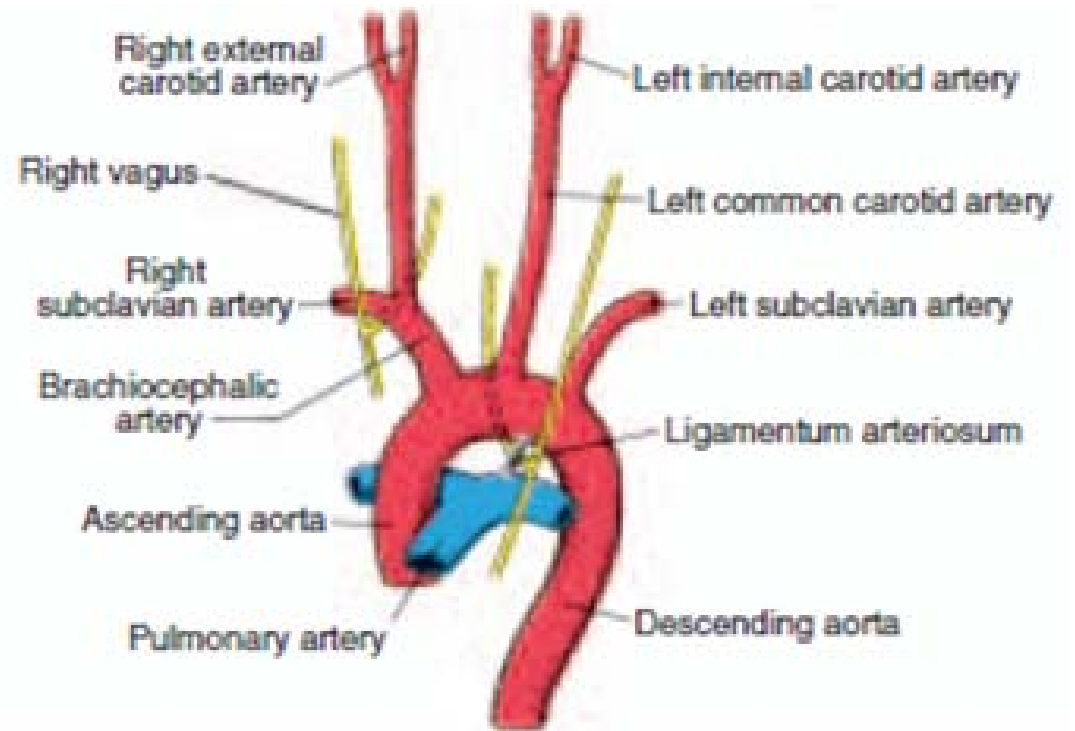
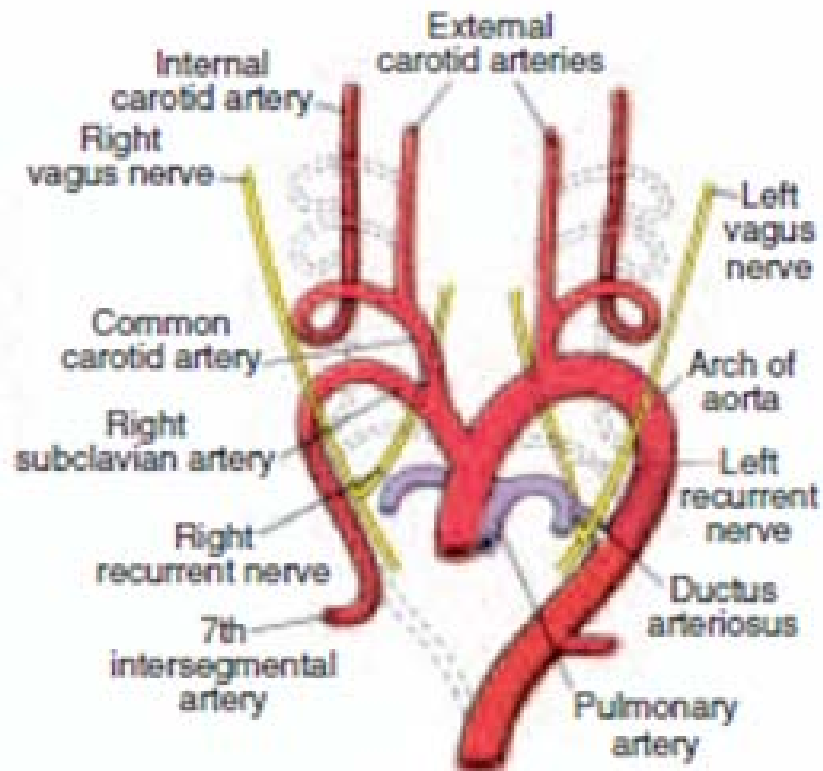
1. Two dorsal aortae grow cranially, beyond the point of attachment of first arch artery





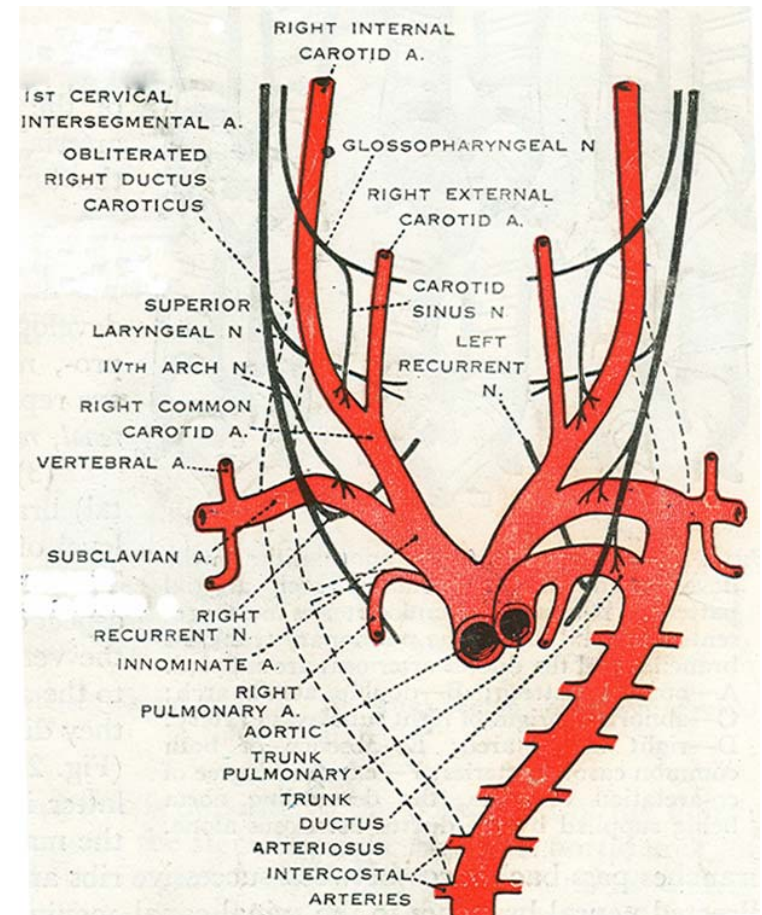






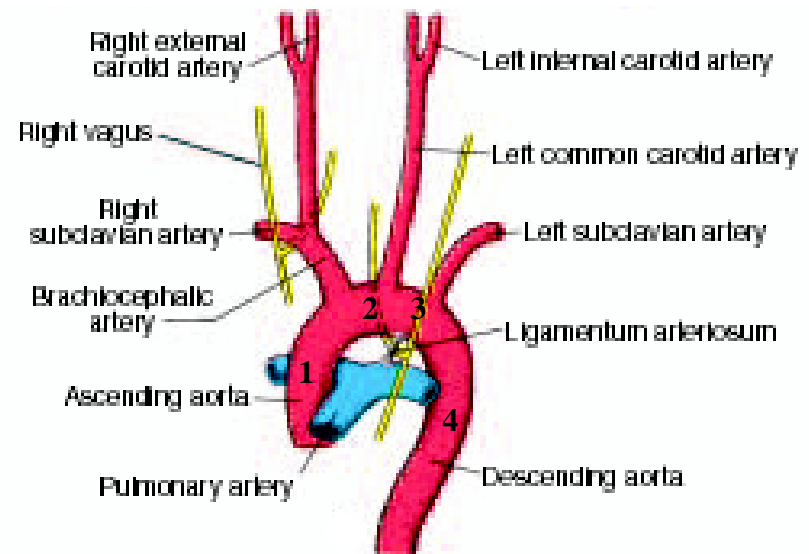
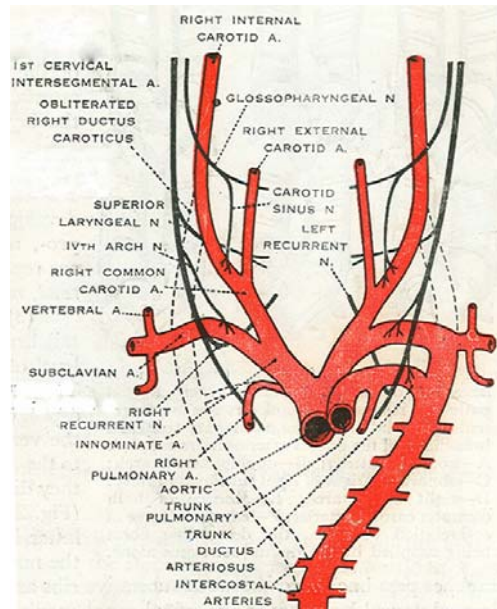
FATE OF AORTIC ARCHES

1. First aortic arch disappears (except a small portion which forms part of maxillary artery).
2. Second arch artery disappears (except the stapedial artery which also disappears after birth).
3. Third aortic arch forms :
 - a. Common carotid artery from its proximal part.
 - b. Internal carotid artery from its distal part.
4. Fourth aortic arch :
 - a. On the right side forms proximal part of right subclavian artery.
 - b. On the left side forms part of arch of aorta
5. Fifth aortic arch disappears.
6. Sixth aortic arch:
 - a. Proximal part forms pulmonary artery
 - b. Distal part –
 - i) Disappears on right side.
 - ii) Forms ductus arteriosus



DEVELOPMENT OF ARCH OF AORTA

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2. Part of arch of aorta between brachiocephalic and left common carotid arteries is formed by left limb of aortic sac.
3. Part of arch of aorta between left common carotid and left subclavian arteries is formed by left 4th aortic arch.
4. Remaining part is formed by left dorsal aorta up to the level of the future lower border of 4th thoracic vertebra.



Development of common carotid artery

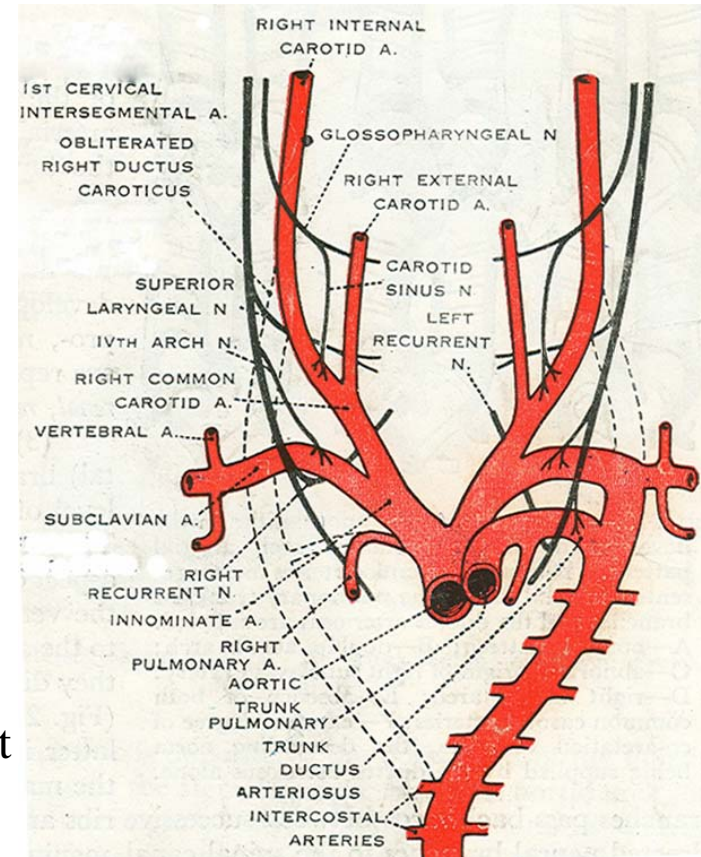
1. Formed by proximal part of 3rd aortic arches.

Development of internal carotid artery

1. Proximal part is formed by distal part of 3rd aortic arch
2. Distal part is formed by cranial part of dorsal aorta.

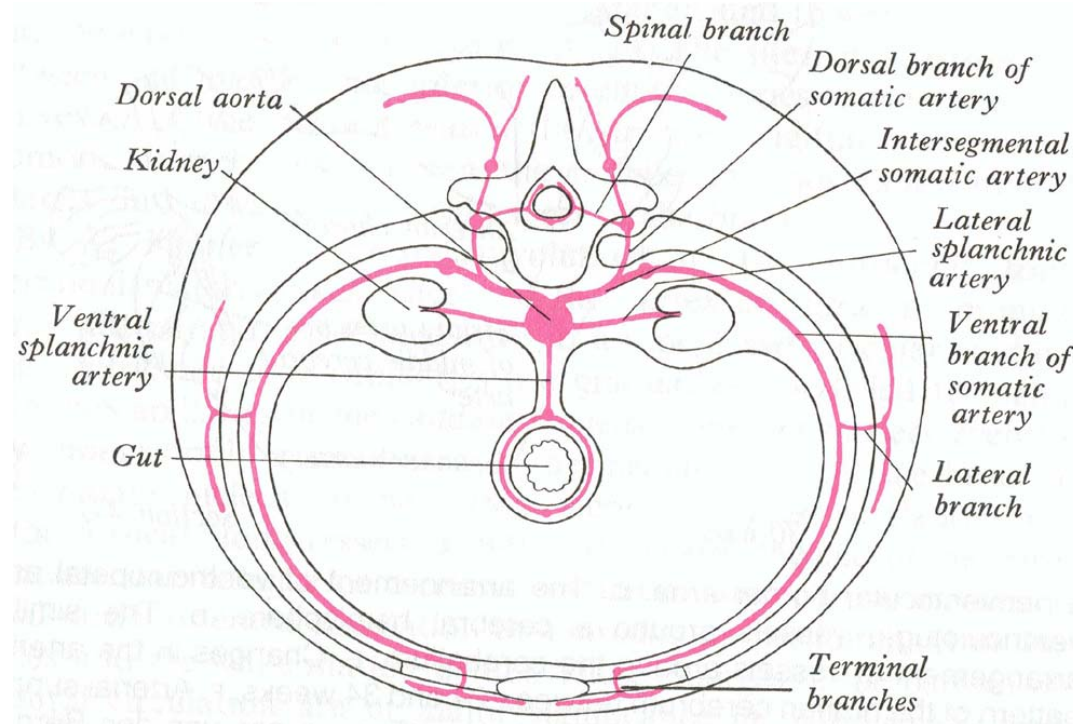
Development of subclavian arteries:

- i) Left subclavian artery is formed by 7th cervical intersegmental artery.
- ii) Right subclavian artery is formed by right 4th aortic arch and 7th cervical intersegmental artery.



Other arteries - Primitive dorsal aorta

- three group of branches
- Ventral splanchnic arteries
- Lateral (intermediate splanchnic) arteries
- Dorso – lateral (somatic intersegmental)branches



Branches of Aorta

Ventral splanchnic -

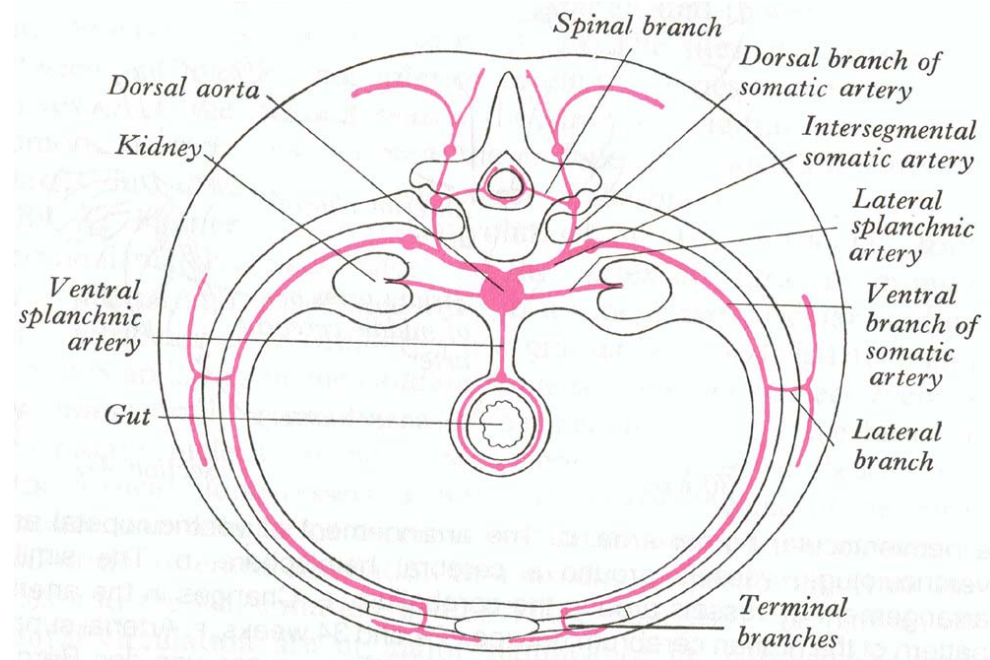
- Coeliac , Superior & inferior mesenteric
- Bronchial , oesophageal

Lateral splanchnic –

- Renal , suprarenal , phrenic , spermatic & ovarian

Dorso- lateral –

- Intercostal , lumbar arteries
- Terminal Part- Median sacral A.



Arteries of Limb

- Limbs supplied by lateral branches of somatic intersegmental arteries

Axis artery – upper limb – 7th cervical intersegmental artery

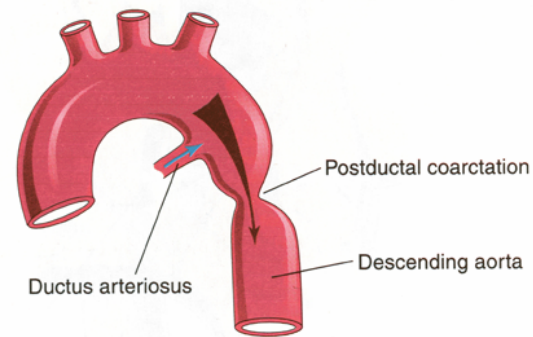
- Persist as – axillary , brachial , ant. interosseous artery

Axis artery – lower limb - - 5th lumbar intersegmental artery

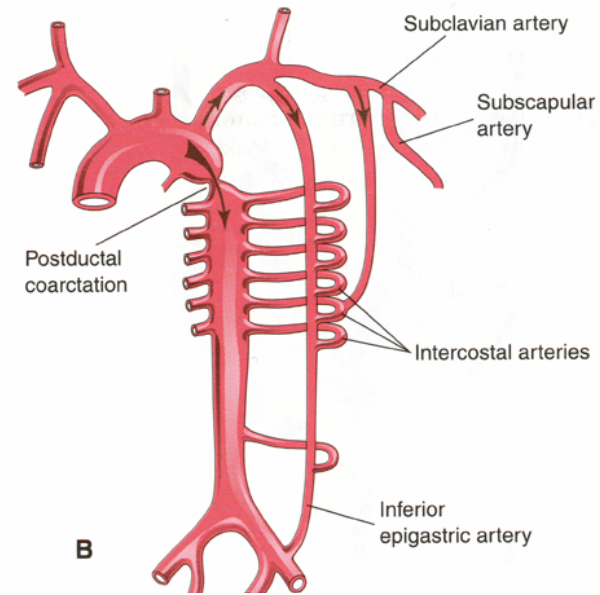
- Seen as branch of Internal iliac artery
- Original axis artery –
- inferior gluteal ,
- Part of popliteal , peroneal , planter arch

CONGENITAL ANOMALIES

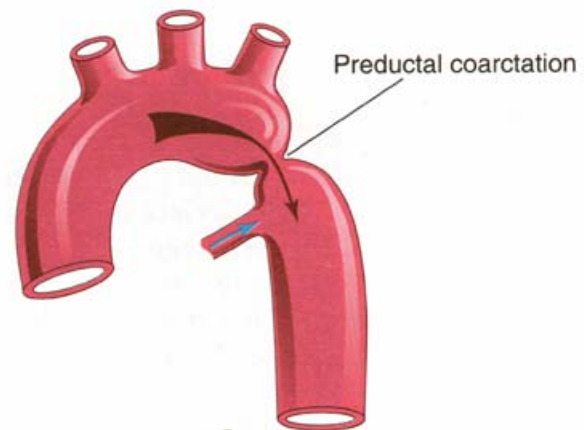
1. Persistence of ductus arteriosus.
2. Coarction of aorta:
 - i) Preductal
 - ii) Postductal
3. Right sided arch of aorta
4. Double arches of aorta
5. Abnormal origin of right subclavian artery.



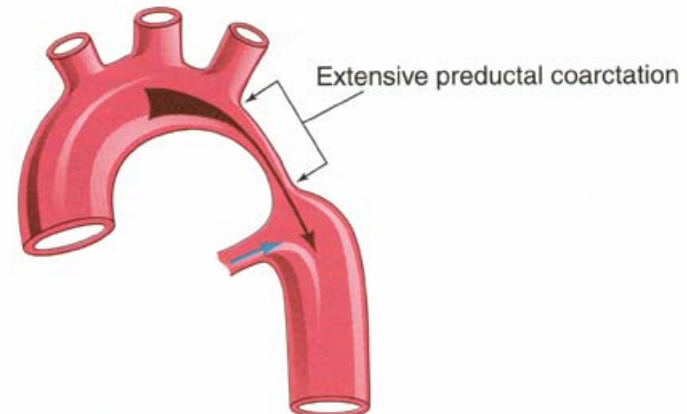
A



B

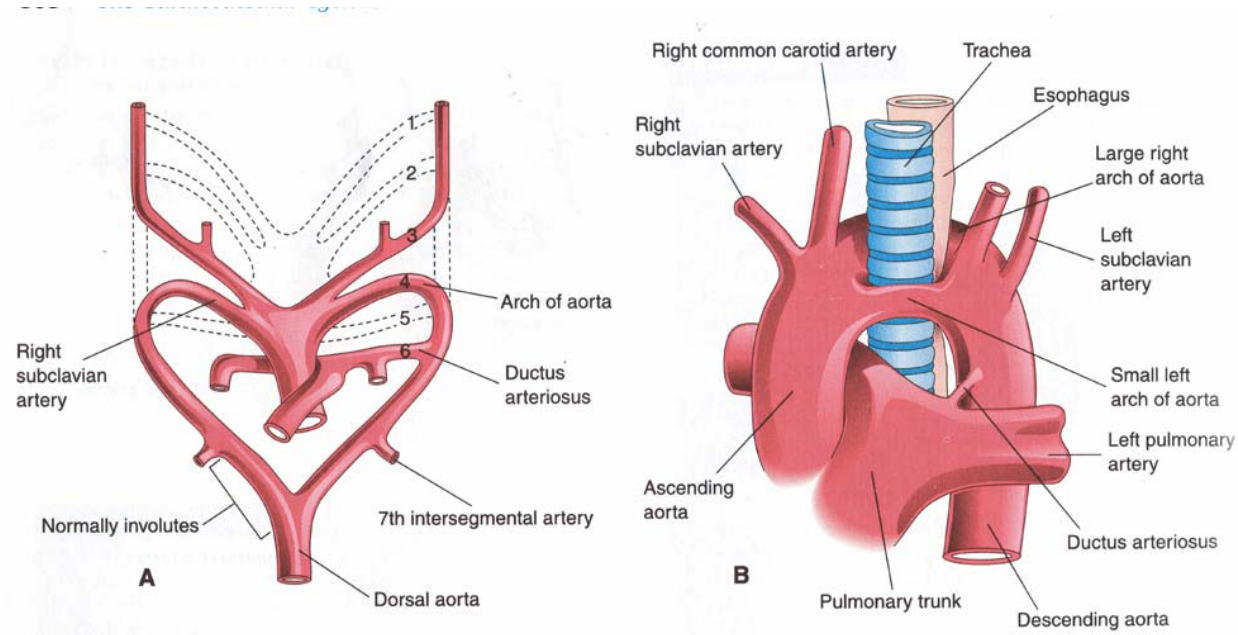


C

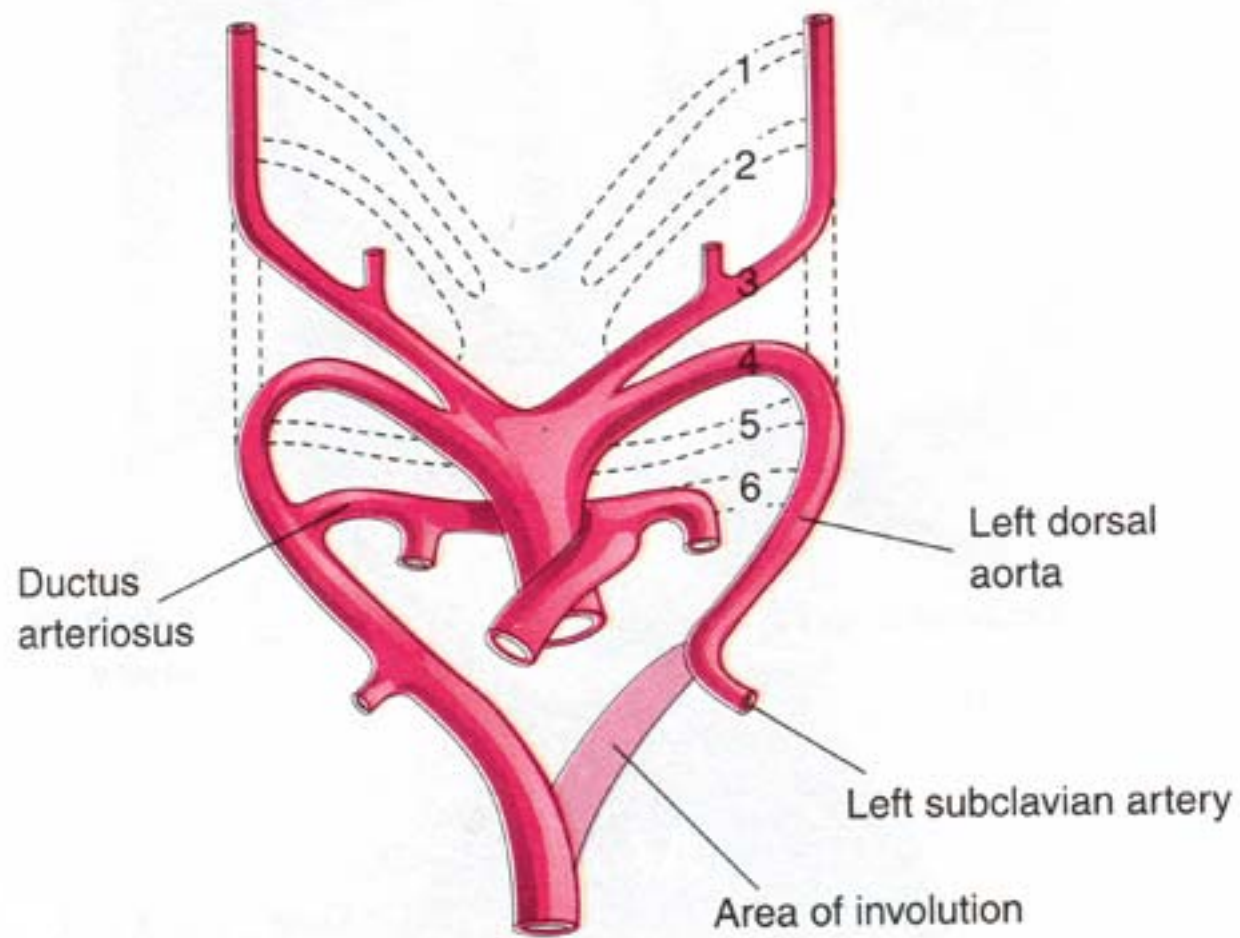


D

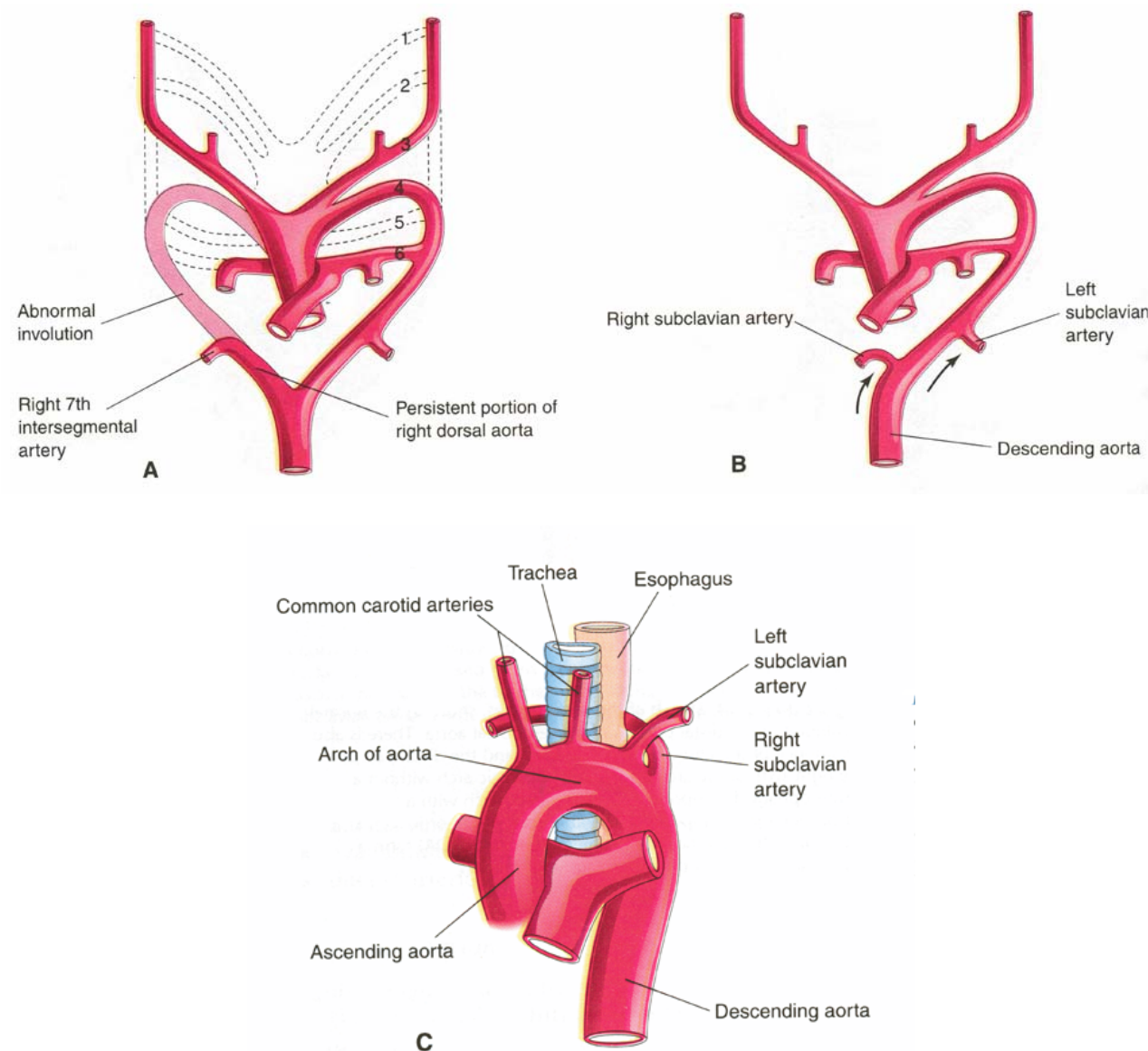
COARCTATION OF AORTA



DOUBLE ARCH OF AORTA



RIGHT SIDED ARCH OF AORTA



ABNORMAL ORIGIN OF RIGHT SUBCLAVIAN ARTERY

