ANATOMY

RR-8.0

Contents

EMBRYOLOGY

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Development of Germ Layers

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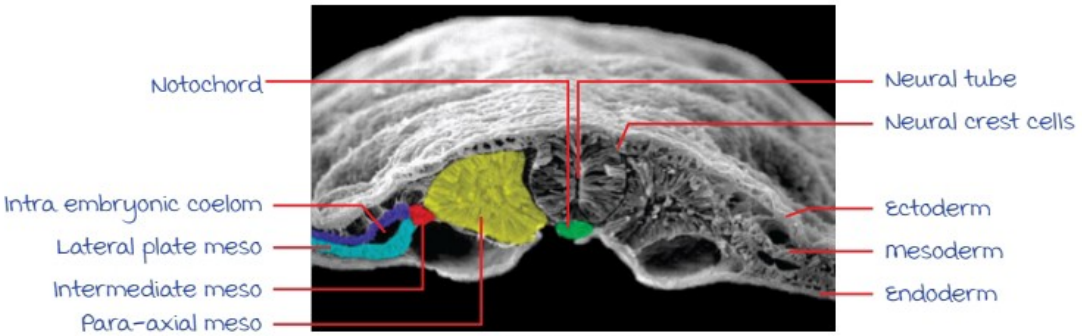
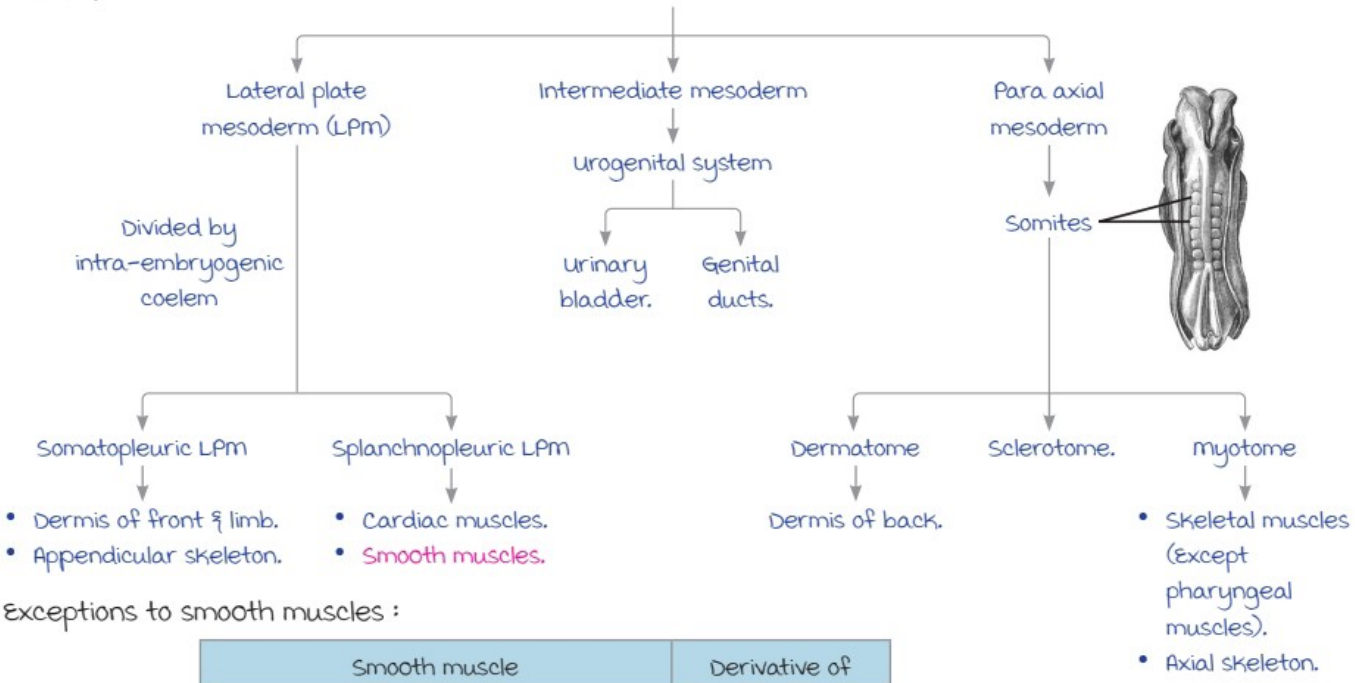


Germ layers

Mesoderm :



Exceptions to smooth muscles :

Smooth muscle	Derivative of
• Smooth muscles of ascending aorta, pulmonary trunk, coronary artery • Ciliaris muscle	Neural crest cells
• Sweat gland • Mammary gland	Ectoderm
• Sphincter & dilator pupillae	Neuroectoderm

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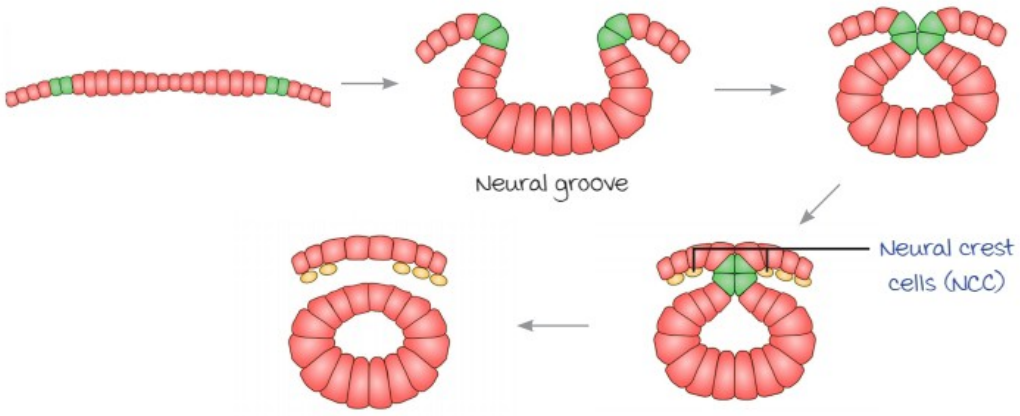
Neural Tube :

Formation :

Formed by stimulation of ectoderm by notochord.



Remnants of notochord :

1. Apical ligament of dens.
2. Nucleus pulposus (Central part of intervertebral disc).
3. Tectorial membrane (Continuation of posterior longitudinal ligament).

Derivatives :

Forms CNS structures :

- Brain & spinal cord.
- Oligodendrocytes (myelination).
- Astrocytes (Blood brain barrier).
- Ependymal cells (Lining of ventricles).
- Retina & pigment.

Note :

Intervertebral disc : 2 parts.

- Outer : Annulus fibrosus.
- Central : Nucleus pulposus.

Neural Crest Cells (NCC) :

Present at the junction of neural tube & ectoderm.

Structures formed

PNS structures :

- All ganglion.
- Enteric plexus.
- Schwann cells.
- Adrenal medulla.
- Parafollicular-C cells.
- Melanoblast/cyte.

Derivatives of head & neck :

- Skull bones (most).
- Dentine (Odontoblasts).
- Pharyngeal arch cartilage.
- Dermis of head & neck.
- Conotruncal septum.

Note : Adrenal cortex → Derivative of intermediate mesoderm.

Development of Diaphragm

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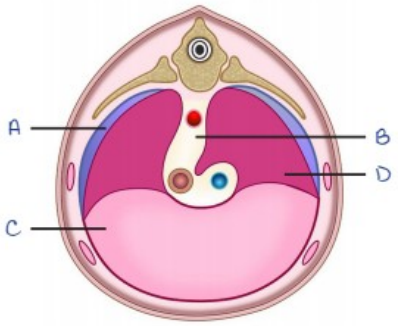
Derivatives :

	Structure	Derivative
A	Body wall mesoderm/ cervical somites	Muscles of diaphragm
B	Dorsal mesentery of esophagus	Crus of diaphragm
C	Septum transversum	Central tendon
D	Pleuroperitoneal membrane	Incorporated by muscles



Applied Anatomy :

Congenital diaphragmatic hernia :

- Occurs d/t absence of pleuroperitoneal membrane

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Persistence of pleuroperitoneal canal (Bochdalek foramen)

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Intestinal herniation.

- Left > Right.
- Complication : Lung hypoplasia.

Pharyngeal Arches

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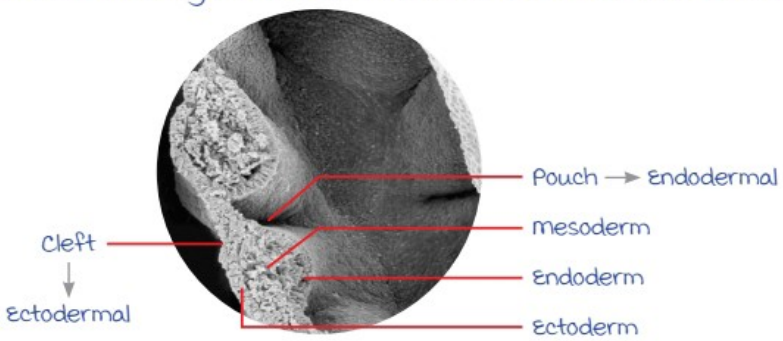
Core of mesoderm, lined by ectoderm on one side & endoderm on the other.



Pharyngeal Clefts :

1st cleft :

- Only cleft that persists.
- Derivatives :
  - External auditory canal.
  - Outer layer of tympanic membrane.

Cervical sinus

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Formed by outgrowth of 2nd arch ectoderm

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Obliterates 2nd–4th clefts.

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Applied anatomy :

Persistence of cervical sinus → Branchial cyst : Swelling along sternocleidomastoid.

Pharyngeal Pouches :

Pouch	Derivatives
1	• Inner layer of tympanic membrane • Tympanic cavity • Auditory tube/eustachian tube • Mastoid antrum
2	• Palatine tonsil
3	• Thymus • Inferior parathyroid
4	• Superior parathyroid
Remnant of 5th pouch	• Ultimobranchial body

Note :

C-cells : Derived from NCC > Ultimobranchial body.

Applied anatomy :

DiGeorge syndrome :

- Anomaly of 3rd > 4th pouch.
- m/c micro-deletion syndrome : 22q11 deletion.
- Absent thymus & hypoparathyroidism.

DiGeorge syndrome

Pharyngeal Arch Cartilages

Arch	Derivative structures
1	• Meckel's cartilage → Malleus & incus • Mandible
2	• Stapes (Except footplate : Derived from otic capsule) • Styloid process • Stylohyoid ligament • Lesser cornua of hyoid
3	• Greater cornua of hyoid • Body of hyoid
4 & 6	• Laryngeal cartilages

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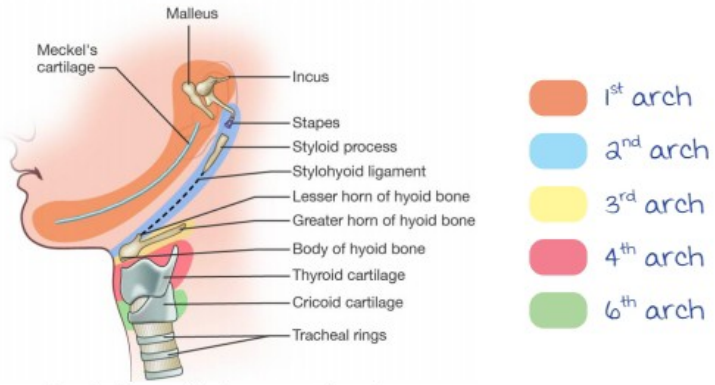

Derivatives of pharyngeal arches

Arterial & Venous Development

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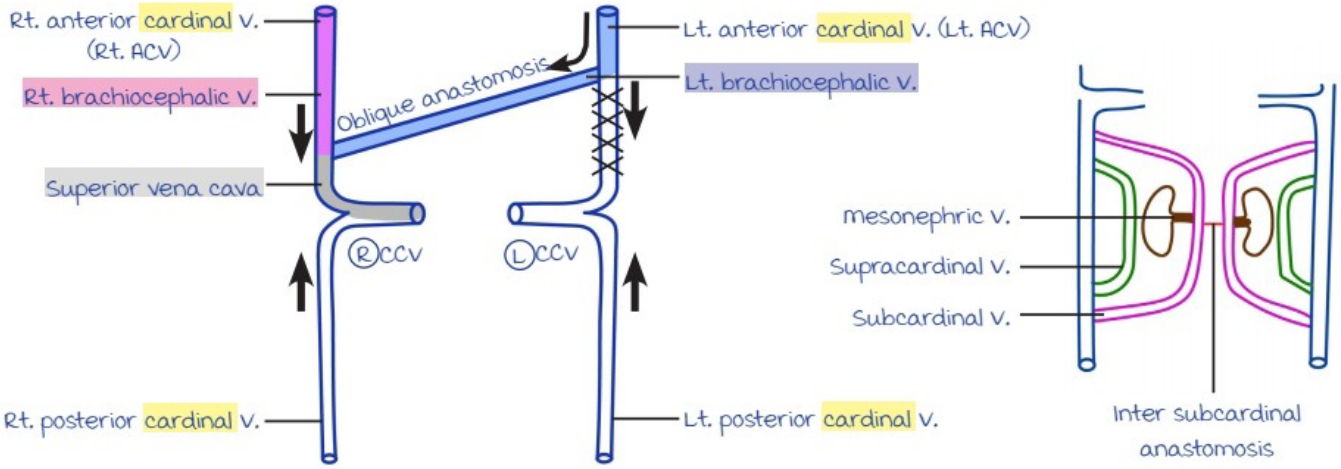
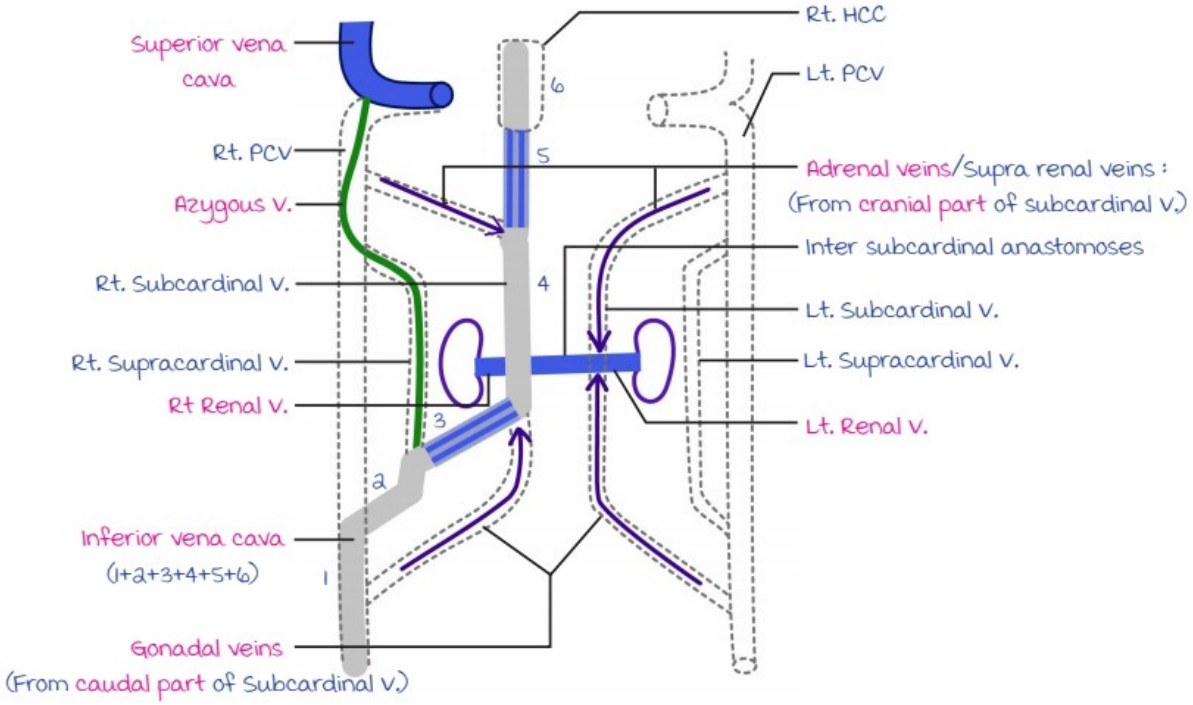
VENOUS DEVELOPMENT





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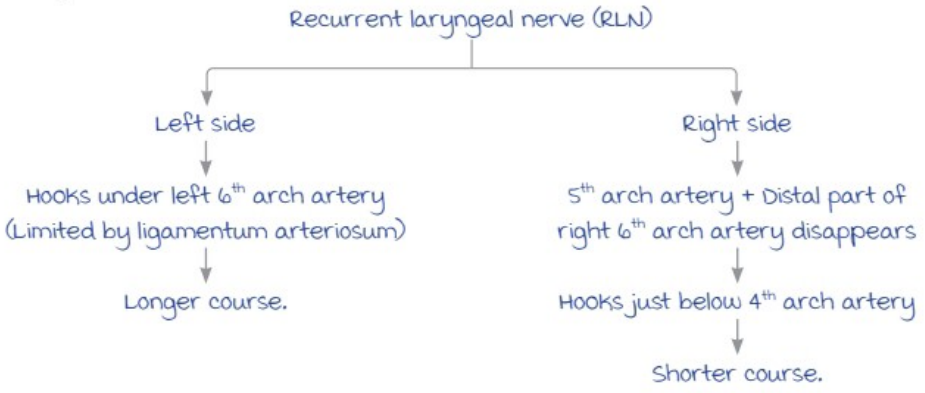
Vein		Derivative of
Rt. brachiocephalic vein		Right ACV
Lt. brachiocephalic vein		Left ACV + Oblique anastomosis
Superior vena cava		Right ACV + Right CCV
Inferior vena cava		Right PCV Right supracardinal ⊕ Anastomosis Right subcardinal
Renal vein	Right	Right mesonephric vein
	Left	Left mesonephric vein + Intersubcardinal anastomosis
Azygos vein		Right supracardinal vein > Right PCV
Gonadal vein		Caudal part of subcardinal vein
Adrenal vein		Cranial part of subcardinal vein

PHARYNGEAL ARCH ARTERIES

Connect the developing heart in the front to the 2 dorsal aorta.

Structure		Arch artery
Arch of aorta		• Aortic sac • Left horn of aortic sac • Left 4th arch artery
Brachiocephalic trunk		Right horn of aortic sac
CCA		Proximal part of 3rd arch artery
ICA		Distal part of 3rd arch artery
Subclavian artery	Left	Left 7th cervical intersegmental artery
	Right	• Right 4th arch artery • Right 7th cervical intersegmental artery
Pulmonary artery		Proximal part of 6th arch artery
Ductus arteriosus		Distal part of 6th arch artery

Applied aspect :



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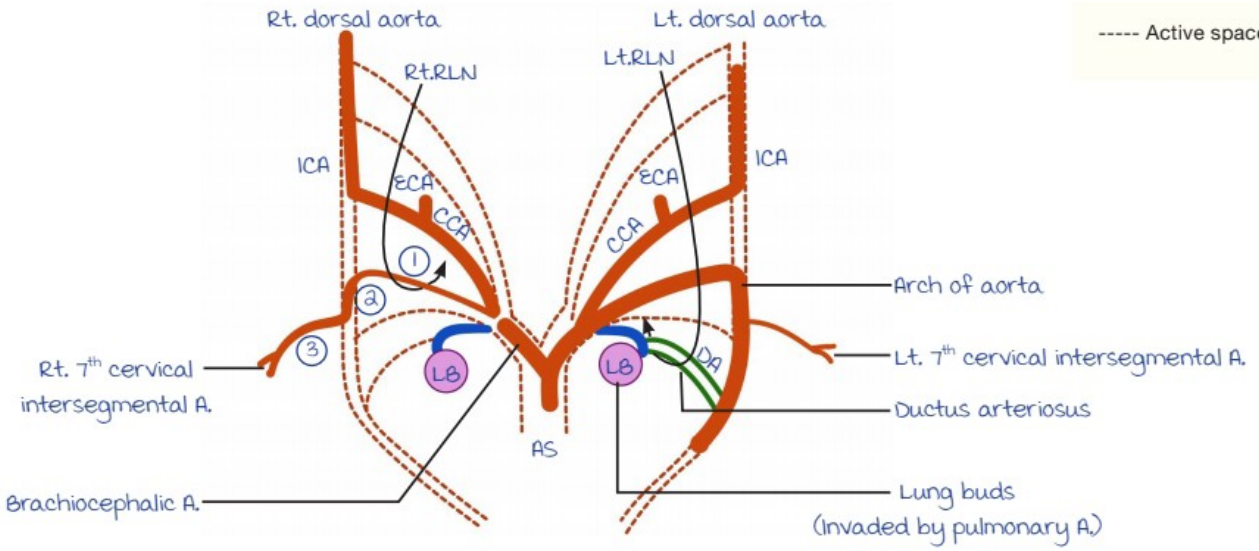
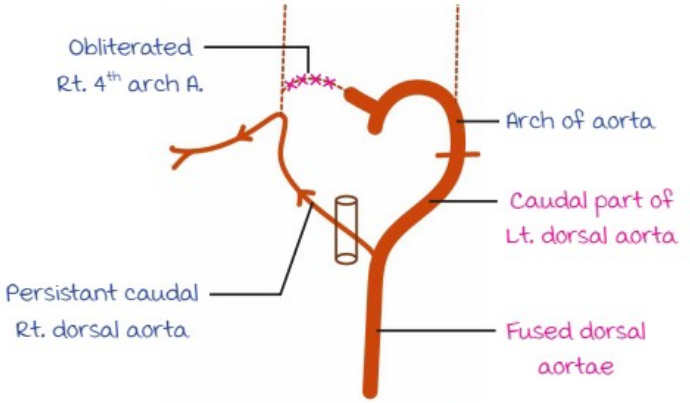
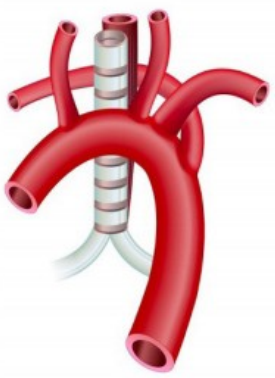


Dysphagia lusoria :

Obliteration of right 4th arch artery → Persistence of caudal part of right dorsal aorta → Abnormal right subclavian artery





Double aortic arch : Persistence of both sides.

- 4th arch arteries &
- Dorsal aorta.

Arterial Derivatives :

Aortic arch	Derivatives
1st arch	Maxillary artery
2nd arch	Hyoid & stapedial artery
3rd arch	CCA & proximal ICA
4th arch	Left : Arch of aorta
	Right : Part of right subclavian
5th arch	Degenerates
6th arch	Left : Proximal left pulmonary artery, distal ductus arteriosus
	Right : Right pulmonary artery