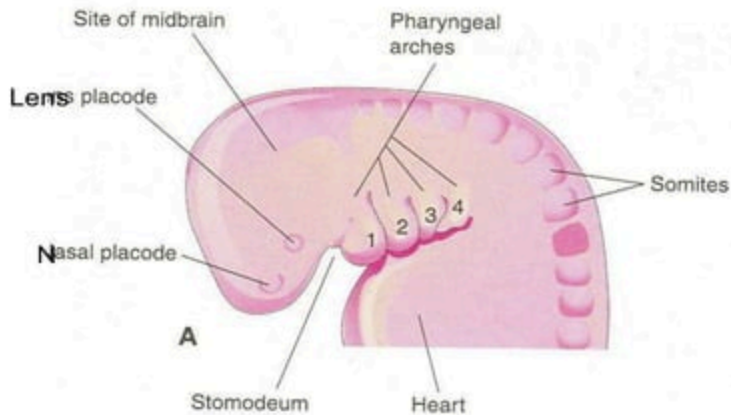


PHARYNGEAL ARCHES

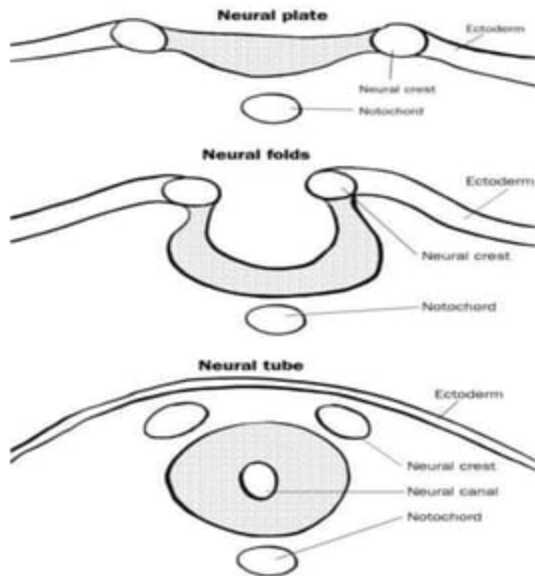


What is Pharyngeal Arch?

- Rod-like thickenings of mesoderm present in the wall of the foregut.
- They appear in 4th-5th weeks of development.
- Contribute to the characteristic external appearance of the embryo.
- As its development resembles with gills (Branchia: Greek word) in fishes & amphibians, therefore also called as **Branchial arch**

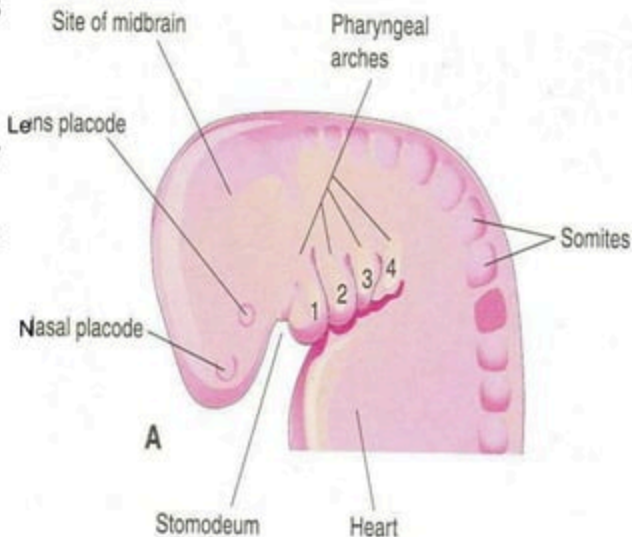
Development of Pharyngeal Arches

- Begin to develop early in the 4th wk. as neural crest cells migrate into head & neck region.

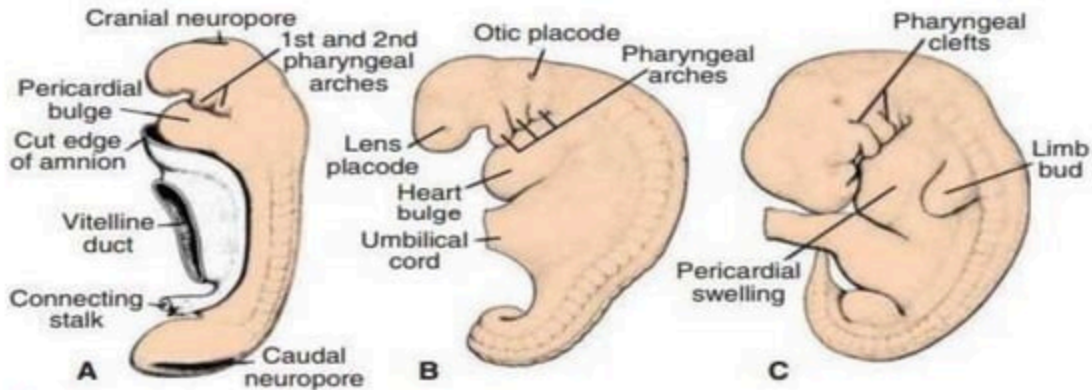


Development of Pharyngeal Arches

- First pair appears as surface elevations lateral to the developing pharynx.
- Soon other arches appear as obliquely disposed, rounded ridges on each side of the pharynx



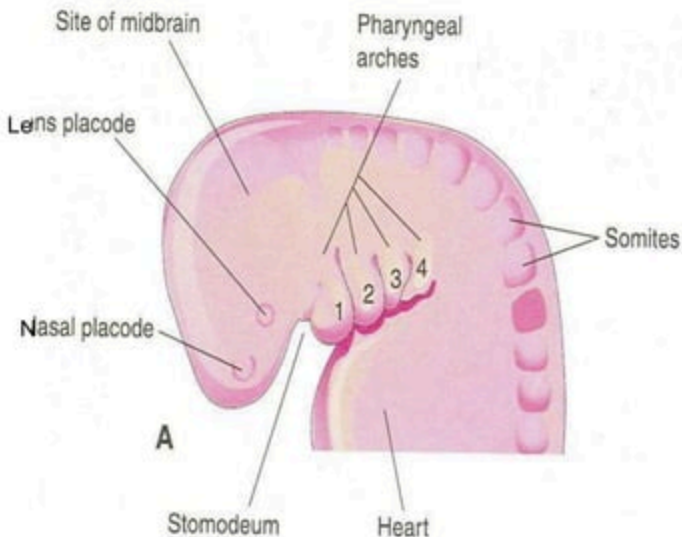
Development of Pharyngeal Arches



1.3 Development of the pharyngeal arches. **A.** 25 days. **B.** 28 days. **C.** 5 weeks.

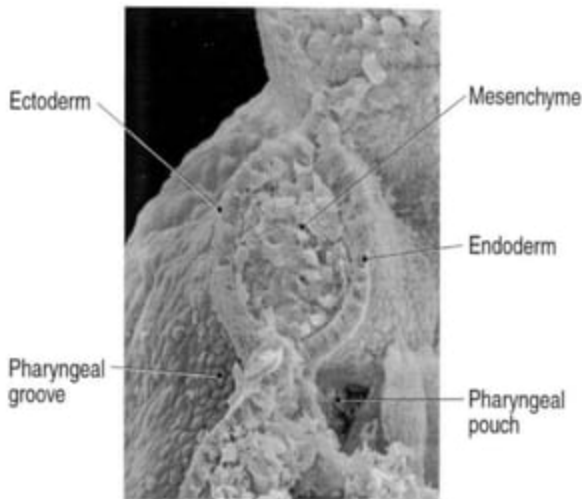
Pharyngeal Arches

- By the end of the 4th wk., four pairs of arches are visible externally.
- 5th & 6th are rudimentary & not visible on the surface of embryo.
- **5th arch does not develop in humans**
- Numbered in craniocaudal sequence.



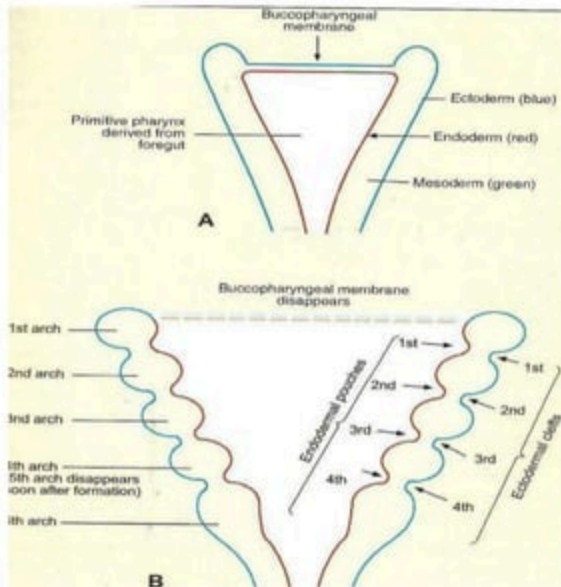
Pharyngeal Arch Components

- Consists of a core of mesenchyme.
- Covered externally by ectoderm & internally by endoderm.
- In the 3rd wk., original mesenchyme is derived from mesoderm.
- During the 4th wk., most of it is derived from neural crest cells.



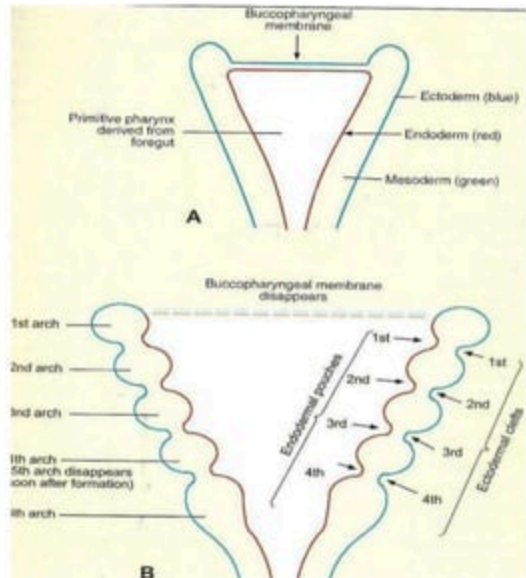
Pharyngeal Clefts/Grooves

- Invaginations of ectoderm which separate the pharyngeal arches from each other on the outer surface
- 4 on each side.



Pharyngeal Pouches

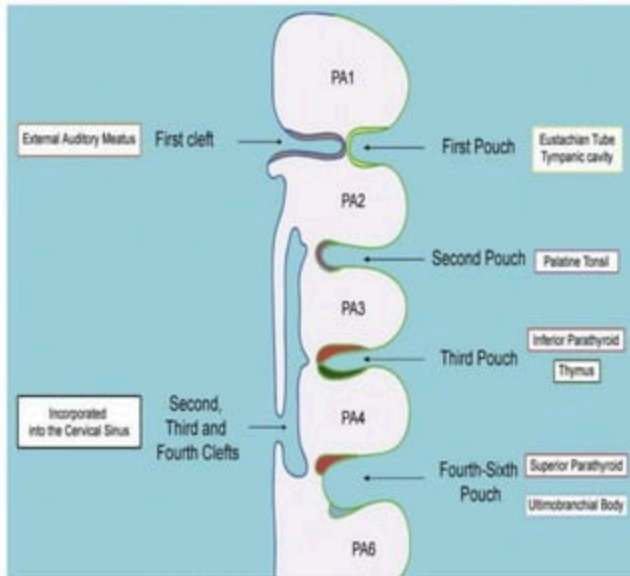
- Evagination of the endoderm forms pouches
- Develop in a craniocaudal sequence
- 4 on each side
- 5th pair is absent or rudimentary



Pharyngeal Apparatus

Consists of:

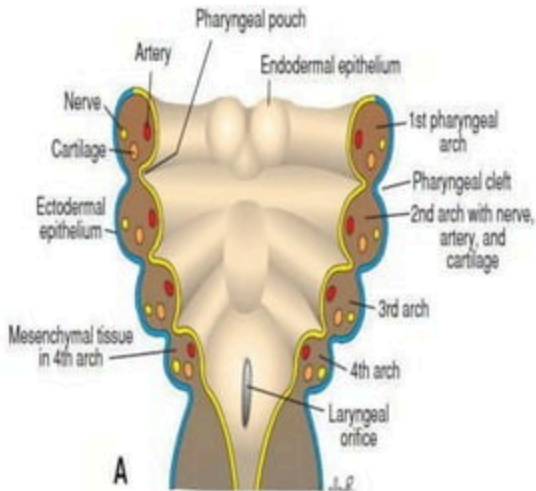
- Pharyngeal arches
- Pharyngeal pouches
- Pharyngeal grooves/clefts
- Pharyngeal membrane



Structures in a Pharyngeal Arch

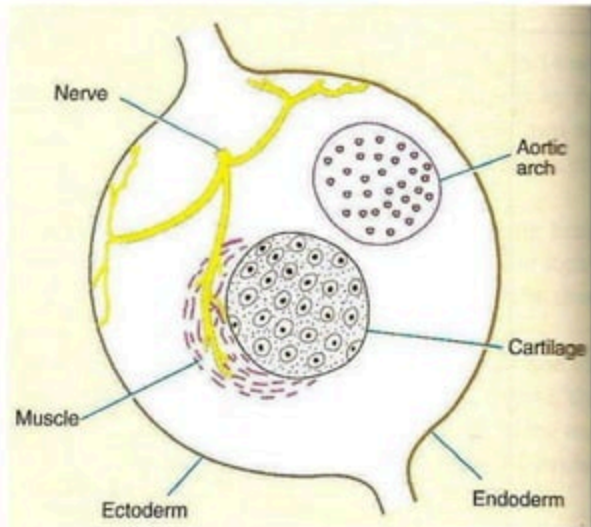
A typical pharyngeal arch contains:

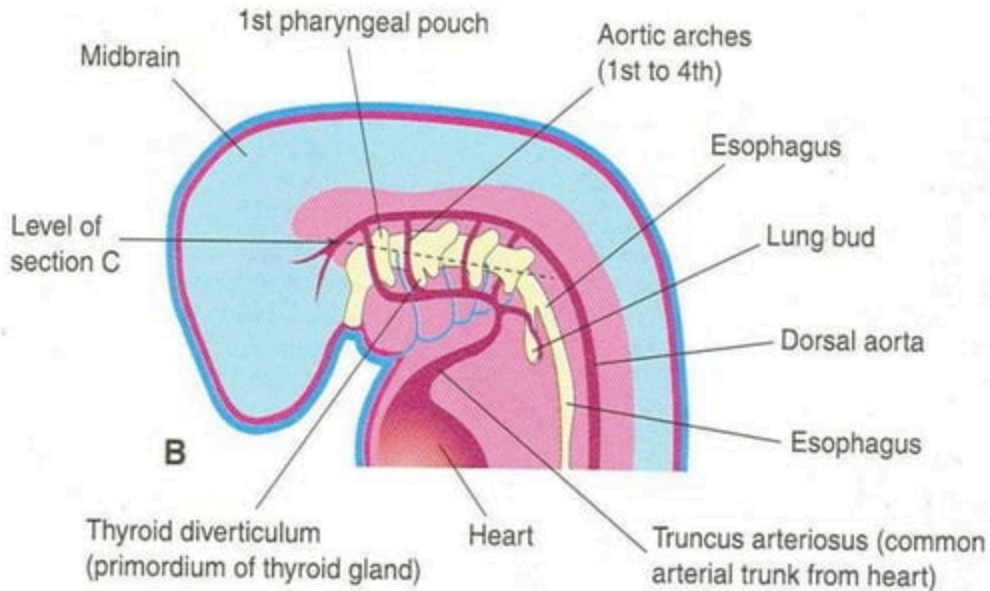
- An aortic arch, **an artery** that arises from the truncus arteriosus of the primordial heart.
- A **nerve** that supplies the mucosa and muscles derived from the arch.



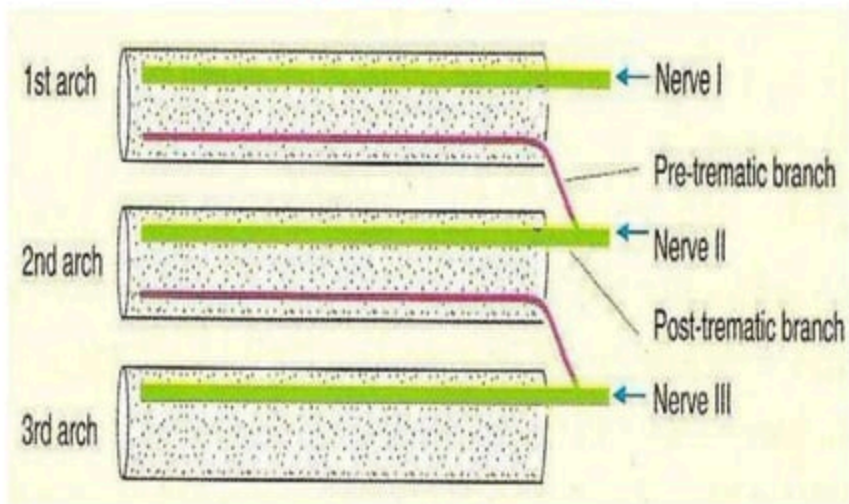
Structures in a Pharyngeal Arch

- A **cartilage** that forms the skeleton of the arch.
- A **muscular** component that differentiates into muscles in the head and neck.





Arrangement of nerves supplying the pharyngeal arch (in lower animals)



Nerves of Pharyngeal Arches

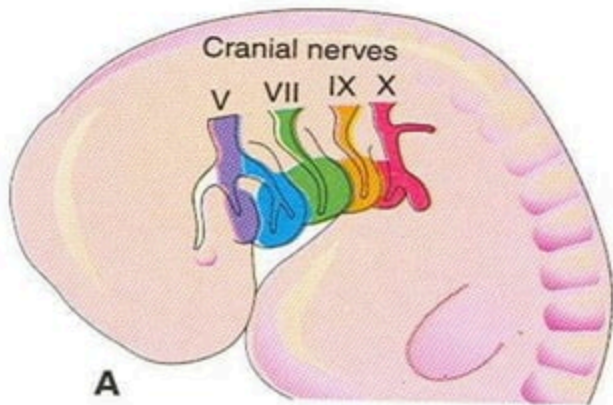
1st Arch: Mandibular branch of V nerve

2nd Arch : Facial

3rd Arch: Glossopharyngeal

4th Arch : Superior laryngeal branch
of Vagus

6th Arch: Recurrent laryngeal branch
of Vagus



First Pharyngeal Arch (Mandibular Arch)

Subdivides into dorsal and ventral parts

➤ Dorsal : **Maxillary Process**

➤ Ventral : **Mandibular Process**

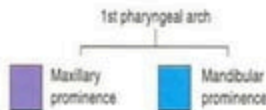
Maxillary process forms

Maxilla

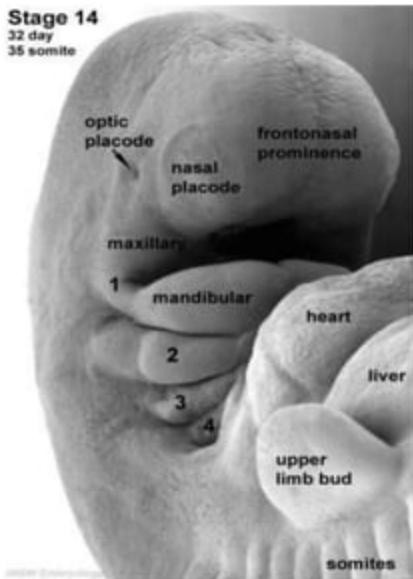
Zygomatic

Vomer

Squamous part of Temporal bone

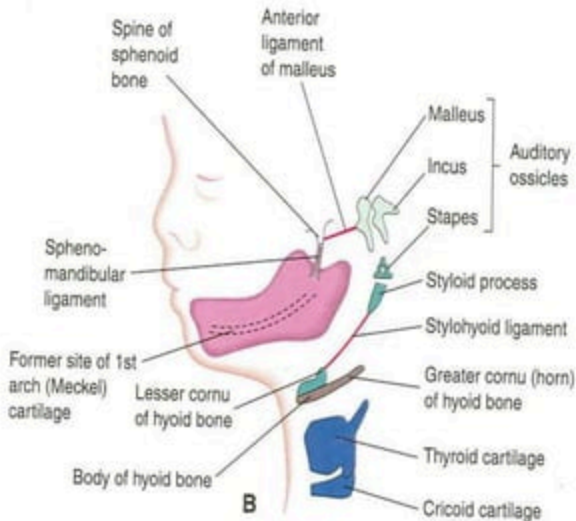


First Pharyngeal Arch (Mandibular Arch)



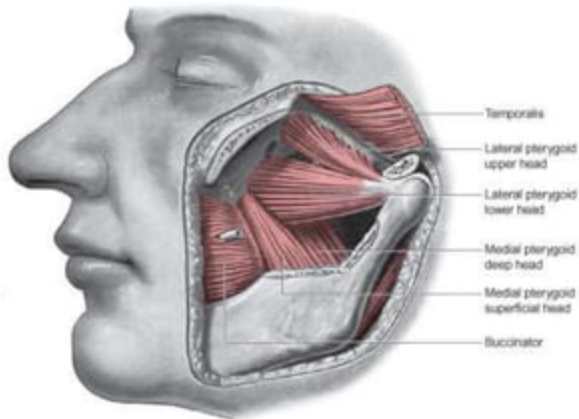
First Pharyngeal Arch (Mandibular Arch)

- **Cartilage** : **Meckel's cartilage**
- Ventral part gets absorbed into the developing mandible.
- Mesenchyme of mandibular process gives rise to mandible by IM ossification.
- Dorsal part gives rise to **2 bones**
and 2 ligaments



Muscles of First Pharyngeal Arch

- Masseter
- Temporalis
- Medial pterygoid
- Lateral pterygoid
- Ant belly of digastric
- Mylohyoid
- Tensor tympani
- Tensor veli palatini



First Pharyngeal Arch

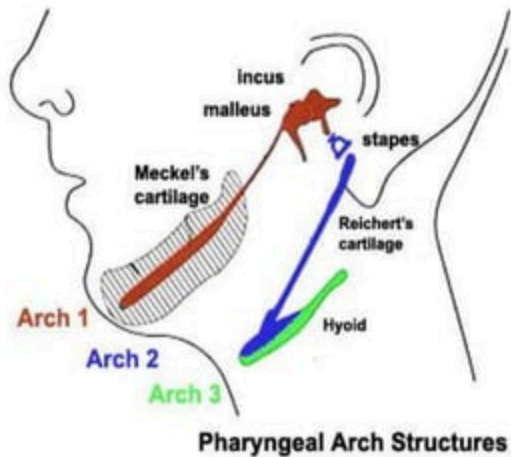
- **Nerve** : Mandibular branch of trigeminal nerve (V) (post trematic nerve)
- Chorda tympani of facial nerve is pretrematic nerve
- **Artery** : Maxillary artery

Second Pharyngeal Arch (Hyoid Arch)

Cartilage: Reichert's cartilage.

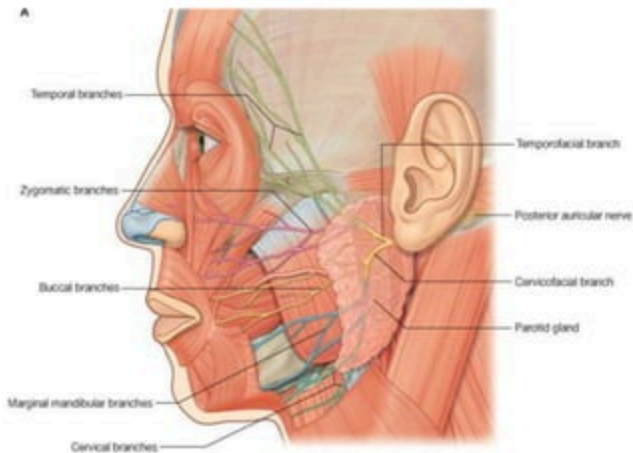
It forms:

- **S**tapes
- **S**tyloid Process
- **S**tylohyoid Ligament
- **S**maller Cornu of Hyoid
- **S**uperior half of body of Hyoid



Muscles of Second Pharyngeal Arch

- Muscles of facial expression
- Occipito frontalis
- Platysma
- Stylohyoid
- Post belly of digastric
- Stapedius
- Auricular muscles



Second Pharyngeal Arch

Nerve :Facial nerve

Artery: Stapedial artery (only during fetal life)

Third Pharyngeal Arch

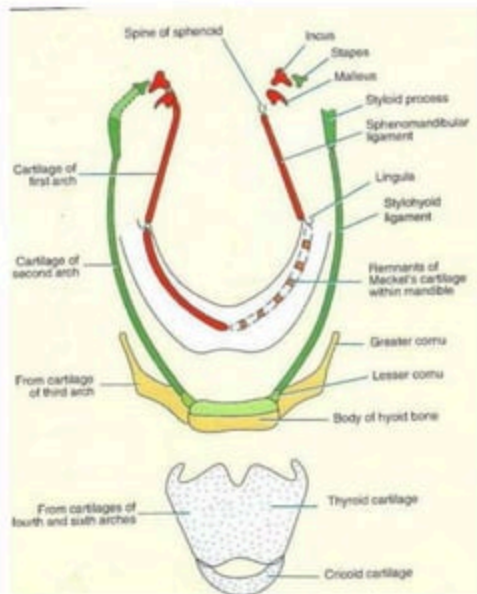
Cartilage forms:

- Greater cornu
- Lower half of the body of hyoid bone.

Muscle : Stylopharyngeus

Nerve: Glossopharyngeal nerve

Artery : CCA, ICA



Fourth Pharyngeal Arch

Cartilage: Thyroid cartilage

Muscles :

Constrictors of pharynx

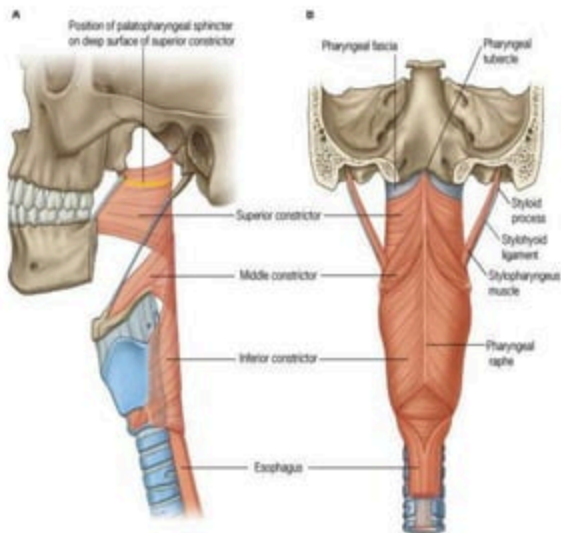
Cricothyroid

Levator veli palatini

Nerve: Sup laryngeal nerve

Artery : Arch of aorta

Rt SCA



Sixth Pharyngeal Arch

Cartilage: All cartilages of larynx except

Epiglottis

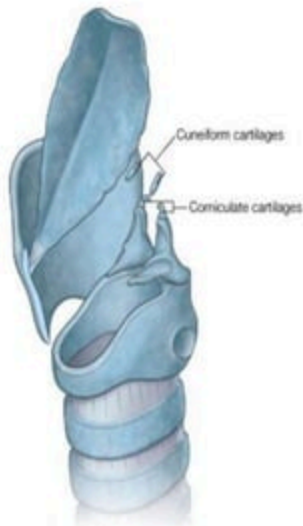
Muscles:

All the intrinsic muscles of larynx except

Cricothyroid

Nerve : Recurrent laryngeal branch of Vagus
nerve

Artery: Pulmonary Arteries & Ductus Arteriosus



Nerve & muscles of Pharyngeal arches

Arch	Nerve of Arch	Muscles of Arch
First	Mandibular	Medial and lateral pterygoids, Masseter, Temporalis, Mylohyoid, Anterior belly of digastric, Tensor tympani, Tensor palati.
Second	Facial	Facial Muscles, Occipitofrontalis, Platysma, Stylohyoid, Posterior belly of digastric, Stapedius, Auricular muscles.
Third	Glosso-pharyngeal	Stylopharyngeus
Fourth	Superior laryngeal	Muscles of larynx and pharynx
Fifth	Recurrent laryngeal	

Pharyngeal arch	Muscular contributions	Skeletal contributions	Nerve	Artery
1 st <u>Mandibular arch</u>	<u>Muscles of mastication</u> , Anterior belly of <u>digastric</u> , <u>Mylohyoid</u> , <u>Tensor tympani</u> , <u>Tensor palatini</u>	Premaxilla, <u>Maxilla</u> , <u>Zygomatic</u> , Squamous part of <u>Temporal Mandible</u> , <u>Malleus</u> , <u>Incus</u> , Ant Lig of Malleus, <u>Sphenomandibular ligament</u> .	<u>Mandibular division of Trigeminal(V)</u>	<u>Maxillary artery</u>
2nd <u>Hyoid arch</u>	<u>Muscles of facial expression</u> , <u>Platysma</u> , <u>Stapedius</u> , <u>Stylohyoid</u> , <u>Posterior belly of Digastric</u> , <u>Auricular</u>	Reichert's cartilage <u>Stapes</u> , <u>Styloid Process</u> , <u>Stylohyoid ligament</u> , <u>Lesser horns</u> & Upper part of body of Hyoid	<u>Facial nerve (VII)</u>	<u>Stapedial artery</u>
3rd	<u>Stylopharyngeus</u>	<u>Greater horns</u> & Lower part of body of hyoid	<u>Glossopharyngeal nerve (IX)</u>	<u>Common Carotid</u> , <u>Internal carotid</u>
4th	<u>Cricothyroid</u> ,Levator veli palatini, Constrictors of pharynx	<u>Thyroid cartilage</u>	<u>Vagus nerve (X)</u> , <u>Superior laryngeal nerve</u>	Aortic arch <u>Subclavian</u> artery
6th	All intrinsic muscles of <u>Larynx</u> except <u>Cricothyroid</u>	<u>Cricoid</u> , <u>Arytenoid</u> , <u>Corniculate</u> , <u>Cuneiform</u>	<u>Vagus nerve (X)</u> , <u>Recurrent laryngeal nerve</u>	<u>Pulmonary</u> arteries & <u>Ductus arteriosus</u>

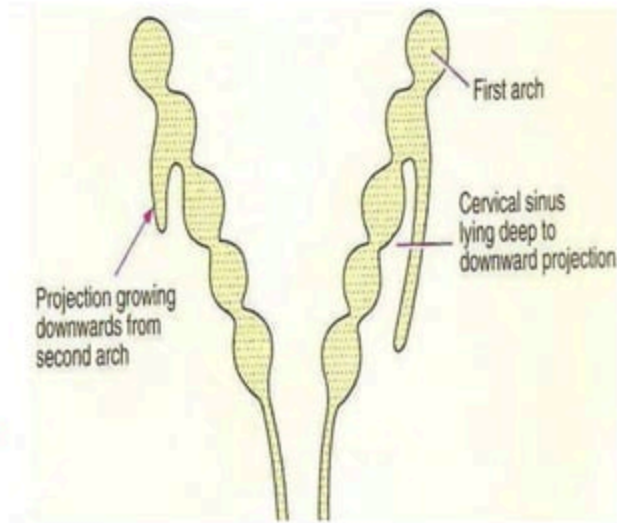
Fate of Ectodermal Clefts

1st cleft: Ventral part obliterated

Dorsal part- Ext. acoustic meatus &
Pinna

2nd to 4th clefts: Obliterated due to
overgrowing of second pharyngeal
arch

Cervical sinus: Branchial cysts/sinus



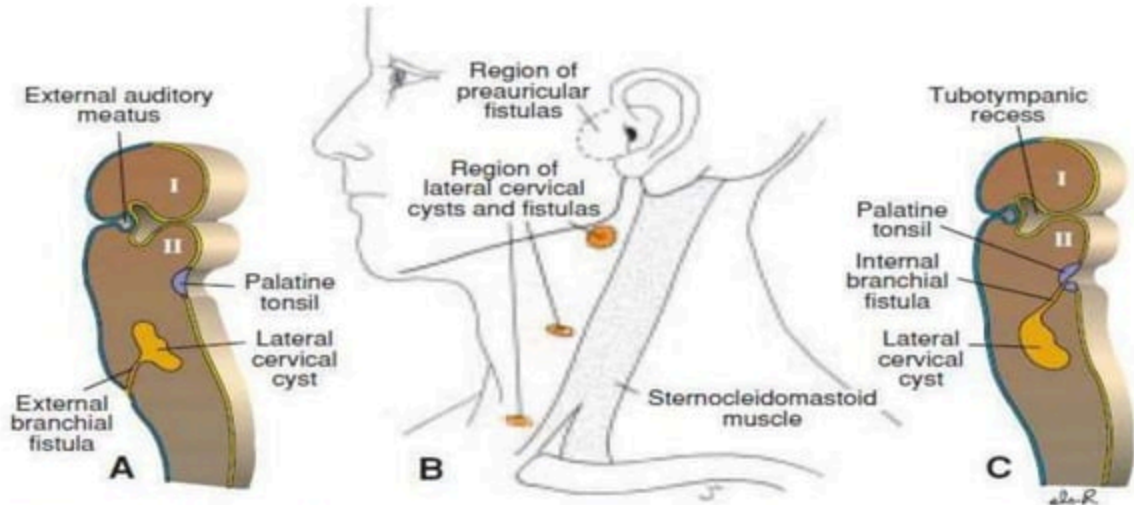
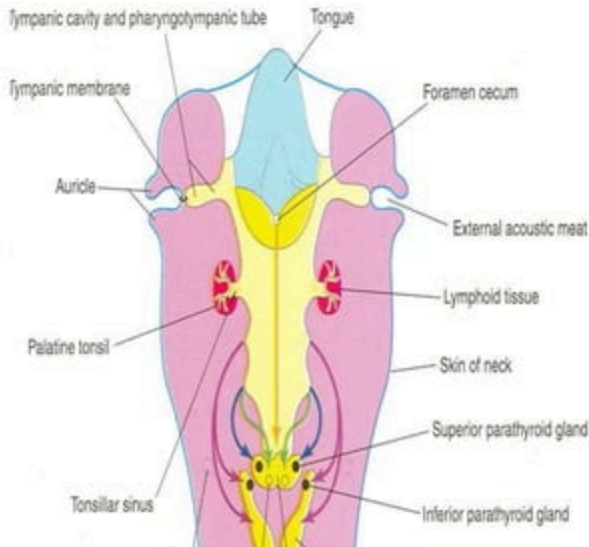


Figure 15.14 A. Lateral cervical cyst opening at the side of the neck by way of a fistula. B. Lateral cervical cysts and fistulas in front of the sternocleidomastoid muscle. Note also the region of preauricular fistulas. C. A lateral cervical cyst opening into the pharynx at the level of the palatine tonsil.

Pharyngeal Membranes

- Endoderm of pouches & Ectoderm of grooves are separated by mesenchyme except bet first & second pouch where they approach each other: **Pharyngeal Membrane**
- This becomes the tympanic membrane lined on outside by ectoderm & inside by endoderm

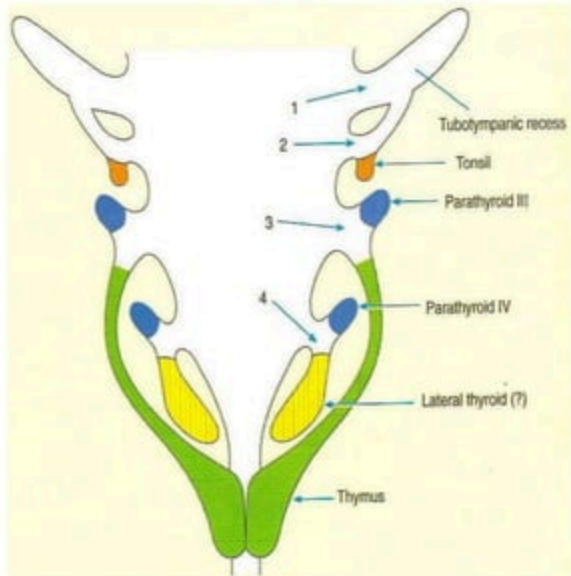


Derivatives of First Pharyngeal Pouch

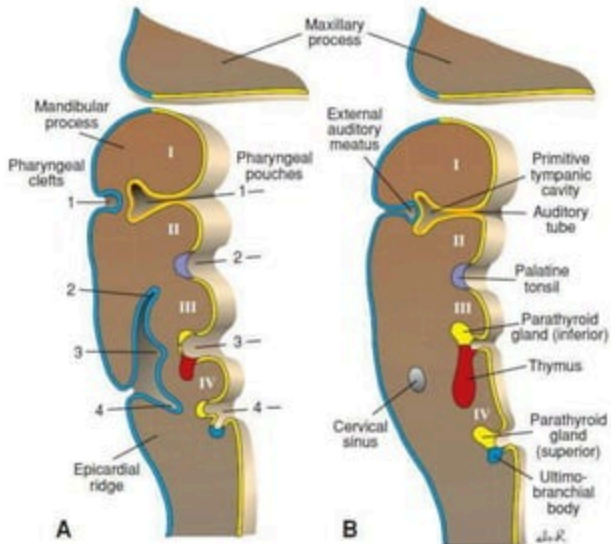
- First pharyngeal pouch expands:

Tubo tympanic Recess

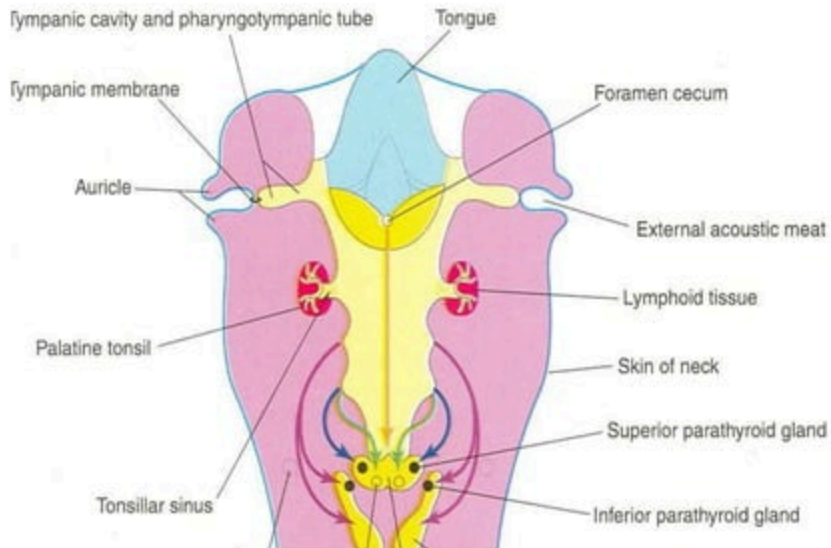
- Expanded distal part forms tympanic cavity and mastoid antrum
- Proximal part forms the auditory tube



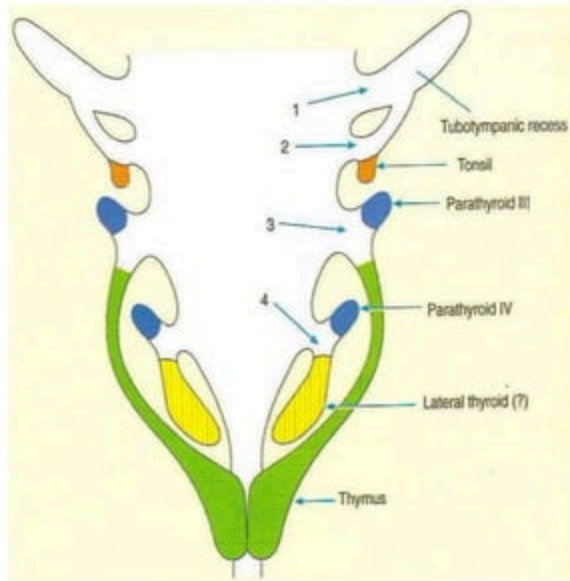
Derivatives of First Pharyngeal Pouch



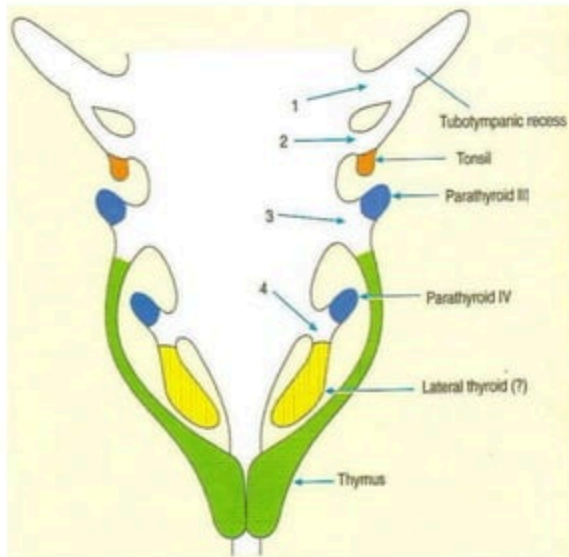
Derivatives of Second Pharyngeal Pouches



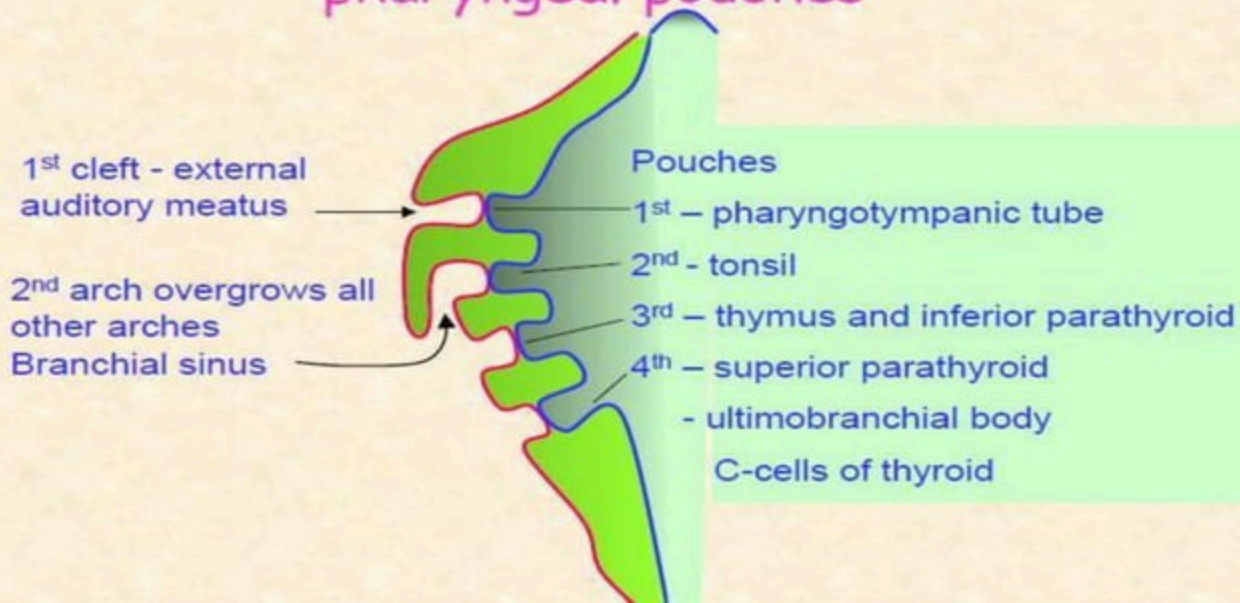
Derivatives of Third Pharyngeal Pouches



Derivatives of Fourth Pharyngeal Pouches



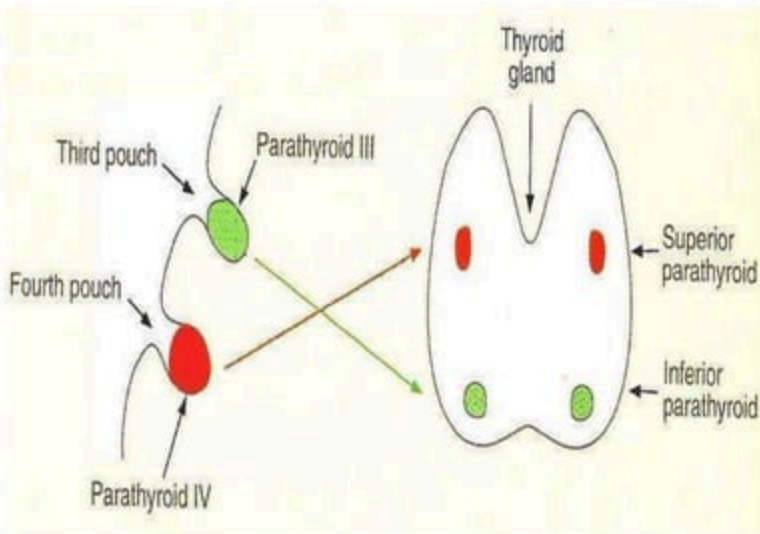
Derivatives of branchial clefts and pharyngeal pouches



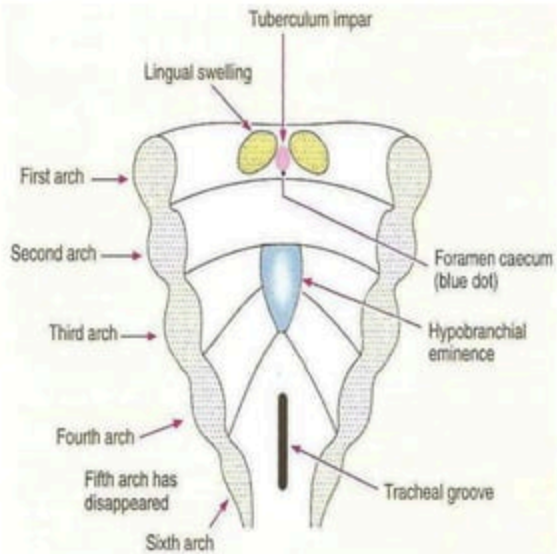
Derivatives of Pharyngeal pouches

Pharyngeal pouch	Derivatives
1 st pouch	Eustachian tube, tympanic cavity
2 nd pouch	Palatine tonsil, tonsillar fossa
3 rd pouch	Inferior parathyroid, thymus glands
4 th pouch	Superior parathyroid
5 th pouch	Ultimobranchial body, parafollicular cells of thyroid

Development of Parathyroid glands



Development of the Thyroid gland

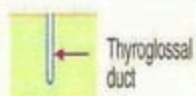


Site of foramen caecum

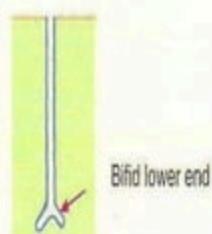
A



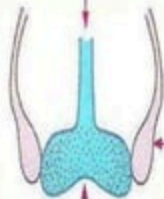
B



C



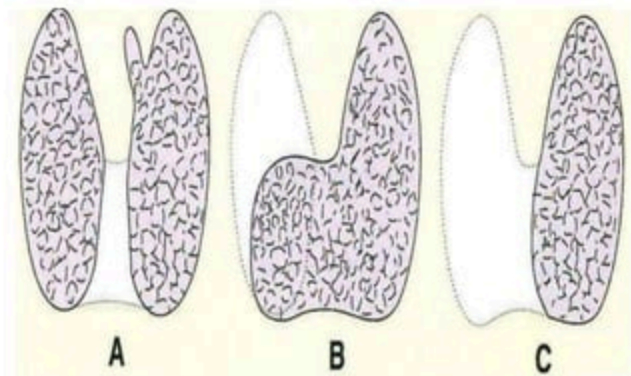
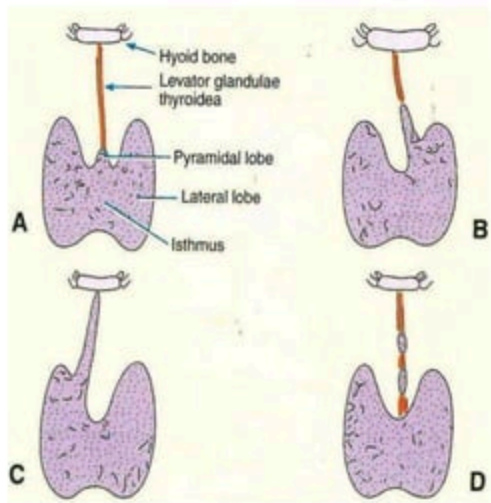
Thyroglossal duct



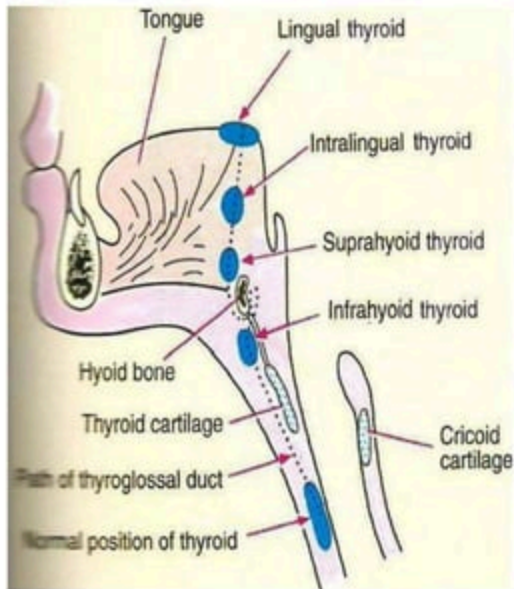
Thyroid developing from thyroglossal duct

D

Anomalies of shape of thyroid gland



Anomalies of position of thyroid gland



Other anomalies of thyroid gland

- Ectopic thyroid tissue
- Remnants of thyroglossal duct:
 - (a) Thyroglossal cysts
 - (b) Thyroglossal fistula
 - (c) Carcinoma