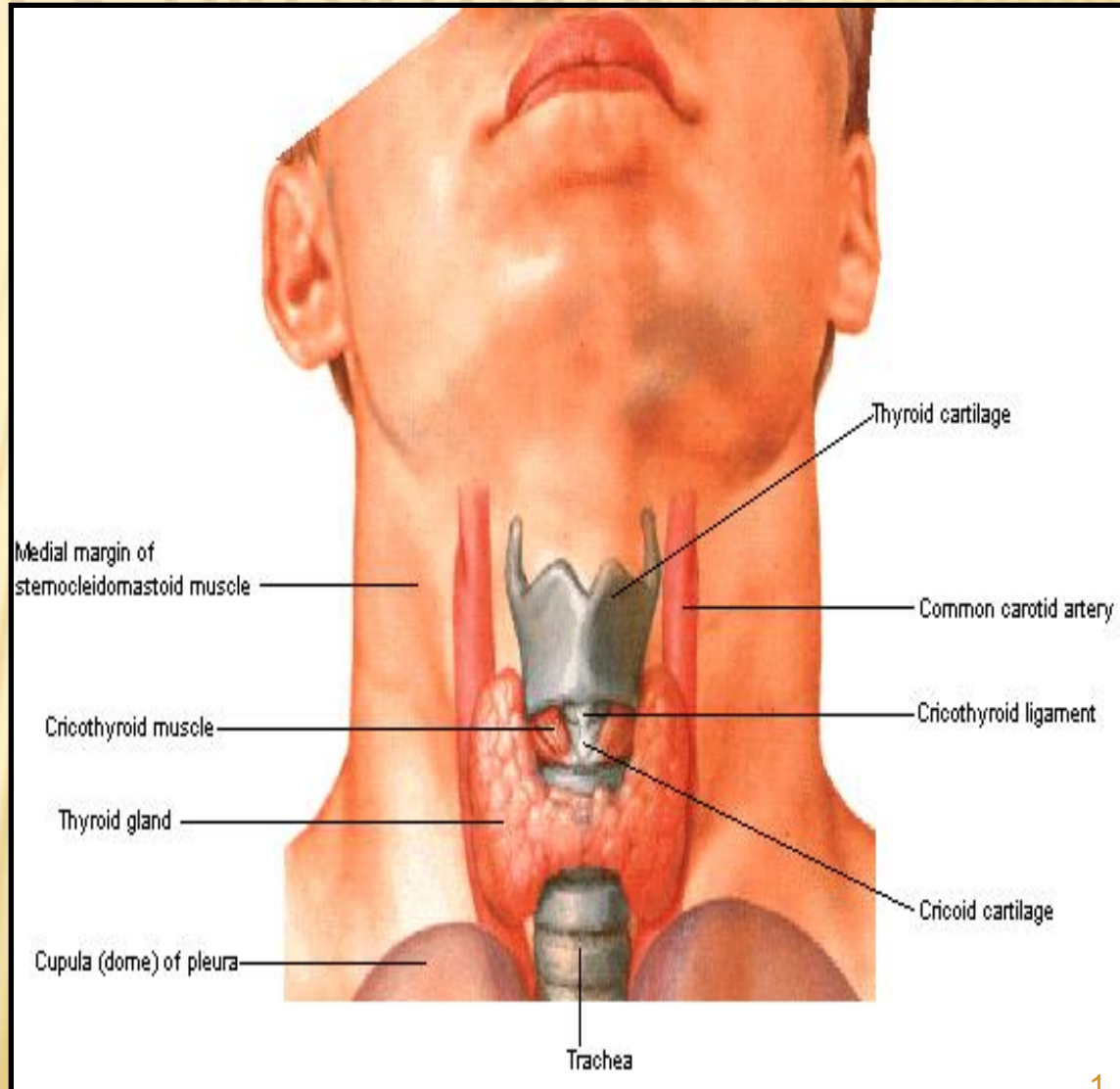


# ANATOMY & EMBRYOLOGY OF THYROID & PARATHYROID

By  
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# OBJECTIVES

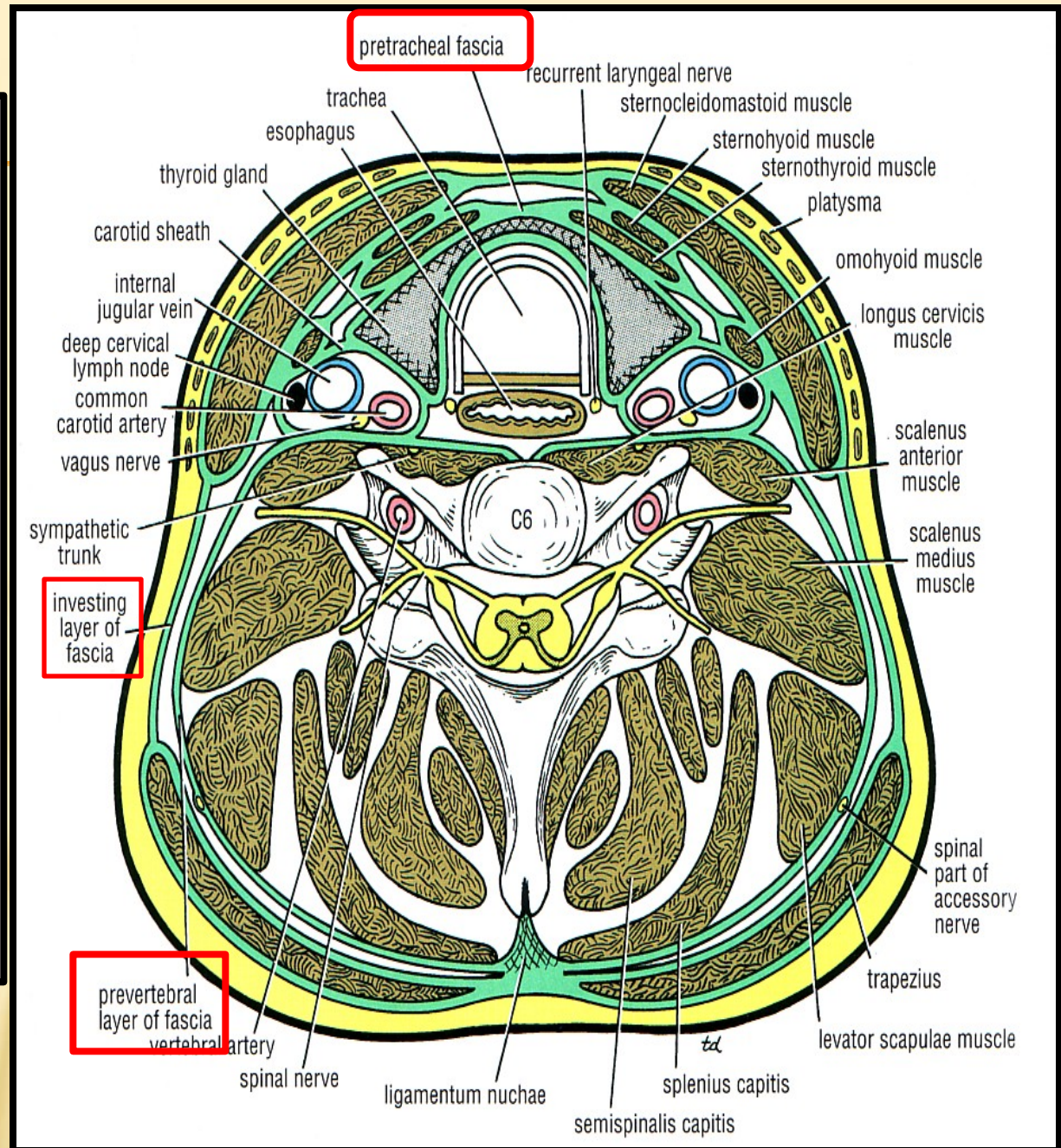
- × *By the end of the lecture, the student should be able to:*
- × Describe the shape, position, relations and structure of the **thyroid gland**.
- × List the blood supply & lymphatic drainage of the thyroid gland.
- × List the nerves endanger with thyroidectomy operation.
- × Describe the shape, position, blood supply & lymphatic drainage of the **parathyroid glands**.
- × Describe the **development** of the **thyroid & parathyroid glands**.
- × Describe the most common congenital anomalies of the **thyroid gland**.

Before we go to the thyroid

What are the parts of the deep fascia or deep cervical fascia of the neck?

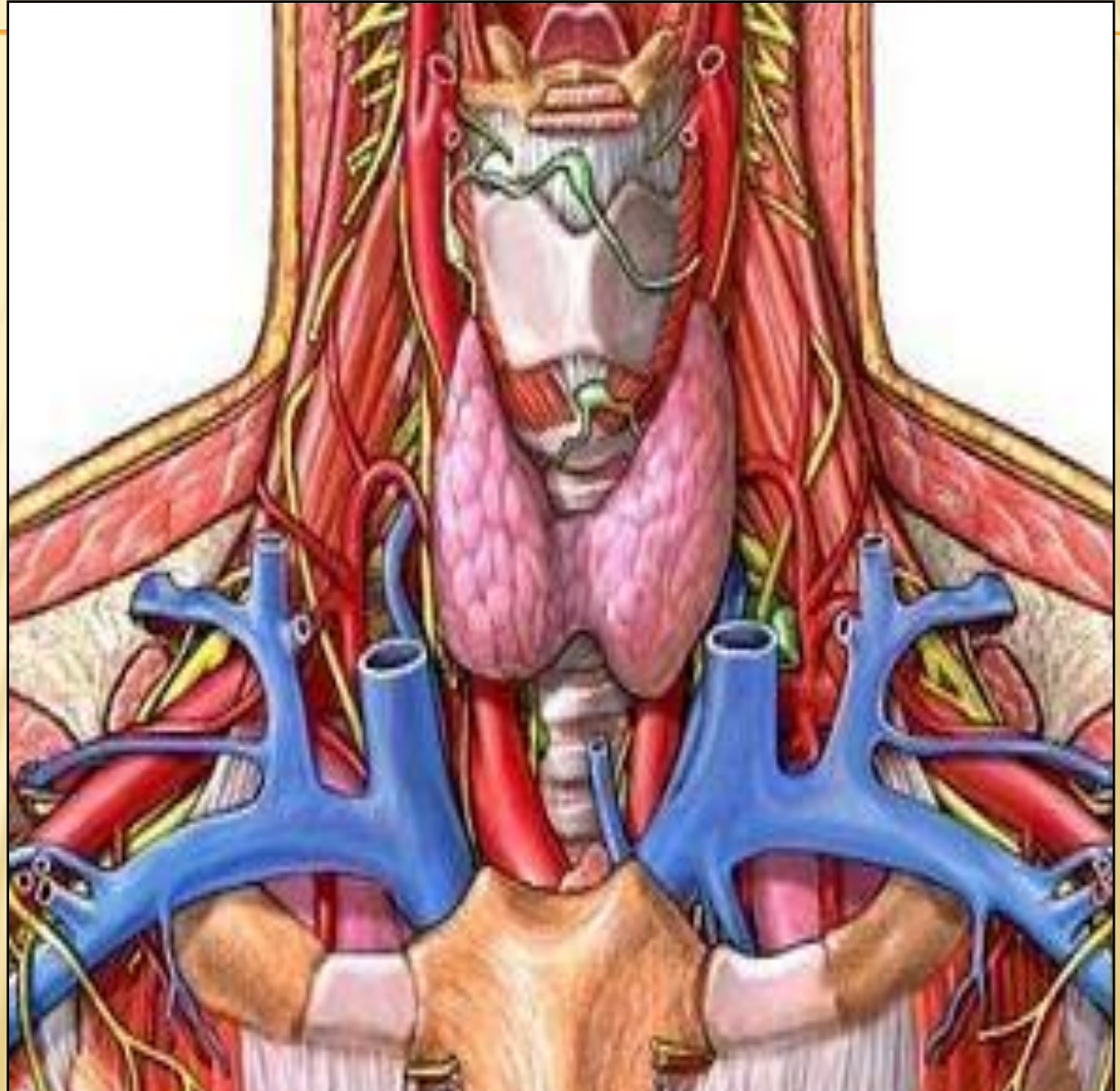
It is divided mainly into 3 layers:

- 1- Investing layer.
- 2- Pretracheal layer.
- 3- Prevertebral layer.



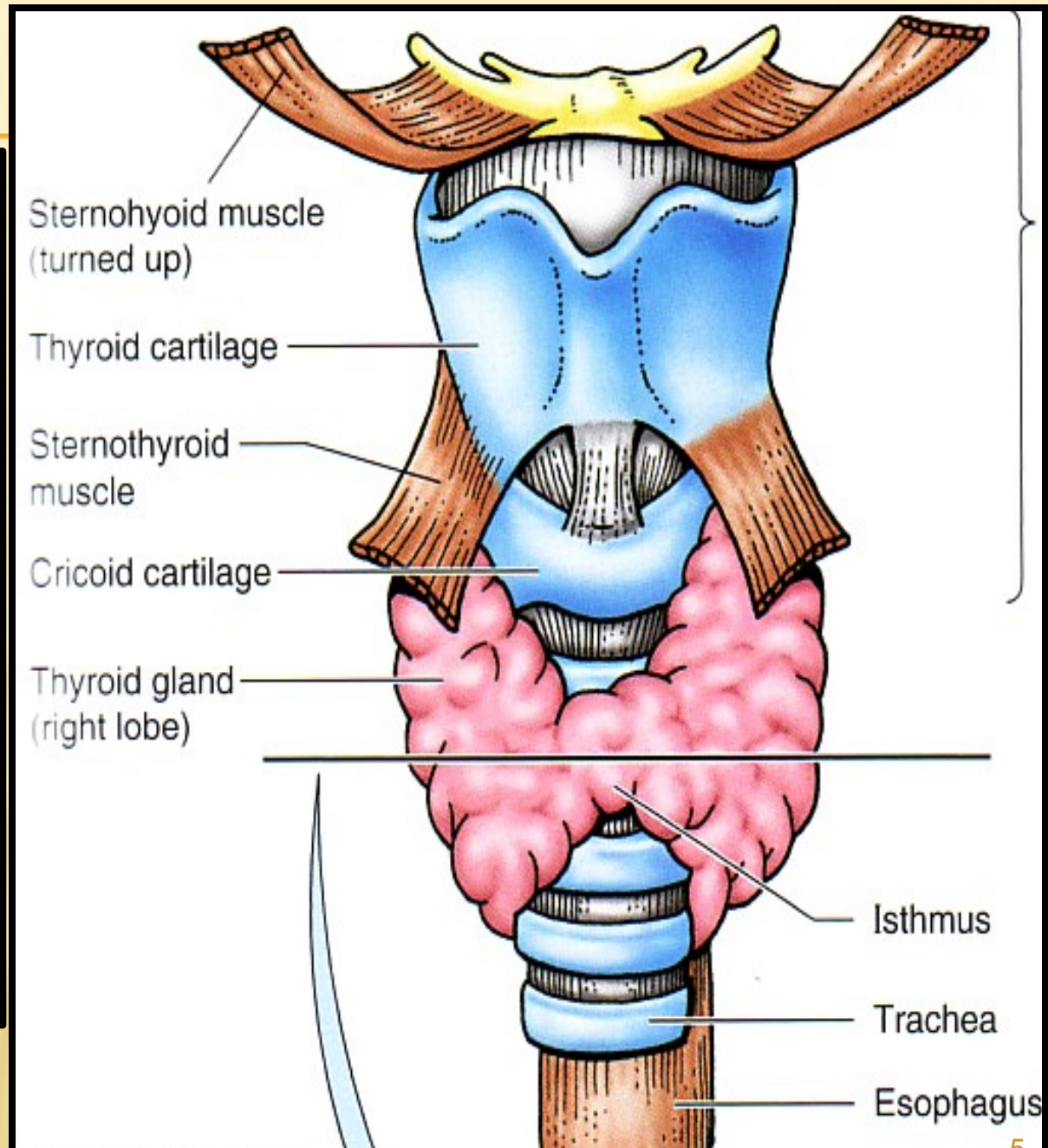
# Thyroid gland

- × Endocrine, **butterfly shaped** gland.
- × Consists of right & left lobes.
- × The **2 lobes** are connected to each other by a narrow **isthmus**, **which** overlies the **2<sup>nd</sup>, 3<sup>rd</sup> & 4<sup>th</sup> tracheal rings**.
- × It is surrounded by a **facial sheath** derived from the **pretracheal layer of the deep cervical fascia**.

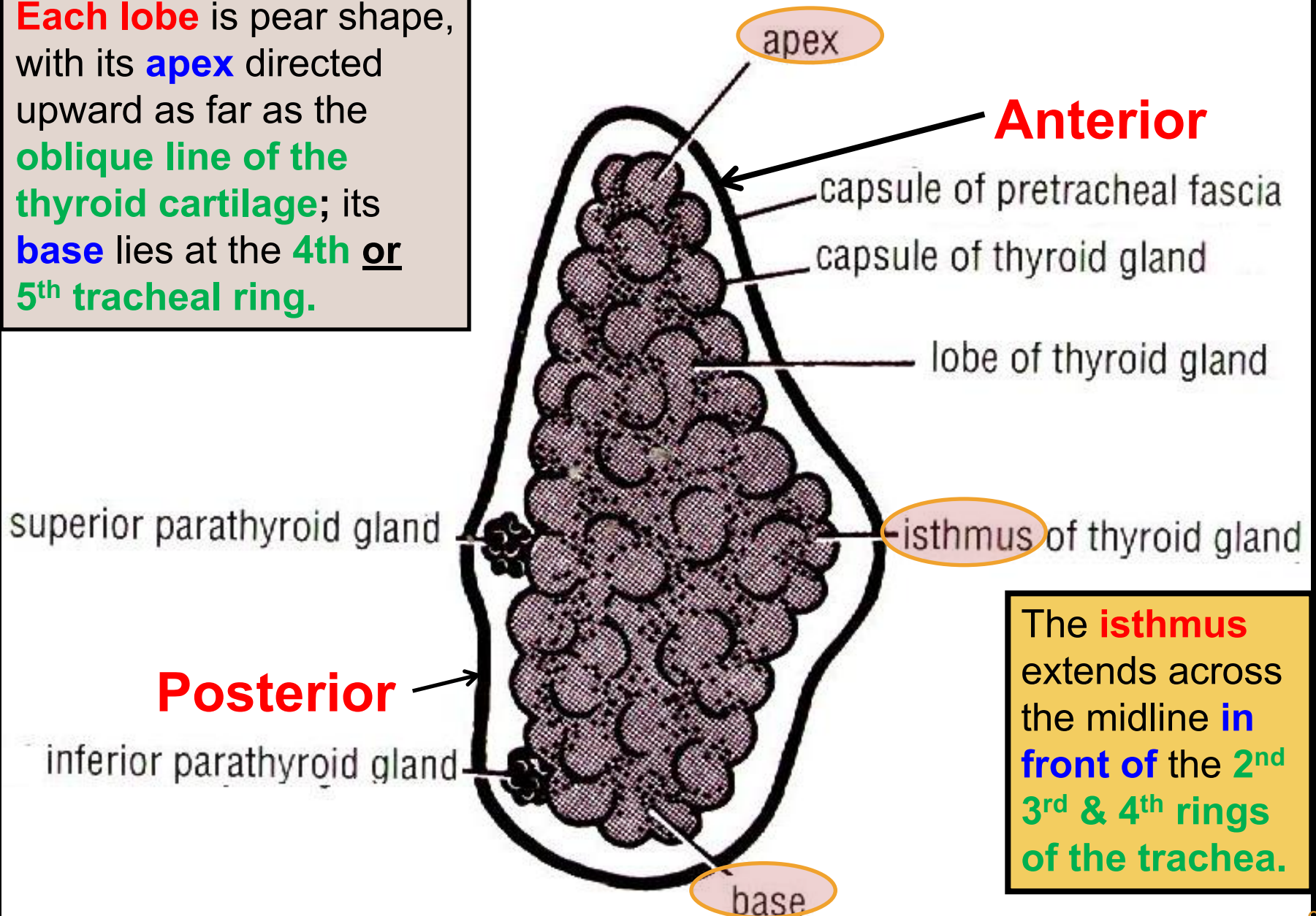


# Thyroid gland

- × Each lobe is **pear-shaped**, with its **apex** reaches up to the **oblique line of thyroid cartilage**.
- × **Its base** lies at the level of **4<sup>th</sup> or 5<sup>th</sup> tracheal rings**.
- × Inside the **pretracheal facial capsule**, there is another **C.T capsule**.
- × So, it is surrounded by **2 membranes**.



Each **lobe** is pear shape, with its **apex** directed upward as far as the **oblique line of the thyroid cartilage**; its **base** lies at the **4<sup>th</sup> or 5<sup>th</sup> tracheal ring**.



**Anterior**

apex

capsule of pretracheal fascia

capsule of thyroid gland

lobe of thyroid gland

isthmus of thyroid gland

superior parathyroid gland

**Posterior**

inferior parathyroid gland

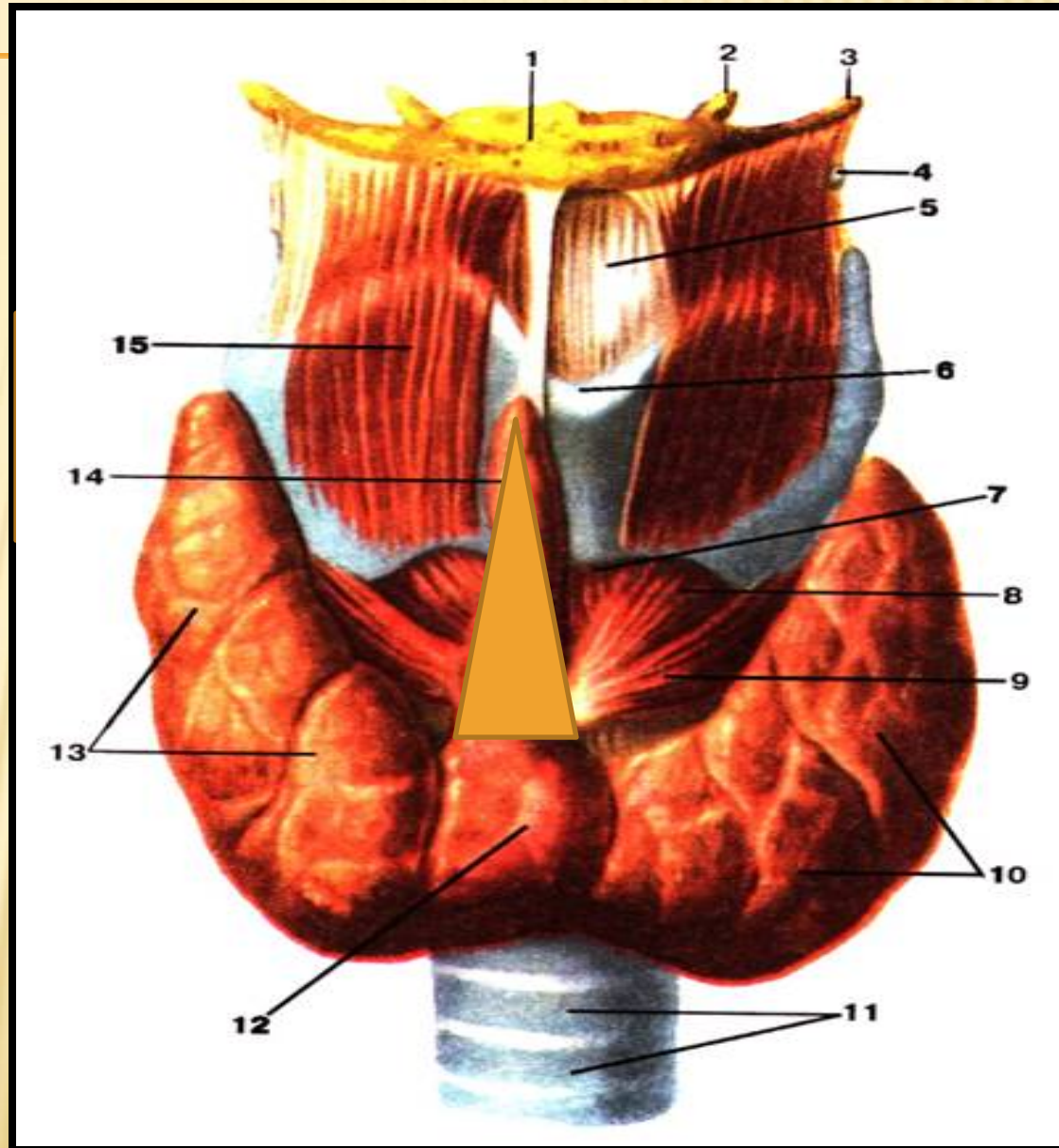
base

The **isthmus** extends across the midline **in front of** the **2<sup>nd</sup> 3<sup>rd</sup> & 4<sup>th</sup> rings of the trachea**.

A 3<sup>rd</sup> small pyramidal lobe is often present which **projects from the upper border of the isthmus** usually to left of middle line.

Pyramidal lobe is connected to hyoid bone by a **fibrous or muscular band** called levator glandulae thyroideae.

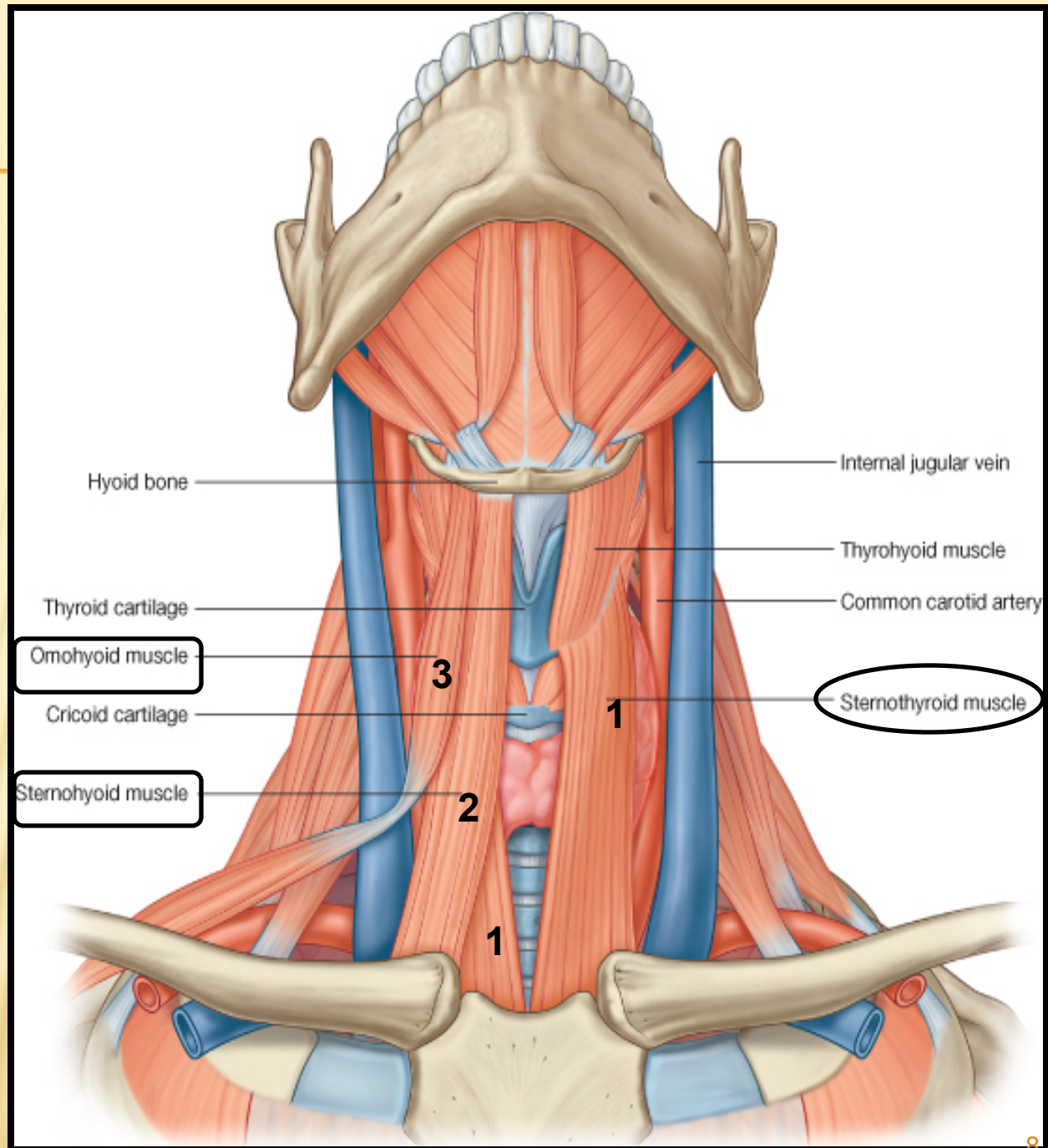
*This pyramidal lobe represents in 50% of people the fibrosed & obliterated thyroglossal duct.*



# RELATION OF THYROID GLAND

## Anterolaterally: (4 S).

1. **S**ternothyroid.
2. **S**ternohyoid.
3. **S**uperior belly of omohyoid
4. **S**ternomastoid.





## Posteriorly:

Carotid sheath & its contents.

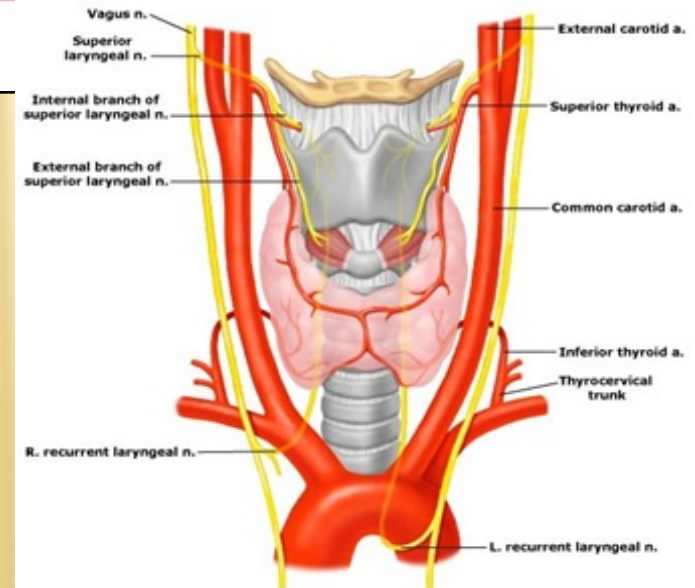
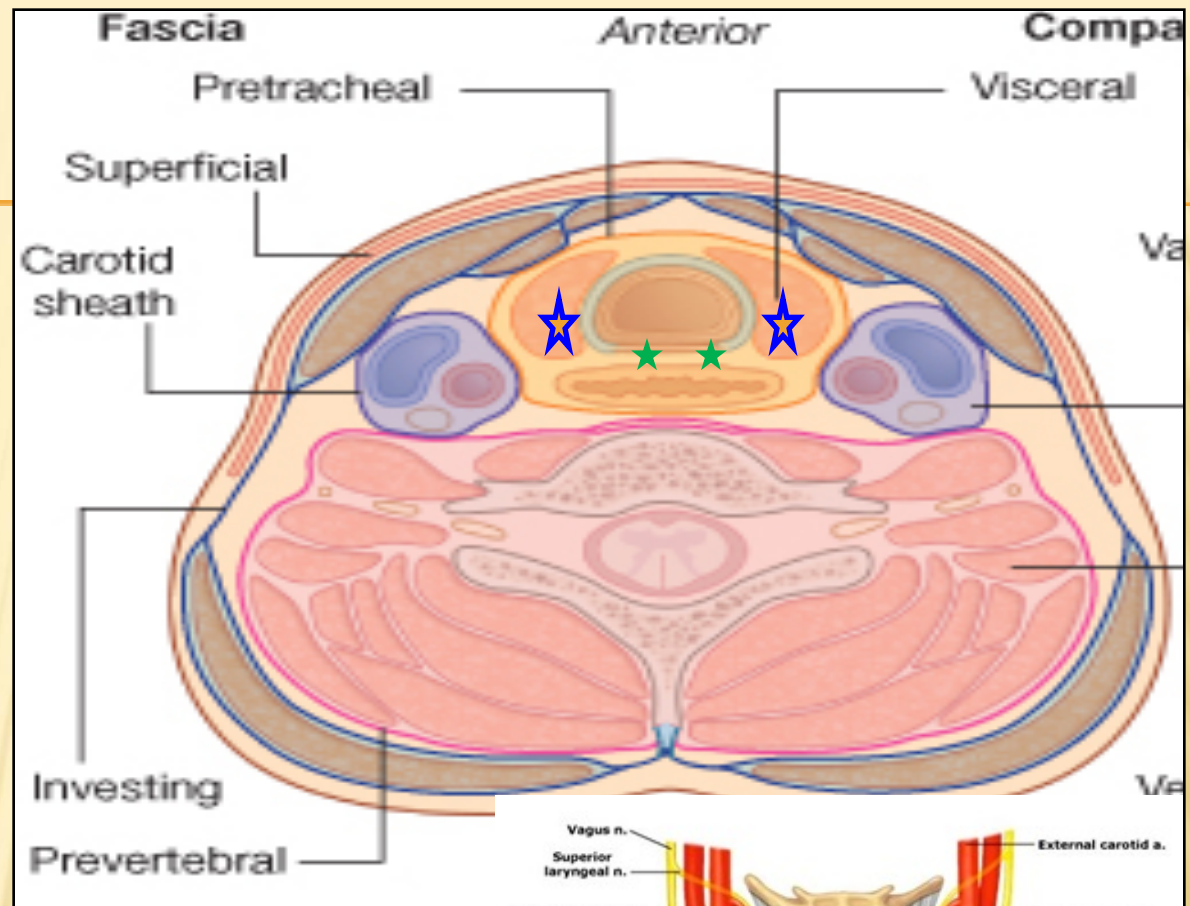
## Medially:

## Above:

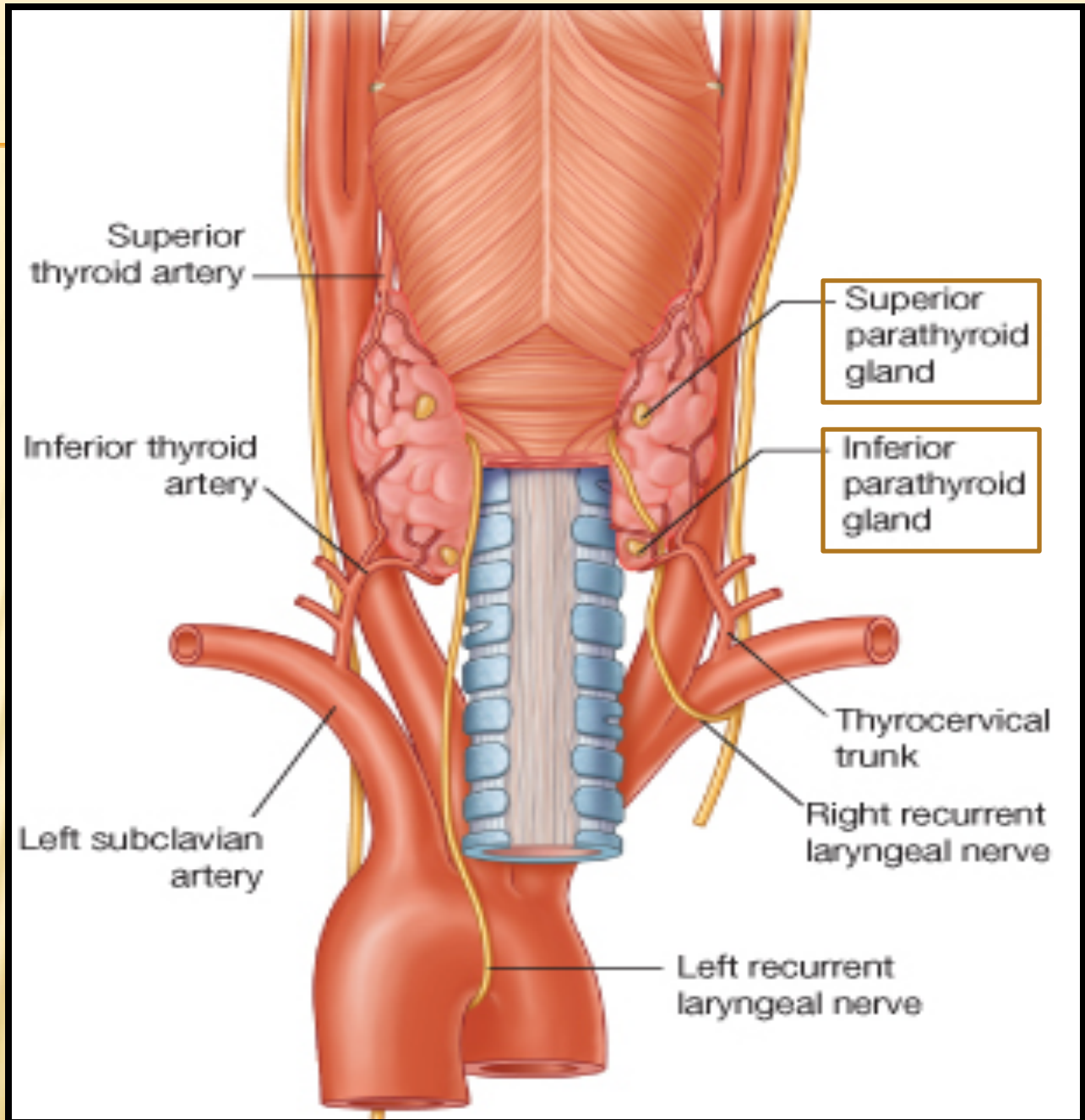
- ❖ Larynx & pharynx .
- ❖ *Cricothyroid muscle & external laryngeal nerve*

## Below:

- ❖ Trachea & esophagus.
- ❖ *Recurrent laryngeal nerve in between.*



- ✘ The rounded **posterior border** is related to the **superior & inferior Parathyroid glands**.
- ✘ It is also related to the **anastomosis between superior & inferior thyroid arteries**.



# ARTERIAL SUPPLY

## 1-Superior thyroid a.:

It is a branch from the external carotid a.

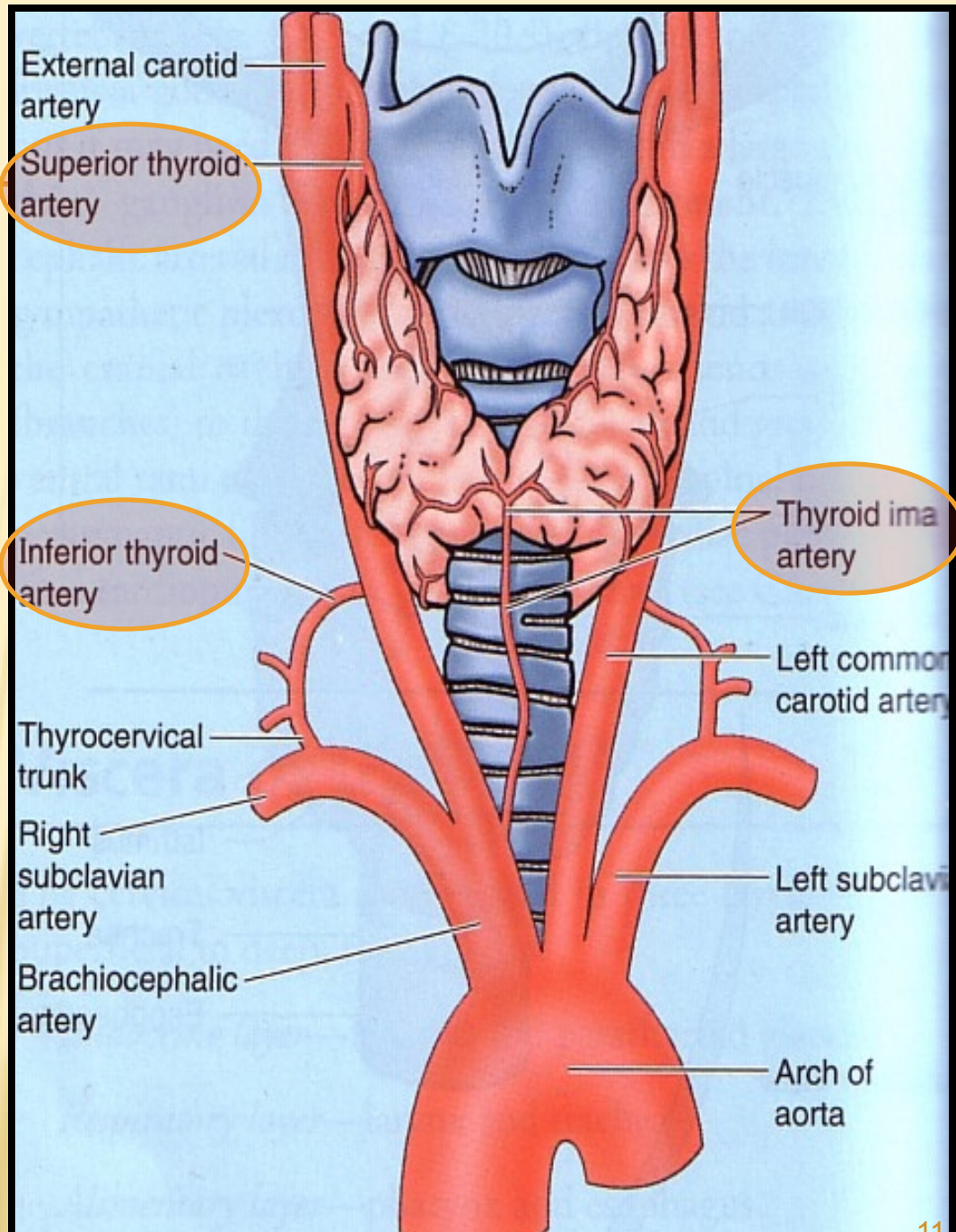
It descends to the upper pole of the lobe, with the external laryngeal nerve.

It runs along the upper border of the isthmus to anastomosis with its fellow

## 2- Thyroidea ima artery:

If present, it arises from aortic arch or from brachiocephalic artery.

It ascends in front of the trachea to reach the isthmus.



### 3-Inferior thyroid artery

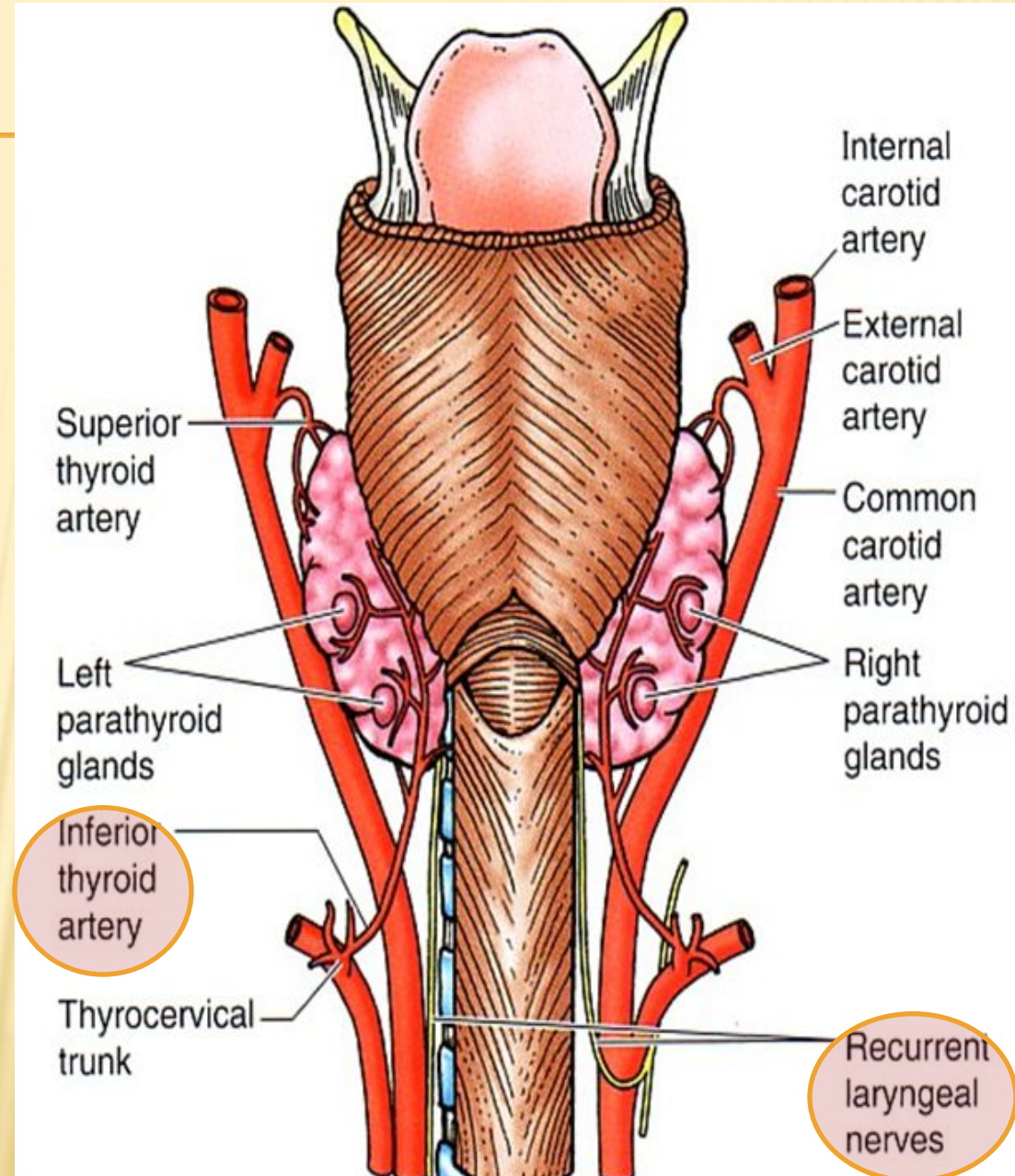
From the **thyrocervical trunk** of **1<sup>st</sup> part of subclavian artery**,

Then it curves medially **behind the carotid sheath**.

It ascends behind the gland to the level of **cricoid cartilage** (at level of C6 vertebra).

Then it reaches the posterior aspect of the gland.

The **recurrent laryngeal nerve** crosses either in front or behind it.



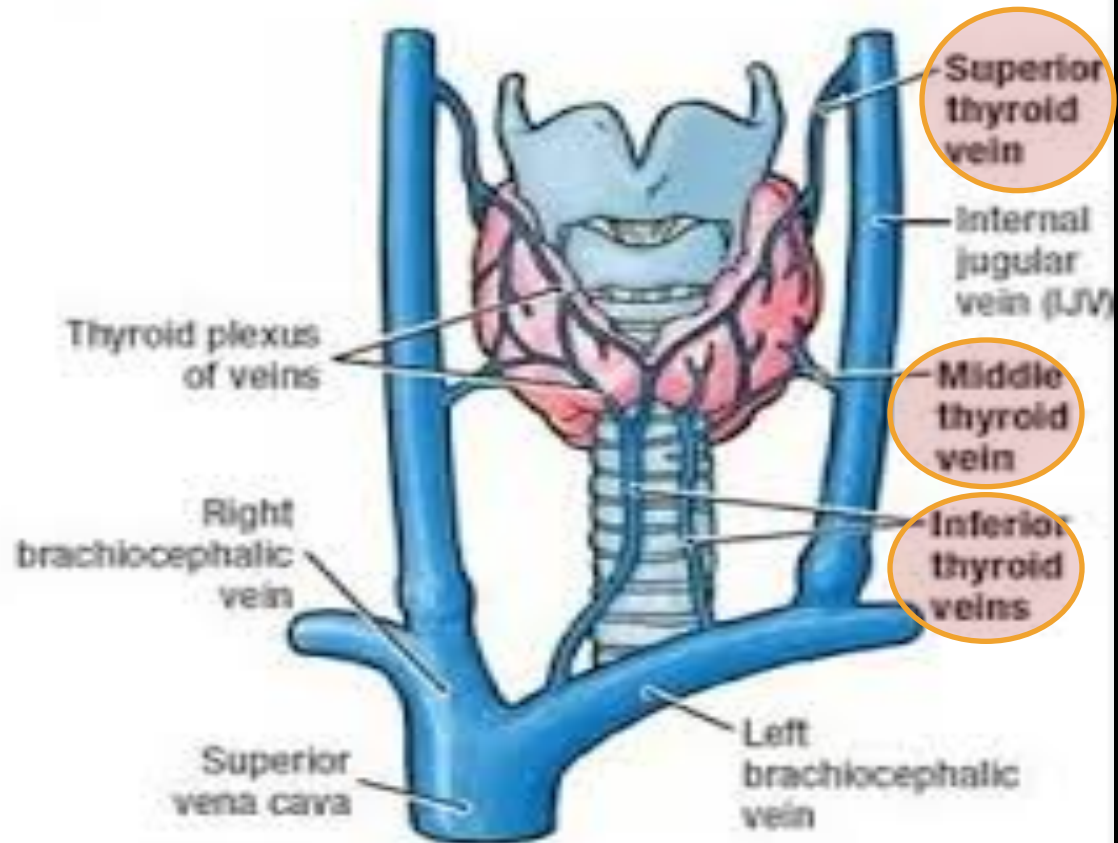
# Veins of Thyroid Gland

- 1-Superior thyroid vein → internal jugular vein
- 2- Middle thyroid vein → internal jugular vein
- 3- Inferior thyroid vein → left brachiocephalic vein

Lymph Of the Thyroid Gland :  
Deep cervical & paratracheal lymph nodes.

## Innervation :

- **Sympathetic :**  
Cervical Sympathetic Trunk.
- **Parasympathetic :**  
Branches of Vagus N.



# PARATHYROID GLAND

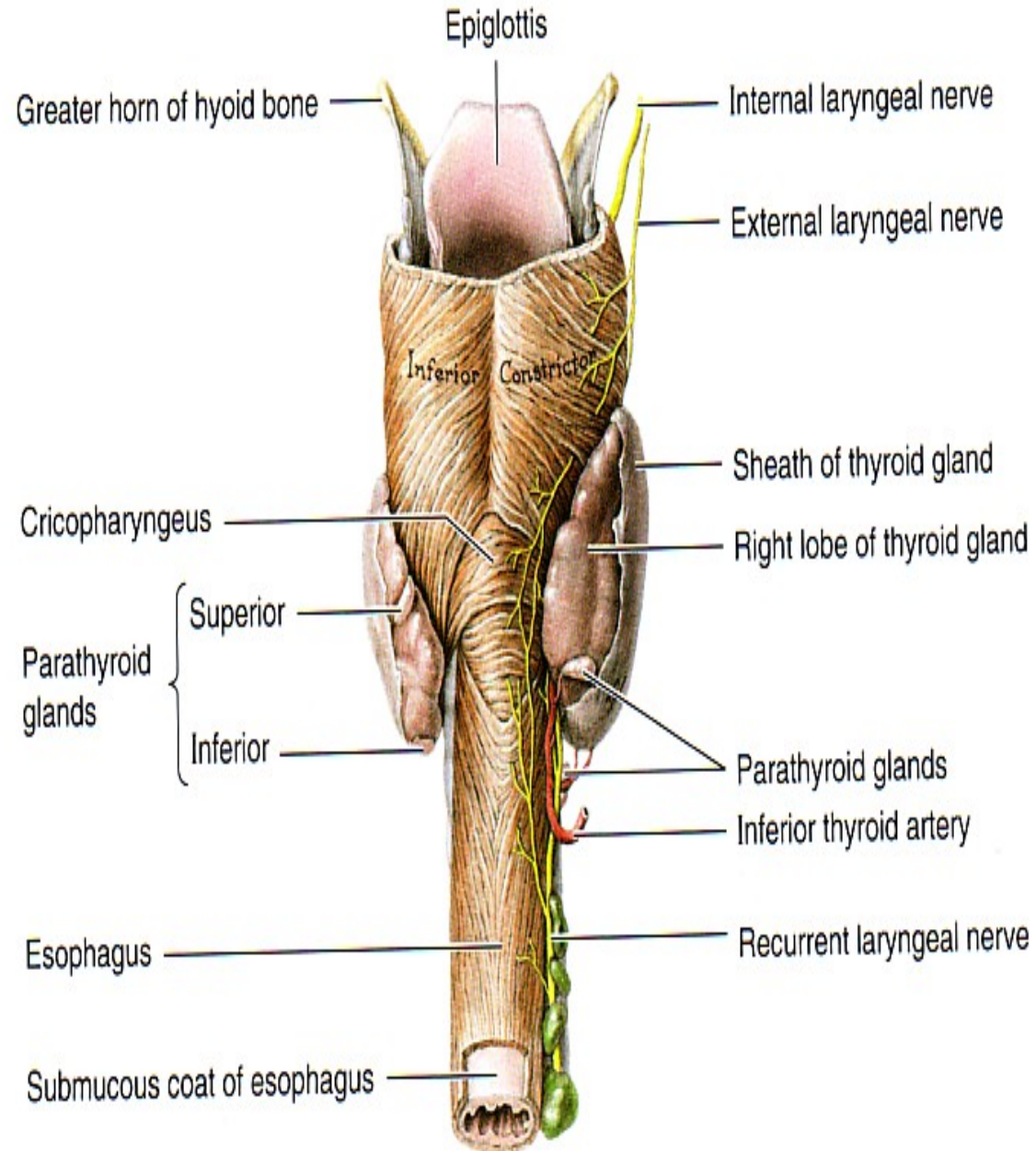
**4 small ovoid bodies**, about 6 mm. long.

**They lie** within the facial capsule of the gland, (between the 2 membranes).

**2 superior parathyroid** has a constant position at the **middle of the posterior border** of the gland.

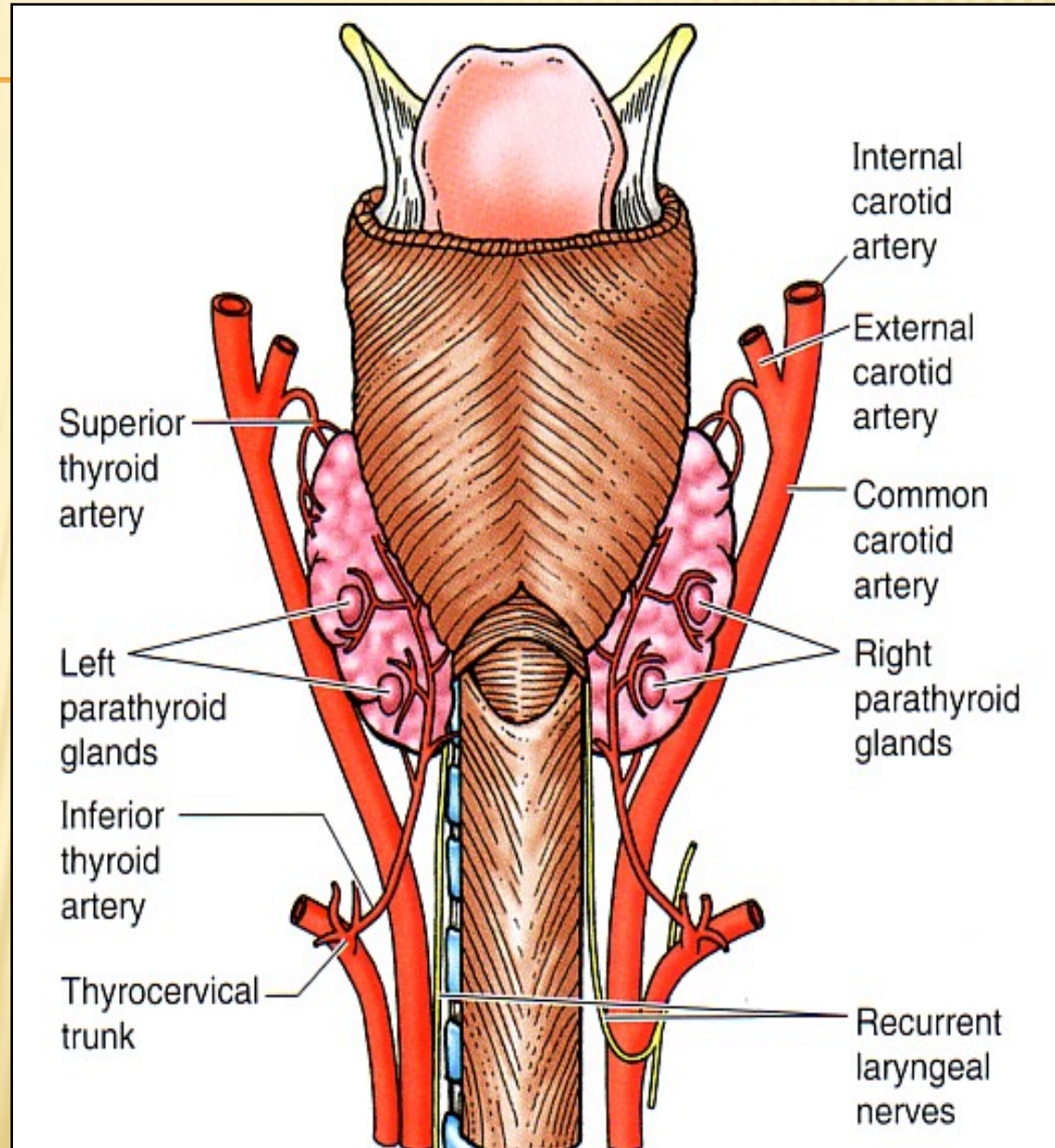
**2 inferior parathyroid usually** at the level of the **inferior pole**.

**They lie within** the thyroid tissue **or sometimes outside** the facial capsule.

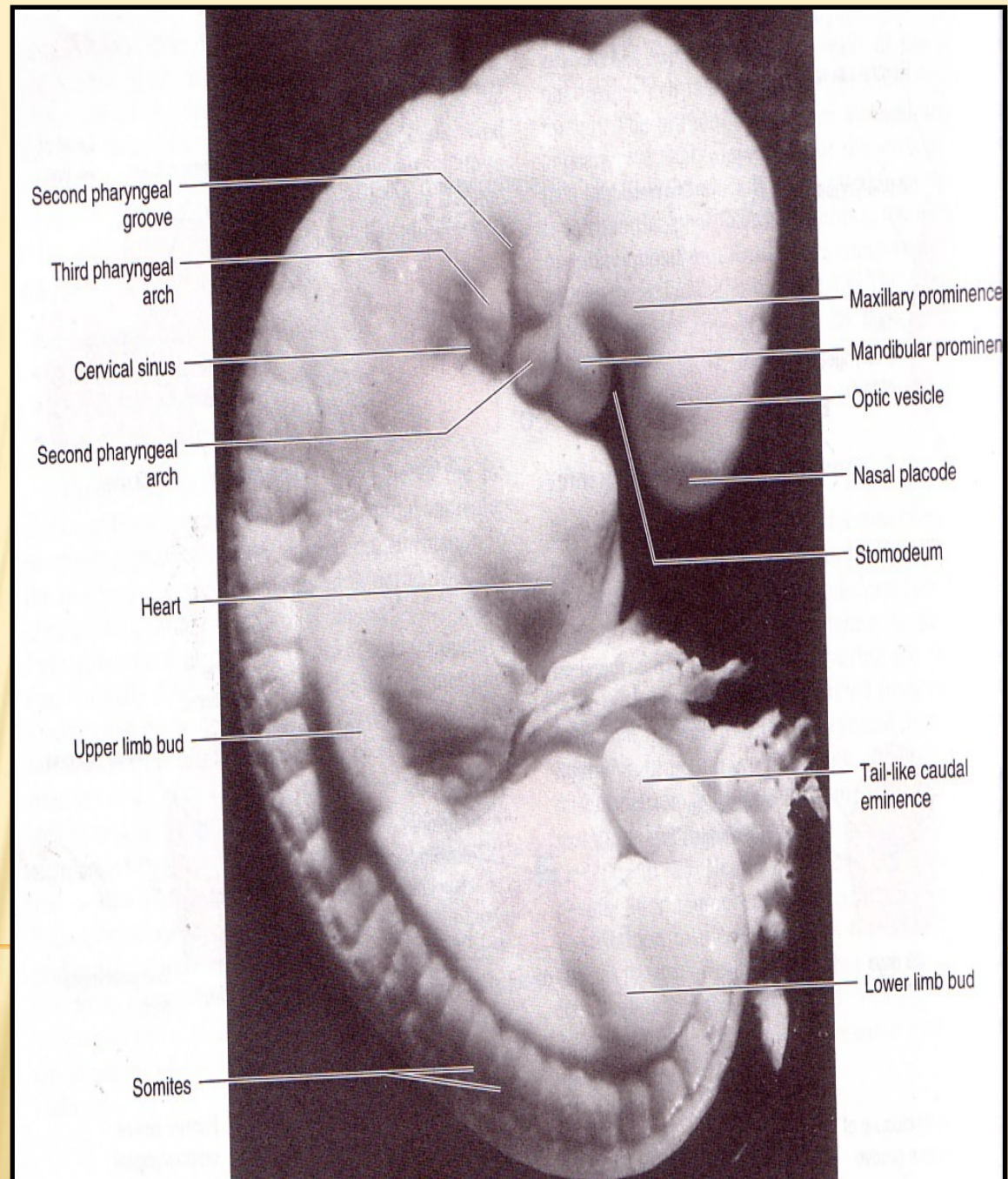


# PARATHYROID GLANDS

- × They are **supplied by superior & inferior thyroid arteries.**
- × **Their veins** are drained to **superior, middle and inferior thyroid veins.**
- × **Lymph nodes:**  
**Deep cervical & paratracheal lymph nodes.**
- × **Nerve supply :**  
**Sympathetic Trunk**  
**Superior & middle cervical sympathetic ganglia (vasomotor).**



# DEVELOPMENT OF THYROID AND PARATHYROID GLANDS



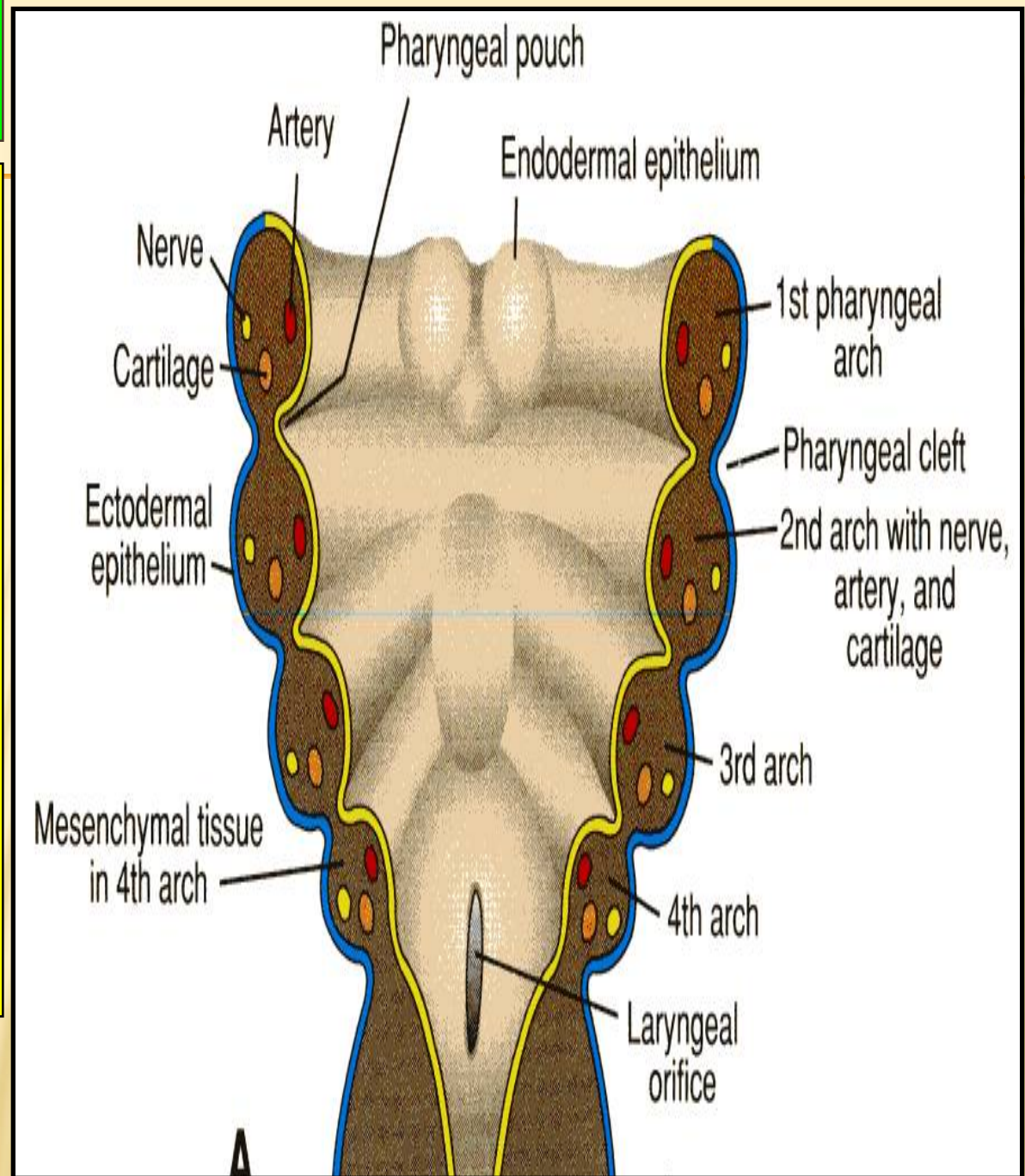


# Pharyngeal Apparatus

The *head & neck* region develops from the **pharyngeal apparatus**.

It is formed of:

- 1- Pharyngeal **arches**
- 2- Pharyngeal **grooves or clefts (externally)**.
- 4- Pharyngeal **pouches (internally)**.

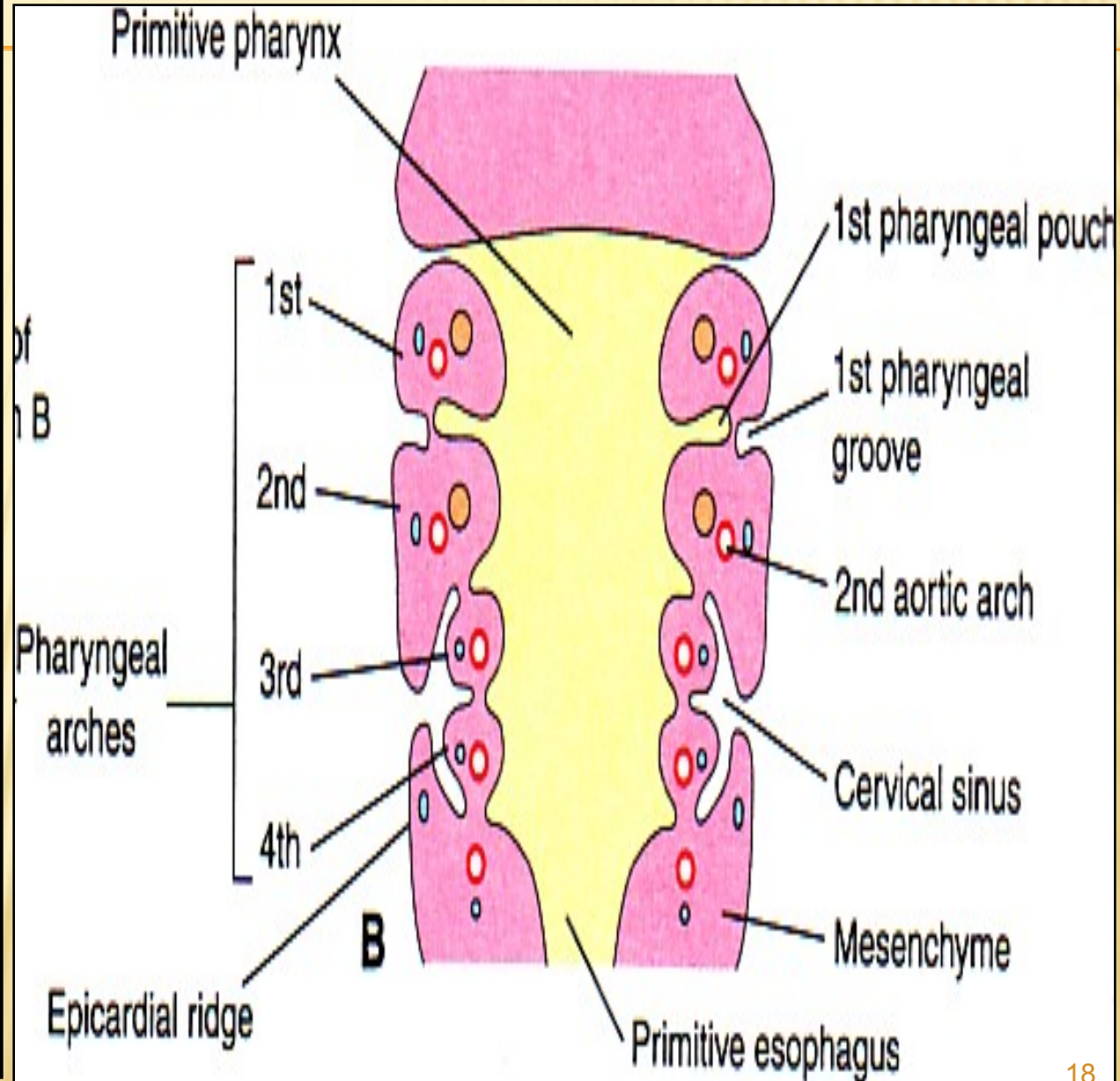


# PHARYNGEAL APPARATUS

▪ **The mesoderm** in the head and neck regions divided into **sex cubical masses** called the **6 pharyngeal or branchial arches**.

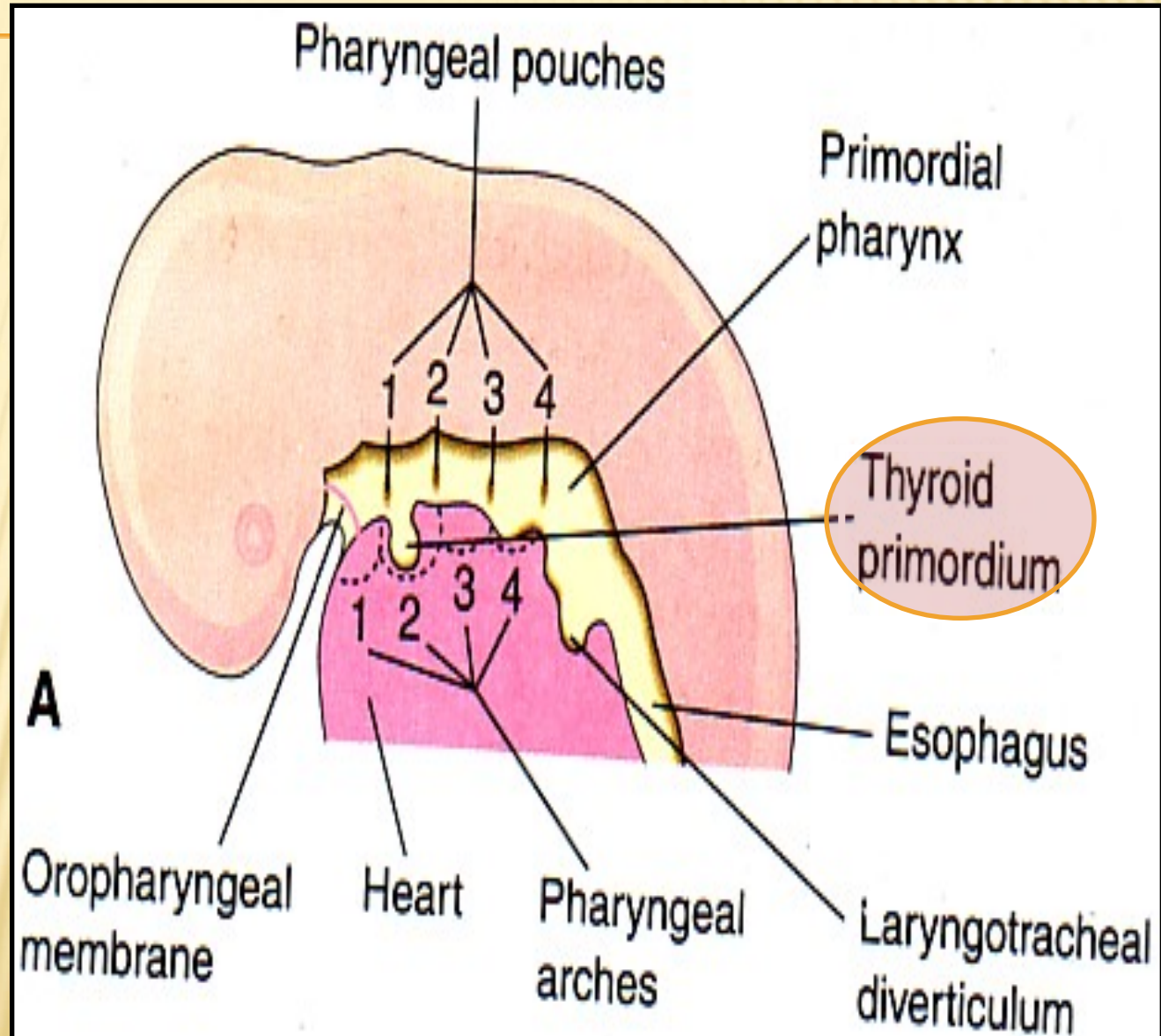
▪ Each arch is formed of a **Core** of **mesoderm**, **Covered externally** by **ectoderm** and the **space** between 2 arches from **outside** is called **cleft or groove**.

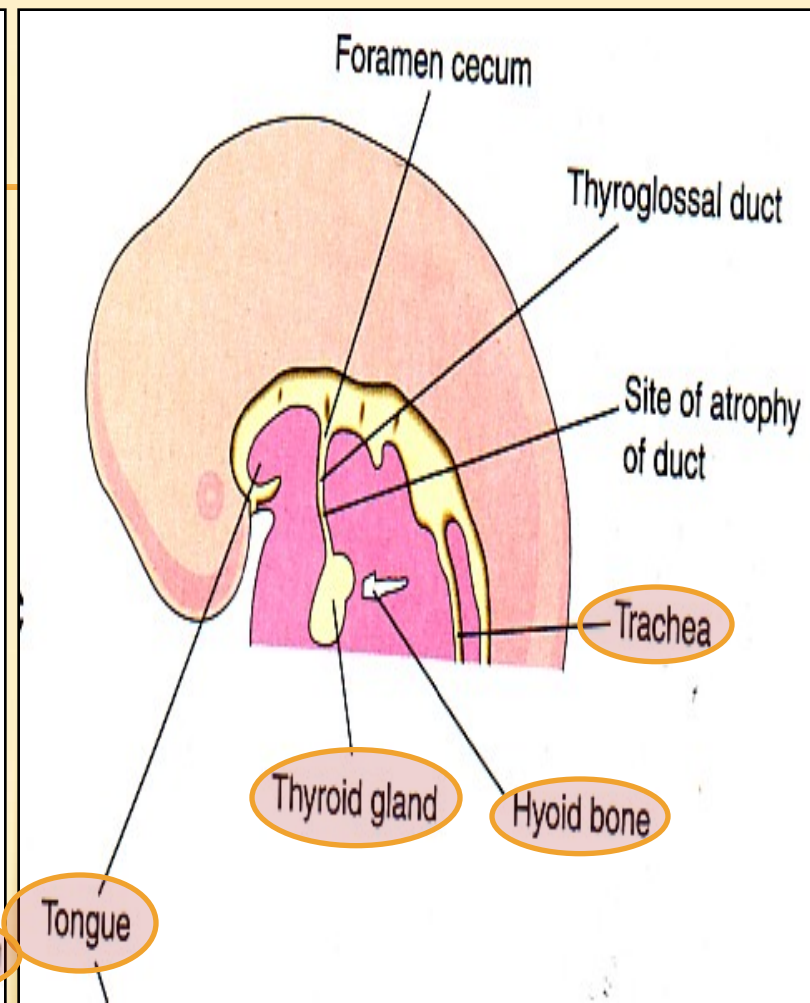
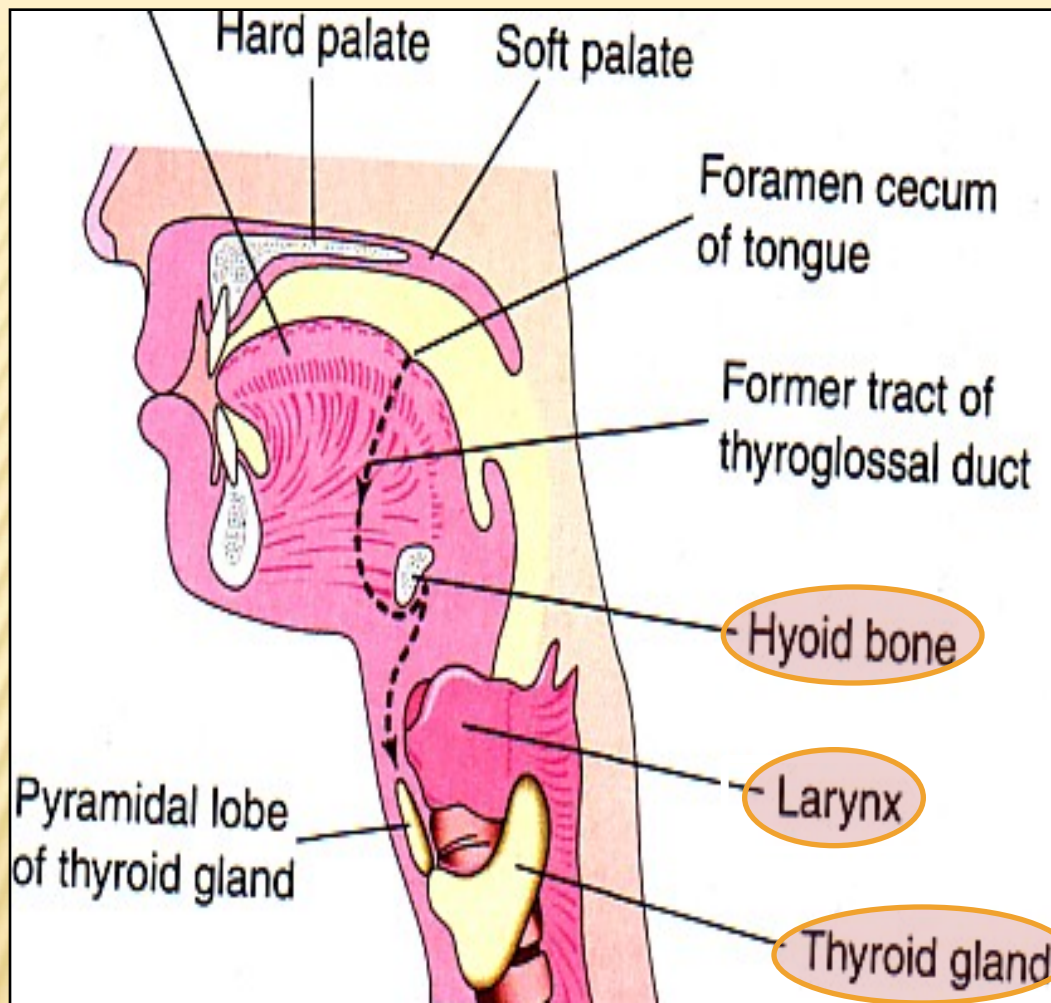
▪ **Each arch is lined** from **inside** by **endoderm** and the **space** between the 2 arches from **inside** is called **pouch**.



# THYROID PRIMORDIUM

- By the **24<sup>th</sup> day** after fertilization, the thyroid gland **begins** its development.
- It is the **first** endocrine gland to develop.
- **It develops** from the **endoderm of the floor of the primitive pharynx**.
- **It develops** from the (Thyroid primordium).



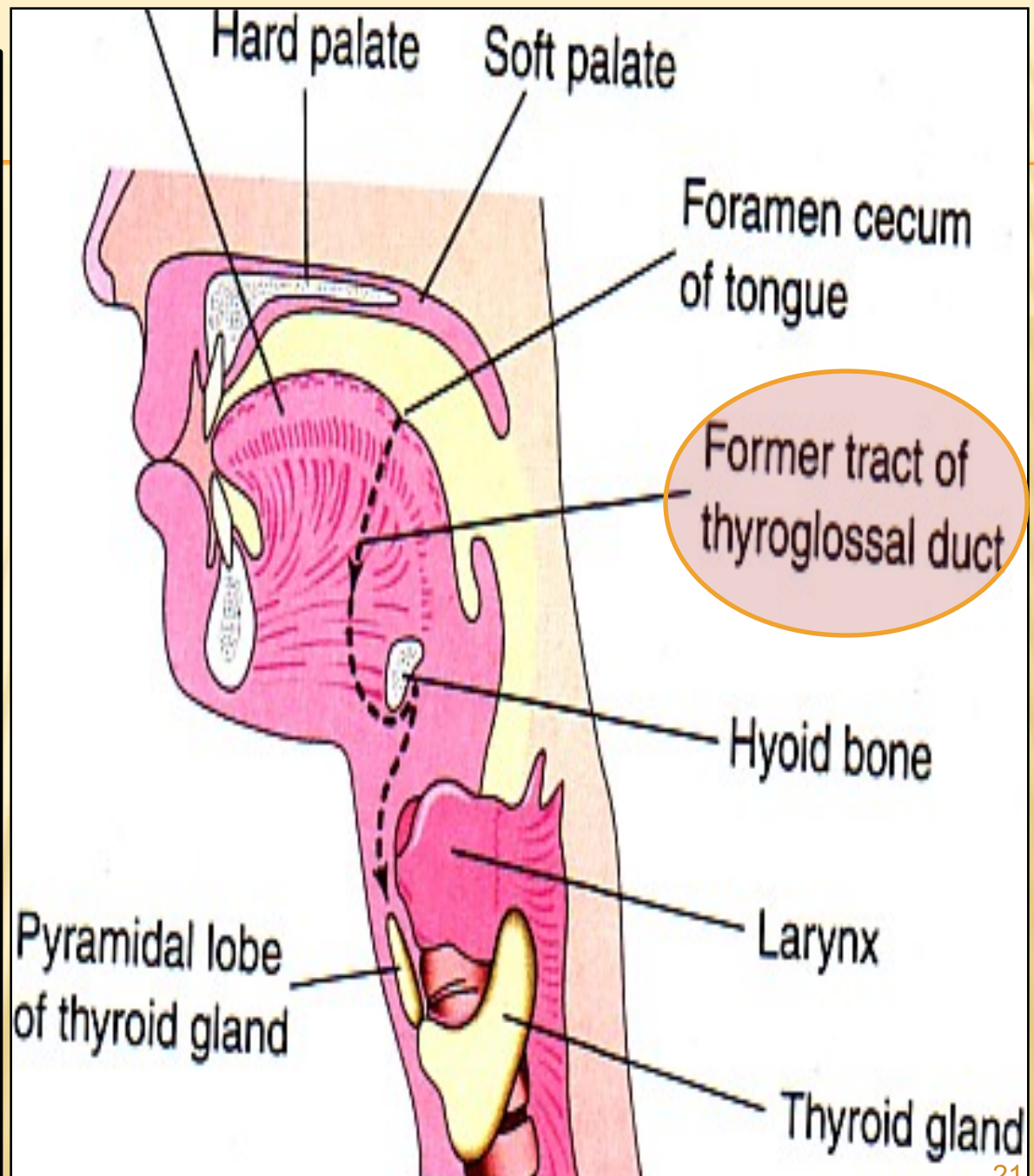


As the tongue grows, the developing thyroid gland descends downward in the neck. **It descends anterior to the developing hyoid bone & laryngeal cartilages through the thyroglossal duct.**

The thyroid is **connected to** the developing **tongue** **by** a narrow tube, called the **thyroglossal duct**.

**At first** the **thyroid primordium** is **hollow**, but soon it becomes **solid** & **divided** into **2 lobes** and an **isthmus**.

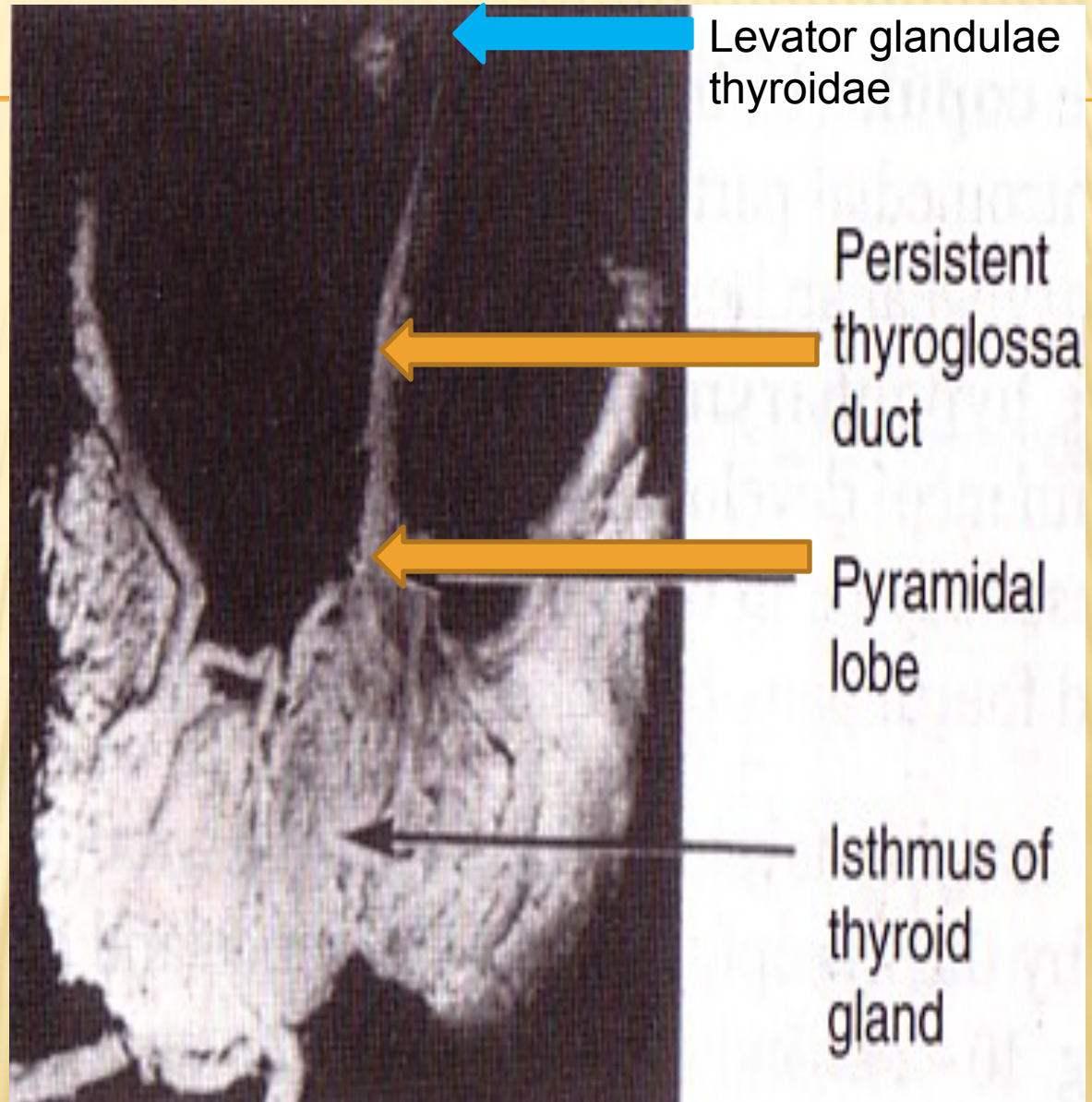
**By 7th week (50 th day)** the gland takes its final **shape & position**, and the **thyroglossal duct** begins to **fibroses** and **degenerates**.



The upper end of duct persists in the dorsum of the tongue as the **foramen cecum**.

The distal part of the duct may persists in 50% of people to form the **pyramidal lobe**.

The **pyramidal lobe** may be attached to the hyoid bone by fibrous or smooth muscle; the **Levator glandulae thyroideae**.



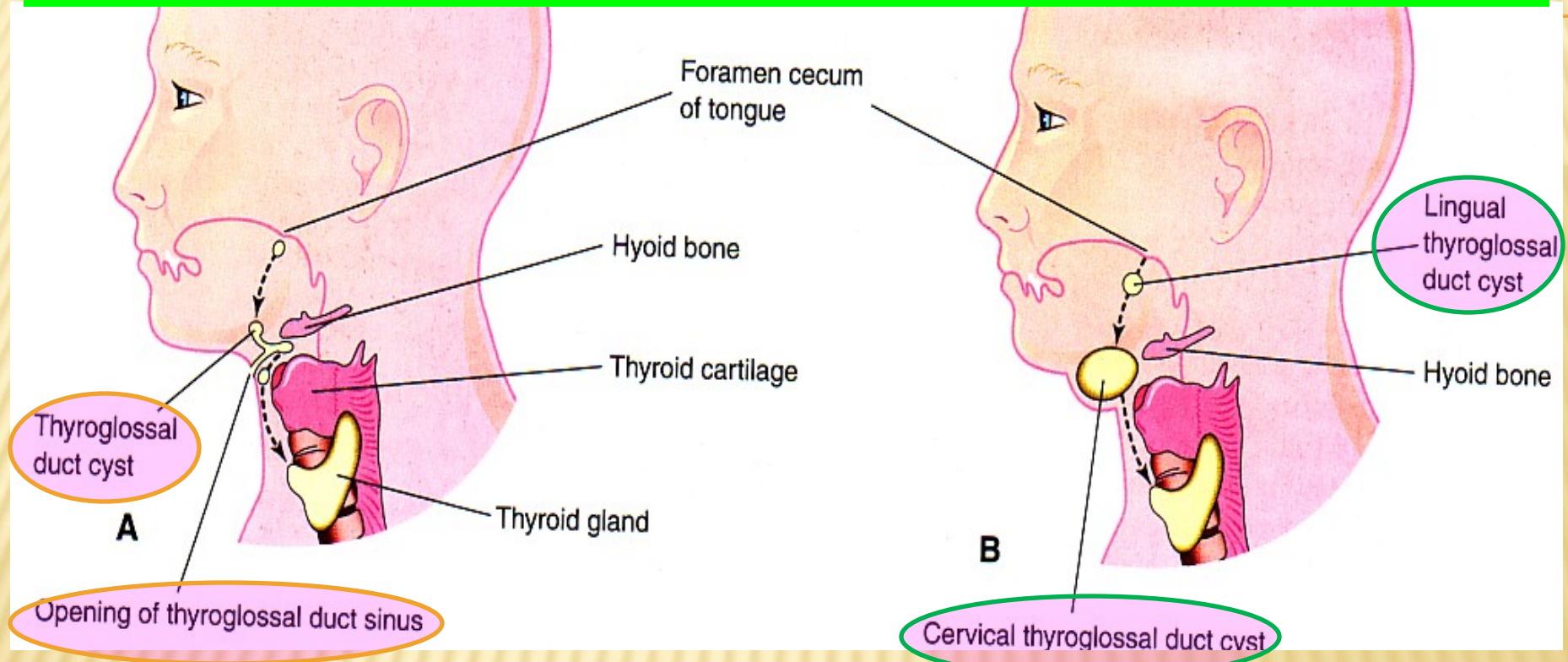
# Congenital Anomalies

- 1- Congenital hypothyroidism.
- 2- Persistence of thyroglossal duct.
- 3- Cervical thyroglossal duct cyst.**
- 4- Ectopic thyroid gland.**
- 5- Accessory thyroid tissue.
- 6- Agenesis of the thyroid gland.



**Figure 10 - 20.** Typical thyroglossal duct cyst in a female child. The round, firm mass (indicated by the sketch) produced a swelling in the median plane of the neck just inferior to the hyoid bone.

# Location of Thyroglossal cyst

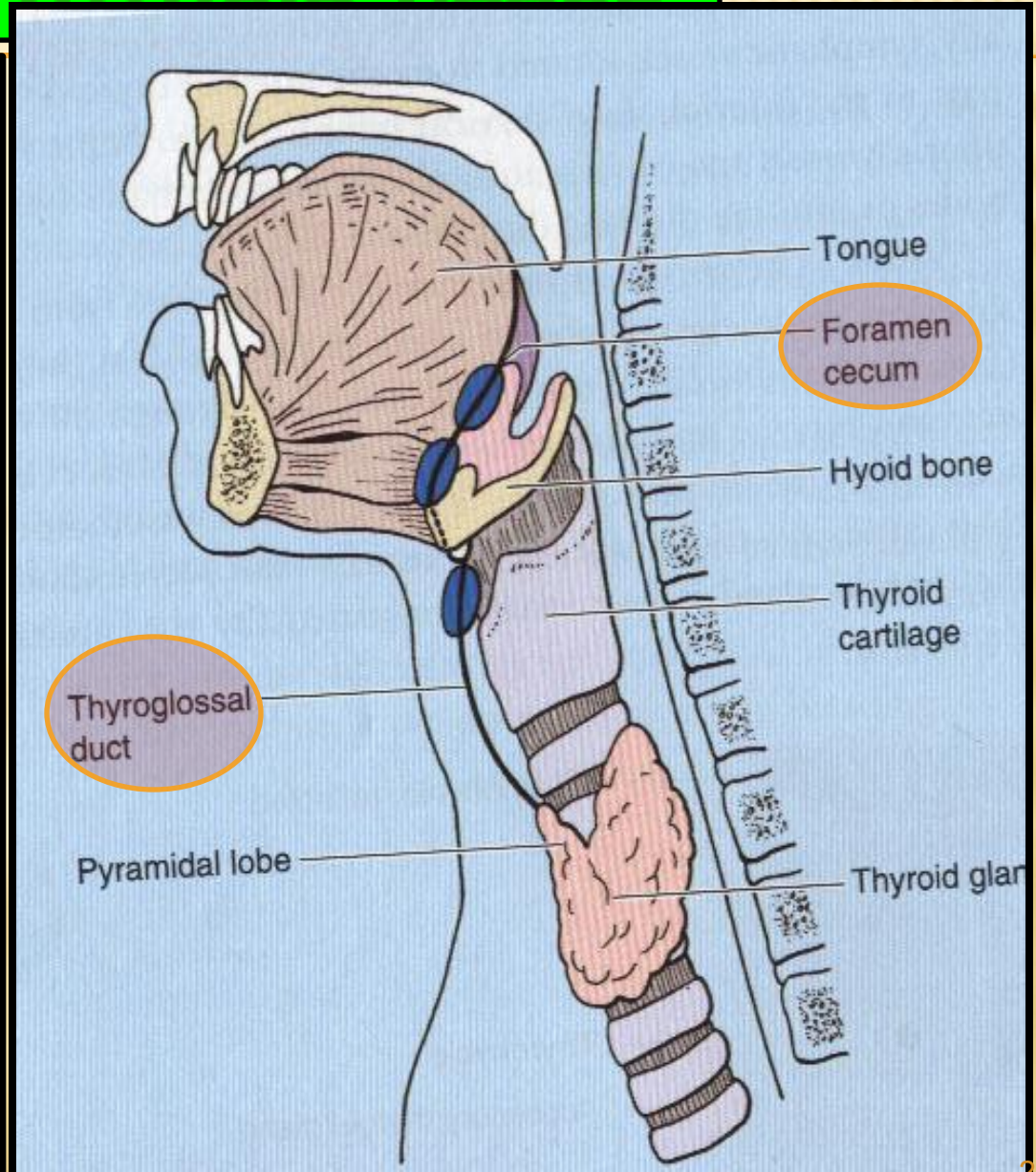


- **A**, showing the possible locations of **thyroglossal duct cysts** **through** the broken line indicating the course of the duct. **A thyroglossal duct sinus** is illustrated.
- **B**, illustrating **lingual & cervical thyroglossal duct cysts**.
- **Most of thyroglossal duct cysts are located just anterior & inferior to hyoid bone.**



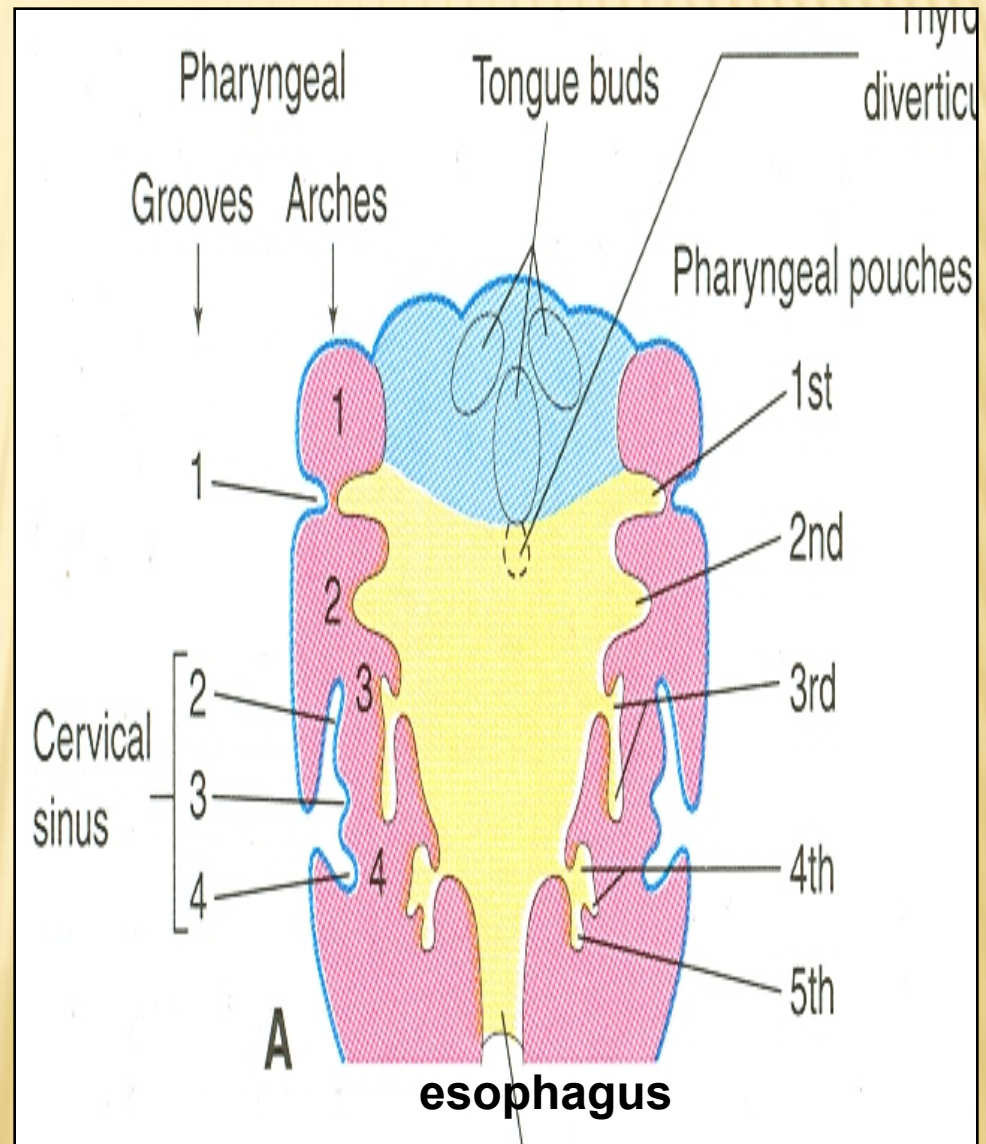
# ECTOPIC THYROID TISSUE

- ✗ The thyroid glands develops high up close to foramen cecum of the developing tongue.
- ✗ Then it descends along the thyroglossal duct to reach its final position by the **7<sup>th</sup> week**.
- ✗ **Ectopic** : Descent of the thyroid could be arrested at any point, or extends down behind the sternum in the thorax.



# Pharyngeal Pouches

- These are pairs of pouches **develop** in a craniocaudal sequence **between the arches internally.**
- **The first pair of pouches** lies between the first and second pharyngeal arches.
- There are **four pairs of pharyngeal pouches.**
- **The fifth pair of pouches** is **absent** or **rudimentary.**



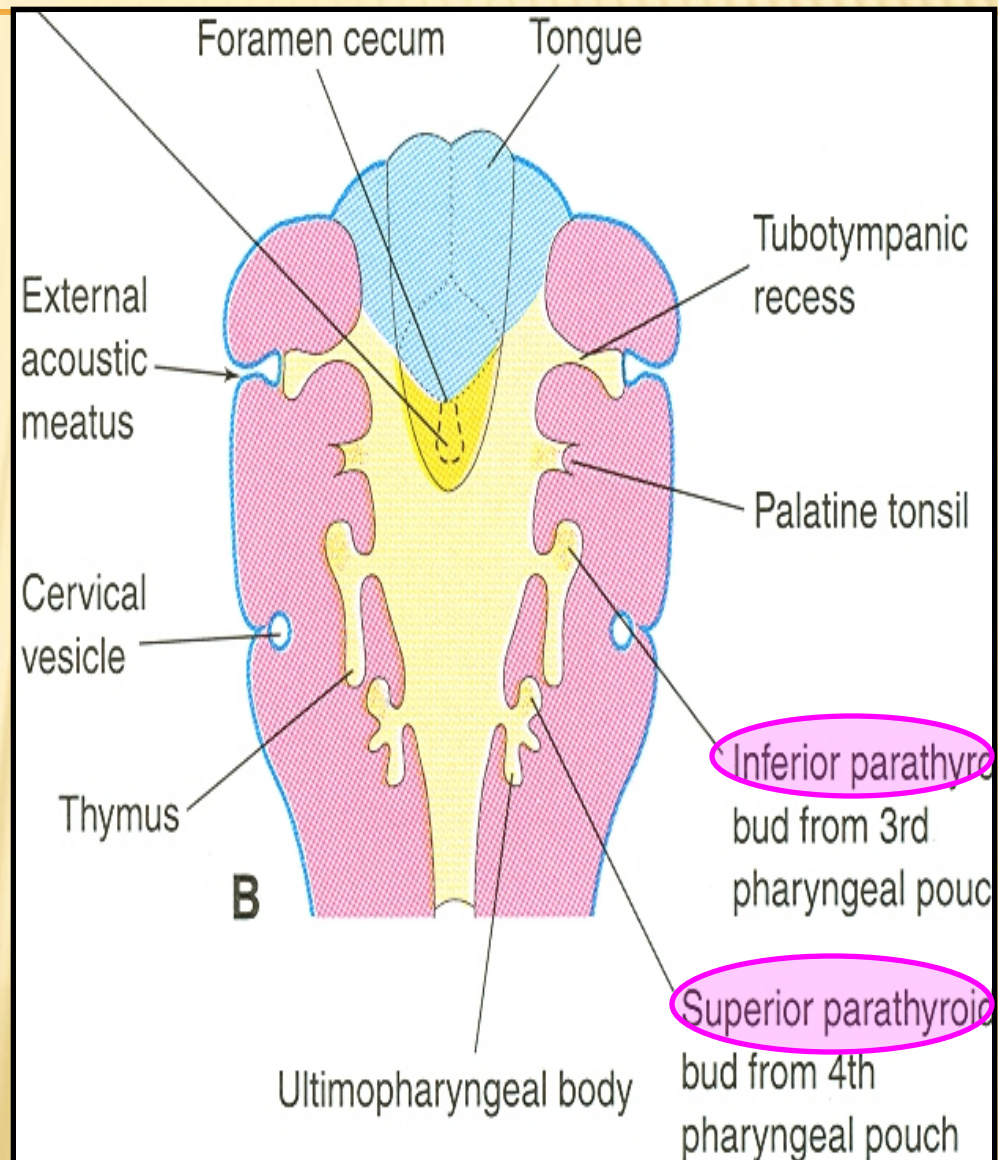
# DEVELOPMENT OF THE PARATHYROIDS

Each of the 3<sup>rd</sup> & 4<sup>th</sup> pharyngeal pouch develops into **dorsal** and **ventral** parts.

By the **sixth week** : the **Dorsal part** of the **3<sup>rd</sup> pouch** develops into **inferior parathyroid bud**,

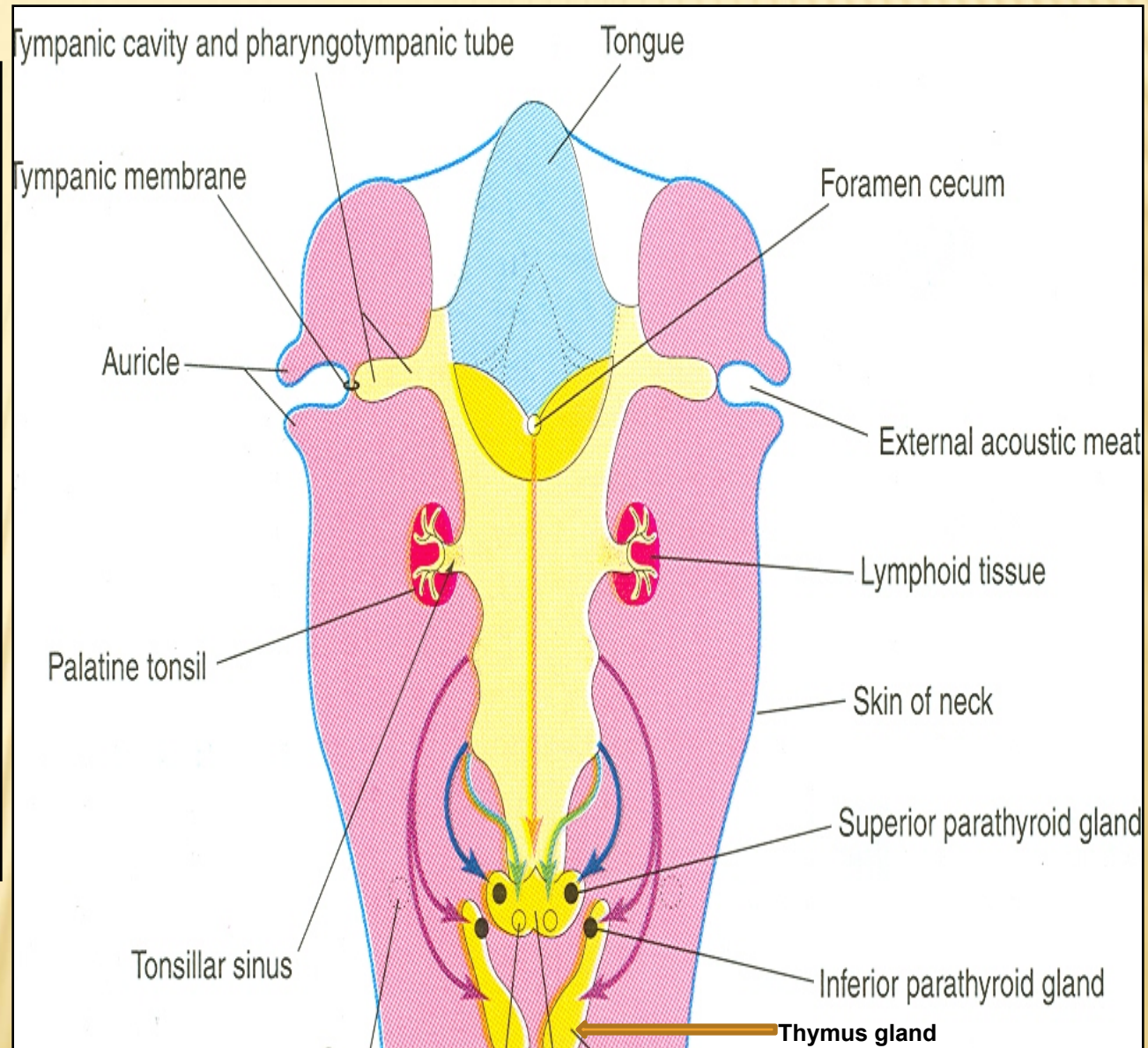
while the **dorsal part** of the **4<sup>th</sup> pouch** develops into the **superior parathyroid bud**.

The **ventral** part of **3<sup>rd</sup> pouch** gives the **thymus gland** primordium while the **ventral** part of the **4<sup>th</sup>** forms what is called **Ultimopharyngeal body** (is an embryological structure that gives rise to **parafollicular cells of thyroid** that secrete **calcitonin** hormone that lowers the blood calcium level).



# DEVELOPMENT OF THE PARATHYROIDS

- As the **thymus** primordium develops, it **descends** downward to the **thorax**, behind the sternum in superior mediastinum,
- It draws the **inferior parathyroid bud** to a lower level than the superior parathyroid.
- **Both parathyroid glands lie behind the thyroid gland.**



## Clinical notes

- The **External laryngeal nerve** runs close to the **superior thyroid artery** before turning medially to supply the cricothyroid muscle. High ligation of the superior thyroid artery **during thyroidectomy places this nerve at risk of injury**, so it should be ligated within the upper pole of the gland. **Its lesion will cause hoarseness of voice.**
  - The **inferior thyroid artery** is closely associated with the **recurrent laryngeal nerve**. This nerve can be found, in a triangle bounded **laterally** by the **common carotid artery**, **medially** by the **trachea**, and **superiorly** by the **thyroid lobe**.
  - The relationship of the **recurrent laryngeal nerve** and the **inferior thyroid artery** is **highly variable** in that the nerve can lie deep or superficial to the artery, or between the branches of the artery, and be different on either side of the neck.
- So, Consideration of this nerve and its branches must be given during thyroidectomy.**



**NB. RLN lesion may result in impaired breathing & speech.**

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**THANK YOU**

# TEST YOUR SELF!

- × Which of the following nerves is endanger in ligation of the superior thyroid artery?
- × A. External laryngeal
- × B. Recurrent laryngeal.
- × C. Internal laryngeal.
- × D. Superior laryngeal.
- × Which of the following structures lies anterior to the thyroid lobe?
- × A. Inferior belly of omohyoid.
- × B. Internal jugular vein.
- × C. Vagus nerve.
- × D. Sternohyoid.

