ENDOCRINE SYSTEM

Anatomy & Histology
Lec. 3 V2

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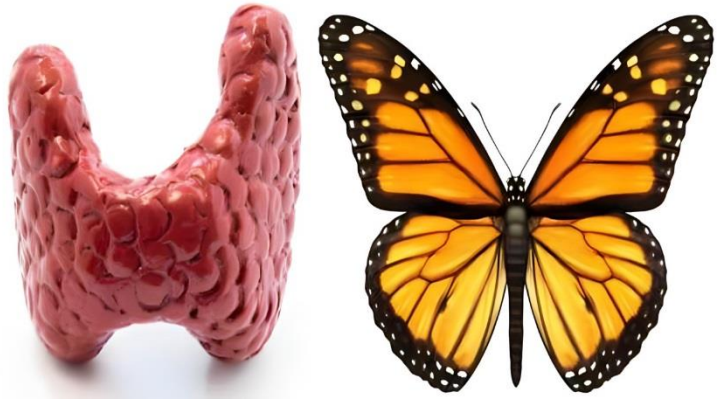
ما ينطق به الدكتور من شرح سيكون باللون الاحمر
وما يكون مهم في شرح الدكتور يكون باللون البنفسجي
ما يكون مهم في السلايدات يكون بخطين أو بخط
وما يكون شرح إضافي يكون باللون الأزرق

Thyroid gland topics:

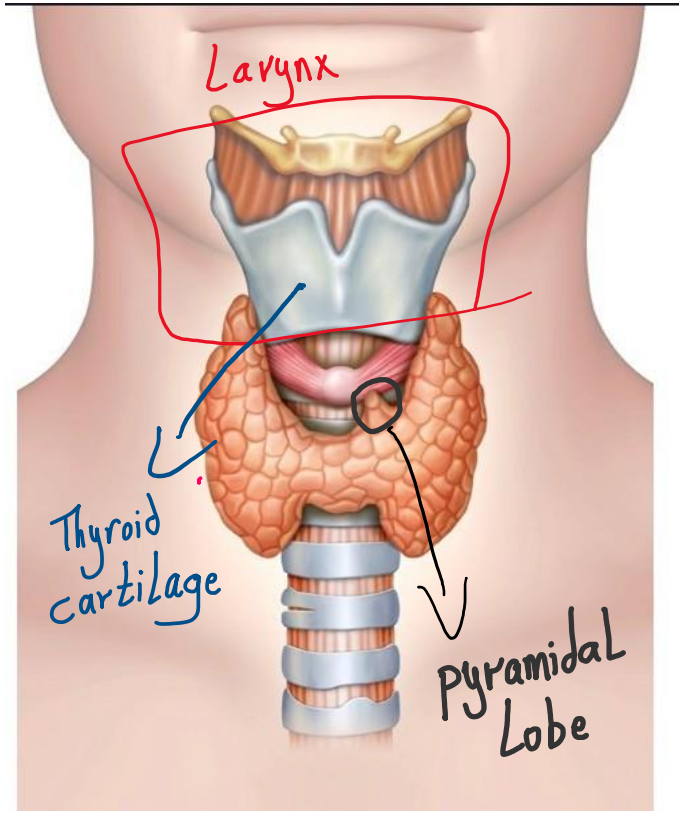
1) **Location**
2) **Relations**
3) **Blood supply**
4) **Lymphatic drainage and nerve spply**
5) **Embryology**
6) **Congenital abnormalities**

Thyroid Gland

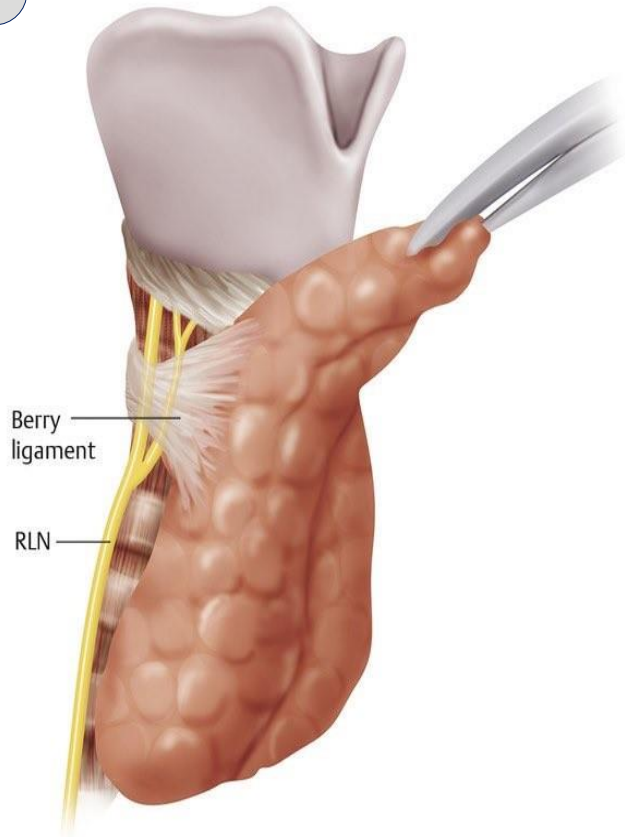


ANATOMY

Thyroid hormones are involved in many aspects of metabolism and associated events. The thyroid is the first gland is formed during organogenesis in around 20 days or the third week, starting even before the pituitary gland.



- Highly vascular, butterfly-shaped gland surrounding the anterior surface of the trachea just below the larynx
- located in the anterior neck and spans C5-T1 vertebrae
- Consists of right and left lobes connected by a narrow isthmus.
- Surrounded by a sheath derived from the visceral pretracheal layer of the deep fascia (attachment to larynx/trachea).
- Berry ligament!!



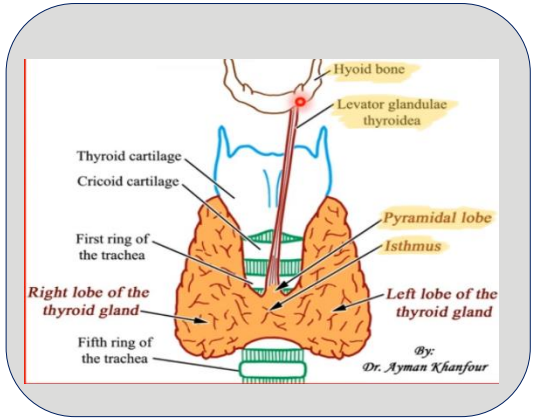
Anatomically, the thyroid gland is located in the lower part of the neck (it is easily accessible), inferior to the larynx. It initially appears near the oral cavity behind the tongue but descends to the neck. In some cases, it can be found in the thorax, either as the whole gland or some of its tissues, showing quite a variation in its location, similar to the parathyroid glands. This is a key landmark for examining the thyroid clinically: by locating the thyroid cartilage and then moving down to feel the gland.

The thyroid gland has the highest vascularity and It is close to major blood vessels, so it receives blood at high speed and pressure. It looks like a butterfly with two lobes on each side, connected in the midline via the isthmus. The isthmus is more to the left lobe, and sometimes a tiny pyramidal lobe is found in 40% of the population and it arises due to an embryological effect.. The presence or absence of the pyramidal lobe is normal.

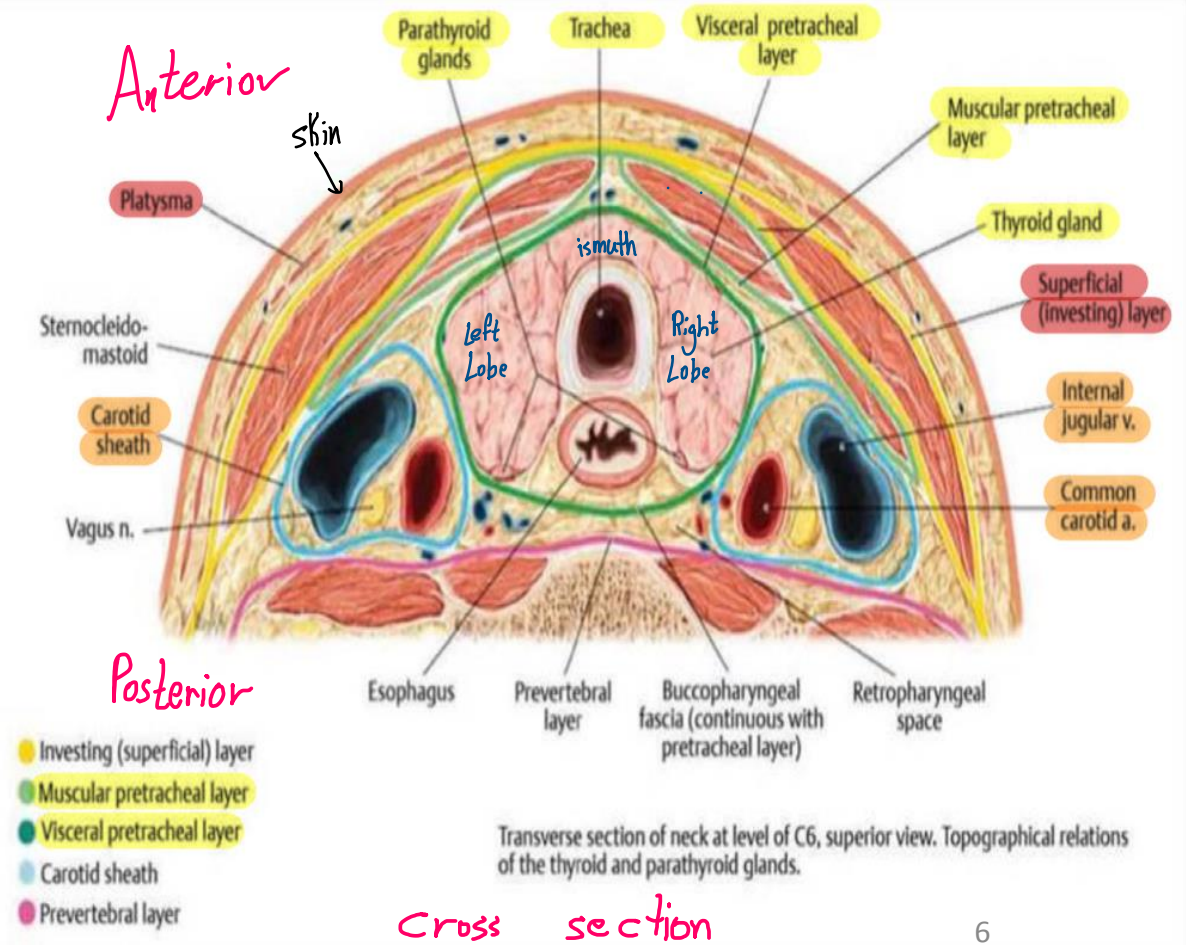
The thyroid cartilage is further connected to upper structures and is connected behind it with the cricoid cartilage (the only ring-shaped cartilage in the larynx). The thyroid cartilage is located superior to the thyroid gland and is larger than the cricoid cartilage.

The lobes of the thyroid gland are not just in the anterior part; they also hug the trachea from the sides.

The deep fascia of the neck separates different structures into different compartments and is important in case of infection by limiting its spread. The visceral pretracheal fascia is the one that encloses the thyroid gland ⏩ Anterior to it is the muscular pretracheal fascia and then superficial (investing) fascia.Remember, the carotid sheath contains two blood vessels (the common carotid artery and the internal jugular vein) and the vagus nerve, through which most parasympathetic fibers run.

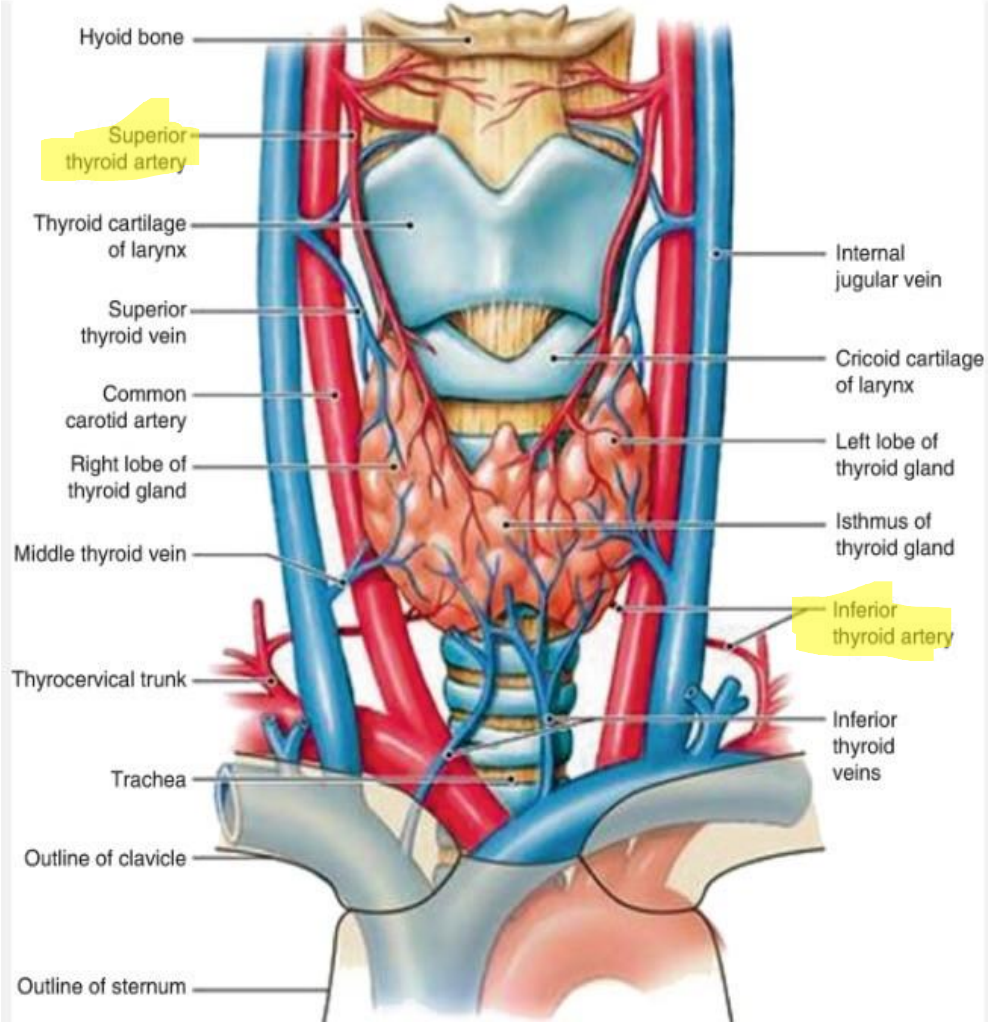


- Each **lobe** is pear shaped--- apex being directed upward----- oblique line on the lamina of the thyroid cartilage.
- Base lies below at the level of the 4th or 5th tracheal ring.
- The **isthmus** extends across the midline in front of the 2nd-4th tracheal rings.
- A **pyramidal lobe (40%):** Is often present, and it projects upward from the isthmus (band connects it to the HB (Hyoid Bone) --- **levator glandulae thyroideae (fibromuscular band)**



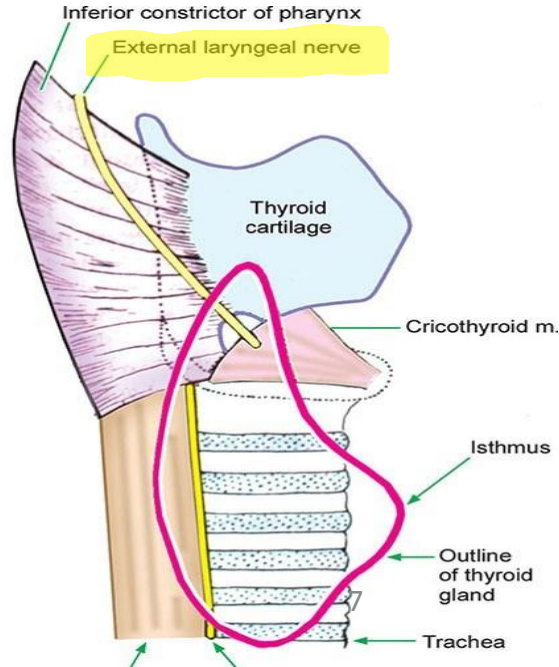
RELATIONS OF LOBES

There is a difference in the relations of the lobe and the isthmus



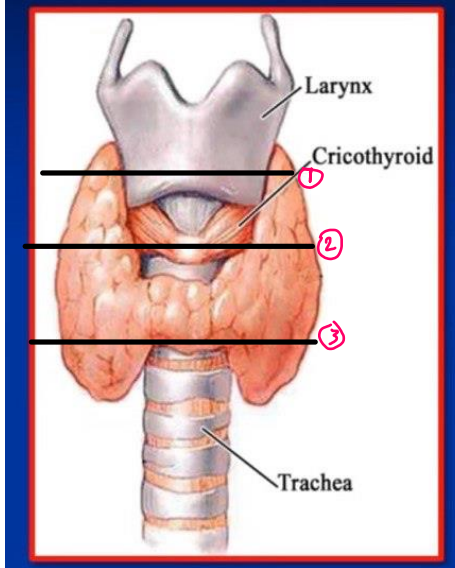
Medial: the larynx, the trachea, the pharynx, and the esophagus (cricothyroid muscle and its nerve supply, the external laryngeal nerve. The recurrent laryngeal nerve is in the groove between the esophagus and the trachea.)

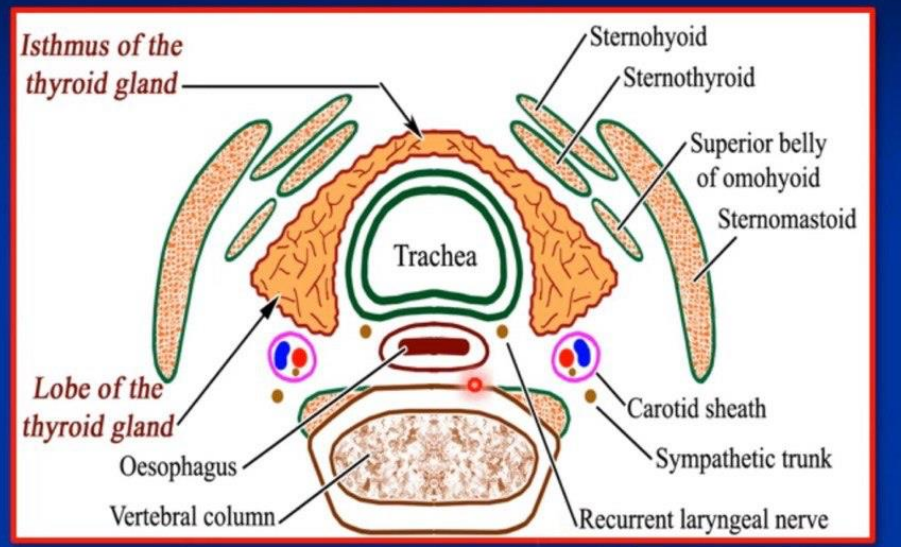
These nerves the external laryngeal nerve. The recurrent supply the muscles of the larynx and are very important because both of them accompany an artery.



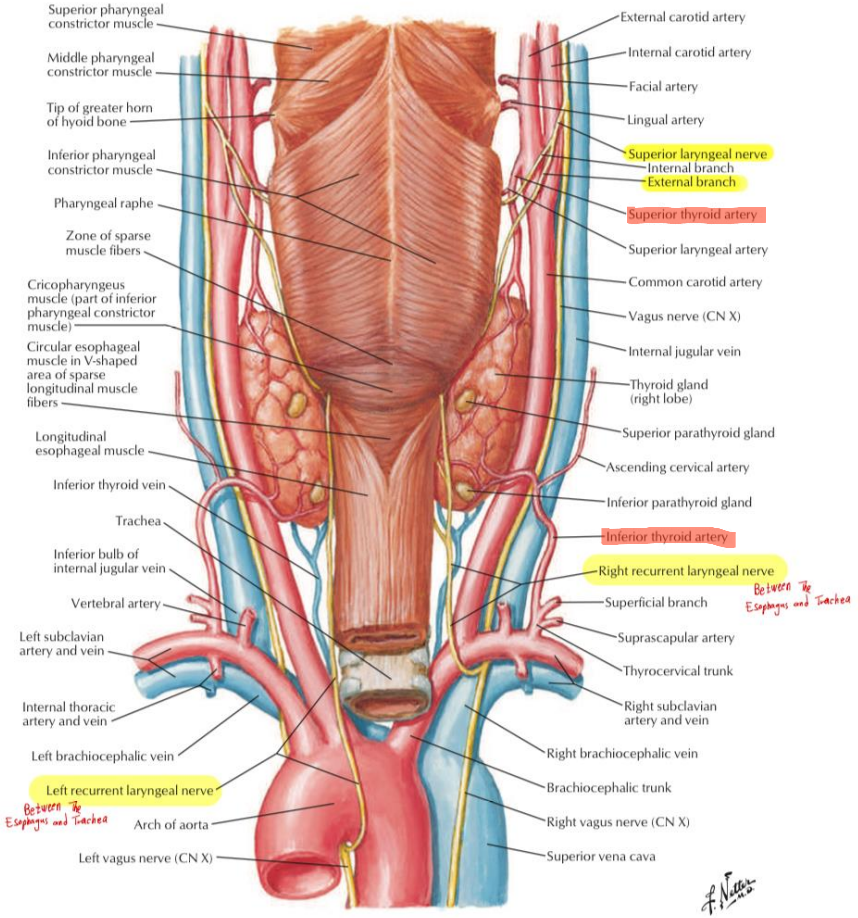
Additional images hep you to imagine

2. Medial surface





- Upper part: Larynx and pharynx. ①
- Middle part: Cricothyroid muscle. ②
- Lower part: Trachea and oesophagus with the *recurrent laryngeal nerve* in between. ③



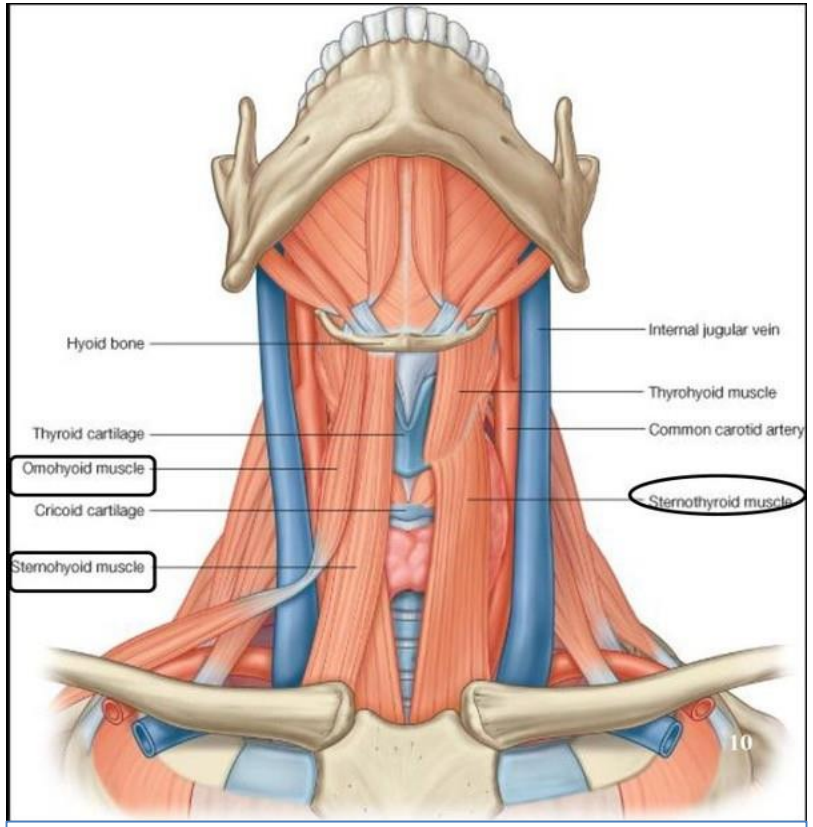
The external laryngeal nerve runs with the superior thyroid artery.

The recurrent laryngeal nerve runs with the inferior thyroid artery.

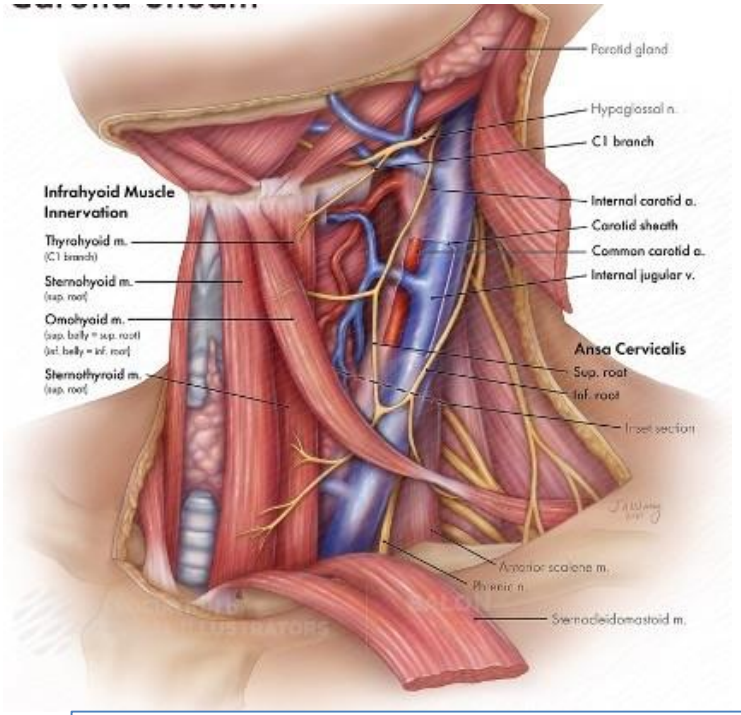
Pathologies of the thyroid, especially cancer, have been on the rise since the 1990s. We are detecting some cancers faster than we used to. In some cases, we may need to remove the entire thyroid gland (thyroidectomy). During this procedure, we must ligate the blood vessels before, including the superior and inferior thyroid arteries, and sometimes a third artery. However, we must be careful not to ligate the nerves, as they are tiny. We need to identify and separate them before ligating the arteries.

The lobes are not perfectly midline structures, unlike isthmus

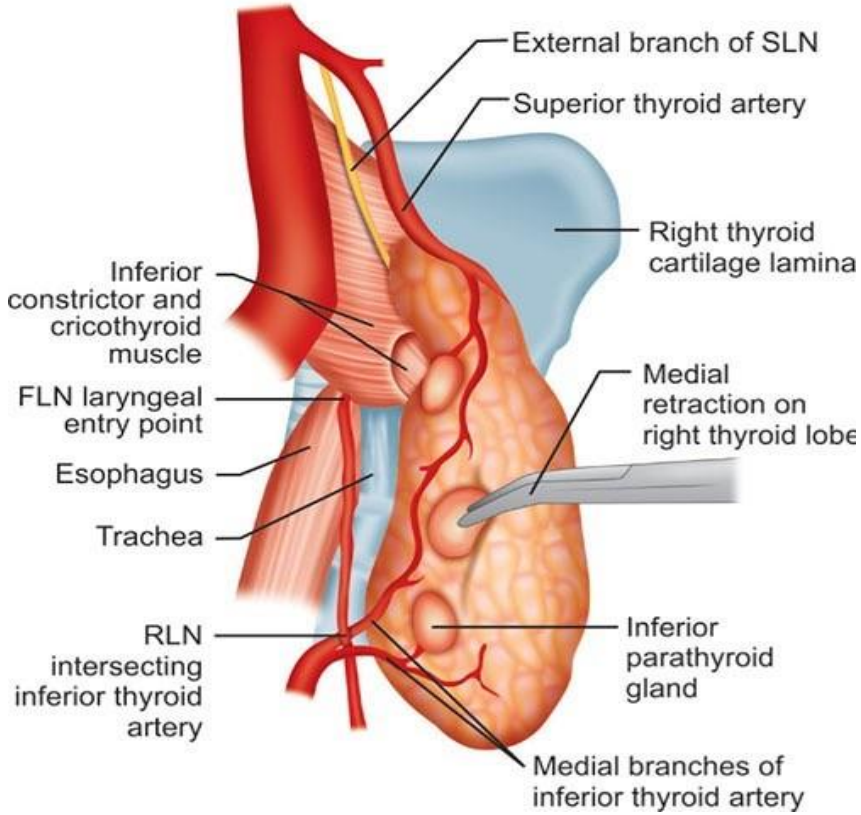
RELATIONS OF LOBES



Anterolateral: sternothyroid, the superior belly of the omohyoid, the sternohyoid, and the anterior border of the sternocleidomastoid



Posterolateral: carotid sheath with the common carotid artery, the internal jugular vein, and the Vagus nerve

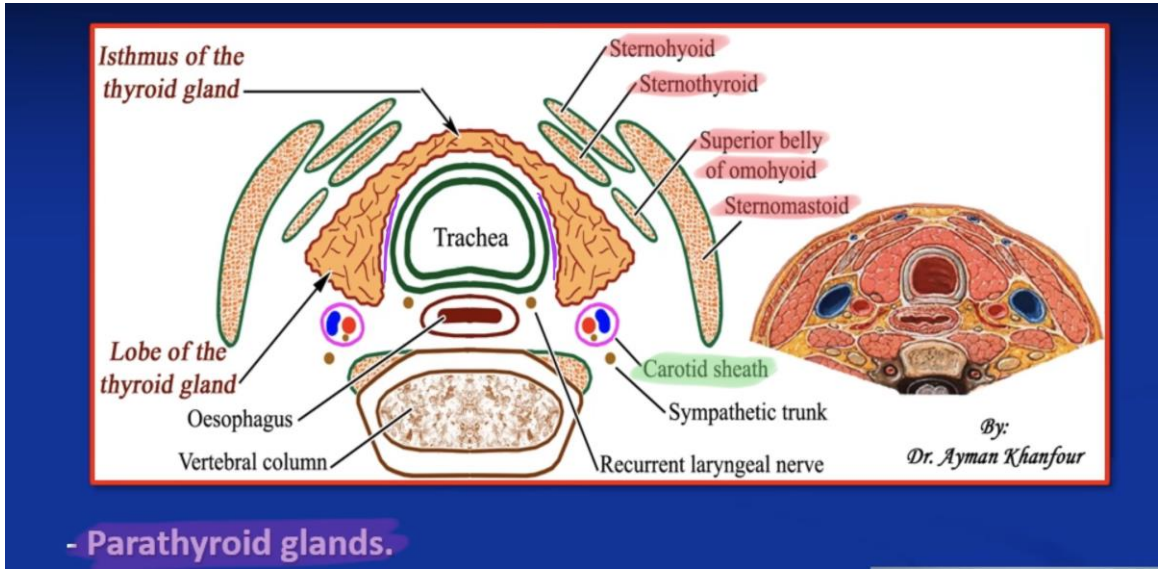


Posterior: superior and inferior parathyroid glands and the anastomosis between the superior and inferior thyroid arteries

Anterior relations mainly are muscles (S) muscles

The isthmus is not the posterior aspect of the lobes.

The posterior relations include two glands on each lobe, one superior and one inferior "the parathyroid glands". Sometimes these glands (parathyroid glands) are visible, and other times they are within the thyroid tissue. It is necessary to locate the parathyroid glands before removing the thyroid. Another posterior relation includes anastomoses between the superior and inferior thyroid arteries.



- Parathyroid glands.

Anastomoses
Between Superior and inferior Thyroid Artery

Anterior (Muscles)

Posterior Lateral
- Common carotid .A
- Internal Jugular .V
- Vagus Nerve

Posterior

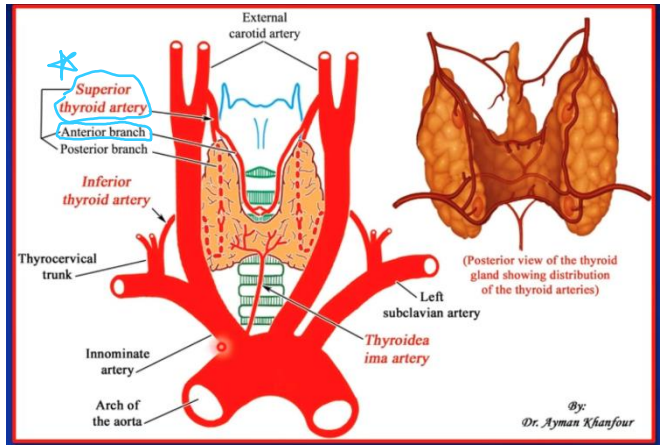
Isthmus Relations

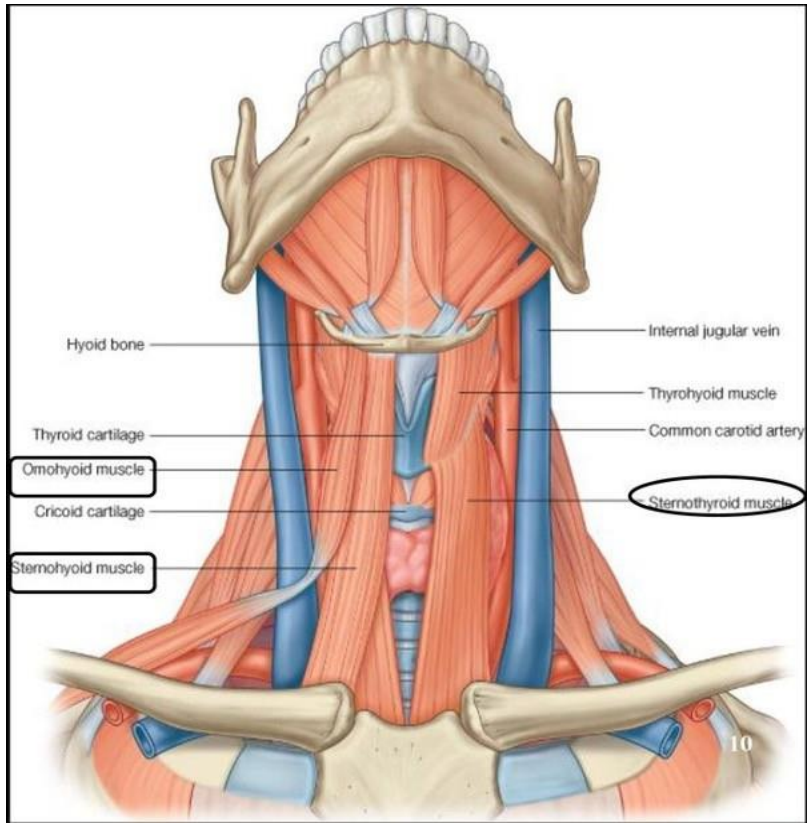
The superior thyroid artery divides into three branches (Ant,post and lateral)that run along the superior aspect of the lobes and then on the isthmus. The fascia and skin(in the very midline) in this area are not completely covered by muscles, making it slightly easier to palpate the thyroid in patients.

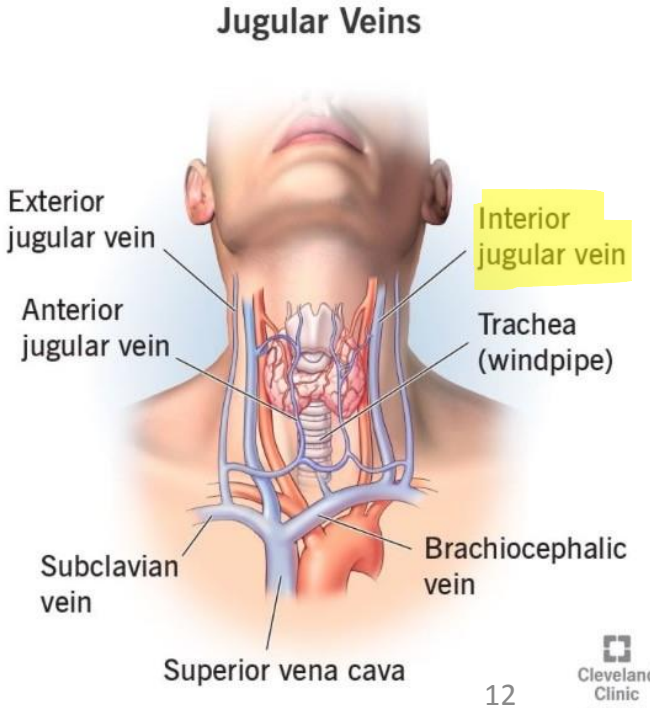
Anterior: sternothyroid, the sternohyoid, anterior jugular veins, fascia, and skin

Superior: terminal branches of the superior thyroid arteries (+anastomosis).

Posterior: 2-4 tracheal rings.





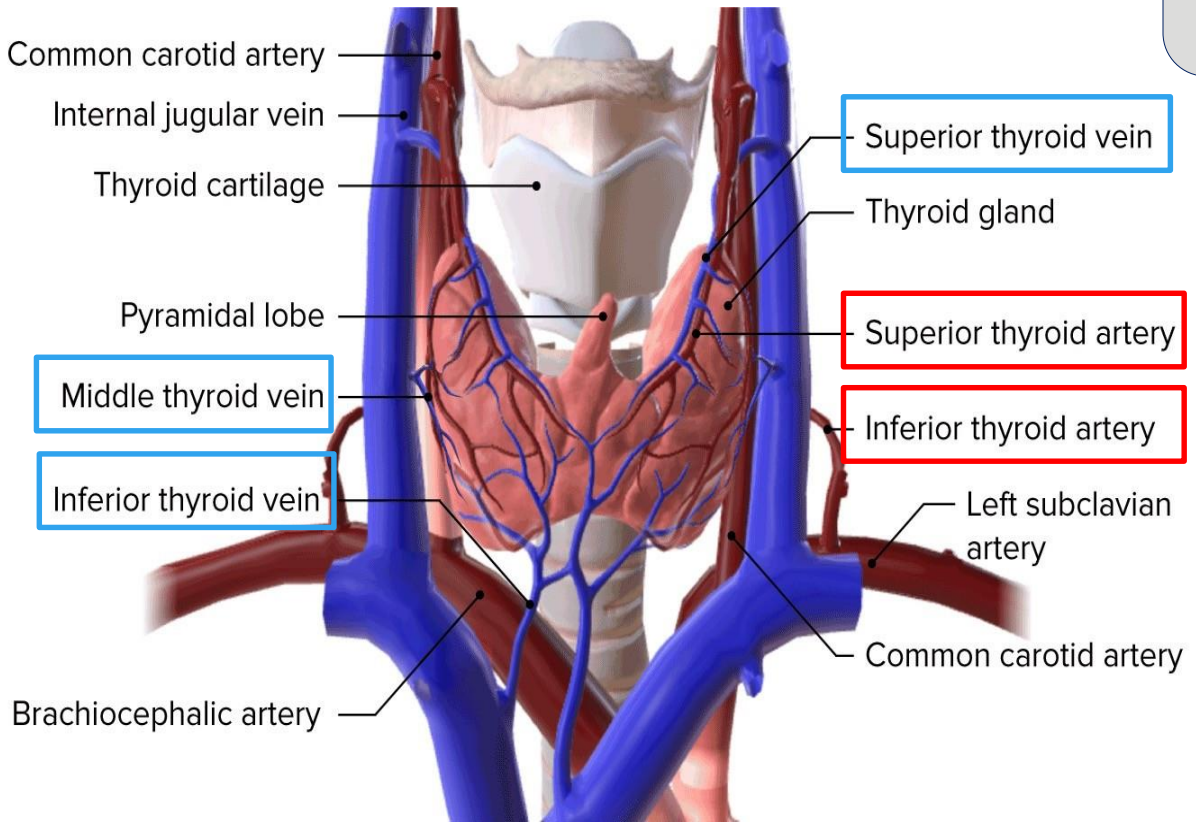


Blood Supply/Venous D.

RBCV: Right Brachiocephalic Vein
LBCV: Left Brachiocephalic Vein
SVC: Superior Vena Cava
IJV: Internal Jugular Vein
RtCCA **right** common artery

1. **The superior thyroid artery** originates from the external carotid artery (**ECA):** it descends to divide into ant., post., and lateral branches.the gland is wider laterally Accompanied by the external laryngeal nerve.

Anastmoses

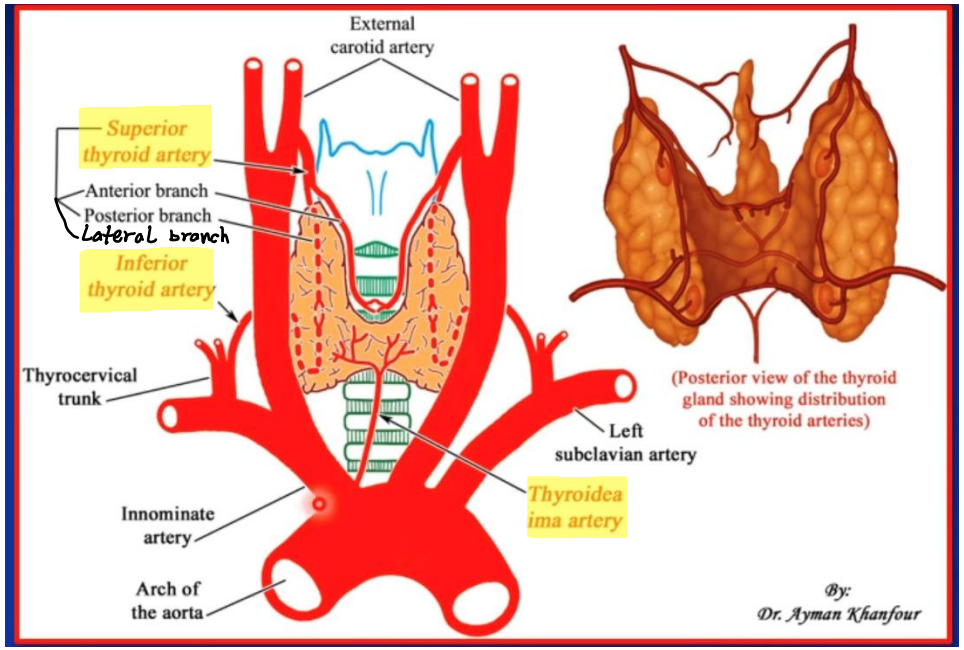


3. The thyroidea ima is more or less toward the isthmus **(it is more of a midline artery**). (BCA, arch of aorta, rtCCA)), if present (10%), It ascends in front of the trachea to the **isthmus.**

2. The **inferior thyroid artery (TCT; subclavian a.): originates from thyrocervical trunk from subclavian divides into sup. and inf. branches.** reaches the posterior border of the gland and anastomose there. The recurrent laryngeal nerve crosses either in front of or behind the artery, or it may pass between its branches.

Superior and middle thyroid Vs ------IJV.
Inferior thyroid –-- 1) left—LBCV, right---- RBCV/SVC
2) trunk (2 Vs)---- LBCV, RBCV, or SVC

In procedures in this region, we must pay attention to the thyroidea ima artery.
The thyroidea ima is usually a single artery, while there are two superior and two inferior thyroid arteries on both sides, with extensive anastomoses between them.
The possible origins of the thyroidea ima are the brachiocephalic artery, the arch of the aorta, or the right common carotid artery.



Now the venous drainage of the thyroid gland: we have 3 paired veins mainly:

1. Superior thyroid vein
2. middle thyroid vein

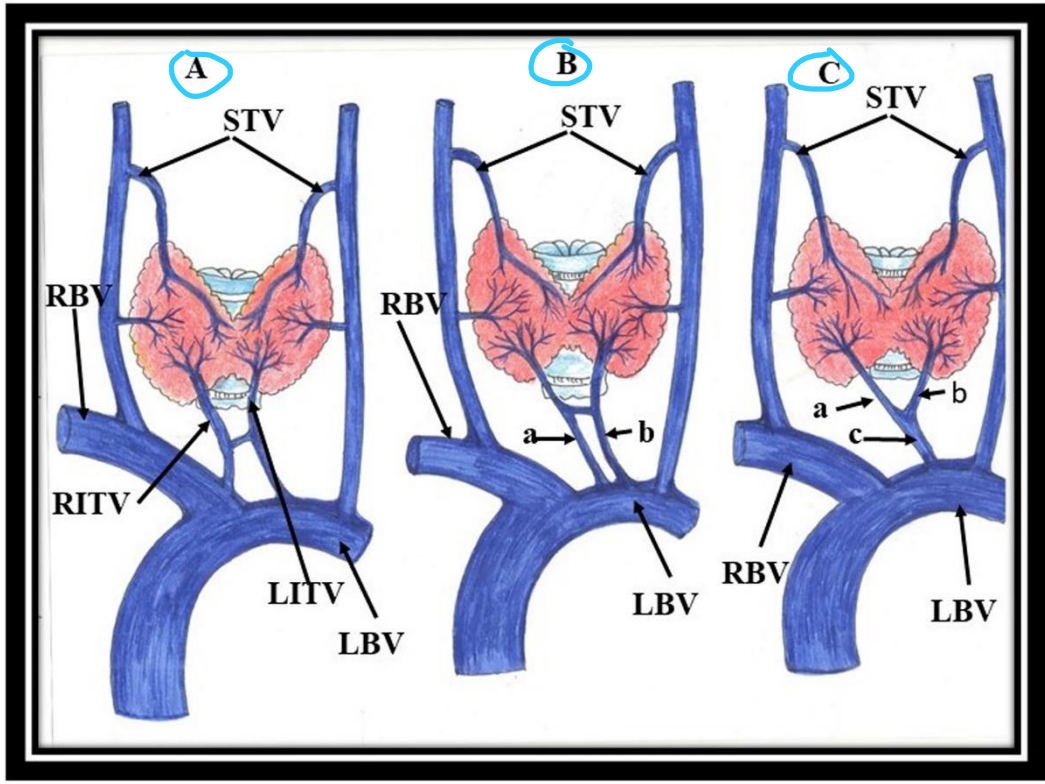
} Drain into internal jugular vein

3. Inferior thyroid: this vein is a bit tricky; it has many variations. We could have:

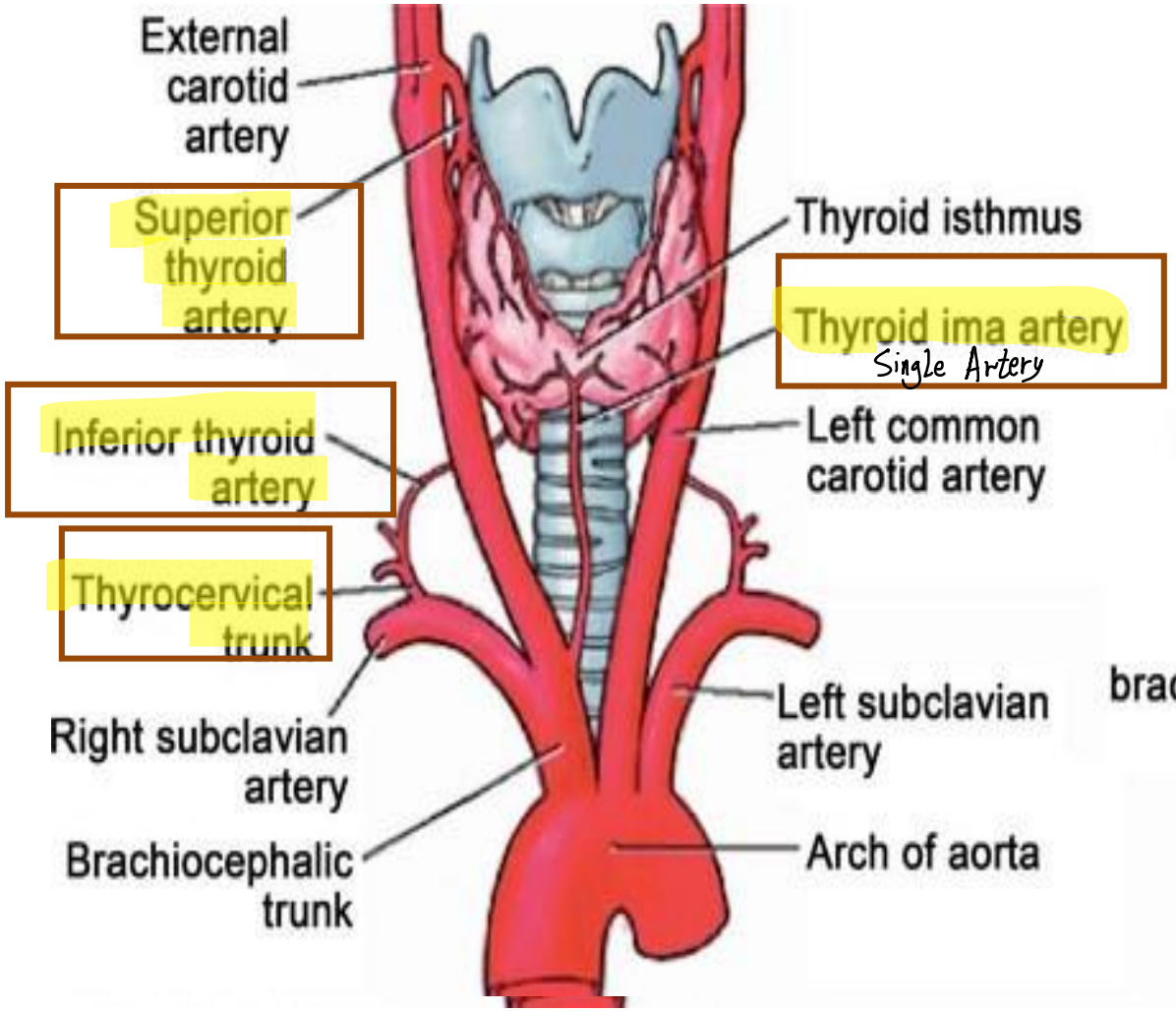
A
- each of the inferior thyroid veins (left and right) drain into left brachiocephalic vein and right brachiocephalic vein, respectively.

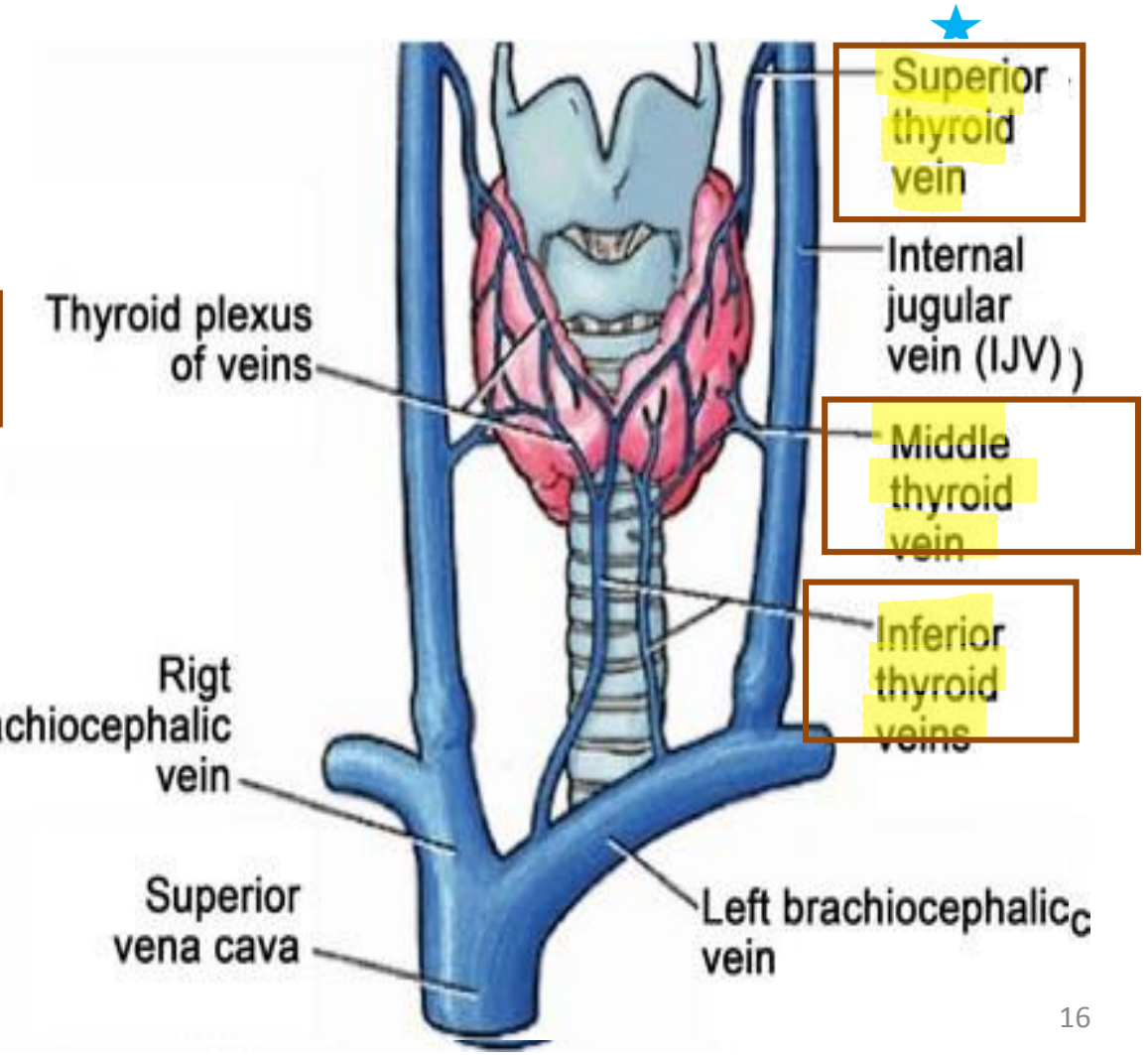
C But with Left BV
- the inferior thyroid veins may join and drain directly into the superior vena cava or into the right brachiocephalic vein via a common trunk.

B
- The inferior thyroid veins of the two sides anastomose via common trunk with one another as they descend in front of the trachea. They drain into the left brachiocephalic vein in the thorax.

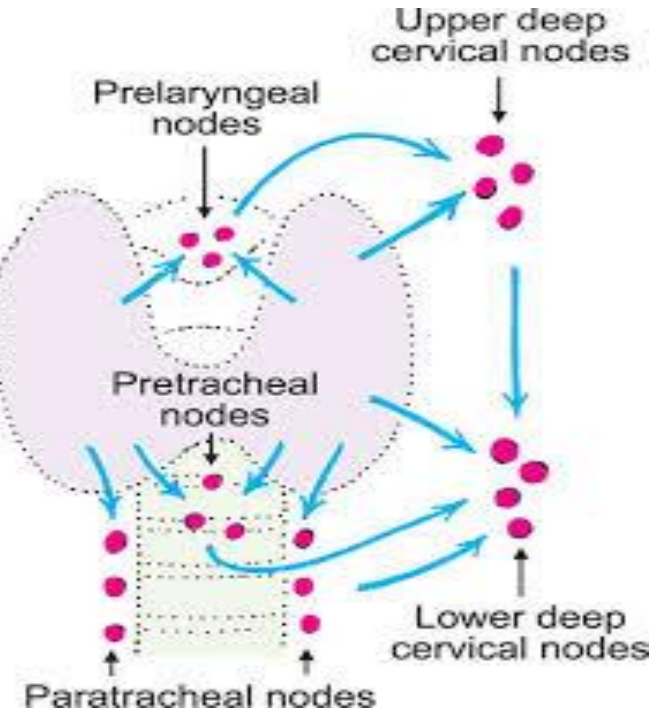


Blood Supply/Venous D.



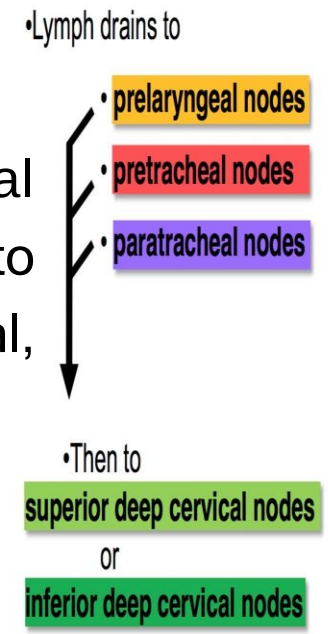


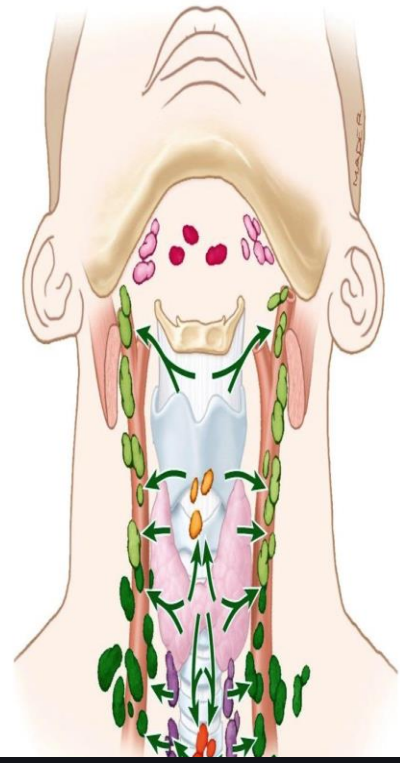
Lymph Drainage./ Nerve Supply



Lymph drainage

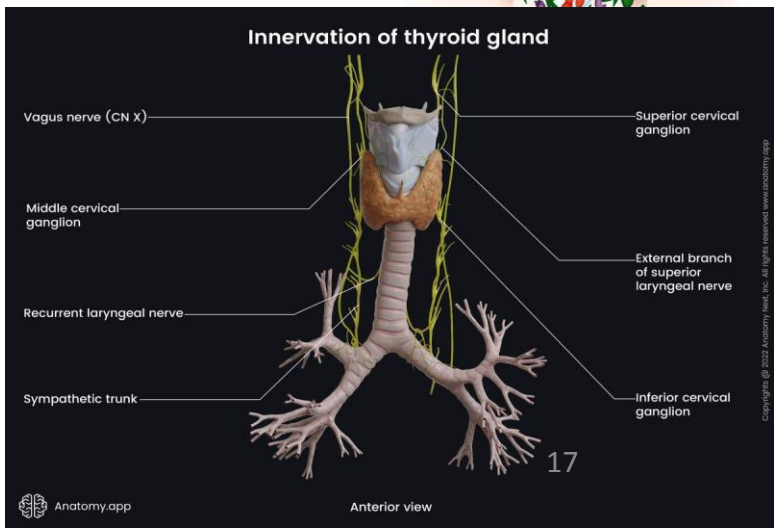
- Drains mainly laterally into the deep cervical lymph nodes. A few lymph vessels drain into the paratracheal nodes (prelaryngeal, pretracheal!!).
  - **Determining the exact locations for lymph drainage is extremely important for thyroid carcinoma detection and determining the metastatic stages.**



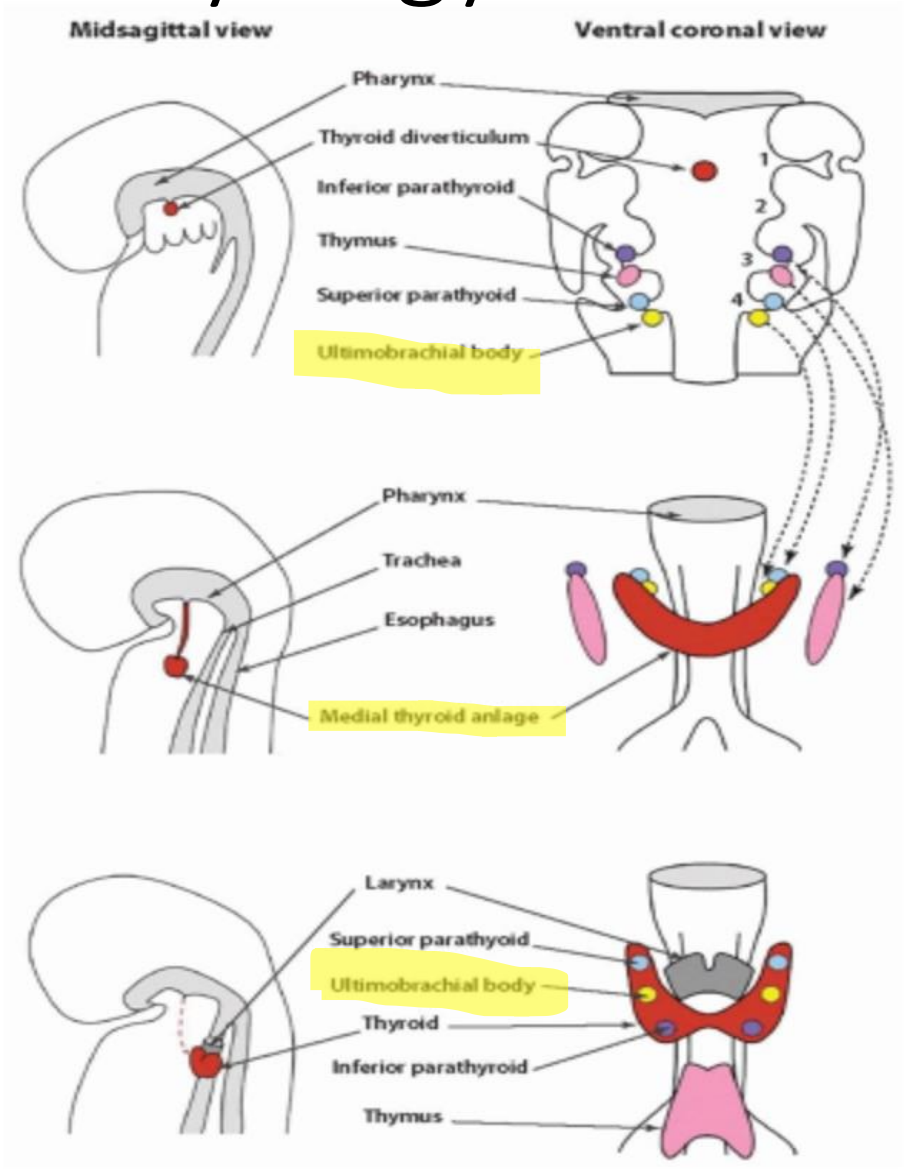


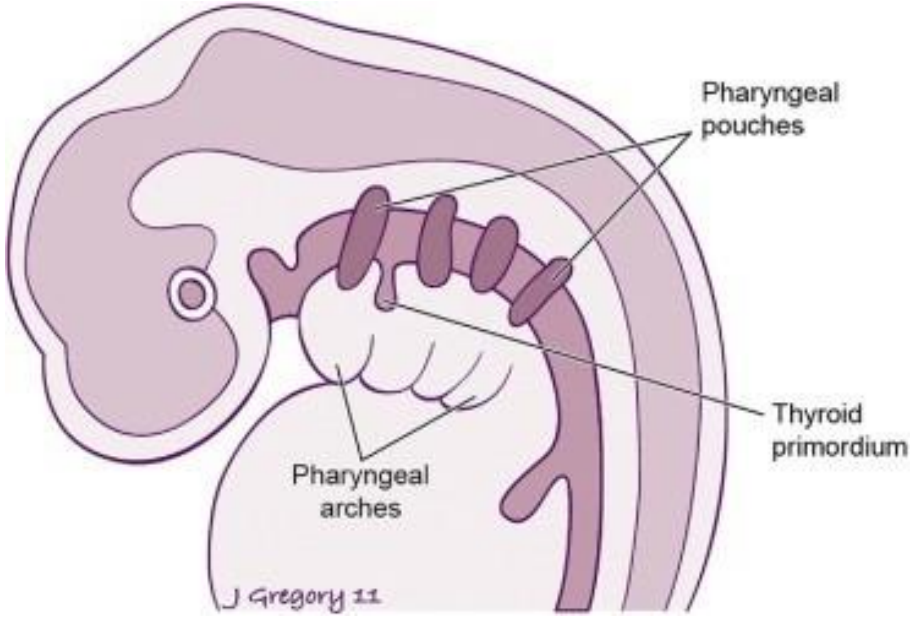
Nerve supply (autonomic innervation):

- Sympathetic: Superior, middle, and inferior cervical sympathetic ganglia.
- Parasympathetic: The Vagus nerve provides the main parasympathetic fibers



Embryology



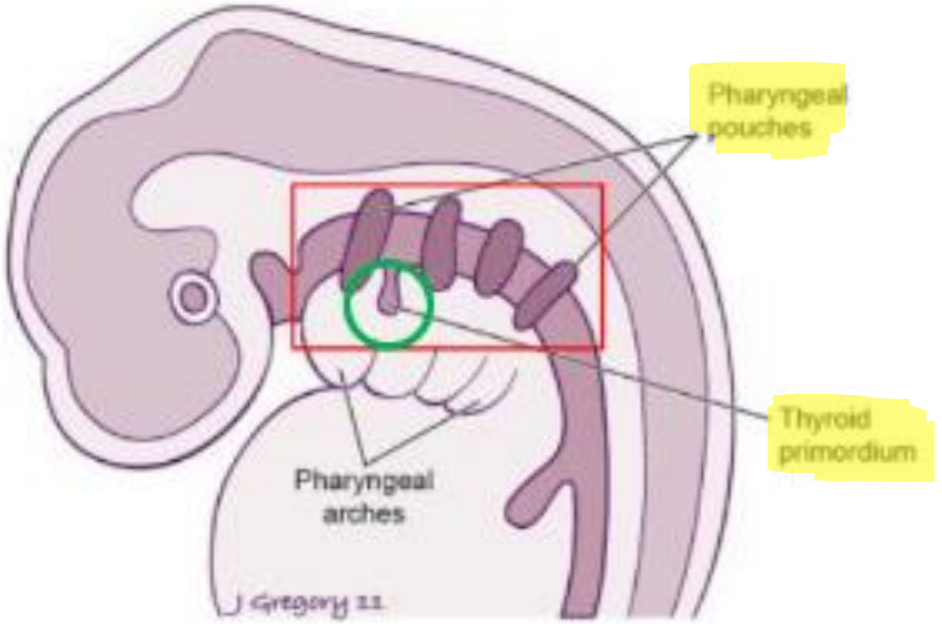


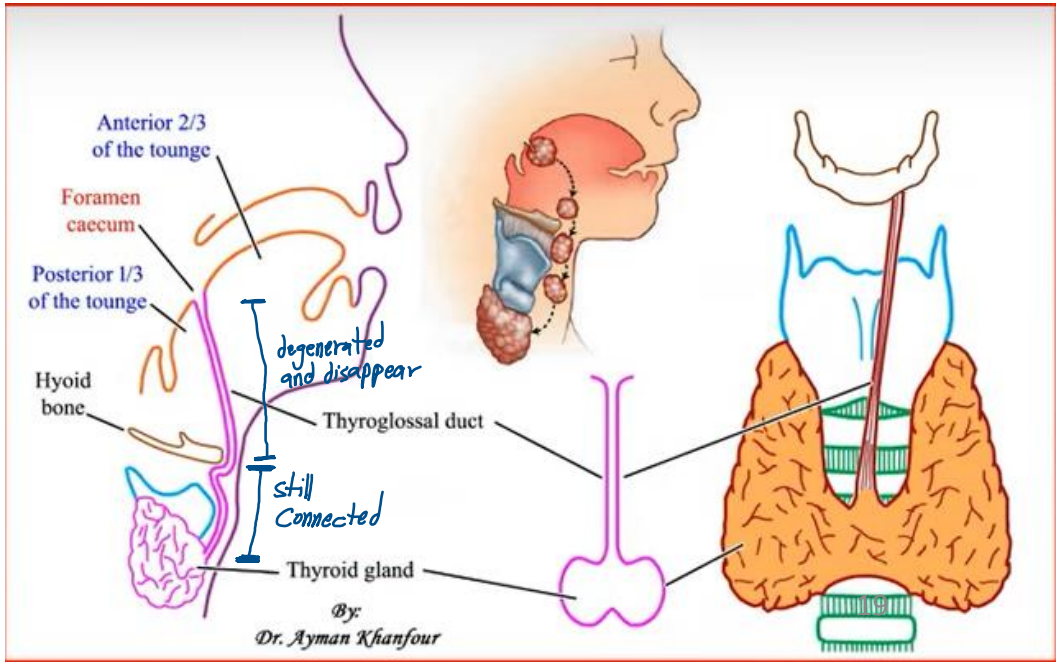
- Development begins as a diverticular outgrowth from the <u>primitive pharynx.</u>
- The diverticulum then descends inferiorly to reach its final destination in the neck.
- During its descent, the thyroid connects to the tongue by the <u>thyroglossal duct</u>

The thyroid gland originates from endoderm from the primitive pharynx between 1st /2nd pharyngeal pouches.

We are gonna talk about the development of the thyroid gland.

- At the foramen cecum of the tongue, a thyroid diverticulum originates there. This diverticulum descends downwards forming a stalk called thyroglossal duct it will stay connected to the base of the tongue which should degenerate by the end of tenth week.
- As the thyroid diverticulum descends , it proliferates and differentiates forming follicular elements of the thyroid.
- It passes in front of hyoid bone tell it reaches ultimobranchial bodies which are derived from the 4th/5th pharyngeal pouches, that prevents further descend of the thyroid gland.





Ultimobranchial bodies cells give rise to the parafollicular C-cells that participate in calcium homeostasis.

Embryology

- Originates from endoderm between the 1st /2nd pharyngeal pouches near the base of the tongue.
- Around day 20-24, endodermal cells of the primitive pharynx proliferate--- thyroid diverticulum—earliest endocrine gland to develop. * remember the pituitary gland originated at the week 4.

In the fifth week :

- The diverticulum migrates caudally (midline)---- attached to the tongue via thyroglossal duct (TGD)
- In early descent, the thyroid is hollow but then solidifies during migration---- follicular elements of the thyroid.
- Division of the thyroid into right and left lobes.
- Ultimobranchial bodies arise from the 4th/5th pharyngeal pouches ---parafollicular c-cells.

Embryology

By the seventh week:

•TG (Thyroid gland) reach its final destination in the neck

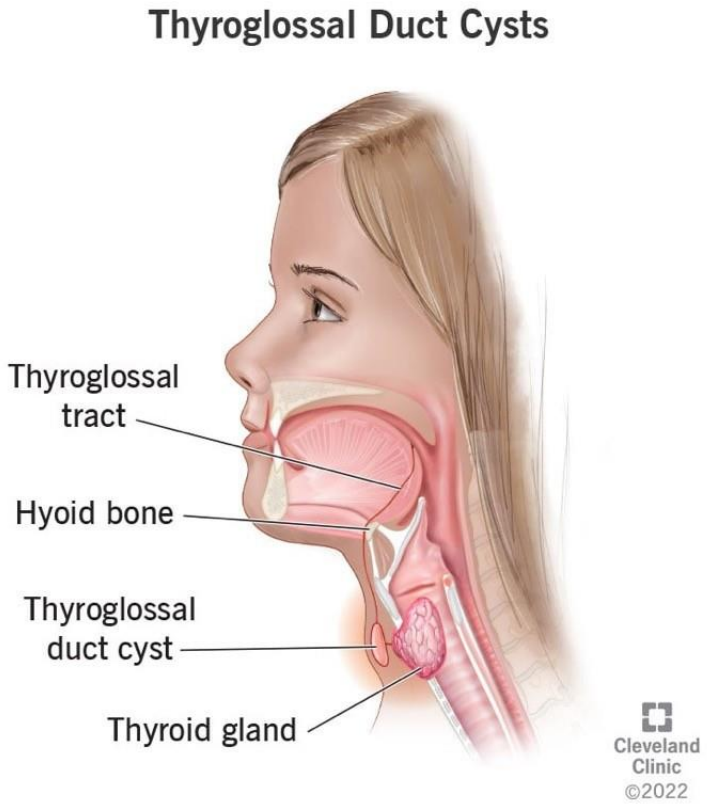
By the tenth week :

- TGD (thyroglossal duct) degenerates ---**incomplete** obliteration of the duct can lead to abnormalities, including thyroglossal duct cysts, or a pyramidal lobe.

By the twelfth week

- Functionally mature (functional and starts secreting hormones)
- Incomplete descent of the thyroid could lead to **lingual thyroid**.

Incomplete Degeneration Of Thyroglossal Duct



Incomplete descent of thyroid

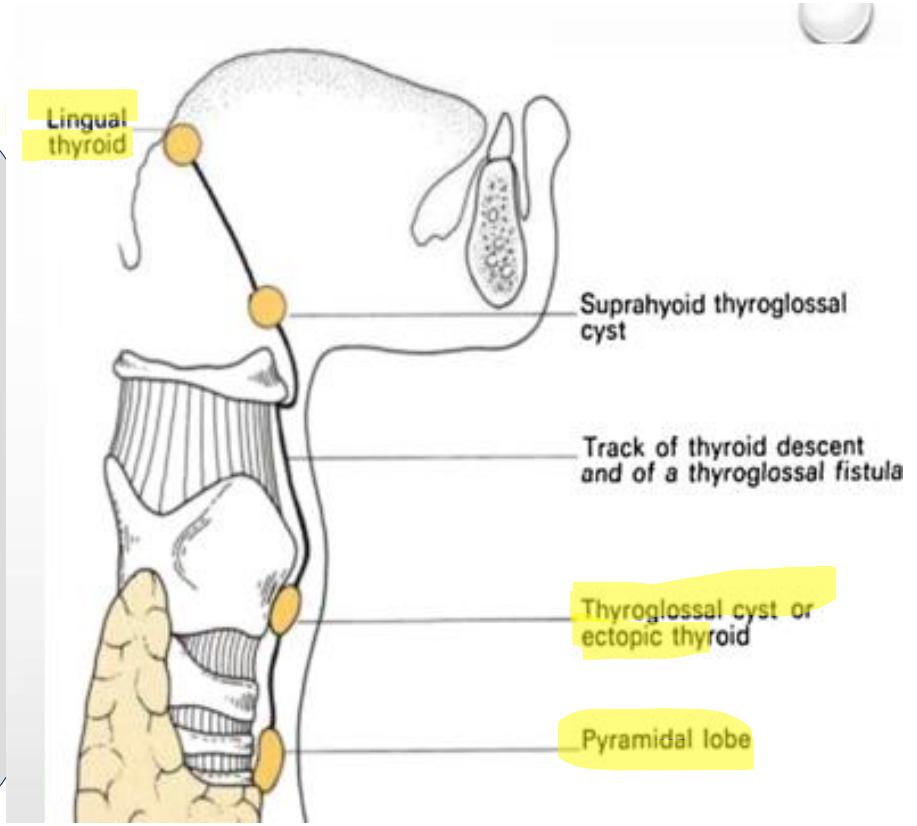
- LINGUAL THYROID

We talk about congenital abnormalities according to thyroglossal duct or thyroid it self

- **What is the pyramidal lobe?**
- The **pyramidal lobe of thyroid** is a normal anatomic variant representing a superior of thyroid tissue arising from the thyroid isthmus. It is seen as a third thyroid lobe and is present in 40 % of the population. It represents a persistent remnant of the thyroglossal duct.

• thyroglossal duct cyst

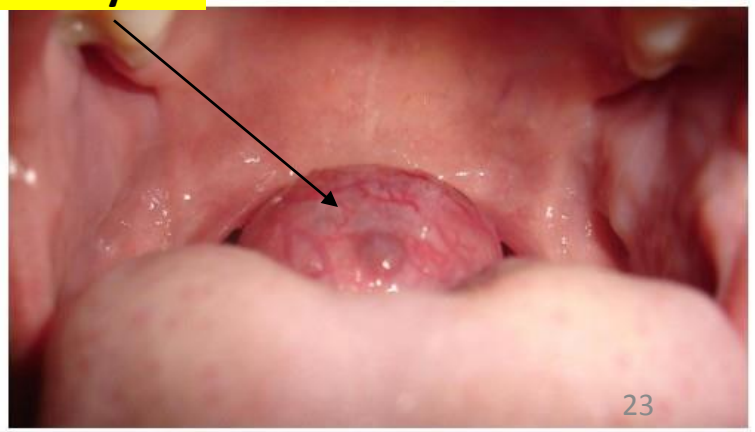
- The thyroglossal duct is an important structure during embryonic development that helps in the migration of the thyroid gland to its final anatomical position.
- However, in some cases, the thyroglossal duct **fails** to completely obliterate & can give rise to a thyroglossal duct cyst.
- Thyroglossal duct cysts are typically fluid-filled or mucous-filled structures. Thyroglossal duct cysts are more commonly observed in children, although they can also occur in adults.
- These cysts are usually painless and present as a soft, smooth. They may **enlarge** over time or become infected, leading to symptoms such as pain, redness, and swelling.
- To prevent potential complications and to alleviate symptoms, surgical removal of the thyroglossal duct cyst is typically recommended



• LINGUAL THYROID

- lingual thyroid is a specific type of thyroid anomaly and results from the lack of normal caudal migration of the thyroid gland.
- In symptomatic patients the lingual mass may result in dysphagia, or even airway obstruction (more common in infants).
- Often no treatment is required. In cases where surgical excision is being contemplated, it is **essential** to establish if there is any normal thyroid tissue elsewhere. Cuz we can't نستغني عن thyroid gland.

Lingual thyroid



PAST PAPER:

1.Anterior Midline Masses:

A. Thyroglossal duct cyst

B. lateral cervical cyst

C. hyoid cyst

2.The superior thyroid artery is initially associated with the _____ and must be ligated _____ during thyroidectomy:

A. External Laryngeal Nerve, away the gland

B. Internal Laryngeal Nerve, away from the gland

C. External Laryngeal Nerve, near from the gland

D. Recurrent Laryngeal Nerve, near the gland

E. Recurrent Laryngeal Nerve, away from the gland

4. Upper Limitation of thyroid gland:

A. Pretracheal fascia

B. The superior belly of the omohyoid

C. The capsule of thyroid

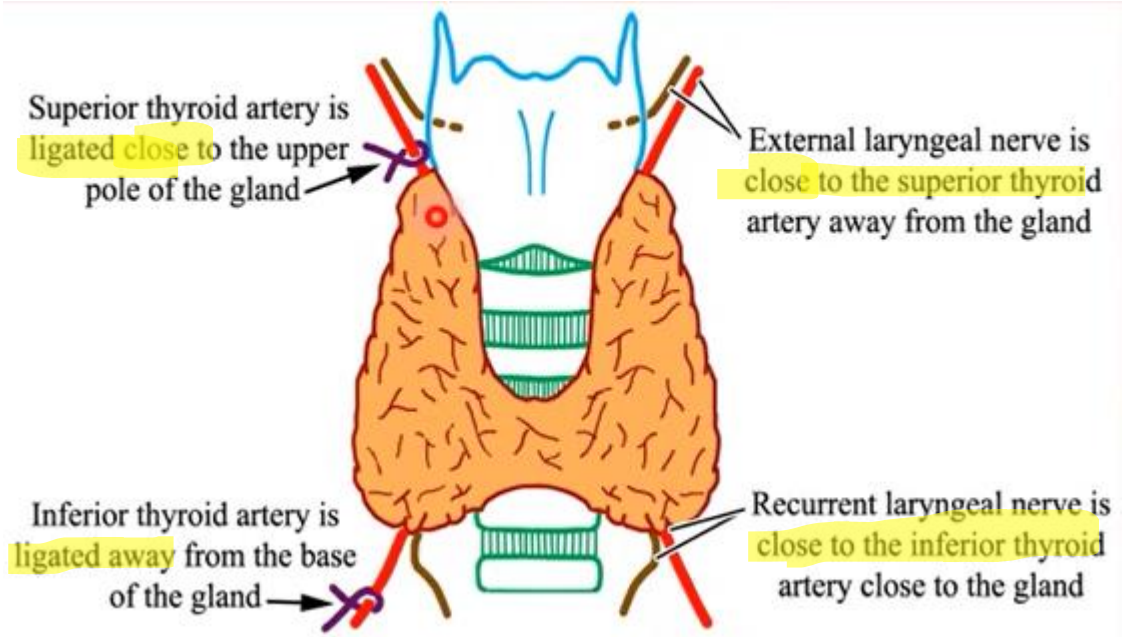
There is explanation for this question.

answers:

A C A

2.

Nerve	External laryngeal nerve	Recurrent laryngeal nerve
Artery	Superior thyroid artery	Inferior thyroid artery
Where to ligate	Near the gland	Away from the gland

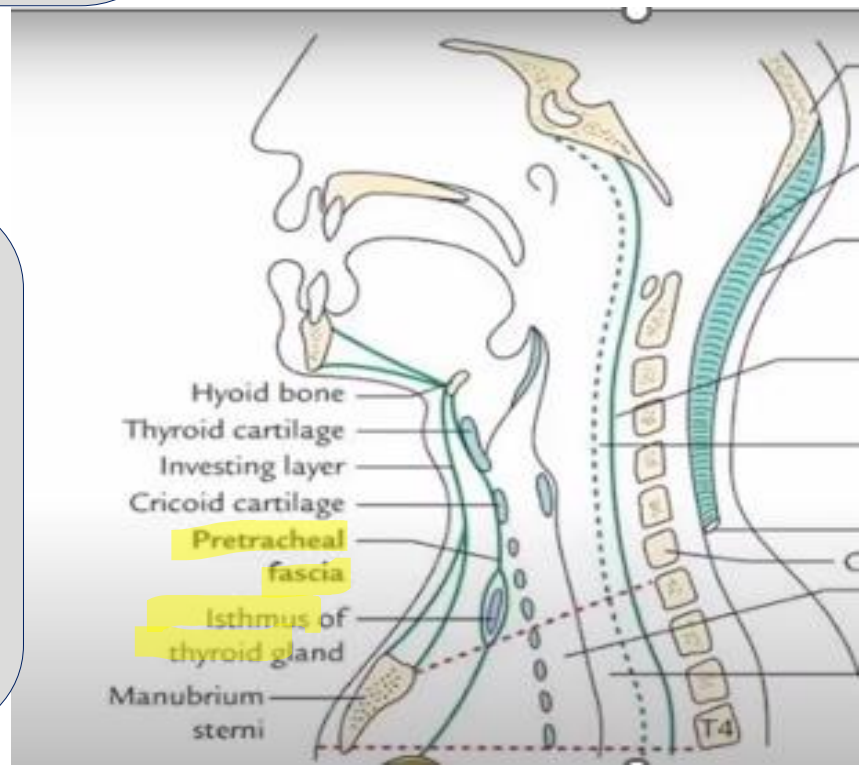


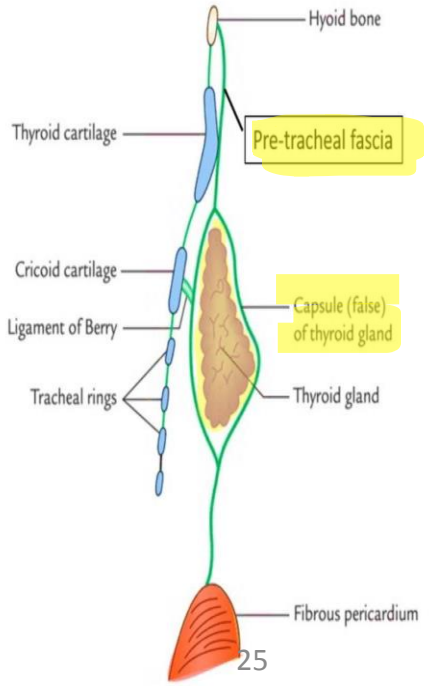
4. He wants the superior border of the thyroid gland.

a. Correct answer

b. The superior belly of the omohyoid is anterolateral relation

c. The capsule of thyroid surrounds but pre-tracheal fascia is upper to it





-NOW, you can revise the previous lecture also 😂

TRUE OR FALSE?
PRVIOUS LECTURES.

- Pituitary is bounded by the optic chaism directly.
- Adh is released from the adenohypophysis.
- Neurohypophysis is rich with thyrotrophs.
- Release of oxytocine is immediate.
- Pituicytes are abundant in the pars distalis.
- ACTH acts on adrenal medulla.
- Hypothalamic releasing hormones reach the pg by the systemic circulation directly.
- Posterior pituitray is supplied mainly by the superior hypophyseal artery.

The Answers:

1.F, diaphragma sellae separates it from the optic chiasm
2.F, it is released from the hypothalamus
3.F, adenohypophysis
4.F,needs stimulus(nerve impulse)
5.F, pars nervosa
6.F, adrenal cortex
7.F,portal circulation
8.F, inferior hypophyseal artery

v2

اعادة تنسيق للشرائح