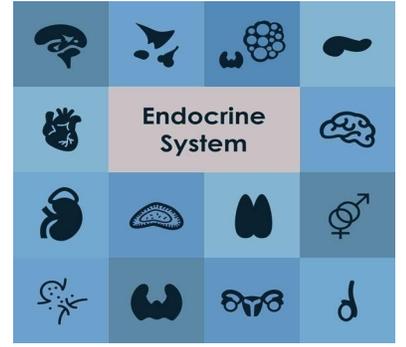




BAU-Medicine



Sheet No.2

Lecture Date: 27th of Dec 2020

Lecture Title: **Histology and embryology of the endocrine glands 1 (part 2) / parathyroid gland**

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اللهم اغفر له وارحمه وعافه واعف عنه وأكرم نزله ووسع مدخله
واغسله بالماء والثلج والبرد ونقه من الخطايا، كما نقيت الثوب
الأبيض من الدنس وأبدله دارا خيرا من داره وأهلا خيرا من أهله،
وزوجا خيرا من زوجته وأدخله الجنة ، واعذه من عذاب القبر ومن
عذاب النار

Thyroid Gland- Relations

Anterolateral:

1. Sternomastoid
2. Omohyoid superior
3. Sternothyroid
4. Sternohyoid

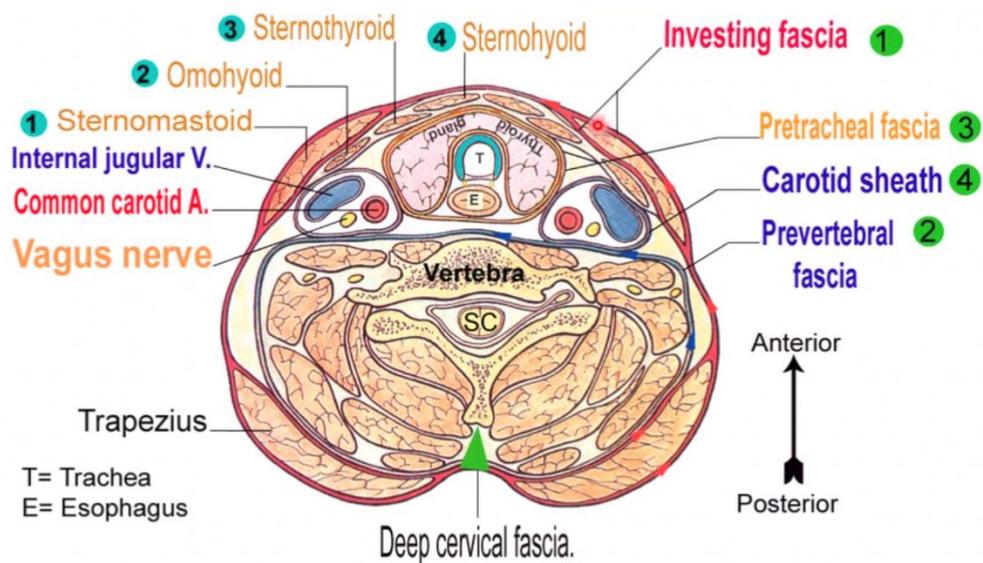
◇ The muscles are arranged from posterior to anterior (Sternomastoid is the most posterior one and sternohyoid is the most anterior one)

Medial:

1. Larynx
2. Trachea
3. Pharynx
4. Esophagus
5. Cricothyroid muscle
6. Recurrent laryngeal n.

Posterolateral:

- Carotid sheath ,which contains:
 - 1- Internal jugular vein (has the thinnest wall)
 - 2- Common carotid artery
 - 3- Vagus nerve



Clinical correlations: Enlargement of the Thyroid (Goiter)

Goiter (abnormal enlargement of the thyroid gland). Two types:

- A. **Hypothyroidism**, caused by iodine deficiency. This condition causes the gland to **swell** in its attempt to produce more hormones.
- B. **Hyperthyroidism**, overproduction of thyroid hormones.

Compression of the enlarged gland on the related structures may cause:

1. Trachea and Larynx → breathing difficulties (dyspnea) and wheezing.
2. Cricothyroid muscles → Low-pitched voice.



Cricothyroid muscle is innervated by external laryngeal nerve and it's responsible for tensing the vocal cords.

3. Esophagus and Pharynx, → swallowing difficulties (dysphagia).
4. Recurrent laryngeal nerve, → hoarseness (harshness) voice.
5. Distention of neck veins (mainly the internal jugular vein) → compression on carotid sheath contents.

Clinical correlations :Thyroidectomy

- Surgical removal of the thyroid gland.
- Safety measures should be taken:
 1. **Parathyroid glands should be saved** by maintaining the posterior part of the thyroid gland in place.
 2. **Avoid bleeding**, injury of the thyroid vessels and anterior jugular veins.
- ◇ Thyroid vessels :
 - 1-Arteries (superior thyroid artery, inferior thyroid artery and thyroidea ima artery)
 - 2-Veins(Superior thyroid vein, middle thyroid vein and inferior thyroid veins)
 3. **Avoid muscle paralysis**, injury of the recurrent laryngeal and the external laryngeal nerves.



Injury of the external laryngeal nerve causes paralysis of cricothyroid muscle, therefore the patient presents with a monotonous voice.

Parathyroid glands

- Four small ovoid endocrine glands, located behind lobes of thyroid.
- They play a vital role in the regulation of calcium and phosphorus metabolism.
- Lie on or within thyroid gland, inside pretracheal fascia.



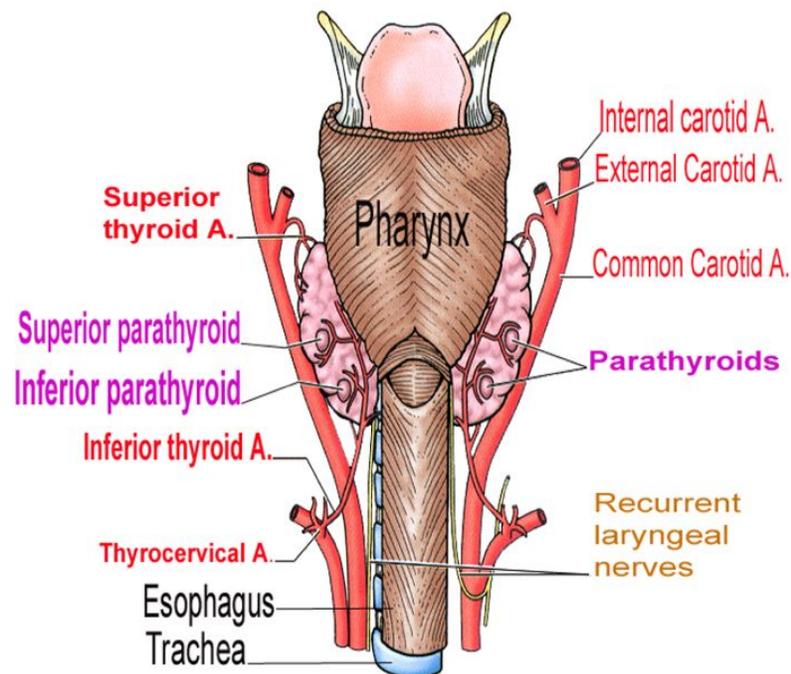
Thyroid gland has 2 capsules :

- 1- **Inner** , fibrous
 - 2- **Outer**, from pretracheal fascia
- The parathyroid is located between the 2 capsules

The Superior gland

At upper pole, posteriorly ,more constant in position, usually at the middle of the posterior border of each lobe → (parathyroid IV , originates from the 4th pharyngeal pouch).

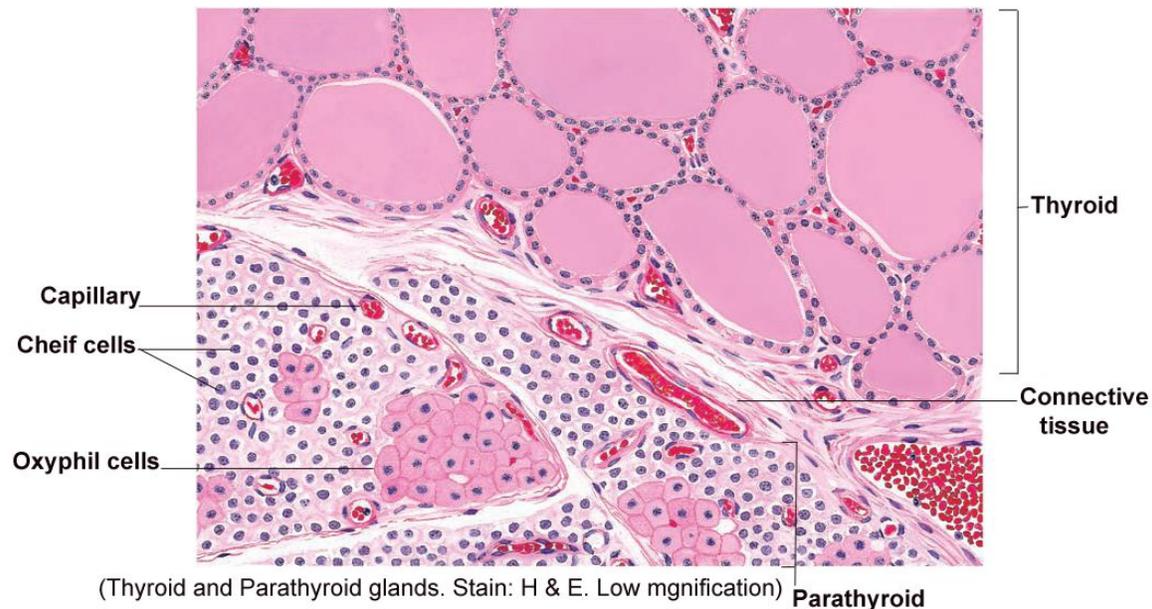
The Inferior gland: At lower pole of each lobe , variable in position, may live in the thorax; may move down with the thymus gland to be located in the superior mediastinum→ (parathyroid III , originates from the third pharyngeal pouch).



Parathyroid Glands: Arteries

- **Supplied mainly by the inferior thyroid arteries.**
- Inferior thyroid artery is a branch of thyrocervical trunk ,which is a branch of the first part of subclavian artery
- Chief cells→ produce parathyroid hormone→ stimulate osteoclasts activity to increase calcium level in the blood.

Histology of the parathyroid gland



Parathyroid Glands: High magnification

Contain 2 types of cells:

1. The chief cells

- Small, Round, and pale (slightly acidophilic cytoplasm).
- Numerous and arranged in dense cords or clusters, surrounded by abundant fenestrated capillaries
- The rounded nuclei (blue in color-basophilic) are close together (smaller amount of cytoplasm)
- Synthesize and secrete parathyroid hormones

2. The Oxyphil cells

- Found as **single** cells or in small **clusters**
- **Larger** and **less numerous**
- Show a highly **acidophilic cytoplasm** with dark nuclei.
- Increase in number with increasing age

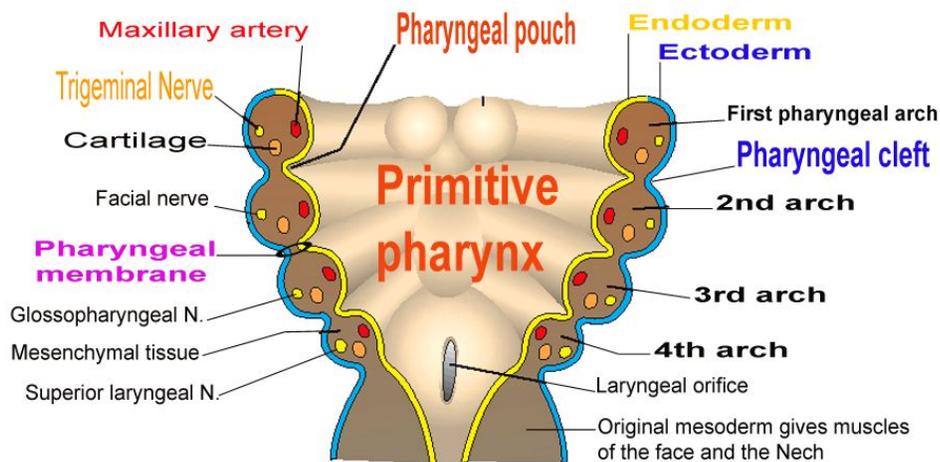
Development of parathyroid gland

- **Intro :**

As we said in the previous lecture , the embryo will convert itself from a flat trilaminar disc into a cylinder by 2 types of folding:

- 1- Cephalocaudal folding
- 2- Transverse folding

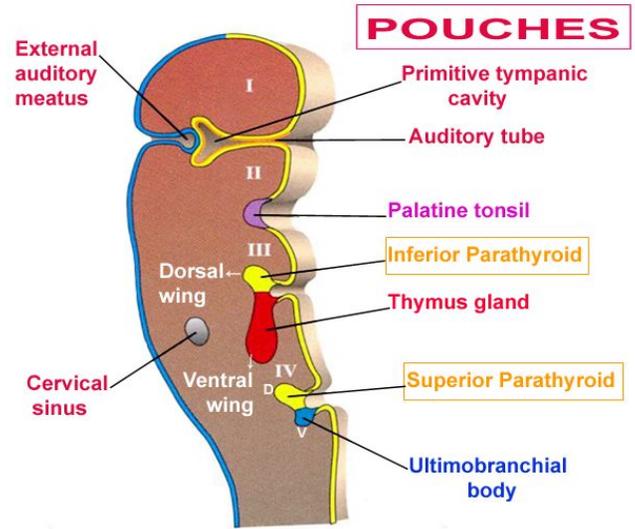
- The endoderm will be engulfed inside the embryo and lines the foregut and hindgut
- The Primitive pharynx is the first part of the foregut
- The **primitive pharynx** is the part located caudal to the buccopharyngeal membrane, and lined with endoderm.
- At this time primitive pharynx is a **soft** funnel-shaped tube. (Wide superiorly and narrow inferiorly)
- Later invaded by a massive neural crest cells to develop a series of supporting **horseshoe-shaped** condensations **Pharyngeal arches**
- Between the pharyngeal arches from the inside →pouches (outgrowths)
- Between the pharyngeal arches from the outside →Clefts , which are ectodermal
- Both pouches and clefts appear between the 2 sequential arches, for example the first pharyngeal pouch is between the first and second pharyngeal arches and so on....



1. Five pharyngeal arches (1, 2, 3, 4, 6) are well developed whereas, arch No. 5 regress completely.
2. Four pharyngeal pouches (1, 2, 3, 4) are well developed whereas, pouch No. 5 regress completely.

Pharyngeal pouches

- During the 5th week, the primitive pharynx gives **4** endodermal outgrowths between the adjacent arches called pharyngeal **pouches**.
- The 3rd and 4th pouches gives a Dorsal wing or part and a Ventral wing or part.
- **Sidenote:** the doctor mentioned something about the origin of the ventral wing, and that some books say it comes from the 5th pouch and others say it comes from the 4th pharyngeal pouch, he also said that we need to remember that it is from **a ventral part of a pouch**

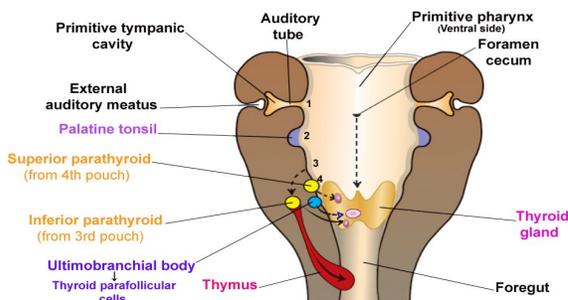


Migration of pharyngeal pouches Derivatives

The **dorsal** wing of the 3rd pouch form **parathyroid III** (inferior parathyroid), and the dorsal wing of 4th pouch form **parathyroids IV**.(superior parathyroid)

The two parathyroids exchange positions as they migrate **infero-medially**, the parathyroid III becomes the inferior parathyroid and the parathyroid IV becomes the superior parathyroid.

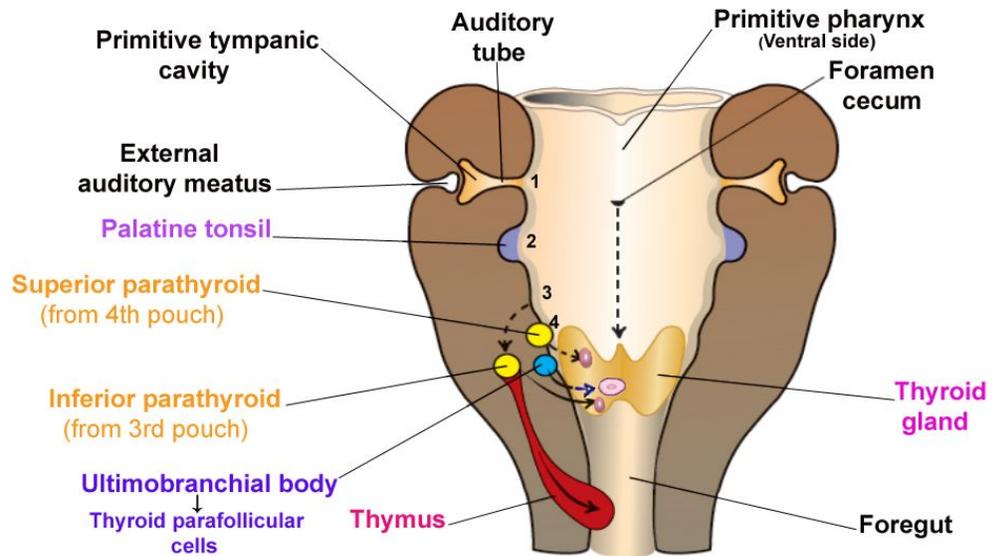
They come to lie on the posterior aspect of the thyroid gland by the **7th week**.



Ultimobranchial body

The ventral wing of 4th pouch develops into the ultimobranchial body, which migrate inferomedially to implant into the posterior aspect of the thyroid

The ultimobranchial bodies incorporated within the thyroid gland to form the **C-cells (parafollicular cells)** that produce calcitonin hormone involved in regulation of calcium level in the body fluids



Retrosternal Parathyroid

The development of the inferior parathyroid glands is closely associated with the thymus

(The 3rd pouch gives dorsal and ventral wings , the dorsal wing gives the inferior parathyroid gland while the ventral wing gives the thymus)

For this reason it is not unusual for the surgeon to find the parathyroid III in superior mediastinum because it has been dragged down by the thymus.

