ENDOCRINE

ANATOMY

 # 6

WRITER:
Mariam qussay

CORRECTOR:
Alzahraa Saleh

DOCTOR:
Ghada Abu el Ghanem

Parathyroid glands

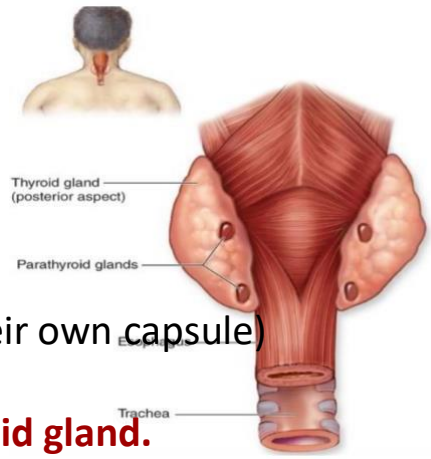
-In addition of the role of parafollicular cells in thyroid, parathyroid glands have the main role when comes to calcium homeostasis.

They are found on the posterior border of the thyroid gland.

Anatomy/ Characteristics

We have 4 parathyroid glands.

2 are superior (closer to the apex of each lobe)
and 2 are inferior (closer to the base of each lobe).



- **Four small ovoid masses—3 × 6 mm—total weight 0.4 g.** (each one is 0.1 g)

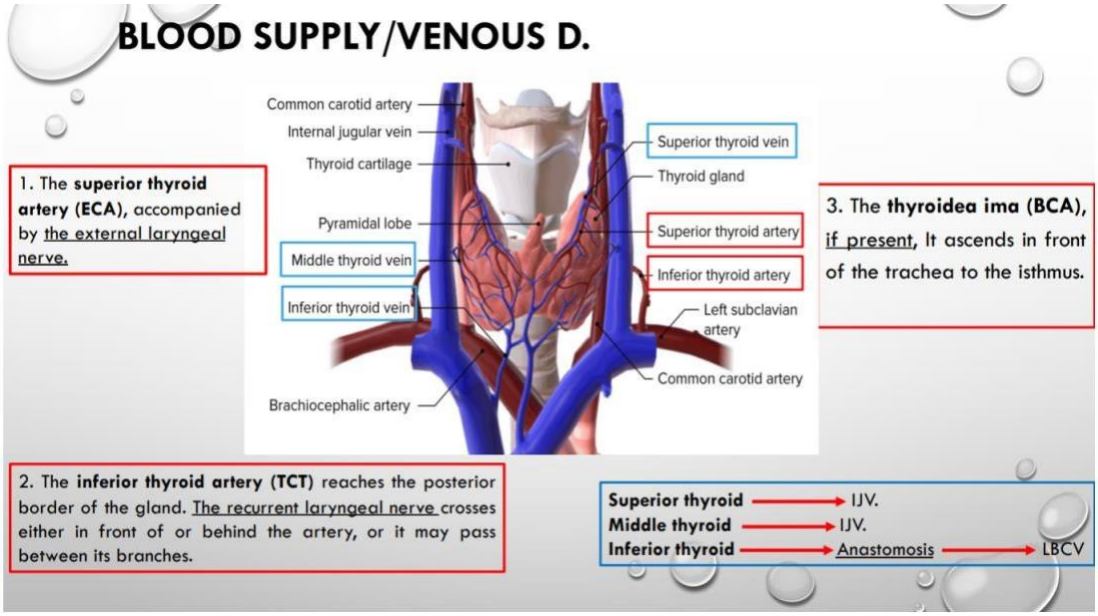
- **Located on the back of the thyroid gland, usually embedded in the gland's capsule.** (And they have their own capsule)

- **Closely related to the posterior border of the thyroid gland.**

-Blood supp./Venous D./ Lymph D.: same as thyroid

Lymph drainage

- Drains mainly laterally into the **deep cervical lymph nodes.** A few lymph vessels to the paratracheal nodes (prelaryngeal, pretracheal!!).



• The two superior parathyroid glands are the more constant in position--- lie at the level of the middle of the posterior border of the thyroid gland.

• Contained within a thin capsule from which septa extend into the gland (septa).

• The two inferior parathyroid glands usually lie close to the inferior poles of the thyroid gland.

Increasing age---many secretory cells are replaced with adipocytes (>50%) of the gland in older people.

Like many of other glands we have, they tend to have adipocytes (fat cells).

Anatomy/ Embryology

-Endoderm is the origin.

1-Superior parathyroid glands

- **Derived from the fourth pharyngeal pouch.**

- **Located near the posterolateral aspect of the superior pole of the thyroid,1cm superior to the junction of the recurrent laryngeal nerve (RLN), and theinferior thyroid artery.**

2-Inferior parathyroid glands

- **Derived from the third pharyngeal pouch.** (Just like the thymus)

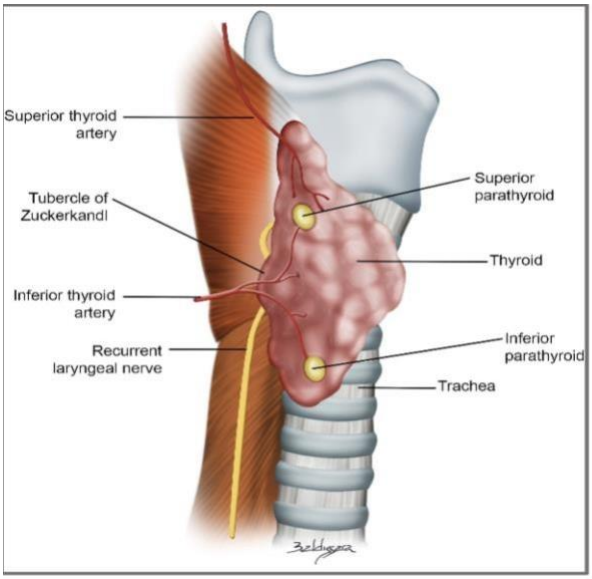
- **Located near the inferior poles of the thyroid glands, within 1-2 cm of the insertion of the inferior thyroid artery into the inferior pole of the thyroid.**

- **Location is much more variable than the superiors and can be intra-thyroidal or within the thymus or other mediastinal structures and can even be found along the aortic arch (16%).**

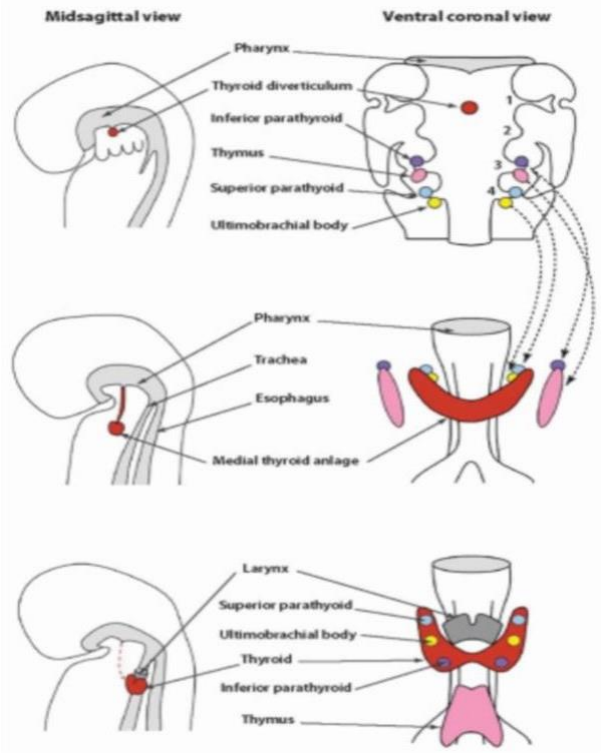
(*So, if it is not where it is supposed to be, this doesn't mean we don't have it … But it possible that we don't have it)*

-you expected that inferior is derived from the fourth but NO!

Because each one derived from pouch, but the descendants make them superior or interior.



Embryology



- as you can see the **thyroid** comes from first and second Pharyngeal pouches , then descends caudally.

-**Ultimobranchial bodies** arise from the fourth/fifth pharyngeal pouches give parafollicular c-cells.

Superior parathyroid glands are derived from the **fourth pharyngeal pouch** and **Inferior parathyroid** glands are derived from the **third pharyngeal pouch.**

-note that **thymus** descends much further than inferior parathyroid, But they are derived from the same pouch.

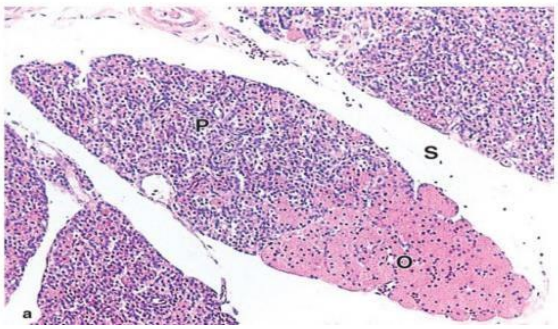
-**inferior parathyroid** sticks in the **posterior** aspect of thyroid gland.

But sometimes, the inferior parathyroid **fails** to stick to the Posterior aspect of thyroid, so it keeps its journey all the way Down and stick with thymus, it may stick around it or inside it.

-the superior parathyroids will be in their place *(variation in location is not high).*

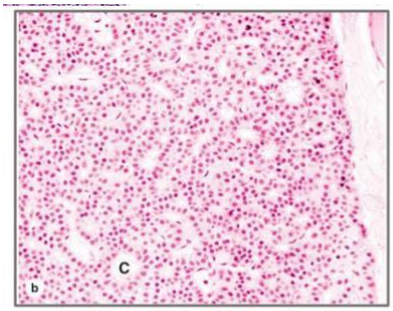
Structure

Parathyroid glands contain 2 types of calls:



1-Chief cells:

- **Manage the secretion of parathyroid hormone (PTH).**
- **Prominent Golgi apparatus and a developed Endoplasmic reticulum (synthesis and secretion of the hormone)**
- **Smaller than the oxyphil cells, they are more abundant.**



(a) A small lobe of parathyroid gland, septa (S),
(b) (b) Higher magnification shows that principal cells have round central nuclei and pale-staining cytoplasm

2-Oxyphil cells:

-they appear after puberty, somehow it is a sex hormones thing, but they were not there before.

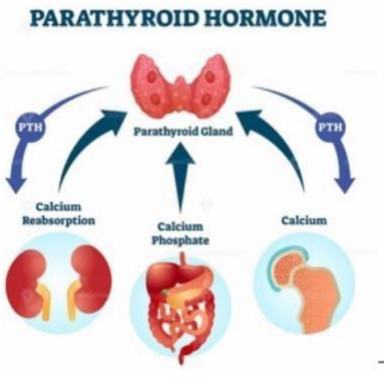
-The purpose of these cells is not entirely understood.
-Larger than the chief cells and seem to increase in number with age. (But they wouldn't be higher than chief cells)

-Their functions still unknown, but in patients with chronic renal diseases, and people that use drugs of hyperparathyroidism, Oxyphil cells secreted PTH.

-one of the aspects how aging effects the homeostasis, things get different the older you get.
-adipocytes

- Oxyphil cells

PTH major targets:



Calcium comes from:
Diet, bones, kidney (calcium, sodium, phosphate).

-PTH is the main controller of calcium level.

-3 mechanisms to restore the levels of calcium:

1- Osteoblasts/Osteoclasts:

- **Elevate the number and activity of osteoclasts.**
- **Resorption of the calcified bone matrix and release of Ca2+ increase the concentration of circulating Ca2+ ----- suppresses PTH production.**
- **Opposite to that of calcitonin.**

Low calcium levels → **PTH** binds to receptors on **osteoblasts** → activate It and it will release **osteoclasts stimulating factor** → more liberation of calcium → resorption of calcium from matrix that rich with hydroxyapatite crystals → breaking down and liberation calcium to the blood → higher calcium levels → **negative feedback** inhibits releasing of PTH.
(**Pathological osteoporosis** in severe deficient of calcium)

2- Kidney:

it contains distal convoluted tubule, it has PTH receptors, PTH promotes calcium reabsorption and excretion of phosphate.

3- Intestine: (the part where we get calcium from the outside)

Activated vitamin D (in the kidney**) promotes the absorption of calcium** (by epithelial cells lining small intestine.) **due to the increased formation of the calcium-binding protein in the intestinal epithelial cells.**

-calcium is important because:
1-contraction of the heart (significant lower levels of calcium causes disastrous effect on the heart)
2-contraction of the skeletal muscles.

Surgical Considerations

I have to have the normal levels of calcium, if I lose PTH it is a big problem, how could I lose it?

-Having an advanced stage of carcinoma in thyroid, will cause removing of parathyroid glands (when we have no choice but to remove the thyroid.

- **Have inconsistent locations between individuals and these locations can vary widely.**
- **Damage to the glands can occur during neck surgery, especially thyroidectomy.**
- **Preservation of as many parathyroid glands as possible.**
- **A single parathyroid gland should be sufficient!!!!**! (One parathyroid gland is enough to secret PTH)
- **Lifelong calcium and vitamin D supplementation may be required, when?** To compensate the space when we remove the thyroid and all the parathyroid glands.
- **Removal of both pairs of the parathyroid gland is extremely uncommon.** Because we can notice it early (example: losing a huge amount of weight while eating normally → high T3 +T4 levels)

GOOD LUCK

V2

Page7:

PTH binds to receptors on osteoblasts
(not osteoclasts)