ENDOCRINE SYSTEM

Anatomy & Histology
Lec. 4

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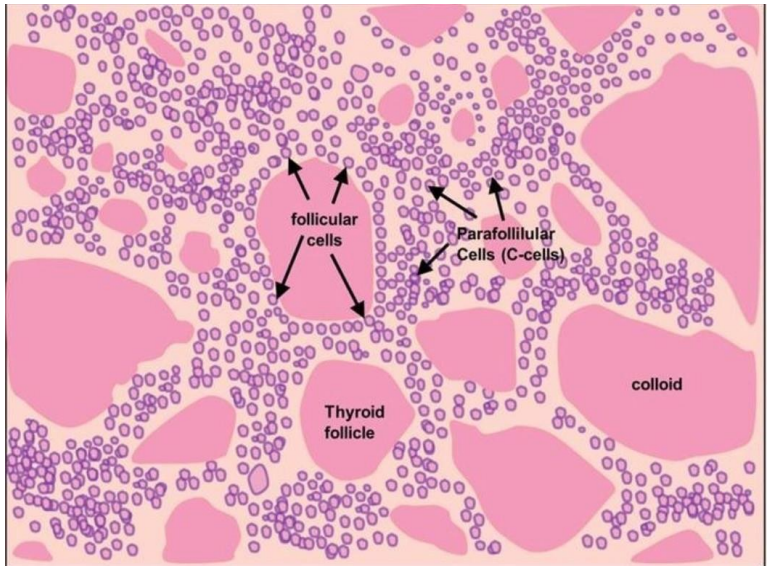
ما ينطق به الدكتور من شرح سيكون باللون الاحمر
وما يكون مهم في شرح الدكتور يكون باللون البنفسجي
ما يكون مهم في السلايدات يكون بخطين أو بخط

Thyroid Gland

The highest vascularised among endocrine glands
Two lobes and ismuth
It is the only one that stores its hormones in big quantities

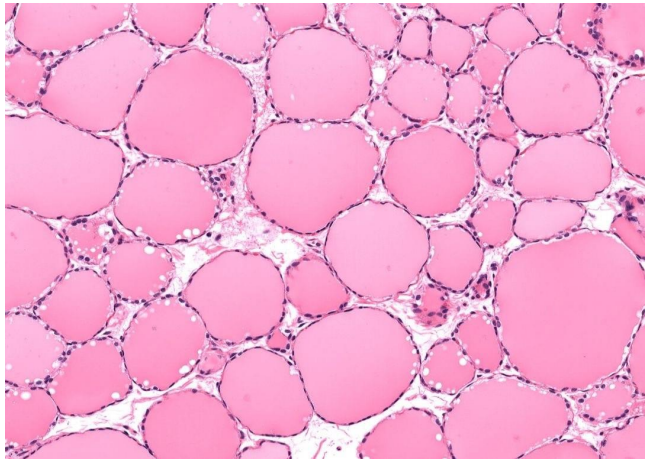
HISTOLOGY

The **parenchyma** is composed of millions of rounded epithelial thyroid **follicles** of variable diameter, each with simple **epithelium** and a central lumen densely filled with gelatinous acidophilic **colloid.**



- Only endocrine gland in which a large quantity of secretory product is stored.
- Storage is outside the cells--- in the colloid of the follicle lumen.
- There is sufficient hormone in follicles to supply the body for up to 3 months.

When you have Iodine deficiency, you will be covered for 3 months after that You need to fix iodine deficiency and restore it



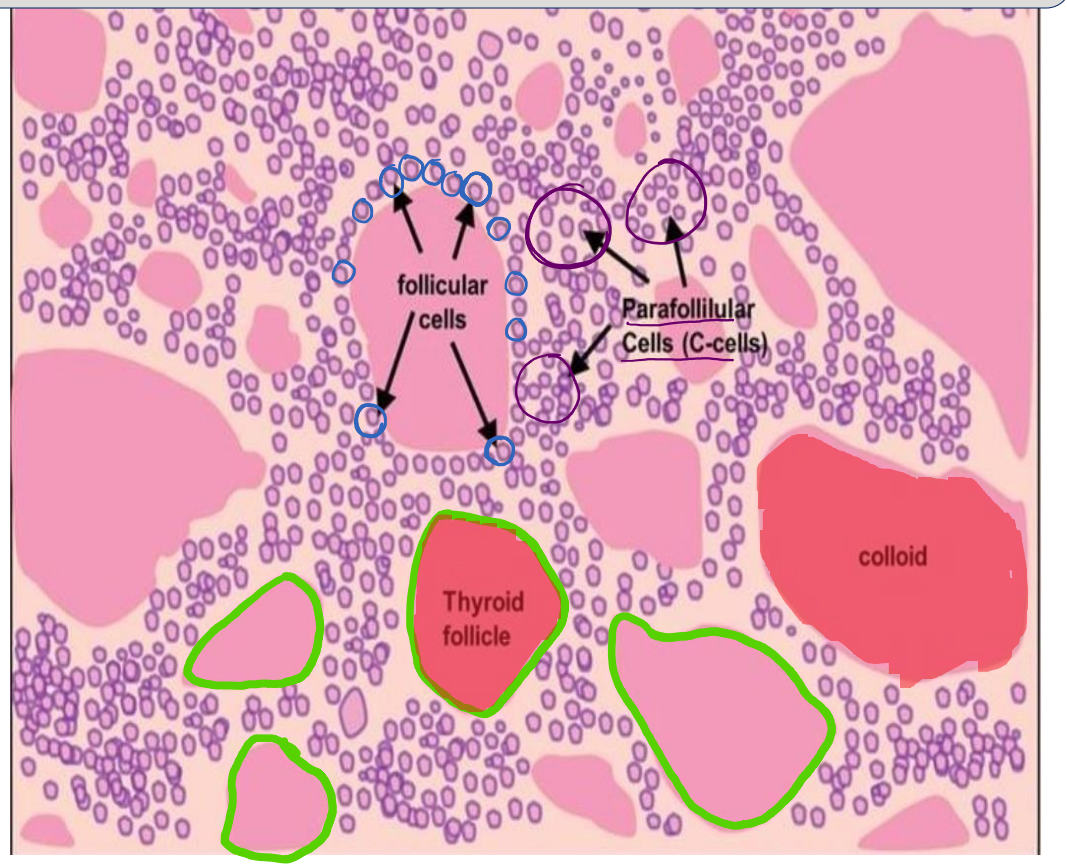
- Thyroid colloid contains the large glycoprotein **thyroglobulin---**the precursor for the active thyroid hormones.

We have 2 types of cells follicular cells and parafollicular cells
Q: which one is associated with hypothalamus and pituitary?
Ans: Follicular cells
Q:Follicular cells have receptors for____
Ans :TSH
*** TRH receptors are on thyrotropin cells in pituitary**

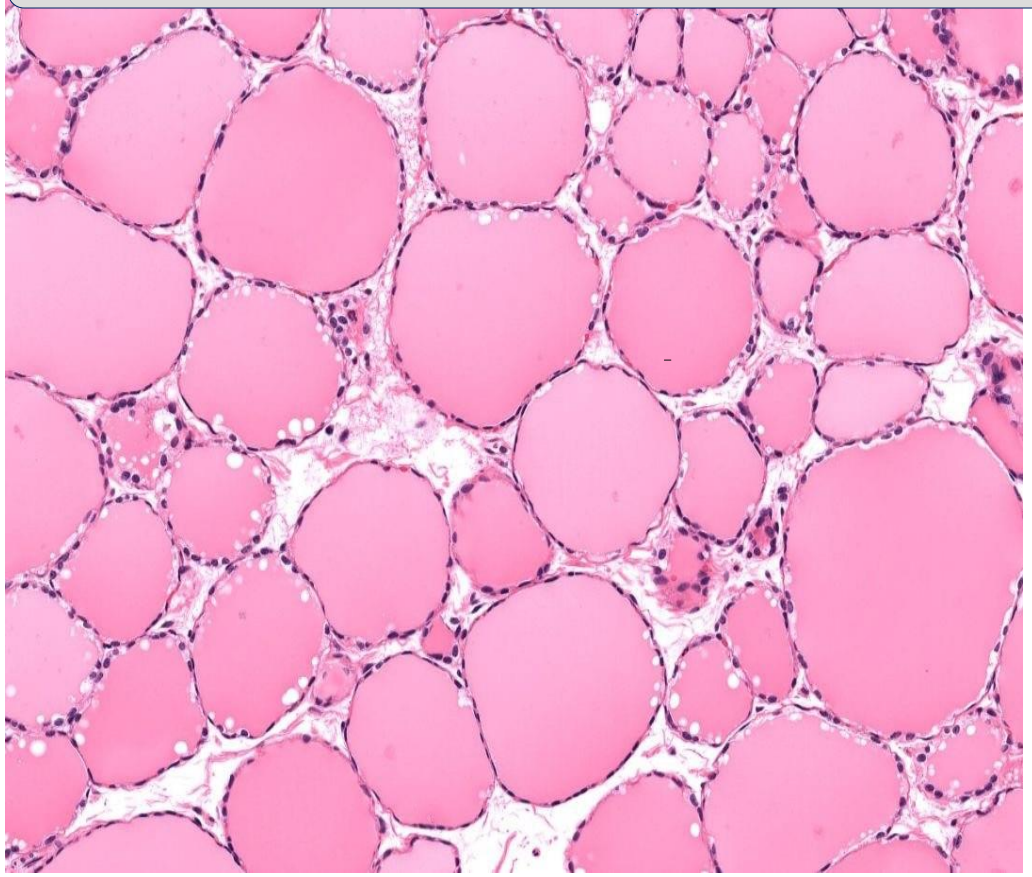
HISTOLOGY

A section in thyroid gland will appear as such

They are Flattened follicular cells however this section shows them as rounded cells



Flattened follicular cells indicate inactivity



Follicles with different diameters

colloid where thyroid hormones are stored in large quantities

Follicular cells :simple cuboidal epithelial cells which decided to be glandular surrounding

Parafollicular cells or C- cells they have a role in Ca homeostasis

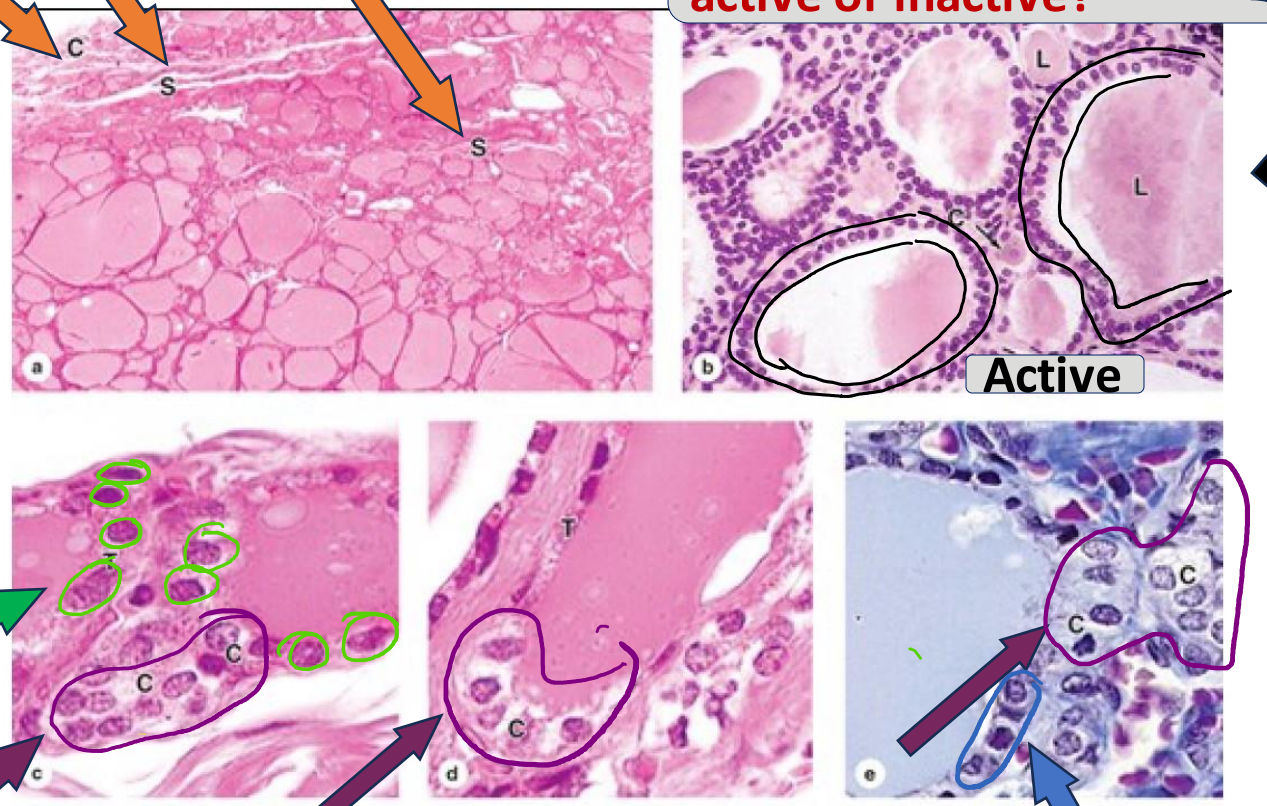
Thyroid Histology

- Capsule: thyroid has a capsule blinds with the visceral layer of deep facial, it sends its septa, developing compartmentalisation
- Incontrast to pituitary, which is delicate small and has thin capsule with no septa

- Ianactive cells are flattened more or less squamous , they have less cytoplasm.
- Where as active cells look rounded big cuboidal cells
- The size of cytoplasm indicates the activity of the cells

ParaFollicular cells are bigger and lightly stained cells , look like empty cells

What Do you think is it active or inactive?



(a) thin capsule (C), septa (S).
(b) The lumen (L), present are large pale-staining parafollicular or C cells (C).
(c-e) Thyrocytes or follicular cells(T) from parafollicular C cells (C) by their smaller size and darker staining properties

Thyrocytes or follicular cells

Thyroid Follicular Cells And Parafollicular Cells.

- Is covered by a fibrous capsule--- septa.
- Follicles are densely packed together--- sparse reticular connective tissue.
- Stroma is very well vascularized with fenestrated capillaries.
- The follicular cells, or thyrocytes, range in shape from squamous to low columnar (activity related—TSH).
- The cells exhibit organelles indicating active protein(thyroglobulin) synthesis
- The nucleus is generally round and **central**.
- rER are basally.
- **Apically**: Golgi, granules(which contains hormones and lysozymes), and other organles.

Parafollicular Cells.

Where these cells are

- Parafollicular cell (C cell), is also found inside the basal lamina of the follicular cells(shareing the same basal lamina) or as isolated clusters between follicles

They have a different origin

- Derived from the neural crest or **endoderm (mainly) between th 4th and the 5th pouch**!!!!!

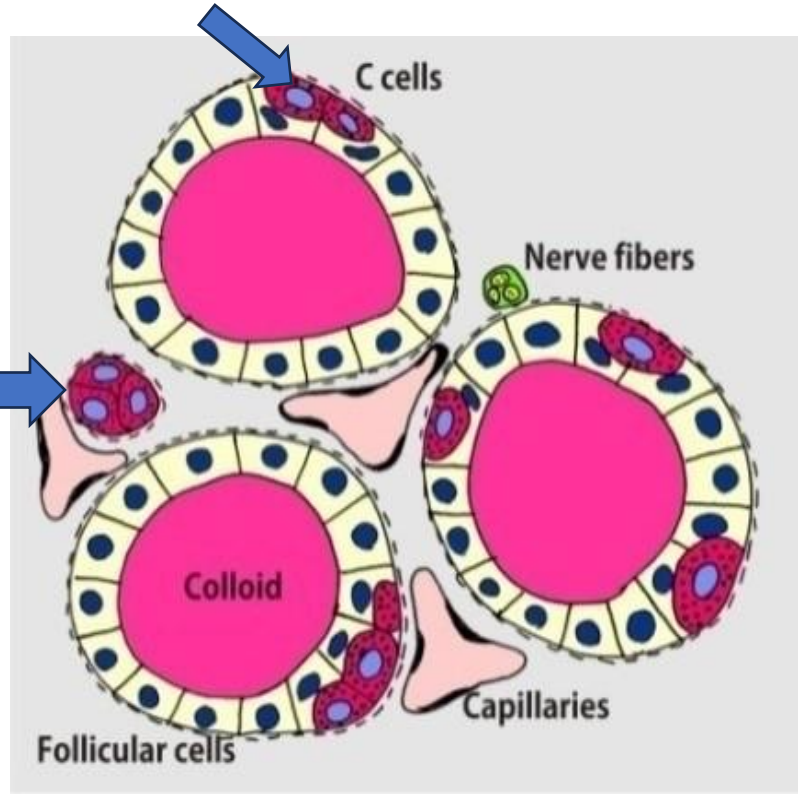
How you can differentiat between them

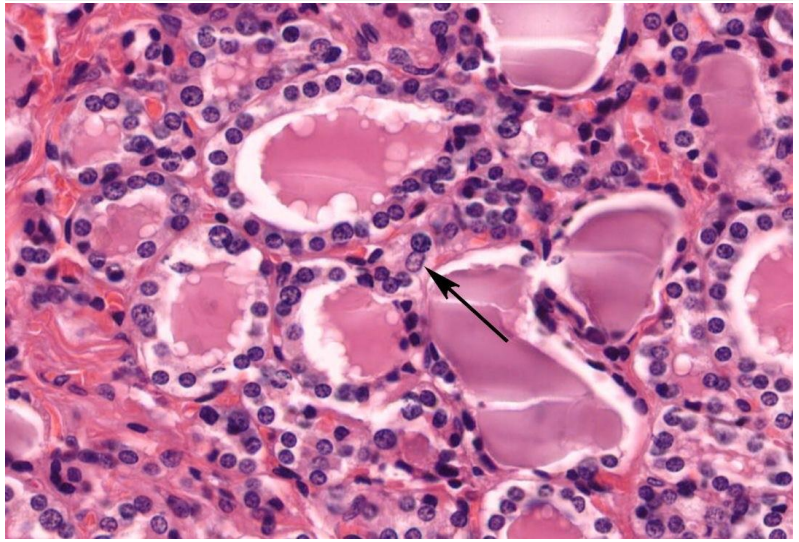
- Somewhat larger than follicular cells and stain less intense, with bigger nucleus farther from colloid lumen

While follicular cells come with smaller nucleus, more eosinophilic closer and contact with colloid

•Smaller amount of rER, large Golgi complexes, numerous small granules containing **calcitonin**.

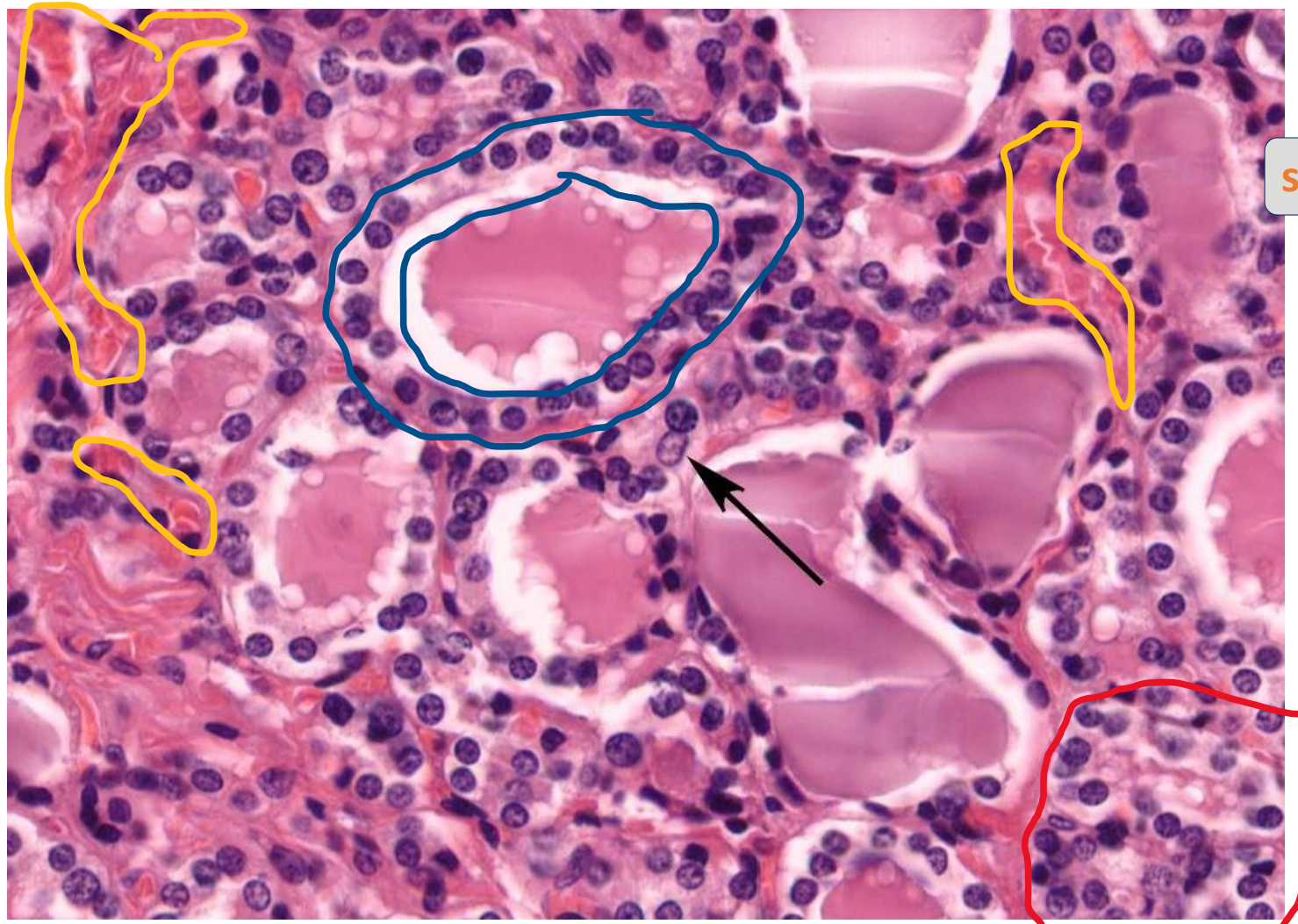
- Secretion of calcitonin is triggered by **elevated blood Ca^{+2}** levels, and it inhibits osteoclast activity.





What Do you think is it active or inactive?

Active



sinusoid

parafollicular

Production of thyroid hormone & its control

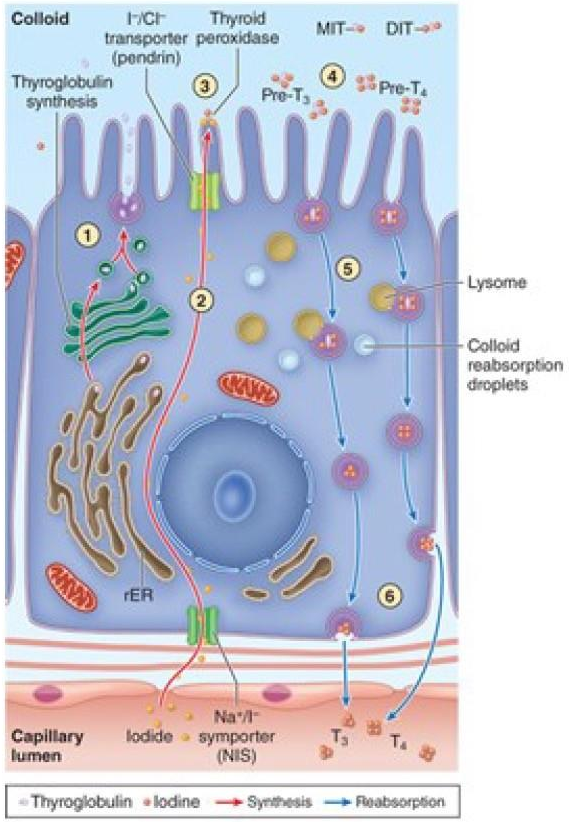
These 3 slides have been already discussed in biochemistry, so you won't be asked about it here 😊

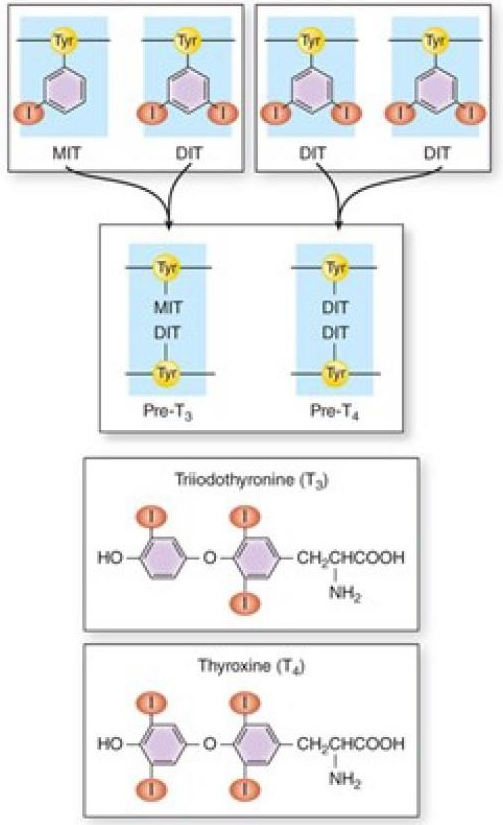
The major activities of this process

- The production of **thyroglobulin** (140 tyrosyl residues)
- The uptake of iodide (30-fold concentration)
- Iodination of tyrosyl residues (oxidation of iodide)
- Formation of T3 and T4
- Endocytosis of iodinated thyroglobulin (lysosomal proteases)
- Secretion of T4 and T3

Skip

Production Of





Involve an unusual, multistage process in the thyrocytes---with both an exocrine/ endocrine phases promoted by TSH. and occur in the same cell.

- The diagram shows the multistep process by which thyroid hormones are produced via the stored thyroglobulin intermediate. In an exocrine phase of
- The process, (1) the glycoprotein thyroglobulin is made and secreted into the follicular lumen and (2) iodide is pumped across the cells into the lumen.
- In the lumen (3) iodide is converted to iodine by membrane-bound thyroid peroxidase and added to tyrosine residues of thyroglobulin (4) to form monoiodotyrosine (MIT) or diiodotyrosine (DIT), which are then covalently coupled to form t3 and t4 still within the glycoprotein. The iodinated
- Thyroglobulin is then (5) endocytosed by the thyrocytes and degraded by lysosomes, (6) releasing free active T3 and T4 to the adjacent capillaries in
- An endocrine manner. Detailed steps are given in the text. Both phases are promoted by TSH and may occur simultaneously in the same cell.

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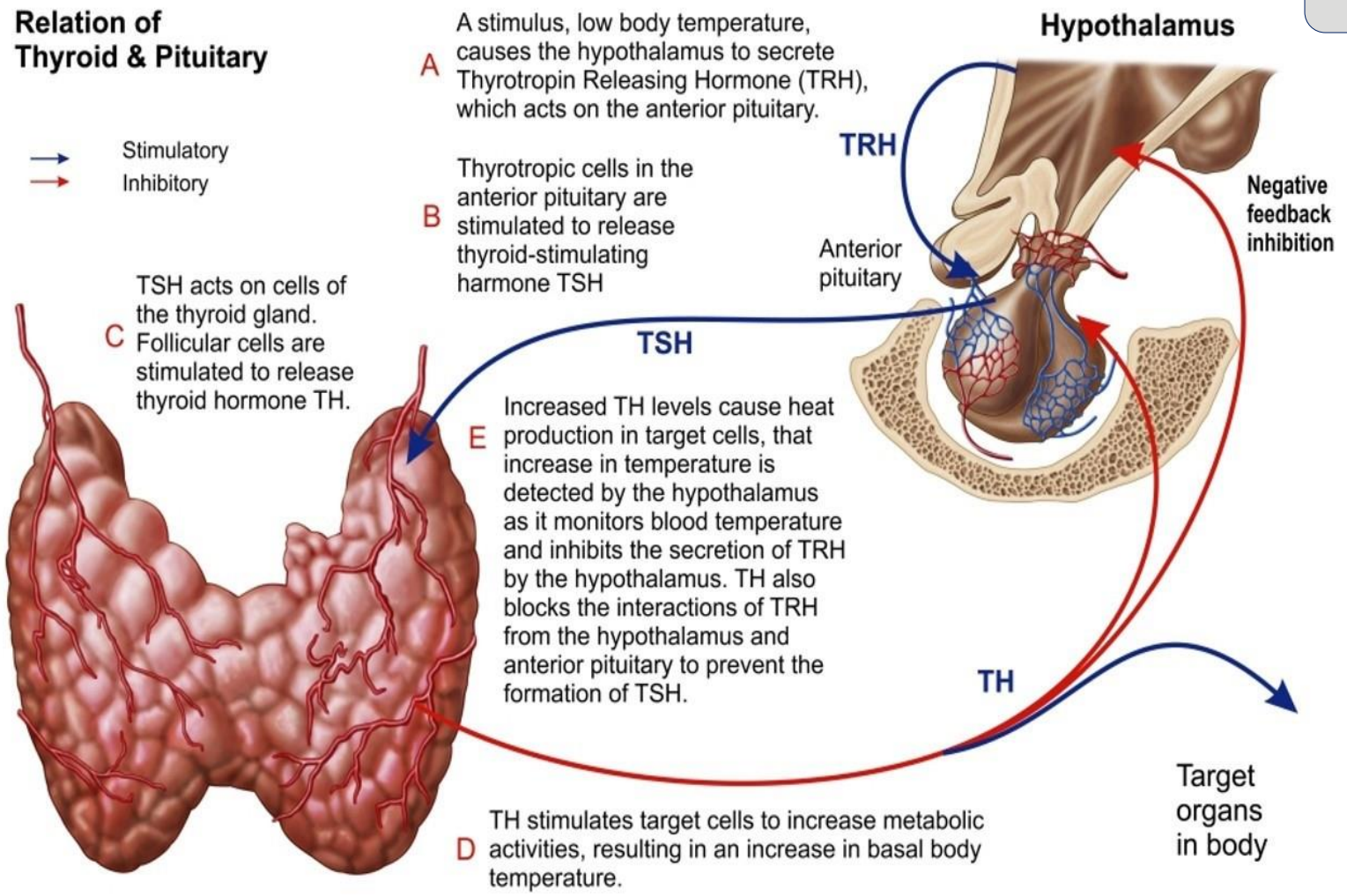
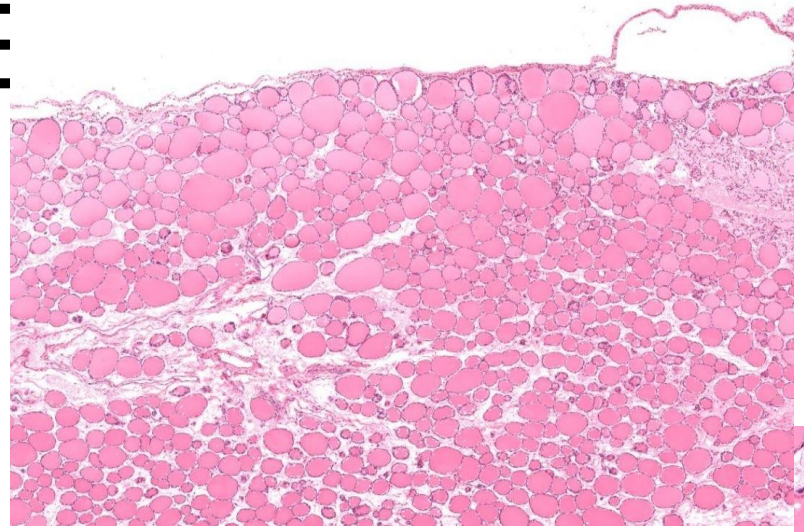
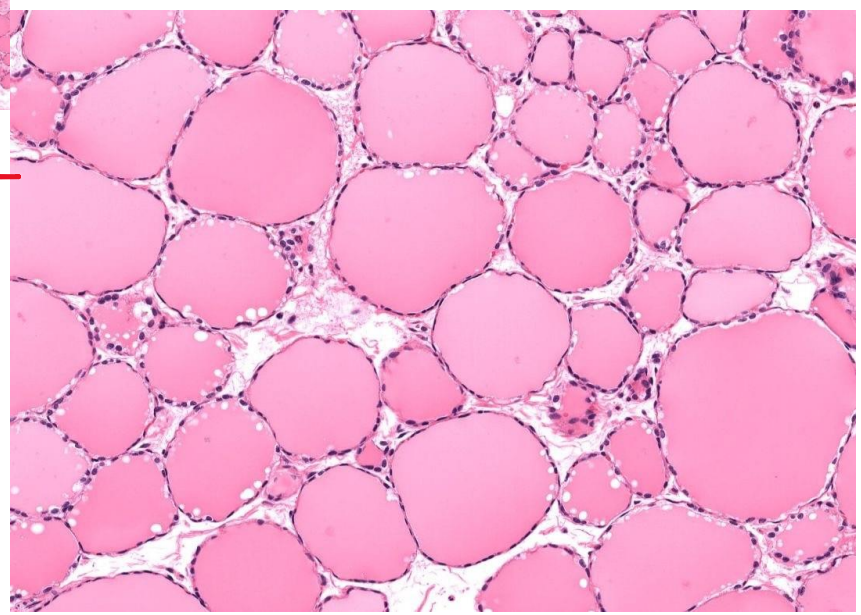
Negative Feedback Loops Affecting Anterior Pituitary Secretion



THYROID: ACTIVE OR INACTIVE?





Quite packed with the colloid

-There are 2 capsules around the thyroid which sends in septa inside to —> separate the tissue inside (more into smaller compartments)

-But around the follicles we don't have much connective tissue (septa)—>we just have some reticular fibers to support them

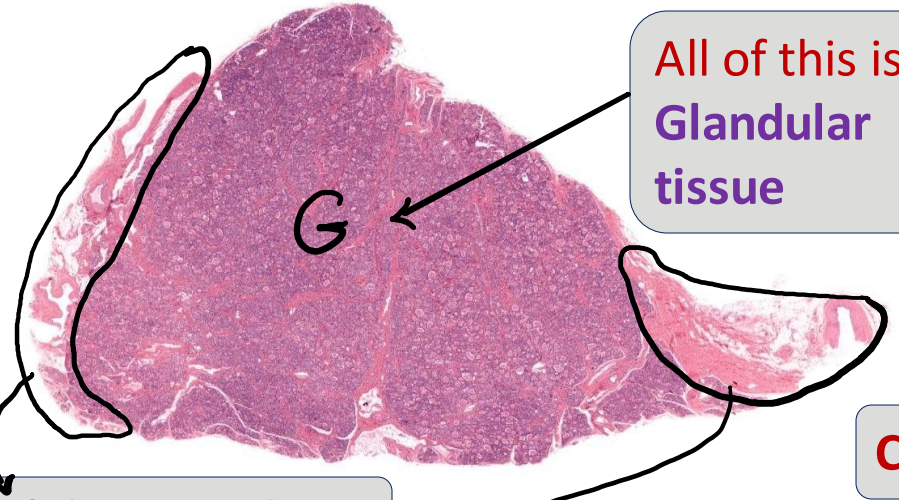
That makes sense as a High amount of connective tissue -> might interval with the transport of the hormones

***So just a small amount of reticular fibers present**

Other than that:

***In each part of the gland we will see an amount of connective tissue in the form of Septa**

This isn't the whole thyroid , it's just a small chamber

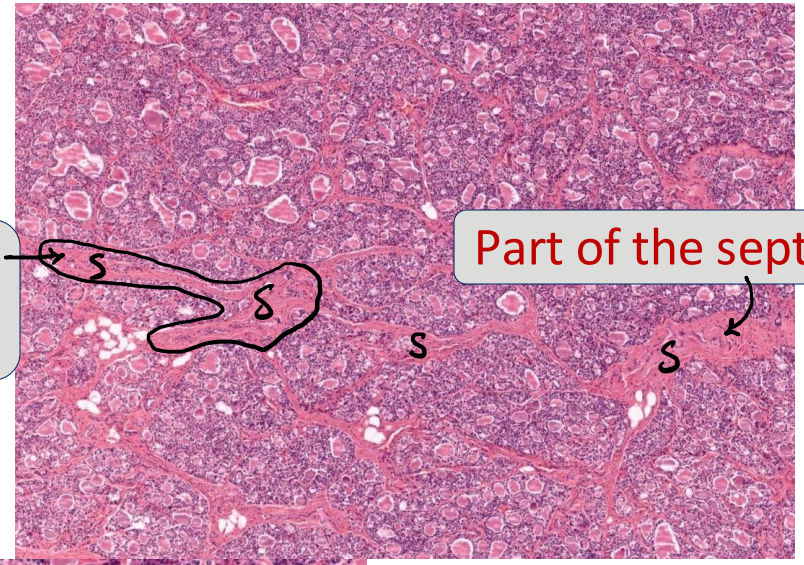


All of this is a **Glandular tissue**

Part of the **Capsule**

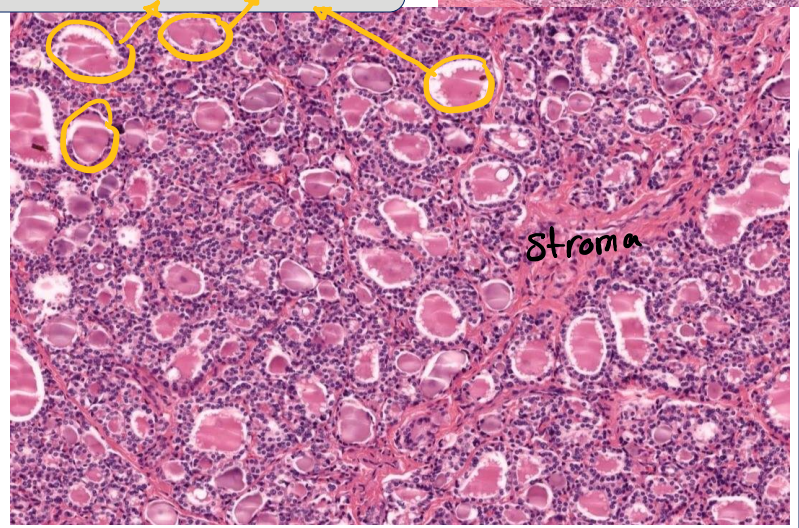
Septa=stroma

Pinkish to reddish(**STROMA**)



Part of the septa

Colloid inside the follicles



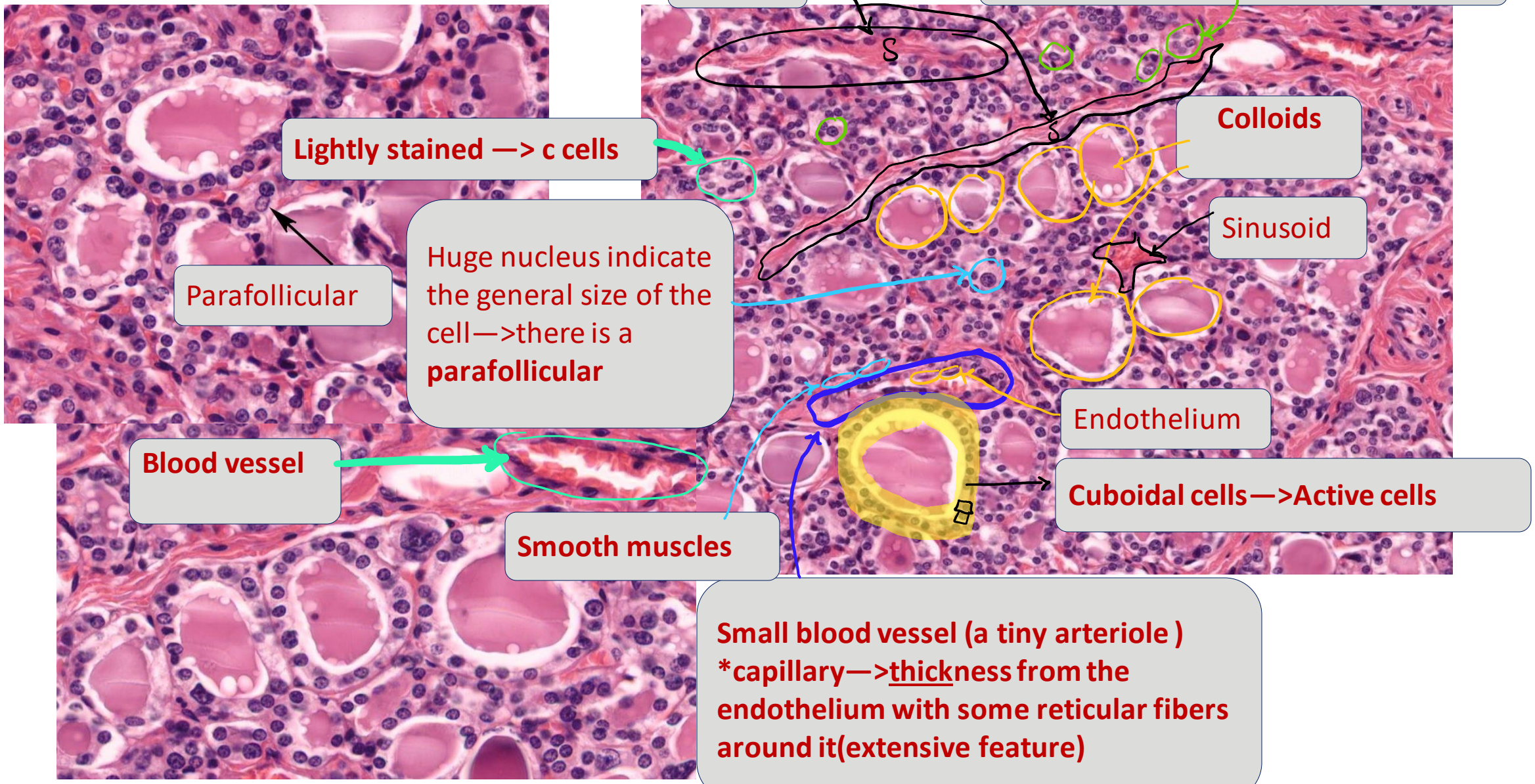
We can see here the parafollicular only, as all the cells are mixed so we can't see in this magnification which one which!!

****2 important terms in organs or glands in general:**
1)Stroma -> connective tissue part (supporting the gland)
2)Parynchema->functional cells
Ex: liver ->hepatocytes
Pancreas ->glandular tissue (exocrine& endocrine)
Thyroid->Follicular(Thyrocytes)& parafollicular

الصورة الجاي تم تكبيرها فظهر تفاصيل أكثر، معجوقة شوي بس بسيطة جدا ، امشو خطوة خطوة 🍿

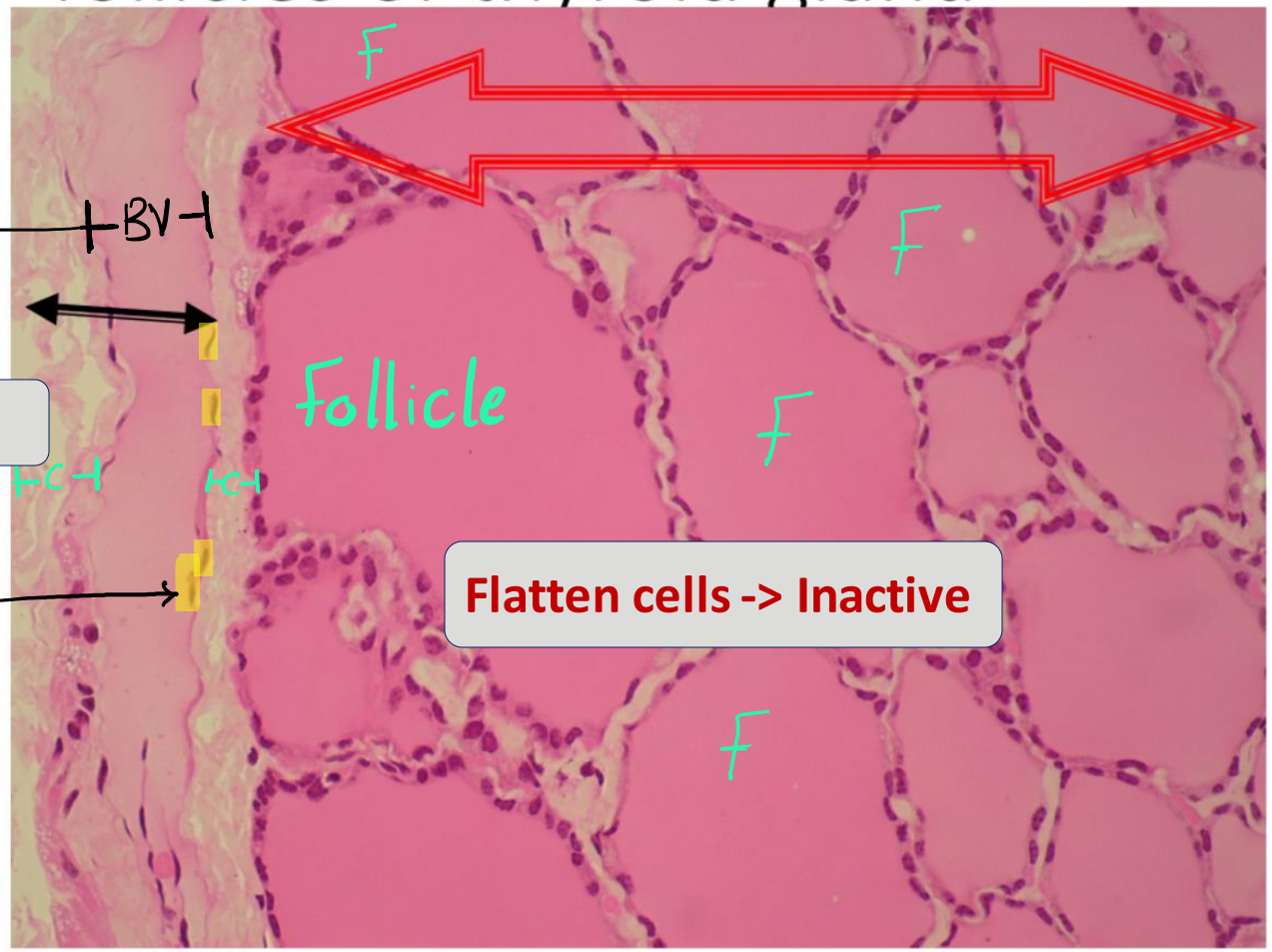
Higher magnification

Lumen in sinusoid relatively is big compared to the capillary's lumen



Small blood vessel (a tiny arteriole)
***capillary—>thickness from the endothelium with some reticular fibers around it(extensive feature)**

Capsule - follicles of thyroid gland



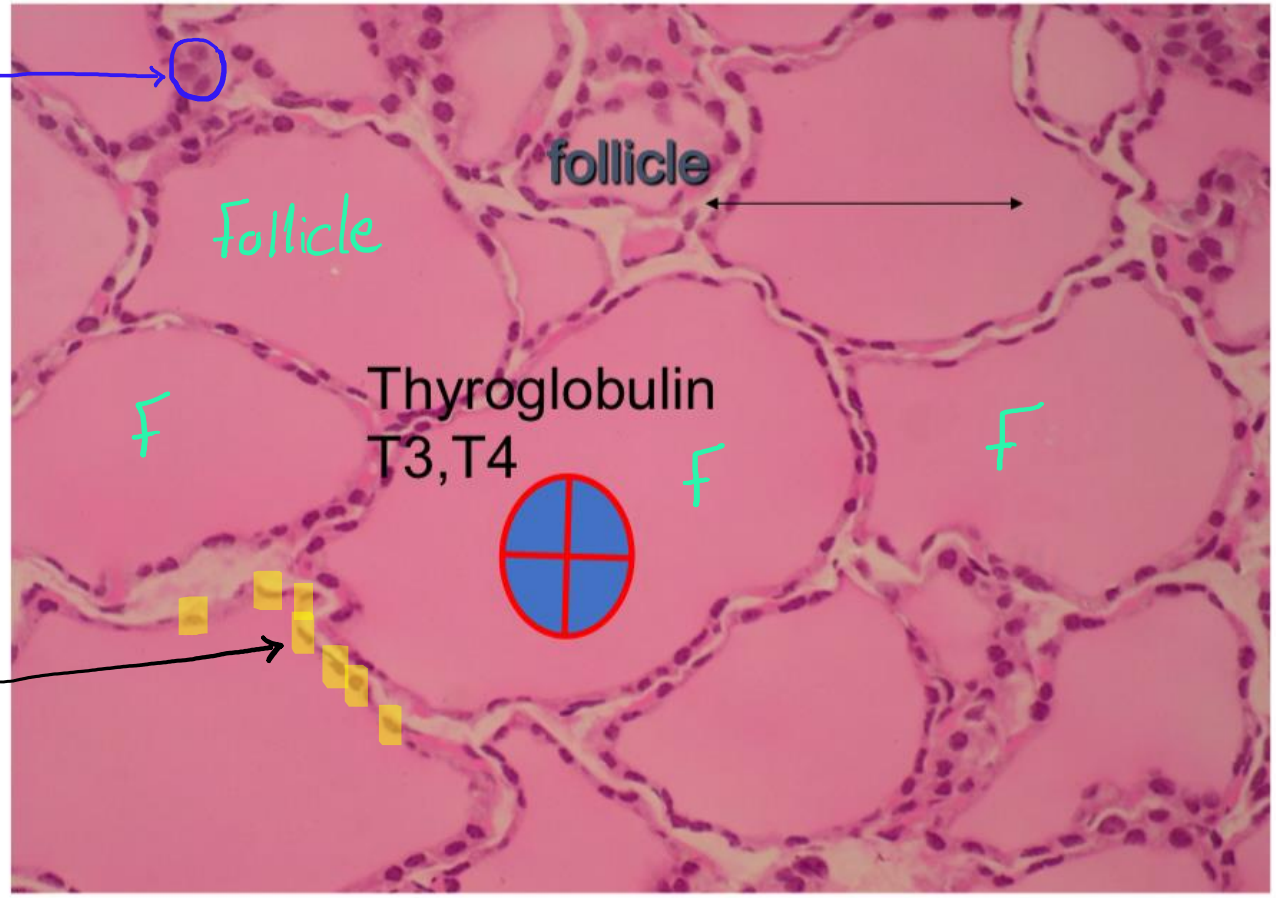
Blood vessel (small vein ->as it's bigger than the capillary)

The capsule

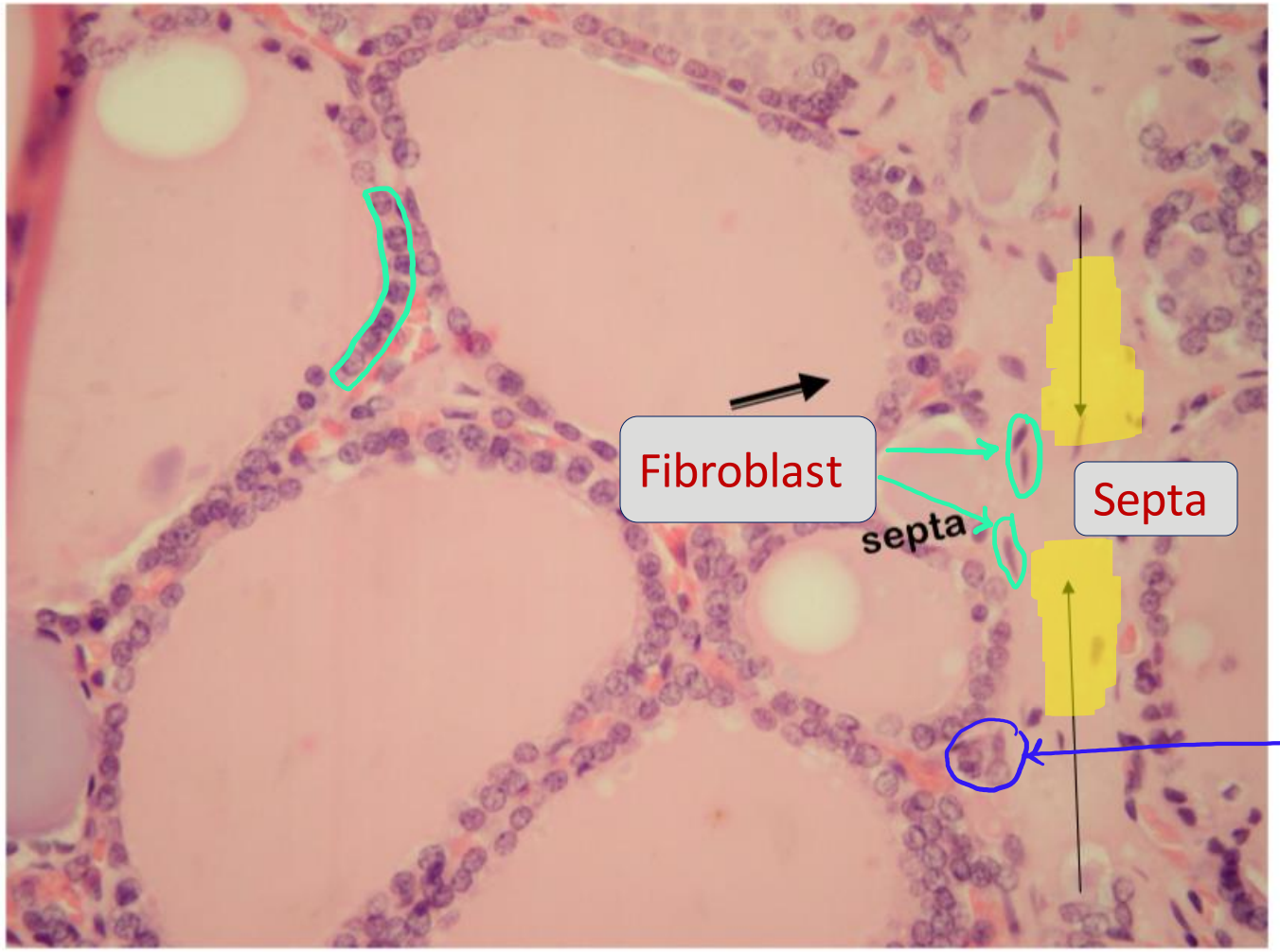
Flattened nuclei

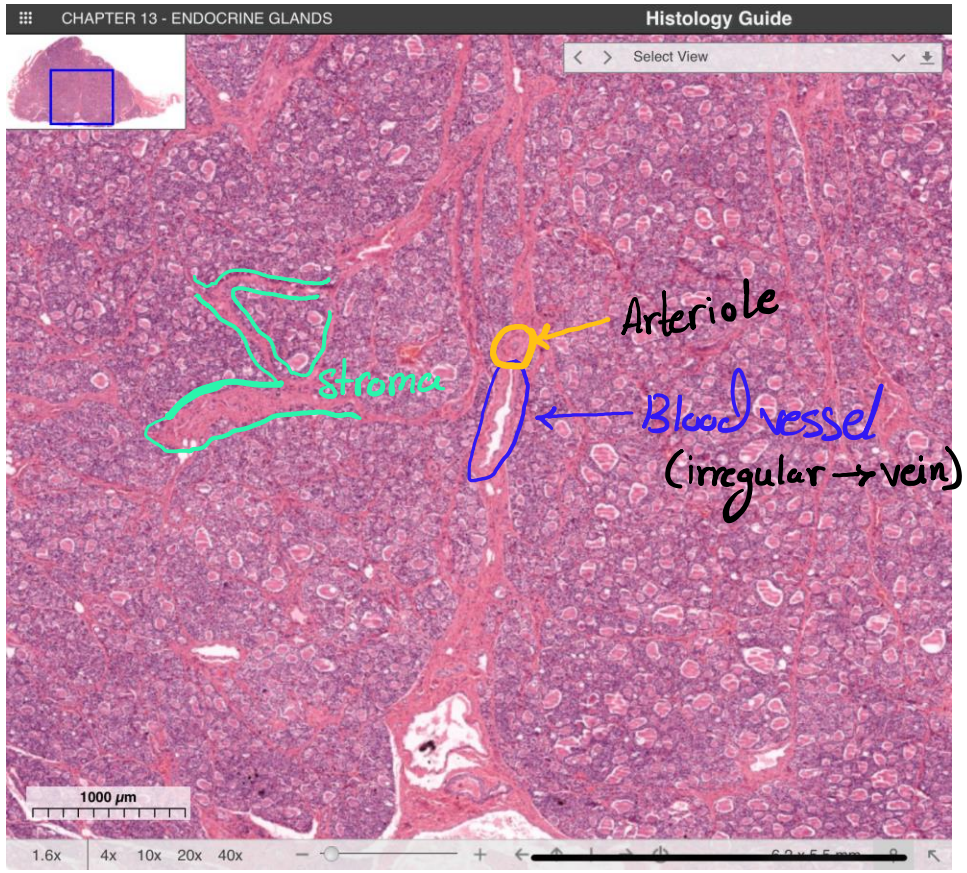
Flatten cells -> Inactive

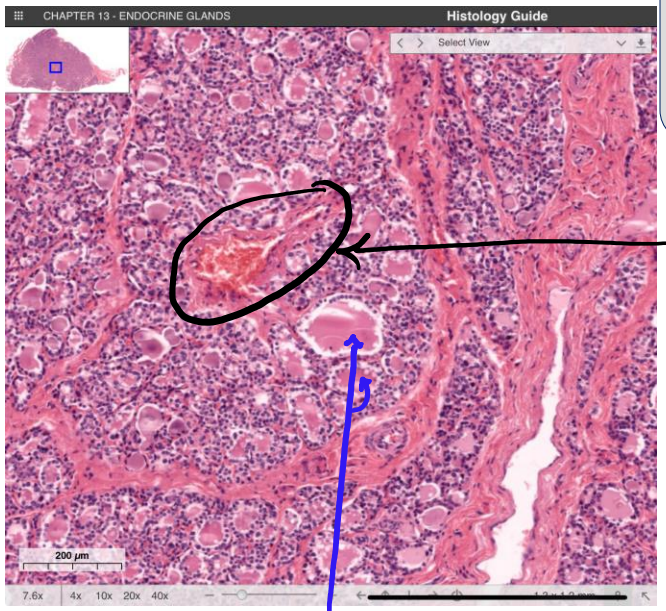
Resting(hypoactive)thyroid gl.



Cuboidal cells—> active



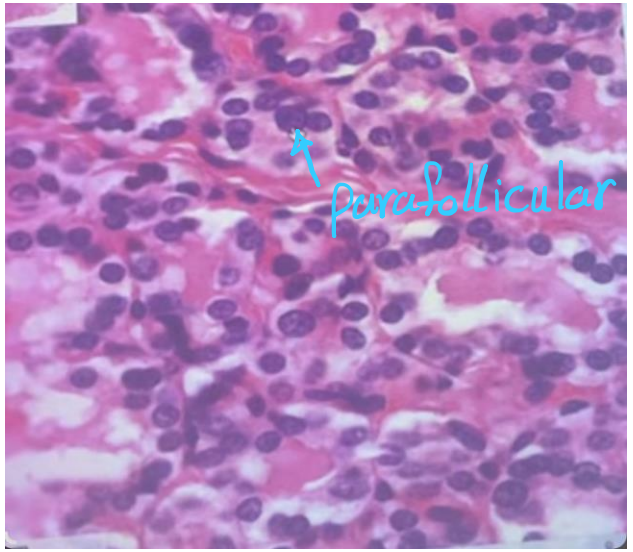


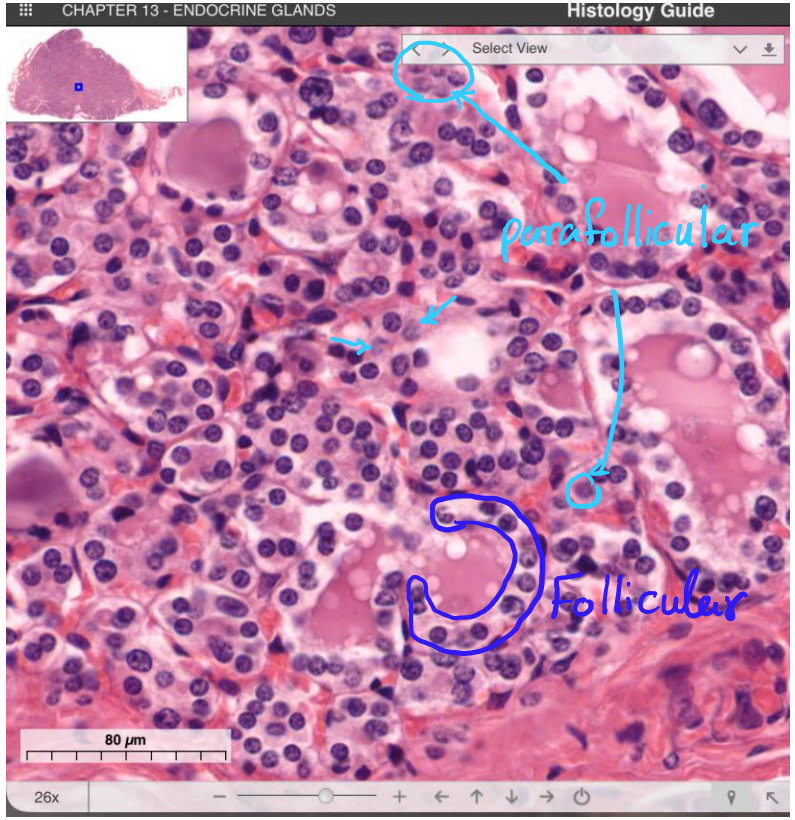


Histology website:
http://www.histologyguide.org/slideview/MH-151-thyroid/13-slide-1.html?x=15312&y=18575&z=24.8

Blood vessel (look at its thickness ->its thicker than the sinusoid)

Colloid surrounded by a follicular cells





اللهم يا قاضي الحاجات
ويا مجيب الدعوات ويا
مفرج الكربات اجعل لغزة
وأهلها من كل ضيق
مخرجا ومن كل هم فرجا
وكن لهم ولياً ونصيراً
يارب العالمين.