MED439
KING SAUD UNIVERSITY

Revised & Approved

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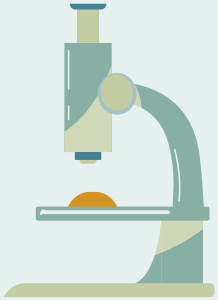


Histology Team
439

Thyroid & Parathyroid Glands

Color index:

Slides

Important

Doctors notes

Extra

Editing file

Objectives:

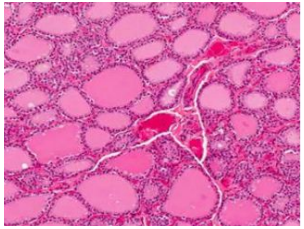
By the end of this lecture, the student should be able to:

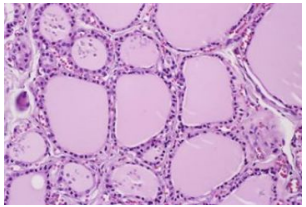
1. Describe the histological structure of thyroid gland.
2. Identify and correlate between the different endocrine cells in thyroid gland and their functions
3. Describe the microscopic structure of the parathyroid gland.
4. Describe the functional structure of the parathyroid cells.

Thyroid Gland

Stroma

1- Capsule: dense irregular collagenous C.T.
2- Septa (Interlobular septa).
3- Reticular fibers: collagen type 3
Thin reticular C.T. composed mostly of reticular fibers with rich capillary plexus surrounds each thyroid follicle. highly vascular





Parenchyma "thyroid follicles" Are the structural and functional units of the thyroid gland.

1- Simple cuboidal epithelium

A- Follicular (principal) cells 99,9% of cells

Function: Synthesis of thyroid. hormones (T4 & T3)

L/M: hundreds to thousands in number, variable in size, ranges from (200 nanometer to 1 micrometer)
- Simple cuboidal cells.
- Round and central nucleus with prominent nucleoli.
- Basophilic cytoplasm.
- Apical surface reaches the lumen of the thyroid follicle. Important in distinguish between them

E/M:
- Mitochondria.
- abundant RER. (synthesis of thyroglobulin)
- Supranuclear Golgi Complex.
- Numerous apically-located lysosomes.
- Numerous dispersed small vesicles
- The vesicles contain newly formed thyroglobulin. types 1-Secretory vesicles 2-pinocytotic vesicles (endocytosis)
- Numerous apical short microvilli. Increase surface area of secretion

B- Parafollicular cells (C cells) (Clear cells)

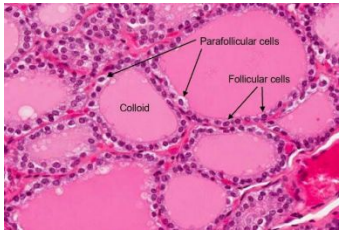
Function: Secrete calcitonin. Lower calcium level

L/M:
- Pale-stained cells (Clear Cells). Unstained
- Are found singly or in clusters in between the follicular cells.
- Their apices do not reach the lumen of the follicle.
- Are larger than follicular cells (2-3 times).
- Only 0.1% of the epithelial cells.
- Have round nucleus

E/M:
- Mitochondria.
- RER (moderate).
- Well-developed Golgi.

2- Colloid: central colloid-filled lumen.

N.B. Each follicle is surrounded by thin basal lamina.
Colloid : gel-like substance
Acidophilic - amorphous (مالو شكل)
Where thyroglobulin is stored



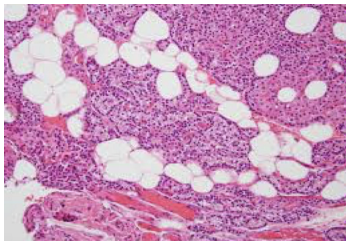
Parathyroid Glands

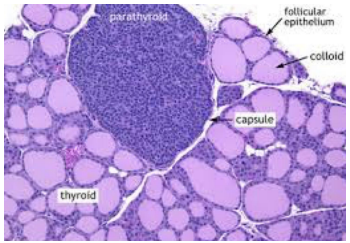
- They are 4 glands on the posterior of thyroid gland.

Stroma

1. Capsule: Each gland has its Thin capsule.
2. Septa: thin. Separate the gland into indistinct lobules
3. Reticular C.T. Reticular cells

NB; C.T. stroma in older adults often contains many adipose cells.



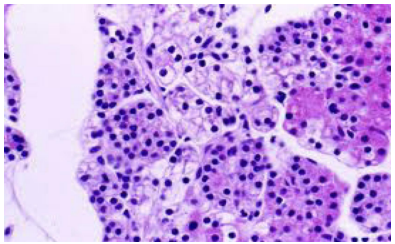


Parenchyma

The parenchyma is formed of cords or clusters of epithelial cells (chief cells & oxyphil cell) with blood capillaries in between. These cells are surrounded by reticular fibers.

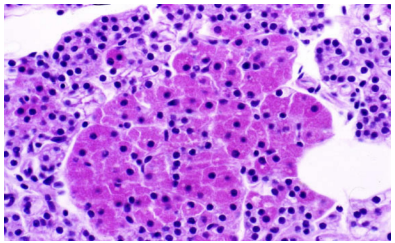
Chief cells

1- They are slightly eosinophilic.
Because: contain high amounts of lipids and glycolipid
2- are rich in rER.
3- They secrete parathyroid hormone (↑blood calcium). Have secretory granules.
Most numerous, smaller in size, polygonal in shape
Present in newborn and adult that's why it is principal cells.



Oxy= reddish Oxyphil cells elderly form of chief cells

1- They are arranged in groups or clusters or as isolated cells. Polygonal or rounded in shape
2- They are deep eosinophilic (acidophilic).
3- They have more numerous mitochondria.
4- They are less numerous but larger than chief cells.have almost no secretory granules
5- They are of unknown function.
N.B. (They may be inactivated chief cells).
Present only in adults older than 20



F Doctor's notes

Slide 3

• Thyroid gland in neck in front of the trachea. Its capsule is thick & just beneath the skin and that make it prone to injury. سهل وصول الإصابة لها لأنها قريبة من الجلد
• Any gland formed is of : (قاعدة ثابتة)
1. Stroma: formed of
    - Dense capsule CT (beneath the skin)
    - Septa thiner than the capsule
    - Blood capillaries : the secretion of gland يروح لكل tissue through the the blood capillary
    - Reticular fibers (type 3 collagen) thin so not stained well but it's seen by sliver stain
• The gland is butterfly shaped gland and under microscope there are many cross oval structures تشبه حبات البطيخ.
• All endocrine glands formed of cluster of cells EXCEPT thyroid gland have a unique structure "follicles"

2. Parenchyma:
    A- **Follicular (principal) cells**
        LM:
        - have prominent nucleoli which means it's active for hormone secretion
        - It guide the hormone synthesis and release the nucleus
        - the hormone is mainly protein which synthesized by ribosomes in cytoplasm or RER
        - Have short Microvilli to increase the surface area for absorption and secretion.
        EM:
        - Mitochondria = to supply energy
        - RER = to synthesize hormones
        - supra(مسافة)nuclear Golgi apparatus (between the cell membrane and the colloid) عشان تكون قريبة من ال colloid for secretion immediately.
        - Vesicles (secretory + for thyroglobulin)
        - Blood capillaries: for up taking material for synthesis of thyroid hormones and hormonal secretion into the circulation .
        - Cells never store active thyroid hormones only the inactive stored in the colloid .
    B- **Parafollicular cells (C or clear cell)**
        - LM: Clear : cytoplasm not stained.
        - EM: Well developed golgi apparatus for secretion of calcitonin. The calcium homeostasis is maintained by PTH - Calcitonin.
        حتى لو ع حساب الكالسيوم في العظام، اهم شي يكون مستواه في الدم طبيعي

F Doctor's notes

Slide 4

• **Parathyroid glands** are impeded in thyroid gland, they can be seen through dissection of thyroid gland (between the thyroid & trachea)
• They're mainly 4 right and left upper and right and left lower parathyroid glands (بعض الناس عندهم ٦)
• Formed of stroma and parenchyma.

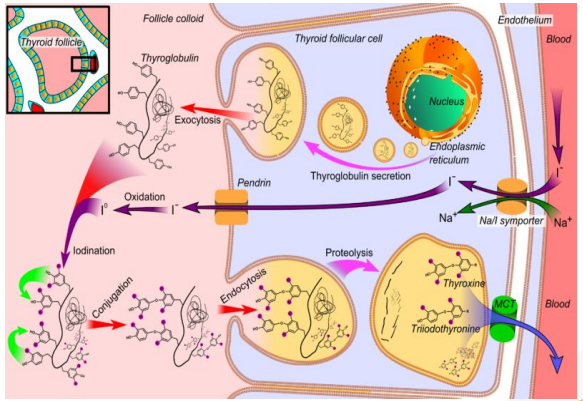
1. Stroma:
   - Capsule: very thin (unlike thyroid gland) because it's well protected by thyroid gland
   - Septa: very thin
   - Reticular CT

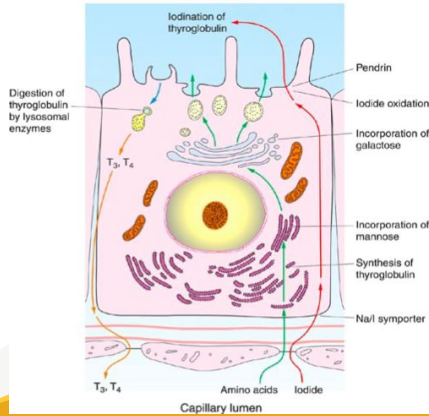
Older adults tend to have many adipose tissue in CT because the functional cells undergo atrophy & replaced by fat cells as they age.

2. Parenchyma: cords or cluster of cells
   - Oxyphils cells: pink
   - Chief cells: pale blue (also known as principal cells because they secrete PTH & represent the majority of cells of parathyroid glands)

M Doctor's notes [Helpful video]

T3&T4 synthesis:
iodide enter the cells (follicular cells) from plasma then oxidized to iodine by the action of peroxidase (intracellular),endoplasmic reticulum within cell secrete thyroglobulin which play important role then, iodine and thyroglobulin is secreted out of cells where iodination of tyrosine residues in thyroglobulin occurs in the lumen of the thyroid follicle in colloid also by the action of peroxidase (extracellular & intraluminal) and produce T3&T4





MCQs

Q1) Which of the following is a feature of follicular cell?
A- it's simple columnar epithelium
B- Basophilic cytoplasm.
C- Larger than parafollicular cells
D- it doesn't have vesicles

Q2) Which of the following is a feature of parafollicular cell?
A- it's simple columnar epithelium
B- Smaller than follicular cells
C- heir apices reach the lumen
D- found singly or in clusters

Q3) Which of the following secretes parathyroid hormone?
A- principal cells
B- Chief cells
C- Oxyphil cells
D- both B&C

Q4) Which of the following is found in the Parenchyma of Parathyroid Gland?
A- principal cells
B- Chief cells
C- Oxyphil cells
D- both B&C

Q5) Which of the following is a characteristic of oxyphil cells?
A- Rich in rER
B- Abundant mitochondria
C- Smaller than chief cells
D- Slightly eosinophilic

Q6) What is the cell responsible for the secretion of Calcitonin?
A- Follicular cells
B- Parafollicular cells
C- Oxyphil cells
D- Chief cells

Q1: B
Q2: D
Q3: B
Q4: D
Q5: B
Q6: B

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