Identification of Endocrine glands

1. Pineal gland

Introduction:

The pineal gland, also called the epiphysis cerebri, is a small pine cone-shaped gland located on the posterior end of the roof of the third ventricle. This gland is a part of the epithalamus and is responsible for the synthesis of two biogenic hormones – melatonin and serotonin.

Identifying characters:

1. Covered by a layer of connective tissue (pia mater) which projects inward to divide the gland into lobules.
2. Under low magnification uniform parenchyma cells with few blood vessels were observed; however, in the sample of older individuals darkly stained irregular shaped calcified concentration called the brain sand (corpora arenacea) could be observed. the brain sand is the most distinctive feature of the pineal gland.
3. At high magnification, two cell types with different nuclei were observed-
   a. 95% of the cells had a large, round, and lightly stained nucleus. It had peripheral processes and irregular shapes. (The Pinealocytes).
   b. Small dark nucleus and long peripheral process. (the astrocytes).
4. Some fenestrated blood capillary was also visible.

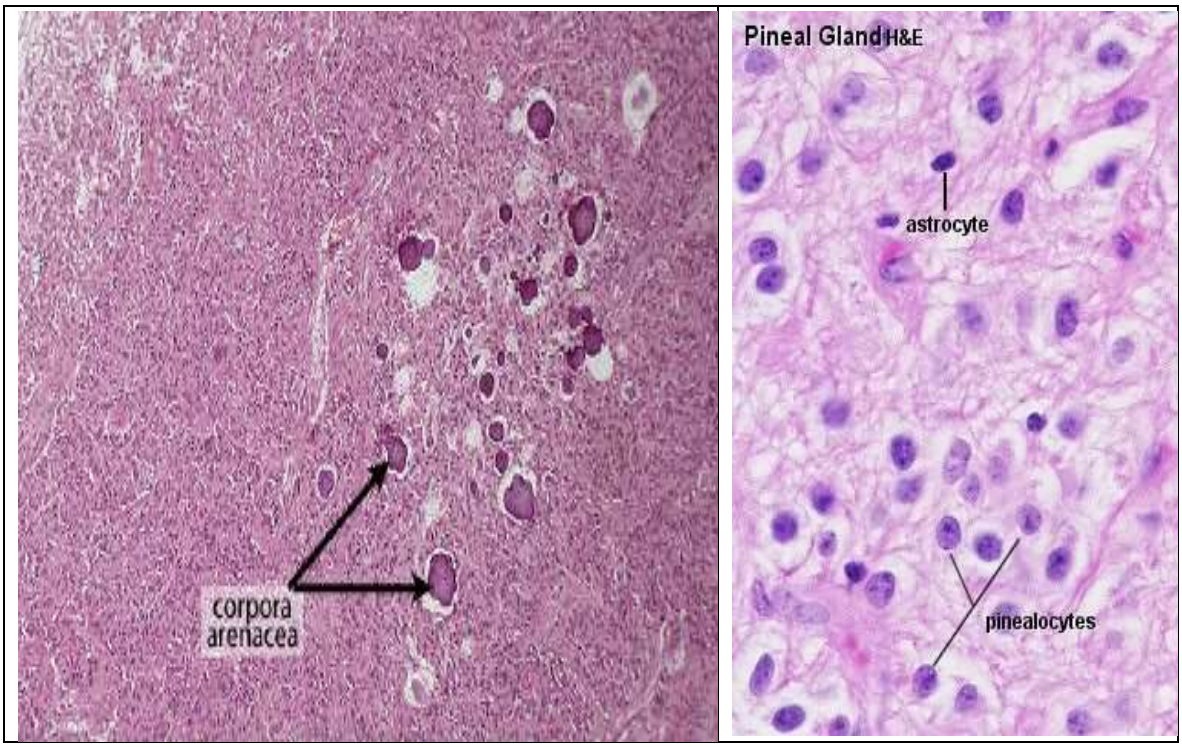


Figure 1:Brain sand (corpora arenacea) in the parenchyma of pineal gland. most of the parenchyma is composed of pinealocytes (left panel). Pinealocytes with pale staining nucleus and astrocytes with dark nucleus (right panel).

2. Pituitary

Introduction:

The pituitary is a bilobed gland located the cavity of sella turcica of the sphenoid bone. The two lobes have different structures and embryological origins. The posterior part, also called the pars nervosa, originates from the hypothalamus and is responsible for the secretion of oxytocin and vasopressin. The anterior pituitary, also called pars distalis, originates from pharynx as Rathke's pouch and joins the posterior pituitary. The anterior pituitary is responsible for the synthesis of a number of hormones called tropic hormones which control the secretion of other endocrine glands.

Identifying characters:

1. Two differently stained lobes could be observed under low power -
    a. A darkly stained region with closely packed chords of cells of a varying range of nuclear-cytoplasmic ratios and staining properties. (Anterior pituitary)
    b. A lightly stained region with few cells and lots of nerve cell processes (axons). (posterior pituitary)
1. In the darkly stained part (anterior part) three different types of cells could be observed; based on staining property-
    a. Acidophils- Stains pink with HE stains. (Represents Somatotrophs and Mammotrophs.)
    b. Basophils- Stains purple with HE stains. (Represents Corticotrophs, Thyrotrophs, and Gonadotrophs.)
    c. Chromophobes- Poorly stained cells. (Represents degranulated or resting acidophils or basophils.)
2. In the lightly stained region, the following was observed-
    a. Chords of nonmyelinated axons.
    b. Few scattered nucleated cells called the Pituicytes.
    c. Special non-nucleated, spherical structures with secretary granule- called the Herring body

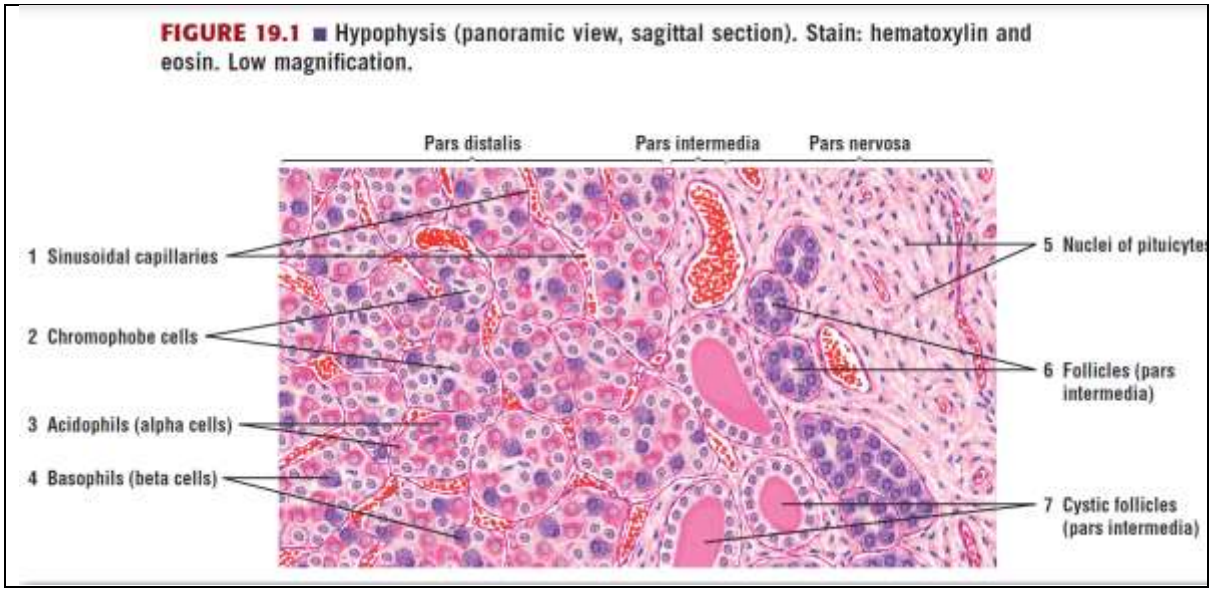


FIGURE 19.1 ■ Hypophysis (panoramic view, sagittal section). Stain: hematoxylin and eosin. Low magnification.

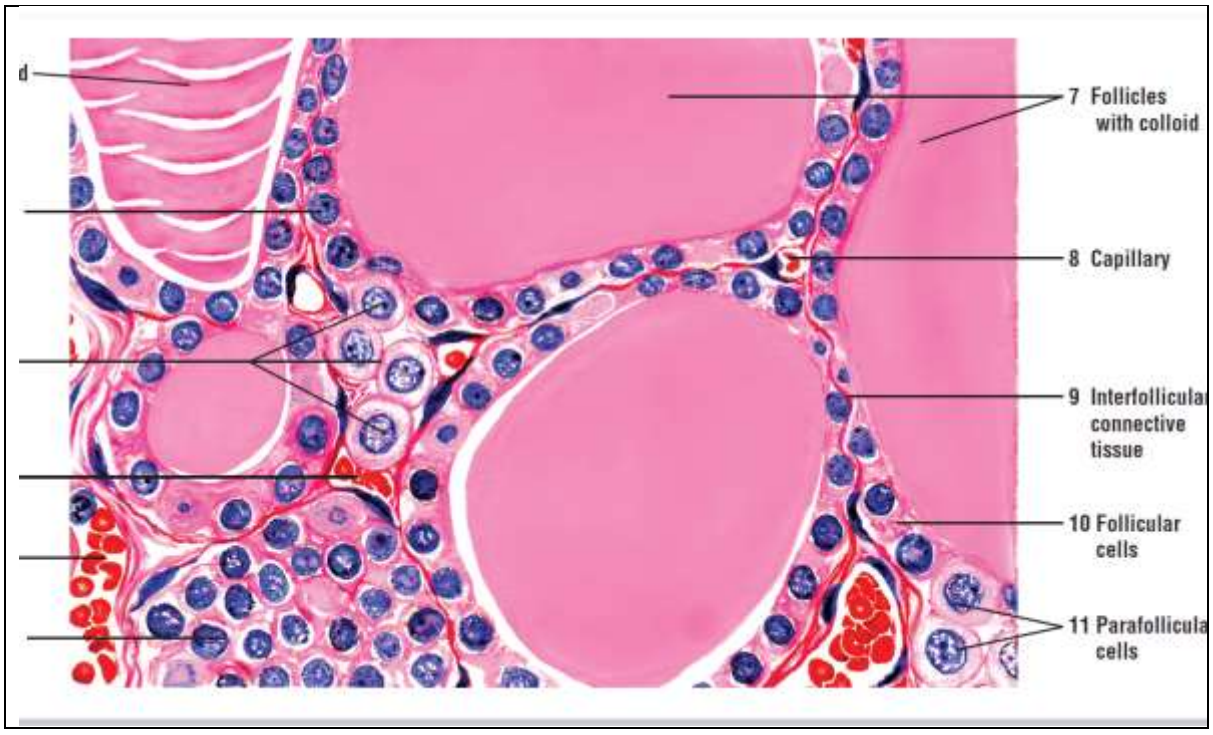
3. Thyroid

Introduction:

The thyroid gland is a bilobular endocrine gland situated in front of the neck inferior to the larynx. The gland is responsible for the synthesis of hormones T3, T4, and calcitonin.

Identifying characteristics:

1. Encased by a thin connective tissue capsule that extends inward and divides the gland into lobules.
2. Each lobule was found to contain a cluster of follicles like structures called the thyroid follicles.
3. Each follicle was surrounded by a single layer of cuboidal or low columnar epithelial cells (called the follicular or principal cells) resting on a basement membrane.
4. Eosin positive, pink colloidal substance called thyroglobulin was noted in the lumen of each follicle. (*The follicular cells appear purple in colour with HE stains. The inactive follicular were with large lumens, abundant colloids, and appear solid. In contrast, active follicles small with little or no colloid.)
5. Follicles were embedded in thin connective tissue stroma with a rich supply of fenestrated capillaries.
6. Between follicles poorly stained cells or the C- cells or Clear cells were also noted. These cells are responsible for the synthesis of calcitonin.



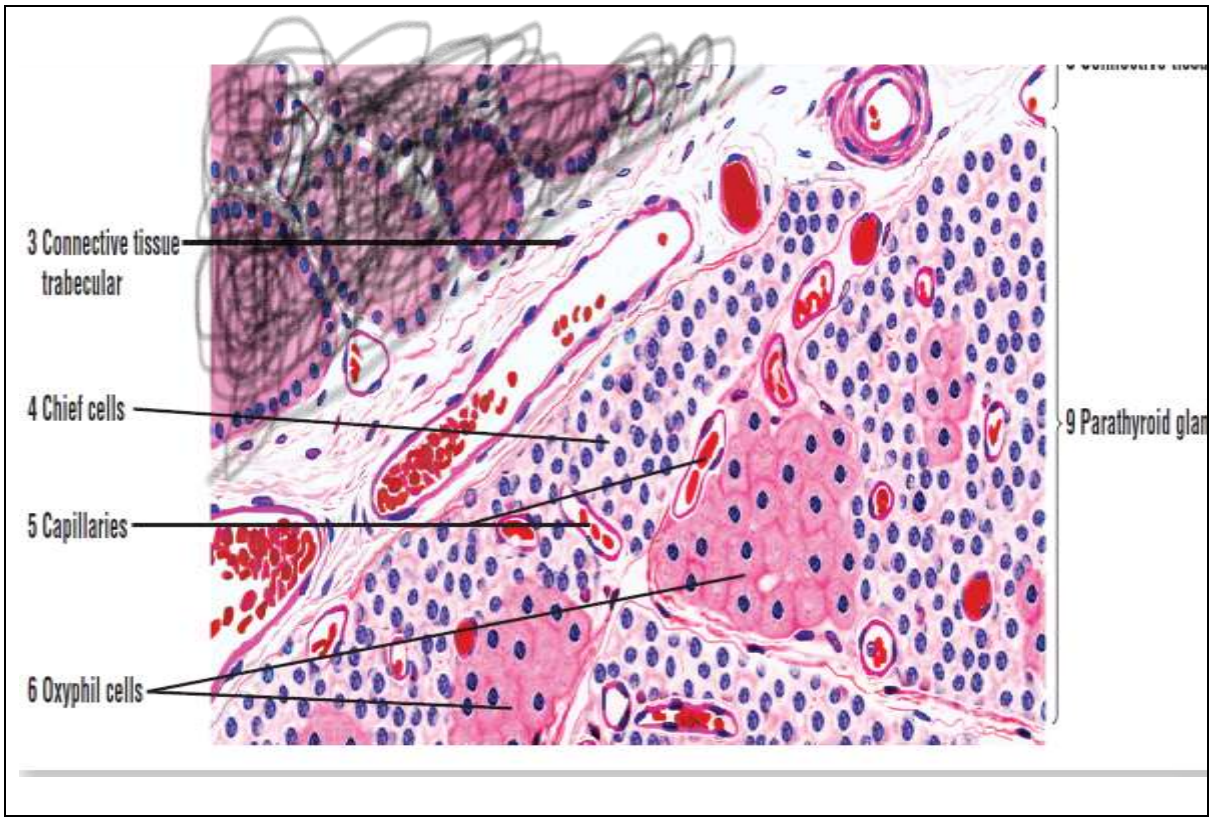
4. Parathyroid glands

Introduction:

These are four small pea-shaped glands located posterior aspects of the thyroid gland embedded in the connective tissue to the thyroid gland itself. These endocrine glands are responsible for the secretion of parathormone and calcium homeostasis.

Identifying characters:

1. Encased by a thin connective tissue capsule that extends inward and divides the gland into irregular lobules.
2. Each lobe was found to contain compact cells of three different types 1. Chief cells 2. Oxyphil cells 3 Adipose cells, embedded in reticular connective tissue. Sometimes a 4th cell type could also be observed; the water clear cells.
3. Chief cells- polygonal cells with a central round nucleus; lightly stained (clear) cytoplasm with granules of parathormone; these cells are smaller than other cell types. May have intracellular fat.
   (The chief cells may sometimes form pseudo follicles.)
4. Oxyphil cells- intermediate in size; have eosinophilic (acidophilic) cytoplasm with pink stain without granules. Appear at puberty as single cells, then as pairs of cells, and by the age of 40, they form nodules.
5. Adipose cells- large white cells with fat deposit and without a distinct nucleus.



5. Pancreas

Introduction:

The pancreas is a leaf-shaped digestive gland located behind the stomach, extending from the C-shaped region of the duodenum up to the spleen. The pancreas is also called a mixed gland because it contains both exocrine and endocrine parts. The functional unit of the exocrine part is called the pancreatic acini – responsible for the secretion of digestive enzymes. The endocrine part, responsible for the synthesis and secretion of hormones, is called the islets of Langerhans.

Identifying charters:

1. Covered by a thin capsule of loose connective tissue which extends inward to divide it into polygonal lobules. The lobules through polygonal roughly resemble a triangle.
2. In the intralobular region blood vessels, nerves, and interlobular ducts were observed.
3. The majority of the observed field was composed of clusters of darkly stained pyramidal cells that encircles a small central lumen; these cell clusters are called the pancreatic acini. The acinar cells have a broad base and narrow apical surface. The cytoplasm contains zymogen granules of digestive enzymes.
4. Duct systems of various degree could be observed.
5. Clumps of lightly stained cells containing fenestrated capillaries and surrounded by a delicate capsule (The islets of Langerhans) was noted.
6. Although the islets contain 3 types of cells it is hard to identify different cell types using, HE staining.

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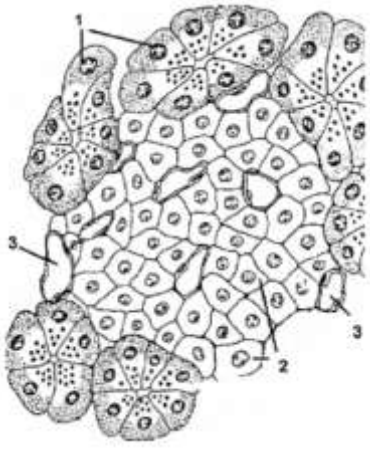
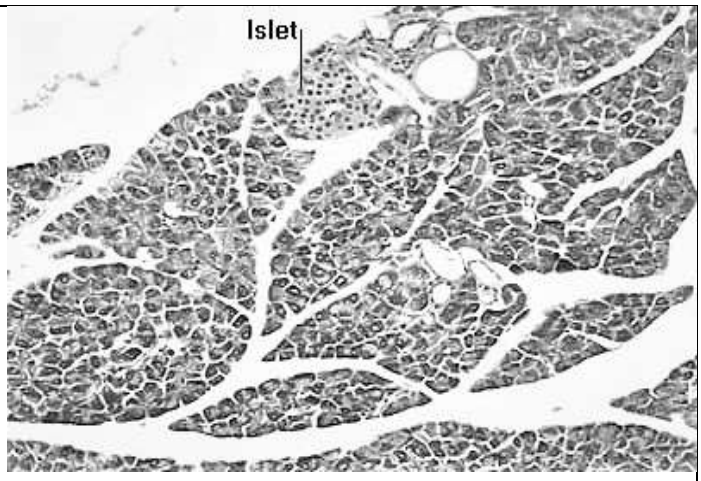
<tr><td> 
</td><td> 
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<tr><td>1-exocrine acinar cells; 2-endocine islet cells; 3-capillaries</td><td>Pancreas at low magnification showing the lobules and islets.</td></tr>
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Figure 2: Histology of pancreas under high and low magnification

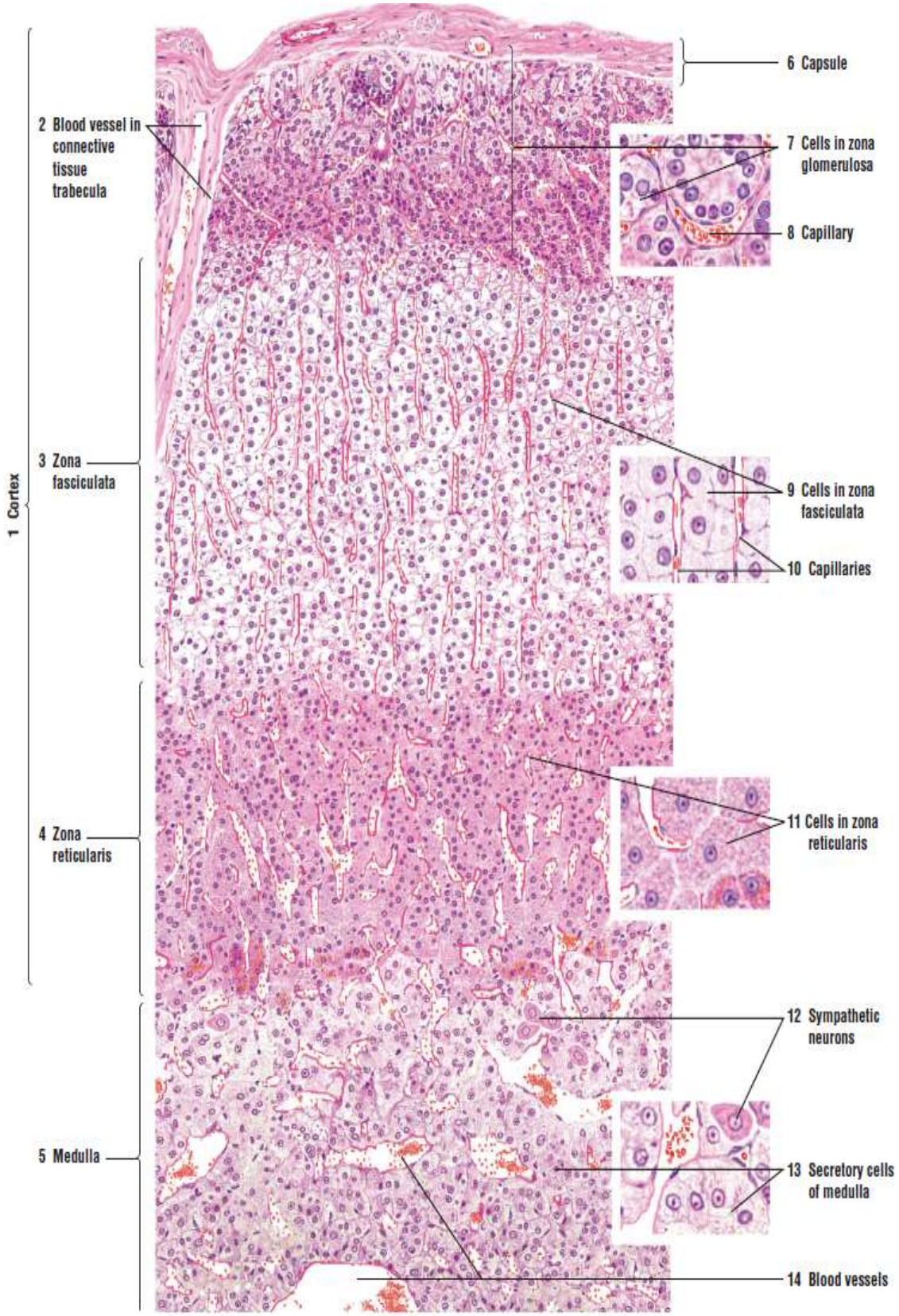
6. Adrenal Glands

Introduction:

These are triangular-shaped glands, located on the top of each kidney. The gland consists of two parts cortex and medulla that have separate embryological origin and function. The cortex part, has origin like that of gonads and is responsible for the synthesis and secretion of adrenal steroids while the medulla has origin like that of the nervous system and is mainly involved in the synthesis and secretion of catecholamines.

Identifying characteristics:

1. The gland is covered by an outer connective tissue capsule.
2. Under low magnification two, clearly marked zones where observed
    a. Outer denser cortex and
    b. Inner less dense medulla
3. In the cortex, three distinct layers with the following features were observed-
    a. Zona glomerulosa – Outermost layer with closely packed cells arranged in irregular chords. Columnar cells with a strongly stained nucleus and less pale cytoplasm.
    b. Zona fasciculata – Middle zone also arranged in straight cords. Polyhedral cells with a strongly stained nucleus and paler cytoplasm; foamy appearance due to the presence of lipid droplets.
    c. Zona reticularis – Inner layer with netlike anastomosing cords of cells. These cells had deeply stained cytoplasm compared to the other two layers.
4. Medulla-
    a. One or more large vascular sinusoid was observed.
    b. Large, lightly stained polyhedral cells (the chromaffin cells) arranged in cords or clumps were visible.
    c. A small number of round/polyhedral cells (Ganglion cells) were also observed.


1 Cortex
2 Blood vessel in connective tissue trabecula
3 Zona fasciculata
4 Zona reticularis
5 Medulla
6 Capsule
7 Cells in zona glomerulosa
8 Capillary
9 Cells in zona fasciculata
10 Capillaries
11 Cells in zona reticularis
12 Sympathetic neurons
13 Secretory cells of medulla
14 Blood vessels

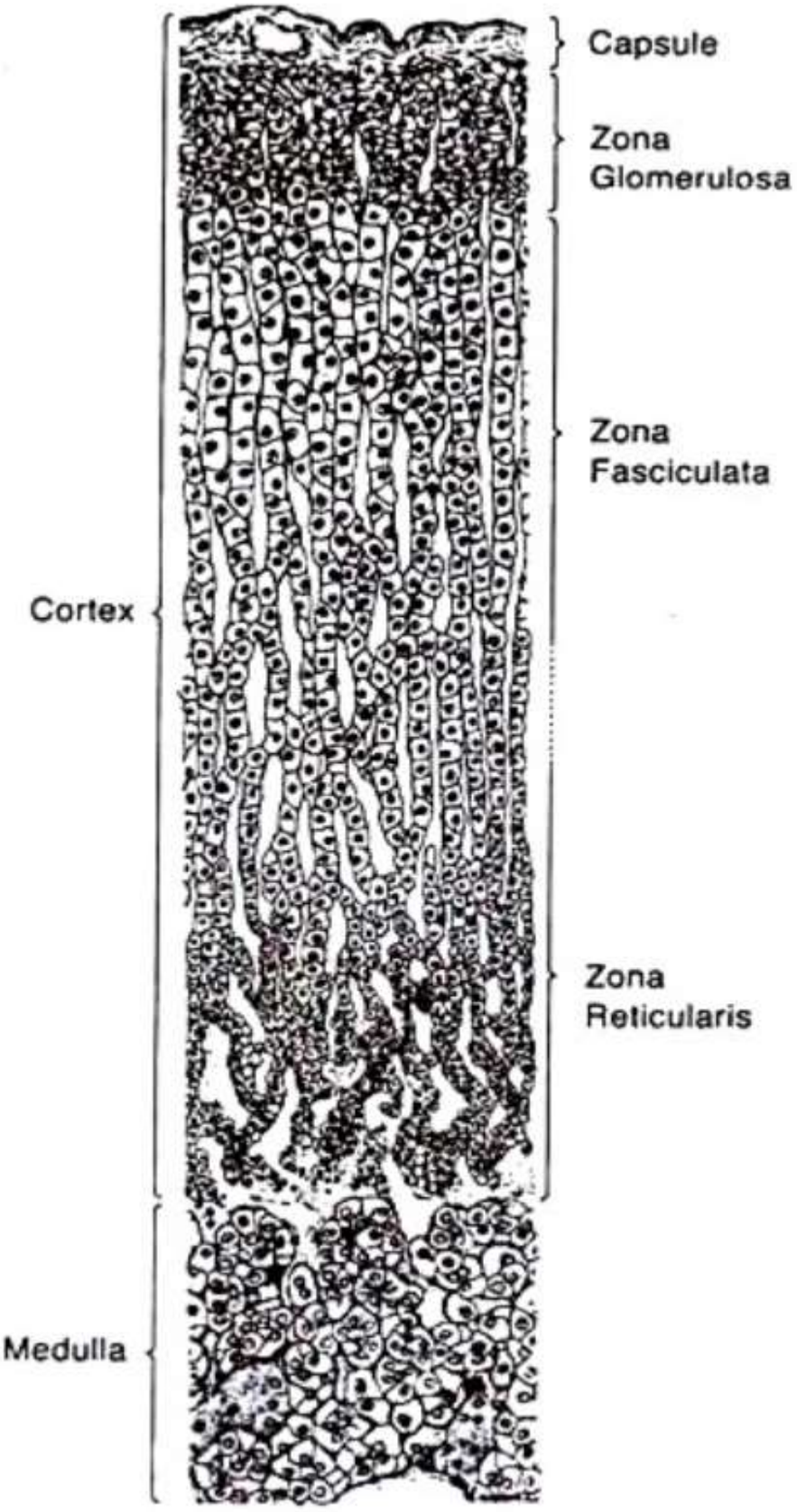


Fig. 7.30 : Sections through the adrenal gland of rat