

AL-Rasheed university college

Pharmacy department

First year

Human anatomy

Endocrin

الدكتور طارق جواد الربيعي

اختصاص جراحه عامه

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The Endocrine Glands

- Secretory cells of endocrine glands release their products, signaling molecules called [Hormones], into a neighboring vascularized compartment for uptake by capillaries, and distribution throughout the body rather than directly into an epithelial duct like the cells of exocrine glands.
- The cells typically aggregate as [Cords] or [Follicles, as in thyroid]
- Beside the specialized endocrine glands, many other organs have an endocrine functions such as the heart, lungs, thymus, gut, kidneys, testis, ovaries, pancreas, adipose cells, vascular endothelial cells.

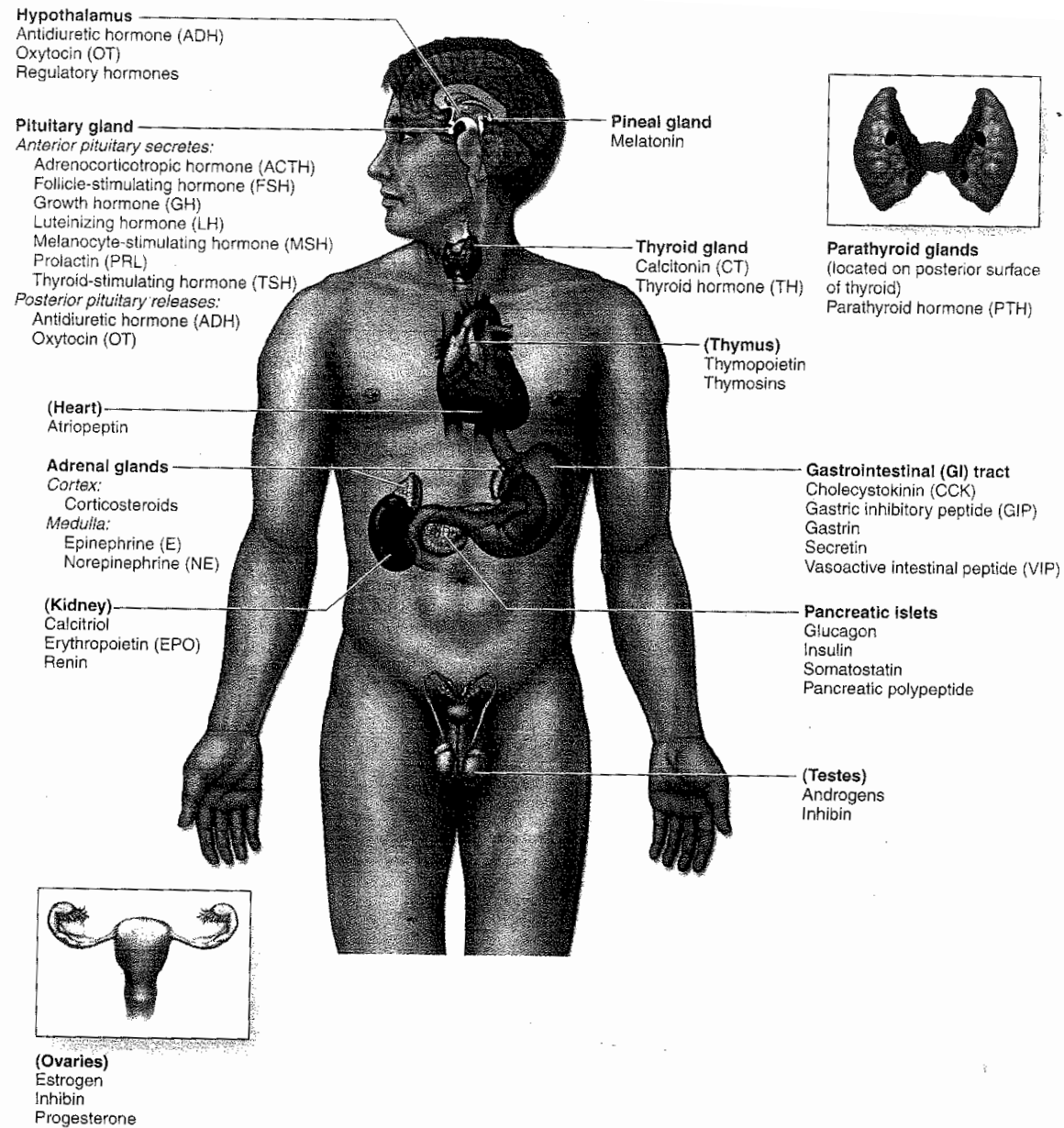


Figure 1. Endocrine system. The endocrine glands and major hormones they secrete are listed with their locations. In parentheses are shown other organs, including the heart, kidney, thymus, gut, and gonads, that contain endocrine cells and have important endocrine functions. In addition many widely distributed tissues and cells throughout the body have endocrine functions but are not shown here. These include adipose cells which secrete the hormone leptin and vascular endothelial cells which produce polypeptides called endothelins which promote vasoconstriction.

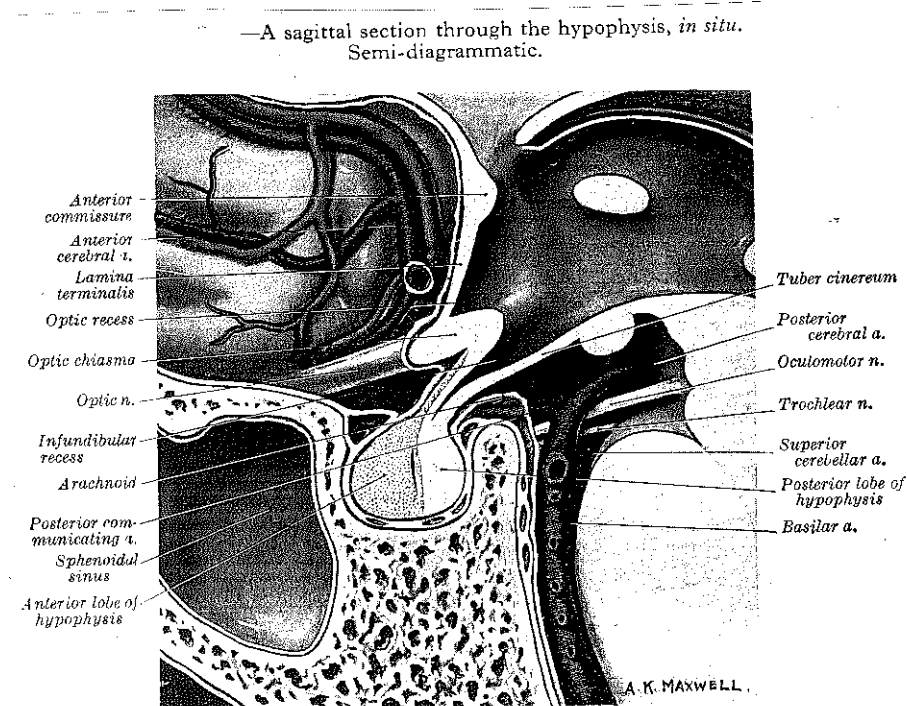
The Pituitary Gland (1)

(Hypophysis Cerebri)

- Is a small oval structure, directly attached to the hypothalamus region at the undersurface of the brain by a stalk called the (infundibulum)
- It weights (0.5 g) and dimensions of (10 X 13 X 6 mm)
- It is well protected, it is situated in the (sella turcica) of the sphenoid bone
- Sella turcica (Turkish saddle) is a part of the middle cranial fossa

Relations

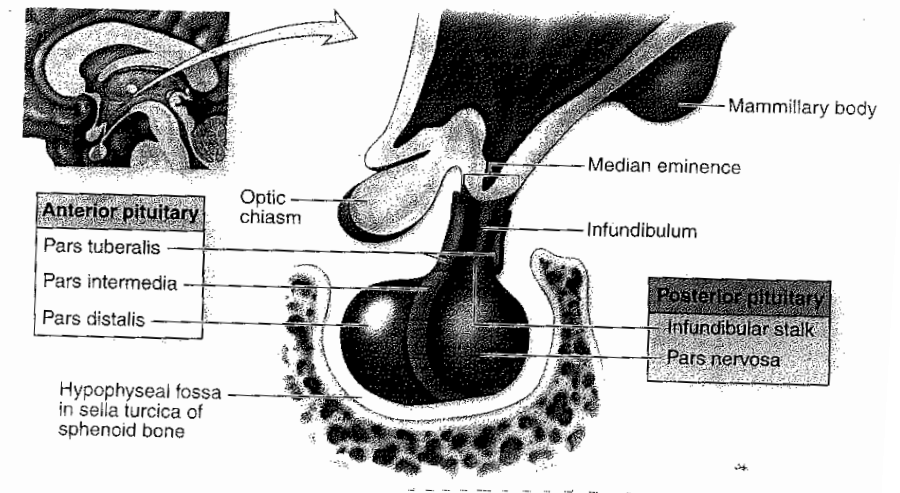
- Anteriorly : the sphenoid sinus
- Posteriorly : dorsum sellae, basilar artery, the pons
- Superiorly : the diaphragma sellae and its aperture for passage of the infundibulum
- Inferiorly : the body of the sphenoid
- Laterally : the cavernous sinus and its contents



The Pituitary Gland (2)

- The pituitary gland is a composite structure consisting of two lobes (Anterior and posterior) histologically very different from each other
 1. The anterior lobe (adenohypophysis) divided into
 - a. Pars anterior or (pars distalis)
 - b. Pars intermedia (separated by a cleft from pars Anterior)
 - c. Pars tuberalis: is a projection from pars anterior extending along the anterior and lateral surfaces of the pituitary stalk.
 2. The posterior lobe [Neurohypophysis] consist of:
 - a. Pars nervosa
 - b. Infundibular stalk

Pars nervosa has no secretory cells, but it is composed of neural cells, secretory axons with their nuclei in the hypothalamus.



The Endocrine Glands

The Pituitary Gland (3)

Embryology

The pituitary gland develops from two sources

1. Small endodermal diverticulum (Rathke's pouch) which grows superiorly from the root of the stomodeum anterior to the bucco –pharyngeal membrane
2. Small ectodermal diverticulum (the infundibulum) which grows inferiorly from the floor of the diencephalon of the brain.

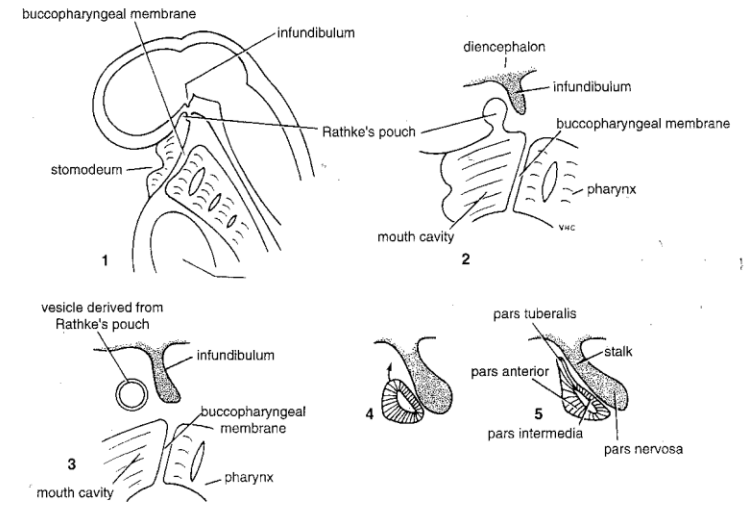
Arterial Blood supply

From superior and inferior hypophyseal arteries (branches of the internal carotid artery)

Venous drainage

Into the cavernous sinus

NB. There is a hypothalamic – hypothyseal portal system involved in the carrying of hormones released



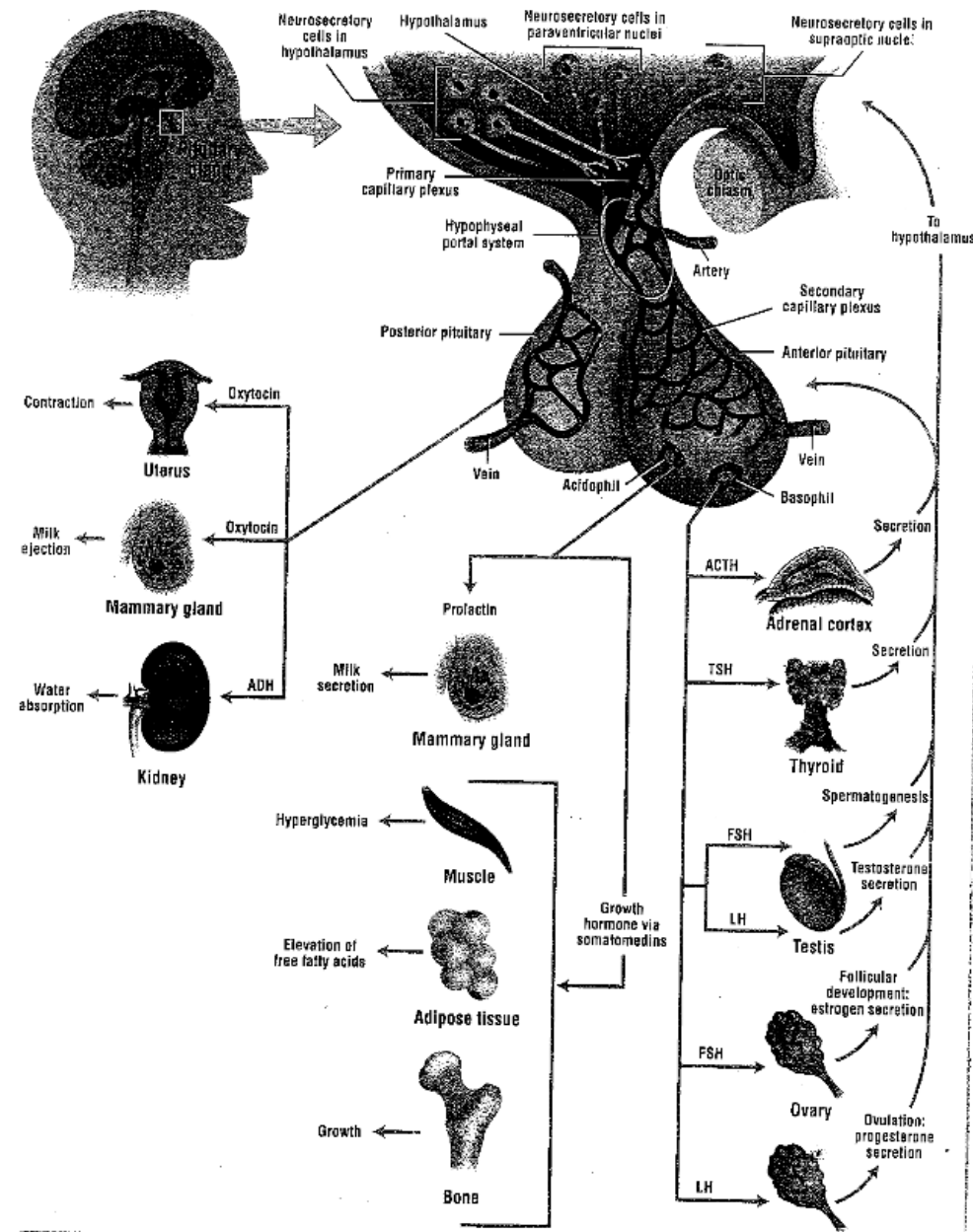
The different stages in the development of the pituitary gland shown in sagittal sections.

The Endocrine Glands

The Pituitary Gland

Functions

- The pituitary gland influence the activities of many other endocrine glands , breast , and other tissues.
- The pituitary gland itself is controlled by the hypothalamus
- The activities of the hypothalamus are modified by informations received along:
 - a. Numerous nervous different pathways from different parts of the central nervous system
 - b. By the plasma level of circulating hormones and electrolytes



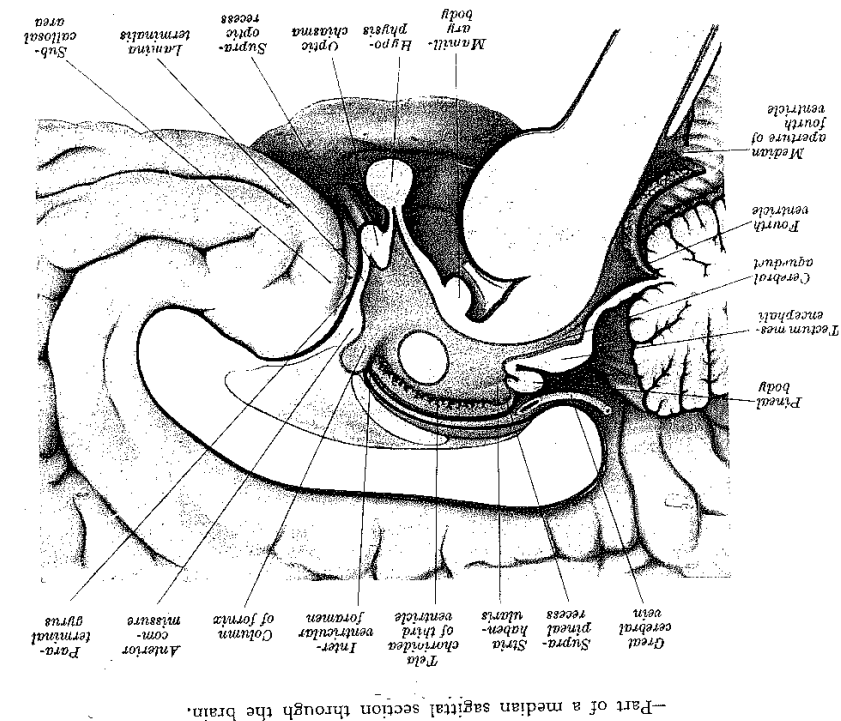
OVERVIEW FIGURE ■ Hypothalamus and hypophysis (pituitary gland). A section of hypothalamus and hypophysis illustrates the neuronal, axonal, and vascular connections between the hypothalamus and the hypophysis. Also illustrated are the major target cells, tissues, and organs of the hormones that are produced by both the anterior (adenohypophysis) and posterior (neurohypophysis) pituitary gland. ACTH, adrenocorticotropic hormone; TSH, thyroid-stimulating hormone; FSH, follicle-stimulating hormone; LH, luteinizing hormone.

The Endocrine Glands

The Pineal Gland (Body) (1)

(Epiphysis Cerebri)

- Is a very small pine cone-shaped
- Measures about (5 – 8 mm X 3 – 5 mm)
- Weight about (150 mg)
- Developed with the brain from neuroectoderm in the roof of the diencephalon.
- It is found In the posterior end of the roof of the third ventricle of the brain
- Attached to the brain by a stalk
- The gland is rich in blood supply
- Nerve supply: unmyelinated sympathetic (post ganglion fibers) enter the gland and end among (pinealocytes) forming synapses with some.



The Endocrine Glands

The Pineal Gland (2)

Functions

Secretion of the hormone (melatonin)

1. Has an effect on melanocytes lightening skin color.
2. Melatonin secretion is promoted by darkness and inhibited by light

It functions as neuroendocrine transducer:-

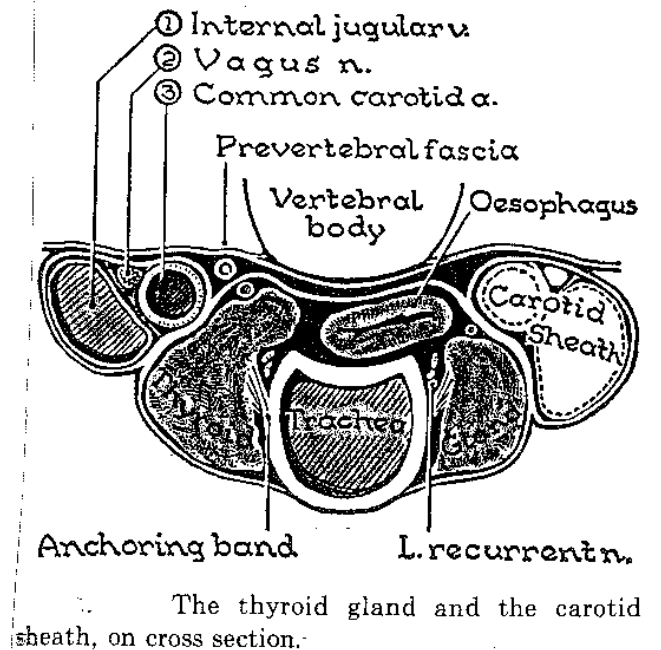
Information received by the retina in form of light is converted by the pineal into chemical signal (melatonin) which has wide range of actions.

- a. Regulates the circadian (day and night) rhythm causing hypnotic effect at night.
- b. Induces rhythmic changes in the activity of the hypothalamus, pituitary gland, reproductive processes (onset of puberty)
- c. Effects on ageing
- d. Regulation of immune system.

The Endocrine Glands

The Thyroid Gland (1)

- Is a highly vascular organ
- Consist of two lobes (right and left) connected by a narrow isthmus
- Surrounded by pretracheal fascia, which attaches the gland to larynx and trachea which is responsible for thyroid moving up and down with the larynx during swallowing
- Weights about (30 g)
- It lies against the 5th , 6th , 7th cervical and 1st thoracic vertebrae
- Each lobe is pear-shaped narrow apex upward
- Its broader base is at the level of 4th – 5th rings of trachea
- The isthmus lies in the midline across the 2nd – 4th rings of the trachea, and connects the lower poles of the lobes of the gland



The Endocrine Glands

The Thyroid Gland (2)

Relations of the lobes

Anteriorly : sternothyroid, sternohyoid muscles, the superior belly of the omohyoid, anterior border of the sternocleido-mastoid

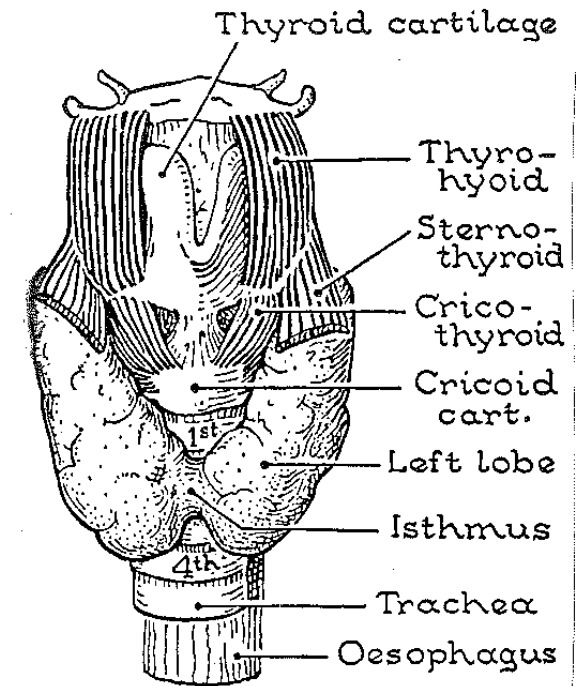
Posteriorly: the carotid sheath and its contents (common carotid artery, internal jugular and vagus nerve [X] parathyroid glands

Medially the larynx, pharynx and trachea, esophagus with recurrent laryngeal nerve between them

Relations of the isthmus

Anteriorly sternothyroid, sternohyoid muscles, internal jugular vein.

Posteriorly 2nd, 3rd, and 4th rings of trachea



The thyroid gland, front view

The Endocrine Glands

The Thyroid Gland (3)

Arterial blood supply

1. Superior thyroid artery, branch of the external carotid artery
2. Inferior thyroid artery, thyrocervical trunk from the subclavian artery
3. Thyroidea ima (if present) from brachiocephalic artery

Venous drainage

1. Superior thyroid vein, drain into internal jugular vein
2. Middle thyroid vein, drain into internal jugular vein
3. inferior thyroid vein, drain into left brachiocephalic vein

Lymphatic drainage

Mostly laterally into deep cervical lymph nodes

Nerve supply

Sympathetic from superior, middle, and inferior cervical sympathetic ganglion

The Endocrine Glands

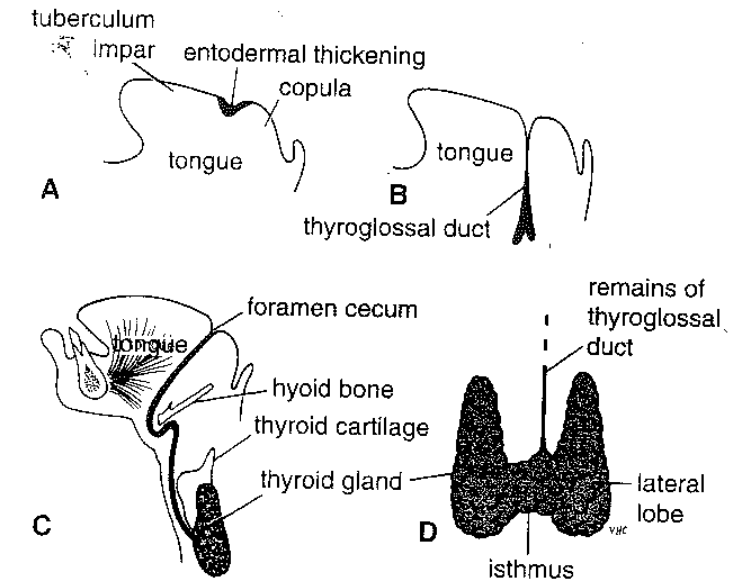
The Thyroid Gland (4)

Embryology

- Develops from entodermal thickening in the middle of the floor of the pharynx, later becomes a diverticulum that grows inferiorly and is called the thyroglossal duct
- Distal end becomes bilobed and then expanded to form the thyroid gland
- The site of origin on the tongue remains as pit called foramen cecum

Function of the thyroid gland

1. Production of thyroid hormones: thyroxine and triiodothyronine: increase the metabolic activities of most cells in the body
2. Production of thyrocalcitonin hormone (a product of the parafollicular c-cells) it lowers the level of blood calcium.



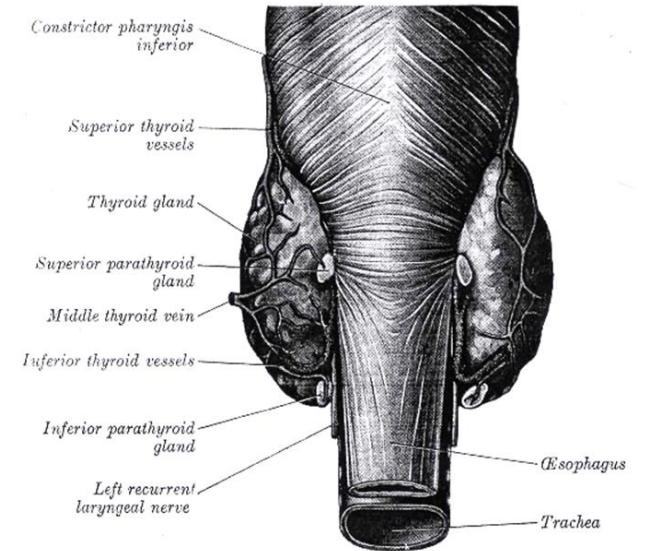
The different stages in the development of the thyroid gland. **A.** Sagittal section of the tongue showing an entodermal thickening between the tuberculum impar and the copula. **B.** Sagittal section of the tongue showing the development of the thyroglossal duct. **C.** Sagittal section of the tongue and neck showing the path taken by the thyroid gland as it migrates inferiorly. **D.** The fully developed thyroid gland as seen from in front. Note the remains of the thyroglossal duct above the isthmus.

The Endocrine Glands

The Parathyroid Glands (1)

- Are small yellowish – brown (like bumblebee) ovoid or lentiform bodies.
- Usually lie between the posterior borders of the lobes of thyroid gland.
- Measures about (6 x 3 – 4 x 1-2 mm).
- They are four in number , two on each side (superior and inferior parathyroid gland)
- They lie within the fascial capsule of the thyroid.
- The two superior gland lie at level of the middle of the posterior of the thyroid.
- The two inferior glands : lie close to the lower pole.
- **Arterial blood supply**
 - From superior and inferior thyroid arteries.
- **Venous drainage:**
 - Into superior and inferior thyroid veins.
- **Lymphatic drainage :**
 - Deep cervical and paratracheal lymph nodes
- **Nerve supply**
 - From superior or middle cervical sympathetic ganglic

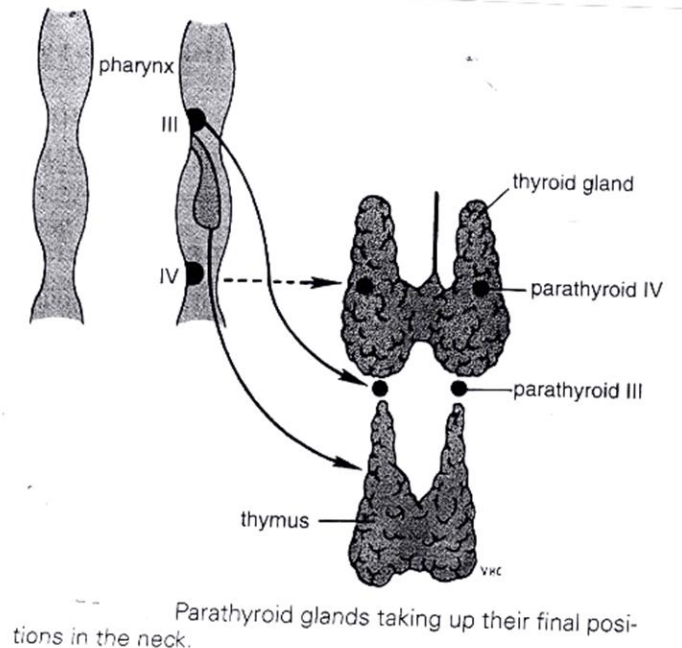
—A dissection of the lower part of the pharynx and the upper part of the œsophagus from behind, to show the position of the parathyroid glands.



The Endocrine Glands

The Parathyroid Glands (2)

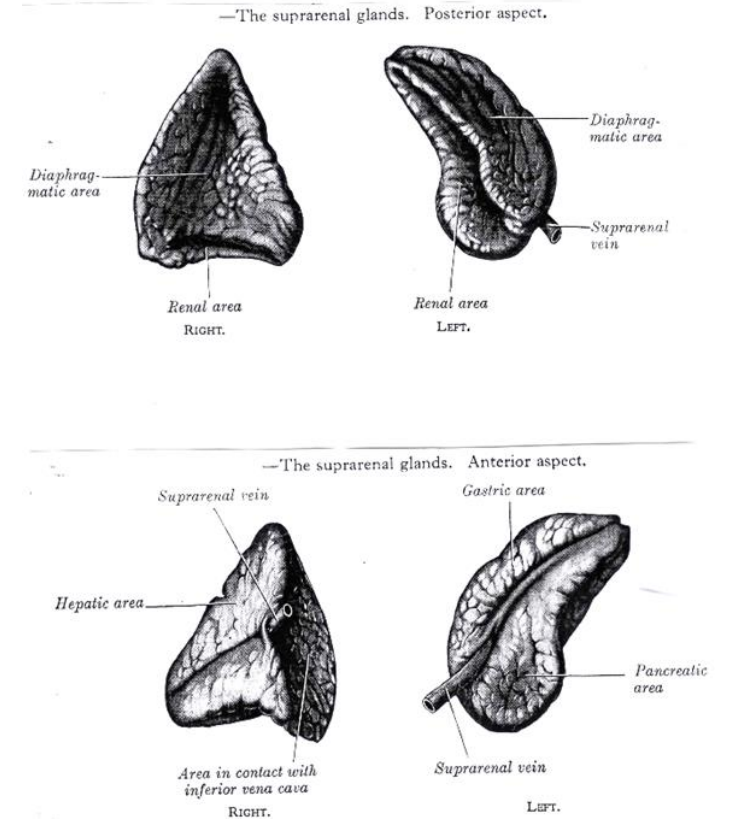
- Embryology
- The pair of inferior parathyroid glands develop from the 3rd pharyngeal pouch on each side.
- The pair of superior parathyroid gland develops from 4th pharyngeal pouch . On each side.
- **Functions of the parathyroid glands.**
 - The chief cells produce the (parathyroid hormone) which :
 1. Stimulate osteoclastic activities in the bone , thus mobilizing the bone calcium , and increasing the calcium level in the blood.
 2. Stimulate the absorption of dietary calcium from the small intestine.
 3. Stimulates the reabsorption of calcium in the proximal convoluted tubules of the kidney.



The Endocrine Glands

The Adrenal (Suprarenal)Glands (1)

- The two adrenal glands are yellowish retroperitoneal organs.
- Lie on the upper poles of the kidneys.
- They are somewhat a symmetrical.
- Their medial borders are (5 cm) apart.
- They are very friable organs.
- Each measures (30 – 50 mm) in length and about (30 mm) breath and
- (4 – 6 mm) in thickness.
- Average weight is (3 – 4 g).



The Endocrine Glands

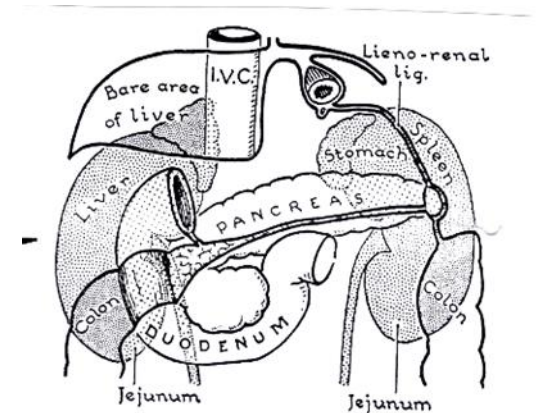
The Adrenal Glands (2).

- The right adrenal glands:

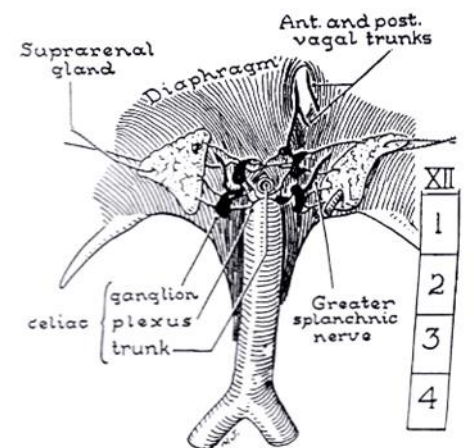
- Pyramidal in shape.
- Caps the upper pole of the right kidney behind the right lobe of the liver.
- Extends medially behind the inferior vena cava.
- It rests posteriorly on the diaphragm.

The left adrenal glands.

- Crescentic in shape.
- Extends along the medial border of the left kidney from the upper pole.
- It lies behind the tail of pancreas , lesser sac and stomach.
- It rests on the diaphragm.



The anterior relations of the kidneys and suprarenal glands. (The duodenum and pancreas are drawn in situ; the other relations are indicated by name.)



The celiac plexus and the suprarenal glands (retracted). Note vertebral levels.

The Endocrine Glands

The Adrenal Glands (3)

- **Structure and development**

- The naked eye section of each glands has :

1. An outer golden yellow cortex.
2. An inner vascular dark brown medulla.

- Ontogenetically , phylogenetically and structurally and functionally the cortex and medulla are distinct from each other but anatomically they form single entity.

- A. **The adrenal glands derived from two sources.**

1. The medulla is derived from by migration of cells from the neural crest , and is ectodermal in origin.
2. The cortex is developed in situ from mesodermal of intermediate cell mass.

The Endocrine Glands

The Adrenal Glands (4)

- **Arterial blood supply:**

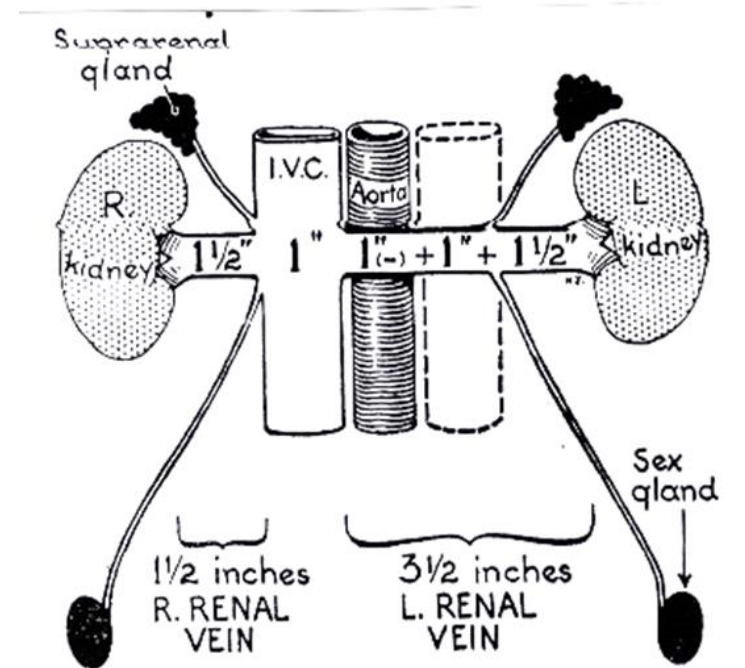
1. The proper (suprarenal) artery from aorta.
2. Branches from phrenic artery.
3. Branches from renal artery.

- **Venous drainage:**

- Single vein emerges from the hilum of each gland.
1. The right drains into the inferior vena cava.
 2. The left drains into the left renal vein.

- **Nerve supply :**

1. Preganglionic sympathetic fiber derived from the splanchnic nerve supply the gland most of them end in the medulla (and synapse in it).
2. Branches from both vagi.



The left renal vein, so-called, is in reality the vein of the three left paired glands, and it is longer than the right vein.

The Endocrine Glands

The Adrenal Glands (5)

- **Functions of the adrenal glands**

- A. **the cortex of the adrenal glands:**

- Secrete the following hormones

1. Mineral corticoids : which are concerned with control of the fluid and electrolyte balance.

2. Glucocorticoide : concerned with the metabolism of carbohydrate , fat and protein.

3. Small amount of sex hormones . Which probably play a role in the prepubertal development of sex organs.

- B. **The medulla of adrenal glands.**

Secrete catcholamines

Epinephrine and norepinephrine

- **THANKS**