

# THYROID GLAND

- ❑ The thyroid gland is the largest gland in the body, secretes thyroxine and triiodothyronine, which function in the regulation of energy metabolism
- ❑ In an adults it weighs between 25 and 30 grams

## Location

- ❑ The thyroid gland is located in the neck, just below the larynx anterior and lateral to trachea

# Structure of thyroid gland

- ❑ Thyroid gland is a butterfly shaped gland 5cm long
- ❑ It has two lobes on either side of trachea.
- ❑ The two lobes are connected to each other by a narrow band of tissue called isthmus which is present anterior to the trachea
- ❑ Microscopically thyroid gland is made up of spherical sacs called thyroid follicles
- ❑ A thyroid follicle has a wall which surround a central lumen
- ❑ The wall of thyroid gland is made up of cuboidal epithelial cells which are called follicular cells
- ❑ The cells synthesize thyroid hormones and secrete them into lumen of the follicle where it is stored in form of colloid
- ❑ **Between** the follicles are epithelial cells called **parafollicular cells** that produce a hormone called *calcitonin, or thyrocalcitonin*.

# Blood supply to Thyroid gland

- Thyroid gland is extensively vascularized. Receives about 80-120 ml/min blood
- Two set of paired arteries supplies the thyroid gland
  - ❑ The superior thyroid artery – paired arteries arises from the external carotid artery supplies the upper pole
  - ❑ The inferior thyroid arteries- paired arteries from the thyrocervical trunk of subclavian artery
- Three paired veins collects blood from thyroid gland
  - **The superior thyroid vein** - drains the upper pole to the internal jugular vein;
  - **The middle thyroid vein** - drains from the lateral side of the gland to the internal jugular;
  - **The inferior thyroid veins** - drain the lower pole to the brachiocephalic veins

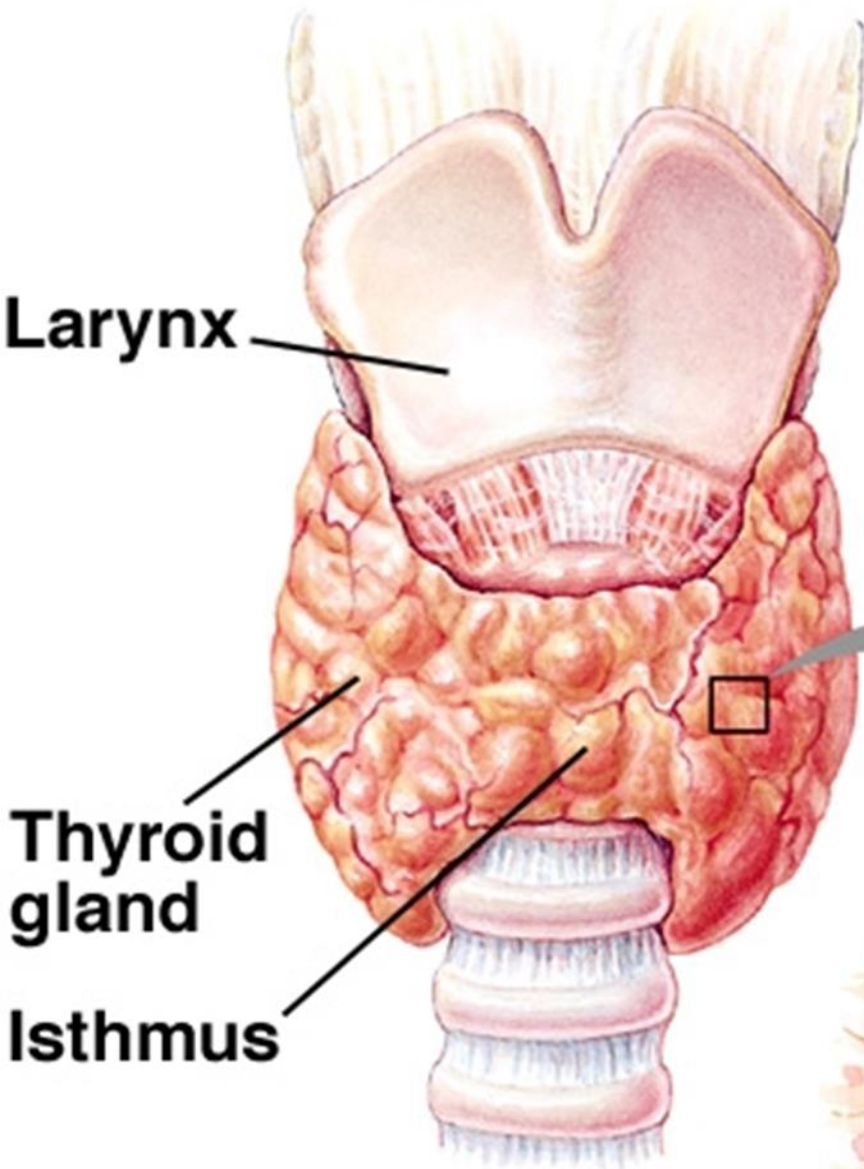
## **Nerve Supply:**

- Sympathetic nervous system.

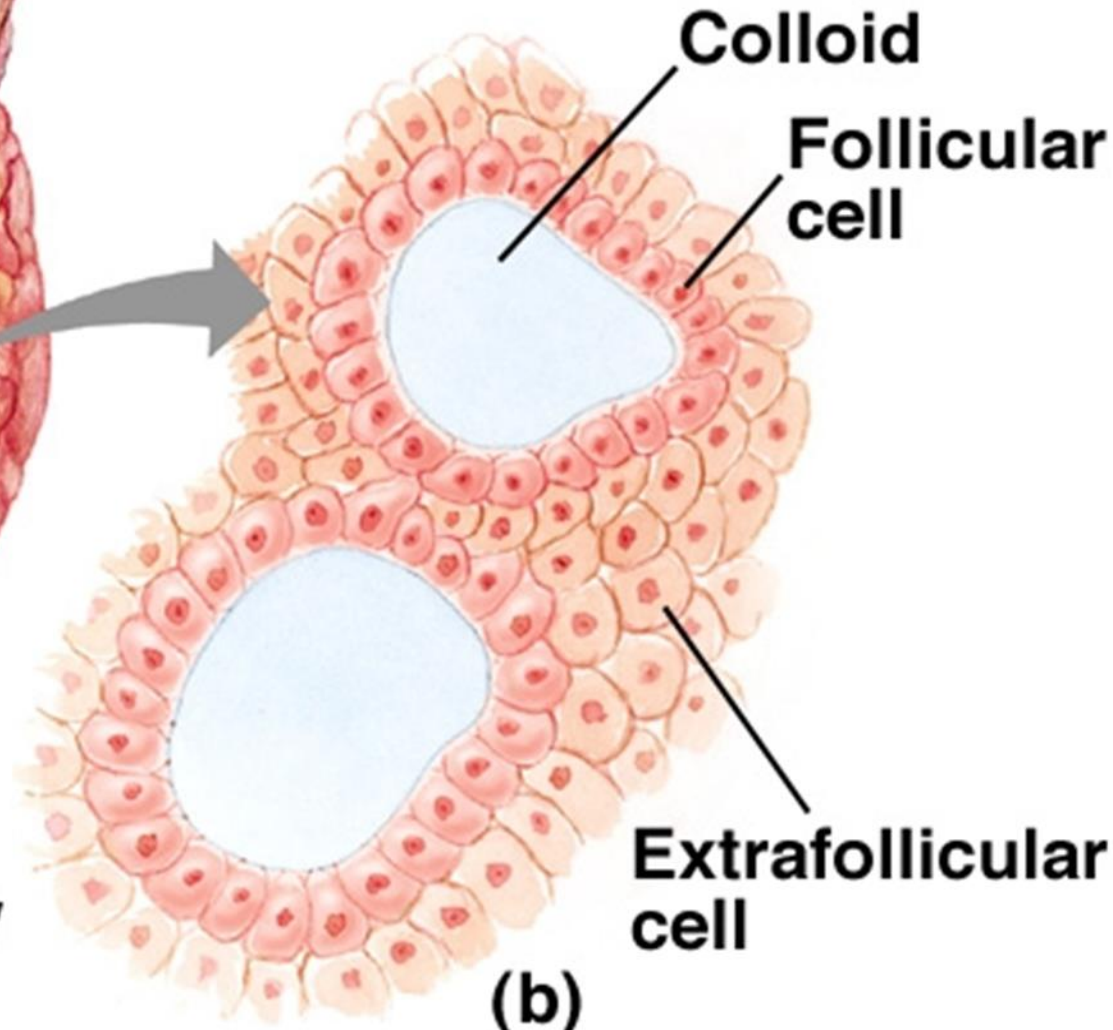
## **Function of the thyroid Gland:**

- T3 ,T4 & Calcitonin synthesis.
- Protein synthesis.
- Release of energy from carbohydrate.
- Sexual maturity.
- Calcitonin inhibit the mobilization of calcium from the bones also causes increase excretion of calcium from the kidneys and so lowers the calcium level in the blood.

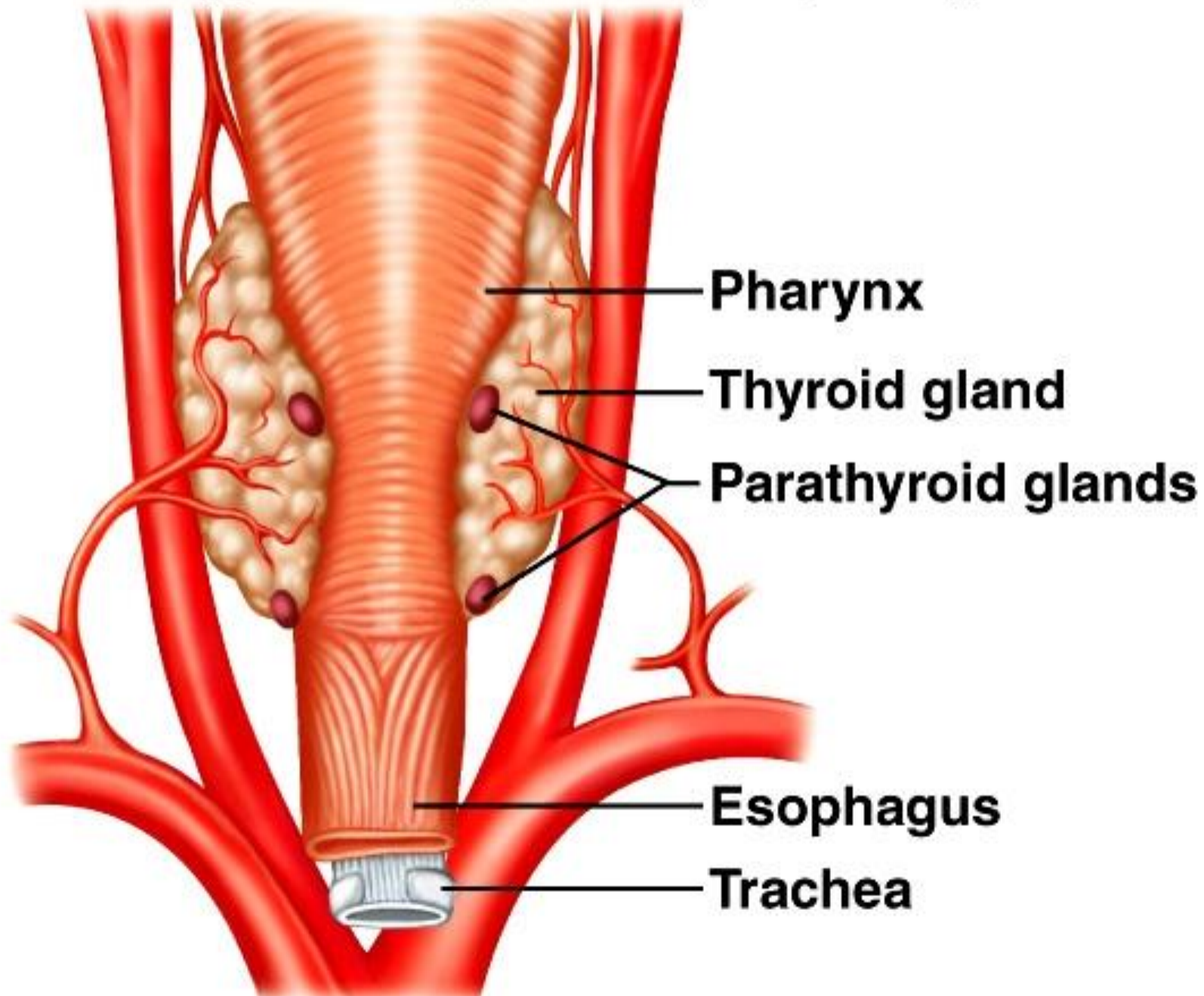
# Thyroid Gland



(a) Anterior view



(b)



Pharynx

Thyroid gland

Parathyroid glands

Esophagus

Trachea

Posterior view

Superior  
thyroid artery

Larynx

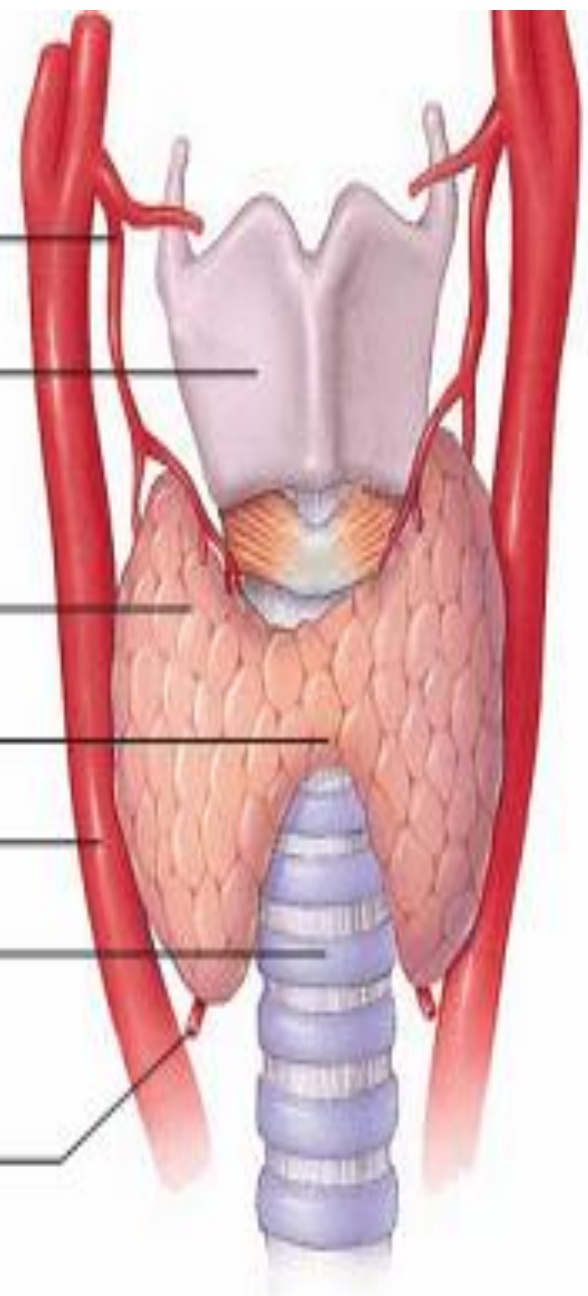
Thyroid gland

Isthmus

Common  
carotid artery

Trachea

Inferior  
thyroid artery



(a) Anterior view

Pharynx

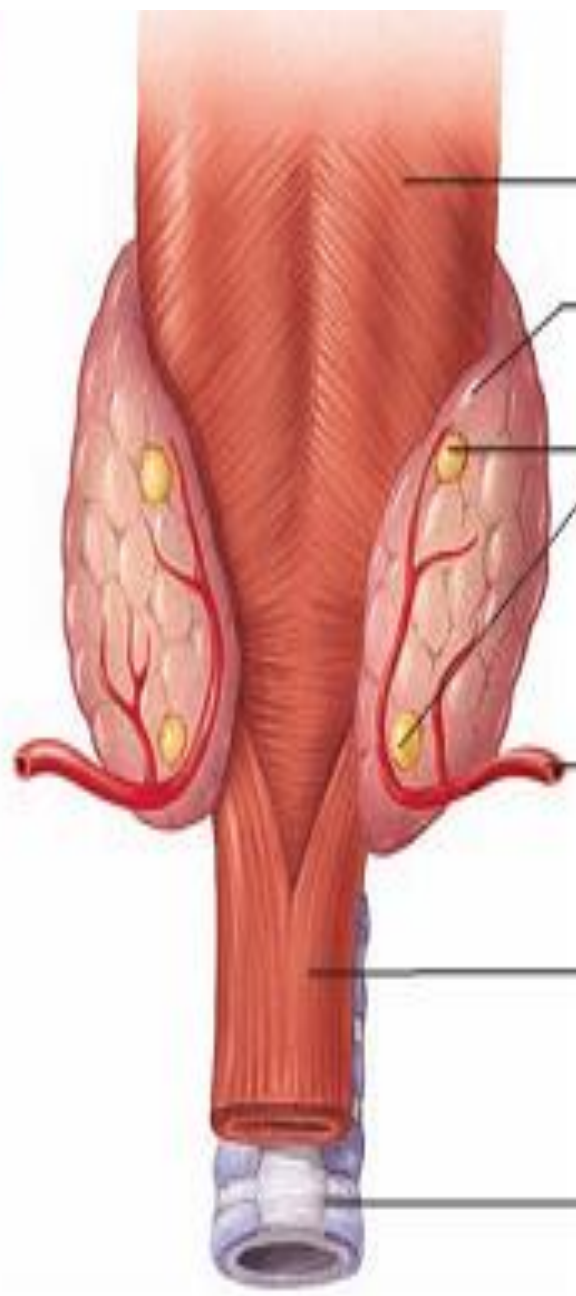
Posterior aspect  
of thyroid gland

Parathyroid  
glands

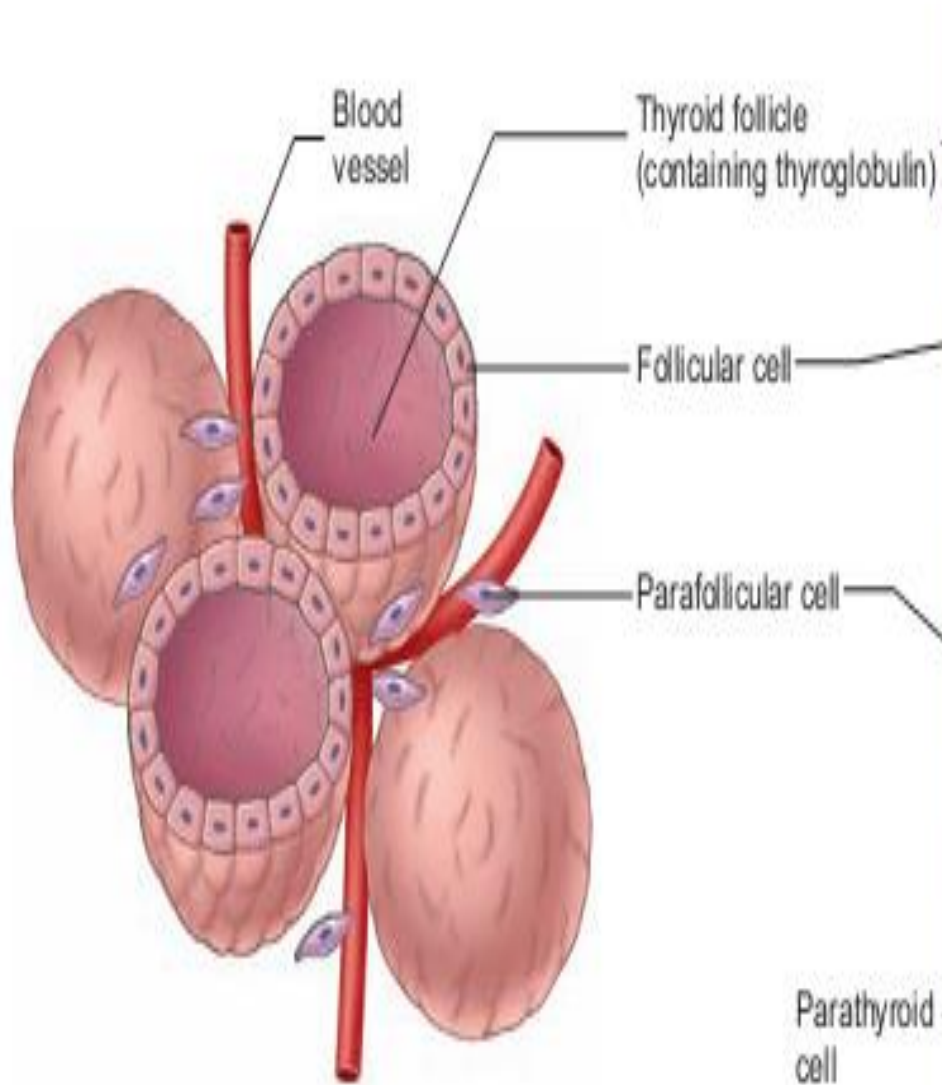
Inferior thyroid  
artery

Esophagus

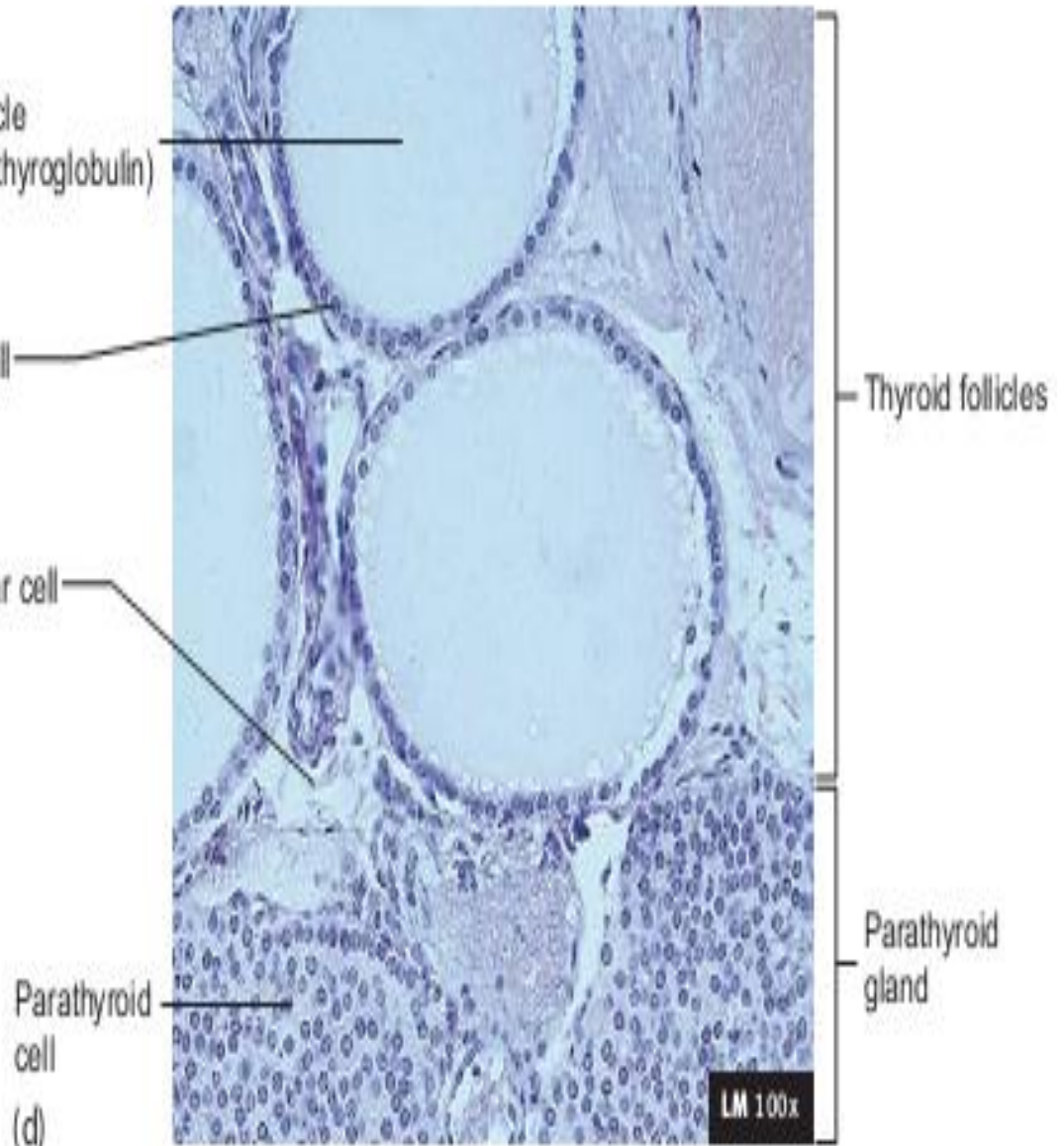
Trachea



(b) Posterior view



(c)



(d)



# ADRENAL GLAND

## Location

- The paired adrenal (suprarenal) glands lie superior to each kidney in the retroperitoneal space
- They are protected by a pad of fat and also has a connective tissue capsule

# Structure

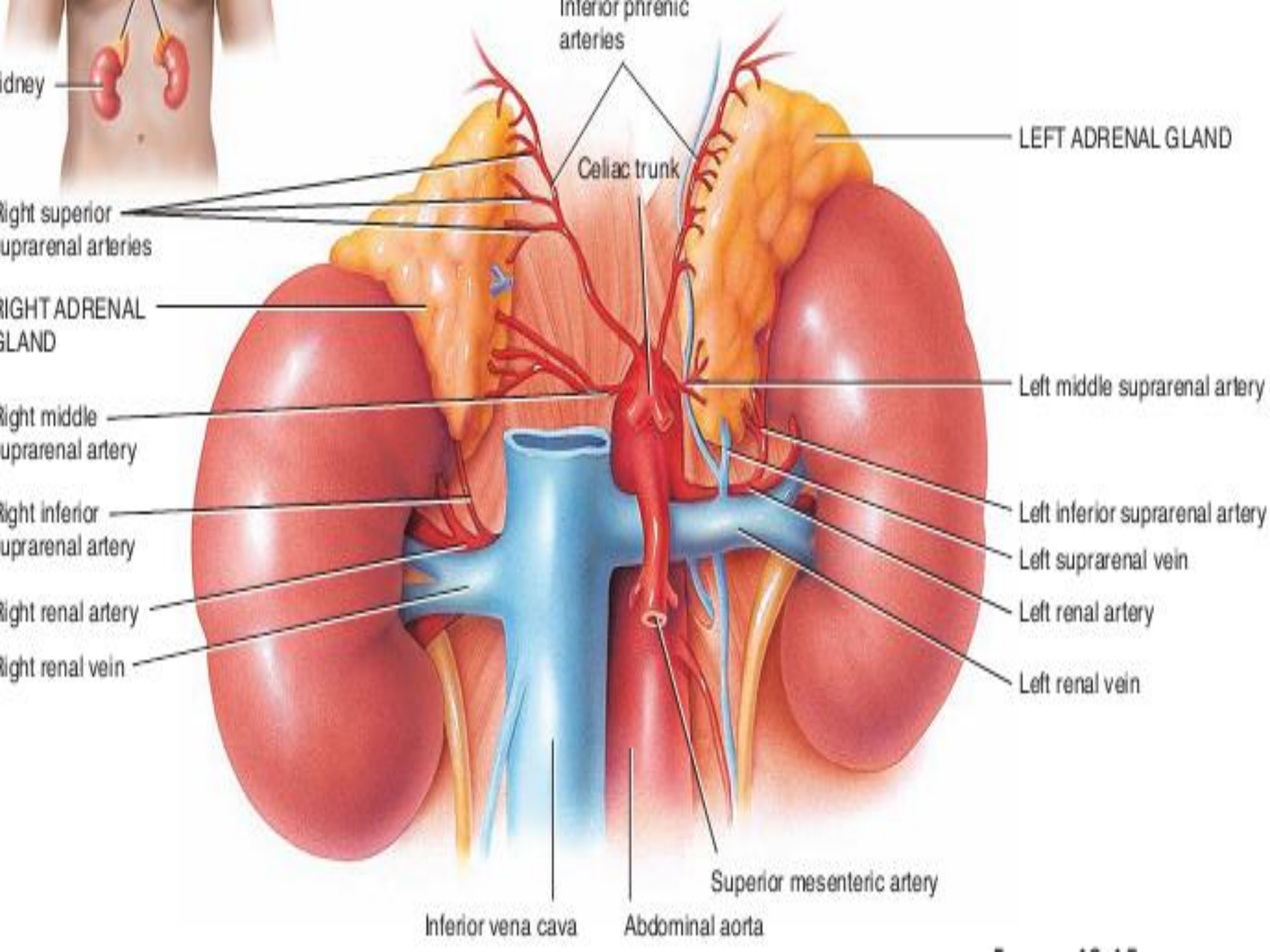
- Pyramid shaped
- Size is about 5 cm (2 in.) long, 3 cm (1.1 in.) wide, and 1 cm (0.4 in.) deep
- Has structurally and functionally two different regions
  - ❑ The **adrenal cortex** which is located peripherally and comprise 80 – 90 % of gland
  - ❑ The **adrenal medulla** which is small central portion

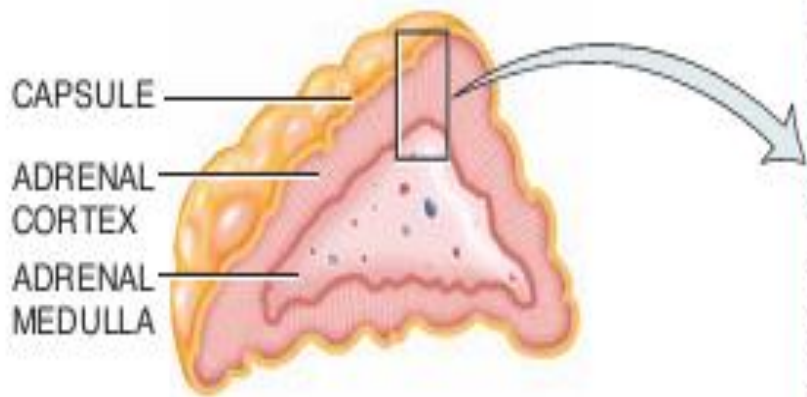
# Adrenal cortex

- It is the outer portion of adrenal gland and has distinctive yellow colour because of stored fat
- Histologically it can be divided into three different regions
  - ❑ The outer most zone is called **zona glomerulosa** in which cells are closely packed and arranged in spherical clusters and arched columns, secrete hormones called mineralocorticoids
  - ❑ The second zone is called **zona fasciculata**, is the widest of the three zones and consists of cells arranged in long, straight columns. Mainly secrete glucocorticoids
  - ❑ The inner most zone is called **zona reticularis** which secretes androgens

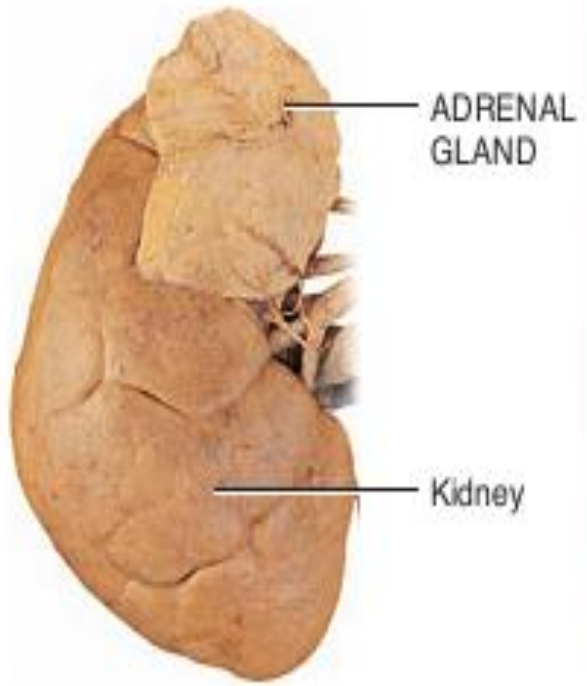
# Adrenal medulla

- The inner core of adrenal gland
- Has distinctive red colour because of extensive vascularization
- The adrenal medulla primarily consists of clusters of large, spherical cells called chromaffin cells
- These cells secrete epinephrine and norepinephrine
- They are innervated by preganglionic sympathetic axons

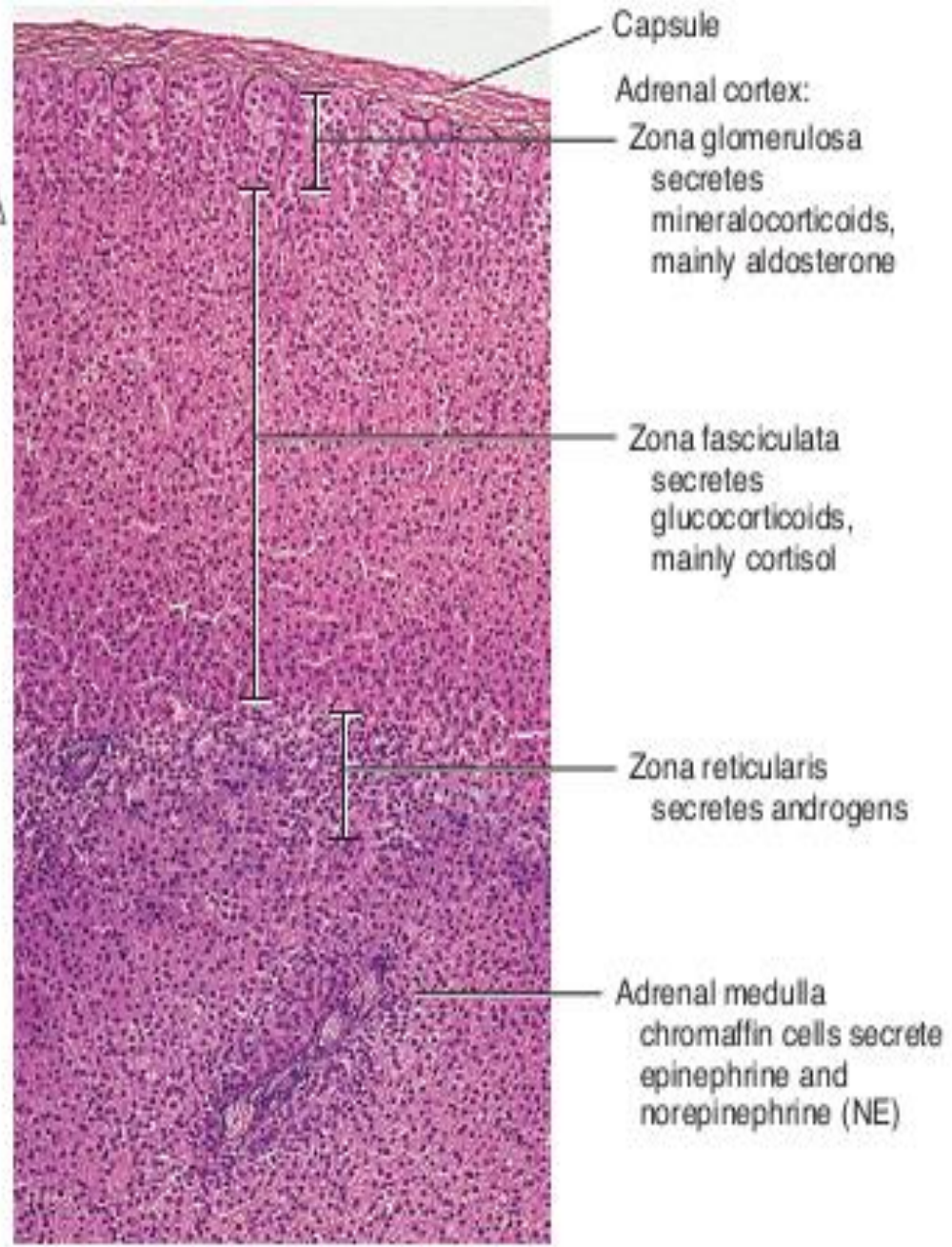




(b) Section through left adrenal gland



(c) Anterior view of adrenal gland and kidney



LM 50x

(d) Subdivisions of adrenal gland

# Blood supply to adrenal gland

- Receives three vessels

- a branch from the inferior phrenic artery- superior supra-renal artery

- a direct branch from the aorta- middle supra renal artery

- a branch from the renal artery – inferior supra renal artery

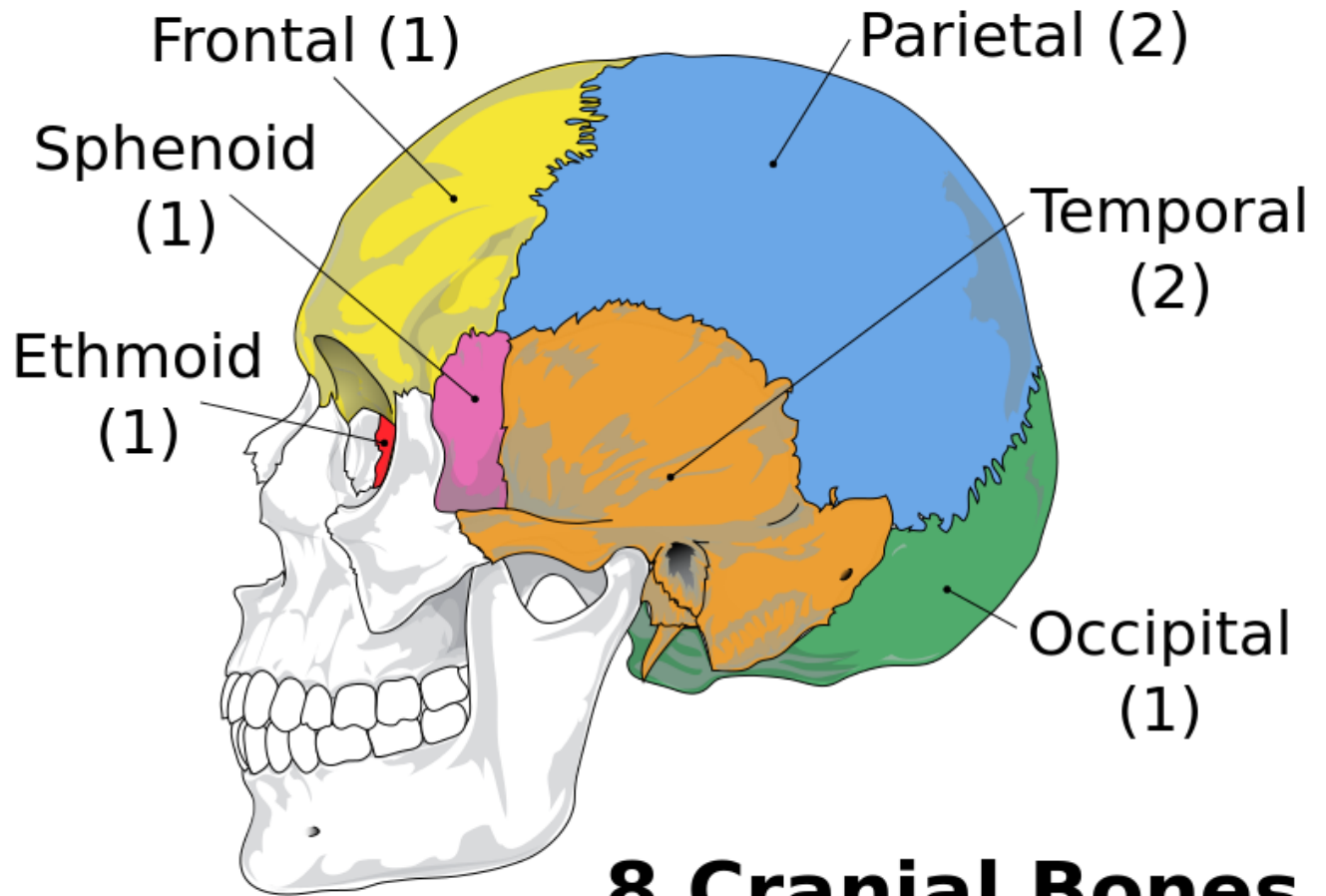
- The venous drainage from right adrenal gland is different from left adrenal gland

- The right supra renal vein drains directly to inferior venacava while the left supra renal vein drains to the renal vein

# Pituitary gland

- The pituitary gland is a pea-shaped structure that measures 1–1.5 cm in diameter
- It lies in the hypophyseal fossa of the sella turcica of the sphenoid bone
- It is located on the inferior aspect of the brain in the region of the diencephalon and is attached to the brain by a structure called the pituitary stalk or infundibulum.
- Circle of willis surrounds the pituitary gland.





## 8 Cranial Bones

# Structure

- Pituitary gland has two anatomically and functionally separate portions:
- the anterior pituitary
- the posterior pituitary.

## Anterior pituitary

- The anterior pituitary also called the adenohypophysis, accounts for about 75% of the total weight of the gland
- The anterior pituitary consists of two parts in an adult:
  - ❑ **The pars distalis** the larger portion
  - ❑ **The pars tuberalis** forms a sheath around the infundibulum

## Posterior pituitary

- The posterior pituitary also called neurohypophysis, is the neural part of the pituitary gland.
- It consists of two parts:
  - ❑ **The lobus nervosa** which is bulbous portion in contact with the adenohypophysis
  - ❑ **The infundibulum**, funnel shaped stalk of tissue that connects the pituitary to the base of the hypothalamus.

## **Hormones of Pituitary Gland:**

- 9 different hormones are produced by Pituitary gland.
- 7 hormones are produced by anterior pituitary.
- 2 by posterior pituitary.
- Posterior pituitary mainly stores hormones that are produced by hypothalamus.

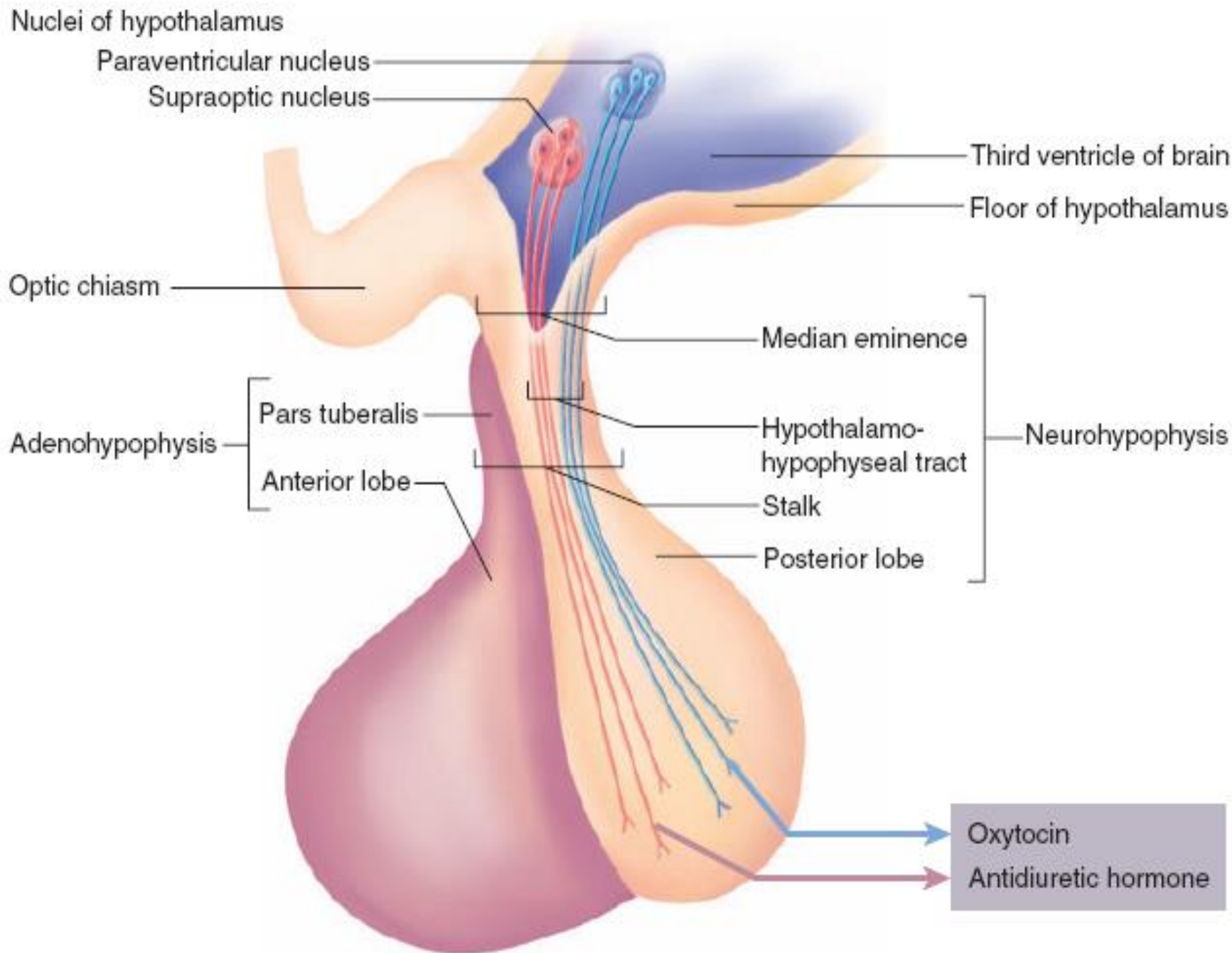
Hormone	Action	Regulation of Secretion
<b>Adenohypophysis</b>		
Growth hormone (GH), or somatotropin	Regulates mitotic activity and growth of body cells; promotes movement of amino acids through cell membranes	Stimulated by growth hormone–releasing hormone (GH–RH) from the hypothalamus; inhibited by growth hormone–inhibiting hormone (GH–IH) (somatostatin) from the hypothalamus
Thyroid-stimulating hormone (TSH), or thyrotropin	Regulates hormonal activity of thyroid gland	Stimulated by thyrotropin-releasing hormone (TRH) from the hypothalamus; inhibited by thyroid hormones
Adrenocorticotrophic hormone (ACTH)	Promotes release of glucocorticoids and mineralocorticoids from the adrenal cortex; assists in breakdown of fats	Stimulated by corticotropin-releasing hormone (CRH) from the hypothalamus; inhibited by glucocorticoids from the adrenal cortex
Follicle-stimulating hormone (FSH)	In males, stimulates production of sperm cells; in females, regulates follicle development in ovary and stimulates secretion of estrogen	Stimulated by gonadotrophin-releasing hormone (GnRH) from the hypothalamus; inhibited by sex steroids from the gonads
Luteinizing hormone (LH), or ICSH in males	Promotes secretion of sex hormones; in females, plays role in release of ovum and stimulates formation of corpus luteum and production of progesterone; in males, stimulates testosterone secretion	Stimulated by gonadotrophin-releasing hormone (GnRH) from the hypothalamus
Prolactin	Promotes secretion of milk from mammary glands (lactation)	Inhibited by prolactin-inhibiting hormone (PIH) from the hypothalamus
Melanocyte-stimulating hormone (MSH)	Can cause darkening of the skin	Stimulated by corticotropin-releasing hormone (CRH) from the hypothalamus; inhibited by dopamine, also from the hypothalamus
<b>Neurohypophysis</b>		
Oxytocin	Stimulates contractions of muscles in uterine wall; causes contraction of muscles in mammary glands	Hypothalamus, in response to stretch in uterine walls and stimulation of breasts
Antidiuretic hormone (ADH)	Reduces water loss from kidneys; elevates blood pressure	Hypothalamus, in response to changes in water concentration in the blood

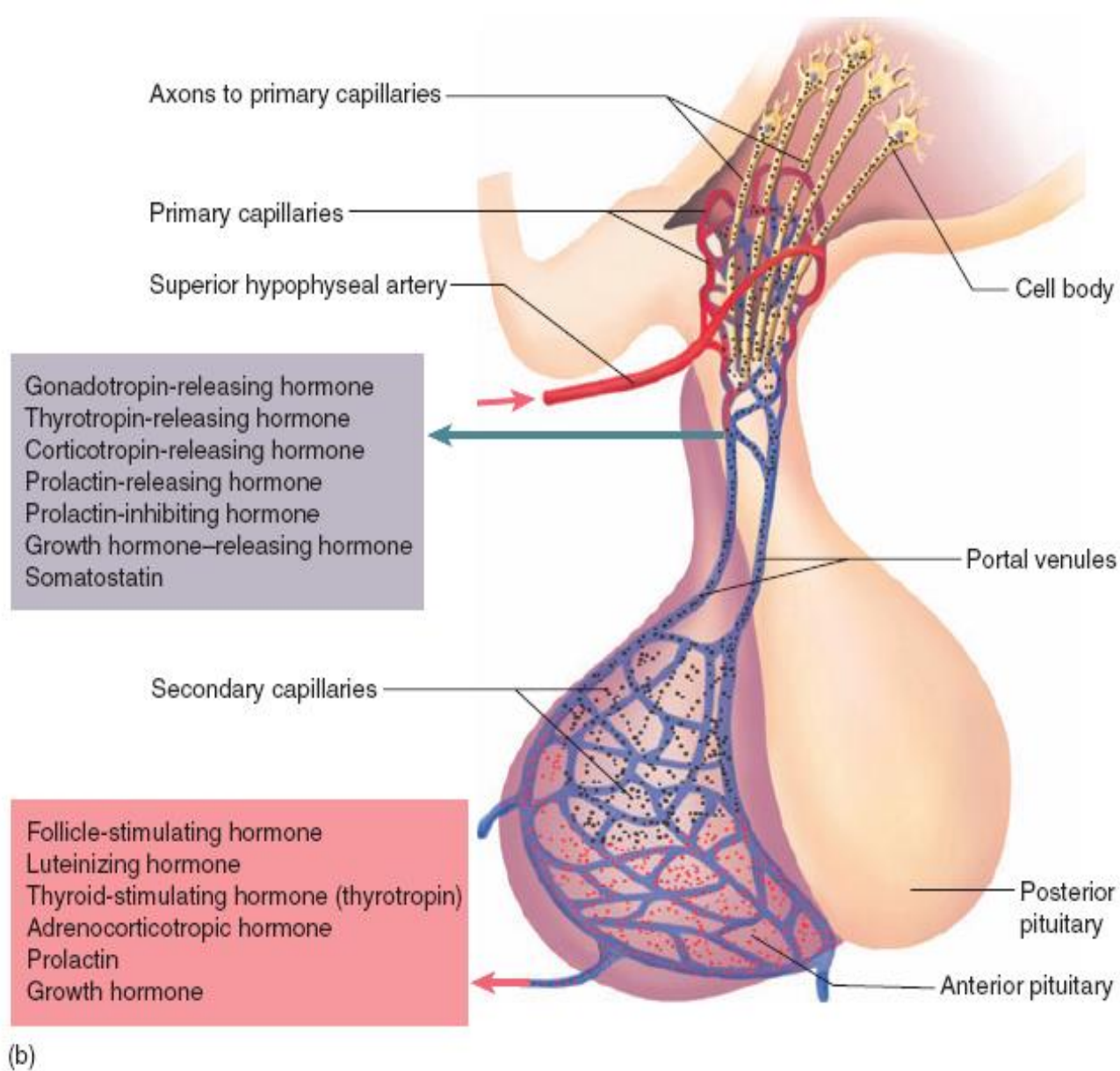
## Hormones of the Anterior Pituitary

HORMONE	SECRETED BY	HYPOTHALAMIC-RELEASING HORMONE (STIMULATES SECRETION)	HYPOTHALAMIC-INHIBITING HORMONE (SUPPRESSES SECRETION)
Human growth hormone (hGH), also known as somatotropin	Somatotrophs.	Growth hormone–releasing hormone (GHRH), also known as somatotropin.	Growth hormone–inhibiting hormone (GHIH), also known as somatostatin.
Thyroid-stimulating hormone (TSH), also known as thyrotropin	Thyrotrophs.	Thyrotropin-releasing hormone (TRH).	Growth hormone–inhibiting hormone (GHIH).
Follicle-stimulating hormone (FSH)	Gonadotrophs.	Gonadotropin-releasing hormone (GnRH).	—
Luteinizing hormone (LH)	Gonadotrophs.	Gonadotropin-releasing hormone (GnRH).	—
Prolactin (PRL)	Lactotrophs.	Prolactin-releasing hormone (PRH).*	Prolactin-inhibiting hormone (PIH), which is dopamine.
Adrenocorticotrophic hormone (ACTH), also known as corticotropin	Corticotrophs.	Corticotropin-releasing hormone (CRH).	—
Melanocyte-stimulating hormone (MSH)	Corticotrophs.	Corticotropin-releasing hormone (CRH).	Dopamine.



# Pituitary hypothalamus connection





**Figure 17.4 Anatomy of the Pituitary Gland.** (a) Major structures of the pituitary and hormones of the neurohypophysis. Note that these hormones are produced by two nuclei in the hypothalamus and later released from the posterior lobe of the pituitary. (b) The hypophyseal portal system. The hormones in the *violet box* are secreted by the hypothalamus and travel in the portal system to the anterior pituitary. The hormones in the *red box* are secreted by the anterior pituitary under the control of the hypothalamic releasers and inhibitors.