Endocrine pathology- pituitary gland

DR.EMAN KRIESHAN, M.D.

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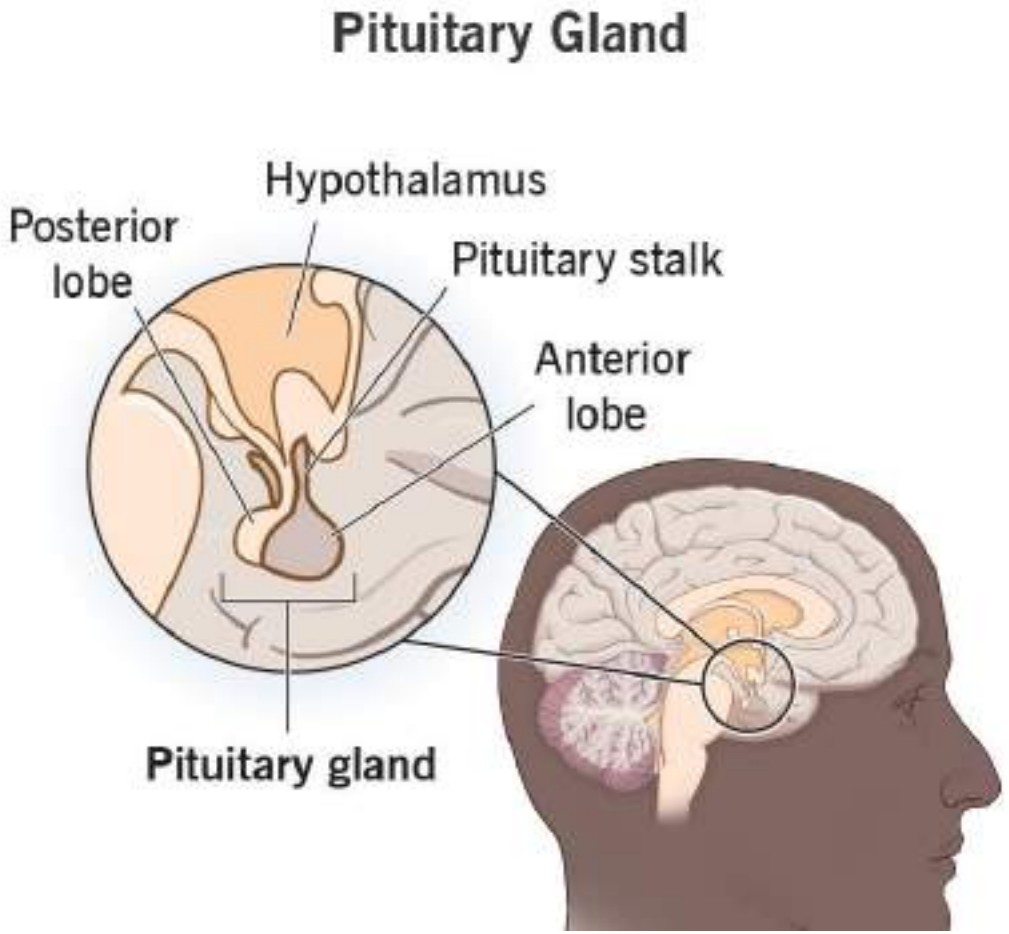
Anatomy


Pituitary Gland
Hypothalamus
Posterior lobe
Pituitary stalk
Anterior lobe
Pituitary gland

Histology

Anterior

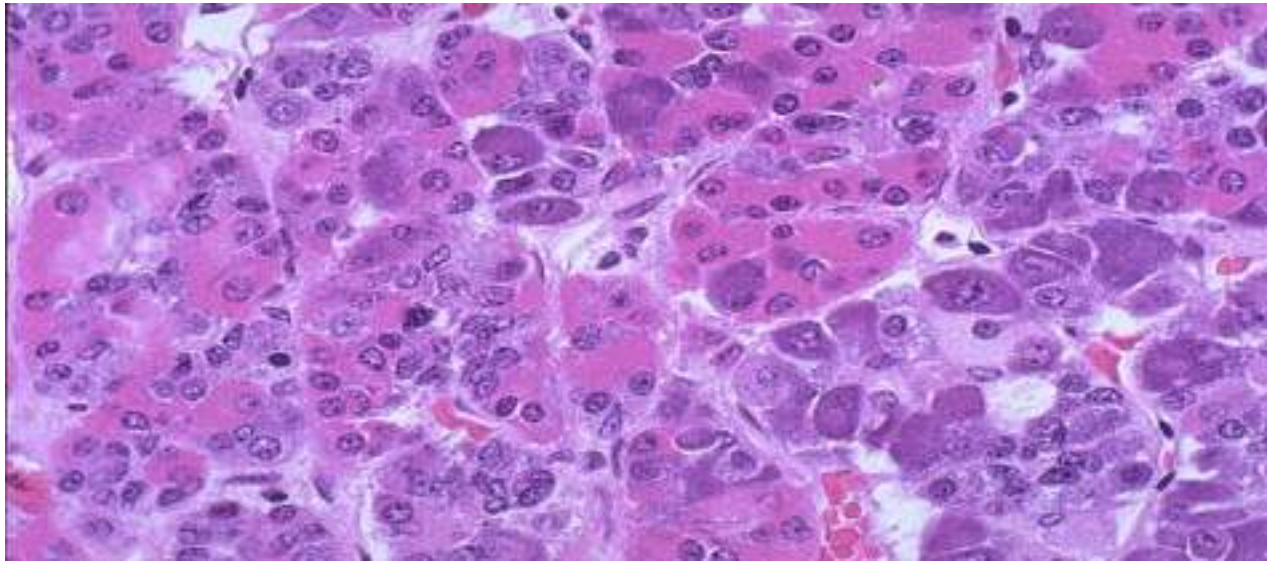
•Acidophils (40% of cells) = red or orange.

- GH, PRL.

•Basophils (10% of cells) = basophilic (light blue).

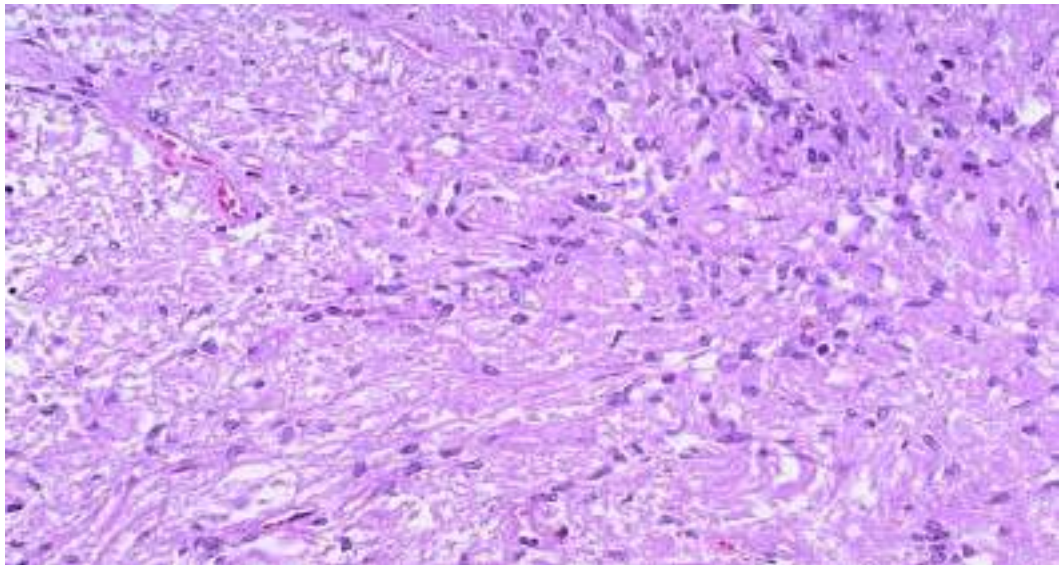
- TSH, LH, FSH, ACTH.

•Chromophobes (50% of cells) = amphophilic (purplish/grey), have secretory activity.

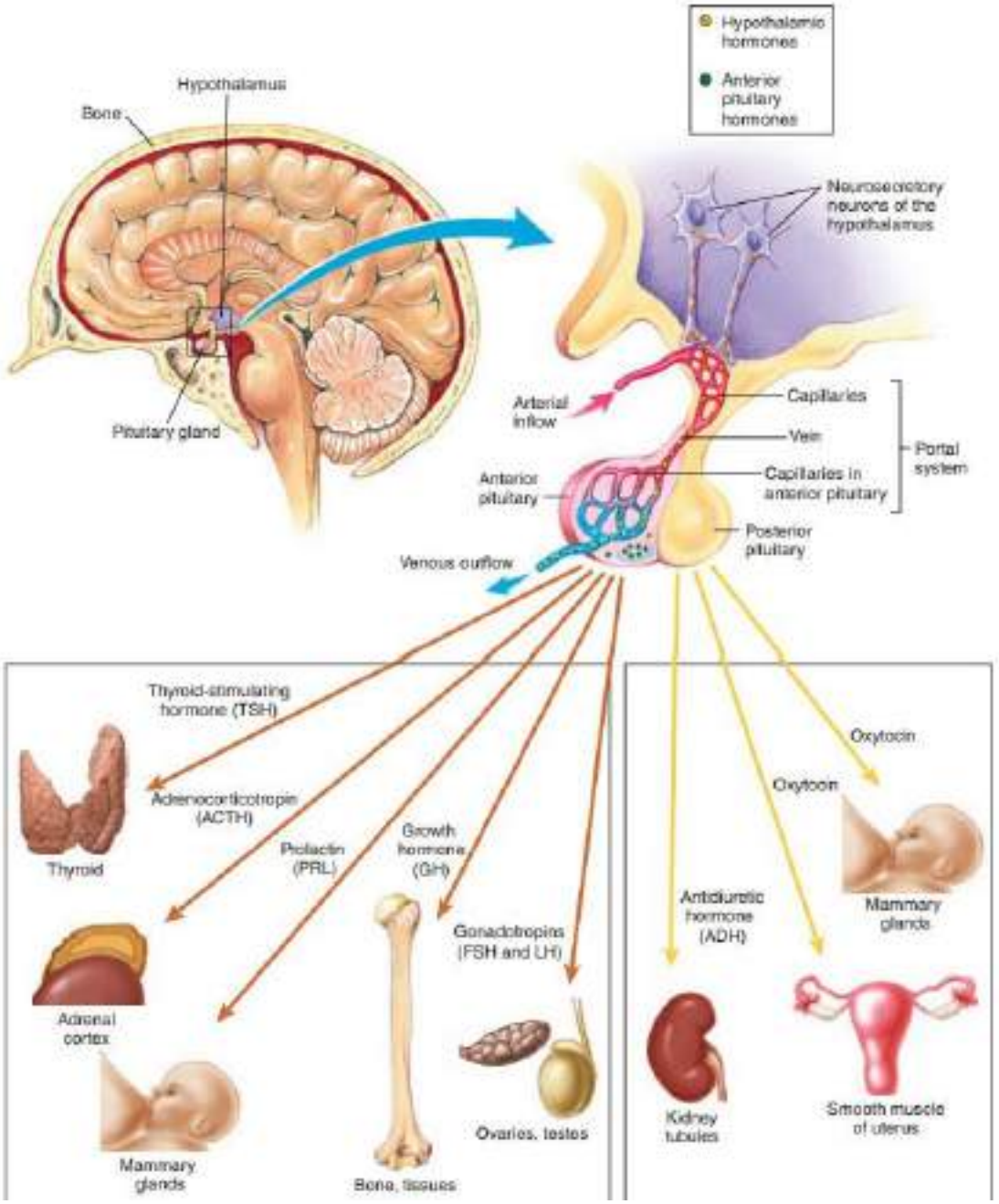


Histology cont.

- Posterior:
- resembles neural tissue, with glial cells, nerve fibers, nerve endings, and intra-axonal neurosecretory granules.
- The hormones **vasopressin** (antidiuretic hormone, or ADH) and **oxytocin** made in the hypothalamus (supraoptic and paraventricular nuclei) are transported into the intra-axonal neurosecretory granules where they are released.



Function


Hypothalamic hormones
Anterior pituitary hormones
Hypothalamus
Bone
Pituitary gland
Neurosecretory neurons of the hypothalamus
Arterial inflow
Capillaries
Vein
Portal system
Capillaries in anterior pituitary
Anterior pituitary
Posterior pituitary
Venous outflow
Thyroid-stimulating hormone (TSH)
Thyroid
Adrenocorticotropin (ACTH)
Prolactin (PRL)
Growth hormone (GH)
Gonadotropins (FSH and LH)
Adrenal cortex
Mammary glands
Bone, tissues
Ovaries, testes
Oxytocin
Oxytocin
Antidiuretic hormone (ADH)
Mammary glands
Kidney tubules
Smooth muscle of uterus

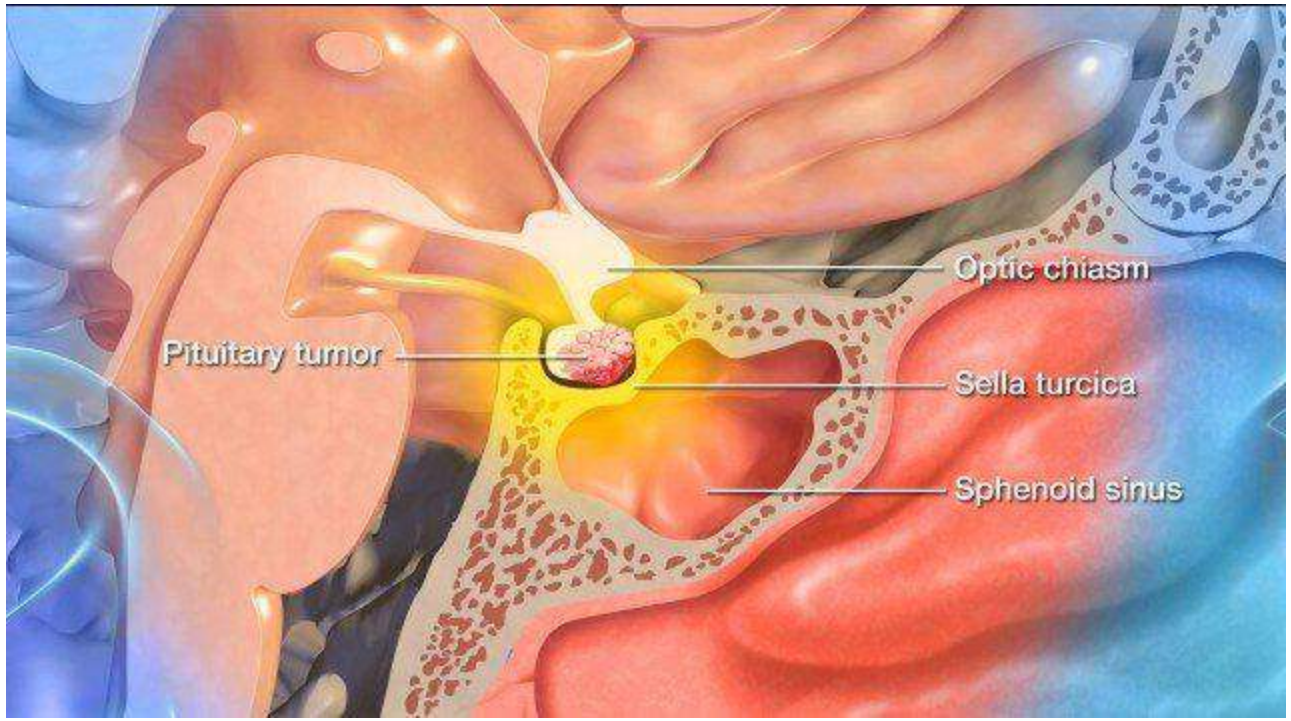
1. HYPERPITUITARISM

- Hyperpituitarism is defined as an excessive secretion or production of ≥1 of the hormones produced by the pituitary gland.

- The primary causes of Hyperpituitarism are various hormone-secreting pituitary tumors. In most cases, due to ADENOMA arising in the anterior lobe.

- Less common causes include :
  * Hyperplasia
  * Carcinoma
  * Ectopic hormone production
  * Some hypothalamic disorders

Pituitary adenoma



pituitary adenomas

- They are the most common suprasellar mass in adults (craniopharyngiomas are more common in children), **usually benign??**.
- Median age at diagnosis is 40 years.

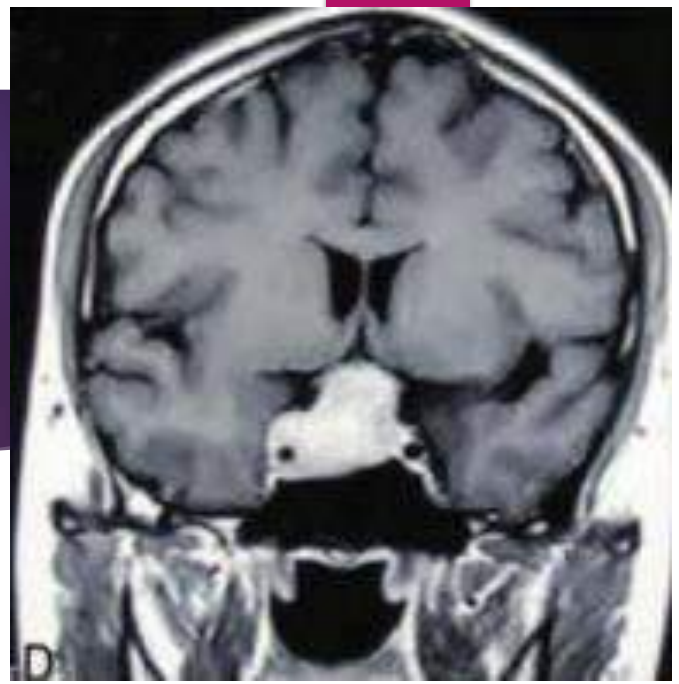
- Majority occur in the sella turcica, originating within the adenohypophysis / anterior pituitary lobe.

- They are categorized based on size:
  - Microadenoma : less than 1 cm.
  - Macroadenoma : greater than 1 cm.

Clinical features

- Clinical features of hormone excess: acromegaly, gigantism, Cushing disease, sequelae of hyperprolactinemia, hyperthyroidism, rarely gonadotropin excess.
- Larger tumors (> 1 cm) can be associated with mass effects such as headache, visual disturbance and hypopituitarism.
- 3% occur with MEN syndrome.
- Hemorrhagic necrosis of large tumors (pituitary apoplexy) may be a surgical emergency

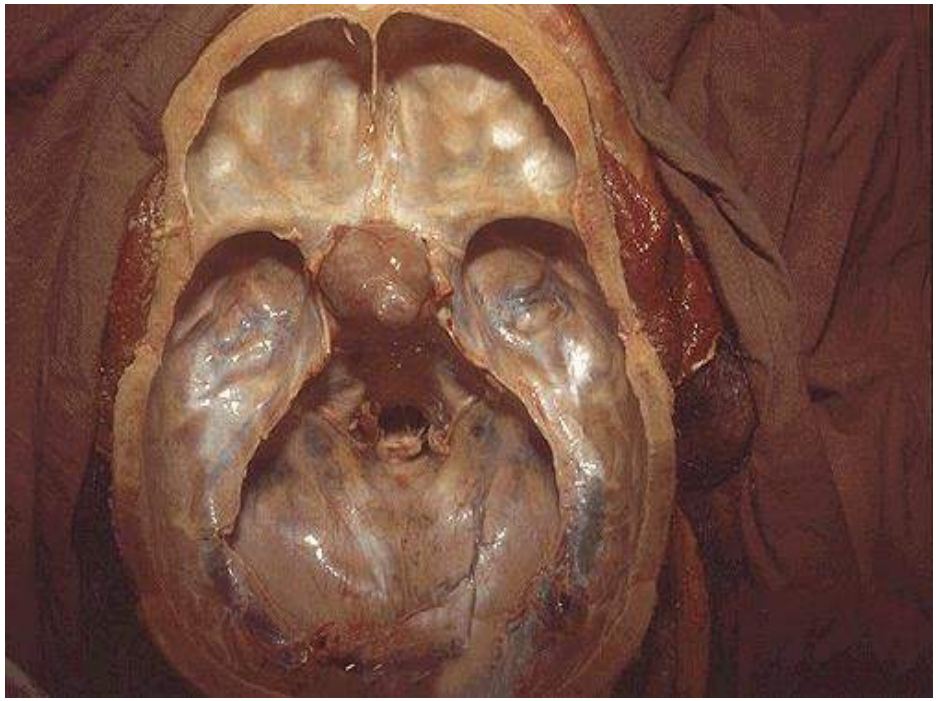
Diagnosis



- **Radiology**
- **Laboratory:**
- Serum prolactin.
- Growth hormone and IGF1 are biomarkers of acromegaly or gigantism
- Cortisol and ACTH are elevated in Cushing disease

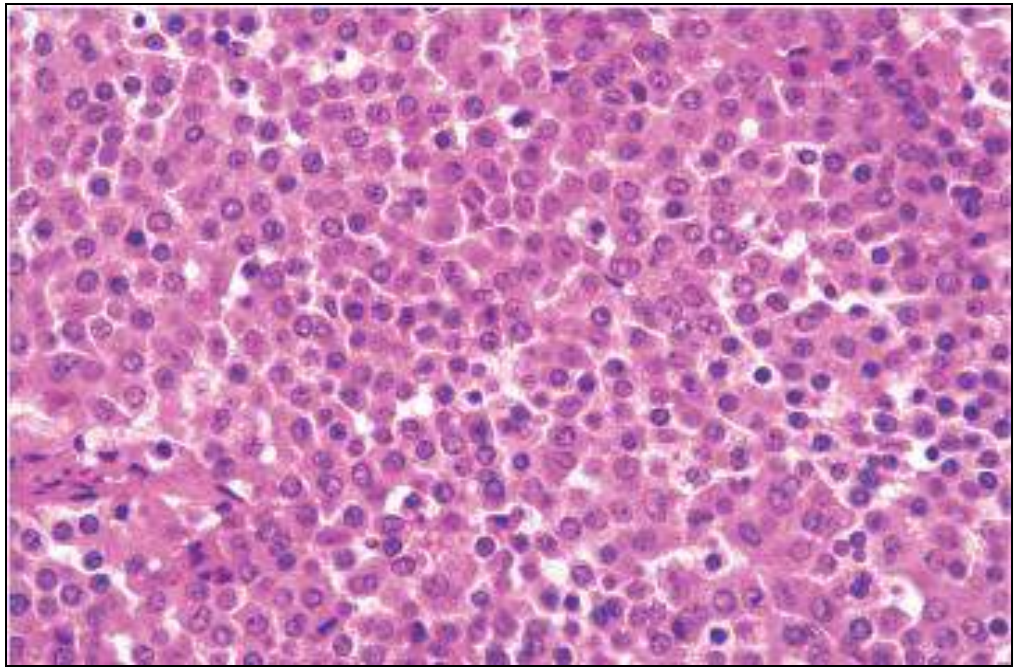
Gross morphology

- Ranging from Well circumscribed tumor to invasive lesion in up to 30%.
- Hemorrhage & necrosis seen in large tumors

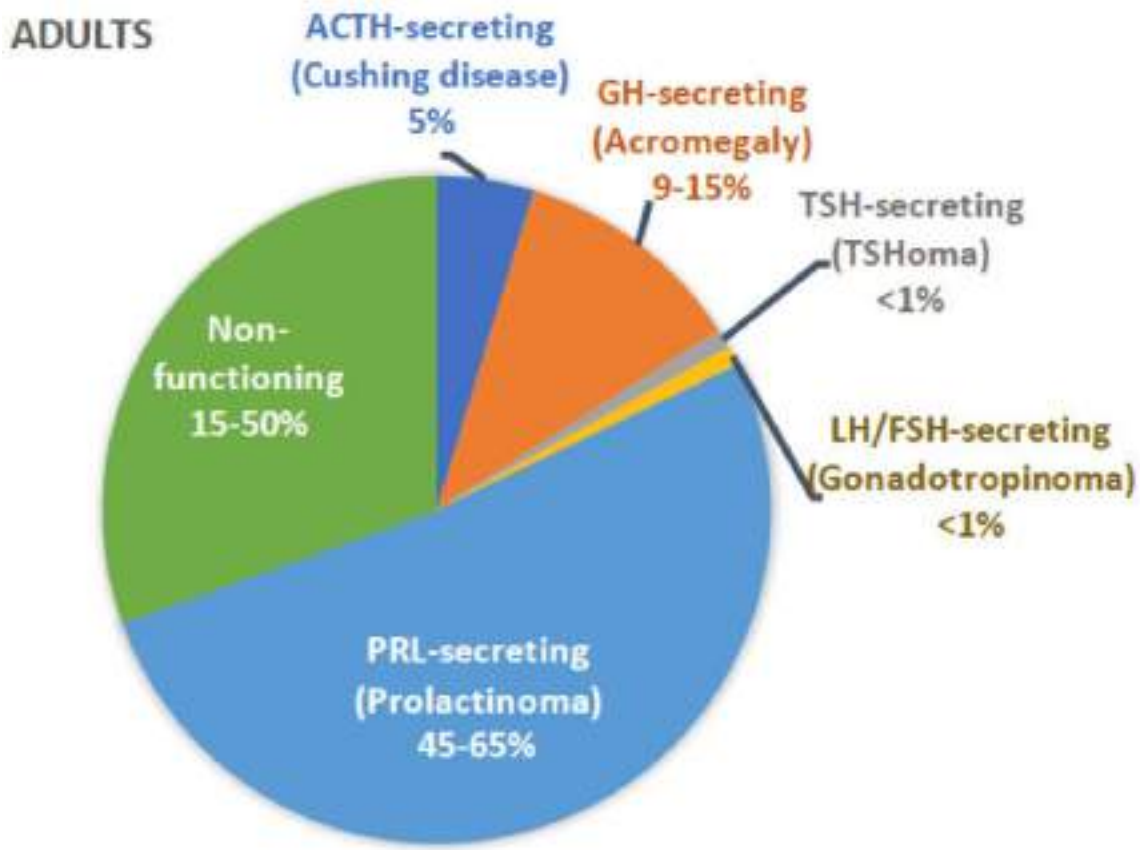


Histologic features

- Cells may be classified as acidophilic, basophilic or chromophobic based on tinctorial differences; this usually correlates with content of hormone containing secretory cells



Types and frequency of PAs based on their functional status in adult



1- PROLACTINOMA :

- The most common secretory tumors of the pituitary gland, accounting for up to 45 percent of pituitary adenomas.
- Prolactinomas can lead to a wide variety of symptoms, either due to mass effect or hypersecretion of prolactin.
- Hyperprolactinemia is not always due to prolactinoma, and other causes like pregnancy, drugs, hypothyroidism, and pituitary stalk effect due to other pituitary tumors.
- Prolactinomas arise from monoclonal expansion of pituitary lactotrophs that have undergone somatic mutation.

Signs and Symptoms Due to Mass Effect:

- Headaches
- visual field deficits.
- Cranial nerve palsies.
- Seizures, hydrocephalus.

Signs and Symptoms Due to hyperprolactinemia:

Males
Decreased libido
Impotence
Erectile dysfunction
Oilgozoospermia (due to secondary hypogonadism).

Females
Oligomenorrhea, amenorrhea
Infertility, loss of libido
Galactorrhea

Treatment

- Macroprolactinomas incidentally discovered without symptoms can be observed with periodic monitoring of the labs and imaging.

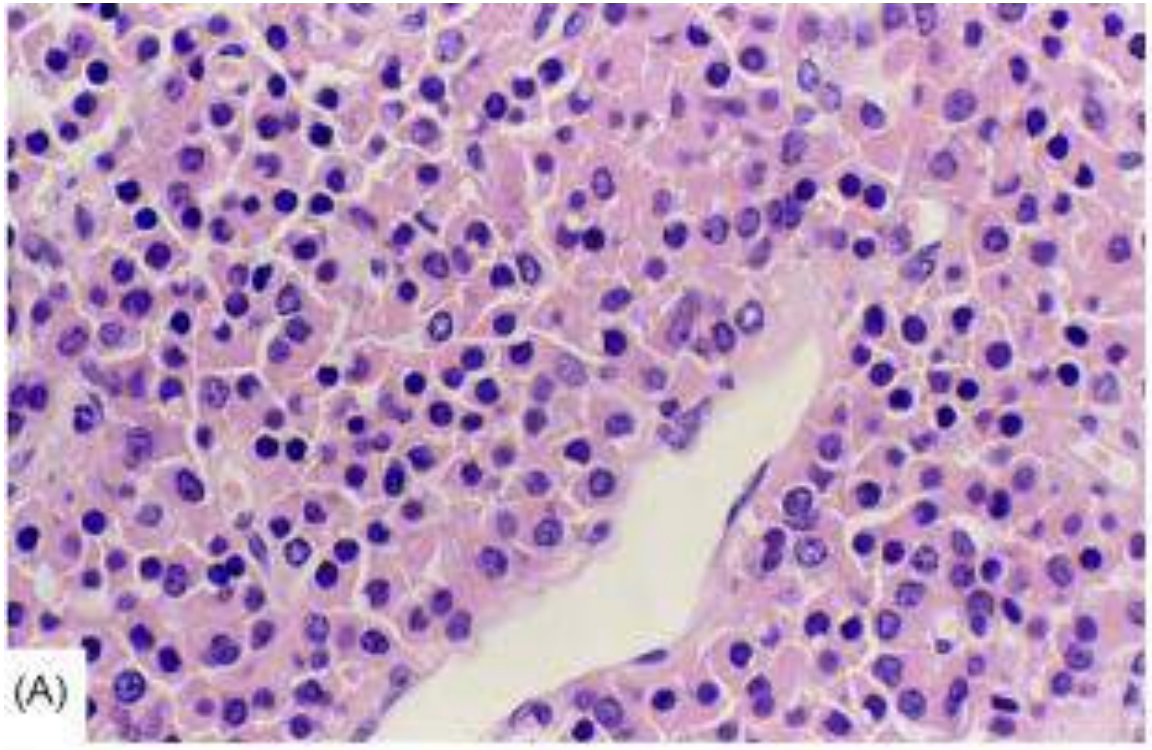
- Macroprolactinoma or symptomatic microadenoma should be treated with dopamine agonist therapy.

2.Growth hormone secreting adenoma

- Persistent secretion of GH stimulates the hepatic secretion of insulin-like growth factor I (IGF-I).
- 40% Associated with GNAS 1 gene mutation
- Symptoms :
- May be delayed so adenomas are usually large
- Produce GIGANTISM (children) or ACROMEGALLY (adults).
- Diagnosis:
- measurement of GF & IGF-1.
- Confirm by failure to suppress GH production in response to an oral load of glucose.

Histology

- Composed of granular ACIDOPHILIC cells and may be mixed with prolactin secretion.



3- Corticotroph cell adenoma

- Composed of Chromophobe or basophilic cells, Usually microadenomas.

- Presentation:
- Functionless .
- Cushing ‘s Disease (↑ ACTH)
- ↑ ICP .

- Higher chance of becoming malignant

HYPOPITUITARISM.

- Hypopituitarism is a medical condition characterized by insufficient hormone production in the pituitary gland.

- **Etiology**
- Hypopituitarism can originate from 2 primary sources :
- pathology of the hypothalamus, which affects the production of tropic hormones that act on the pituitary.
- direct pathology within the pituitary gland itself.

- The predominant cause of hypopituitarism is pituitary tumors, which account for 61% of cases.

The symptoms associated with hormonal deficiencies are:

- ACTH deficiency: ACTH deficiency results in adrenal insufficiency.
- TSH deficiency: TSH deficiency leads to hypothyroidism.
- Gonadotropin deficiency: Gonadotropin deficiency leads to hypogonadism.
- GH deficiency: GH deficiency in children can result in poor growth and short stature, in adults, some individuals may experience fatigue and weakness.
- ADH deficiency: ADH deficiency leads to diabetes insipidus, characterized by symptoms such as polydipsia and polyuria.

Craniopharyngiomas.

- craniopharyngiomas are specialized tumors with benign histology and malignant behavior. These lesions have a tendency to invade surrounding structures and to recur after a seemingly total resection.

- Craniopharyngiomas most frequently arise in the pituitary stalk and project into the hypothalamus

- Derived from remnants of Rathke's Pouch.

- The most common presenting symptoms are headache, endocrine dysfunction and visual disturbances.