Diseases of Pituitary & Adrenal Glands

DEPARTMENT OF PATHOLOGY

DEPARTMENT OF MEDICINE

DEPARTMENT OF CLINICAL PATHOLOGY

DEPARTMENT OF PHARMACOLOGY

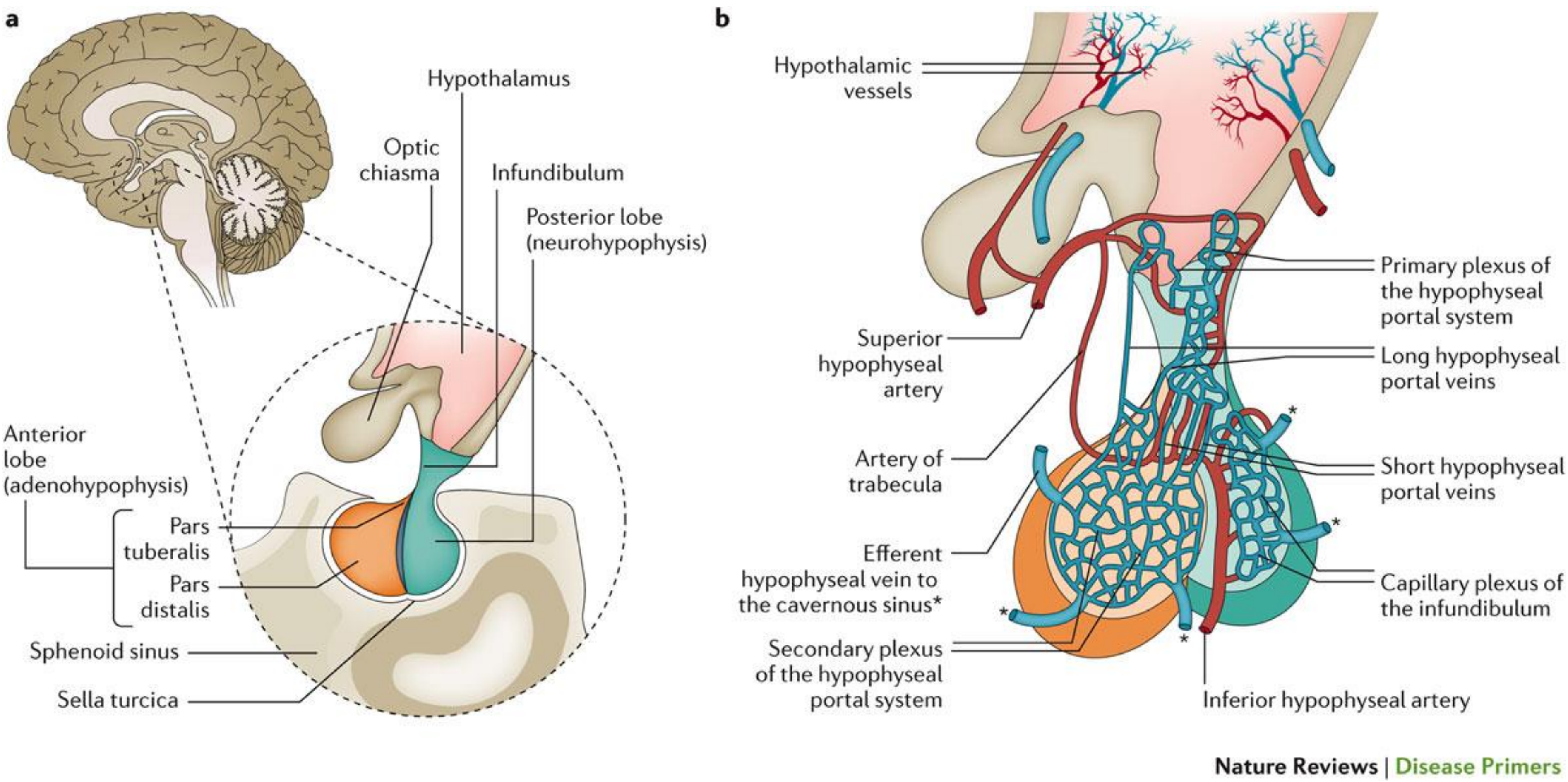
Outline: Dis. of pituitary & adrenal glands

- Pathology (35 min)
- Clinical presentation, diagnosis (80 min)
- Laboratory investigation (15 min)
- Pharmacologic treatment
- QA (5 min)

Pathology of Pituitary gland

- Anatomy and histology
- Pathology
  - Pituitary adenoma
  - Pituitary apoplexy
  - Craniopharyngioma

Anatomy and vascularization of the pituitary gland



Pituitary portal system: Rapid transport and exchange of hormone between Hypothalamus and Anterior pituitary

Part **b** courtesy of M. E. Aykurt, Erciyes University, Kayseri, Turkey Karaca, Z. *et al.* (2016) Sheehan syndrome. *Nat. Rev. Dis. Primers* doi:10.1038/nrdp.2016.92

Pituitary hormones

Anterior pituitary

Hormone-secreting cells

- Somatotroph – GH
- Lactotroph – PRL
- Corticotroph – ACTH
- Gonadotroph – FSH & LH
- Thyrotroph – TSH

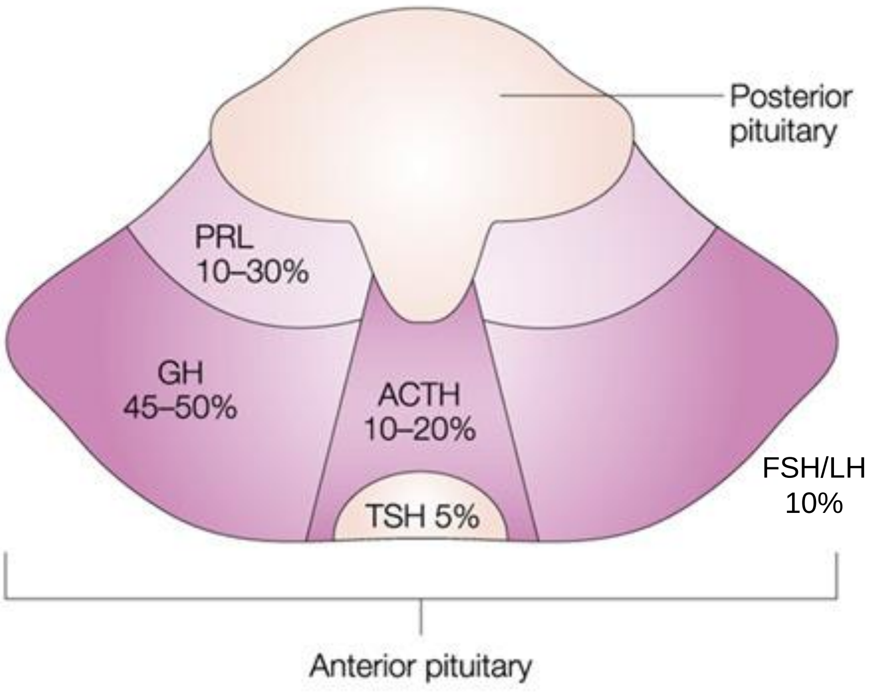
Posterior pituitary

Store and release

- ADH
- Oxytocin

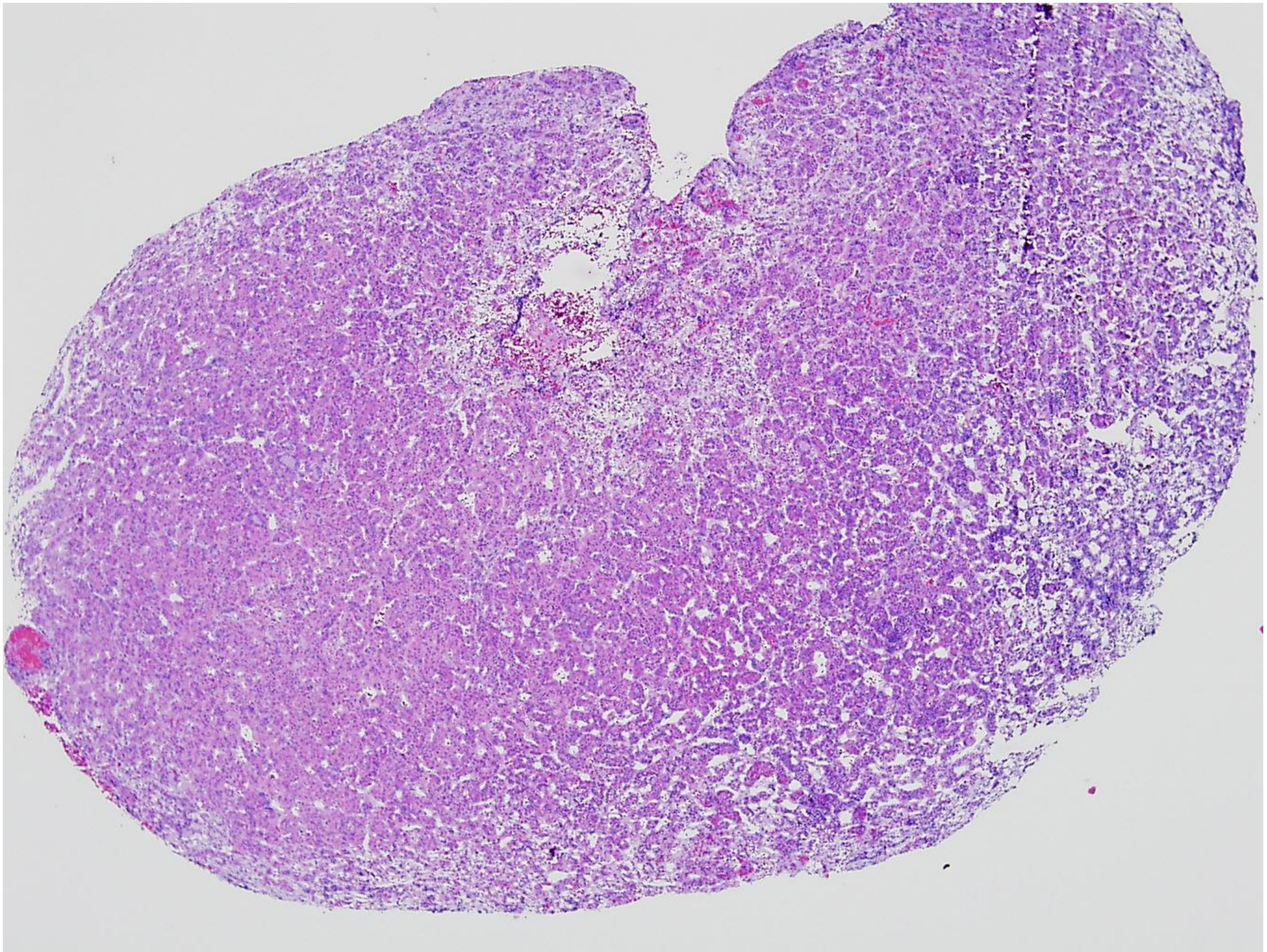
Distribution of cells

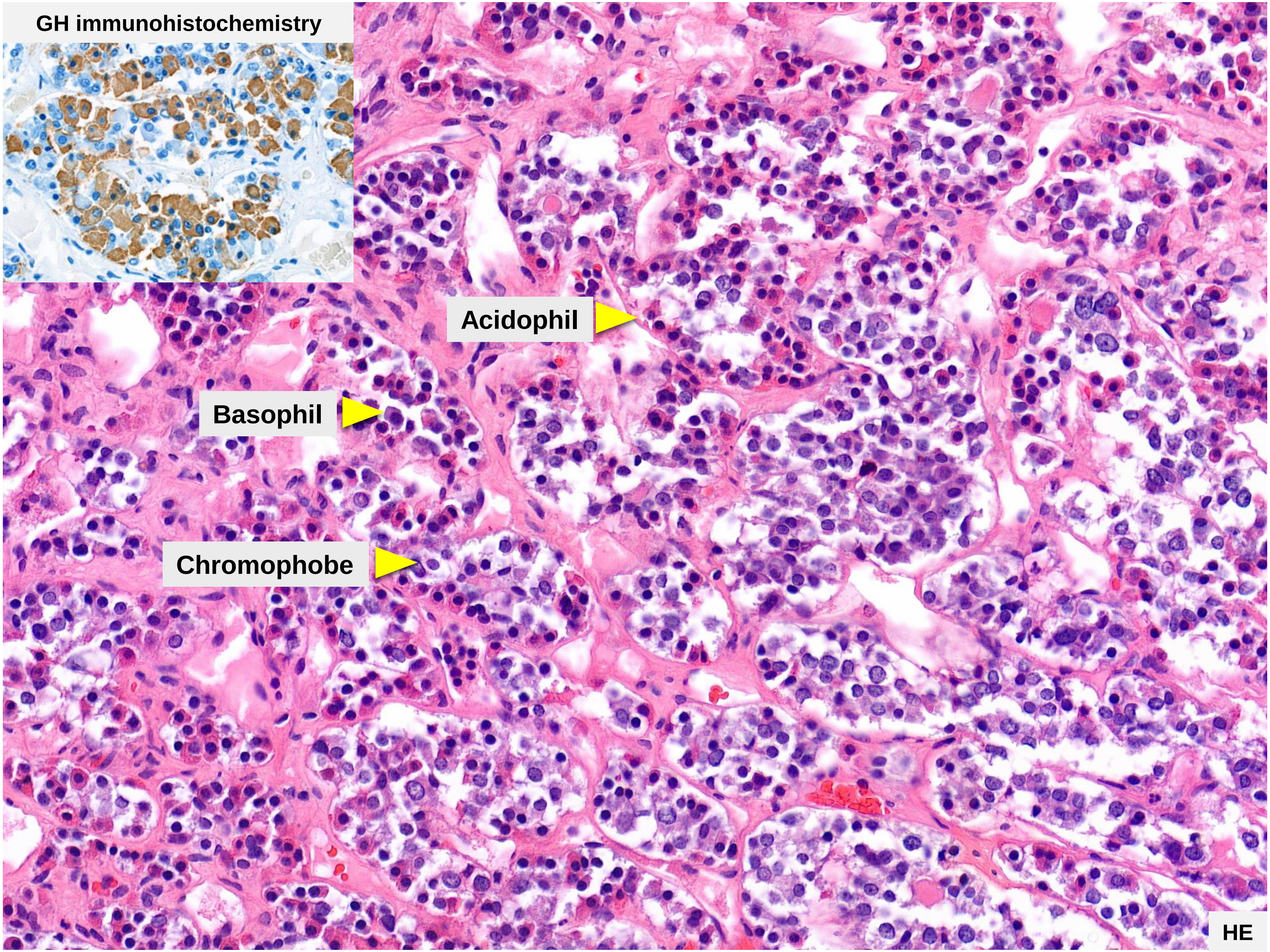
Lloyd RV. AFIP nontumor series. Endocrine disease



Nature Reviews | Cancer

Histology of anterior pituitary




GH immunohistochemistry
Acidophil
Basophil
Chromophobe
HE

Clinical presentations

- Endocrine abnormalities:
  - Hyperpituitarism
  - Hypopituitarism
- Local mass effects:
  - Bitemporal hemianopia (optic nerves, chiasma)
  - Compression of other cranial nerves
  - Invasion to adjacent blood vessels
  - Increased intracranial pressure (expanding mass)

Hyperpituitarism

Excess secretion of pituitary hormones

- Pituitary adenoma (clinically functioning)*
- Pituitary hyperplasia
- Pituitary carcinoma
- Non-pituitary tumors
- Certain hypothalamic disorders

Hypopituitarism

Decreased secretion of pituitary hormones

- Pituitary adenoma (clinically nonfunctioning)*
- Pituitary apoplexy*
- Other tumors*
- Cyst
- Destruction (self-study)
  - Ischemic injury: Sheehan syndrome
  - Surgery, radiation, inflammatory disorders

Pituitary adenoma

- Incidence (new case per year) 3.9-7.4: 100,000
- 10-15% of intracranial tumor
- 20-25% incidental finding
- Peak incidence: 30-50 years
- Most: Benign clinical course

Pituitary adenoma: Classification

Functioning status:

Clinical & Biochemical evidence of hormone excess

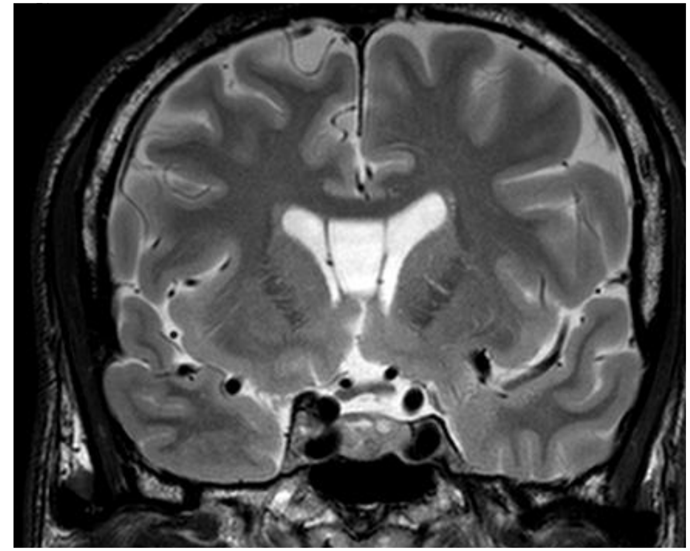
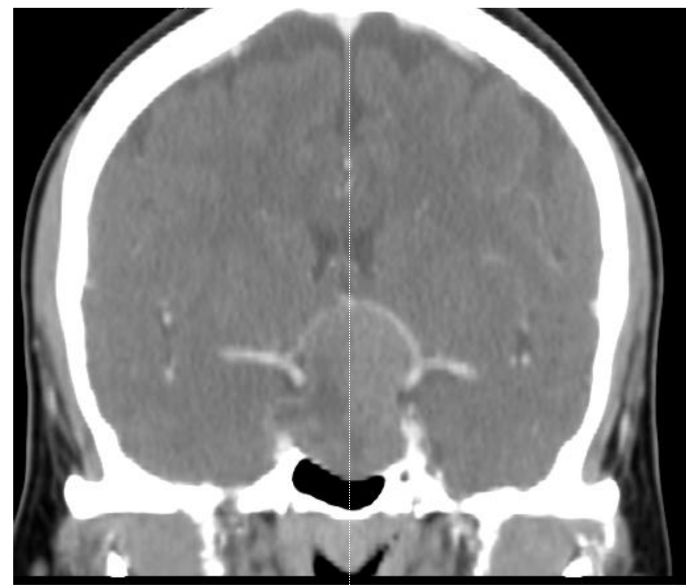
- Clinically functioning
- Clinically nonfunctioning

Size:

- Microadenoma < 1 cm
- Macroadenoma ≥ 1 cm

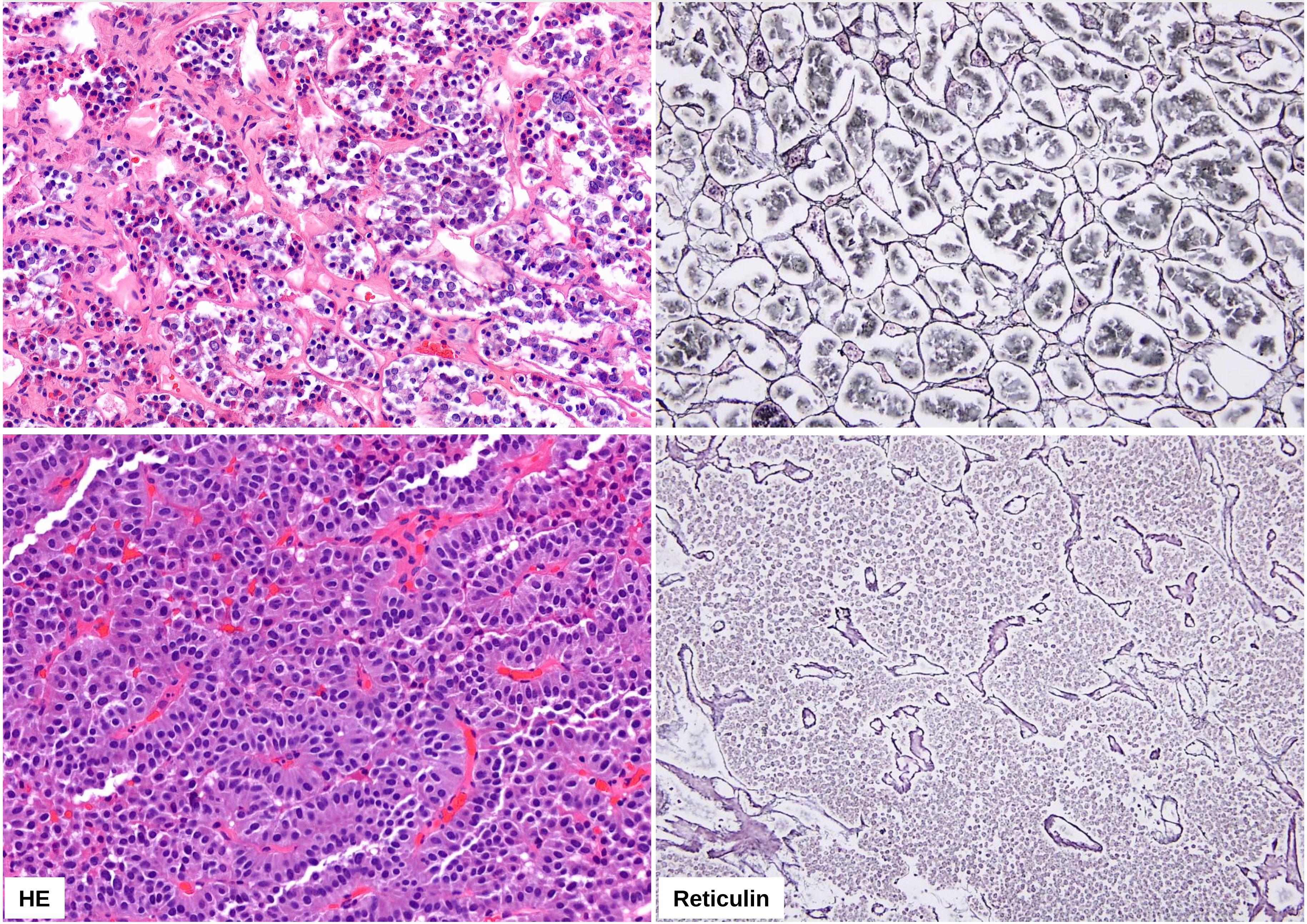
Invasiveness:

- Noninvasive
- Invasive (dura, bone, sphenoid sinus)

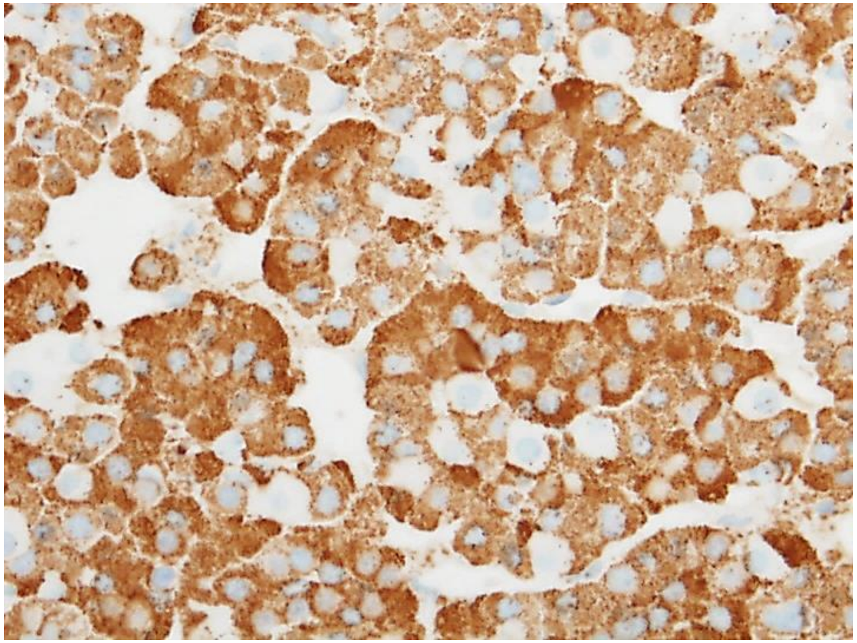




eyepathologist.com

Monomorphism of tumor cells contrasts with the mixture of cells in the normal anterior pituitary. Absence (disrupted) reticulin network.



Pathology investigations



Pituitary hormone immunohistochemical staining

FSH, LH, ACTH, GH, PRL, TSH

- To detect whether an adenoma produces hormone or not
- Does not confirm secretion status of hormone (need correlation with clinical and biochemical tests)

Pituitary adenoma classification

Functioning adenoma

- Produce & Secret Hormone

- Lactotroph adenoma (prolactinoma): PRL
- Somatotroph adenoma: GH
- Corticotroph adenoma: ACTH
- Gonadotroph adenoma: FSH/LH
- Thyrotroph adenoma: TSH

Hyperpituitarism ± Mass effects

Nonfunctioning adenoma

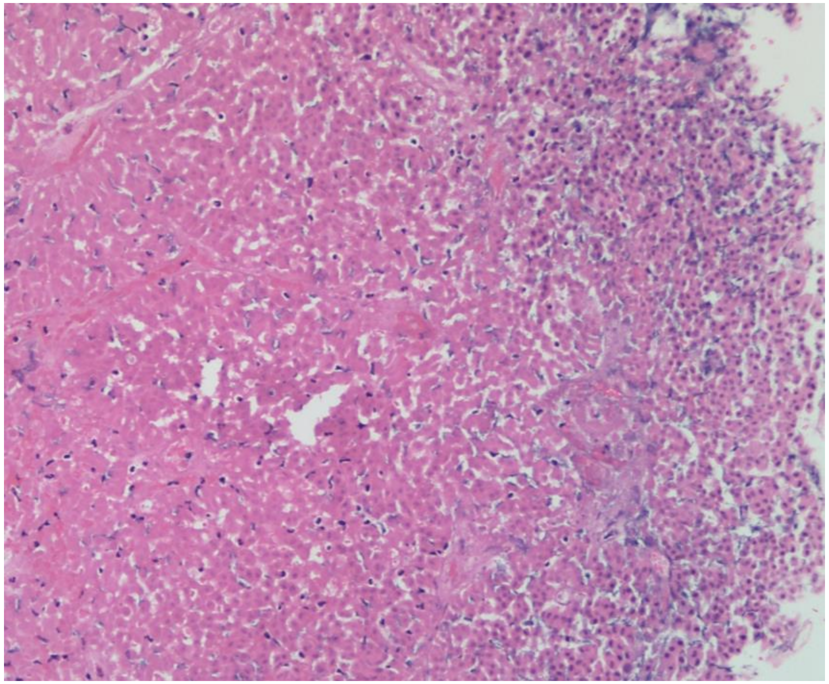
- May or may not produce hormone
- No hormone secretion

- Null cell adenoma
- FSH, LH, GH, ACTH

Hypopituitarism, Mass effects

Pituitary apoplexy

- Acute hemorrhage into pituitary, often occurring into an adenoma
- Pathology: Hemorrhage/Hemorrhagic infarct (coagulative necrosis)
- Clinical:
  - Severe headache
  - Diplopia
  - Hypopituitarism
  - Acute increased intracranial pressure

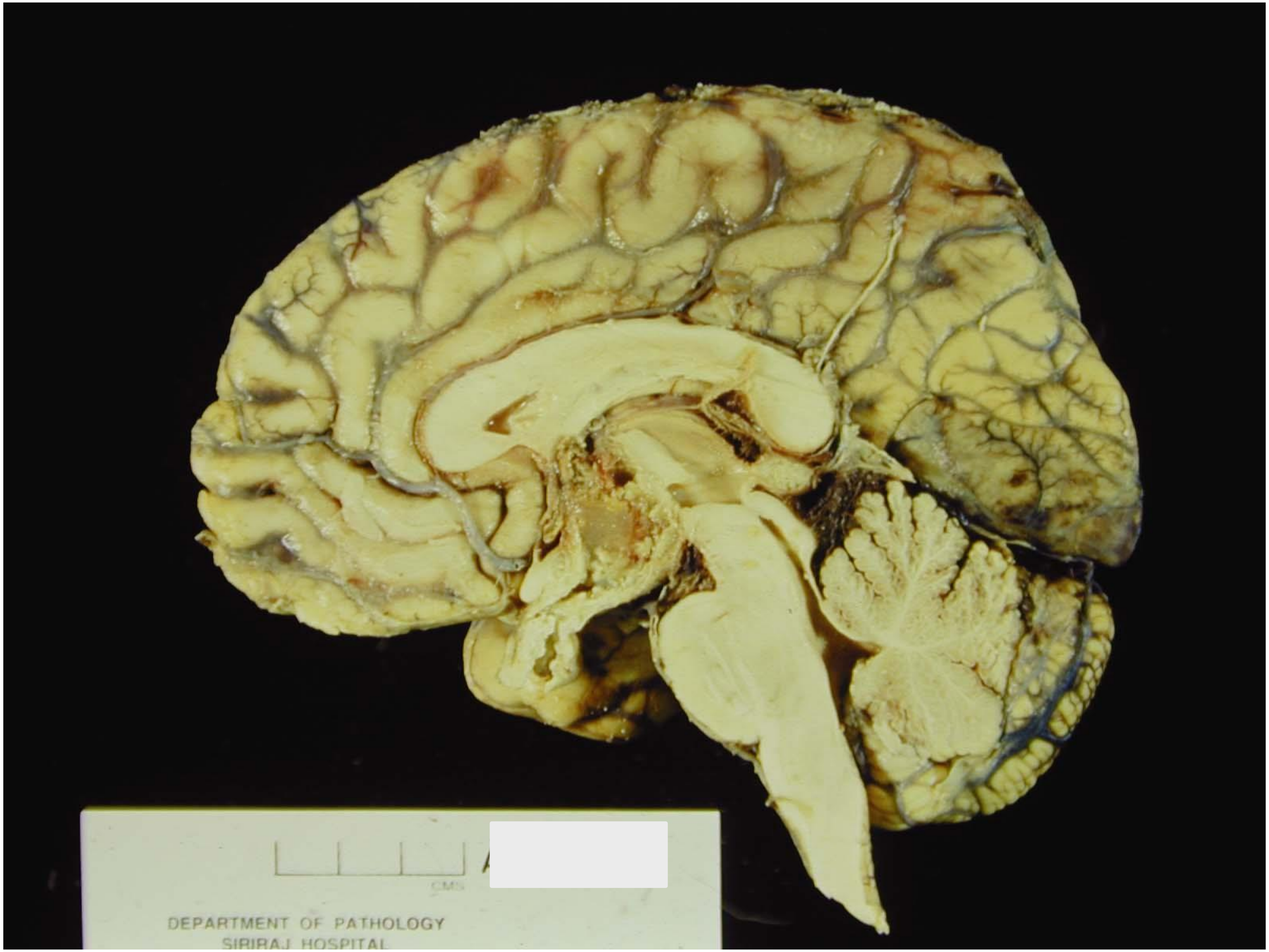


Craniopharyngioma

- Most are suprasellar tumor
- 1-5% of intracranial tumors
- Benign, slow growing tumor
- Bimodal distribution
  - Children: 5-15 years
  - Adult: 45-60 years
- Origin: Epithelial remnant of Rathke's pouch

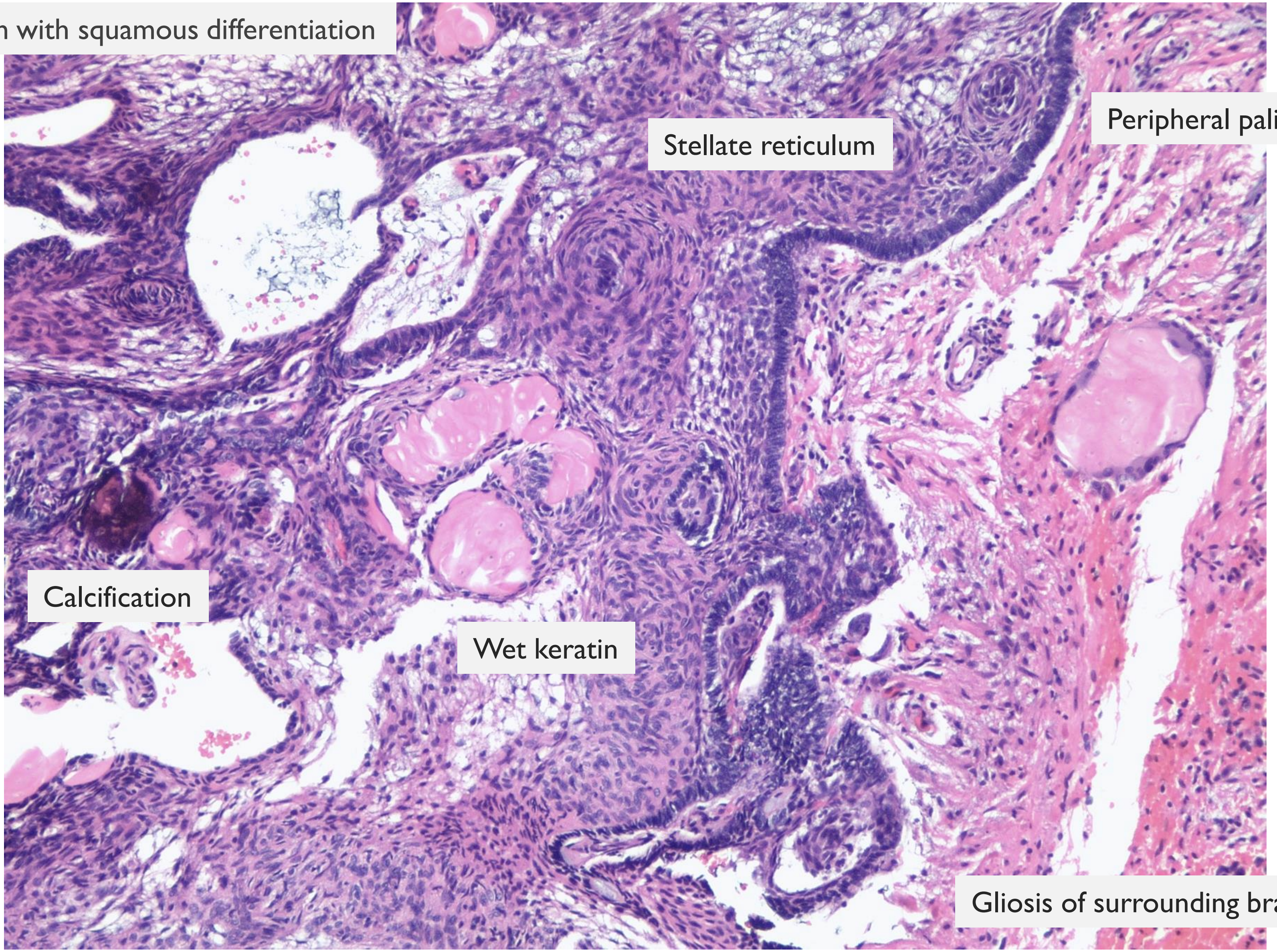
Clinical presentations

- Mass effect, compress pituitary gland
  - Headache
  - Visual disturbance
  - Endocrine dysfunction
- Extension to hypothalamus
  - Diabetes insipidus



Solid-cystic tumor filled with green-brown fluid

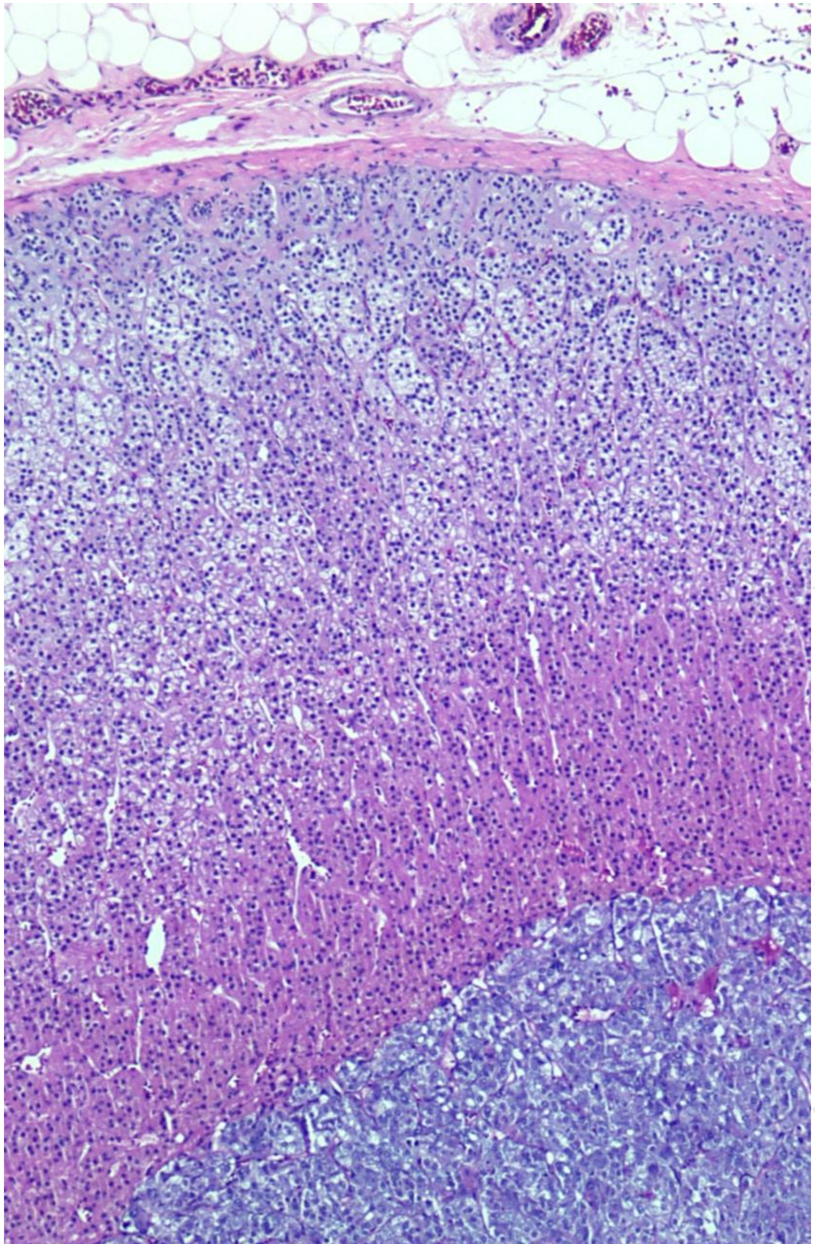
Picture courtesy of Dr. Tumtip S.

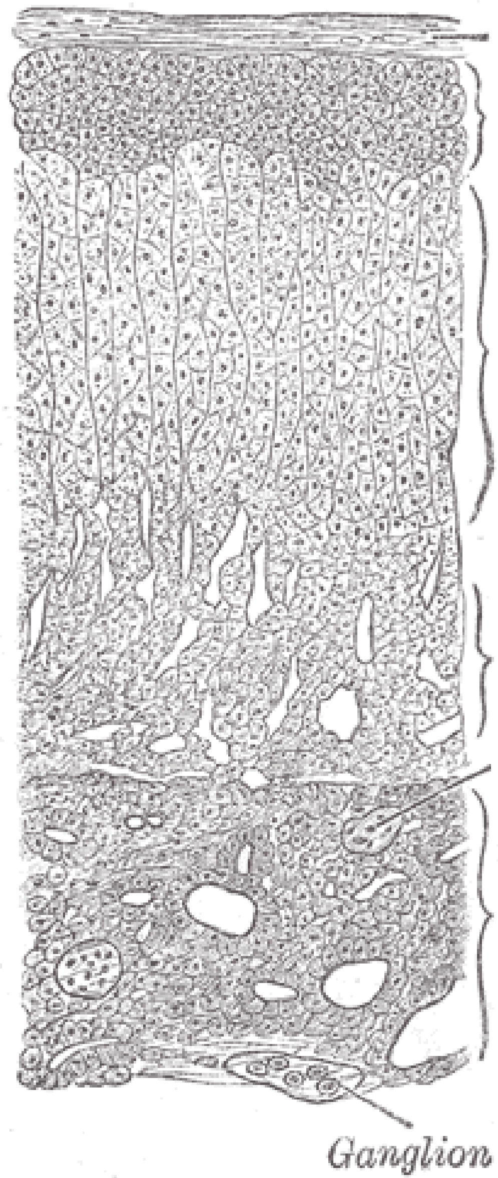


Craniopharyngioma

Diseases of Adrenal gland

- Histology
- Pathology
  - Cortical atrophy
  - Cortical hyperplasia
  - Neoplasm
  - Adrenal insufficiency





https://upload.wikimedia.org/wikipedia/commons/5/5c/Gray1185.png

Adrenal cortical atrophy

Suppression of endogenous ACTH

↓

Lack of stimulation of Z. fasciculata and reticularis

↓

Bilateral Cortical Atrophy

Decrease in cell number, size and weight

Adrenal gland: Decrease in size, weight, number of cortical cells

Photograph courtesy of Dr. Piyawadee L.

Adrenal cortical hyperplasia

- Increase in number of cortical cells
- Increase in size and weight
- Causes
  - ACTH-secreting pituitary adenoma
  - Ectopic ACTH syndrome
  - Others
- Morphology: Diffuse, nodular, mixed

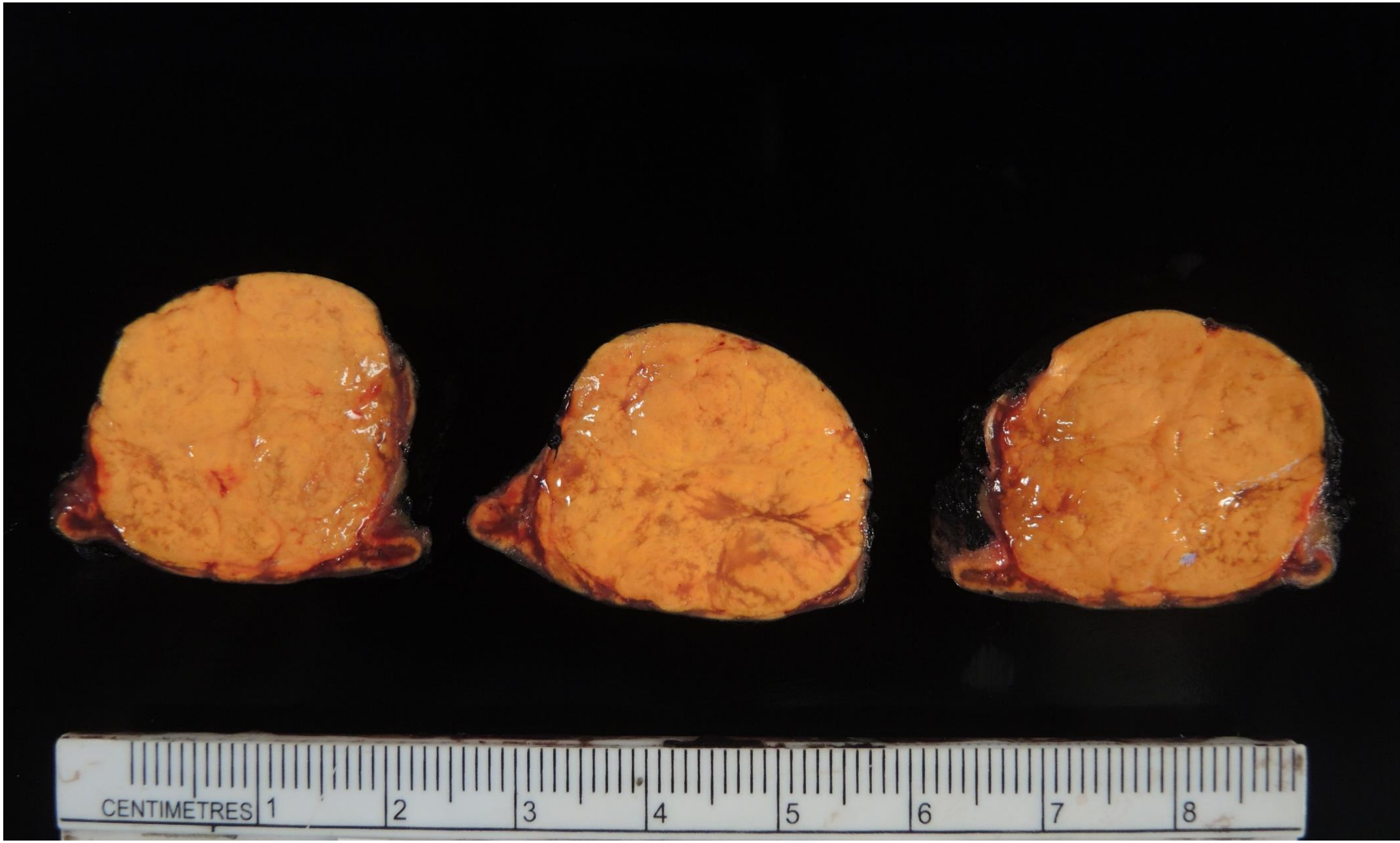
Robbins and Cotran Pathologic Basis of Disease

Adrenal gland neoplasms

- Primary tumors
  - Adrenal cortical adenoma
  - Adrenal cortical carcinoma
  - Pheochromocytoma
- Secondary (metastatic) tumors

Adrenal cortical neoplasms

- Adenoma
  - Equally common in adult and children
  - Functioning or Non-functioning (determined by clinical)
  - Can be incidental finding (non-functioning)
- Carcinoma
  - Rare neoplasm, children predominate
  - Tend to be functioning
- Most are sporadic



Adrenal cortical adenoma Solitary, well-circumscribed. Usually yellow-gold color.

(photograph courtesy of department of pathology)

Pheochromocytoma

- Tumor of adrenal medulla (paraganglioma of adrenal medulla)
- Sporadic or familial syndrome
- 10% Tumor
  - 10% of sporadic cases are bilateral
  - 10% malignant (defined by metastasis)
  - 10% are not associated with hypertension
  - 10% extra-adrenal (designated paraganglioma)

Pheochromocytoma Originates from the adrenal medulla, circumscribed, often non-encapsulated. Pink-grey to tan cut surface.

(photograph courtesy of department of pathology)

Adrenal metastases

- Most are carcinoma
- Adenocarcinoma being the most common
- Various primary sites
  - Lung and breast are the most common

Pathology causing adrenal insufficiency

- Infection
  - TB, fungi (Toxoplasma)
  - AIDS (CMV, Kaposi sarcoma)
- Massive hemorrhage
  - Meningococcal septicemia (Waterhouse-Friderichsen syndrome)
- Autoimmune adrenalitis
- Metastatic cancers

Reference

- Robbins Basic Pathology (accessed via ClinicalKey©)