Lecture 9 Adrenal gland pathology

Fatima Obeidat, MD

PRIMARY HYPERALDOSTERONISM

a. Bilateral idiopathic hyperaldosteronism,

- bilateral nodular hyperplasia of adrenals
- the most common underlying cause (60% of cases)

b. Adrenocortical neoplasm, adenoma (the most common cause) or, rarely, an adrenocortical carcinoma.

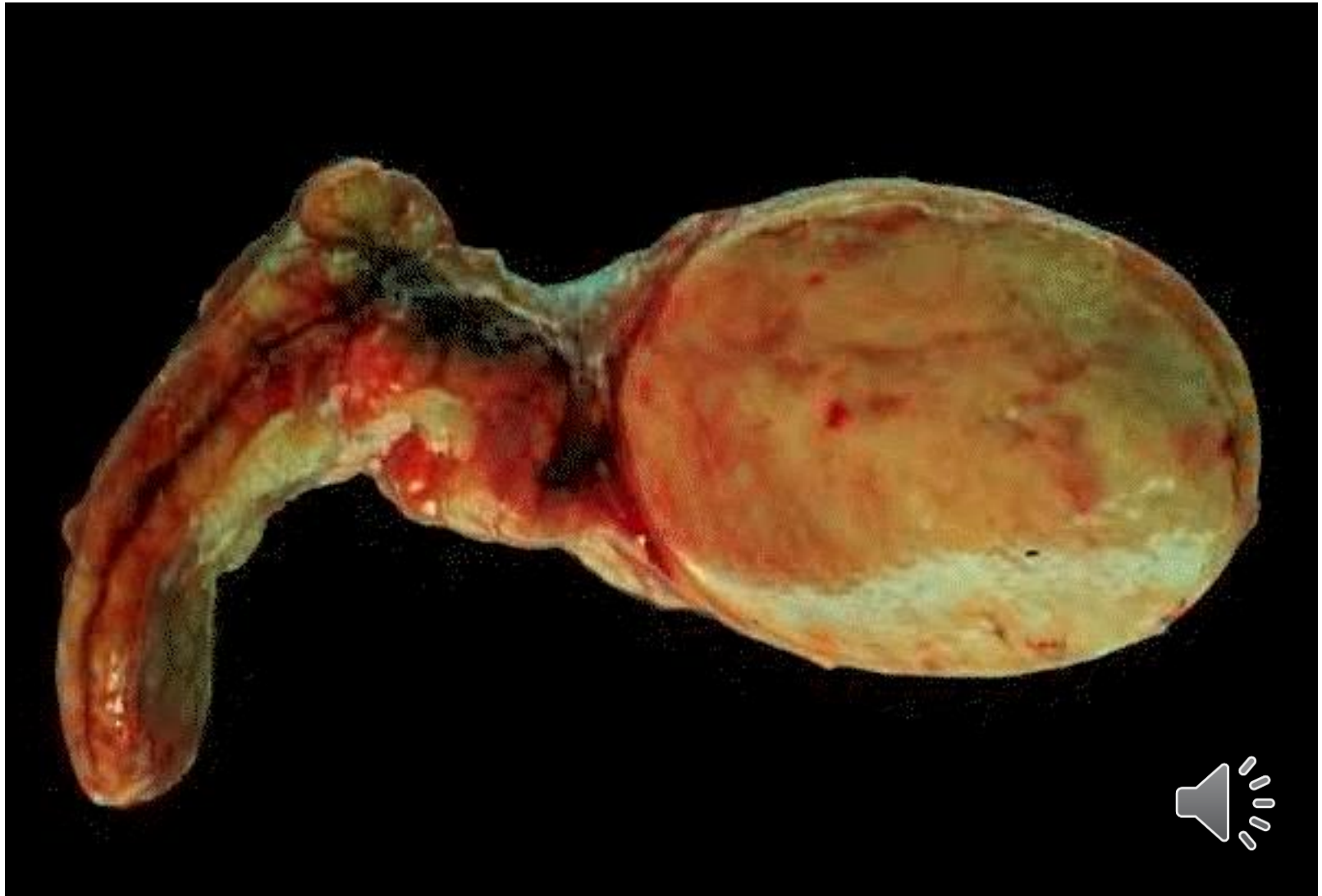
- In approximately 35% of cases, the cause is a solitary aldosterone-secreting Aldosterone-producing adrenocortical adenoma referred to as *Conn syndrome*

c. Rarely, familial hyperaldosteronism may result from a genetic defect that leads to overactivity of the *aldosterone synthase* gene, *CYP11B2.*

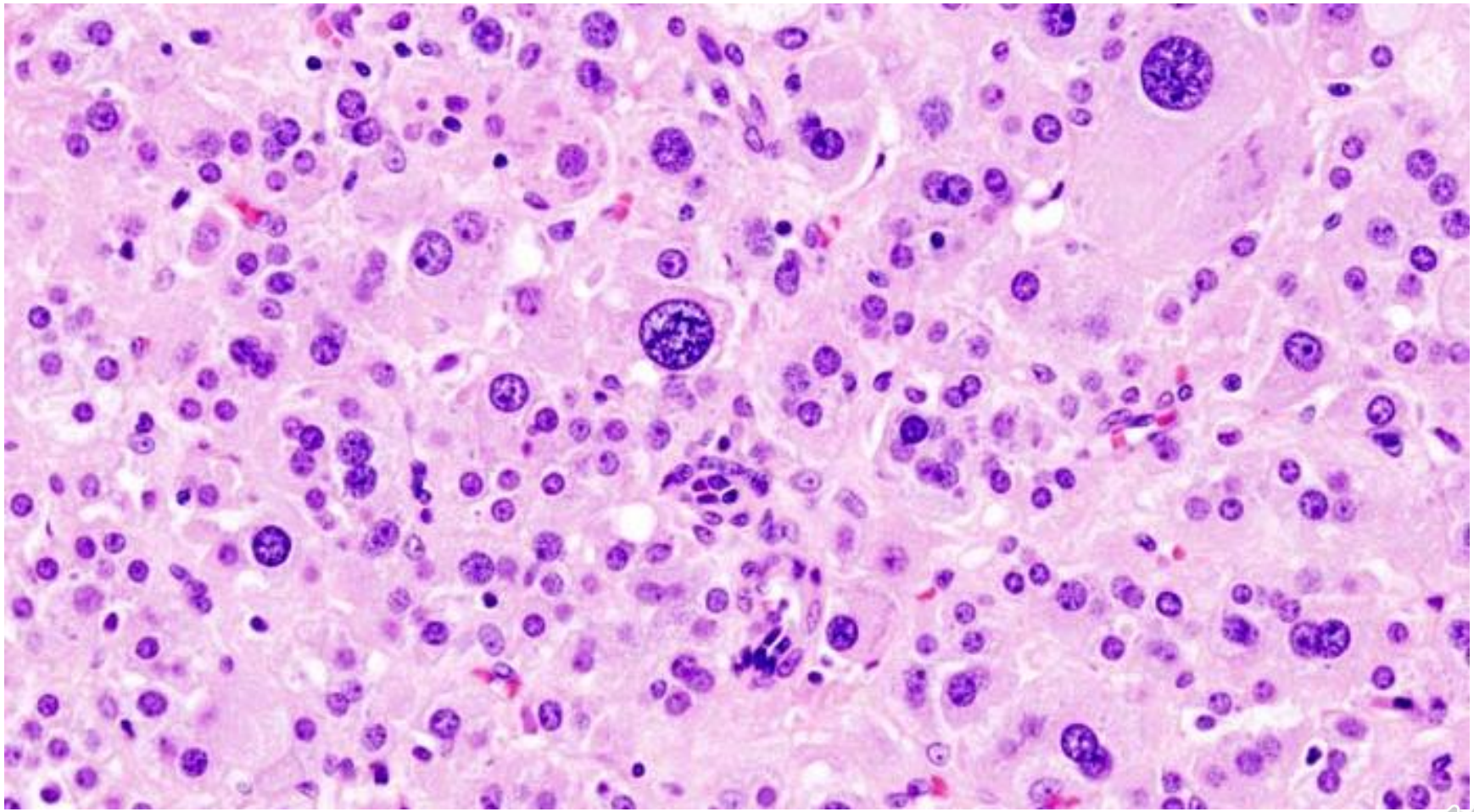
Features of aldosterone producing adrenocortical adenoma

- Solitary
- Encapsulated
- Well circumscribed
- Histology: can show endocrine atypia
- May contain spironolactone bodies if treated with spironolactone

Adrenocortical adenoma



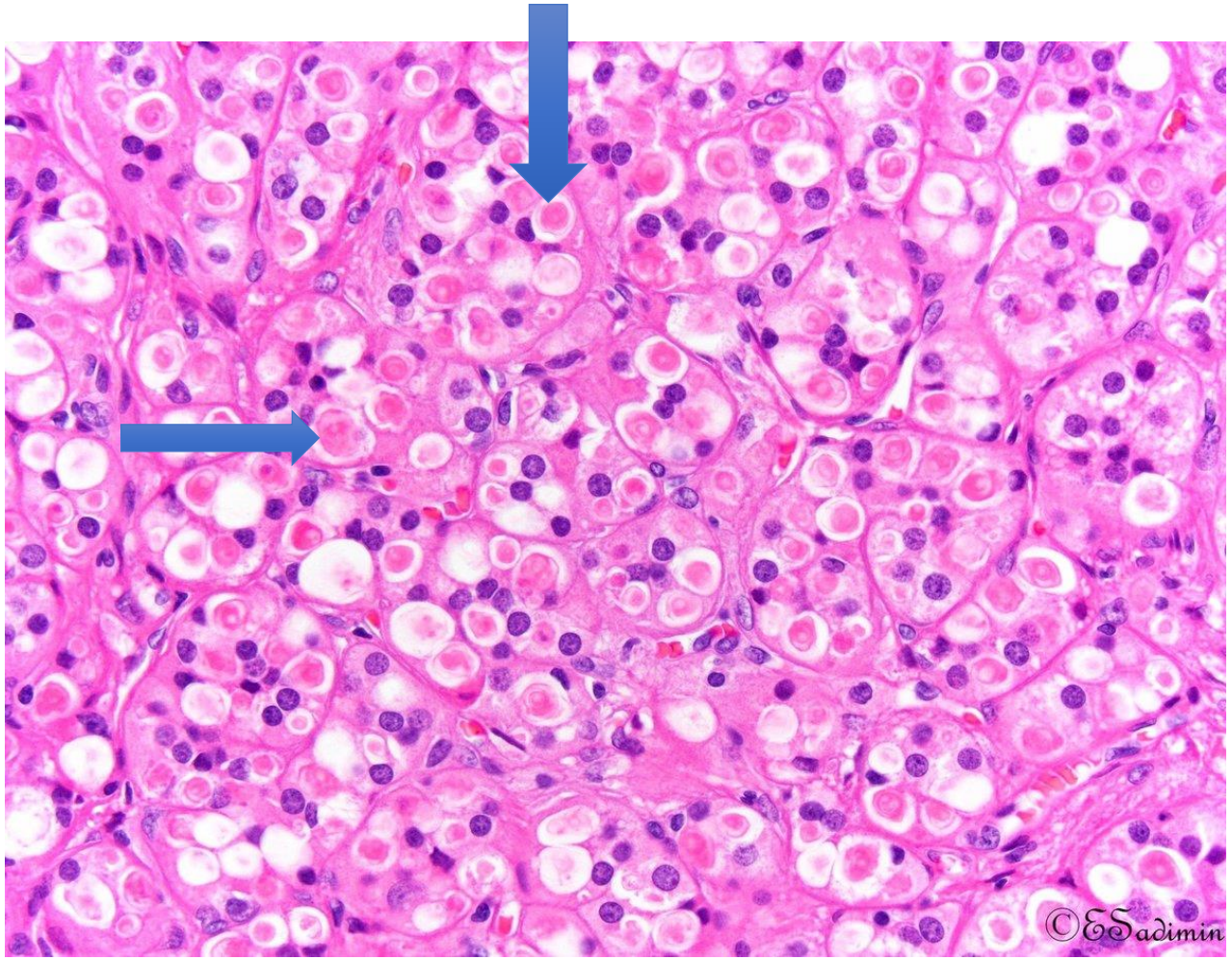
Adrenocortical adenoma/ note the endocrine atypia



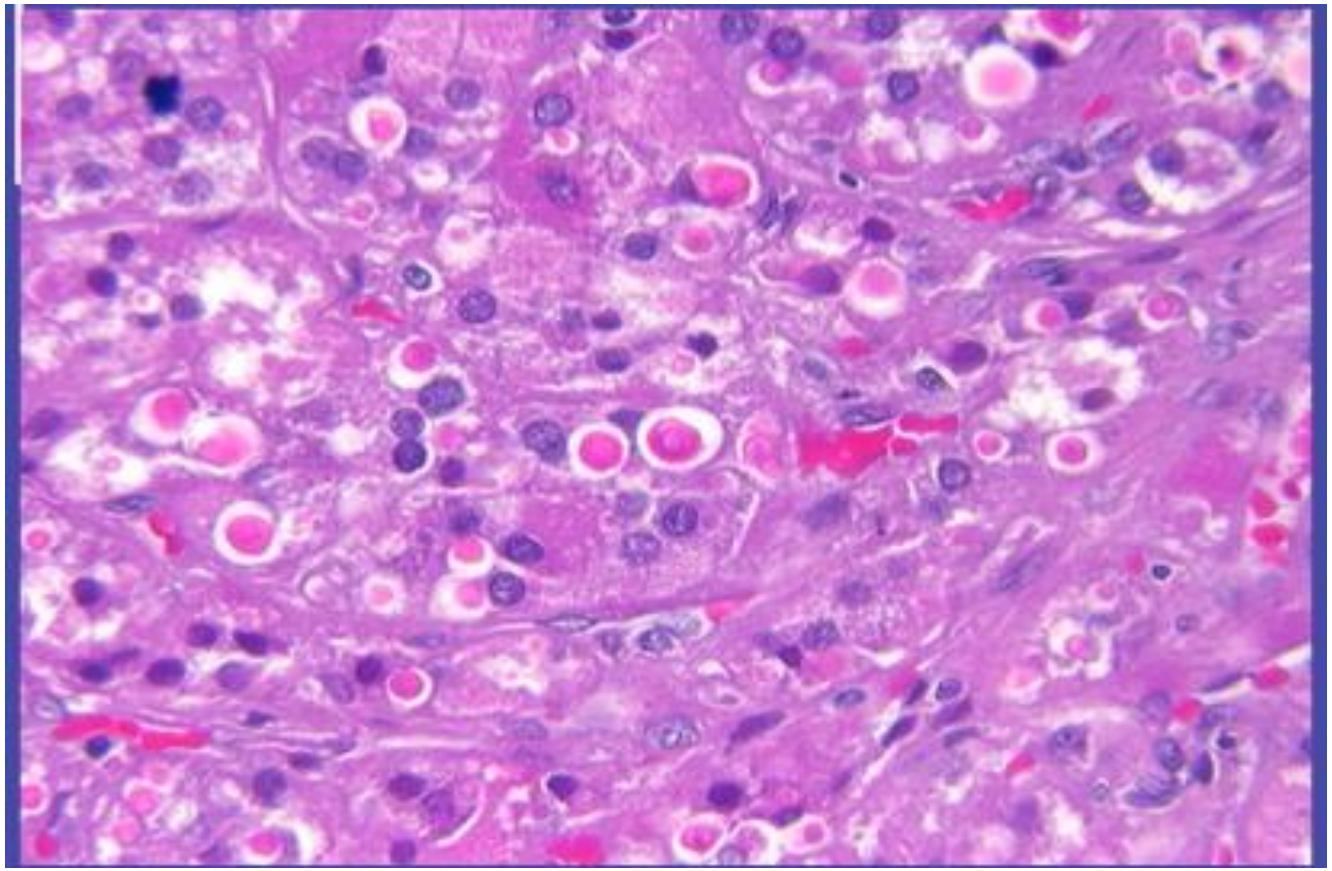
Spironolactone bodies

- Aldosterone producing adenomas contain eosinophilic, laminated cytoplasmic inclusions= spironolactone bodies which appear after treatment with spironolactone (an aldosterone antagonist)

Spironolactone bodies



Spironolactone bodies



CLINICAL FEATURES OF HYPERALDOSTERONISM

The clinical hallmark is hypertension

- Hyperaldosteronism may be the most common cause of secondary hypertension
- *Hypokalemia*

Adrenal insufficiency

- Decreased hormonal production from the adrenal
- Divided into three types

1. Acute insufficiency
2. Chronic insufficiency= Addison disease
3. Secondary insufficiency

Acute Adrenocortical Insufficiency :

Occurs in the following situations:

a. Crisis in patients with chronic adrenocortical insufficiency precipitated by stress

b. In patients maintained on exogenous corticosteroids .. Sudden withdrawal, or stress

c. Massive adrenal hemorrhage

.

3.Massive adrenal hemorrhage

May destroy enough of the adrenal cortex to cause acute adrenocortical insufficiency.

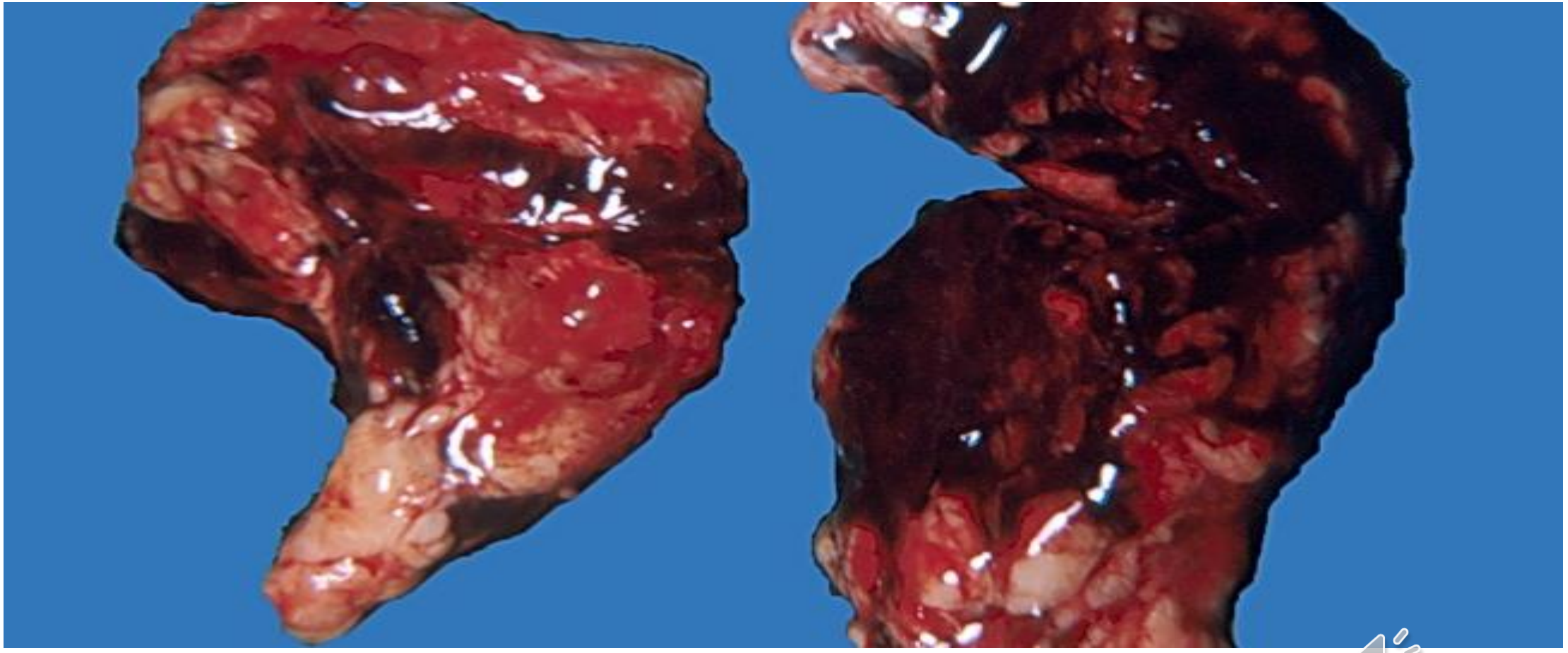
- This condition may occur :

1. In patients maintained on anticoagulant therapy
2. Patients suffering from sepsis : a condition known as the Waterhouse-Friderichsen syndrome

- Sepsis due to: *Neisseria meningitidis* ,*Pseudomonas* spp., , and *Haemophilus influenzae*
- *Underlying cause* involves endotoxin-induced vascular injury

.

Massive adrenal hemorrhage



primary chronic adrenocortical insufficiency **(Addison disease)**:

-Uncommon disorder resulting from **progressive destruction** of the adrenal cortex.

Causes:

- Autoimmune adrenalitis.
- Infections
- Metastatic tumors

ADDISON DISEASE

1. Autoimmune adrenalitis

- 60% to 70% of Addison disease cases and is the most common cause of primary adrenal insufficiency in developed countries.
- There is autoimmune destruction of steroid-producing cells, and autoantibodies to several key steroidogenic enzymes have been detected in affected patients

Addison disease

2. Infections,: Tuberculosis and Fungal infections

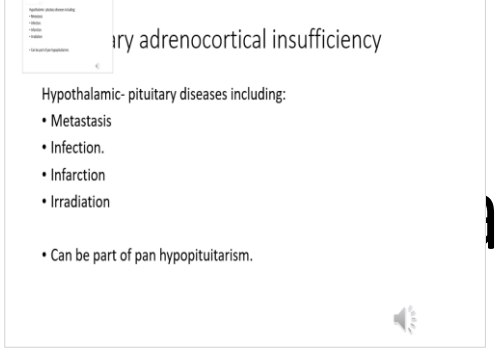
- Tuberculous adrenalitis, which once accounted for as many as 90% of cases of Addison disease, has become less common with the advent of anti-tuberculosis therapy
- Disseminated infections caused by *Histoplasma capsulatum* and *Coccidioides immitis* also may result in chronic adrenocortical insufficiency.

ADDISON DISEASE

- Patients with AIDS are at risk for the development of adrenal insufficiency from several infectious (cytomegalovirus and TB) and noninfectious

3. *Metastatic neoplasms* involving the adrenals:

   Carcinomas of the lung and breast are the most common primary sources.



ary adrenocortical insufficiency

Hypothalamic- pituitary diseases including:

- Metastasis
- Infection.
- Infarction
- Irradiation

- Can be part of pan hypopituitarism.

Clinical features of adrenal insufficiency

- Clinical manifestations of adrenocortical insufficiency do not appear until at least 90% of the adrenal cortex has been compromised.

a. progressive weakness and easy fatigability .

b. Gastrointestinal disturbances are common and include anorexia, nausea, vomiting, weight loss, and diarrhea

c. In patients with **primary adrenal disease**, increased levels of ACTH precursor hormone stimulate melanocytes, with resultant ***hyperpigmentation*** of the skin and mucosal surfaces: The face, axillae, nipples, areolae, and perineum are mainly affected

Note: hyperpigmentation is not seen in patients with secondary adrenocortical insufficiency.

d. Decreased aldosterone in primary hypoadrenalism results in potassium retention and sodium loss , with consequent - *hyperkalemia, hyponatremia, volume depletion,* and *hypotension*,

- In secondary hypoadrenalism is characterized by deficient cortisol and androgen output but normal or near-normal aldosterone synthesis. This is because ACTH doesn't affects the production of aldosterone.

Adrenal medulla

- Chromaffin cells… derived from the neural crest.
- Secrete catecholamines.
- Most important disease: neoplasms.

TUMORS OF THE ADRENAL MEDULLA

Pheochromocytoma

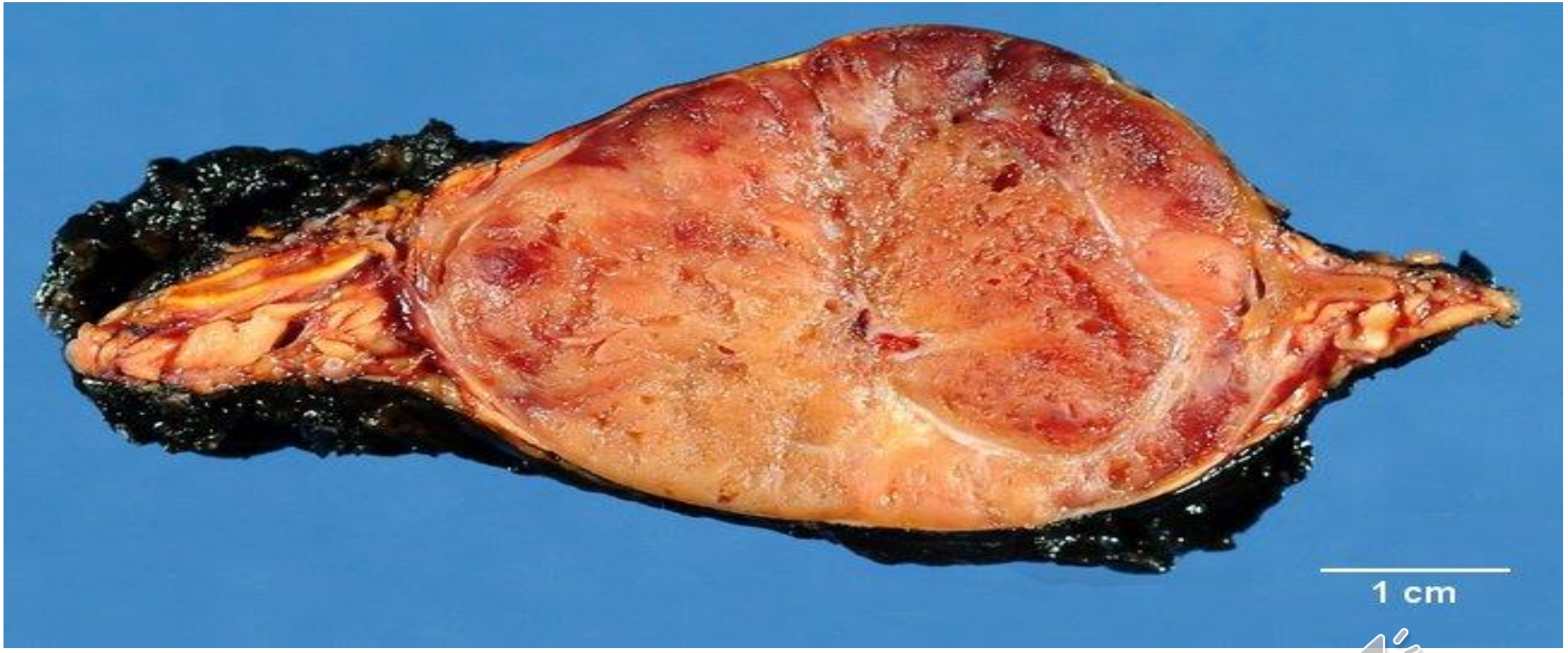
- gives rise to a surgically correctable form of hypertension.
- Pheochromocytomas usually subscribe to "rule of 10s":

a. *10% of pheochromocytomas are extraadrenal,* called *paragangliomas,*
b. *10% of adrenal pheochromocytomas are bilateral*; this proportion may rise to 50% in cases that are associated with familial syndromes.

c. 10% of adrenal pheochromocytomas are malignant,

d. 10% familial.. Now we think up to 25% might be familial.

pheochromocytoma



pheochromocytoma

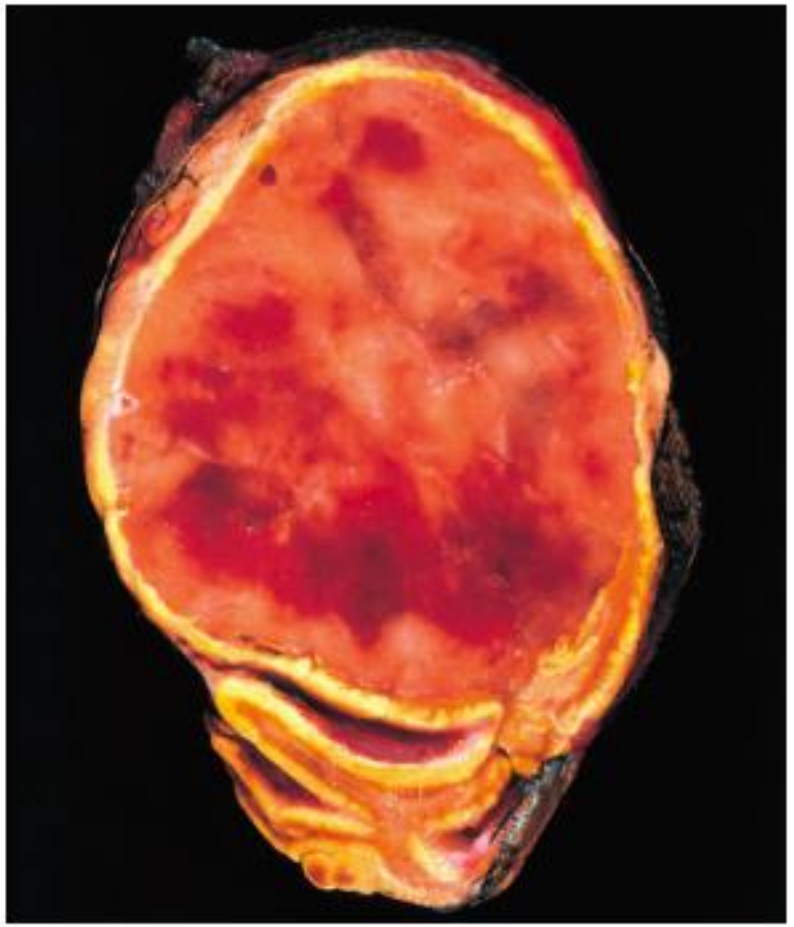
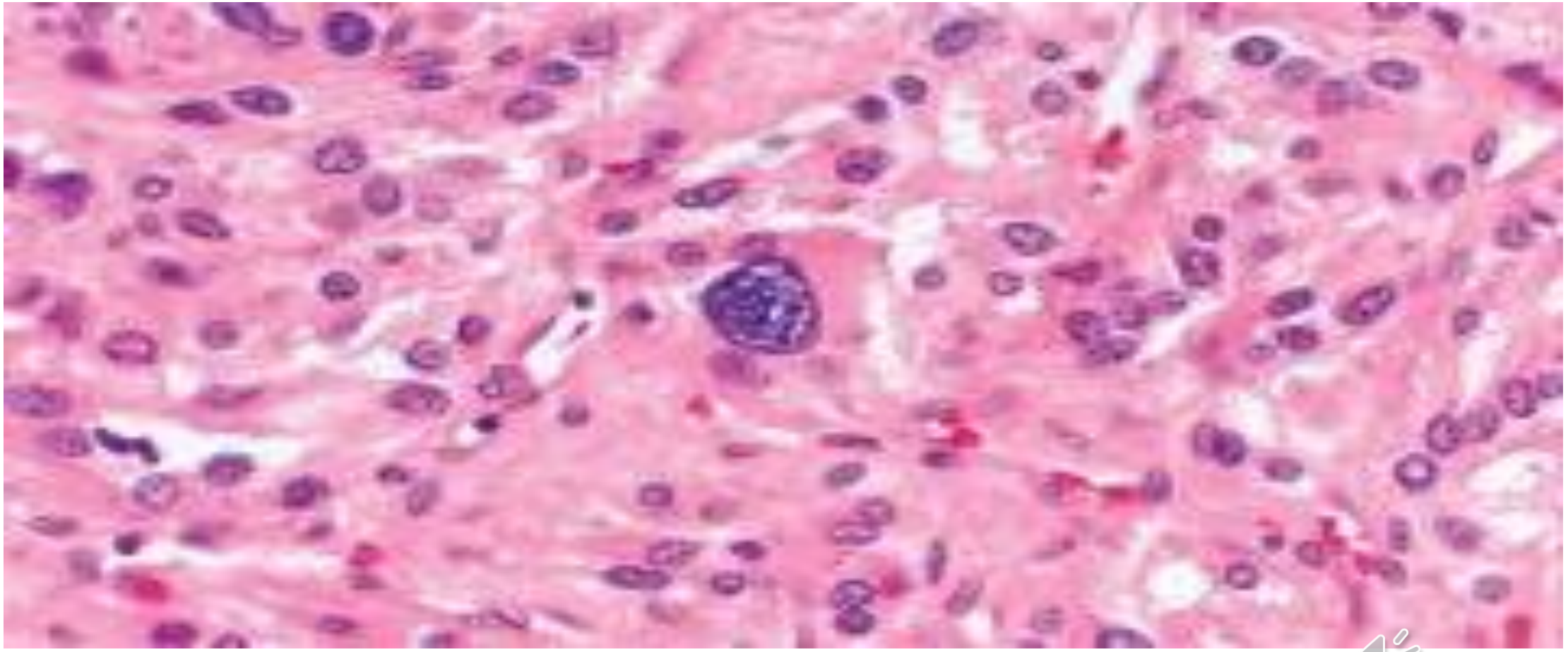


Fig. 20.44 Pheochromocytoma. The tumor is enclosed within an attenuated cortex and demonstrates areas of hemorrhage. The comma-shaped residual adrenal gland is seen *(lower portion)*.

On microscopic examination

- Are composed of polygonal to spindle-shaped chromaffin cells and their supporting cells, compartmentalized into small nests, or **Zellballen,** by a rich vascular network
- The cytoplasm has a finely granular appearance, because of the presence of granules containing catecholamines.
- The nuclei of the neoplastic cells are often pleomorphic

pheochromocytoma



Pheochromocytoma..

- The definitive diagnosis of malignancy in pheochromocytomas is based exclusively on the presence of metastases.

Clinical Features

- The predominant clinical manifestation is *hypertension*

- Sudden cardiac death may occur, probably secondary to catecholamine-induced myocardial irritability and ventricular arrhythmias.