النادي الطبي

Endocrine system

SUBJECT : patho summary

LEC NO. : 4

DONE BY : sara nafi' + omar shanaq

وَقُل رَّبِّ زِدْنِي عِلْمًا

The Adrenal Cortex

❖ Adrenocortical hyperfunction: Hyperadrenalism

1. Cushing syndrome: excess of cortisol
2. Hyperaldosteronism: excess of mineralocorticoid
3. Adrenogenital or virilizing syndromes: excess of androgens

1. Hypercortisolism: Cushing Syndrome

↑ Glucorticoids

Exogenous

{ Most Common } الزيادة مصدر خارجي مش بجسم

Exogenous glucocorticoids (iatrogenic).

Endogenous

Pituitary gland هايكون السبب

1. Cushing disease: Primary hypothalamic-pituitary diseases associated with hypersecretion of ACTH
2. Secretion of ectopic ACTH by nonpituitary neoplaspasms
3. Primary adrenocortical neoplasms

Hypercorticolism : Cushing syndrome

Cushing disease

*Accounts for ~ 70% of cases of endogenous

F > M

Pituitary gland contains : mainly **ACTH-producing microadenoma** in some cases ① macroadenoma ② rarely corticoloroph hyperplasia

↑ Cortisol ↑ ACTH

High urine levels of Excreted Corticosteroids

Ectopic ACTH secretion

Due to→ small -cell carcinoma the lung

Adrenal gland: **bilateral cortical hyperplasia** secondary to elevated ACTH → the rapid downhill course of patients cuts short the adrenal enlargement

امراض عدت جبل ماتسبب في Significant enlargement of Adrenal gland

Primary adrenocortical neoplasms

Neoplasm Adrenally

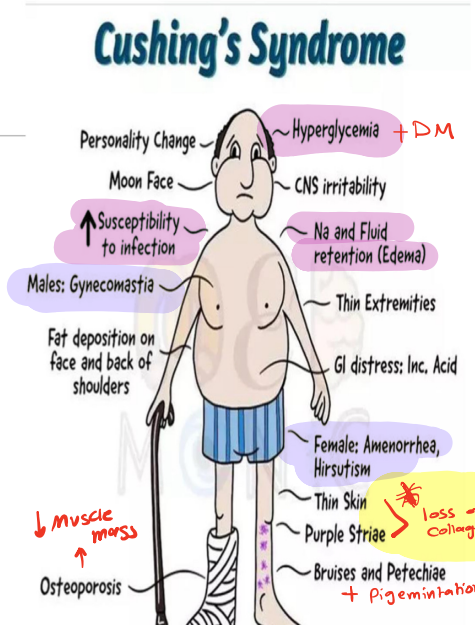
ACTH-independent Cushing syndrome or adrenal Cushing syndrome.

* Most cases Caused by Unilateral → Carcinoma / Adenoma

Primary Cortical hyperplasia (Rare) → Macronodules < 3 cm / micronodules 1-3 mm

↑ Cortisol ↓ serum levels of ACTH

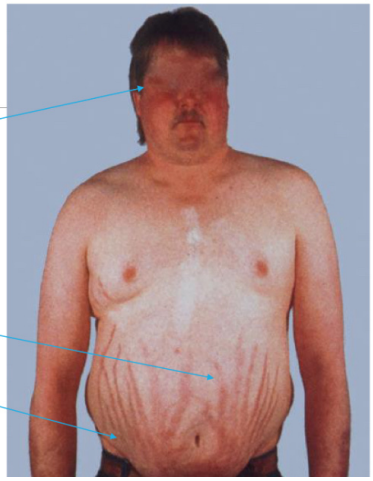
Clinical features:



Cushing Syndrome

Characteristic features include:

- -Moon facies
- -Central obesity
- -Abdominal striae.

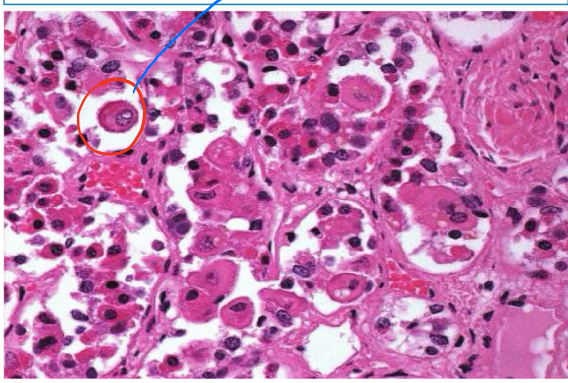


Morphology:

The pituitary gland:

- In pituitary Cushing syndrome, there is an **adenoma.**
- The **pituitary** in all forms of Cushing's syndrome shows **Crooke's hyaline change**:
- The normal granular, basophilic cytoplasm of the ACTH-producing cells is replaced by homogeneous, lightly basophilic material due to the accumulation of intermediate keratin filaments in the cytoplasm.
- It is due to high exogenous or endogenous glucocorticoids.

Crooke's hyaline change. Non-tumorous corticotrophs in the pituitary of a patient with raised glucocorticoids show an accumulation of hyaline material as a concentric whorl in the cytoplasm.



Morphology :The adrenal gland

→ Depends on the cause of Hypercortisolism

1.Bilateral cortical atrophy:

Exogenous Glucocorticoids

→ Suppression in the endogenous ACTH

(bilateral cortical atrophy due to a lack of stimulation of the zona fasciculata and zona reticularis by ACTH

The zona glomerulosa is of normal thickness because it functions independently of ACTH.

2) Diffuse hyperplasia:

ACTH-Dependent Cushing syndrome

- Both glands are enlarged

The adrenal cortex is diffusely thickened and variably nodular

The yellow color of glands derives from the presence of lipid-rich cells ir the zona fasciculata & reticularis,which appear vacuolated.

3) Primary pigmented adrenal nodular hyperplasia:

The cortex is replaced almost entirely by macronodules or darkly pigmented micronodule

The pigment is believed to be lipofuscin

4. Functional adrenal adenomas or carcinomas:

ADenoma > Carcinoma

Carcinoma	Adenoma → yellow
Larger (200 - 300g)	Weight less than 30g
Non-Capsulated	Thin or well-Developed Capsules

With functioning tumors, the adjacent adrenal cortex and that of the contralateral adrenal gland are **atrophic**, due to suppression of endogenous ACTH by high cortisol levels.

-Adenoma is composed of cells similar to those encountered in the normal zona fasciculata ← Microscopic examination

Mitotic activity + necrosis are not seen ← Adrenocortical Adenoma

2.Hyperaldosteronism

Primary hyperaldosteronism

overproduction of aldosterone

↳ suppression of the renin-angiotensin (RAS) system and decreased plasma renin activity.

Causes:

1. Bilateral idiopathic hyperaldosteronism :

↳ Bilateral Nodular hyperplasia of ADrenal gland

↳ Mutation in KCNJ5 gene

2. Adrenocortical neoplasm:

↳ Aldosterone-Producing adenoma → Conn Syndrome

↳ Rarely → carcinoma

3. Rarely, familial hyperaldosteronism

↳ Genetic defect

Secondary hyperaldosteronism (Common)

aldosterone release occurs in response to activation of the renin-angiotensin system (RAS). Characterized by increased levels of plasma renin

Causes:

1.Decreased renal perfusion (renal artery stenosis)

2. Arterial hypovolemia and edema (CH, nephrotic syndrome)

3. Pregnancy (caused by estrogen-induced increases in plasma renin substrate)

Clinical features:

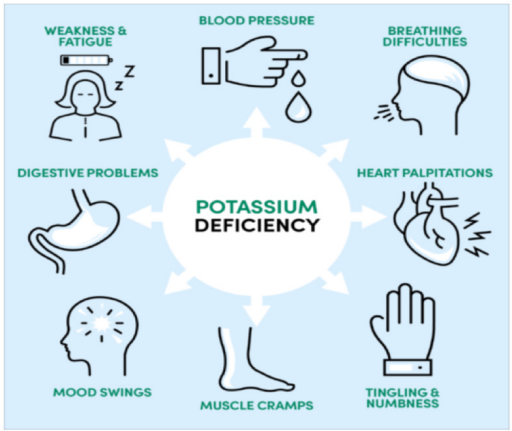
- Na retention & K excretion

- **Hypertension**.

- The long-term effects are cardiovascular compromise (e.g., left ventricular hypertrophy) and an increased risk of stroke and MI.

- **Hypokalemia** results from potassium wasting, and can cause:

  - neuromuscular manifestations (weakness, paresthesia, visual disturbances).



Morphology

Aldosterone-producing adenomas:

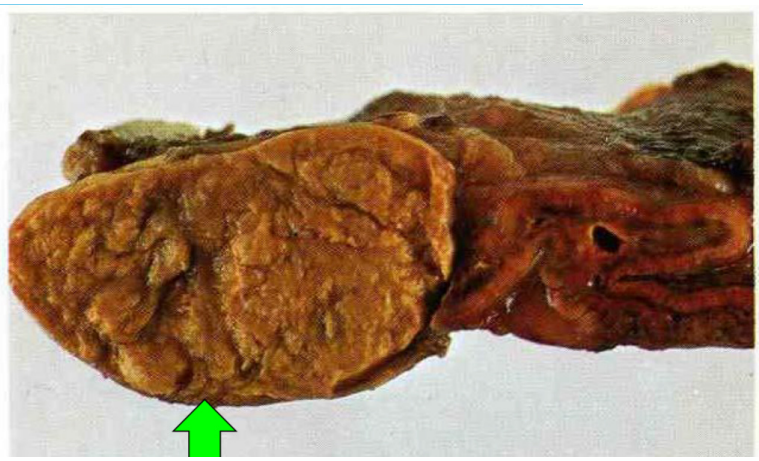
- Almost always solitary, small and well-circumscribed.
- Bright yellow and, surprisingly, are composed of lipid-laden cortical cells resembling fasciculata cells than glomerulosa cells.
- The cells are uniform; occasionally, there is some nuclear and cellular pleomorphism.
- A characteristic feature of aldosterone-producing adenomas is the presence of eosinophilic, laminated cytoplasmic inclusions, known as spironolactone bodies (after treatment with spironolactone)
- Adenomas associated with hyperaldosteronism do not usually suppress ACTH secretion. Therefore, the adjacent adrenal cortex and that of the contralateral gland are NOT atrophic.

Bilateral idiopathic hyperplasia:

diffuse or focal hyperplasia of cells resembling the normal zona glomerulosa.

Adrenal cortex, adenoma:

- A golden-yellow, encapsulated adenoma arising from the adrenal



3. Adrenogenital or virilizing Syndromes

→ Androgen excess

Adrenal Causes of androgen excess

1. Adrenocortical neoplasms: Carcinoma > Adenomas

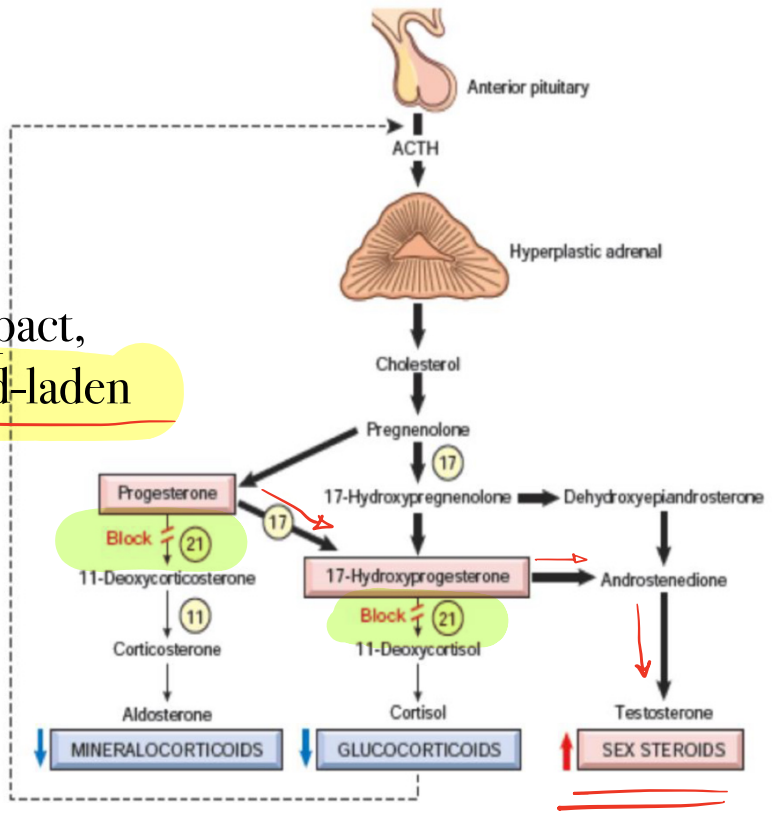
2. Congenital adrenal hyperplasia (CAH)

Congenital adrenal hyperplasia (CAH)

a group of autosomal recessive disorders, each characterized by a hereditary defect in an enzyme involved in adrenal steroid biosynthesis, particularly cortisol.

The most common enzymatic defect in CAH is a 21-hydroxylase deficiency (90%), (range from a total lack to a mild loss)

↓ cortisol production → ↑ ACTH (compensatory) → adrenal hyperplasia → ↑ production of cortisol precursor steroids are then channeled into the synthesis of androgens with virilizing activity.



Morphology:

Adrenal bilaterally ← in all Cases

The proliferating cells mostly are compact, eosinophilic cells intermixed with lipid-laden clear cells.

Hyperplasia of corticotroph cells in the anterior pituitary in most patients

Clinical Features

Clinical Sx may occur in the perinatal period, later childhood, or (less commonly) adulthood.

- **Masculinization in females (due to androgen excess) :**
  - clitoral hypertrophy, ambiguous genitalia, and
  - oligomenorrhea, hirsutism, and acne in post-pubertal girls.
- **In males (due to androgen excess) :**
  - Enlargement of the external genitalia and other evidence of precocious puberty in young patients.
- **Aldosterone deficiency**: salt wasting and hypotension.
- **Concomitant cortisol deficiency**

سبحان الله وبحمده
سبحان الله العظيم