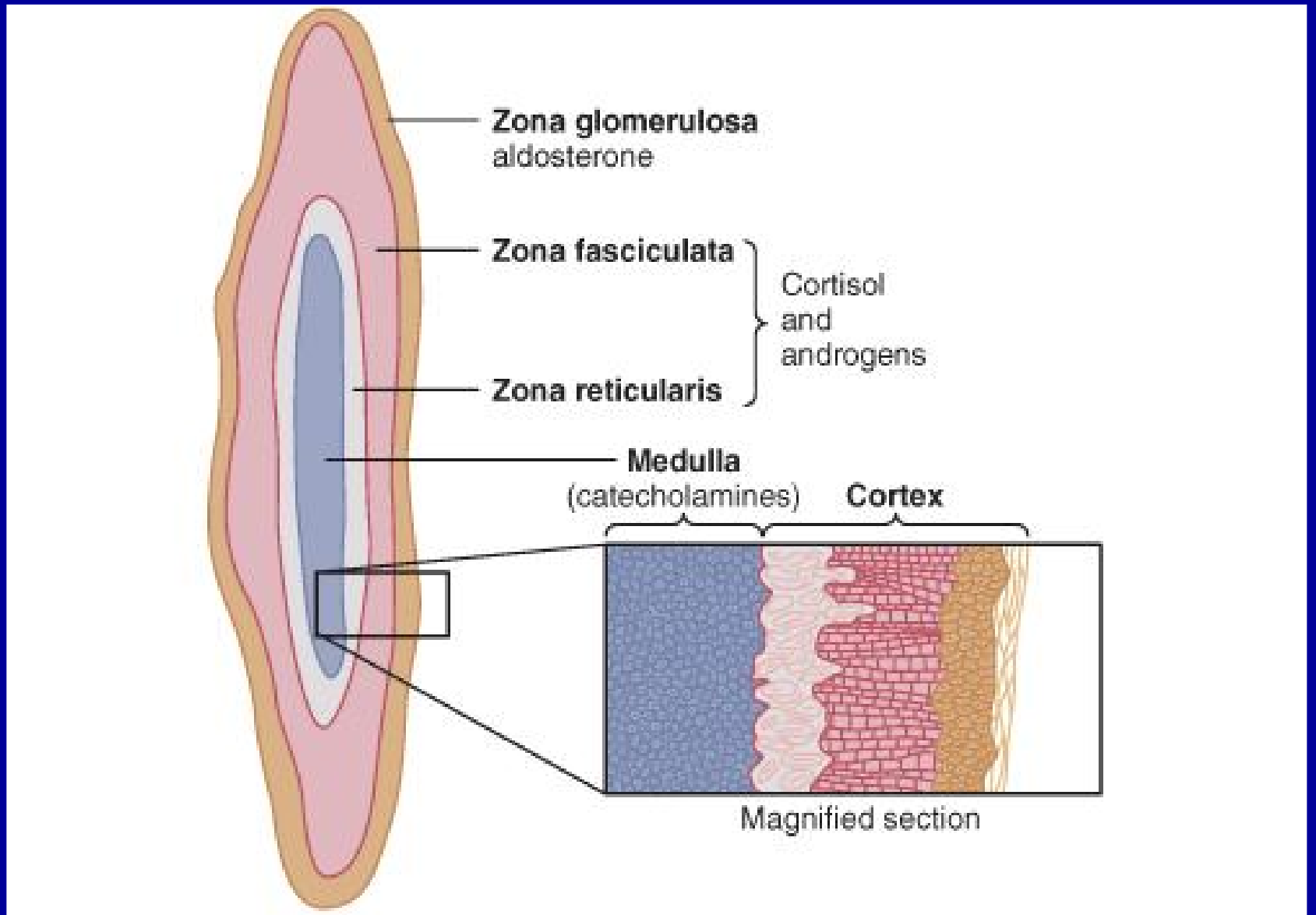


Renal Actions of Aldosterone:

1- Increases Renal Tubular Reabsorption of Sodium and Secretion of Potassium.

2- Acts mainly on the *cells of the* proximal tubules, collecting ducts and distal tubules.

Aldosterone causes sodium to be conserved in the ECF while increasing potassium excretion in the urine.

Circulatory Actions of Aldosterone

Excess Aldosterone Increases ECF volume and Arterial Pressure .

Control of Aldosterone Secretion

Four factors play essential roles in the regulation of aldosterone.

1- Increased potassium ion concentration in the ECF greatly *increases* aldosterone secretion.

2- Increased activity of the renin-angiotensin system (increased levels of angiotensin II) also greatly *increases* aldosterone secretion.

3- Increased sodium ion concentration in the extracellular fluid *very slightly decreases* aldosterone secretion.

4- ACTH from the anterior pituitary gland, stress, surgery,….

The kidneys to control arterial pressure through :

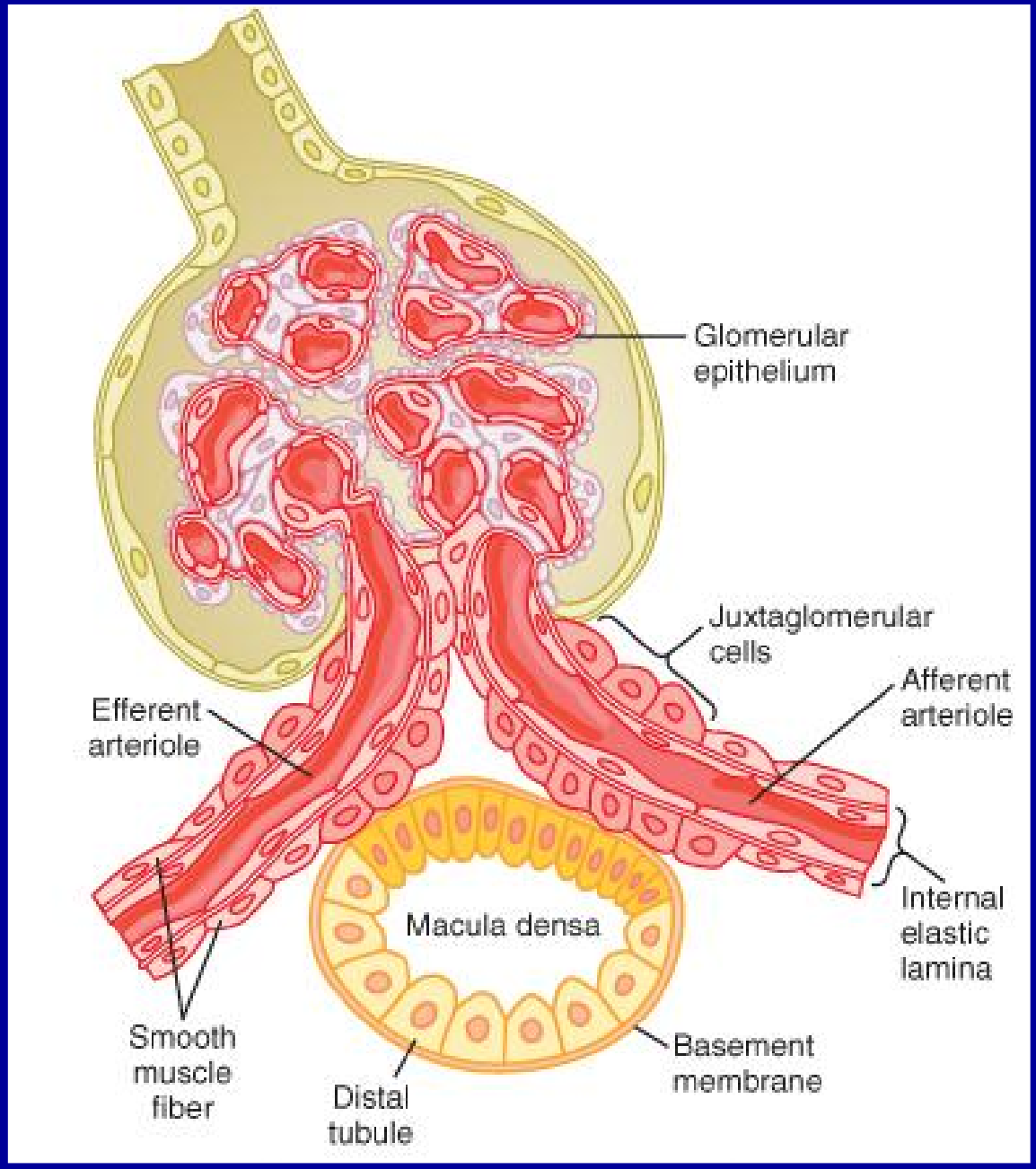
1- changes in ECF volume.

2- renin-angiotensin system.
powerful mechanism for controlling blood pressure.

Renin :
is a enzyme released by the kidneys when the arterial - pressure falls.

Renin is synthesized and stored in in the *juxtaglomerular cells* (*JG cells*) of the kidneys.

The JG cells are modified smooth muscle cells located *in the walls of the afferent arterioles immediately proximal to the glomeruli*.



Renin acts on another plasma protein (*angiotensinogen*), to release *angiotensin I* which is converted to *angiotensin II (in the lungs)*.

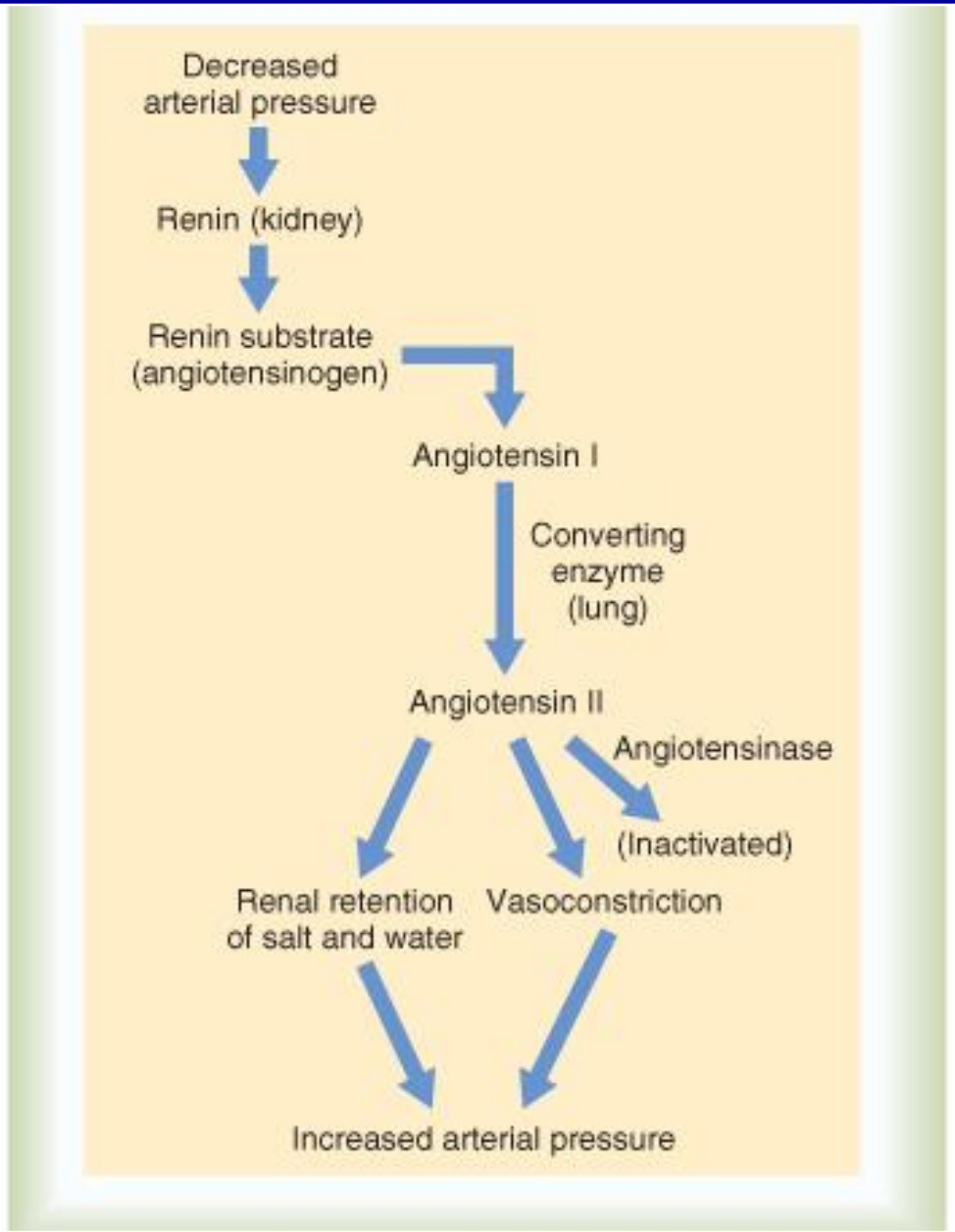
Angiotensin II increases the blood pressure through:

1- Vasoconstriction occurs intensely in the arterioles & much less so in the veins.

Constriction of the arterioles increases the total peripheral resistance, thereby raising the arterial pressure.

2- decrease excretion of both salt and water by the kidneys.

This slowly increases ECF volume, which then increases the arterial pressure during subsequent hours and days.



Primary Aldosteronism (Conn's Syndrome)

tumor of the zona glomerulosa cells → secretes large amounts of aldosterone.

- **The most important effects are hypokalemia.**
- **slight increase in ECF volume and blood volume.**
- **very slight increase in plasma sodium concentration.**
- **almost always, hypertension.**

- There are occasional periods of muscle paralysis caused by the hypokalemia.

- decreased plasma renin concentration (from feedback suppression of renin secretion caused by the ↑ aldosterone) or by the excess ECF volume and arterial pressure.

- Treatment: usually surgical removal.

Adrenal insufficiency:
(aldosterone deficiency) (Addison's disease)

Increased excretion of sodium and water.

Reduction in ECF volume.

Tendency toward low blood pressure.

• Complete absence of aldosterone, the volume depletion may be severe.

unless the person is allowed to eat large amounts of salt and drink large amounts of water to balance the increased urine output of salt and water.

Adrenogenital Syndrome

Adrenocortical tumor secretes excessive quantities of *androgens* that cause intense *masculinizing* effects throughout the body.

In a female:
she develops virile characteristics, including growth of a beard, a much deeper voice, occasionally baldness, masculine distribution of hair on the body.

In prepubertal male: a virilizing adrenal tumor causes the same characteristics as in the female plus rapid development of the male sexual organ.

In the adult male: the virilizing characteristics of adrenogenital syndrome are usually obscured by the normal virilizing characteristics of the testosterone secreted by the testes.

It is often difficult to make a diagnosis.
However, the excretion of 17-ketosteroids (derived from androgens) in urine may be 10 to 15 times normal, used in diagnosing the disease.

Cushing syndrome: (Hypercortisolism)

Causes and types:

(1) adenomas of the *anterior pituitary* →↑ ACTH.

(2) abnormal function of the *hypothalamus* →↑ CRH.

(3) "ectopic secretion" of ACTH by a tumor elsewhere in the body, such as an abdominal carcinoma.

(4) adenomas of the *adrenal cortex*.

When Cushing's syndrome is secondary to ↑ ACTH by the anterior pituitary = *Cushing's disease*.

How to differentiate between ACTH-dependent and ACTH-Independent Cushing's syndrome?

By administrating large doses of *cortisol* (*dexamethasone*).

- In patients with ↑ ACTH → no suppression of ACTH secretion.

- patients with primary adrenal overproduction of cortisol (ACTH-independent) → ↓ levels of ACTH.

* Cushing's syndrome may occur when large amounts of glucocorticoids are administered over prolonged periods for therapeutic purposes.

e.g. patients with chronic inflammation associated with diseases such as rheumatoid arthritis.

Cushing's syndrome

- mobilization of fat from the lower part of the body, with concomitant extra deposition of fat in the thoracic and upper abdominal regions, giving rise to a buffalo torso.

- The appearance of the face described as a "moon face,"

- 80% of patients have hypertension

(because of the mineralocorticoid effects of cortisol).

Cushing's syndrome

Effects on Carbohydrate and Protein Metabolism:

- ↑ blood glucose concentration (↑ gluconeogenesis and ↓ glucose utilization by the tissues).

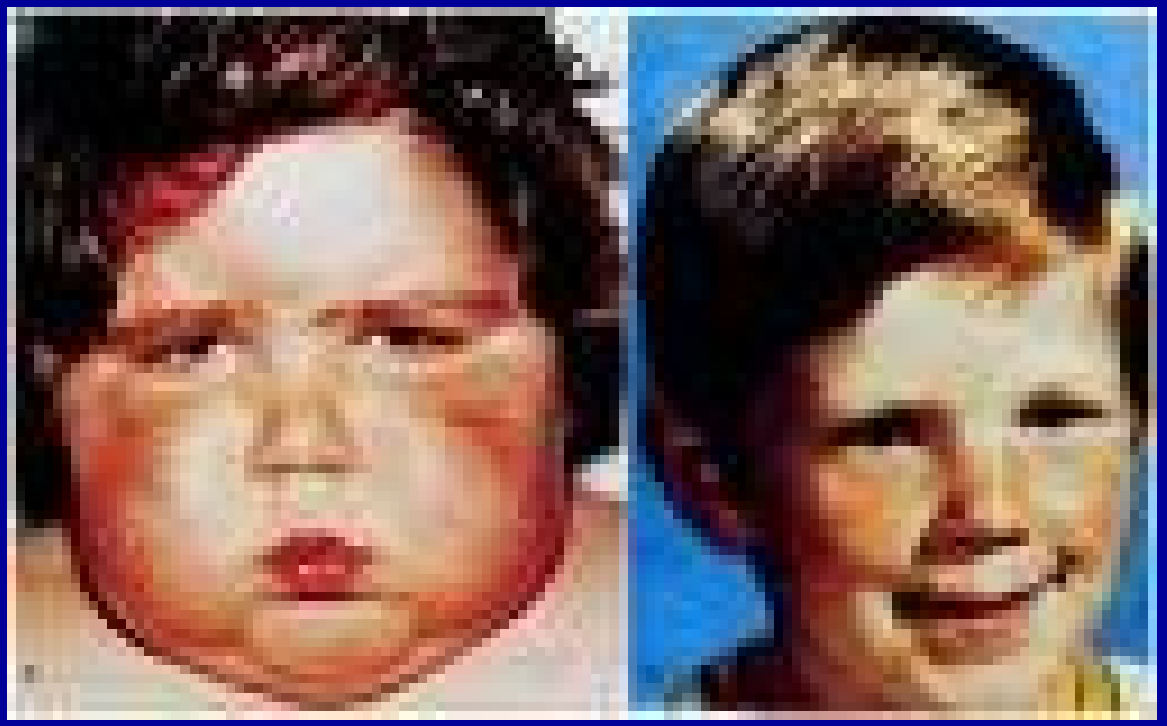
- ↓ tissue proteins almost everywhere in the body (except liver).

• Protein loss from the muscles in particular causes severe weakness.

• suppressed immune system.

• protein collagen fibers in the s.c.

• severely ↓ protein deposition in bones → severe *osteoporosis*.



وفقكن الله

Oversecretion of Aldosterone

(Conn's syndrome)

Kidneys "Escape" from Sodium Retention but arterial Pressure Rises.
increased sodium reabsorption and decreased sodium excretion by the kidneys are transient.

After 1 to 3 days of sodium and water retention, the ECF volume rises by about 15% and there is a simultaneous increase in arterial blood pressure.

When the arterial pressure rises sufficiently, kidneys excrete amounts of sodium equal to the daily intake, despite continued presence of high levels of aldosterone. The primary reason for the escape is the pressure natriuresis and diuresis that occur when the arterial pressure rises.