physiology الشابتر سطلات بشاء الله أعلبه

- لخصت حكي الدكتورة + notes
- اسئلة mixed
- فيديوهات توضيح

wish you the best ★

By Raneem Al-syouf

playlist

https://youtube.com/playlist?list=PLEfydt_NwyrYMuTTPP06lIiRYf0_ceCBu&si=3zClvIb4ITZ6HiuY

Pathophysiology-Hypertension

Faculty of Pharmaceutical Sciences

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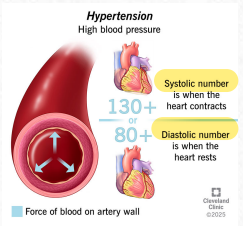
Blood Pressure (BP) Regulation

(Hypertension HTN)

Hypertension

❖ **What do Blood Pressure Numbers Mean?**



- Top number (Systolic) while the bottom number (Diastolic).
- Normal Blood Pressure: Blood Pressure of < 140/ 90.
- Blood Pressure of 130 to 139/ 85 to 89 should be closely watched.

- High Blood Pressure: Blood Pressure > 140/ 90. Usually NO SYMPTOMS! "The Silent Killer". May have headache, blurry vision, chest pain, and frequent urination at night.

① ② ③ one of the complexation of hypertension is Angina ④

tunica intima — endothelial dysfunction
tunica media
tunica externa

Functions: 1- smooth blood flow
2- maintain vascular tune between vasodilation and vasoconstriction.
3- balance between coagulation and anti coagulation
4- balance between inflammation and anti inflammation

hypertension means systemic hypertension so peripheral organs ↓ تعطل — كمية الدم إلي زج تروح لل

medications & sympathatic blockers (Antagonist)
Adrenergic Antagonist

Females who are 1- obese 2- smokers 3- On oral contraceptive drugs 3- Family history have higher risk of HTN

2- smokers → endothelial dysfunction

3- On oral contraceptive drugs → synthetic estrogen or progesterone → works on the RAAS, stimulate the liver release of Angiotensinogen

Estrogen works as a protection (Before menopause) so it maintains the thickness of blood vessels
After menopause Estrogen levels decreases

- Beta blockers treatment : β_1 in heart cardiac muscle contraction ↑ HR ↑
  β_2 in lungs broncho dilation ↑
- peripheral adrenergic receptors : α_1 works in tunic media vasoconstriction (smooth muscles)

β_1 β_2 α_1 Antagonist

https://youtu.be/tIjPI1jhQLI?si=gP33uGTYNxFzXNaL → اذا ناسيهم وحاب ترجع تناشيهم منيهم

- Beta blocker side effect ⊡ Bradycardia (β_1 blocker)

لا غير توقف أخذ الدوا فجأه

- life style modification & Exercising → increase collatiral circulation
  140/90 أقل من
  increase metabolism rate
  prevention
  less salty diet → Na^+/Cl^+ increase blood volume BP↑

ANP (Atrieal natriutic peptide) decrease BV↓ BP↓
↳ get released from the Atrium

regulation of HTN

short term regulation
- baroreceptors (in Aorta + carotid sinus)
- chemoreceptors (indirect detection) next baroreceptor

Blood volume↑ O_2↑ Co_2↓ H^+↓ PH↑
BV↓ O_2↓ (Hypoxia) Co_2↑ (hypercapnea) PH↓

long term
- RAAS system

the third step → generation of the action potential as a result of opening the Na^+ channels

7. A 30-year-old female smoker who uses oral contraceptives is at a higher risk for hypertension. What is the physiological reason provided for why estrogen/progesterone can raise BP?

A. They directly inhibit the release of Renin

B. They stimulate the liver to release Angiotensinogen

C. They cause a massive release of ANP from the heart

D. They block the alpha adrenoceptors on vascular smooth muscle

B

Hypertension

- **Hypertension is an intermittent or sustained elevation of diastolic or systolic blood pressure. Generally, a sustained systolic blood pressure of 139 mm Hg or higher or a diastolic blood pressure of 89 mm Hg or higher indicates hypertension.**
- Increased blood pressure is the most common health problem in adults and the leading risk factor in CVD.
- It affects about 1 billion people worldwide.
- Hypertension increases with age. bc the walls of arteries and arterioles becomes thin
- Males more than females until menopause. More in blacks compared to whites.

True or False: Most patients with hypertension are asymptomatic. *

- [x] True
- [ ] False

American Heart Association Recommended Blood Pressure Levels

contraction relaxation / filling

BP Category	Systolic (mmHg)		Diastolic (mmHg)	Follow-up
Optimal	< 120	and	< 80	Recheck 2 years
Normal	< 130	and	< 85	Recheck 2 years
High Normal	130-139	or	85-89	Recheck 1 year

cases تجيب رح + حفظ

American Heart Association Recommended Blood Pressure Levels

BP Category	Systolic (mmHg)		Diastolic (mmHg)	Follow-up
Stage 1 (mild HTN)	140-159	or	90-99	Confirm within months
Stage 2 (moderate HTN)	160-179	or	100-109	Evaluate within 1 month
Stage 3 (severe HTN)	180 or >	or	110 or >	Evaluate immediately

lifestyle modification
lowest dose
لو صار hypotensive مؤقت يرجع طبيعي
medications then evaluate within month
hypotensive حالة أقل من ١٠٠ systolic
emergency hypertension

1. A 45-year-old male presents for a routine checkup. His blood pressure is recorded at $152/94\ mmHg$. According to the American Heart Association guidelines in your material, what is the correct classification and recommended follow-up for this patient?

A. Stage 3 (severe) HTN; evaluate immediately

B. High Normal; recheck in 1 year

C. Stage 2 (moderate) HTN; evaluate within 1 month

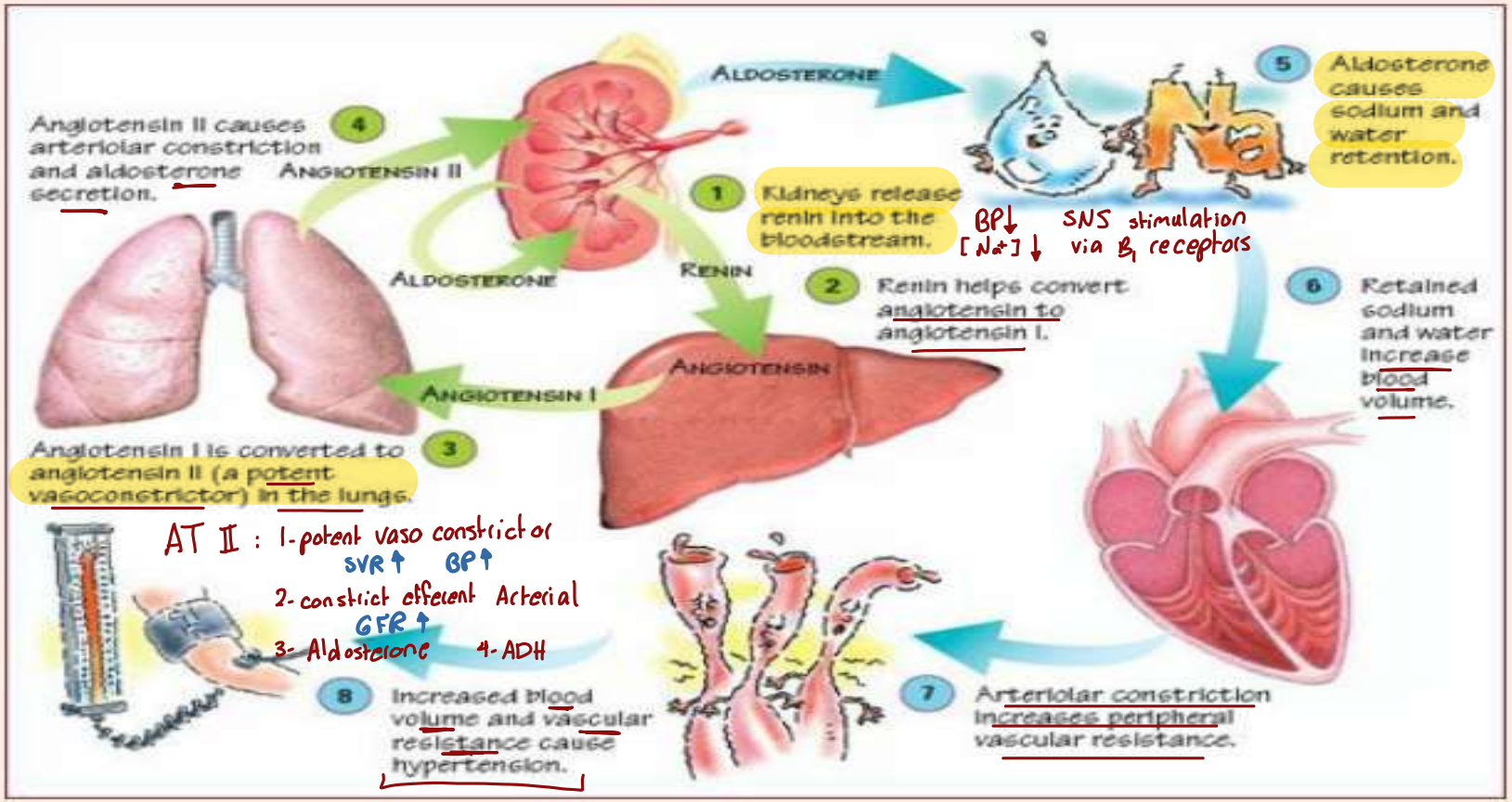
D. Stage 1 (mild) HTN; confirm within 2 months

D

https://youtu.be/K27ipbateKY?si=TvUf8ChlSIUW7GbJ

RAAS explanation ☆

Blood volume ↓ Blood pressure ↓ BP = Co × systemic vascular resistance (total peripheral resistance)



When the Sympathetic NS is active, it wants to divert blood to muscles and the heart. It causes vasoconstriction of the kidney arterioles (afferent) to reduce GFR and save water. It stimulates Renin release.

Hypertension

centrally

BV ↑

amount of blood

average 5L

BP = CO × SVR

systolic — cardia output

Diastolic — systemic vascular resistence

TPR ↑ (total peripheral resistence)

CO ↑ (total blood flow)

HR ↑ (beat/min) × SV ↑ (vol. ejected/beat)

end diastolic volume - end systolic volume

sympathetic NS (increase HR)

vasoconstriction peripherally يعيد الى القلب

vasodilation centrally قريب الى القلب

- pre load ↑
= venous return ↑
- contractility ↑
- After load ↑

(hypervolemia)

(hypertension)

- blood vessels diameter decrease

vasoconstriction peripherally

Resistence ↑

- viscosity ↑
- blood vessels langh ↑

(hypovolemia)

centrally

Blood flow ↑

BF ↑ BP ↑ CO ↑

Blood flow ↓

BP ↑ BF ↓ R ↑

peripherally

resistance

impoltant note 8-

- stroke volume (SV) increase when preload is high ↑ and Afterload is low ↓

but in "Hypertension" BP ↑

afterload is high ↑

During severe hypovolemia, the sympathetic system and Angiotensin II will constrict the afferent arterioles, lowering GFR to prevent water loss (though Ang II preferentially constricts the efferent to maintain GFR in mild cases, in severe shock, GFR drops)

https://youtu.be/sNCtvsY3TS8?si=jyYYH6SAxdxxoRDg

رائع

Hypertension

- **Divided into two categories:**
  - **Primary or idiopathic hypertension:** (unknown cause)
    - Chronic elevation of blood pressure without evidence of other diseases.
    - Affect 90-95% of hypertensive patients.
  - **Secondary hypertension**: caused by other diseases like kidney disease (if it's related to a systemic disease that raises peripheral vascular resistance or cardiac output.).

$BP = Co \times PVR$

2. A patient with chronic kidney disease is diagnosed with high blood pressure. This type of hypertension is most accurately classified as:

A. Secondary hypertension

B. Essential hypertension

C. Primary hypertension

D. Idiopathic hypertension

A

Secondary hypertension

Secondary hypertension may be caused by:

- Renal hypertension.
- Adrenocortical hormone as:
  - Primary hyperaldosteronism. too much aldosterone
  - Excess corticosteroids (Cushing's syndrome). cortisol ↑ with inflammation ↑ against immunity
- Adrenal gland abnormalities: Pheochromocytoma (rare catecholamine–secreting tumor of adrenal chromaffin cells it produces adrenaline & noradrenaline, and they cause hypertension), characterized by episodes of headache, excessive sweating, and palpitation.

"ورم"

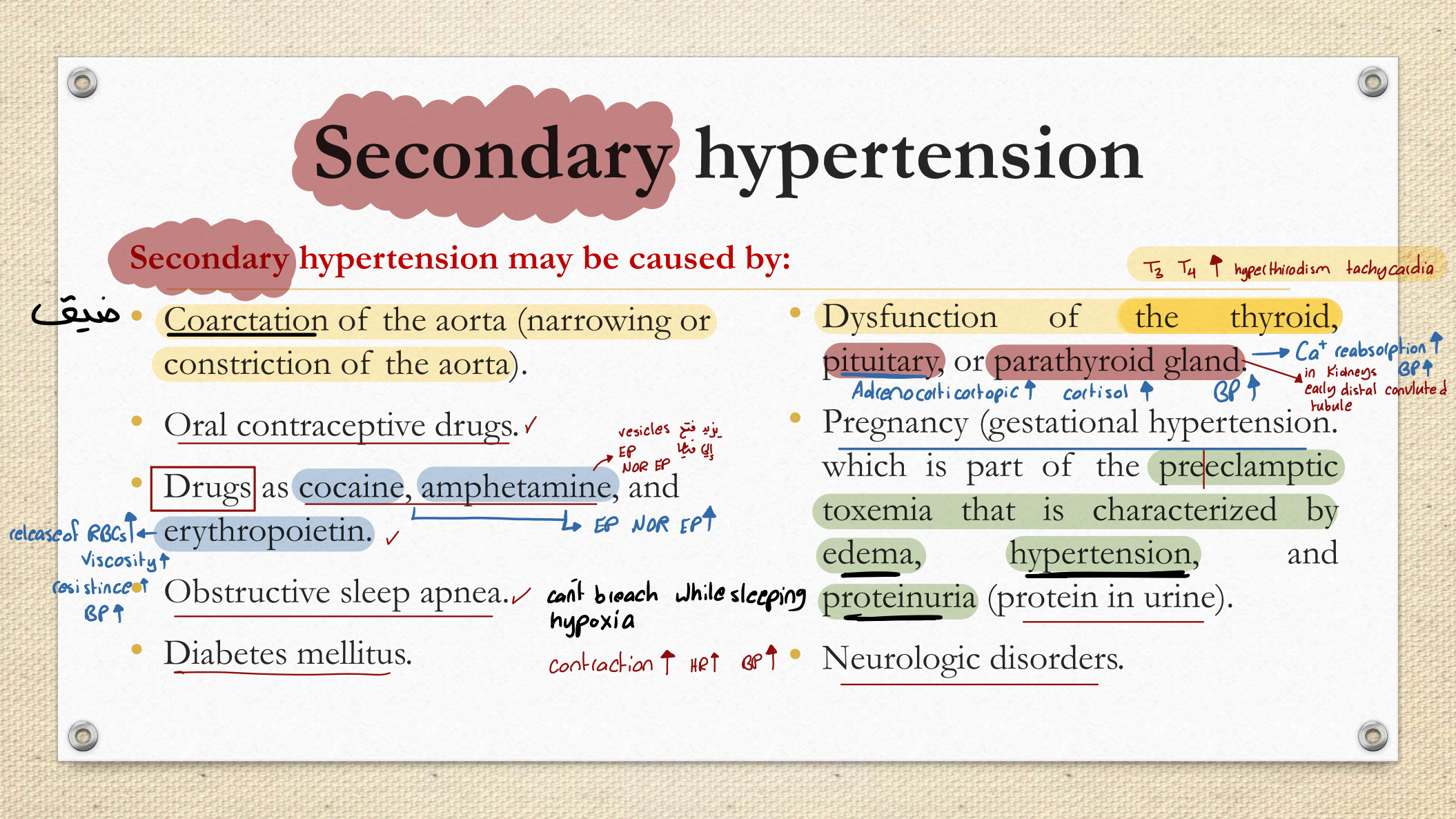
خفقان

Secondary hypertension

Secondary hypertension may be caused by:

ضيق

- Coarctation of the aorta (narrowing or constriction of the aorta).
- Oral contraceptive drugs. ✓
- Drugs as cocaine, amphetamine, and erythropoietin. ✓
- Obstructive sleep apnea. ✓
- Diabetes mellitus.
- Dysfunction of the thyroid, pituitary, or parathyroid gland.
- Pregnancy (gestational hypertension. which is part of the preeclamptic toxemia that is characterized by edema, hypertension, and proteinuria (protein in urine).
- Neurologic disorders.



9. Secondary hypertension characterized by headache, excessive sweating, and palpitations is often associated with which adrenal tumor?

A. Primary hyperaldosteronism

B. Cushing's Syndrome

C. Gestational hypertension

D. Pheochromocytoma

D

Hypertension

أشياء ضمن دائرة تحكمك

❖ Controllable Risk Factors:

- Increased salt intake.
- Obesity (Lectin works fine in non-obese people, but when an adipose tissue (fat) increases in the body, the sensor gets damaged).
- Alcohol.
- Stress.
- Lack of exercise.

❖ Uncontrollable Risk Factors:

خارج نطاق تحكمك

- Heredity.
- Age.
  - ✓ Men between age 35 and 50.
  - ✓ Women after menopause.
- Race:
  - ✓ 1 out of every 3 African Americans.
  - ✓ Higher incidence in non-Hispanic blacks and Mexican Americans.

Hypertension

- **Women and High Blood Pressure:**
  - Birth Control Pill. (oral contraceptive)
  - Pregnancy.
  - Overweight. (obese)
  - After Menopause.
  - African Americans.

Hypertension

What does High Blood Pressure do to my body?:

- Stroke.
- Congestive heart failure. HF
- Kidney failure.
- Heart attack.
- Heart rhythm problems.
- Aneurysm. تمدد الأوعية الدموية
  arteries weakness

- High blood pressure adds to the workload of the heart. ✓
- The heart must pump harder. ✓
- If high blood pressure continues for a long time, the heart and arteries may not function appropriately. ✓
- The heart may at first thicken and then dilate and weaken causing heart failure.
- Other body organs may also be affected.

Arterial Blood Pressure Regulation

Short term regulation of blood pressure:

- A regulation of blood pressure due to a change in position.
- Baroreceptor reflex (Immediate rapid mechanism). This is done/regulated by baroreceptors, which are responsible for regulating blood pressure from moment to moment. Baroreceptors prevent fluctuating BP. (short term) (تقلب)
- Baroreceptors are neurons (collection of nuclei) located in the arch of the aorta and large blood vessels of the chest. (carotid)
- These baroreceptors are sensitive to either increase or decrease in blood flow.

Arterial Blood Pressure Regulation

- **Short term regulation of blood pressure:** we need SNS
  - In the case of decreasing blood flow (hypotension), these receptors will send an impulse through the glossopharyngeal nerve to the vasomotor center, which is located in the medulla oblongata (have a collection of nuclei which are called tractus solitarius).
    - a cell body for interneurons
  - The vasomotor center (tractus solitarius) will stimulate the sympathetic nervous system, increasing contractility, and cardiac output. It also enhances the release of epinephrine & norepinephrine from the medulla of the adrenal gland which leads to central vasodilation and peripheral vasoconstriction; so, BP will return to normal.
    - SNS ↑ contraction ↑ CO ↑ EP/NOR EP ↑

Arterial Blood Pressure Regulation

- **Short term regulation of blood pressure:** BF ↑ SNS blocked

  - In the case of an increase in blood flow, the impulse will be sent to the vasomotor center (tractus solitaries). It will block the sympathetic nervous system rather than stimulate the parasympathetic nervous system. Thus, contractility and cardiac output will be decreased, vasodilation peripherally will occur, and BP will return to normal.

3. During a sudden decrease in blood flow (hypotension), which neural pathway is activated as a short-term regulation mechanism?

A. Baroreceptors send impulses through the glossopharyngeal nerve to stimulate the vasomotor center

B. Direct activation of the vagus nerve to increase contractility

C. Stimulation of the parasympathetic system to decrease heart rate

D. Blocking the sympathetic nervous system to allow vasodilation

A

Nervous Regulation of the Circulation

Nervous control of the circulation mainly affects more global functions (e.g., redistribution of blood flow, cardiac contractility, and rapid control of arterial blood pressure).

Autonomic Nervous System

- **Sympathetic Nervous System** (Norepinephrine is the neurotransmitter substance): It stimulates vasoconstriction by activation of alpha adrenoceptors on vascular smooth muscle.

peripherally to raise BP ↑ α_1

Nervous Regulation of the Circulation

Autonomic Nervous System

- **Sympathetic Nervous System:**
  - Vasoconstriction of arterioles results in increased vascular resistance and redistribution of blood flow. BP↑
  - Vasoconstriction of veins results in increased circulating blood volume, increased venous return, which subsequently leads to increased ventricular filling and stroke volume. → Co↑ → BP↑
  - Increase in the activity of the heart (heart rate and contractility ↑).

Nervous Regulation of the Circulation

Autonomic Nervous System

- **Parasympathetic system:**

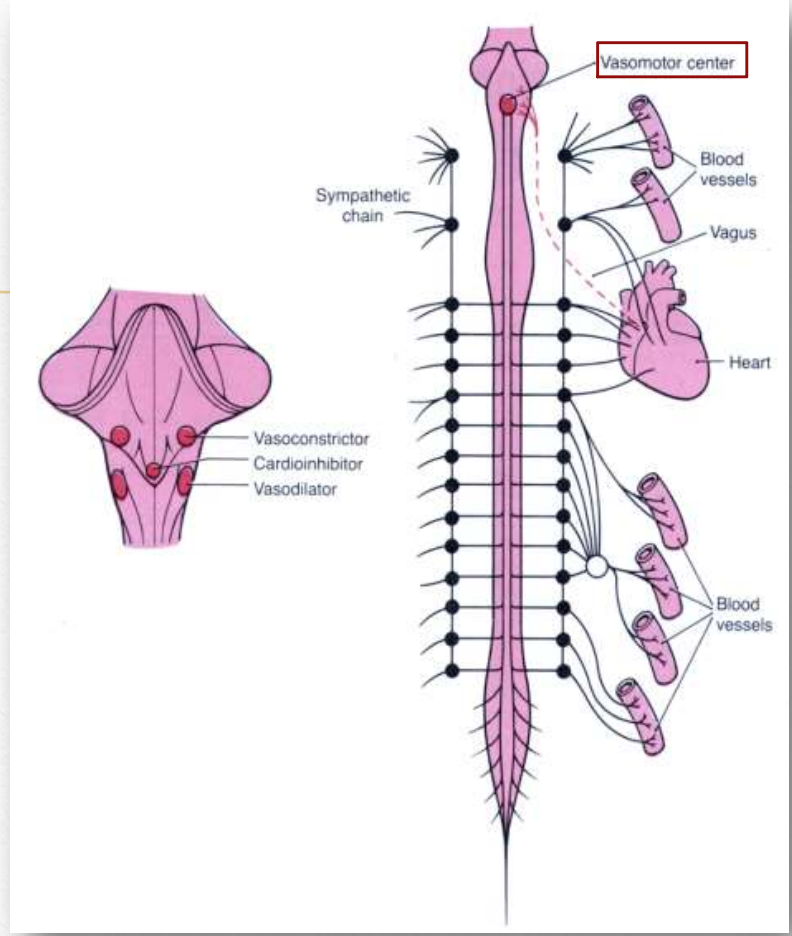
Plays a minor role in the regulation of circulation. Its important function relates to its control of the heart rate (stimulation of *vagus nerves* results in a decrease in heart rate and contractility).

Anatomy of the Sympathetic Nervous Control of the Circulation

Nerves leave the spinal cord through thoracic and lumbar spinal nerves, pass into the sympathetic chain, and then into the circulation through:

- Specific sympathetic nerves innervate the vasculature of the internal viscera and the heart.
- The spinal nerves innervate mainly the vasculature of the peripheral metarterioles.

الأوعية الدموية



The Sympathetic Vasoconstrictor System and its Control by the Central Nervous System

- **The distribution of vasoconstrictor fibers varies:**
  - Greater distribution in the kidneys, gut, spleen, and the skin. peripherally
  - Less potent in the skeletal muscle and brain.
- **Vasomotor center:**
  - Located in the brain (reticular شبكي substance of the medulla and lower pons).
  - transmits impulses through the spinal cord and hence sympathetic vasoconstrictor fibers to almost all blood vessels of the body for blood pressure control.

Areas of the Vasomotor Center:

يتقسم لـ 3 أقسام

1. Vasoconstrictor Area:

For blood vessels

Neurons secrete norepinephrine which stimulates the vasoconstrictor neurons of the sympathetic nervous system. (SNS)

2. Vasodilator Area:

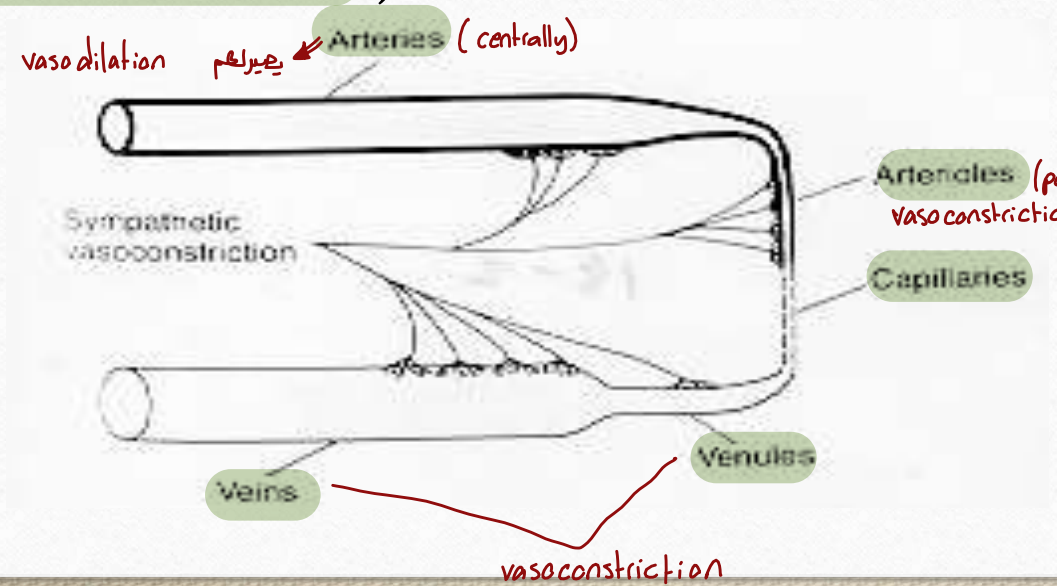
Fibers from neurons in this area project upward to the vasoconstrictor area and inhibit vasoconstrictor activity.

3. Sensory Area:

Receives afferent sensory nerve signals from the vagus and glossopharyngeal nerves and the output signals from this sensory area then help to control the activities of both the vasoconstrictor and vasodilator areas, thus providing "reflex" control of many circulatory functions (e.g., **baroreceptor reflex** for blood pressure control).

no smooth muscles

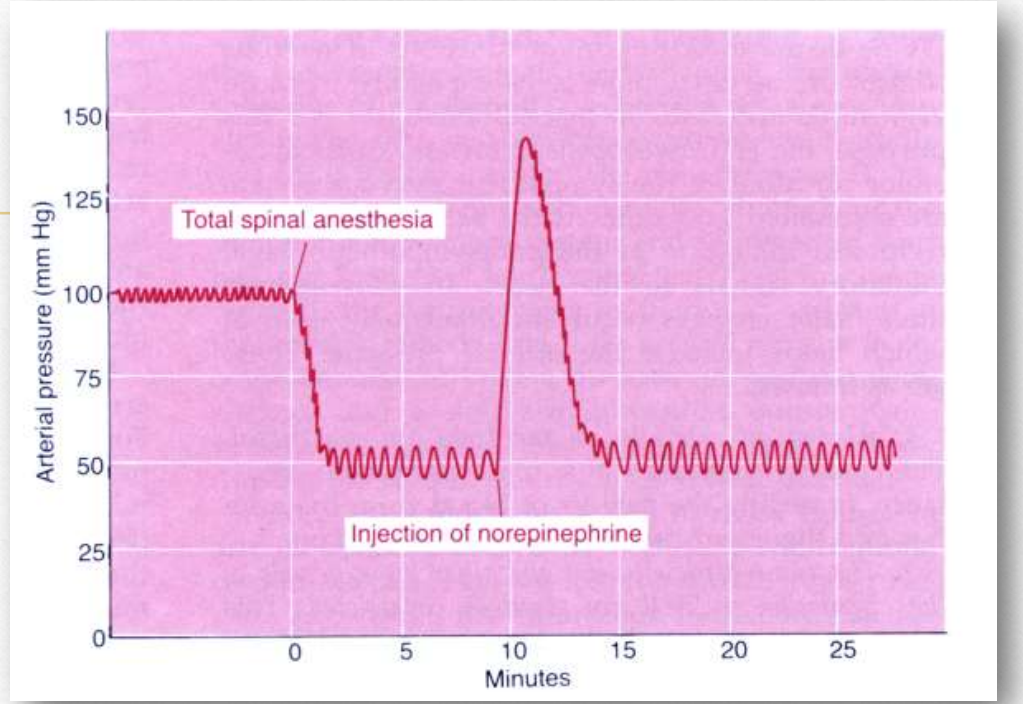
All vessels except capillaries, pre-capillary sphincters, and most metarterioles are innervated. Small arteries and arterioles when stimulated will increase resistance to flow and decrease the flow of blood to the tissues. Innervation of large vessels (e.g., veins) decreases the volume of the veins and alters the volume of the venous side of the circulation, so the volume is transferred to the arterial side. (Again, "reservoir function")



Sympathetic carry mostly vasoconstrictor fibers and a lot are present in the kidney, gut, spleen, skin, and *less are in* the skeletal muscle and brain.

Sympathetic Vasoconstrictor Tone

Under normal conditions, the vasoconstrictor area transmits signals continuously (0.5-2 impulses/sec). These impulses maintain a partial state of contraction in vascular smooth muscle (**vasomotor tone**).



Effect of total spinal anesthesia on arterial blood pressure

- **Control of Heart Activity by the Vasomotor Center:**

  Sympathetic nerve fibers to the heart increase heart rate and contractility when stimulated, whereas impulses from the vagus nerve (parasympathetic nerve fibers) decrease heart rate.

- **Control of Heart Activity by Higher Nervous Centers:**

  Reticular substance

  Hypothalamus — can either excite or inhibit the vasomotor center

  Cerebral Cortex

- **The Adrenal Medullae:**

  Excitation of sympathetic fibers to the adrenal medullae cause the secretion of epinephrine and norepinephrine into the circulation.

Role of the Nervous System for Rapid Control of Arterial Pressure ABP

The entire vasoconstrictor and cardioaccelerator functions of the SNS are stimulated as a unit. At the same time, there is reciprocal inhibition of the normal parasympathetic vagal inhibitory signals. As a result, 3 changes occur, each of which contributes to increasing arterial blood pressure: arteriolar constriction and large vessel constriction (especially veins) increases circulating blood volume and venous return, increased cardiac contractility and stroke volume, and increase in arterial pressure. Direct stimulation of the heart (HR increases up to 3-fold and contractility is increased).

These effects can double arterial pressure within 10-15 sec. Sudden inhibition can decrease pressure by half within 10-40 sec.

Increased Arterial Pressure during Exercise:

During exercise, active muscles require greatly increased blood flow. BF↑

- Local vasodilatory mechanisms.
- Elevation of arterial blood pressure (an increase of 30-40% can increase blood flow by 2-fold).

Exercise is initiated by activation of the motor areas of nervous system. At the same time these areas are activated to initiate exercise, the reticular activating system of the brain stem is also activated (incl. stimulation of the vasoconstrictor and cardioaccelerator areas of the vasomotor center). These raise arterial pressure instantaneously to keep pace with the increase in muscle activity. This occurs with many other types of stress (e.g., fight or flight reaction).

SNS

Question 21 / 40

During moderate exercise, the blood flow increases to all tissues except:

1. ○ Heart
2. ○ Liver
3. ○ Kidney
4. ◉ Intestines ✓
5. ○ None of the above

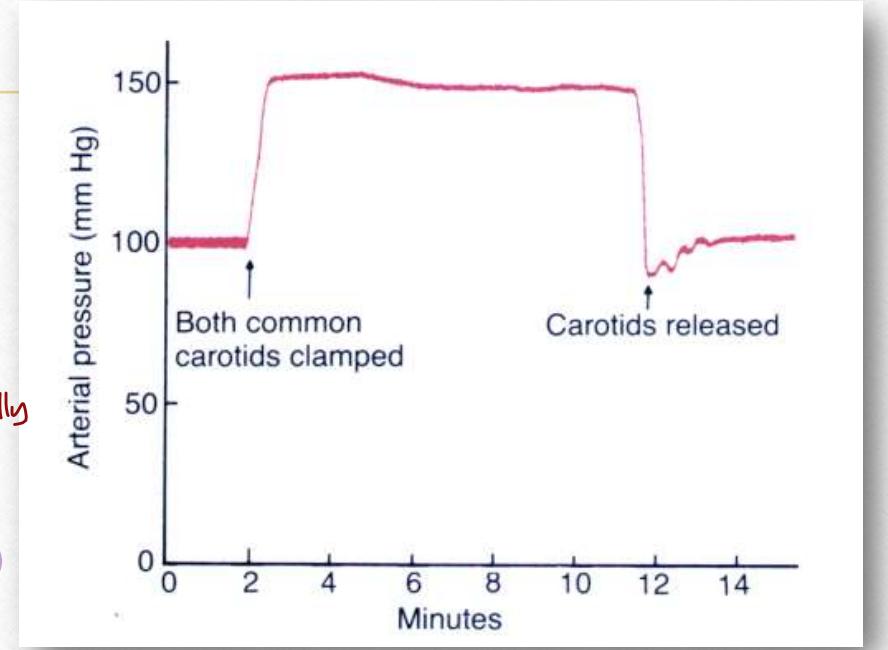
The Baroreceptor Reflex

Once signals have entered the medulla secondary signals inhibit the vasoconstrictor center and excite the vagal center. This results in vasodilation of the veins and arterioles throughout the systemic circulation and decreased heart rate and contractility.

peripherally

Therefore, stimulation of the baroreceptor reflex reduces blood pressure through a decrease in peripheral resistance and a decrease in cardiac output. Low pressure has the opposite effect.

↓BP = CO↓ × TPR↓



Typical Carotid Sinus Reflex on Arterial Pressure Caused by Clamping Both Common Carotids

The Baroreceptor Reflex

Function during changes in body posture:

When going from laying down to standing up there is a decrease in a stretch of the baroreceptors which respond immediately to increase pressure by removal of inhibition on the vasoconstrictor center.

Question 33 / 40

Baroreceptors are main regulator for blood pressure in human body which can control high blood pressure levels for long-term.

1. ○ True
2. ○ False

Next

False

Mechanisms for Maintaining Normal Arterial Pressure

- **Arterial Baroreceptor Control System:**

  Receptor: Spray-type nerve endings

  Location: in the wall of large arterial vessels (internal carotid artery and the wall of aortic arch; (baroreceptor, pressoreceptors)

  Stimulus: Stretch

Normally, the carotid baroreceptors are not stimulated by pressures between 0-60 mmHg. Above 60 mmHg they respond progressively more and more rapidly and reach a maximum at about 180 mmHg. **The aortic baroreceptors behave similarly but operate at pressures 30 mmHg higher than the carotid**. Respond very rapidly to changes in pressure, with the rate of impulse firing increasing during systole and decreasing during diastole.

contraction Filling

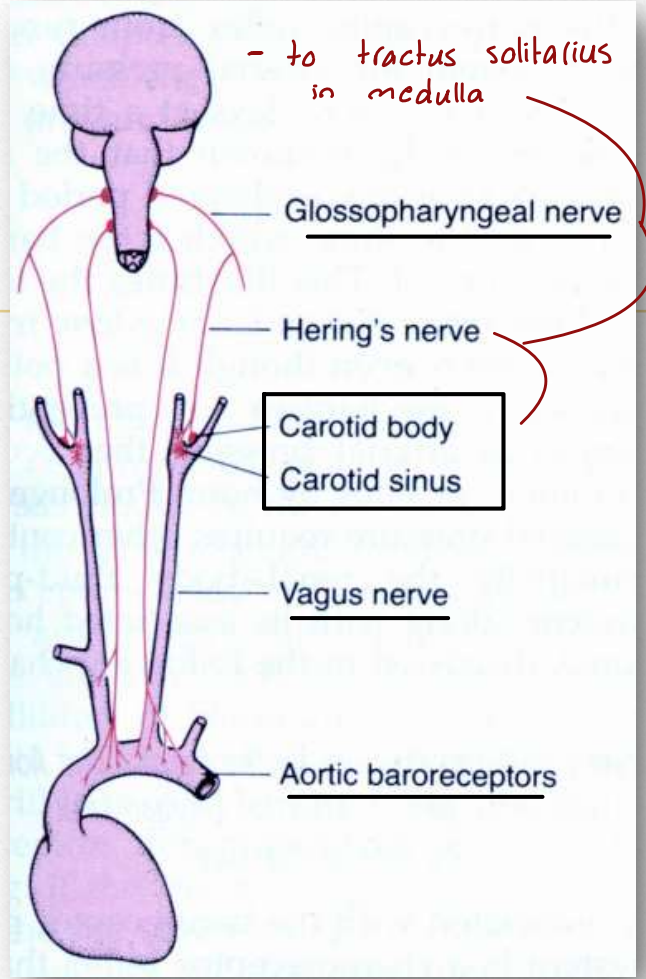
Arterial Baroreceptor Control System:

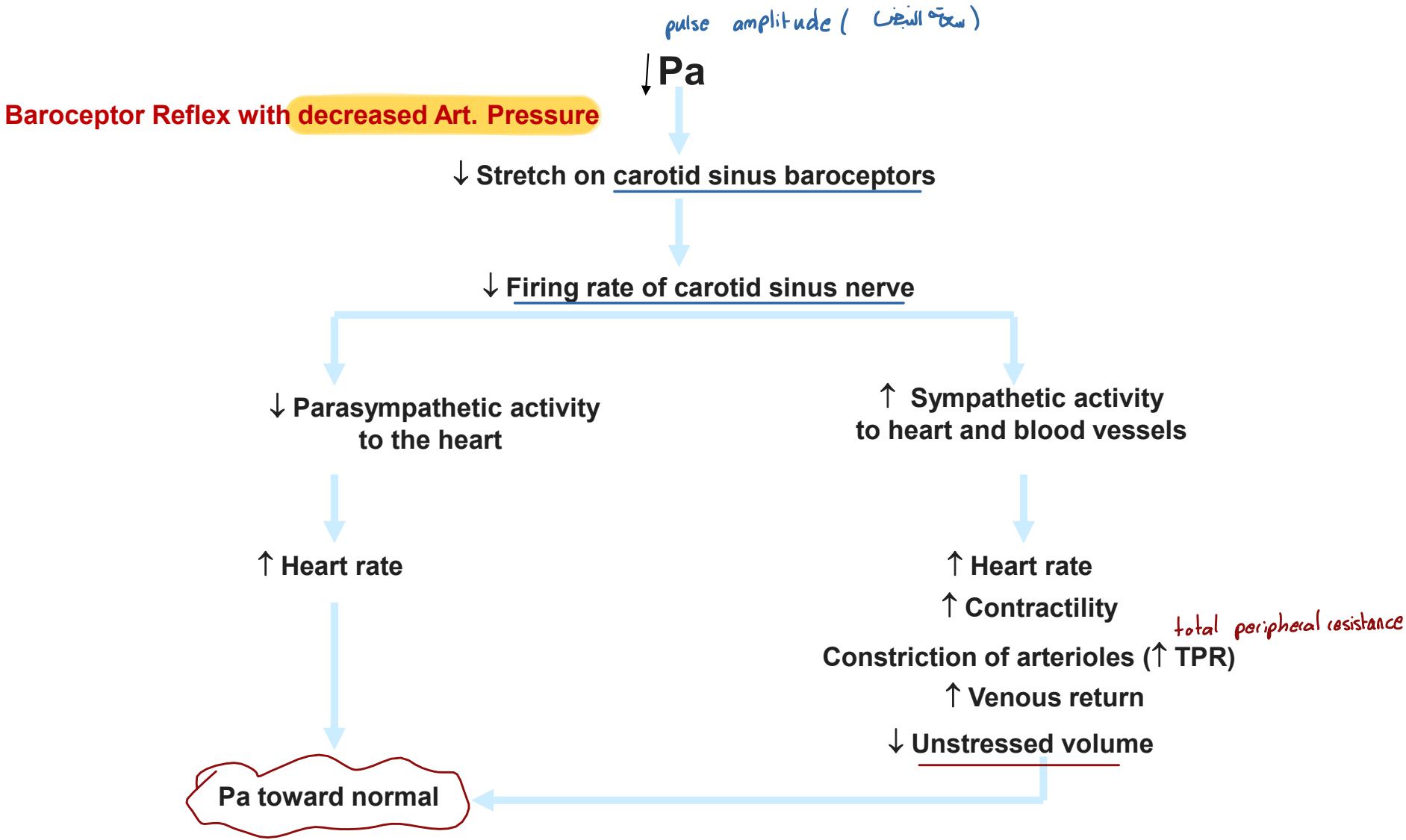
carotid glossopharyngeal

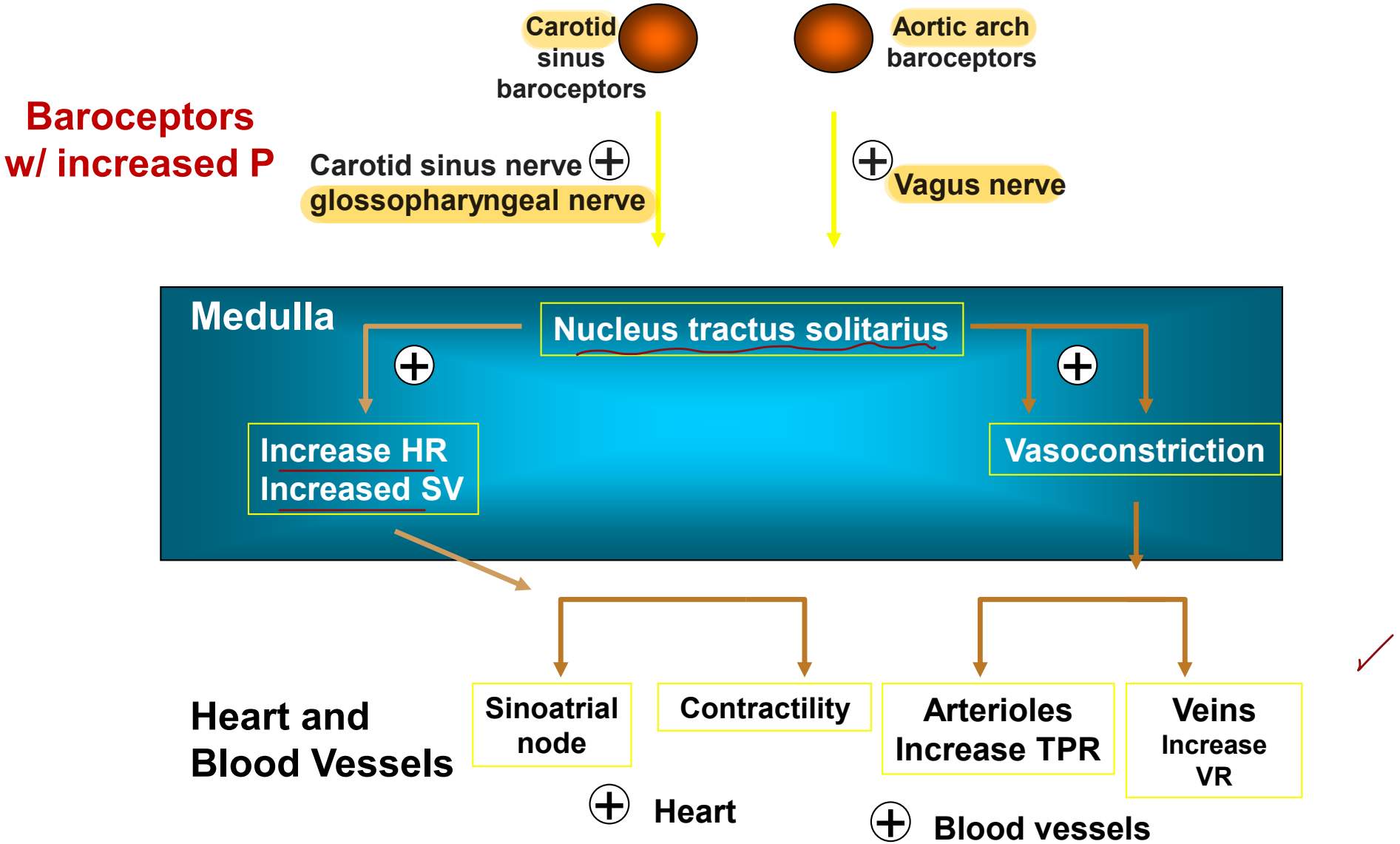
aortic vegus

- Pathway: Internal carotid transmits impulses through Herring's nerve to the glossopharyngeal nerve and hence to the tractus solitarius in the medulla.

- Signals from the aortic arch are transmitted through the vagus nerves also into this area of the medulla.




pulse amplitude (سعة النبض)
↓ Pa
Baroceptor Reflex with decreased Art. Pressure
↓ Stretch on carotid sinus baroceptors
↓ Firing rate of carotid sinus nerve
↓ Parasympathetic activity to the heart
↑ Sympathetic activity to heart and blood vessels
↑ Heart rate
↑ Heart rate
↑ Contractility
total peripheral resistance
Constriction of arterioles (↑ TPR)
↑ Venous return
↓ Unstressed volume
Pa toward normal


Carotid sinus baroceptors
Aortic arch baroceptors
Baroceptors w/ increased P
Carotid sinus nerve
glossopharyngeal nerve
Vagus nerve
Medulla
Nucleus tractus solitarius
Increase HR
Increased SV
Vasoconstriction
Heart and Blood Vessels
Sinoatrial node
Contractility
Arterioles Increase TPR
Veins Increase VR
Heart
Blood vessels

Question 36 / 40

Which of the following is CORRECT description of body responses toward low blood flow to the brain?

1. ○ Increase stretch on carotid sinus baroreceptor which lead to activation of parasympathetic system
2. ○ Increase stretch on carotid sinus baroreceptor which lead to activation of sympathetic system
3. ○ Decrease stretch on carotid sinus baroreceptor which lead to activation of parasympathetic system
4. ○ Decrease stretch on carotid sinus baroreceptor which lead to activation of sympathetic system
5. ○ None of the above

4

- **Carotid and Aortic Chemoreceptors:**
  - Closely associated with the baroreceptors.
  - Stimulus: lack of O_2, excess of CO_2, or excess of H^+ (hypoxia; hypercapnia; pH ↓)
  - Receptor: located in several small organs (1-2 mm in size), carotid, and aortic bodies.
  - Each body has close contact with the arterial blood. Low pressure stimulates the chemoreceptors because diminished blood flow reduces oxygen and increases carbon dioxide and hydrogen ions. These receptors are not strongly stimulated until systolic pressure falls below 80 mmHg.

BP↓ O_2↓ hypoxia CO_2↑ hypercapnia H^+↑ pH↓

  - Pathway: same as Baroreceptor.
  - The Reflex: The signals transmitted from the chemoreceptors into the vasomotor center EXCITE the vasomotor center and increase arterial pressure.

Arterial Blood Pressure Regulation

Long-Term Control (RAAS)

- It is done through the Renin-Angiotensin-Aldosterone System [RAS].
- When cardiac output decreases, it decreases CO in all the body including the kidneys.
- When the globular filtration rate or the renal perfusion decreases, the kidneys will respond to this by increasing renin production.

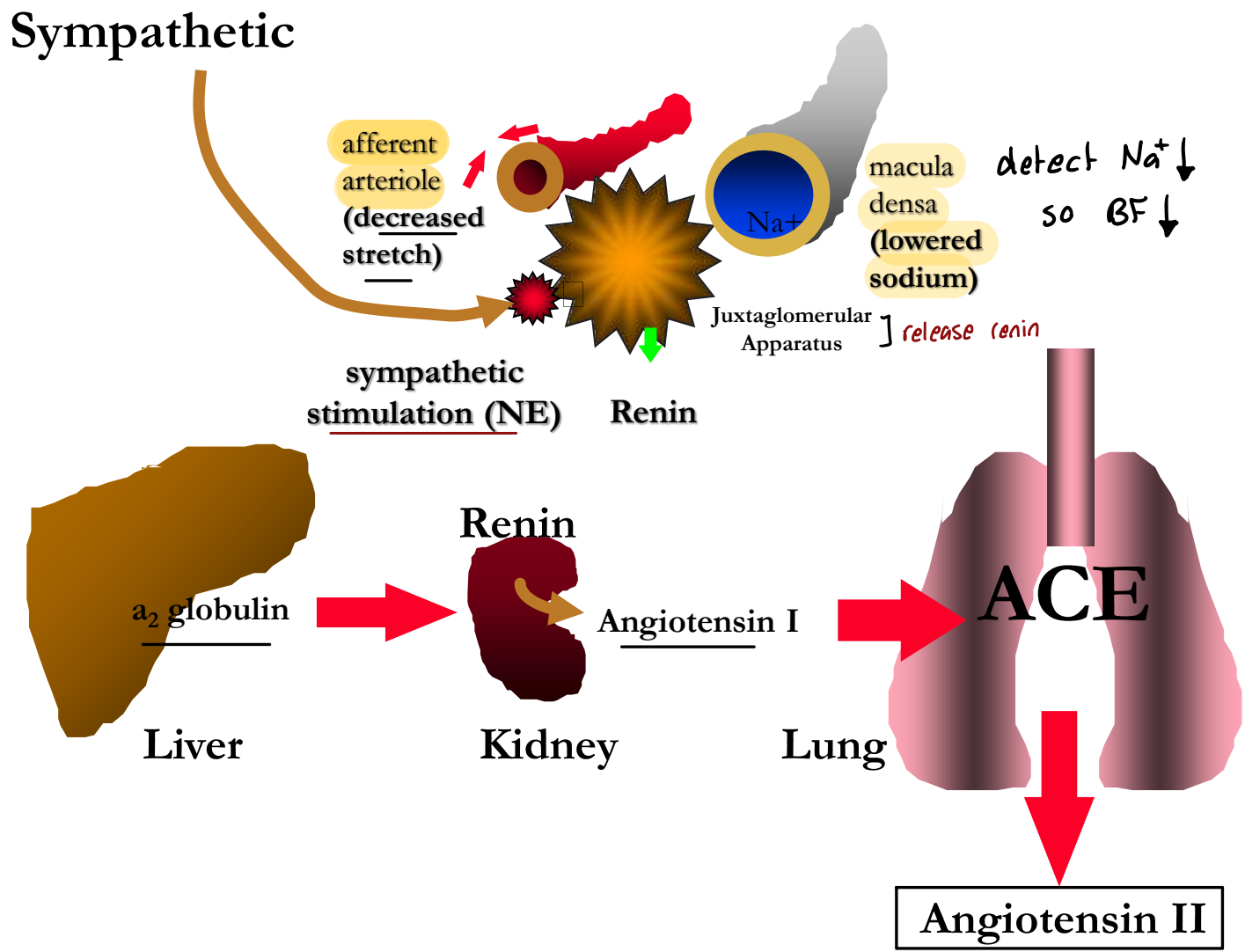
GFR ↓

from Kidneys

Baroceptors in long term AP regulation

However, if BP is maintained for 1 to 2 days, the baroceptors will reset at this 'new' level of 160 mmHg. Therefore, baroceptors are not as important, in long-term regulation.

https://youtu.be/K27ipbateKY?si=G0DRE0Y9Hns9ZruL



Renin

- **Renin is a protease that cleaves angiotensinogen to angiotensin I. Then angiotensin 1 is converted to angiotensin 2 by the angiotensin-converting enzymes (ACE) in the lungs.**

- Renin is secreted by the juxtaglomerular apparatus in response to a reflexive sympathetic activity or beta receptor stimulation, decreased central volume of blood or decreased plasma Na+.

Angiotensin II

- **One of the most potent vasoconstrictors known.**
- Octapeptide (8 amino acids).
- Constricts principally arteriolar smooth muscle to increase resistance.
- Stimulates the vasomotor center of the brain.
- **Stimulates the release of *Aldosterone* (steroid hormone) by the adrenal medulla.**
- Inactivated by angiotensinase enzyme.

Effect of Angiotensin to Cause Retention of Salt and Water

where sodium goes water follows

- **Direct Renal Effect** (can decrease urinary output 4-6 fold):

✓ Enhances the reabsorption of Na ions from the proximal tubule (Na reabsorption = water retention = increase in volume… vasoconstriction). ↳ peripherally

- **Stimulation of Aldosterone Secretion** from the adrenal glands

✓ Increase in salt reabsorption by the kidney tubules, increase in extracellular fluid sodium, and water retention.

- **Blocks bradykinin,** which is a local mediator of vasodilation:

✓ So, blocking it causes vasoconstriction.

Aldosterone

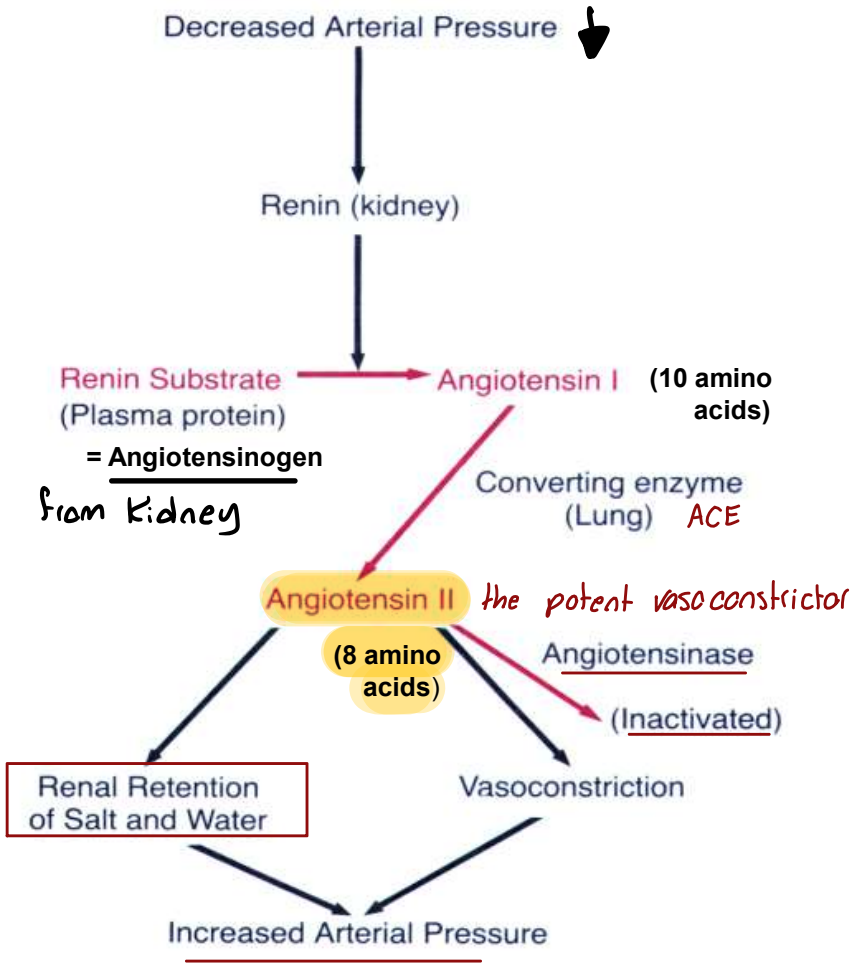
- *Steroid hormone* secreted by the adrenal medulla in response to angiotensin II formation.

BV ↑ BP ↑

- Increases blood volume by promoting the reabsorption of sodium and water.

- Takes hours to be effective in raising blood pressure and volume because it requires protein synthesis.

The Role of the Renin-Angiotensin System in Regulating Arterial Pressure



Antidiuretic Hormone (ADH, Vasopressin)

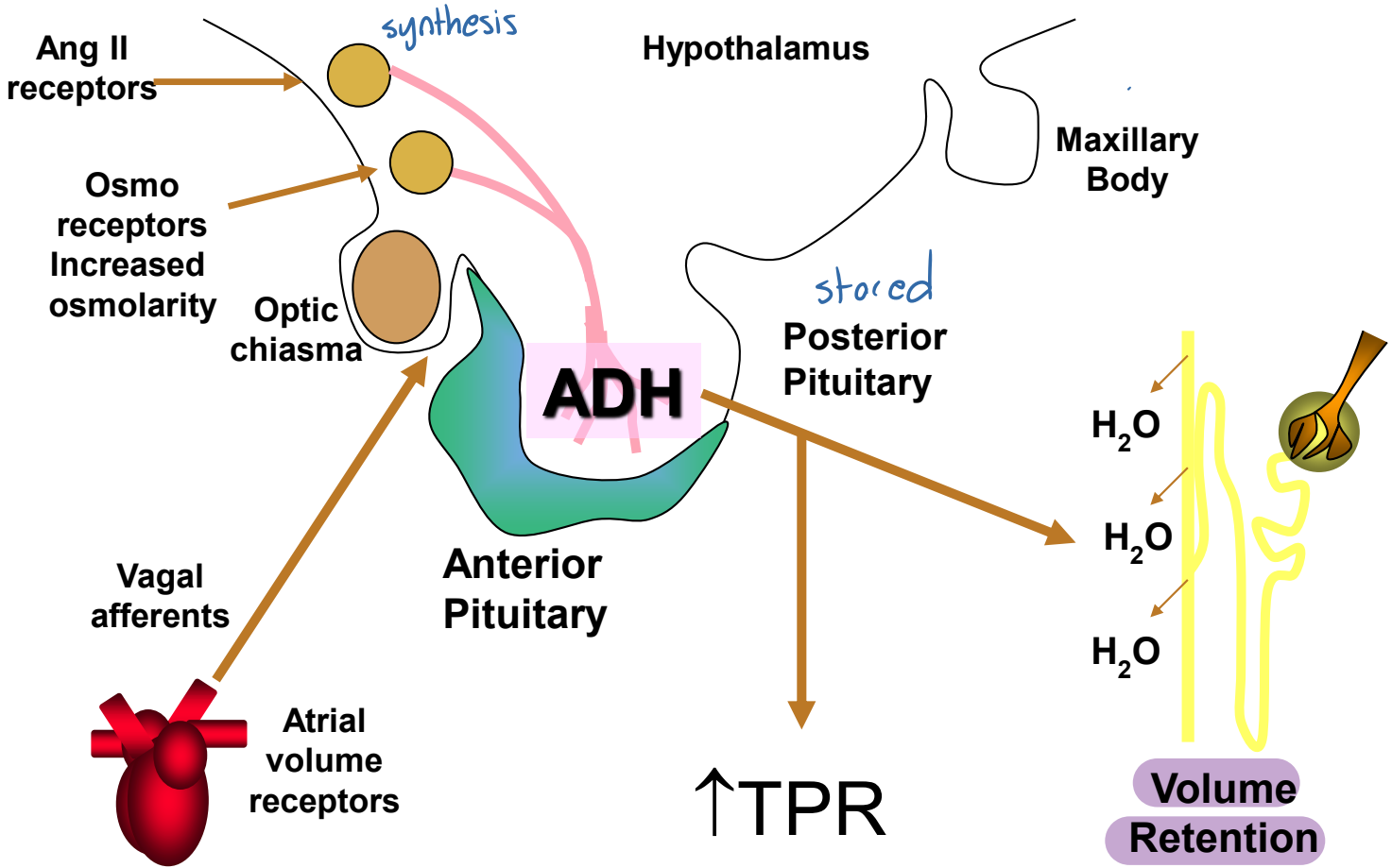
Anatomy

1. ADH is an oligopeptide that is synthesized in the hypothalamus and stored in the posterior pituitary before it is released into the bloodstream.
   with oxytocin
2. ADH release is stimulated by *osmoreceptors* in the anterior pituitary, triggers ADH and thirst (2% osmolarity) change is enough.
3. These hormones prevent diuresis (loss of water in urine) in case of dehydration and hypovolemia.

Anti diuretic

BF ↓

ADH (Vasopressin) and Blood Volume



ADH (Vasopressin) receptors

- V_1 receptors are in vascular smooth muscle.
- V_2 receptors are in the principal cells of the renal collecting duct.
- V_2 receptors are involved in water reabsorption in the collecting duct and in the maintenance of body osmolarity.

5. A patient is prescribed a medication that blocks the conversion of Angiotensin I to Angiotensin II. Based on the RAAS mechanism, what is the primary expected effect on the vessels?

A. Decreased arteriolar constriction

B. Increased peripheral vascular resistance

C. Increased secretion of Aldosterone

D. Stimulation of the vasomotor center to raise BP

A

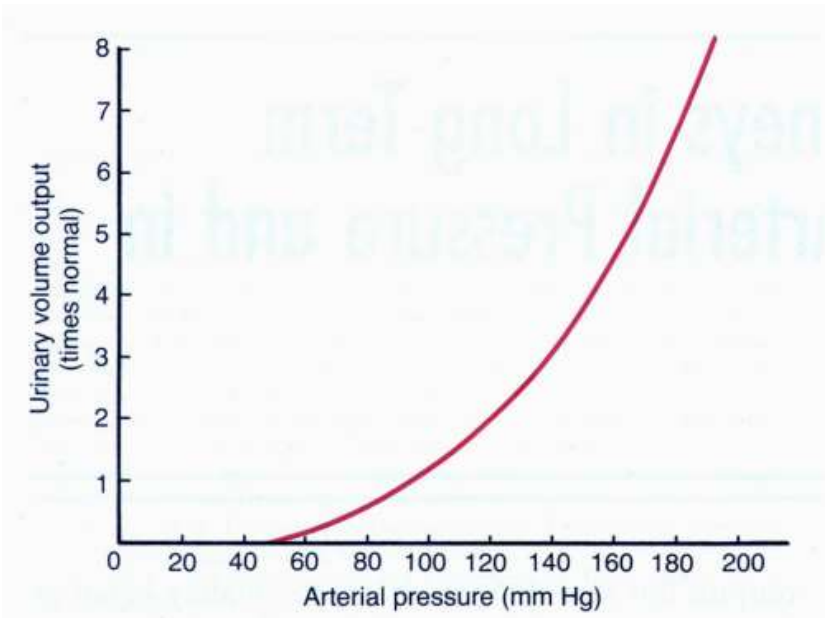
The Renal-Body Fluid System for Long Term Control of Arterial Pressure:

When the body contains too much extracellular fluid, arterial pressure rises. This increase in pressure causes the kidneys to excrete the excess fluid until pressure returns to normal (pressure diuresis).

Quantification of pressure diuresis using renal function curves

As pressure increases urinary volume, there is an equal effect on the urinary output of salt (pressure natriuresis),

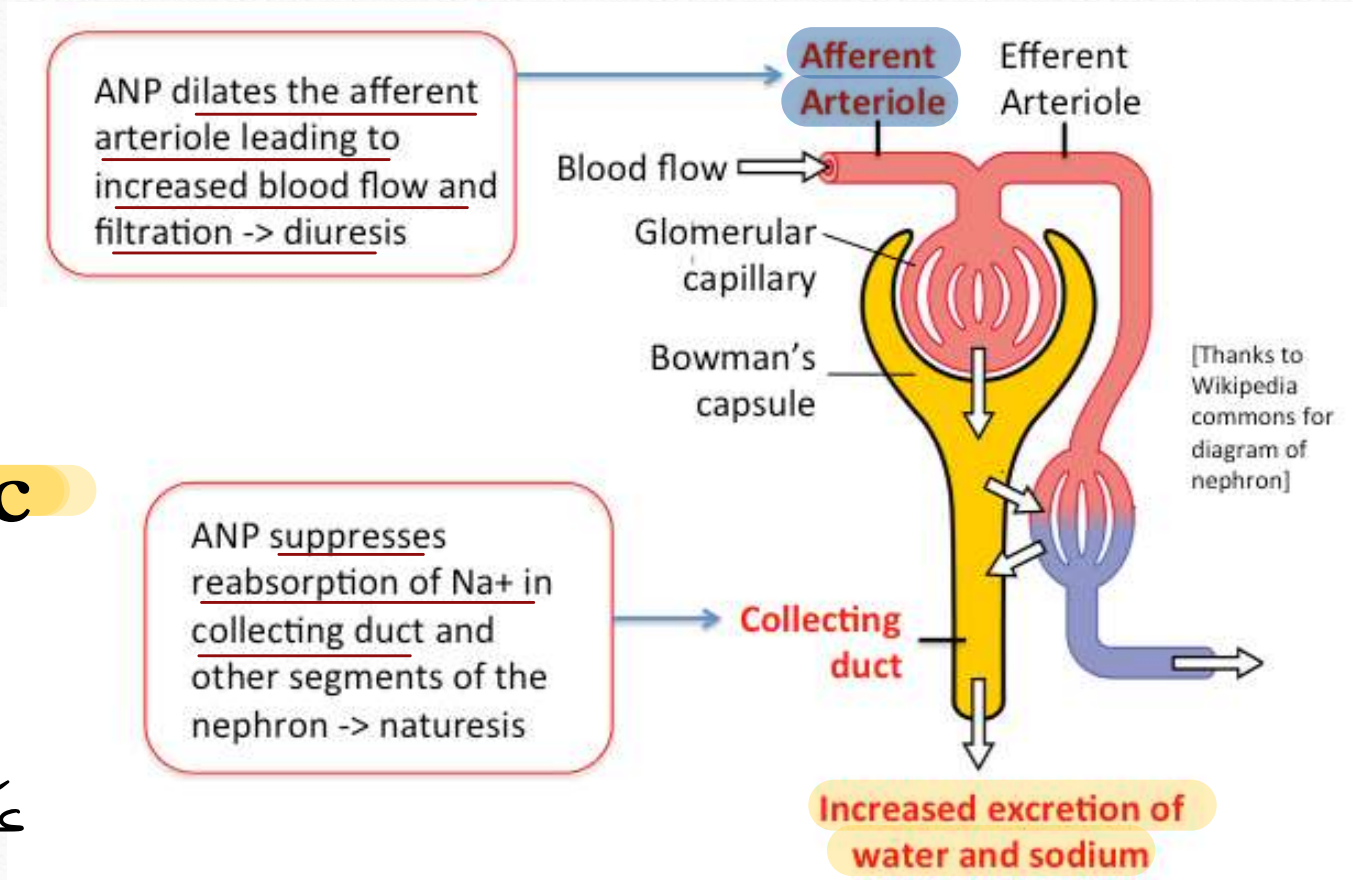
i.e. the relationship is similar for sodium excretion



Typical Renal Output Curve
Measured in an Isolated
Perfused Kidney

Atrial Natriuretic Peptide (ANP)

عكس الكل



http://www.vivo.colostate.edu/hbooks/pathphys/endocrine/otherendo/anp.html

6. Which hormone, released from the atrium, acts to decrease blood volume and blood pressure by increasing salt and water excretion?

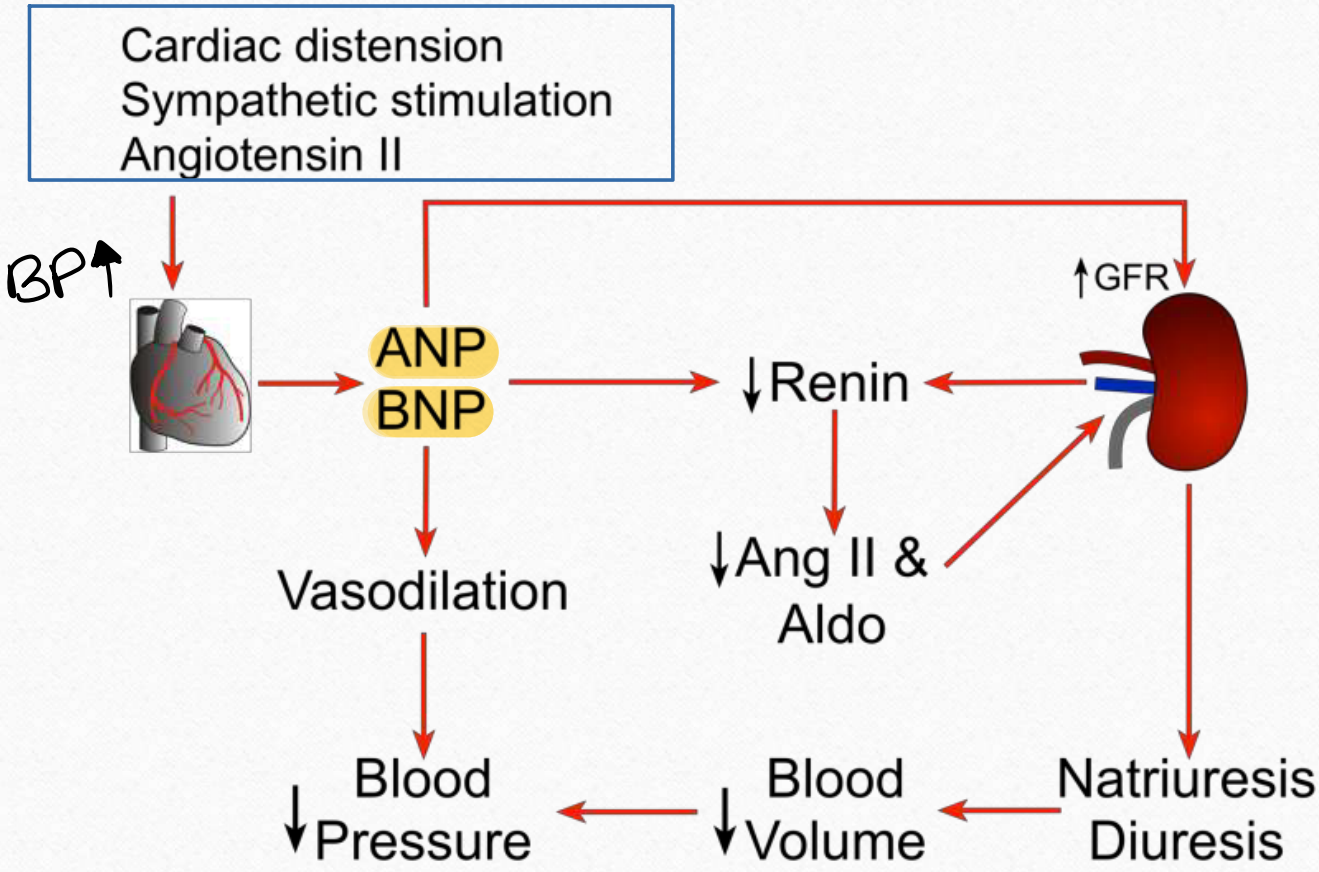
A. Angiotensin II

B. Antidiuretic Hormone (ADH)

C. Atrial Natriuretic Peptide (ANP)

D. Aldosterone

c



https://www.cvphysiology.com/Blood%20Pressure/BP017

- Regulation of GFR -

Autoregulation

- myogenic mechanism

stretch ↑ BF ↑ لما من وظا شفطا

بدنا نرجع balance نعمل

afferent vasoconstriction

GFR ↓

- tubularglumerular feedback

macula densa

distal convoluted tubule موجودة في

sensitive to Na^+ / Cl^-

afferent vaso constriction

GFR ↓

neural regulation

(sympathetic effect)

- low dose (stimulation)

afferent dilation

efferent dilation

(No effect) بيسيطر

Autoregulation dominate

- moderate dose (stimulation)

equal vasoconstriction

For afferent/efferent arteriole *

(same level)

GFR ↓ بكمية قليلة

hormonal regulation

- Angiotensin II (4 functions)

vasoconstriction

GFR ↓

- Atriel natriutic peptide (ANP)

afferent vasodilation

GFR ↑

- high dose (stimulation)

severe / extreme

afferent vasoconstriction

reduce GFR ↓ بكمية كبيرة

efferent vasoconstriction كما في

بس كان afferent أكبر بكثير

GFR ↓ → GF ↓

↓

urine output ↓

BF ↑ systemic circulation إلى الراجع

❑What Can I Do?

- High blood pressure is a lifelong disease.
- Blood pressure can be controlled not cured.
- Controlling blood pressure will reduce the risk of stroke, heart attack, heart failure, and kidney disease.

❑What Can I Do?

- Loose weight if your overweight.
- Get regular physical activity.
- Avoid excessive alcohol.
- Stop smoking.
- Manage your stress.
- Decrease salt intake.
- Eat for heart health.
- Discuss the use of oral contraceptives with your doctor.
- Discuss the use of some medications with your doctor.

short answer Be healthy you stay wealthy ★

• Commandments for Blood Pressure Control:

-Know your blood pressure

- Have it checked regularly

-Know what your weight should be

- Keep it at that level or below

-Don't use excessive salt in cooking or at meals

- Avoid salty foods

-Eat a low-fat diet

- According to AHA regulations

-Don't smoke cigarettes

- Or use tobacco products

-Take your medicine exactly as prescribed

- Don't run out of pills even for a single day

-Keep your appointments with the doctor

-Follow your doctor's advice about exercise

4. Which medication class is commonly used as a first-line treatment for hypertension in patients without comorbidities?

A. Beta-blockers

B. Angiotensin-converting enzyme (ACE) inhibitors

C. Anticoagulants

D. Antihistamines

Answer: B

Explanation: ACE inhibitors are often first-line due to their effectiveness in lowering blood pressure and protecting the kidneys, especially in patients with diabetes or heart disease.

❑Main medication for HTN

➢ ***Diuretics:***

- Rid the body of excess fluids and salt

➢ ***Beta-blockers:***

- Reduce the heart rate and the work of the heart

➢ ***Calcium antagonists:***

- Reduce heart rate and relax blood vessels

Anything ends with pril

➢ ***Angiotensin II receptor blockers (ACE):***

- Interfere with the bodies production of angiotensin, a chemical that causes the arteries to constrict (narrow)

➢ ***Vasodilators:***

- Cause the muscle in the wall of the blood vessels to relax, allowing the vessel to dilate (widen).