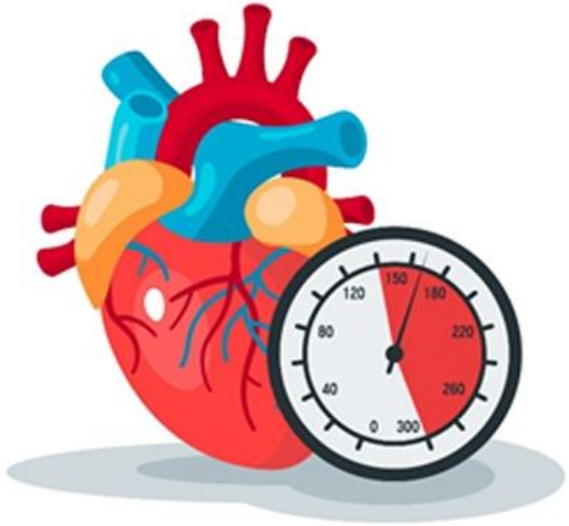
Ashur University
College of Medicine

Grade 1

Cardiovascular Module
Cardiovascular Physiology
Lec.9

Regulation of Blood Pressure



Ass. Professor Internal Medicine

Dr. Qasim Razzaq Radhi

5/5/2025



Objectives:

1. List the mechanisms that regulate BP by adjusting the vascular resistance, body fluids and blood volume.
2. Outline the arterial baroreceptor reflex.
3. Describe the changes in blood pressure while going from lying to standing position.
4. Outline the Renin-angiotensin-aldosterone pathway.

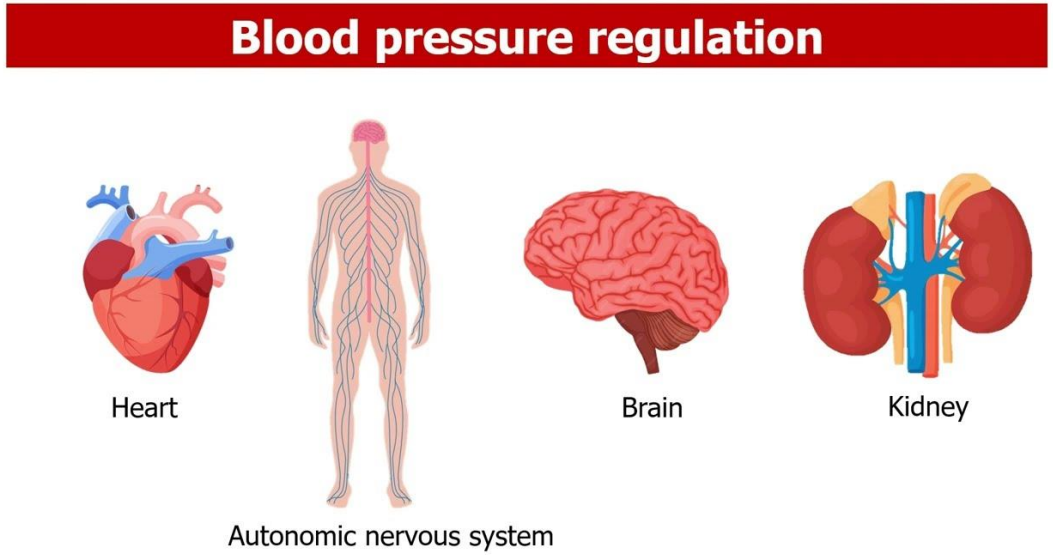


Regulation of Blood Pressure

Arterial pressure control **begins** with the life saving measures of the **nervous pressure controls**.

Then continues with the sustaining characteristics of the **intermediate pressure controls** and,

Finally, is **stabilized at the long-term pressure level** by the renal – body fluid mechanism.



Regulatory Mechanism

- Short- term mechanisms
- Intermediate - term mechanisms
- Long - term mechanisms

Short-term mechanisms

Potent mechanisms, act within a few seconds after alteration of the BP and their action lasts for several hours. They are mostly **nervous reflexes** that adjust the vascular capacity and resistance.

1. **Arterial baroreceptor reflex.**
2. **Arterial chemoreflexes (increase sympathetic activity → ↑BP)**
3. **Release of adrenal medullary catecholamines.**
4. **The CNS ischemic response**

   (sympathetic vasoconstrictor system → ↑BP)
5. **The abdominal compression reflex (Increase BP)**

Cardiovascular center

Vasomotor constrictor center (VCC)

(By Sympathetic pathway) →

Generalized vasoconstriction →

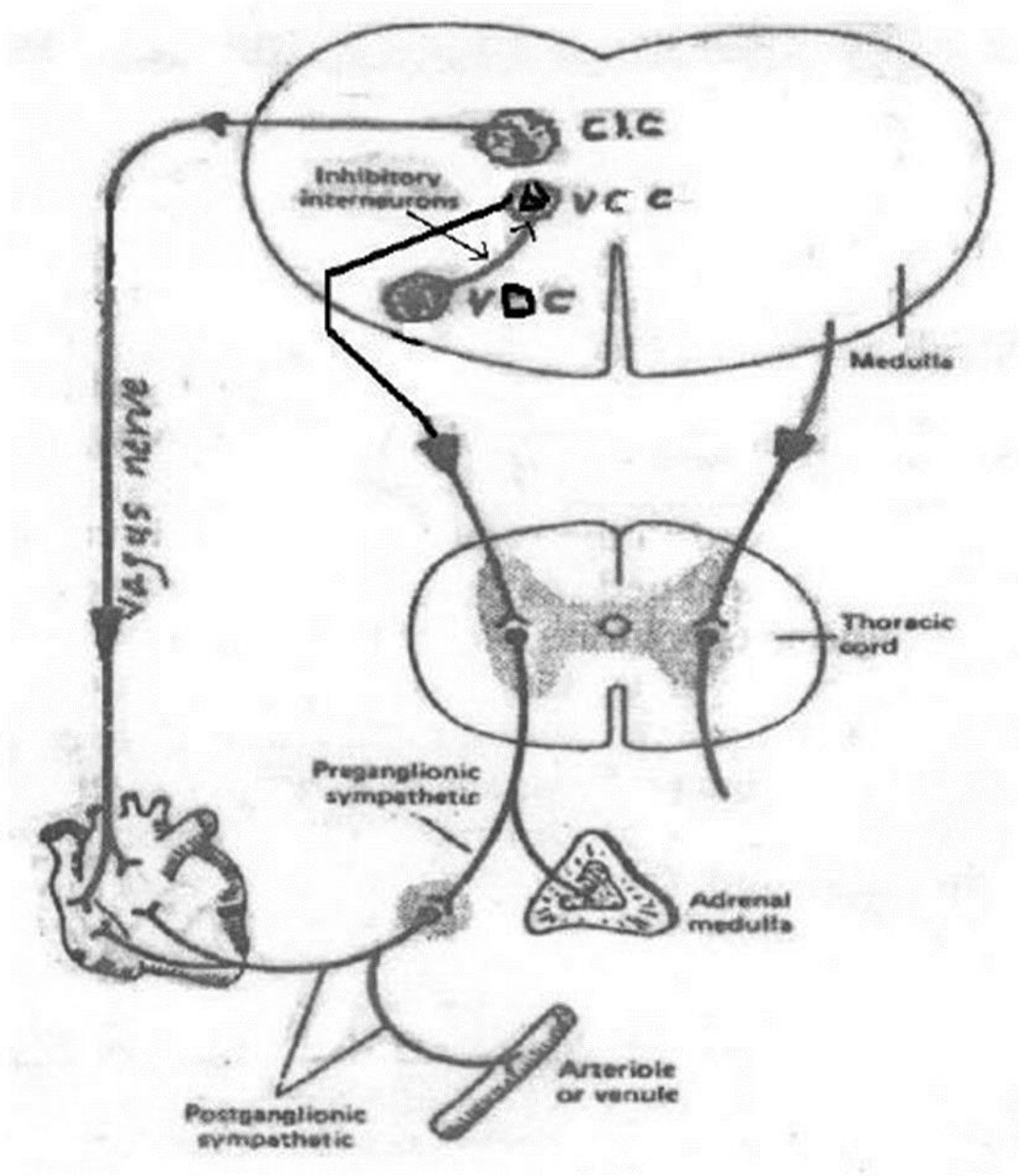
Increases Total Periphral Resistance (TPR)

……

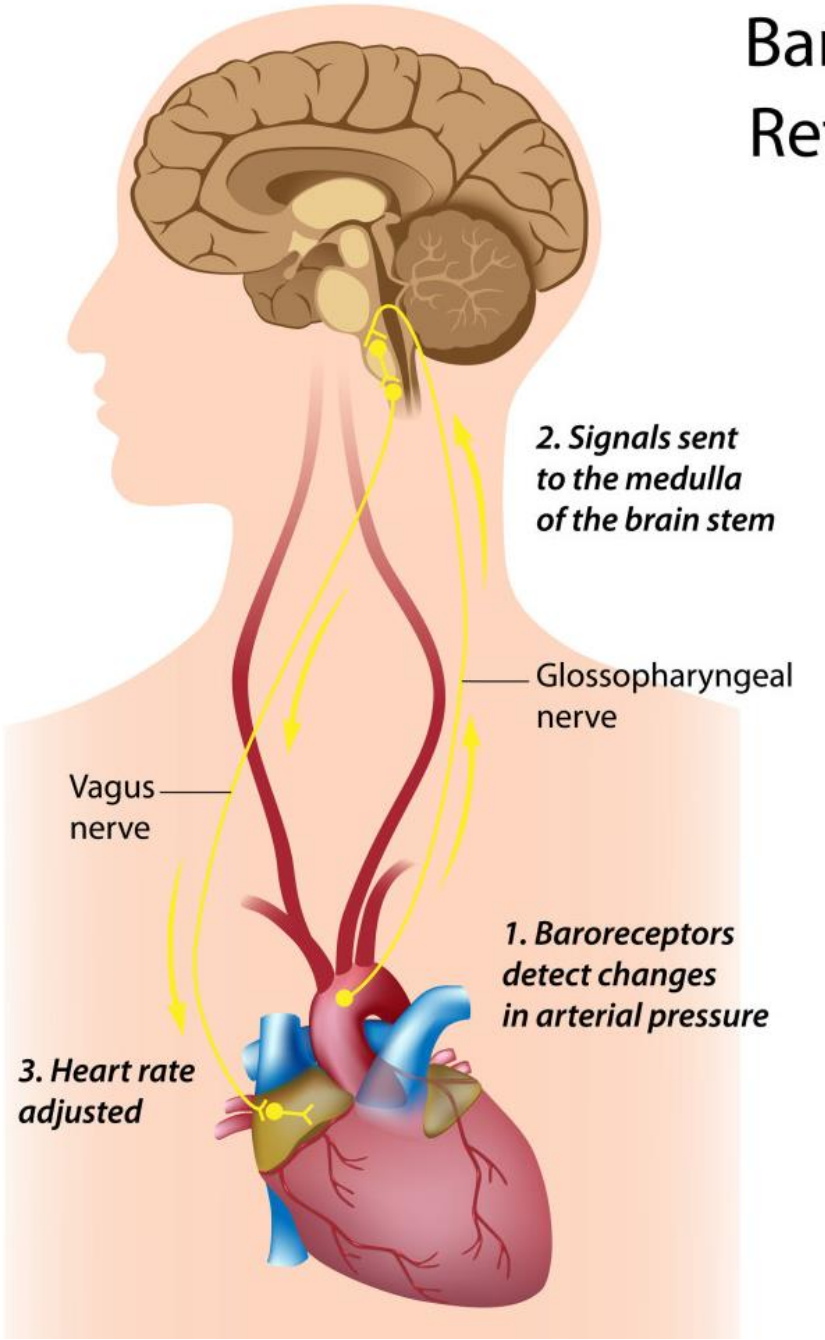
Cardioinhibitory center (CIC) : →

(By Parasympathetic - Vagus Nerve)

Reduce Heart rate



Baroreceptor Reflex



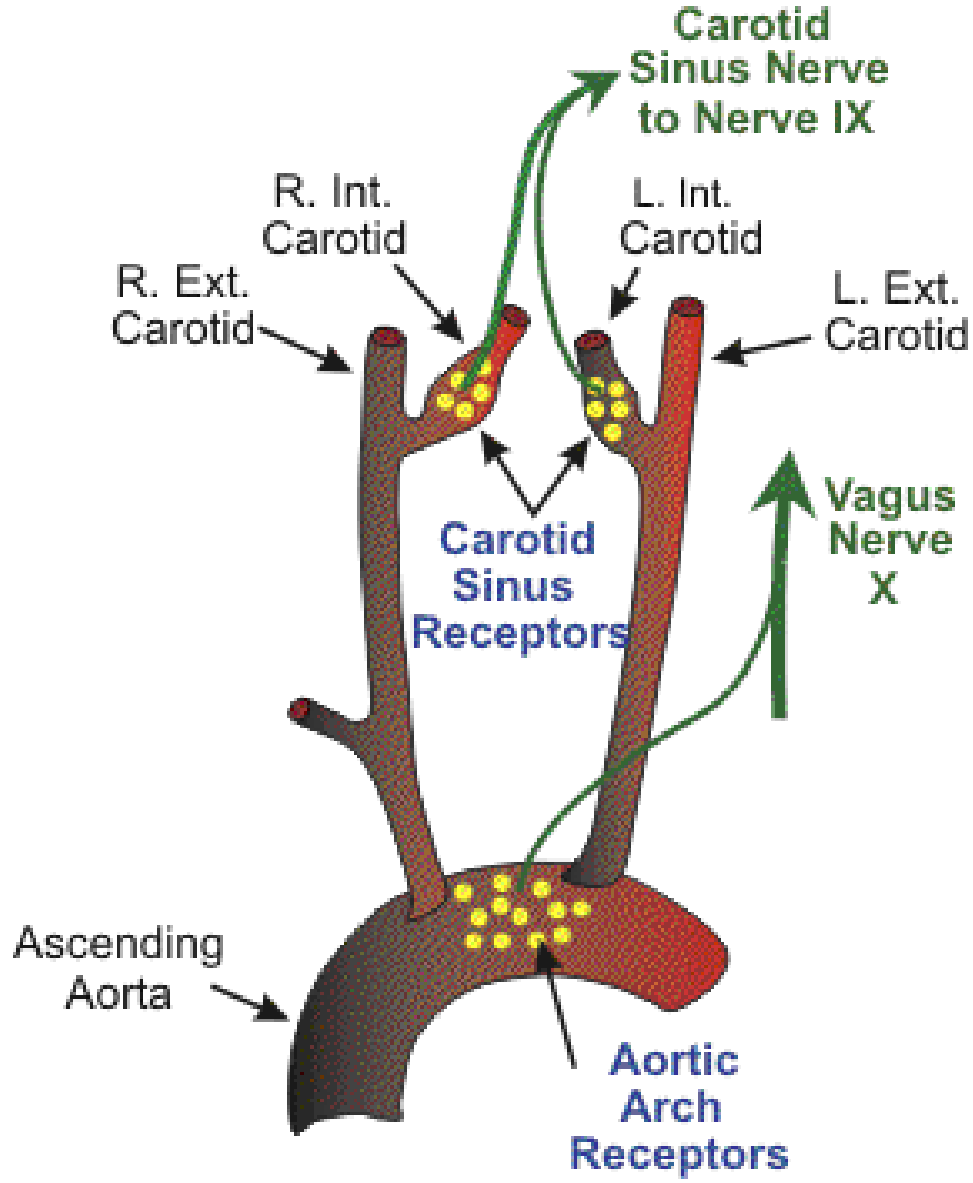
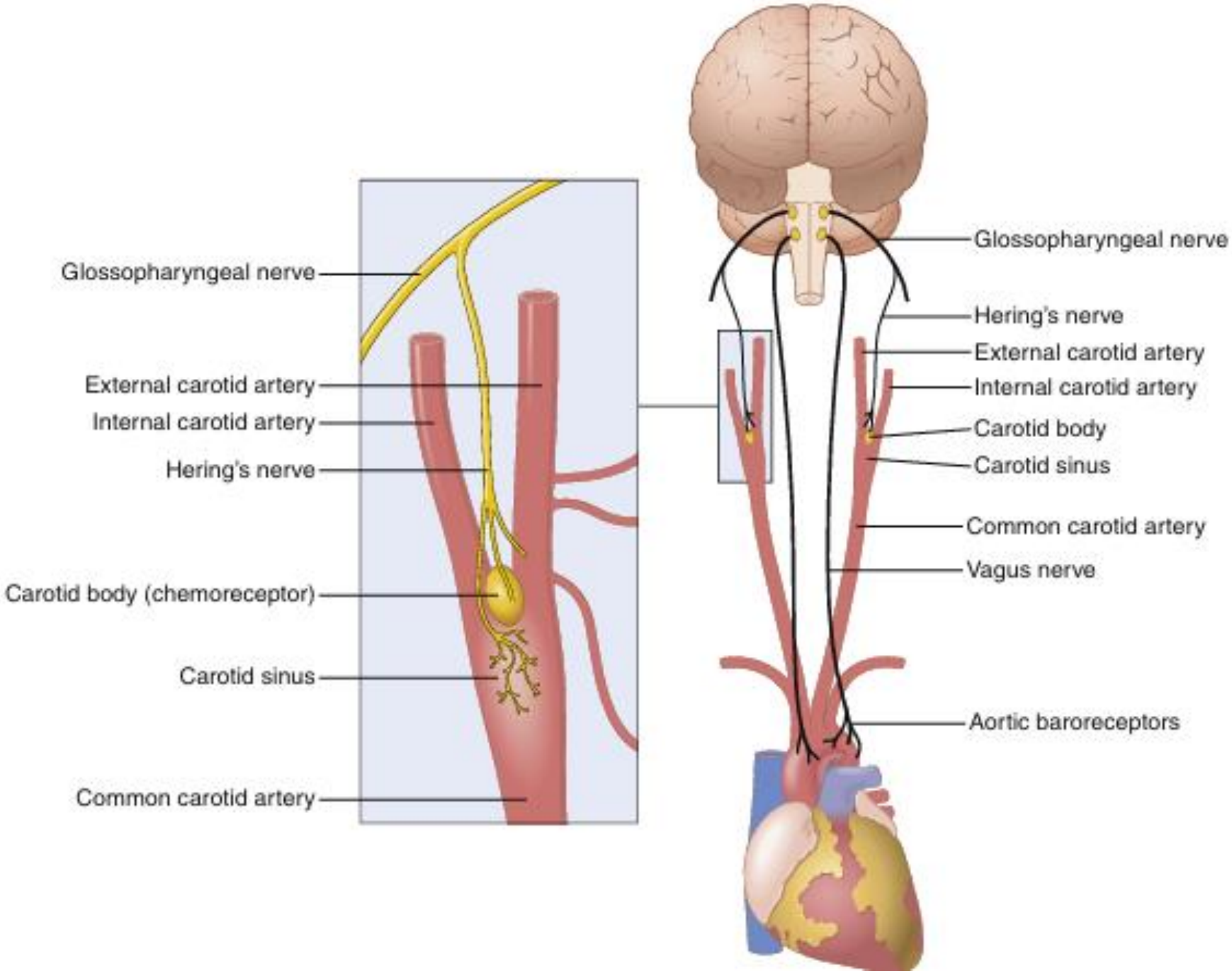


Figure 1. Location and innervation of arterial baroreceptors.

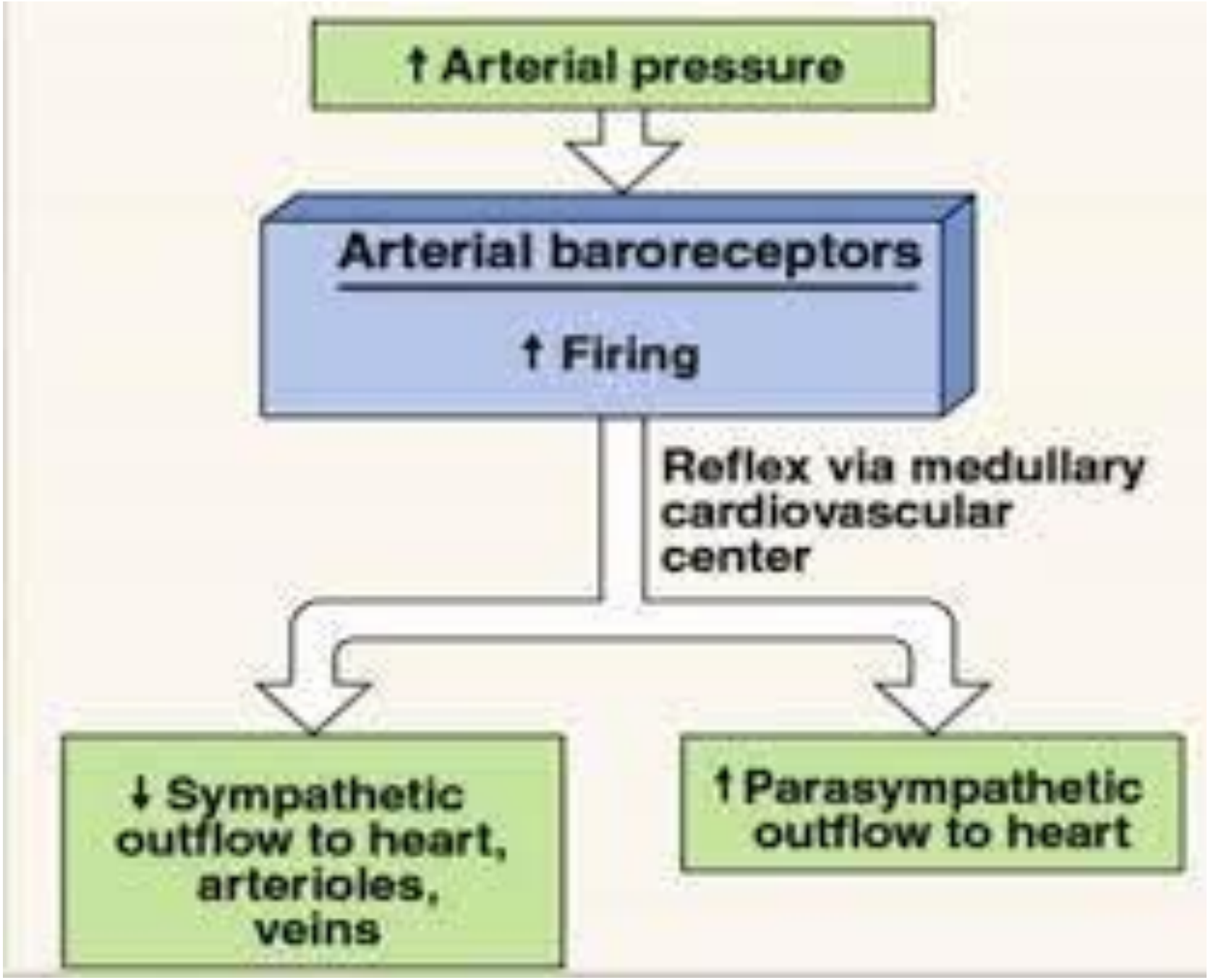
Figure

Baroreceptor system for controlling arterial pressure.



Baroreceptors Reflex:

BP = CO X PR



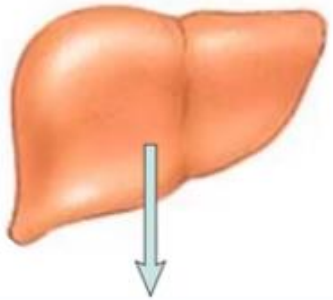
Intermediate-term mechanisms

Control BP by adjusting the vascular resistance as well as the blood volume. They act within a few minutes and their action lasts for several days.

1. **Renin-angiotensin vasoconstriction mechanism.**
2. **Right atrial mechanism.**
3. **Capillary fluid shift mechanism.**
4. **Stress relaxation mechanism.**

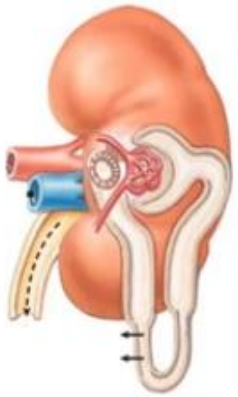
Renin-Angiotensin Mechanism

Drop in blood pressure



Kidneys – JGA

Angiotensinogen



Renin

Angiotensin I

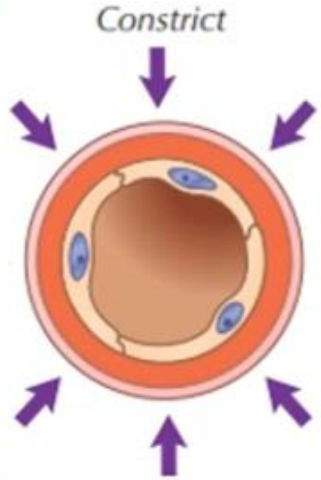
Angiotensin Converting Enzyme



Angiotensin II

VASOCONSTRICTION

Increase Blood Pressure



Right Atrial mechanism

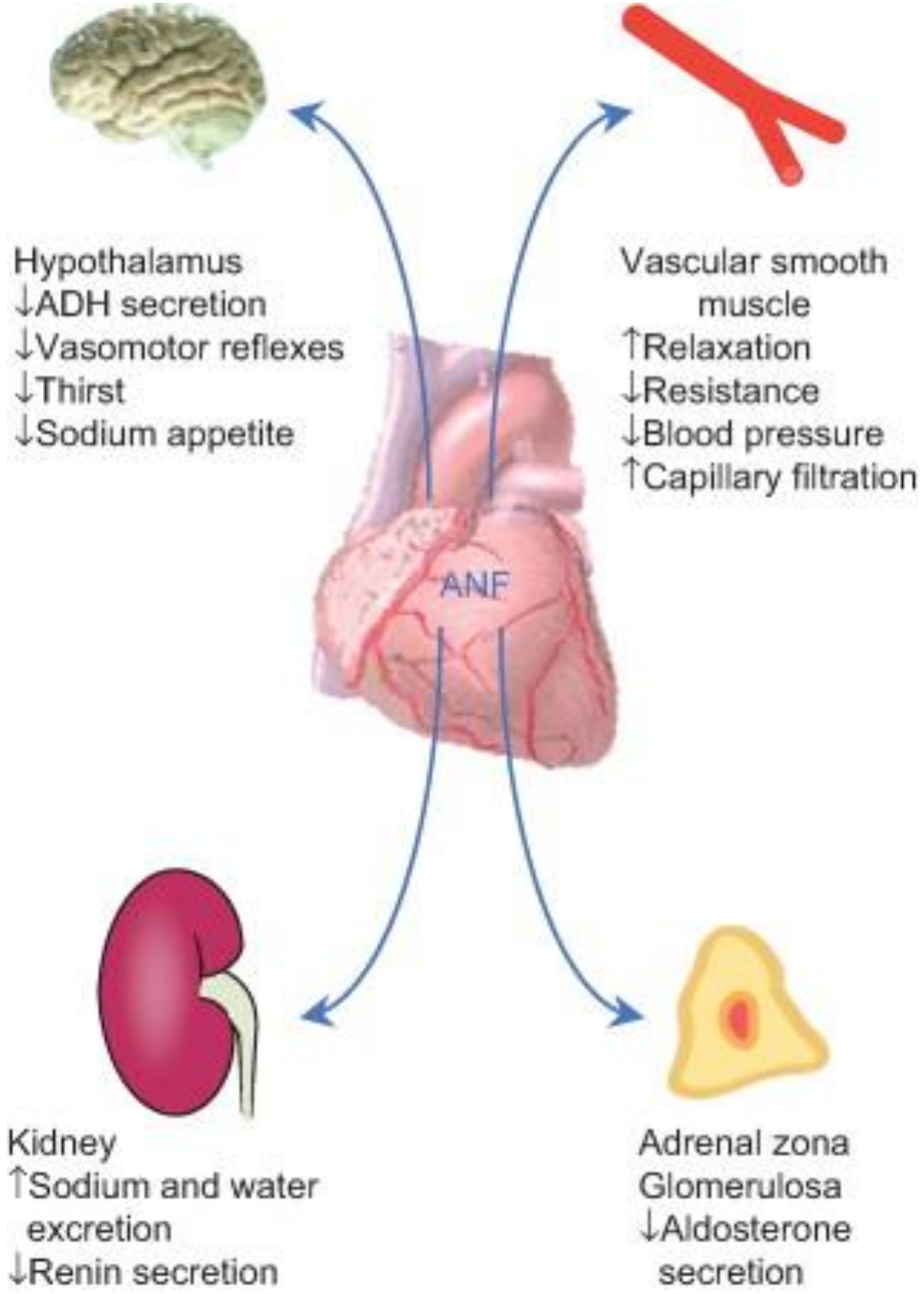
This occurs especially when the arterial BP is altered as a result of changes in the blood volume. **An increase in the blood volume stimulates the volume receptors in the right atrium resulting in the following effects:**

- **The secretion of atrial natriuretic peptide (ANP)** this helps salt and water excretion by the kidney.
- **Generalized vasodilatation (VD)** including VD of the afferent renal arterioles (which increases the GFR, leading to more water and salt excretion).
- **Reflex inhibition of secretion of the antidiuretic hormone (ADH).** This helps water excretion by the kidney.

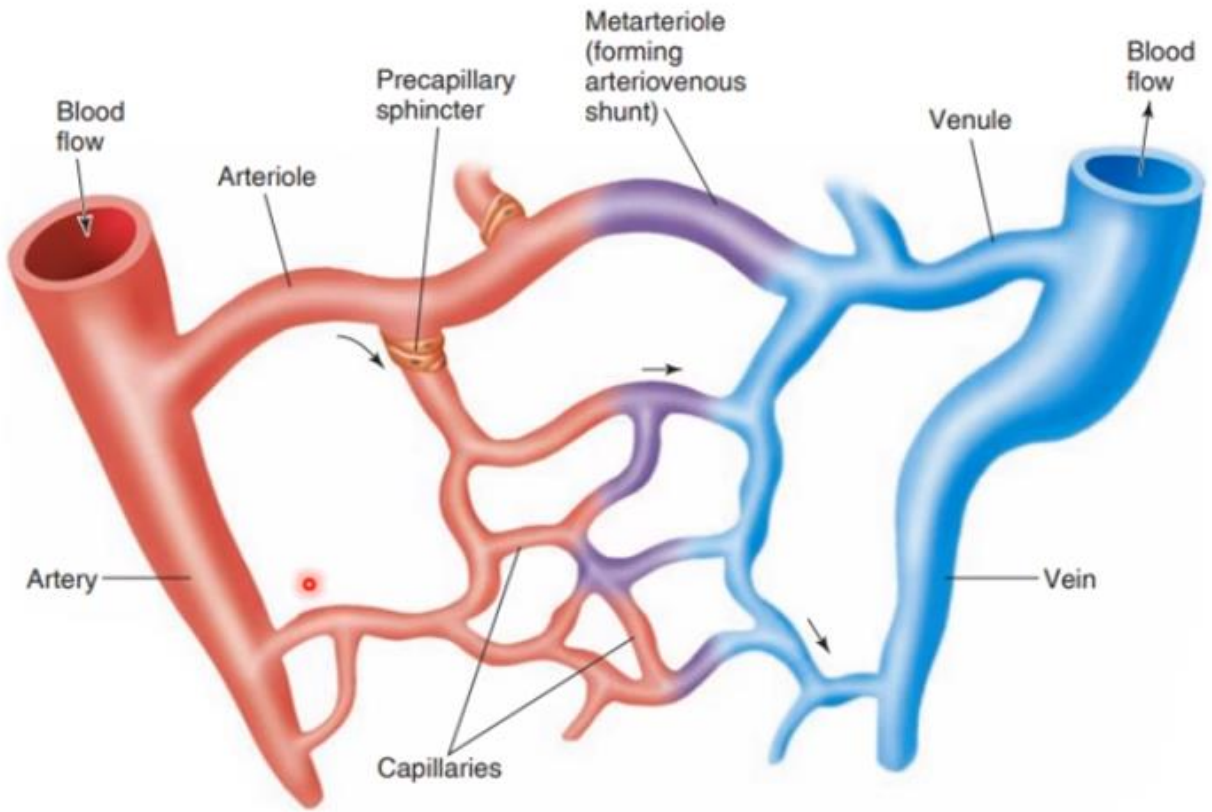
All these effects help lowering of the arterial BP,

and opposite effects (elevation of BP) occur when the blood volume is decreased.

Atrial Natriuretic Peptide (ANP) action



Capillary fluid shift mechanism



Decreased Blood Pressure

Capillary pressure ⇩

Fluid is absorbed from the surrounding tissues into the capillaries

blood volume in circulation ⇧

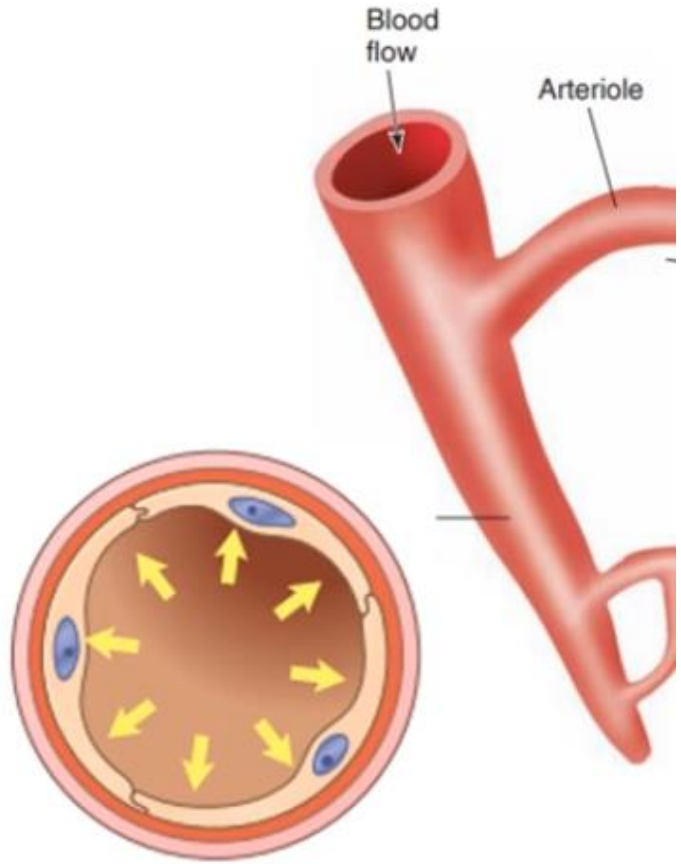
Blood Pressure ⇧

drarunadavis

Stress Relaxation Mechanism

Increase in BP → More tension on blood vessel wall

Relaxation of smooth muscles of the blood vessel → Blood pressure decreases



Intermediate Regulation of Blood Pressure

Renin-Angiotensin Mechanism

Drop in blood pressure

Kidneys – JGA





Angiotensinogen

Renin

Angiotensin I

Angiotensin Converting Enzyme



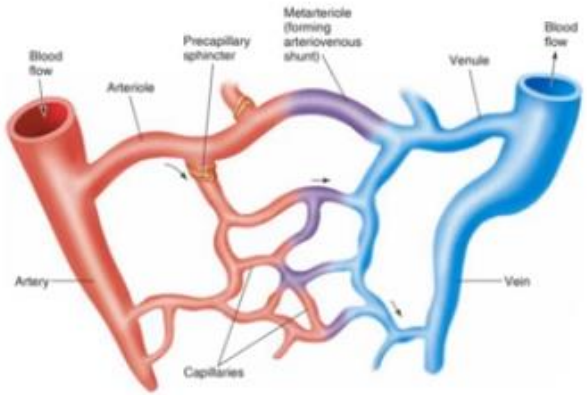
Angiotensin II

VASOCONSTRICTION

Increase Blood Pressure



Capillary fluid shift mechanism



Decreased Blood Pressure

Capillary pressure ↓

Fluid is absorbed from the surrounding tissues into the capillaries

blood volume in circulation ↑

Blood Pressure ↑

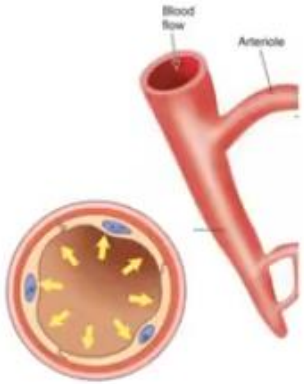
Stress Relaxation Mechanism

Increase in BP

More tension on blood vessel wall

Relaxation of smooth muscles of the blood vessel

Blood pressure decreases



drarunadavis

Long - term mechanisms

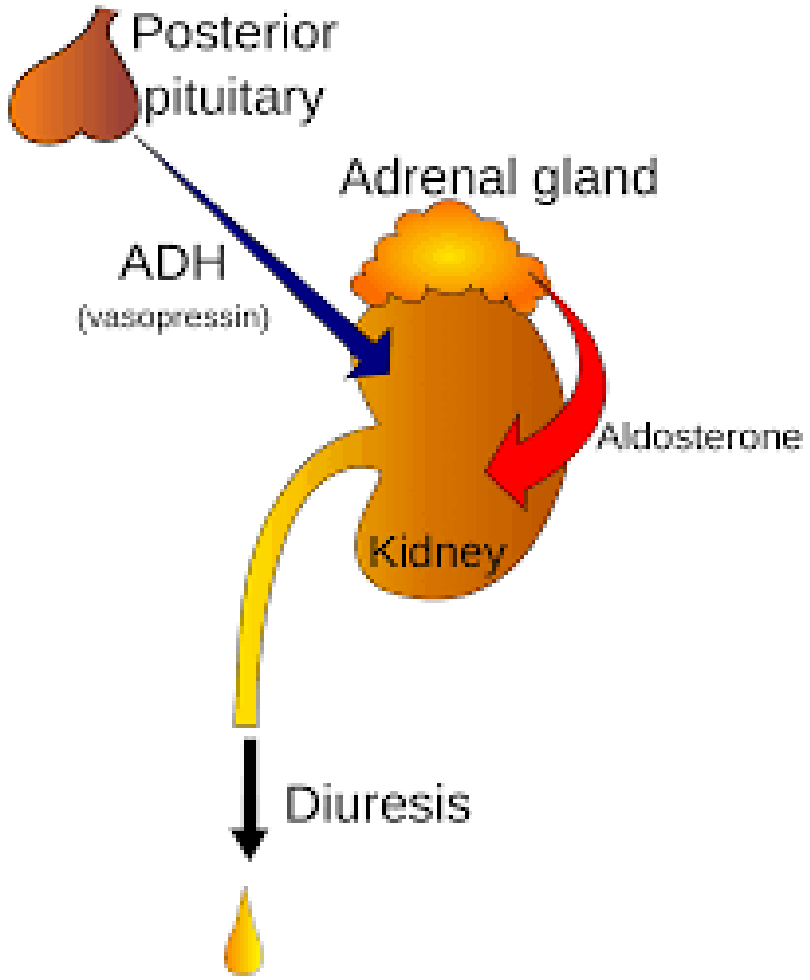
Long term (slow response) regulation:

Hormonally mediated.

Takes few hours to begin showing significant response , acting within days to months

Mainly Renal Body fluid control mechanism :
Acts if BP is too low

Anti-Diuretic Hormone (ADH), or Vasopressin.



Hypertension is known as :

“The Silent Killer”

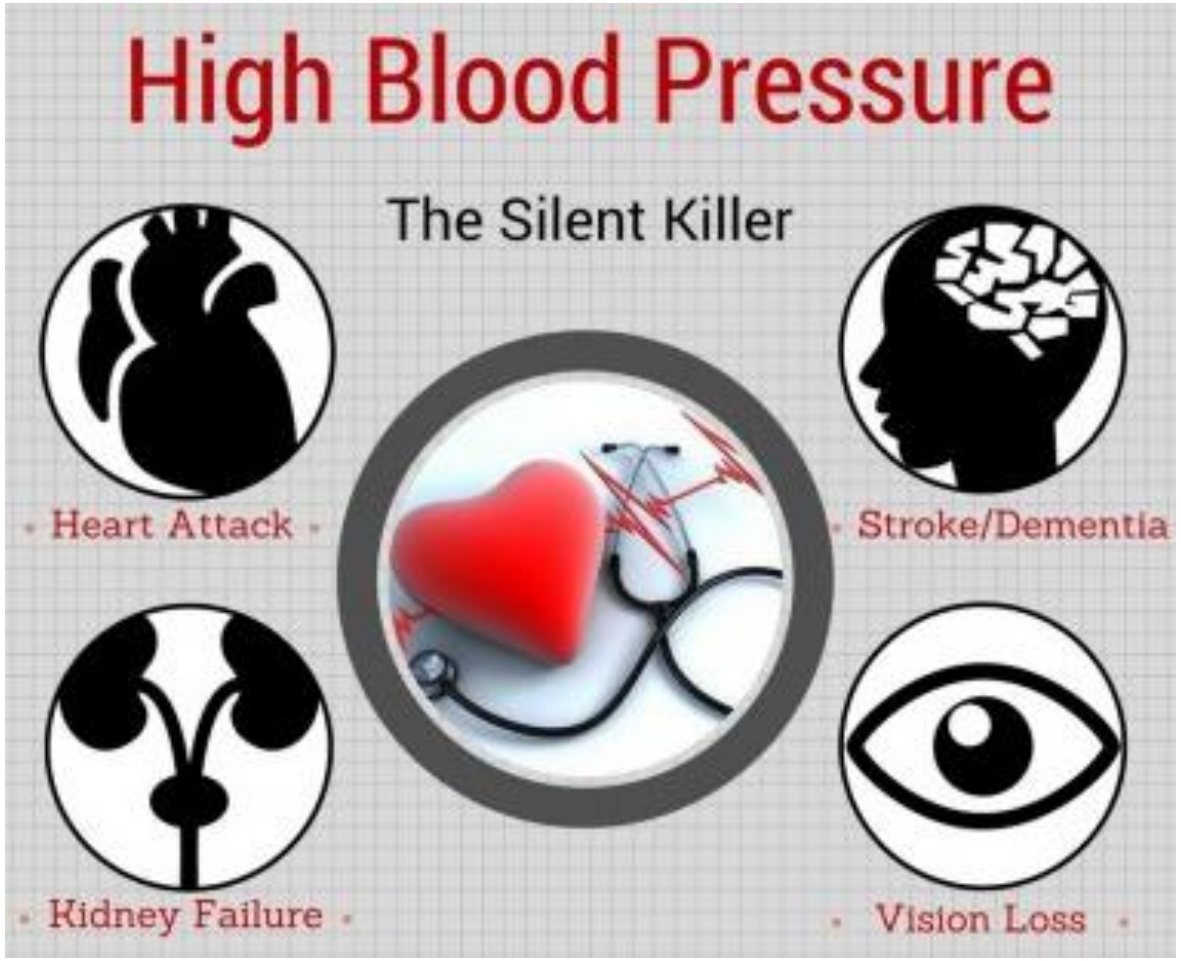
Hypertension can lead to :

Heart attack

Stroke and

Kidney disease.







Thank You