# 14. HYPERTENSION

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**DEFINATION**

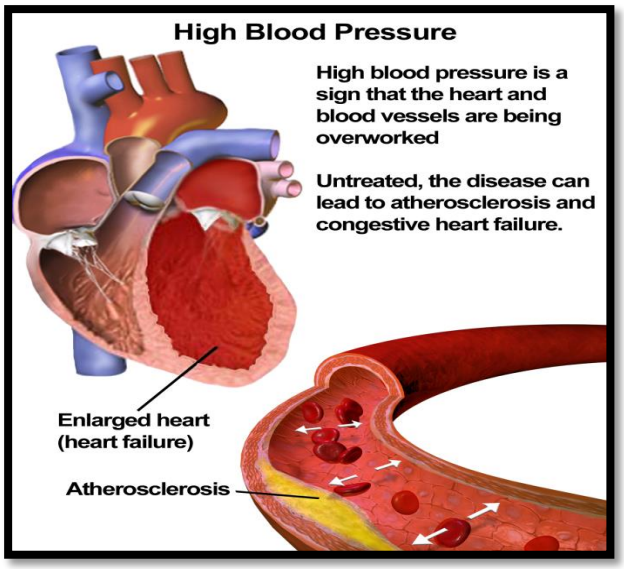
## 14. HYPERTENSION

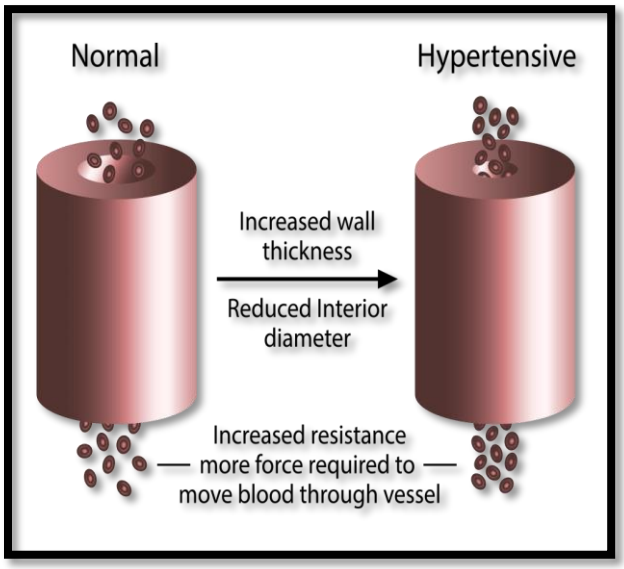
Blood Pressure: Cardiac output X Peripheral vascular resistance

"Blood pressure is the force exerted by the blood against the walls of blood vessels, and the magnitude of this force depends on the cardiac output and the resistance of the blood vessels".

### INTRODUCTION

- Blood pressure is the force of your blood pushing against the walls of your arteries.
- Each time our heart beats, pumps blood into the arteries.
- Blood pressure is highest when your heart beats, pumping the blood. This is called systolic pressure.
- When our heart is at rest, between beats, your blood pressure falls. This is called diastolic pressure.
- Our blood pressure reading uses these two numbers. Usually the systolic number comes before or above the diastolic number.




*The blood flowing inside vessels exerts a force against the walls - this is blood pressure*

### CLASSIFICATION OF BLOOD PRESSURE FOR ADULTS (JNC7)

| Category | systolic, mm Hg | diastolic, mm Hg |
|---|---|---|
| **Normal** | 90–119 | 60–79 |
| **High normal (Prehypertension)** | 120–139 | 80–89 |
| **Stage 1 hypertension** | 140–159 | 90–99 |
| **Stage 2 hypertension** | 160–179 | 100–109 |
| **Stage 3 hypertension (Hypertensive emergency)** | ≥180 | ≥110 |
| **Isolated systolic hypertension** | ≥140 | <90 |

**There are mainly two types of high blood pressure.**

- **Primary (essential) hypertension**
  For most adults, there's no identifiable cause of high blood pressure. This type of high blood pressure, called primary (essential) hypertension, tends to develop gradually over many years.
- **Secondary hypertension**
  Some people have high blood pressure caused by an underlying condition. This type of high blood pressure, called secondary hypertension, tends to appear suddenly and cause higher blood pressure than does primary hypertension. Various conditions and medications can lead to secondary hypertension.

**Other Types of Hypertension**

**Labile hypertension ( Sustain hypertension):**

- Patient having labile hypertension are those who has sometime but not always have arterial pressure in HT range. These patients are often considering as borderline HT.

**Malignant hypertension:**

- Sustained hypertension can become accelerated or enter a malignant phase.
- Patient with malignant HT often has a BP above 200\140 the condition is define by the presence of papilledema usually accompanied by the retinal haemorrhage and exhudate rather than by absolute pressure level.

**Accelerated HT:**

- It is define as significant increase over previous HT level associated with evidence of vascular damage **on Funduscopic examination** but without papilledema.

**Isolated systolic hypertension:**

- The hypertensive condition in which the Systolic pressure is ≥ 140 mmhg and diastolic pressure is <90 mmhg is called Isolated systolic hypertension (ISH).

## ETIOLOGY [CAUSES]

✓ **Primary (essential) hypertension [90-95%]**

For most adults, there's no identifiable cause of high blood pressure. This type of high blood pressure, called primary (essential) hypertension, tends to develop gradually over many years.

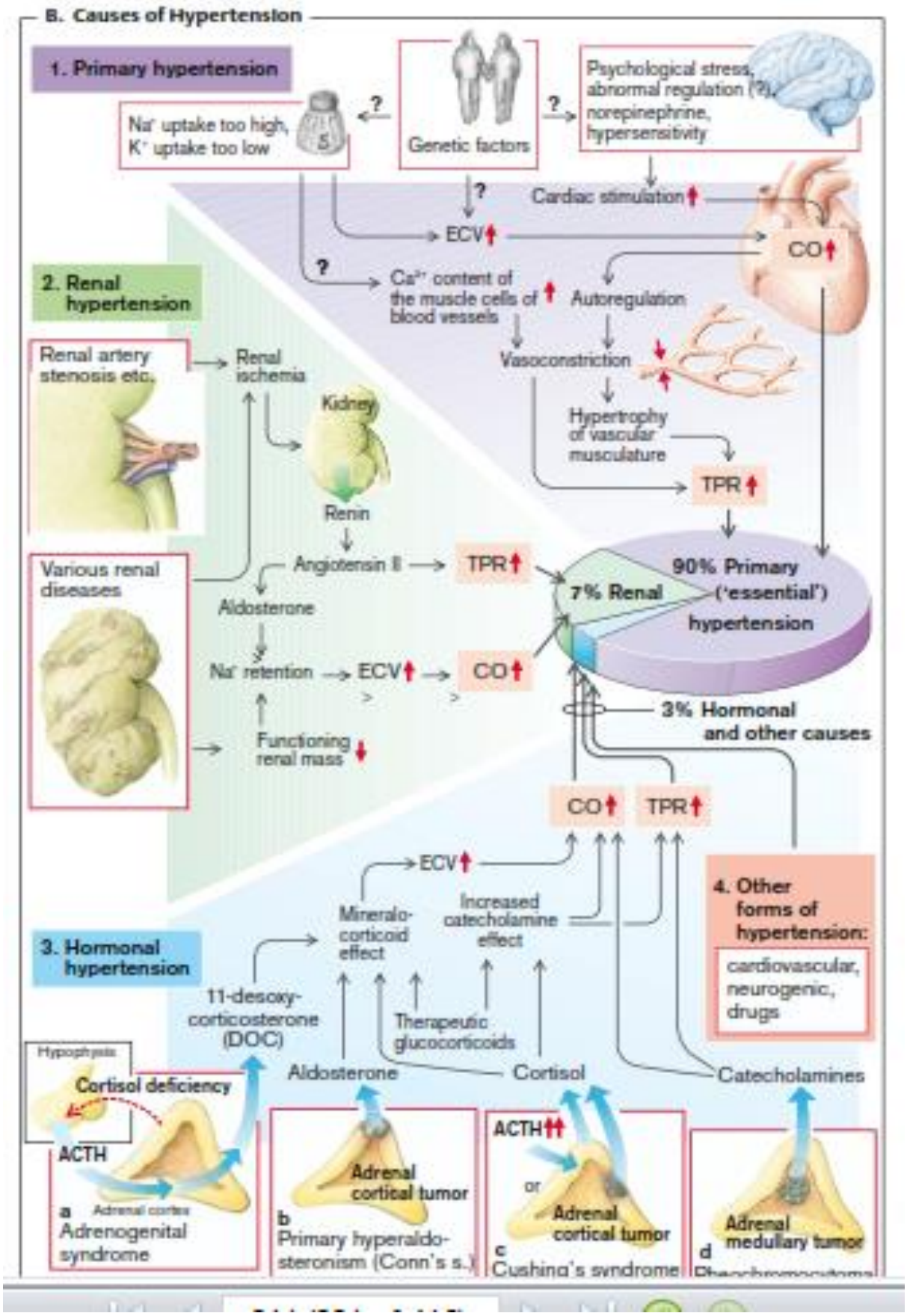
✓ **Secondary hypertension [5-10%]**

Some people have high blood pressure caused by an underlying condition. This type of high blood pressure, called secondary hypertension, tends to appear suddenly and cause higher blood pressure than does primary hypertension. Various conditions and medications can lead to secondary hypertension, including:

- Obesity
- Obstructive sleep apnea
- Kidney problems
- Adrenal gland tumors
- Thyroid problems
- Certain defects in blood vessels you're born with (congenital)
- Certain medications, such as birth control pills, cold remedies, decongestants, over-the-counter pain relievers and some prescription drugs
- Illegal drugs, such as cocaine and amphetamines
- Alcohol abuse or chronic alcohol use

✓ **Lifestyle factors**

- Physical inactivity
- A salt-rich diet associated with processed and fatty foods
- Alcohol and tobacco use.


B. Causes of Hypertension
1. Primary hypertension
Na⁺ uptake too high, K⁺ uptake too low
Genetic factors
Psychological stress, abnormal regulation (?), norepinephrine, hypersensitivity
Cardiac stimulation
ECV
CO
Ca²⁺ content of the muscle cells of blood vessels
Autoregulation
Vasoconstriction
Hypertrophy of vascular musculature
TPR
2. Renal hypertension
Renal artery stenosis etc.
Renal ischemia
Kidney
Renin
Angiotensin II
Aldosterone
Na⁺ retention
Various renal diseases
Functioning renal mass
90% Primary ('essential') hypertension
7% Renal
3% Hormonal and other causes
3. Hormonal hypertension
11-desoxy-corticosterone (DOC)
Mineralo-corticoid effect
Increased catecholamine effect
Therapeutic glucocorticoids
Aldosterone
Cortisol
Catecholamines
4. Other forms of hypertension:
cardiovascular, neurogenic, drugs
Hypophysis
Cortisol deficiency
ACTH
a Adrenogenital syndrome
Adrenal cortical tumor
b Primary hyperaldosteronism (Conn's s.)
ACTH
or
Adrenal cortical tumor
c Cushing's syndrome
Adrenal medullary tumor
d

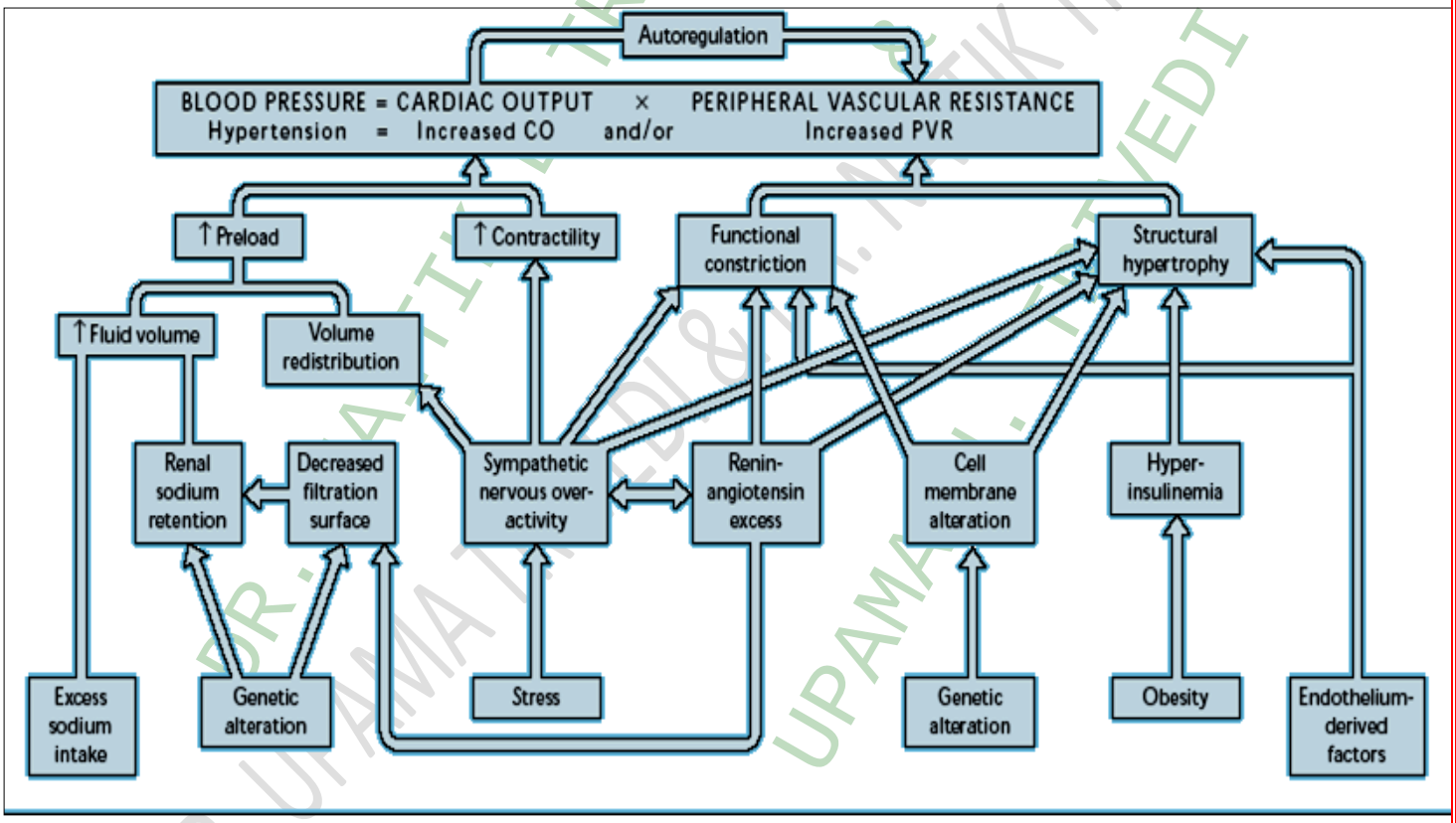
## 14. HYPERTENSION

A number of physiological mechanisms are involved in the maintenance of normal blood pressure, and their derangement may play a part in the development of essential hypertension.

It is probable that a great many interrelated factors contribute to the raised blood pressure in hypertensive patients, and their relative roles may differ between individuals.

Among the factors that have been intensively studied are:

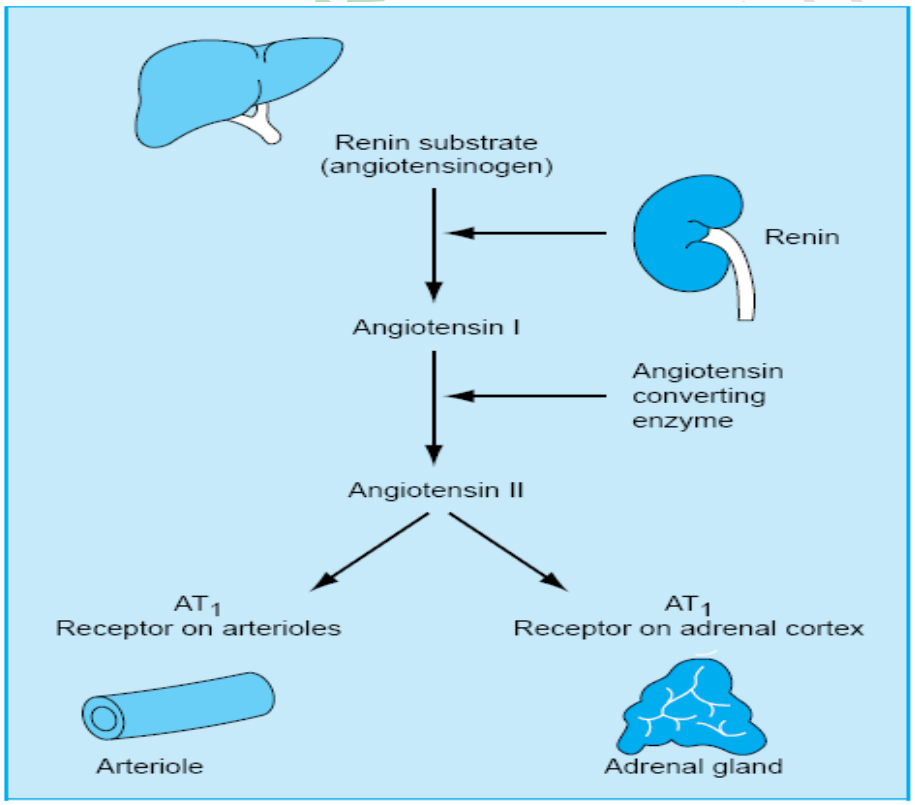
salt intake, obesity and insulin resistance, the renin-angiotensin system, and the sympathetic nervous system. In the past few years, other factors have been evaluated, including genetics, endothelial dysfunction (as manifested by changes in endothelin and nitric oxide), low birth weight and intrauterine nutrition, and neurovascular anomalies.




**Role of Renin-angiotensin system in pathophysiology of HT**

The renin-angiotensin system may be the most important of the endocrine systems that affect the control of blood pressure. Renin is secreted from the juxtaglomerular apparatus of the kidney in response to glomerular underperfusion or a reduced salt intake. It is also released in response to stimulation from the sympathetic nervous system. Renin is responsible for converting renin substrate (angiotensinogen) to angiotensin I, a physiologically inactive substance which is rapidly converted to angiotensin II in the lungs by angiotensin converting enzyme (ACE). Angiotensin II

is a potent vasoconstrictor and thus causes a rise in blood pressure. In addition it stimulates the release of aldosterone from the zona glomerulosa of the adrenal gland, which results in a further rise in blood pressure related to sodium and water retention. The circulating renin-angiotensin system is not thought to be directly responsible for the rise in blood pressure in essential hypertension. In particular, many hypertensive patients have low levels of renin and angiotensin II (especially elderly and black people), and drugs that block the renin-angiotensin system are not particularly effective. There is, however, increasing evidence that there are important non-circulating "local" renin-angiotensin epicrine or paracrine systems, which also control blood pressure. Local renin systems have been reported in the kidney, the heart, and the arterial tree. They may have important roles in regulating regional blood flow.




Renin-angiotensin system and effects on blood pressure and aldosterone release

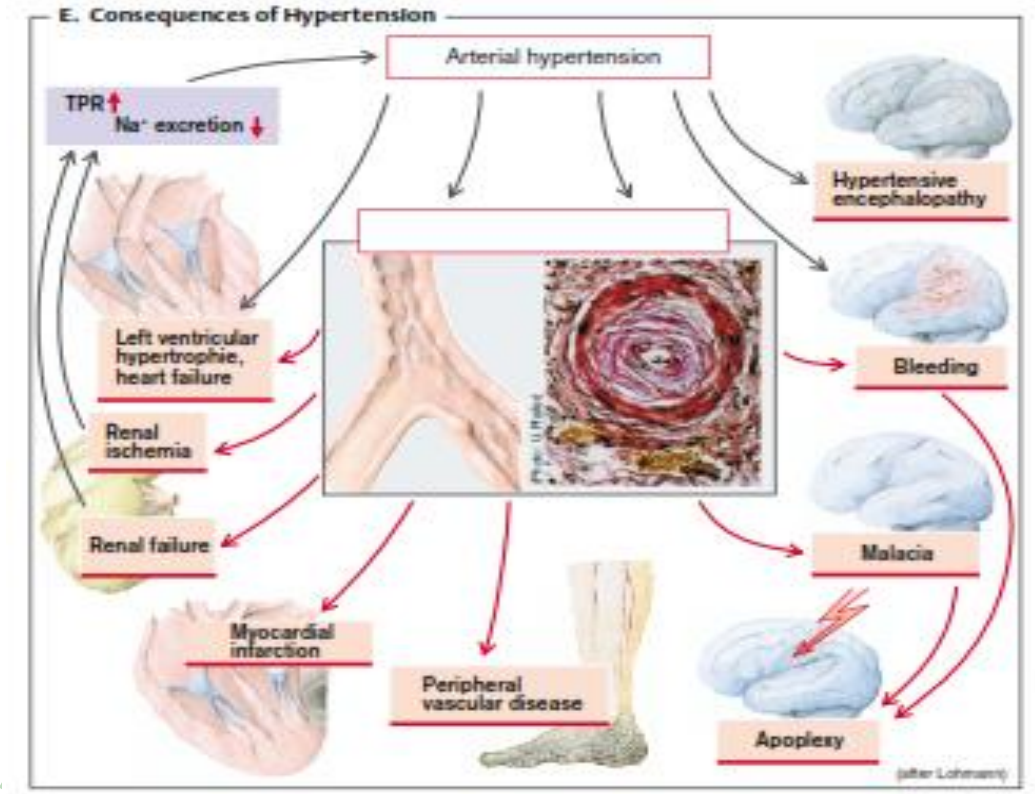
**Role of Sympathetic Nervous System in HT:**

- Baroreceptor (Pressure receptor) in the carotids and aortic arch respond to changes in blood pressure and influence arteriolar dilation arteriolar constriction.

- When stimulated to constriction the contractile force strengthens, increasing the heart rate and augmenting the peripheral resistance and thus increasing the cardiac output.

- If pressure remains elevated the baroreceptor reset at the higher levels and so sustain the HT.
- Little evidence suggest that adrenaline and noradrenaline have a clear role in etiology of HT.
- However many of the drug used to treat HT lowers blood pressure by blocking Sympathatic nervous system.

## CONSQUENCES OF HYPERTENSION




## SIGN & SYMPTOMS

- ❖ High blood pressure usually causes no symptoms and high blood pressure often is labeled "the silent killer." People who have high blood pressure typically don't know it until their blood pressure is measured.
- ❖ Sometimes people with markedly elevated blood pressure may develop:
  - Nausea and vomiting
  - Blood in the Urine
  - Blurred Vision
  - Chest Pain
  - Decreased Urine Output
  - Dizziness
  - Headache
  - Leg Swelling

- Nosebleeds
- Pounding Sensation in the Neck, Chest, or Ears
- Shortness of Breath

❖ People often do not seek medical care until they have symptoms arising from the organ damage caused by chronic (ongoing, long-term) high blood pressure.

## COMPLICATION

Uncontrolled high blood pressure can lead to:

- **Heart attack or stroke.** High blood pressure can cause hardening and thickening of the arteries (atherosclerosis), which can lead to a heart attack, stroke or other complications.
- **Aneurysm.** Increased blood pressure can cause blood vessels to weaken and bulge, forming an aneurysm. If an aneurysm ruptures, it can be life-threatening.
- **Heart failure.** To pump blood against the higher pressure in vessels, heart muscle thickens. Eventually, the thickened muscle may have a hard time pumping enough blood to meet body's needs, which can lead to heart failure.
- **Weakened and narrowed blood vessels in your kidneys.** This can prevent these organs from functioning normally.
- **Thickened, narrowed or torn blood vessels in the eyes.** This can result in vision loss.
- **Metabolic syndrome.** This syndrome is a cluster of disorders of your body's metabolism, including increased waist circumference; high triglycerides; low high-density lipoprotein (HDL) cholesterol, the "good" cholesterol; high blood pressure; and high insulin levels. These conditions make you more likely to develop diabetes, heart disease and stroke.
- **Trouble with memory or understanding.** Uncontrolled high blood pressure may also affect your ability to think, remember and learn. Trouble with memory or understanding concepts is more common in people with high blood pressure.