



## Lecture 4

# Hypertension (HTN)



- <http://youtu.be/8aeivxRIGDc>
- [http://youtu.be/pPxnIh\\_WTb8](http://youtu.be/pPxnIh_WTb8)
- <http://youtu.be/PYkaoQc-fLU>
- [Nucleus Medical Media](#) “High Blood Pressure”

# OBJECTIVES

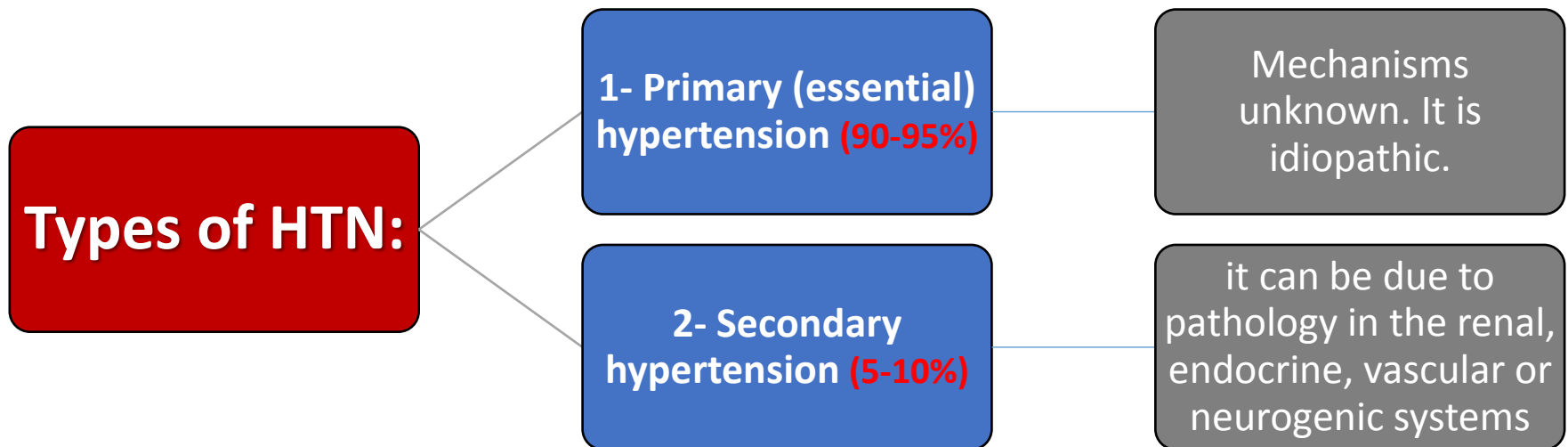
**At the end of this lecture, the students should be able to:**

- Know the aetiology of hypertension
- Risk factors of hypertension
- Investigate patients appropriately for causes of secondary hypertension.
- Complications of hypertension
- Treatment by lifestyle modification

**Definition:** Blood pressure in the arteries is elevated, a sustained **diastolic** pressure greater than **90** mm Hg, or a sustained **systolic** pressure in excess of **140** mm Hg.

- It's asymptomatic until late
- Common problem **25%** of population are hypertensive.
- Silent Killer
- May lead to stroke or MI.

Risk factors	
Race (African-Americans)	Environmental factors (including diet, particularly sodium intake)
Gender (Men, postmenopausal)	inactive lifestyle
Age	Heavy alcohol consumption
Hereditary(Genetics- family history)	Diabetes
Obesity	Use of oral contraceptives



## 2- Secondary hypertension

<b>Renal</b>	<ul style="list-style-type: none"><li>• <b>Glomerulonephritis</b></li><li>• <b>Renal artery stenosis</b></li><li>• <b>Renal vasculitis</b></li><li>• <b>Adult polycystic disease</b></li><li>• <b>Chronic renal disease</b></li><li>• <b>Renin producing tumors</b></li></ul>
<b>Endocrine</b>	<ul style="list-style-type: none"><li>• Adrenocortical hyperfunction (Cushing syndrome)</li><li>• Hyperthyroidism/Thyrotoxicosis</li><li>• Hypothyroidism/Myxedema</li><li>• Pheochromocytoma</li><li>• Acromegaly</li><li>• Exogenous hormones</li><li>• Pregnancy-induced</li></ul>
<b>Vascular</b>	<ul style="list-style-type: none"><li>• Coarctation of aorta</li><li>• Vasculitis e.g. Polyarteritis nodosa</li><li>• Increased intravascular volume</li><li>• Increased cardiac output</li><li>• Rigidity of the aorta</li></ul>
<b>Neurogenic</b>	<ul style="list-style-type: none"><li>• Psychogenic</li><li>• Increased intracranial pressure</li><li>• Sleep apnea</li><li>• Acute stress, including surgery</li></ul>

# Hypertension classification based on Clinical

## Benign hypertension

it can be essential HTN or secondary HTN

Modest level

Fairly stable over years to decades.

Compatible with long life

## Malignant hypertension 5%

it can be essential HTN or secondary HTN

There is rapidly rising BP which often leads to end organ damage

Associated with renal failure, retinal hemorrhages and exudates, with or without papilledema

**Systolic** pressure over **200** mmHg, and **diastolic** pressure is usually over **120** mmHg,

Leads to **death** in **1** or **2** years if untreated

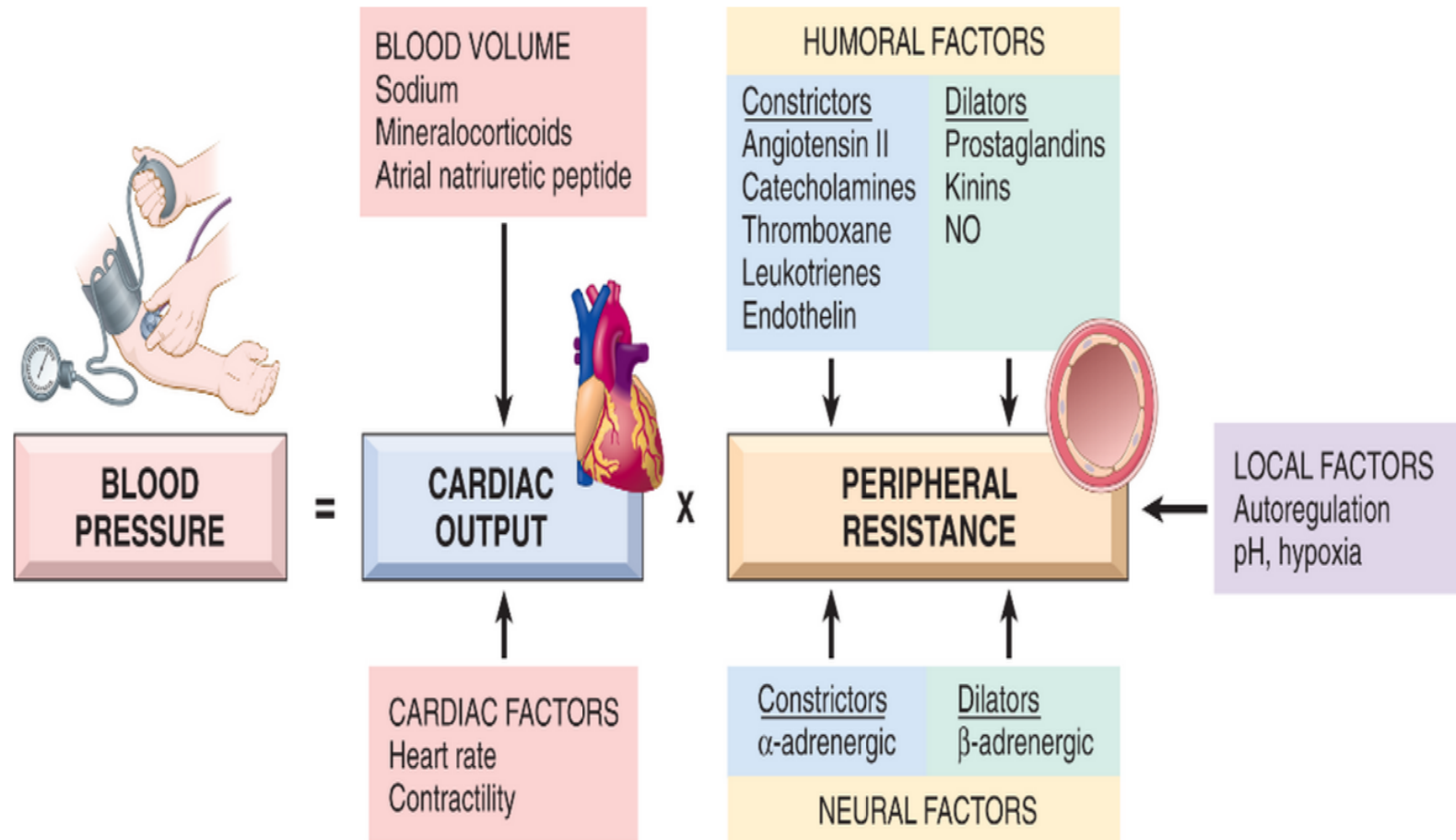
# Postulated mechanisms/PATHOGENESIS of Essential Hypertension

1. Defect in sodium excretion

2. Defect in cell membrane function:-Na/Ca transport

3. Increased vasoconstrictive response

# Regulation of Blood Pressure (BP)

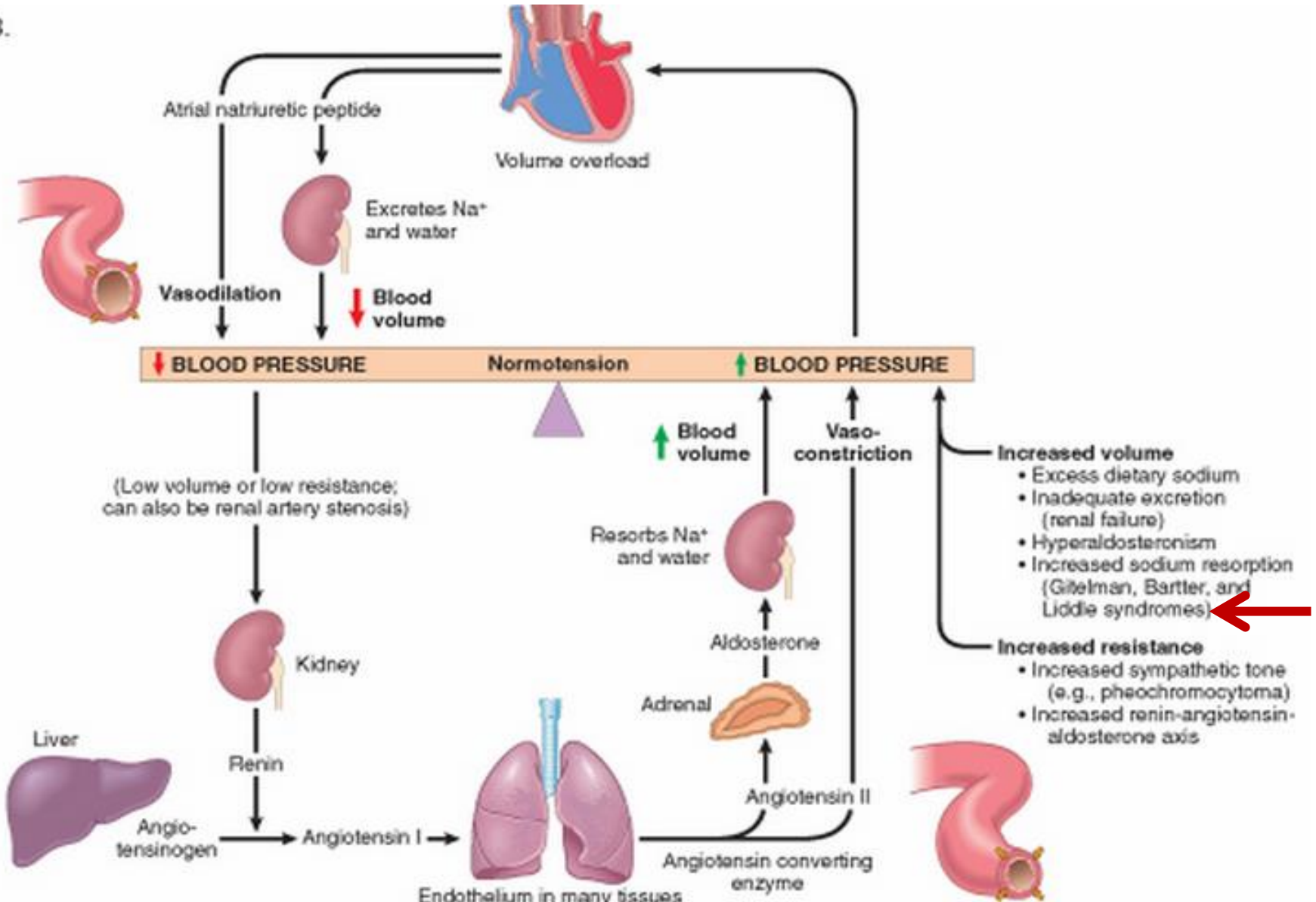


## NOTE:

- *atrial natriuretic peptide*, secreted by heart atria in response to volume expansion (e.g., in heart failure) inhibits sodium reabsorption in distal tubules and causes global vasodilation.

**Blood pressure regulation:** determined by vascular resistance and cardiac output.

B.



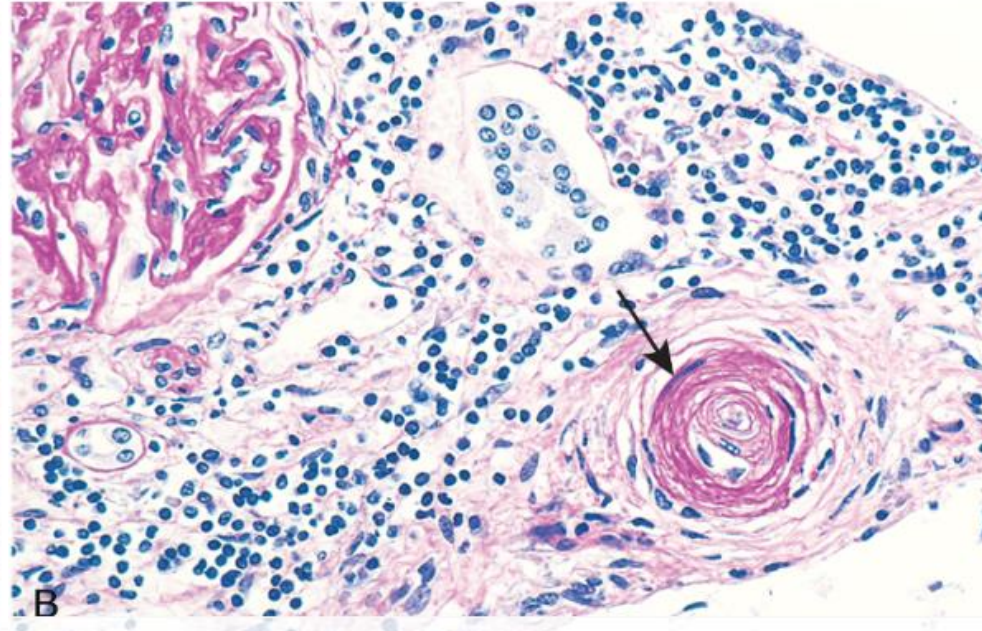
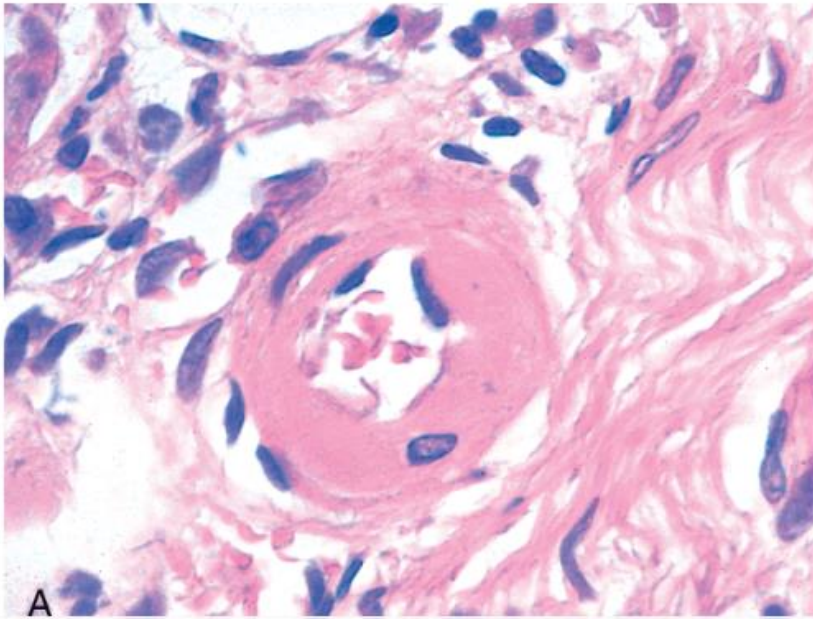
- Reduced renal sodium excretion in the presence of normal arterial pressure is probably a key initiating event.



## **Morphology:** Two forms of small blood vessel disease are hypertension-related:

A- Hyaline hypertension. (associated with benign hypertension)

B- Hyperplastic hypertension. (associated with malignant hypertension)



A- Hyaline arteriosclerosis: the arteriolar wall is thickened with the deposition of amorphous proteinaceous material (hyalinized), and the lumen is markedly narrowed Leads to benign **nephrosclerosis** due to diffuse **renal ischemia**

B- Hyperplastic arteriosclerosis: ("**onion-skinning**") (**arrow**) causing luminal obliteration May be associated with necrotizing arteriolitis (**fibrinoid necrosis**) (periodic acid-Schiff stain)

# Left ventricular cardiac hypertrophy (hypertensive heart disease)

- Longstanding **poorly treated** HTN leads to left sided hypertensive heart disease.
- Hypertrophy of the heart is an **adaptive response** to pressure overload due to HTN.
- HTN induces left ventricular pressure overload which leads to hypertrophy of the left ventricle with increase in the weight of the heart. The free LV wall is  $> 2\text{cm}^*$  and the weight of the heart is  $> 500^*$  grams
- In time, the increased thickness of the left ventricular wall impairs diastolic filling. This often induces left atrial enlargement.
- Long term LVH\* leads to : dilatation and wall thinning.
- Treatment of hypertension **helps recovery**.

## Major Complications Of Hypertension

Coronary heart disease (CAD)	Cerebrovascular accidents
Cardiac hypertrophy and CHF	Aortic dissection
Renal failure	Retinopathy

\* **LVH: Left Ventricle Hypertrophy.**

\* **Normal 1.2 to 1.4 cm.**

\* **Normal 320 to 360 g.**

**Note:** The first line of treatment for hypertension is identical to the recommended preventive lifestyle changes and includes dietary changes, physical exercise, and weight loss

# Questions

## 1- Why is hyper tension serious problem?

Asymptomatic until late- Silent Killer – painless  
Leading risk factor – MI & Stroke  
Complications alert to diagnosis but late

## 2- When do we consider a patient having hypertension?

A sustained diastolic pressure greater than 89 mm Hg  
A sustained systolic pressure in excess of 139 mm Hg  
so , 140 /90 and more

## 3- what is essential hypertension ( primary ) ?

It is the most common hypertension ( 90-95%) with unknown cause and mechanism (idiopathic)

## 4- what are the causes of secondary hypertension ?

- Renal Diseases
- Endocrine Diseases
- CV Diseases
- Neurological Problems

## 5- What are the main Determinants of BP ?

Cardiac output and peripheral vascular resistance

## 6- At which level does the peripheral resistance predominantly regulated?

at the level of arterioles

# Questions

## 7- What is the key initial event in most form of HTN ?

Reduce renal Na excretion

## 8- what are the Hypertension effects on the blood vessels ?

Accelerate atherogenesis which is a major risk factor

Arteriosclerosis ( loss of elasticity) (particularly in the kidney), lead to thick wall and narrow lumen

## 9 - What are the types of arteriolosclerosis?

1. Hyaline arteriolosclerosis: Characteristic of **benign hypertension**
2. Hyperplastic arteriolosclerosis: in **malignant HTN**

## 10- What is malignant HTN ?

- 1) rapidly progressive with end organ damage
- 2) BP > 210/120 mmHg (diastolic pressure should be more than 120)

## 11- what are the major complications of HTN ?

- renal failure
- aortic dissection
- retinopathy
- cardiac hypertrophy and HF (systemic heart disease)
- cerebrovascular accidents
- coronary heart disease

## 12 - in systemic heart disease (hypertensive heart disease) what happen to the LV ?

LVH : The free LV wall is > 2cm and the weight of the heart is > 500 grams

# MCQs

**1- From the characteristic features of malignant hypertension**

- A- diastolic pressure over 120 mm Hg**
- B- modest level**
- C- stable over years to decades**
- D- All the above**

**2- Which One of the following is a major complication of hypertension**

- A- Aortic regurgitation**
- B- Liver failure**
- C- Cerebral accidents**
- D- None of the above**

**Answers:**

- 1-A**
- 2-C**
- 3-C**
- 4-C**

**3- A 75 years old male died as a complication of malignant hypertension**

**Which one of the following histological findings may be found on transverse section from his kidney arterioles?**

- A- Thin wall**
- B- Widening lumen**
- C- Hyperplastic lumen**
- D- Fibrous wall**

**4- The primary anatomic site of pressure regulation in the vascular system is:**

- A. aorta**
- B. arteries**
- C. arterioles**
- D. capillaries**

5- which one of the following have more risk of HTN ??

- A- young female
- B- male eating canned food ( high salt )
- C- african-american
- D- b and c

# MCQs

6-Complications of chronic hypertension include each of the following except:

- A. left ventricular hypertrophy
- B. congestive heart failure
- C. renal failure
- D. diabetes mellitus

Answers:

5-D

6-D

7-D

8-A

7-Causes of secondary hypertension include all of the following except:

- A. renal artery stenosis
- B. Hyperthyroidism
- C. Renal vasculitis
- D. lipoid nephrosis

8- Severe (malignant) hypertension is characterized by:

- A. hyperplastic arteriosclerosis
- B. aortic insufficiency
- C. Marfan's syndrome
- D. calcific aortic stenosis

# MCQs

**9- Hypertension can be associated with:**

- A. pheochromocytoma
- B. adrenal cortical adenoma
- C. both
- D. Neither

**10-Which condition is diastolic pressure over 120 mmHg?**

- A. Benign Hypertension
- B. Malignant hypertension
- C. Hyaline hypertension
- D. None of them

**11- Hypertension can contribute in the development of :**

- A. Pericarditis
- B. Coronary heart disease
- C. Migraine
- D. Rheumatic fever

**12-Which of the following is not a cause of secondary hypertension:**

- A. Acute stress
- B. Increased cardiac output
- C. Renin producing tumors
- D. Aneurysm

Answers:

9-C

10-B

11-B

12-D

# MCQs

**13- Risk factors for hypertension include :**

- A. Active life style
- B. Iron deficiency
- C. family history
- D. Young age

**14- Hyaline arteriosclerosis is a Characteristic of :**

- A. malignant hypertension
- B. Benign hypertension
- C. Long standing hypertension
- D. Hyperplastic hypertension

**15- Which of the following is a mechanism of Essential Hypertension :**

- A. Increased parasympathetic response
- B. Defect in potassium excretion
- C. Defect in cell membrane function (Na/Ca transport)
- D. Aortic dissection

**16- Hyperplastic arteriosclerosis :**

- A. is a Characteristic of malignant hypertension.
- B. Can be seen in diabetic
- C. Is a Characteristic of benign hypertension
- D. is Associated with benign nephrosclerosis

Answers:

13- C

14-B

15- C

16-A



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