

CARDIO-VASCULAR SYSTEM

5



Pathology

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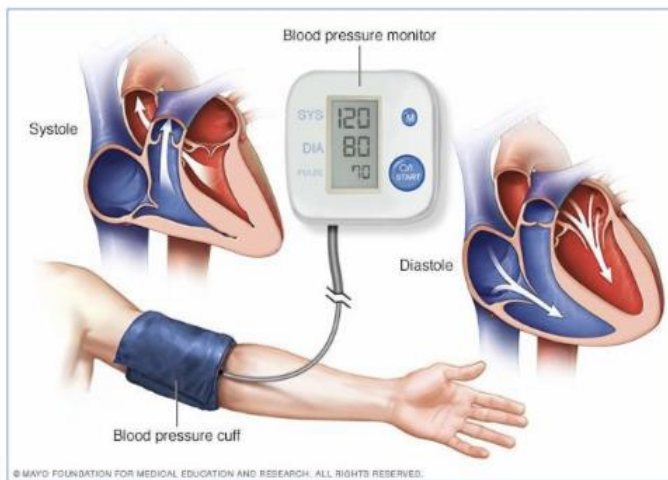
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In this lecture we are going to talk about Hypertensive vascular disease.

Blood pressure is measured using either Sphygmomanometer or Digital blood pressure monitor. Both of them will show us two type of blood pressure measurements (The Systolic and Diastolic blood pressure measurements)



Currently, a blood pressure is said to be high whenever a: -

- 1- sustained diastolic pressures >80 mm Hg
- 2- and/or sustained systolic pressures >130 mm Hg

Types of hypertension: -

We can classify hypertension depending on many variables and that includes: -

1- Classification according to Severity: -

Benign (95%) versus malignant (5%)

2- According to cause:

A- Primary (essential, idiopathic) (95%)

B- secondary (5%): -

-Most common: -

renal disease or renal artery narrowing (renovascular hypertension)

-Other less common: -

many other conditions....


3- According to side of circulation: (the affected side of the circulation): -

Systolic vs diastolic



As you see we have many conditions that cause secondary hypertension (Renal -most common – and other endocrine, cardiovascular and neurological related conditions)

Essential Hypertension	Accounts for 90% to 95% of all cases	Most common of all
Secondary Hypertension		Most common of secondary causes
Renal	Acute glomerulonephritis Chronic renal disease Polycystic disease Renal artery stenosis Renal vasculitis Renin-producing tumors	
Endocrine	Adrenocortical hyperfunction (Cushing syndrome, primary aldosteronism, congenital adrenal hyperplasia, licorice ingestion) Exogenous hormones (glucocorticoids, estrogen [including pregnancy-induced and oral contraceptives], sympathomimetics and tyramine-containing foods, monoamine oxidase inhibitors) Pheochromocytoma Acromegaly Hypothyroidism (myxedema) Hyperthyroidism (thyrotoxicosis) Pregnancy-induced (pre-eclampsia)	
Cardiovascular	Coarctation of aorta Polyarteritis nodosa Increased intravascular volume Increased cardiac output Rigidity of the aorta	
Neurologic	Psychogenic Increased intracranial pressure Sleep apnea Acute stress, including surgery	

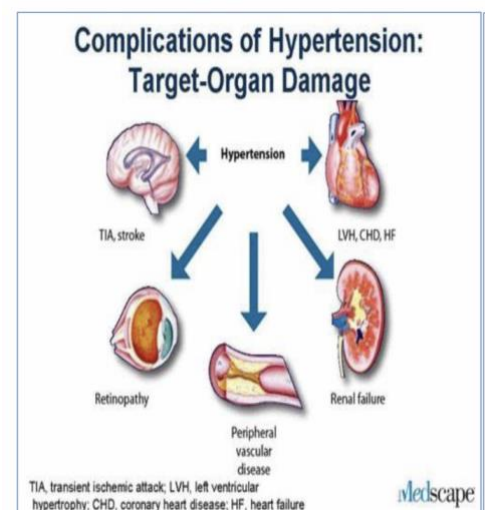


Malignant hypertension: -

- 5% (also known as accelerated HTN).
- A rapidly rising blood pressure that, if untreated, leads to death within 1 to 2 years.
- This condition is called Malignant Hypertension and it is also called Accelerated Hypertension, but this condition is not related to a malignant process, and it is called so because of its dismal prognosis; it can lead to very important and very aggressive complications and mortality in those patients.
- Systolic pressures > 200 mm Hg or diastolic pressures > 120 mm Hg
- It causes renal failure and retinal hemorrhages and other end organ damage.
- usually superimposed on preexisting benign hypertension (either essential or secondary).

Hypertension (HTN) has the following potential complications (target organ damage): -

1. stroke (CVD) & multi- infarct dementia
2. atherosclerotic coronary heart disease
3. cardiac hypertrophy and heart failure (hypertensive heart disease)
4. aortic dissection
5. renal failure
6. retinal hemorrhage



Pathogenesis of essential HTN: -

1. Genetic factors:

familial clustering of hypertension:

A- angiotensinogen polymorphisms and angiotensin II receptor variants; polymorphisms of the renin-angiotensin system.

B- Susceptibility genes for essential hypertension: genes that control renal sodium absorption, etc...

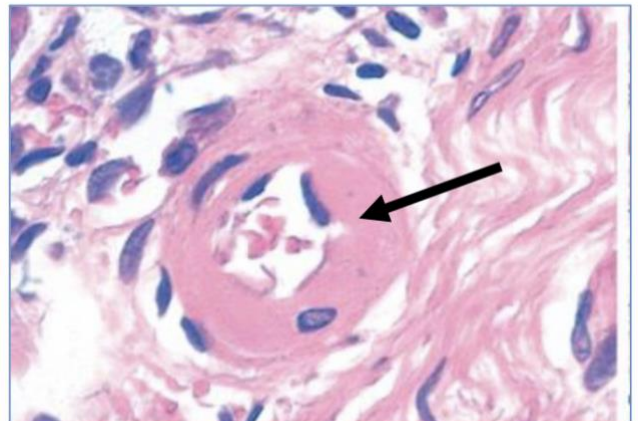
2. Environmental factors modify the impact of genetic determinants: stress, obesity, smoking, physical inactivity, ↑ salt consumption.

Blood vessels in HTN- Morphology: -

- HTN is associated with Arteriolosclerosis (small arterial disease).
- Two forms of small blood vessel disease are hypertension-related: -
 - 1- hyaline arteriolosclerosis
 - 2- hyperplastic arteriolosclerosis

1. Hyaline arteriolosclerosis: -

- Associated with Benign hypertension.
- It is called Hyaline; because of the homogeneous pink hyaline thickening of arteriolar walls.
- The homogeneous pink hyaline thickening of arteriolar walls will lead to luminal narrowing and it will have an important impact on tissues supplies by these arterioles. But what causes the thickening???



This is due to the leakage of plasma components across injured endothelial cells into vessel walls (so basically hypertension causes micro trauma to the endothelial cells and this trauma will cause injury of the endothelial cells and leakage of the plasma component into the walls of the arterioles),this will also lead to an inflammatory response in the wall and increased ECM production by smooth muscle cells in response to chronic hemodynamic stress that is caused by hypertension will lead to more thickening of the arteriole wall .

Hyaline arteriolosclerosis: Complications

- Most significant in kidneys ---> nephrosclerosis (glomerular scarring) and with time this leads to chronic renal failure.
- Other causes of hyaline arteriolosclerosis (without the presence of hypertension): -
 - 1- elderly patients (normo-tensive)
 - 2- diabetes mellitus

2. Hyperplastic arteriolosclerosis

- 1- associated with severe (malignant) hypertension.
- 2- The hallmark of this condition is the “**Onionskin**” appearance ; and this is a result of concentric laminated thickening of arteriolar walls, which leads to luminal narrowing and even complete occlude of injury or trauma that develops in these arterioles following the recurrent attacks of very high blood pressure .

Another abnormality that can be seen with malignant hypertension is **Fibrinoid vessel wall necrosis (necrotizing arteriololitis)**

