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PATHOLOGY

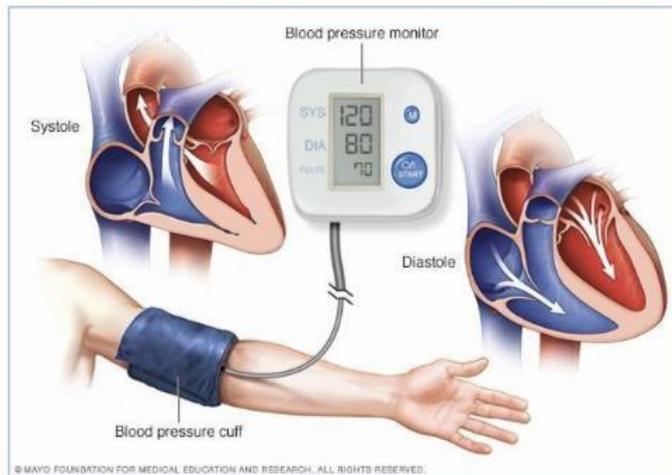
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In this lecture we are going to talk about Hypertensive vascular disease.

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)

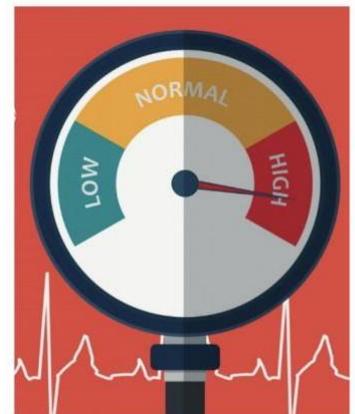
note: diseases of renal system affects cardiovascular system and vice versa

-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	→ Most common of all
Accounts for 90% to 95% of all cases	
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	

You are not supposed to memorize this table except for those two sentences here



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.
(incidence of renal failure and retinal hemorrhages is much higher than in patients with benign hypertension)
- usually superimposed on preexisting benign hypertension (either essential or secondary).

Clinical scenario: it usually presents as attacks of high blood pressure readings, the patient already has benign hypertension but for some reason his blood pressure is not properly controlled, either he is having another condition that affects his blood pressure or he is not taking his medications properly.

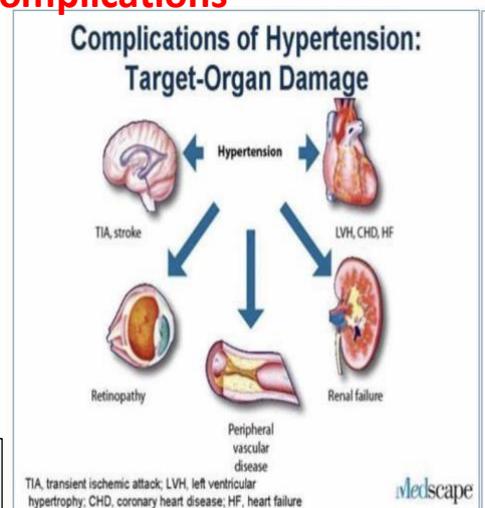
Hypertension (HTN) has the following potential complications

(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

Those with malignant hypertension are more prone to these complications in a shorter period of time

Hypertension will lead to damage in the arterioles all over the body but those vital organs will show the most significant effect leading to morbidity and mortality.



Pathogenesis of essential HTN: -

These factors are just proposals for the underlying cause (it's idiopathic)

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: -

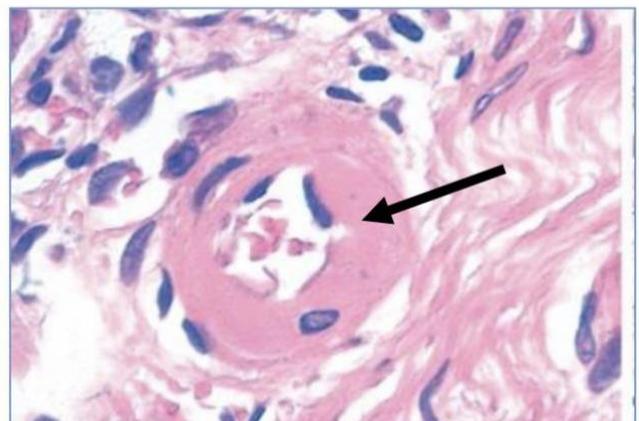
- HTN is associated with **Arteri**osclerosis (small arterial disease).
- Two forms of small blood vessel disease are hypertension-related: -
 - 1- hyaline arteriosclerosis
 - 2- hyperplastic arteriosclerosis

1. Hyaline arteriosclerosis: -

- 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 supplied 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 (healing) response in the wall and increased ECM production by smooth muscle cells in response to chronic hemodynamic stress that is caused by hypertension this will lead to more thickening of the arteriole wall

In normal arterioles the diameter is small and the thickness of the wall as well. Here the wall is thicker than normal and this thickness comes from the pinkish amorphous material so the lumen gets narrower.



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

Note: hyaline arteriolosclerosis is slowly progressive just like the benign hypertension leading to ischemia, end organ damage or stroke, it happens if benign hypertension is persistent and not well controlled for years.

2. Hyperplastic arteriolosclerosis:-

1. associated with severe (malignant)hypertension. (Rapid consequences and faster end organ damage if uncontrolled).
2. The hallmark of this condition is the “**Onionskin** “ appearance ; and this is a result of concentric laminated thickeningof arteriolar walls, which leads to luminalnarrowing 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 arteriolitis)**

