



CVS PATHOLOGY



Modified NO:



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HYPERTENSIVE VASCULAR DISEASE

Arteriolosclerosis

In this lecture, we are going to talk about a disease that affects arteries (arteriolosclerosis) specifically Hypertensive vascular disease.

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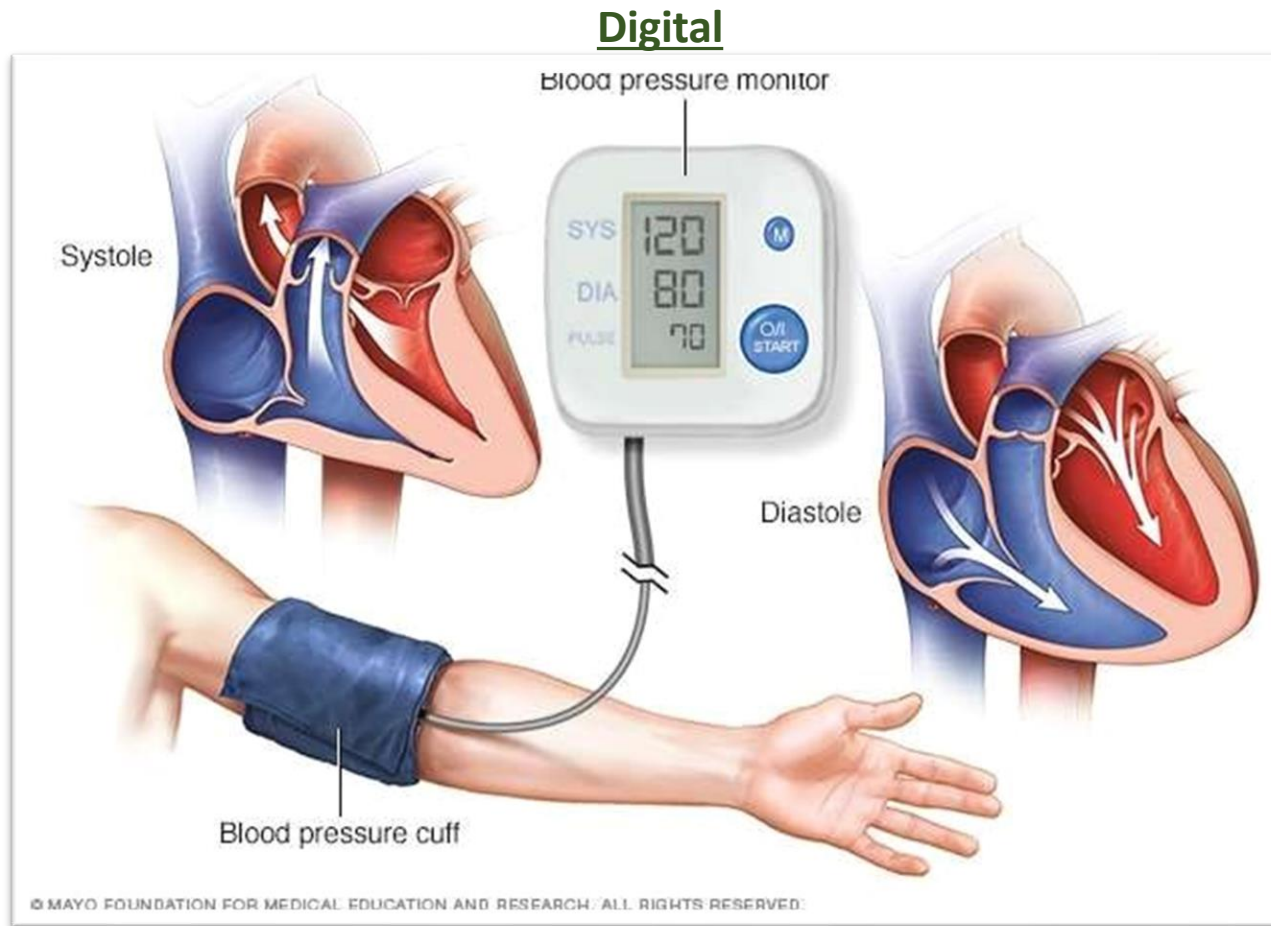
Slides

Doctor

Additional info

Important

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sphygmomanometer



A sphygmomanometer or a Digital blood pressure monitor is used to measure BP. (Both methods will show us two types of blood pressure measurements: systolic and diastolic).

Blood pressure



- Currently, cutoffs in diagnosing hypertension in clinical practice:
sustained diastolic pressures >80 mm Hg,
and/or sustained systolic pressures >130 mm Hg

Types of hypertension

There are many ways to classify the hypertension:

- According to severity:

Benign (95%) versus malignant (5%)

- According to cause:

Primary (essential) (95%) versus secondary (5%)

- According to side of circulation:

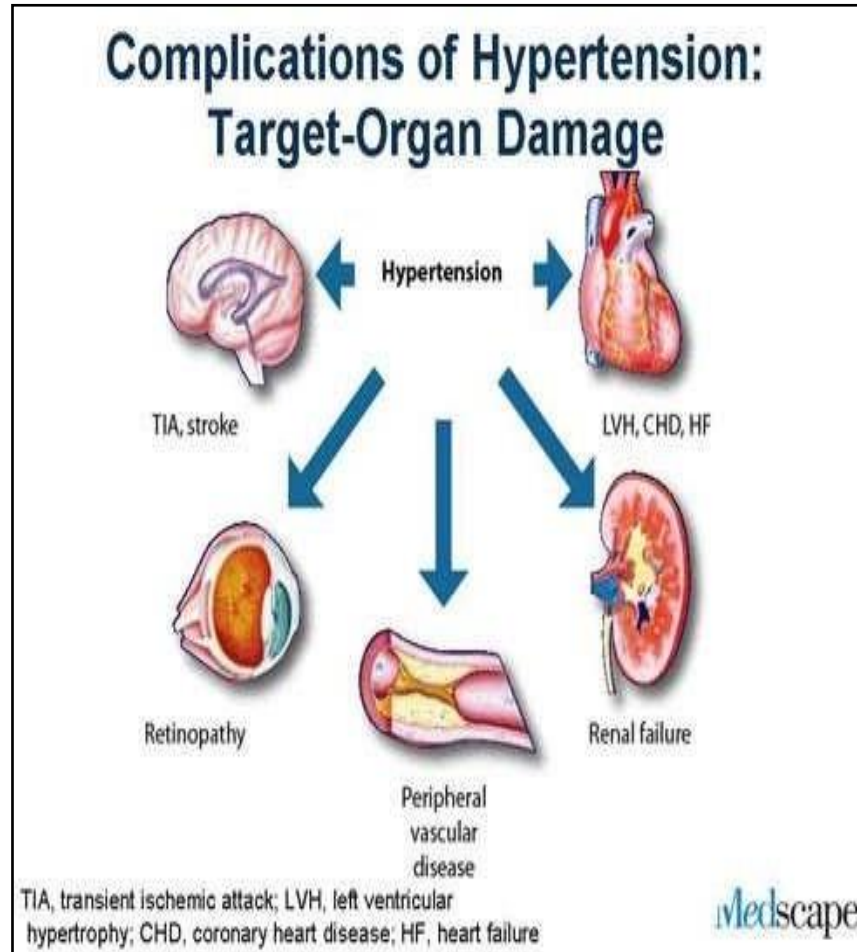
- Systolic vs diastolic

- **Malignant hypertension** (also known as accelerated HTN)
 - About 5% of all hypertensive patients will experience a rapidly rising blood pressure that, if untreated, leads to death within 1 to 2 years
 - systolic pressures > 200 mm Hg or diastolic pressures > 120 mm Hg
- **IMPORTANT!** This condition is not related to a malignant process, but it is called malignant because of its dismal prognosis. It can lead to very significant and aggressive complications, and if untreated, it will result in death within 1-2 years. Also, it can cause end-organ damage.
 - renal failure and retinal hemorrhages
 - usually superimposed on preexisting **benign** hypertension (either essential or secondary). In many cases might be related to uncontrolled primary or secondary disease.

Dismal prognostic disease" refers to a medical condition that has a poor outlook or outcome. This means that the chances of recovery or survival from the disease are low. The term is often used by doctors to describe serious illnesses that are difficult to treat or manage. It's a way of saying that the disease is likely to get worse over time or may not improve at all.

Hypertension (HTN) has the following potential complications:

So, uncontrolled HTN of any underlying etiology can lead to the following complications, or what we call target organ damage:



- stroke (CVD) & multi- infarct dementia.
- atherosclerotic coronary heart disease.
- cardiac hypertrophy and heart failure (*hypertensive heart disease*)
- aortic dissection
- renal failure
- retinal hemorrhages

Types of hypertension- according to etiology/cause

- 1 essential (idiopathic) hypertension (95%): most of cases
- 2 secondary hypertension:
 - Most common of secondary: related to renal disease or renal artery narrowing (renovascular hypertension)
 - Other less common: many other conditions....

Essential Hypertension (Primary hypertension)

Accounts for 90% to 95% of all cases

Most common of all

Secondary Hypertension %5

Renal

Most common of secondary causes

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

- Secondary hypertension can be related to:
1. Renal conditions (most common)
 2. Endocrine conditions.
 3. Cardiovascular disorders.
 4. Neurologic disorders.



- **Pathogenesis of essential HTN**

- **Genetic factors**

familial clustering of hypertension like:

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

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

- **Environmental factors modify the impact of genetic determinants**

- Those environmental factors include:

stress, obesity, smoking, physical inactivity, ↑ salt consumption

Blood vessels in HTN- Morphology

- HTN is associated with arterio sclerosis (small arterial disease)

• We have mentioned before that blood vessels affected in hypertension are mainly arteries specifically arterioles (arteries with the smallest size) and we called this condition in the previous lecture arteriolosclerosis.

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

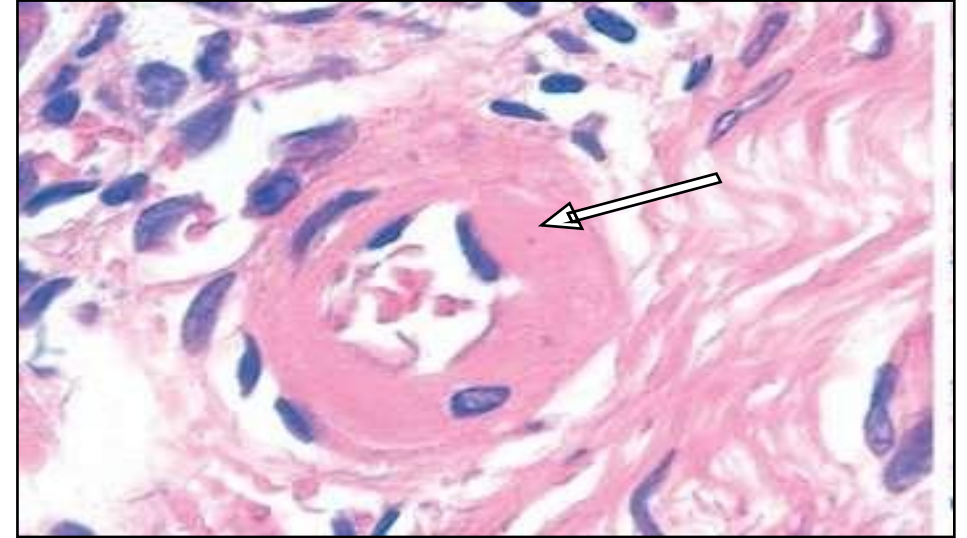
- 1 hyaline arteriolosclerosis
- 2 hyperplastic arteriolosclerosis

Arteriosclerosis is a wide term with many causes as:

- Hypertension
- Atherosclerosis
- Age
- etc

1- Hyaline arteriolosclerosis

- Associated with benign hypertension
- homogeneous **pink** hyaline thickening of arteriolar walls (that's why it was called hyaline).
- This thickening of the arteriole will lead to eventual **luminal narrowing** and it will have important determinants on the tissues supplied by those arterioles.



- The luminal narrowing and the pinkish material within the walls come from the leakage of plasma components across injured endothelial cells into vessel walls so, hypertension here will lead to microtrauma to endothelial cells which will lead to injury of endothelial cells and leakage of some plasma proteins into the walls of these arterioles, this will also lead to an inflammatory response in the wall
- increased ECM proteins production by smooth muscle cells that are lining the media of these arterioles adding to the thickening of the wall and this is also a response to chronic hemodynamic stress that is caused by hypertension.

- **Hyaline arteriolosclerosis: Complications**

- **Most significant in kidneys → nephrosclerosis (glomerular scarring)**

- Can affect any organ but most profound in the kidney, and this chronic damage that affects the arterioles will eventually lead to nephrosclerosis and this will lead to chronic renal failure with time.

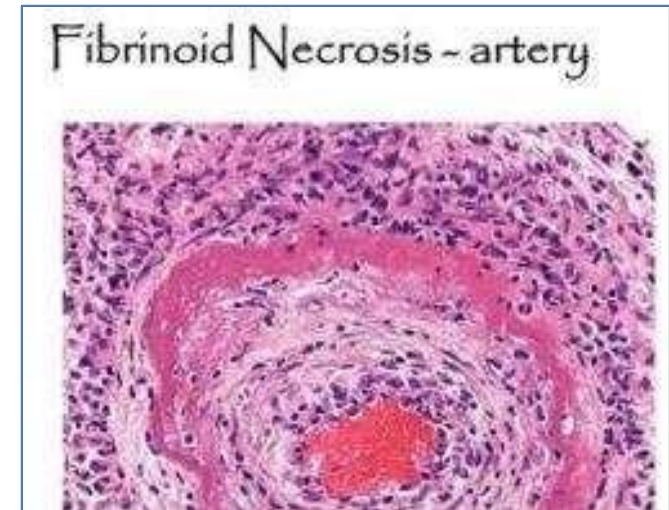
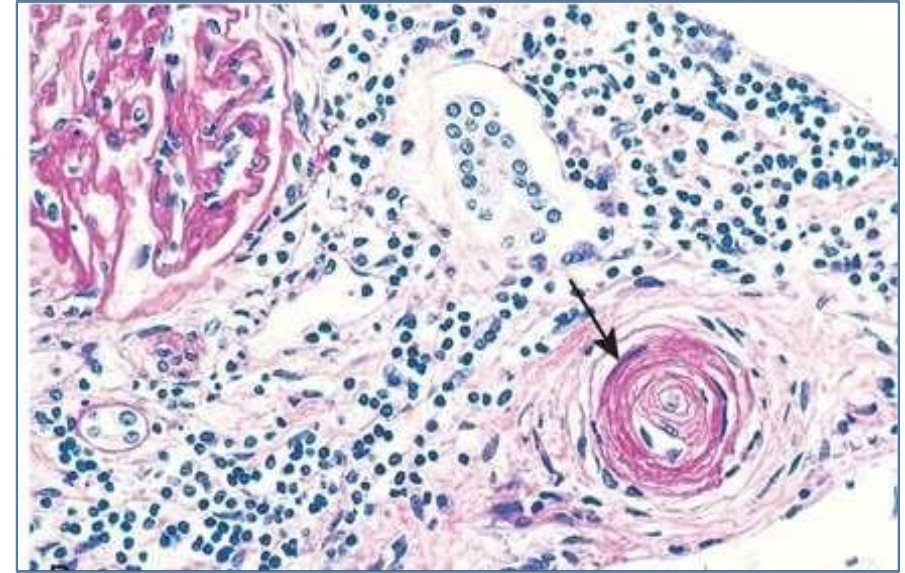
- **Other causes of hyaline arteriolosclerosis (without the presence of hypertension):**

- 1- elderly patients (normo-tensive) as a part of the aging process.**

- 2- diabetes mellitus**

2- Hyperplastic arteriolosclerosis

- This type is associated With severe (malignant) hypertension
- The hallmark of this condition under microscope is called "**onionskin**" and this onionskin appearance of the arterioles is the result of concentric laminated thickening of arteriolar walls which leads to eventual luminal narrowing and even complete occlusion due to injury and trauma that develops in those arterioles following the recurrent attacks of very high blood pressure readings.
- reduplicated basement membrane
- Another abnormality that can be seen with malignant hypertension is **fibrinoid vessel wall necrosis**.
(necrotizing arteriolitis)



- The repeated thickening of the arteriolar walls caused by the proliferation of smooth muscle cells and deposition of extracellular materials in response to severe hypertension.
- Each “layer” represents a cycle of damage and repair, creating a pattern similar to the rings seen in a sliced onion.



Q: What does (reduplicated basement membrane) mean ?

A: It means that the basement membrane will have multiple layers instead of the normal one, so it becomes thicker than normal and is functionally considered abnormal and results in reduced blood flow to the tissue.

The presence of these multiple layers will give the appearance of the onion when it is cut. This is termed (**onion skin) appearance.**

E-learning Questions:

1. Malignant hypertension is a case of hypertension that results from a malignancy:

- A. True
- B. False

2. Hyperplastic arteriolosclerosis is a small artery disease frequently associated with one of the following conditions:

- A. Diabetes mellitus
- B. Aging process
- C. Malignant hypertension
- D. Secondary hypertension

3. Secondary hypertension is most frequently related to an underlying endocrine disorder:

- A. True
- B. False

Answers: B,C,B

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فطعم الموت في أمرٍ صغيرٍ كطعم الموت في أمرٍ عظيمٍ

Additional sources

▼ دعواتكم لأهلنا في غزة

VERSIONS	SLIDE #	BEFORE CORRECTION	AFTER CORRECTION
V1 → V2	14		Fixing the page (technical issues)
V2 → V3			



امسح الرمز و شاركنا بأفكارك لتحسين أدائنا!!