The Cardio-VASCULAR System

- ○ Anatomy
- ○ Histology
- ● Pathology
- ○ Pharmacology
- ○ Physiology
- ○ Microbiology

Lec #: 6

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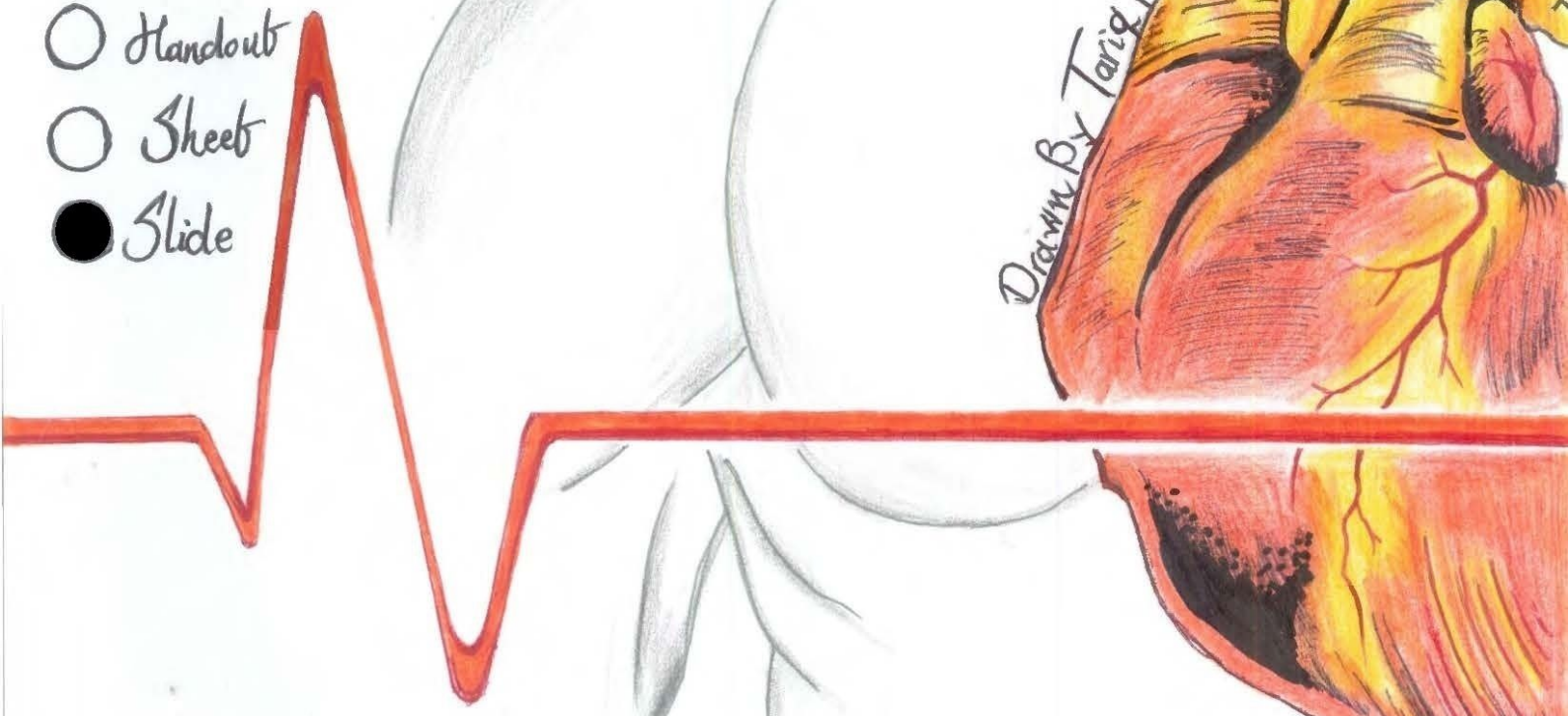
Done By:

- ○ Handout
- ○ Sheet
- ● Slide



HYPERTENSIVE VASCULAR DISEASE

Hypertension(HTN)

- Cutoffs in diagnosing hypertension in clinical practice➔ sustained diastolic pressures >90 mm Hg, and/or sustained systolic pressures >140 mm Hg

- ***Malignant hypertension***

→ A small percentage of HTN patients (5%) present with 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**

→ associated with renal failure and retinal hemorrhages

→ most commonly is superimposed on preexisting benign hypertension

Hypertension (HTN) has the following complications:

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

Types of hypertension

1- **essential hypertension: most cases (95%) are idiopathic**.

2- **secondary hypertension:** Most of the remaining cases **(**are due to renal disease, or renal artery narrowing **(called renovascular hypertension), and to a lesser degree many other conditions….**

Essential HTN
Accounts for 90% to 95% of all cases

Secondary HTN

Renal
Acute glomerulonephritis
Chronic renal disease
Polycystic disease
Renal artery stenosis
Renal vasculitis
Renin-producing tumors

Endocrine
Adrenocortical hyperfunction (Cushing syndrome,
primary aldosteronism, CAH
licorice ingestion)
Exogenous hormones (glucocorticoids, estrogen
sympathomimetics
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

- ***<u>Pathogenesis of essential HTN</u>***
- **Genetic factors**
- **familial clustering of hypertension**
- HTN has been linked to specific angiotensinogen polymorphisms and angiotensin II receptor variants; polymorphisms of the renin-angiotensin system.
- Susceptibility genes for essential hypertension are currently **unknown** but probably include those that control renal sodium absorption, etc.

Pathogenesis of essential HTN

- **Environmental factors**
- such as stress, obesity, smoking, physical inactivity, and high levels of salt consumption, modify the impact of genetic determinants.
- Evidence linking dietary sodium intake with the prevalence of hypertension in different population groups is particularly strong.

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

Hyaline arteriolosclerosis

- **associated with benign hypertension.**
- **marked by homogeneous, pink hyaline thickening of the arteriolar walls, and luminal narrowing.**
- **Results from leakage of plasma components across injured endothelial cells, into vessel walls and increased ECM production by smooth muscle cells in response to chronic hemodynamic stress.**

- **Complications:**
- **Most significant in the kidneys➔ nephrosclerosis (glomerular scarring).**
- **Other causes of hyaline arteriolosclerosis (in absence of HTN):**

1- elderly patients (normo-tensive)

2- diabetis mellitus

Hyperplastic arteriolosclerosis

- is more typical of **severe (malignant)** hypertension.
- "**onionskin**," concentric, laminated thickening of arteriolar walls and luminal narrowing.
- The laminations consist of smooth muscle cells and thickened, reduplicated basement membrane.
- In malignant hypertension these changes are accompanied by fibrinoid deposits and vessel wall necrosis **(necrotizing arteriolitis)**, which are particularly prominent in the kidney

A, Hyaline arteriolosclerosis. The arteriolar wall is thickened with the deposition of amorphous proteinaceous material, and the lumen is markedly narrowed.
B, Hyperplastic arteriolosclerosis ("onion-skinning") (*arrow*)
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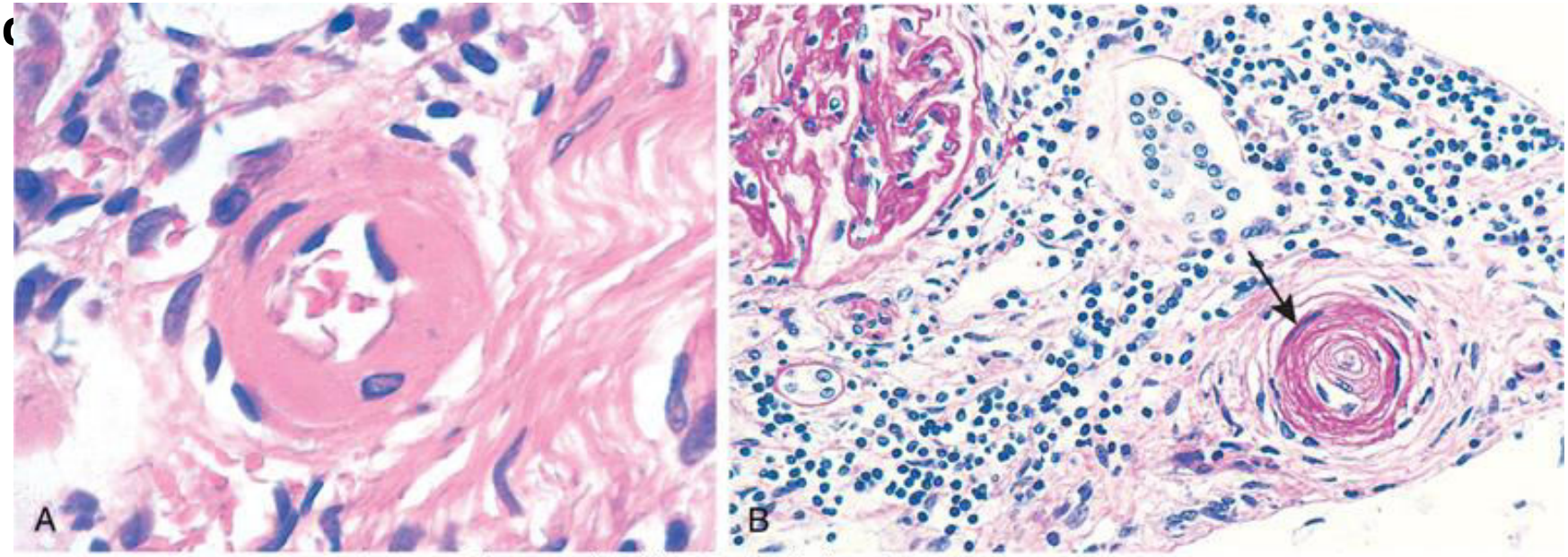

DISORDERS OF BLOOD VESSEL HYPERREACTIVITY

- Several disorders are characterized by inappropriate or exaggerated vasoconstriction of blood vessels:

  1- Raynaud Phenomenon

  2- Myocardial Vessel Vasospasm

1- Raynaud Phenomenon

- results from exaggerated vasoconstriction of arteries and arterioles in the extremities (the fingers and toes, but also sometimes the nose, earlobes, or lips).

  -restricted blood flow induces paroxysmal pallor or cyanosis

- involved digits characteristically show "red-white-and-blue" color changes from most proximal to most distal (reflecting proximal vasodilation, central vasoconstriction, and more distal cyanosis, respectively).

  - Raynaud phenomenon can be a primary entity or may be secondary to other disorders

Primary Raynaud phenomenon

- **caused by exaggerated vasomotor responses to cold or emotion (intrinsic hyperreactivity of medial smooth muscle cells)**
- **affects 3% to 5% of the general population and has a predilection for young women.**
- **Structural changes in the arterial walls are absent except late in the course, when intimal thickening may appear.**
- **The course is usually benign**
- **chronic cases may show atrophy of the skin, subcutaneous tissues, and muscles.**
- **Ulceration and ischemic gangrene are rare.**

Secondary Raynaud phenomenon

- **refers to vascular insufficiency due to arterial disease caused by other entities**
- **these include SLE, scleroderma, Buerger disease, or atherosclerosis.**
- **every patient with Raynaud phenomenon should be evaluated for these secondary causes**