PATHOLOGY TEAM 430

Done by:

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Note

The important notes with

ORANGE COLOR

4th Lecture:

Hypertension

Introduction

- Common problem (25% of population)
- Asymptomatic until late- Silent Killer – painless –
- Leading risk factor – MI & Stroke
- Complications alert to diagnosis but late…
- Hypertension and Hypertensive Vascular Disease

Hypertension definition: a sustained diastolic pressure more than 90 mm Hg or a sustained systolic pressure in excess of 140 mm Hg (>140/90).

- Hypertension is considered as an important risk factor of:
  - Coronary heart disease.
  - Cerebrovascular accidents (stroke)
  - cardiac hypertrophy
  - Congestive heart failure.
  - Aortic dissection.
  - Renal failure.
  - Retinopathy

Some of risk factors which can lead to Hypertension:

- Hereditary
- Race. African-Americans
- Gender. Men & postmenopausal women
- Age
- Obesity
- Diet, particularly sodium intake

Other factors associated with Hypertension include:

- Heavy alcohol consumption
- Diabetes
- Use of oral contraceptives
- Sedentary or inactive lifestyle

Types of hypertension based on the etiology:

I. **Primary/Essential Hypertension (95%) :** Mechanisms largely unknown. It is idiopathic.

II. **Secondary Hypertension (5-10%)**

- **Renal**
  - Glomerulonephritis
  - Renal artery stenosis
  - Adult polycystic disease
  - Chronic renal disease, renin producing tumors.

- **Endocrine**
  - Adrenocortical hyperfunction

(Cushing syndrome, primary aldosteronism, congenital adrenal hyperplasia which is an example of gene defect affecting aldosteron metabloism)

  - Exogenous hormones

(glucocorticoids, estrogen [including pregnancy-induced and oral contraceptives] and sympathomimetics)

  - Hyperthyroidism "Thyrotoxicosis"
  - Hypothyroidism"Myxdema"
  - Pheochromocytoma

"damage to adrenal gland which can lead to catecholamine in the blood"

  - Acromegaly

- **Cardiovascular**
  - Coarctation of Aorta
  - Polyarteritis nodosa (or other vasculitis)
  - Increased intravascular volume
  - Increased cardiac output
  - Rigidity of the aorta

- **Neurogenic**

Psychogenic
Intracranial pressure
Sleep apnea, acute stress "including surgery"

Types of hypertension based on the clinical features:

Benign (90 to 95%)	Malignant (5%)
◦ Modest level. ◦ Fairly stable over years to decades. ◦ Compatible with long life.	◦ Diastolic pressure over 120mmHg ◦ Rapidly rising blood pressure. ◦ Severe hypertension (diastolic>120) ◦ Renal failure. ◦ Retinal hemorrhages and exudates (w/wo papilledema). ◦ Leads to death in 1 or 2 years if untreated.

Pathogenesis of Hypertension

Blood pressure (BP) = Cardiac Output x Peripheral Resistance

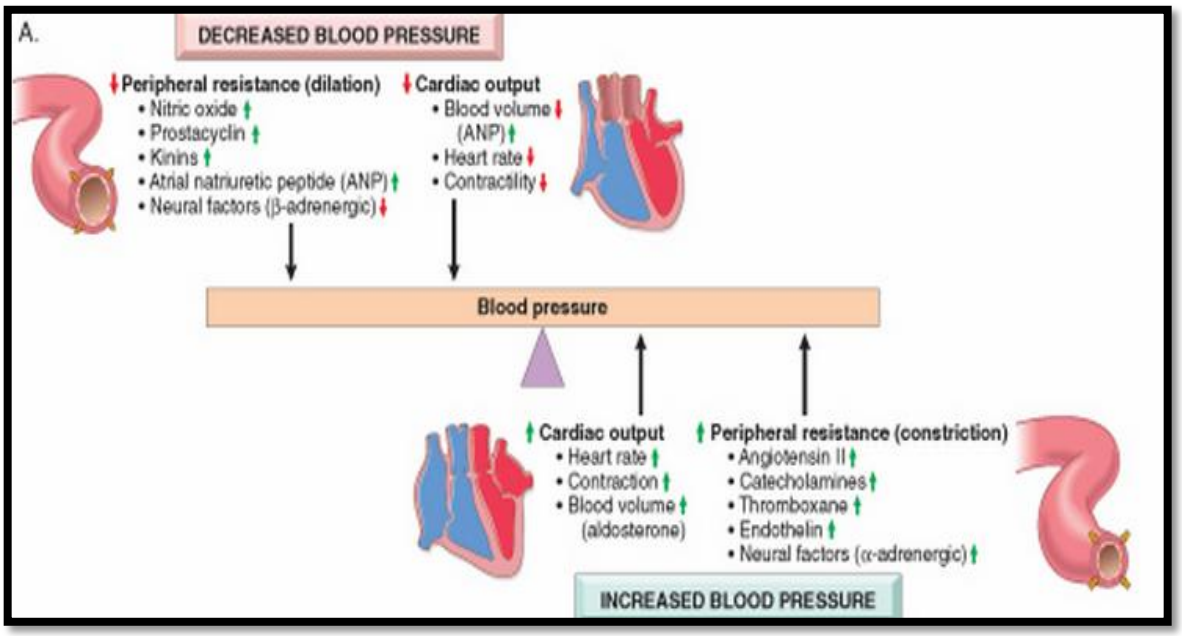
Blood pressure is a function of cardiac output and peripheral vascular resistance → two hemodynamic variables that are influenced by multiple genetic, environmental, and demographic factors.

The factors:

- Endocrine Factors :Renin, Angiotensin, ADH, Aldosterone
- Neural Factors : Sympathetic & Parasympathetic
- Blood Volume :Sodium, Mineralocorticoids
- Cardiac Factors : Heart rate & Contractility

Regulation of Blood Pressure

"VERY IMPORTANT PECTURE"



Note:

The blood pressure is influenced by the changes of cardiac output & peripheral resistance. So, any change in these factors can lead to changes in the blood pressure "either ↑ or ↓".

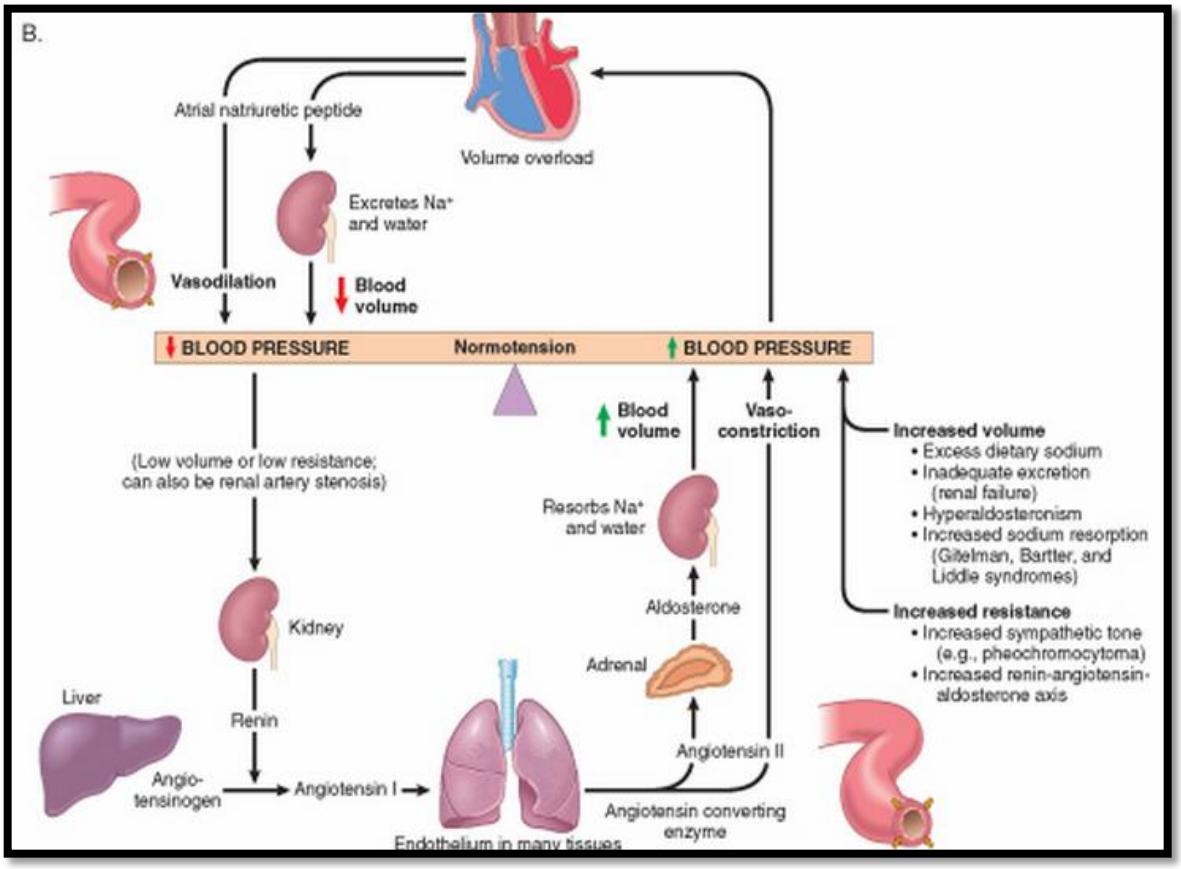
Peripheral resistance is regulated predominantly at the level of the arterioles

lower volumes or pressures result in a reduced glomerular filtration rate in the kidney with increased resorption of sodium by proximal tubules.

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

Renin-angiotensin-aldosterone and atrial natriuretic peptide rule

"VERY IMPORTANT PECTURE"



Postulated mechanisms of Essential Hypertension

1. Defect in sodium excretion
2. Defect in cell membrane function:
   -Na/Ca transport
   -Increased vasoconstrictive response
3. Increased sympathetic response

Remember !!

Peripheral resistance is regulated predominantly at the level of the arterioles

Reduced renal sodium excretion in the presence of normal arterial pressure is probably a **key initiating event**; it is a final common pathway for the pathogenesis of most forms of hypertension

Vascular pathology of Hypertension

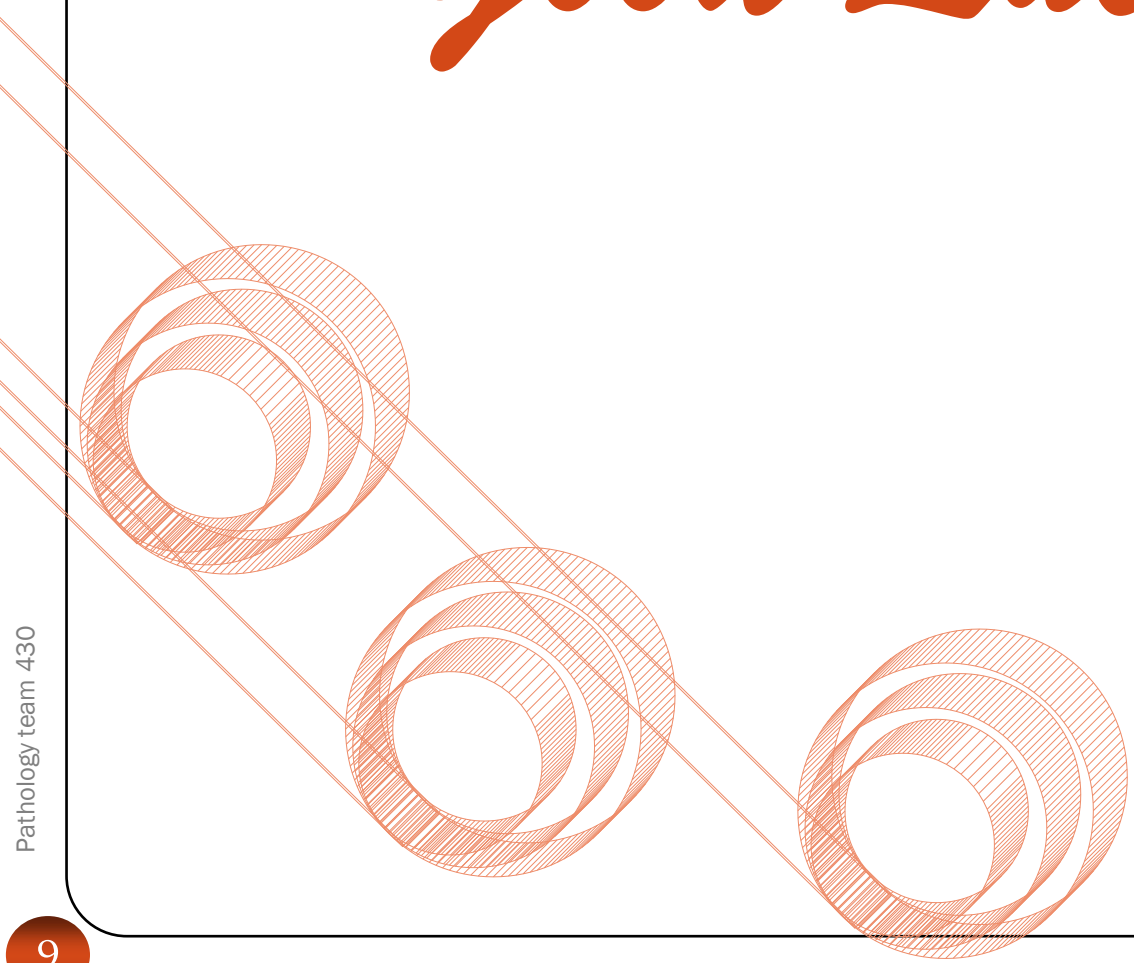
- Accelerate atherogenesis
- Aretrioscelrosis (particularly in the kidney), lead to thick wall and narrow lumen
- It can be either:
  - Hyaline (in benign HTN)
  - Hyperplastic "onionskinning" (in malignant HTN)

Major complications of Hypertension

- Coronary heart disease
- Cerebrovascular accidents
- Cardiac hypertrophy and heart failure (*hypertensive heart disease*)
- Aortic dissection
- Renal failure
- Retinopathy

Hypertension "Systemic hypertensive cardiac disease"

- History of hypertension or extracardic anatomical evidence of HTN
- LVH "left ventricular hypertrophy": concentric with absence of other cause of LVH
- The free LV wall is > 2cm and the weight of the heart is > 500 grams
- Long-term: dilatation and wall thinning
- Treatment of HTN helps recovery



Good Luck