- 50 years old man,diabetic , smoking 20 cigrets a day ,he is always irritable and ancious presented to casualty dept with weakness of Rt side of body and difficulty to talk….
- What is the first important clinical test

- A 20 years old boy presented to casualty dept with severe headache and epistaxis. His fundi exam was abnormal…..

- A pregnant lady in her last trimester presented to medical clinic with headache,SOB and swelling of her feet, her BP was 180/100

Hypertension and its pathophysiology

Lecture Plan

- Define hypertension
- Classify hypertension
- Explain the different causes of Hypertension
- Differentiate modifiable and unmodifiable causes of hypertension
- Explain the pathophysiology of hypertension
- Define the effects of hypertension on heart and other organs of the body

Hypertension

- **Hypertension** is **defined** as a systolic **blood pressure**. (SBP) higher than 140 mHg or a diastolic **blood pressure**. (DBP) higher than 90 mmHg; the diagnosis is based on. the average of 2 or more readings taken at each of 2 or more visits after an initial screening.

Classification of arterial hypertension

Category	Systolic BP (mm hg)	Diastolic BP (mm hg)
Normal BP	Below 130	Below 85
High-normal BP (pre-hypertension)	130-139	85-89
Stage 1 (mild) hypertension	140-159	90-99
Stage 2 (moderate) hypertension	160-179	100-109
Stage 3 (severe) hypertension	180 or higher	110 or higher

Arterial hypertension

Primary hypertension (90%) -

- without evidence of other diseases
- multifactorial syndrome
- increased TPVR

Secondary hypertension (10%)

- depends on other diseases (kidneys, endocrine etc.)

Factors contributing to primary hypertension

- Stress
  - Increased sympathetic activity
  - Stress-induced vasoconstriction
- Genetic factors
  - familiar cases of hypertension,
  - identification of gene responsible for hypertension
- Racial and environmental factors
  - Black race -higher incidence of essential hypertension
  - salt intake (due to ↑ blood volume, sensitivity of CVS to adrenergic influences)

Risk factors modifying the course of essential hypertension

- age
- sex (premenopausal females have better prognosis)
- atherosclerosis (impairs vessels elasticity)
- smoking, excess of alcohol intake
- diabetes mellitus and insulin-resistance

Obesity association with hypertension

Part of syndrome X, or the metabolic syndrome which includes:

- central obesity,
- dyslipidemia (especially elevated triglycerides),
- insulin resistance and/or hyperinsulinemia
- high blood pressure.

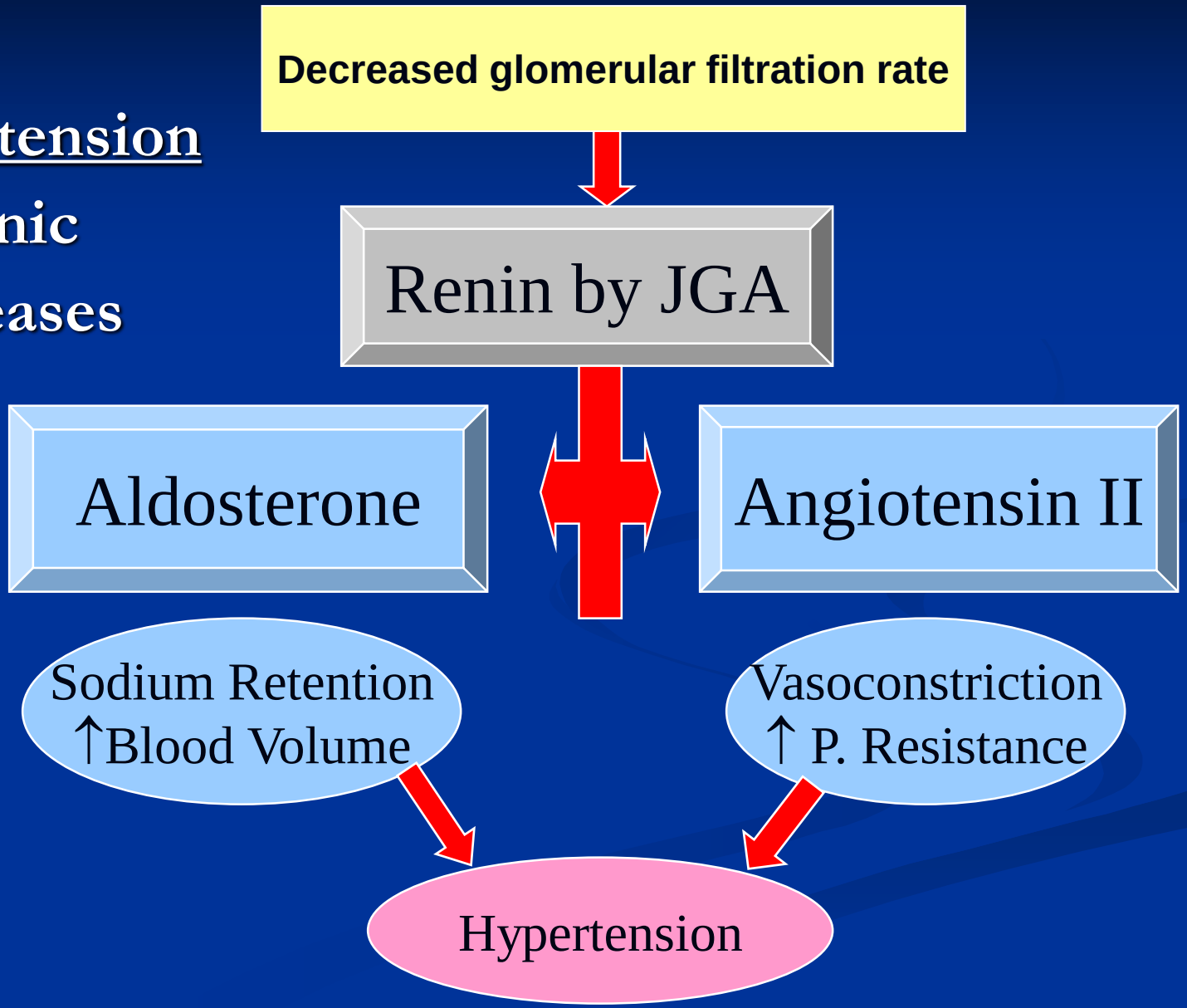
Hyperinsulinemia can increase BP:

- produces renal sodium retention (at least acutely) and increases sympathetic activity.
- mitogenic action of insulin promotes vascular smooth-muscle hypertrophy increasing TPVR

Secondary hypertension

Renal hypertension

- from chronic kidneys diseases



Etiology of secondary hypertension

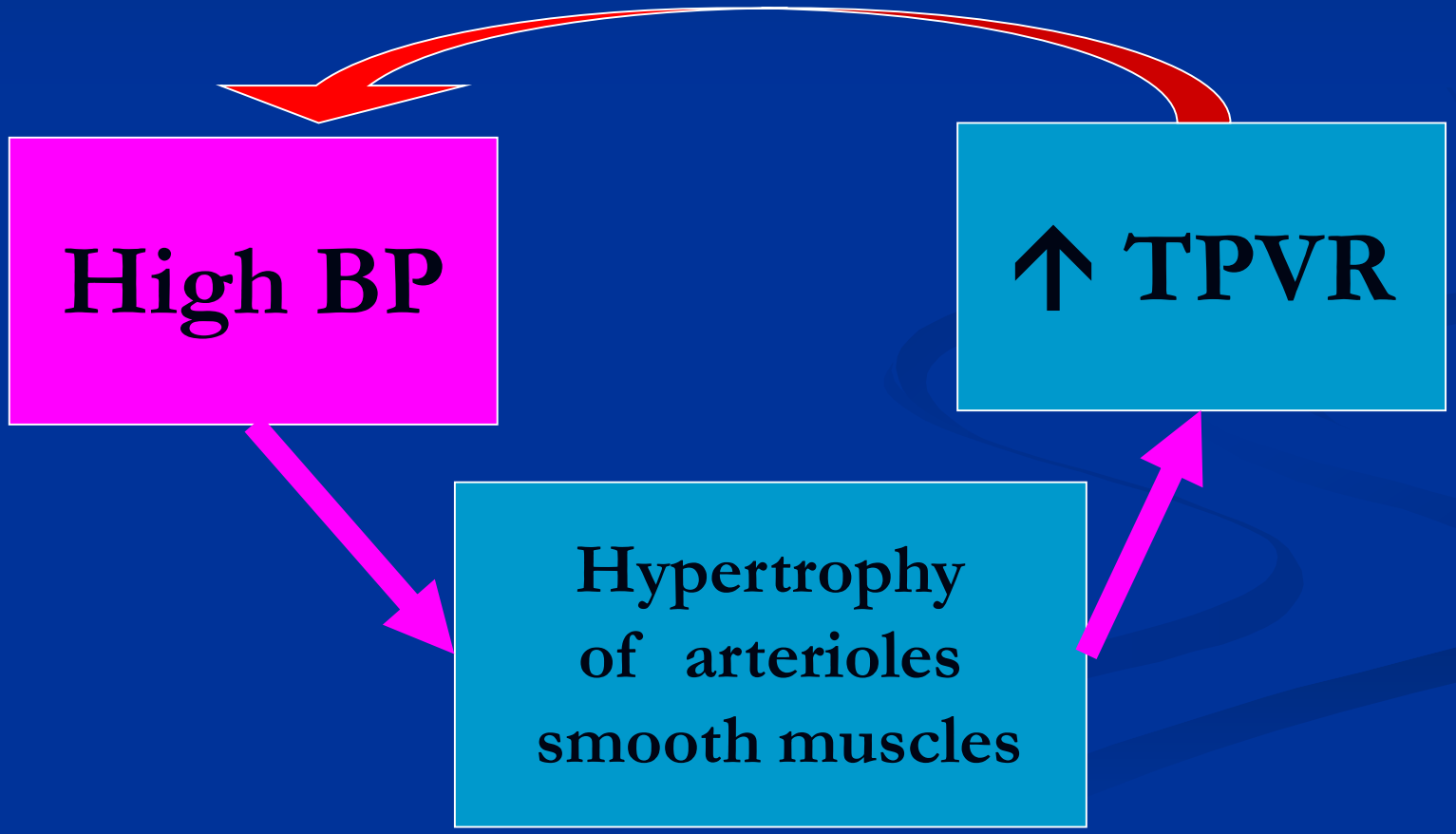
- ↑secretion of aldosterone
- Cushing's syndrome/disease - ↑ glucocorticoid secretion.
- Phaeochromocytoma - tumour releasing both noradrenaline and adrenaline.
- Pregnancy (the last 3 months)
- Drugs (steroids, oral contraceptives, sympatomimetics, aldosterone, and vasopressin).
- Cardiovascular disorder (coarctation of the aorta) - low pressure distal to the coarctation.
- Atherosclerosis

Hypertension pathogenesis

- Stress, hypodynamia → sympathetic overactivity → increased cardiac output.
- Episodes of high BP → increase of TPVR
- increase of TPVR → ↓glomerular filtration → ↑renin-angiotensin-aldosterone cascade →increased NaCl/water retention.
- increased vascular tone results in a rise in TPVR

Hypertension pathogenesis

Vicious circle of hypertension



Hypertension pathogenesis

- Deficiency of vasodilator substances
  - bradykinin from kinin-kallikrein system
  - neutral lipid and prostaglandin from renal parenchyma
- Endothelial dysfunction
  - Imbalance between endothelin and NO, prostacyclin.

Hypertension signs and symptoms

Primary hypertension is asymptomatic until complications develop in target organs.

Heart

- **left ventricule hypertrophy**
- **angina pectoris**
- **myocardial infarction**
- **heart failure**

Hypertension signs and symptoms

- **Hypertensive retinopathy** - retinal hemorrhages, exudates, vascular accidents.
- **Hypertensive encephalopathy** - dizziness, headache, fatigue, nervousness.
- **Brain stroke** – ischemic and hemmorrhagic
- **Hypertensive nephropathy** - chronic renal failure due to chronically high blood pressure.

Hypertension treatment

Primary hypertension cannot be cured, but it can be controlled to prevent complications.

- Losing weight.
- Changes in diet.
- Stop smoking.
- Reducing the intake of alcohol and sodium.
- Moderate regular aerobic exercise.
- If modification of lifestyle in 6 months was not successful, **antihypertensive drugs are prescribed**.

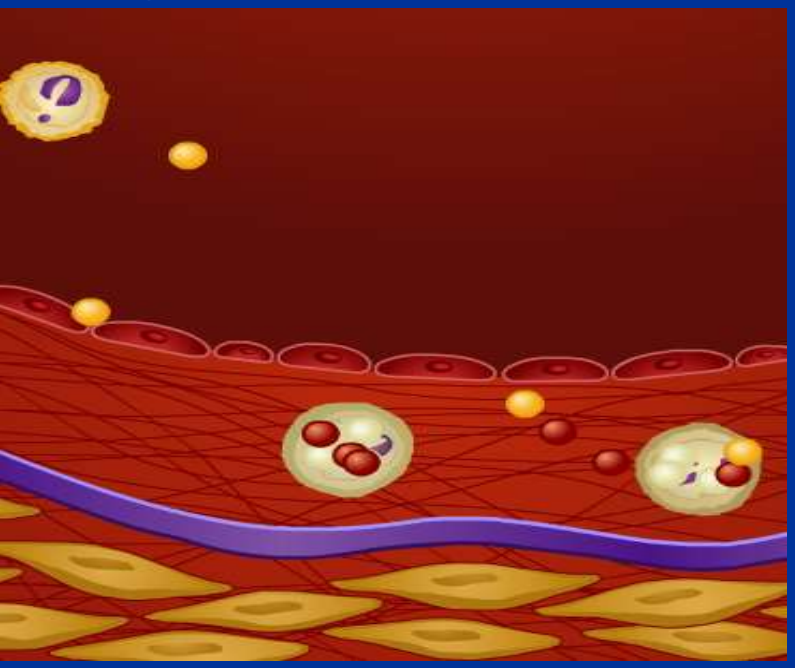
Antihypertensive drugs

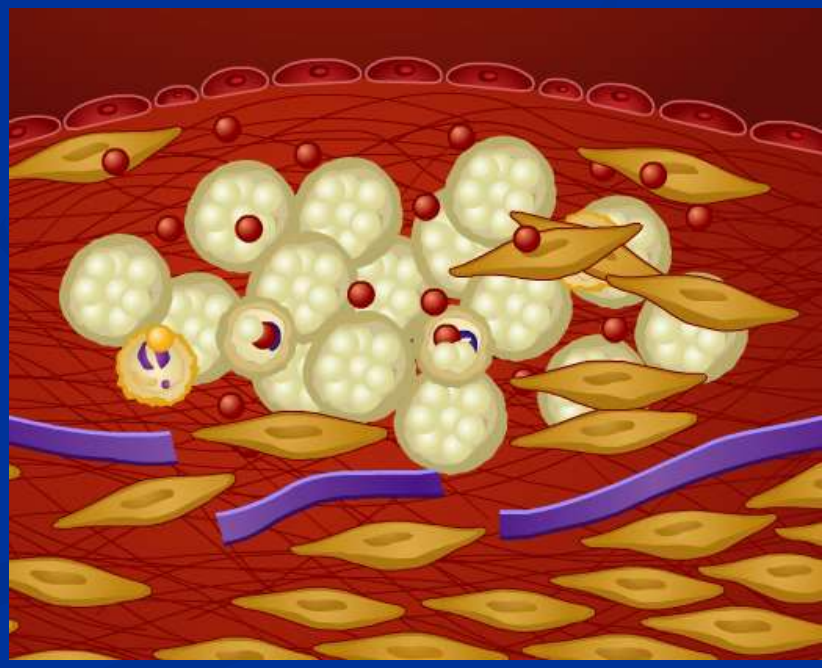
- 1. ACE Inhibitors
- 2. Beta blockers
- 3. Calcium channel blockers
- 4. Diuretics
- 5. Dilators (vasodilators)

Atherosclerosis pathogenesis

The lipid hypothesis

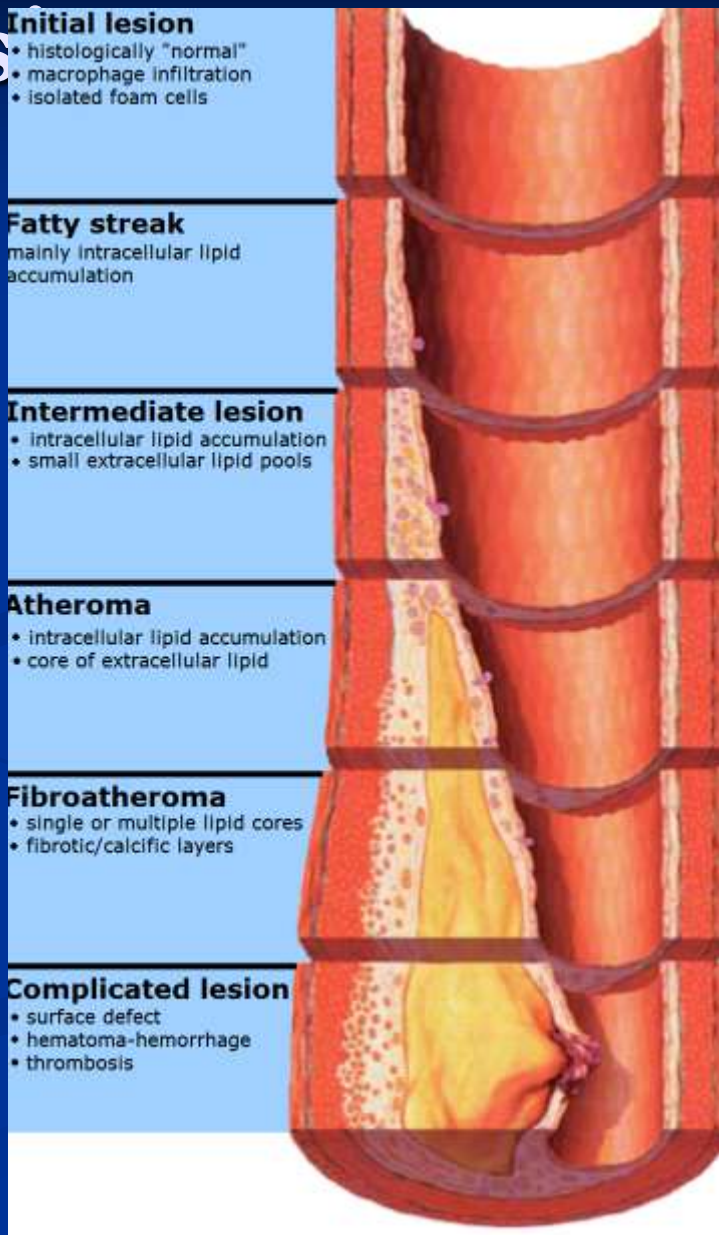
plasma LDL penetration into the arterial wall → lipid accumulation in smooth muscle cells and in macrophages (foam cells)→ smooth muscle cell hyperplasia and migration into the subintimal and intimal region





Atherosclerosis pathogenesis

- The atherosclerotic plaque may produce a severe stenosis or may progress to total arterial occlusion.
- With time, the plaque becomes calcified.
- Some plaques are stable
- Others may undergo spontaneous fissure or rupture (unstable or vulnerable)
- The ruptured plaque stimulates thrombosis.



Atherosclerosis symptoms

If the narrowing of an artery is less than 70% - asymptomatic

Symptoms occur due to the location of the narrowing

- Coronary arteries – angina pectoris, heart attack
- Carotid arteries - brain stroke.
- Arteries in the legs - leg cramps (intermittent claudication).
- Renal arteries - kidney failure or high blood pressure (malignant hypertension).

Atherosclerosis symptoms

- Symptoms occur due to deprivation of tissues blood supply
- The first symptom may be pain or cramps.
- Typically, symptoms develop gradually as the atheroma slowly narrows an artery.

Prevention and Treatment

Prevention – to modify risk factors

- smoking,
- high blood cholesterol levels,
- high blood pressure,
- obesity,
- physical inactivity.

- When atherosclerosis becomes severe the complications themselves must be treated.