Subject: CVS-pathology

Topic: Lectures 4(pg 1-2)&5(pg 3-4)

Done by:

Arteriosclerosis:

Arterial **thickening, hardening** leading to loss of elasticity, it has three recognized patterns. Numbered 1,2,3.

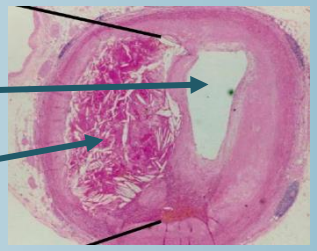
2.Atherosclerosis:

Most frequent and clinically important pattern of arteriosclerosis.

Lesions: **atheromas** (atheromatous plaques) affect the intima. They're made of a fibrous cap (proteins &certain cells) and a cholesterol lipid core (cholesterol crystals, cell derbris, foam cells & calcium)

The plaques narrow the lumen.

Necrotic center with whitish cholesterol crystals



1. Mönckeberg's medial calcific sclerosis:

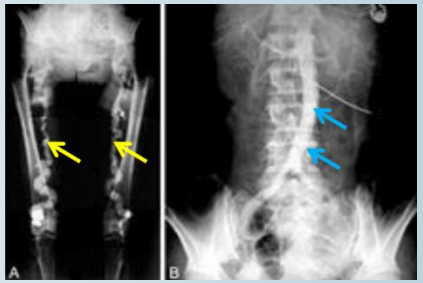
Medial→ affects tunica media (muscular arteries)

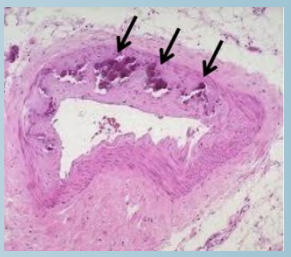
Calcific → calcific deposits (hardening; like bones)

Meaning: vessels are visible on **x ray**, they're palpable if they're subcutaneous, **purple deposits in Tunica media with H&E**.

Info: Affects people above 50

NOT clinically significant if it's on its own (no accompanying Atherosclerosis) [doesn't affect the lumen]





Atherosclerosis; Pathogenesis:

2 main elements: Inflammation of endothelium[1] with LDL particles deposition[2].

Formation of atheromatous plaques: ① chronic endothelial injury or assault [by smoking, hyperlipidemia, HTN, toxins or Immune reactions] cause ② Endothelial dysfunction **(activation)** ③ Inflammatory responses (macrophage activation and smooth muscle cells migration) ④ Macrophages engulf lipids forming a lipid core (debris formation within the atheroma) ⑤ smooth muscle cells proliferation and production of collagen and ECM deposition.

Arteriosclerosis: progression

It takes a plaque many years to significantly impact the lumen diameter, the clinical phase is usually in middle age to elderly.

The pathological stage "Atheroma" develops from the 3rd decade of life, and further complications like fibroatheroma and complicated lesions develop even later at the 4th and 5th decades.

Possible complications:

1. Aneurysm and rupture
2. Occlusion by thrombus (superimposed thrombus can cause complete obstruction)
3. Critical stenosis (more atherosclerosis and bigger lesion)

Constituents of the plaque affect the progression & complication of the Atheroma:

- Vulnerable plaque: MORE susceptible to complications [contains: **Thick fat core**/ Thin fibrous cap/ More inflammation]
- Stable plaque [contains: Thin fat core/ Thick fibrous cap/ less inflammation]

Arteriosclerosis: Risk factors

1. **Major nonmodifiable risk factors**
   - Male, Old, family history and genetic abnormalities
2. **Major modifiable risk factors**
   - Hyper Lipidemia, HTN, smoking, DM, inflammation
3. **Lesser uncertain risks**
   - Obesity, physical inactivity, stress, hormonal deficiency like estrogen, diet: high carbs, trans fat
   - Hyperhomocystinemia, Metabolic syndrome, Lipoprotein a levels, **Factors Affecting Hemostasis**

→**5X more MI** in men **aged 40-60** and increasing Ischemic heart disease rates with age.

→Increasing Atherosclerosis after menopause in women.

→genetically, the case could be either:

Familial clustering of multiple other risk factors like HTN or DM or a well-defined genetic derangements in lipoprotein metabolism like familial hypercholesterolemia

➔ **20% of cardiovascular events occur without any identifiable risk factors** and here we suspect the lesser risks

Hypertensive vascular disease:

Hypertension diagnosis is made when either:

- Diastolic is >80 mm Hg or
- Systolic is >130 mm Hg

Types are classified according to:

- **Severity:** Benign (95%) versus **malignant (5%)**
- **Etiology:** Primary (essential) (95%) and it's the most common of all vs secondary (5%)
  - Secondary HTN causes: endocrine, cardiovascular and neurologic and renal (the most common) e.g. renal artery narrowing causes renovascular HTN),
- **Side of circulation:** systolic vs diastolic

Complications of HTN:

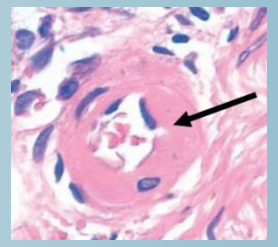
- P stroke (CVD) &multi-infarct dementia
- atherosclerotic coronary heart disease (HTN→ Atherosclerosis)
- cardiac hypertrophy and heart failure (hypertensive heart disease)
- aortic dissection
- renal failure
- retinal hemorrhage

3.Arteriolosclerosis: (small arterial disease)

HTN is associated with 2 forms of arteriolosclerosis:

1. hyaline arteriolosclerosis (with benign hypertension)

Leakage of plasma components across endothelial cells causes:

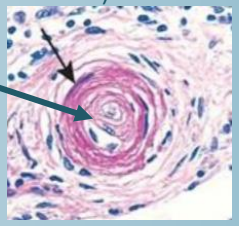


- homogeneous pink hyaline thickening of arteriolar walls and **luminal narrowing**

Increased ECM production by smooth muscle cells due to chronic HTN

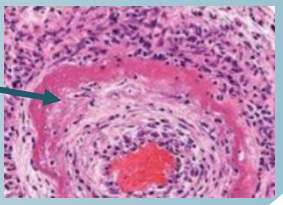
- complications mostly affect the kidneys: nephrosclerosis (glomerular scarring)
- hyaline arteriolosclerosis can happen without HTN:
  1) In normo-tensive elderly people
  2) diabetic people

2.Hyperplastic arteriolosclerosis (with malignant HTN)



shows as luminal narrowing with onionskin thickening of the walls with a reduplicated basement membrane

Another abnormality seen with MHTN is **necrotizing arteriolitis**



Also known as fibrinoid necrosis

Pathogenesis of essential HTN:

Genetic factors:

- polymorphisms in the renin-angiotensin system
- Susceptibility genes: like genes that control renal sodium absorption

Environmental factors: modify the impact of genetic determinants: e.g. stress, obesity, smoking, physical inactivity, ↑ salt consumption

Malignant Hypertension: (accelerated HTN)

5% of cases

Characterized by: attacks of rapidly rising blood pressure that, if untreated, cause death within 1-2 years

Diagnosed when:

- systolic pressures > 200 mm Hg or
- diastolic pressures > 120 mm Hg

causes aggressive complications like **renal failure and retinal hemorrhages** and mortality

↳ usually superimposed on preexisting benign hypertension (either essential or secondary)