The Cardio-VASCULAR System

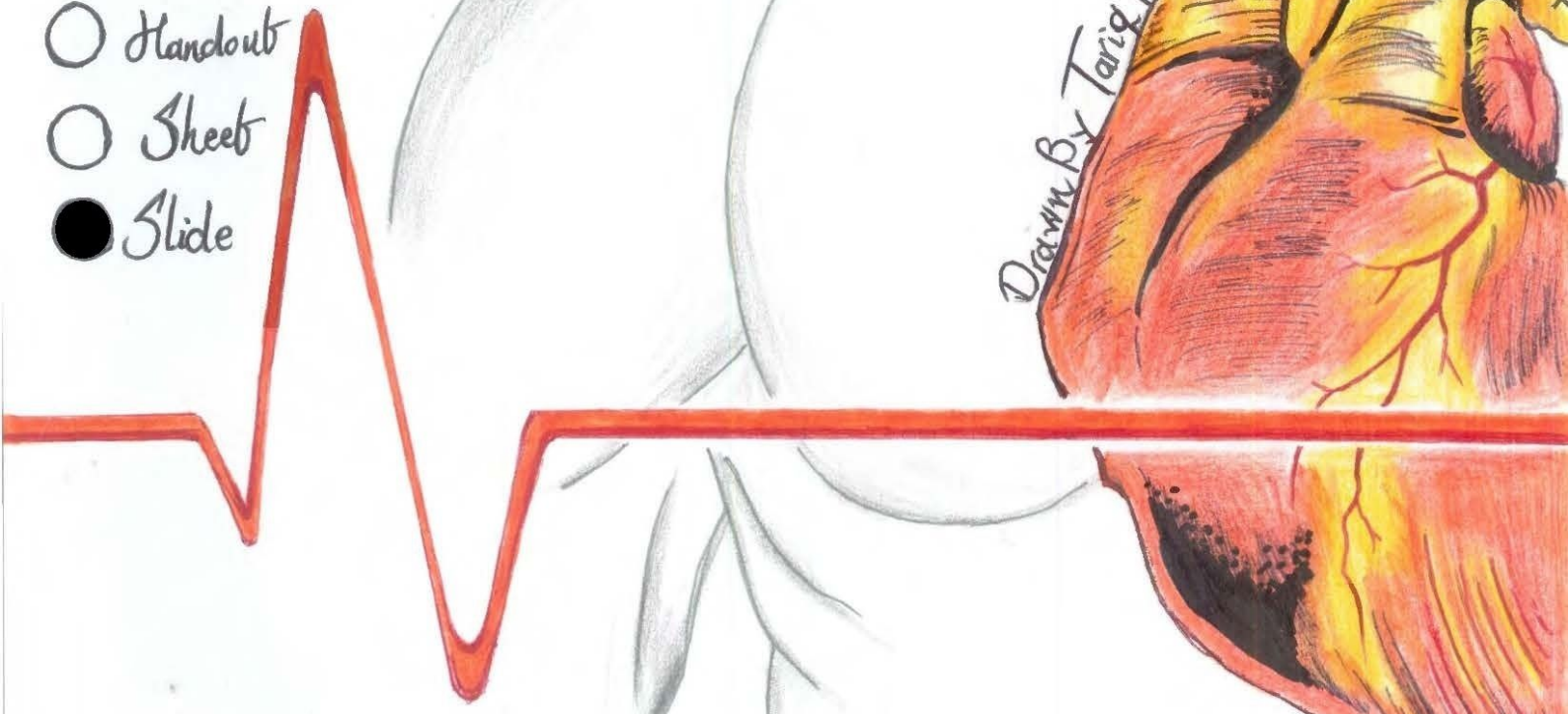
- ○ Anatomy
- ○ Histology
- ● Pathology
- ○ Pharmacology
- ○ Physiology
- ○ Microbiology

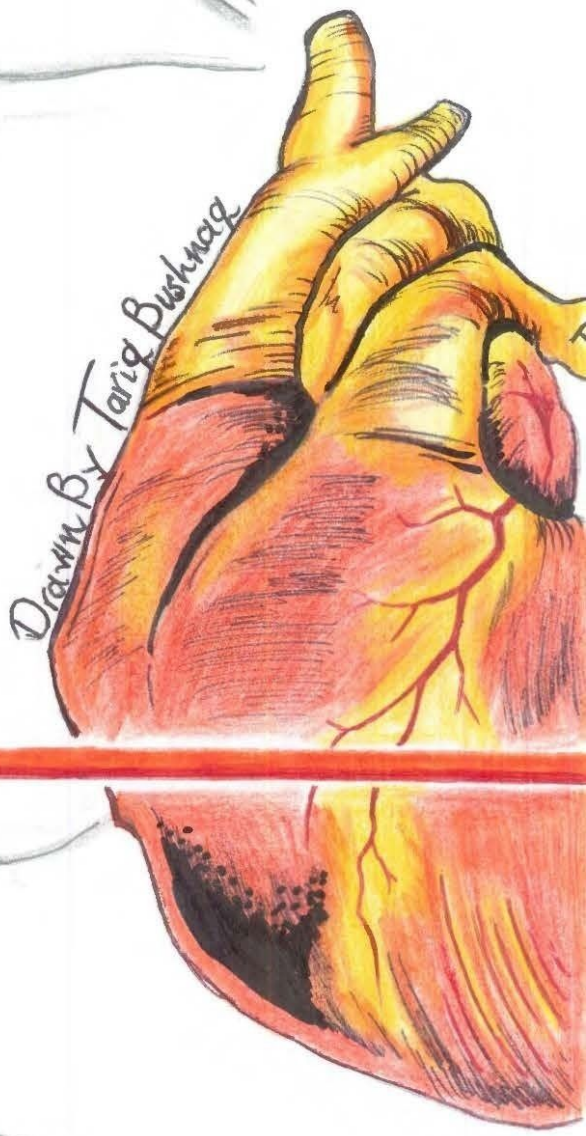
Lec #: 4

Dr. Name: Dr.Nisreen

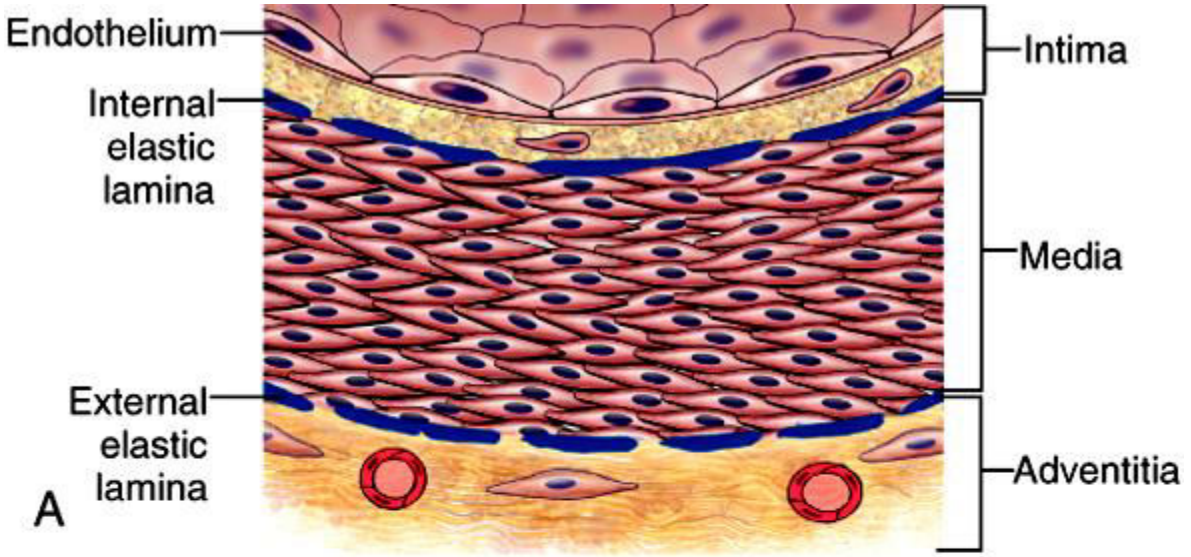
Done By:

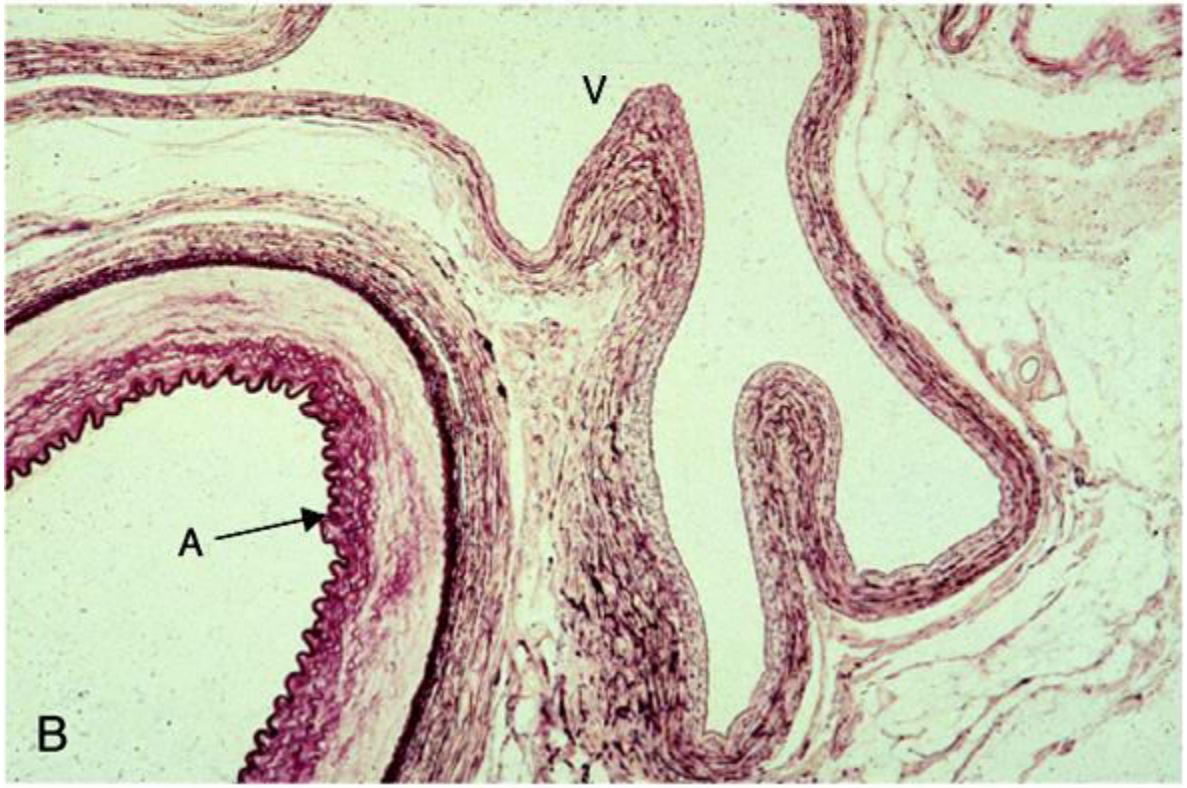
- ○ Handout
- ○ Sheet
- ● Slide





Normal
blood vessels
A= artery
V= vein





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ARTERIOSCLEROSIS

- ***Arteriosclerosis*** **literally means "hardening of the arteries"**
- It reflects arterial wall thickening and loss of elasticity.
- Three patterns are recognized, with different clinical and pathologic consequences:

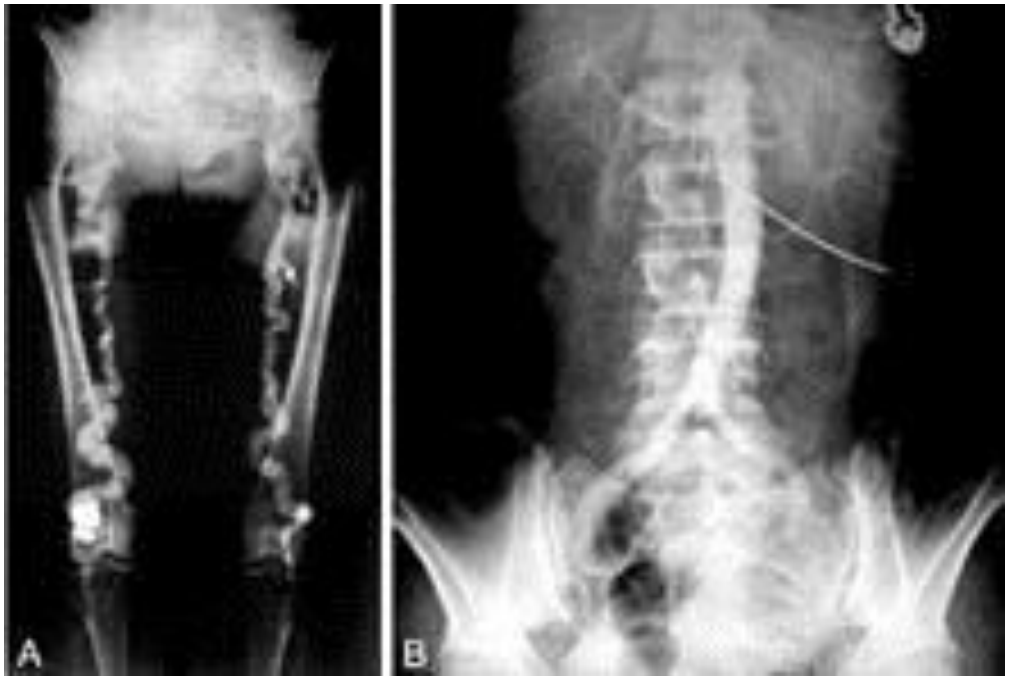
1-Arteriolosclerosis

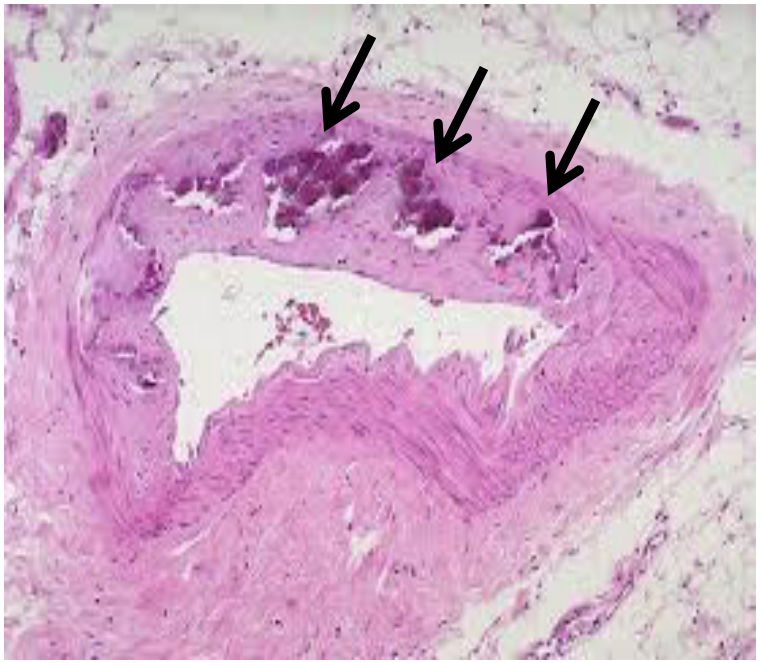
- affects small arteries and arterioles.
- is most often associated with hypertension and/or diabetes mellitus

2-Mönckeberg medial calcific sclerosis

- is characterized by calcific deposits in muscular arteries
- typically in persons older than age 50.
- radiographically visible
- often palpable calcifications
- do **not** encroach on the vessel lumen and are usually not clinically significant

2-Mönckeberg medial calcific sclerosis





3-Atherosclerosis

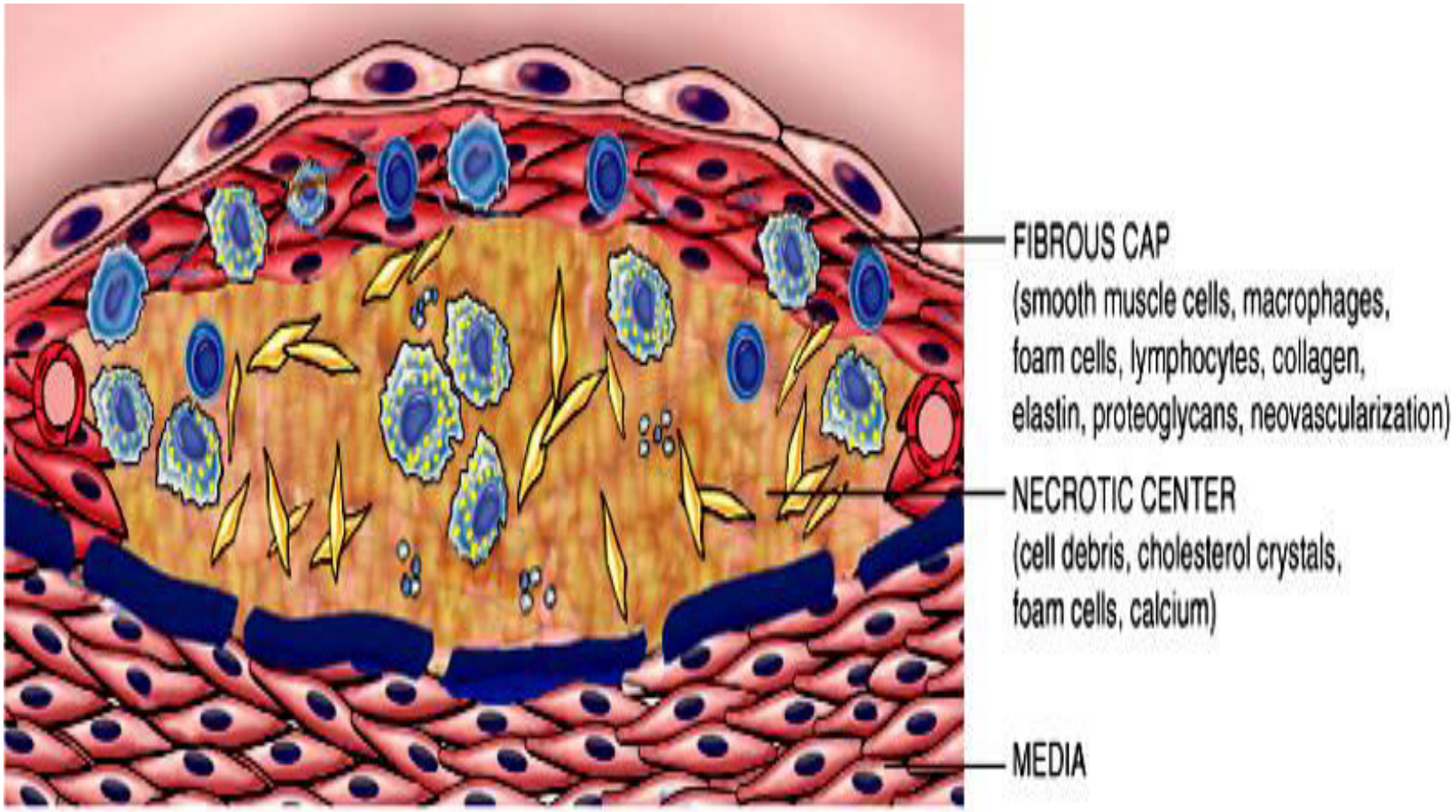
- from Greek root words for "gruel" and "hardening,"
- is the most frequent and clinically important pattern
- characterized by intimal lesions called ***atheromas*** (also called *atherosclerotic plaques*), that protrude into vascular lumina.
- An atheromatous plaque consists of a raised lesion with a soft, yellow, grumous core of lipid (mainly cholesterol and cholesterol esters) covered by a firm, white fibrous cap

Pathogenesis

- The atherosclerotic process is not fully understood.
- Atherosclerosis is initiated by inflammatory processes in the endothelial cells of the vessel wall associated with retained low-density lipoprotein (LDL) particles.
- This retention may be a cause, an effect, or both, of the underlying inflammatory process

- LDL particles and their content are susceptible to oxidation by free radicals
- This will lead to endothelial stimulation and initiation of inflammatory process.

The major components of a well-developed intimal atheromatous plaque



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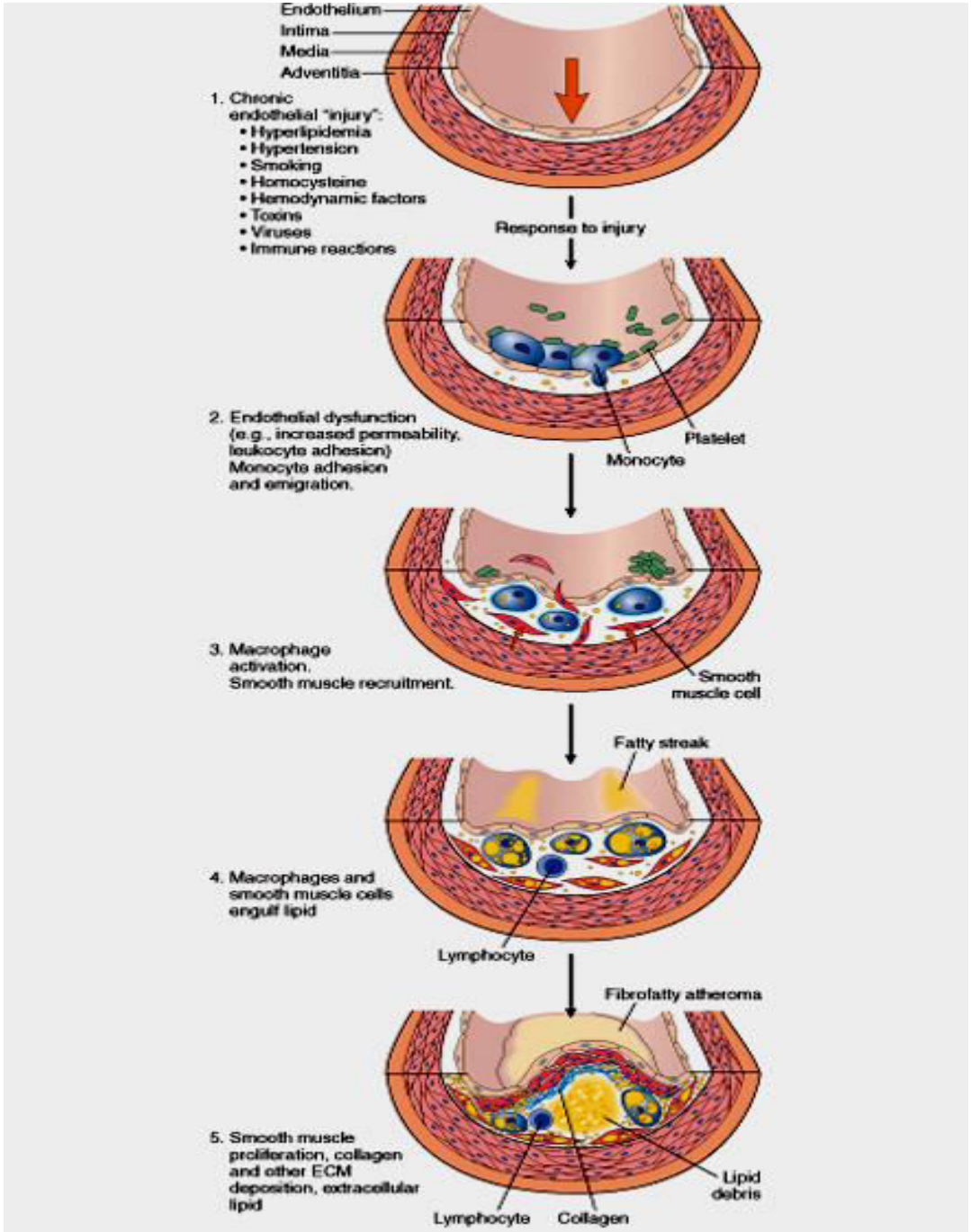
Atheromatous plaque

Formation of atheromatous plaque



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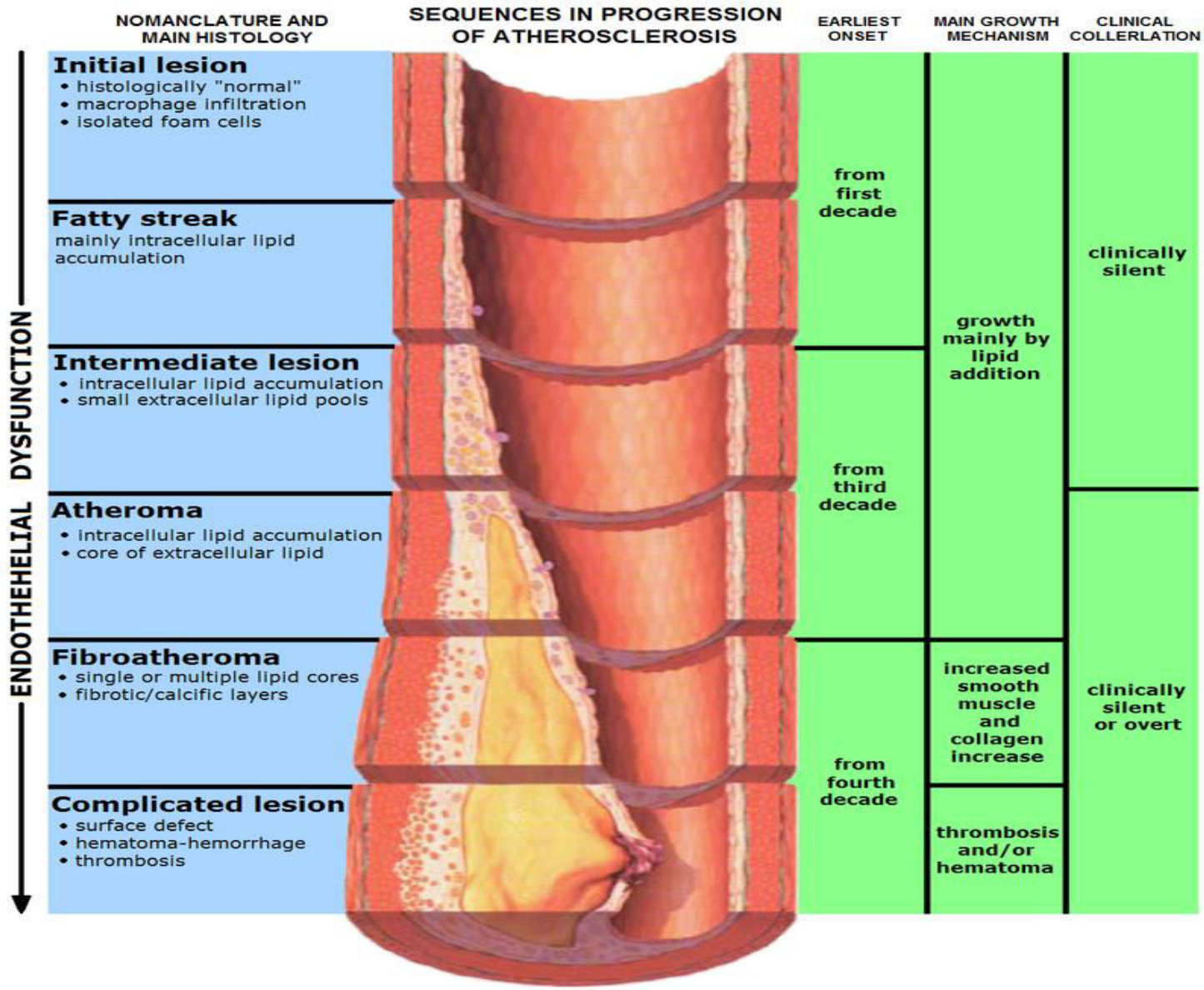

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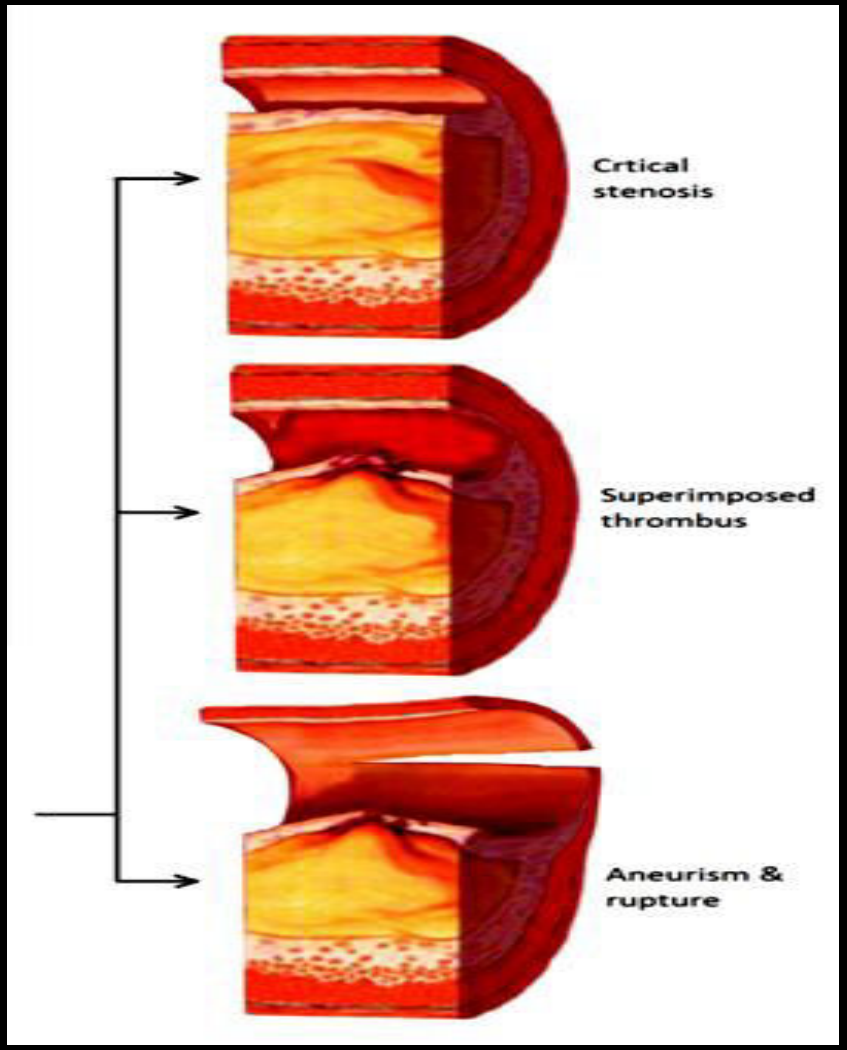
Atherosclerosis progression



Epidemiology

- atherosclerosis is much less prevalent in Central and South America, Africa, and Asia.

- The mortality rate for IHD in the United States is among the highest in the world and is approximately five times higher than that in Japan.

- Nevertheless, IHD has been increasing in Japan and is now the second leading cause of death there. Moreover, Japanese who immigrate to the United States and adopt American ***lifestyles and dietary customs*** acquire the same predisposition to atherosclerosis as the homegrown population.

- ***Multiple risk factors have a multiplicative effect:*** 2 risk factors increase the risk 4X. E.g. if 3 risk factors are present (e.g., hyperlipidemia, hypertension, and smoking), the rate of myocardial infarction is increased 7X.

Risk Factors for Atherosclerosis

Major Risks	Lesser, Uncertain, or Non-quantitated Risks
Nonmodifiable	Obsesity
Increasing age	Physical inactivity
Male gender	Stress ("type A personality)
Family history	Postmenopausal estrogen deficiency
Genetic abnormalities	High carbohydrate intake
	Lipoprotein(a)
Potentially Controllable	Hardened (trans)unsaturated fat intake
Hyperlipidemia	
Hypertension	Chlamydia pneumoniae infection
Cigarette smoking	
Diabetes	
C-reactive protein	

Major Constitutional Risk Factors for atherosclerosis

- **Major Risks (*Nonmodifiable):***

*Increasing age

*Male gender

*Family history

*Genetic abnormalities

- ***Potentially Controllable/modifiable:***
- Hyperlipidemia
- Hypertension
- Cigarette smoking
- Diabetes

1-age

- Between ages 40 and 60, the incidence of myocardial infarction in men increases 5 times.
- Death rates from IHD rise with each decade even into advanced age.

2-Gender

- Premenopausal women are relatively protected against atherosclerosis compared with age-matched men.
- MI and other complications of atherosclerosis are uncommon in premenopausal women unless they are otherwise predisposed by diabetes, hyperlipidemia, or severe hypertension.
- After menopause, the incidence of atherosclerosis-related diseases increases and with greater age eventually exceeds that of men

3-Genetics

- well-established familial predisposition to atherosclerosis and IHD is **multifactorial**.
- In some instances it relates to:
- **familial clustering** of other risk factors, such as hypertension or diabetes; or :
- **well-defined genetic derangements in lipoprotein metabolism**,

- e.g. familial hypercholesterolemia that result in excessively high blood lipid levels.

Additional Risk Factors for atherosclerosis

- 20% of all cardiovascular events occur in the absence of any major risk factor

1-Inflammation as marked by C-reactive protein

2-Hyperhomocystinemia

3-Lipoprotein a

4-Factors Affecting Hemostasis

- **Other Risk Factors**

1-lack of exercise

2-competitive, stressful lifestyle ("type A" personality)

3-obesity

4-Postmenopausal estrogen deficiency

5-High carbohydrate intake