Atherosclerosis

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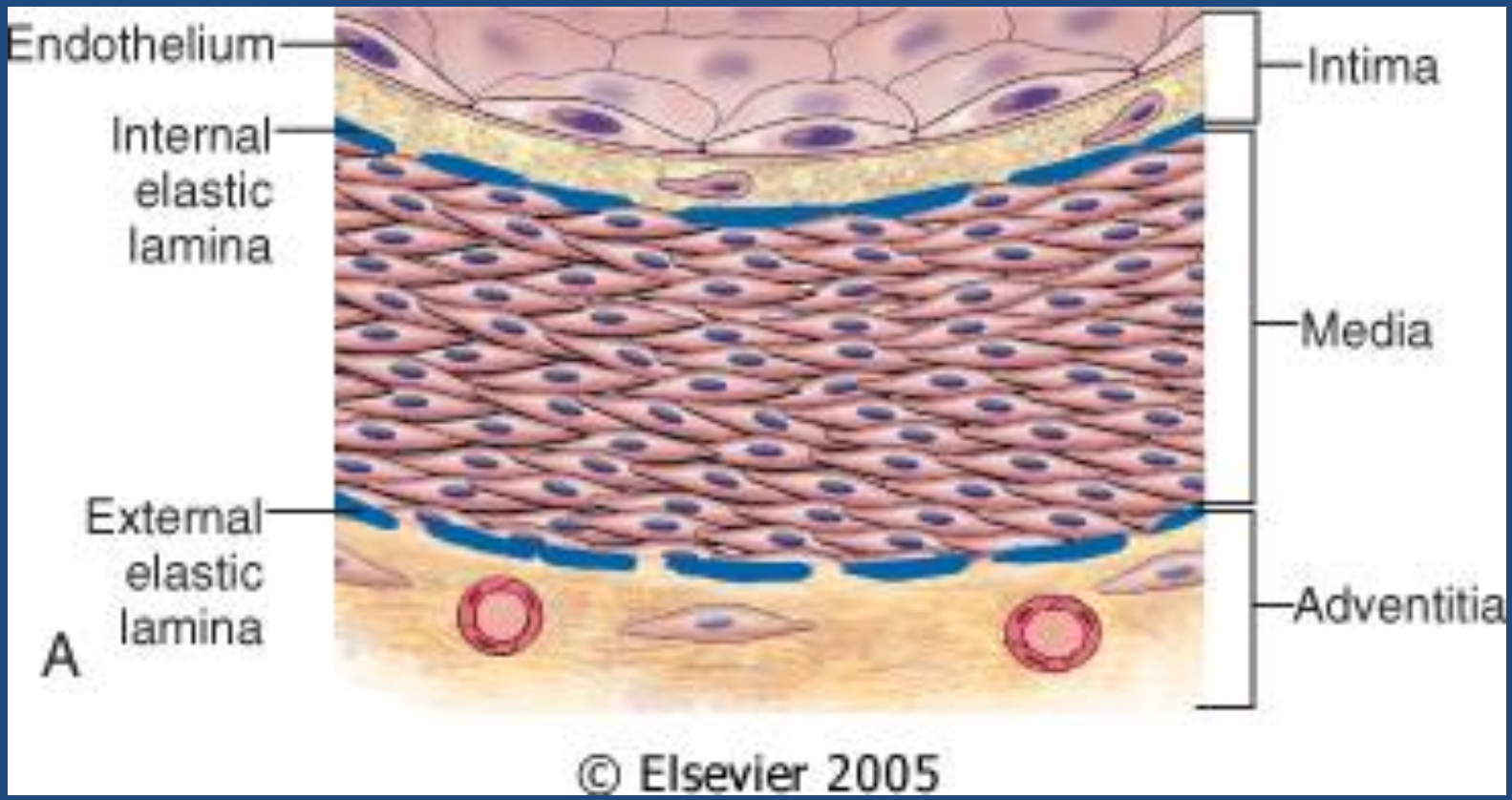
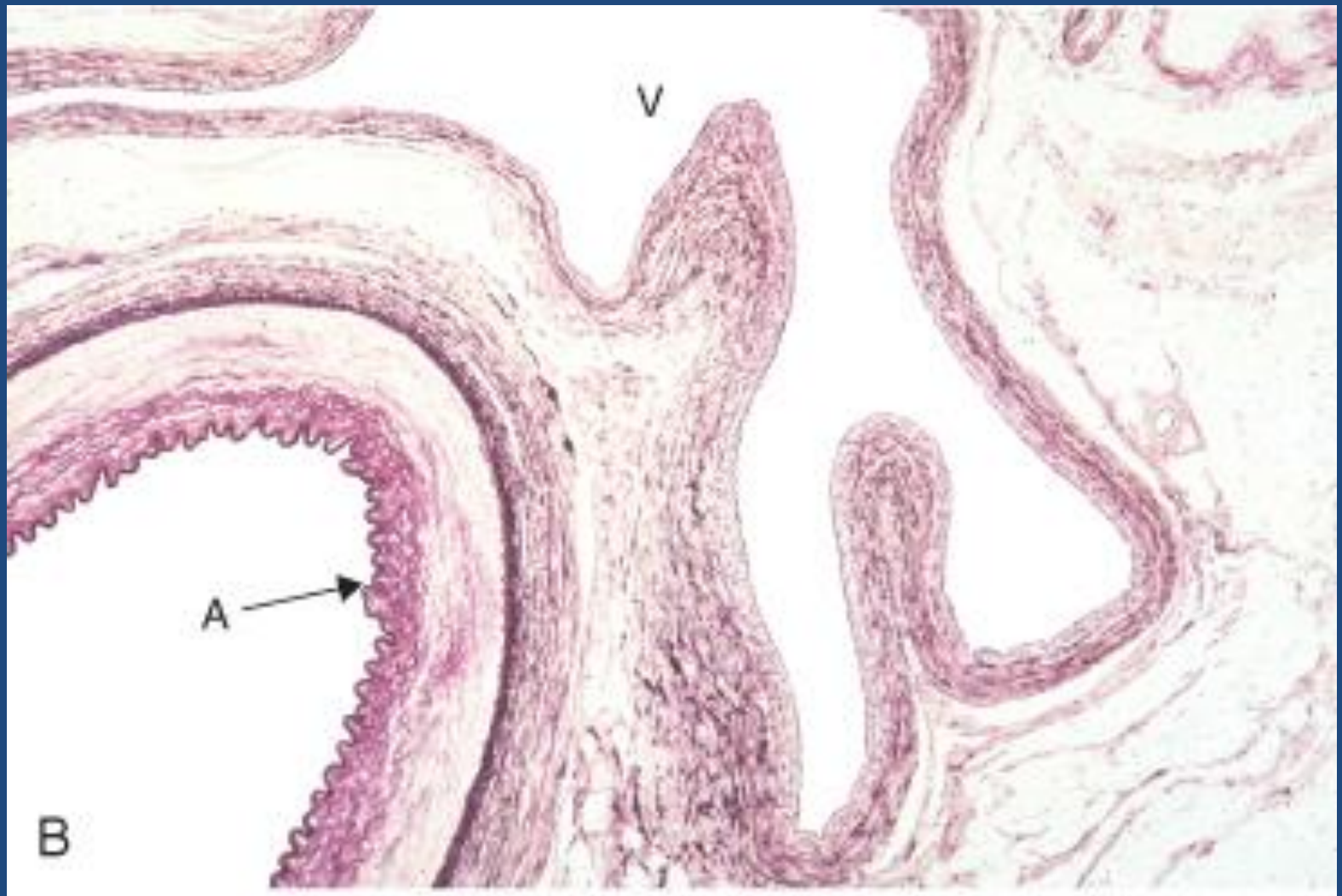
Vessel wall structure



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Atherosclerosis

- A type of arteriosclerosis
- Chronic inflammatory response in the walls of arteries
- Slowly progressive
- A build-up of fat (cholesterol) within the artery wall
- Characterized by intimal lesions called: atheromas, atheromatous or fibrofatty plaques

Atherosclerosis
Common sites

- Abdominal aorta
- Coronaries
- Popliteal artery
- The internal carotid arteries
- The vessels of the circle of Willis

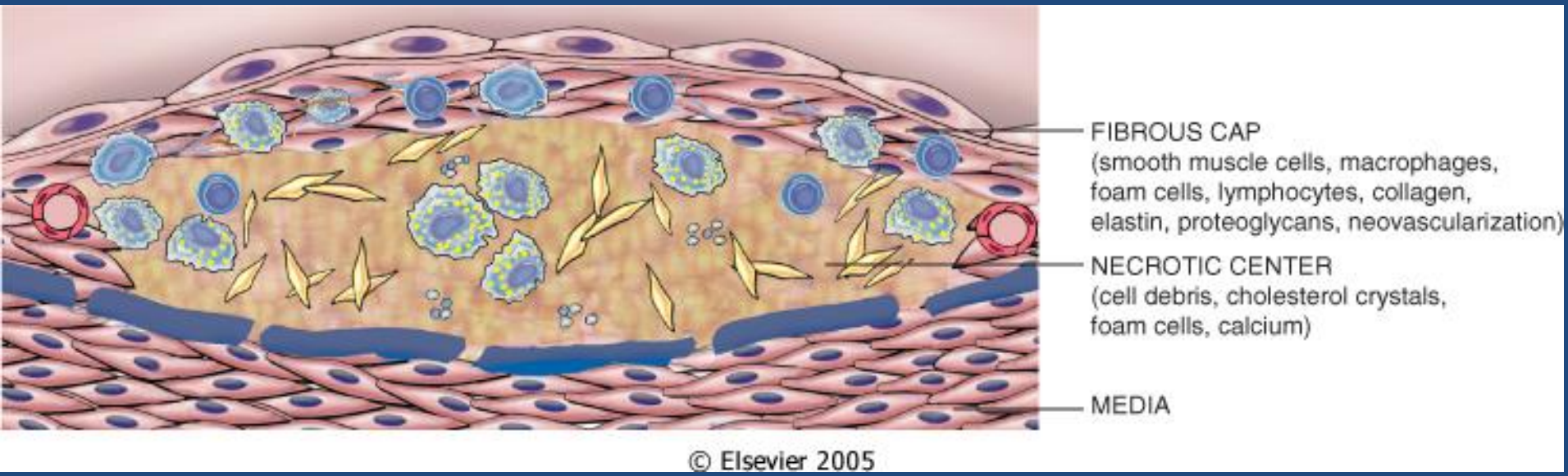
Atherosclerosis Risk factors

Major	Lesser, Uncertain, or Nonquantitated
Nonmodifiable	
Increasing age	Obesity
Male gender	Physical inactivity
Family history	Stress ("type A" personality)
Genetic abnormalities	Postmenopausal estrogen deficiency
	High carbohydrate intake
Potentially Controllable	
Hyperlipidemia	Alcohol
Hypertension	Lipoprotein Lp(a)
Cigarette smoking	Hardened (trans)unsaturated fat intake
Diabetes	*Chlamydia pneumoniae*

LDL Vs. HDL

- LDL cholesterol : deliver cholesterol to peripheral tissues
- HDL, "good cholesterol“: mobilizes cholesterol from developing and existing atheromas and transports it to the liver for excretion in the bile

Atherosclerosis
Fibrous cap



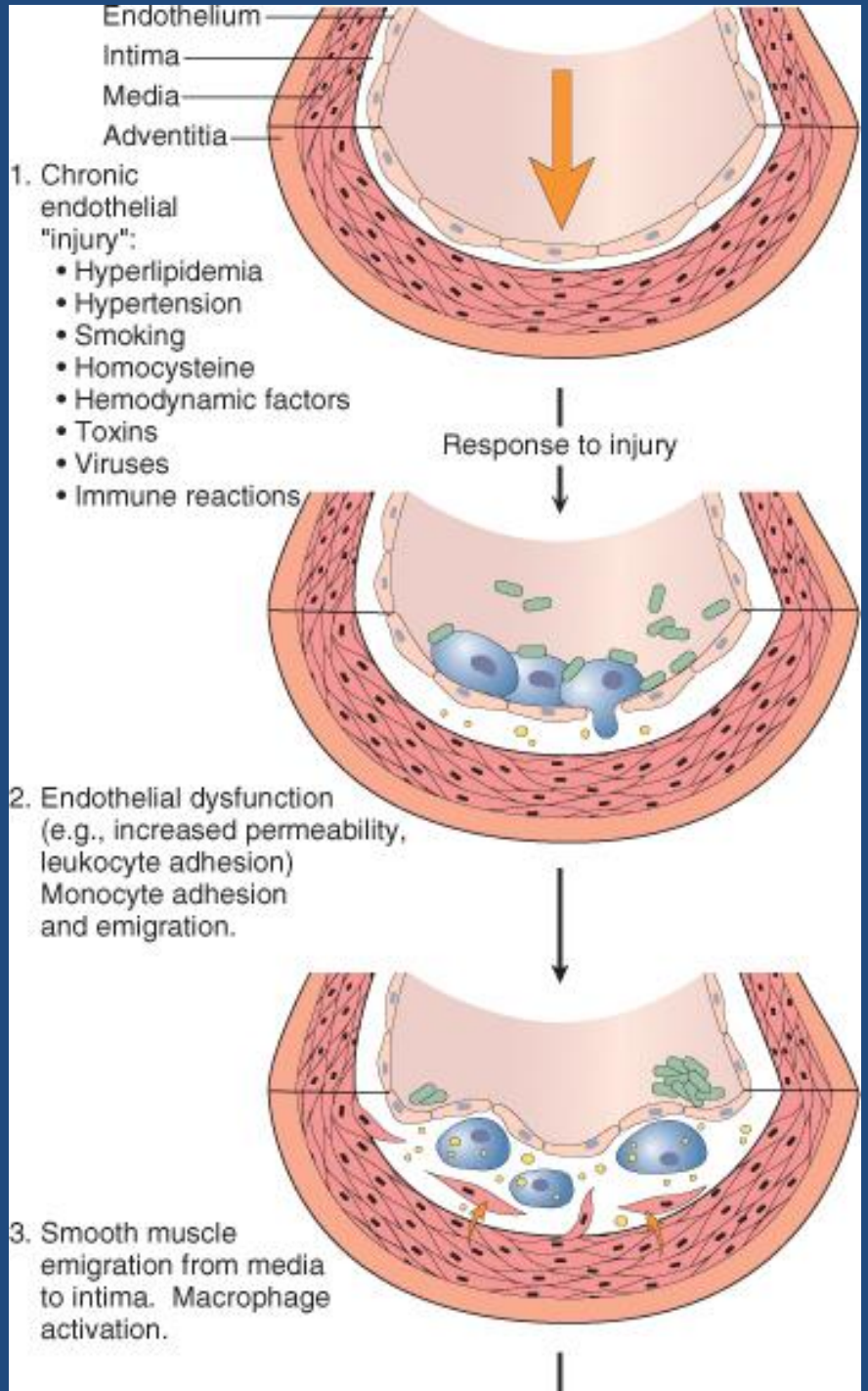
Atherosclerosis Pathogenesis

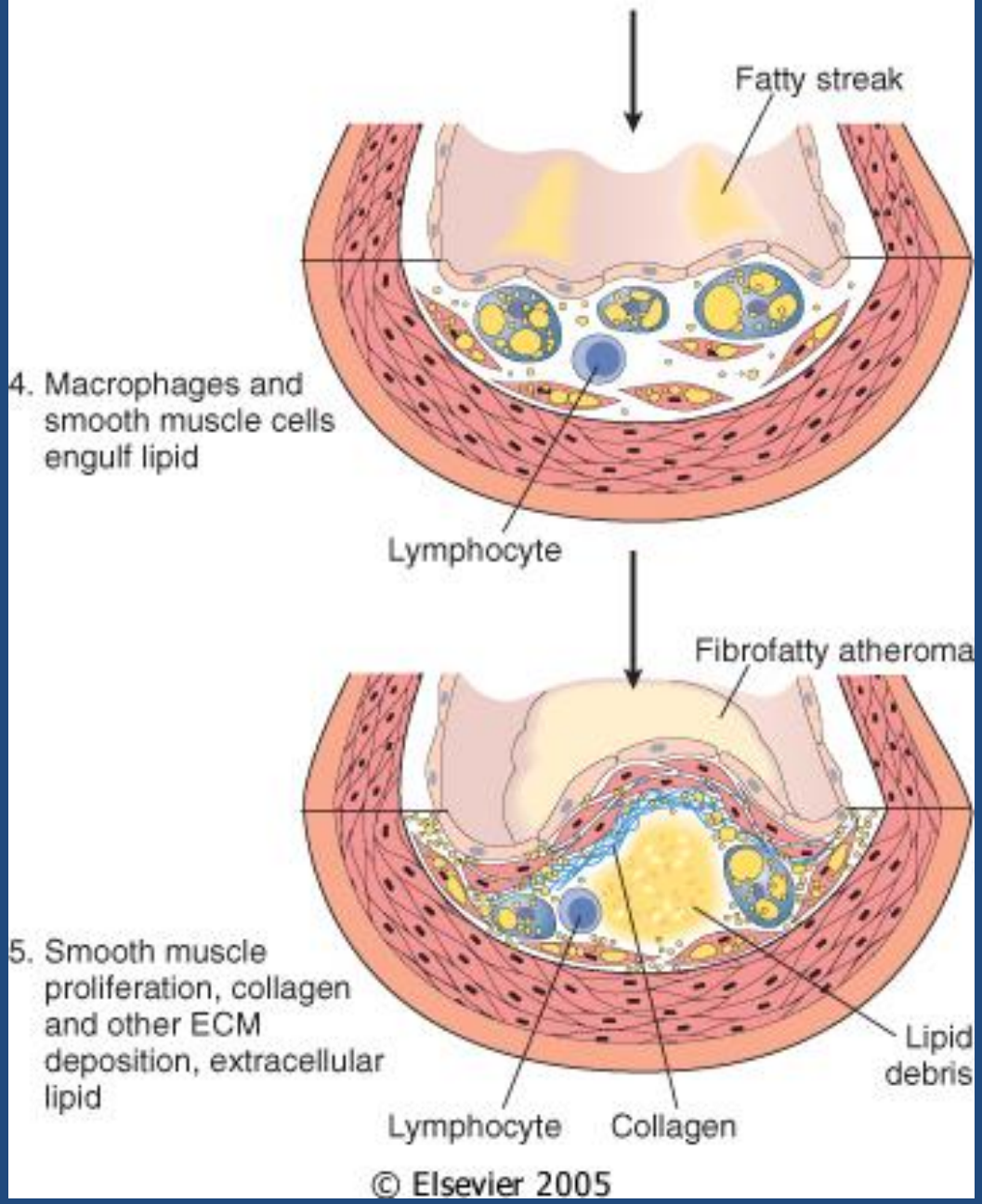
- The main components of a fibrofatty plaques:
  - Lipids
  - Extracellular matrix
  - Cells, Proliferating smooth muscle cells

Atherosclerosis Pathogenesis

response-to-injury hypothesis

- Endothelial injury
  - Not completely understood
  - Nevertheless, the two most important causes of endothelial dysfunction are:
    - Hemodynamic disturbances
    - Hypercholesterolemia
  - Inflammation is also an important contributor.
- Smooth muscle cell proliferation


Endothelium
Intima
Media
Adventitia
1. Chronic endothelial "injury":
• Hyperlipidemia
• Hypertension
• Smoking
• Homocysteine
• Hemodynamic factors
• Toxins
• Viruses
• Immune reactions
Response to injury
2. Endothelial dysfunction (e.g., increased permeability, leukocyte adhesion) Monocyte adhesion and emigration.
3. Smooth muscle emigration from media to intima. Macrophage activation.


Fatty streak
4. Macrophages and smooth muscle cells engulf lipid
Lymphocyte
Fibrofatty atheroma
5. Smooth muscle proliferation, collagen and other ECM deposition, extracellular lipid
Lipid debris
Lymphocyte
Collagen
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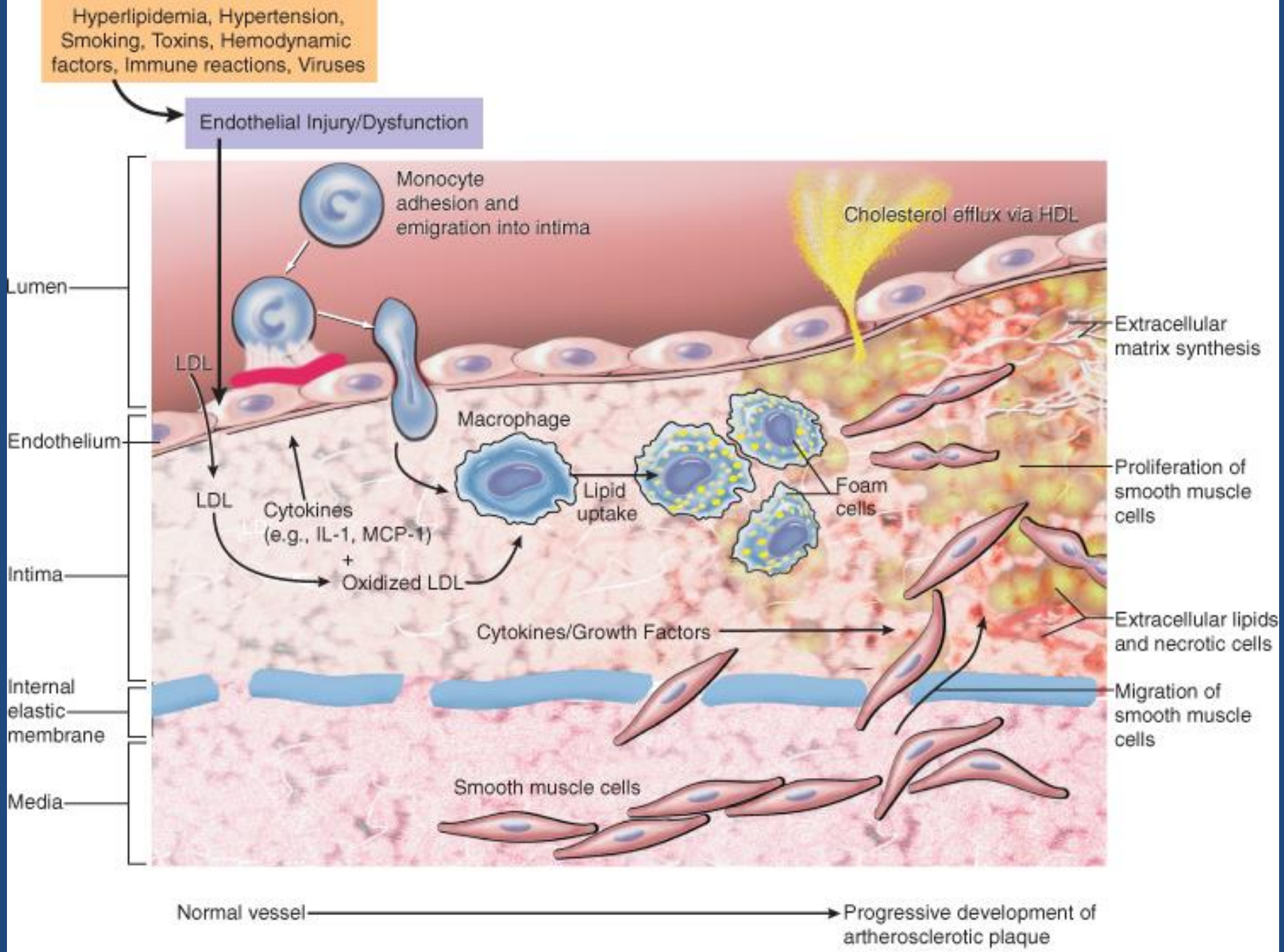
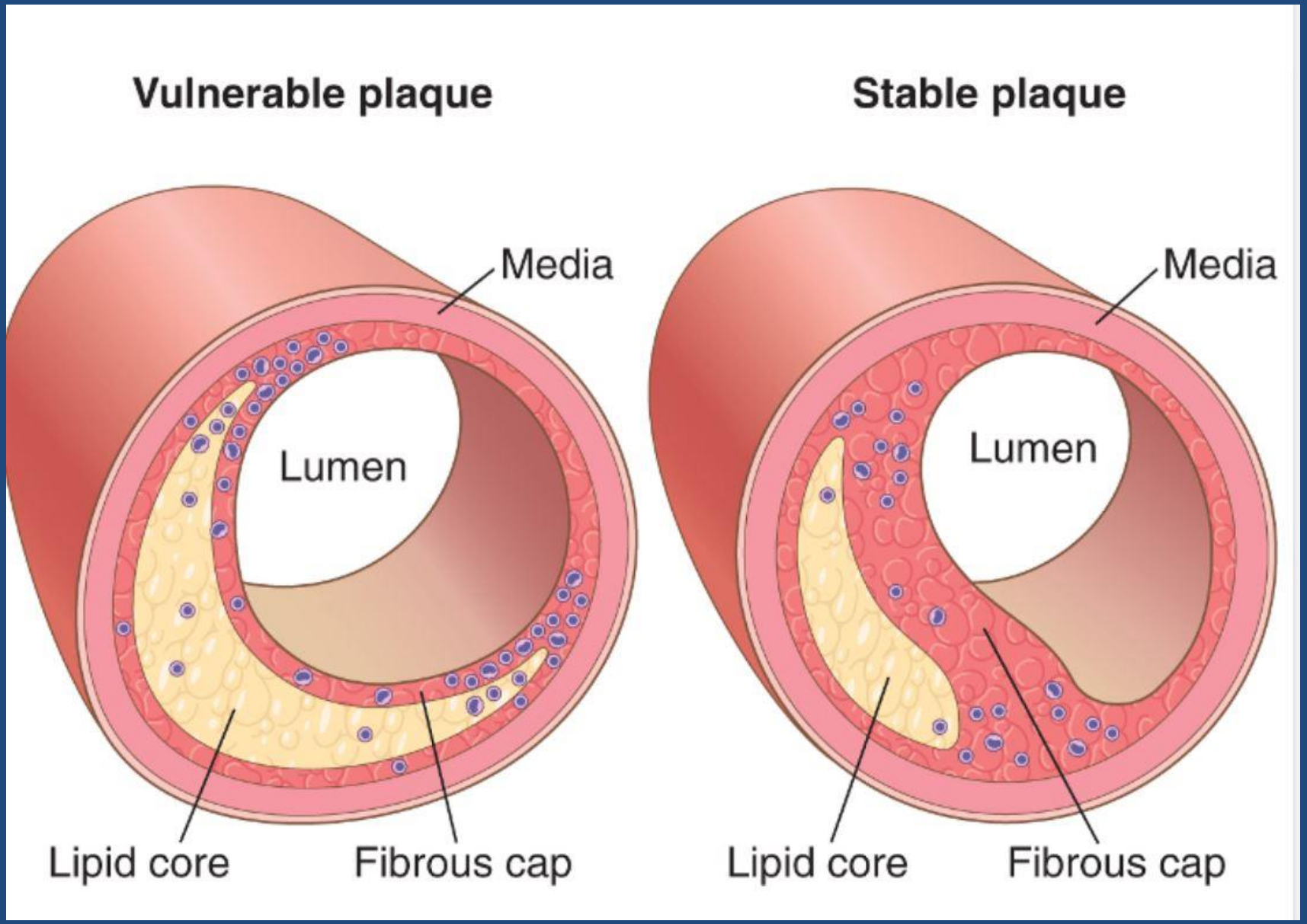
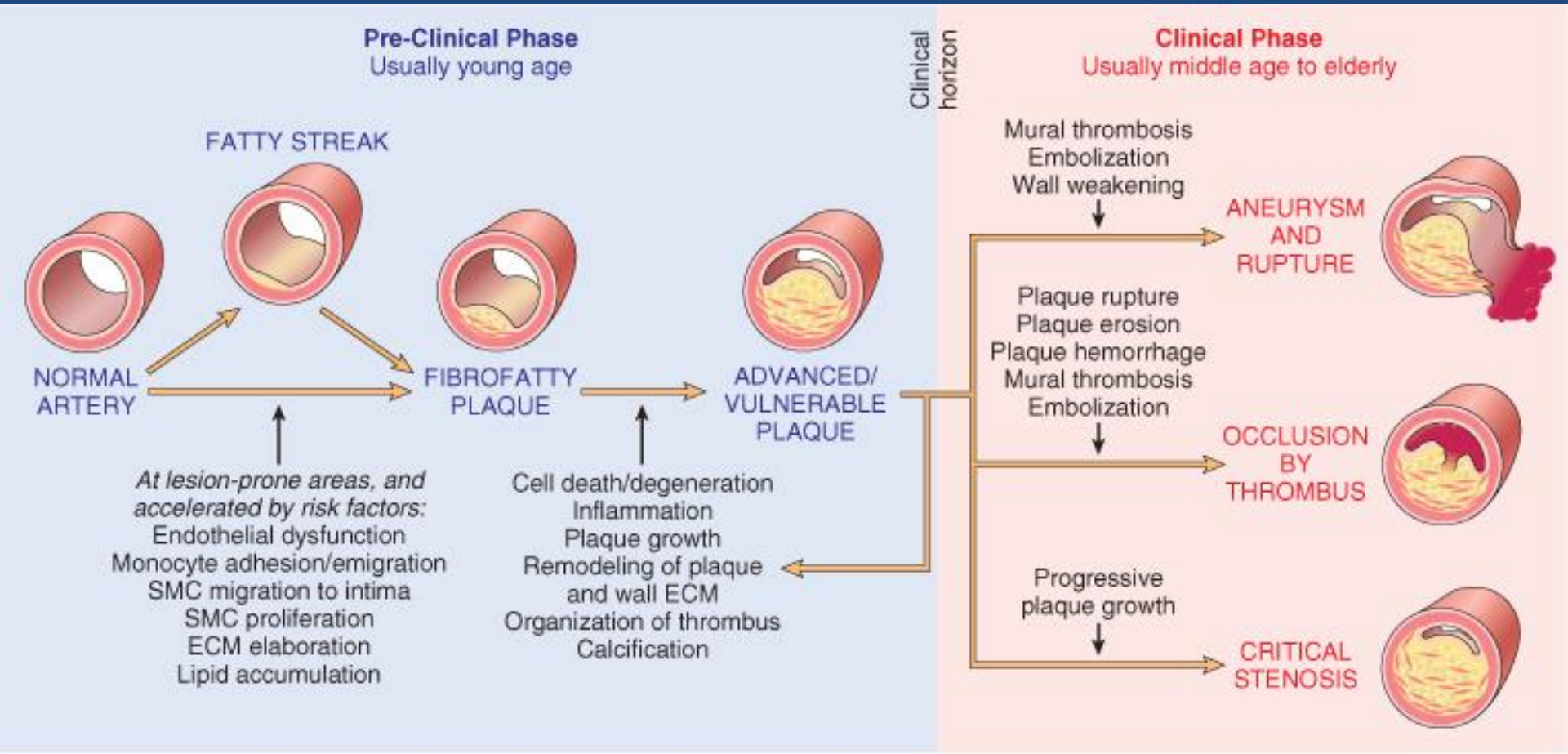



Vulnerable plaque
Media
Lumen
Lipid core
Fibrous cap
Stable plaque
Media
Lumen
Lipid core
Fibrous cap

Atherosclerosis
Consequences



Atherosclerosis
Clinical Complications

- Myocardial infarction (heart attack)
- Cerebral infarction (stroke)
- Aortic aneurysms
- Mesentric occlusion
- Peripheral vascular disease (gangrene of the legs)

Morphological changes that are seen on macro and microscopic levels in atherosclerosis

- Calcification
- Hemorrhage
- Fissure
- Ulcer
- Thrombosis
- Neovascularization
- Medial thinning
- Cholesterol microemboli
- Aneurysmal dilatation