Ischemic Heart Disease

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بسم الله الرحمن الرحيم

Learning Objectives:

1. Describe definition of Ischemic heart disease [IHD].
2. List Risk Factors of Ischemic Heart Disease [IHD].
3. Describe Etiology of Coronary Artery Disease .
4. List Factors Role Relation to IHD Pathogenesis.
5. Outline Types, Clinical Features, complications, Investigations, Management of Angina Pectoris And Myocardial Infarction.

❑ Description of Condition:

❑➔ Inadequate supply to myocardium

❑➔ Imbalance ➔ between blood + oxygen supply to myocardium and myocardial demand

❑➔Main cause of Majority of Ischemic Heart Disease (IHD) ➔ due to a Reduction of coronary blood ➔ because=obstructive Atherosclerosis of Coronary Artery

Thus:

Ischemic Heart Disease (IHD)

Also frequently known ➔ ➔ ➔ as:

Coronary Artery Disease (CAD)

Ischemic Heart Disease (IHD)=

Including 5 Conditions

1)Angina pectoris (chest pain) = Stable & Unstable

2)Myocardial infarction

3)Arrhythmia

4)Heart failure = after Chronic ischemic heart disease

5)Sudden Cardiac Death

ISCHEMIC HEART DISEASE

Pathogenesis:

1) **Critical stenosis or obstruction (>75%) of coronary arteries lumen.**
2) **Acute Plaque Changes:**

A.Rupture of plaque inside the lumen.

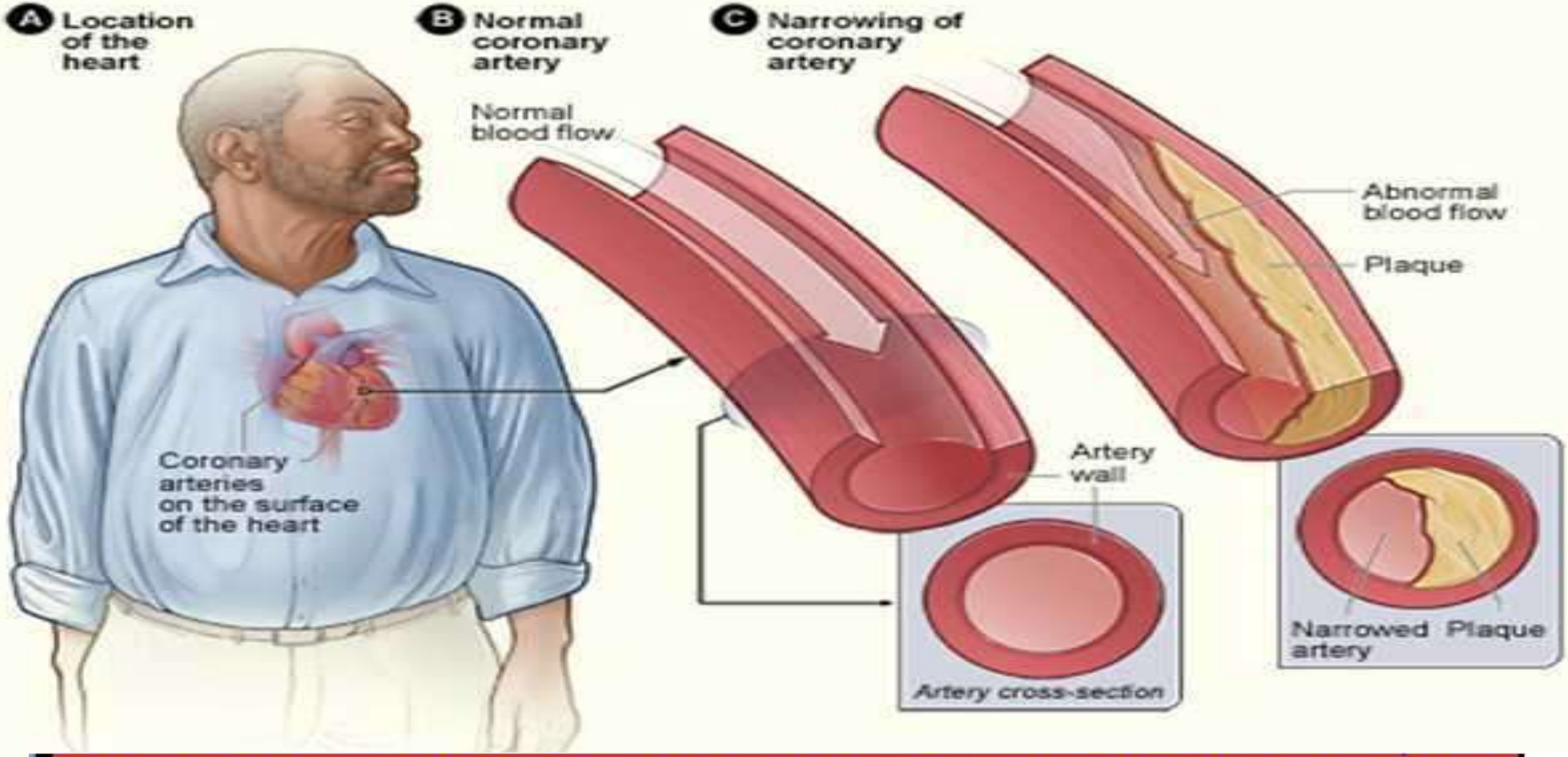
B.Hemorrhage inside the plaque.

→ → → Reduces lumen size → → →

3. Coronary thrombosis:→ Thrombosis on [partially stenosis] of coronary arteries lumen

→ IF → → → complete luminal obstruction → acute myocardial infarction.

→ IF → → → Incomplete luminal obstruction → acute sub-endocardial infarction + unstable angina



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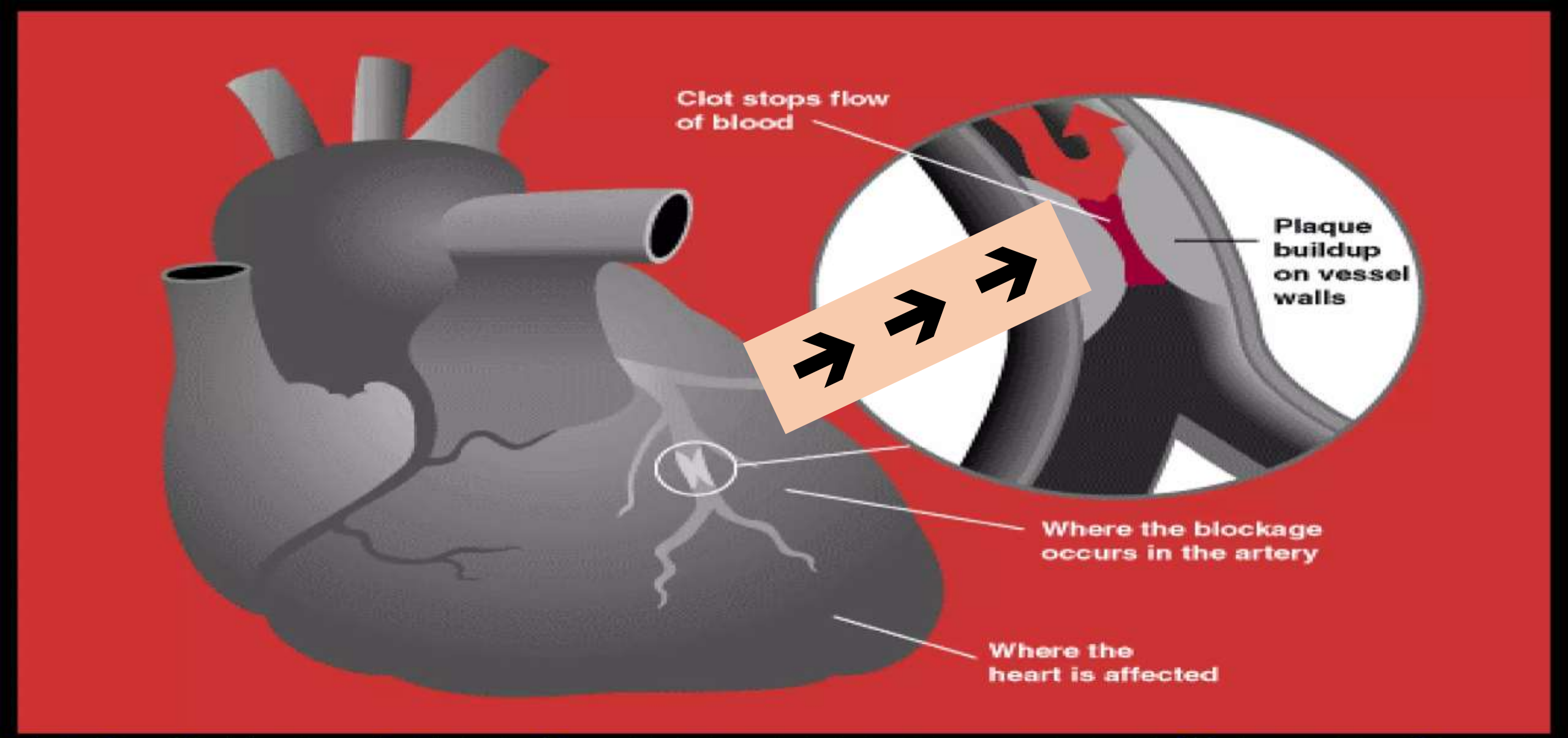
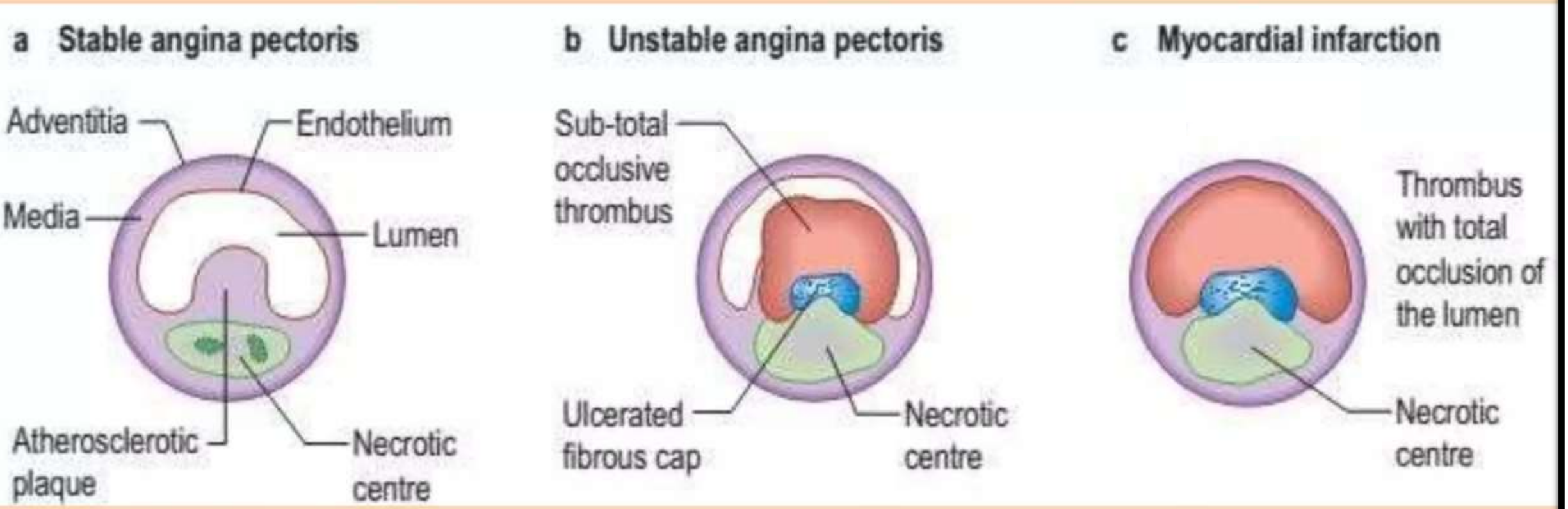


ISCHEMIC HEART DISEASE

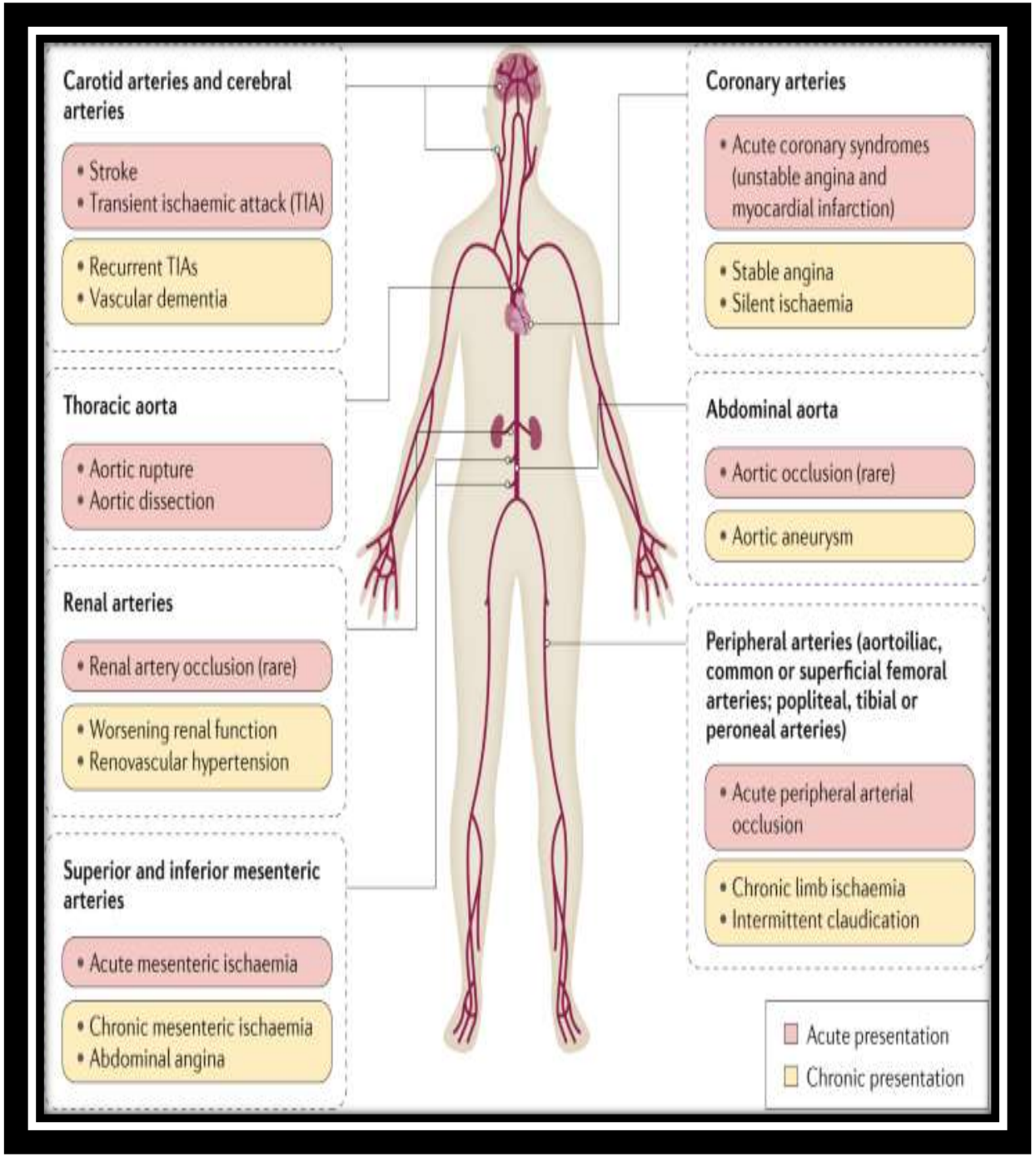
Advanced Atherosclerosis



Atherosclerosis:

Can affect any artery in the body:

1) • **Heart➔ Angina ➔ MI ➔ Sudden Death**
2) • **Brain➔ Transient Ischemic Attack[TIA]➔ Stroke**
3) • **Limbs➔ Claudication and Critical Limb Ischemia.**



Risk factors of Ischemic Heart Disease:
= *similar to* Risk factors of *Atherosclerosis:*

Absolute Risk =

1) Peak Age incidence=

60y for Men and 70y for women.

2) Sex incidence=

Men > women.

3) Positive family history

= Runs in families =

Because they shared :

genetic+ environmental + lifestyle

Relative Risk =

1) Hypertension.
2) Diabetes mellitus.
3) Smoking.
4) High Lipids+ Other dietary factors
5) Platelet activation and high fibrinogen
6) Lack of Physical activity/ exercise.
7) Obesity.
8) Alcohol
9) Stress.

الذبحة الصدرية

Angina Pectoris

* Definition:

Recurrent Paroxysmal Attacks

of Various Sub-Sternal Chest Discomfort feelings

- **Constricting** يمرده
- **Crushing** يسحقه
- **Squeezing** يعصره
- **Choking** يخنقه
- **Knife-like** يذبحه بالسكين
- **(referred pain) = May radiate to:**

the left arm or to the left jaw

* Cause:

Myocardial Blood Flow

Myocardial O2 Demands

Severe Chest pain

Transient inadequate myocardial perfusion

(=last for 15 seconds to 15 minutes)→ i.e. duration and severity not sufficient for → myocardial infarction.

Angina Pectoris

Location of chest pain during angina or heart attack

Upper chest

Substernal radiating to neck and jaw

Substernal radiating down left arm

Susternal radiating down left arm

Epigastric radiating to neck,jaw, and arms

Neck and Jaw

Left shoulder and down both arms

Intrascapular

Angina Pectoris:

Precipitating Factors

1– Common Activities:

- Physical exertion
- Cold exposure
- Heavy meals
- Intense emotions
- Sexual activity

2– Uncommon Activities:

- Lying flat (decubital angina) استلقائي
- Vivid dreams (nocturnal angina)احلام ليليه

4 Patterns of Angina Pectoris:

1) Stable Angina [SA]:

➔(more common)

➔ Attacks by trigger (= stress or exercise)

➔ stop by resting.

2) Unstable Angina [UA] = Acute Coronary Syndrome[ACS]:

➔(more serious)

➔ unpredictable attacks

➔(NO trigger)

➔ Attacks continued even after resting.

3) Variant Angina [VA] = Prinzmetal's Angina:

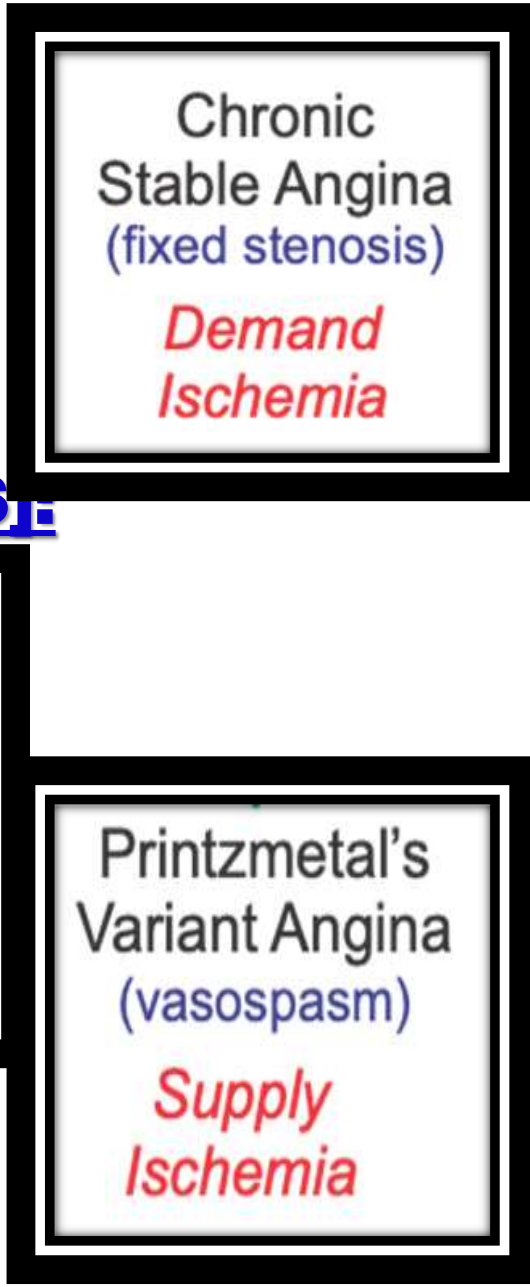
➔ NO trigger

➔ due to coronary artery spasm

➔ almost occurs➔ between midnight and early morning.

4) Refractory Angina [RA] :

➔ when revascularization of Severe Coronary Disease not achieved by medical therapy.



DIFFERENCE B/W STABLE & UNSTABLE ANGINA

STABLE ANGINA

- Due to fixed stenosis
- Demand-led ischemia
- Related to effort
- Symptoms over long term

UNSTABLE ANGINA

- Due to dynamic stenosis
- Supply-led ischemia
- Symptoms at rest
- Symptoms over short term

Clinical examination of Stable Angina

- **History=** The most important diagnostic factor is the description of pain
- **Physical examination=**

. Careful Search for:

- Valve disease (= aortic Valve stenosis)
- Left ventricular dysfunction (cardiomegaly, arrhythmia)
- Arterial disease (peripheral vascular disease)
- Other conditions exacerbate angina (anemia, thyrotoxicosis, hypertension, diabetes mellitus)

Investigations:

Non-Invasive Tests

1. Resting ECG:

- Often normal= even with severe CAD.
- In myocardial ischemia + symptoms:
- ➔➔ show Flat or Inverted T-wave
- ➔ ➔ But the most important evidence= ST Segment Depression or ST Segment Elevation (+ Inverted T-wave)

2. Exercise ECG =

Exercise tolerance test➔By doing standard treadmill or bicycle ➔ monitoring patient's ECG.

➔➔ST Segment Depression = indicate myocardial ischemia

Other Investigations:

- 3. Myocardial Perfusion Scanning
- 4. Stress Echo Cardiography
- 5. Coronary Arteriography

Is Done When:

1) Non-invasive tests failed to establish the cause of chest pain.

2) For Detailed information of extent of coronary artery disease [CAD]

Myocardial Infarction

5 Types of MI:

Type 1 – **MI at same time of ischemia** [due to a primary coronary event], e.g. plaque erosion/rupture, fissuring or dissection

Type 2 – **MI after ischemia** [due to increased oxygen demand or decreased supply]: coronary spasm, coronary embolism, anemia, arrhythmias, hypertension, or hypotension

Type 3 – Diagnosis after **Sudden Cardiac Death**

Type 4 – Diagnosis during **percutaneous coronary intervention (PCI)**

Type 5 – Diagnosis during **coronary artery bypass graft (CABG)**

Myocardial Infarction Symptoms

1) Cardinal Symptom=

➔ ➔ ➔ Prolonged Cardiac Pain:

2) Breathlessness

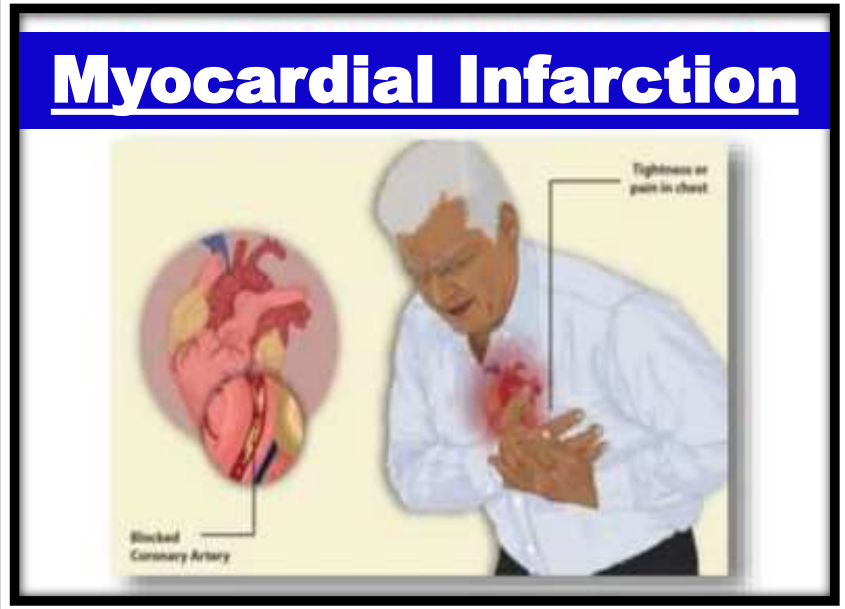
3) Anxiety

4) Pallor

5) Sweating

6) Oliguria

7) Vomiting



Myocardial Infarction SIGNS

1/// Sympathetic Activation=

- Tachycardia

•2///Vagal Activation=

- Bradycardia

3///Impaired Myocardial Function=

- Syncope
- Hypotension
- cold peripheries
- Weak Pulses
- Raised Jugular Vein Pressure
- Third heart sound
- Lung crepitation

Complications of of Myocardial Infarction

1. Cardiac arrhythmia: ➔ >90% of cases➔ Sudden death

2. Acute Left ventricular failure.

3. Acute Cardiogenic shock.

4. Acute Myocardial rupture and hemopericardium.

5. Pericarditis

6. Chronic heart failure.

6. Thrombo-Embolism: =weak ventricle contractility (➔stasis)

7. Ventricular aneurysm.

8. Rupture of =

1) **papillary muscle**
2) **interventricular septum**
3) **ventricle**

Early Medical Management :

➔ urgent hospital admission ➔ because:

1➔ High risk of death

2➔ Recurrent myocardial ischemia➔ 60% Reduced

➔Brief history and Examination of risk factors

➔ If Hypoxia= Oxygen

➔ Assessment for blood cardiac markers

➔ Immediate Intravenous Access

Investigations of Myocardial Infarction :

1)Electrocardiography [12-lead ECG]

Purposes:

- ➔Confirmation = diagnosis
- ➔ If initial ECG normal =in 1/3 of MI cases ➔ Repeat ECGs
- ➔ Best ECG changes= Leads that on the affected area

2)Echocardiography:

Purposes:

1■– Assess left and right ventricular size + function:

1) An enlarged heart or thick ventricles.
2) Weakened heart muscles.

2■– Detect important complications:

1) Problems with heart valves= mitral stenosis + regurgitation .
2) Heart defects present since birth= Atrial + Ventricular septal defect.
3) Blood clots or tumors
4) cardiac rupture
5) Pericardial effusion.

3)Lab. Evaluation of Plasma Cardiac Markers:

❑ **The first to rise**

= most specific test :

1. Troponins: Stay after CK-MB returned to normal.

❑ **Raised after 2 - 4 hr of MI → remains for 7 - 10 days.**

2. Creatine kinase (CK-MB): At early stage of an MI

❑ **Raised after 2 - 4 hr of MI → remains for 1 - days.**

❑ **The Second to rise:**

3. Aspartate AminoTransferase (AST):

❑ **The Third to rise:**

4. Lactate dehydrogenase (LD1):

❑ **Raised after 2 - 4 hr of MI → remains for 3 days.**

4) Other blood tests:

A)Erythrocyte Sedimentation Rate (ESR) = elevated

B) C- Reactive Protein (CRP) = elevated

5) Chest X-ray=

A) Pulmonary edema

B) Heart size =

Often normal

➔ ➔ ➔

May be

Cardiomegaly

The Main Used Therapies :

1– Analgesia= morphine or diamorphine

2 – IV Anti-emetics=Anti-vomiting= metoclopramide

3– Anti-Anginal therapy= relieve pain, reduce arrhythmias

A– glyceryl trinitrate (Sublingual)

B– isosorbide dinitrate

C– β-blockers=Atenolol or Metoprolol

D – Add=

1– Calcium Channel blockers to β-blockers

2– Verapamil and diltiazem to β-blockers

= if β-blocker contraindicated

4– Antithrombotic Therapy=

A…. Antiplatelet therapy:

– Aspirin or clopidogrel

– Aspirin + clopidogrel

– Ticagrelor = more effective than clopidogrel

B…Anticoagulants:

➔ until coronary re-vascularization

1. Heparin
2. Penta Saccharide

5–Reperfusion Therapy To the MI Area

By Thrombolytic agents

1) Alteplase
2) Tenecteplase
3) Reteplase
4) Streptokinase

Later in the Management of MI:

- ❑ Stop smoking
- ❑ Regular exercise (weight control)
- ❑ Diet (lipid-lowering)
- ❑ Prevention drug therapy:

1. – Antiplatelet therapy (aspirin and/or clopidogrel)
2. – β-blocker
3. – ACE inhibitor= Angiotensin Converting Enzyme inhibitor
4. – Statin = (lipid-lowering)

- ❑ Drug to control diabetes and hypertension
- ❑ – For high-risk patients=Implant cardiac defibrillator

References:

- Davidson's Principles and Practice of Medicine 21st Ed
- Kumar and Clark's Clinical Medicine 8th Ed. (2012)
- Harrison's Principles of Internal Medicine, 18th ed

THANKS FOR YOUR LISTENING