The Cardio-VASCULAR System

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

Lec #: 8

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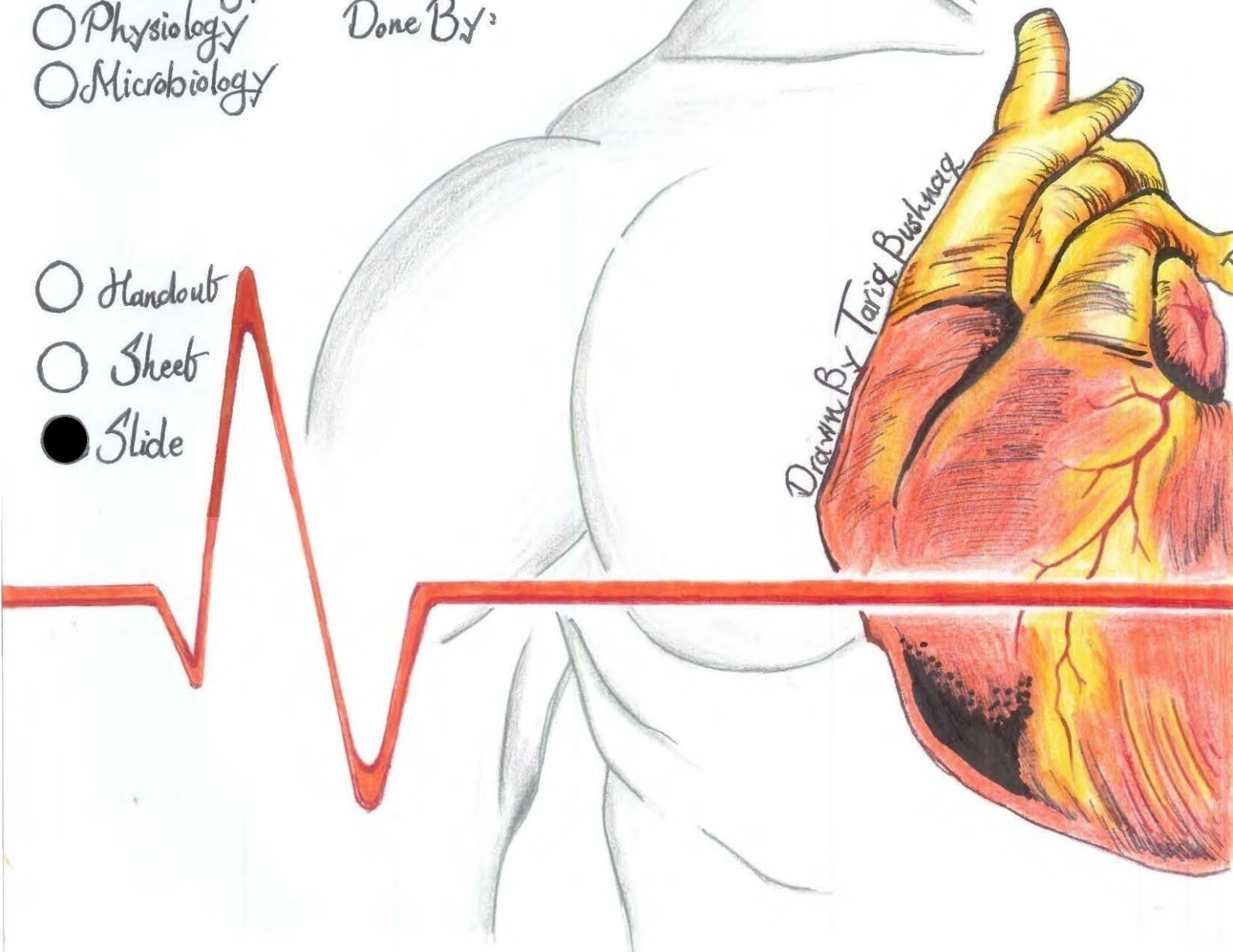
- ○ Handout
- ○ Sheet
- ● Slide



Ischemic heart disease

- **Heart disease remains the leading cause of morbidity and mortality in industrialized nations.**

- **40% of all deaths in the U.S.A (nearly twice the number of deaths caused by all forms of cancer combined).**

- **The yearly economic burden of ischemic heart disease (IHD) alone is in excess of $100 billion.**

ISCHEMIC HEART DISEASE (IHD)

- IHD = coronary artery disease (CAD)
- IHD is a generic description for a group of related syndromes resulting from myocardial *ischemia* (***an imbalance between cardiac blood supply (perfusion) and myocardial oxygen demand***.

Ischemia can result from:

1- reduction in coronary blood flow caused by obstructive atherosclerotic disease → 90 % of cases

2- increased demand (e.g., tachycardia or hypertension)

3-diminished oxygen-carrying capacity (e.g., anemia, carbon monoxide poisoning)

There are four basic clinical syndromes of IHD:

1-Angina pectoris

ischemia causes pain but is insufficient to lead to death of myocardium

2-Acute myocardial infarction (MI)

the severity or duration of ischemia is enough to cause cardiac muscle death

3-Chronic IHD

progressive cardiac decompensation (heart failure) following MI

4-Sudden cardiac death (SCD)

can result from a lethal arrhythmia following myocardial ischemia.

There are four basic clinical syndromes of IHD:

1-Angina pectoris

- Angina pectoris is intermittent chest pain caused by transient, reversible myocardial ischemia (ischemia causes pain but is insufficient to lead to death of myocardium)

-pain→ a crushing or squeezing substernal sensation

- radiate down the left arm or to the left jaw *(referred pain).*

Types of angina :

***1-stable* angina** (occur after certain levels of exertion)

2-variant angina or Prinzmetal angina (due to vessel spasm)

3-*Unstable* angina

occurring with progressively less exertion or even at rest.

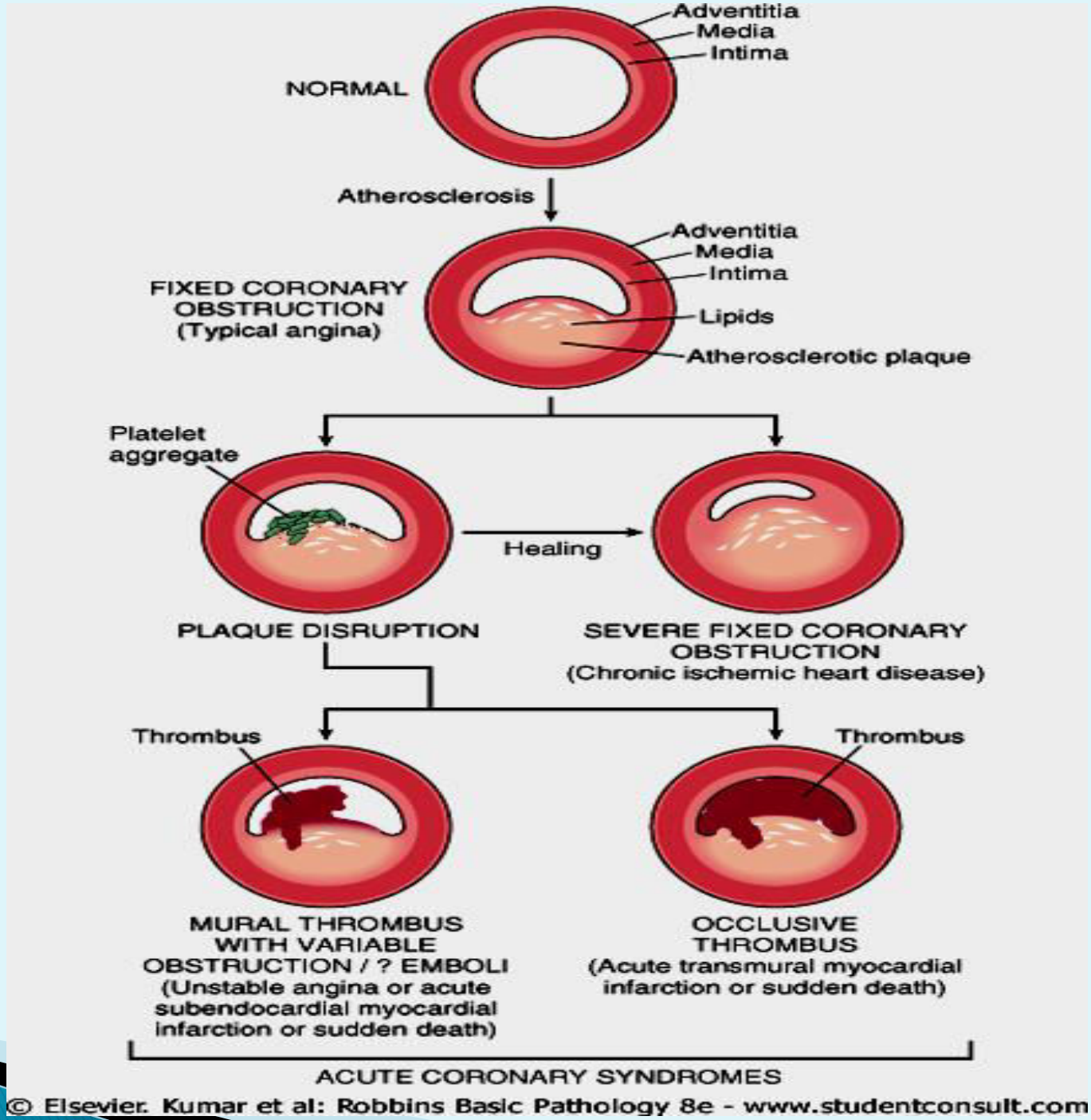
Pathogenesis of angina

- **atherosclerotic occlusion of coronary arteries and <u>new superimposed thrombosis and/or vasospasm</u>**

-lesion obstructing <u>*75%*</u> or more of a vessel lumen = critical stenosis → cause angina only <u>in the setting of increased demand</u>

-a fixed 90% stenosis can lead to inadequate coronary blood flow even <u>at rest</u>.

Pathogenesis



Acute vs chronic vascular insuffeciency

- **Chronic coronary occlusion**

  when a coronary artery develops atherosclerotic occlusion at a sufficiently slow rate, it may be able to stimulate collateral blood flow from other major epicardial vessels → protection against MI even in the setting of a complete vascular occlusion.

- **Acute coronary occlusions**

  cannot spontaneously recruit collateral flow and will result in infarction

Clinical Features of angina & MI

1) Severe, crushing substernal chest pain
2) Discomfort that can radiate to the neck, jaw, epigastrium, or left arm.

- angina pectoris→ pain < 20 minutes and relieved by rest or nitroglycerin
- MI→ pain lasts from 20 minutes to several hours and is not relieved by nitroglycerin or rest.

- 3) MIs can be entirely asymptomatic in 10% to 15% of the **cases (silent infarcts)**➔ particularly common in patients with:

  1- underlying diabetes mellitus (due to peripheral neuropathies)

  2- in the elderly

4- the pulse is rapid and weak

5- patients nauseated particularly with posterior-wall MIs.

6- dyspnea is common (impaired myocardial contractility and dysfunction of the mitral valve apparatus, with resultant pulmonary congestion and edema).

7- massive MIs (>40% of the left ventricle)→ cardiogenic shock .

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1-Typical or *stable angina*

-is episodic chest pain associated with exertion or some other form of increased myocardial oxygen demand (e.g., tachycardia or hypertension due to fever, anxiety, fear).

1-Typical or *stable angina*

- **usually associated with critical atherosclerotic narrowing (≥75%) of one or more coronary arteries.**
- **the myocardial oxygen supply may be sufficient under basal conditions but cannot be adequately augmented to meet any increased requirements (exertion, emotional stress..etc)**

1-Typical or *stable angina*

- **The pain is relieved by rest (reducing demand) or by administering agents such as nitroglycerin;**
- **such drugs cause peripheral vasodilation and thus reduce venous blood delivered to the heart → reducing cardiac work.**
- **in larger doses, nitroglycerin also increases blood supply to the myocardium by direct coronary vasodilation**

2-Prinzmetal, or variant angina

- **Is angina occurring at rest due to coronary artery spasm.**
- **completely normal vessels can be affected.**
- **The etiology is not clear.**
- **Treatment: administration of vasodilators such as nitroglycerin or calcium channel blockers.**

3-Unstable angina (crescendo angina)

- characterized by **increasing** **frequency** of pain, precipitated by progressively **less** exertion.
- the episodes also tend to be more **intense** and **longer** lasting than stable angina.
- **associated with plaque disruption; superimposed partial thrombosis; distal embolization; vasospasm.**
- an indication of more serious, potentially irreversible ischemia (if complete luminal occlusion by thrombus)
- ***Called pre-infarction angina***