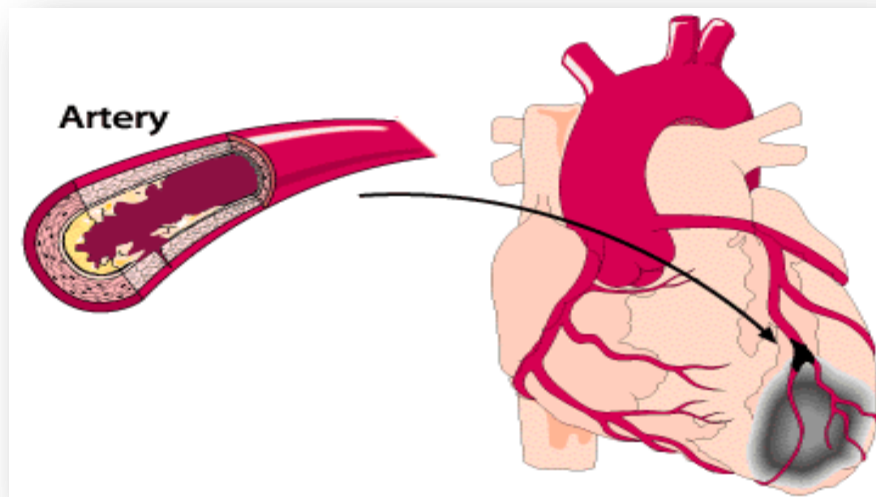


Case 2

Because of sudden severe pain





New terms

Plaque: a buildup of fatty, and deposits within the wall of an artery

Feels sick: a feeling that he will vomit

Antacid syrup: An antacid is a substance, which neutralizes stomach acidity.

Triglycerides: as a blood lipid, it helps enable the bidirectional transference of adipose fat and blood glucose from the liver.

Blood lipids: are lipids in the blood, either free or bound to other molecules

Skin vesicles: small sac or cyst containing liquid or gas on the skin

A defibrillator: is a common treatment for life-threatening cardiac arrhythmias, ventricular fibrillation and pulseless ventricular tachycardia.

Oximeter: a device that measures the oxygen saturation of arterial blood in a subject by utilizing a sensor attached typically to a finger.

Cardiac monitor: The phrase cardiac monitoring generally refers to continuous monitoring of the heart activity, which monitors the pressure and flow of blood within the circulatory system.

Morphine: analgesic drug used to relieve intense pain and suffering

ST segment: In electrocardiography, the **ST segment** connects the QRS complex and the T wave and has duration of 0.080 to 0.120 sec and the T wave and has duration of 0.080 to 0.120 sec

Myocardial ischemia: when blood flow to your heart muscle is decreased by a partial or complete blockage of your heart's arteries (coronary arteries). The decrease in blood flow reduces your heart's oxygen supply.



○ Scenario

A 56-year-old male who works as a bank manager is brought to the ER due to **severe sudden chest pain** that he says feels like “a heavy a stone was place on his chest. He says that **he feels the pain in his shoulders, chin and left arm**. He tells the doctor that he **feels unwell** and is **sweating** even though it’s winter. The patient has been **obese** since childhood and **has smoked 20 cigarettes a day for the past 20 years**. He had previously **taken antacid serum** without consulting a doctor to manage his symptoms but it **did not help**. His **father and two uncles died suddenly** at around the ages of 45-early 50s.

○ Clinical examination:

He was given a small dose of morphine (an analgesic) IV for his chest pain

○ Cardiovascular examination:

- First and second heart sounds → normal
- Fourth heart sound → heard at the apex
- No cardiac murmurs
- ECG: Raised ST segment

○ Investigation

Vital signs	Mansur	Normal range
Blood pressure	95/65	100/60-135/85 mmhg
Pulse	115 regular	60-100/min
Respiratory rate	19	12-16/min
Temperature	36.9	36.6-37.2 C

Blood test	Mansur result after 1 hour	Mansur results after 6 hours	Normal range
Creatine kinase (CK)	130	1400	30-200
Creatine kinase –MB isoenzyme (CK-MB)	4%	20%	5%<
Troponin T	0	0.25	0-0.03 ng/ml

○ Treatment

He has atherosclerosis (**Myocardial infarction**) and is commenced on:

- **IV Heparin** (inhibits further formation of blood thrombi)
- **Ateplase** (prevents recurrent thrombus formation)

Two drugs work together to maintain the flow of blood in coronary artery.

- **Glyceryl trinitrate IV infusion** (opposes coronary spasm)
- **Prepares him to join the cardiac rehabilitation program.**
- **Surgical intervention** (if necessary)

Physiological factors affecting coronary blood flow

1- Auto regulation:

Flow is tightly coupled to oxygen demand, so auto regulation will maintain coronary blood flow whenever perfusion pressure changes due to aortic pressure

2- Chemical factors:

- **Adenosine** (An important coronary vasodilator)
- **NO** (Nitric Oxide)
- **Other chemical factors:** hypoxia, excess CO₂, H⁺, lactic acid

3- Nervous regulation:

- **Sympathetic activation** increased coronary flow
- **Parasympathetic activation** decreases coronary blood flow.

How cholesterol and triglyceride are transported in blood and atherosclerosis develops

Cholesterol is transported to the tissues mainly by **Low-density lipoproteins (LDL)**, which is **atherogenic**. **Triglycerides** are transported by **chylomicrons** **mainly** (they're of dietary origin) and **very low density lipoprotein (VLDL)** (they're of hepatic origin).

If there is an imbalance between oxidants and antioxidants, LDL get oxidized into **oxLDL** > uptake by macrophages scavenger receptor class A (SR-A) > **foam cell transformation** > atherosclerotic plaque formation.

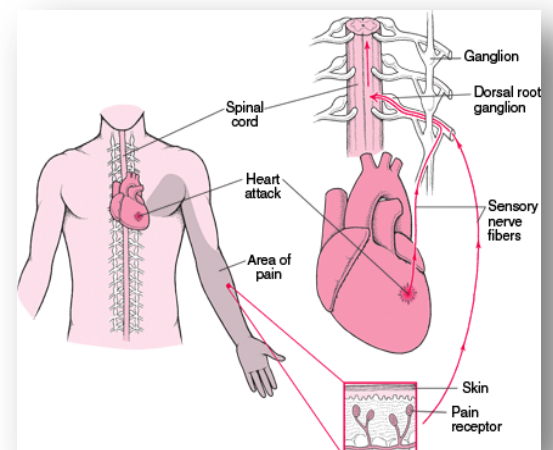
Myocardial infarction and Atherosclerosis

Sign and symptoms:

- 1- severe crushing sub-sternal chest pain, which may radiate to left arm, neck, jaw, epigastrium and shoulder due nervous system
- 2- pulse is rapid and weak
- 3- hypotension
- 4- diaphoresis (excessive sweating) due to low cardiac output
- 5- dyspnea and ECG changes (ST segment elevation and Q is negative)

Pathogenesis of MI

Risk factors > Atherosclerosis > Plaque rupture or Thrombus formation > Blocked artery > Myocardial Infarction





Pathogenesis of atherosclerosis

Foam cells > Fatty streak > intermediate Lesion > Atheroma (mainly cholesterol and cholesterol esters, with necrotic debris) > Fibrous Cap > completed Lesion > rupture of the vessel > Thrombosis.

Risk factors:

Nonmodifiable (Constitutional)
Genetic abnormalities
Family history
Increasing age
Male gender
Modifiable
Hyperlipidemia
Hypertension
Cigarette smoking
Diabetes
Inflammation

enzyme elevation in MI

	Elevated by	Peak	Returns to Normal by
CK-MB	4-8 h	18 h	2-3 days
Cardiac-specific troponin I & T	3-6 h	16 h	7-10 days
LDH	24 h	3-6 days	8-14 days

How smoking affects health

As the smoke moves more deeply into the respiratory tract, more soluble gases are adsorbed and particles are deposited in the airways and alveoli. The substantial doses of carcinogens and toxins delivered to these sites place smokers at risk for malignant and nonmalignant diseases.

Questions

1-What is the overall process of the development of myocardial infarction?

Risk factors > atherosclerosis > Plaque rupture or Thrombus formation >

Blocked artery > Myocardial Infarction.

2-What are some of the risk factors that appear when developing cardiovascular diseases?

- Diabetes
- Obesity, High blood pressure,
- Low blood levels of HDL,
- Advanced age,
- High blood level of cretin lipids (Cholesterol, LDL, and triglyceride).

3-What is the principal use of Heparin?

It is used as an Anticoagulant.



4-What are the symptoms of myocardial Infarction?

- Sweating a lot.
- Sudden severe chest pain.
- Feeling sick.

5-List some of the factors affecting coronary blood flow?

1. Autoregulation.
2. Nervous regulation.
3. Chemical factors E.g. (Adenosine, Nitric Oxide, hypoxia, excess CO₂, H⁺, lactic acid).

6-What are the laboratory tests that would help in the diagnosis of myocardial infarction?

- Creatine kinase (CK-MB) levels.
- Troponin levels.
- Myoglobin levels.
- Lipid profile.
- Complete blood count (CBC).
- C-reactive protein & other inflammation markers.

7-What is the function of coronary angiography?

A test that uses a dye and a special X rays to show the insides of your coronary arteries, to see if the patient needs any surgical management.

8-What is the drug, which is given with heparin to prevent recurrent thrombosis and to work together with heparin to maintain the flow of blood in the coronary arteries?

Alteplase (t-PA; tissue plasminogen activator).

9-A type of cardiac enzymes that usually remains elevated for 10-14 days?

Troponin T and I.

10-A drug that opposes coronary spasm augments coronary blood flow and reduces cardiac work by decreasing the preload and afterload?

Glyceryl trinitrate (GTN).



Thank you for choosing to study from our teamwork. Here's hoping we covered all aspects of the case.
Best of luck,

Nora AlHelali

Nourah Al-Beeshi

Manal AlHamdan

Najd AlOmran

Nouf AlHarbi

Rasha Bassas

Sara AlJasser

Mosaad AlBawardi

Abdulla AlOlaiwey

Abdulla AlBasha

Omar AlRhainy

Salman AlGazan

Abdulrahman AlKaff

Hussain AlKaff