

3] Myocardial infarction: Occurs when there is zero flow or so little flow that it can't sustain cardiac muscle function, Occlusive thrombus (خثرة دوائية) in a coronary artery.

Clinical feature: - pain (severe, lasts longer), breathlessness, vomiting, collapse, syncope (سبات).

Investigations: - (التحولات) ⇒ I] ECG: - partial thickness infarction → ST/T wave change, transmural infarction → ST elevation and Q waves.

2] biochemical markers (Troponine I, T and CK-MB)

3] Chest radiography (صورة صدر) → imaging the entire chest area →

(يظهر إذا كان مكان الخثرة) 4] cardiac ultra sound (US) (صوت قلب)

Management: (العلاج)

I] Immediate access to hospital 2] High-flow oxygen

3] ECG monitoring 4] IV analgesia (مسكن ألم) and antiemetic (مضاد للغثاس)

5] detect and manage acute complication (مضاعفات حادة)

1] arrhythmia 2] ischemia 3] heart failure 4] acute circulatory

Failure (فشل جهاز الدوران) 5] pericarditis (inflammation in pericardium)

6] Embolism (move the clotting)

Causes of death in Myocardial infarction:

1] decreased cardiac output → (no blood flow in pulmonary and systemic

vein). 2] Damming of blood in the pulmonary or systemic vein.

3] Fiberrillation 4] rupture of the heart 5] heart rate more than 160

Surgical treatment of coronary disease:

1] Aortic-coronary bypass surgery → revascularization

2] Coronary angioplasty → pulman → (توسيع)

side and moves to shoulder and neck in left side and it is like chocking pain. and as squeezing (special pain)

What are a Medication given to a patient with angina?

Nitrate to help dilate blood vessel to improve blood flow to the heart.

Antiplatelet drug to prevent blood clot formation.

Calcium antagonist to help relax blood vessel.

B-adrenergic blocker to reduce blood pressure and heart rate.

1) **stable angina**:- effort (emotional stress, exercises) related chest discomfort (pain in the chest region).

Characteristics:- heaviance, pressure, squeezing, smothering (ضيق) chocking pain.

Cause of stable angina:-

1) coronary artery disease. (CAD).

2) other heart disease :-

1) aortic valve disease → lipid accumulation → compression on the valve → reduce valve size → stenosis.

2) Hypertrophic cardiomyopathy → myocardium surround the chamber → responsible for the contraction → increase thickness to myocardium → increase the compression → necrosis the myocyte.

⇒ the stable angina is caused by coronary artery narrowing due to atherosclerosis.

Stable angina :- coronary artery disease.

Acute coronary syndrome :- Unstable angina and myocardium infarction.

Subendocardial infarct  $\Rightarrow$  type from myocardial infarction

- $\rightarrow$  ST segment depression or ST segment non-elevation.
- $\rightarrow$  effect on the tunica interna layer just.

Transmural infarct  $\rightarrow$  type from myocardial infarction

- $\rightarrow$  effect on the three layer.
- $\rightarrow$  ST segment elevation.

decrease the insulin because of diabetes.

Types of arteries that may have a high risk of atherosclerosis :-  
carotid artery

Some people as a genetic have LPA protein at the same structure of LDL, the dysfunctional endothelial also convert these protein to ox-LPA (oxidation LPA protein)  $\Rightarrow$  which make these people more vulnerable to the risk of atherosclerosis.

people with a family history of stable angina have a high risk for unstable angina and people with a family history of unstable angina have a high risk for myocardial infarction.

The first option for ~~treatment~~ treating a person with angina :-  
vasodilation by nitrate

The pain of angina is same for three type start with pain in the left

**heart disease** :- the disease that happen in the heart and coronary artery (present inside the heart).

**vascular disease** :- the disease that happen far than heart and in vascular.

Normal coronary blood flow equal  $225 \text{ ml/min}$  and maybe in the exercise increase three to four fold.

the difference between the term blood flow and blood perfusion :- blood flow mean pump the blood to systemic circulation and blood perfusion mean pump the blood to organ or specific mass of an organ.

Is ~~known~~ known the heart perfusion during diastole

the difference between hypoxia and ischemia ?

**hypoxia** mean decrease the oxygen that arrive to cell, while the **ischemia** mean decrease the oxygen and nutrient that arrive to cell and decrease remove waste.

Three type from the angina :-

1) **stable angina** :- clotting close part from blood vessel and not movement (less dangerous).

2) **unstable angina** :- clotting close part from blood vessel and embolism (movement) (more danger than stable angina).

3) **myocardial infarction** :- clotting completely close blood vessel and lead to death (the most danger type).

increase Ox-LDL  $\Rightarrow$  incentivize for immune system by white blood cell (monocyte component of blood)  $\Rightarrow$  when the tunica interna become dysfunctional endothelial it increased the permeability for tunica interna (happen holes)  $\Rightarrow$  the Ox-LDL enter to smooth muscle (tunica media)  $\Rightarrow$  and the monocyte convert to macrophages  $\Rightarrow$  the macrophages started in swallow the Ox-LDL  $\Rightarrow$   <sup>$\rightarrow$  burst, rupture</sup> foam cell  $\Rightarrow$  the smooth muscle make cap and formation organization (cap composed from smooth muscle and collagen fiber, core composed from Ox-LDL).  $\Rightarrow$  Plaque  $\Rightarrow$  atherosclerosis  $\Rightarrow$  ( جدار )  $\rightarrow$  lipid  $\rightarrow$  or streak  $\Rightarrow$  become thin because of :-

1] the Ox-LDL compression on the cap so become thin.

2] the matrix metalloproteinase enzyme digest the collagen fiber present between smooth muscle so the cap become thin.

$\Rightarrow$  rupture in plaque  $\Rightarrow$  clotting factor and platelet repair this rupture  $\Rightarrow$

stable angina  $\Rightarrow$  affect of disease larger  $\rightarrow$  Ox-LDL larger  $\rightarrow$

affect of (MMP) larger  $\rightarrow$  rate of rupture larger  $\rightarrow$  platelet and clotting

factor larger  $\Rightarrow$  unstable angina it can move every where  $\Rightarrow$  full

block for any blood vessel  $\Rightarrow$  myocardial infarction.

effect for ischemia :-

1] increase contraction (vasoconstriction).

2] if become ischemia in large portion of ventricle  $\Rightarrow$  ventricular failure

3] glucose break down instead fatty acid to providing the cell with energy because of lack of oxygen  $\Rightarrow$  increase lactate acid  $\Rightarrow$

decrease to pH

Importance risk factors that is increase of angina :-

1] Hyperlipidemia → (high cholesterol and fats) → diabetes mellitus and hypertension increase from risk factor that is cause hyperlipidemia

2] diabetes mellitus

left ventricular dysfunctional indicate to lack perfusion.

condition that may exacerbate angina :- الأعراض التي قد تزيد من شدة ألم الصدر

1] anemia (قلة الجايس)

2] Thyroid disease → hyperthyroidism → increase metabolism rate → hypertension (increase blood pressure)

laboratory examination :- (التحاليل التي يجب القيام بها لأمراض الصدر)

1] Urine analysis (DM and renal disease) → to know the sugar and creatinine level in urine.

2] Full blood count → to measure red blood cell, white blood cell and platelet.

3] measurement of :-

1] lipid      2] glucose → completely reabsorption in the body.

3] Creatinine → completely excretion outside the body.

4] hematocrit → volume of red blood cell.      5] thyroid function test.

4] resting ECG → the ECG for stable angina at rest is normal.

5] stress testing → used to evaluate the heart response to exertion and detect any reduced blood flow (ischemia).

Drug therapy for the stable angina :-

1] Nitrate      2] B-adrenergic blocker      3] calcium antagonist

4] Antiplatelet drug.

[2] **Unstable angina** :- rapidly worsening and more painful than the stable angina.

**Characteristics for unstable angina** :-

- [1] occurs at rest usually lasting more than 10 min.
- [2] Severe and new onset → (شديدة وحديثة النشأة)
- [3] Crescendo pattern → (تتبع هذا النمط حيث تزداد شدة الأعراض مع مرور الوقت)

**Causes for unstable angina and myocardial infarction at same are** :-

- [1] Plaque rupture or erosion - تمزق وتآكل
- [2] Dynamic obstruction (coronary spasm) (انسداد ديناميكي) (انقباض الشريان التاجي)
- [3] rapidly advancing coronary atherosclerosis. تقدم سريع في تصلب الشرايين

The unstable angina may be history of chronic stable angina and may present as a new phenomena (حالة جديدة)

Chest pain (substernal region, radiating to the neck, left shoulder and arm.

**physical examination** :- (الفحص السريري)

diaphoresis (تعرق), pale cool skin, sinus tachycardia, 3rd or 4th heart sound.

**biochemical marker** :- Troponin I and T, creatinine Kinase isoenzyme.

**ECG changes** :- 12 lead ECG mandatory, ST elevation or depression.

**Management** :- (العلاج) ⇒ Urgent admission to hospital, bed rest,

Antiplatelet, B-blockers (atenolol), IV or buccal nitrate, Revascularization (it is medical procedure used to restore blood flow to tissue or organ that have reduced circulation, usually due to blocked or narrowed arteries.

When a patient with angina arrives at the hospital, the doctor takes two steps :-

1] He does an ECG (electrocardiogram) for the patient.

2] checking for the cardiac enzyme 1] troponin

2] creatine kinase (CK)

the risk factor is two type :-

1] modifiable :- Cigarette smoking, Diabetes Mellitus, Hypertension, Hyperlipidemia.  $\rightarrow$  (you can treat the cause)

2] Non-modifiable :- Age (the young people is high risk to ~~high~~ death because of angina), Family history, Sex (the men are more susceptible to MI than premenopausal women).

What is the etiology of ischemic heart disease?

because of clotting it happen to inadequate perfusion of the myocardium cause lack of oxygen and imbalance between oxygen supply and demand.

Why is angina more dangerous in adults than in the elderly?!

presence of collateral circulation in the elderly

How does angina occur due to high blood pressure?

hypertension  $\Rightarrow$  increase the pressure on endothelial cell  $\Rightarrow$  disfunctional endothelial  $\Rightarrow$  LDL precipitation  $\Rightarrow$  the disfunctional endothelial working on free radical of oxygen  $\Rightarrow$  oxidation for LDL  $\Rightarrow$  Ox-LDL  $\Rightarrow$

$\rightarrow$  every LDL  $\rightarrow$  oxidation