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Myocardial infarction

Objectives:

- How patient presents.
- Risk factors.
- Diagnosis (X-ray changes).
- Update in management (role of PC physician).
- When to refer.
- Highlight on interventions.

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References: Step-Up, 435 eam, ACC/AHA prevention guideline, 433 team.



❖ How the patient presents?

1. Chest pain:

- a. Intense substernal pressure sensation; often described as “crushing” and “an elephant standing on my chest.”
- b. Radiation to neck, jaw, arms, or back, commonly to the left side.
- c. Similar to angina pectoris in character and distribution but much more severe and lasts longer. Unlike in angina, pain typically does not respond to nitroglycerin.
- d. Some patients may have epigastric discomfort.

2. Can be **asymptomatic** in up to one-third of patients; painless infarcts or atypical presentations more likely in postoperative patients, the elderly, diabetic patients, and women.

3. Other symptoms:

- a. Dyspnea.
- b. Diaphoresis (The combination of substernal chest pain persisting for longer than 30 minutes and diaphoresis strongly suggests acute MI).
- c. Weakness, fatigue.
- d. Nausea and vomiting.
- e. Sense of impending doom.
- f. Syncope.

4. **Sudden cardiac death**—usually due to ventricular fibrillation (VFib).



❖ Role of Primary care physician in case of CVD:

- As a primary care physician you are in contact with patients at an early stage of their disease. The following approach should be in mind :
 1. **PREVENTION** : first step is to determine whom among your patients are at risk of **CVD** (MI, unstable angina ..) by detecting risk factors i.e. (dyslipidemia ,HTN,DM, high BMI) so that preventive measurement can take place by controlling , adjusting the risk factors (by medication or lifestyle modification).
 2. **DETECTION**: (knowing the presentations and signs and symptoms of **CVD**) to ensure you don't miss any case of **CVD** in your patients.
 3. **MANAGEMENT**: (PCP must know the initial management of **CVD** (aspirin dose ,etc.).
 4. **Transferring** (PCP should establish pervious network of health faculty and know which one can provide the definitive treatment, which hospital has a cath lab, who has insurance and who doesn't in order to send patients to the best hospital according to their state.
 5. **follow up** : as a PCP your role is to make sure the patient is having healthy controlled lifestyle post MI, this is by controlling risk factors and educate the patients about the possible prognosis of the disease.

❖ Primary prevention of CVD:

- The achievement and maintenance of good health is being emphasized in programs from The American Heart Association that promote seven ideal cardiovascular health metrics, including :
 1. Not smoking.
 2. Being physically active.
 3. Having a normal blood pressure.
 4. Having a normal blood glucose level.
 5. Having a normal total cholesterol level.
 6. Being normal weight.
 7. Eating a healthy diet.

❖ Risk factors for CVD:

Modifiable		Non-modifiable
● Smoking	● High blood cholesterol	● Age
● High blood pressure	● Physical inactivity	● Gender
● Obesity	● Diabetes	● Family Hx of CAD

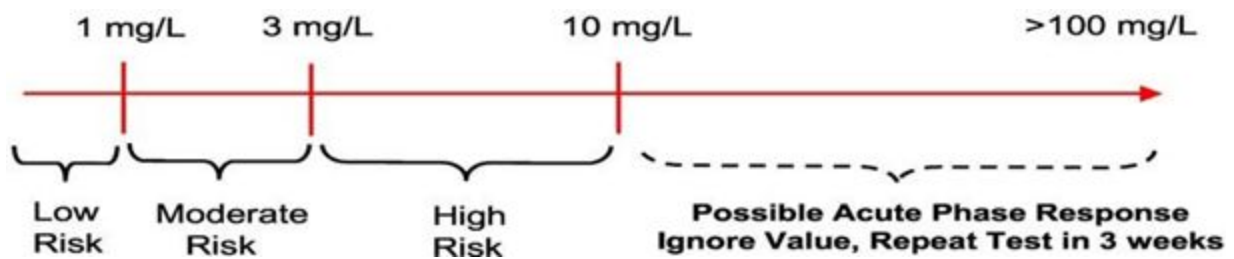


◆ Emerging risk factors for CAD

- Elevated high-sensitivity C-reactive protein *.
- Coronary artery calcification.
- Elevated lipoprotein (a).
- Homocysteine.
- Fibrinogen.

★ * C-reactive protein

- A person's baseline level of inflammation, as assessed by the plasma concentration of CRP, **predicts** the long-term risk of a first myocardial infarction.



In patient with chest pain and C-reactive protein level is:

Between 3 to 10 → indicate the patient is at high risk of develop an attack.

If higher than 10 → indicate that the patient is having an acute attack.

★ Framingham risk score (FRS):

- Scoring system used to calculate a pt's risk of coronary events.
- The Framingham Heart Study first introduced the term risk factor to medical literature.
- The following risk factors are used to assess cumulative risk:
 - HTN treatment.
 - Age.
 - Systolic BP.
 - Smoking Status.
 - Total cholesterol level.
 - HDL-C level.



◆ Classification of patients based on FRS:

Low risk	< 10% CHD risk at 10 years
Intermediate risk	10-20% CHD risk at 10 years
High risk	> 20% CHD risk at 10 years

→ We don't need FRS if (They already have **HIGH RISK** to develop CHD):

- Stroke or TIA.
- Abdominal aortic aneurysm.
- Bypass surgery or balloon angioplasty.
- Familial hypercholesterolemia.
- Type 2 diabetes.
- Peripheral artery disease.
- Kidney disease.
- Carotid artery disease.

Risk Factor	Risk Points		Points	Total Points	10-Year CVD Risk (%)*		
	Men	Women			Men	Women	
Age							
30-34	0	0		-3 or less	<1	<1	
35-39	2	2		-2	1.1	<1	
40-44	5	4		-1	1.4	1.0	
45-49	7	5		0	1.6	1.2	
50-54	8	7		1	1.9	1.5	
55-59	10	8		2	2.3	1.7	
60-64	11	9		3	2.8	2.0	
65-69	13	10		4	3.3	2.4	
70-74	14	11		5	3.9	2.8	
75+	15	12		6	4.7	3.3	
HDL-C (mmol/L)				7	5.6	3.9	
>1.6	-2	-2		8	6.7	4.5	
1.3-1.6	-1	-1		9	7.9	5.3	
1.2-1.3	0	0		10	9.4	6.3	
0.9-1.2	1	1		11	11.2	7.3	
<0.9	2	2		12	13.3	8.6	
Total Cholesterol				13	15.6	10.0	
<4.1	0	0		14	18.4	11.7	
4.1-5.2	1	1		15	21.6	13.7	
5.2-6.2	2	3		16	25.3	15.9	
6.2-7.2	3	4		17	29.4	18.51	
>7.2	4	5		18	>30	21.5	
Systolic Blood Pressure (mmHg)	Not Treated	Treated	Not Treated	Treated	19	>30	24.8
<120	-2	0	-3	-1	20	>30	27.5
120-129	0	2	0	2	21+	>30	>30
130-139	1	3	1	3			
140-149	2	4	2	5			
150-159	2	4	4	6			
160+	3	5	5	7			
Diabetes	Yes	3	4				
No	0	0					
Smoker	Yes	4	3				
No	0	0					
Total Points							



◆ Signs & finding of MI

Positive Signs	Negative Signs
ST-segment elevation	Normal ECG
New Q-wave	Pleuritic, sharp or stabbing chest pain
Chest pain radiating to both the right and left arm simultaneously	Pain reproduced on palpation
Added heart sound "S3"	Positional chest pain
Hypotension	

◆ Serology¹:

- A. **Troponin (I or T)**: this is the most commonly ordered and most specific of the cardiac markers. It is elevated (positive) within a few hours of heart damage and remains elevated for up to two weeks.
- B. **Creatine kinase (CK)** and **CK-MB**: is one particular form of the enzyme creatine kinase that is found mostly in heart muscle; it rises when there is damage to the heart muscle cells and may be used in follow up to an elevated CK and/or when the troponin test is not available.
- C. **Myoglobin**: this test may be used along with troponin to detect a heart attack early.
- D. **hs-CRP**: this test may be used to help determine risk of future heart attacks in people who have already suffered one in the past.
- E. **BNP**: (or NT-proBNP) — although usually used to recognize heart failure, an increased level in people with ACS indicates an increased risk of recurrent events.

¹ <https://labtestsonline.org/tests/cardiac-biomarkers>



These tests are used to help diagnose, evaluate, and monitor people suspected of having Acute Coronary Syndrome (ACS).

MARKER	WHAT IT IS	TISSUE SOURCE	REASON FOR INCREASE	TIME TO INCREASE	TIME BACK TO NORMAL	WHEN/HOW USED
Cardiac Troponin	Regulatory protein complex; two cardiac-specific isoforms: T and I	Heart	Injury to heart	3 to 4 hours	Remains elevated for 10 to 14 days	Diagnose heart attack , risk stratification, assist in deciding management, assess degree of damage
CK	Enzyme; total of three different isoenzymes	Heart, brain, and skeletal muscle	Injury to skeletal muscle and/or heart cells	3 to 6 hours after injury, peaks in 18 to 24 hours	48 to 72 hours, unless due to continuing injury	Frequently performed in combination with CK-MB; sometimes to detect second heart attack occurring shortly after the first
CK-MB	Heart-related isoenzymes of CK	Heart primarily, but also in skeletal muscle	Injury to heart and/or muscle cells	3 to 6 hours after heart attack, peaks in 12 to 14 hours	48 to 72 hours, unless new or continuing damage	Less specific than troponin, may be ordered when troponin is not available
Myoglobin	Oxygen-storing protein	Heart and other muscle cells	Injury to muscle and/or heart cells	2 to 3 hours after injury, peaks in 8 to 12 hours	Within one day after injury	Used less frequently; sometimes performed with troponin to provide early diagnosis

◆ **Acute medical management:**

Aspirin	Antiplatelet. Initial Therapy, Has been shown to reduce mortality and should be part of long term maintenance therapy.
Clopidogrel	Antiplatelet. In patients with aspirin allergy , and if combined with aspirin they may show greater effect in reducing mortality, as it has additive effect to aspirin.
B-blocker	Has been shown to reduce mortality and should be part of long term maintenance therapy.
ACEI	Has been shown to reduce mortality and should be part of long term maintenance therapy.
Statin	“PROVE IT-TIMI 22 trial” showed the superiority of starting atorvastatin 80mg over other statins before discharging a STEMI patient.
Oxygen	Improve symptoms , No clear mortality benefit.
Nitrates	Dilate coronary arteries (increase supply); dilates systemic veins (decrease preload and thus O2 demand). No clear mortality benefit, but they improve symptoms.
Morphine	Analgesics and venodilators. No clear mortality benefit, but they improve symptoms.
Heparin	Anticoagulant Prevents further thrombosis and aids in insuring patency of the occluded artery.



★ Acute reperfusion therapy

1- Fibrinolytics (Medical)	
→ Only used for STEMI	
→ Reduces short and long term mortality.	
→ Should be given during a 12hr window	
→ 2 types of fibrinolytics	
1 . Non fibrin specific (streptokinase)	
2 . fibrin specific (Alteplase...etc.)	
Contradictions	
→ Previous stroke	
→ Recent invasive procedure or surgery	
→ Recent major trauma	
→ Active bleeding or bleeding diathesis	
→ Aortic dissection	

2- Revascularization (Surgical)	
CABG	Used when the patient has: <ul style="list-style-type: none">- Three-vessels occlusion.- Left main coronary artery occlusion.- Left ventricular dysfunction
PCI (door to balloon time <90 minutes) .	Used when the patient has: <ul style="list-style-type: none">- One-vessel occlusion .- Two-vessels occlusion.- No improvement despite maximal medical therapy of ACS.
	Complications of PCI: <ul style="list-style-type: none">- Rupture of coronary artery on inflation.- Restenosis.- Hematoma at the site of entry

★ **Post-discharge treatment:** Aspirin , B- blocker , Statin , ACEI. **“memorize them”**