



**Department of Anesthesia  
Techniques**



# Myocardial ischemia and infarction

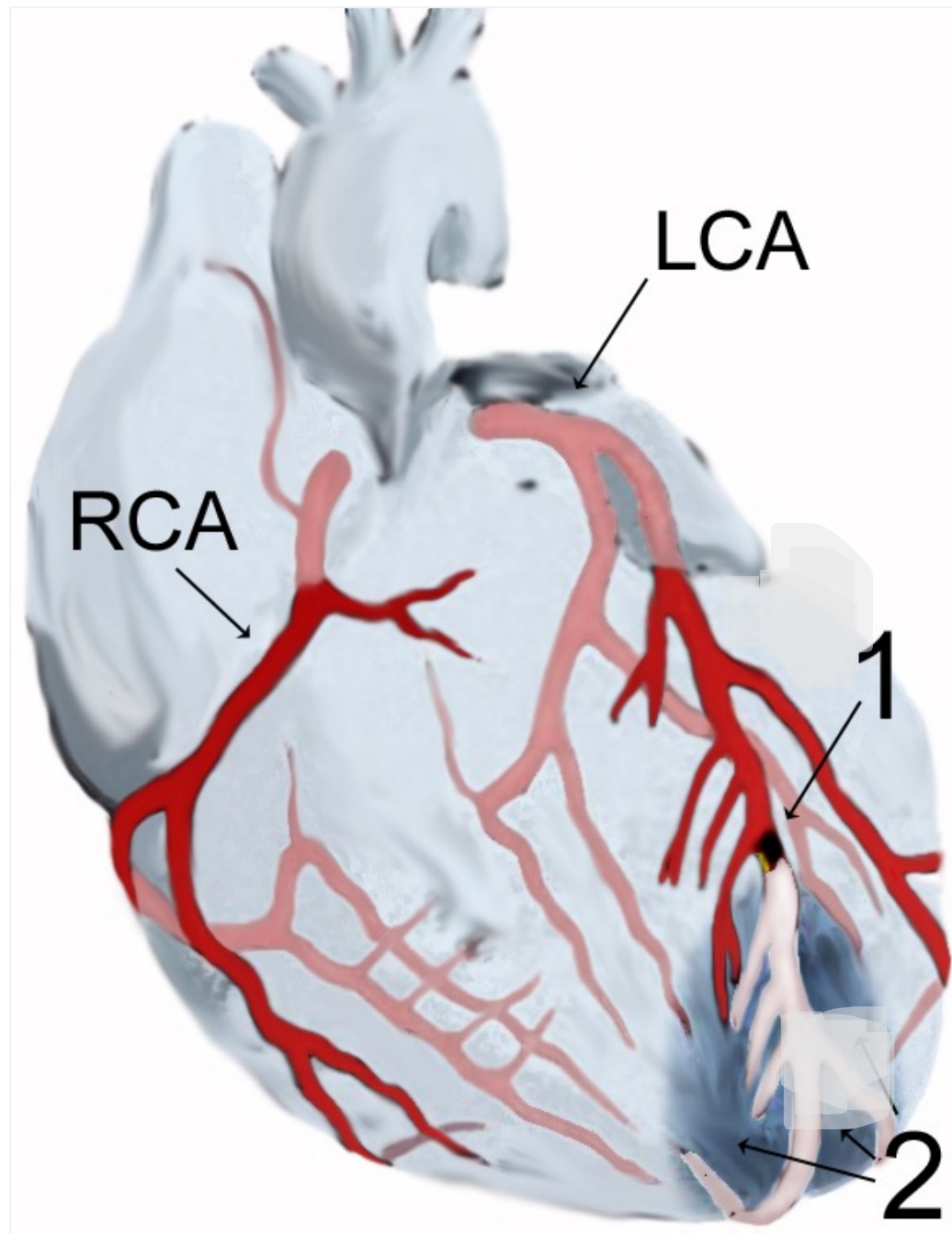
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# Objectives

1. Identify the signs of myocardial ischemia on the ECG.
2. Identify which region of myocardium is ischemic.

# Acute myocardial infarction (AMI)

- **Heart attack**
- blood stops flowing to a part of the heart, and the heart muscle is injured because it is not receiving enough oxygen.
- Myocardial Infarction is the rapid development of myocardial necrosis by a critical imbalance between **oxygen supply** and **demand** to the myocardium



# What is Acute Coronary Syndrome (ACS) ?

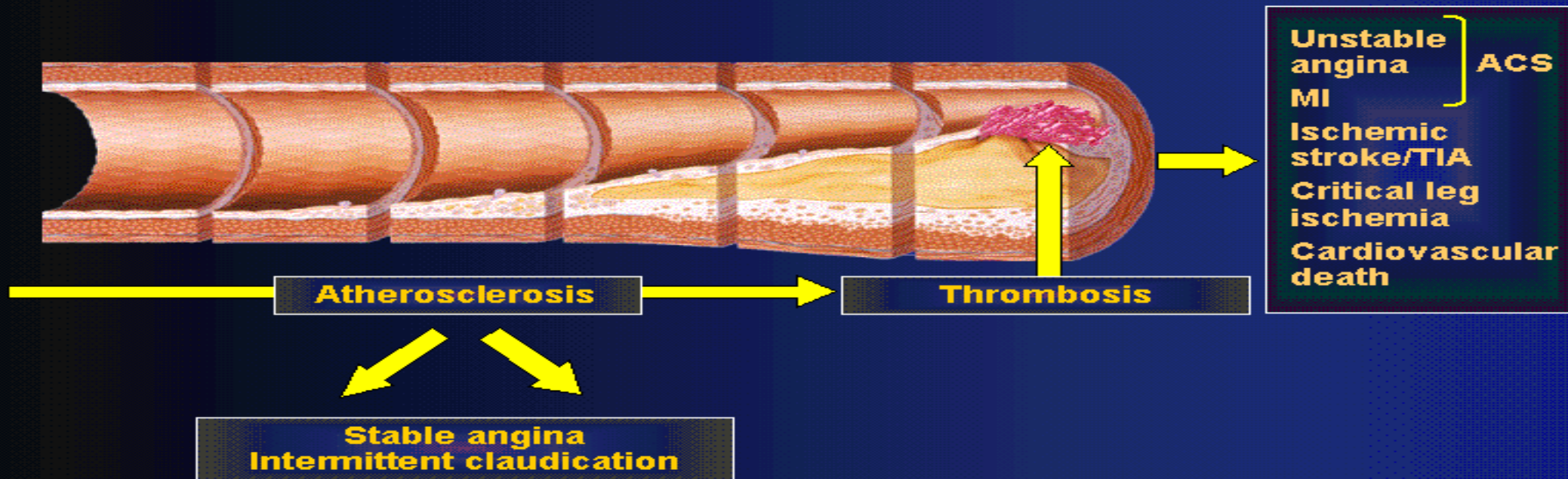
a group of clinical symptoms with acute myocardial ischemia

- Stable Angina (chest pain with activity)
- Unstable Angina (Chest pain with activity or rest)
- Myocardial Infarction with positive ECG (ST elevation MI – STEMI)
- Myocardial Infarction with normal ECG (Non-ST segment elevation MI – non-STEMI)
- **Cardiac markers** in circulation indicates myocardial infarction and help categorize MI and is a useful adjunct to diagnosis

# What happens during ACS?

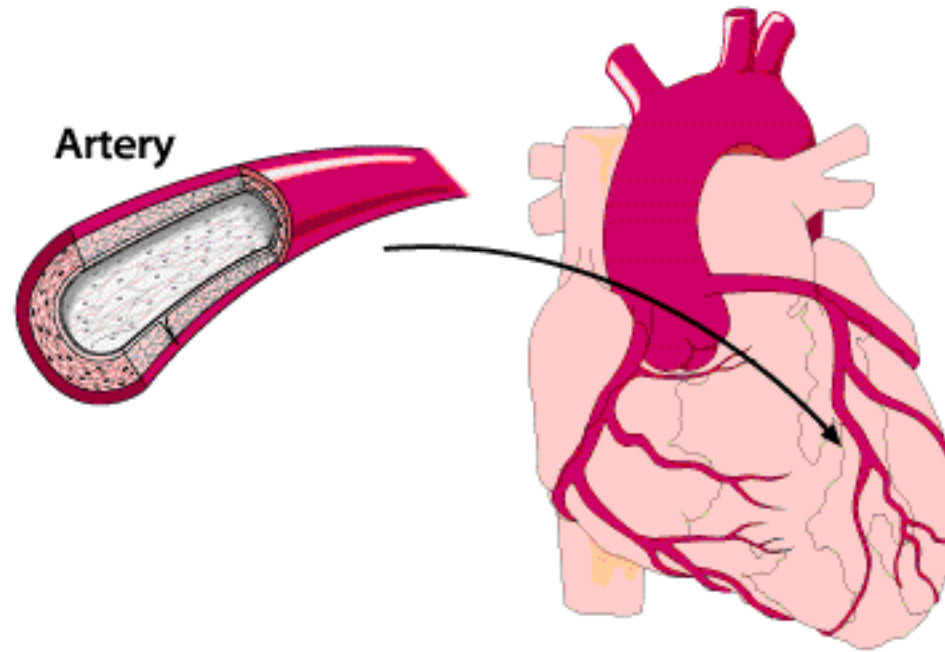
Atherosclerotic plaque ruptures and precipitates thrombus formation

## Vascular Disease: A Generalized and Progressive Process





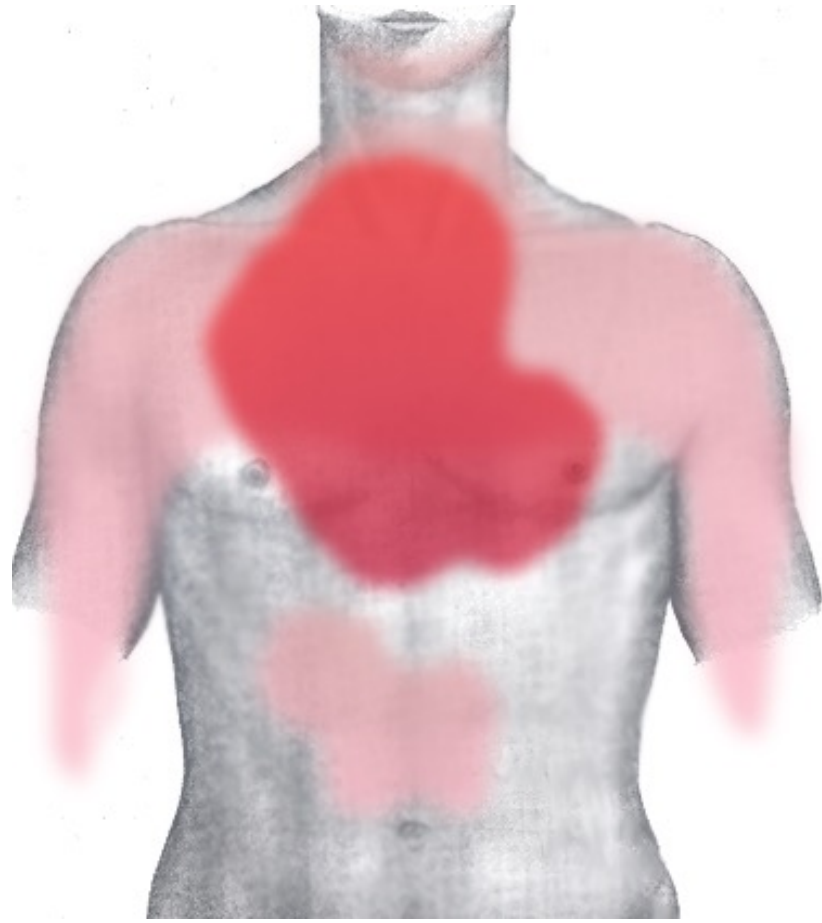
# Acute Coronary Syndrome



# Symptoms of acute MI:

1. Sudden chest pain behind the sternum and sometimes travels to the left arm or the left side of the neck.
2. shortness of breath
3. Sweating
4. Nausea and Vomiting
5. abnormal heartbeats, and anxiety.
6. weakness, a feeling of indigestion, and fatigue.





# Risk factors are:

- Previous cardiovascular disease
- old age
- Smoking and excessive alcohol consumption
- abnormal blood levels of certain lipids
- diabetes
- high blood pressure
- no physical activity
- Obesity
- chronic kidney disease
- use of cocaine and amphetamines..

# Physical exam

- The physical exam can often be unremarkable غير ملحوظة
- Hypertension
- Hypotension
- Acute valvular dysfunction may be present
- Rales
- Neck vein distention
- Third heart sound
- A fourth heart sound
- Dysrhythmias
- Low grade fever

# Cardiac Biomarkers

- Cardiac biomarkers are protein molecules released into the blood stream from damaged heart muscle
- **Troponin T and I**
- **Creatinine Kinase ( CK-MB)**
- **Myoglobin**

# Echocardiography

- evaluating overall ventricular function and wall motion abnormalities
- can also identify complications of MI ( e.g. Valvular or pericardial effusion, VSD)

# Localization of MI

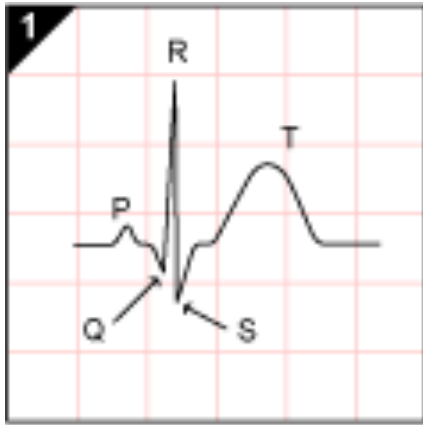
- ST elevation
- **Inferior wall**: II, III, aVF
- **Lateral wall**: I, aVL, V4-V6
- **Anteroseptal**: V1-V3
- **Anterolateral**: V1-V6

# Progression of wave changes

- **Hyperacute T wave changes** - increased T wave amplitude and width
- **ST elevation with hyperacute T wave changes** (transmural injury)
- **Pathologic Q waves** :defined as duration  $\geq 0.04$  s or  $>25\%$  of R-wave amplitude
- Pathologic Q waves, T wave inversion (necrosis and fibrosis)
- Pathologic Q waves, upright T waves (fibrosis)



# Sequence of Changes in evolving acute MI



15 Minutes



40 Minutes

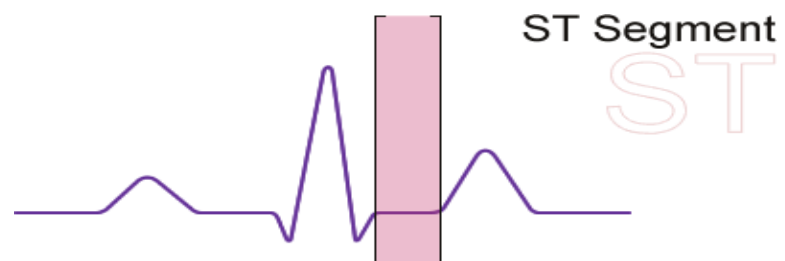


3 Hours



>6 Hours





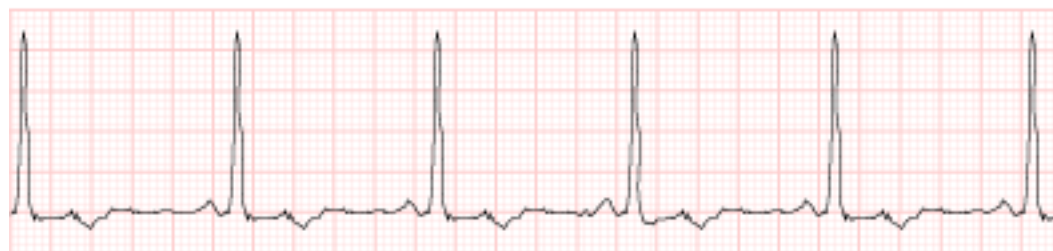
ST Elevation



ST Depression



T Wave Inversion

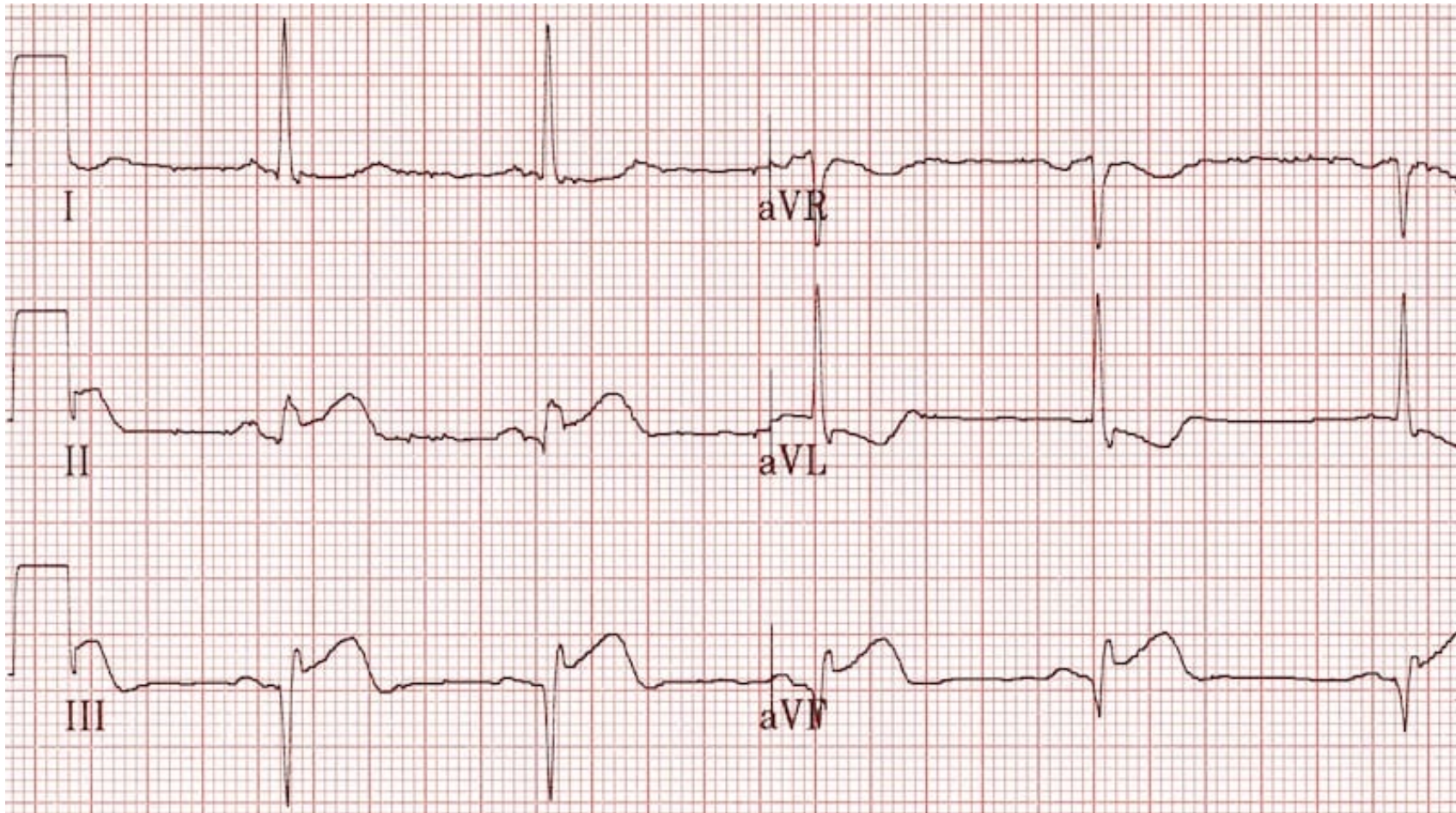


Flat T Wave



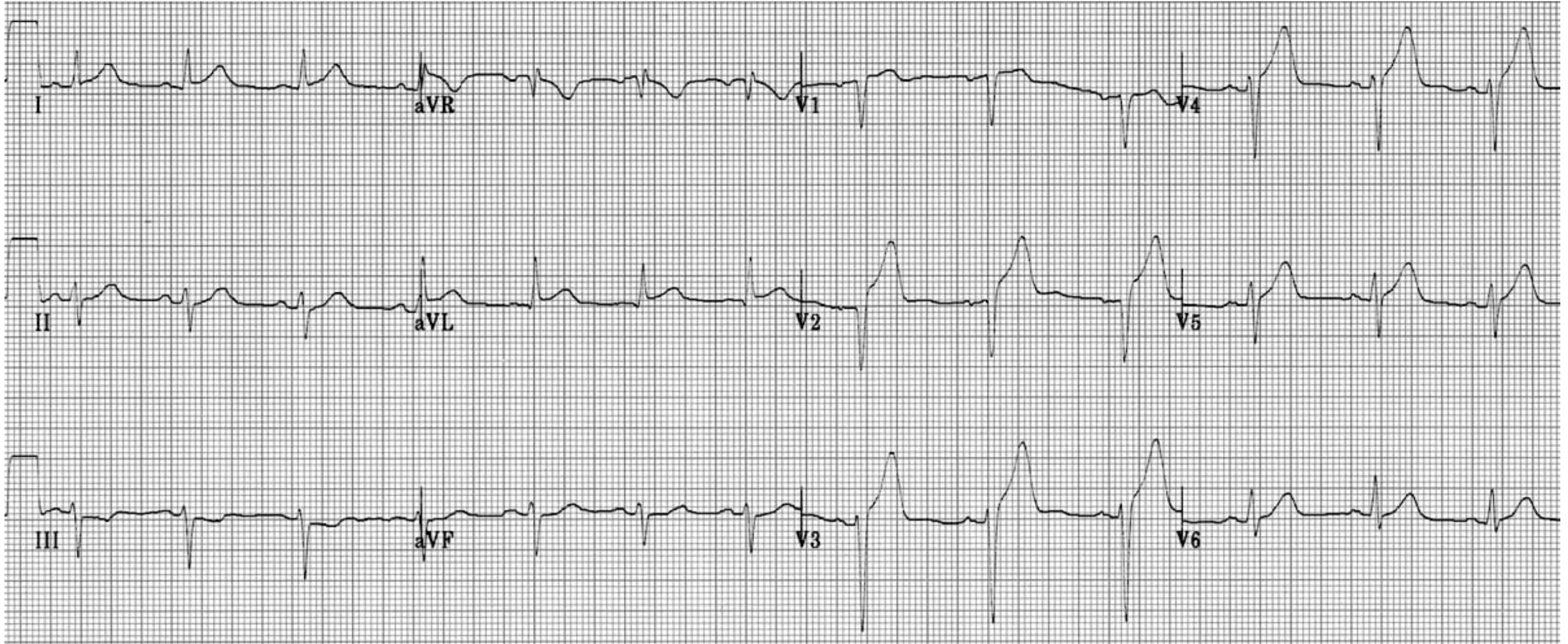
# Inferior MI

Pathologic Q waves and ST-T changes in leads II, III, :Inferior MI  
aVF.





# Anterior MI



# Treatment

- Oxygen
- Nitrates
- Beta-blockers
- Unfractionated heparin , Low-molecular weight heparin
- Thrombolytics:
- Percutaneous Coronary Intervention
- Surgical Revascularization