

The Electrocardiography (ECG) IV

Interpretation of cardiac muscle ischemia

Dr. Waleed R. Ezzat

Lecture Objectives:

1. Define and discuss anterior wall infarct.
2. Define and discuss posterior wall infarct.
3. Recognize infarction involves other area of the heart.

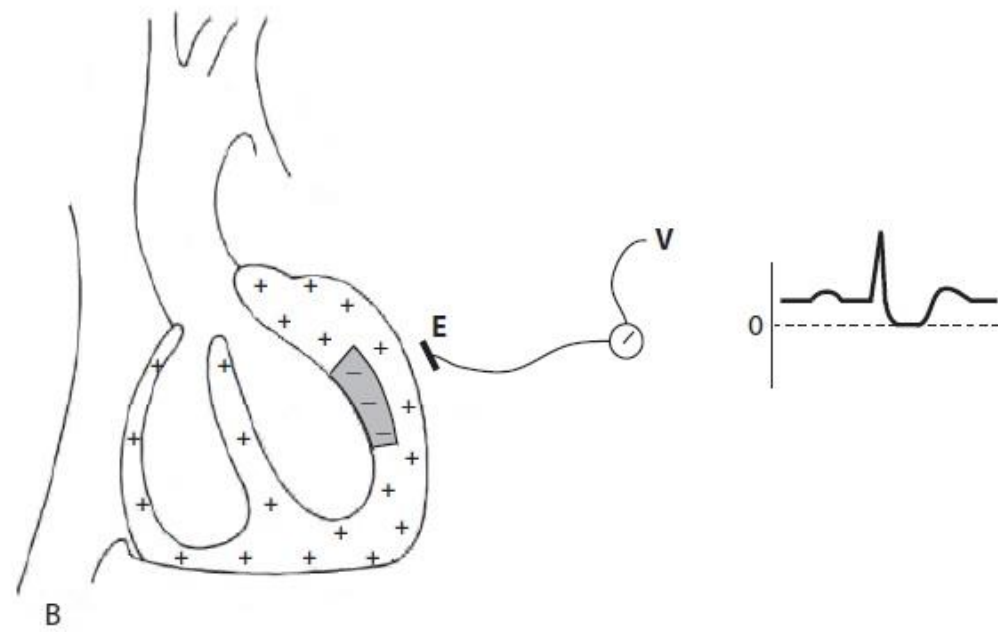
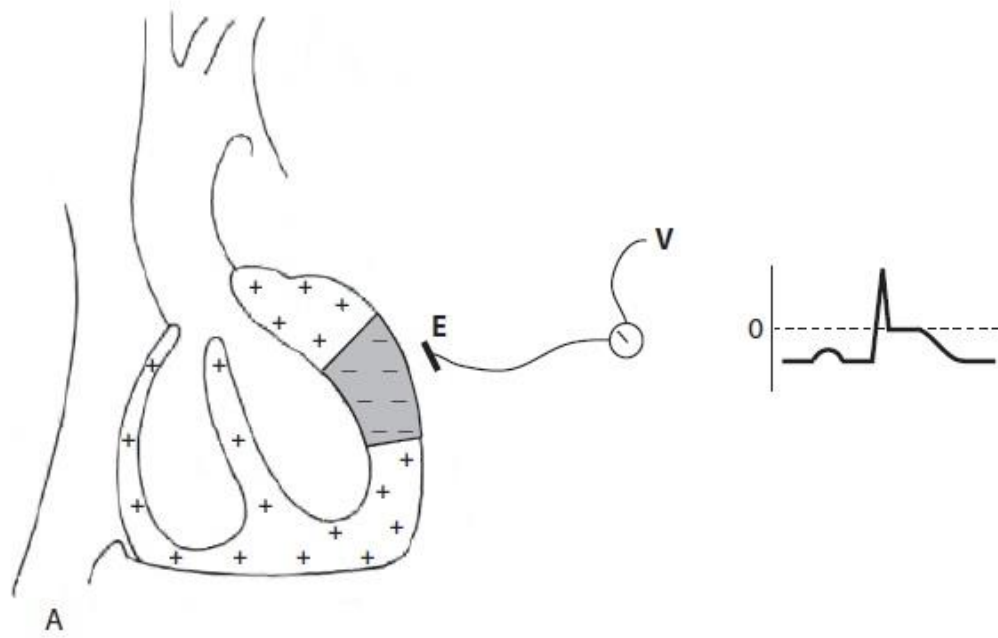
Current of injury

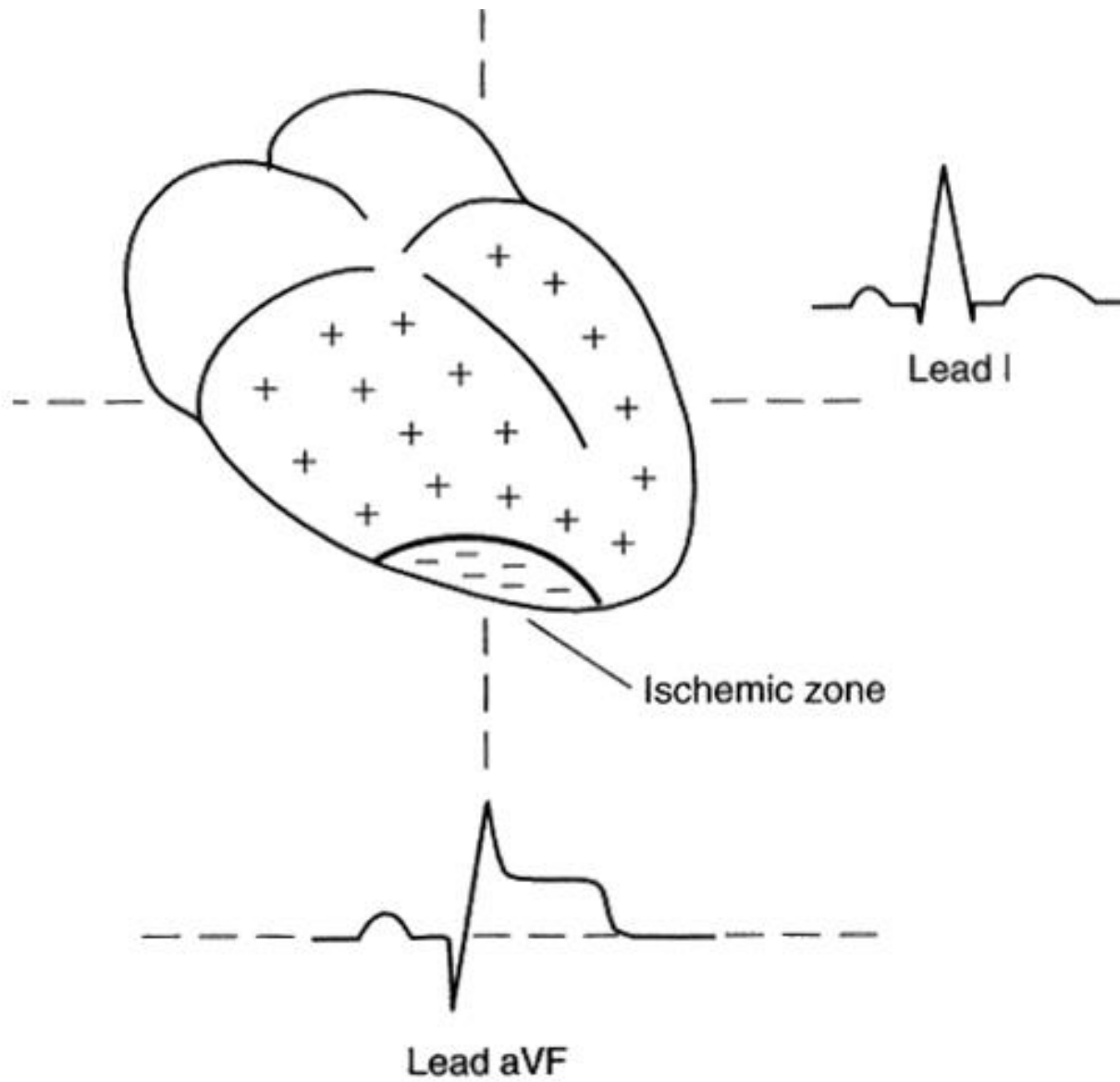
The **current of injury** results when part of the heart remains partially or totally depolarized all the time. This causes *elevation (up)* or *depression (down)* displacement of the ST segment.

Transmural ischemia causes ST elevation; whereas, subendocardial ischemia causes ST segment depression.

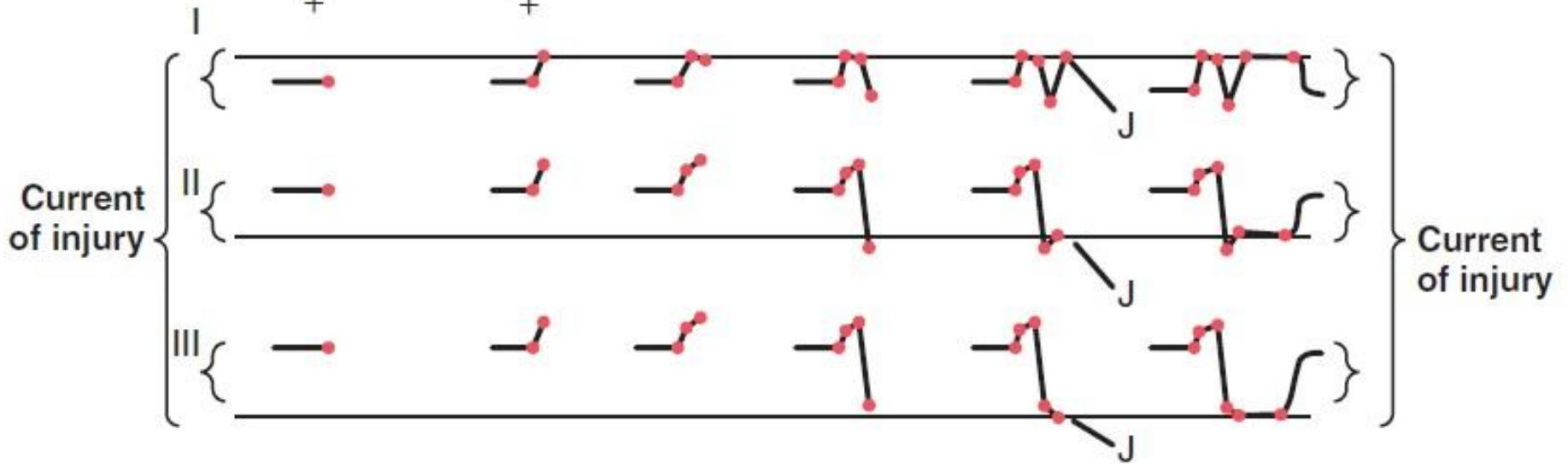
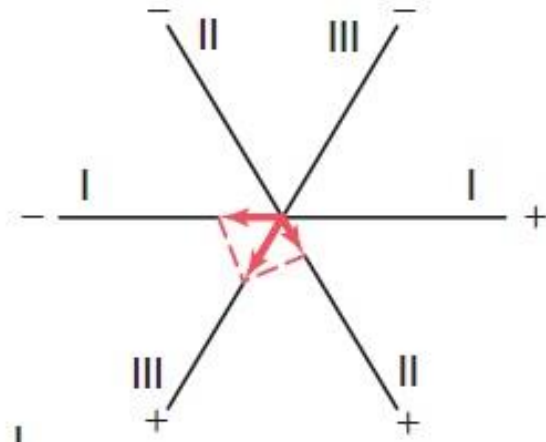
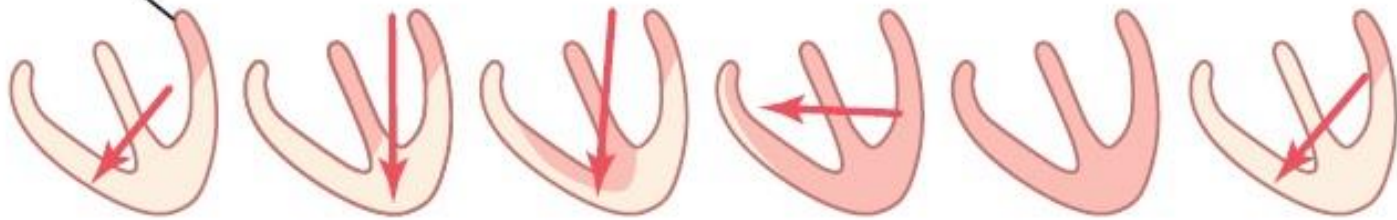
Current of injury can be due to:

1. Physical trauma (e.g. catheterization of the heart).
2. Infectious processes that damage the muscle membranes.
3. Ischemia of local area of muscle caused by local coronary occlusions, which is by far the most common cause of current of injury in the heart.



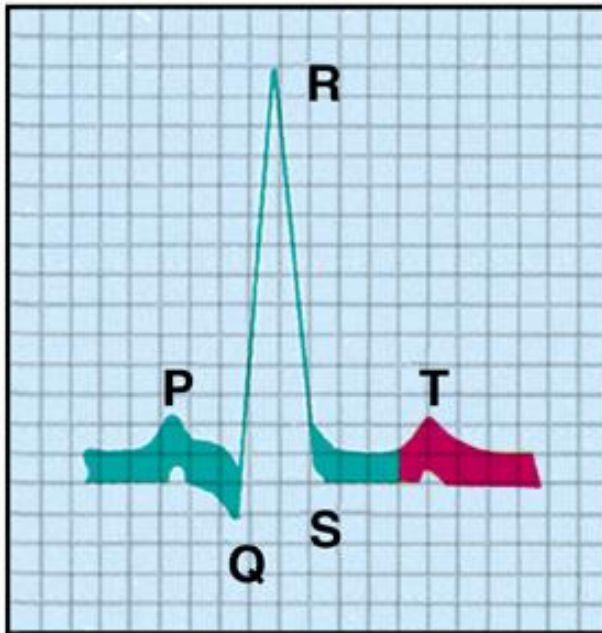


Injured area

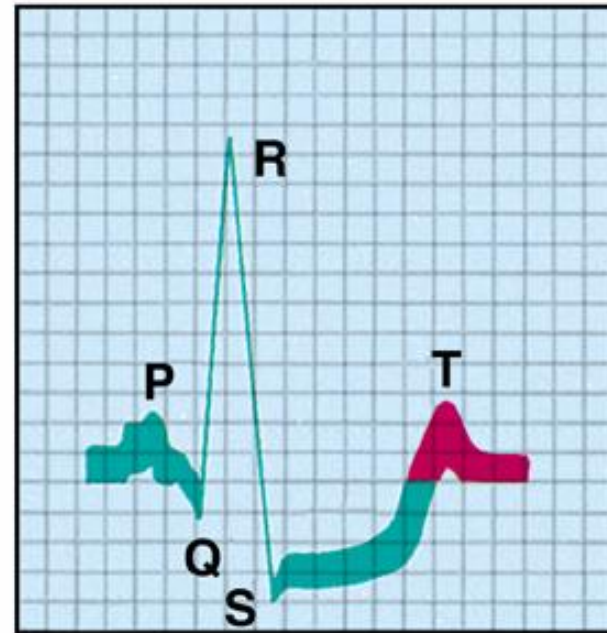


Effect of a current of injury on the electrocardiogram.

Ischemia and S-T depression



Normal



Ischemia

Why does coronary ischemia cause injury potential?

Severe myocardial ischemia causes incomplete repolarization of the muscle membrane due to;

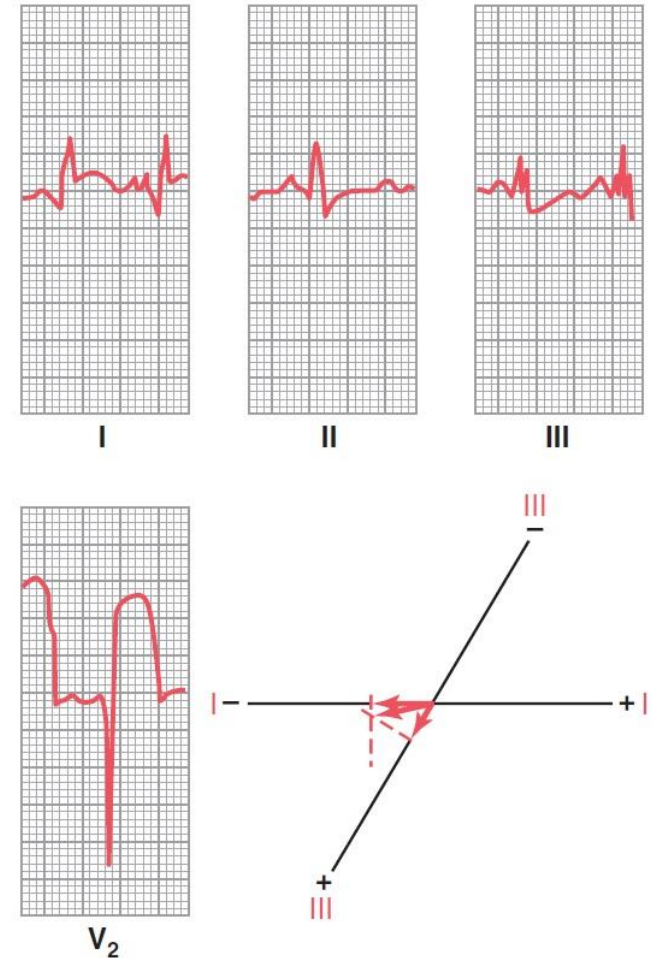
1. Lack of oxygen
2. Excess accumulation of carbon dioxide
3. Lack of sufficient food nutrients essential to maintain normal membrane polarization.

Often the heart muscle does not die because the blood flow from the rich collaterals is sufficient to maintain life of the muscle.

As long as the ischemia state exists, an injury potential continues to flow during the diastolic portion (the T-P portion) of each heart cycle.

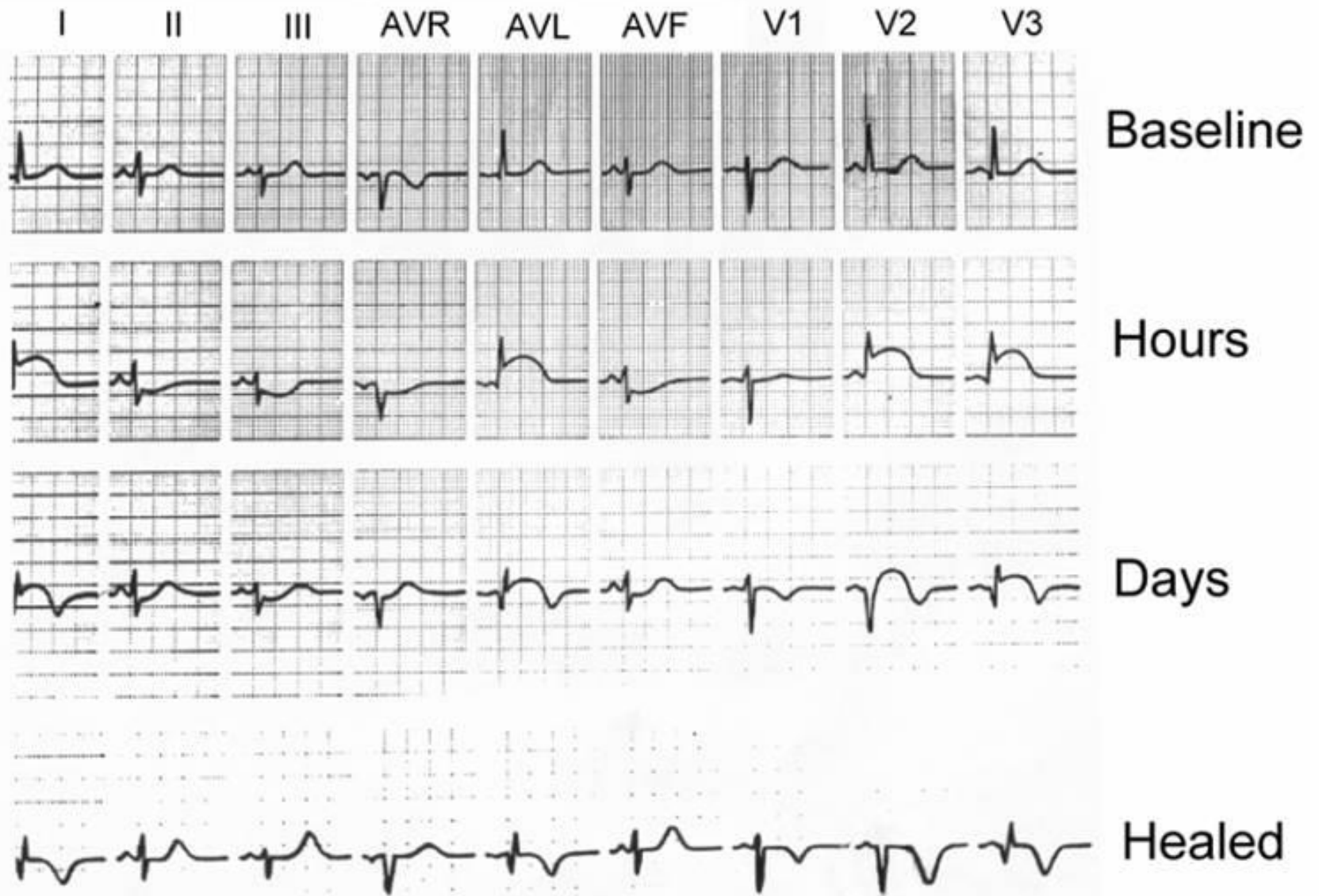
Acute Anterior Wall Infarction

- ◎ The most important diagnostic feature of this ECG is the intense injury potential in chest lead V_2 .
- ◎ This anterior wall infarction almost certainly is caused by thrombosis of the anterior descending branch of the left coronary artery.



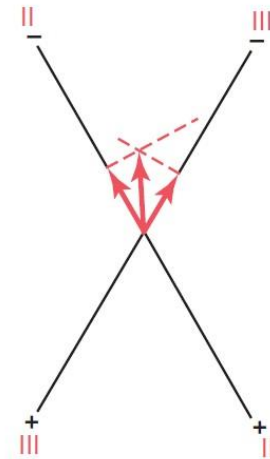
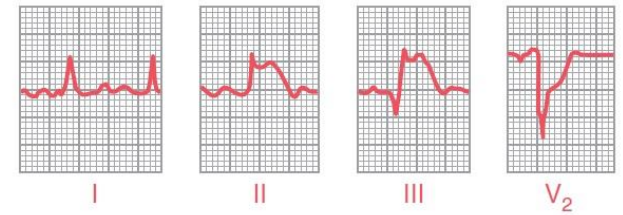
Current of injury in acute anterior wall infarction. Note the intense injury potential in lead V_2 .

Anterior wall infarction

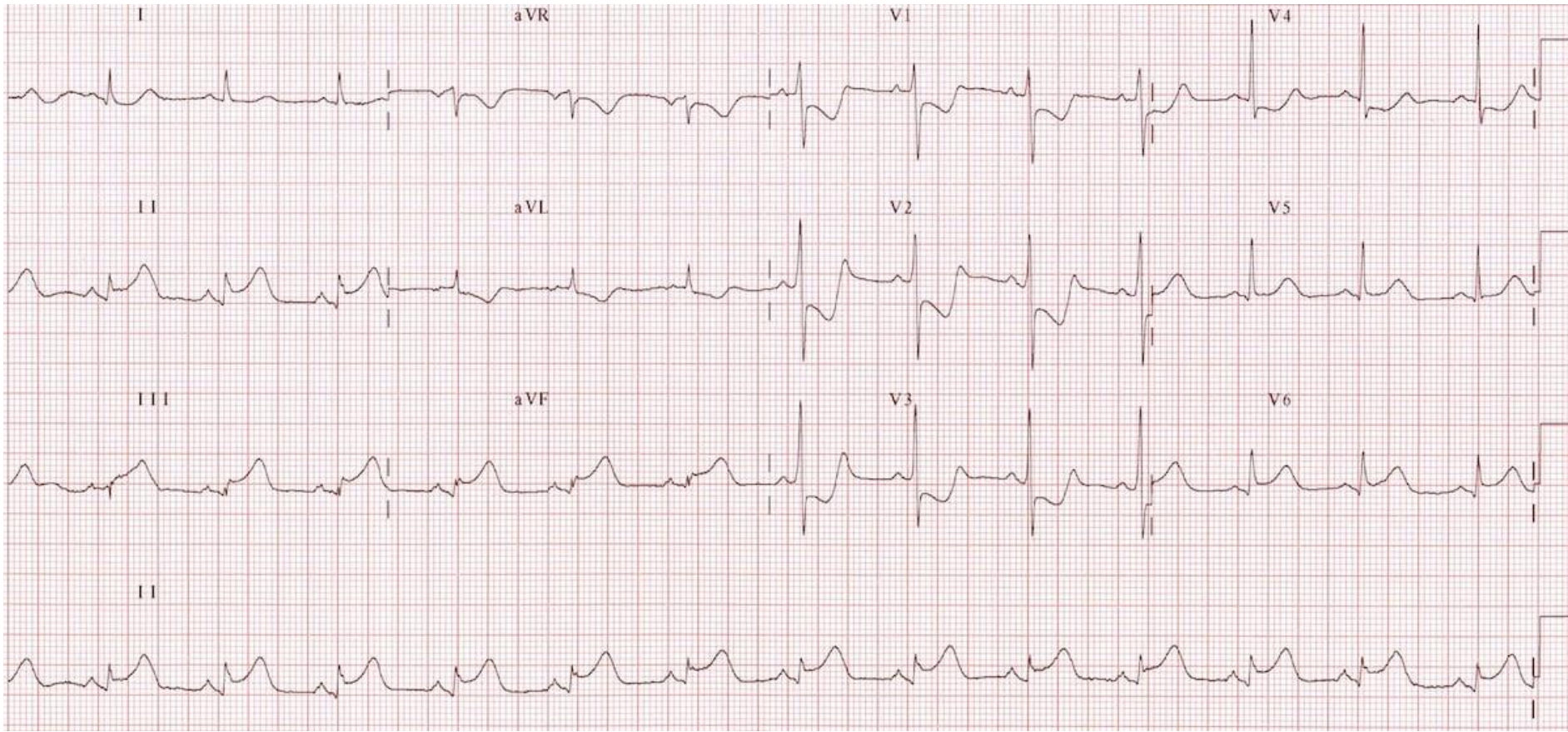


Acute Posterior Wall Infarction

- ◎ The major diagnostic feature of this ECG is in the chest lead as well which reveals ST depression.
- ◎ This means that the current of injury is coming from the back of the heart opposite to the anterior chest wall.



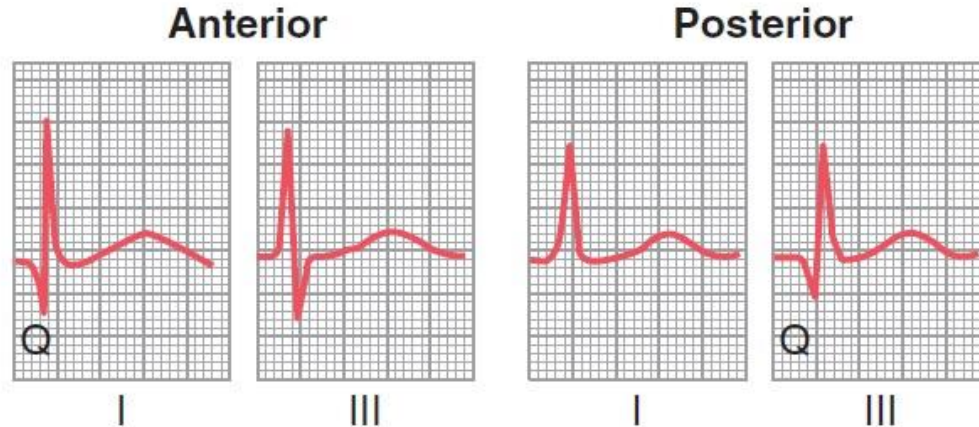
Injury potential in acute posterior wall, apical infarction.



Infarction in Other Parts of the Heart

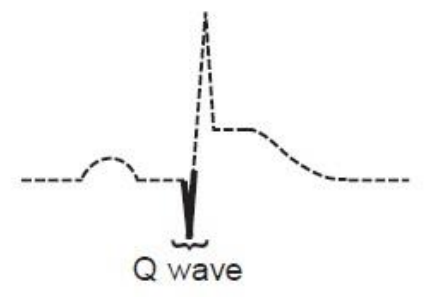
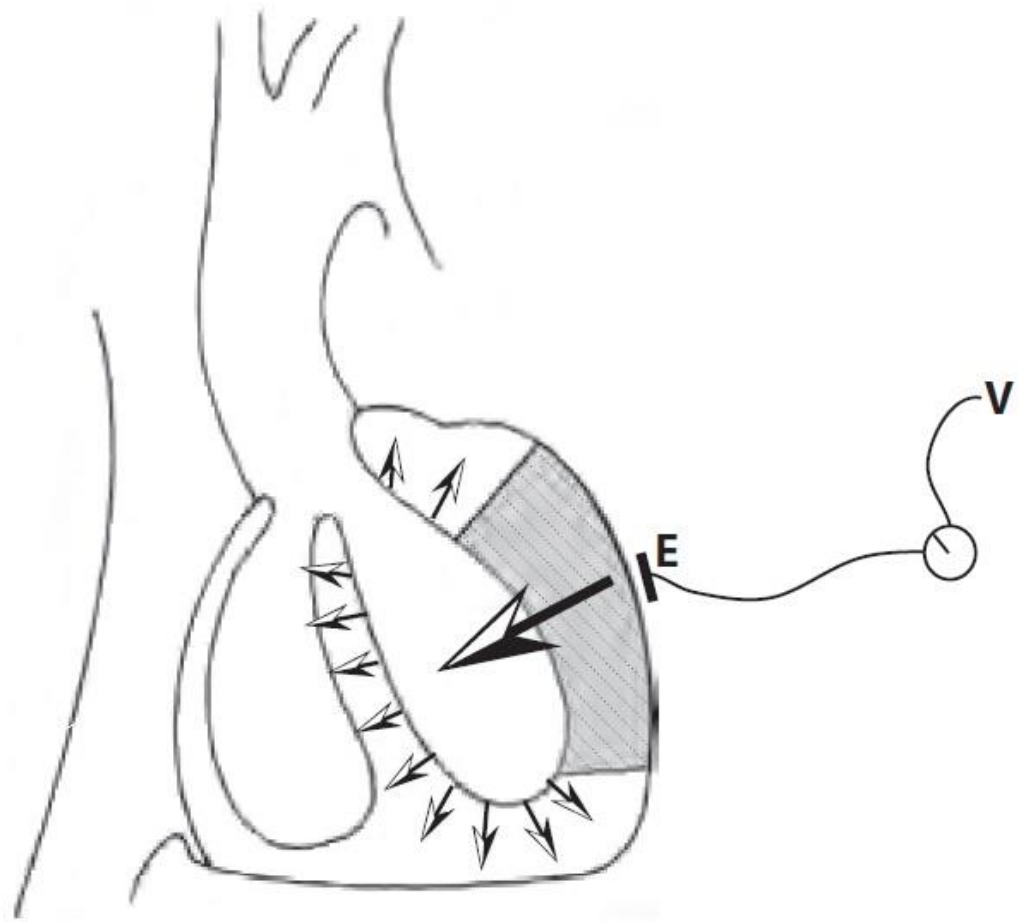
- ◎ By making vectorial analyses of the injury potential in the heart it is possible to determine the locus of any infarcted area emitting a current of injury, regardless of which part of the heart is involved.
- ◎ It should be noted that;
 - The *positive* end of the injury potential vector points toward the normal cardiac muscle
 - The *negative* end points toward the injured portion of the heart that is emitting the current of injury.

Old Recovered Myocardial Infarction (Myocardial Scarring)

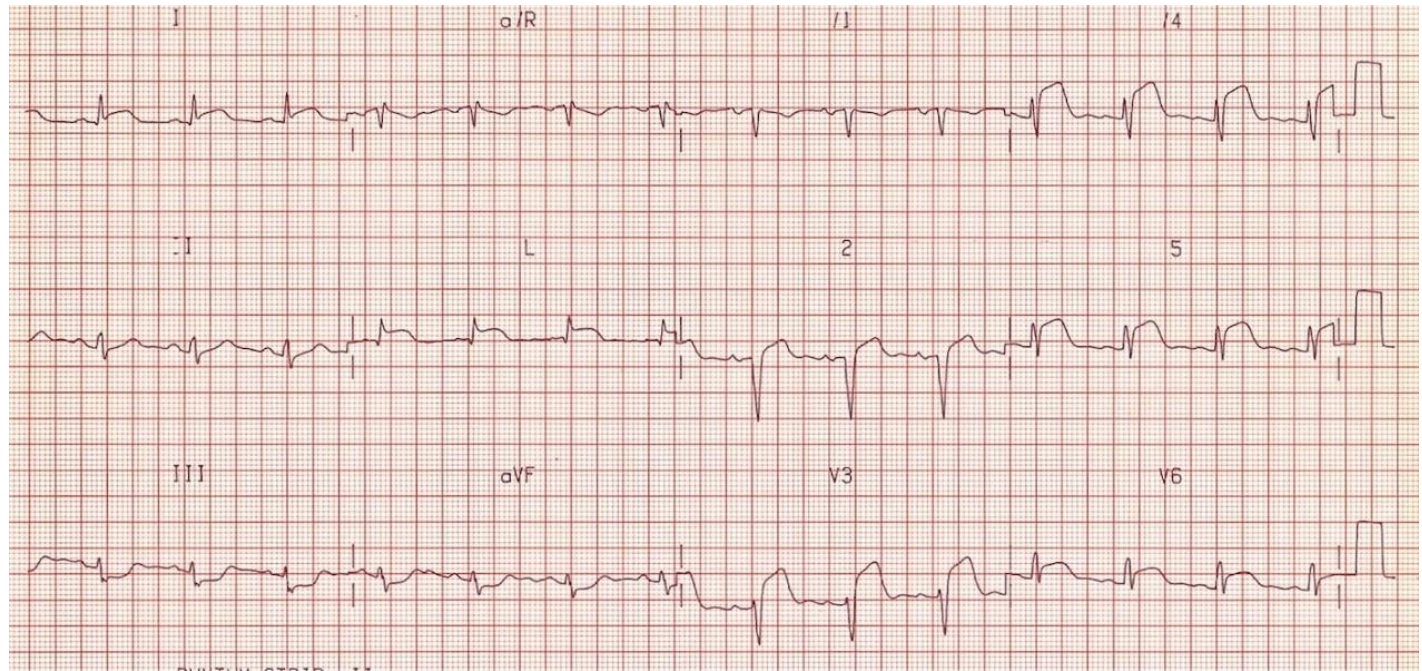


Electrocardiograms of anterior and posterior wall infarctions that occurred about 1 year previously, showing a Q wave in lead I anterior wall infarction and a Q wave in lead III in *posterior wall infarction*.

A Q-wave usually develops at the beginning of the QRS complex in the lead facing the old infarcted area.



Test:



A 60-year-old man presents with tight central chest pain radiating to his left shoulder. This is his initial ECG. Identify the findings and give a diagnosis:

- A. This is a mild myocardial infarction (MI).
- B. This is a case of acute angina and not an MI.
- C. This is an inferior MI with poor prognosis.
- D. This is a lateral MI with moderate prognosis.
- E. This is an anterolateral MI with poor prognosis .