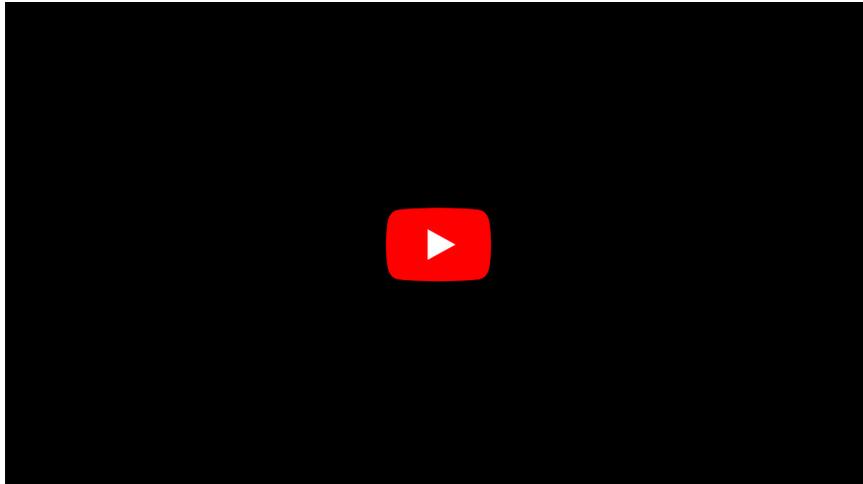


# Ischemic changes on the electrocardiogram

Distribution of ischemic heart disease:

1. **Angina pectoris.**
2. **Heart-attack.**

**Pardee wave:**



## Angina pectoris

**ECG recording during an attack of angina pectoris (AP)**

- **ST segment depression.**
  - Horizontal or descending.
  - Lasts longer than 0.08s.
- **The QRS complex and T wave are mostly normal.**

In the period outside the attack, the ECG curve in patients with angina pectoris is often completely normal.

### Prinzmetal variant of angina pectoris

During an AP attack, horizontal ST depressions are not registered, but rather **ST elevations**.

- The ECG image resembles the Q image of a heart attack.
- Unlike a Q heart attack, the changes are only temporary and usually disappear with the end of the attack.

## Non-Q infarction (non-transmural, subendocardial MI)

This type does not affect the entire heart wall, but necrosis develops only in the subendocardial region, which does not lead to the appearance of a pathological Q wave.

**Changes on the ECG recording in non-Q heart attack**

- **Depression of the ST segment** - occurs when the subendocardial zone of the myocardium is damaged, it depolarizes only with a delay - during the ST segment, the so-called current from the damage is directed into it - away from the electrode, which is above the indicated place - hence the depression.
- **Spiked T** - the damaged subendocardial part repolarizes later, therefore the T wave is higher than normal.

## Q infarction (transmural MI)

Pathologically and anatomically, it affects the entire wall (endocardium, myocardium and pericardium). At its beginning, a Q heart attack is not manifested by a Q wave, but by a so-called **Pardee wave** (a high elevation of the ST segment that directly transitions into a T wave).

## The sequence of changes on the ECG recording in Q heart attack

- **Spiked T.**
  - A high positive T wave, a peak appears in the first minutes.
- **T wave inversion.**
  - In a few minutes in the zone of ischemia, repolarization goes from the endocardium to the epicardium (physiologically, repolarization goes from the epicardium to the endocardium).
  
- **ST segment elevation.**
  - The current from the damage is directed to the ischemic zone.
  - It occurs when the subepicardial zone is damaged - these cells depolarize with a delay only during the ST interval, and therefore the interval is increased.
  - In transmural damage, the subepicardial component predominates over the subendocardial component - there is also elevation.
  - ST elevation is in the area above MI, in the opposite leads there is a mirror image, i.e. depression ST.
  
- **Pathological wave Q** = manifestation of necrosis affecting the entire thickness of the heart wall.
  - It occurs in the first 0.04 s QRS, is in the leads where it should not be, or overlaps the physiological R (r) oscillation (e.g. in V1 to V5) - the so-called absence of the R oscillation.
  - It develops between 4-24 hours after the onset of MI symptoms.

## Distribution of MI by localization

In the ECG image, we distinguish 4 walls of the heart that can be affected by a heart attack (heart like a pyramid, base = *cuspid valves*).

1	MI septal	V1, V2
2	MI front wall	V2-V5
3	MI lateral	V5, V6, I, aVL
4	MI diaphragmatic (lower)	II, III, aVF
5	MI back wall	mirror image V1, V2

## Links

### Related articles

- Manifestations of disturbances in the generation and conduction of excitation on the electrocardiogram
- Cardiac conduction system
- Arrhythmia

### External links

- Ischémia a ST segment (TECHMED) (<https://www.techmed.sk/st-segment-a-ischemia/>)
- Ischémia a T vlna (TECHMED) (<https://www.techmed.sk/t-vlna-a-ischemia/>)

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