

بنام خدا



# MI(STEMI/NSTEMI)

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# MI

Cell death secondary to ischemia

Most common cause atherosclerotic narrowing

STEMI:coagulation necrosis/contraction band,Full thickness myocardial injury,that appear within minutes

# MI

-rise in cardiac biomarkers+at least one of the following

- Symptom of ischemia
- New ST-T change or LBBB
- Pathologic Q wave
- Imaging evidence of new loss of viable myocardium /new RWMA
- Intracoronary thrombus(angiography/autopsy)

-Cardiac death with symptoms suggestive of myocardial ischemia(new ST-T/LBBB)

# Previous MI

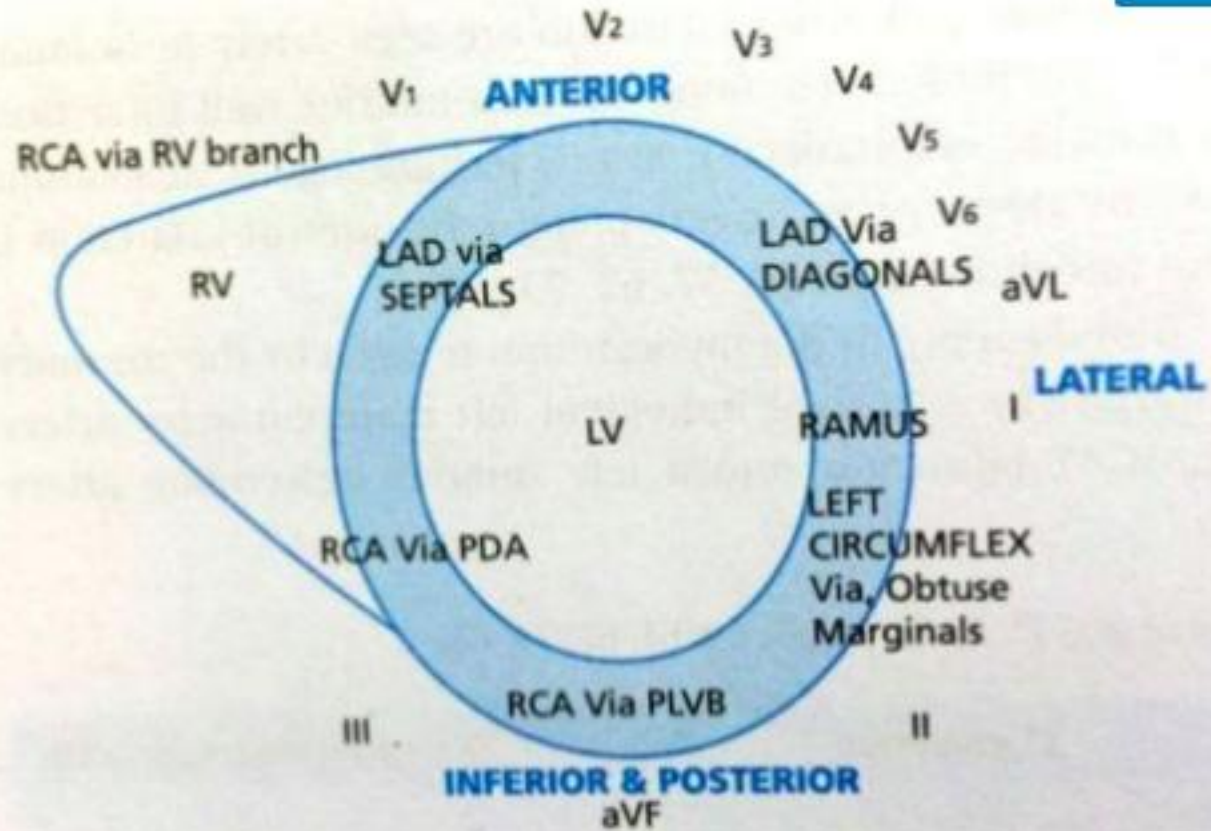
Any of the followings:

- Pathologic Q+/- symptom in the absence of nonischemic causes
- Imaging evidence of a regional loss of myocardium that is thinned and fails to contract
- Pathologic findings of previous MI

# MI

- 1-SPONTANEOUS MI
- 2-SECONDARY
- 3-DEATH BEFORE BIOMARKER DETERMINE OR INCREASED
- 4a-MI+PCI(TROP\*6 or if high,inc >20%)
- 4b-MI+Stent thrombosis
- 5-CABG+MI(trop\*10)

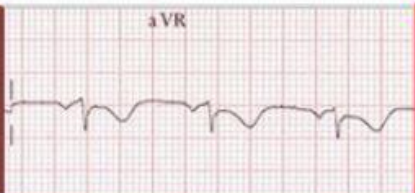
Clip slide



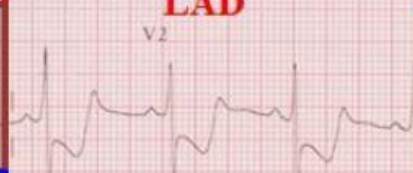
- Septal: V1 and V2
- Anterior: V3 and V4
- Lateral: V5 and V6
- Anteroseptal: V1-V4
- Anterolateral: V3-V6
- Extensive anterior: V1-V6
- Inferior: II, III, aVF
- High Lateral: I, aVL
- Posterior: tall R wave and ST depression in V1-V2



I  
**LCx or diagonal  
branch of LAD**



aVL  
**LCx or diagonal  
branch of LAD**



V6  
**LCx or diagonal  
branch of LAD**



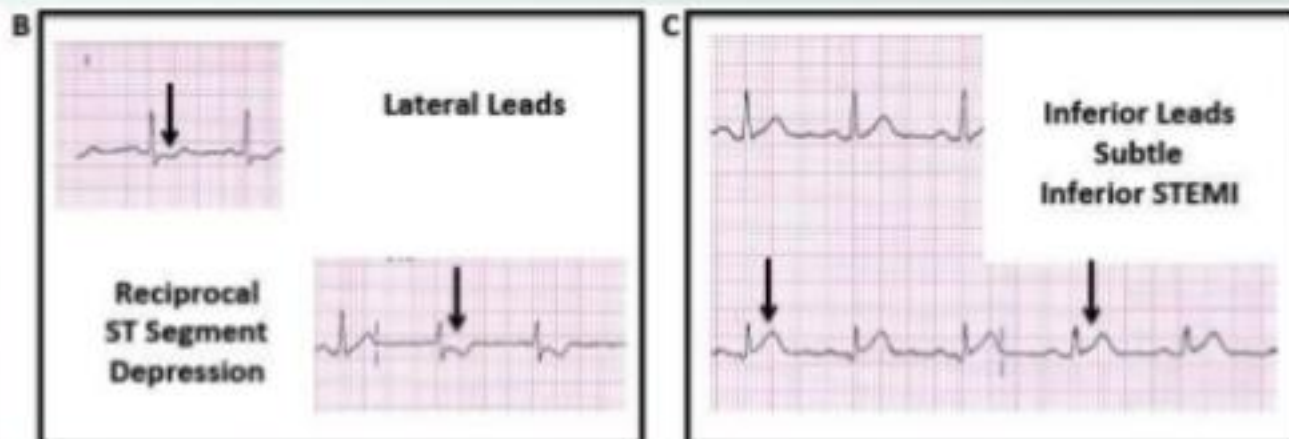
## STEMI criteria

Clip slide

- $\geq 1$  mm (0.1 mV) of ST segment elevation in the limb leads
- $\geq 2$  mm elevation in the precordial leads and present in anatomically contiguous leads

# Examples on reciprocal changes :

Type of MI	Reciprocal changes (ST depression)
Inferior MI	In lead 1 & aVL
Lateral MI	In lead 2, lead 3 & aVF



# “ST-T wave changes”

Mod. 4, Sect. 3, Cd. 1 of 1

## Section 3

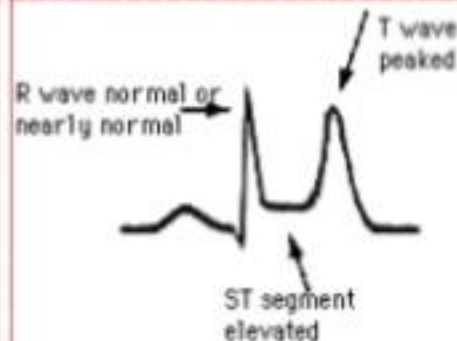
### Progressive Stages and ECG Manifestations of Q Wave (Transmural) Infarction

#### 1. Before coronary occlusion

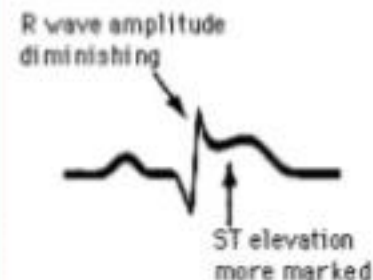


Normal ECG

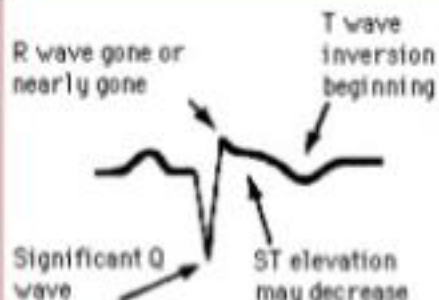
#### 2. Onset and first several hours



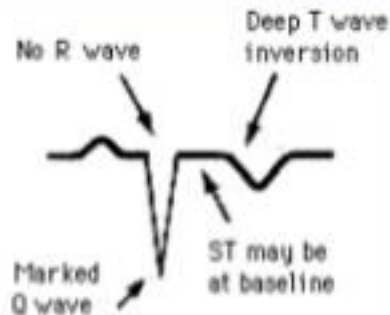
#### 3. First day



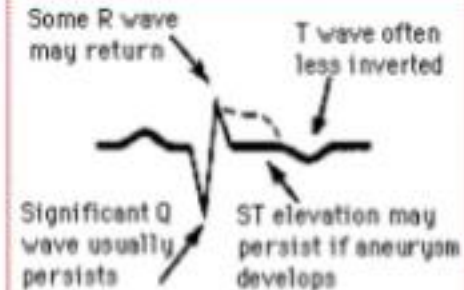
#### 4. First and second days



#### 5. After 2 or 3 days

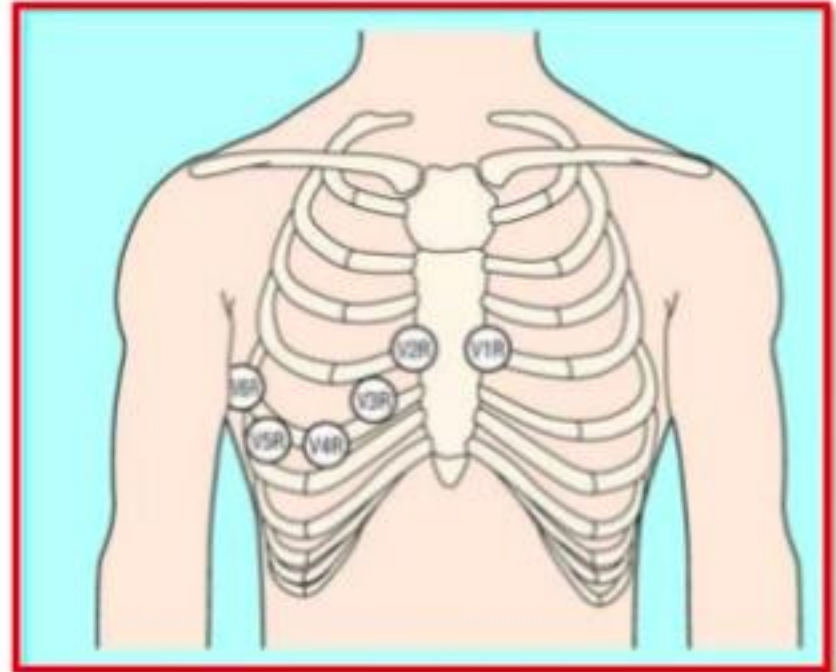


#### 6. After several weeks

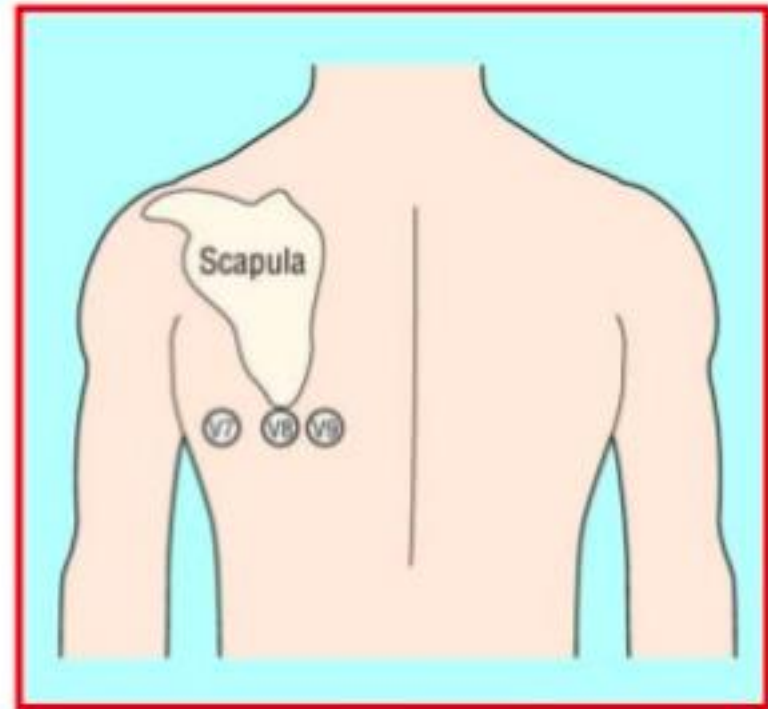


## Right-Sided Leads

- *Right ventricular infarction is confirmed by the presence of ST elevation in the right-sided leads (V3R-V6R).*
- *ST elevation in V4R has a sensitivity of 88%, specificity of 78% and diagnostic accuracy of 83% in the diagnosis of RV MI.*
- *ST elevation in the right-sided leads is a transient phenomenon, lasting less than 10 hours in 50% of patients with RV infarction.*



- **Posterior Leads**
- Leads V7-9 are placed on the posterior chest wall in the following positions.
- V7 – Left posterior axillary line, in the same horizontal plane as V6.
- V8 – Tip of the left scapula, in the same horizontal plane as V6.
- V9 – Left paraspinal region, in the same horizontal plane as V6.



*The degree of ST elevation seen in V7-9 is typically modest – note that only 0.5 mm of ST elevation is required to make the diagnosis of posterior MI*

# Posterior Wall MI ECG

ECG findings:

- ▶ ST segment depression in the septal and anterior precordial leads (V1 to V4).
- ▶ The ratio of the R wave to the S wave in leads V1 or V2 is  $> 1$ .
- ▶ ST elevation in the posterior leads of a posterior ECG (leads V7 to V9).
- ▶ ST elevation in the inferior leads (II, III, and aVF) may be seen if an inferior MI is also present.

## RCA

1. ST elevation in lead III > aVF > II
2. ST depression in lead I and aVL.
3. Sum of ST depression in lead I - III / sum of ST elevation in lead inferior leads < 1
4. S/R ratio in lead avl > 3

## LCX

1. ST elevation in lead II > aVF > III and leads V5 V6
2. No ST depression or sometimes ST elevation in lead I and aVL
3. Sum of ST depression in lead I - III / sum of ST elevation in lead inferior leads > 1
4. S/R ratio in lead avl < 3



# Inf MI

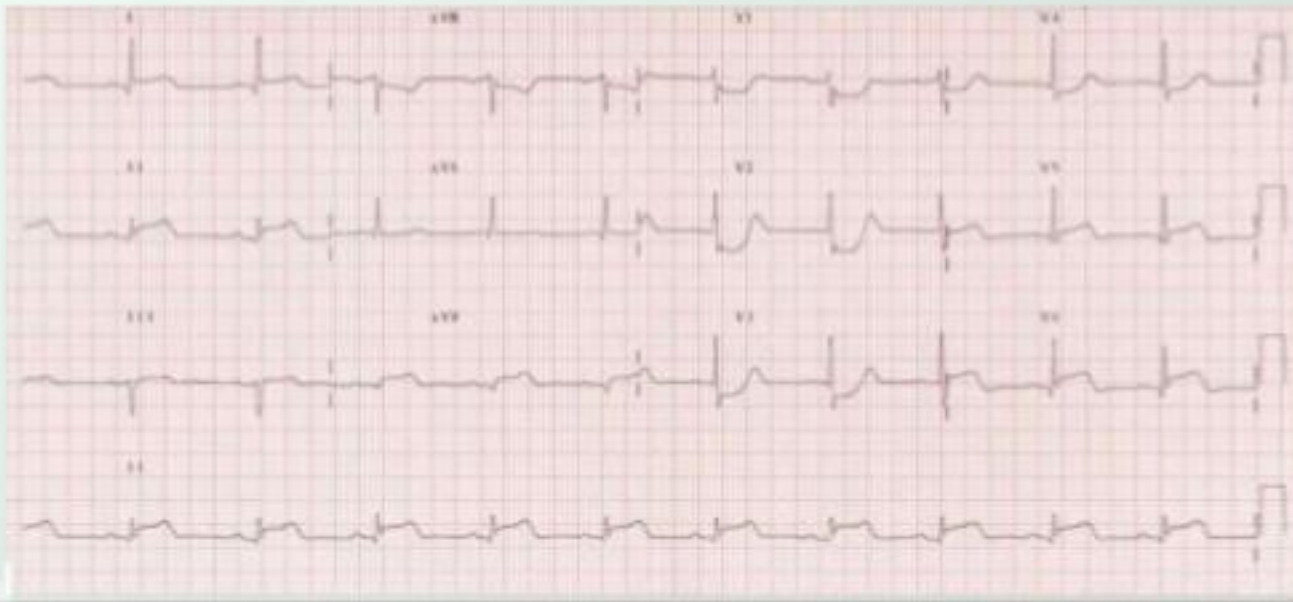
Proximal to mid part RCA :STE III>II+STE V1(right precordial leads)

Distal RCA OR LCX: STE II>III+STD V1-V3 OR STE I&aVL



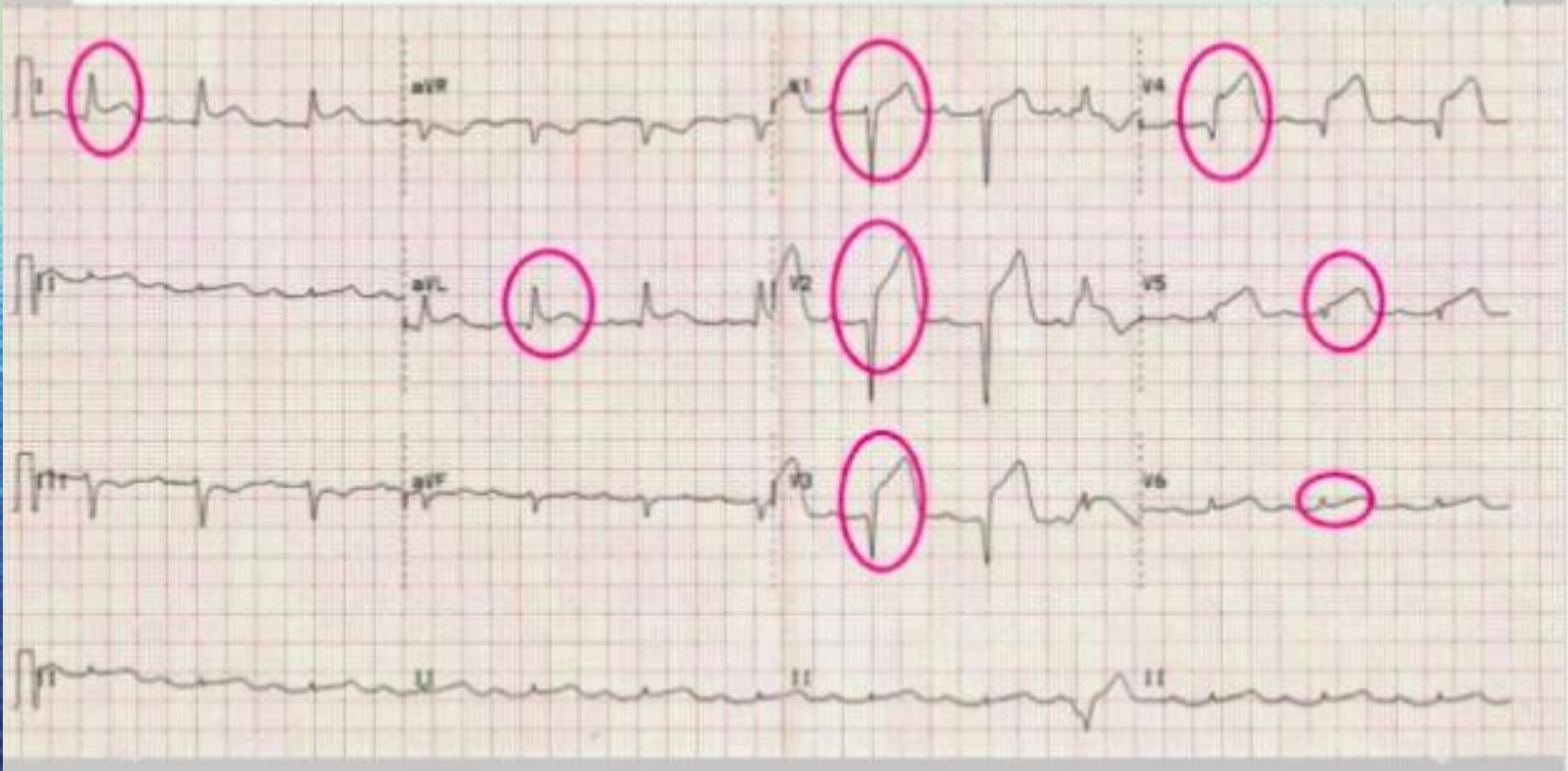
## Inferolateral MI , Posterior extension is suggested by:

- Horizontal ST depression in V1-3
- Tall, broad R waves ( $> 30\text{ms}$ ) in V2-3
- Dominant R wave (R/S ratio  $> 1$ ) in V2
- Upright T waves in V2-3



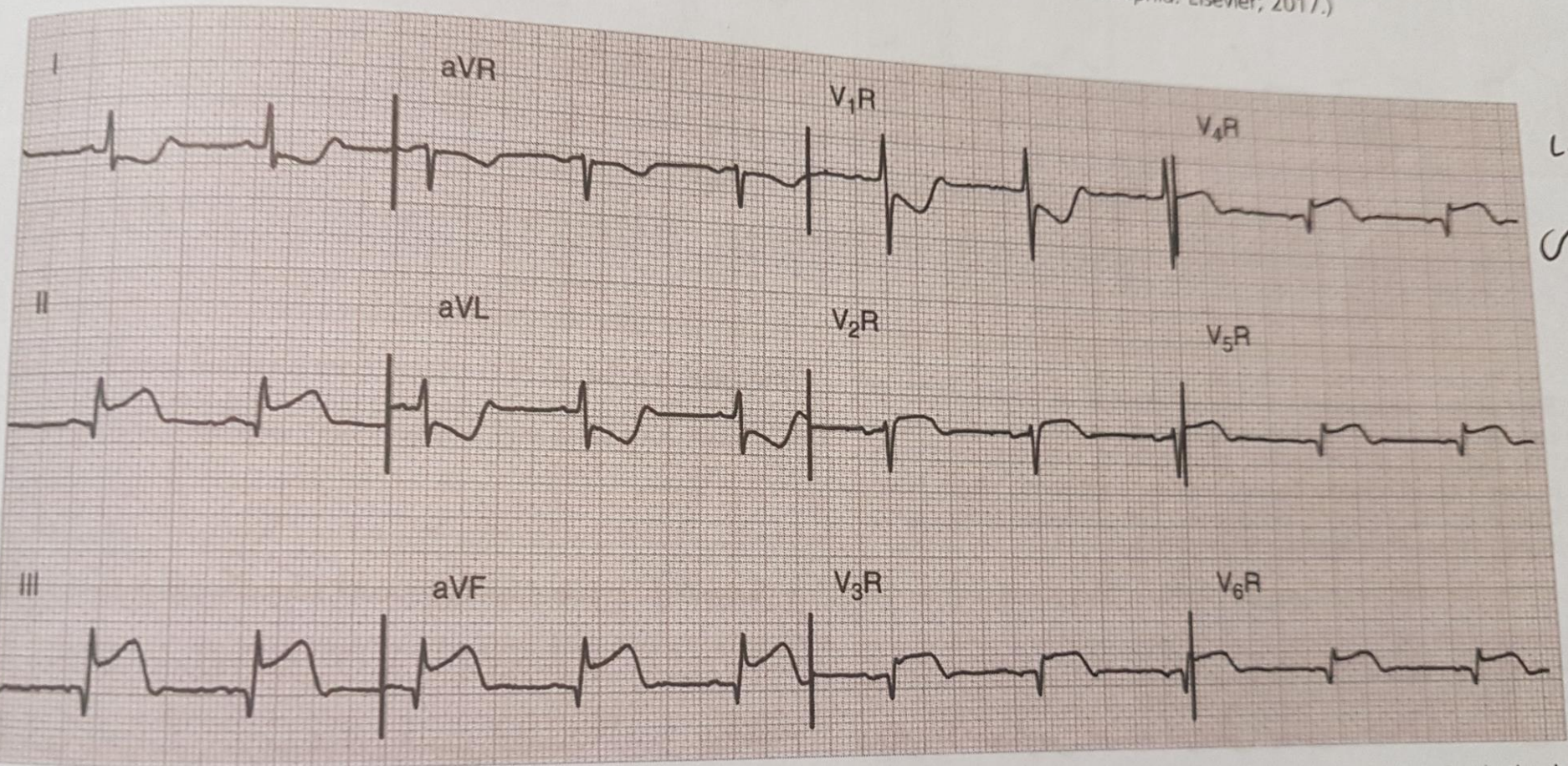


## Extensive anterior MI

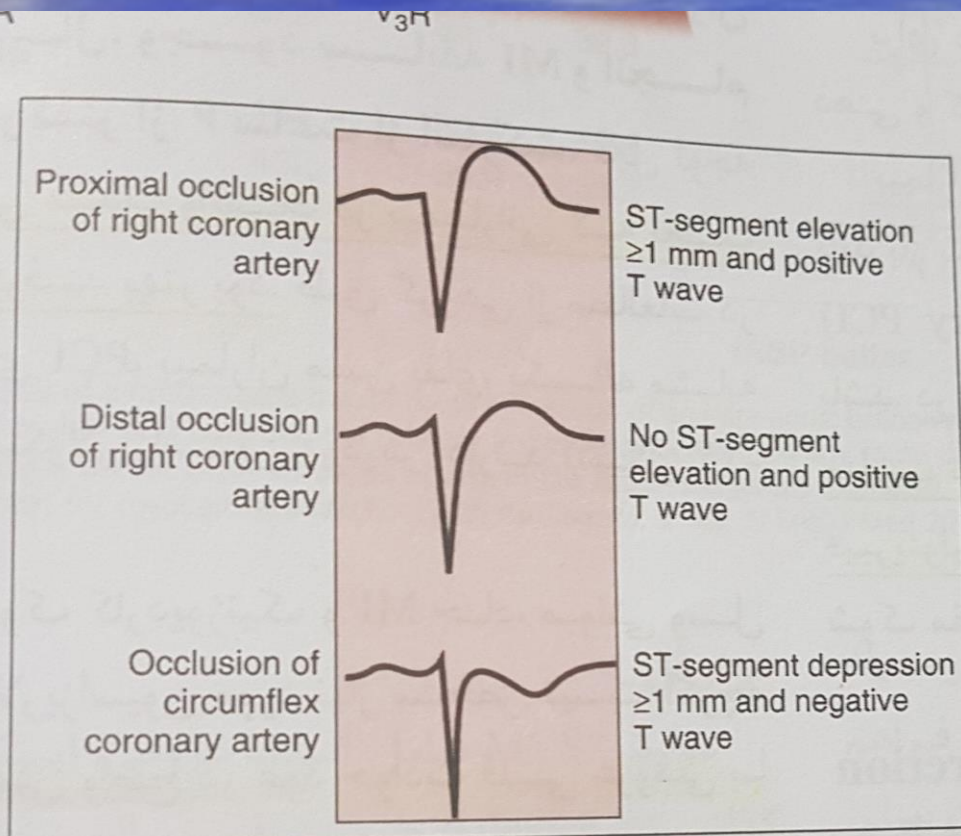


# RV INF MI

... AL, Goldberger ZD,  
5th ed. Philadelphia: Elsevier; 2017.)



# Right leads.



prox RCA

distal RCA

B

- Clinical findings:  
Shock with clear lungs, elevated JVP  
Kussmaul sign
- Hemodynamics:  
Increased RA pressure  
Square root sign in RV tracing
- ECG:  
ST elevation in right-sided leads
- Echo:  
Depressed RV function
- Management:  
Maintain RV preload  
Lower RV afterload  
Restore AV synchrony  
Inotropic support  
Reperfusion

C



# Isolated posterior MI

ST depression in V2-4

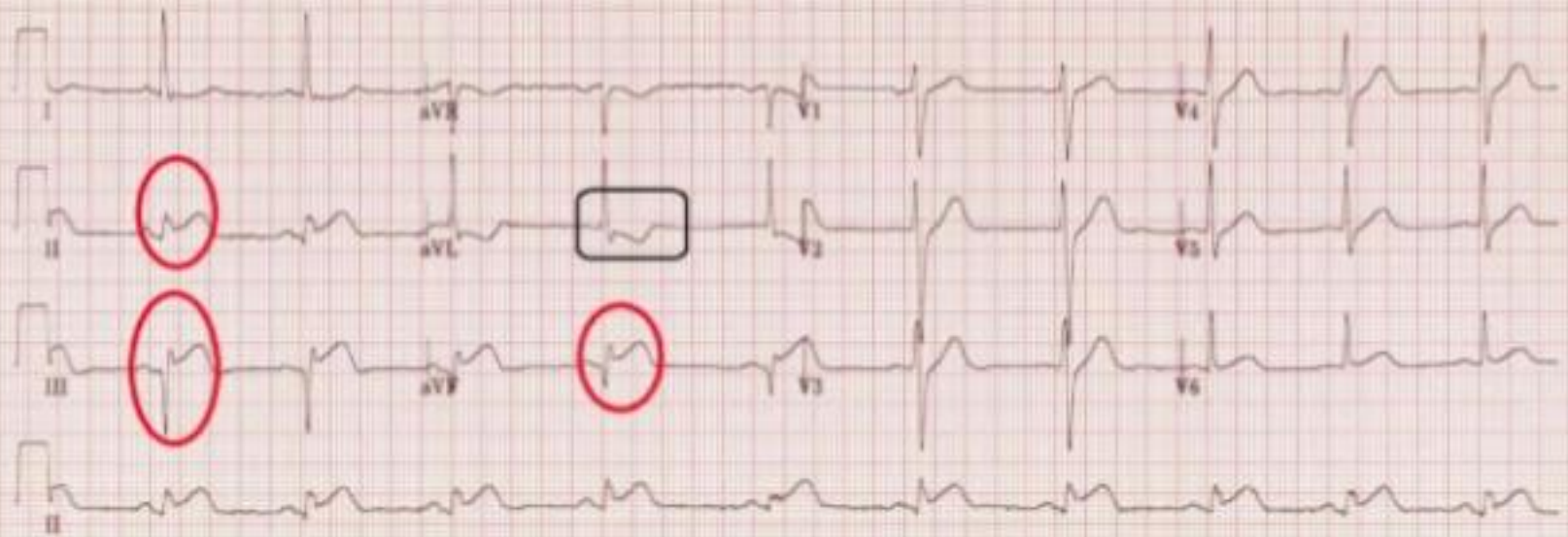
Tall, broad R waves in V2-3





## Inferior MI

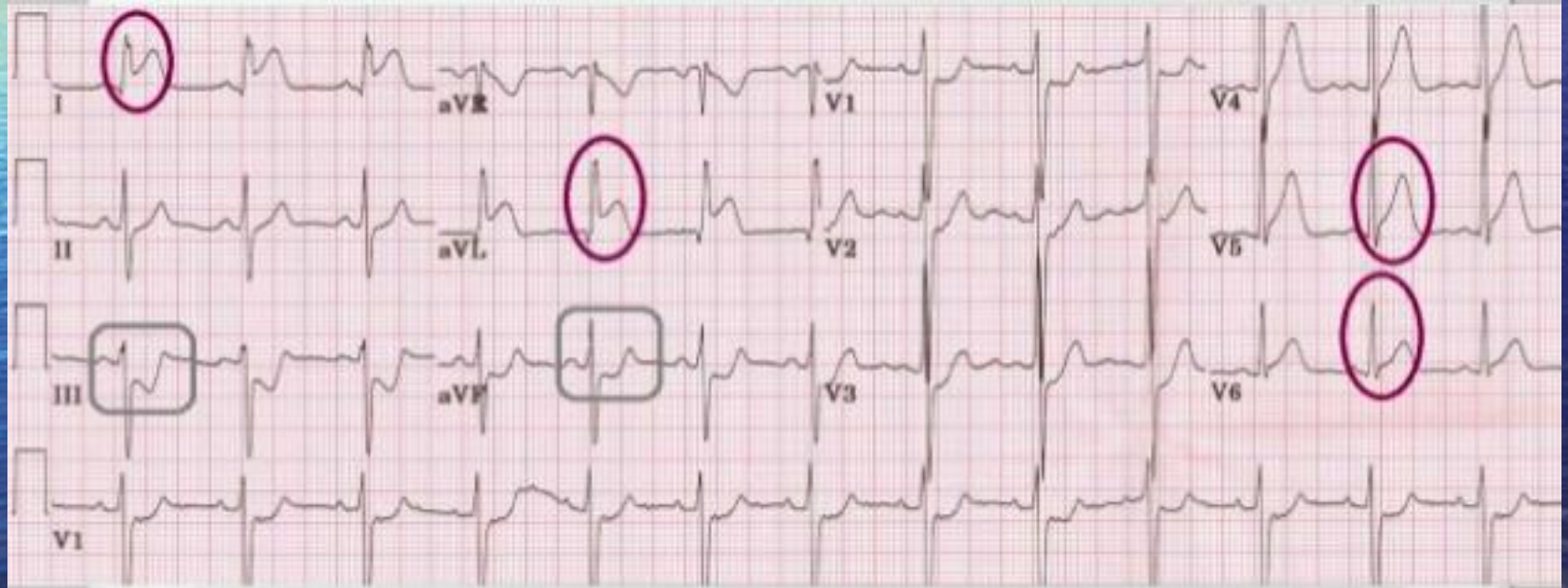
There is ST elevation in II, III and aVF with Reciprocal ST depression and T wave inversion in aVL





# Lateral MI

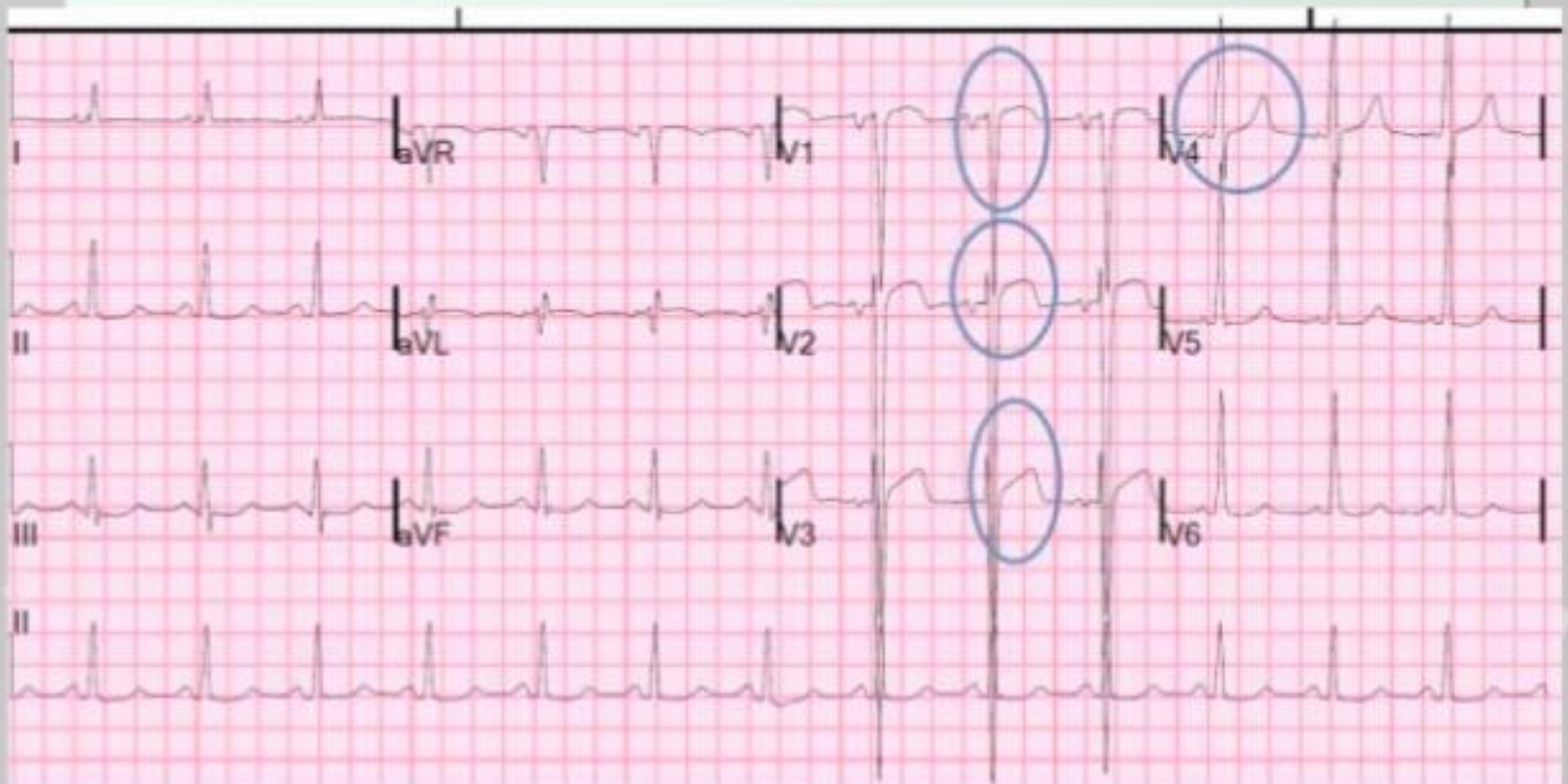
There is reciprocal ST depression in the inferior leads (III and aVF)



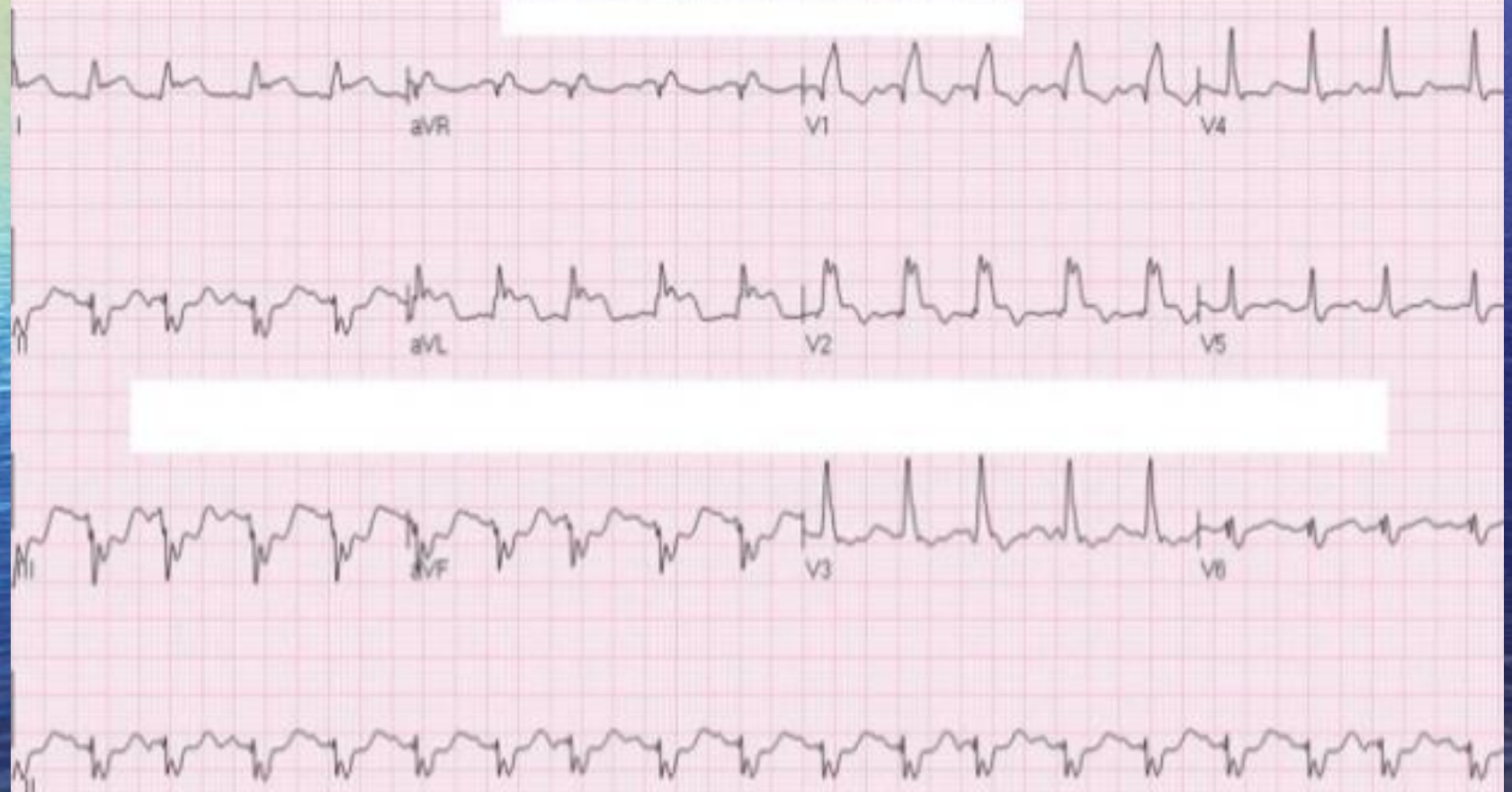




## Anteroseptal MI



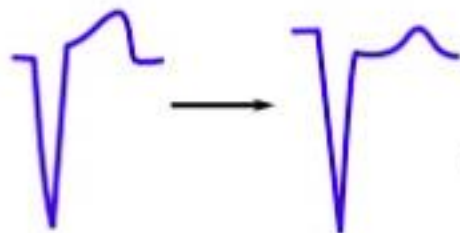
# ***STEMI + RBBB***



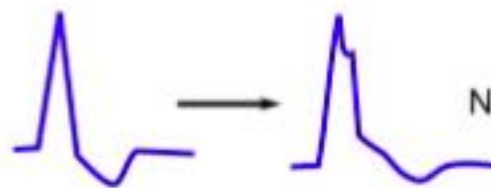
# *“STE in a Paced Rhythm”*

Ischemia in LBTB

## Sgarbossa Criteria



Concordant ST shifts



New QRS notching



QRS notching and ST elevation > 5 mm

# MI WITH LBBB

New onset of LBBB suggests acute MI.

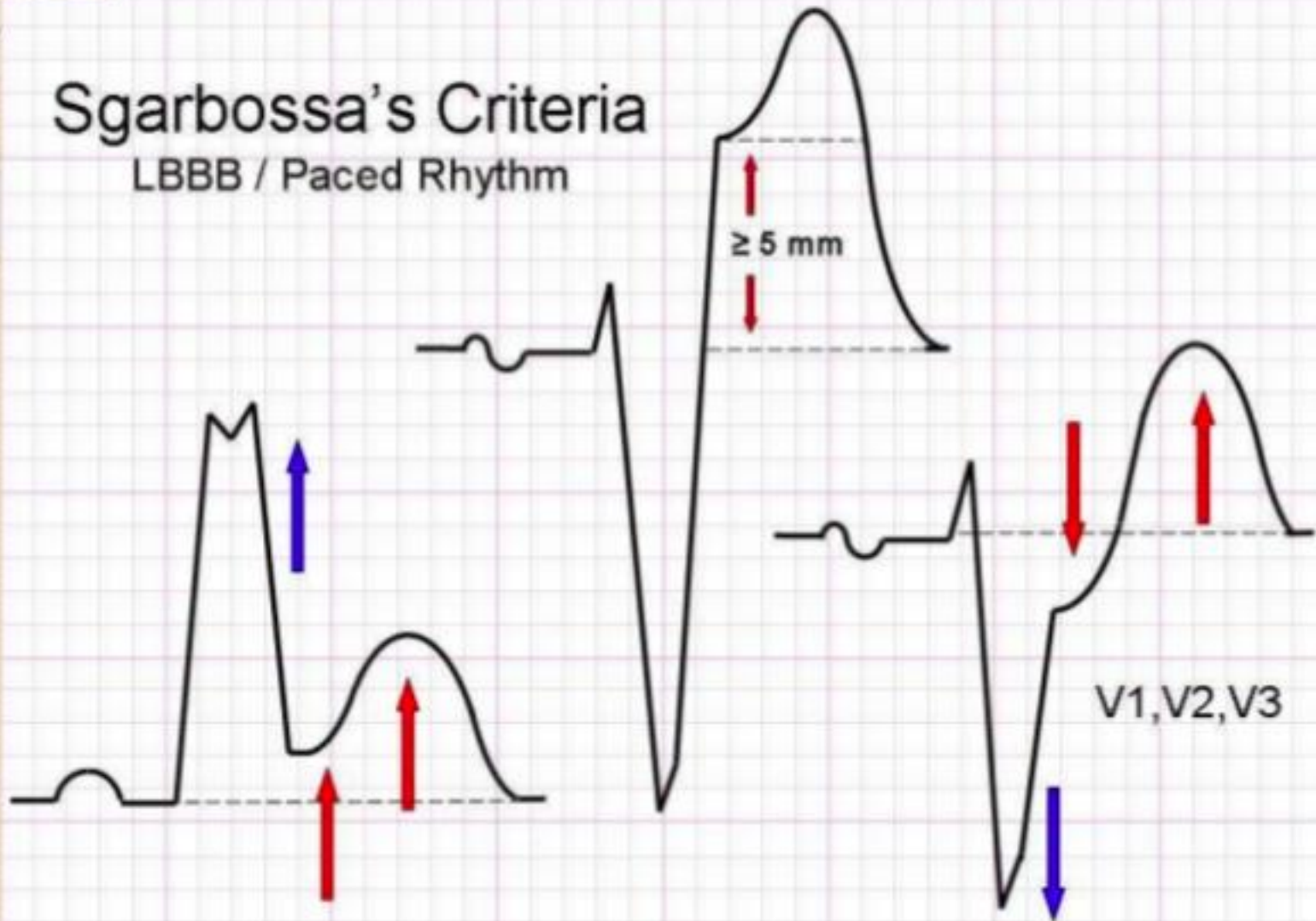
In patients with documented LBBB earlier, it is difficult to diagnose AAMI due to masking effect of LBBB on QRST changes.

CRITERIA USED FOR ACUTE AAMI WITH PRIOR LBBB IS SGARBOSSA CRITERIA

1. ST elevation in at least one lead of  $> 1$  mm concordant to positive QRS complex[5]
  2. ST depression of  $> 1$  mm in V1 to V3[3]
  3. Discordant ST elevation  $> 5$  mm in at least one leads with prominent negative QRS[2]
- A total of  $\geq 3$  points suggests

# Sgarbossa's Criteria

LBBB / Paced Rhythm



# NSTE-ACS

- Rupture of unstable atheromatous plaque
- Plaque erosion
- Coronary vasoconstriction
- Intraluminal narrowing/restenosis
- Unbalance supply/demand

# High risk acs

Ongoing ischemia within 48h

Ongoing pain > 20min

Pulmonary edema

MR

S3/RALES/HOT/INC OR DEC HR

Y > 75Y

REST Pain + STD > 0.05 mv

New BBB/SUS VT

POSITIVE MARKERS

# Acute coronary syndrome

**1**

Non - ST - Elevation MI  
OR  
Unstable angina



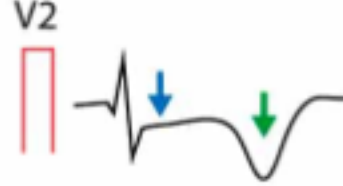
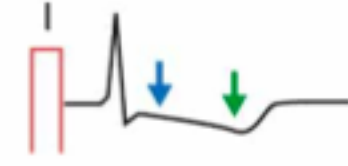
**ECG changes** : ST depression and / or  
T wave inversion . We should differentiate  
between them by the cardiac enzymes.

**2**

ST - Elevation MI



# NSTEMI

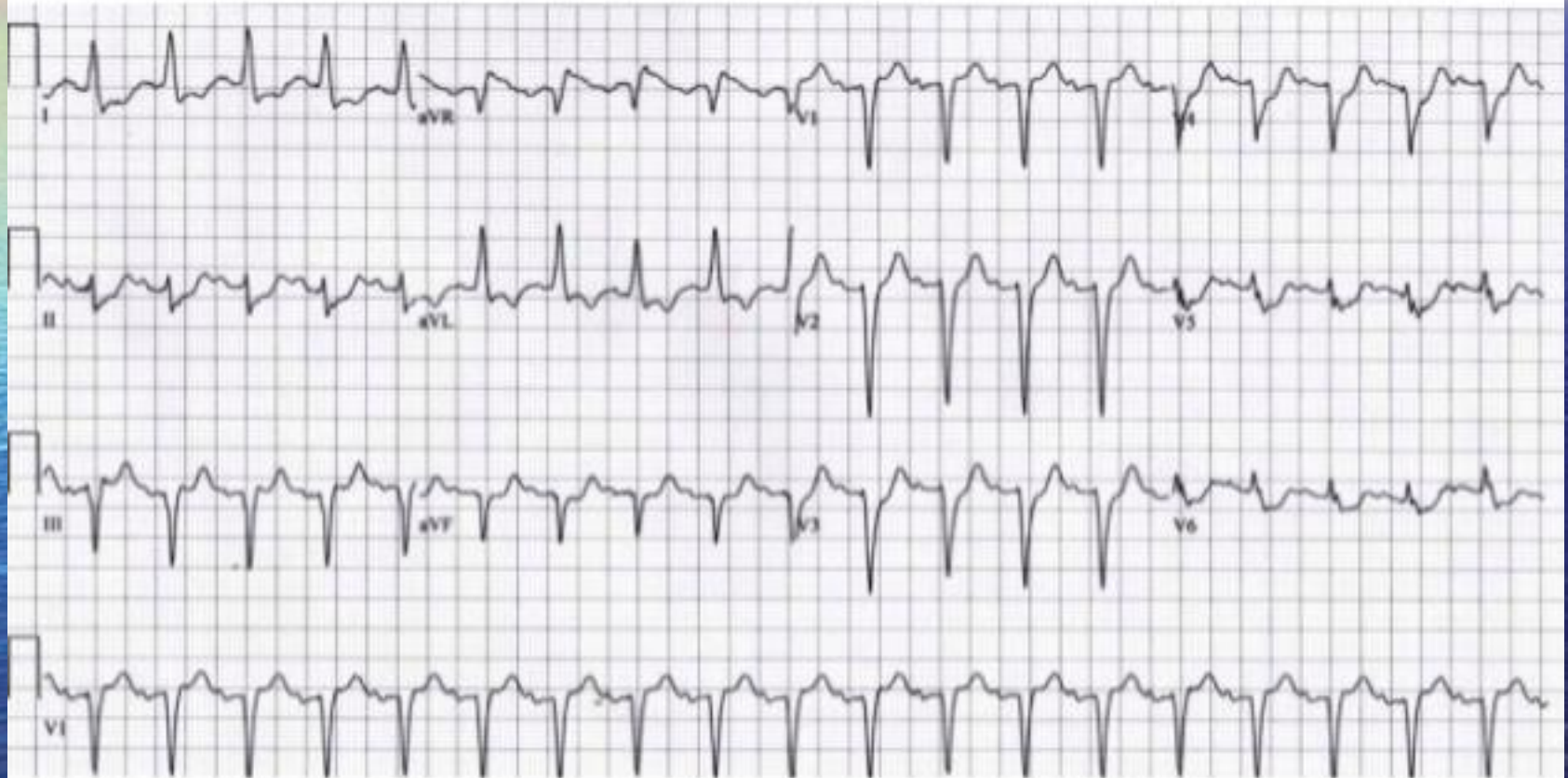


→ ST segment depression

# T wave inversion

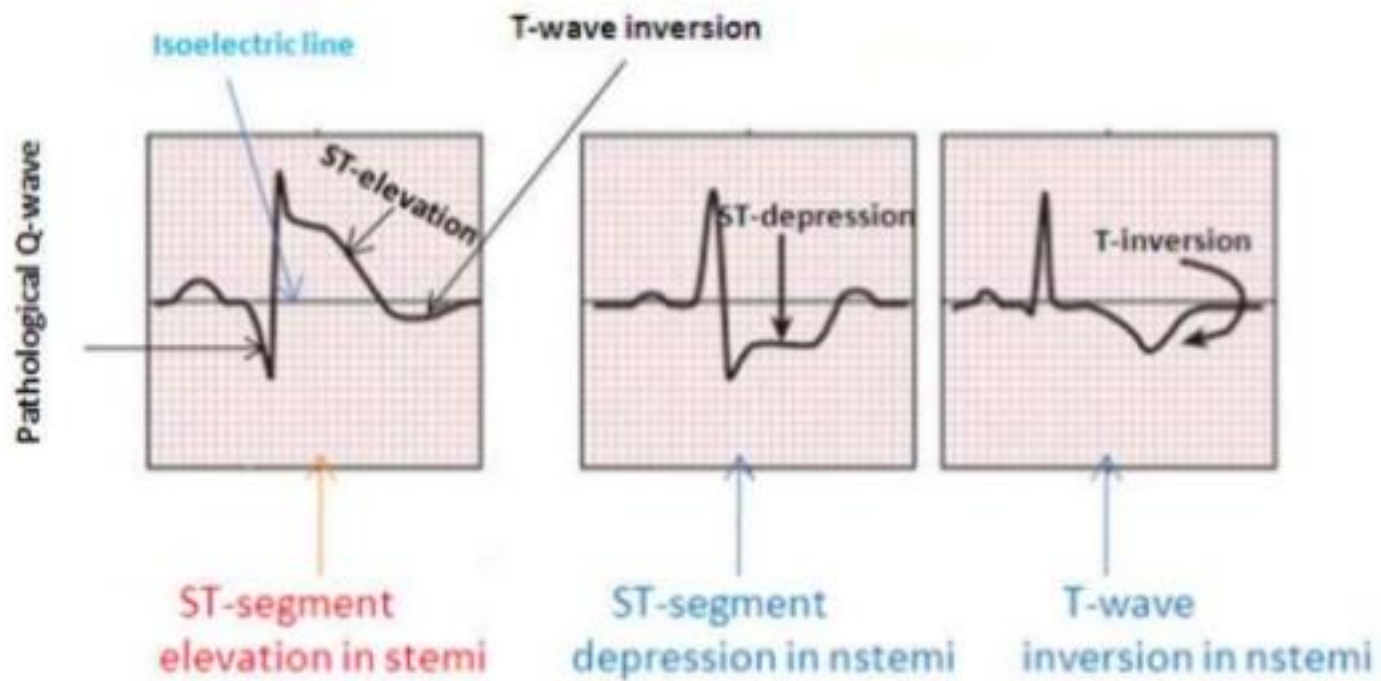


# ST depression



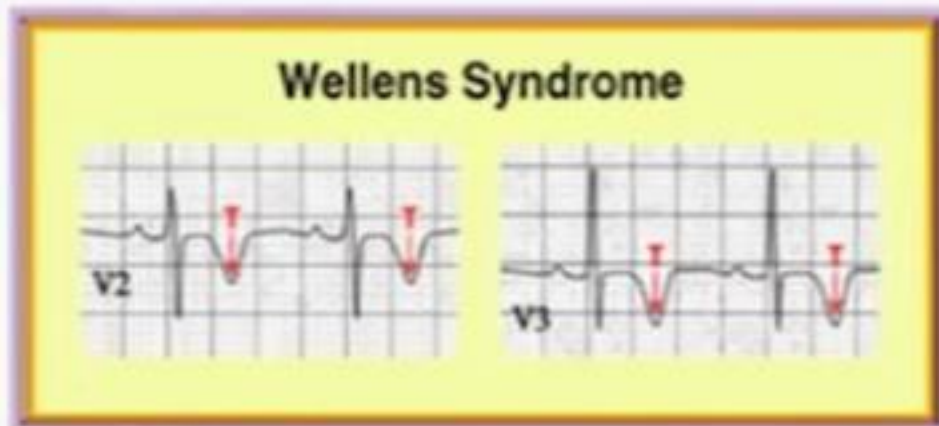
# ST depression





# Types of Wellens' Syndrome

## Wellens' Type 1



## Wellens' Type 2



### **Type 1 (A):**

- Deep & symmetric T wave inversion in the mid-precordial leads.
- More common (75%).

### **Type 2 (B):**

- Biphasic T wave in the mid-precordial leads.
- Less common (25%).

### **N.B.**

The T waves evolve over time from the symmetrical to the biphasic pattern.

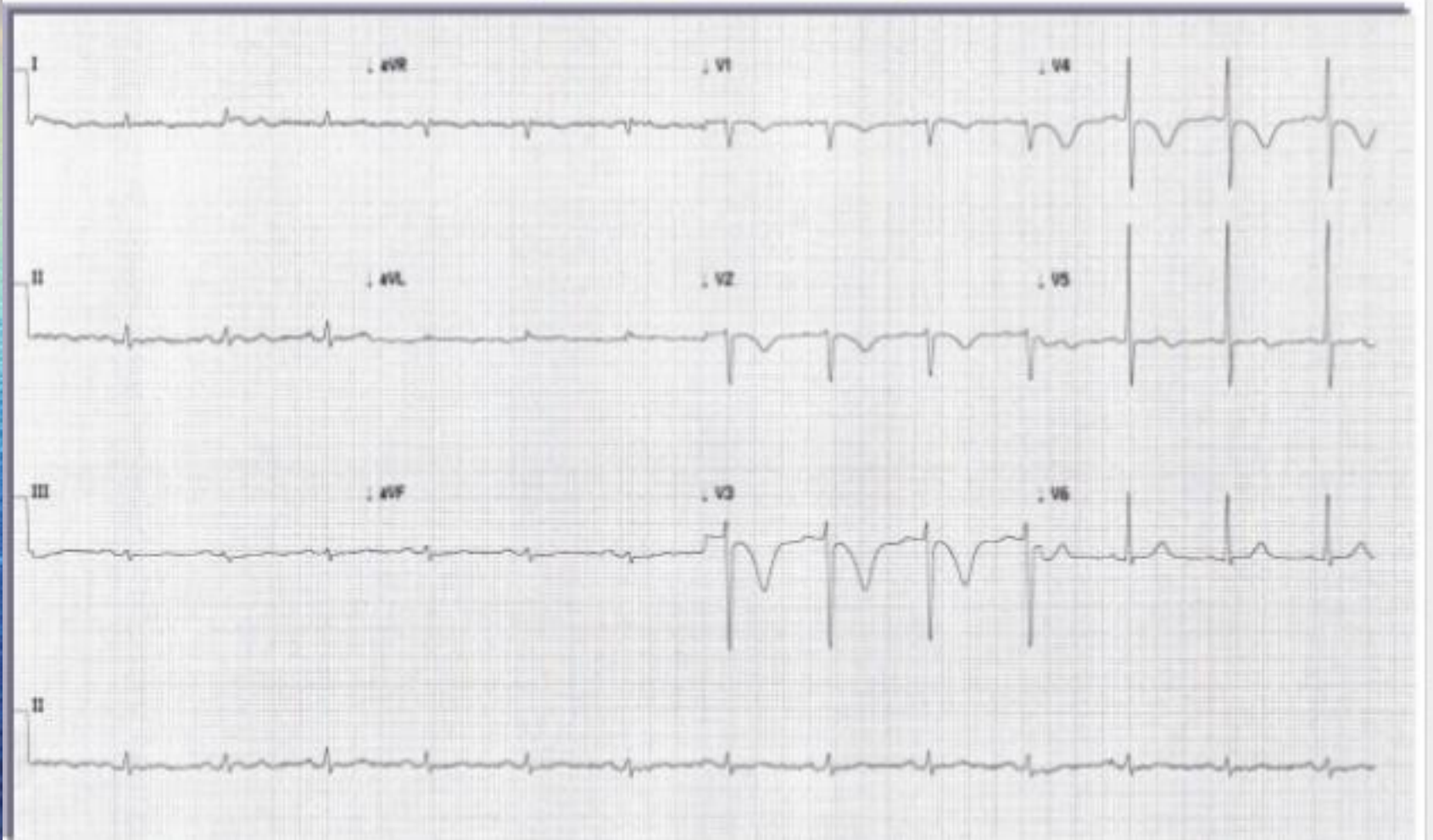
## **Diagnostic Criteria**

Rhinehart et al (2002)

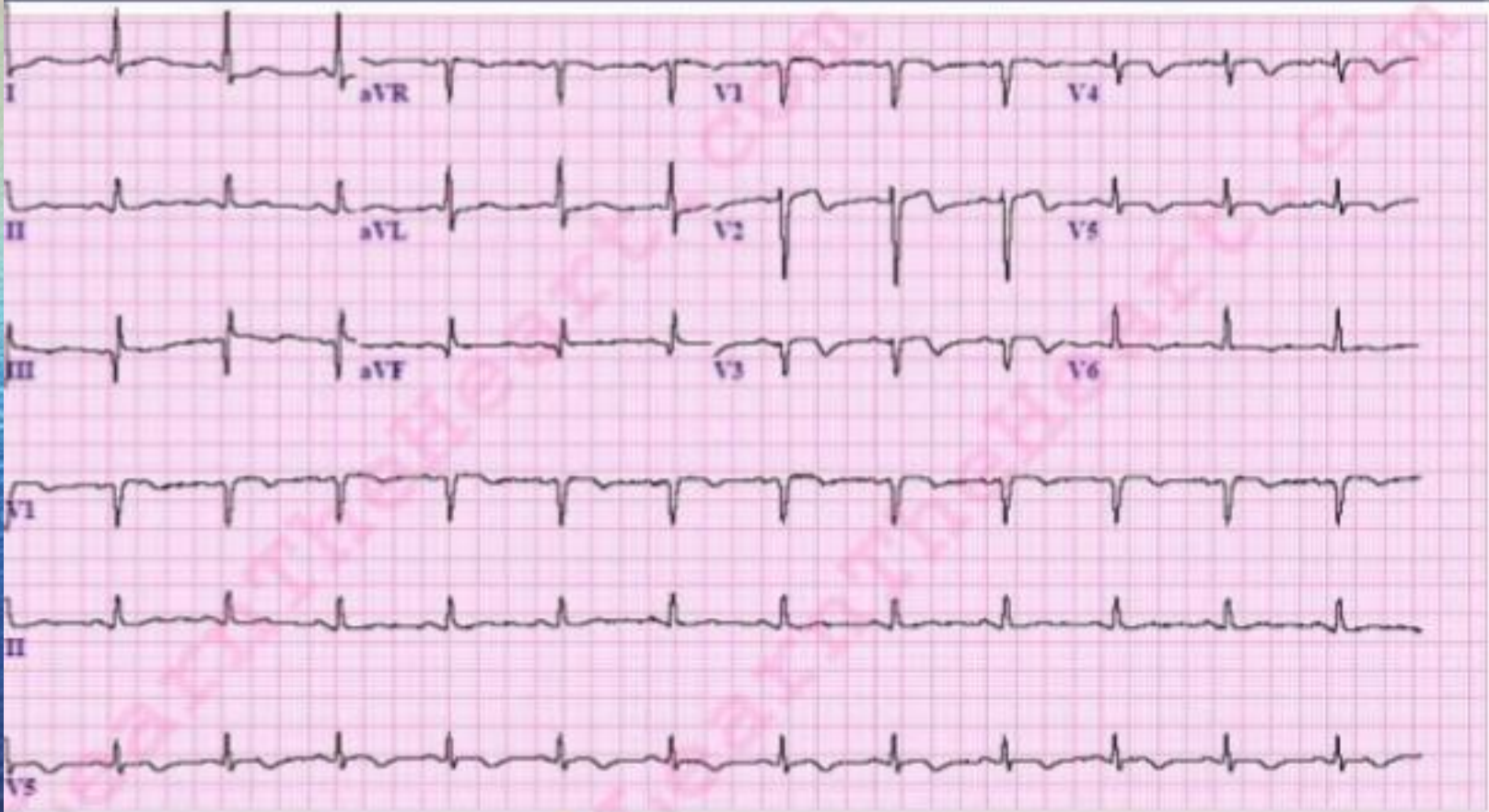
- 1) Deeply-inverted or biphasic T waves in V2-3 (may extend to V1-6).
- 2) Isoelectric or minimally-elevated ST segment (<1mm).
- 3) No precordial Q waves.
- 4) Preserved precordial R wave progression.
- 5) Recent history of angina.
- 6) ECG pattern present in pain-free state.
- 7) Normal or slightly elevated serum cardiac markers.



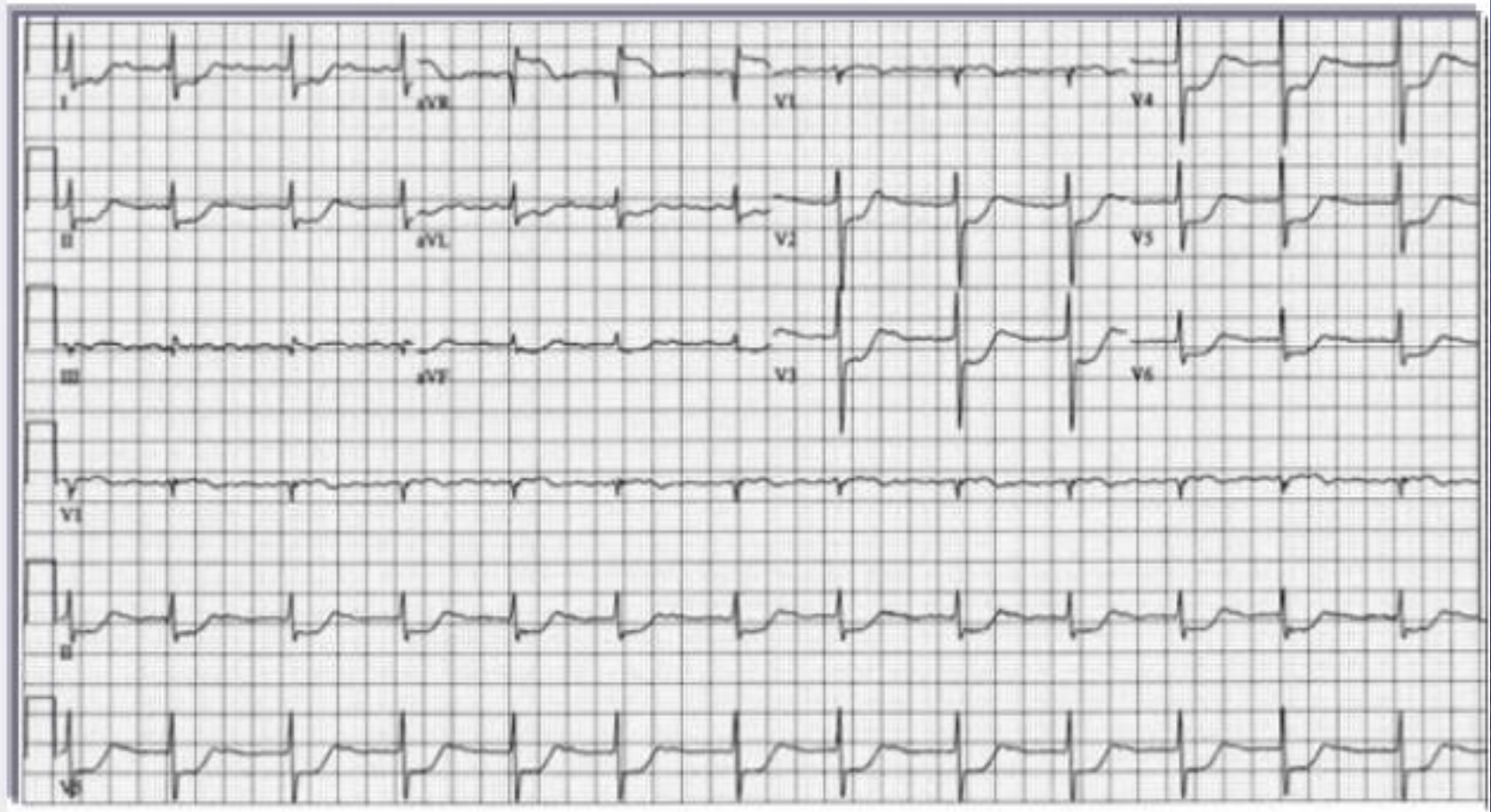
# “Type 1”



# “Type 2”



## *“ST Elevation in aVR”*

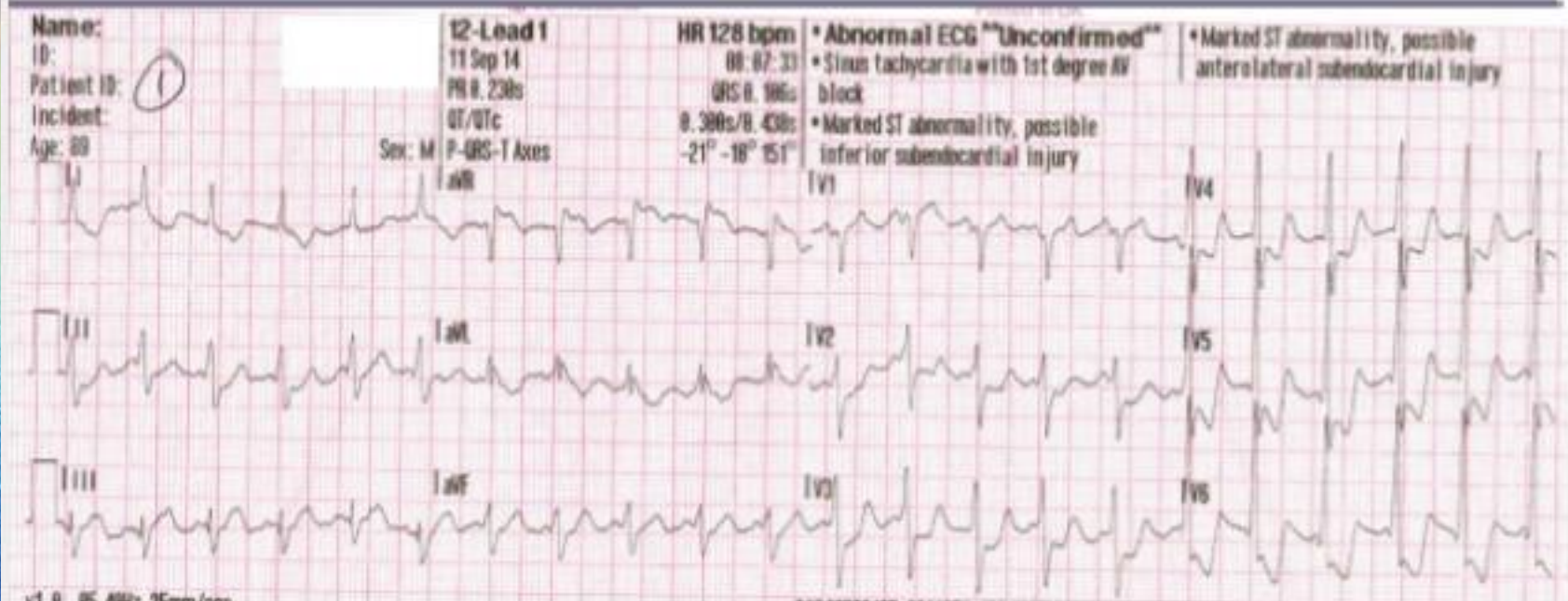


## **“Value of ST elevation in aVR”** (2)(3)

***In ST elevation in aVR + ST depression in multiple other leads, PLEASE consider:***

- 1) LMCA occlusion, especially if:
  - ST elevation in aVR  $>$  V1.. (highly specific)
  - ST elevation in aVR & aVL..
- 2) Proximal LAD occlusion.
- 3) Triple vessel disease.

# “ST Elevation in aVR”



- 1) ST elevation in aVR.
- 2) ST elevation in V1 (< STE in aVR).
- 3) ST depression in most of the chest & limb leads.

## **Why is it BAD?**

1) ST elevation in aVR is directly proportionate to the mortality rate:

- 0.5 mm	➡	10.8 %
- 1 mm	➡	13.8 %
- 1.5-2.5 mm	➡	22.2 %
- > 3 mm	➡	50 %

2) Mortality is 70% without immediate PCI.

3) Medical treatment including thrombolysis does not improve the mortality!!!

