

Myocardial ischemia & Infarction EKG pattern

การวินิจฉัยหัวใจ

1. อาการและอาการแสดง

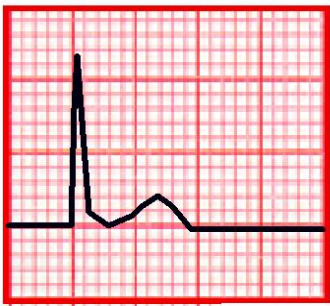
2. คลื่นไฟฟ้าหัวใจ EKG :

ST segment elevation หรือ ST depress

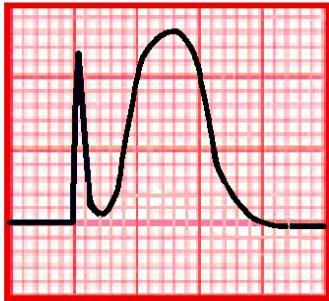
3. Cardiac enzyme :

CPK : CK-MB

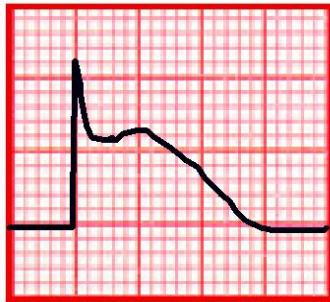
การเปลี่ยนแปลง ของคลื่นไฟฟ้าหัวใจ



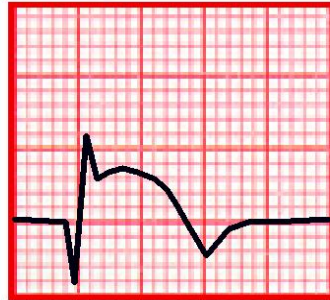
normal



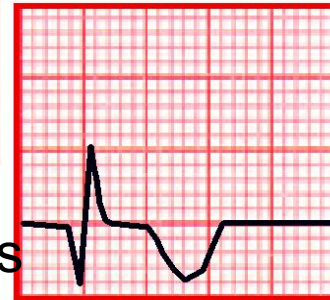
Hyperacute T wave Minute-hours



ST-elevation 0-12 hours



Q-wave Developing
Over 1-12 hours



ST-elevation With T wave inversion 2-5 days



T wave recovery Weeks-months

EKG criteria for CAD

1. With ST elevation

J point ST \uparrow in ≥ 2 contiguous leads

≥ 2 mm in V1-V3 & ≥ 1 mm in other leads

2. Without ST elevation

≥ 1 mm horizontal or down sloping ST \downarrow in ≥ 2 contiguous leads

T wave inversion ≥ 1 mm in ≥ 2 contiguous leads

3. New left bundle branch block

**Noninfarction
Subendocardial**

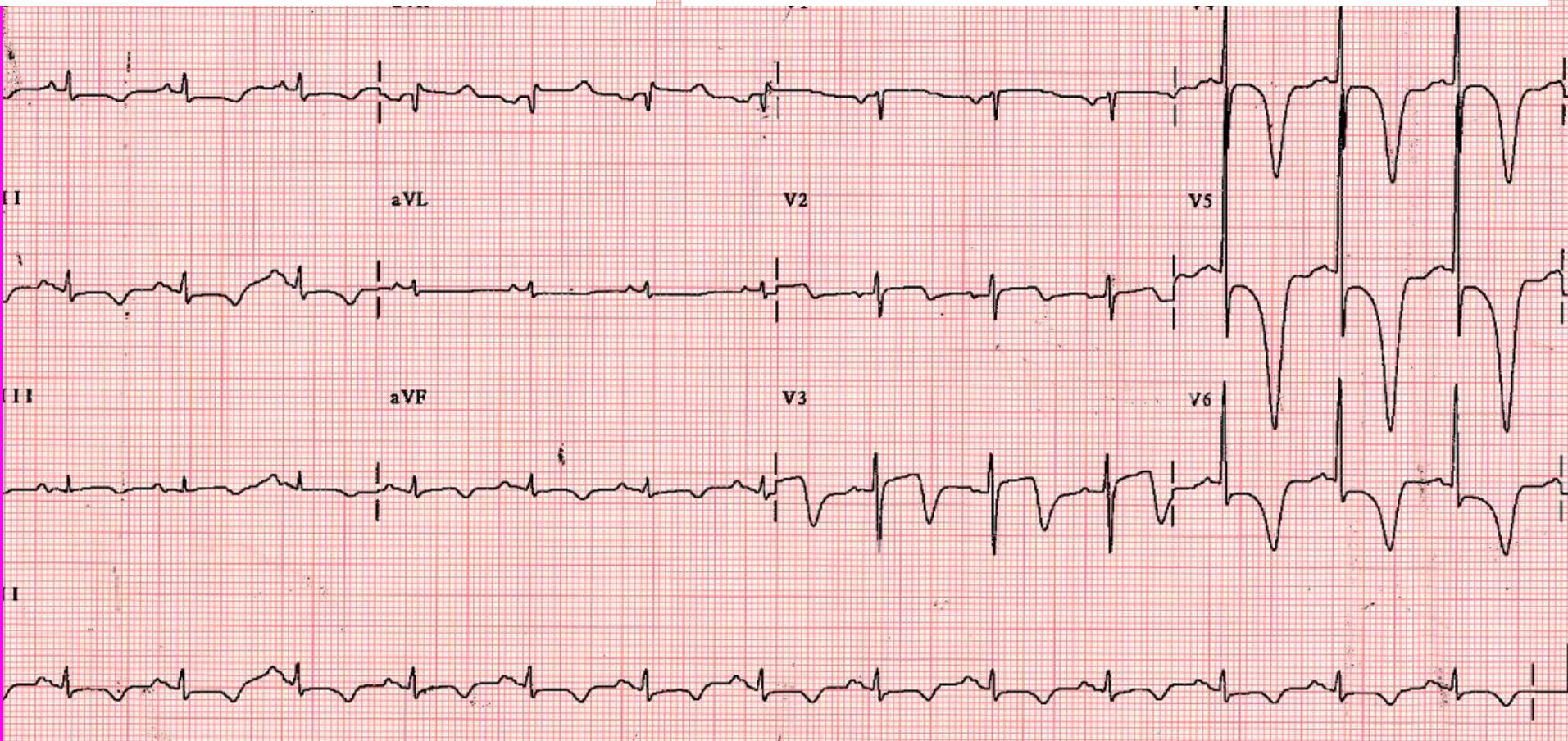
**Transient ST
depression**

**Non-Q wave
(no-ST elevation)**

Infarction

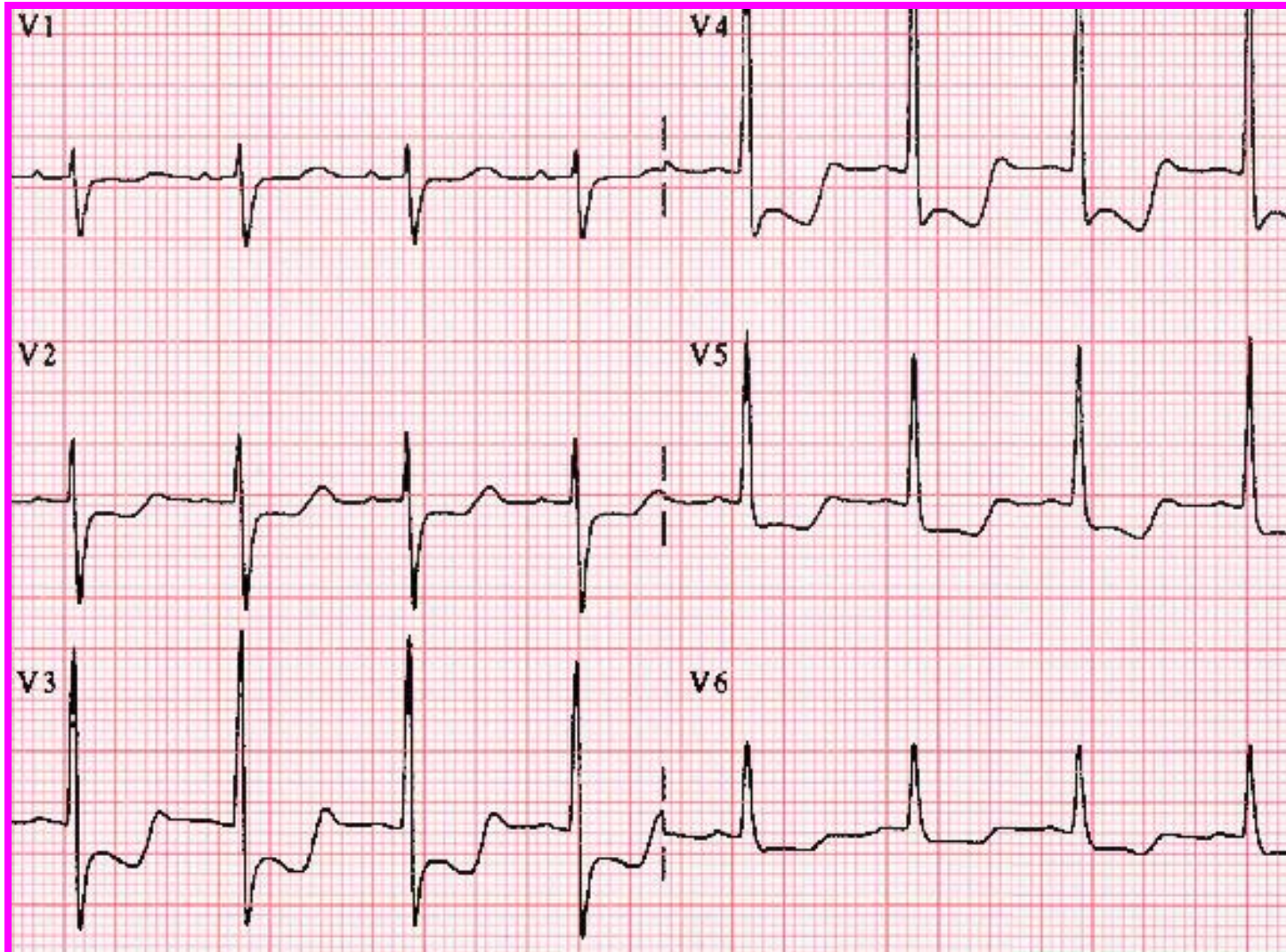
+ enzyme positive

**ST depression or T wave
inversions without Q wave**



Acute unstable angina

- ST depress and T inversion
- Negative enzyme study
- Dynamic EKG change with symptom



**Noninfarction
Transmural ischemia**

Transient ST elevations
or paradoxical T wave
normalization,
sometimes followed
by T wave inversions

Q wave infarction

New Q wave with
Hyperacute
T waves / ST elevations
Followed by
T wave inversions

early



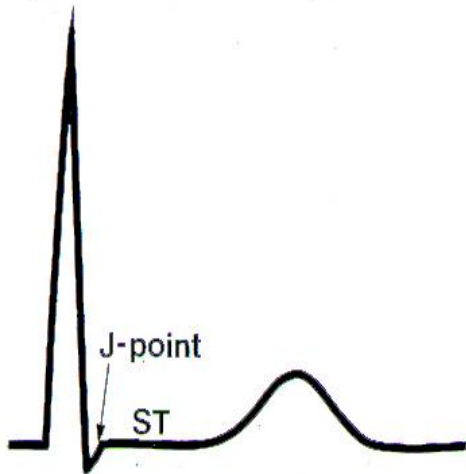
later



ST elevation & depression

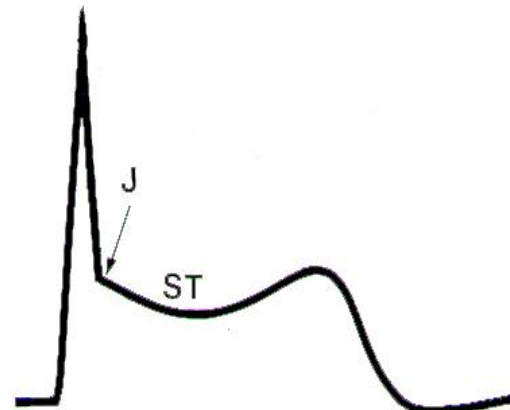
Isoelectric line

J point and ST segment



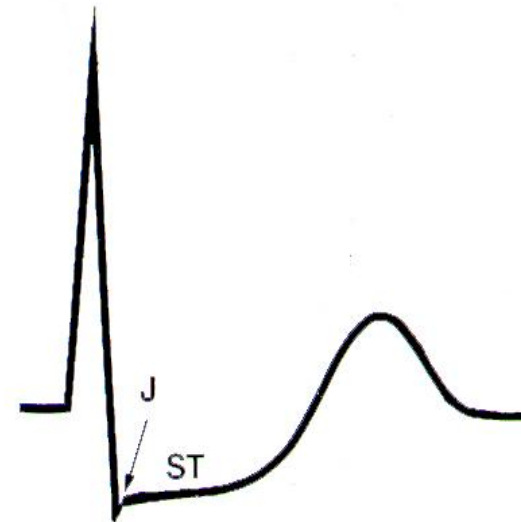
Elevated

J point and ST segment

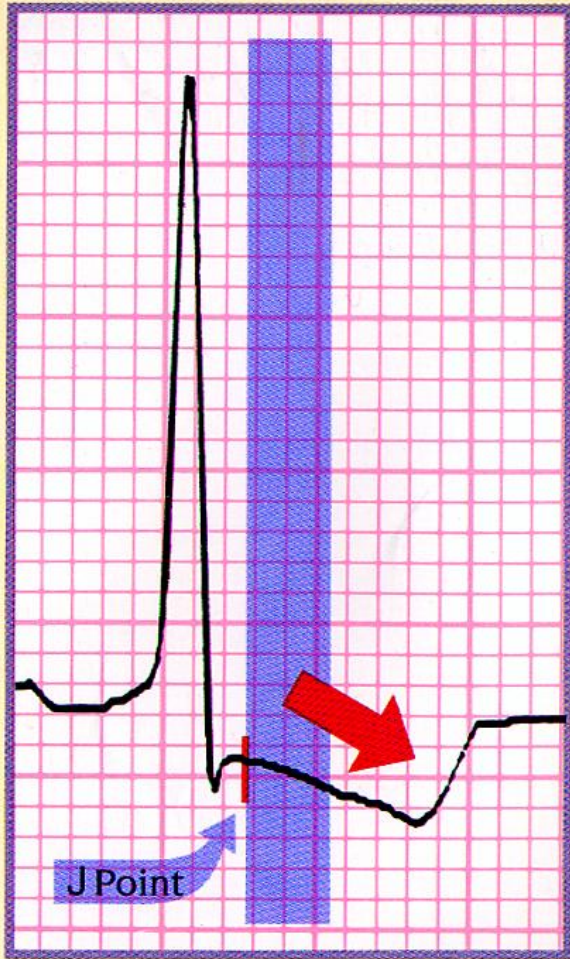


Depressed

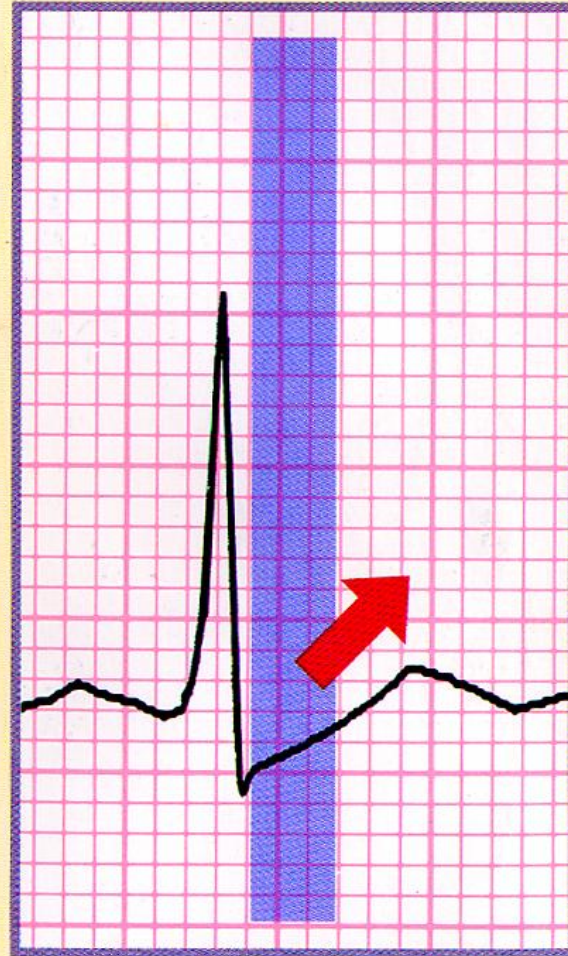
J point and ST segment



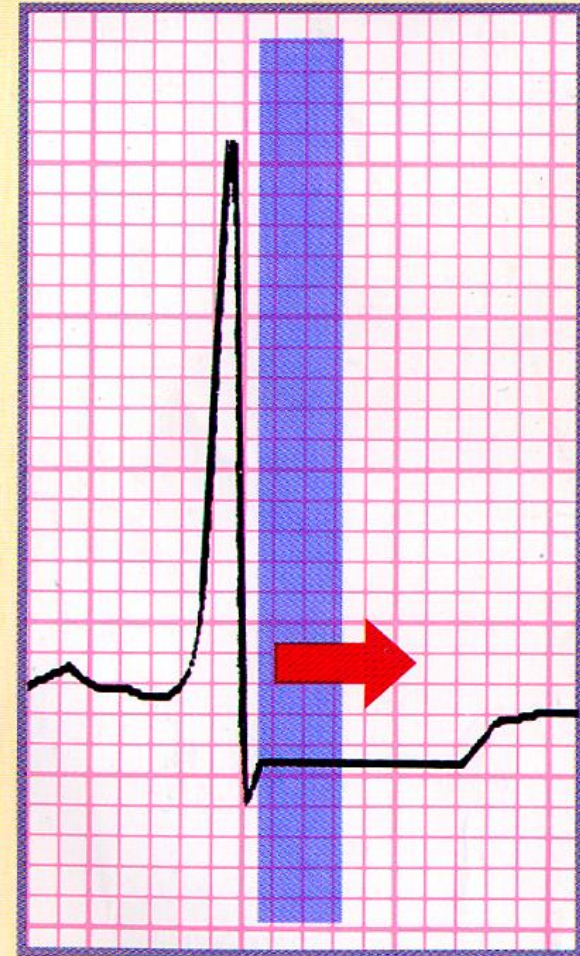
Measure ST segment 60 or 80 ms after the J point



Downsloping ST



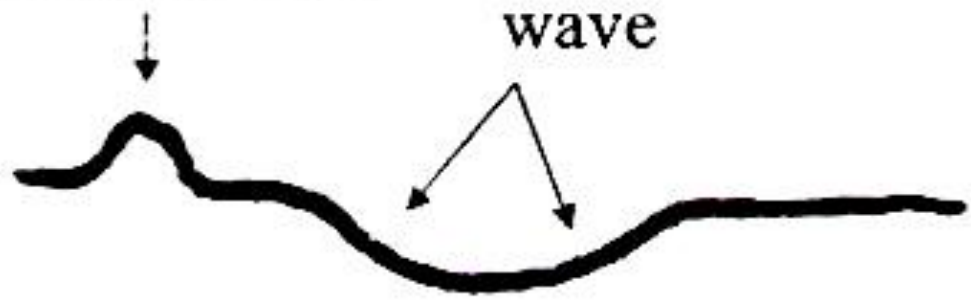
Upsloping ST



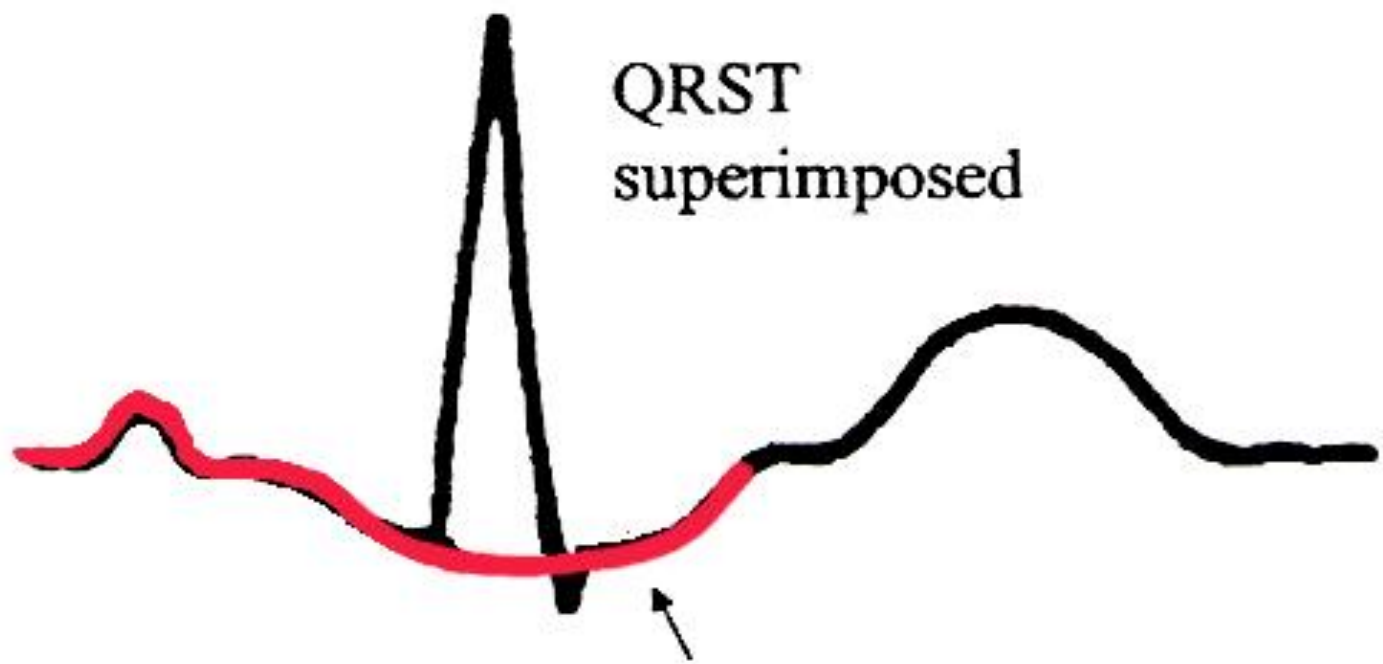
Horizontal ST

P-wave, or atrial activation wave

Atrial repolarization wave

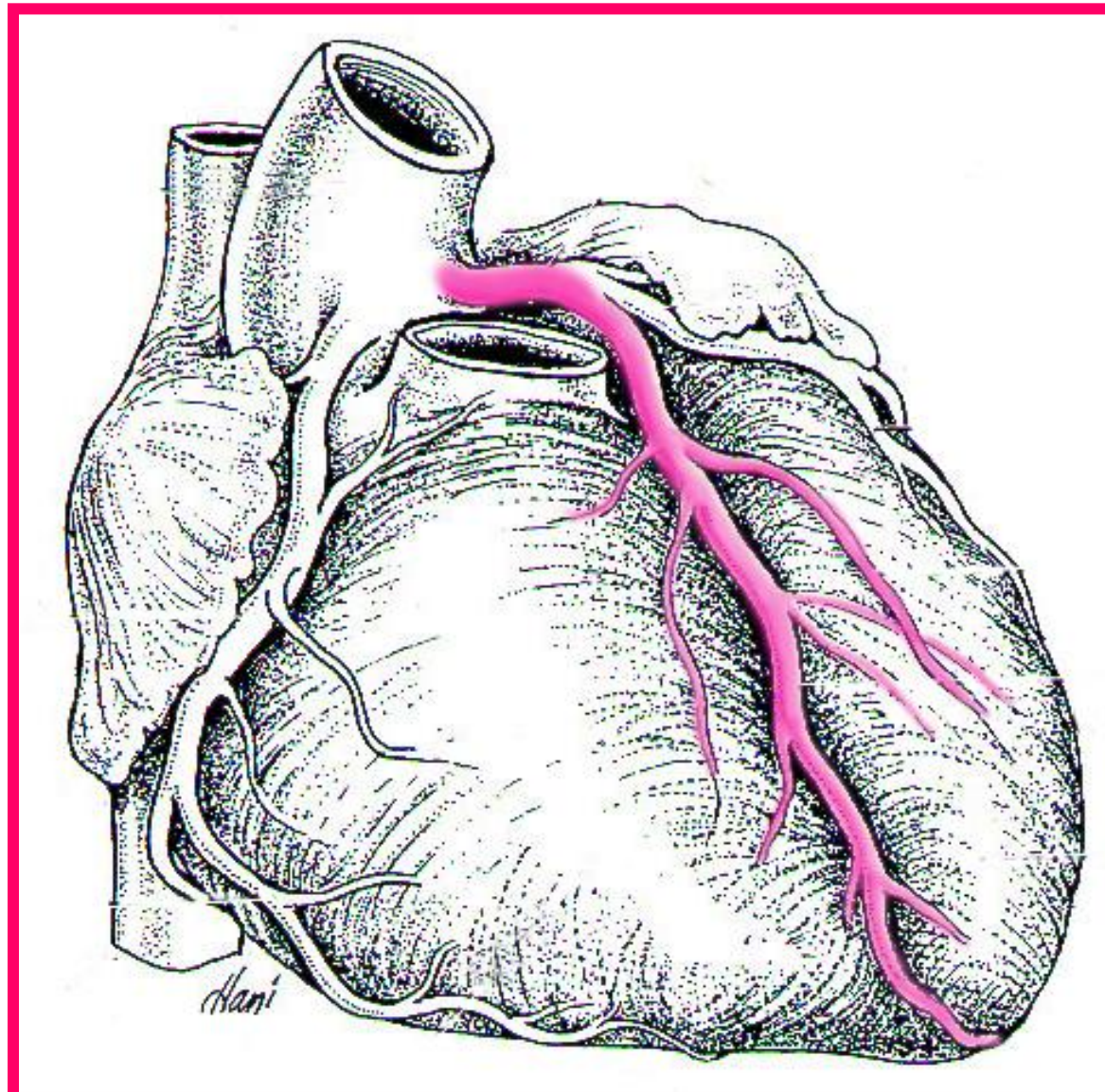


QRST superimposed

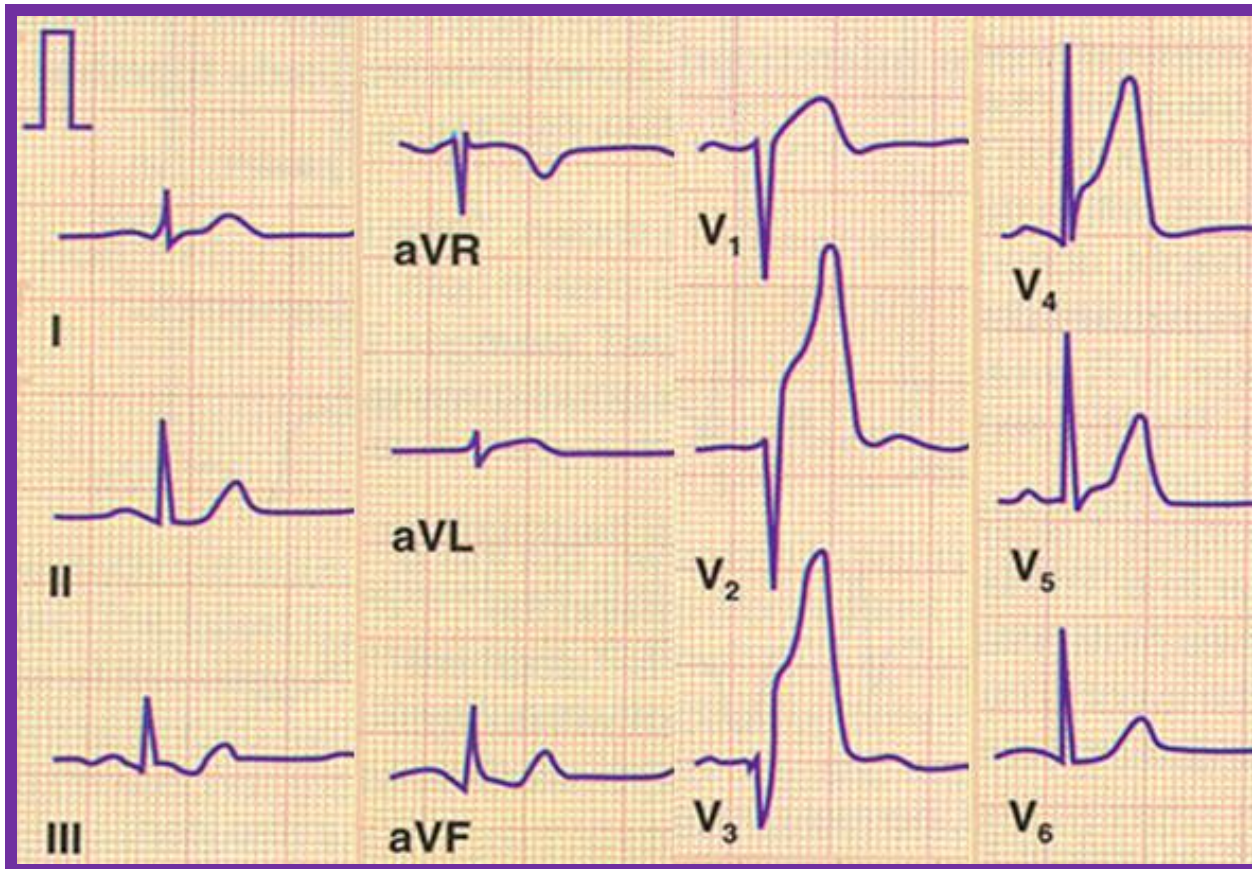


ST IS DEPRESSED RELATIVE TO T-P SEGMENT, BUT NOT RELATIVE TO PR SEGMENT

Left Anterior Descending (LAD) occlusion



Anterior wall MI



Best Monitoring

Left Anterior Descending (LAD) :

V₂

V₃

V₄ เห็นน้อยกว่า

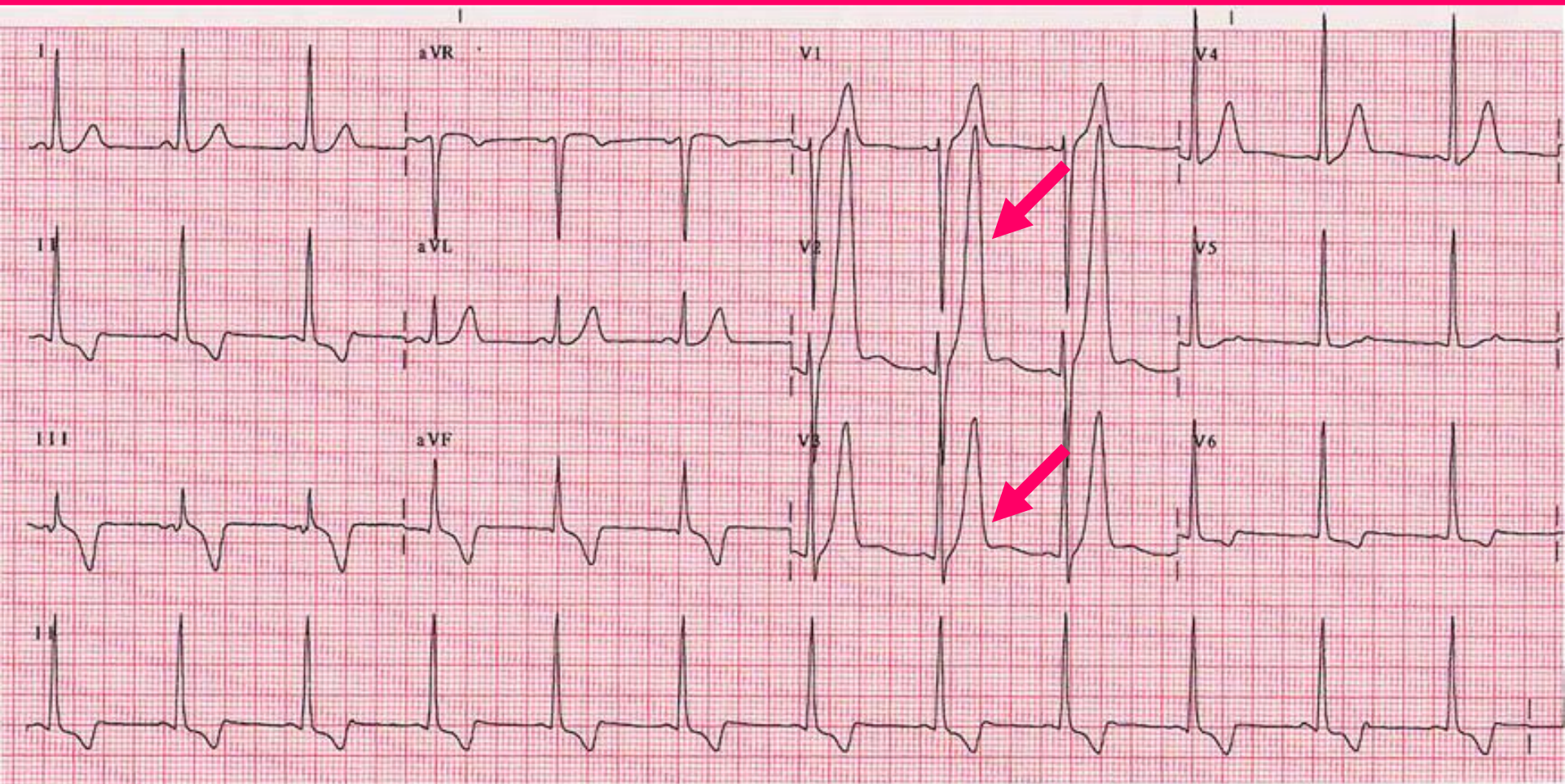
Reciprocal change

II

III

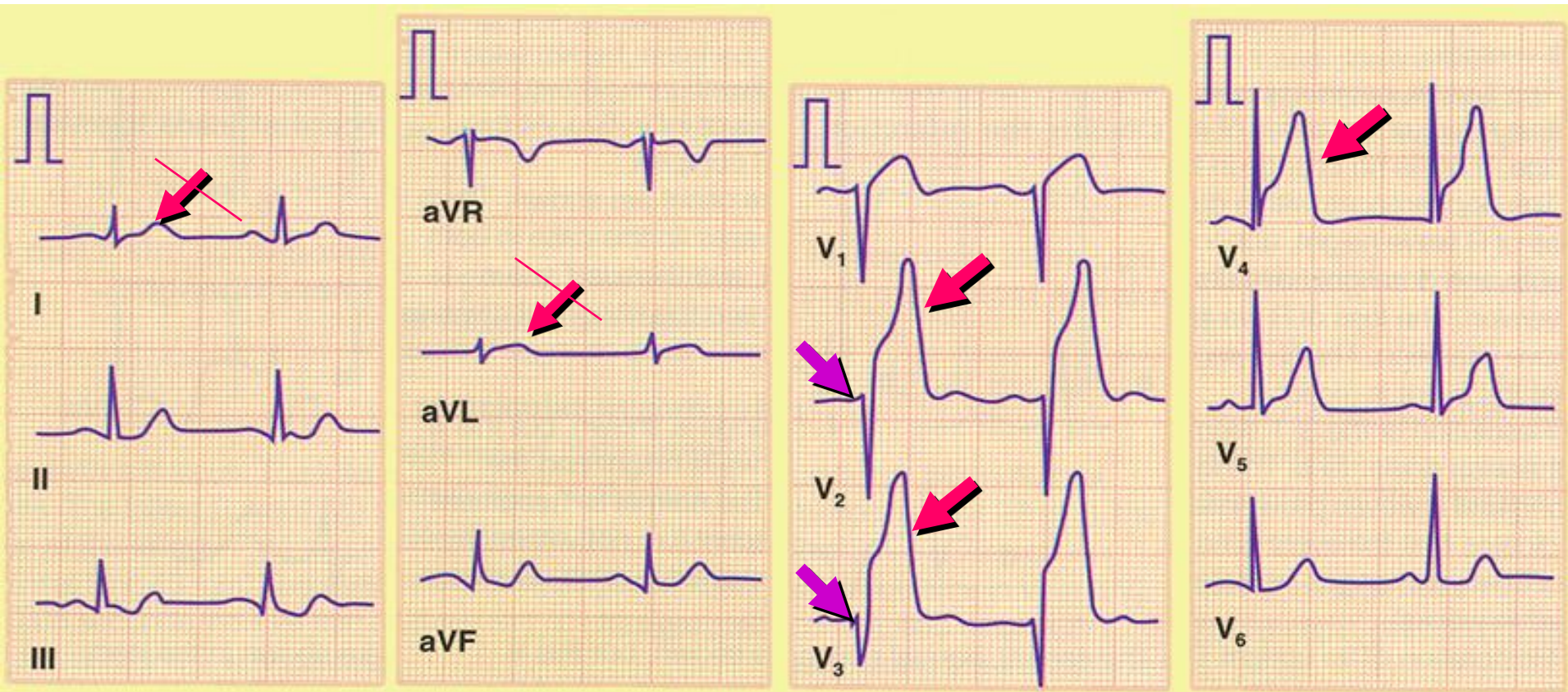
aVF

Hyperacute T waves in early LAD occlusion



ต่างกับ EKG ที่พบใน Hyperkalemia อย่างไร

Anterior MI with LAD occlusion distal to 1st diagonal branch

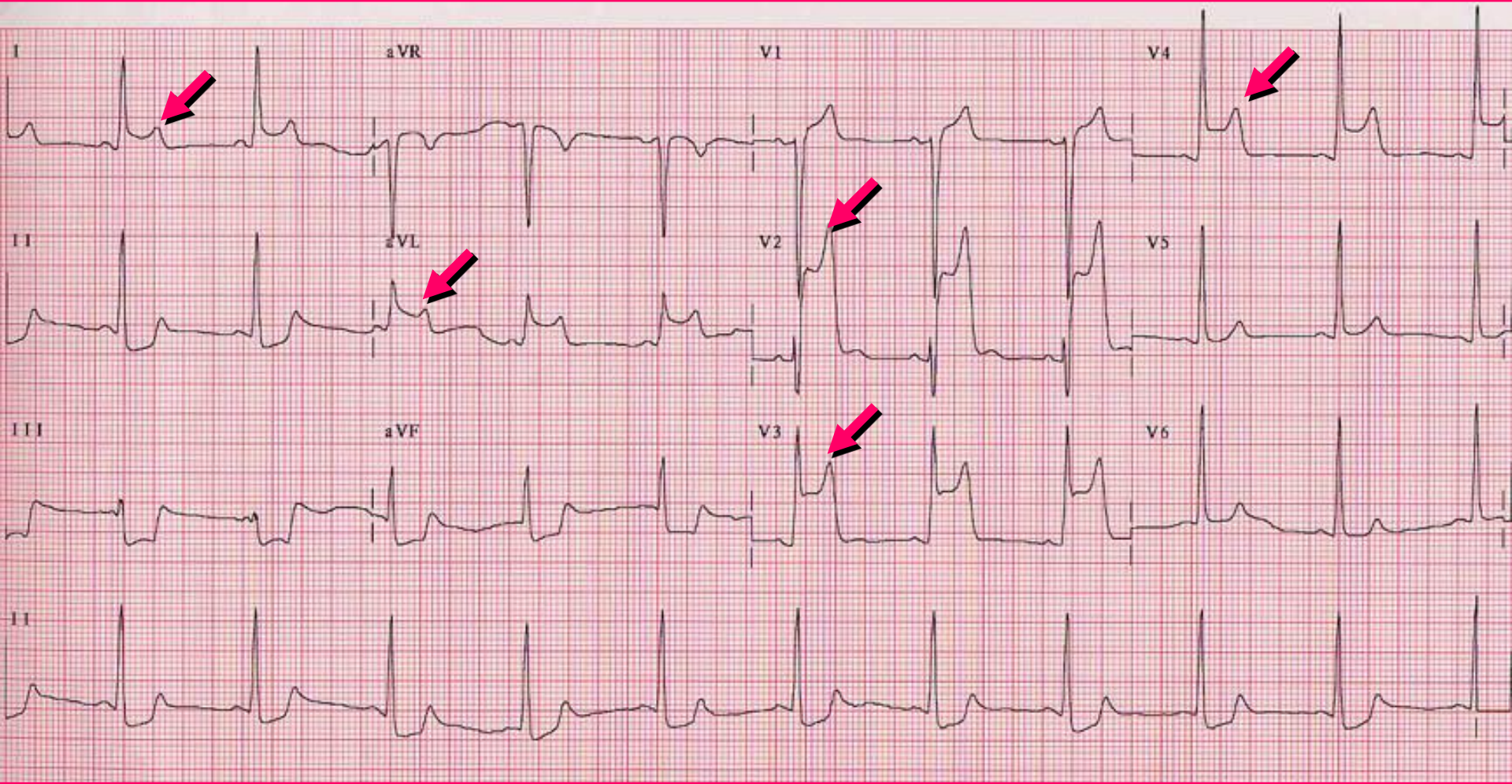


Anterior Wall MI

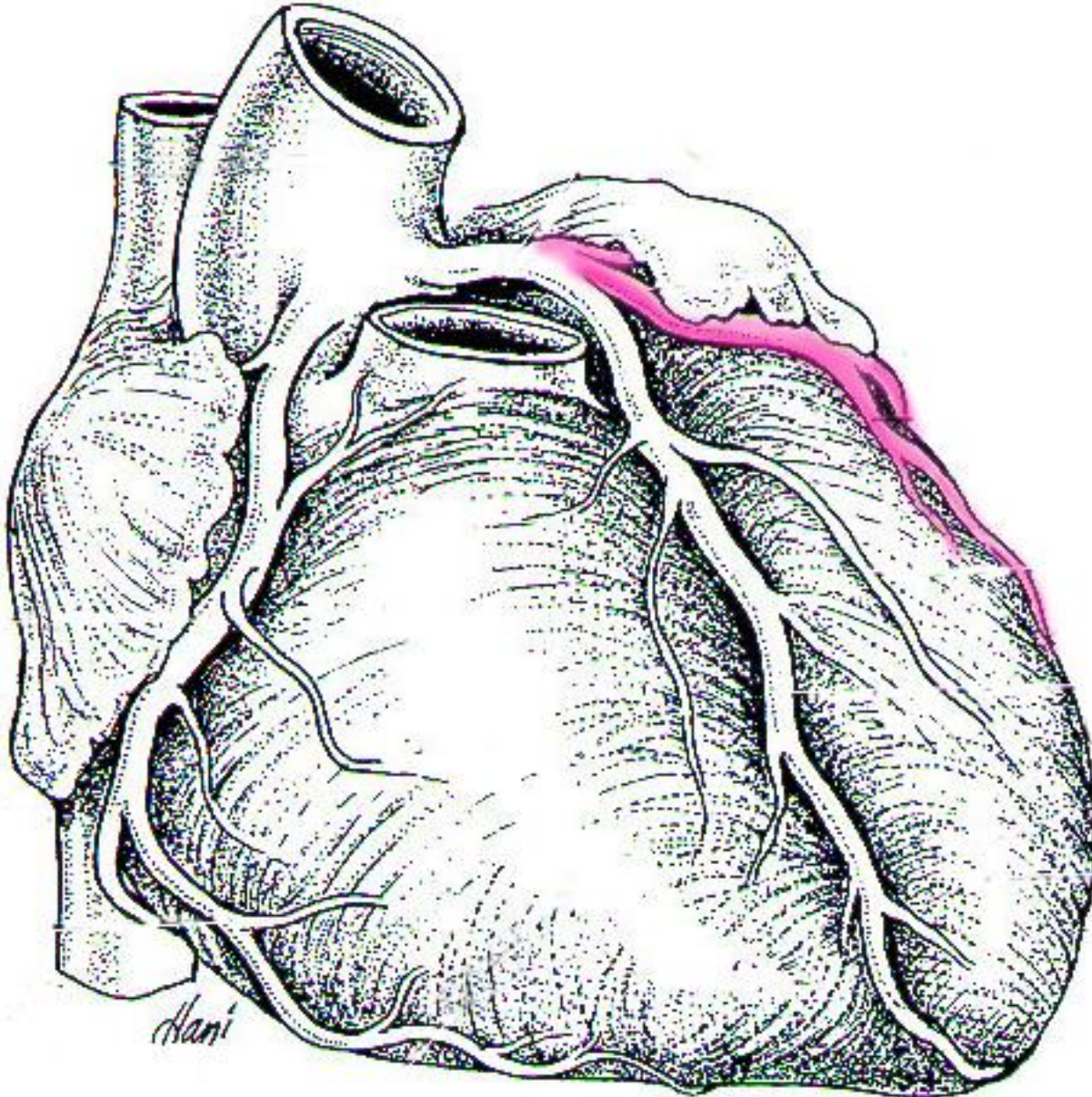
- LAD occlusion proximal to 1st diagonal branch

- ST ↑ ใน lead I หรือ aVL

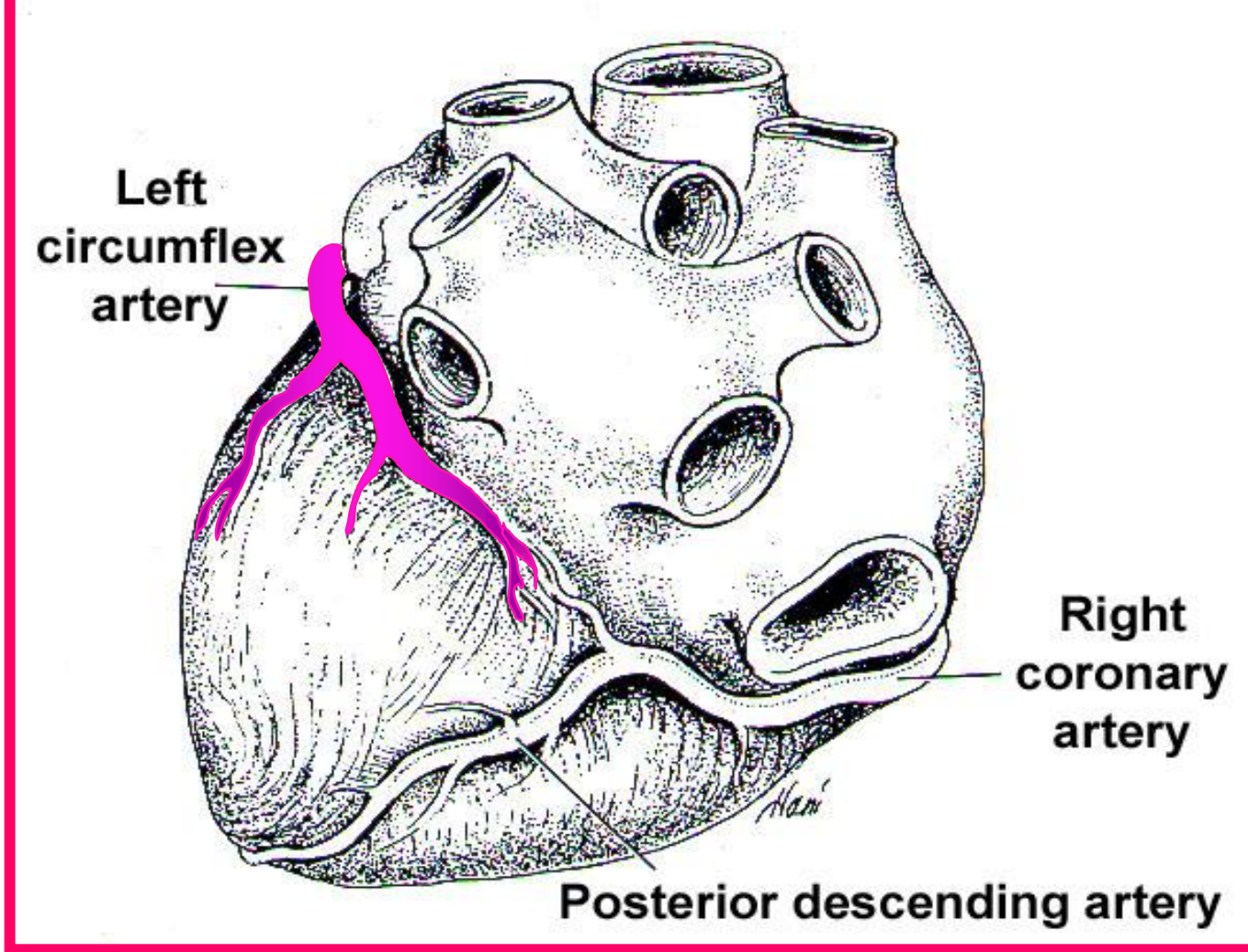
LAD occlusion proximal to 1st diagonal branch



Left circumflex artery occlusion



Apical leads



Inferior wall 10 %

Posterior wall 10 %

SA node 45 %

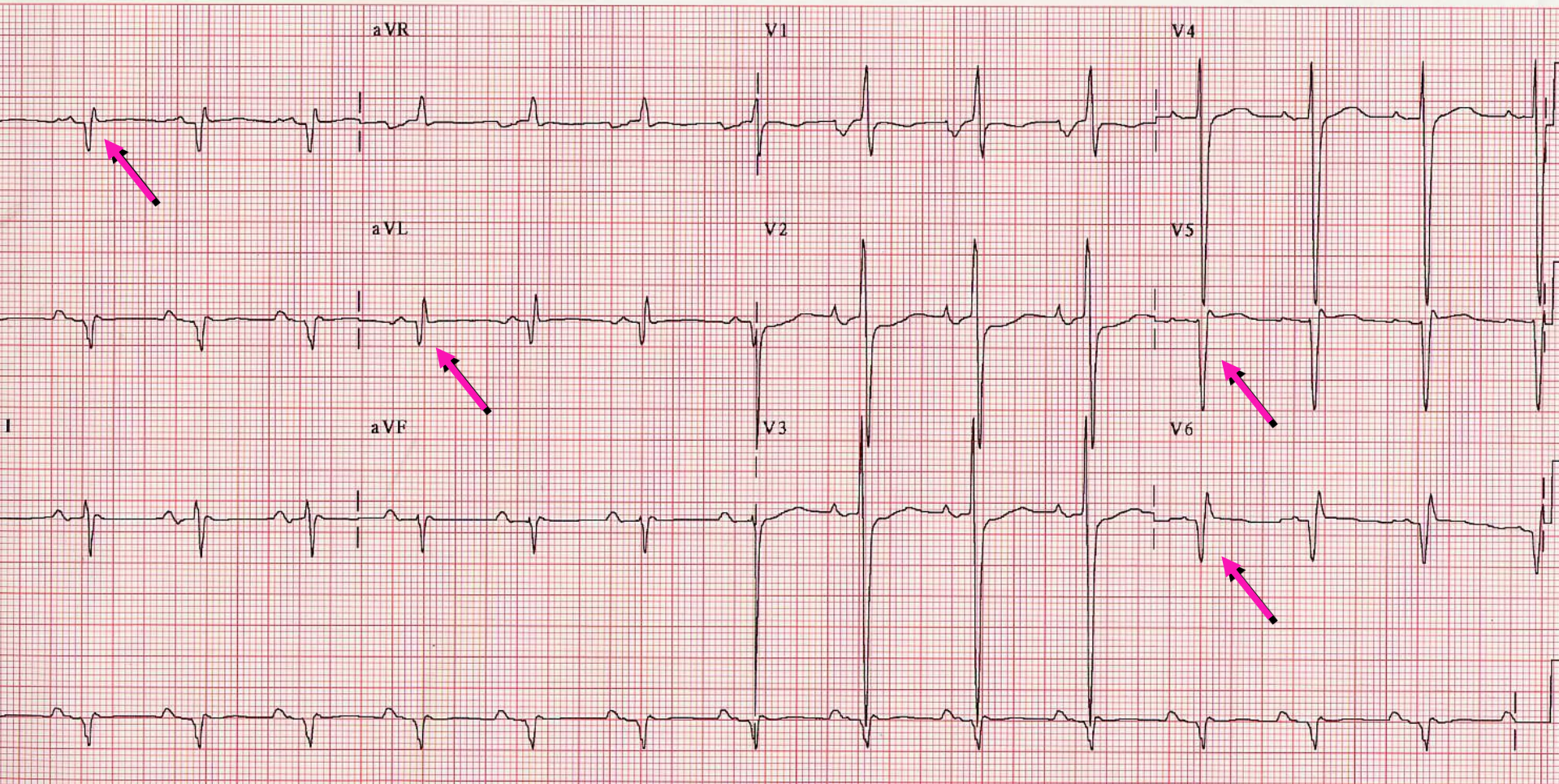
AV node 10 %

(% ของผู้ป่วย)

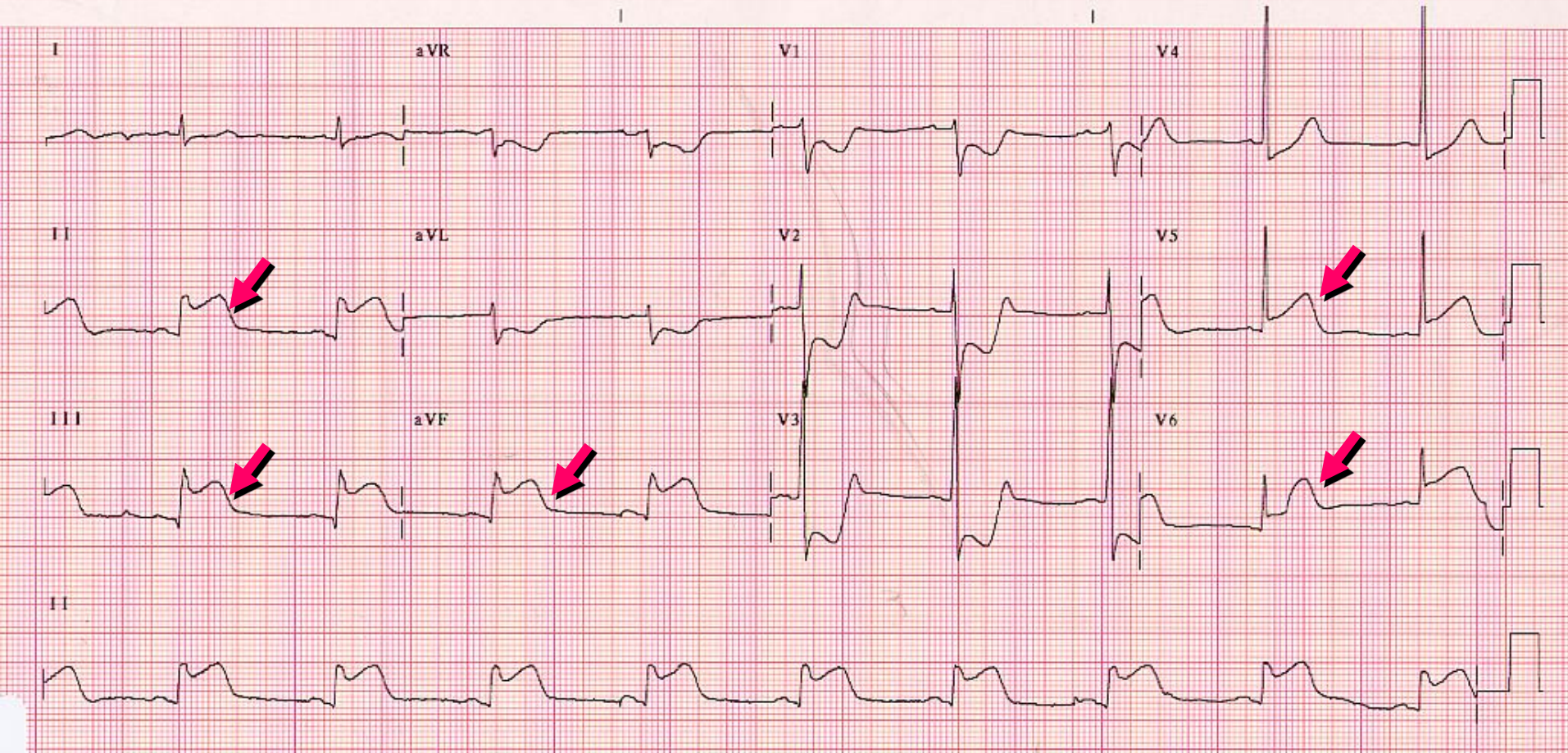
LA เกือบทั้งหมด

25 % ของ LV

Antero-lateal LV



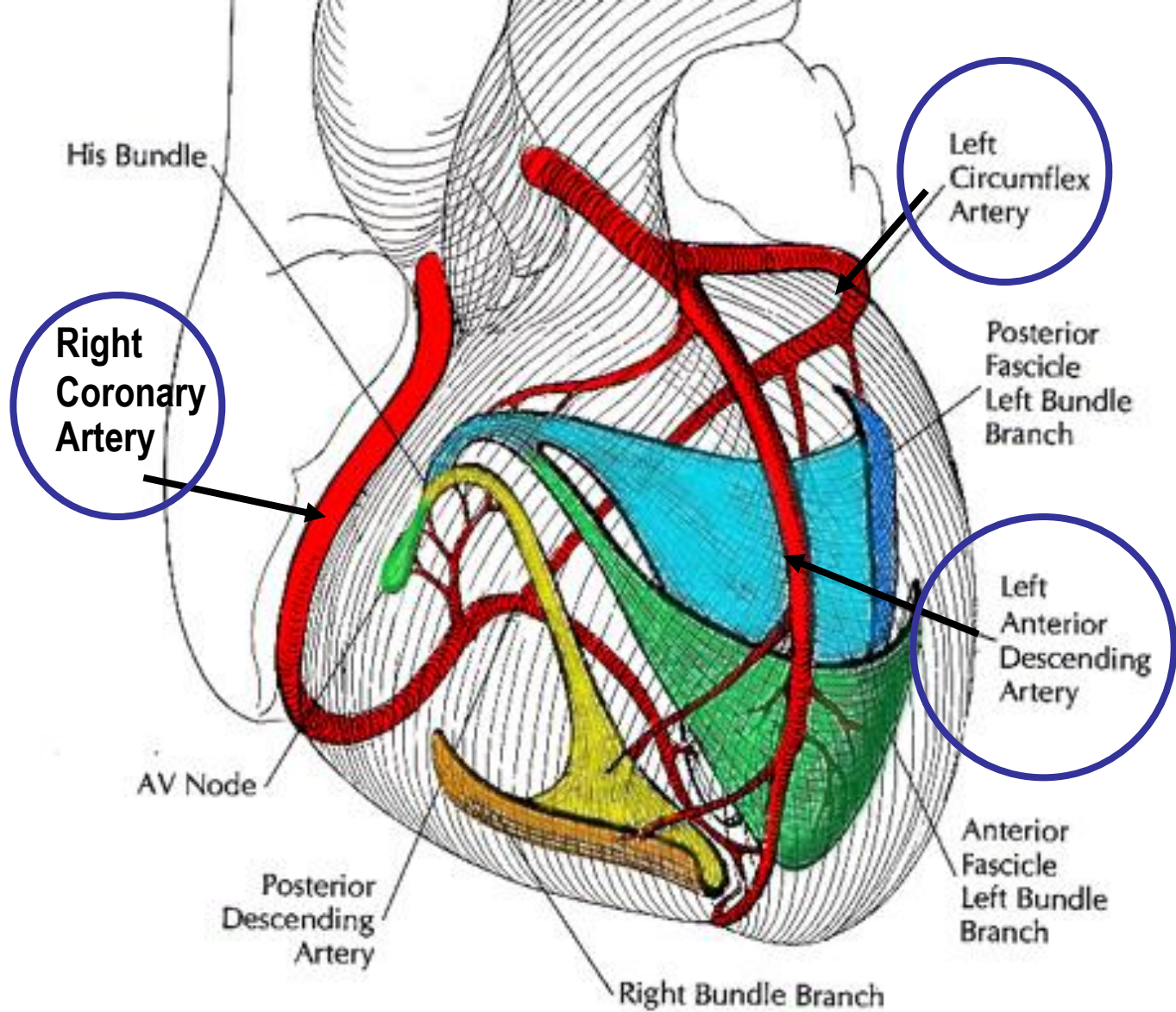
Left circumflex artery occlusion



Best Monitoring

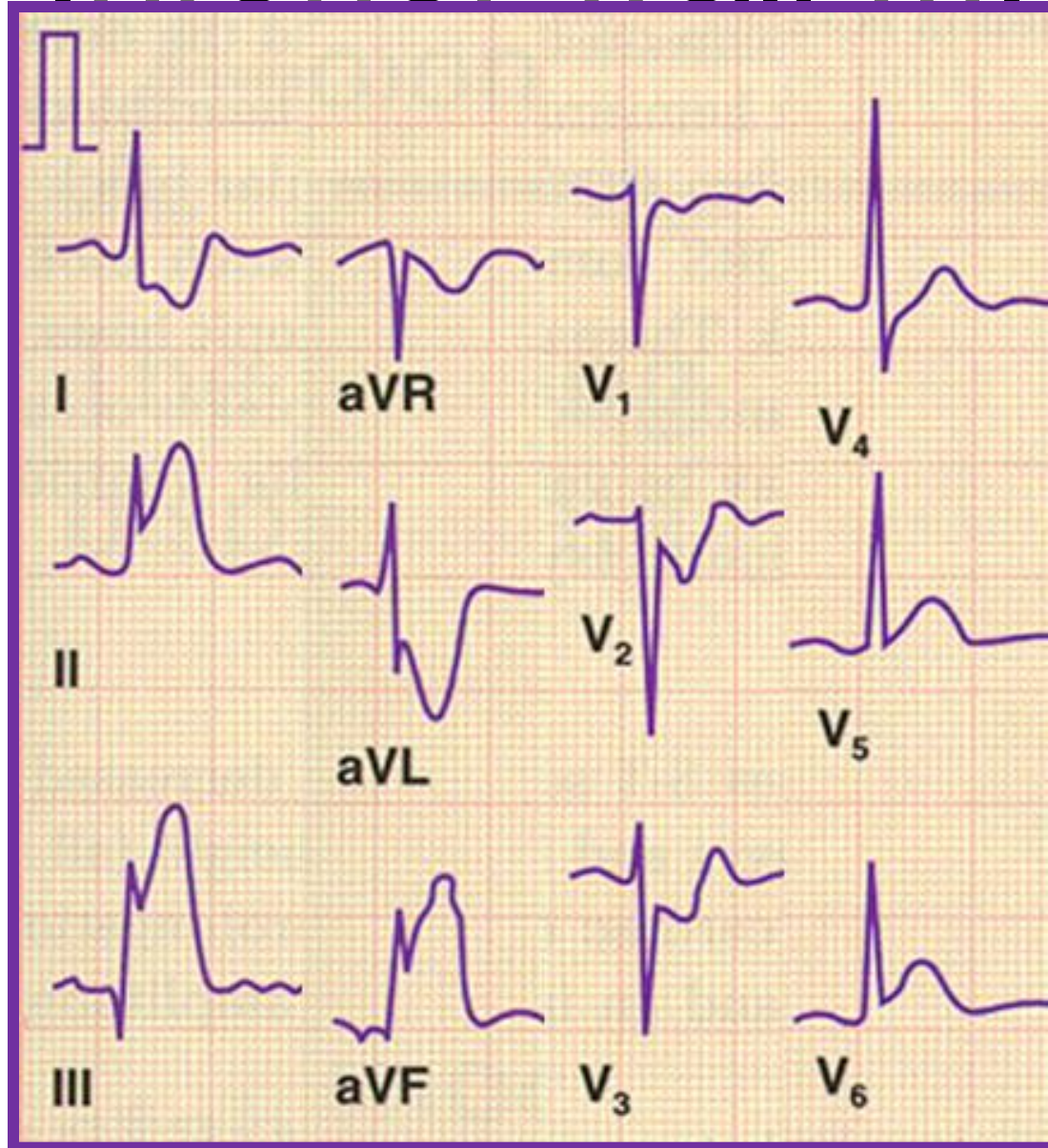
Left circumflex artery (LCx)

- lateral ($V_5 - V_6$)
- inferior (III, aVF, II)
- posterior (V_1, V_2, V_3)



SA 55 %	Septal wall 1/3	HIS bundle
AV node 90 %	RV	Posterior inferior 1/3 LBB

Inferior wall MI



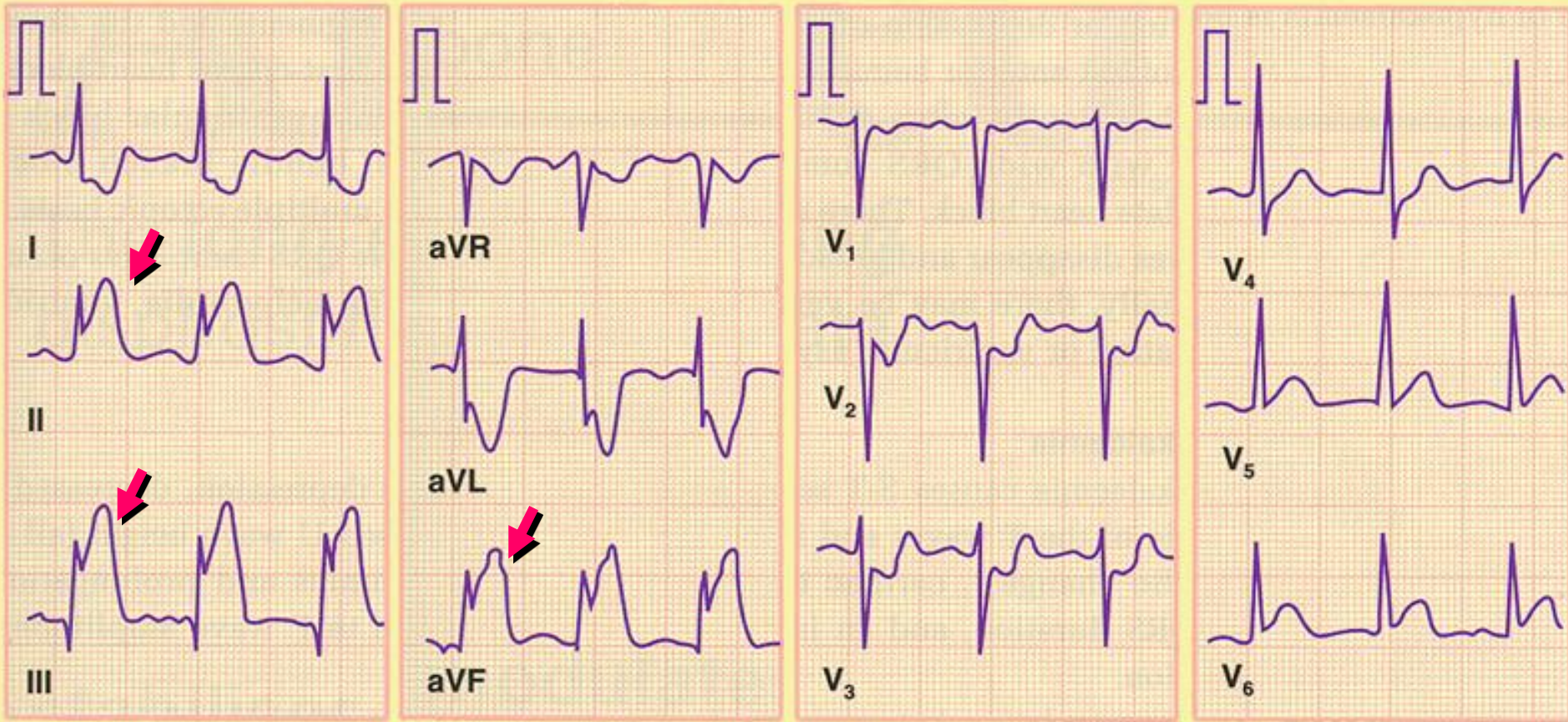
Best Monitoring

- Right Coronary Artery (RCA)
 - III เห็น ST elevate ได้สูงที่สุด
 - aVF ร่องลงมา
 - II เห็นต่ำที่สุด

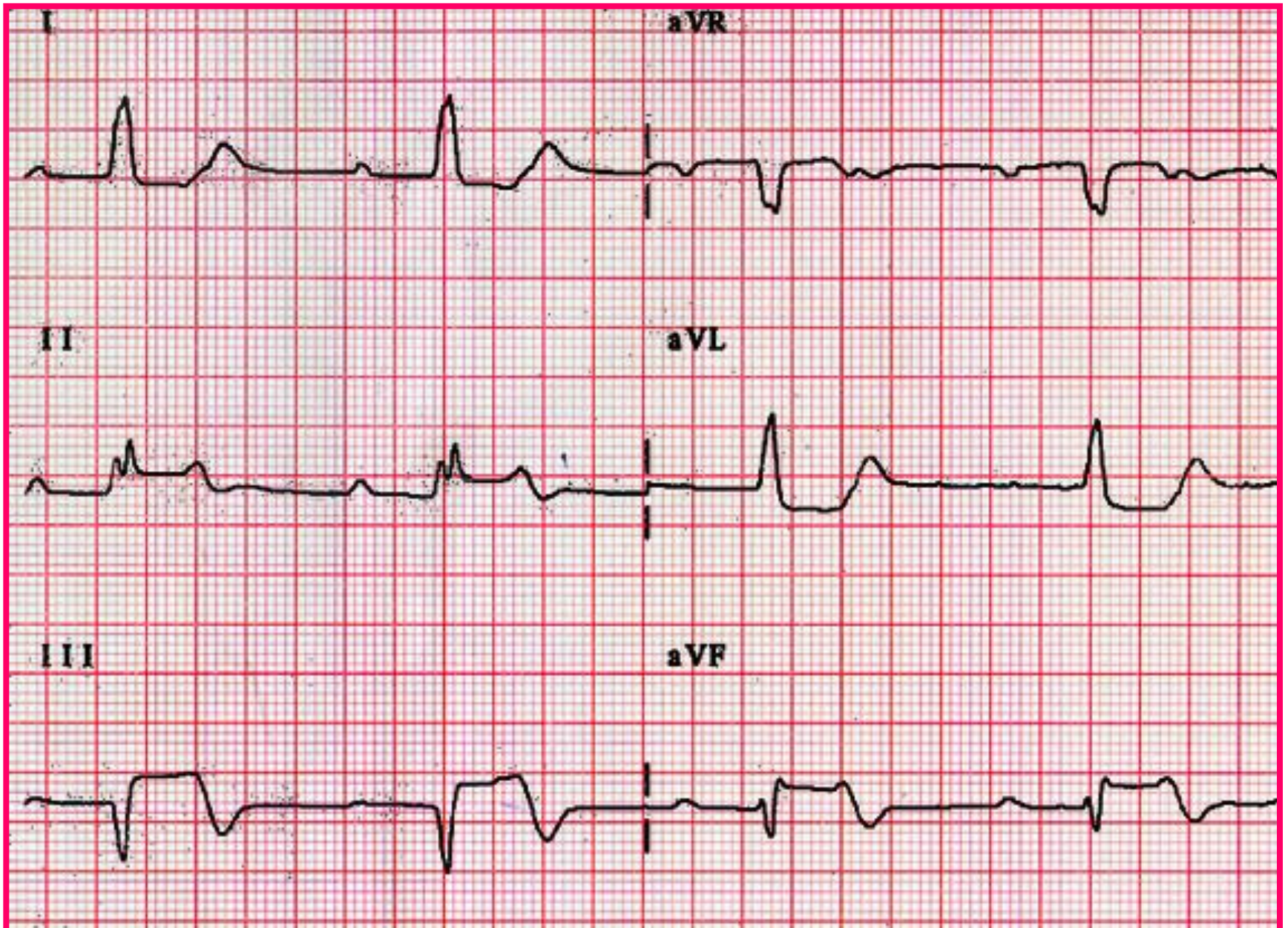
Reciprocal change

- I
- aVL
- V1-V4

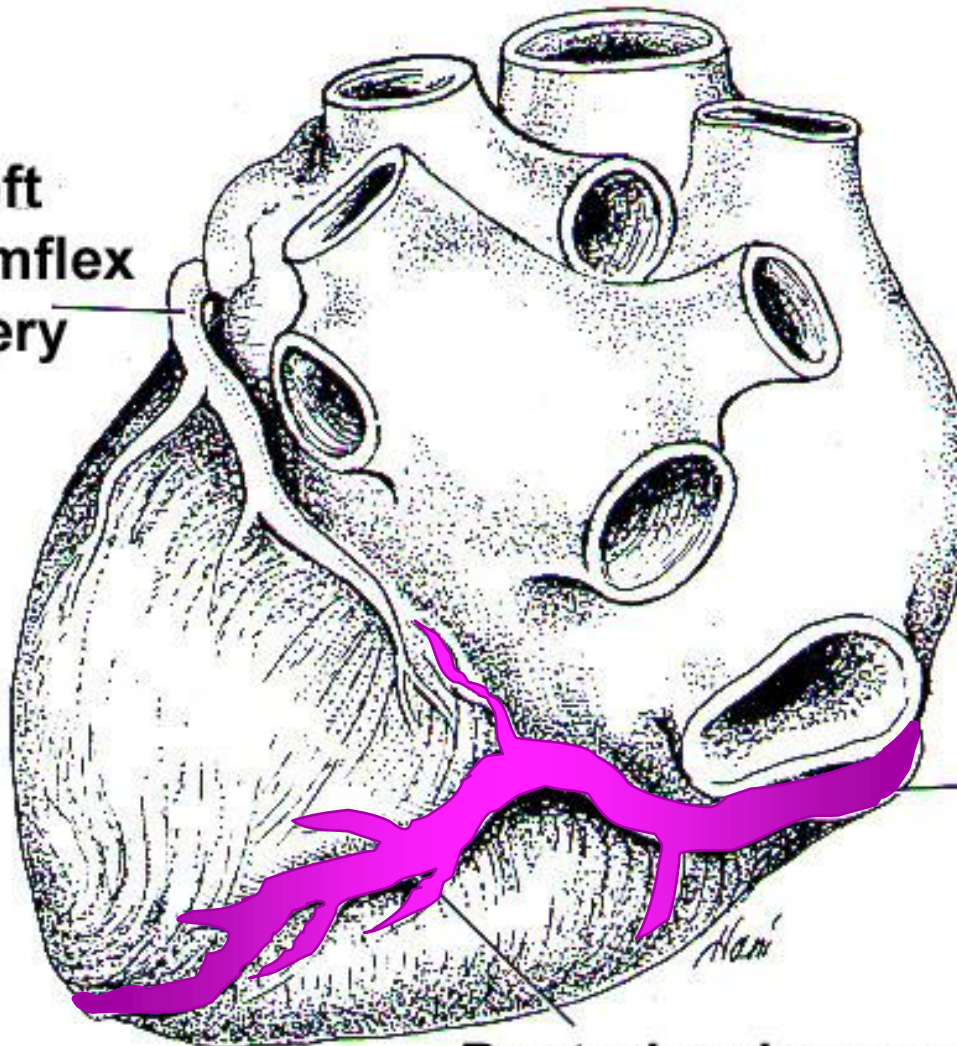
Dominant right coronary artery occlusion



Dominant right coronary artery occlusion



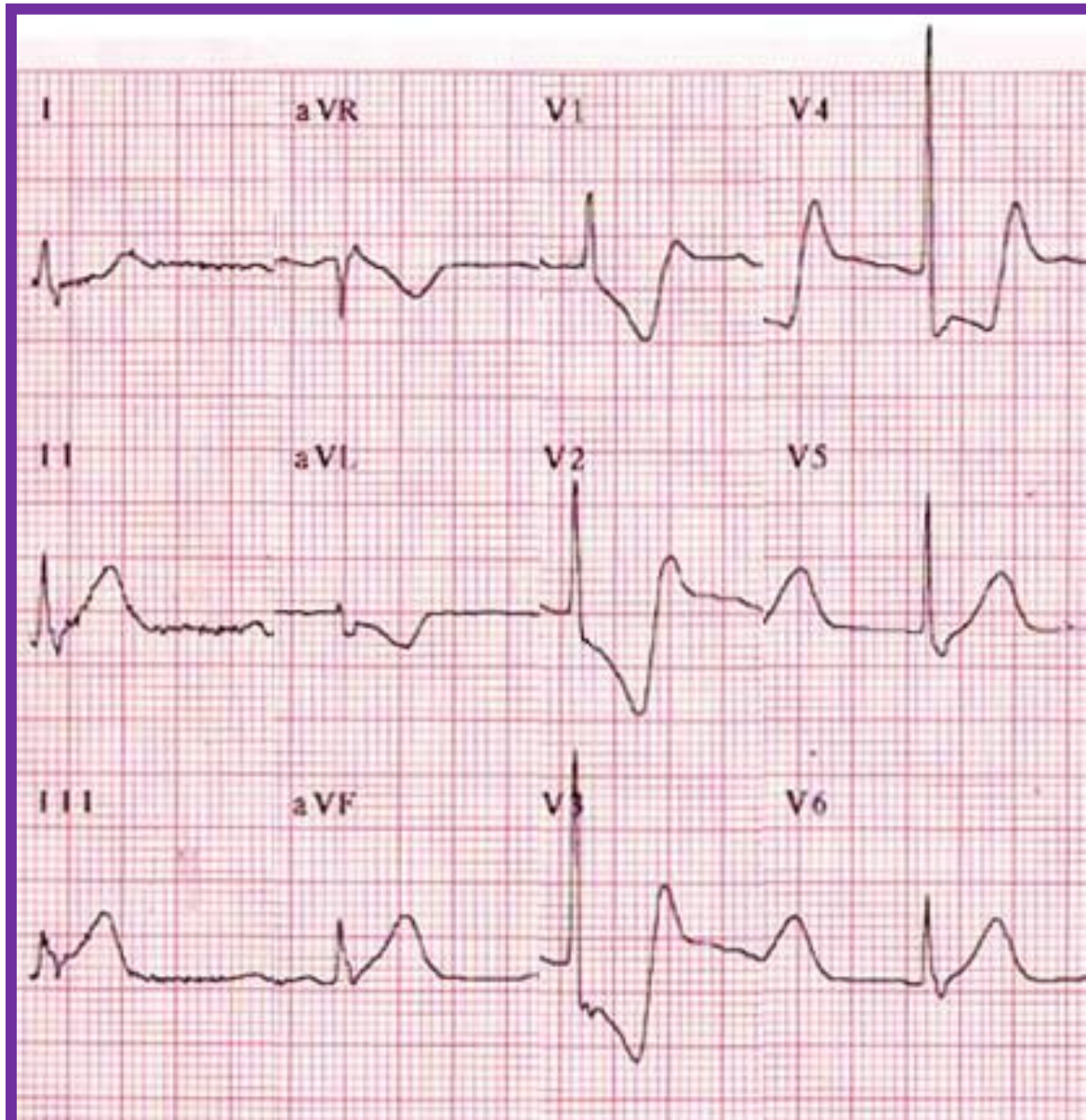
**Left
circumflex
artery**



**Right
coronary
artery**

Posterior descending artery

Posterior wall MI

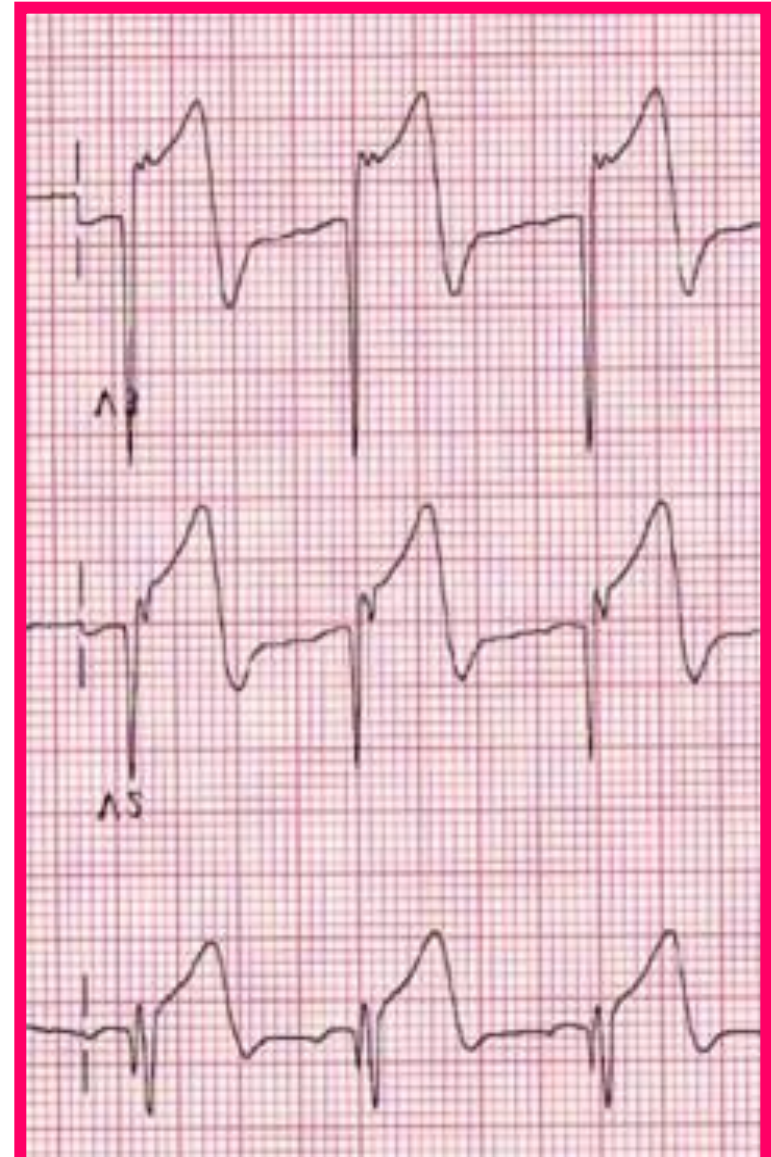
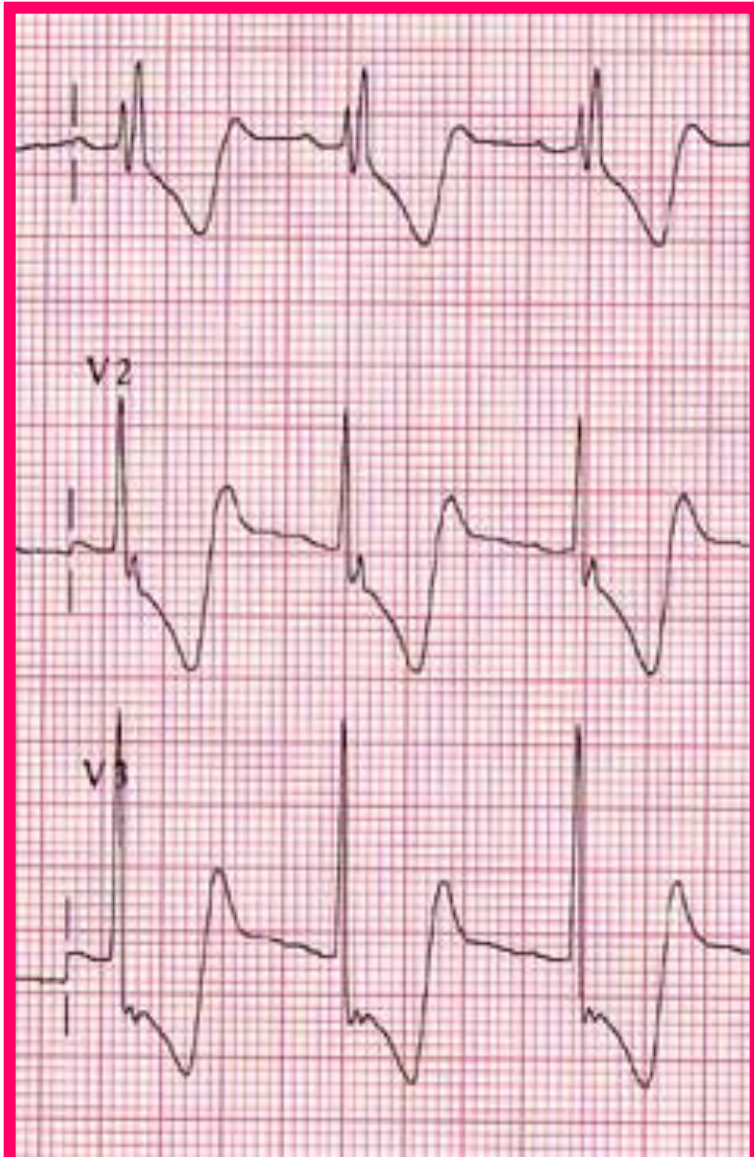


Posterior wall MI

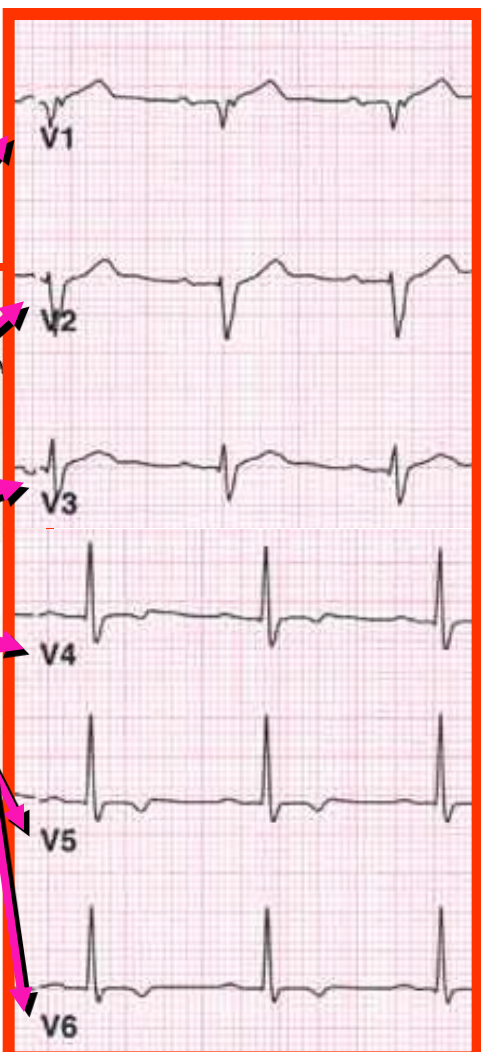
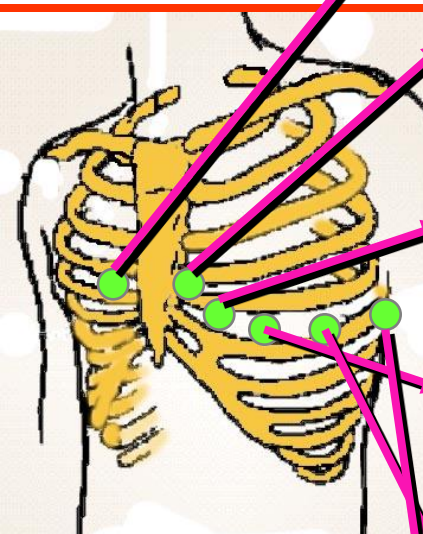
- EKG signs of infarction of contiguous areas
 - Posterior wall : ST ↓ $V_1 - V_3$
ST ↑ $V_7 - V_9$
R wave สูงขึ้นใน lead V1-V3
 - RV infarction : ST ↑ V_1 & RV leads

Posterior wall : R wave สูงขึ้นใน lead V1-V3

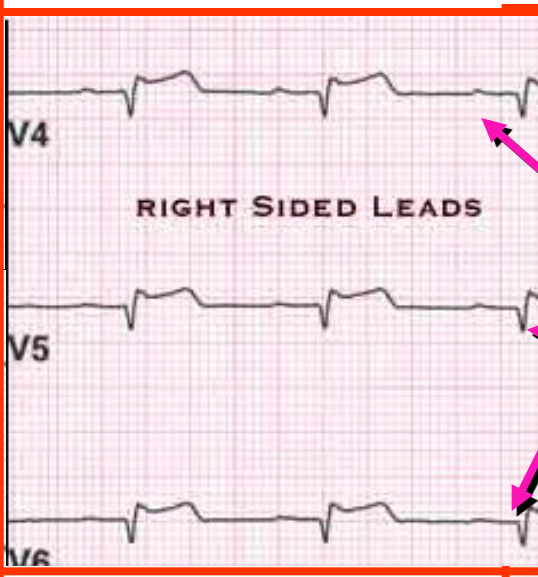
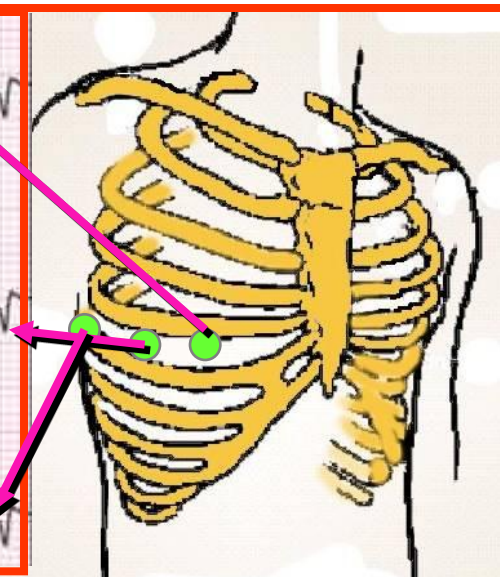
Mirror image



Standard Chest Leads



Right Ventricular Leads



Best Monitoring

- LCx
 - lateral ($V_5 - V_6$)
 - inferior (III, aVF, II)
 - posterior (V_1, V_2, V_3)
- LAD
 - V_2, V_3
- RCA
 - III, aVF, II