

HOW TO LEARN ECG FUN AND EASY ?

SEMINAR DAN WORKSHOP



Sugiyono. S.Kep.Ns. .CH.CHt.CT.NNLP

Transpersonal Hypnotherapist and Consultant

Trainer of Hypnotherapist

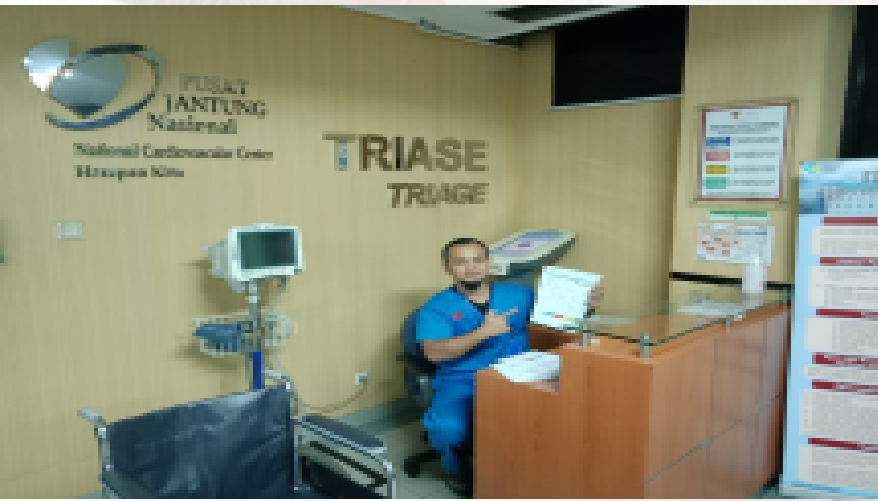
(Certified hypnotist and hypnotherapist from Indonesian Broad Hypnotherapist (IBH)

(Certified practitioner NLP Indonesian Broad Neo NLP society)

Nursing Trainer Cardiovascular Emergency (BTCLS, ACLS, EKG)

EKG

Curriculum Vittae



- Nama : Sugiyono
- Moto : “Selalu Menuju Perbaikan dan Keep Spirit , Belajar, Amal, Ibadah”
- No Telepon/WA : 081326616855
- Email/fb: sugiyononers@gmail.com , Sugie poenya , ig : sugiyono ners_hypnoterapist
- YouTube channel : sugiyono ners_hypnoterapist

Riwayat Pendidikan

- SPK PPNI SEMARANG 1999-2002
- UNIVERSITAS NGUDI WALUYO SEMARANG 2002-2006
- PROGRAM PROFESI NERS 2006-2007
- BASIC CARDIOVASCULAR 2010
- ADVANCE CARDIOVASCULAR/POST BASIC 2017
- ON STUDY Magister Keperawatan peminatan KMB 2018

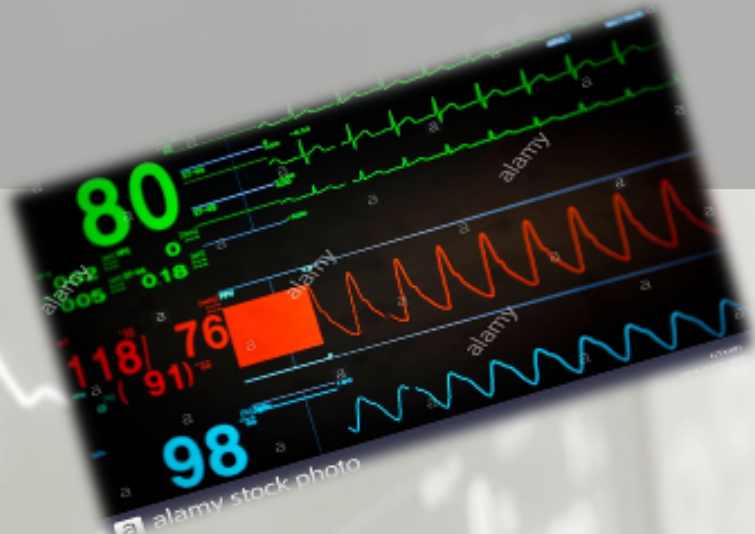


RIWAYAT PEKERJAAN

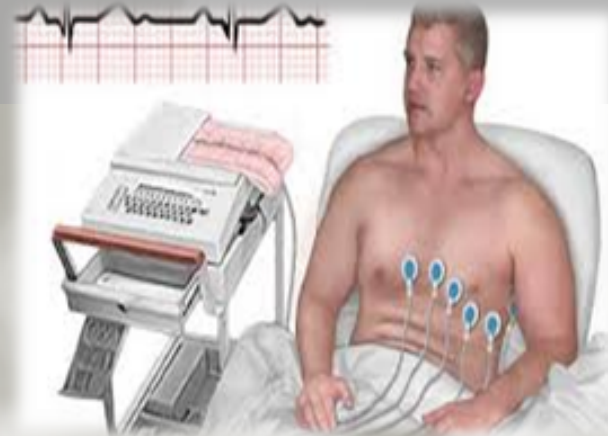
- Ners specialist cardiology di Emergency National Cardiovascular Center Harapan Kita Hospital Jakarta mulai 2008-Sekarang
- Dosen pengajar Mata Kuliah Keperawatan Gadar di STIKES Banten mulai 2010/IMC Bintaro dan Bimbingan Pendidikan Profesi Ners Tangerang dan beberapa PTS di Tangerang
- Tim instruktur pengajar BCLS Diklat RS PJNHK
- Tim instruktur pengajar Kegawat daruratan ***BTCLS dan ACLS for Nurse di Pro Emergency***
- Tim instruktur pengajar basic ECG dan Advance
- Enterpreuner, Trainer hypnosis, Hypnoterapist dan khitan Modern
- Pembicra seminar Nasional dan Kesehatan

OVERVIEW

INTERPRETASI EKG STRIP
CARA MENGHITUNG AXIS
JANTUNG

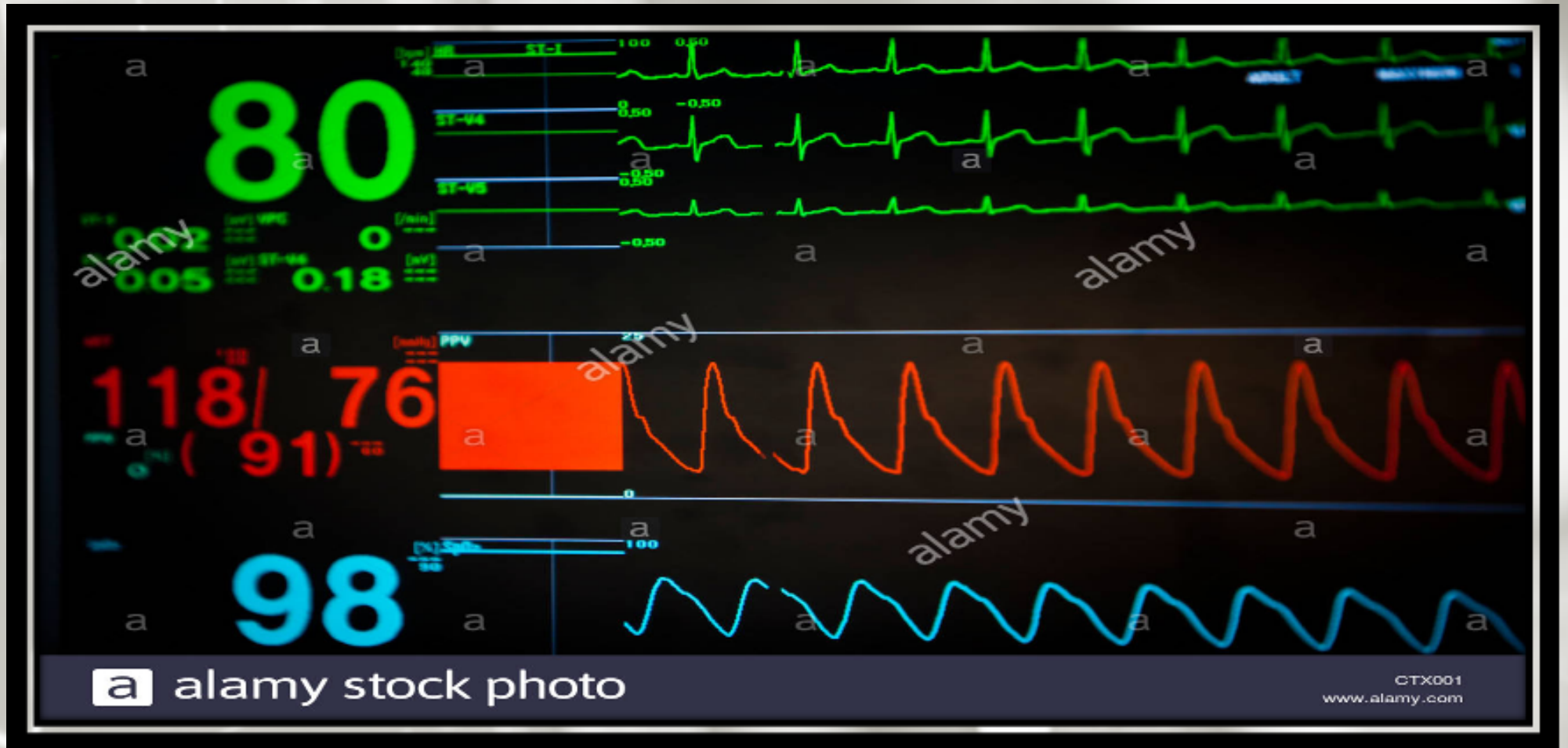


INTERPRETASI EKG 12 LEAD
DAN EKG PADA ACS
STEMI /NSTEMI



INTERPRETASI EKG STRIP

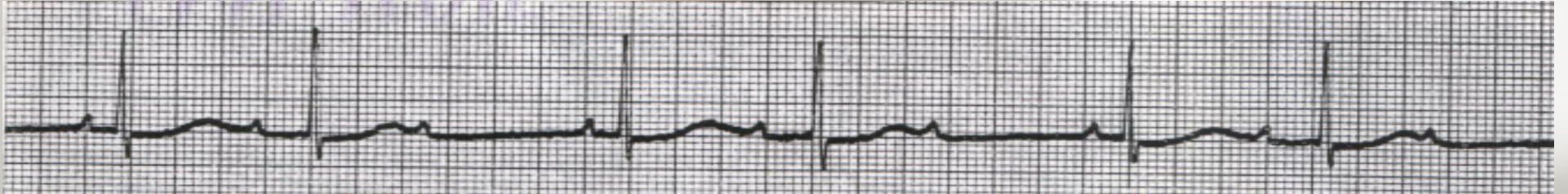
LIHAT LEAD II



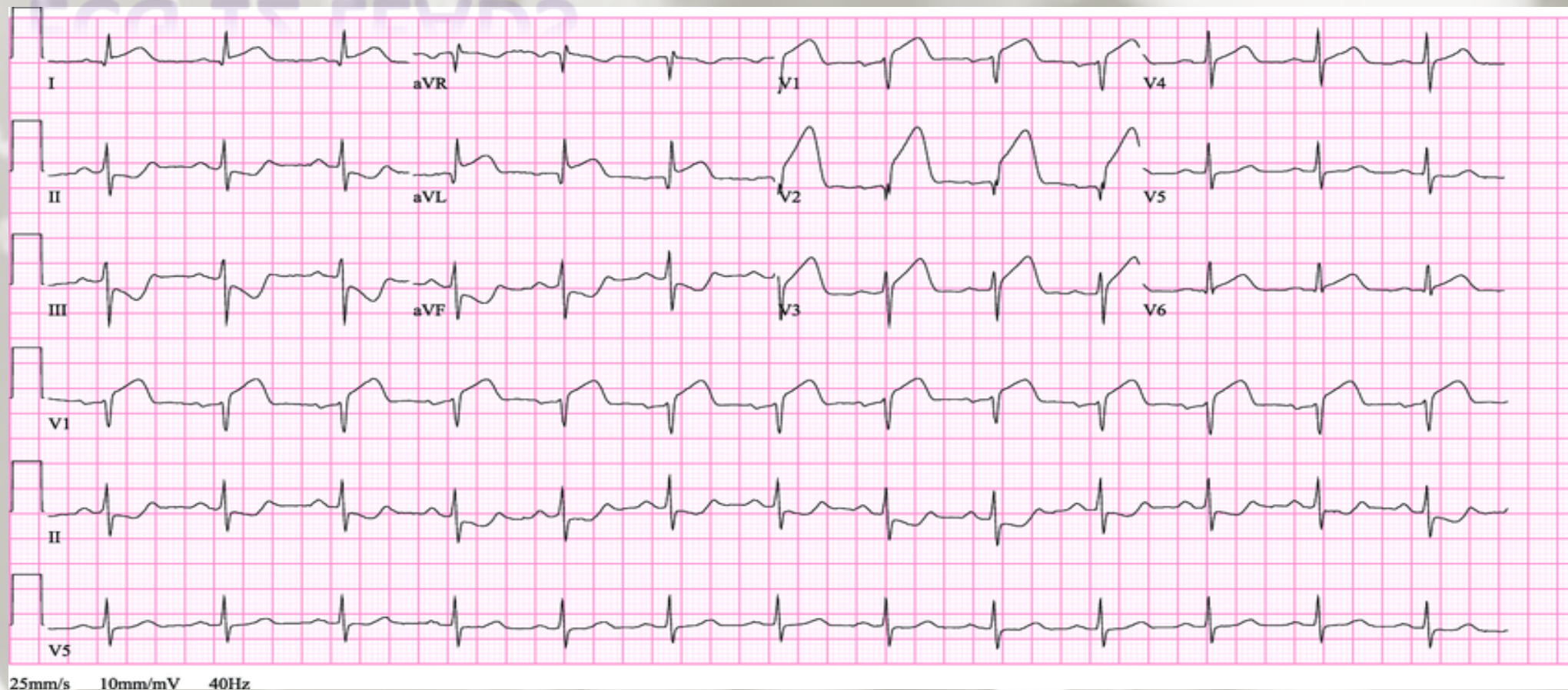
WHAT IS INTERPRETATION ?



ECG STRIP



ECG 12 LEADS



CARA INTERPRETASI EKG STRIP

CARA MENILAI EKG STRIP

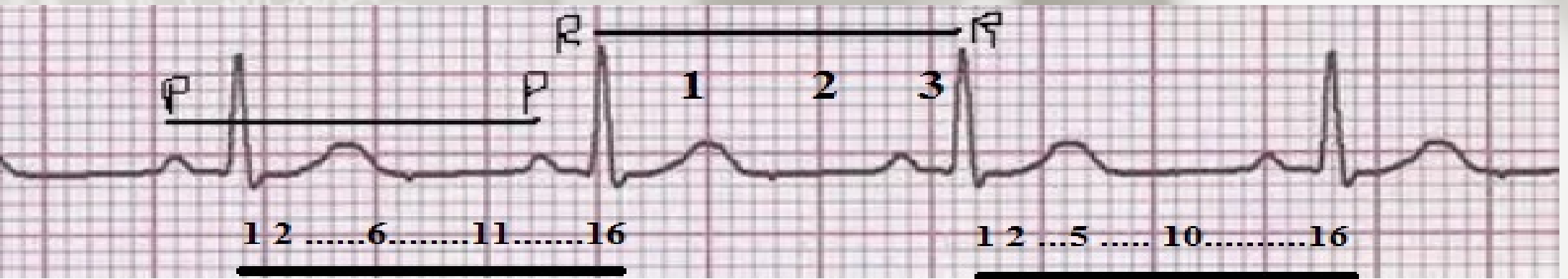
1. Tentukan irama jantung (Rhythm)
2. Tentukan frekuensi (Heart Rate)
3. Tentukan gelombang P normal atau tidak, selalu diikuti gelombang QRS atau tidak
4. Tentukan interval PR normal atau tidak
5. Tentukan kompleks QRS normal atau tidak

Catatan :

- > 100 x/menit : Takikardi
- < 60 x/menit : Bradikardi
- $150 - 250$ x/menit : Takikardi abnormal
- $250 - 350$ x/menit : Flutter (gigi gergaji)
- > 350 x/menit : Fibrilasi (keriting)

Tentukan irama jantung (Rhythm)

Reguler/ Irreguler ?



Jarak R ke R ada 16 kotak kecil

Jarak R ke R ada 16 kotak kecil

2. Tentukan HR/Frekuensi

Menentukan frekuensi jantung

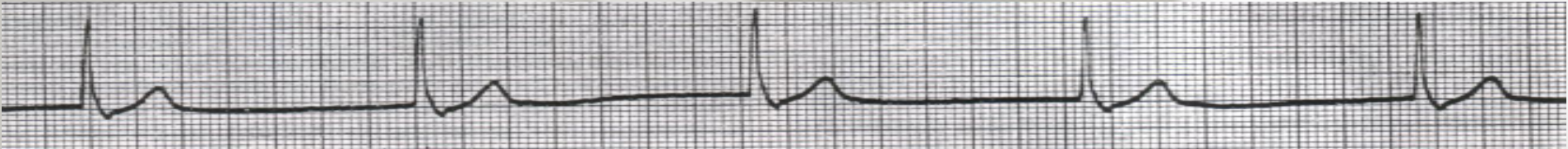
A. $300 = (\text{jml kotakl besar dlm 60 detik})$

Jml kotak besar antara R – R

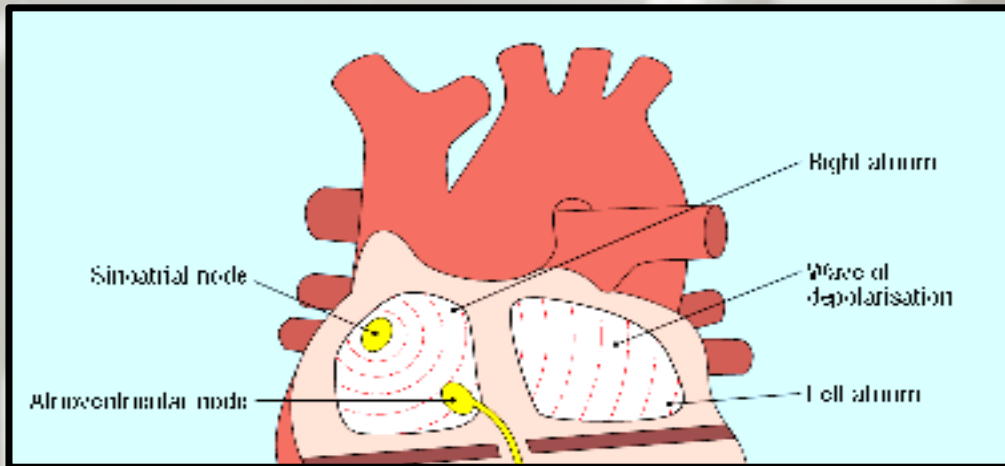
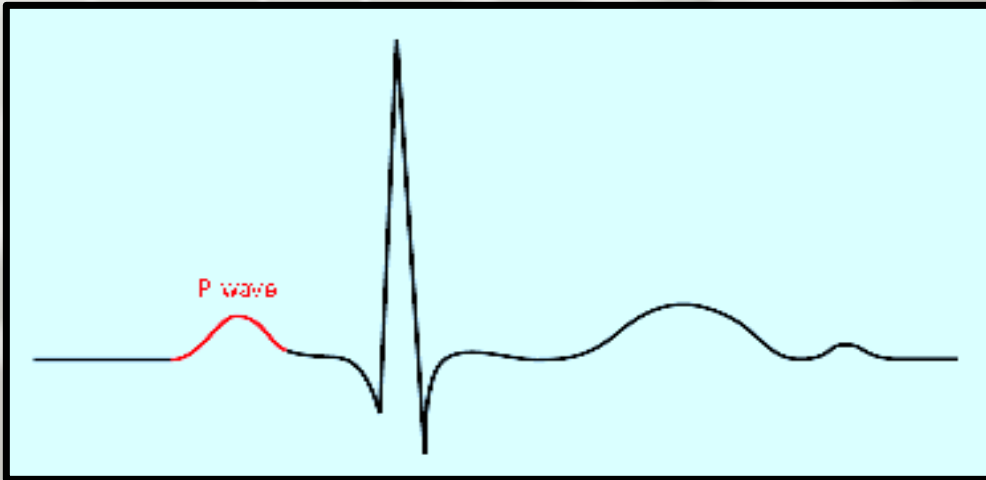
B. $1500 = (\text{jml kotak kecil dlm 60 detik})$

Jml kotak kecil antara R – R

C. Ambil EKG strip sepanjang 6 detik, hitung jumlah QRS dan kalikan 10.



3. Tentukan gelombang P normal atau tidak, selalu diikuti gelombang QRS atau tidak



- Gambaran yang ditimbulkan oleh depolarisasi atrium

- Normal

Tinggi : $\leq 0,3$ mvolt

Lebar : $\leq 0,12$ detik

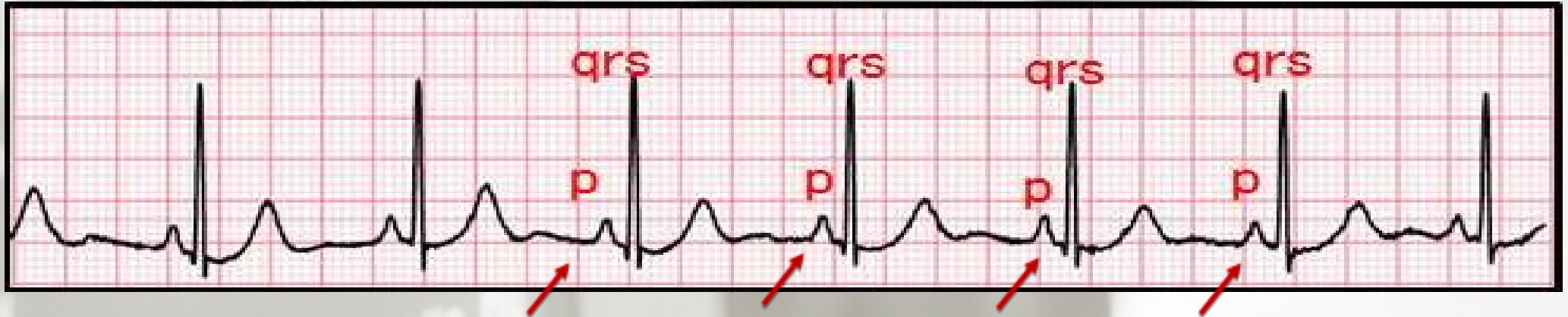
Selalu positif di L II

Selalu negatif di aVR

Kepentingan

Mengetahui kelainan di Atrium

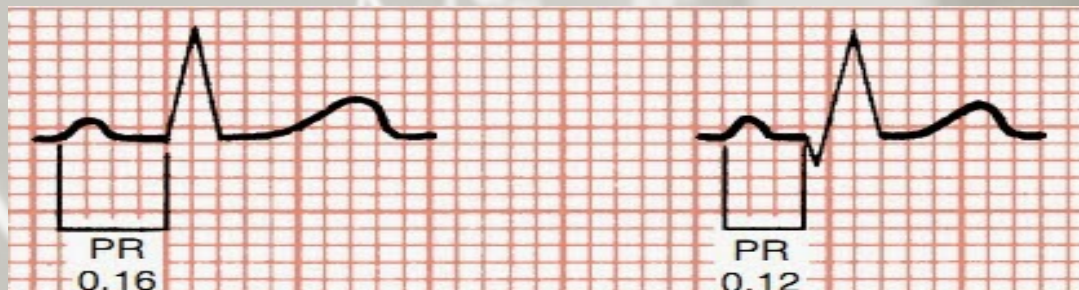
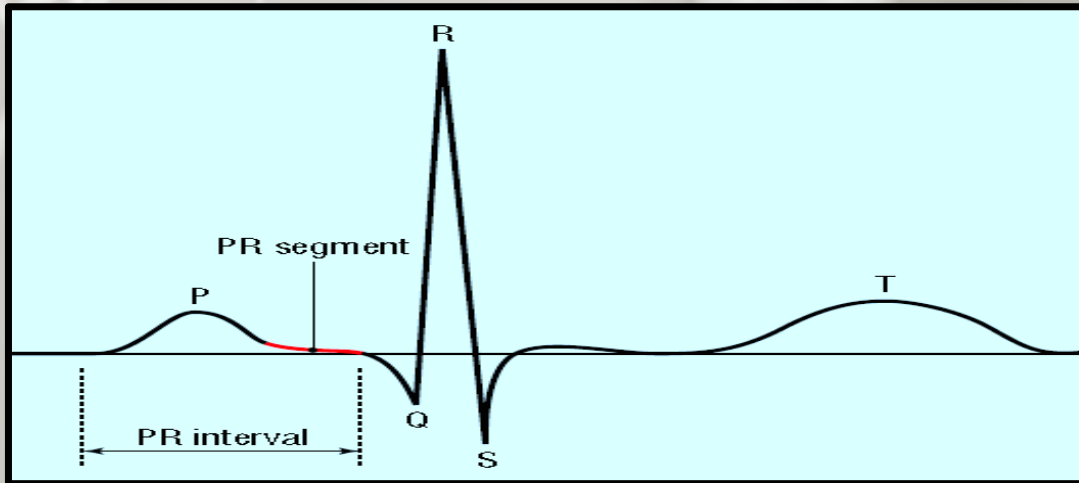
Tentukan gelombang P, selalu diikuti gelombang QRS atau tidak



Pola gelombang P yang diikuti kompleks QRS

4. Tentukan interval PR normal atau tidak

- Diukur dari permulaan P s/d permulaan QRS
- Waktu yang diperlukan untuk menyebarkan impuls dari SA Node sampai serabut ventrikel (Depolarisasi atrium)



Normal :

0,12 - 0,20 detik

Kepentingan :

Kelainan sistem konduksi

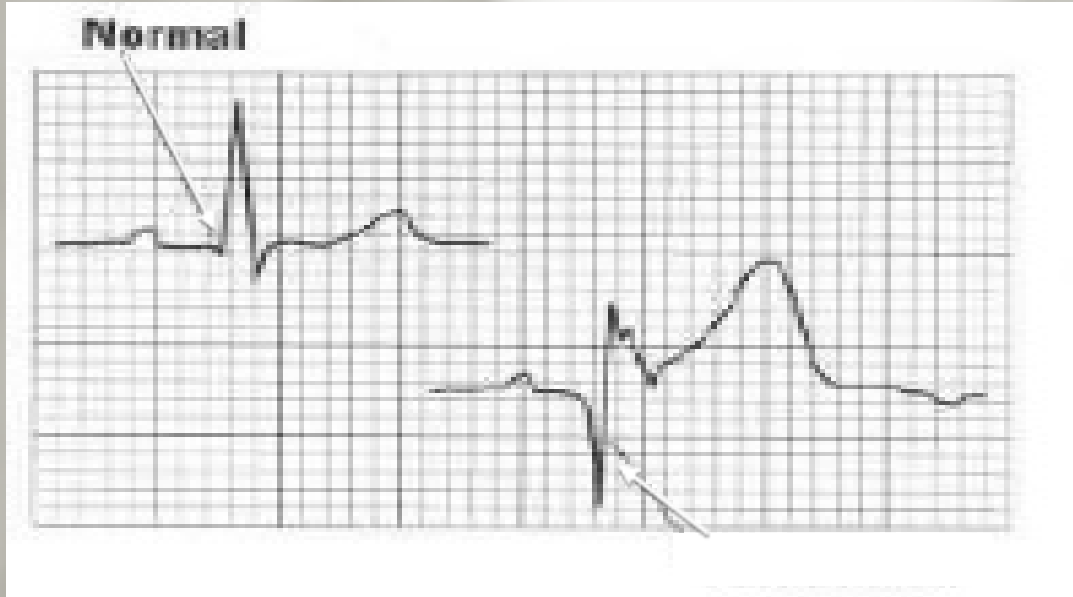
5. Tentukan kompleks QRS normal atau tidak

Gelombang Q

- Menggambarkan awal fase depolarisasi ventrikel
- Lebar : < 0.04 detik
- Dalam : $< 25\%$ amplitudo gelombang R atau $1/3$ tinggi R

Kepentingan :

Q : Menunjukkan adanya nekrosis miokard, disebut Q patologis



KOMPLEKS QRS

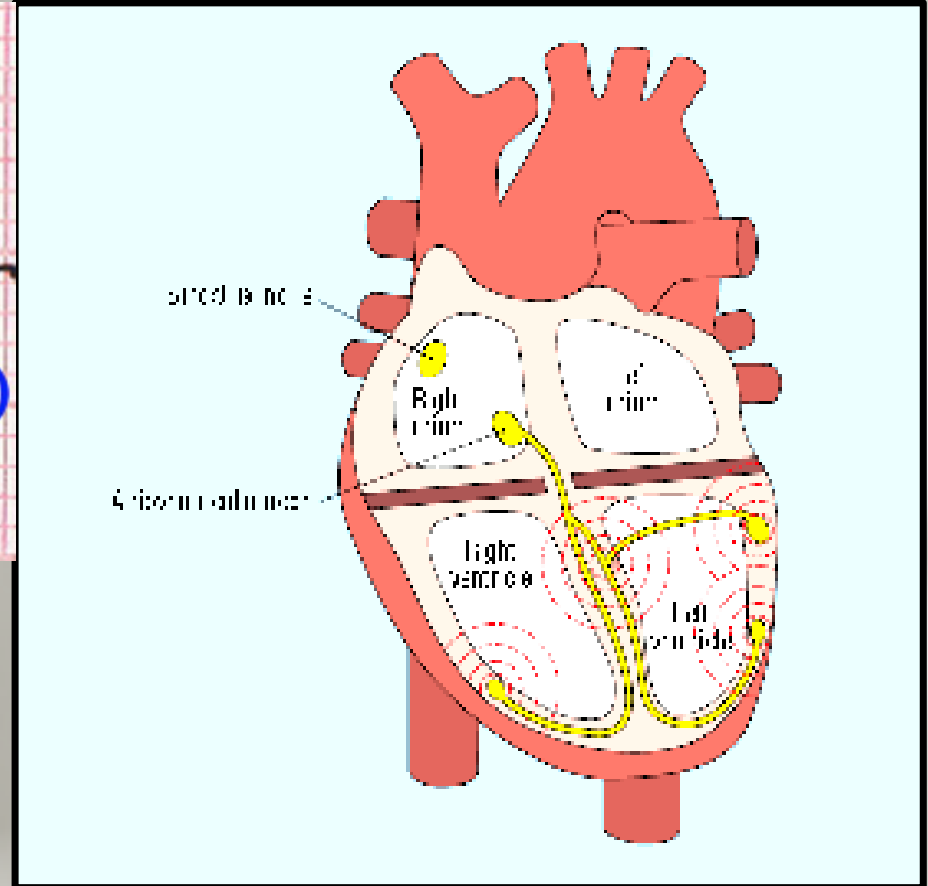
Gambaran yang ditimbulkan oleh depolarisasi ventrikel



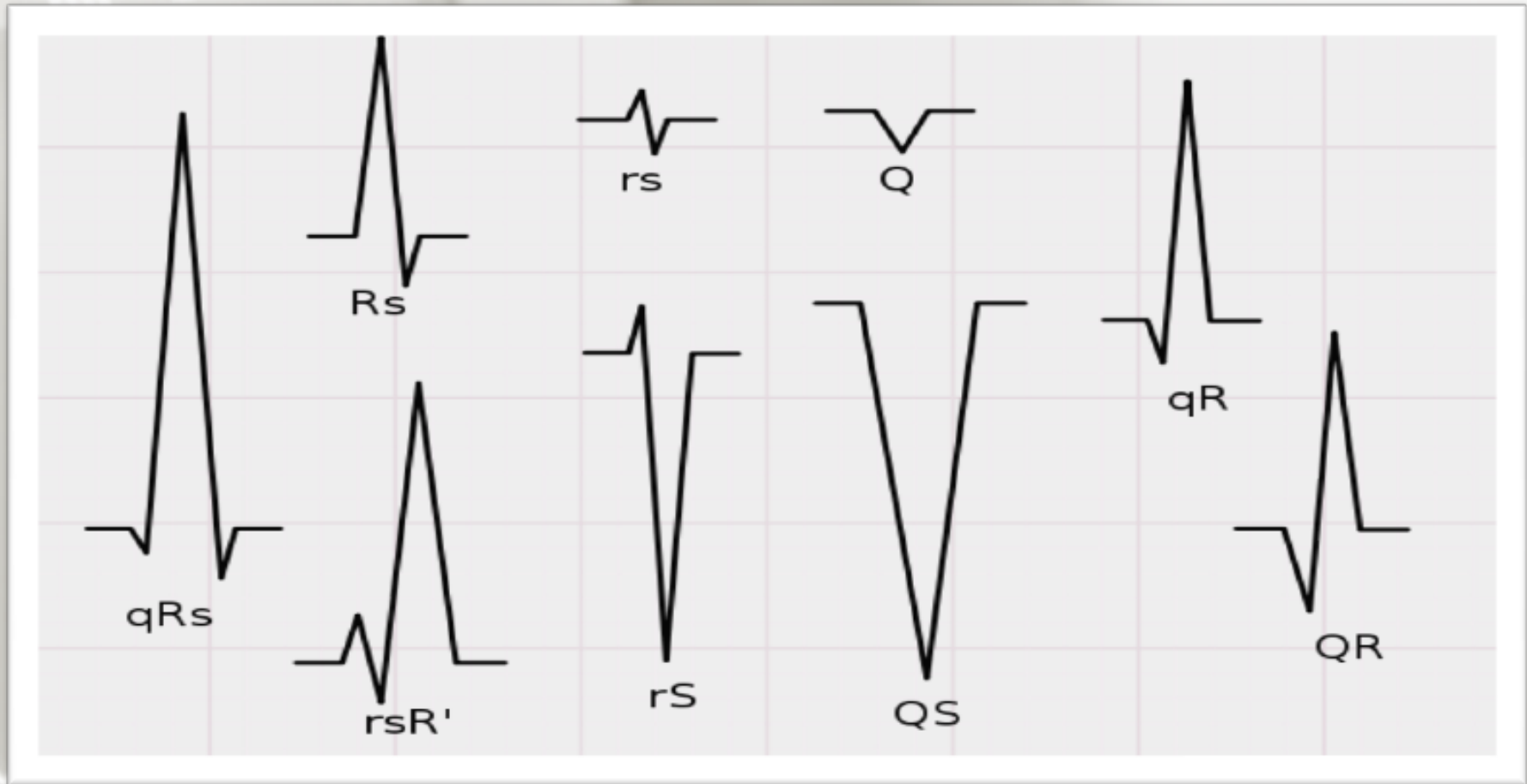
Normal

Lebar : 0,06 - 0,12 detik

Tinggi : Tergantung lead



NOMENKLATUR QRS

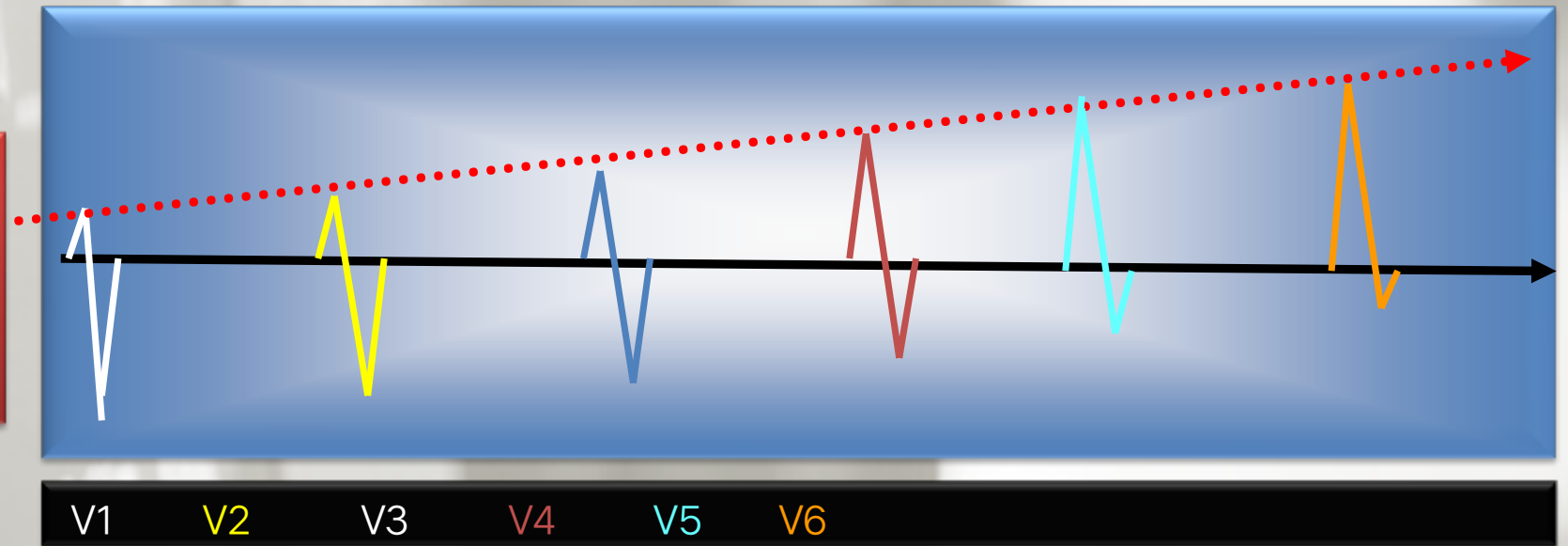


Perbandingan Gelombang R & Gelombang S di lead Prekordial

KETERANGAN

R / S di V1 = < 1

R / S di V6 = > 1



Segmen ST

Diukur dari akhir QRS s/d awal gel T

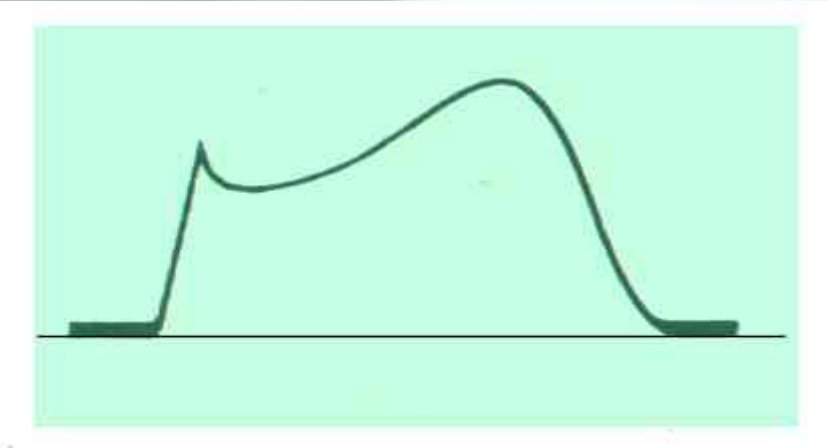
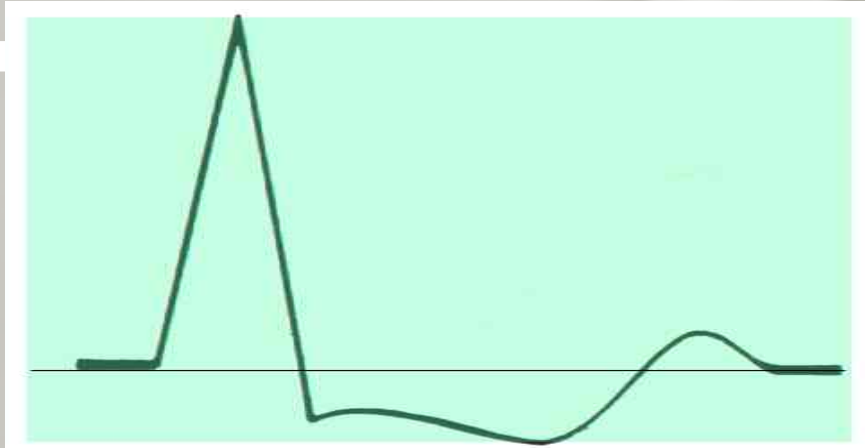
Normal : Isoelektris

Kepentingan : Elevasi

Depresi

Pada iskemia

Pada injuri/infark akut



Gelombang T

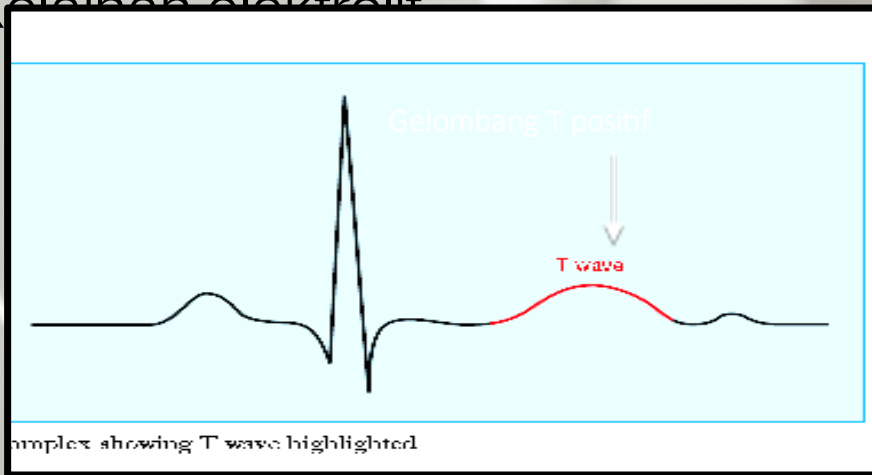
Gambaran yang ditimbulkan oleh repolarisasi ventrikel. Gelombang T positif di lead I,II,V3 sampai V6 dan terbalik di AVR.

Nilai normal :

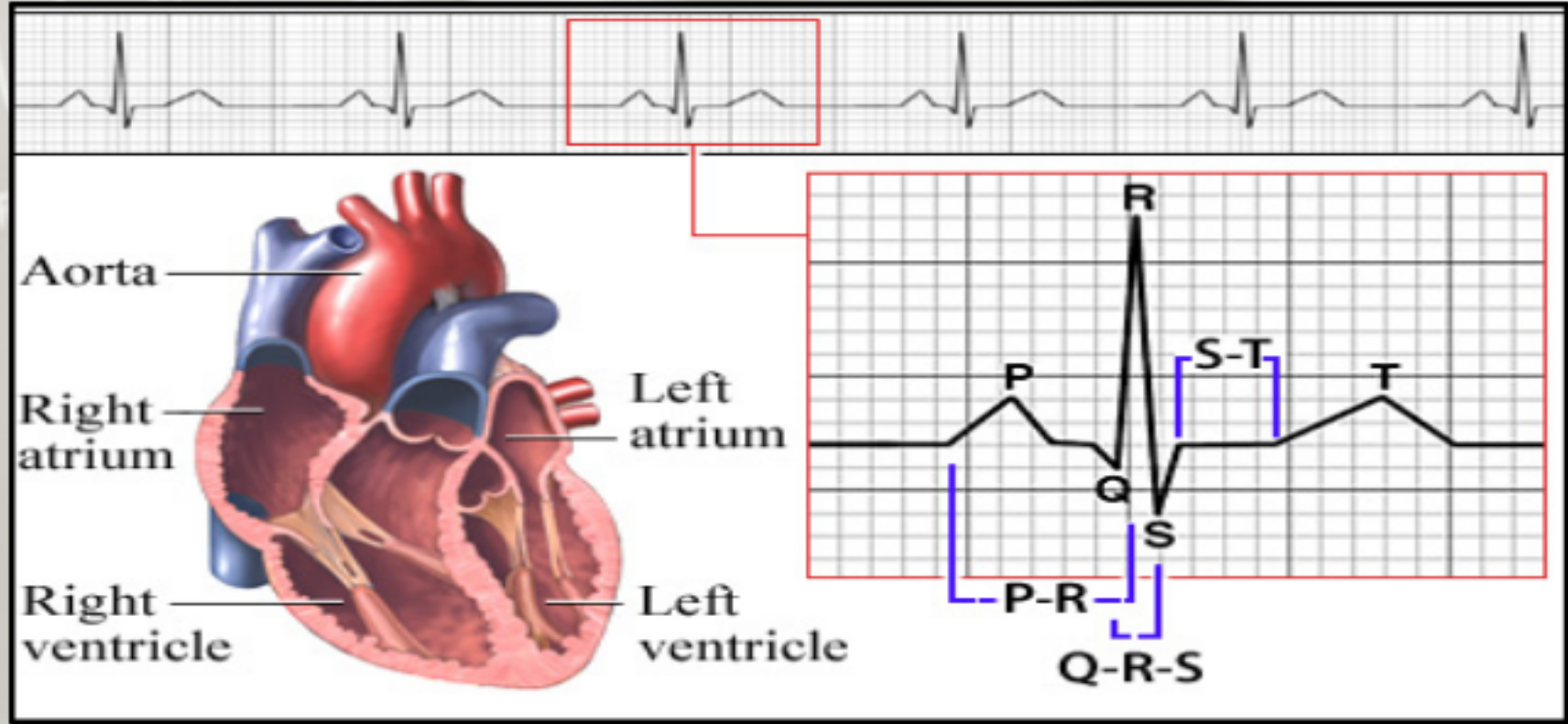
- * < 1 MV di lead dada
- * $< 0,5$ MV di lead ekstremitas
- * Minimal ada $0,1$ MV

Kepentingan :

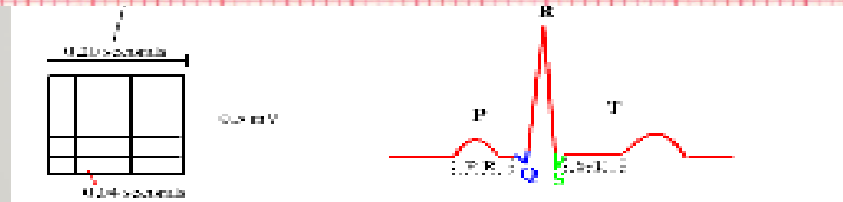
- * Mengetahui adanya iskemia/infark
- * Kelainan elektrolit



Gambaran EKG Normal : irama sinus (SR)



EKG NORMAL



Kriteria EKG normal atau irama sinus (SR) adalah sbb :

- ✓ Irama teratur.
- ✓ Frekwensi jantung (HR) antara 60-100 x/menit.
- ✓ Gel P normal, setiap gel P diikuti gel QRS dan T.
- ✓ Interval PR normal (0,12 – 0,20 detik).
- ✓ Gel QRS normal (0,06 – 0,12 detik).
- ✓ Semua gel sama.
- ✓ Irama EKG yg tidak mempunyai kriteria tersebut disebut disritmia/aritmia.

ECG 12 LEADS

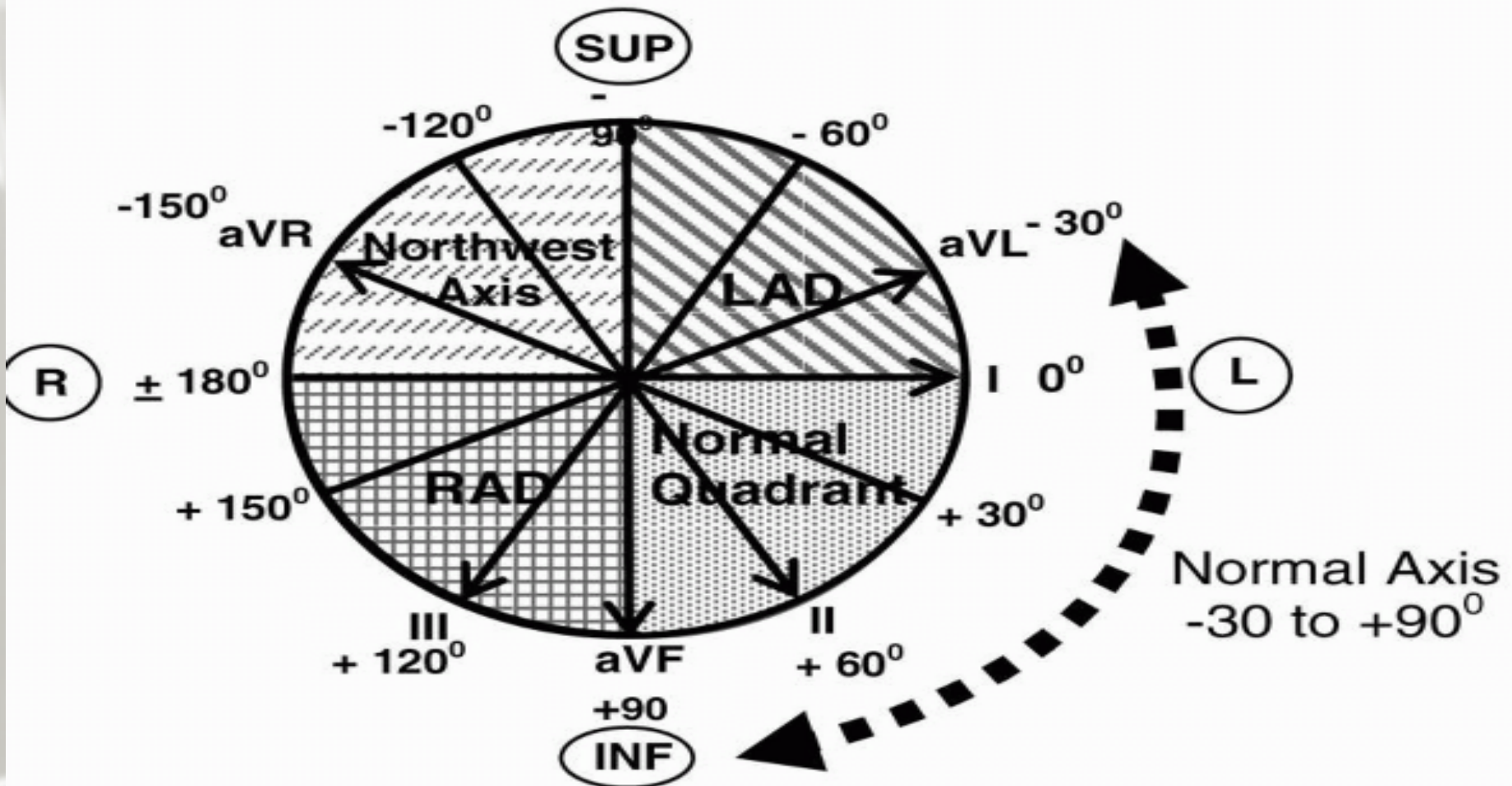
- ✓ Irama teratur.
- ✓ Frekwensi jantung (HR) antara 60-100 x/menit.
- ✓ Gel P normal, setiap gel P diikuti gel QRS dan T.
- ✓ Interval PR normal (0,12 – 0,20 detik).
- ✓ Gel QRS normal (0,06 – 0,12 detik).
- ✓ Axis jantung
- ✓ Tentukan QTc interval
- ✓ Tentukan area infark
 - ✓ Tentukan adanya ikemik (ST segmen depresi, T inveted,)
 - ✓ Tentukan adanya injury miokard (ST elevasi, atau New LBBB)
 - ✓ Tentukan adanya old infark (q patologis)
- ✓ Tentukan area hipertrofi (atrium/ventrikell)
- ✓ Tentukan area blok (RBBB/LBBB)

Kesimpulan

AKSIS JANTUNG

- Aksis adalah sudut yang dibentuk oleh vektor listrik terhadap garis horizontal.
- Analisis terhadap aksis dapat membantu menemukan lokasi kelainan yang terjadi pada jantung.
 - Aksis normal $+90^{\circ}$ hingga -30°
 - Deviasi Kiri -30° hingga -90°
 - Deviasi Kanan $+90^{\circ}$ hingga $+180^{\circ}$
 - Deviasi Kanan Ekstrem -180° hingga -90°

AKSIS JANTUNG



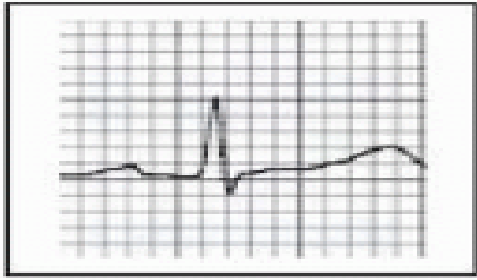
MENILAI AKSIS

Lead I	Lead aVF	Arah Aksis
+	-	Deviasi kiri
+	+	NORMAL
-	+	Deviasi kanan
-	-	Deviasi kanan ekstim

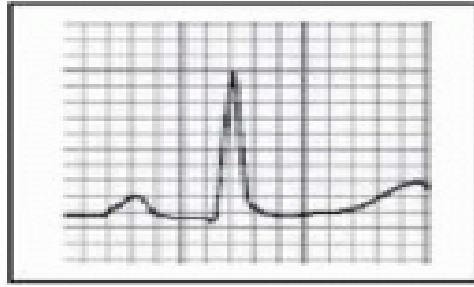
(+) artinya gelombang cenderung ke atas atau panjang
gel $R > q + S$

(-) artinya gelombang cenderung ke bawah atau panjang
gel $R < q + S$

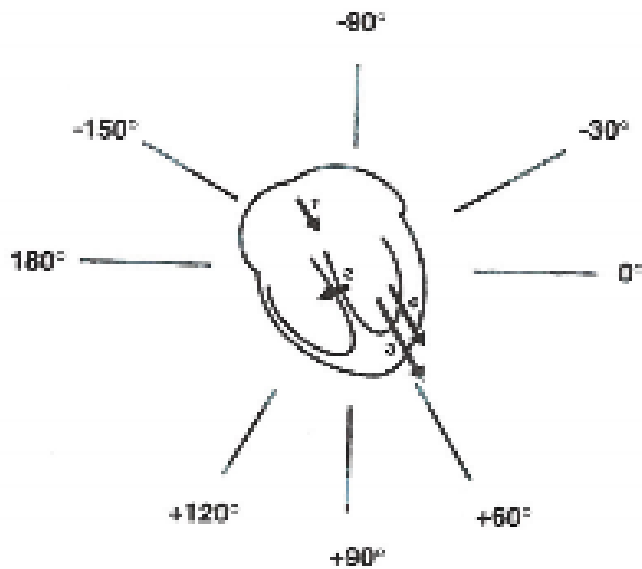
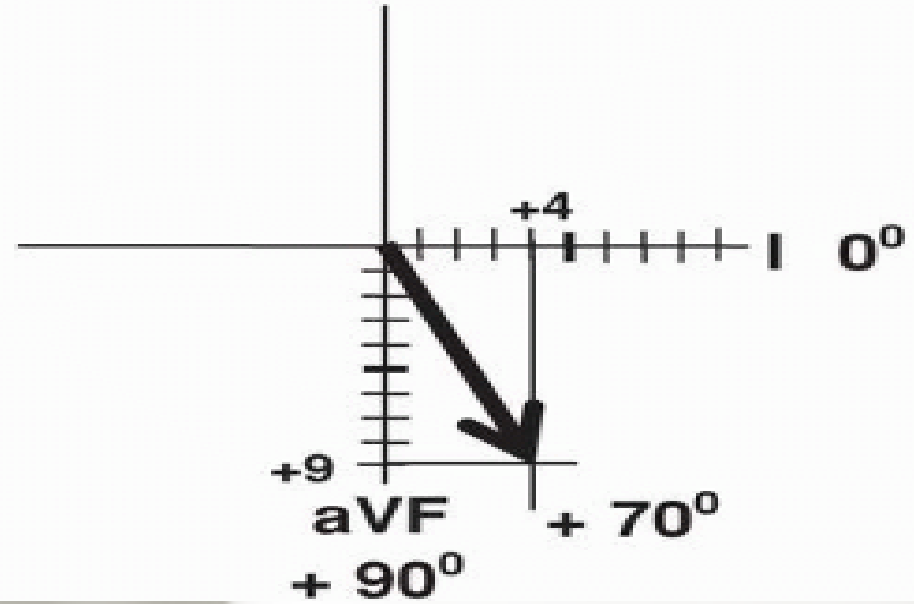
MENILAI AKSIS



Lead I = 4 units



Lead aVF = 9 units

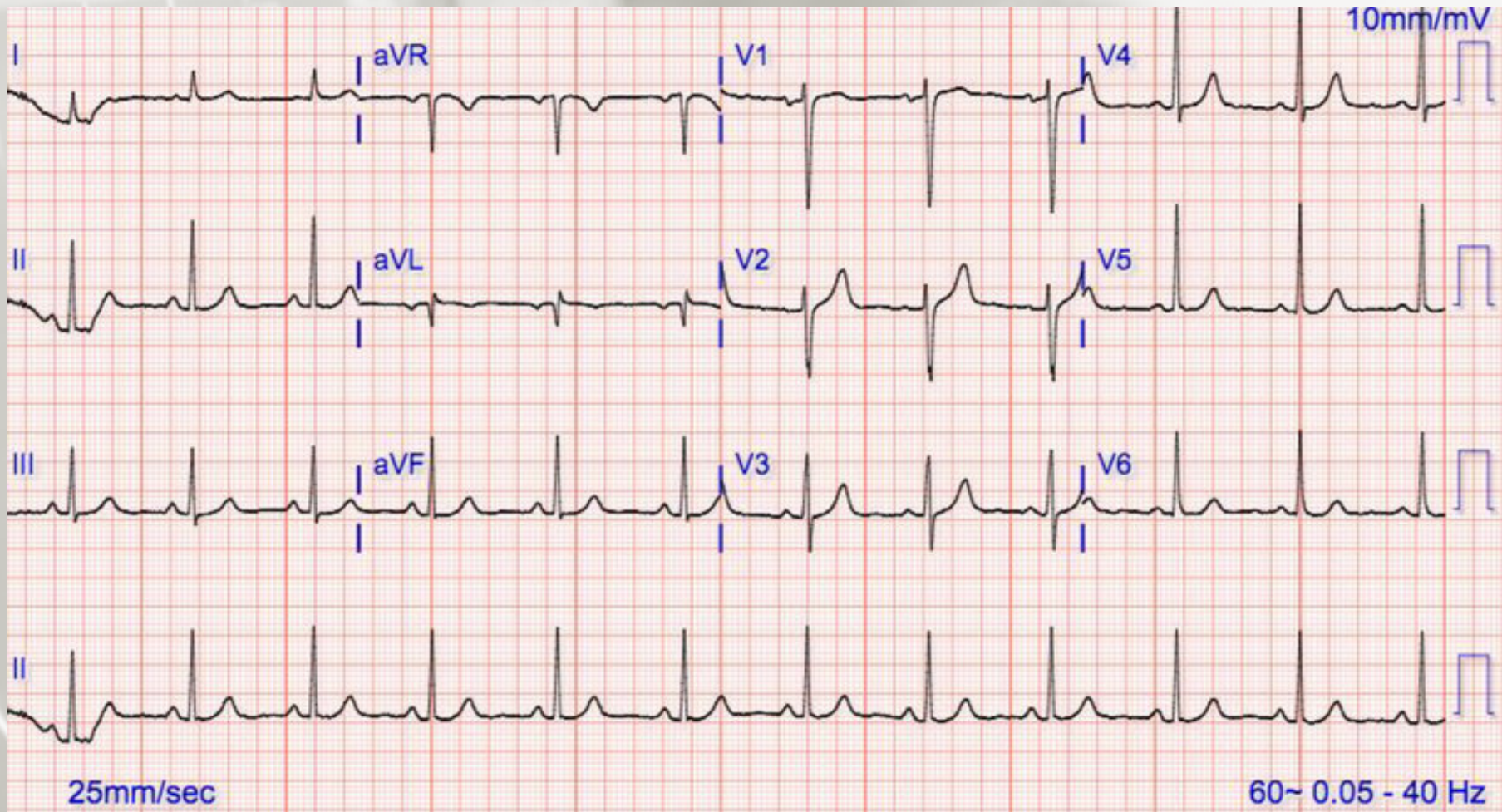


Bisa juga dengan diagram

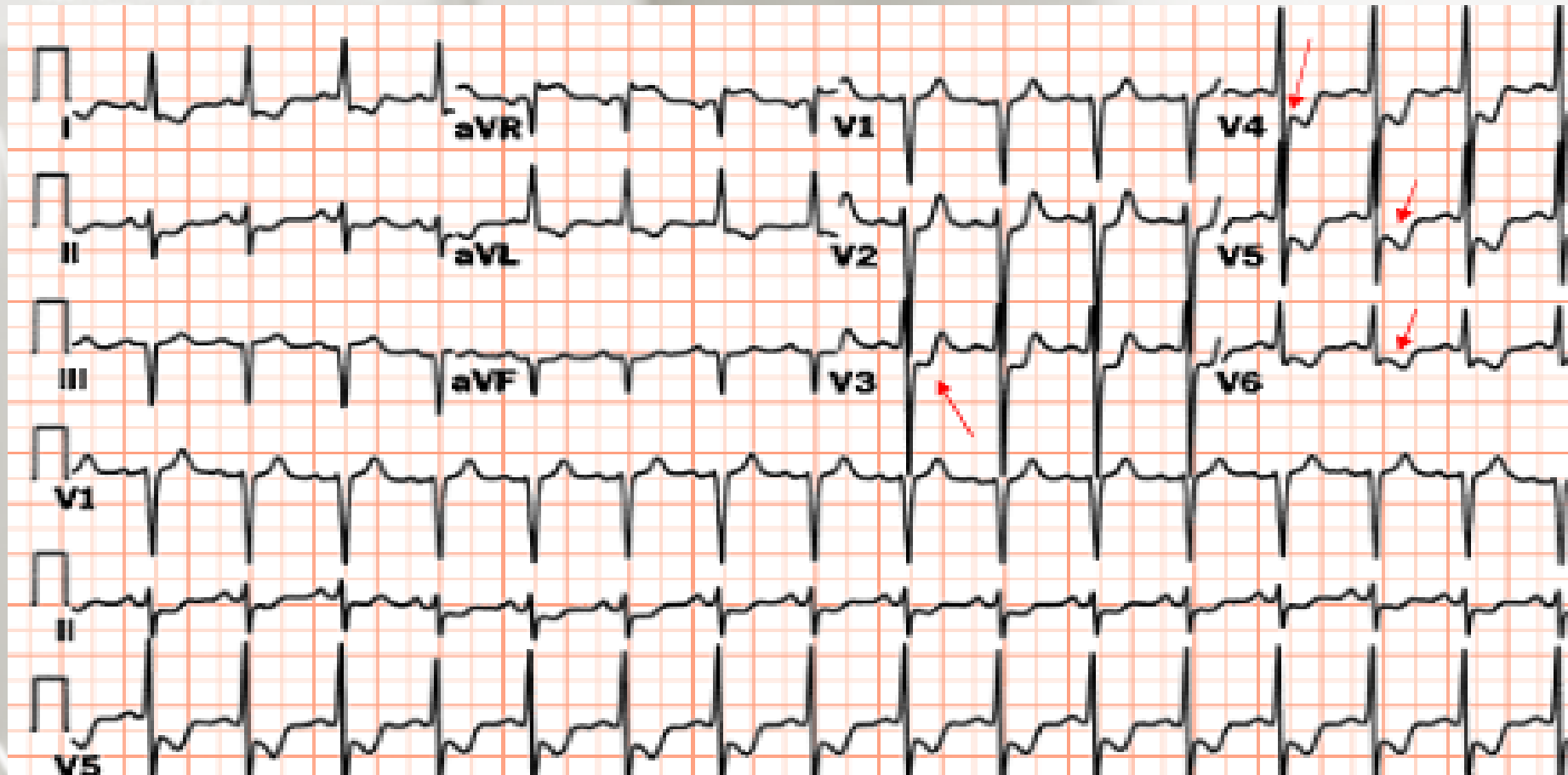
CARDIAC AXIS

Cardiac Axis	Causes
Left axis deviation	Normal variation in pregnancy, obesity; Ascites, abdominal distention, tumour; left anterior hemiblock, left ventricular hypertrophy, Q Wolff-Parkinson-White syndrome, Inferior MI
Right axis deviation	normal finding in children and tall thin adults, chronic lung disease(COPD) , left posterior hemiblock, Wolff-Parkinson-White syndrome, anterolateral MI.
North West	emphysema, hyperkalaemia. lead transposition, artificial cardiac pacing, ventricular tachycardia

LATIHAN

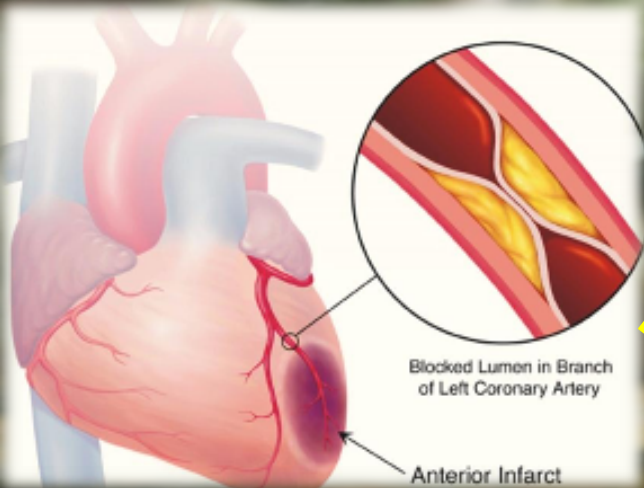


LATIHAN

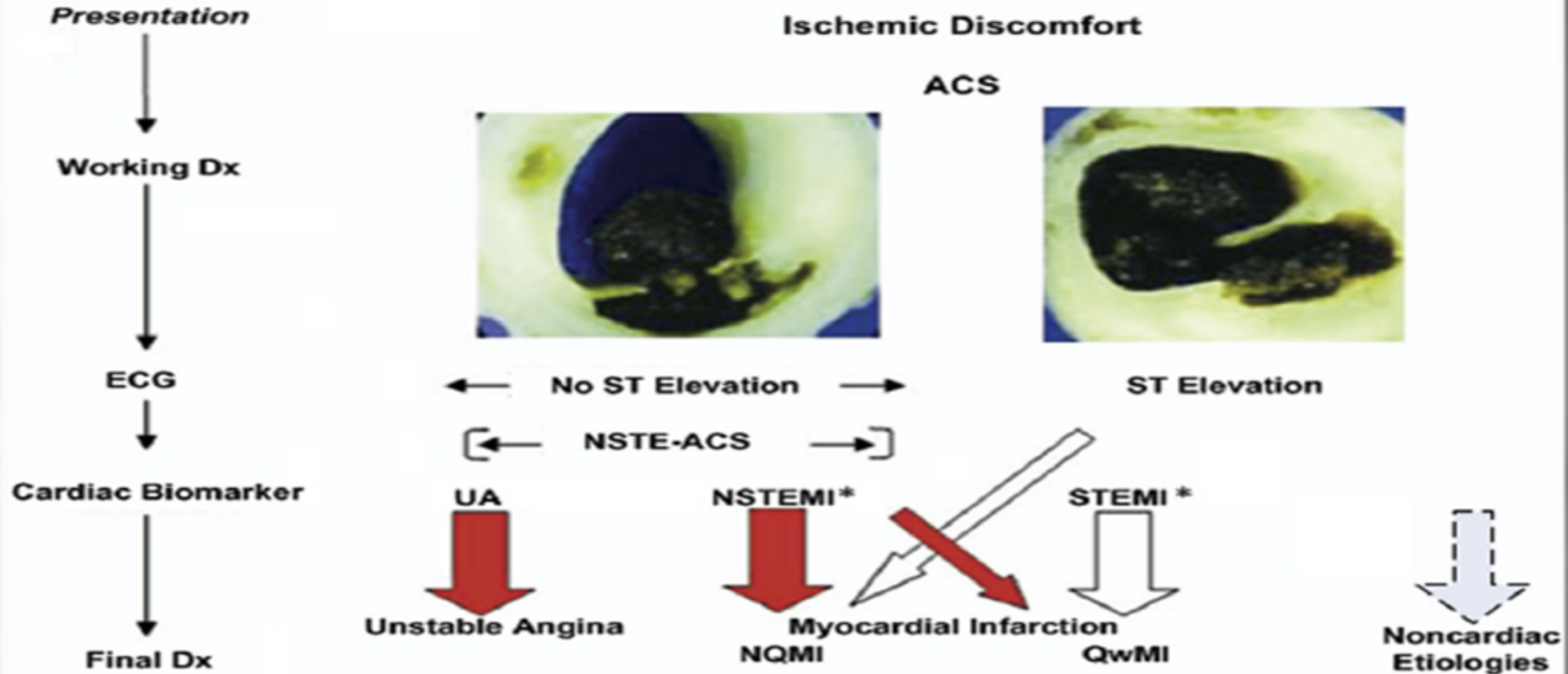


ECG ON ACUTE CORONARY SYNDROM ?

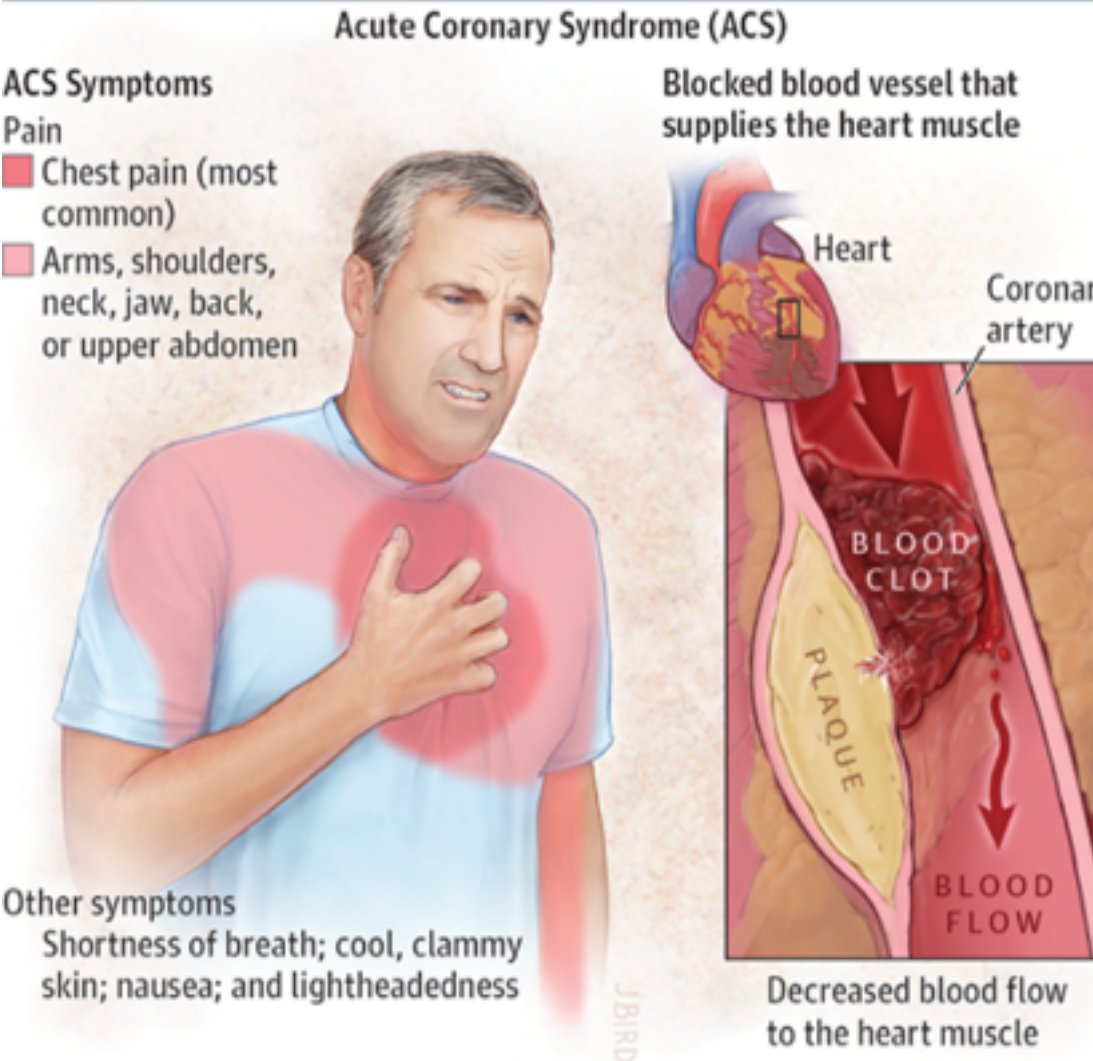
Kondisi **iskemik miokard akut** dan/atau **infark** karena pengurangan mendadak dalam aliran darah koroner.
(AHA, 2015)



PENEGAKKAN DIAGNOSA



Gejala / Keluhan



LOKASI NYERI: sulit melokalisir nyeri

DESKRIPSI NYERI: terasa berat seperti dihippit, diremas, ditekan

PENJALARAN NYERI: lengan kiri, bahu, punggung, rahang bawah, lengan

LAMA NYERI : >20 menit

GEJALA SISTEMIK: disertai mual, muntah atau keringat dingin

PENJALARAN NYERI: lengan kiri, bahu,
punggung, rahang bawah, lengan



Nyeri pada dada atas
atau ulu hati menjalar
ke leher, dagu, dan lengan



Nyeri terasa dari bawah tulang dada,
menjalar ke leher dan dagu
atau menjalar ke lengan kiri



Mual, sesak nafas,
rasa tidak enak pada ulu hati
atau di sekitar tenggorokan



Nyeri pada ulu hati,
atau pundak kiri menjalar
dua tangan kanan dan kiri



Nyeri terasa menembus
ke belakang punggung
diantara dua tulang scapula



Nyeri terasa
menjalar
di punggung

Perubahan EKG

Klasifikasi gambaran EKG Pasien dengan SKA

1. ST - Elevasi atau LBBB yang baru
2. ST - Depresi atau T-inverted yang dinamis
3. EKG non-diagnostik

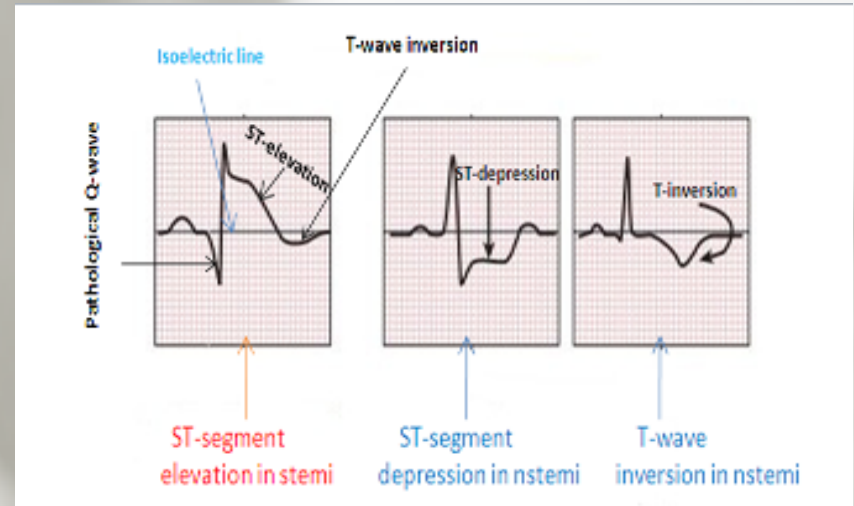


Table 3 Atypical electrocardiographic presentations that should prompt a primary percutaneous coronary intervention strategy in patients with ongoing symptoms consistent with myocardial ischaemia

Bundle branch block

Criteria that can be used to improve the diagnostic accuracy of STEMI in LBBB⁵⁰:

- Concordant ST-segment elevation ≥ 1 mm in leads with a positive QRS complex
- Concordant ST-segment depression ≥ 1 mm in V_1-V_3
- Discordant ST-segment elevation ≥ 5 mm in leads with a negative QRS complex

The presence of RBBB may confound the diagnosis of STEMI

Ventricular paced rhythm

During RV pacing, the ECG also shows LBBB and the above rules also apply for the diagnosis of myocardial infarction during pacing; however, they are less specific

Isolated posterior myocardial infarction

Isolated ST depression ≥ 0.5 mm in leads V_1-V_3 and ST-segment elevation (≥ 0.5 mm) in posterior chest wall leads V_7-V_9

Ischaemia due to left main coronary artery occlusion or multivessel disease

ST depression ≥ 1 mm in eight or more surface leads, coupled with ST-segment elevation in aVR and/or V_1 , suggests left main-, or left main equivalent- coronary obstruction, or severe three vessel ischaemia

Initial Diagnosis, ESC 2017

Recommendations	Class ^a	Level ^b
ECG monitoring		
12-lead ECG recording and interpretation is indicated as soon as possible at the point of FMC, with a maximum target delay of 10 min. ^{36,38}	I	B
ECG monitoring with defibrillator capacity is indicated as soon as possible in all patients with suspected STEMI. ^{44,45}	I	B
The use of additional posterior chest wall leads (V ₇ –V ₉) in patients with high suspicion of posterior MI (circumflex occlusion) should be considered. ^{8,46–49}	IIa	B
The use of additional right precordial leads (V ₃ R and V ₄ R) in patients with inferior MI should be considered to identify concomitant RV infarction. ^{8,43}	IIa	B
Blood sampling		
Routine blood sampling for serum markers is indicated as soon as possible in the acute phase but should not delay reperfusion treatment. ⁸	I	C

1. ST - Elevasi atau LBBB yang baru

Kriteria ST Elevasi



ST elevasi sekurang-kurangnya di 2 lead yang berdekatan

Laki-laki

>40 thn Elevasi J poin 2 mm (0.2 mV) di V2 dan V3 dan 0.1 mV (1 mm) di lead yg lain

<40 thn elevasi J-poin 0.25 mV (2.5 mm) di V2 dan V3 dan 0.1 mV (1 mm) di lead yg lain

Perempuan

Perempuan elevasi J-poin 0.15 mV (1.5 mm) di V2 dan V3 dan 0.1 mV (1 mm) di lead yg lain

LBBB baru



Kriteria Sgarbossa

DIAGNOSING MYOCARDIAL INFARCTION (STEMI)

ST Segment Elevation



↑ 1 mm above baseline (limb)
↑ 2 mm above baseline (chest)
.08 sec to right of J point
Look for in two or more leads
facing same area

Criteria:

ST elevation in ≥ 2 chest leads ≥ 2 mm elevation

ST elevation in ≥ 2 limb leads ≥ 1 mm elevation

Q wave > 0.04 s (1 small square).

*Be careful of LBBB

The diagnosis of acute myocardial infarction should be made circumspectively in the presence of pre-existing LBBB. On the other hand, the appearance of new LBBB should be regarded as sign of acute MI until proven otherwise

Pathologic Q waves are a sign of previous myocardial infarction.

Definition of a pathologic Q wave

Any Q-wave in leads V2–V3 ≥ 0.02 s or QS complex in leads V2 and V3

Q-wave ≥ 0.03 s and > 0.1 mV deep or QS complex in leads I, II, aVL, aVF, or V4–V6 in any two leads of a contiguous lead grouping (I, aVL, V6; V4–V6; II, III, and aVF)

R-wave ≥ 0.04 s in V1–V2 and R/S ≥ 1 with a concordant positive T-wave in the absence of a conduction defect.

A little bit troublesome to remember? I usually **take pathological Q wave as >1 small square deep**

Kriteria Sgarbossa

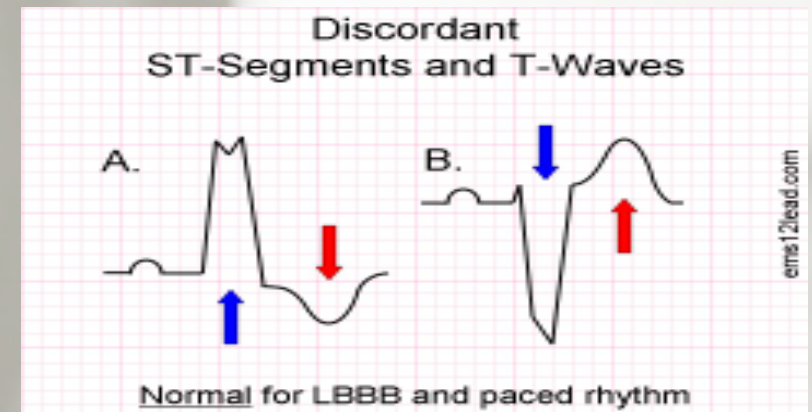
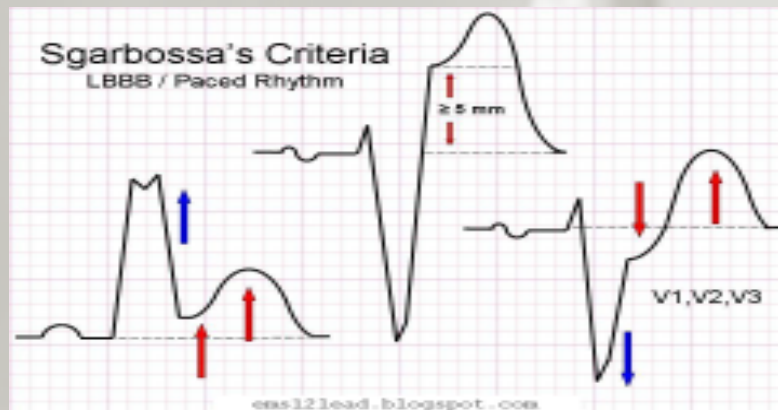
Concordant ST elevasi $> 1\text{mm}$ pada lead positive QRS complex (score 5)

Concordant ST depresi $> 1\text{ mm}$ in V1-V3 (score 3)

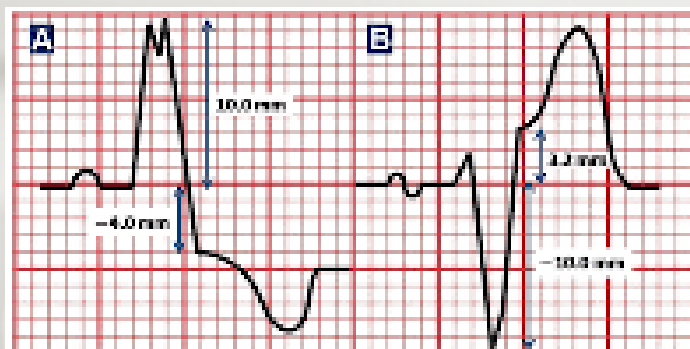
Excessively discordant ST elevasi $> 5\text{ mm}$ pada lead negative QRS complex (score 2)

TOTAL SCORE

$\geq 3 : 90\%$ spesifik didiagnosa infark miokard



SGARBOSA CRITERIA

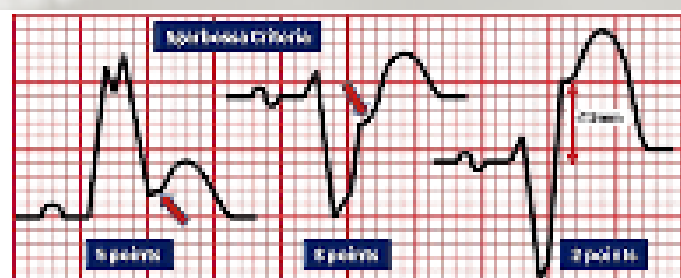


$$\text{Ratio} = 10/4 = 2.5$$

$$\text{Ratio} = 3.3/10 = 0.33$$

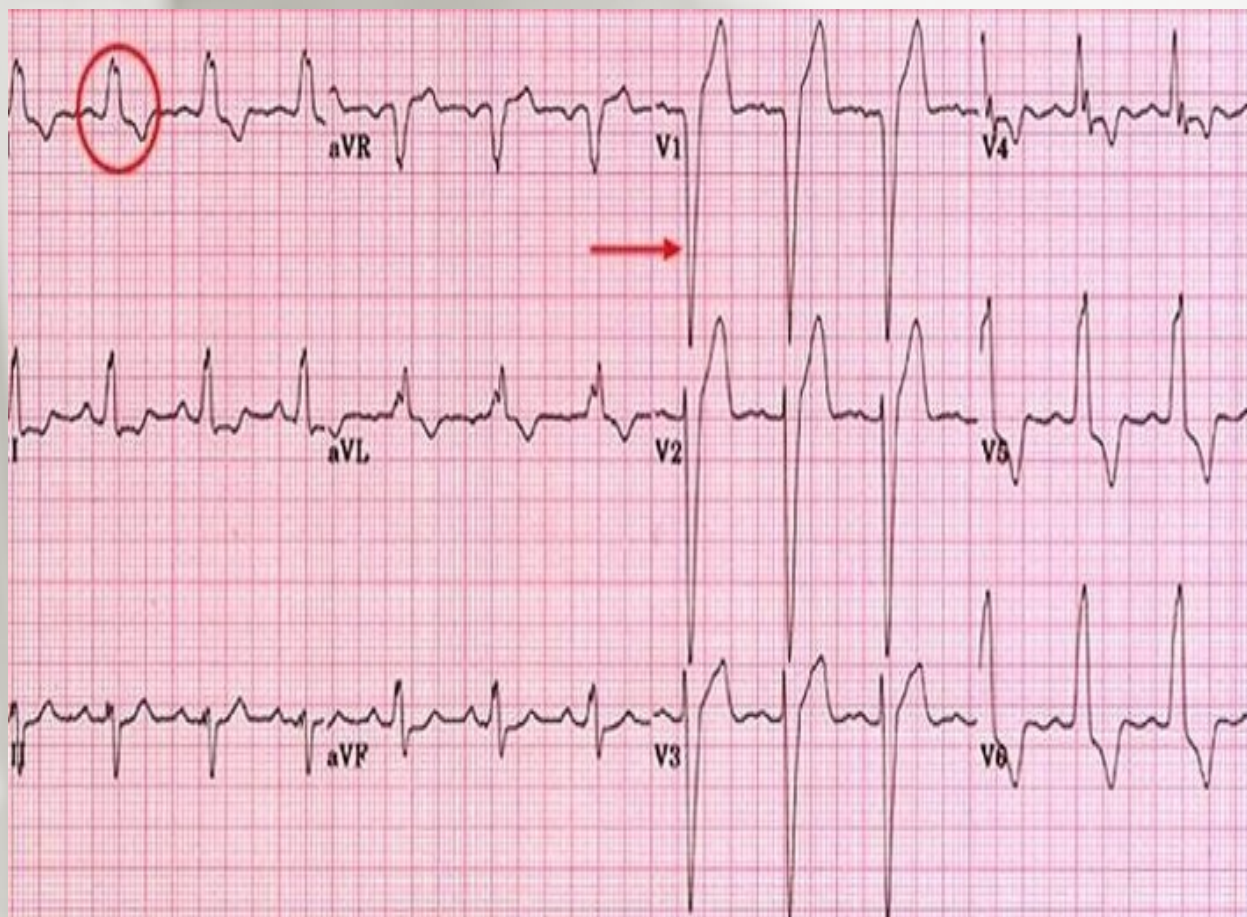
ST/S Ratio

Ratio of ST-segment elevation measured at the J point to the R or S wave, whichever was most prominent

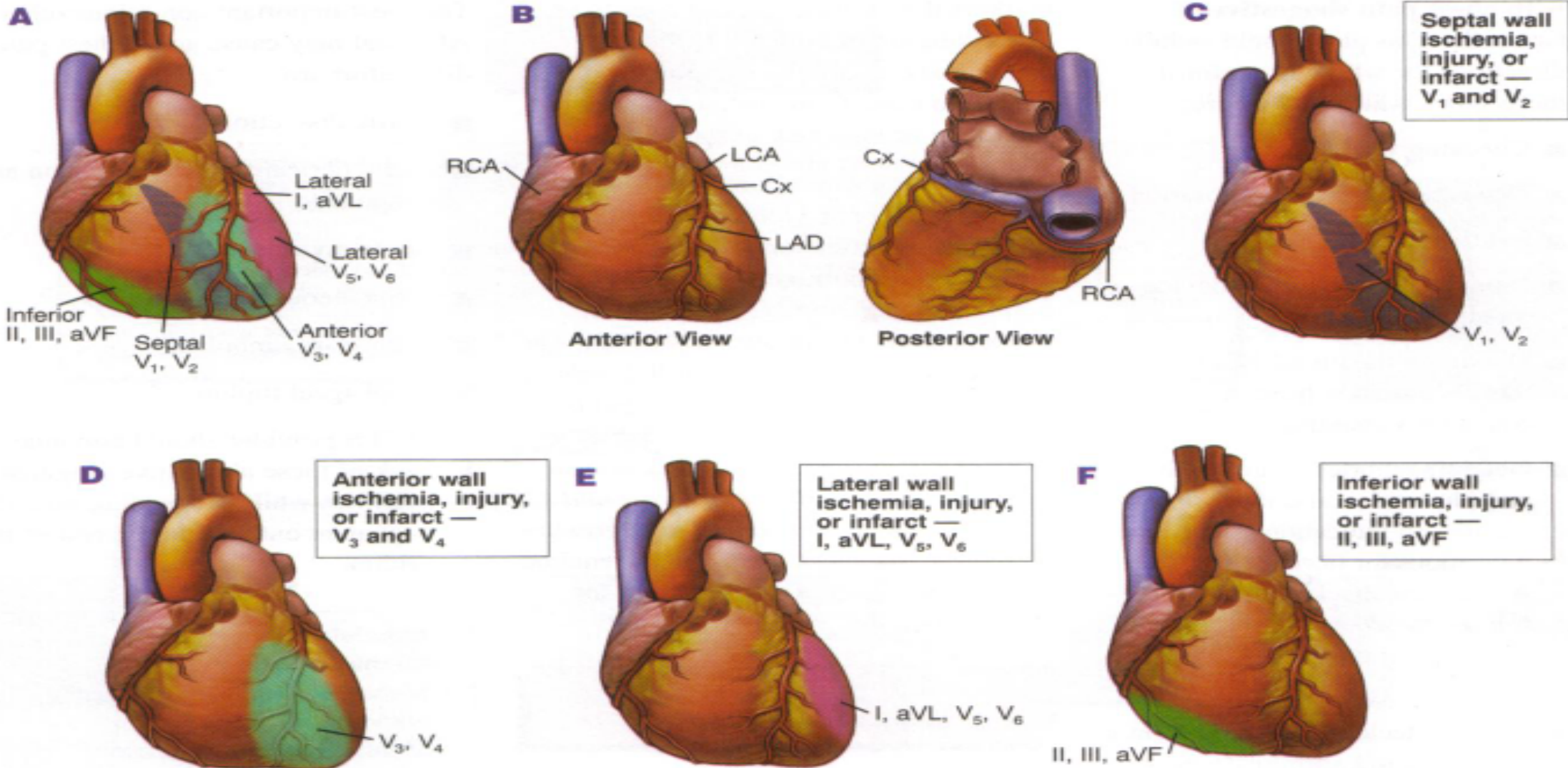


Sgarbosa ECG Criteria for LBBB

Concordant STE ≥ 1 mm	5 points
STE ≥ 1 mm in V1 - V3	3 points
Discordant STE ≥ 5 mm	2 points



Lokasi INAFARK MIOKARD



ST-Depresi

Bermakna bila:

Lead V2 dan V3:

≥ 0.5 mm [0.05 mV] di bawah garis dasar PT di titik J

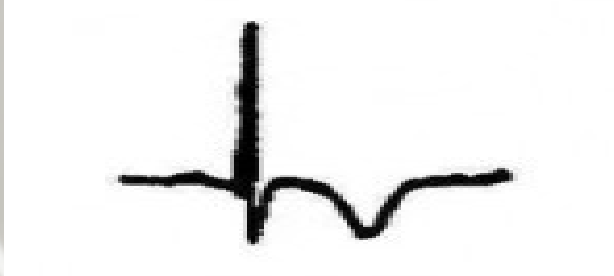
Lead lain:

-0.1 mV (-1 mm)

Perubahan gelombang T

Gelombang T inverted (≥ 2 mm [0.2 mV])

Gelombang T inverted yg baru

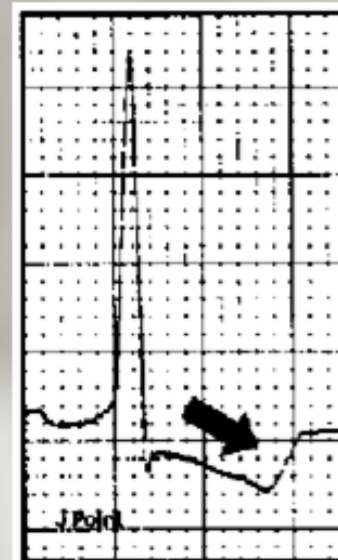


Bentuk Segmen ST

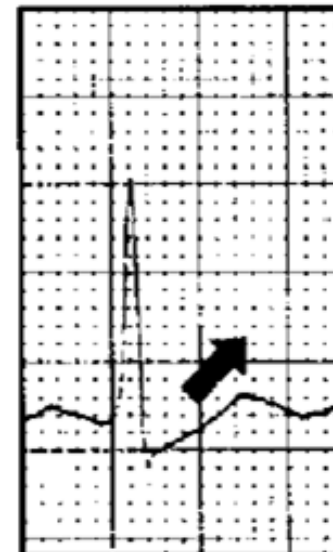
up-sloping (tidak spesifik)

horizontal (lebih spesifik untuk iskemia)

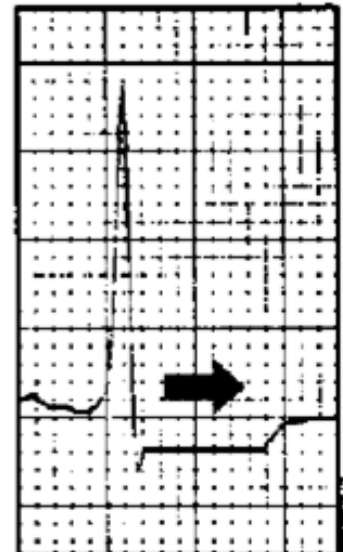
down-sloping (paling terpercaya untuk iskemia)



Downsloping ST



Upsloping ST



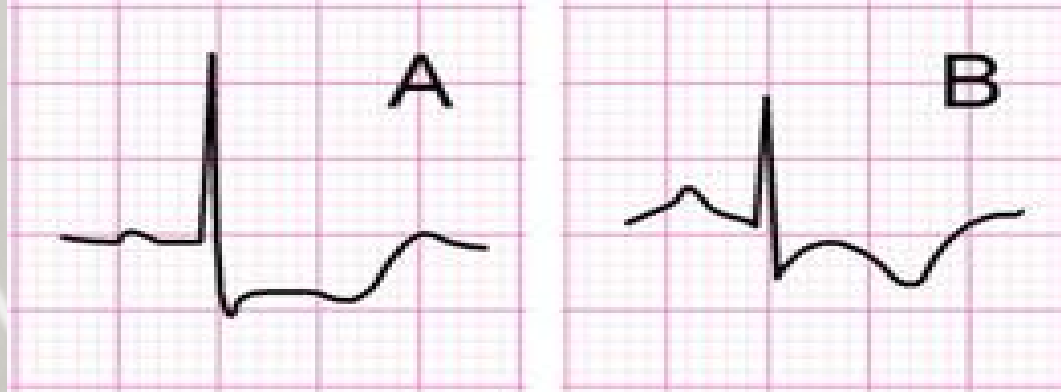
Horizontal ST

NON ST-ELEVATION MI (NSTEMI)

NSTEMI is also known as subendocardial or non Q-wave MI.

In a pt with Acute Coronary Syndrome (ACS) in which the ECG does not show ST elevation, NSTEMI (subendocardial MI) is suspected if

- ST Depression (A)
- T wave inversion with or without ST depression (B)
- Q wave and ST elevation will never happen



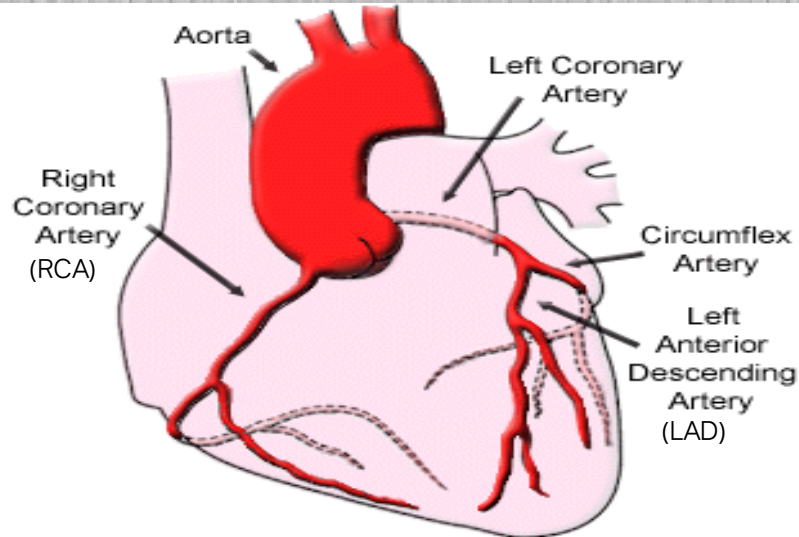
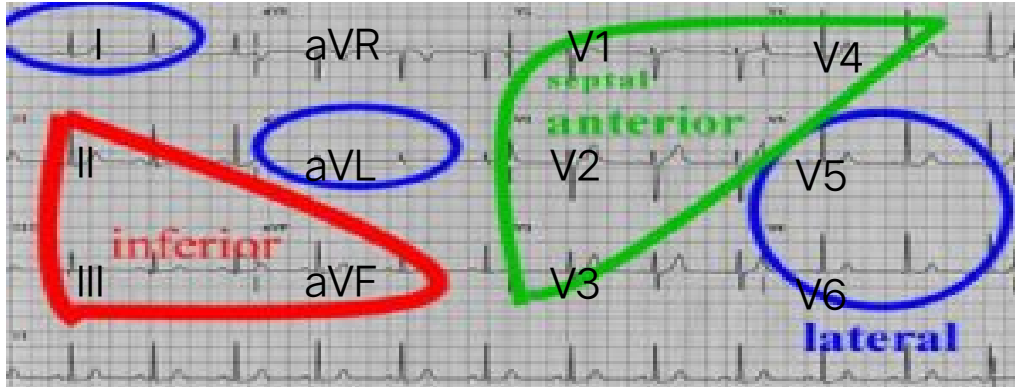
To confirm a NSTEMI, do Troponin test:

- If positive - NSTEMI
- If negative - unstable angina pectoris

ST-SEGMENT

Localizing MI

Look at ST changes, Q wave in all leads. Grouping the leads into anatomical location, we have this:



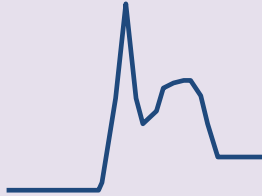
Ischaemic change can be attributed to different coronary arteries supplying the area.

Location of MI	Lead with ST changes	Affected coronary artery
Anterior	V1, V2, V3, V4	LAD
Septum	V1, V2	LAD
left lateral	I, aVL, V5, V6	Left circumflex
inferior	II, III, aVF	RCA
Right atrium	aVR, V1	RCA
*Posterior	Posterior chest leads	RCA
*Right ventricle	Right sided leads	RCA

*To help identify MI, right sided and posterior leads can be applied

ST-ELEVATION MI (STEMI)

0 HOUR



Pronounced T Wave initially
ST elevation (convex type)

1-24H



Depressed R Wave, and Pronounced T Wave. Pathological Q waves may appear within hours or may take greater than 24 hr. – indicating full-thickness MI. Q wave is pathological if it is wider than 40 ms or deeper than a third of the height of the entire QRS complex

Day 1-2



Exaggeration of T Wave continues for 24h.

Days later



T Wave inverts as the ST elevation begins to resolve. Persistent ST elevation is rare except in the presence of a ventricular aneurysm.

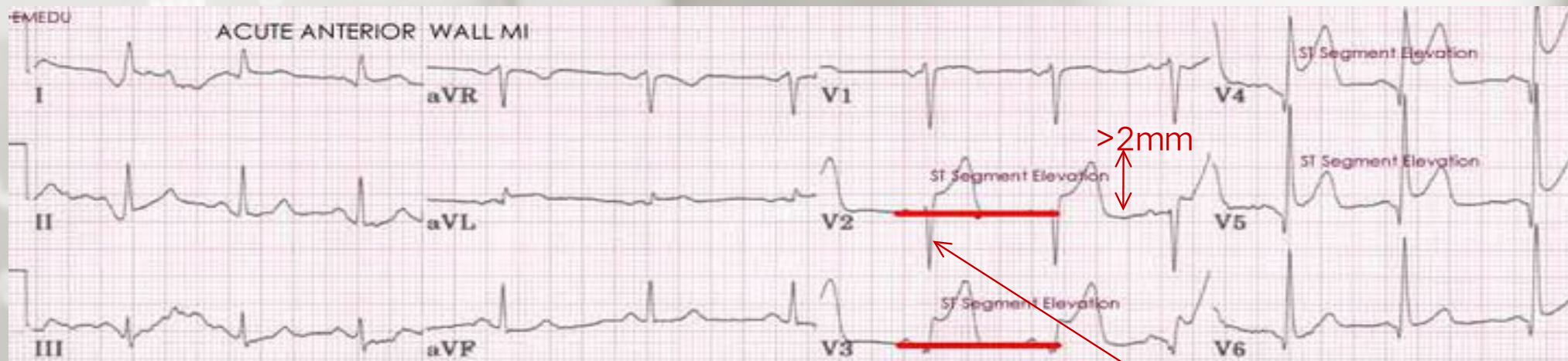
Weeks later



ECG returns to normal T wave, but retains pronounced Q wave. An old infarct may look like this

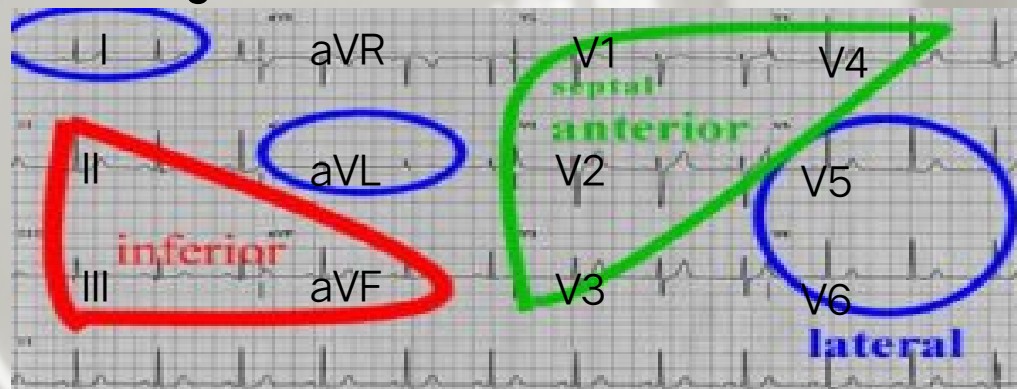
ST SEGMENT

Let's see this



Pathological Q wave

Check again!

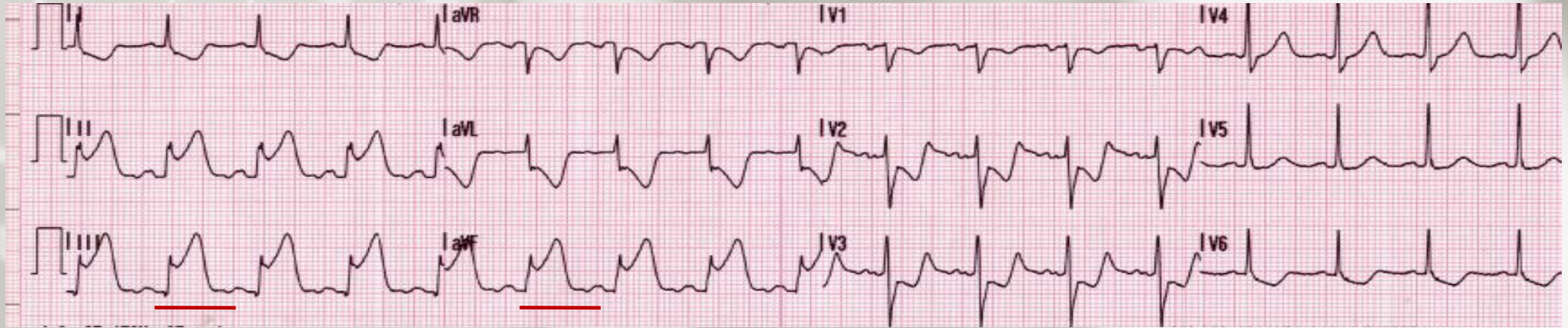


ST elevation in ≥ 2 chest leads $\geq 2\text{mm}$
Q wave $> 0.04\text{s}$ (1 small square).

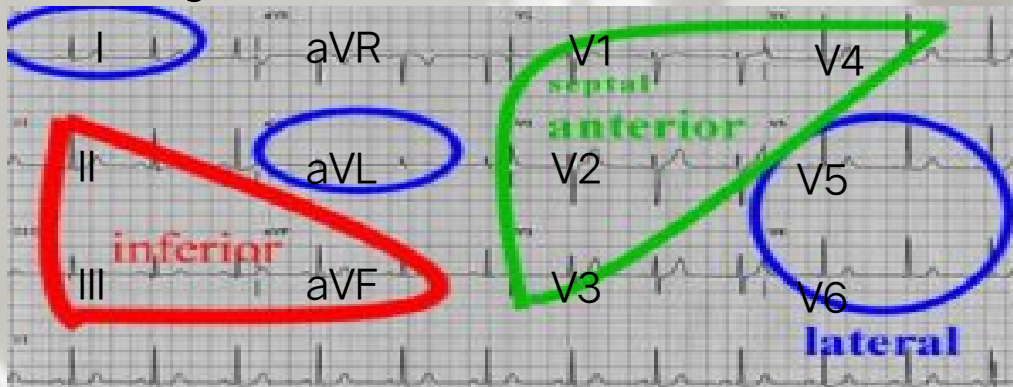
Yup, It's acute anterolateral MI!

ST SEGMENT

How about this one?

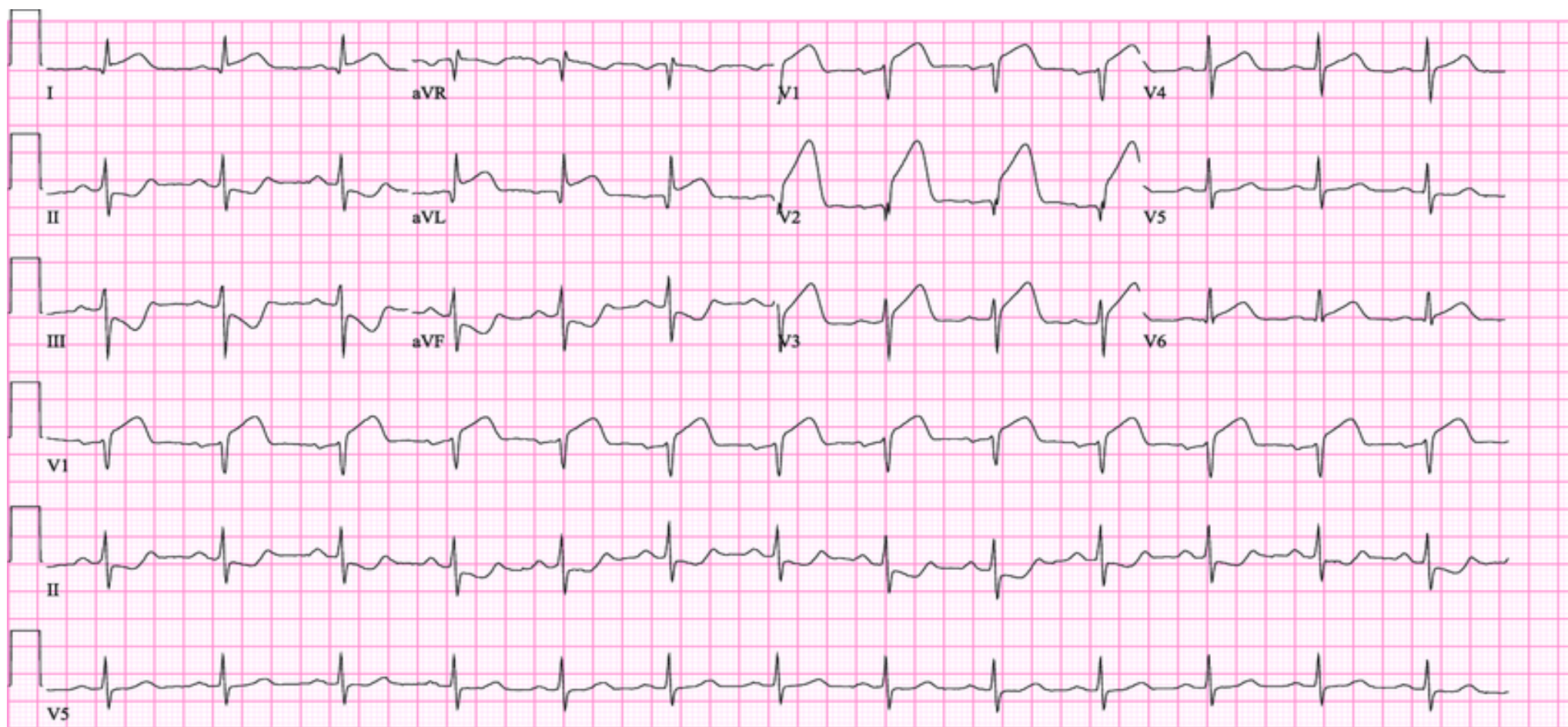


Check again!

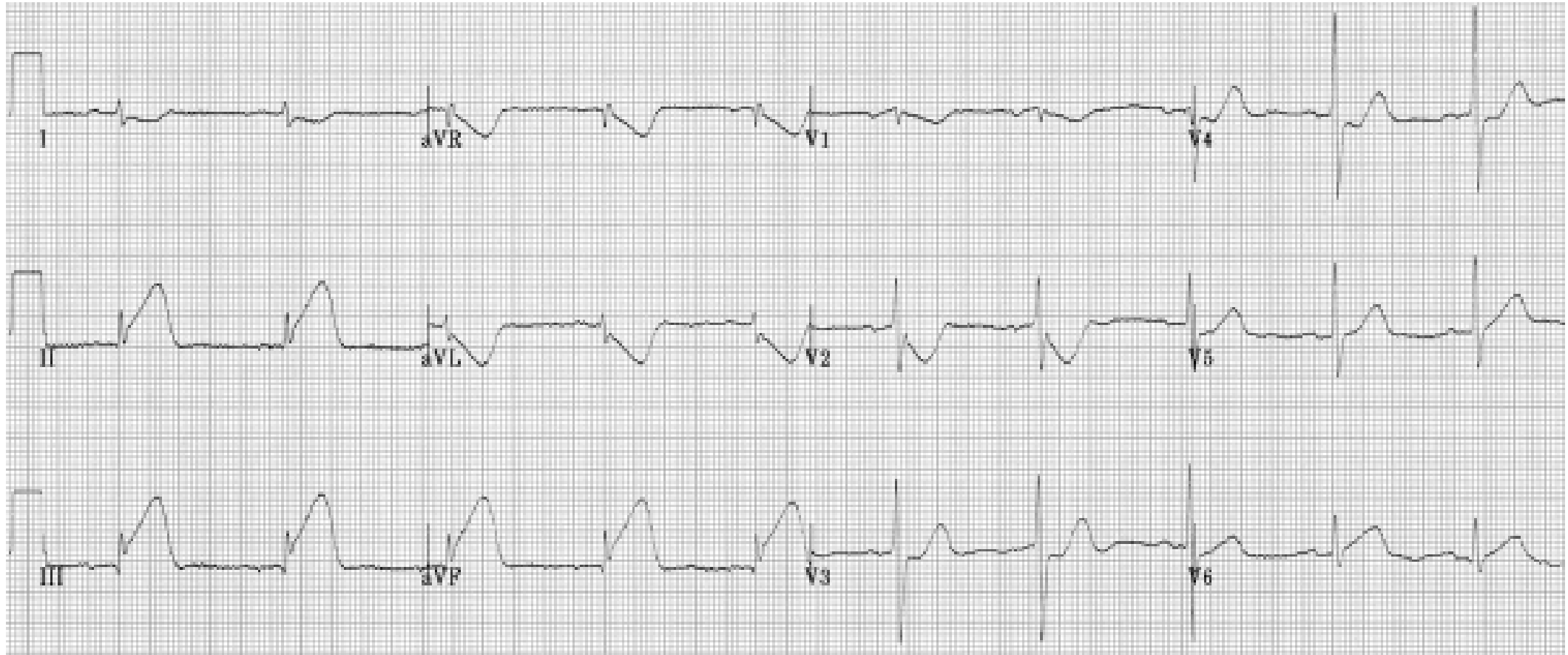


Inferior MI!

Latihan



Latihan



ECG ITS EASY?

HAP
PY

Any Question?

