

RESTAURANT



CCU JBZ Den Bosch

ECG en Infarct



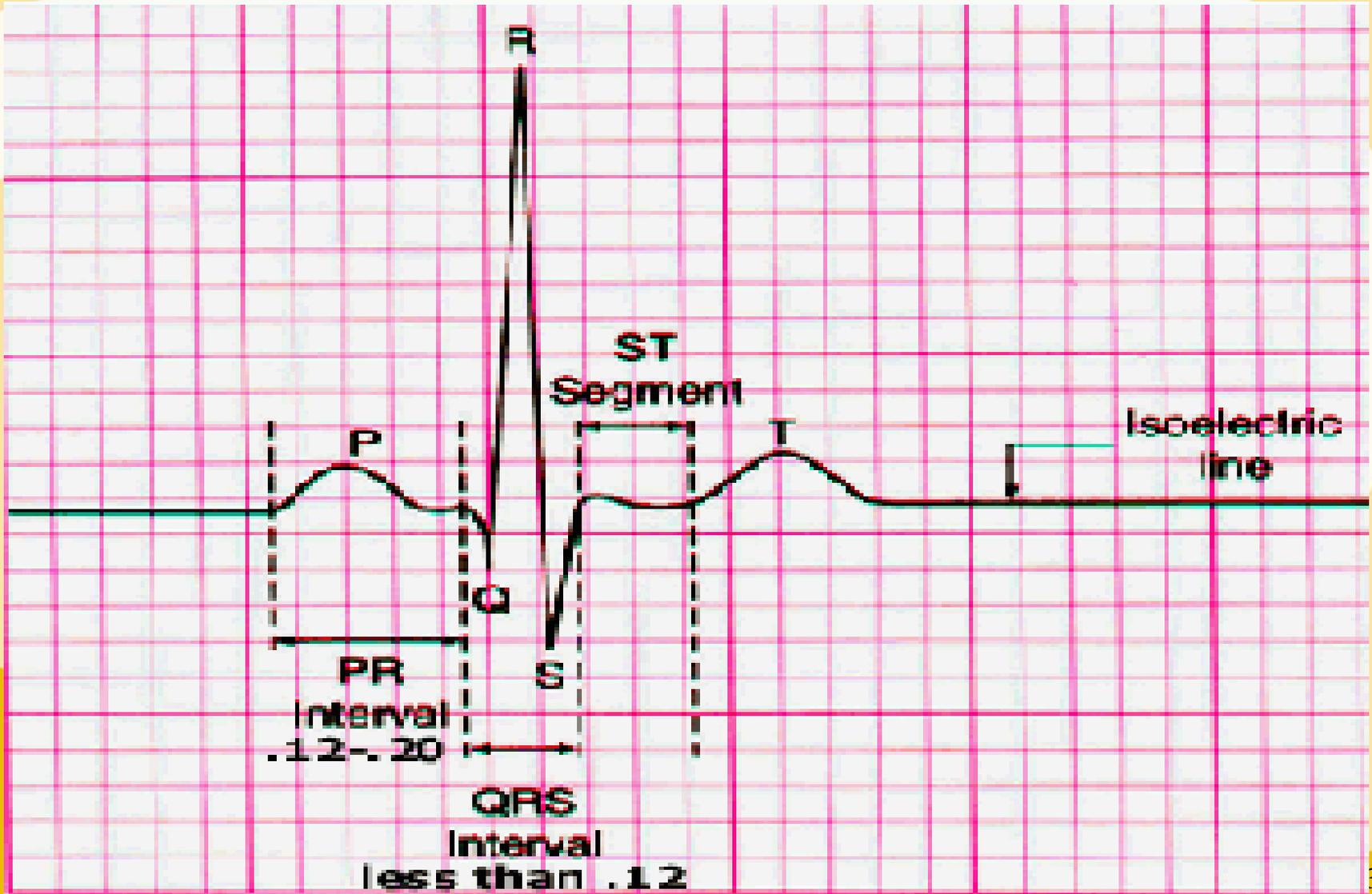
COMMON PRECIPITATING FACTORS IN ANGINA PECTORIS:
HEAVY MEAL, EXERTION, COLD, SMOKING

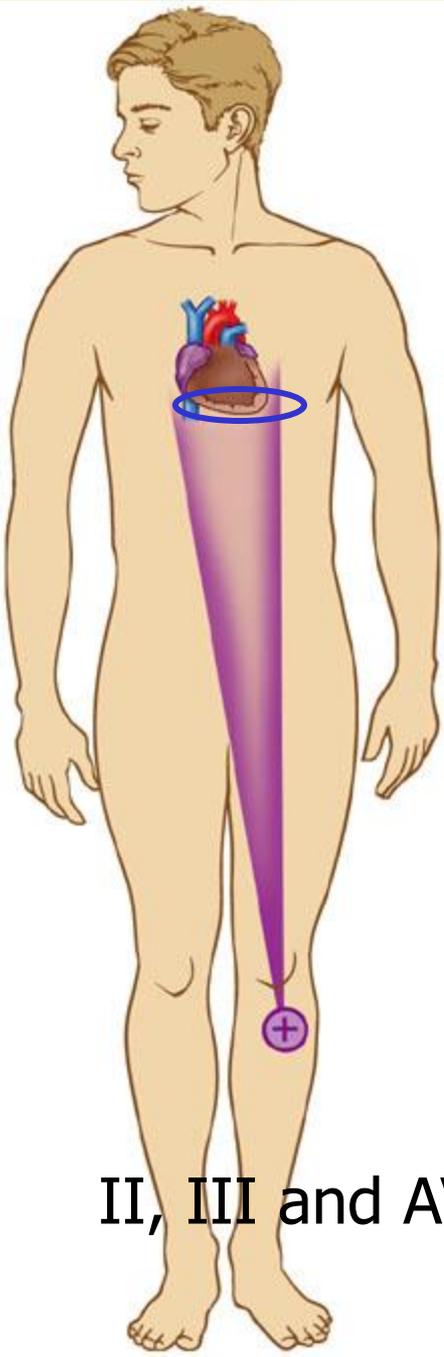
CHARACTERISTIC DISTRIBUTION OF
PAIN IN ANGINA PECTORIS

Diagnose

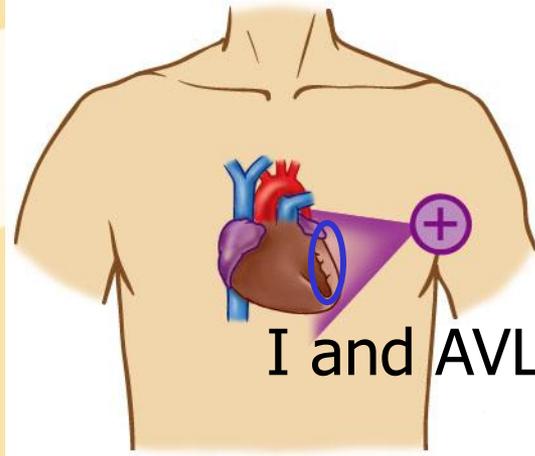
- ECG!

The ECG Tracing

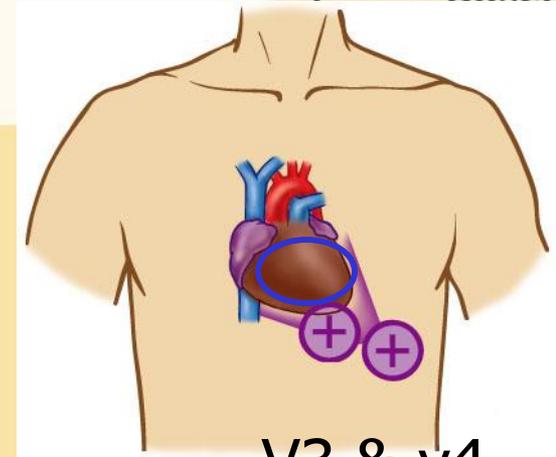




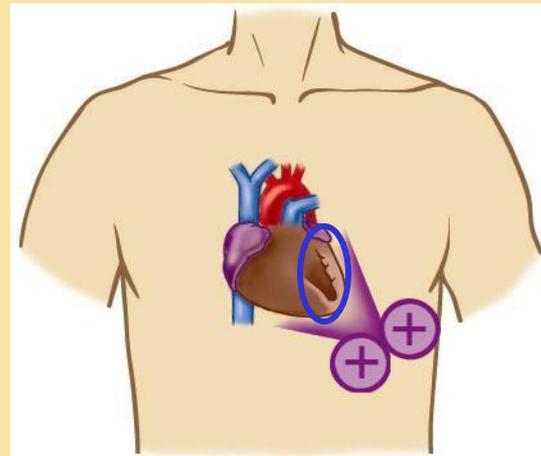
II, III and AVF



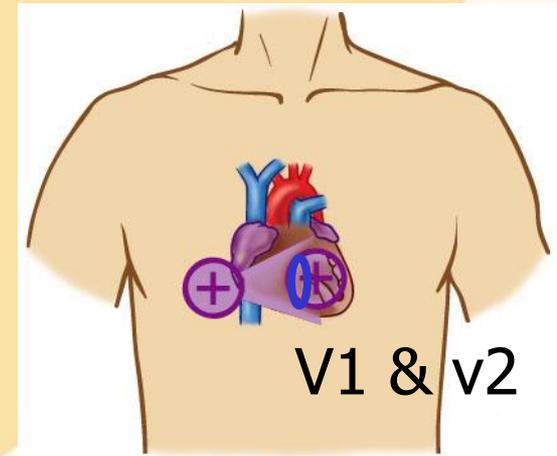
I and AVL



V3 & v4



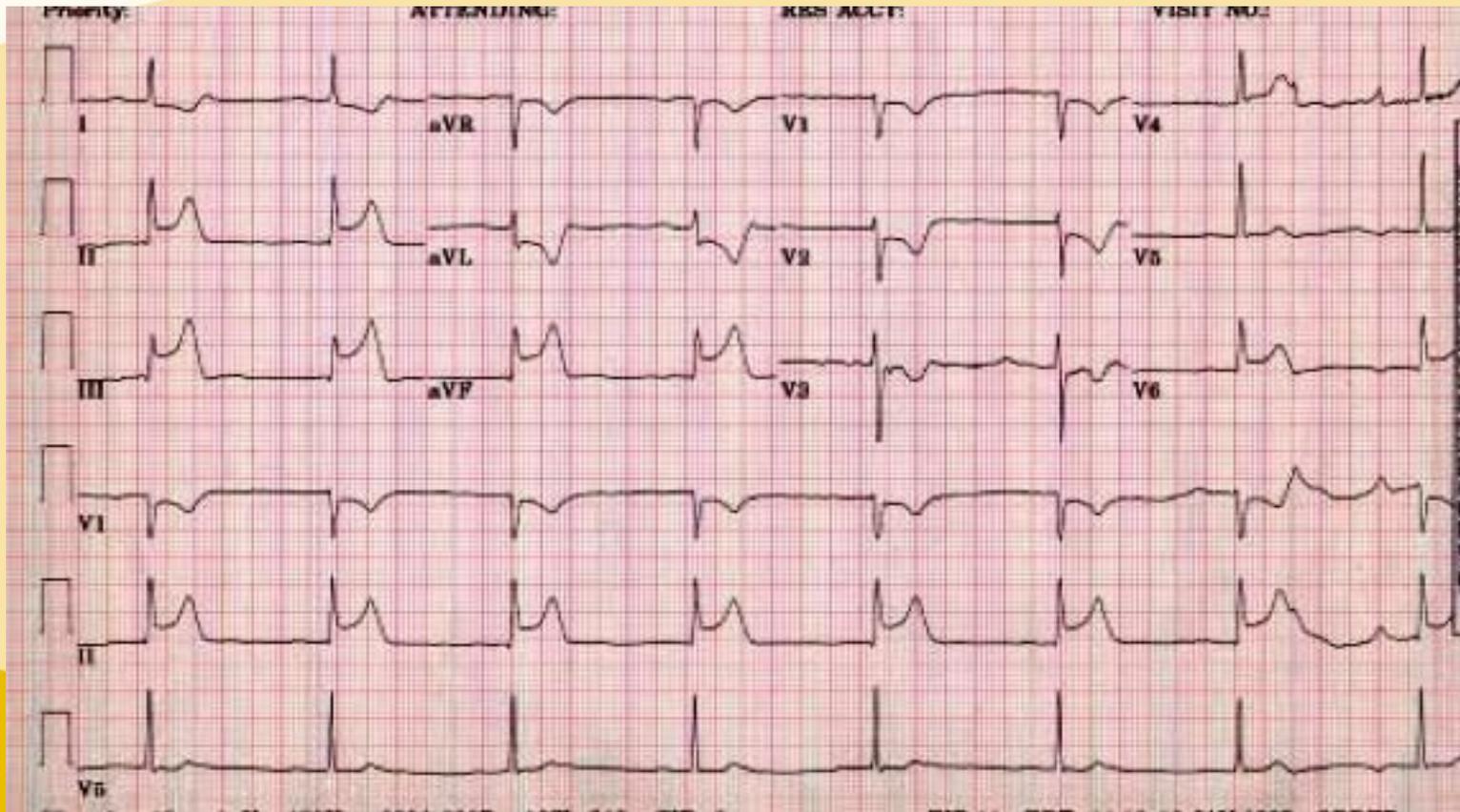
V5 & v6



V1 & v2

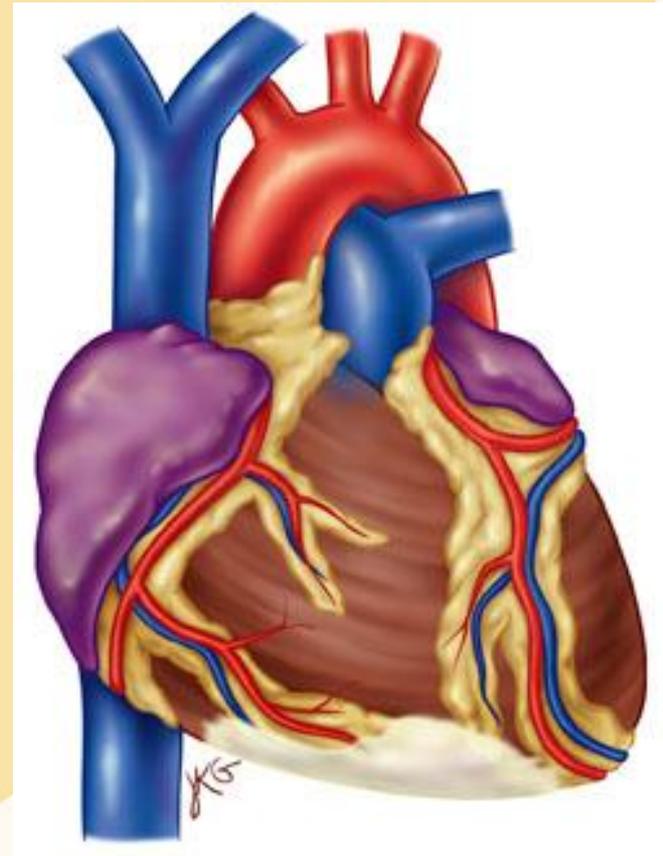
Where the positive electrode is positioned, determines what part of the heart is seen!

Acuut inferior infarct

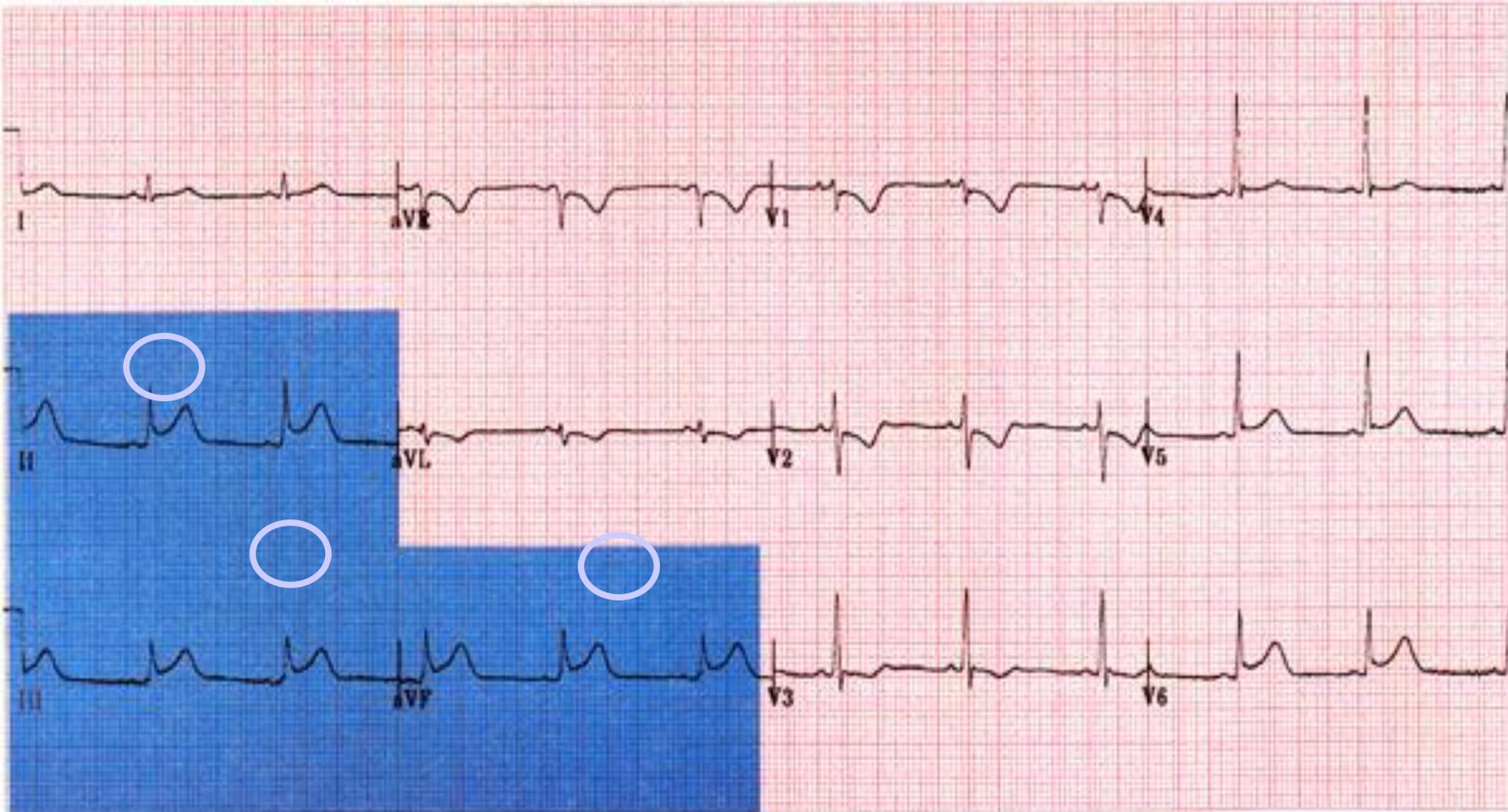


Inferior

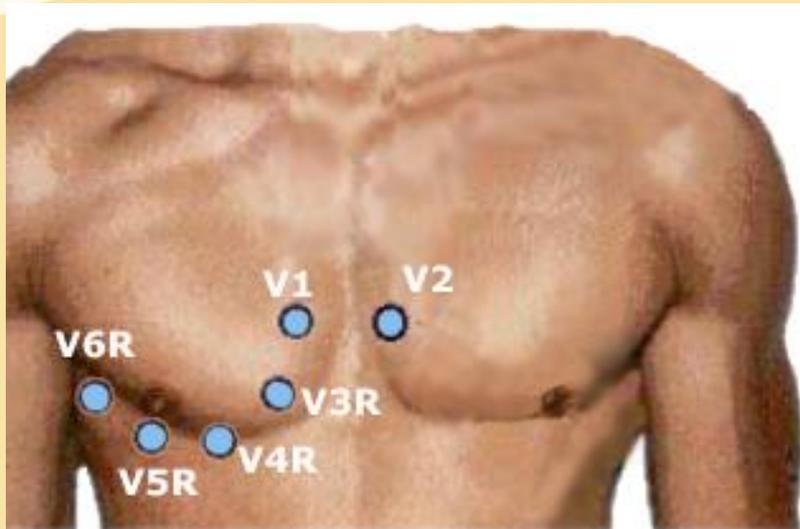
- **II, III, AVF**
 - **Inferior Infarct with ST elevations**
 - **Right Coronary Artery (RCA)**
 - **1st degree Heart Block**
 - **2nd degree Type 1, 2**
 - **3rd degree Block**
 - **N/V common, Brady**



Inferior MI



Rechts gepoold ECG????

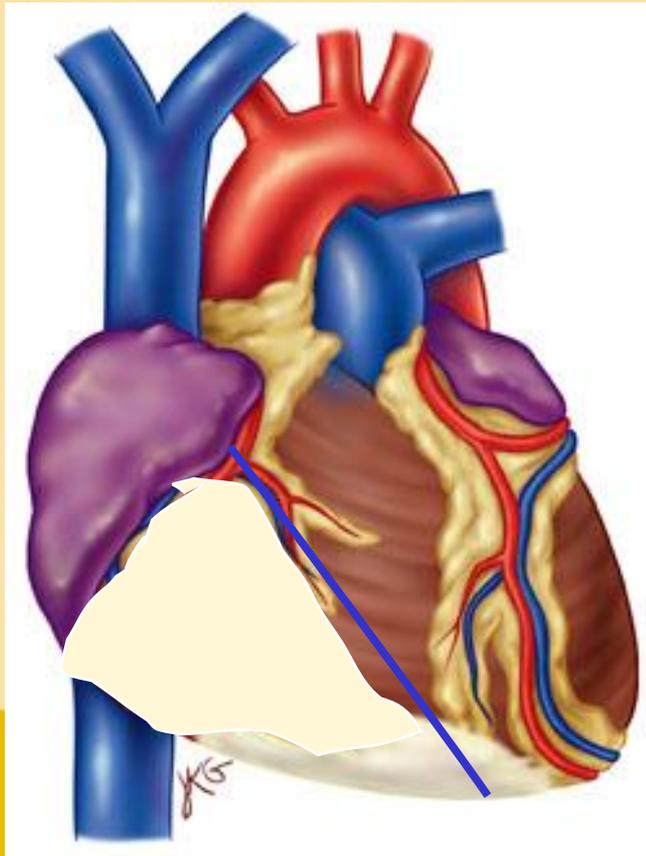


- RVI occurs around 40% in inferior MI's
- Significance
 - Larger area of infarct
 - Both ventricles
 - Different treatment
- Right leads “look” directly at Right Ventricle and can show ST elevations in leads II, III, AVF, V4R, V5R and V6R
- Occlusion in RCA and proximal enough to involve the RV

The single most accurate tool used in measuring RVI.

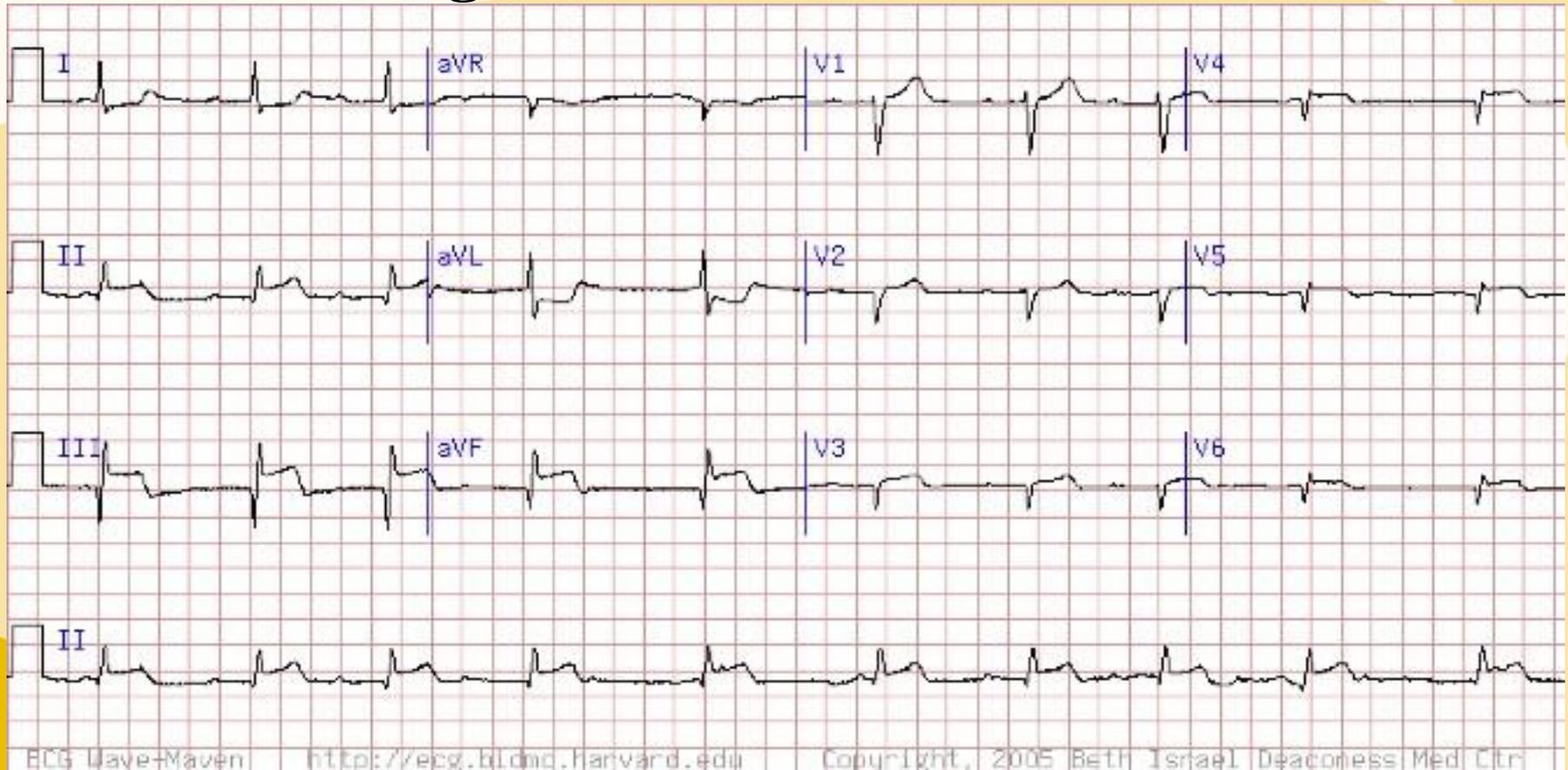
90% sensitive and specific

Kliniek bij een Rechter Ventrikel Infarct



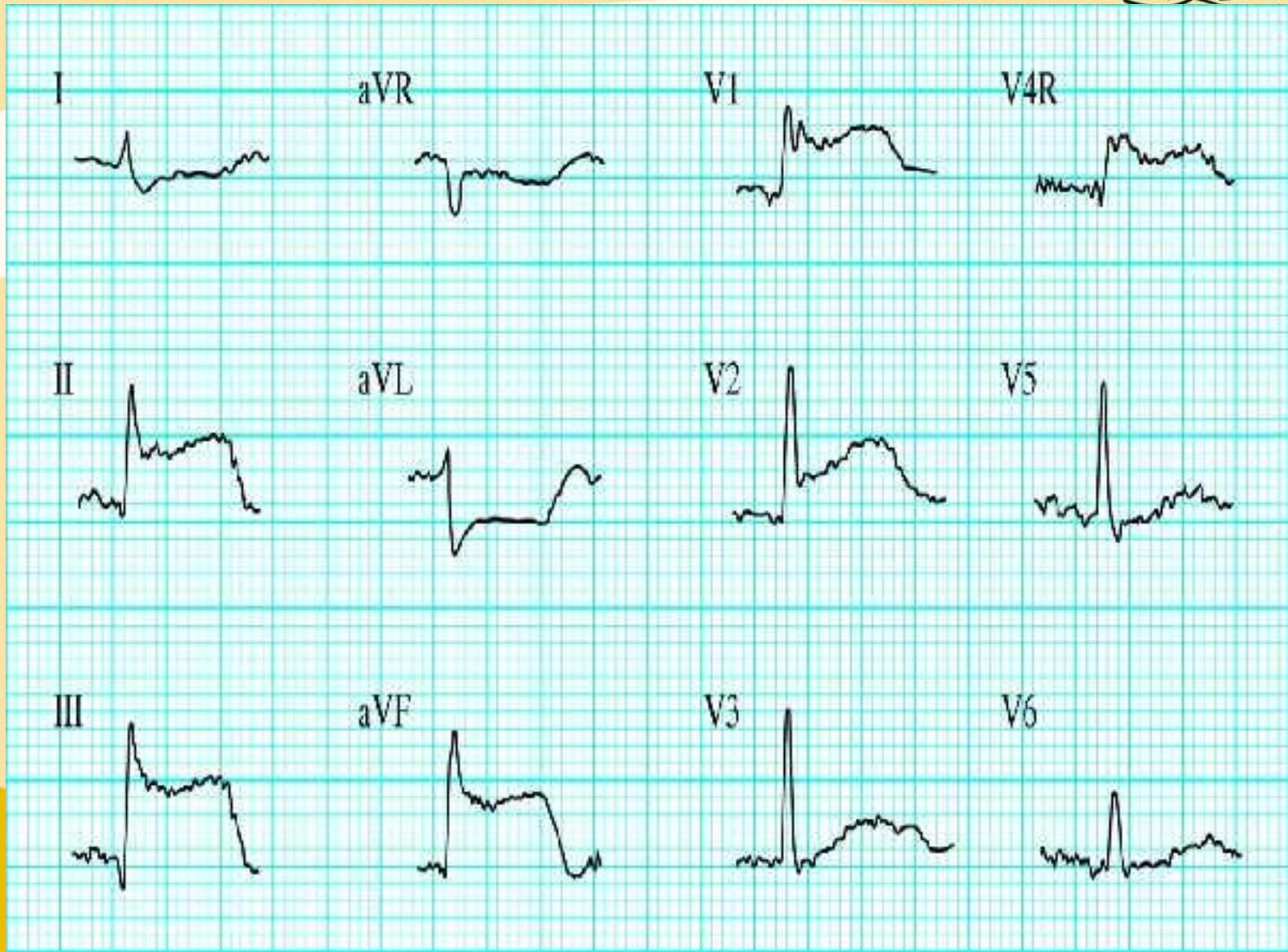
- Hypotension
- Jugular vein distention
- Dry lung sounds

Uitbreiding rechter ventrikel

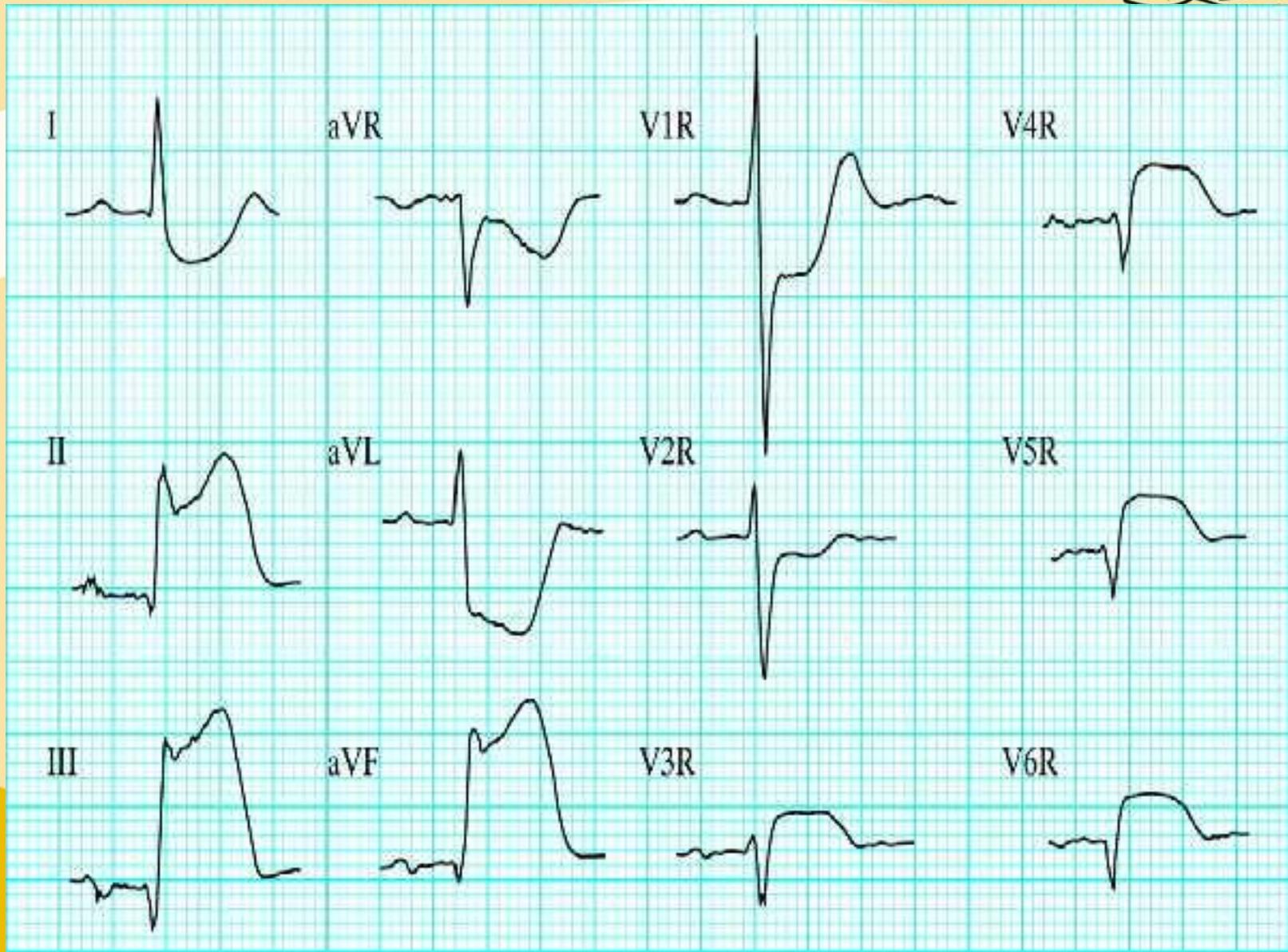


Pas op!

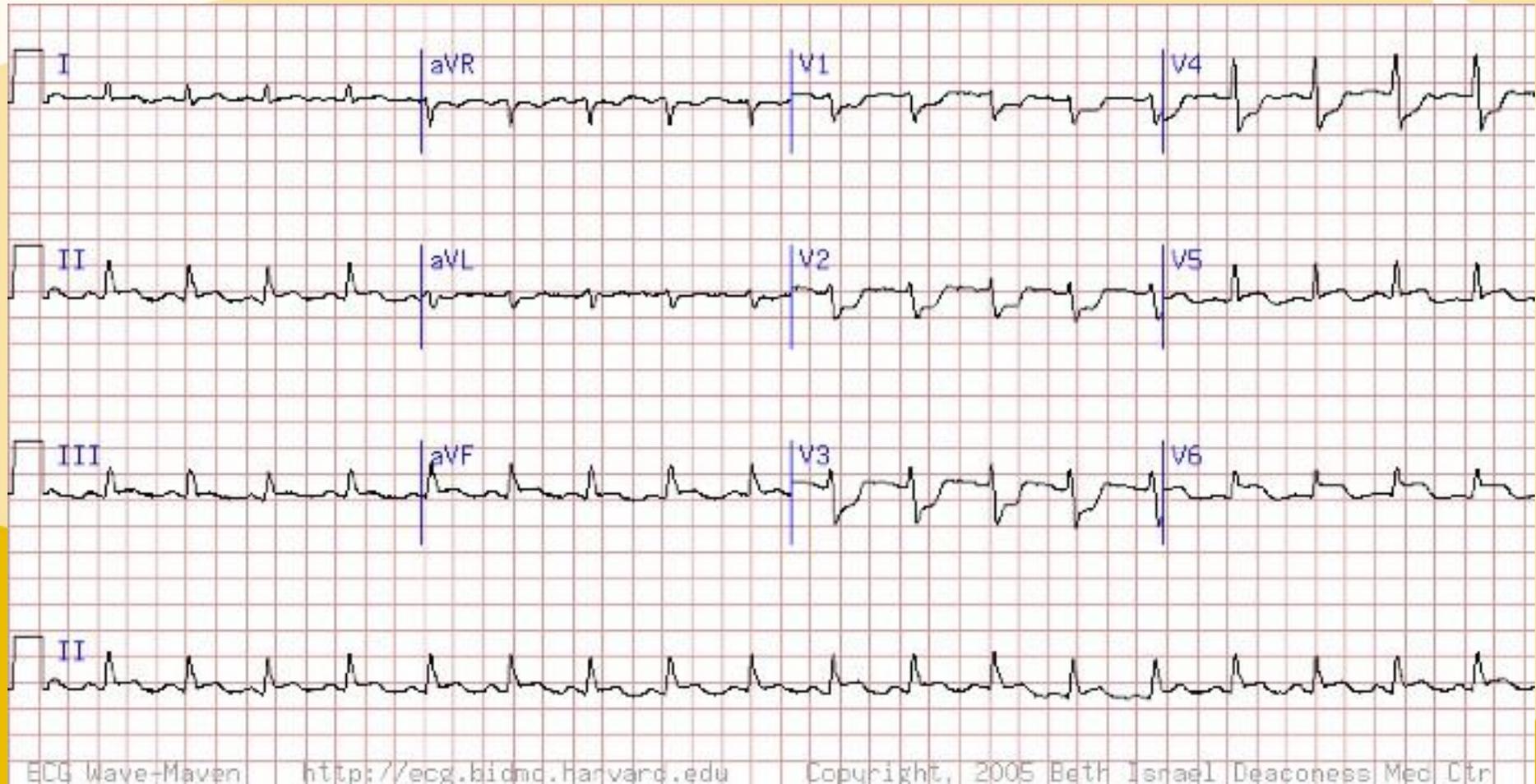
- Bij uitbreiding RV kans op hypotensie, ondanks infarct: vullen
- Bij inferior infarct tgv oclusie RCA kans op geleidingsstoornissen



ZB

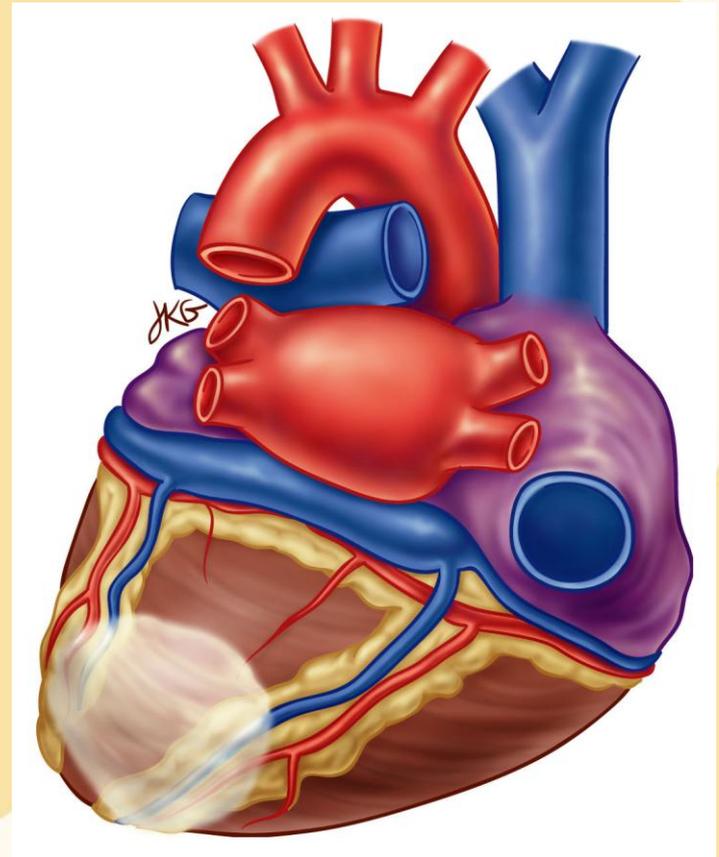


Acuut infero-postero-lateraal infarct

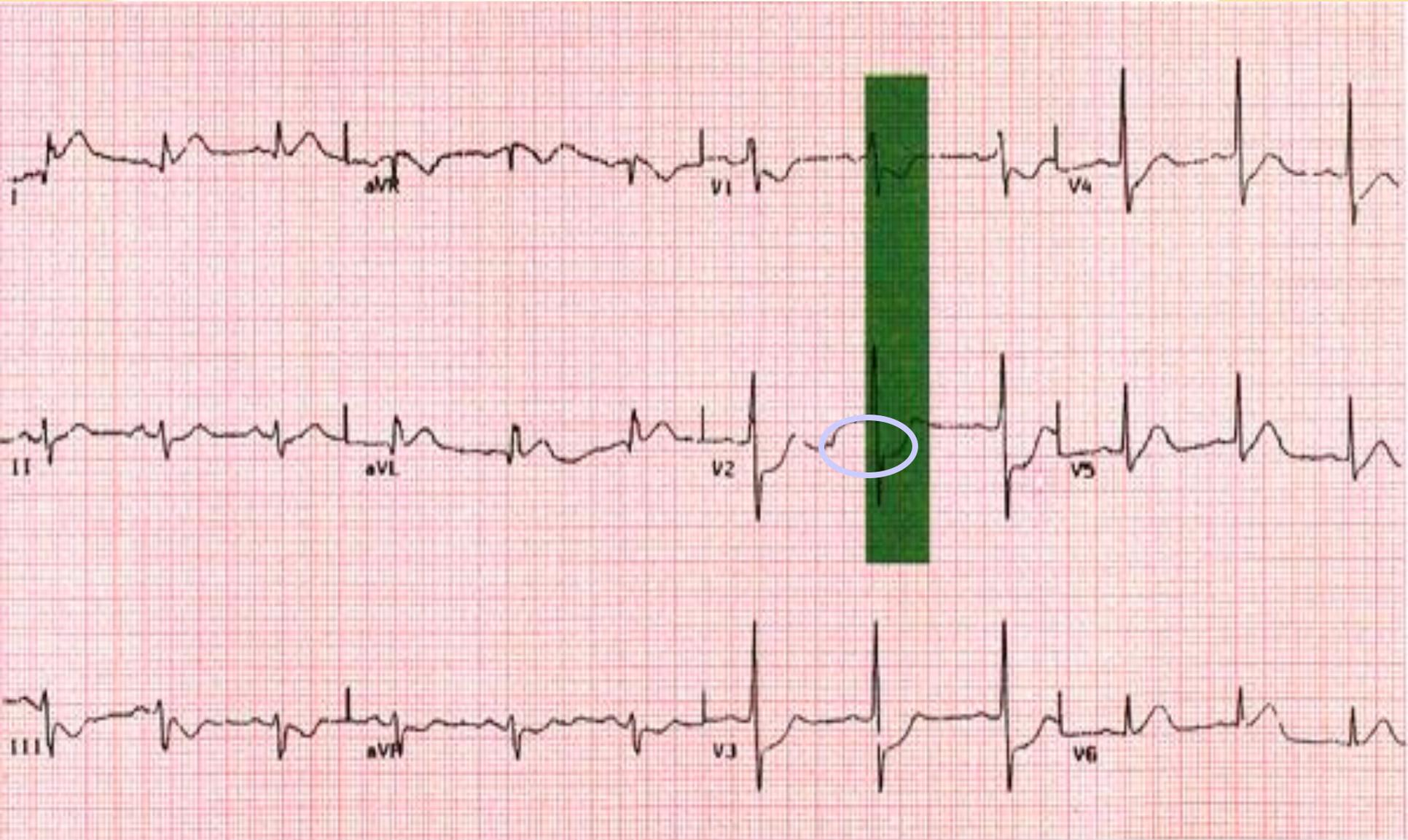


Posterior

- V1, V2
 - **Posterior Infarct with ST Depressions and/ tall R wave**
 - **RCA and/or LCX Artery**
- **Understand Reciprocal changes**
 - **The posterior aspect of the heart is viewed as a mirror image and therefore depressions versus elevations indicate MI**
 - **Rarely by itself usually in combo**



Posterior MI



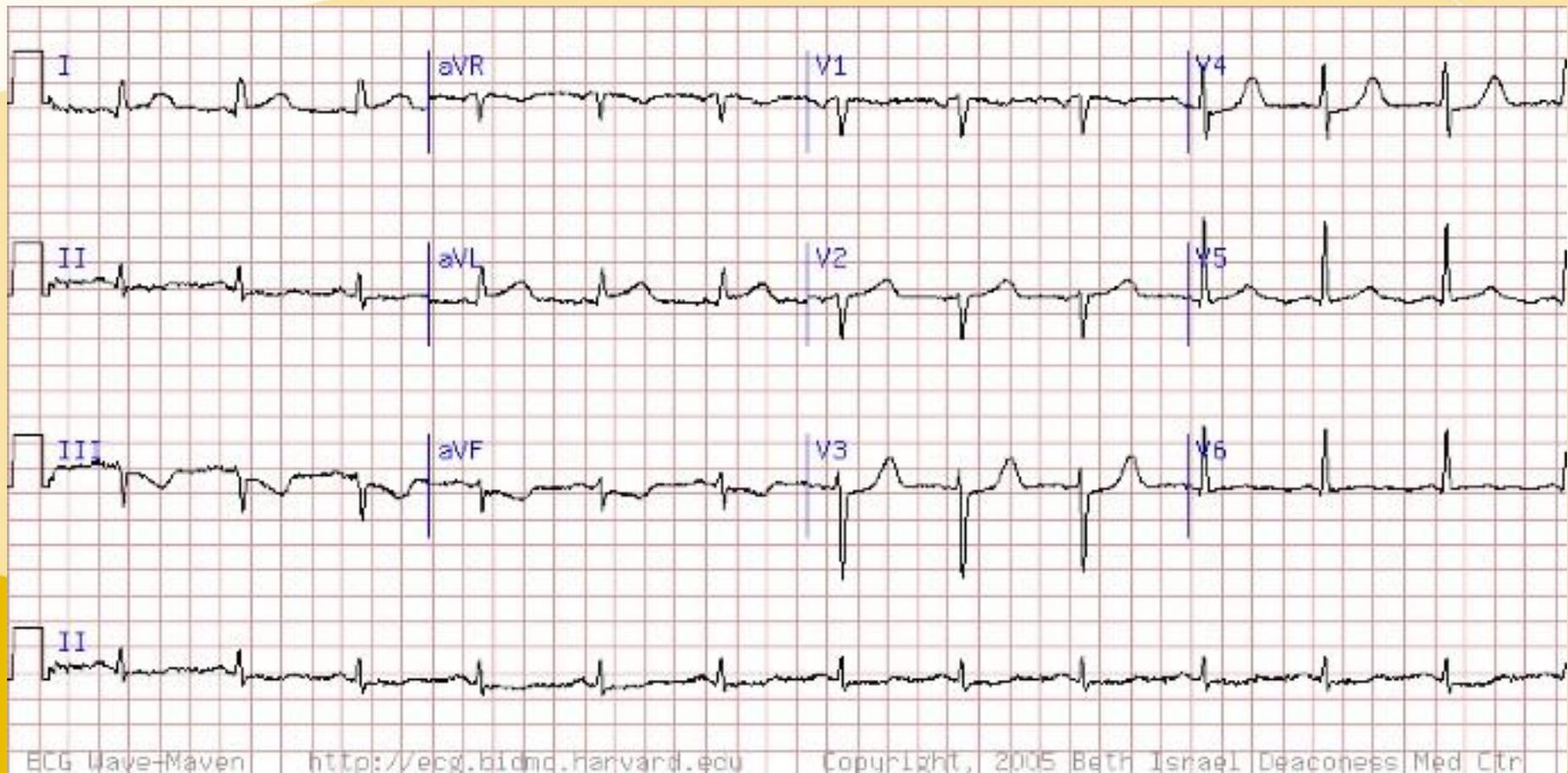
V8



V9

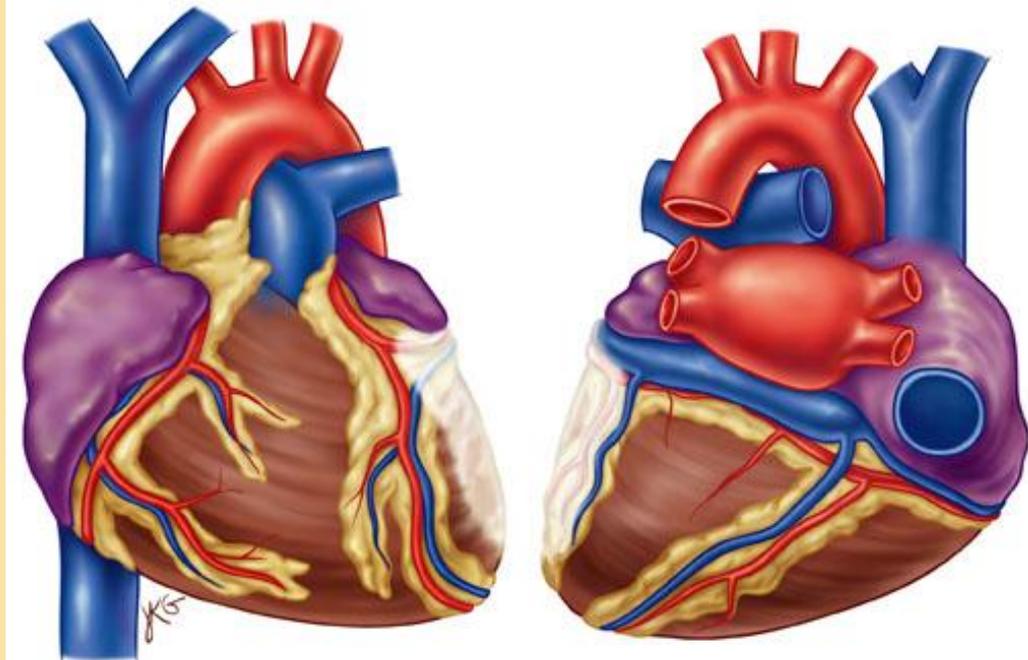


Acuut lateraal infarct



Lateral

- **I, AVL, V5, V6**
 - **Lateral Infarct with ST elevations**
 - **Left Circumflex Artery**
 - **Rarely by itself**
 - **Usually in combo**



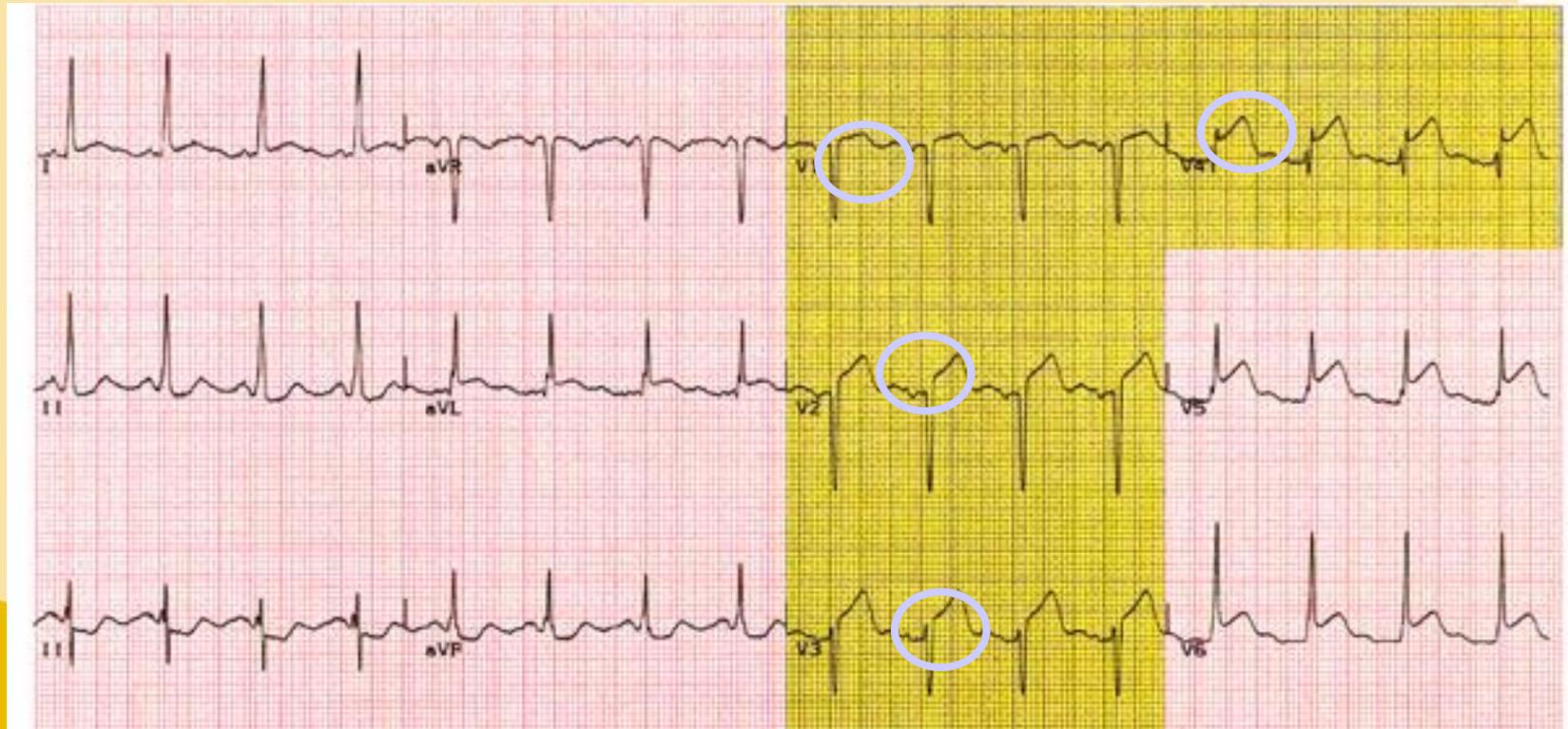
Lateral MI



Pas op!

- Altijd groter dan het lijkt

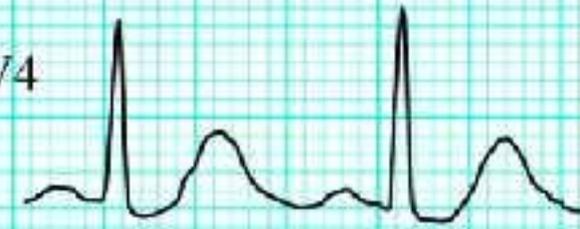
Anterior MI



V1



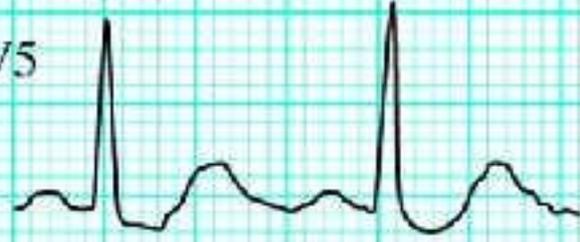
V4



V2



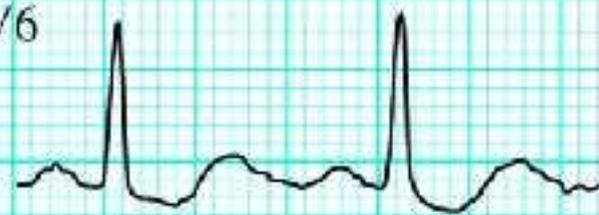
V5



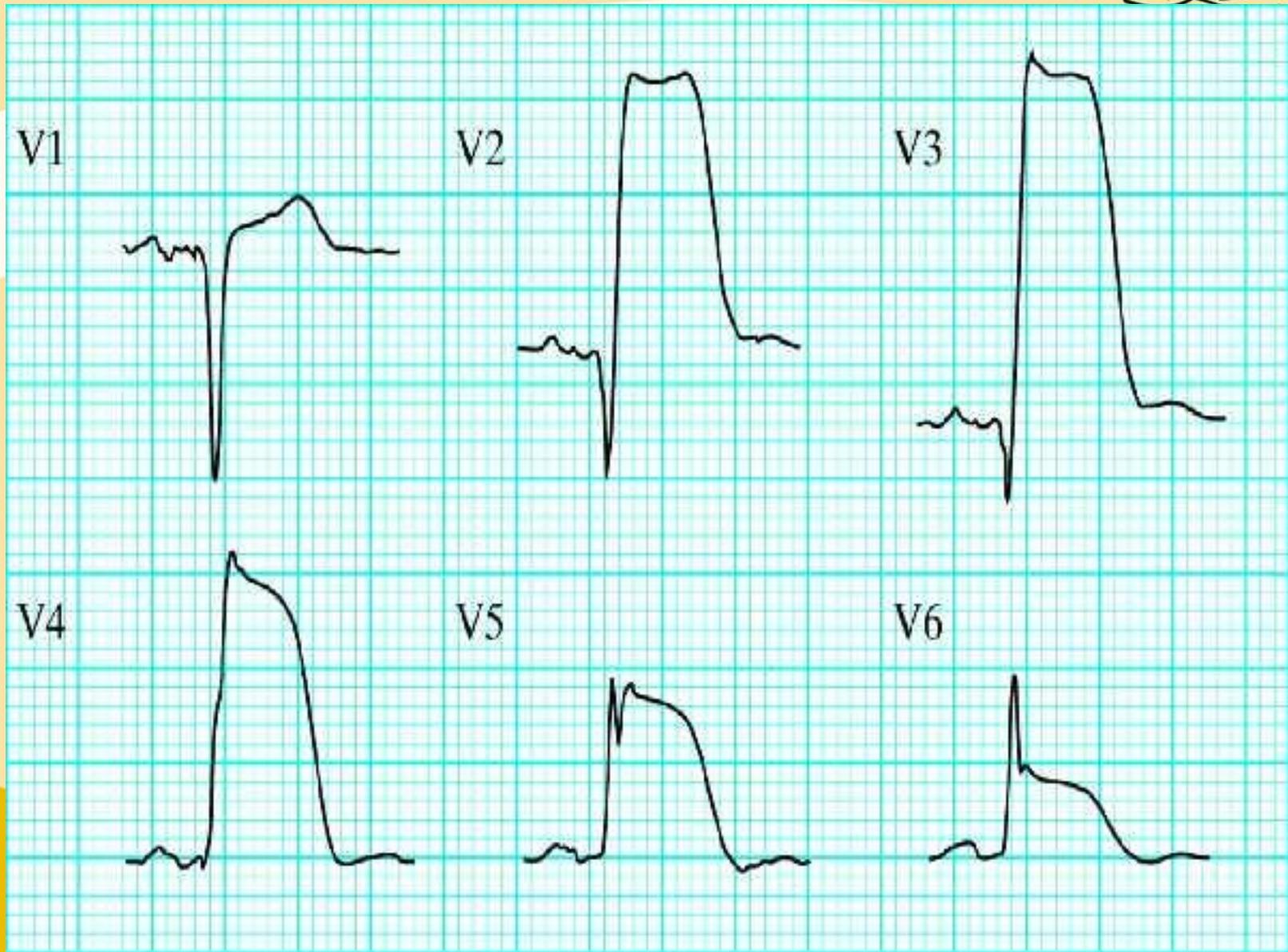
V3



V6

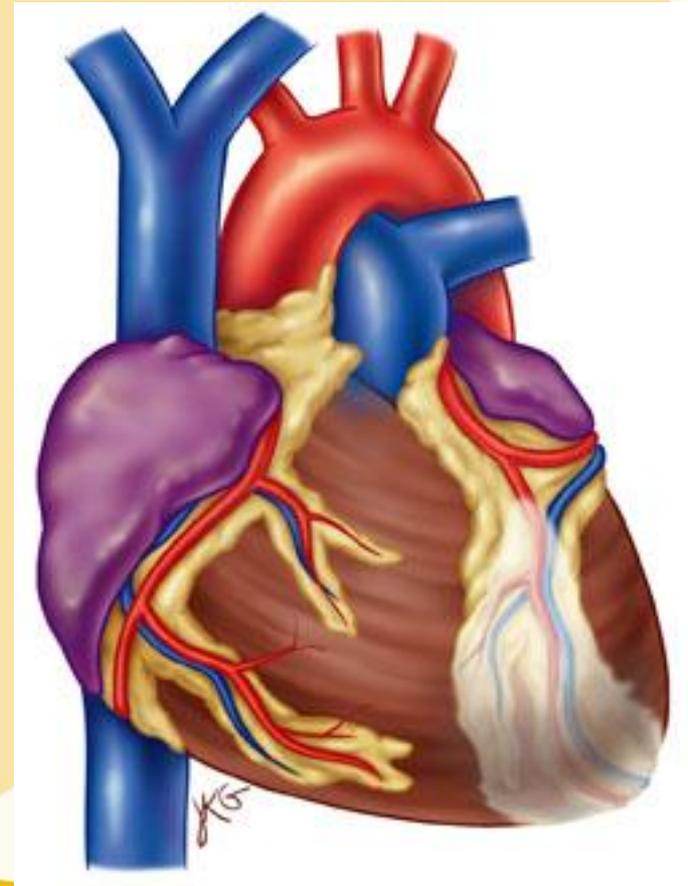


ZB

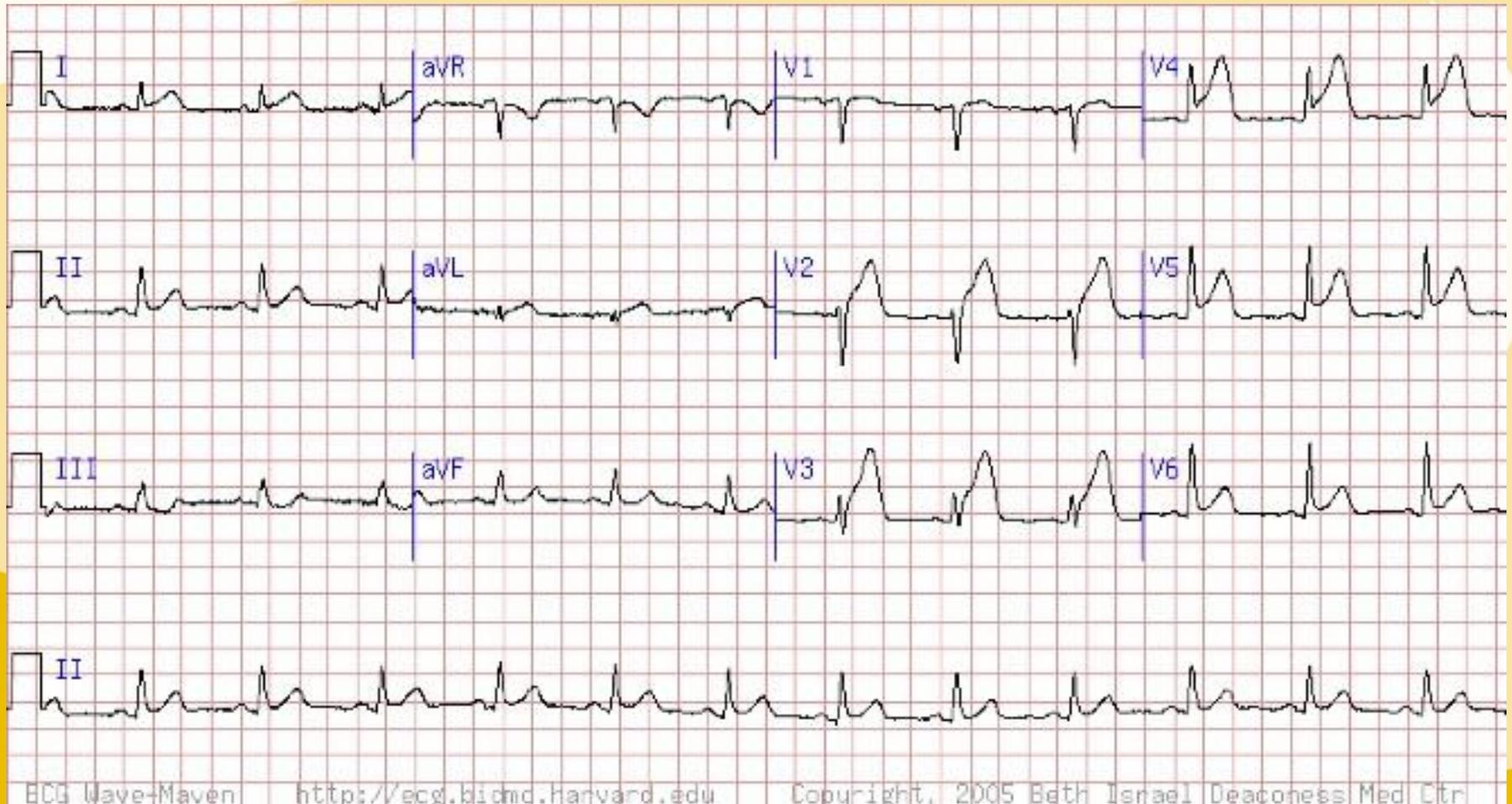


Anterior

- **V1, V2, V3, V4**
 - Anterior infarct with ST elevation
 - Left Anterior Descending Artery (LAD)
 - V1 and V2 may also indicate septal involvement which extends from front to the back of the heart along the septum
 - Left bundle branch block
 - Right bundle branch block
 - 2nd Degree Type2
 - Complete Heart Block



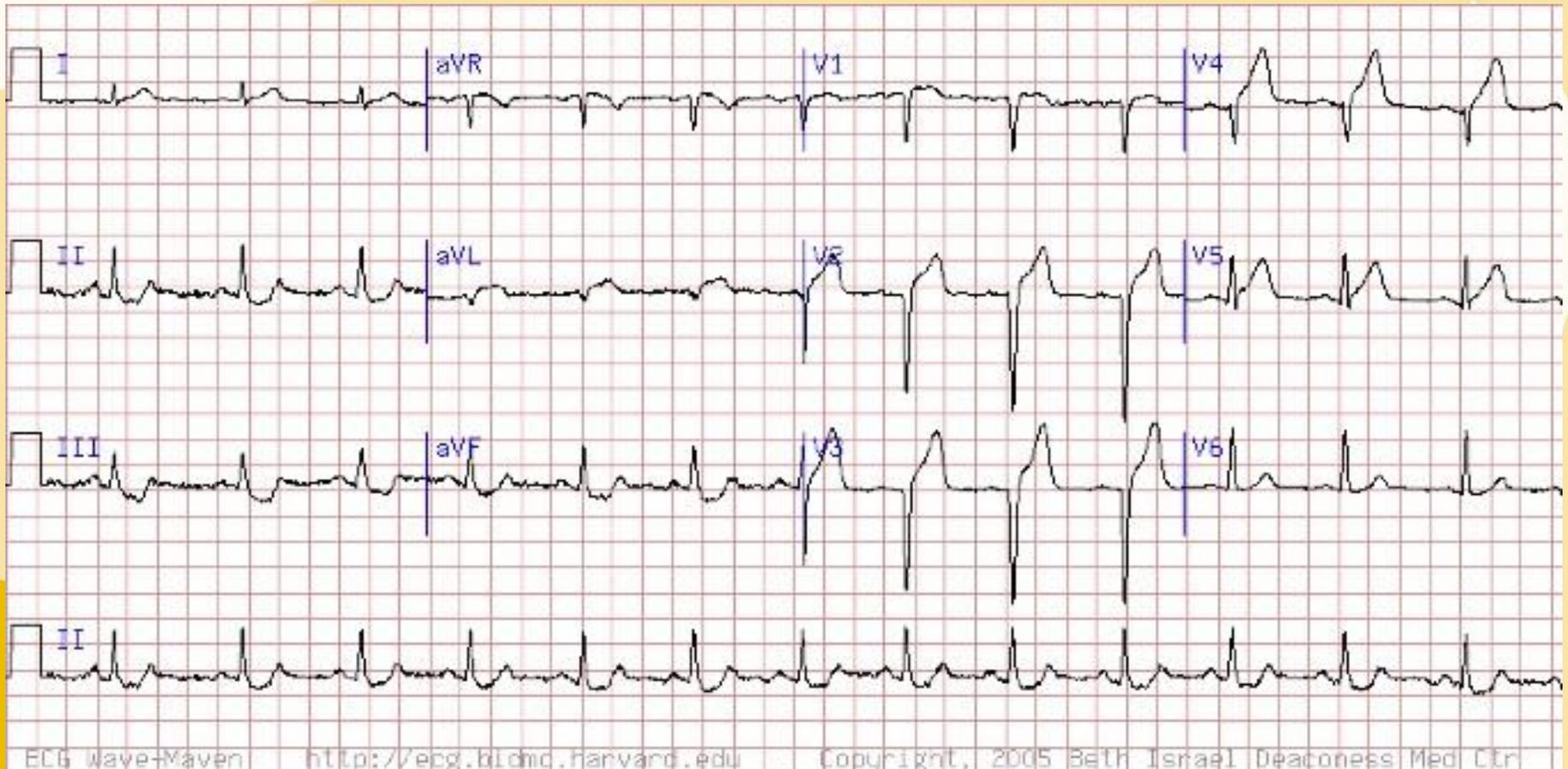
Acuut antero-lateraal en hoog lateraal infarct

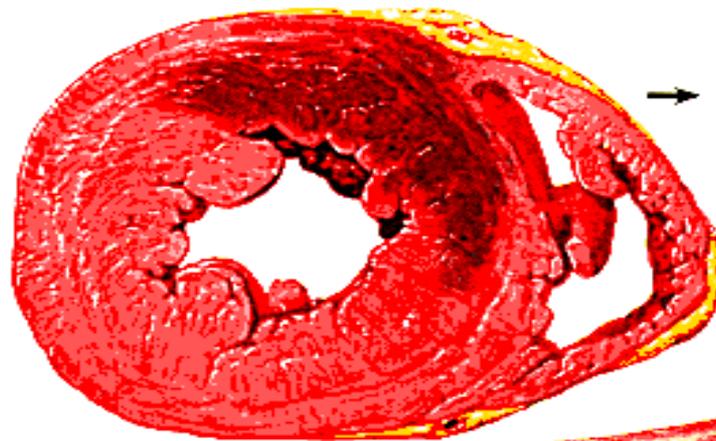


Pas op!

- Groot infarct (waar LAD oclussie ?)
- Wsch groot LAD

Acuut antero-septaal infarct

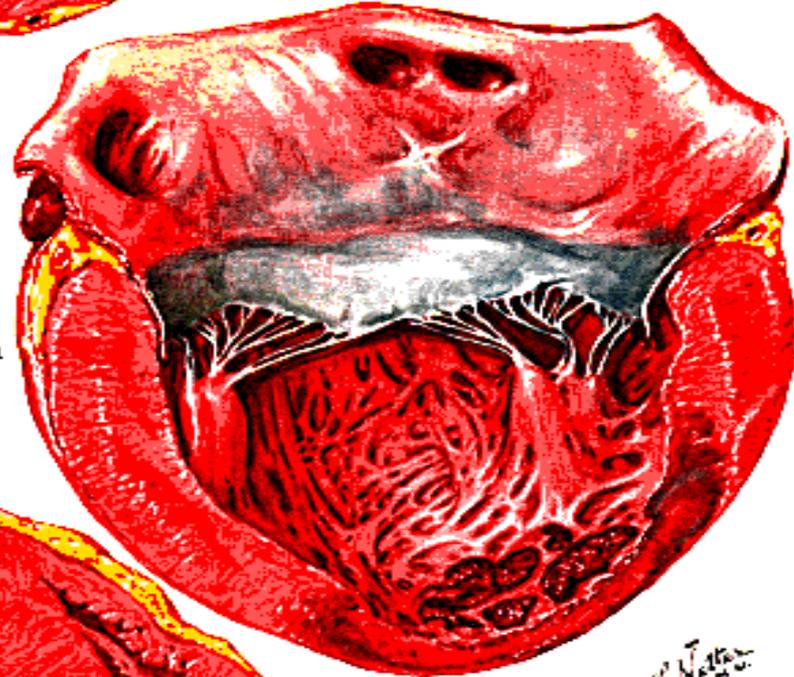




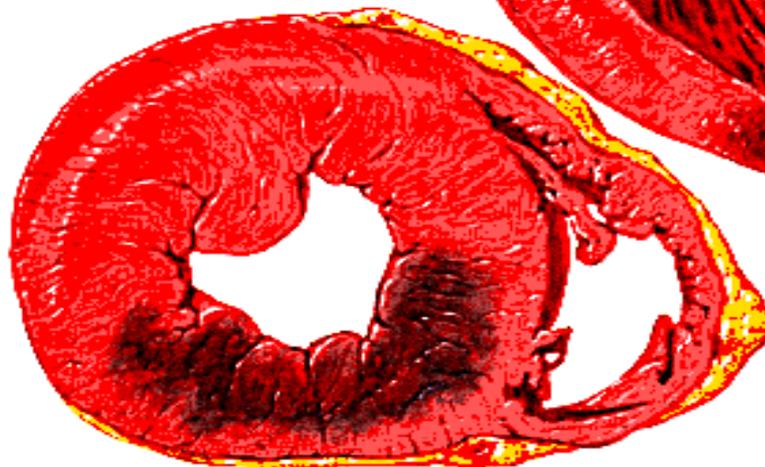
ACUTE ANTEROSEPTAL INFARCT WITH RIGHT BUNDLE-BRANCH BLOCK

ACUTE ANTEROSEPTAL, TRANSMURAL INFARCT COMPLICATED BY RIGHT BUNDLE-BRANCH BLOCK

OTIC
E

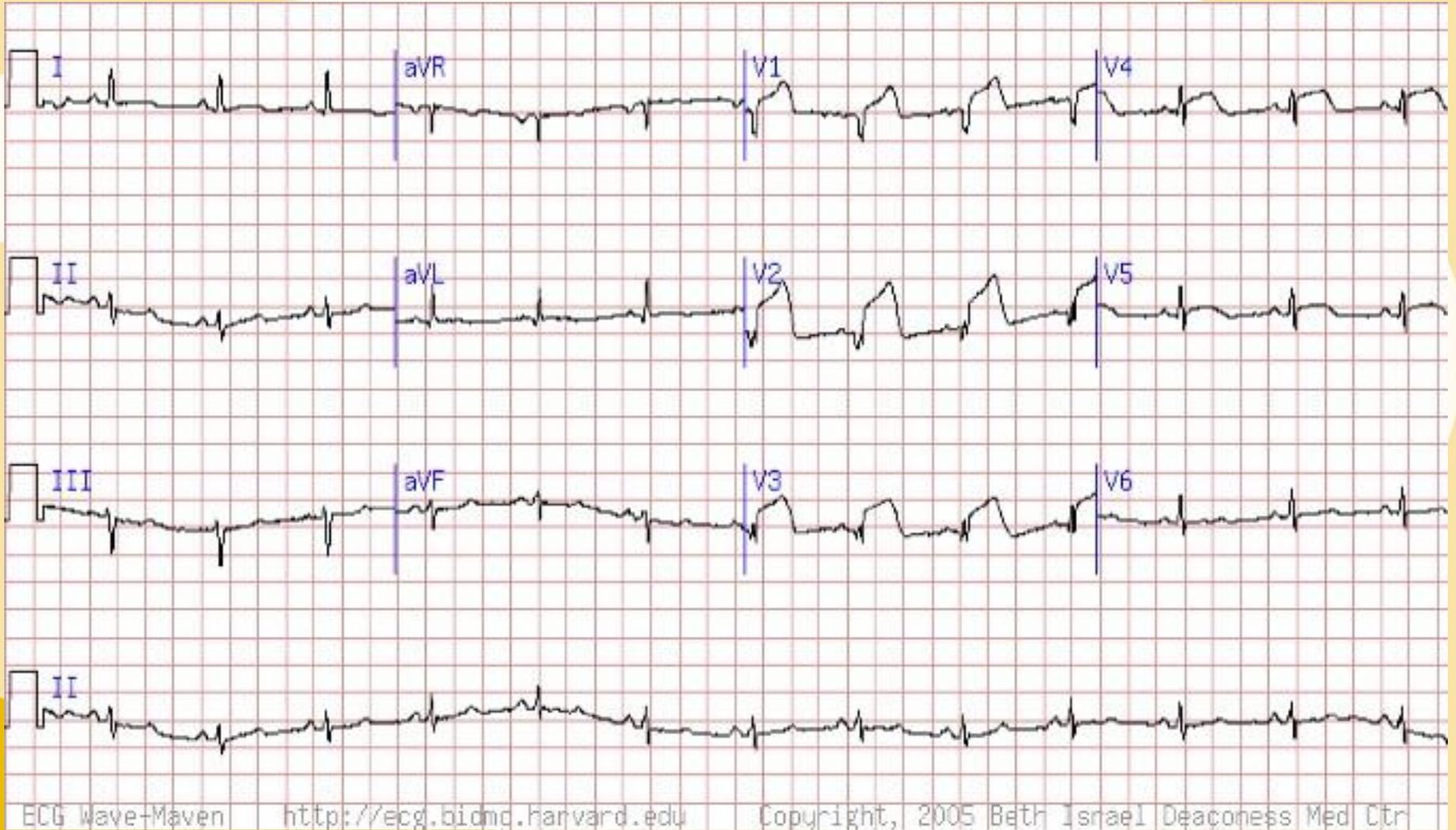


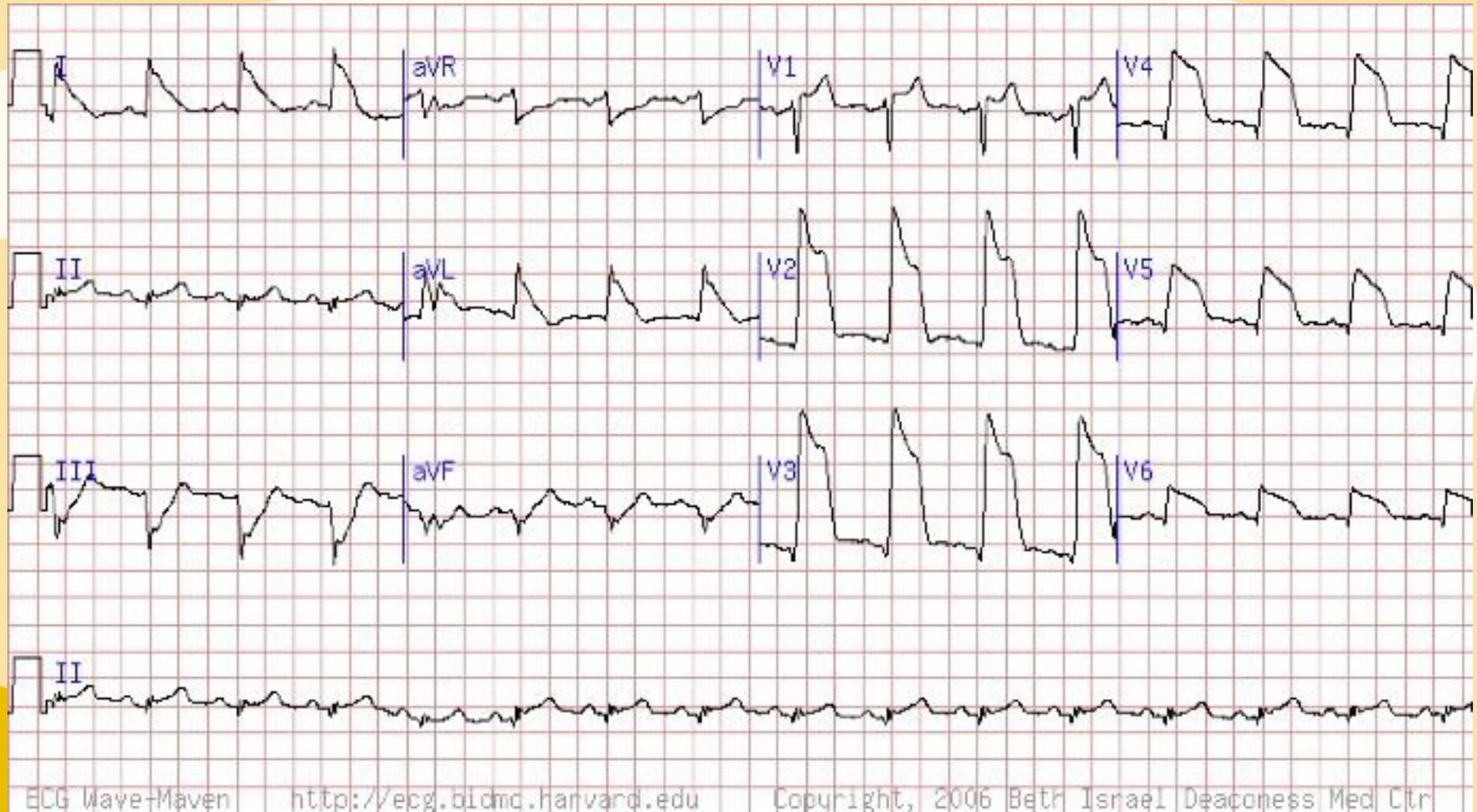
SUBACUTE APICAL INFARCT WITH RESORPTION OF MUSCLE AND MURAL THROMBI



ACUTE POSTERIOR INTRAMURAL INFARCT

F. Netter
© CIBA



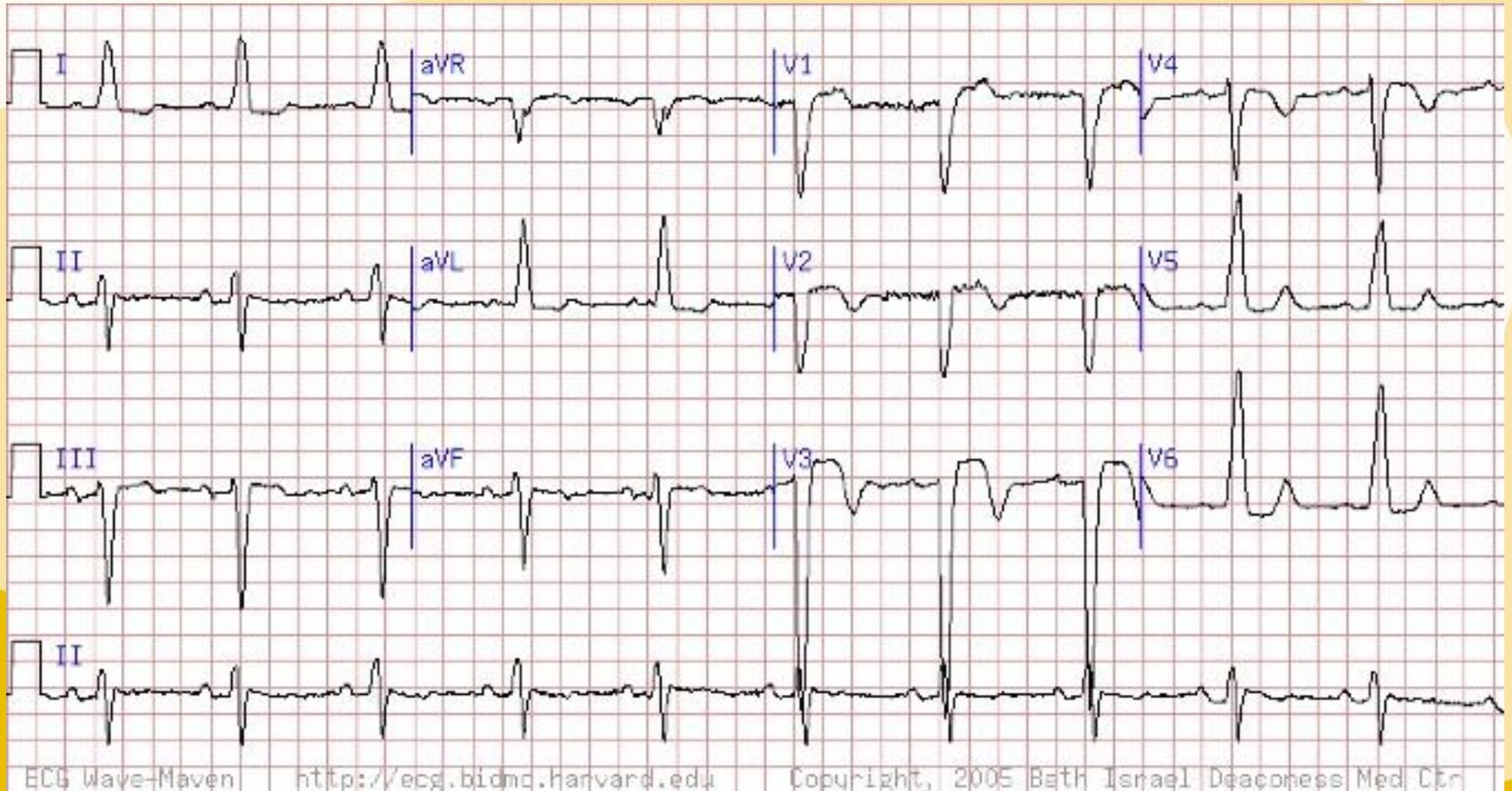


ECG Wave-Maven

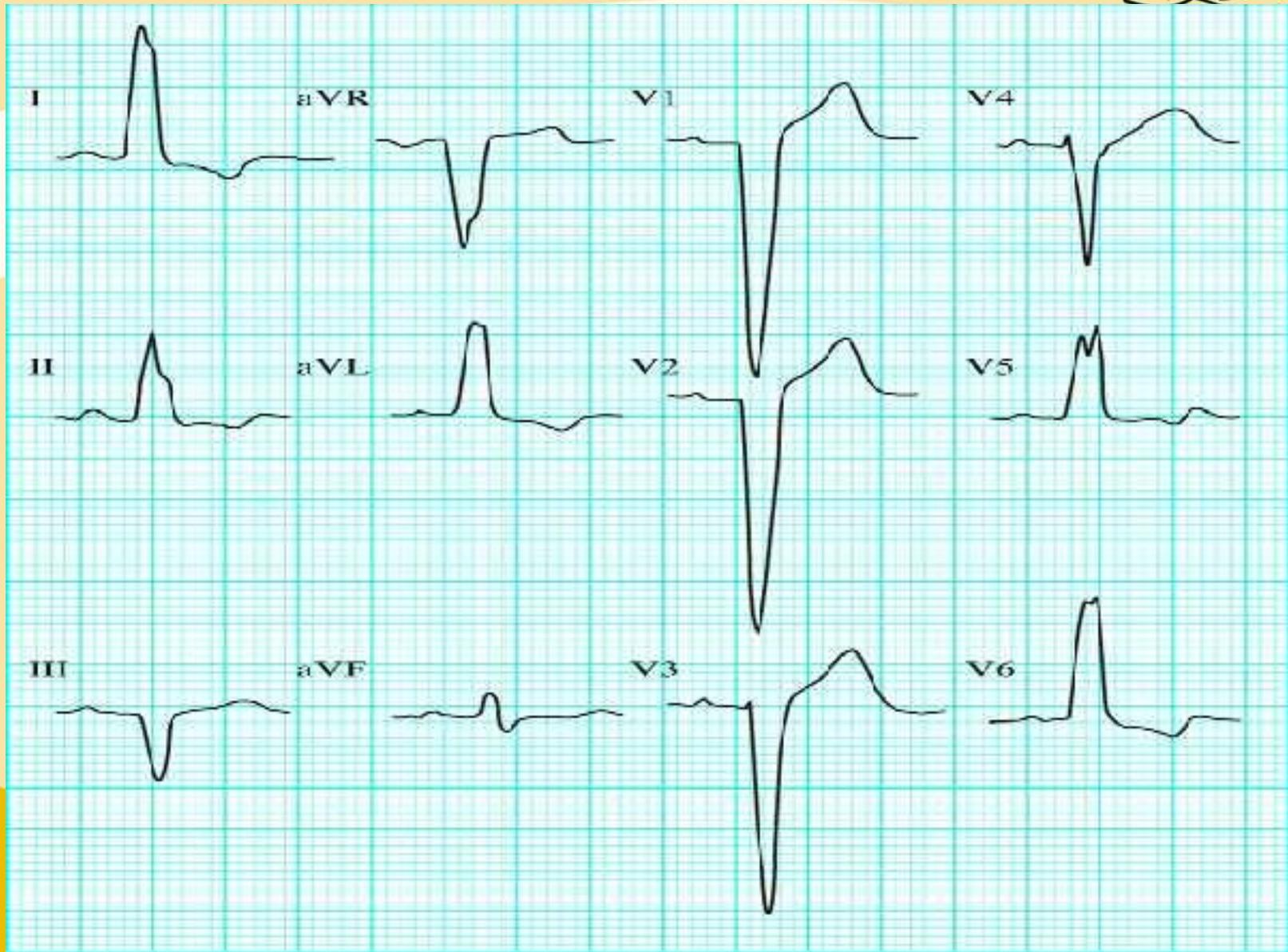
<http://ecg.bidmc.harvard.edu>

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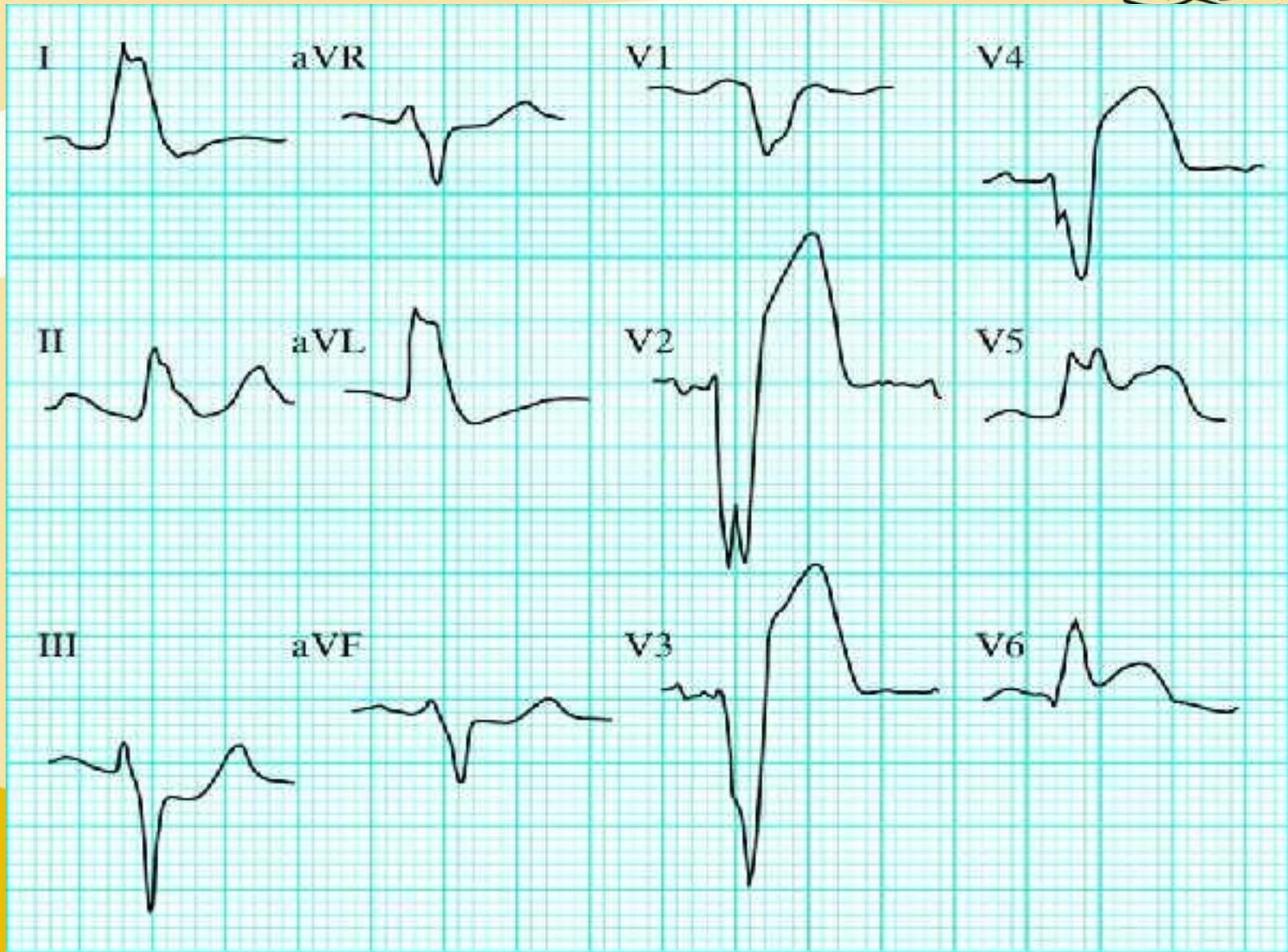
Anterior infarct en LBTB

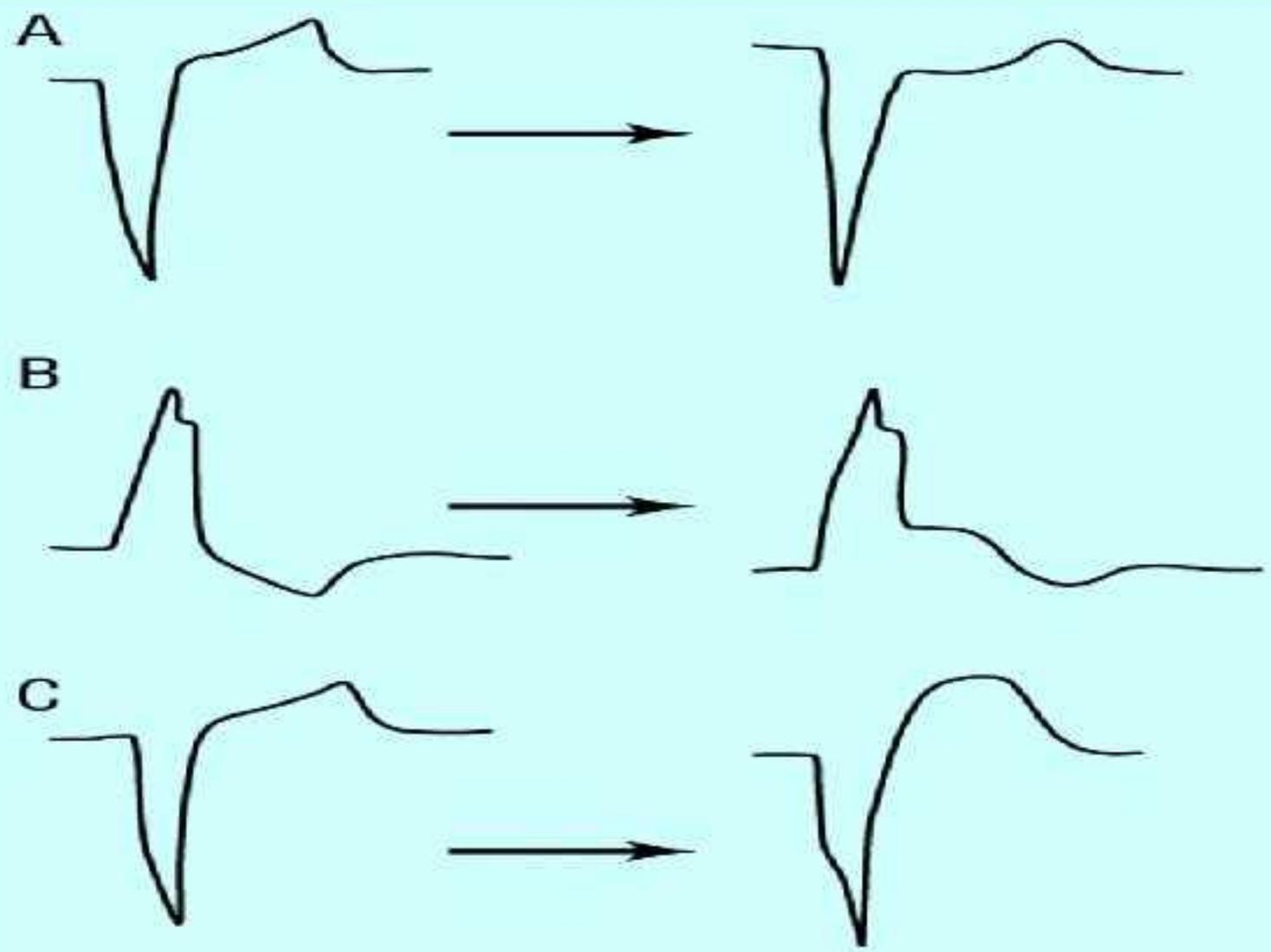


23



ZB



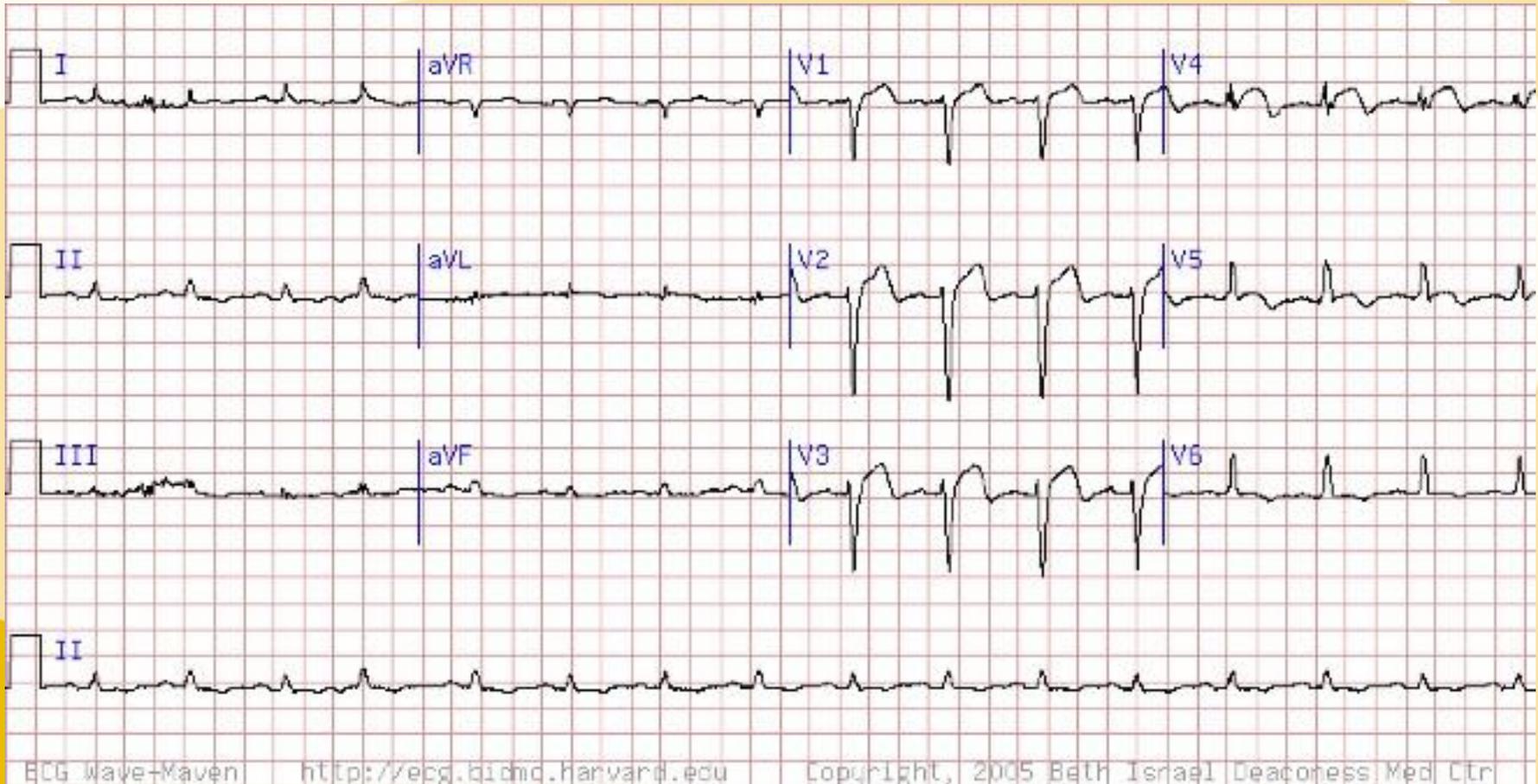


POB en LBTB

Hoe stel je de diagnose wanneer het ECG niet bijdraagt?

- Verdachte anamnese
- Voorgeschiedenis
- Echocardiogram: wandbewegingsstoornissen?

Acuut antero-lateraal infarct

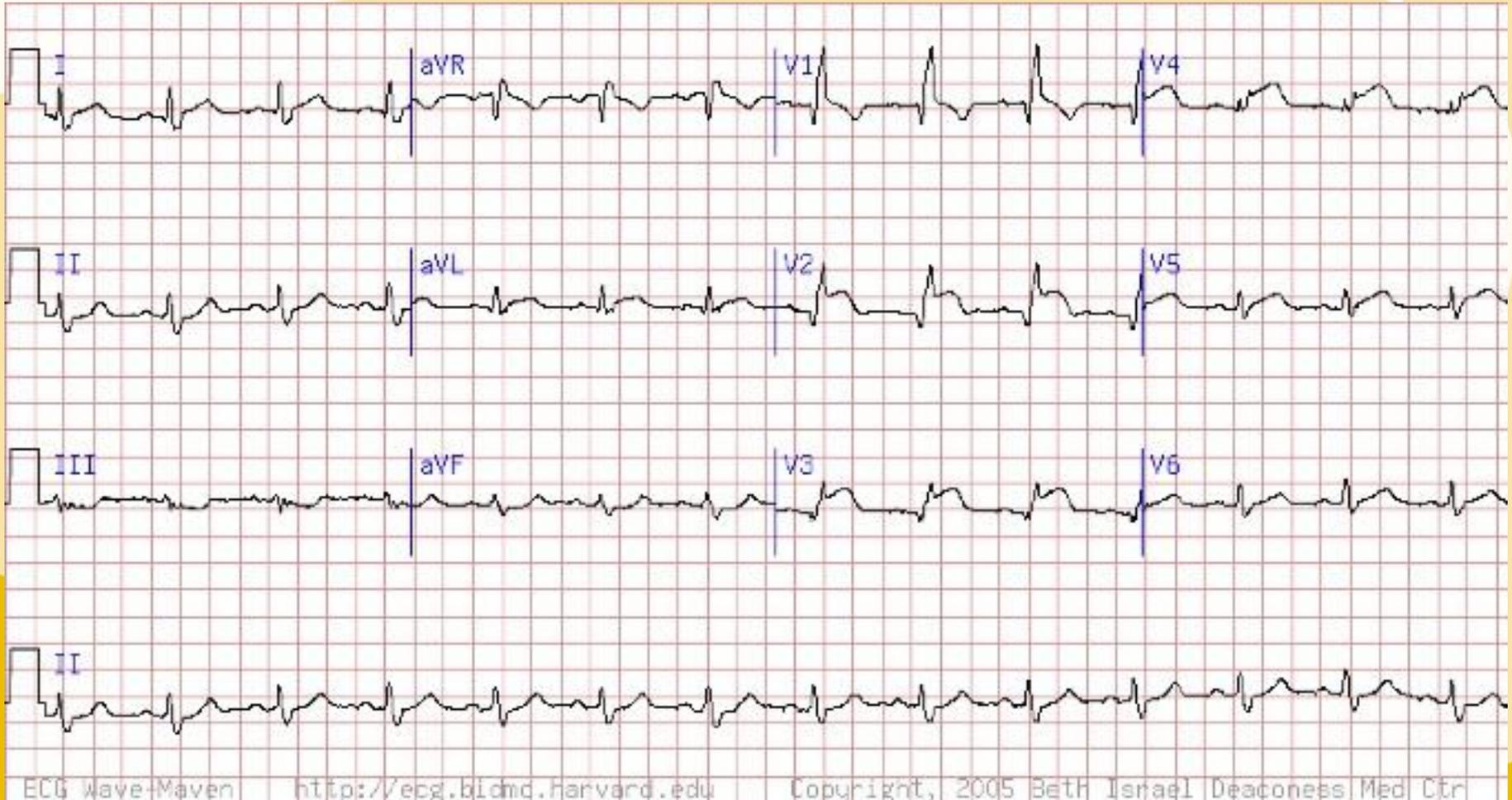


ECG Wave-Maven

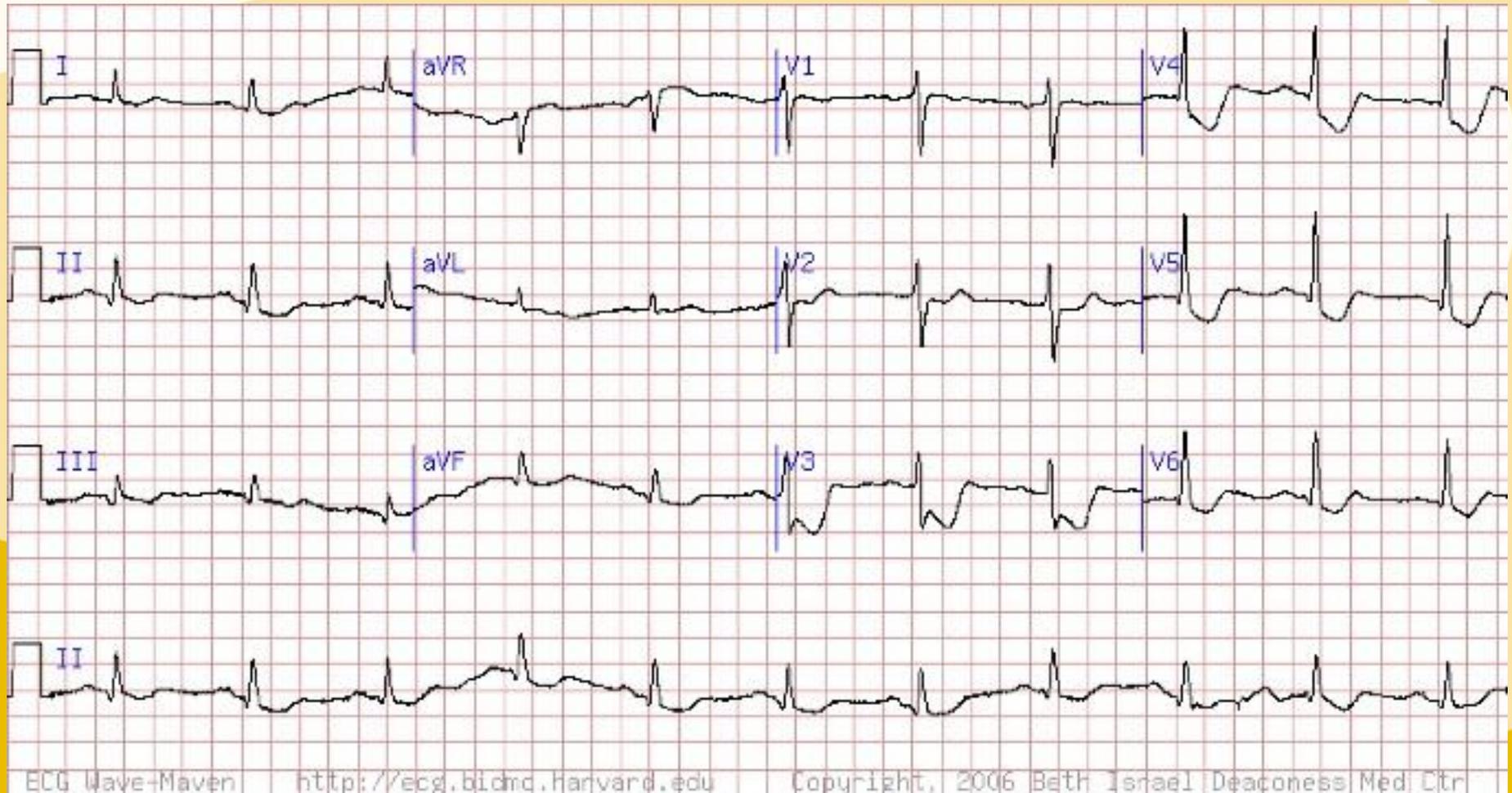
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Acuur anterior infarct met RBTB

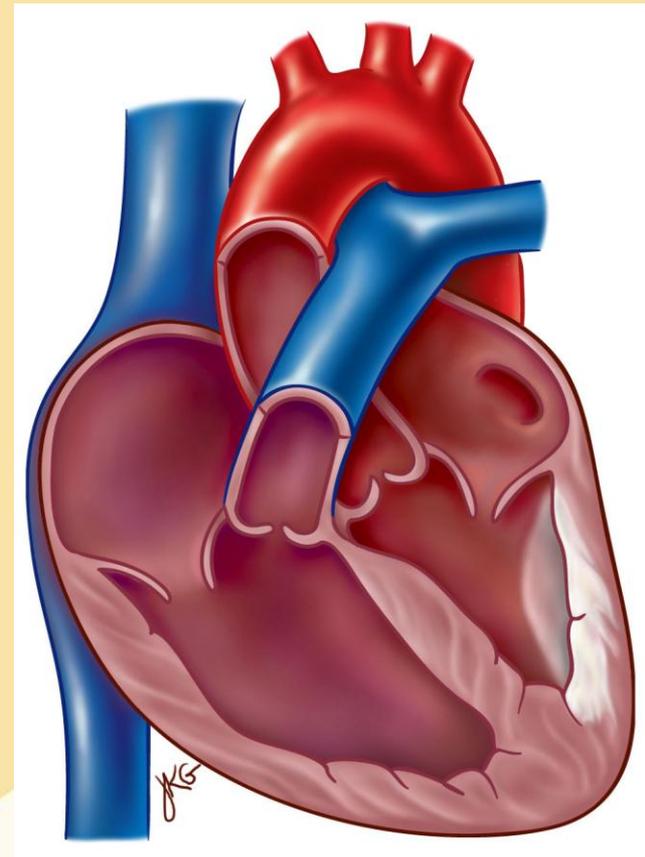


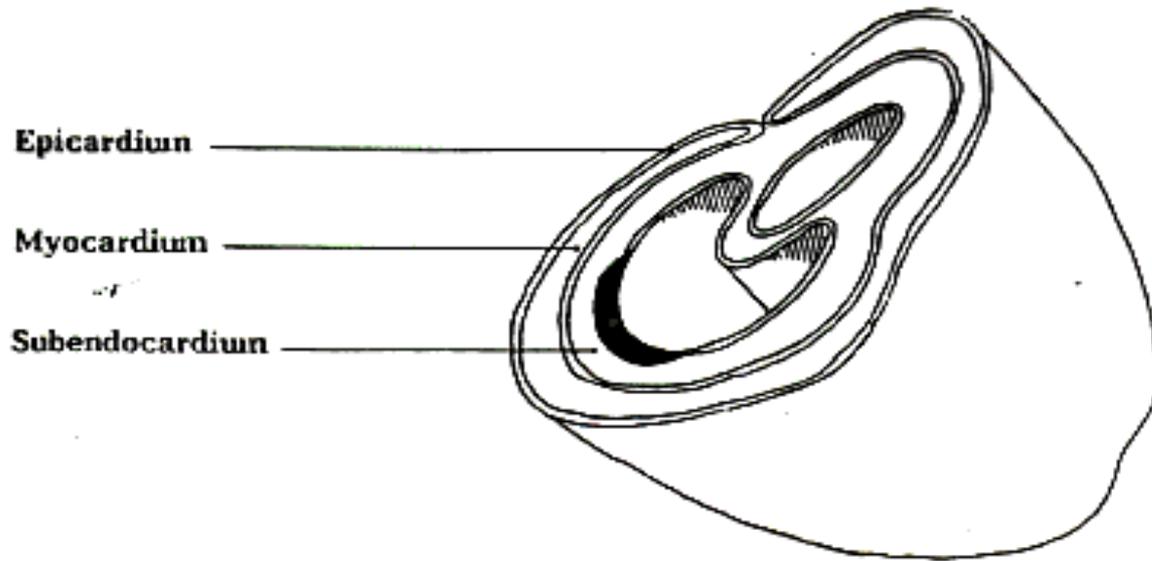
“Uitgebreide ischemie”



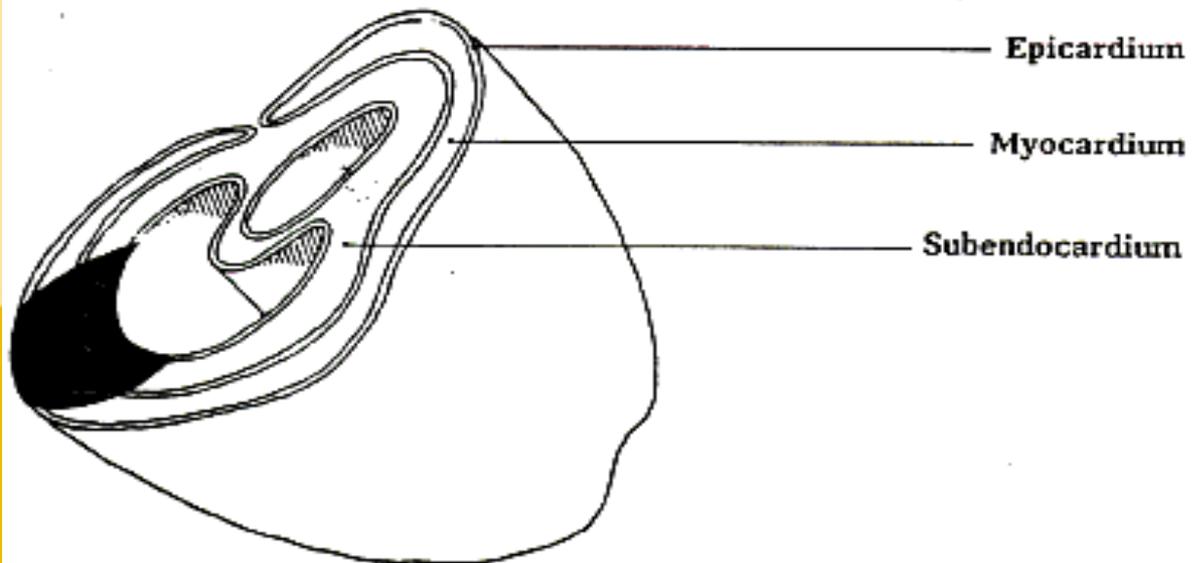
SubEndo

- SubEndocardial infarcts are not transmural
- Look for diffuse or localized changes and non – Q wave abnormalities
 - **T-wave inversions**
 - **ST segment depression**

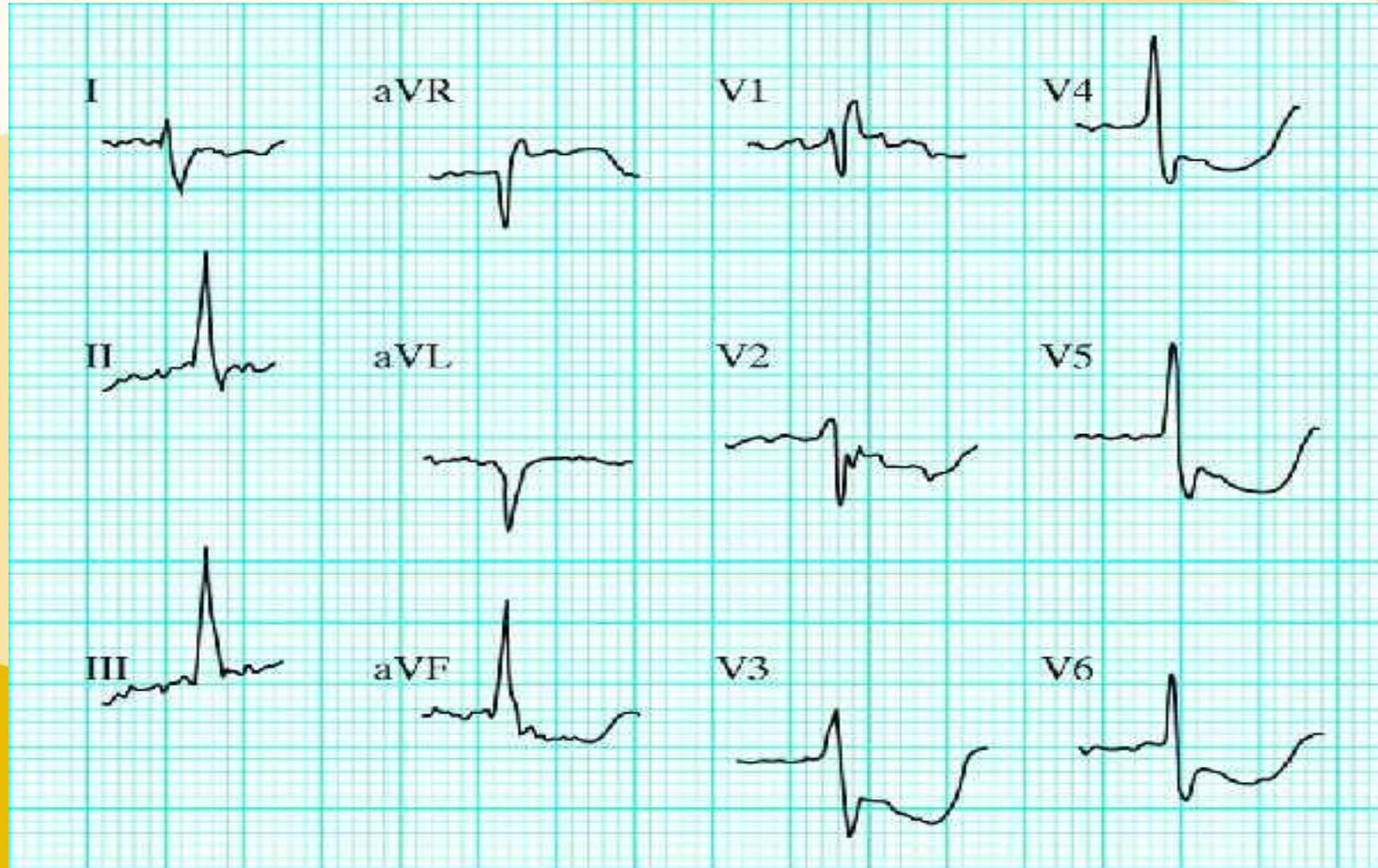




TRANSMURAL INFARCTION



“Uitgebreide ischemie”



“uitgebreide ST elevatie”



“uitgebreide ST afwijkingen”



Behandeling

- Vat zsm open
- Eerste keuze -> primaire PCI
- Binnen eerste uur klachten -> trombolyse net zo effectief
- Indien patient nog op transport moet -> overweeg “facilitated” PCI

Wat te doen op EHBO

- Diagnose stellen
- Ascal p.o. of Aspergic i.v. 300 mg
- Heparine 5000 EH
- Contraindicaties trombolyse?
- Bij klein inferior infarct binnen de eerste uur -> trombolyse en afwachten
- Andere gevallen: overleggen interventie centrum (facilitated of primaire PCI)
- Indien aansluitend toch PCI: Plavix 300 mg
- Pijnstilling

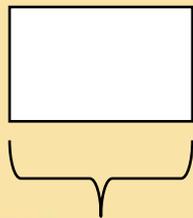
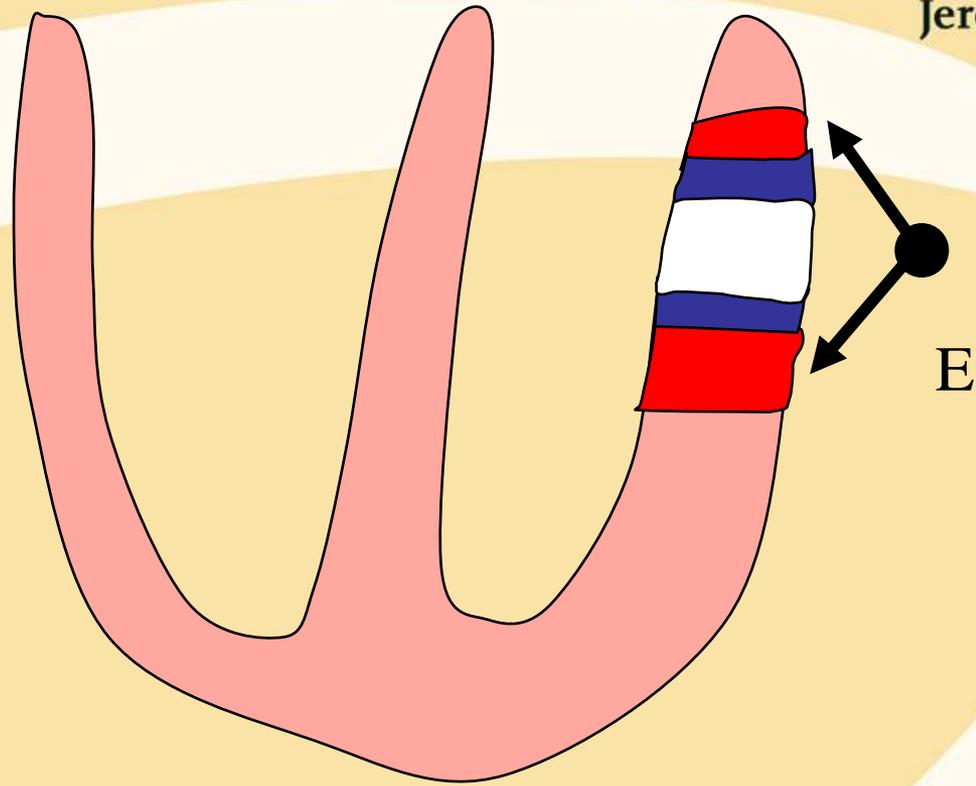
- Contraindicaties trombolyse?
 - Hemorrhagisch CVA met onbekende oorzaak op elk tijdstip in het verleden
 - Ischemisch CVA in de voorafgaande 6 maanden
 - Schade of neoplasmata van het centraal zenuwstelsel
 - Recent belangrijk trauma/chirurgie/hoofdletsel (binnen de voorafgaande 3 weken)
 - Gastro-intestinale bloeding in de voorafgaande maand
 - Bekende bloedingsafwijking
 - Aortadissectie

Belangrijk

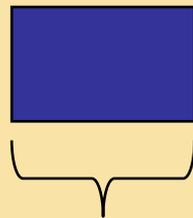
- Tijd heel belangrijk, maar geen paniek!
- Bij OW infarct geen B-blokker in acute fase gezien kans op hypotensie en bradycardie
- Indien klachten al langer dan 6 uur aanwezig en gestegen “hartenzymen”, poging tot reperfusie niet meer (minder) zinvol (meeste myocardschade al gebeurd)

Complicaties

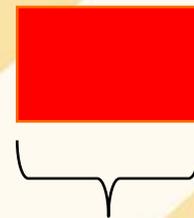
- Cardiogene shock
 - Ventriculaire ritmestoornissen (polymorfe VT of VF)
 - Ventrikelseptum ruptuur
 - Vrijewand ruptuur
- (laatste 2 meestal 2-3 dagen na infarct)



INFARCTION

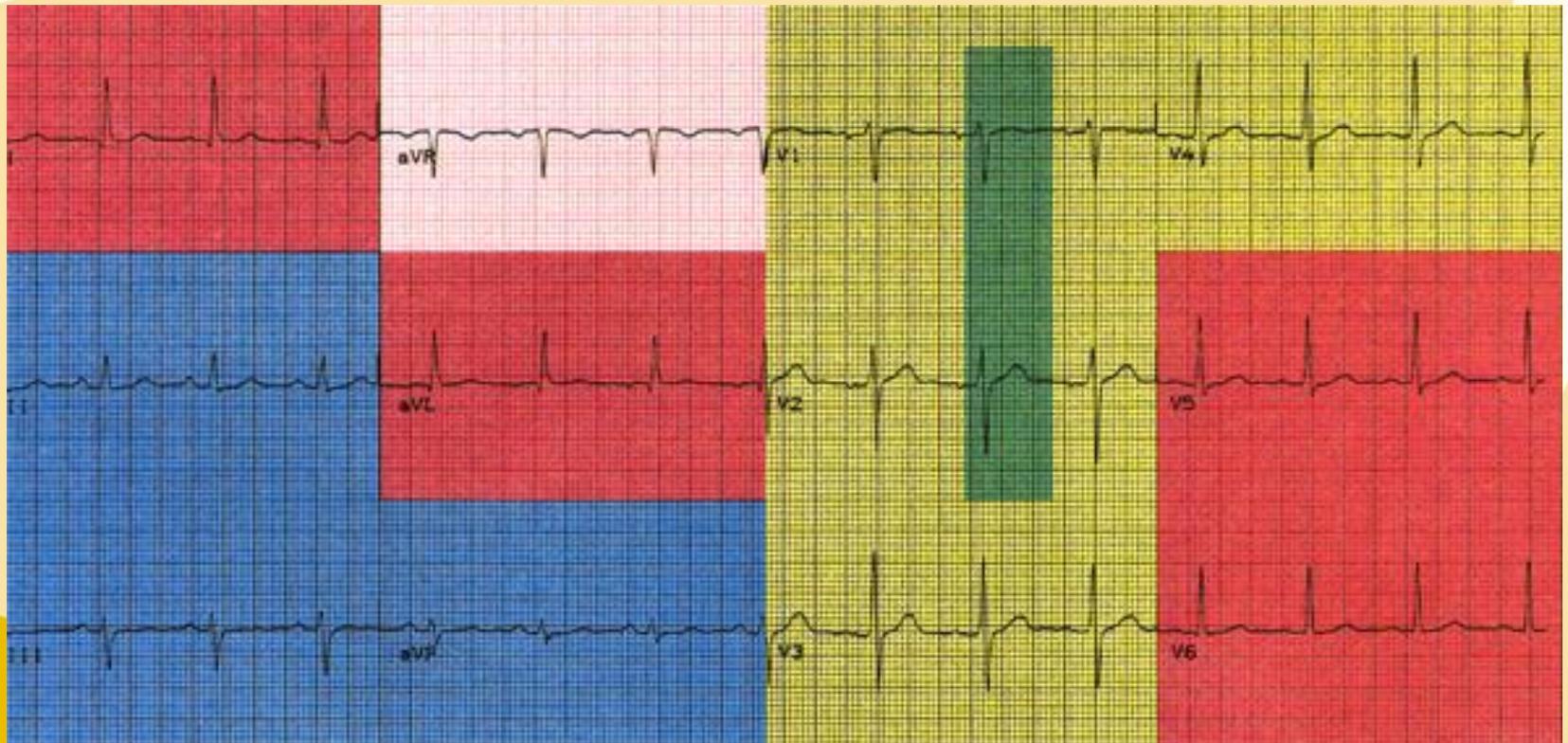


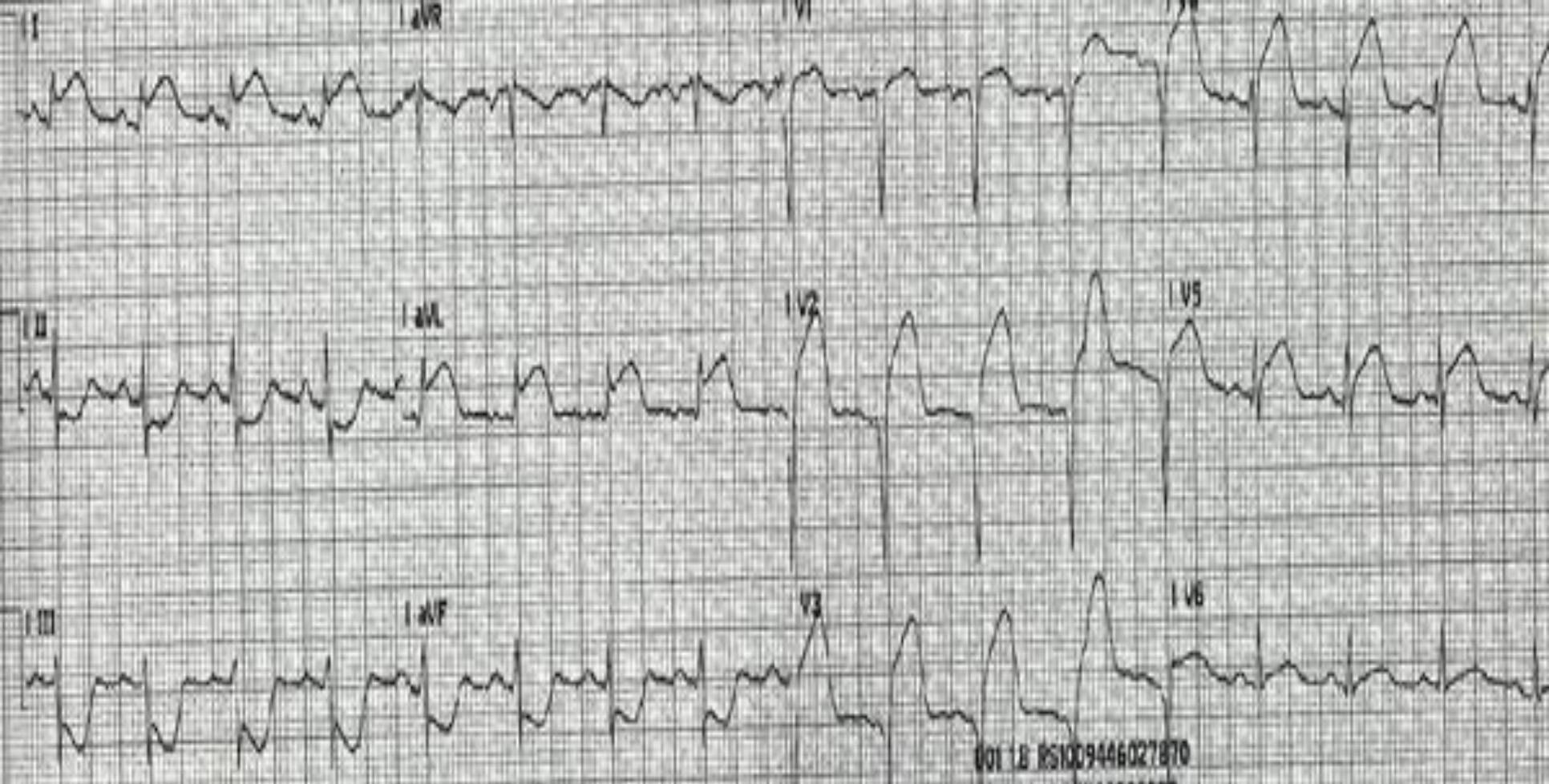
INJURY



ISCHAEMIA

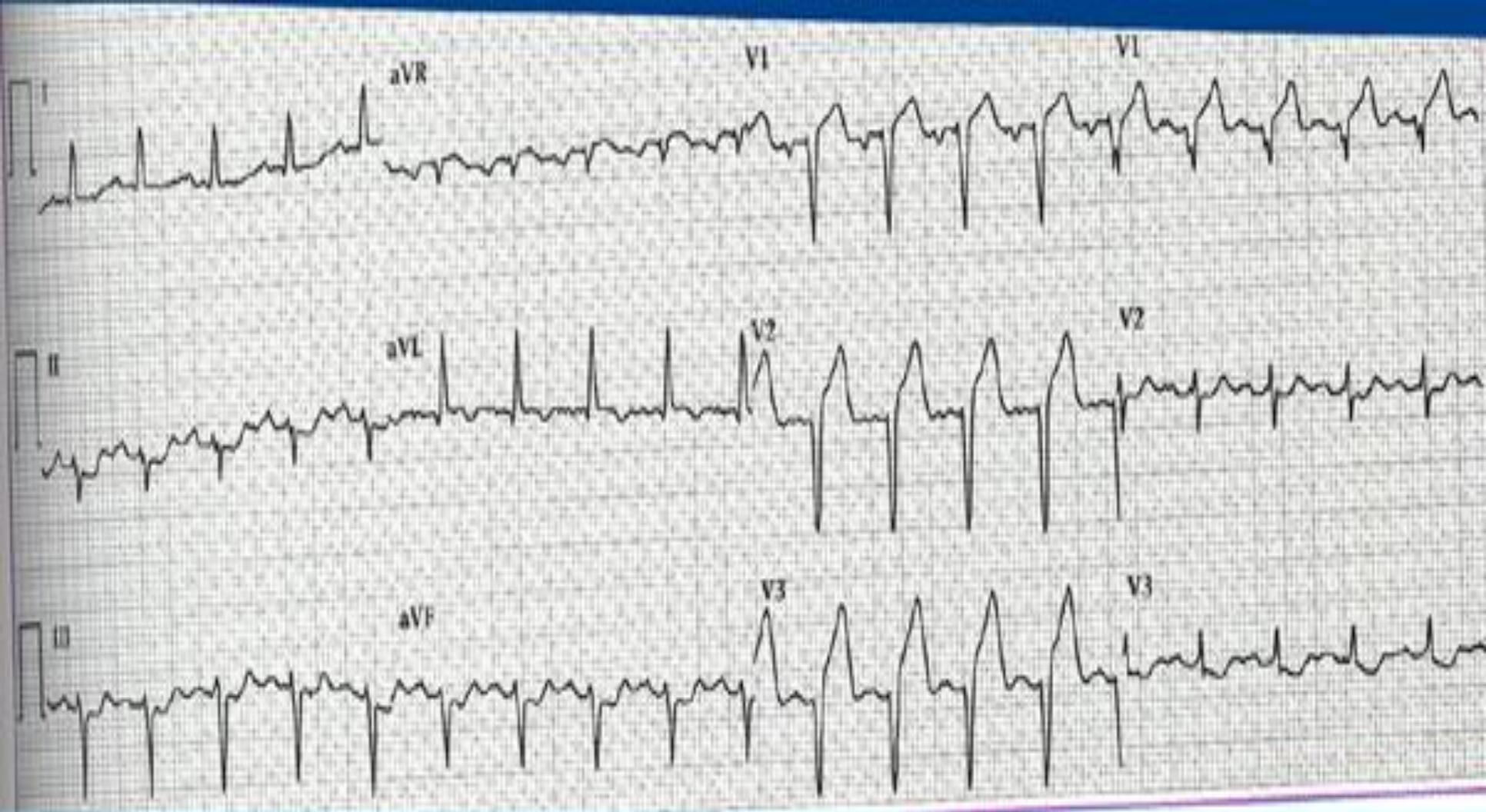
Putting it ALL together





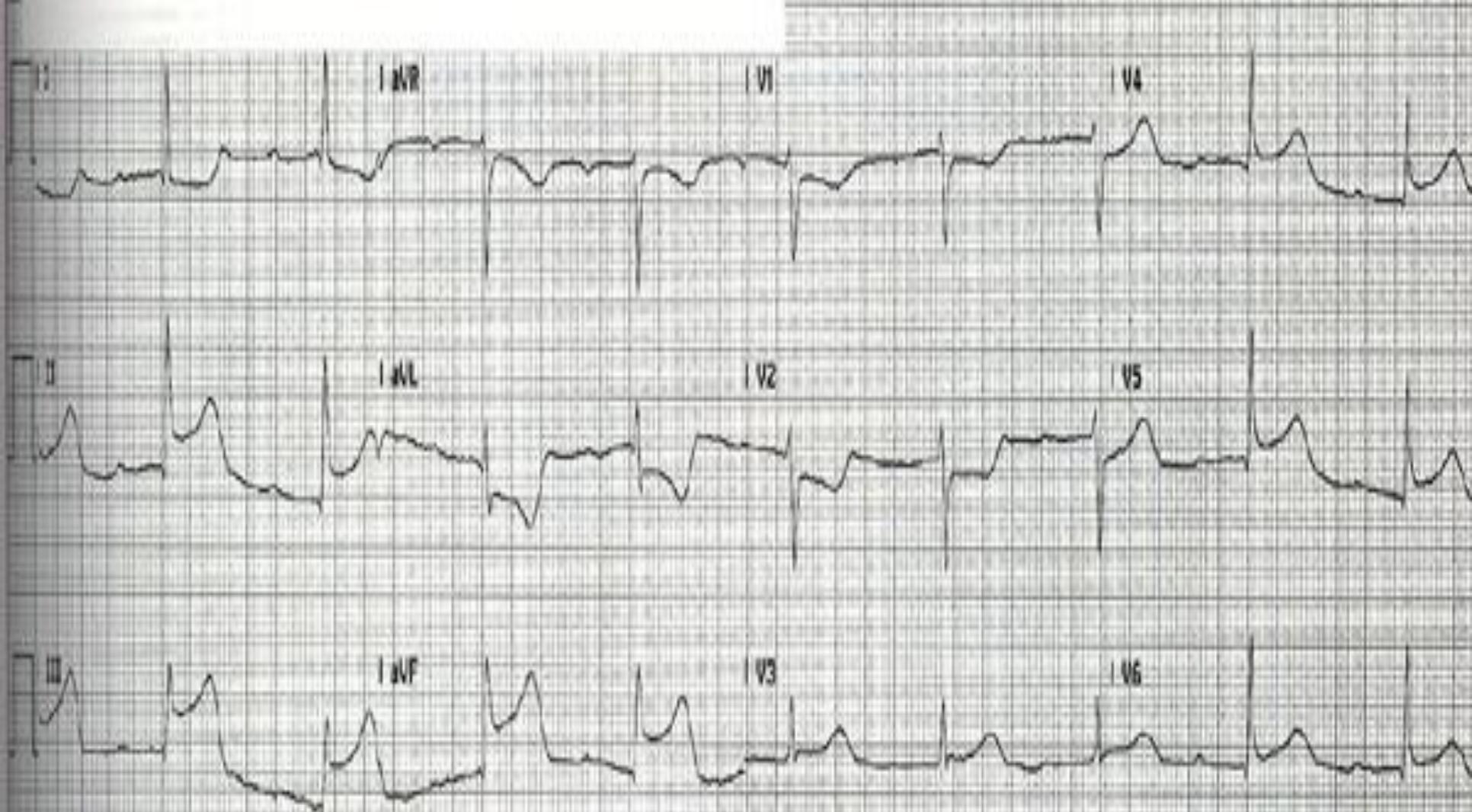
Click for
answer

- Anterior MI with lateral involvement
- ST elevations V2, V3, V4
- ST elevations I, aVL, V5



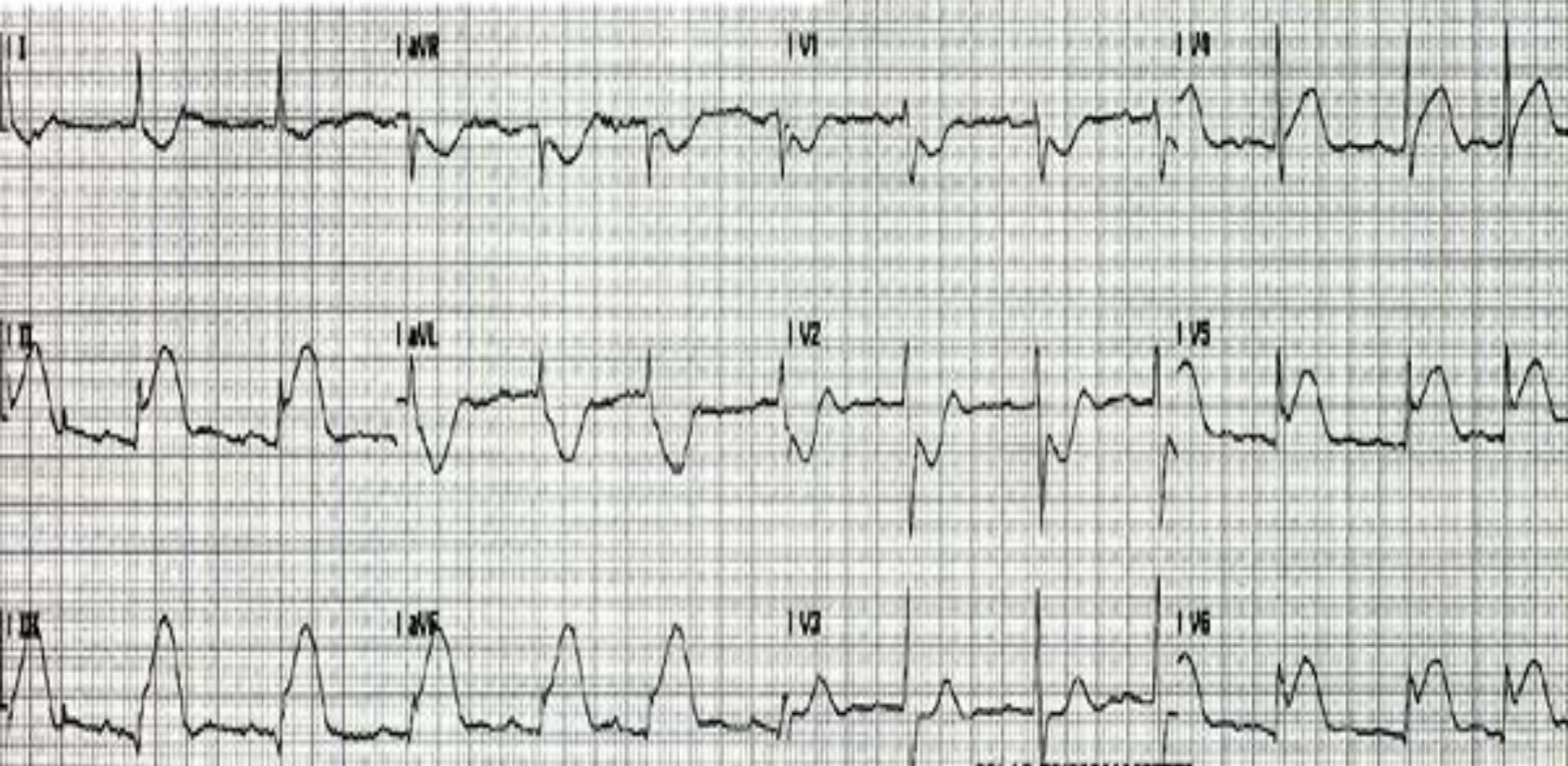
Click for
answer

- Anteroseptal MI
- ST elevations V1, V2, V3, V4



Click for
answer

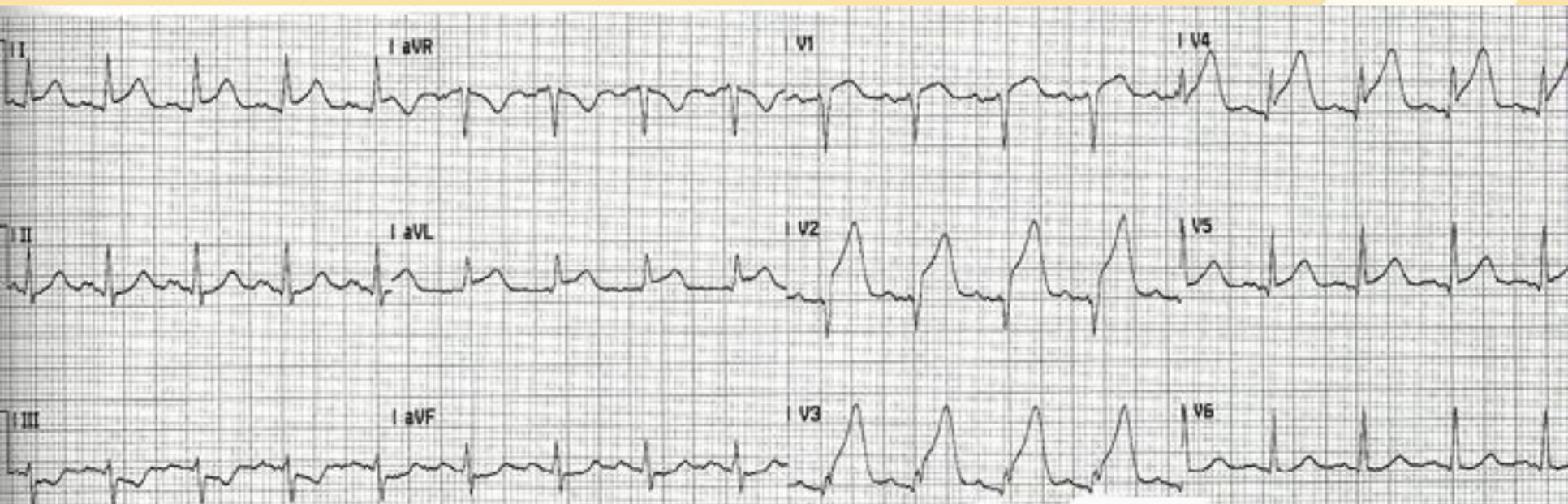
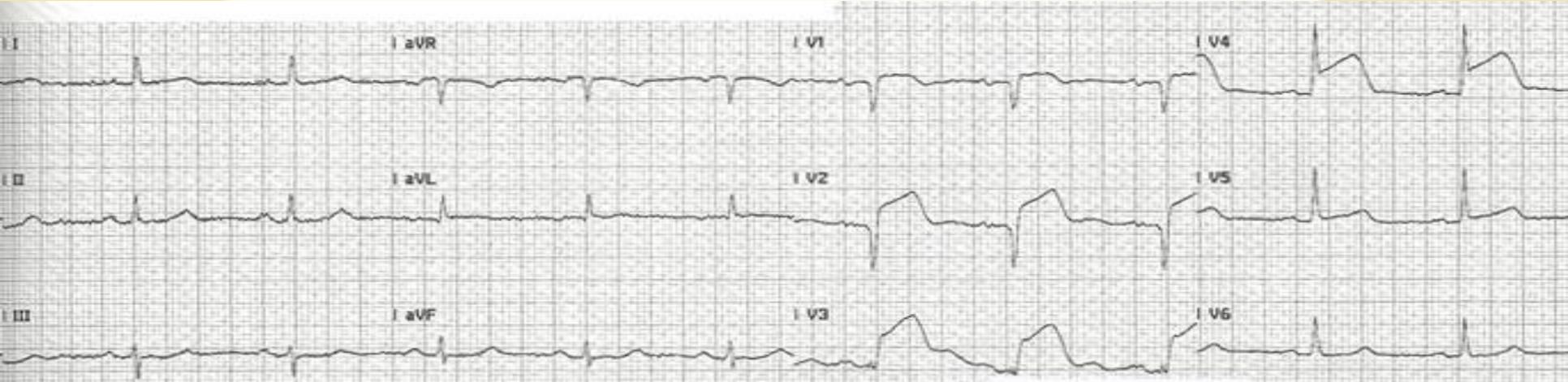
- Inferior MI
- ST elevation 2,3 AVF



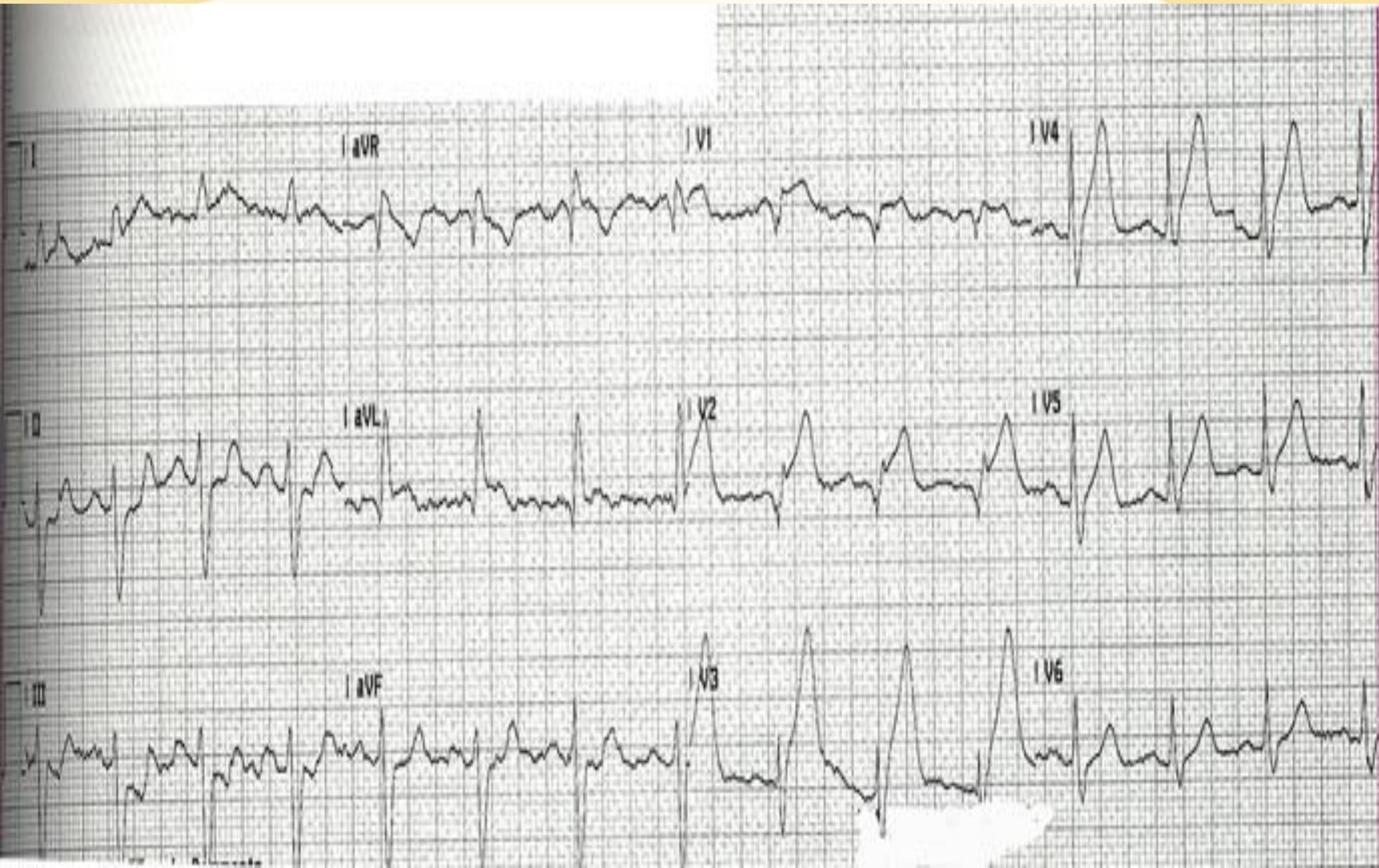
Click for
answer

- Inferior lateral MI
- ST elevations 2, 3, AVF
- ST elevations V5

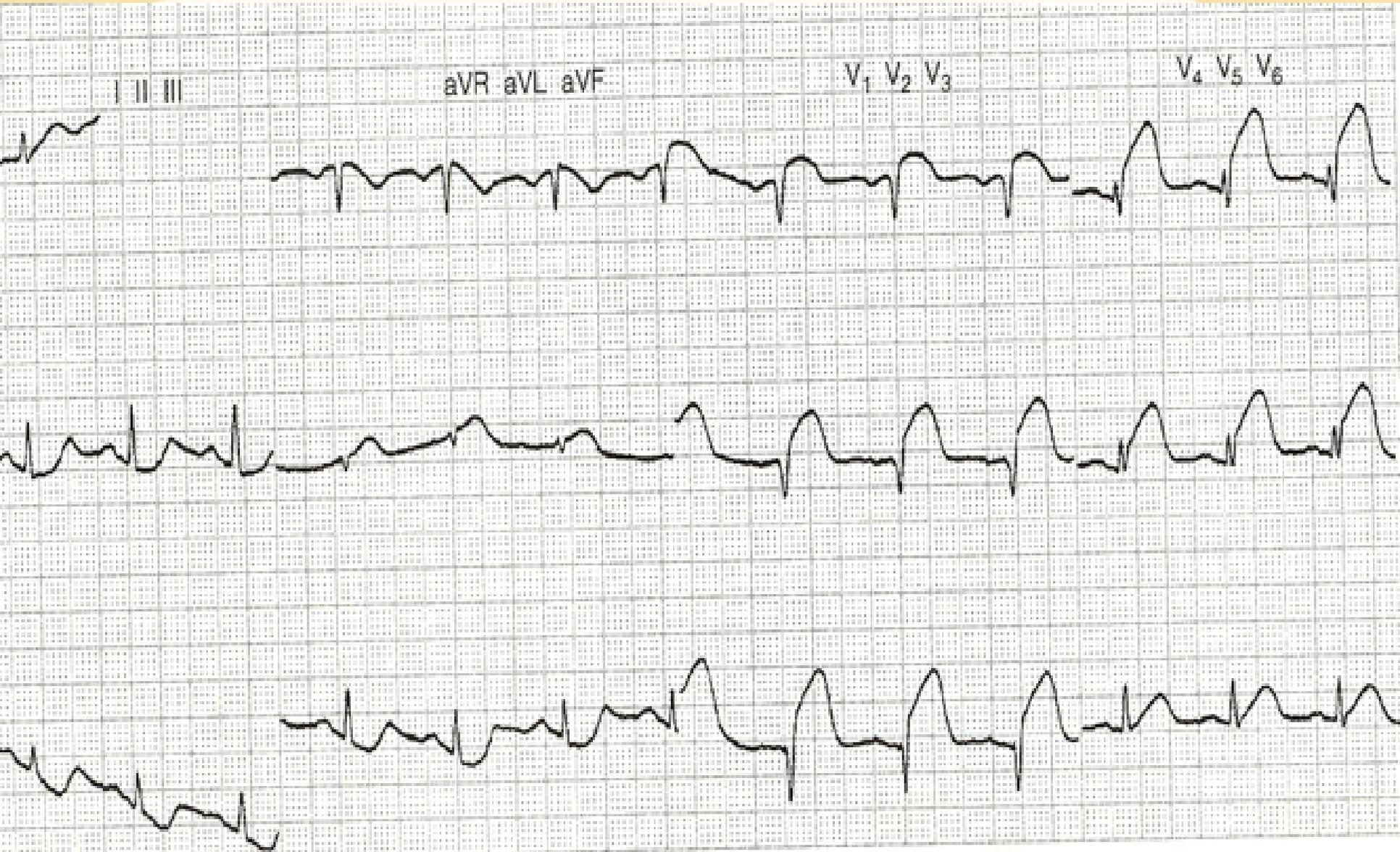
Wat wordt het grootste infarct?



Wat is hier aan de hand?



Is interventie nog zinvol?



Ritmestoornissen

The 4 Arrhythmia Groups

- **Narrow, Regular**
- **Narrow Irregular**
- **Wide, Regular**
- **Wide, Irregular**

P Waves or No P Waves

- **P waves = sinus**
- **Sinus = no defibrillation**

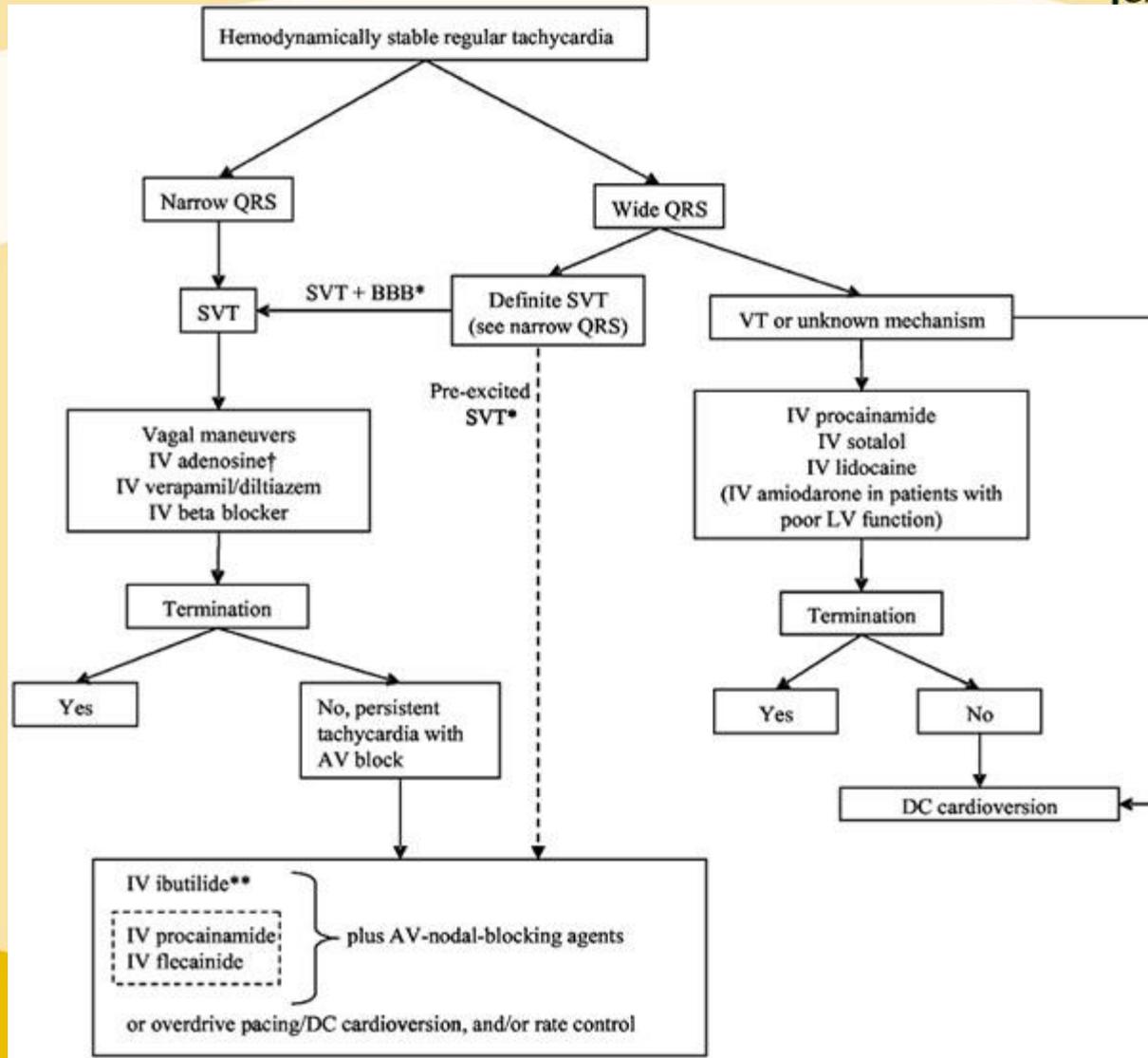
- **P waves = 1 to 1 with QRS**
- **P waves = normal axis**
 - **Upright in 2 and negative in AVR**

Regulair of Irregulair

- Irregulair = supra-ventriculair
- Irregulair = block the AV-node
- Irregulair = not VT

Breed of smal complex

- **Narrow = supra-ventricular**
- **Narrow = block the AV node**
- **Narrow = not Ventricular Tachycardia**
- **Narrow = < 0.12 msec (3 small squares)**



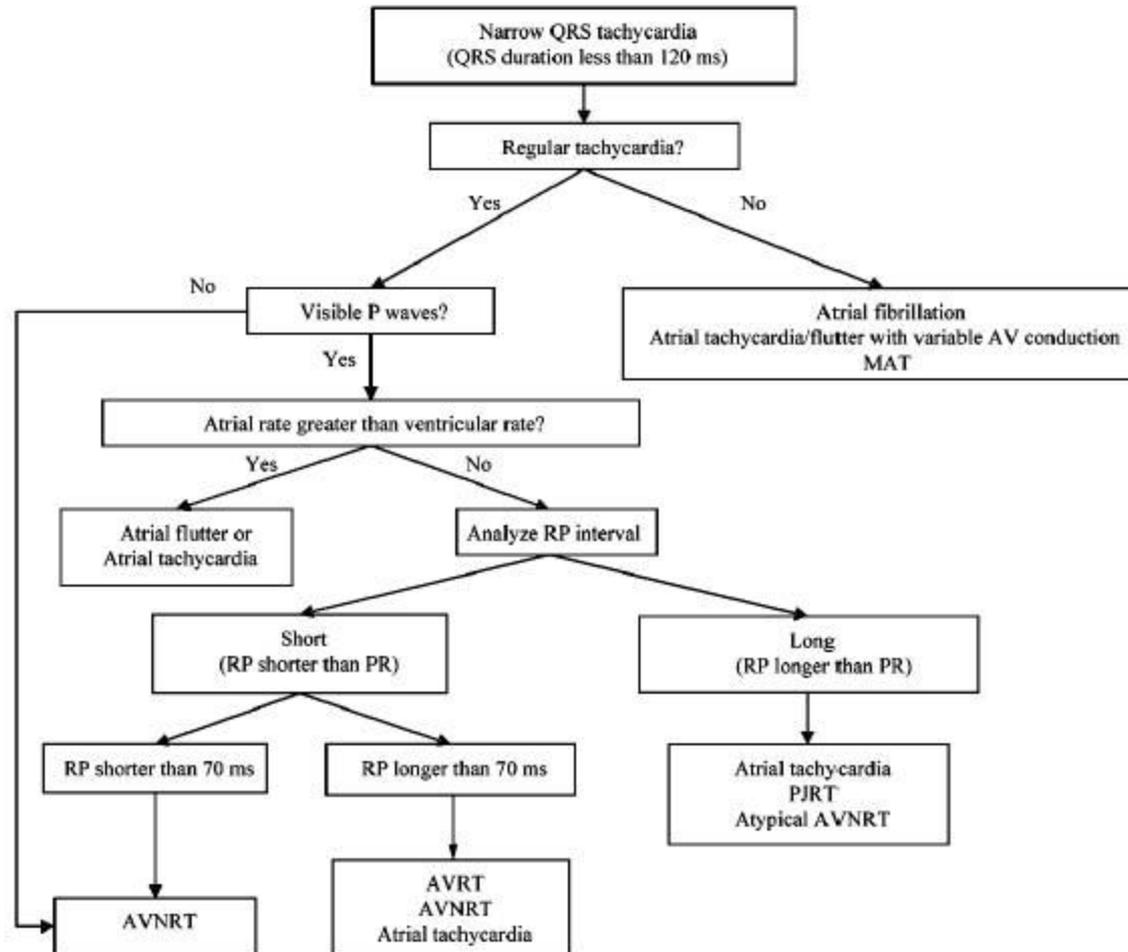


Figure 3. Differential diagnosis for narrow QRS tachycardia. Patients with focal junctional tachycardia may mimic the pattern of slow-fast AVNRT and may show AV dissociation and/or marked irregularity in the junctional rate. AV indicates atrioventricular; AVNRT, atrioventricular nodal reciprocating tachycardia; AVRT, atrioventricular reciprocating tachycardia; MAT, multifocal atrial tachycardia; ms, milliseconds; PJRT, permanent form of junctional reciprocating tachycardia; QRS, ventricular activation on electrocardiogram.



EMEDU

Atrial Flutter with 2:1 conduction
Mild lateral ST depression V4-V6



Ventricular Rate= 150



Flutter waves: Atrial rate = 300
buried in the QRS complex



EMEDU



Atrial Flutter with 2:1 conduction

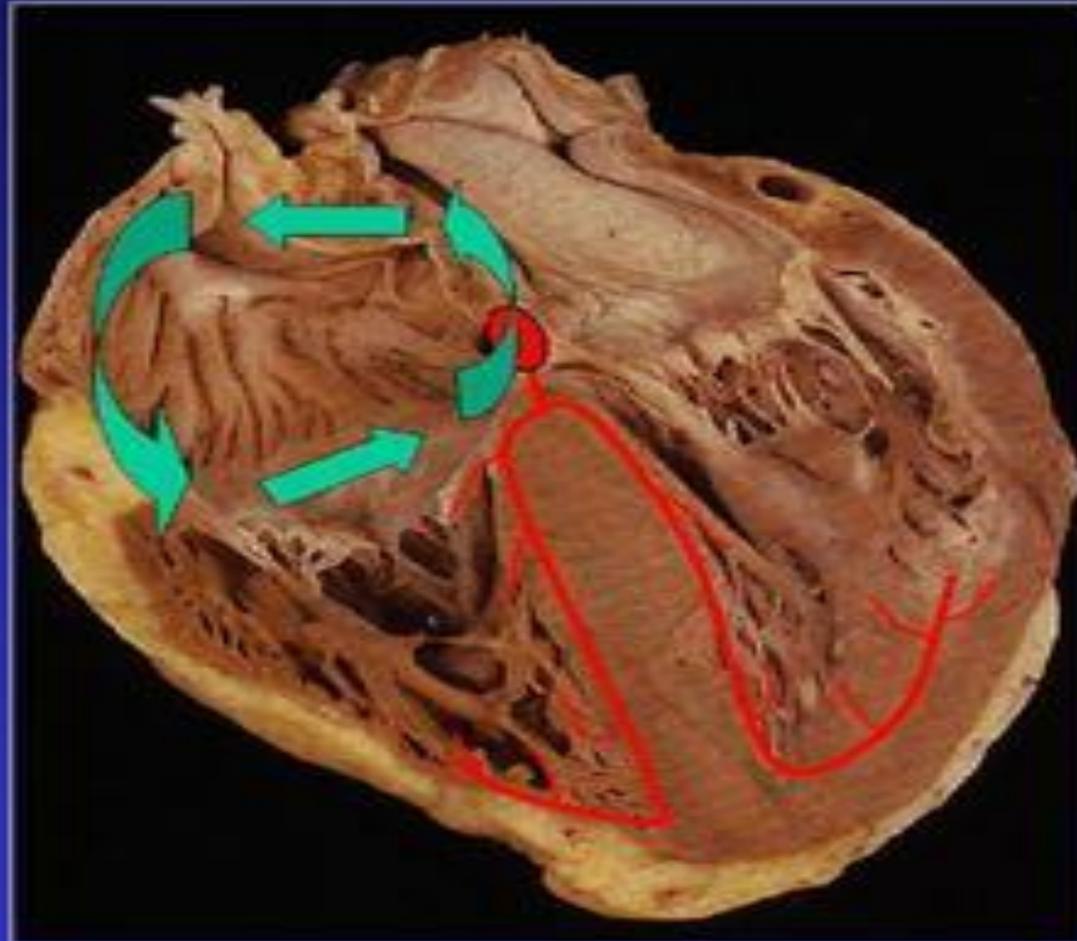


Note the flutter waves with 2:1 conduction
Rate = 150

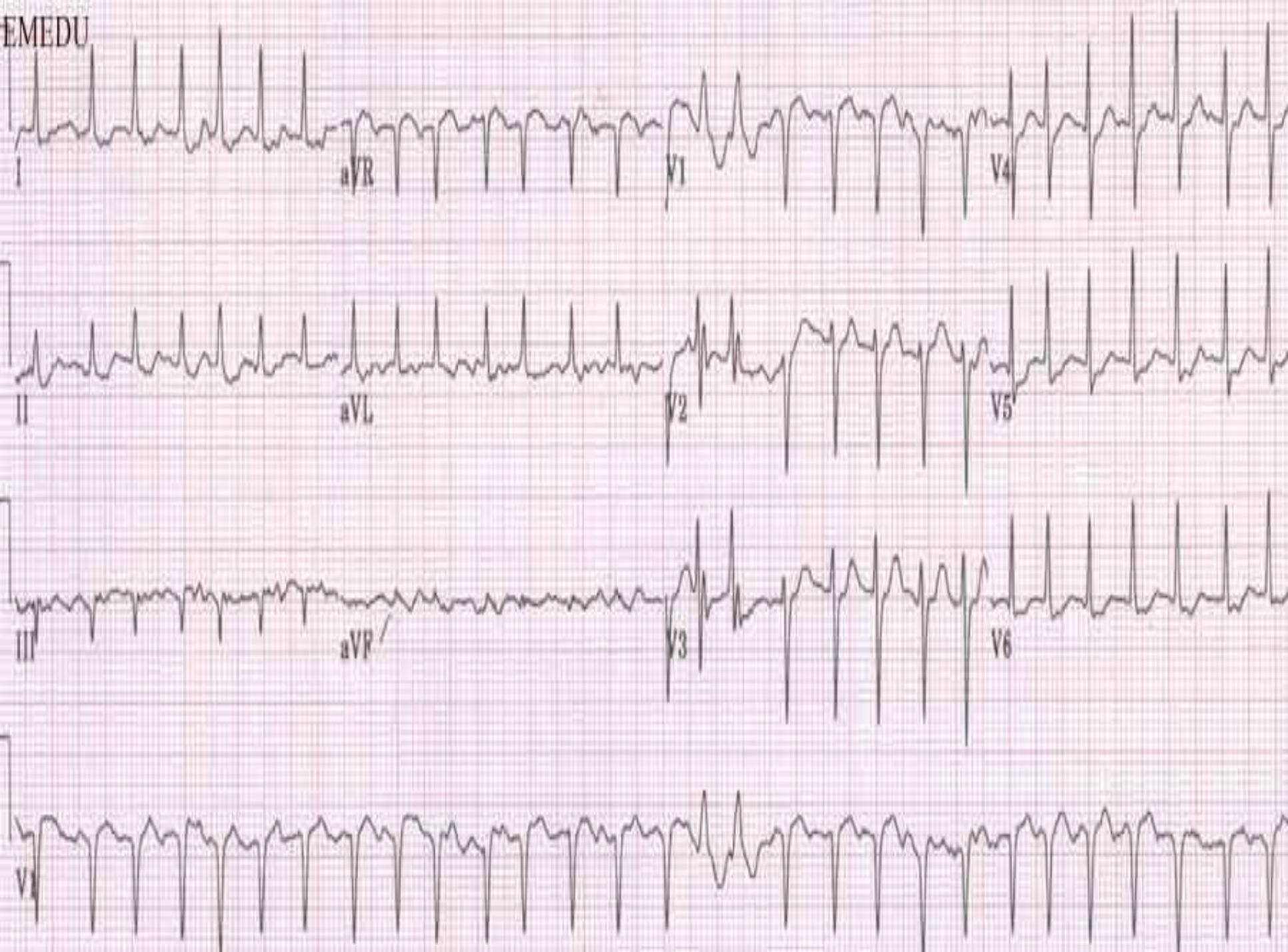


Atrial Flutter

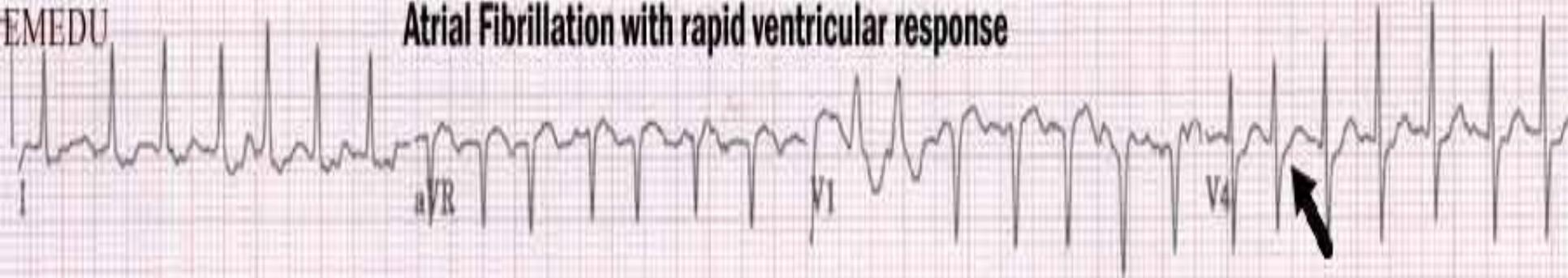
Fotoal



EMEDU



Atrial Fibrillation with rapid ventricular response



Irregularly irregular. No p-waves
Rapid ventricular rate =177



These beats are abarently conducted ▼ ▼

There is some ST depression
V4 V5 V6



EMEDU



EMEDU

Atrial fibrillation with LBBB pattern



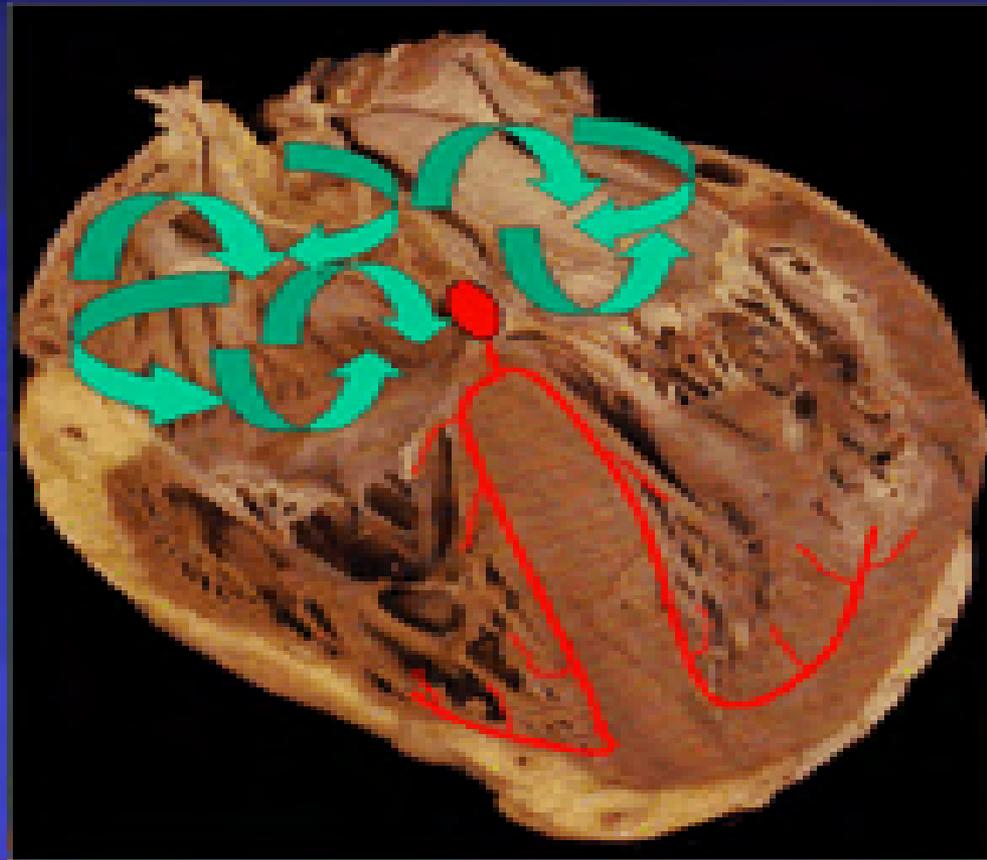
LBBB pattern



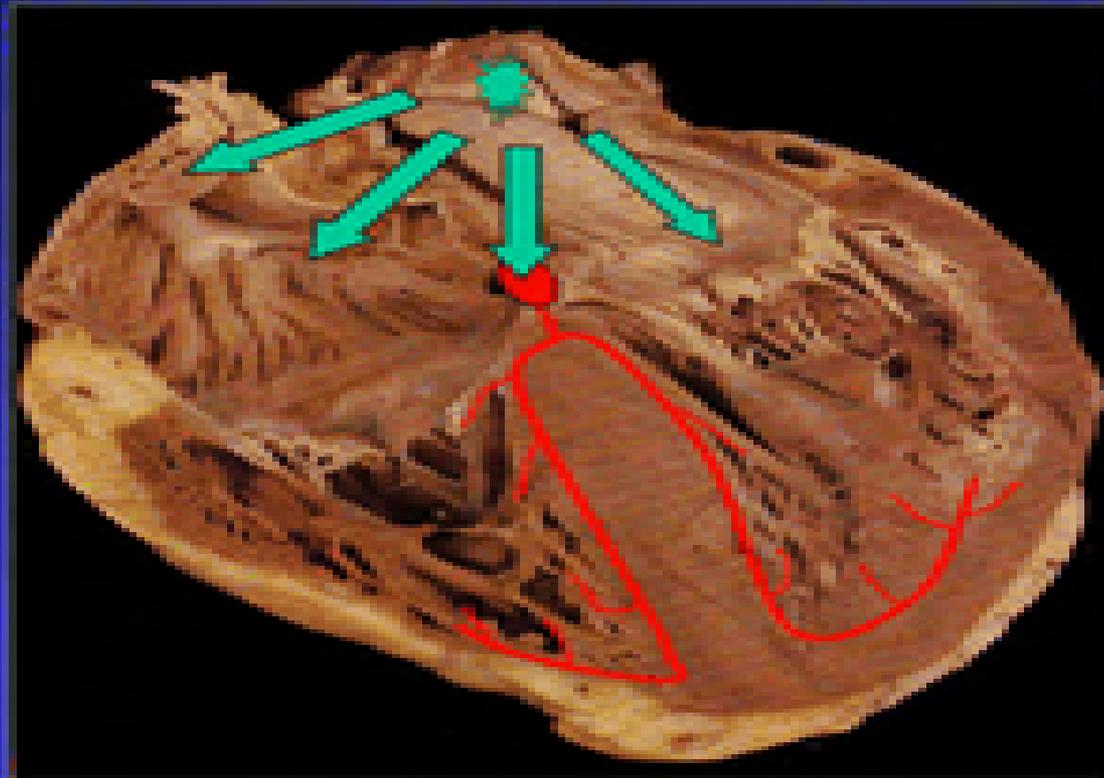
Irregularly irregular

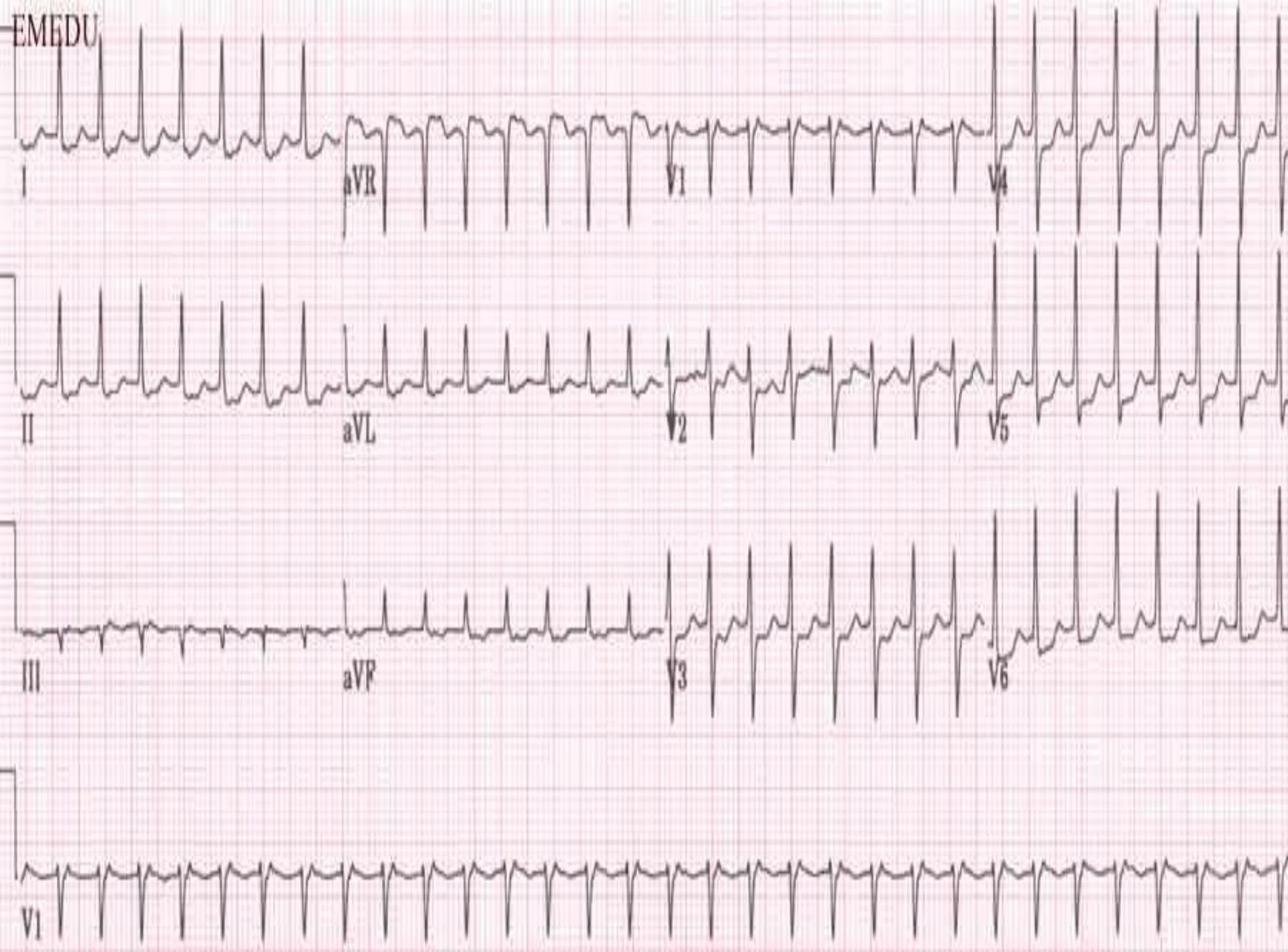
P-waves may be present

Atrial Fibrillation



Atrial Tachycardia

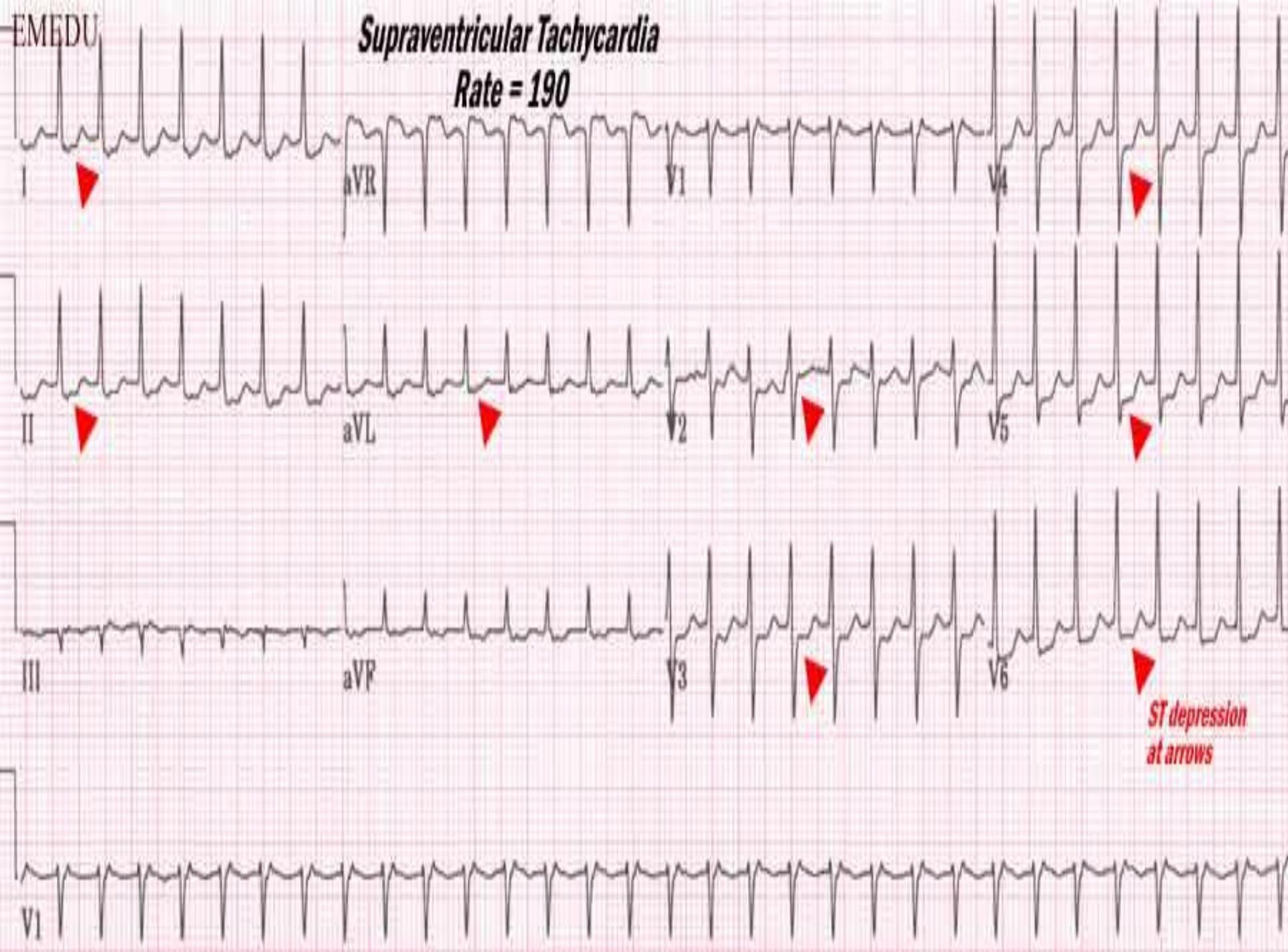


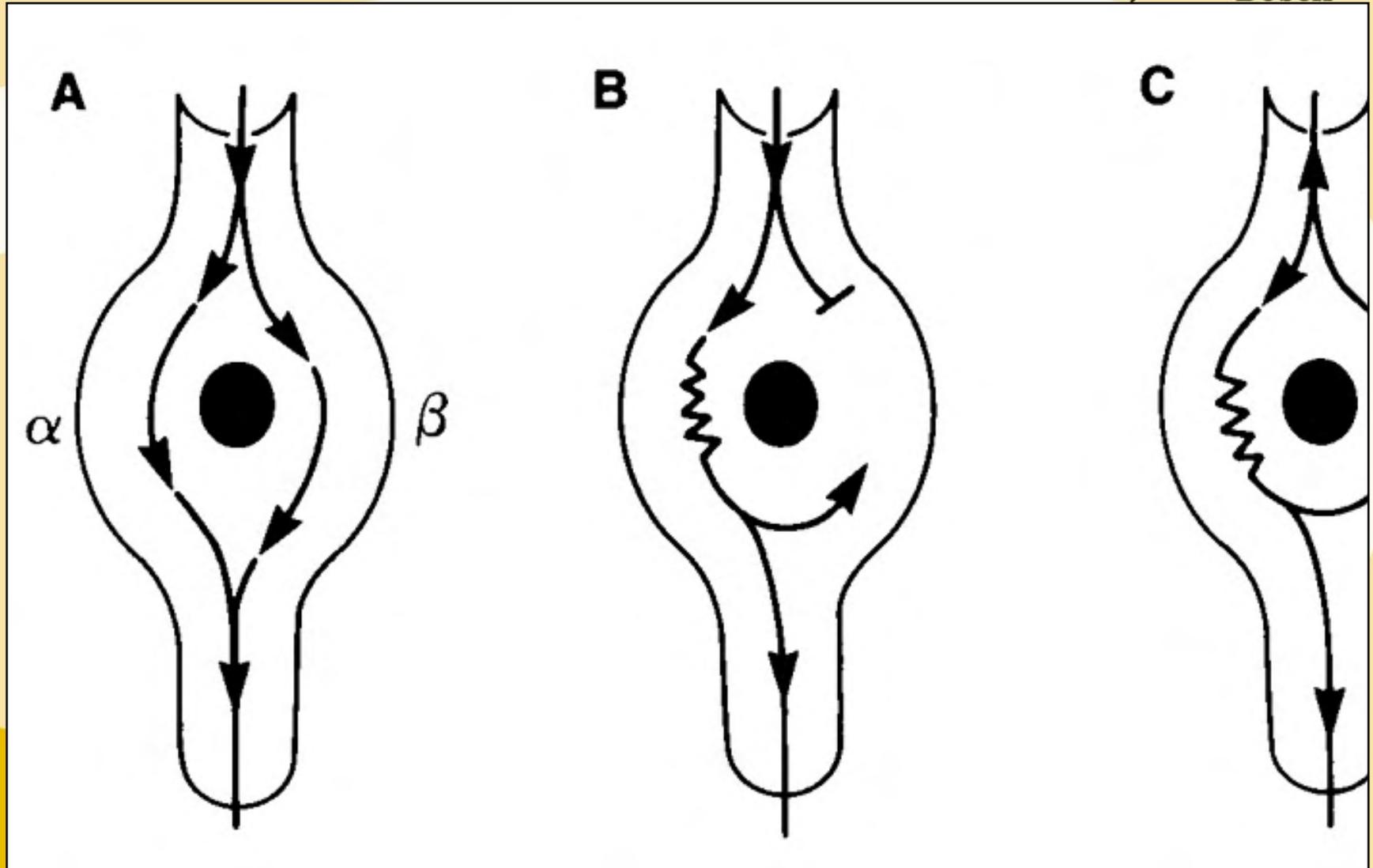


EMEDU

Supraventricular Tachycardia

Rate = 190





EMEDU

I

aVR

V1

V4

II

aVL

V2

V5

III

aVF

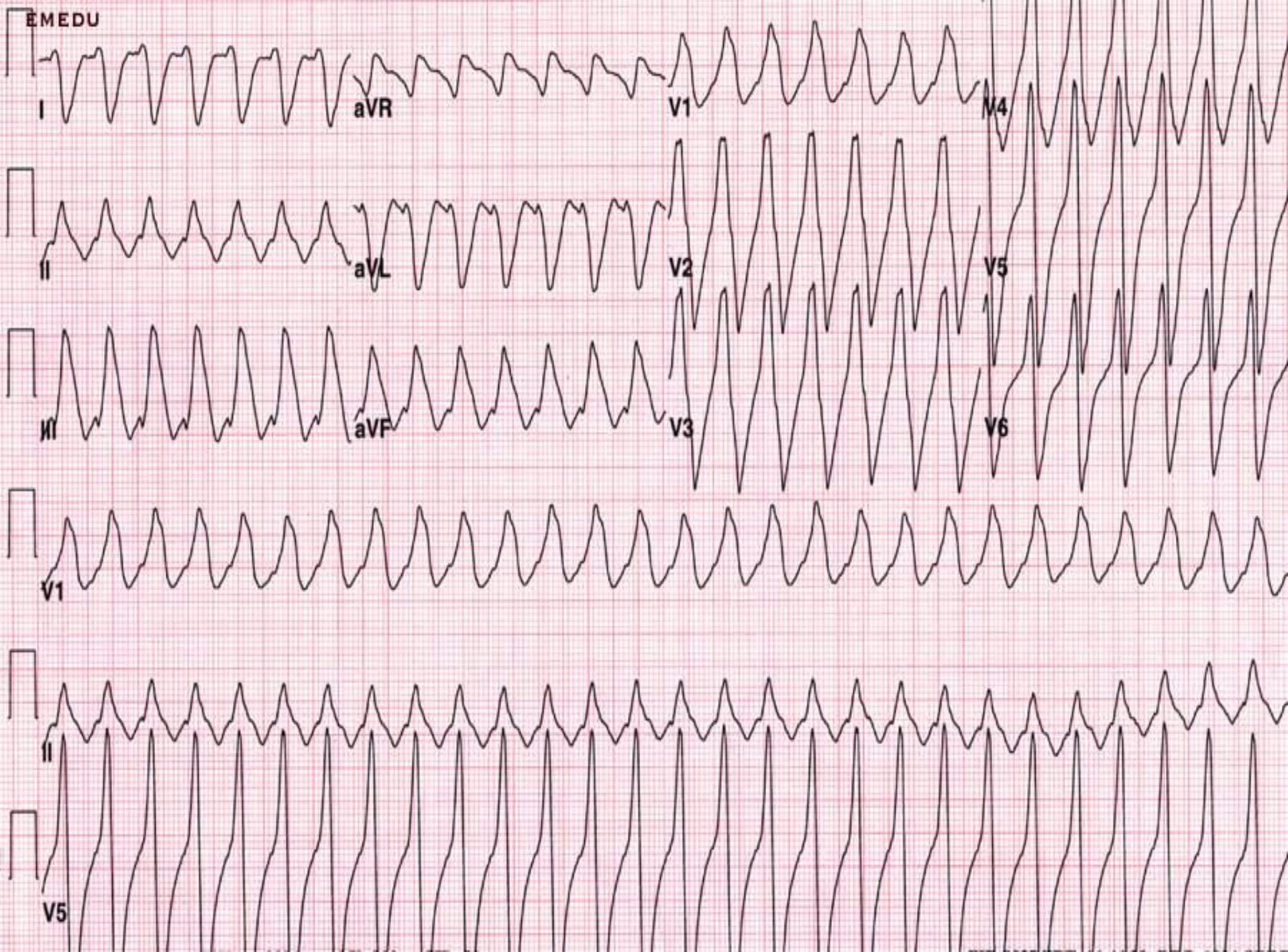
V3

V6

V1

II

V5



E MEDU

Ventricular tachycardia

I

aVR

V1

V4

II

aVL

V2

V5

III

aVF

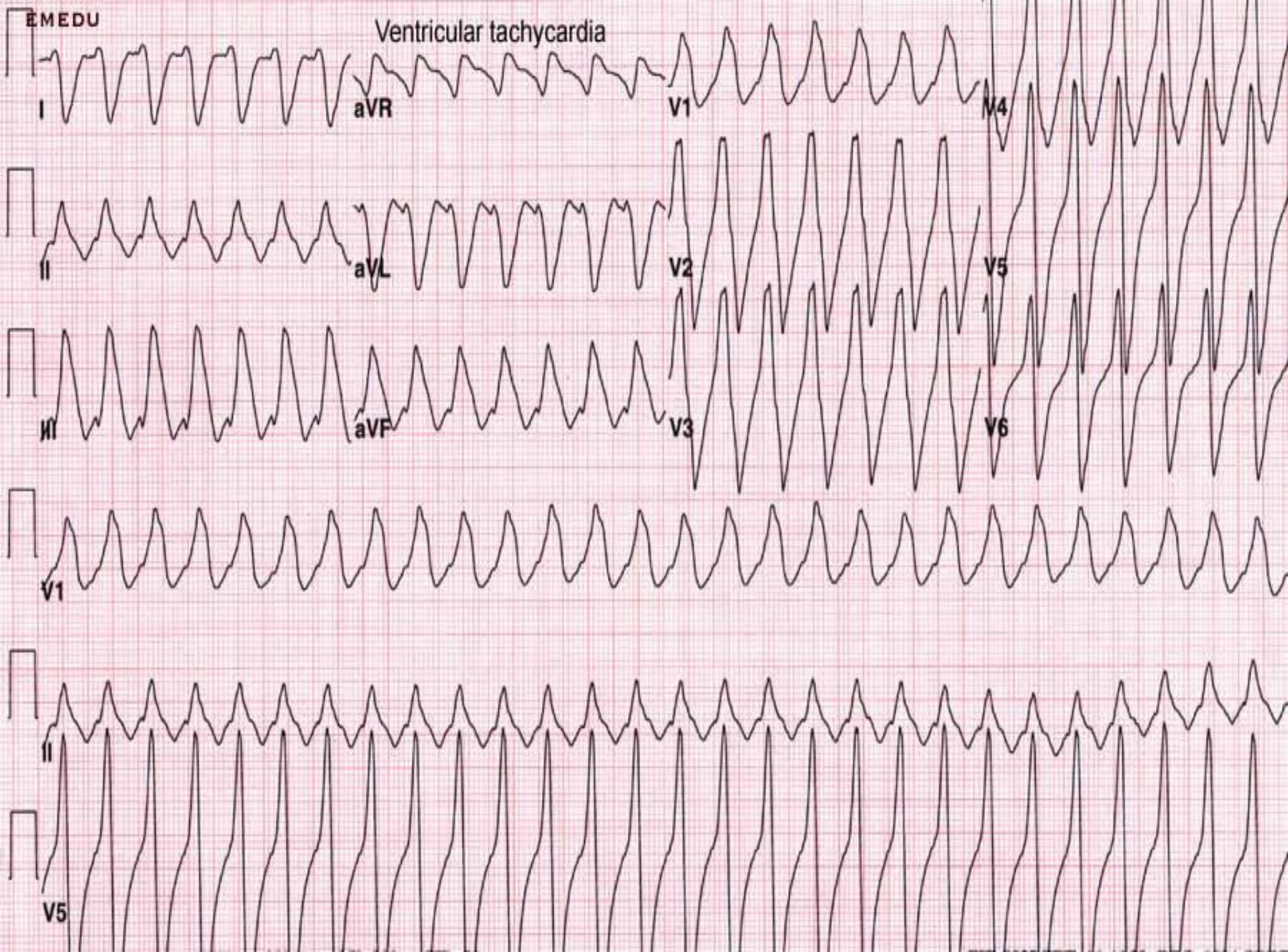
V3

V6

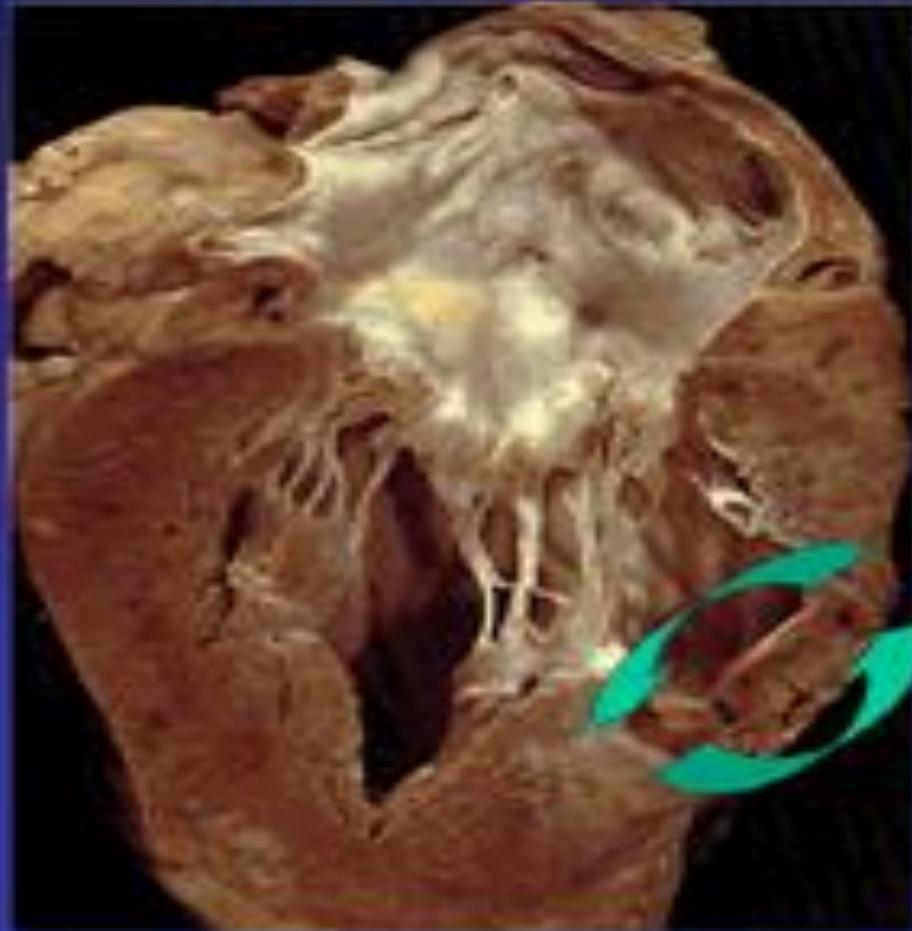
V1

II

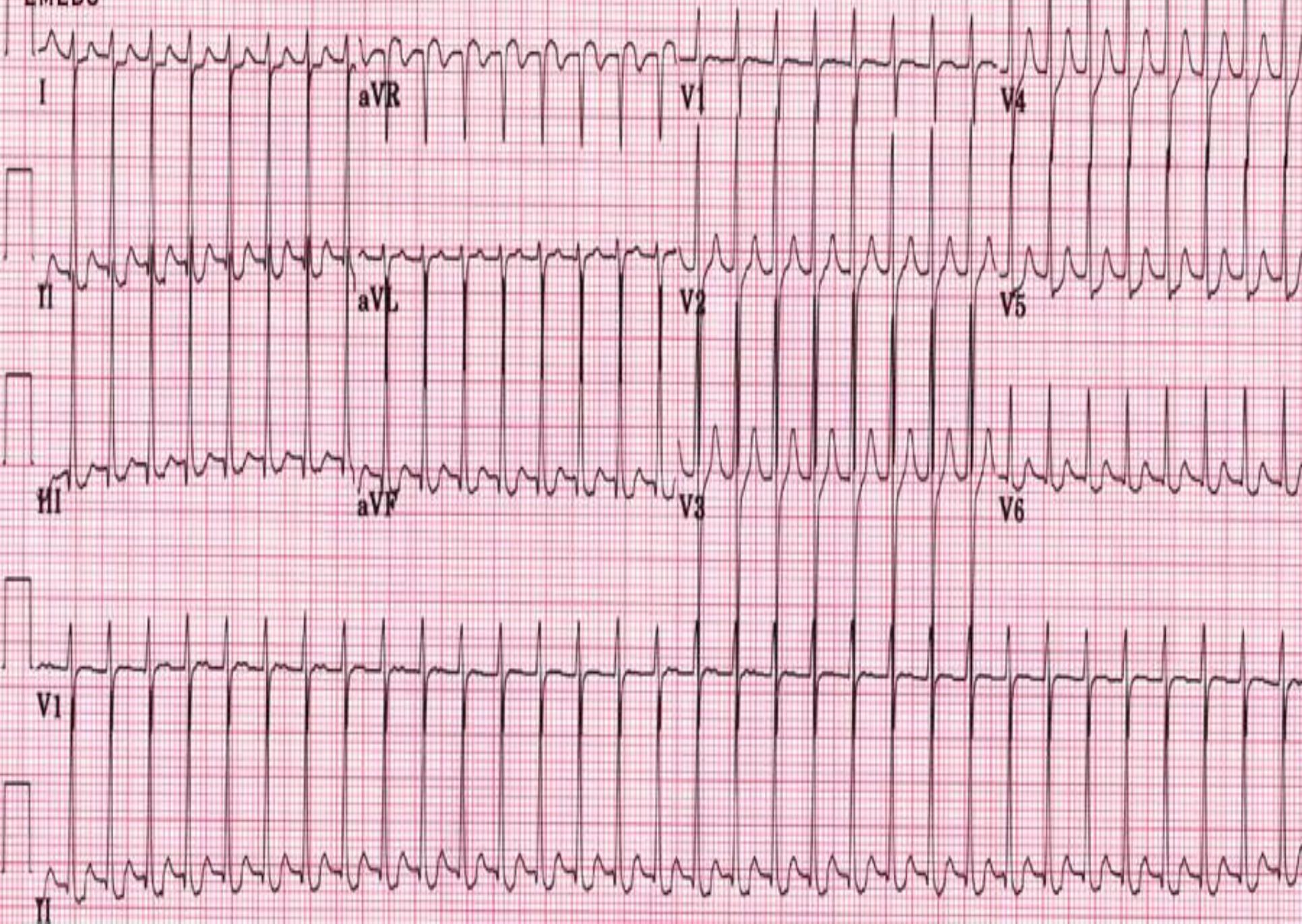
V5



Ventricular Tachycardia

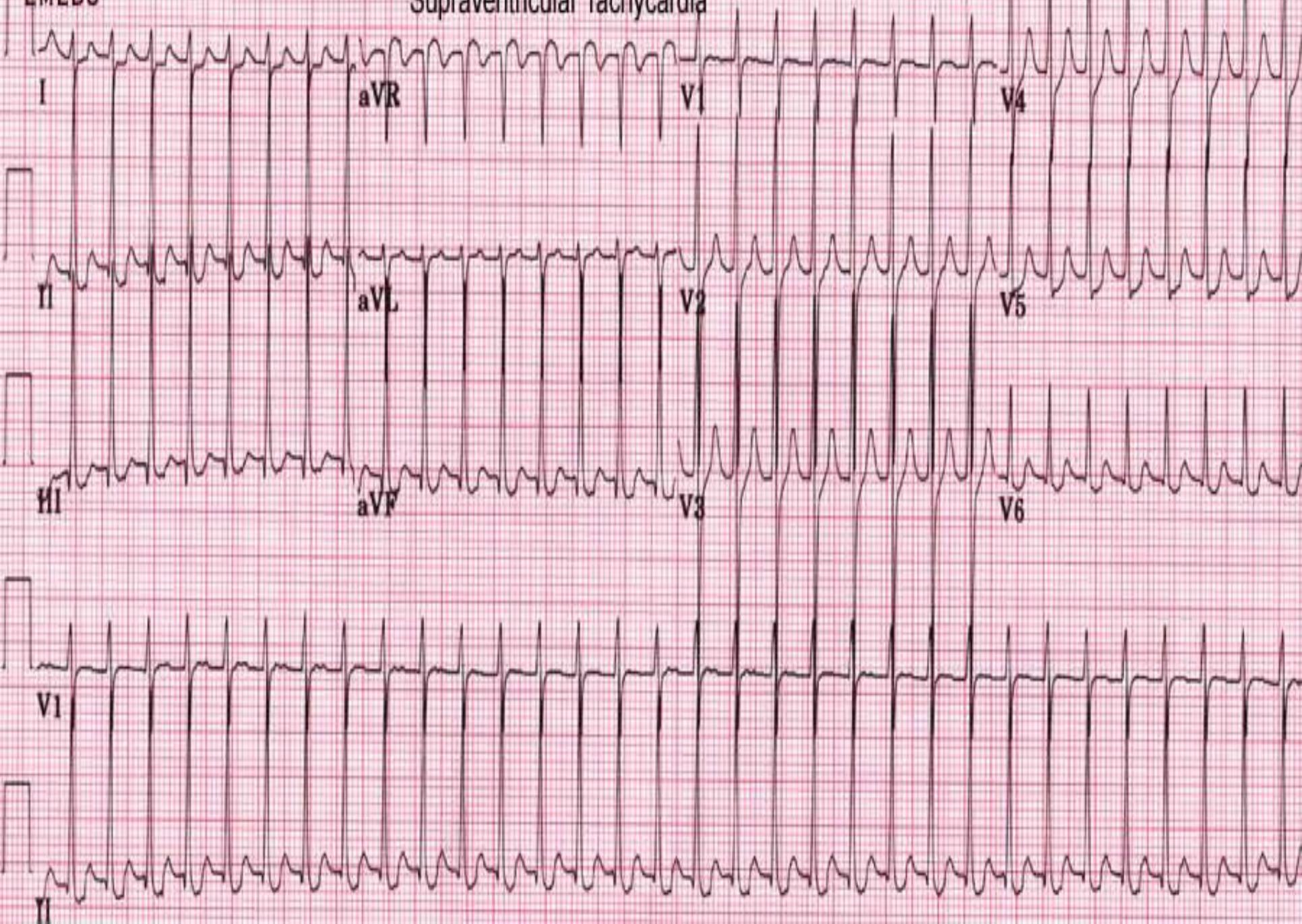


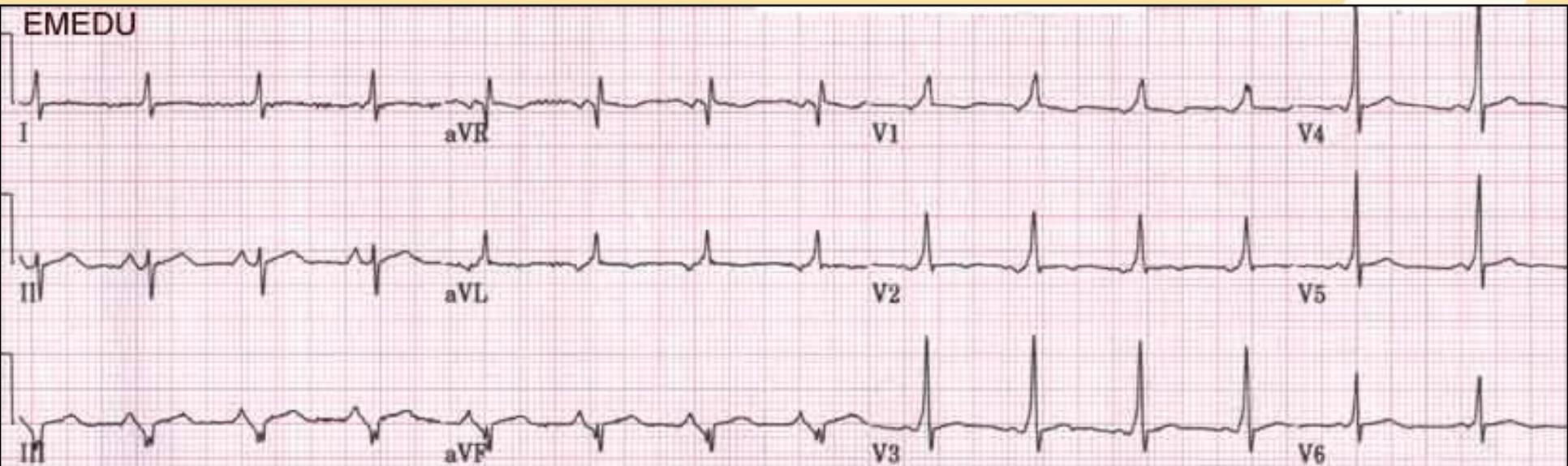
EMEDU



EMEDU

Supraventricular Tachycardia





EMEDU

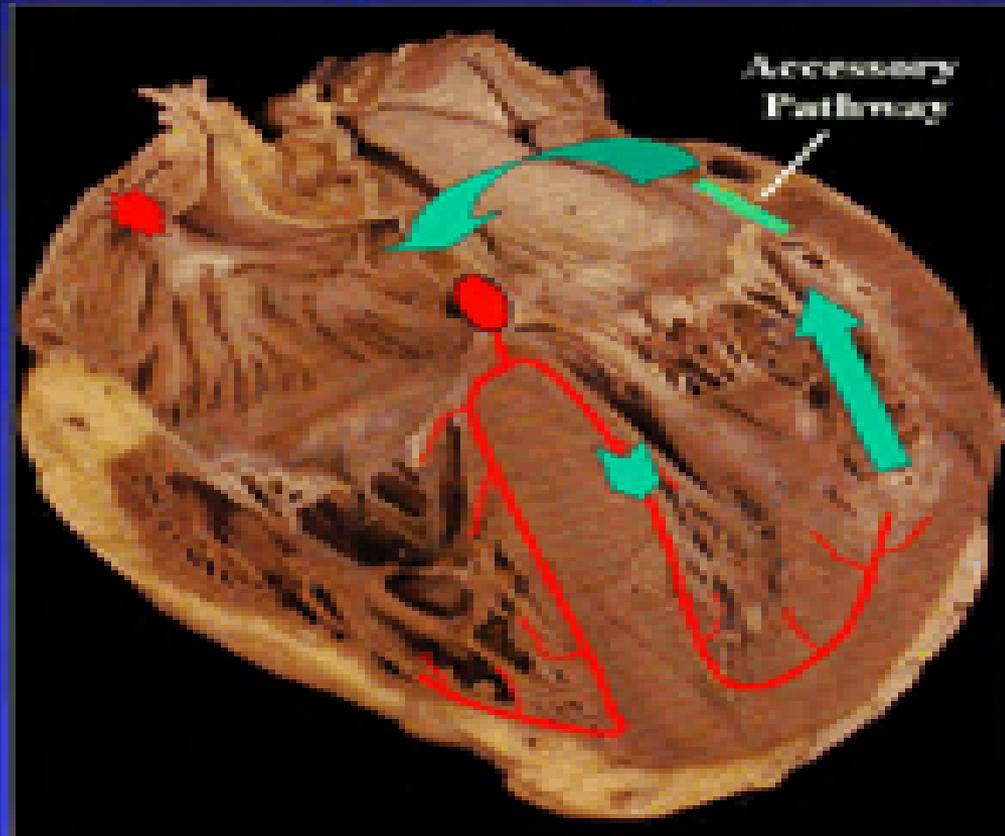
WOLFF-PARKINSON-WHITE

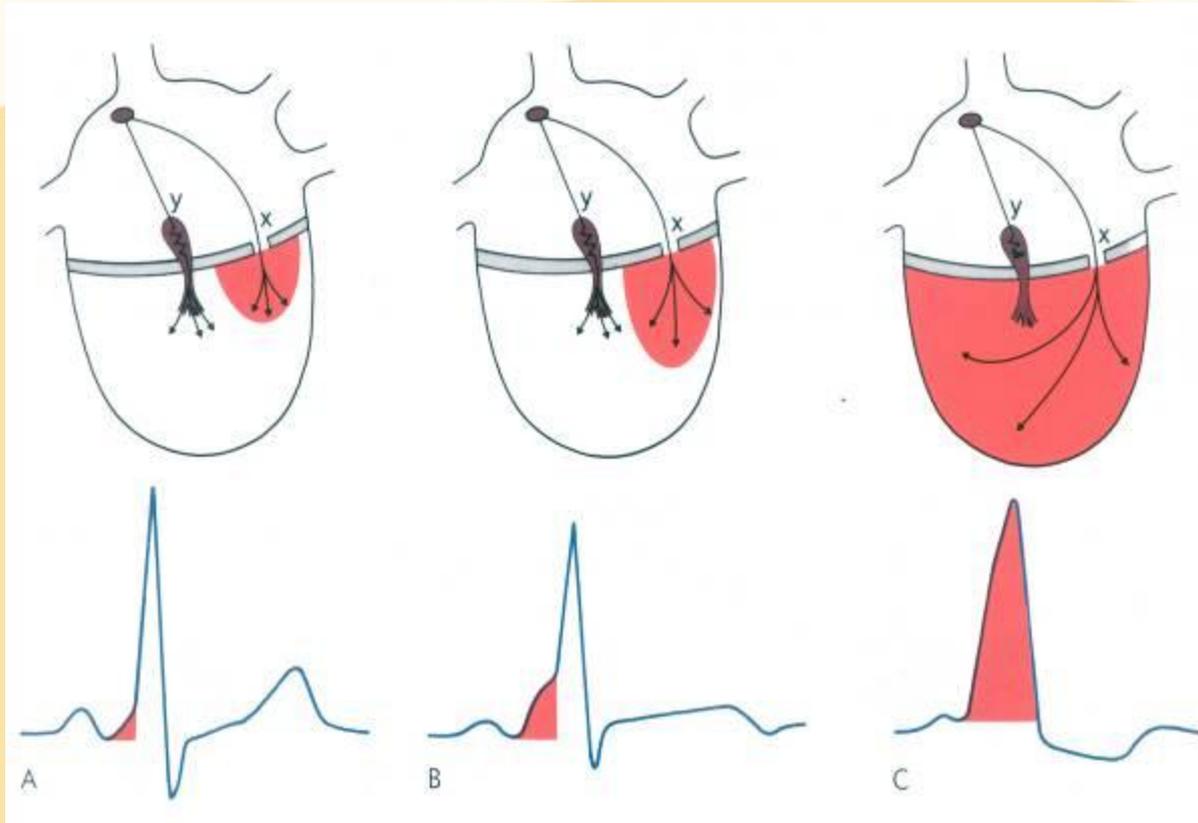


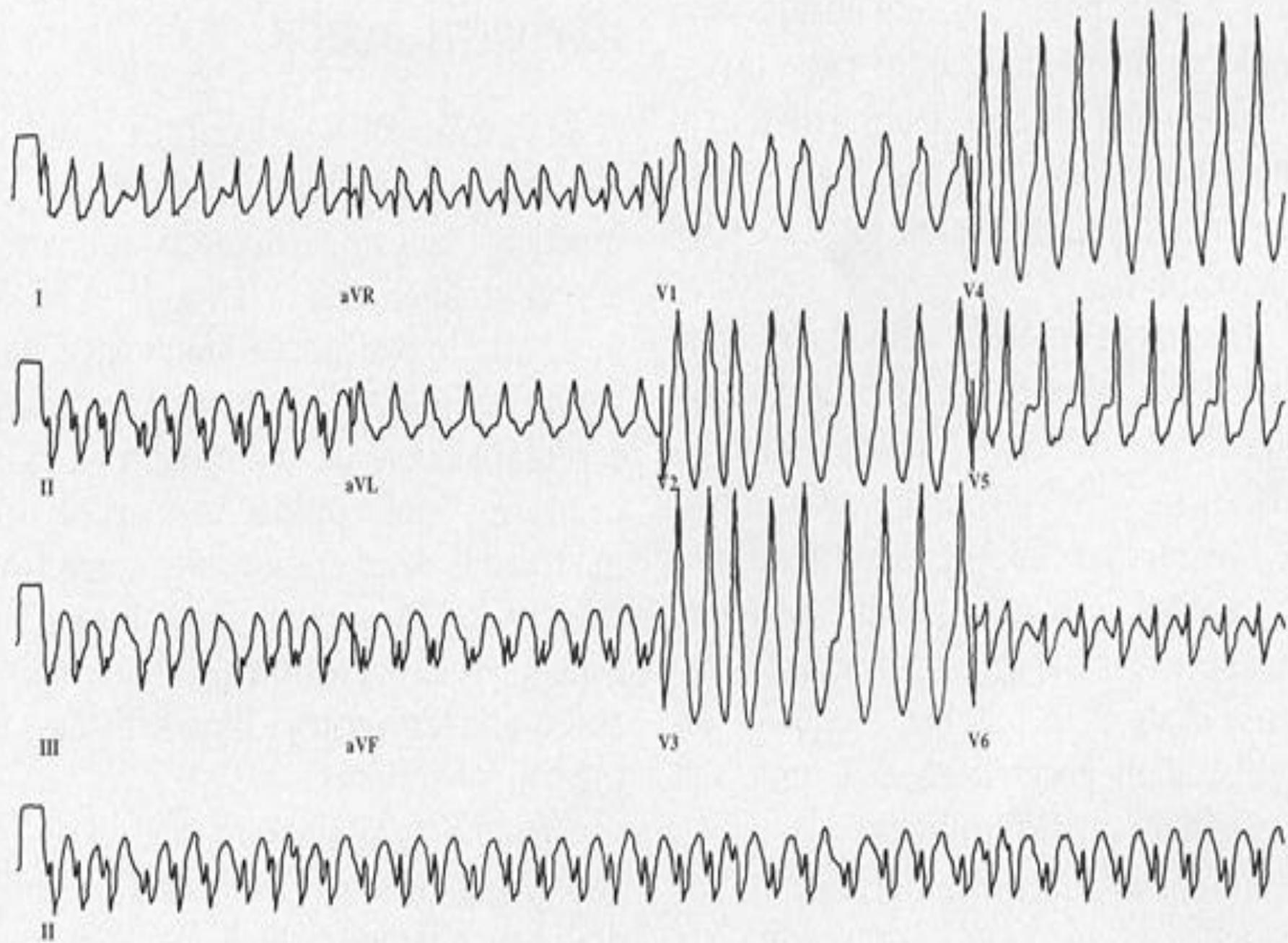
SHORT PR INTERVAL

SLURRING OF R UPSTROKE : DELTA WAVE

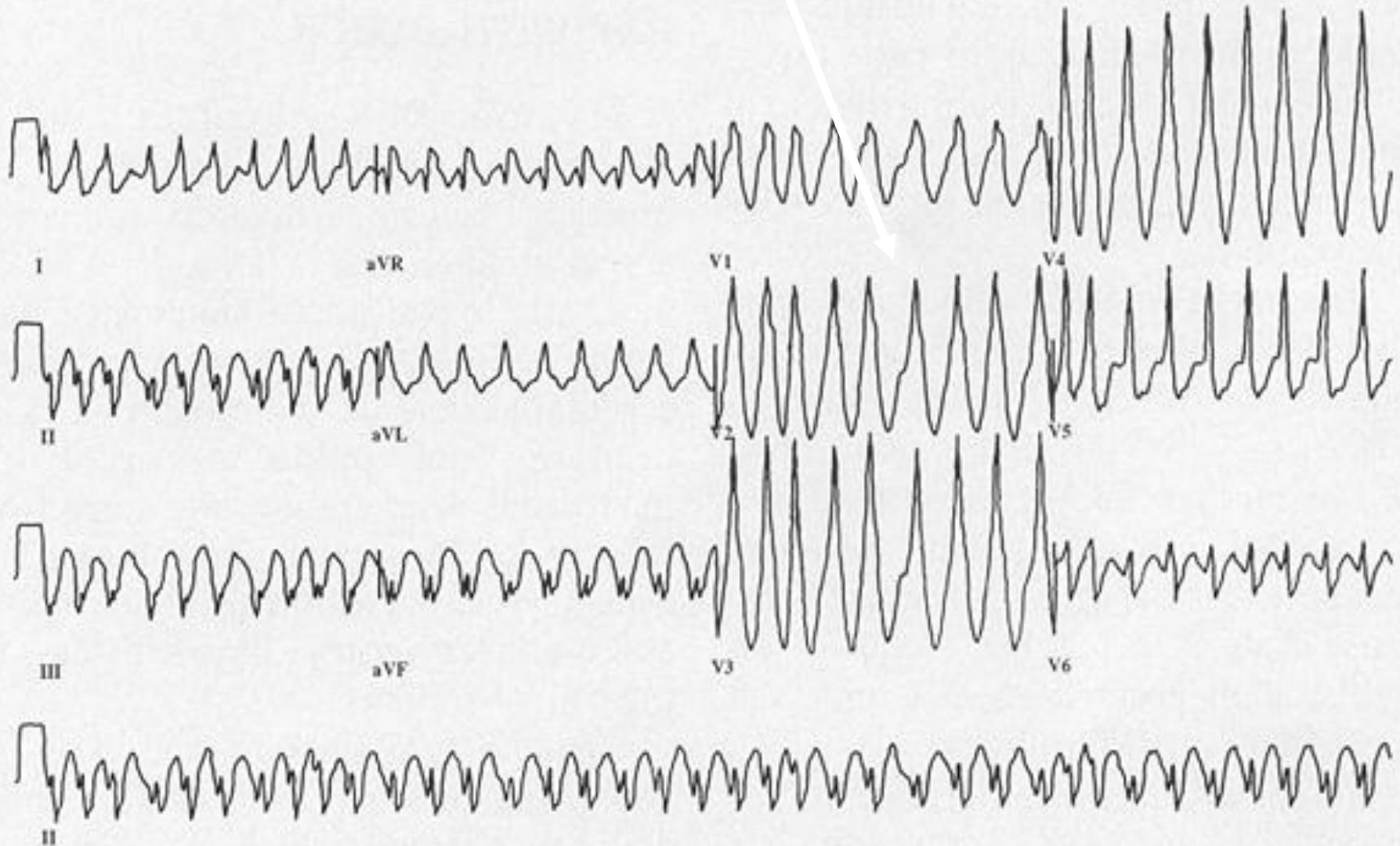
Orthodromic AV Reentry Tachycardia



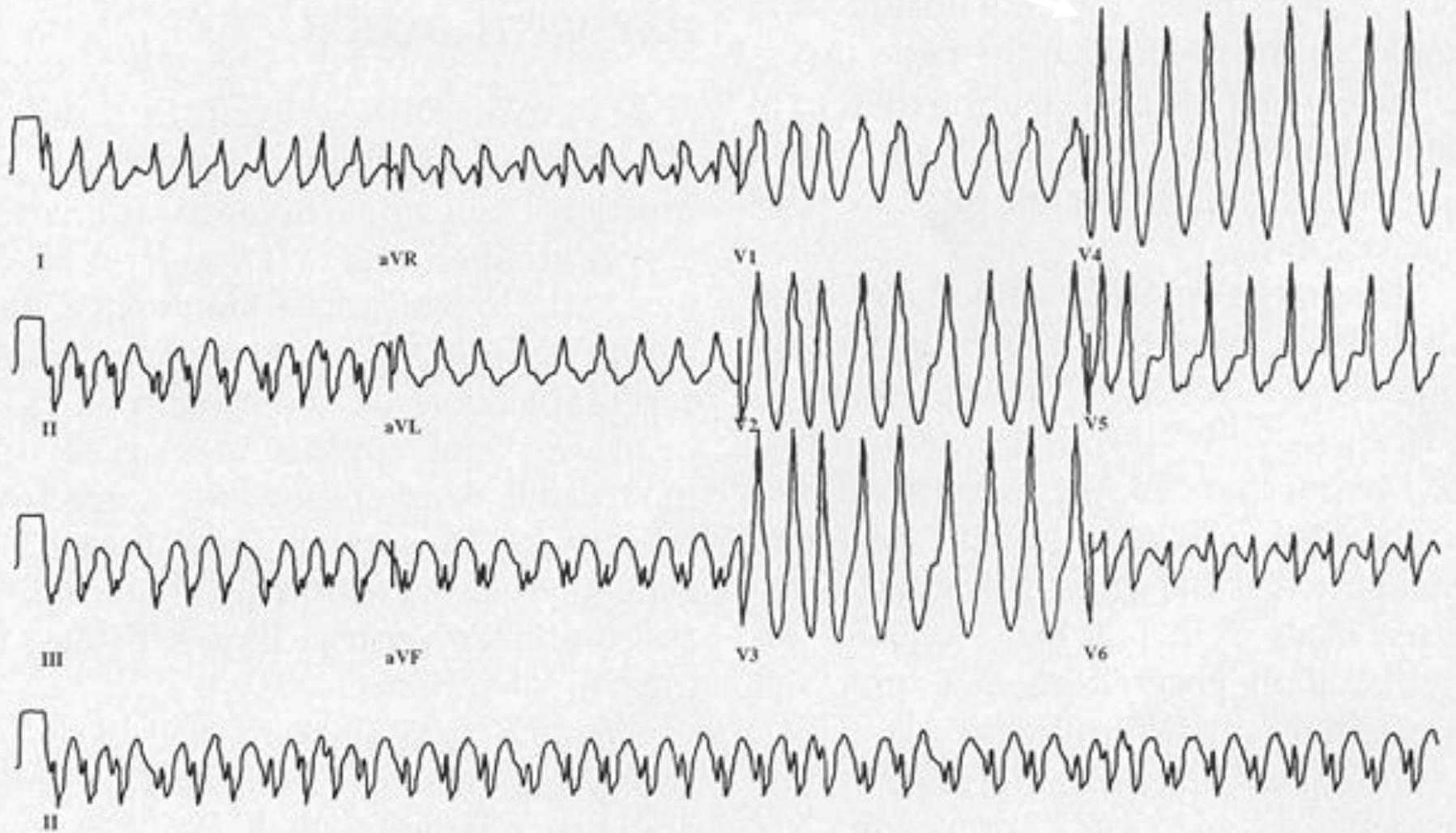


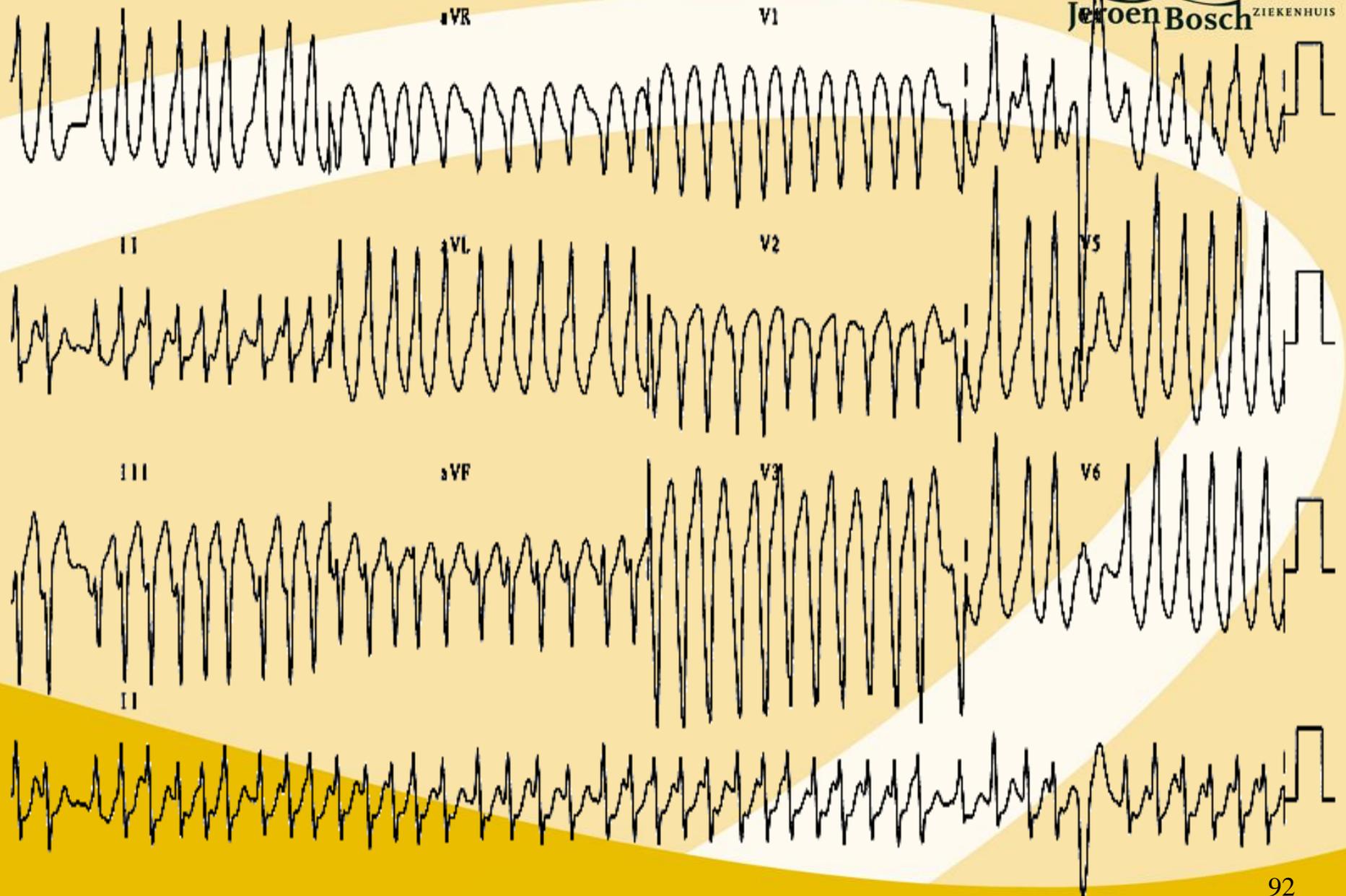


Wide and funny looking complexes



RR interval very short





EMEDU

WOLFF-PARKINSON-WHITE



SHORT PR INTERVAL

SLURRING OF R UPSTROKE : DELTA WAVE

Wide, Irregular, No P waves

- Atrial fibrillation with bundle branch block
- Atrial flutter with variable AV-block and bundle branch block
- Wolf-Parkinson-White Syndrome and atrial fibrillation
- Polymorphic VT or Torsades

WPW – Atrial Fibrillation Chance for a Clean Kill

- DO NOT USE AV blockers!
 - Dilt, dig, beta-blockers
 - Increases accessory pathway conduction
 - Increases risk of ventricular fibrillation
- Cardioversion immediately
- Procainamide then AV blocker
- Amiodarone, Sotalol

Narrow, Regular, Stable: Therapy

Adenosine: 6mg IV push rapid



Adenosine: 12 mg IV push rapid



Verapamil: 2mg/min at a dose of 5 to 10mg
(repeat to no more than a total of 20mg)



Alternatives: Diltiazem, Esmolol, Magnesium, Amiodarone,
Procainamide

Narrow, Regular, No P's

- AVNRT
- Atrial Flutter with consistent block (i.e. not variable block)
- Orthodromic WPW
- (zeldzaam) narrow complex VT

Narrow, Irregular, No P's

- Atrial fibrillation
- Atrial flutter with variable block

Narrow, Regular, UN-Stable: Therapy

- Overweeg adenosine
- Cardioversion
 - Start at 50J and double every time

Regular, Wide, Stable

“This is ventricular tachycardia
until proven otherwise”

Wide, Regular, No P Waves

- Ventricular tachycardia (VT)
- Supraventricular tachycardia with aberrancy (bundle branch block)
- Antidromic Wolf Parkinson White syndrome

Wide, Regular, Stable: Therapy

Unsure?

- **Adenosine** 6mg and repeat at 12 mg

VT most likely then:

- **Magnesium** 2-4 grams over 2-4 minutes
or
 - **Procainamide** 17 mg/kg slow IV
or
- **Amiodarone** 150 mg IV over 10 minutes

Conversion: What Agents ?

- Sotalol
- Flecainide
- Amiodarone
- Propafenone
- Ibutilide
- Procainamide
- Quinidine
- Cardioversion

EMEDU



aVR

V1

V4



aVL

V2

V6



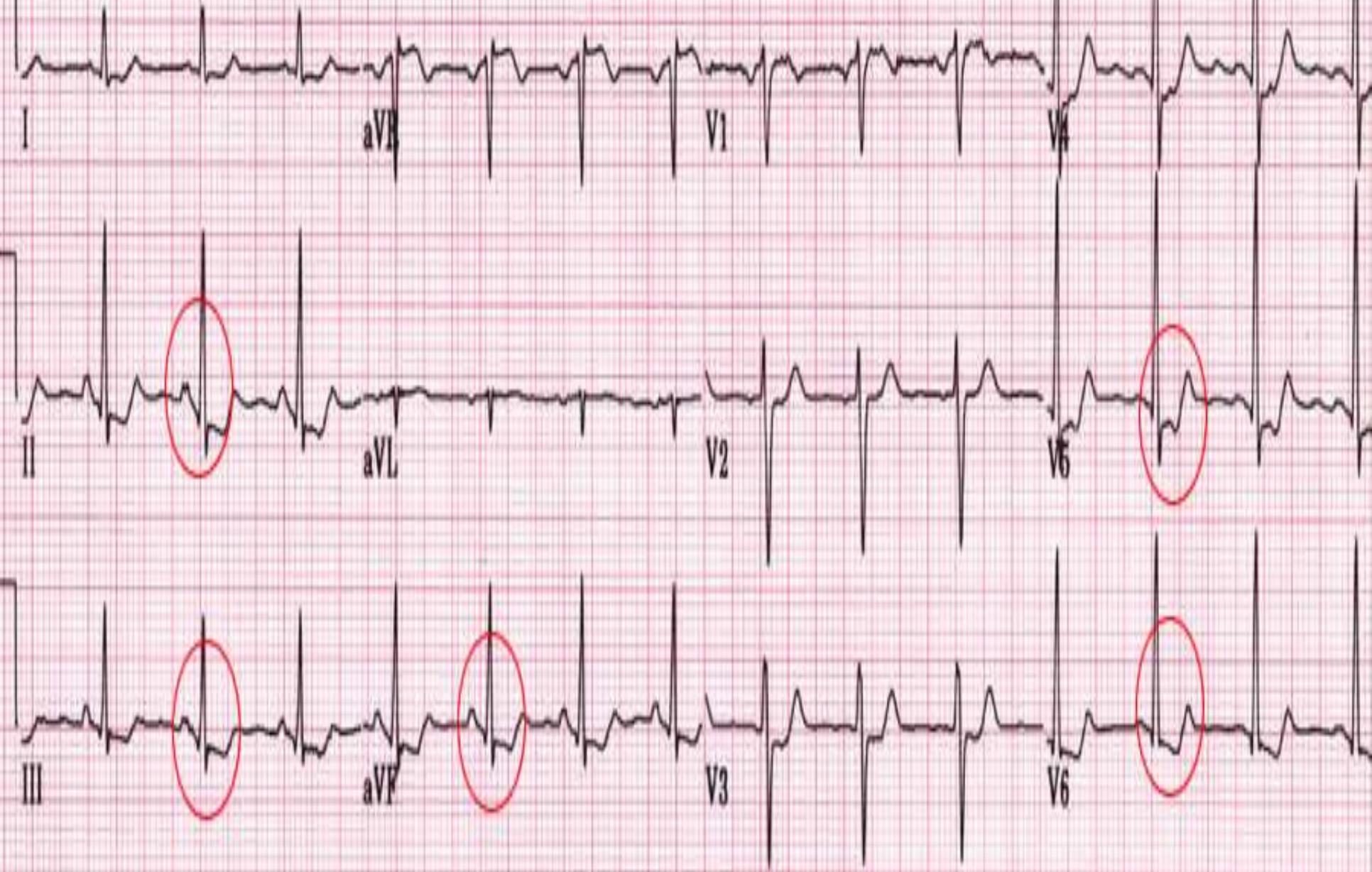
aVF

V3

V6

EMEDU

ST-Twave changes consistent with inferior and lateral ischemia



EMEDU



EMEDU

Long QT interval



Long QT interval QT: 536 QTc: 569

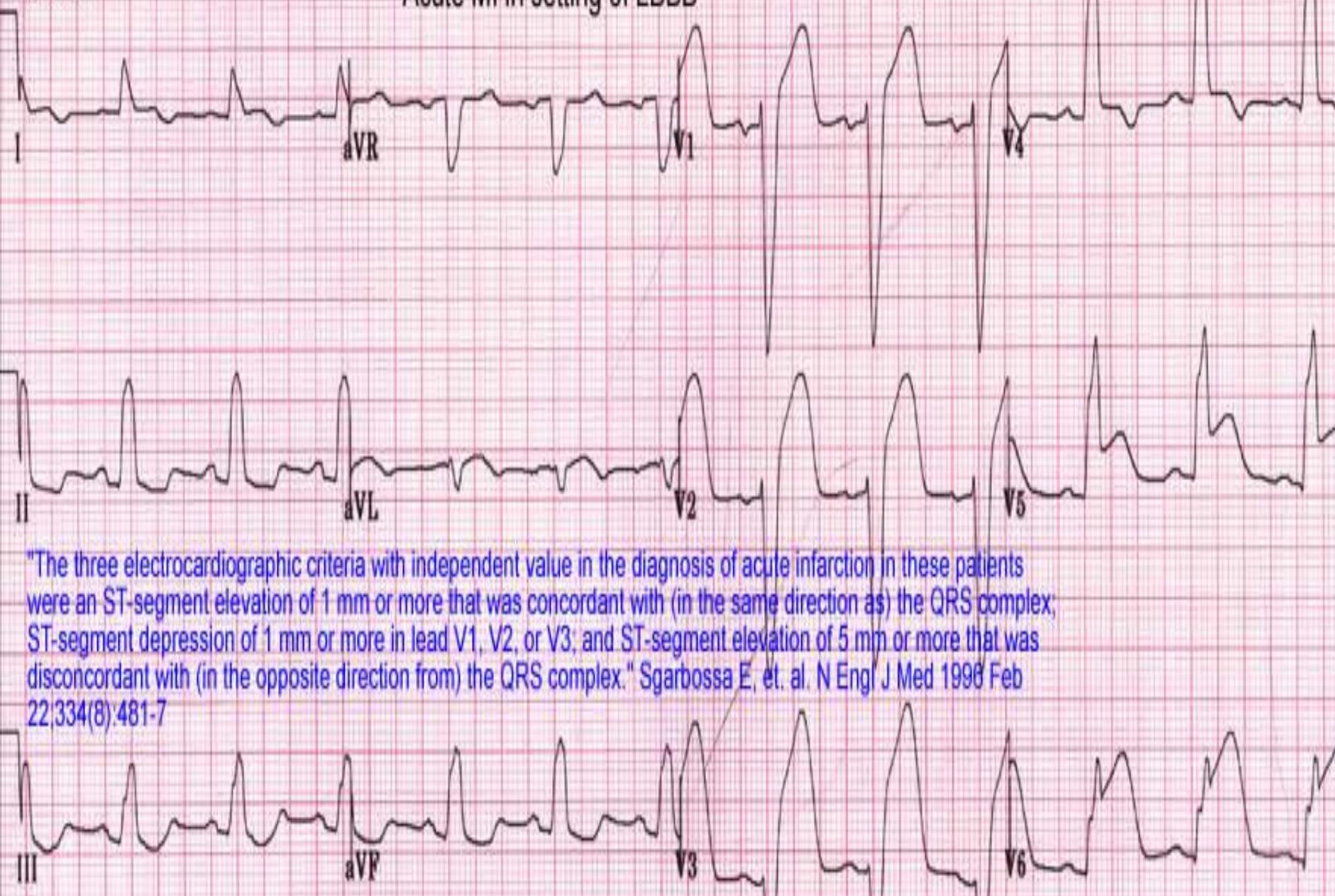


EMEDU



EMEDU

Acute MI in setting of LBBB



"The three electrocardiographic criteria with independent value in the diagnosis of acute infarction in these patients were an ST-segment elevation of 1 mm or more that was concordant with (in the same direction as) the QRS complex, ST-segment depression of 1 mm or more in lead V1, V2, or V3; and ST-segment elevation of 5 mm or more that was discordant with (in the opposite direction from) the QRS complex." Sgarbossa E, et. al. N Engl J Med 1998 Feb 22;334(8):481-7