

The Terrible T-Waves!

The image shows a close-up of an ECG tracing on a standard grid. The central focus is a single lead that exhibits a very tall, narrow, and peaked T wave, which is a classic sign of hyperkalemia. The rest of the tracing is slightly out of focus, showing other leads with varying waveforms.

Russ Brown NRP



No Disclosures

Objectives:

- **Learn the difference between primary and secondary T-wave inversion**
- **Identify T-waves of acute coronary occlusion**
- **Identify the signs of impending occlusion and Wellens T-waves**
- **Identify the signs of pulmonary embolism on the ECG**
- **Learn the difference between ischemic T-waves of coronary occlusion and benign T-wave inversion.**
- **Identify T-wave abnormalities of HOCM**



MAKE A *Difference*



The background of the image is a blue-toned ECG (heart rate) tracing on a grid. The tracing shows several cardiac cycles with visible P waves, QRS complexes, and T waves. The text labels are overlaid on this background.

Hyperkalemia

RVH or LVH

Juvenile T-wave inversion

Acute Coronary syndromes

Pulmonary Embolism

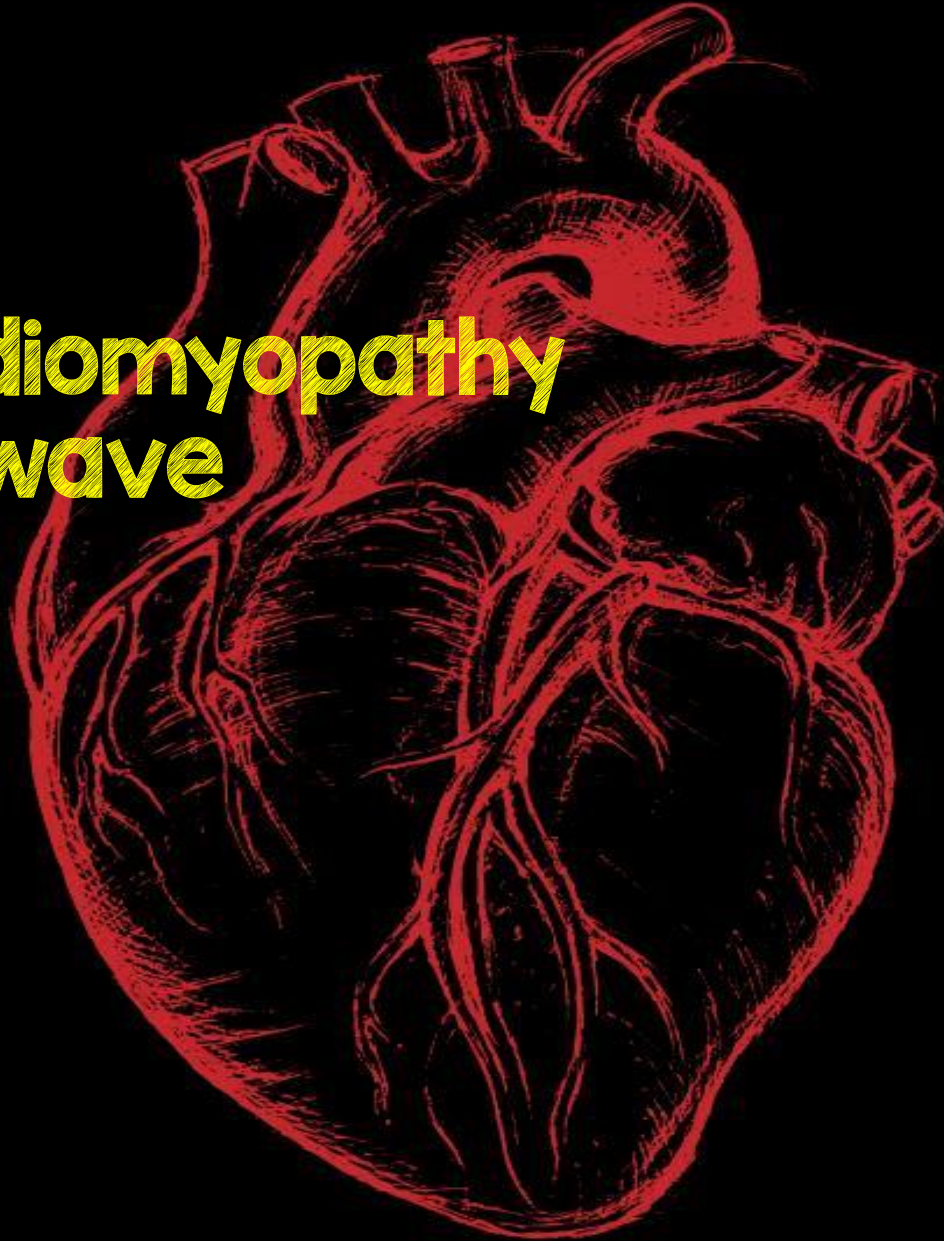
WPW

HOCM

Bundle Branch blocks

Primary

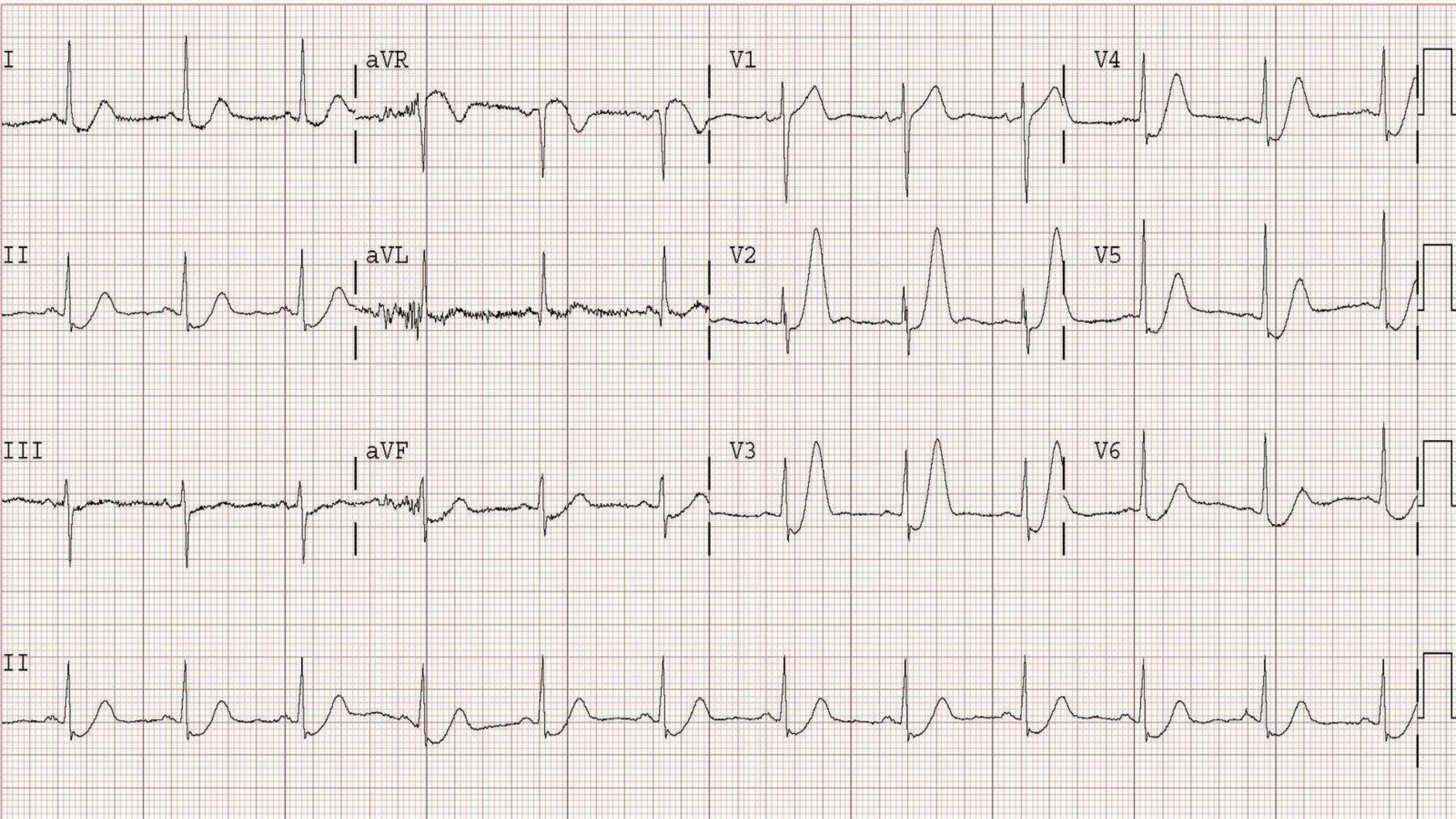
- ACS
- PE
- Stress Cardiomyopathy
- Juvenile T-wave syndrome



Secondary

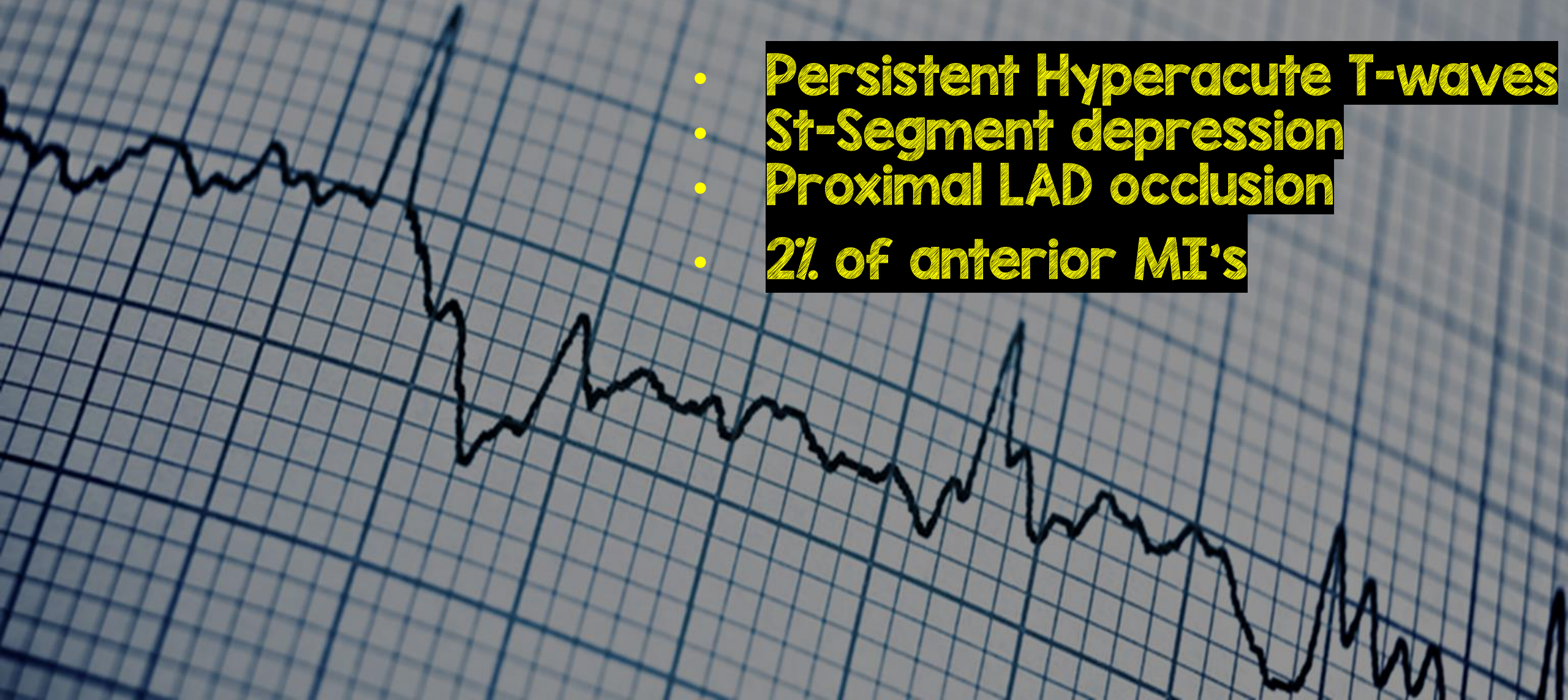
- BBB
- RVH
- LVH
- WPW

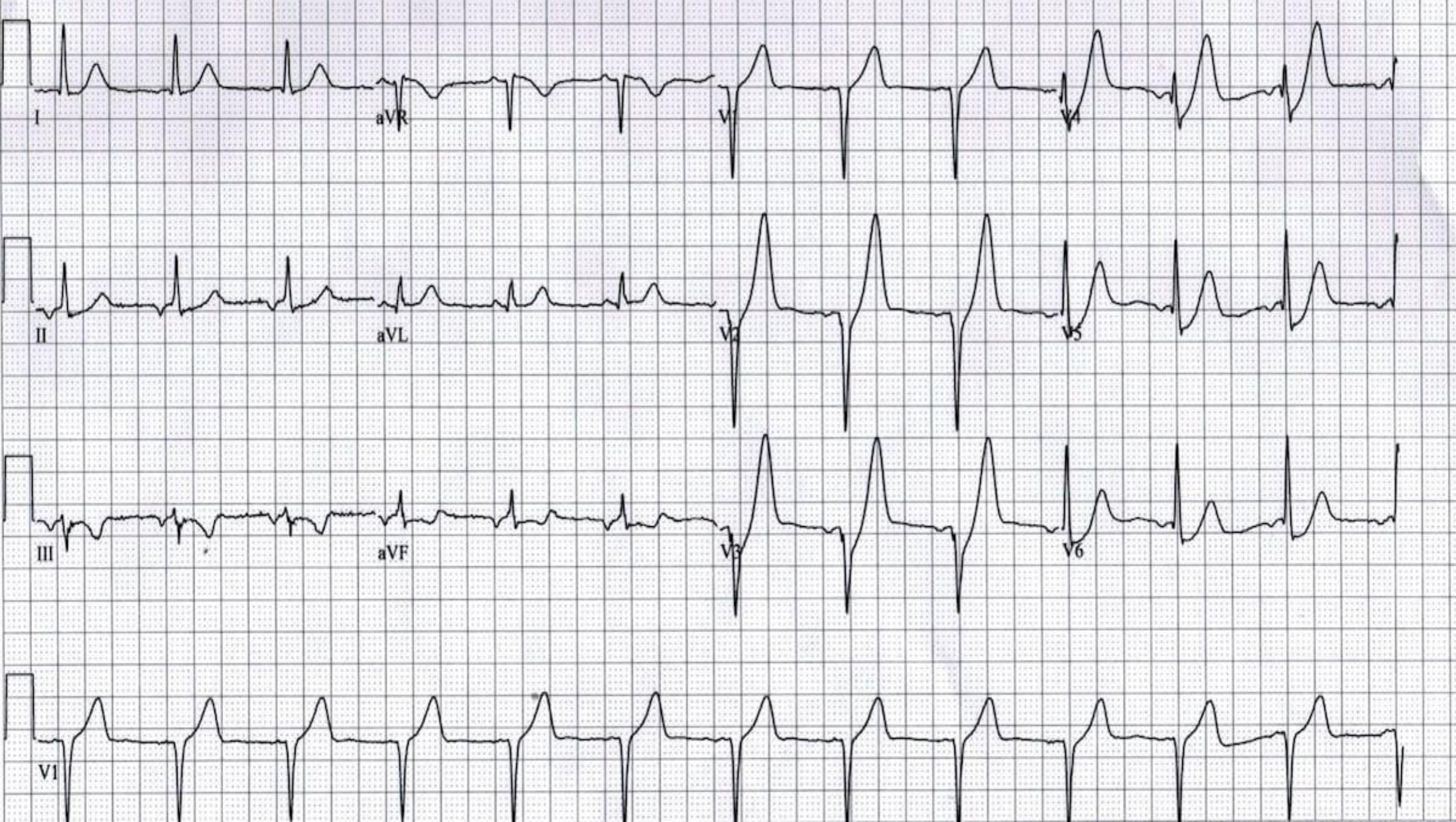




De Winters T-Waves

- Persistent Hyperacute T-waves
- ST-Segment depression
- Proximal LAD occlusion
- 2% of anterior MI's





Rate 74
PR 166
QRSd 110
QT 427
QTc 474

• Sinus rhythm
• Repol abnrm, severe global ischemia (LM/MVD)
• Tall T, consider metabolic/ischemic abnrm
• >>> Acute Ischemia <<<

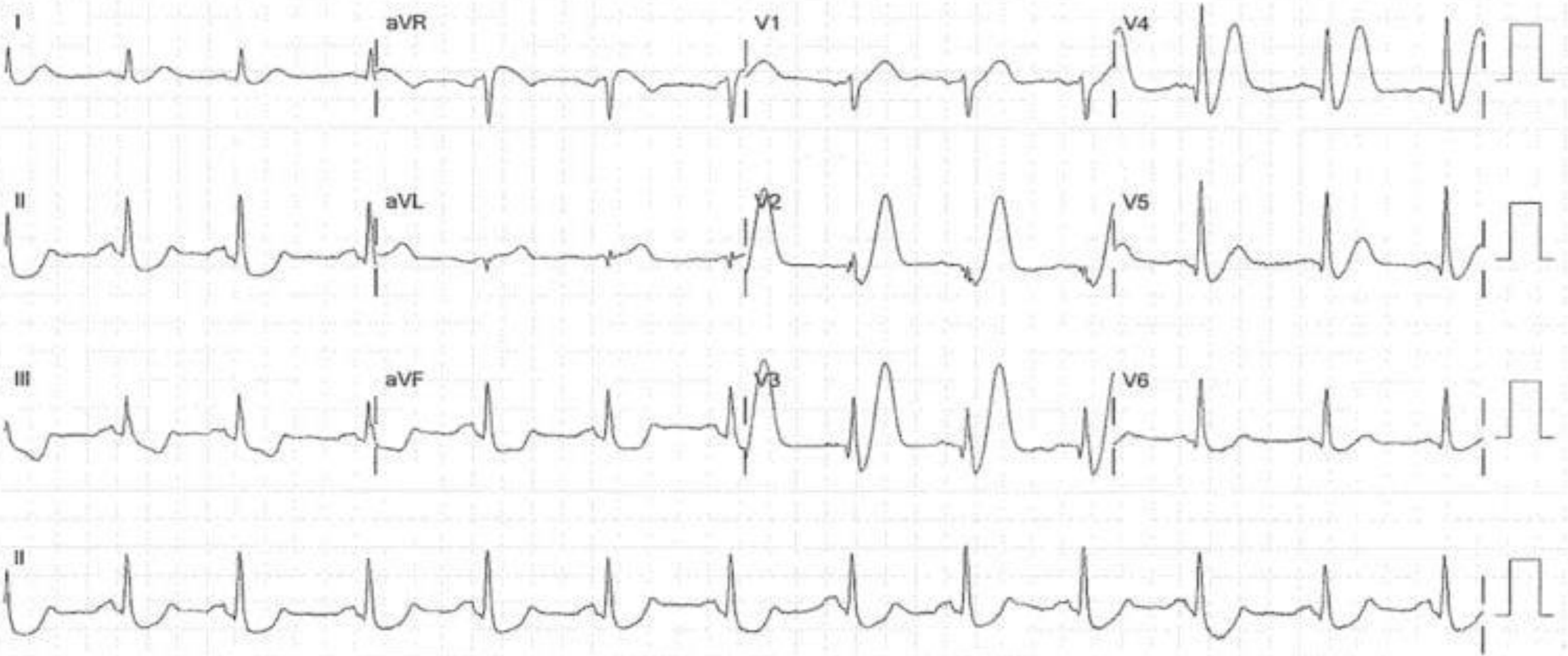
normal P axis, V-rate 50- 99
STe aVR, STd & Tneg, ant/lat/inf
T >1.2mV

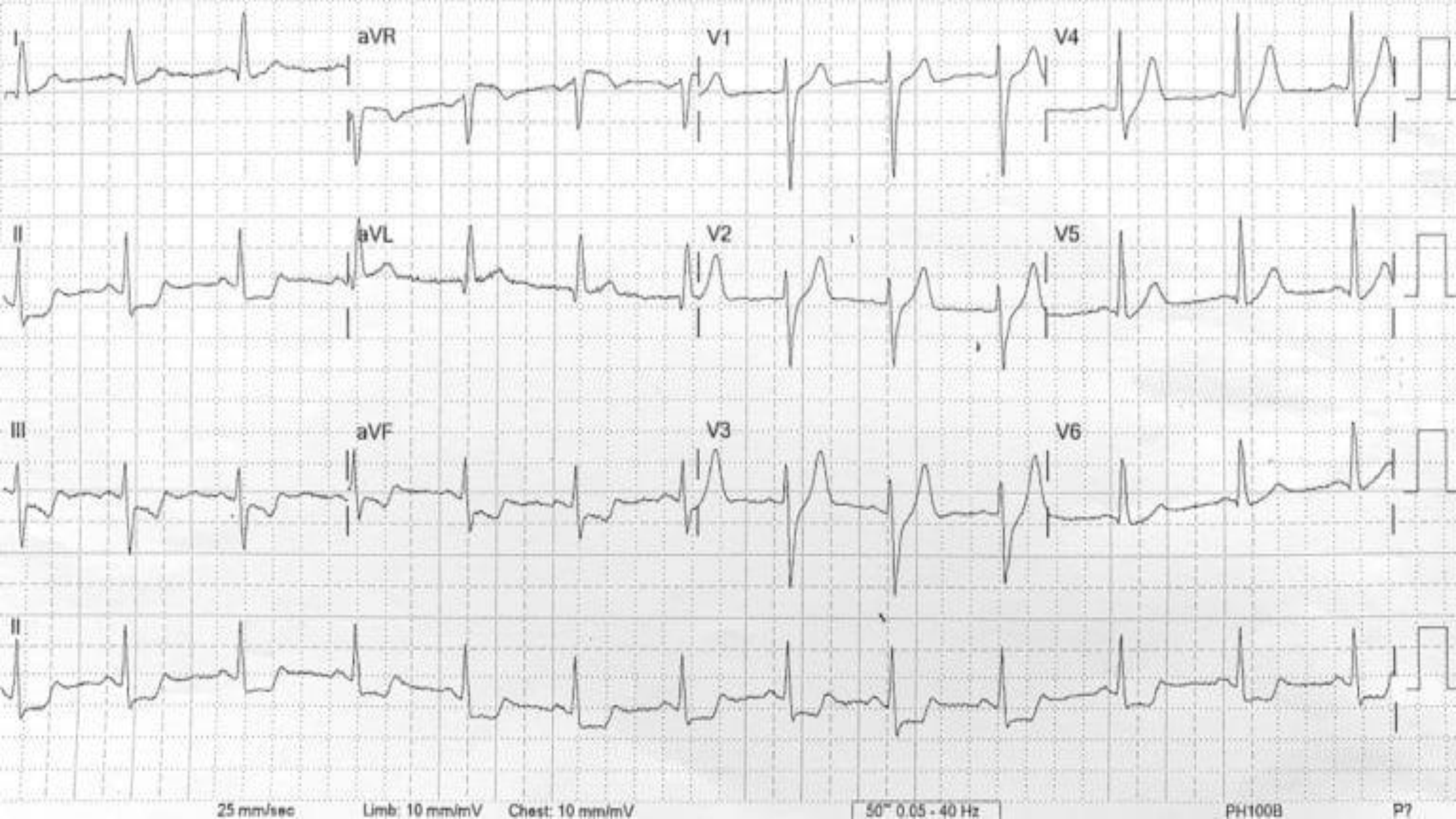
Requested by:

Axes
P 77
QRS 66
T -61

- ABNORMAL ECG -

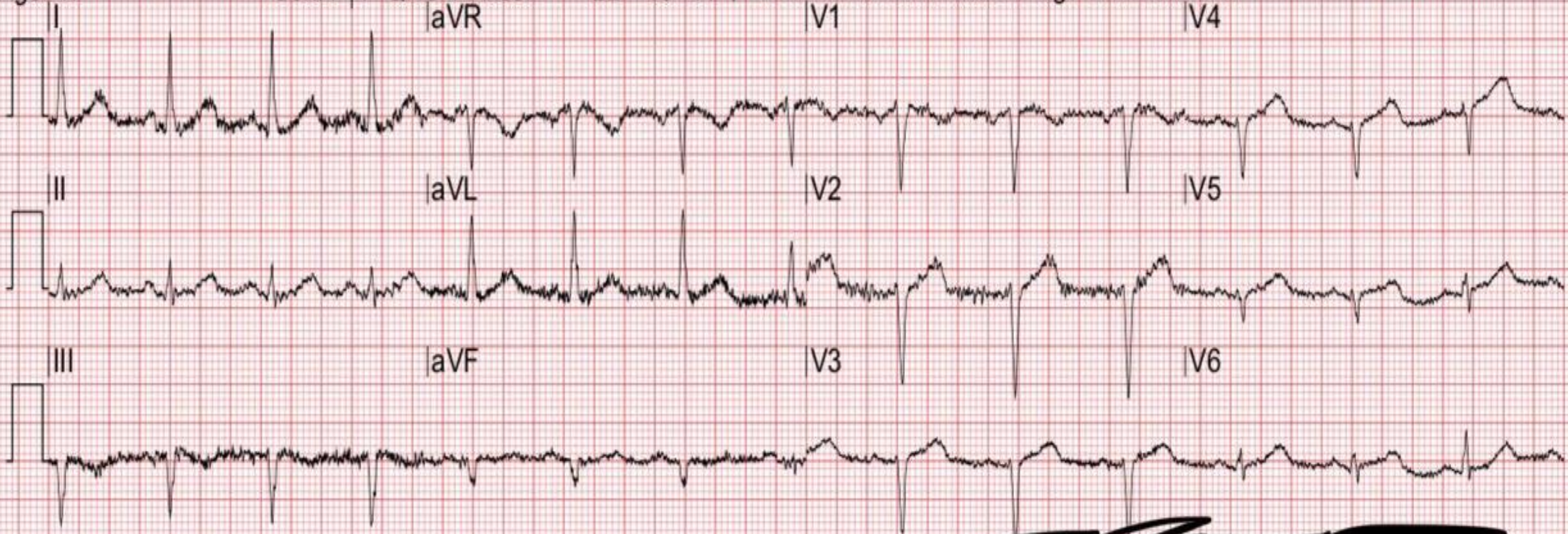
Unconfirmed diagnosis







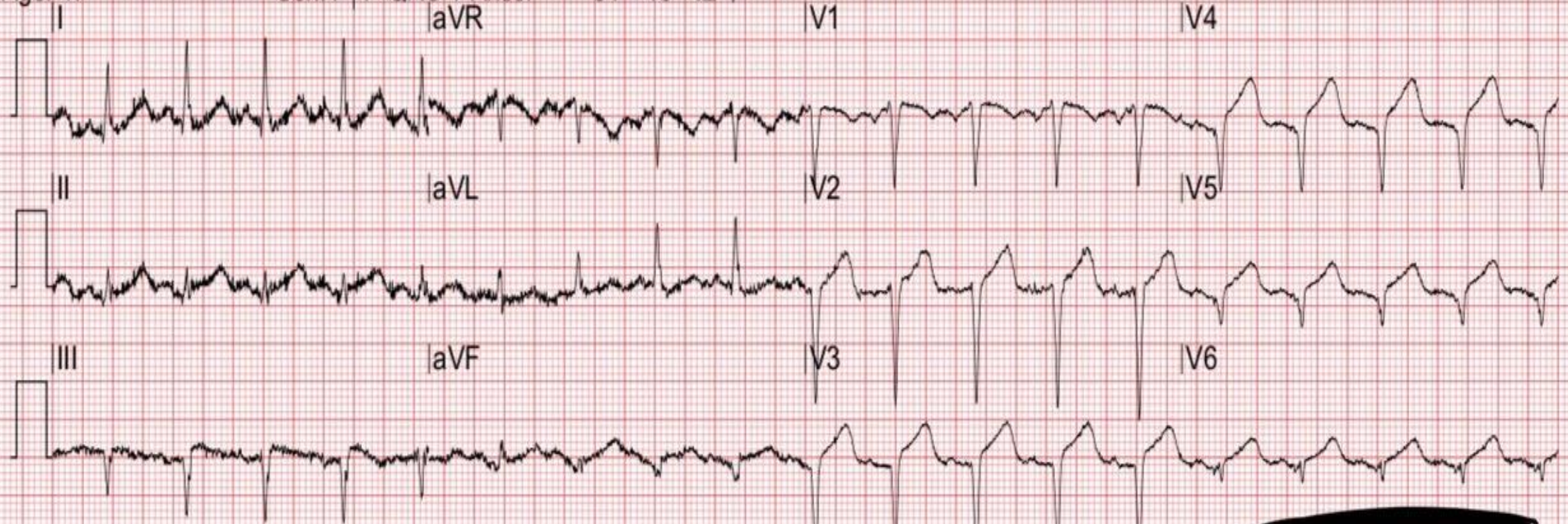
Name: ~~XXXXXXXXXX~~ 12-Lead 2 HR 84bpm • Abnormal ECG **Unconfirmed**
ID: ~~XXXXXXXXXX~~ 7/11/2019 15:37:07 • Sinus rhythm
Patient ID: ~~XXXXXXXXXX~~ PR 0.142s QRS 0.100s • Possible left atrial abnormality
Incident ID: QT/QTc: 0.406s/0.448s • Inferior infarct - age undetermined
Age: 47 Sex: F P-QRS-T Axes: 22° -18° 11° • Possible anterior infarct - age undetermined



x1.0 .05-150Hz 25mm/sec
Physio-Control, Inc. Comments:

~~XXXXXXXXXX~~ 46735


Name:	12-Lead 3	HR 113bpm	• Abnormal ECG **Unconfirmed**
ID:	7/11/2019	15:48:26	• *** MEETS ST ELEVATION MI CRITERIA ***
Patient ID:	PR 0.144s	QRS 0.086s	• Sinus tachycardia
Incident ID:	QT/QTc:	0.354s/0.446s	• EXTENSIVE INFARCT - POSSIBLY ACUTE
Age: 47	Sex: F	P-QRS-T Axes:	31° -15° 42°



x1.0 .05-150Hz 25mm/sec

Physio-Control, Inc. Comments:

[REDACTED] 16735



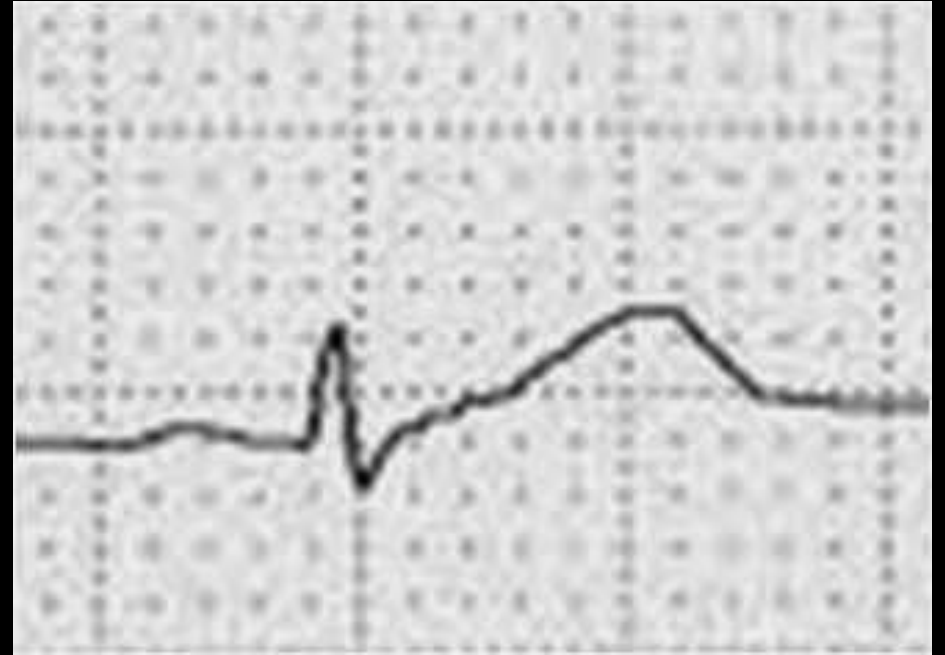
Size

Does

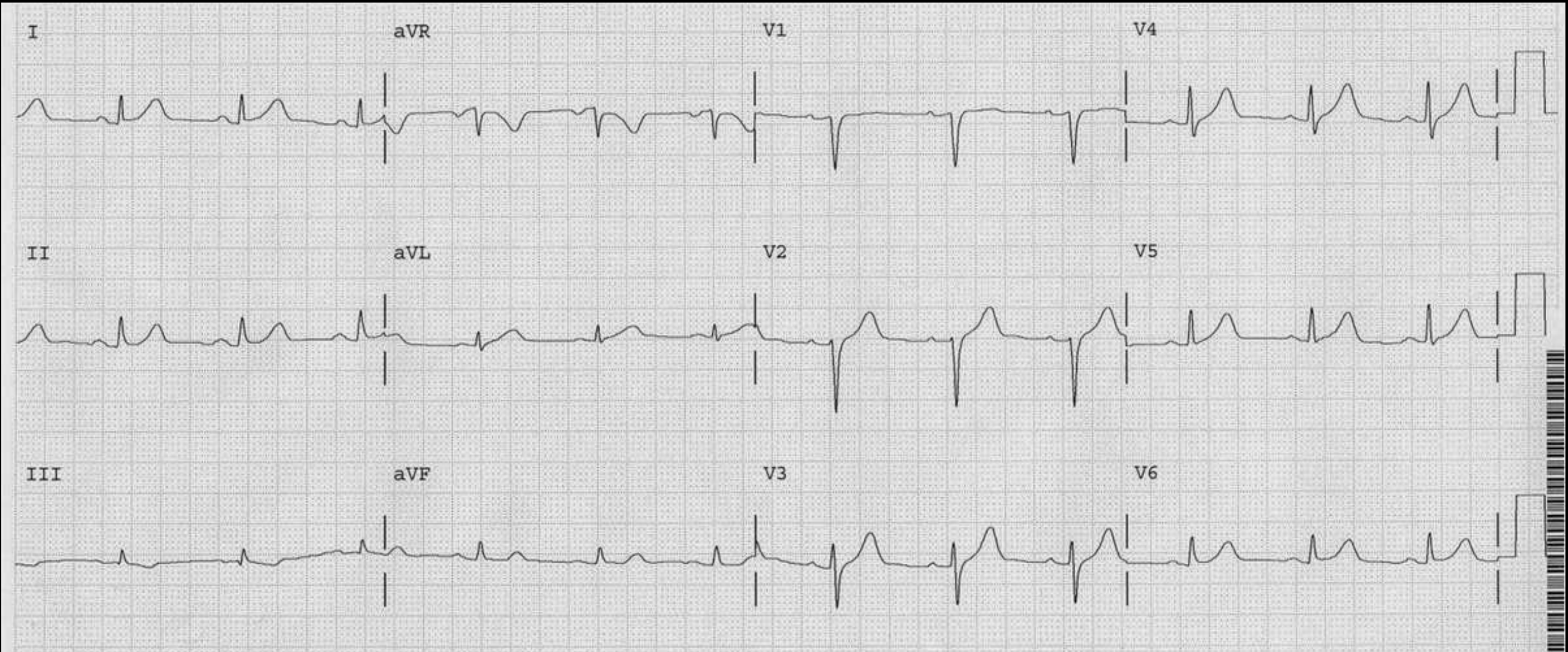
Matter

When the T-wave towers over the QRS be afraid!

**Always consider the
height
of the T-wave to QRS**



45y/o male with burning in his epigastrium



ECG courtesy of
Steve Smith

I

aVR

V1

V4



II

aVL

V2

V5



III

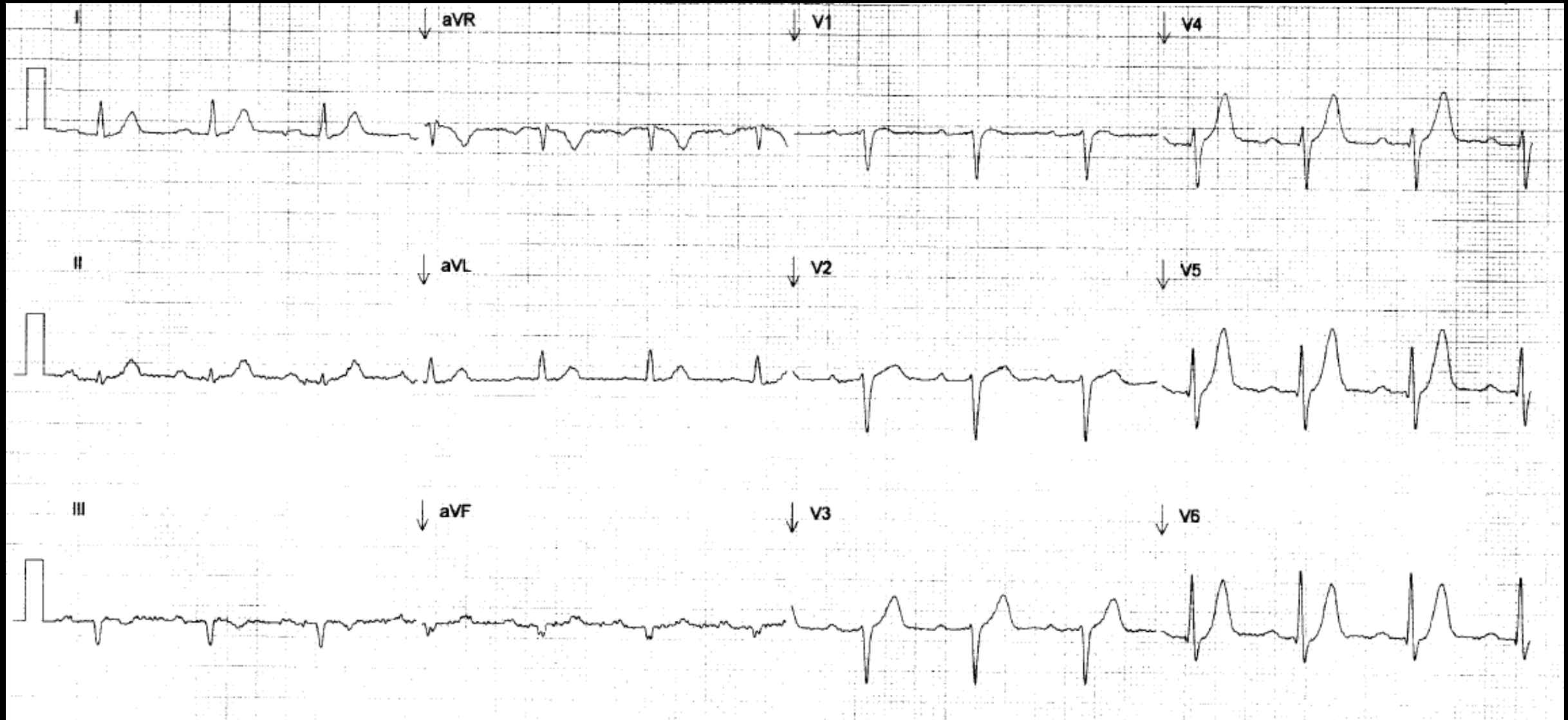
aVF

V3

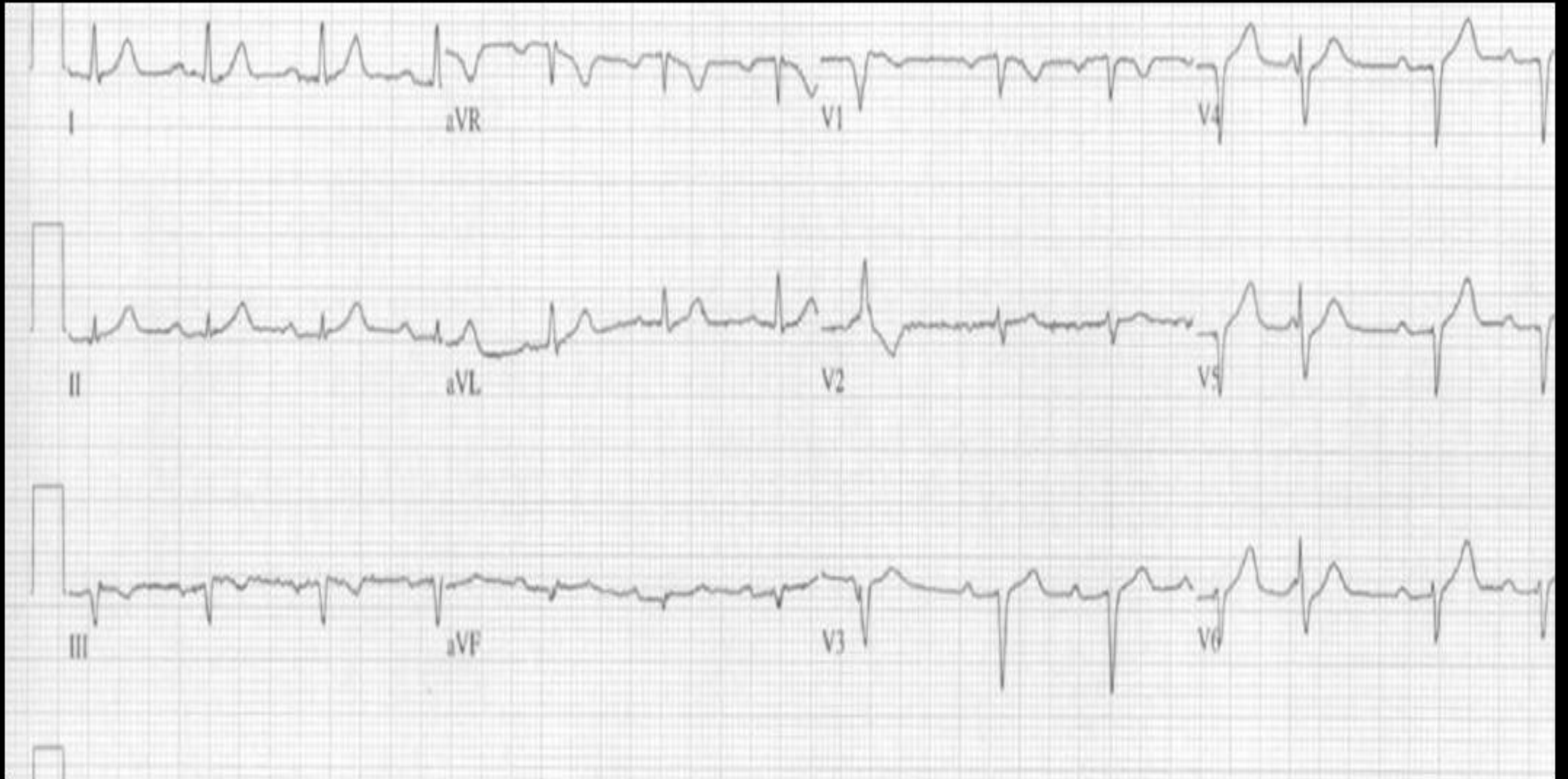
V6



Elderly male with chest pain



2.5 hours later!



13 hours later



100% proximal LAD occlusion

Name:

Record ID:

Patient ID:

Incident:

Age: 62

[REDACTED]

12-Lead 2

08 Apr 17

PR 0.138s

QT/QTc

Sex: M P-QRS-T Axes

HR 74 bpm

10:33:21

QRS 0.100s

0.358s/0.382s

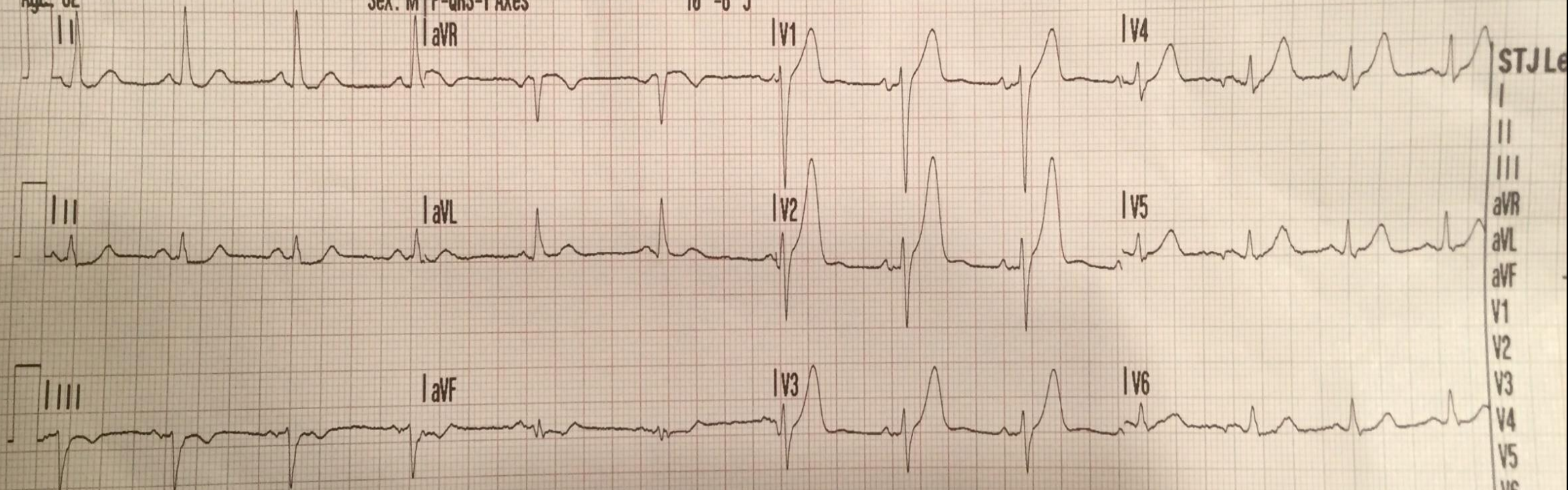
10° -8° 5°

Abnormal ECG ****Unconfirmed****

• Sinus rhythm

• Inferior/lateral ST-T abnormality may

be due to myocardial ischemia



v1 0 05-10Hz 25mm/sec

[REDACTED] 005 000000-007 2LB55R0482000R LP1541116735

Name:

12-Lead 1

• ECG override: Data quality prohibits

Record ID:

██████████ 08 Apr 17

10:27:13

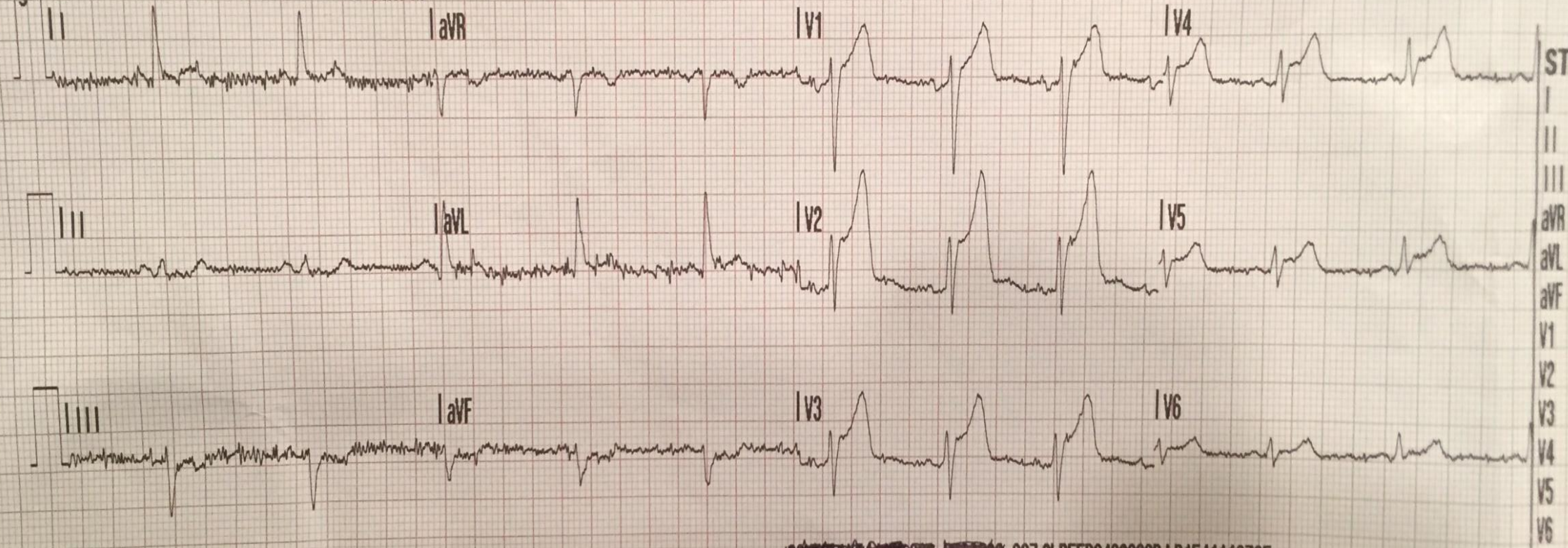
interpretation

Patient ID:

Incident:

Age: 62

Sex: M

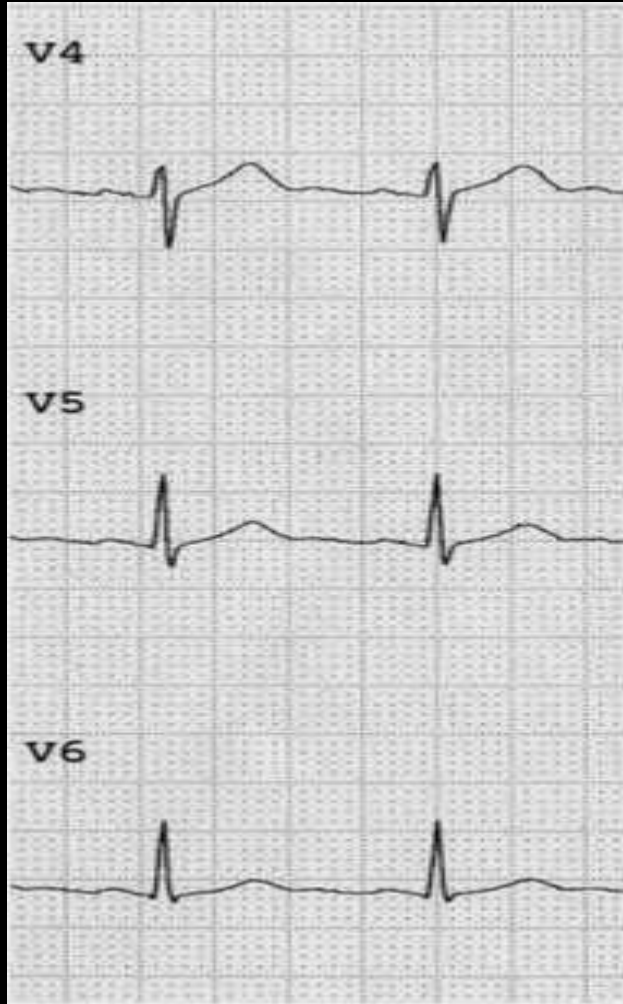


ST
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6

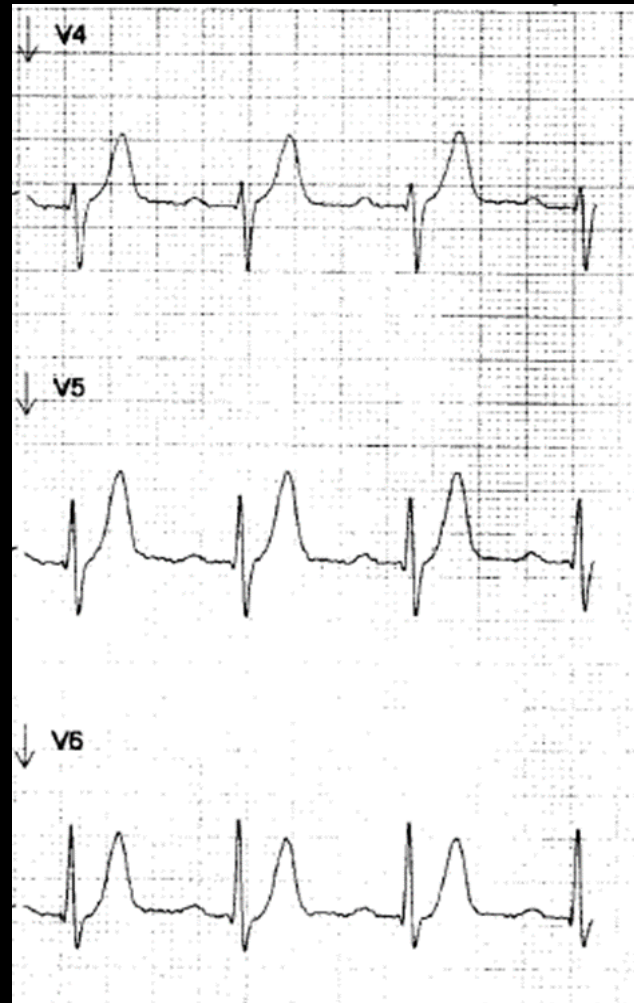
x1.0 .05-40Hz 25mm/sec

██████████ 007 2LB55R0482800R LP1541116735

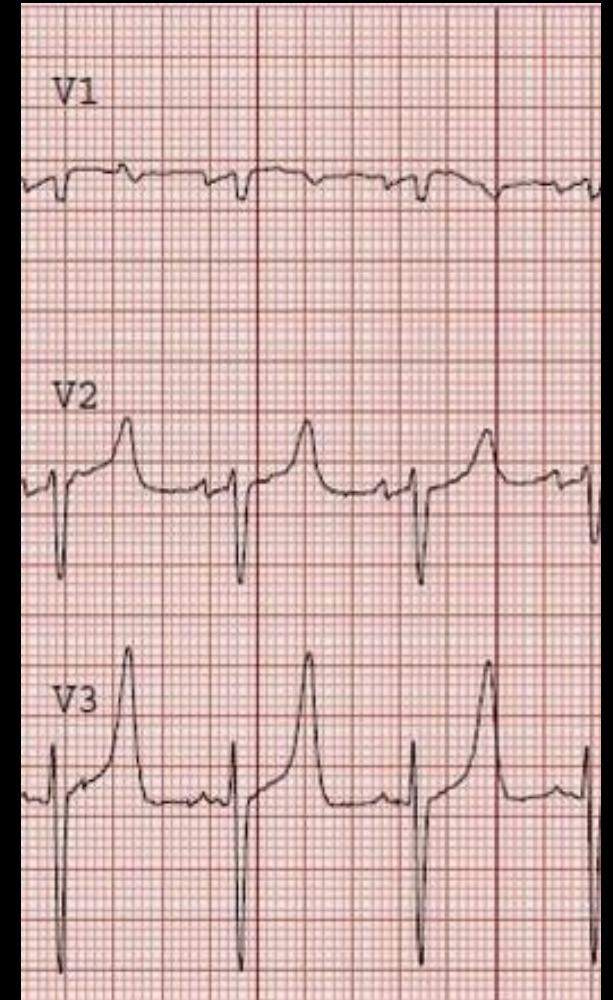
Normal

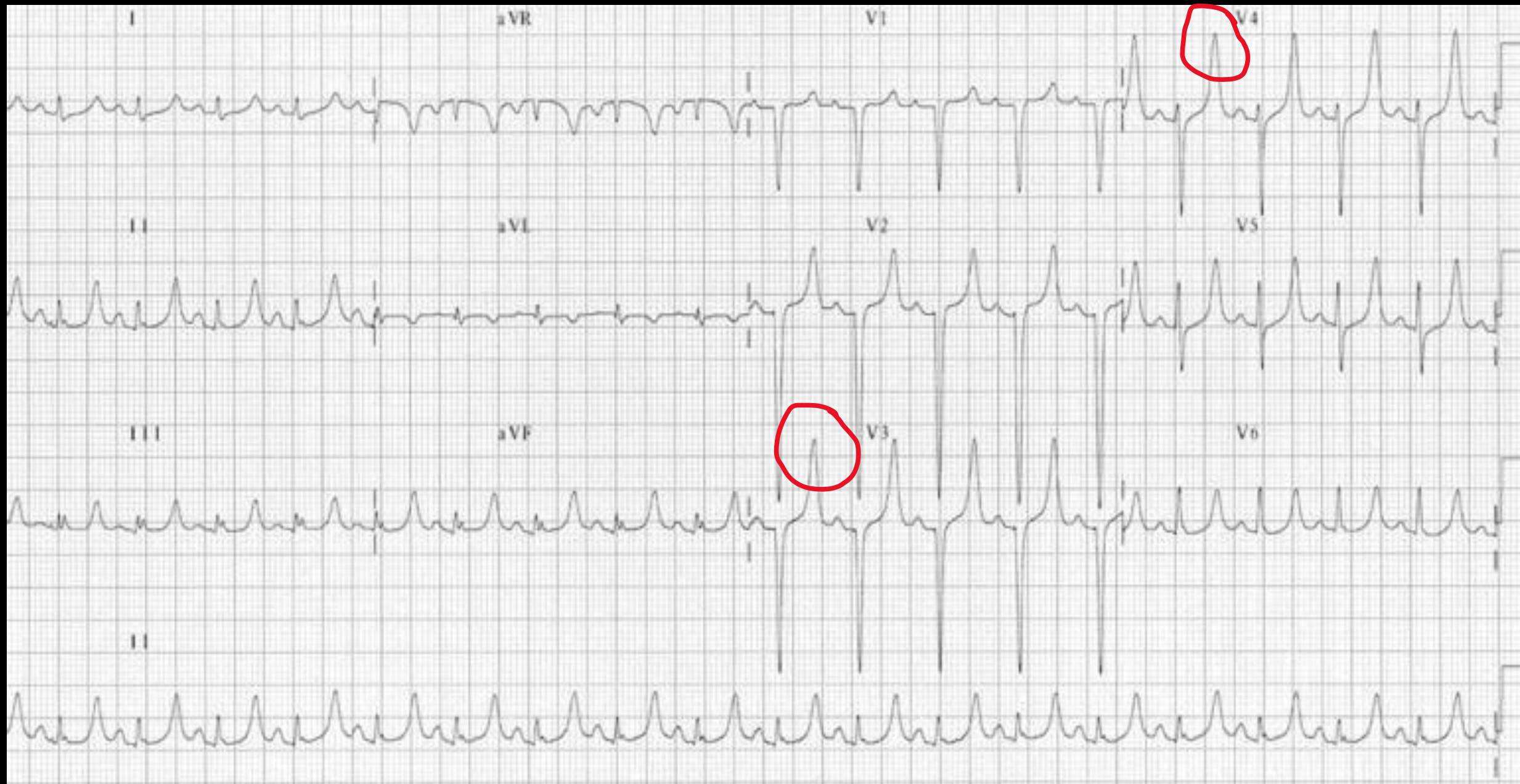


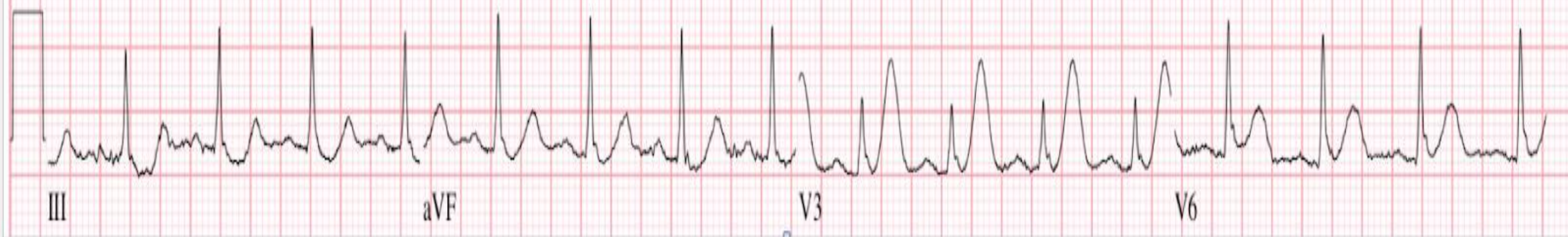
Badness

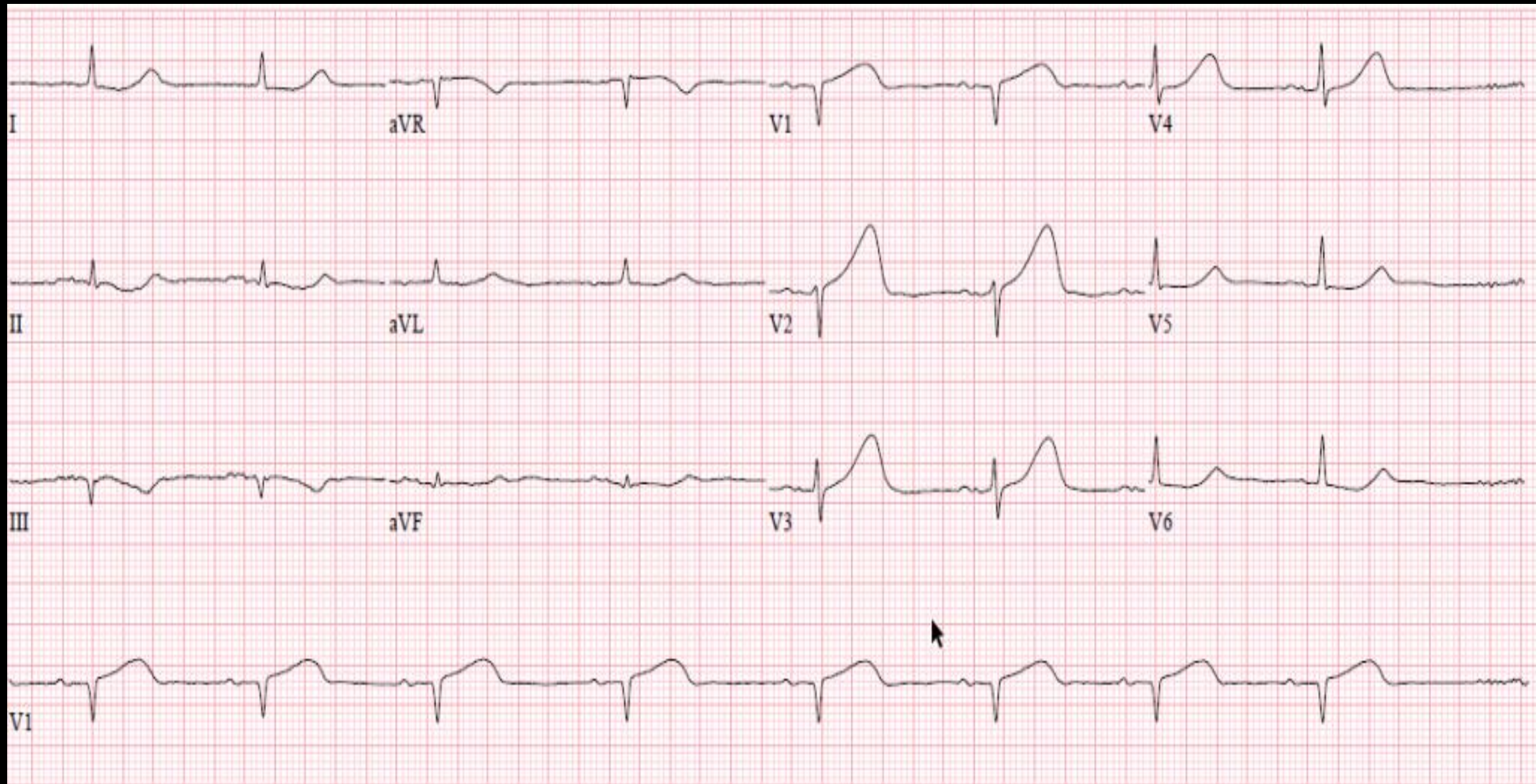


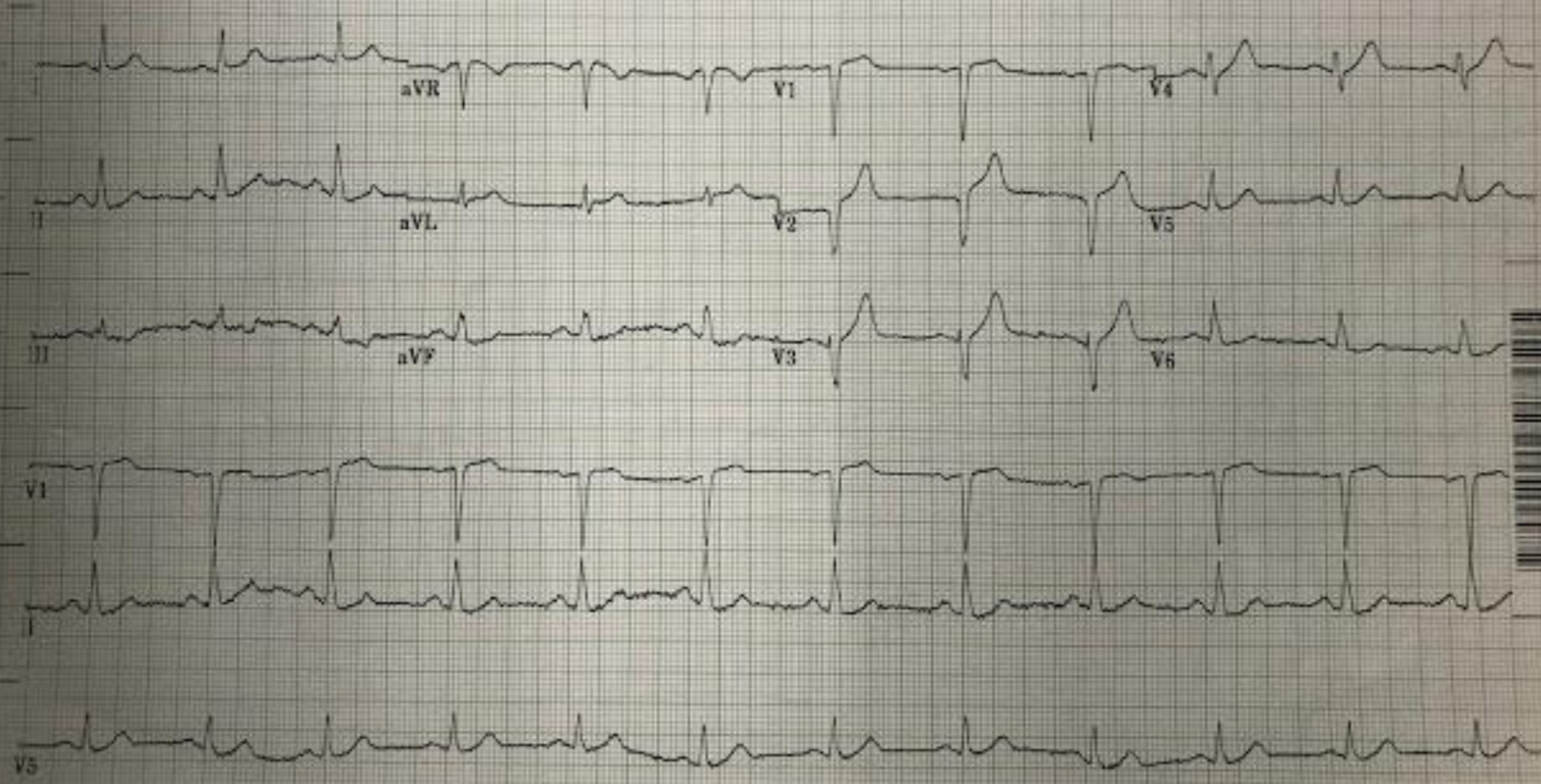
Hyper K









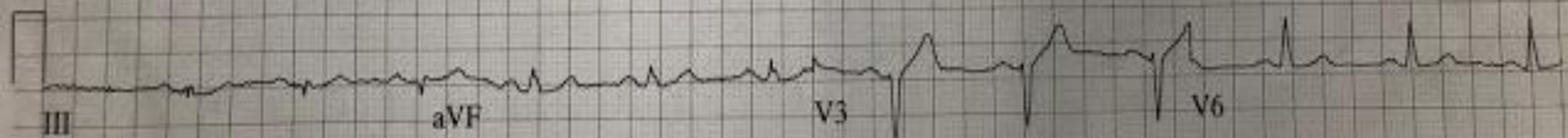
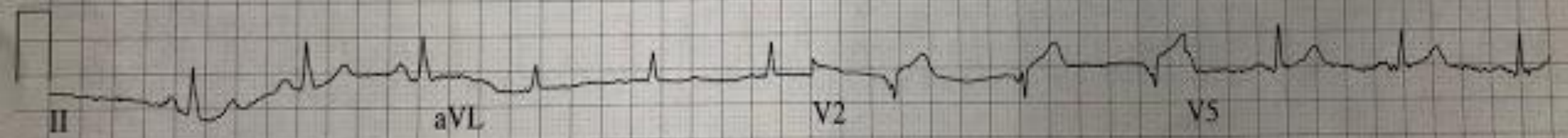
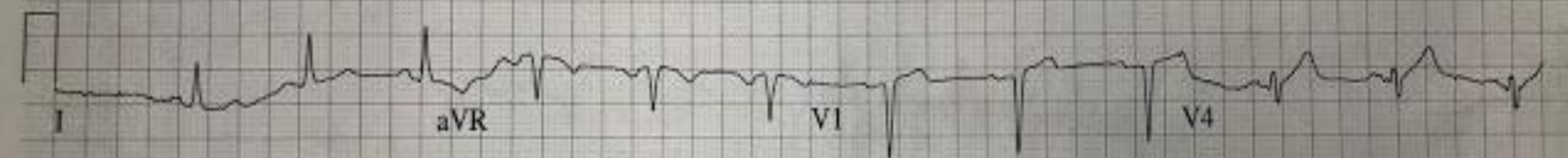


150 Hz 25.0 mm/s 10.0 mm/mV

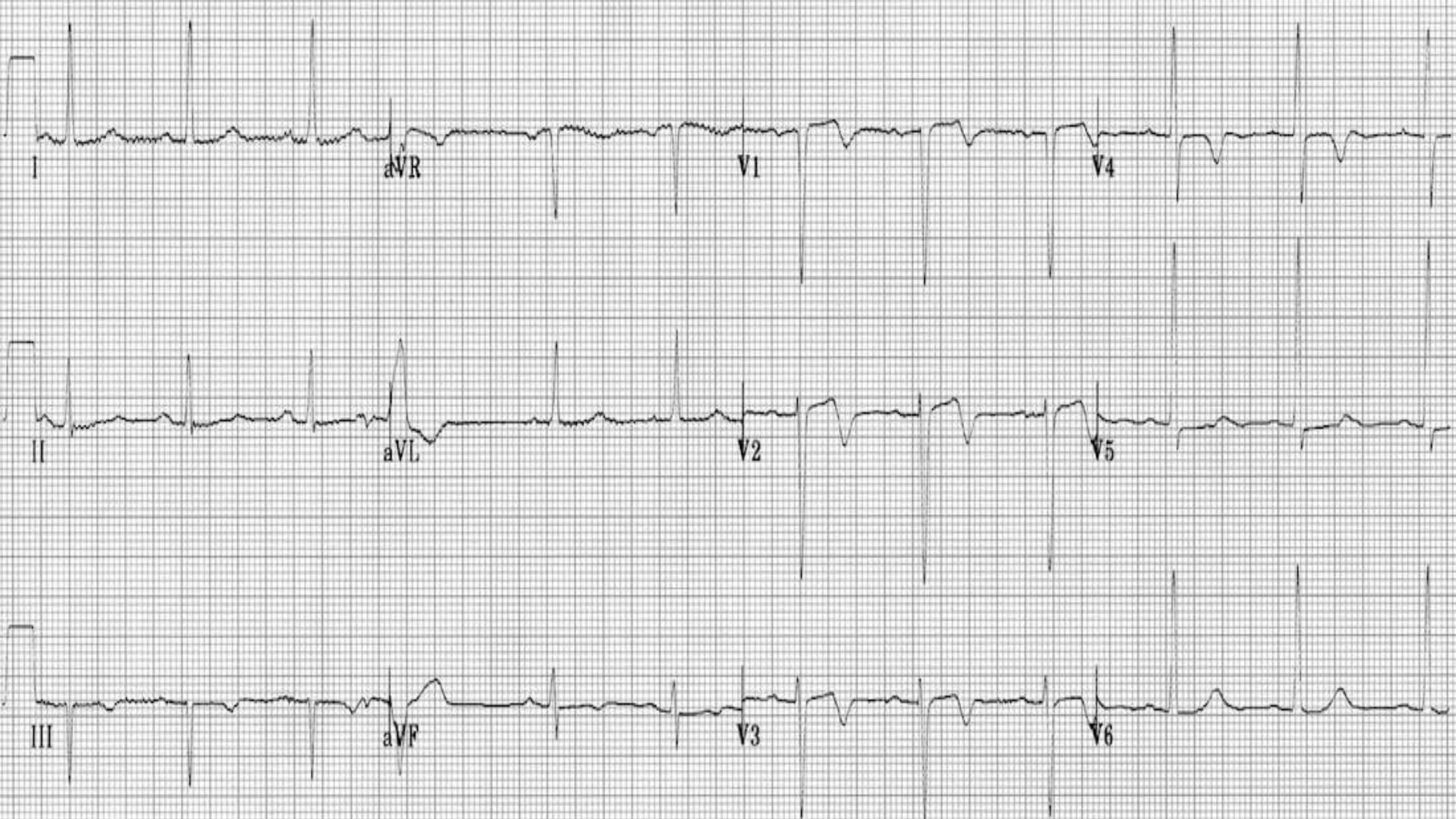
4 by 25s + 3 rhythm lds

MACBEE 020A

5 1981™ 043

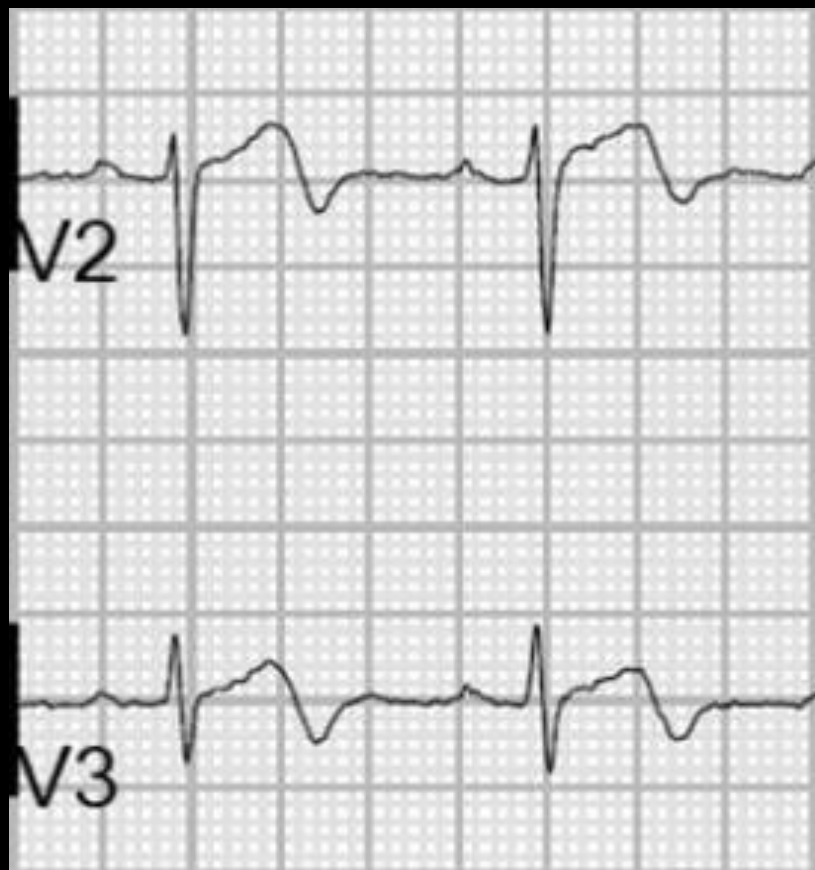




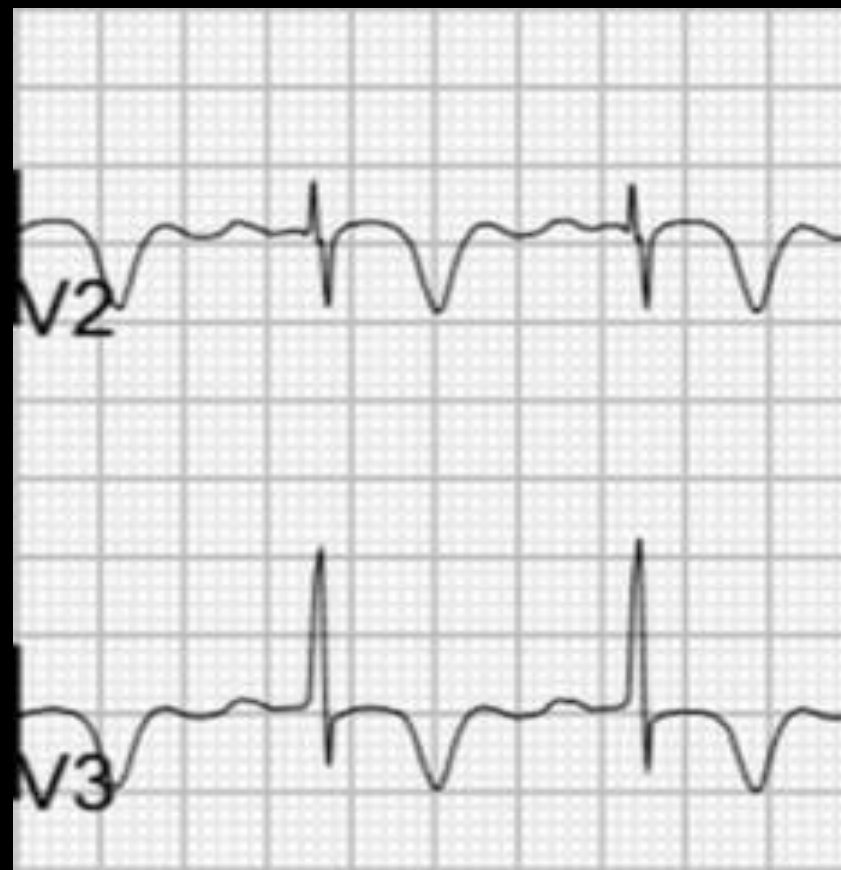


Wellens syndrome

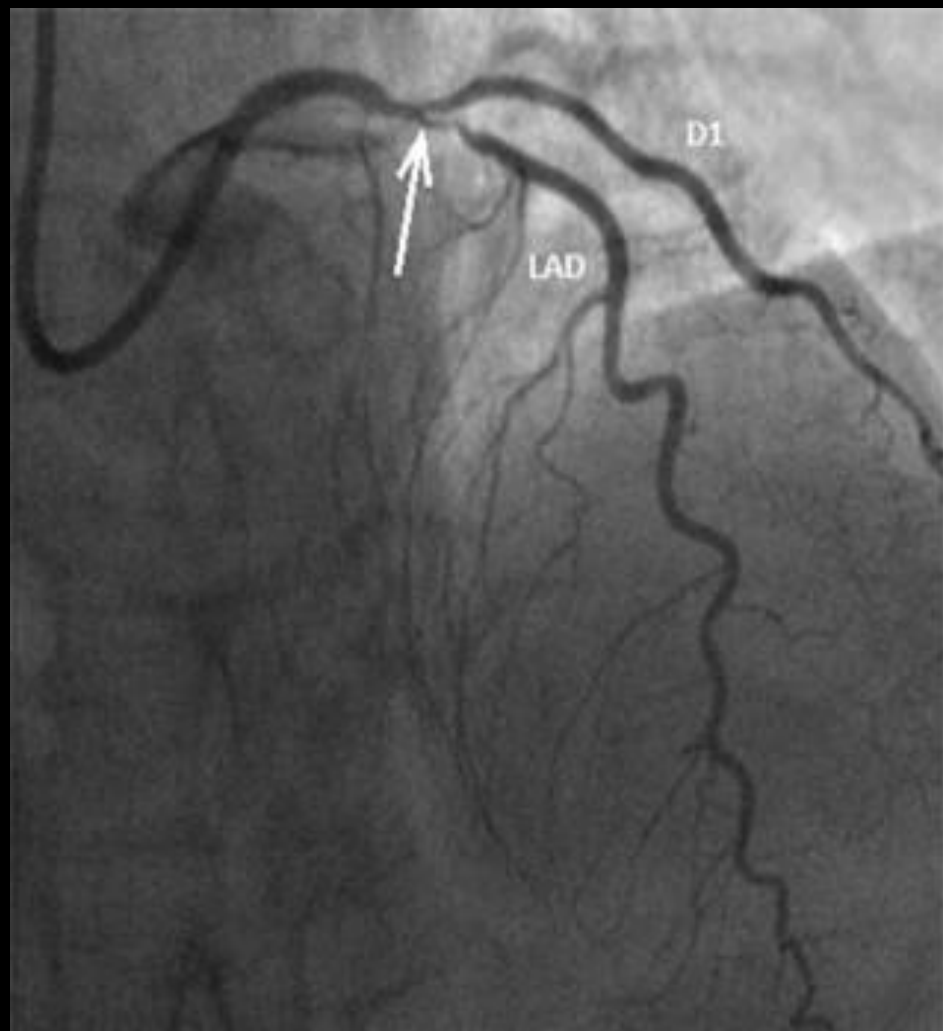
Type A



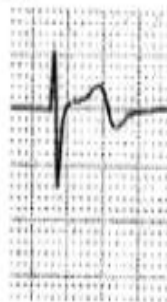
Type B







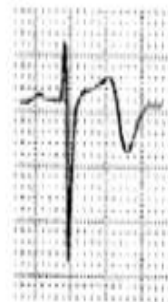
A



Terminal T-wave
inversion

Pattern A

B



Later Terminal
T-wave inversion

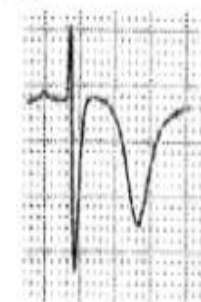
Pattern A

C



Later still

D

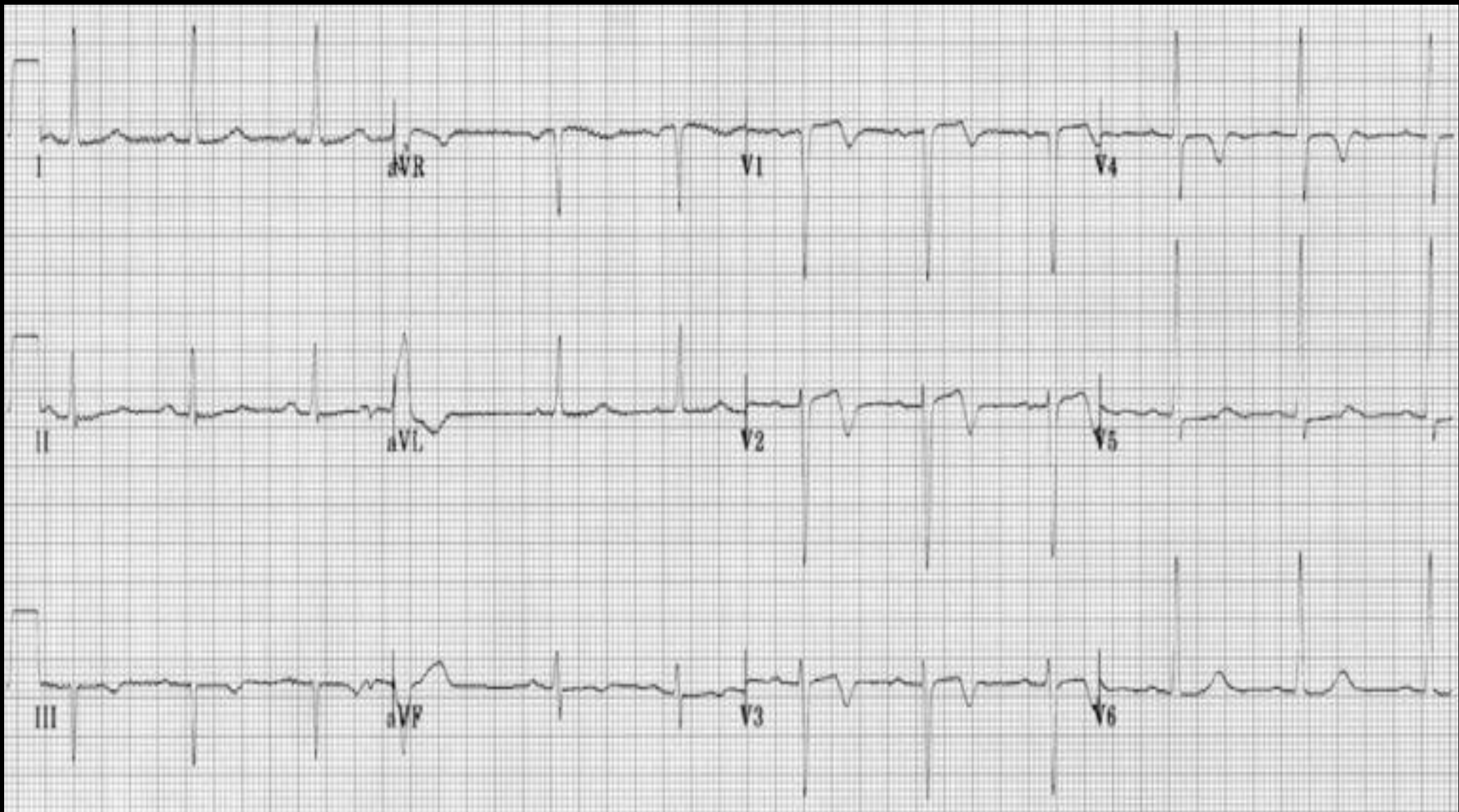


Later: Symmetric
T-wave inversion

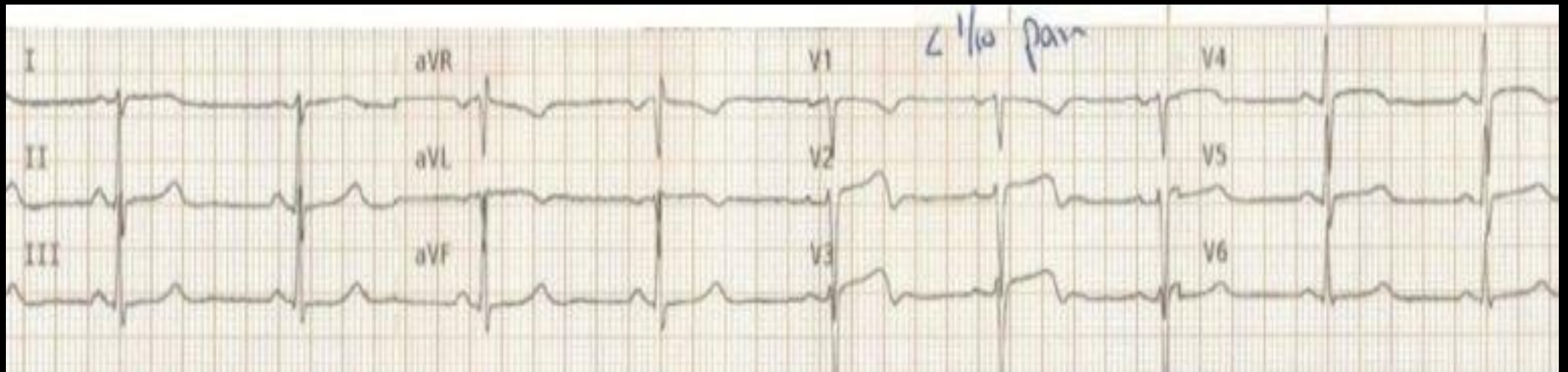
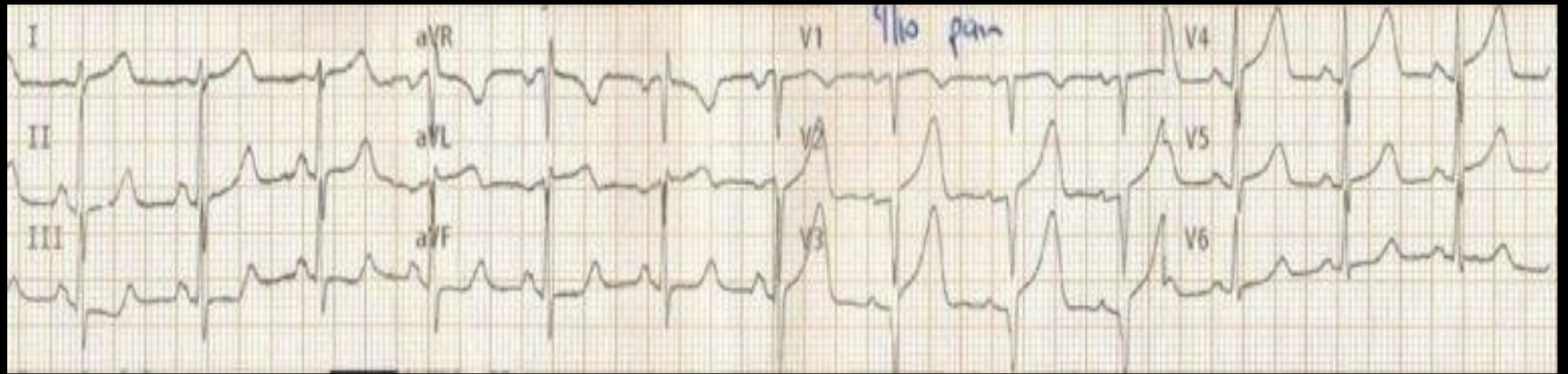
Pattern B

Fig. 19. Evolution of T-wave inversion (A–D) after coronary reperfusion in STEMI reperfusion and in Wellens syndrome (NSTEMI). Reprinted with permission from Smith SW, Zvosec DL, Sharkey SW, Henry TD. The ECG in acute MI: an evidence-based manual of reperfusion therapy. 1st edition. Philadelphia: Lippincott, Williams, and Wilkins: 2002. p. 358.











The background of the image is a blue-toned ECG (heart rate) tracing on a grid. The tracing shows a regular rhythm with a rate of approximately 100-110 bpm. The P waves are upright and narrow, followed by a narrow QRS complex. The ST segment is slightly elevated, and the T waves are upright and narrow. The overall appearance is consistent with sinus tachycardia.

Pulmonary embolism

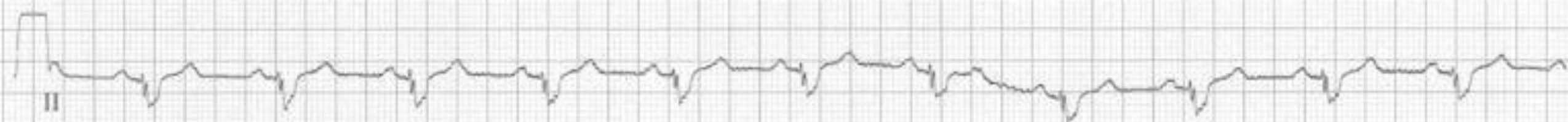
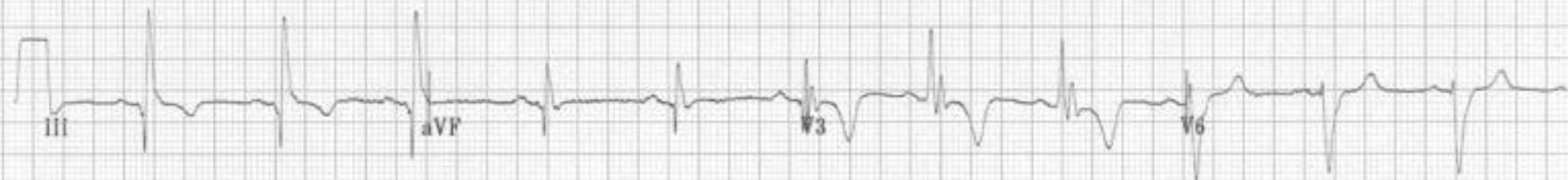
SIQ3T3

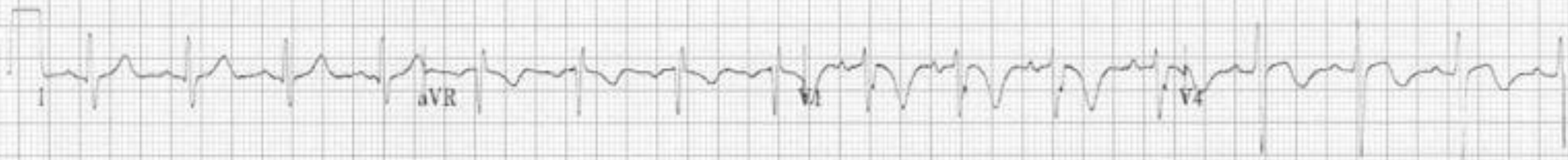
Sinus Tachycardia

RBBB or incomplete

Right ventricular strain pattern

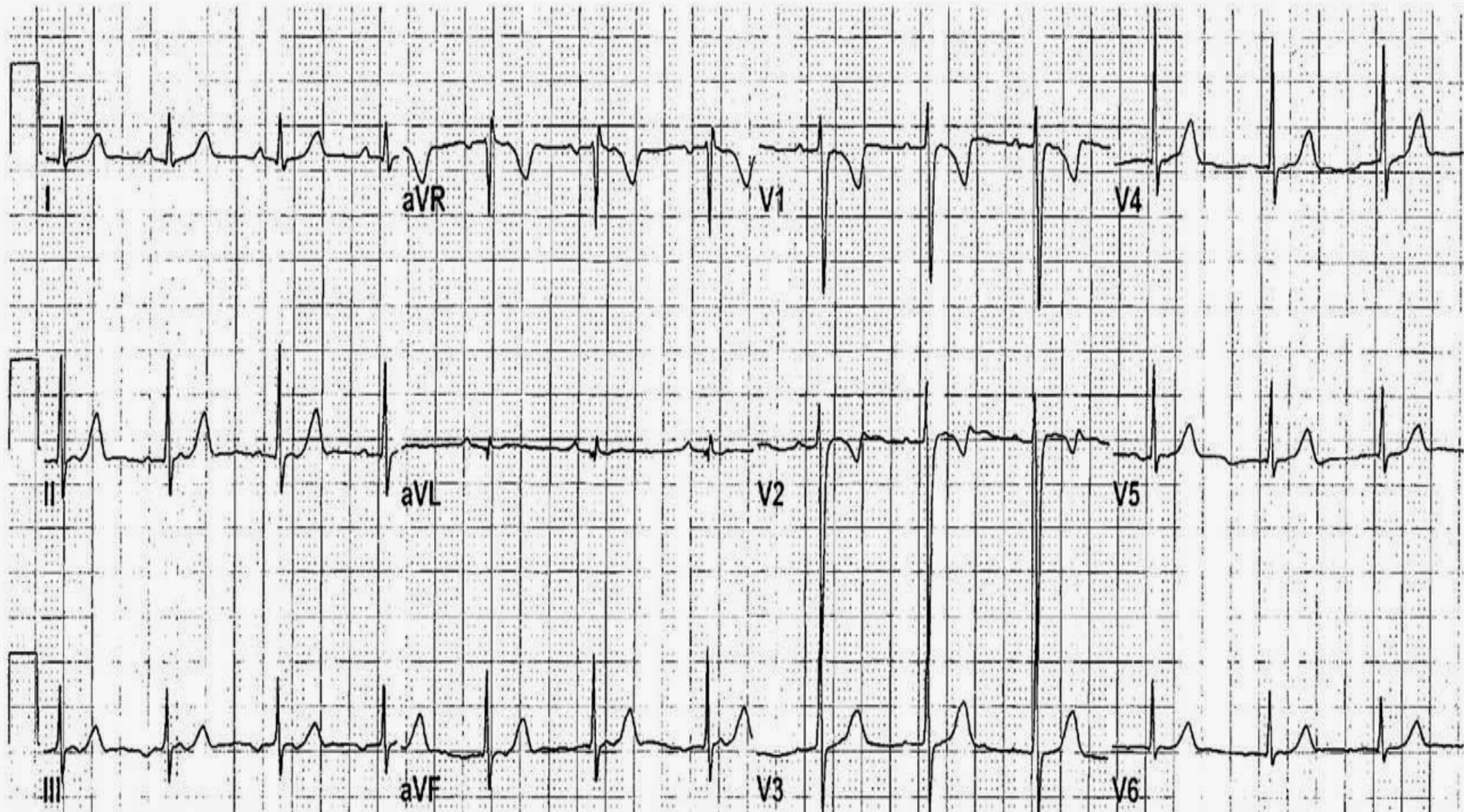
Right Axis Deviation











History
Shape
Location



Benign T-wave inversions

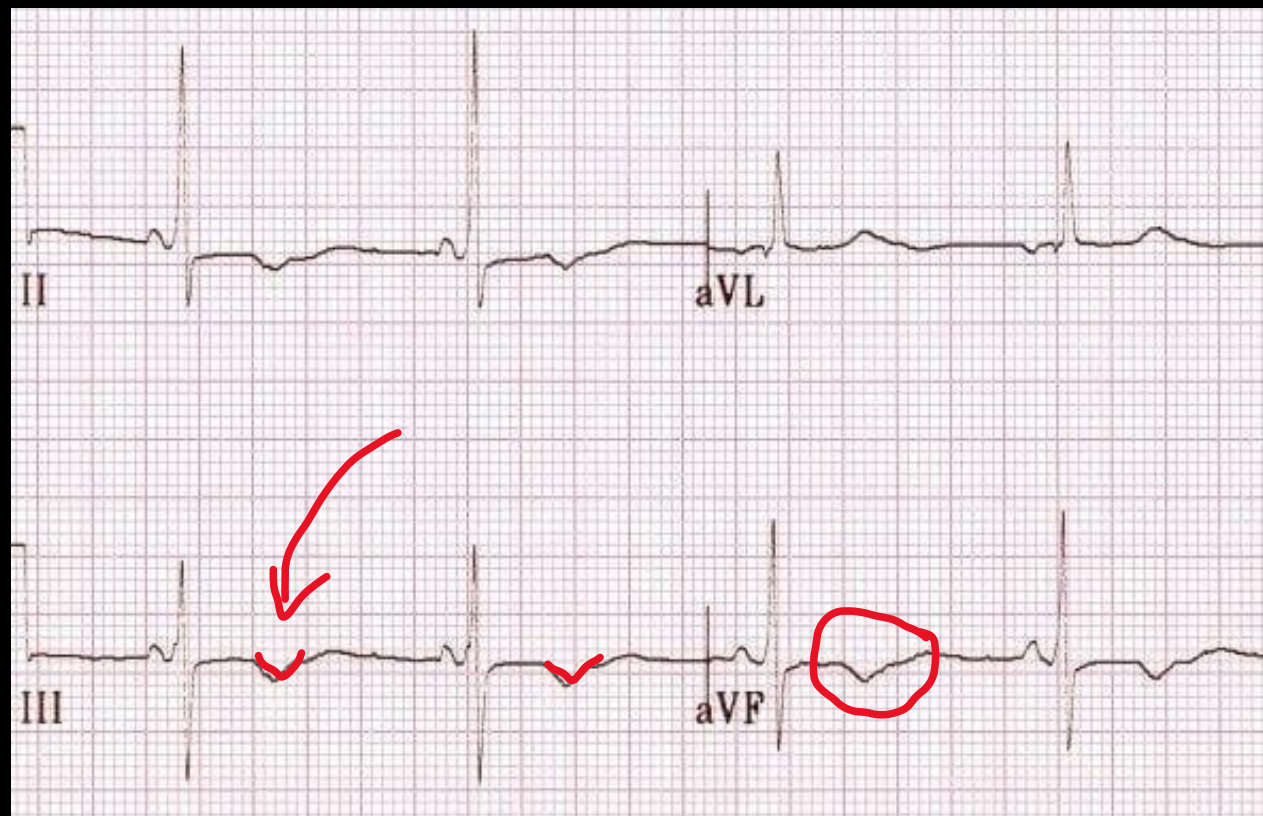
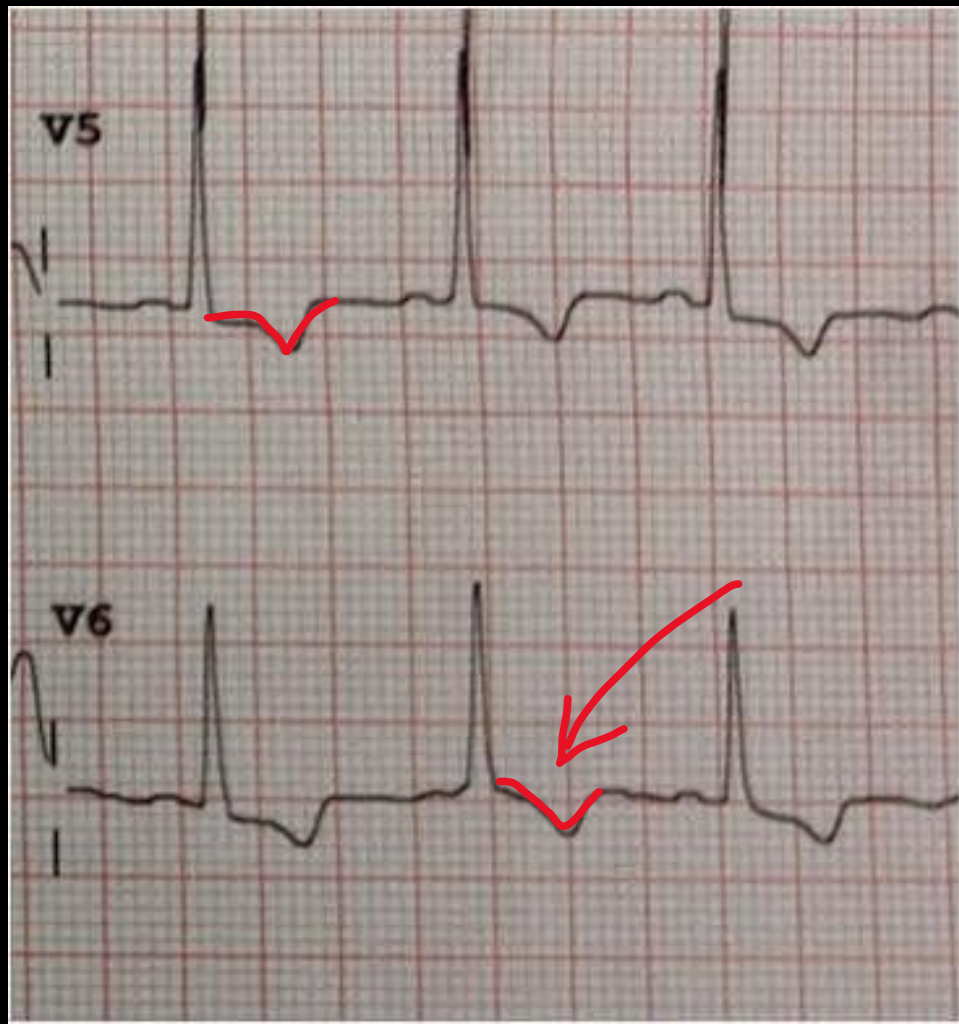
Isolated T-wave inversion

Persistent juvenile T-wave pattern

Athletes

T-wave inversion in V1-V3 in children under 10

T wave inversion in lead 3, V1-V2 and Sometimes avl.

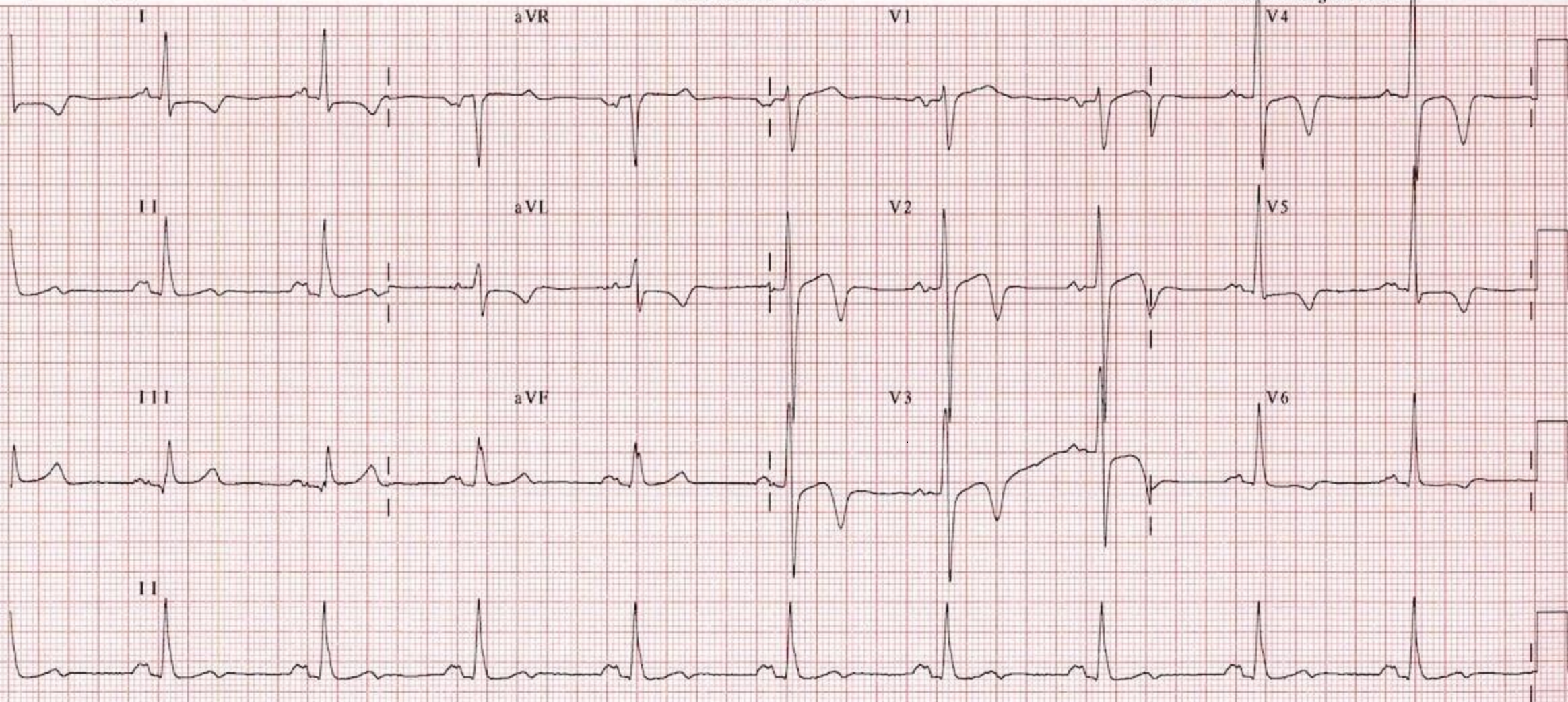


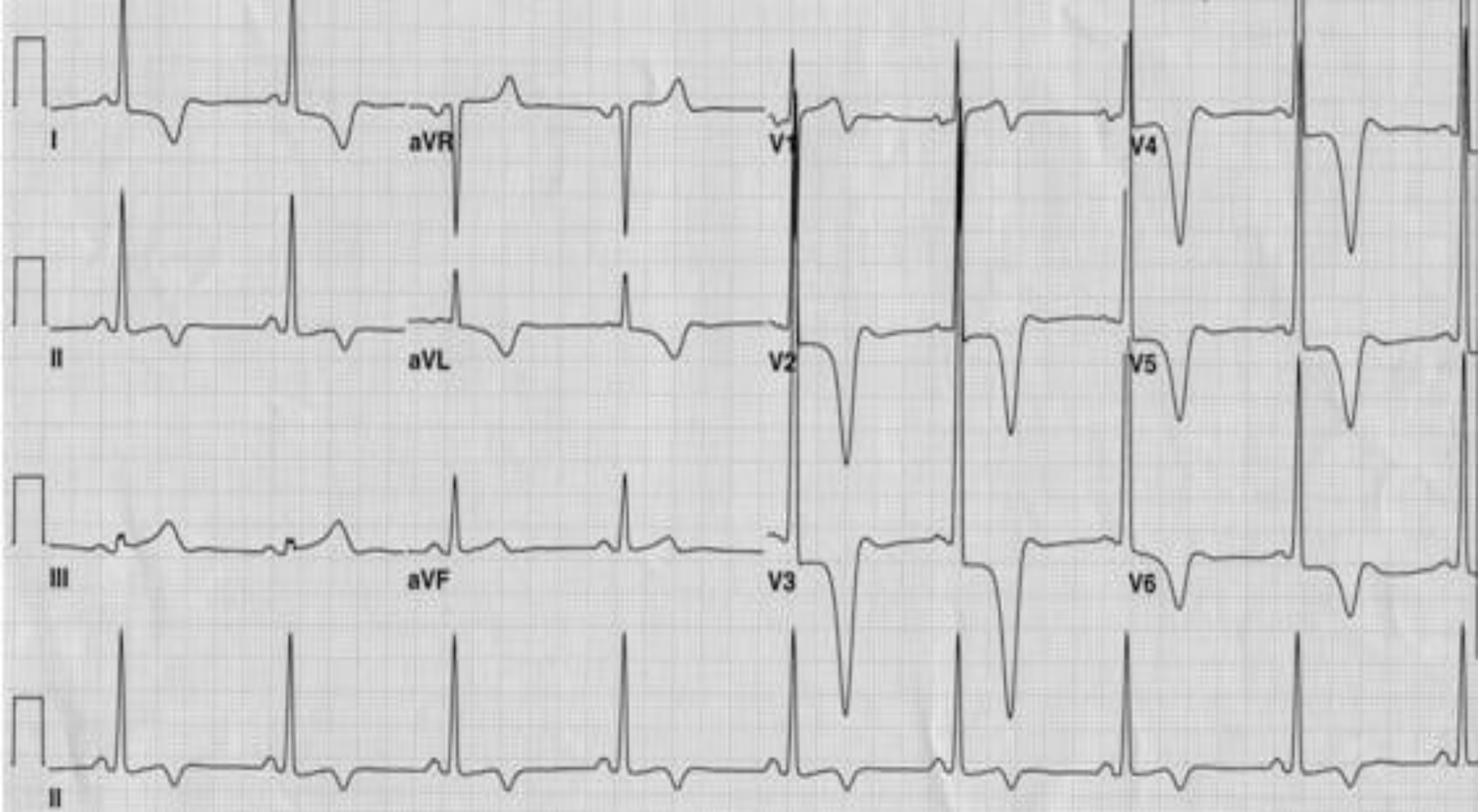


P 53
QRS 58
T 139

- ABNORMAL ECG -

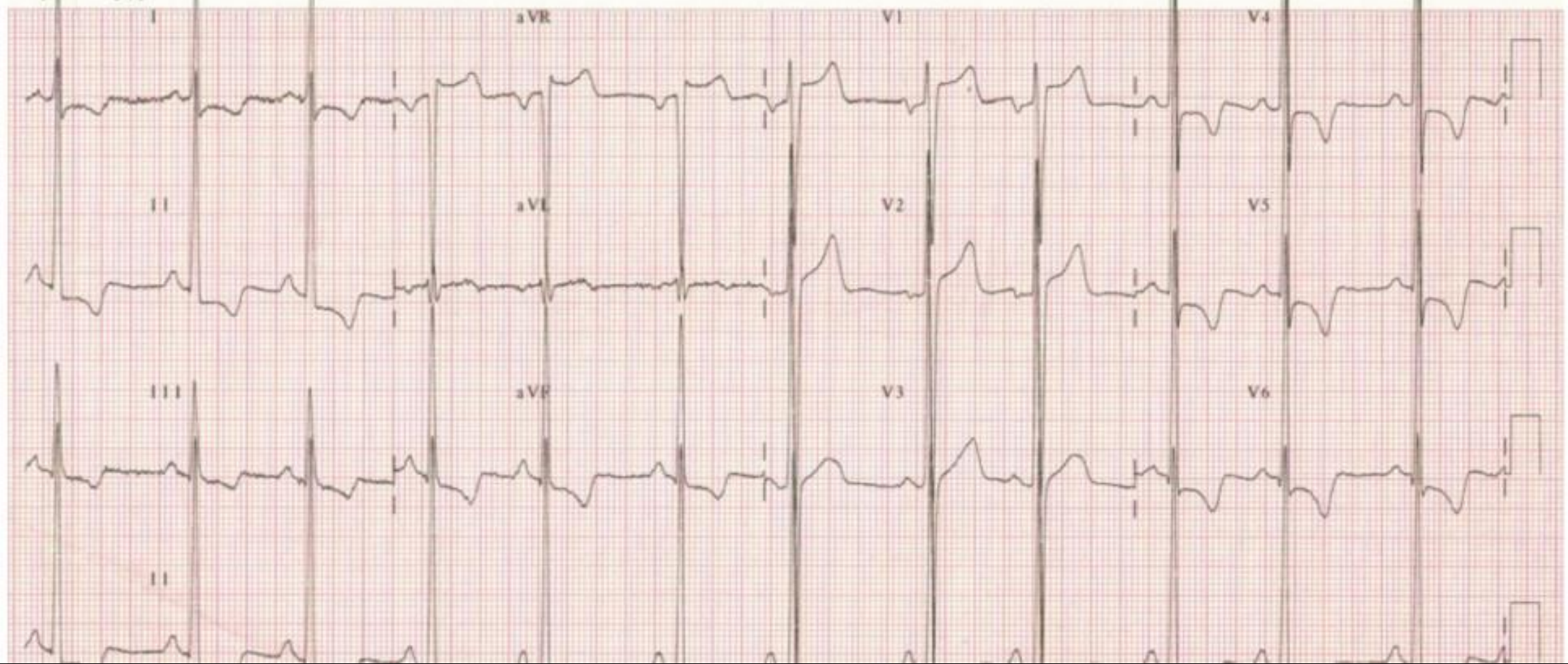
Unconfirmed diagnosis.

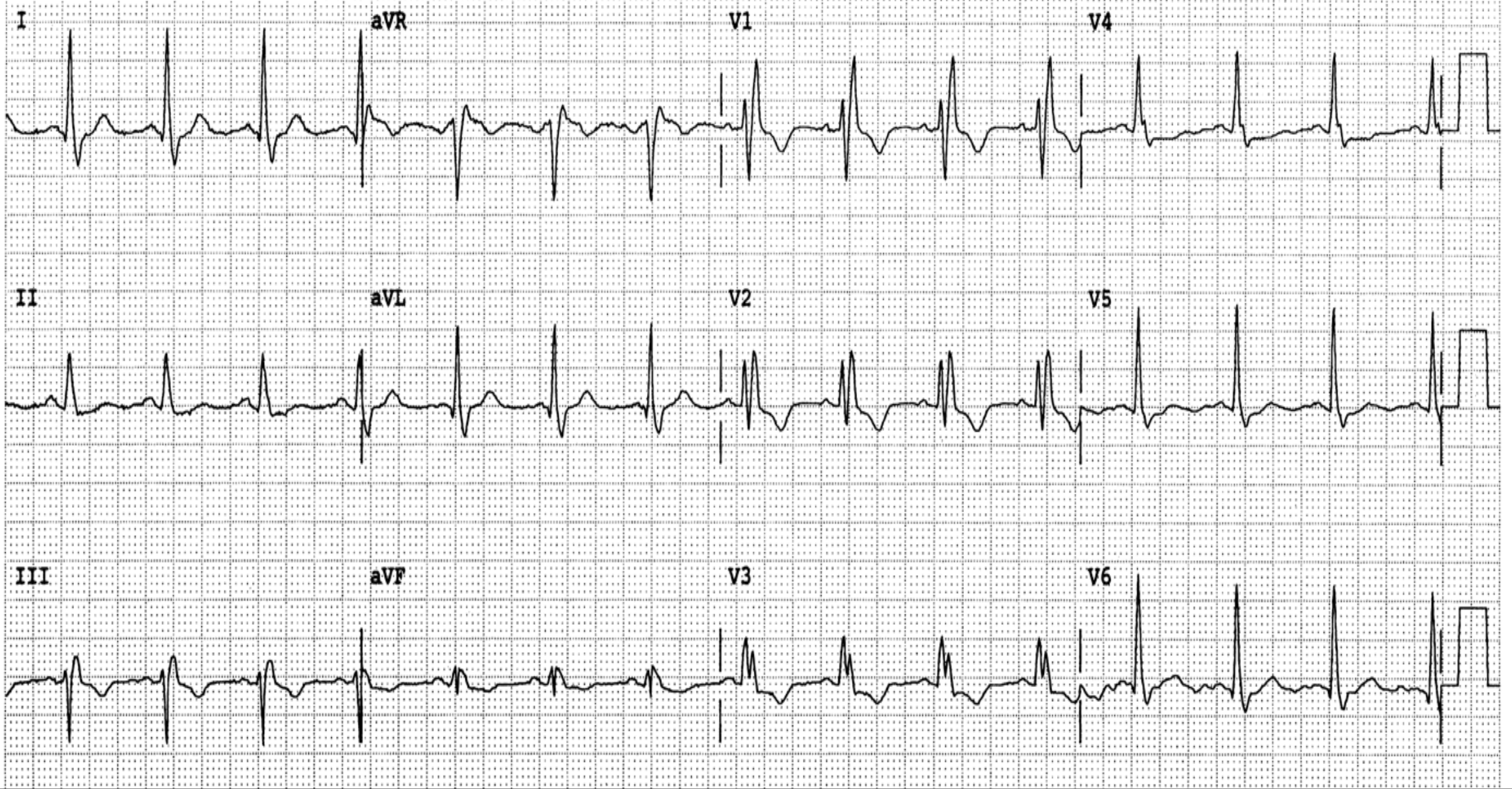


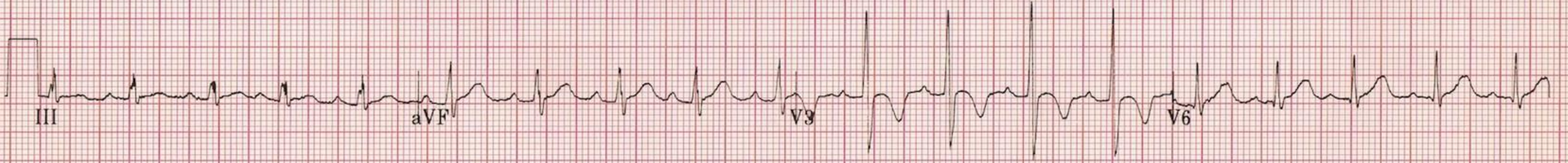


QT 401
QTc 436

--Axe--
P 69
ORS 62
T 241







Summary:

- **T-wave inversion beyond V2 must be looked at with suspicion**
- **It really is about size and symmetry**
- **When the T-wave towers over the QRS be scared!**
- **Take the history into context!**
- **When in doubt get serial ECG's and look at big picture.**

Thank You!

medicrbrown@gmail.com

www.bemedinspired.com

 [@Russbrown3](https://twitter.com/Russbrown3)

