12 Lead ECG Workshop

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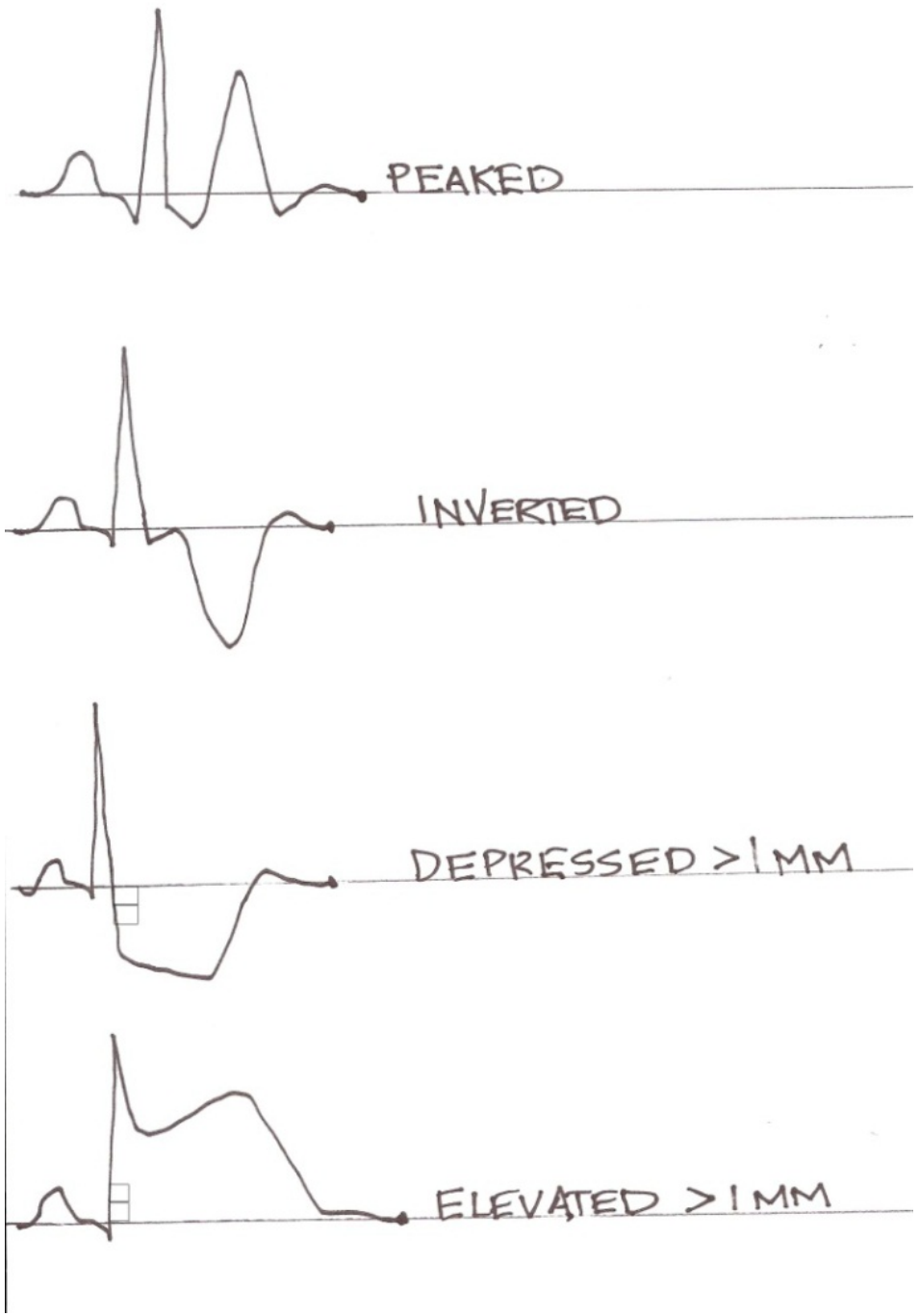
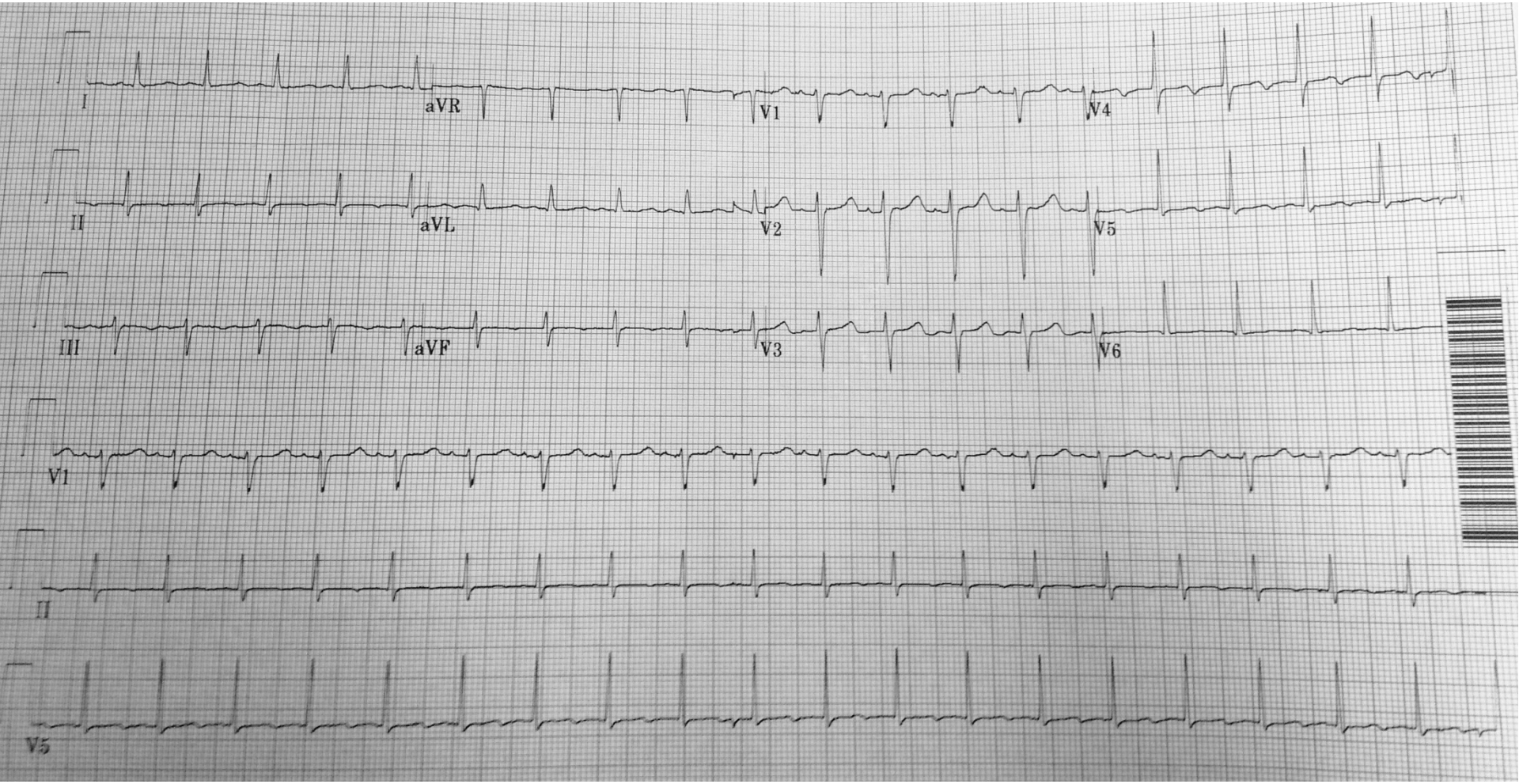
Approach to 12 Leads

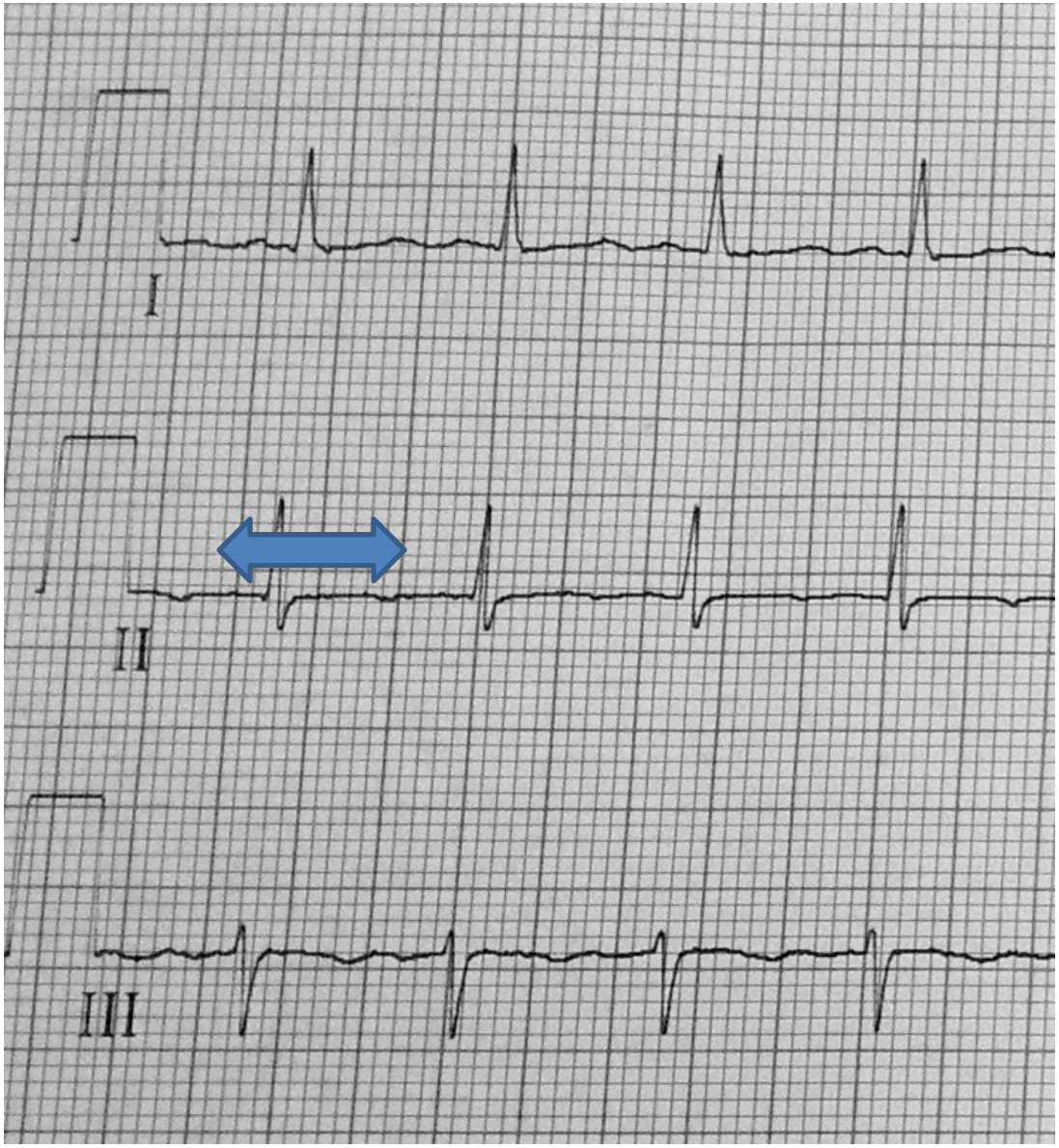
- Rate (fast, slow, ok)
- Rhythm (sinus, ventricular)
- Injury (look at ST segment, Q waves)


PEAKED
INVERTED
DEPRESSED >1MM
ELEVATED >1MM

Non Specific ECG changes



Non Specific ECG changes



Know the playing field!

- Contiguous leads
- Anatomic groups

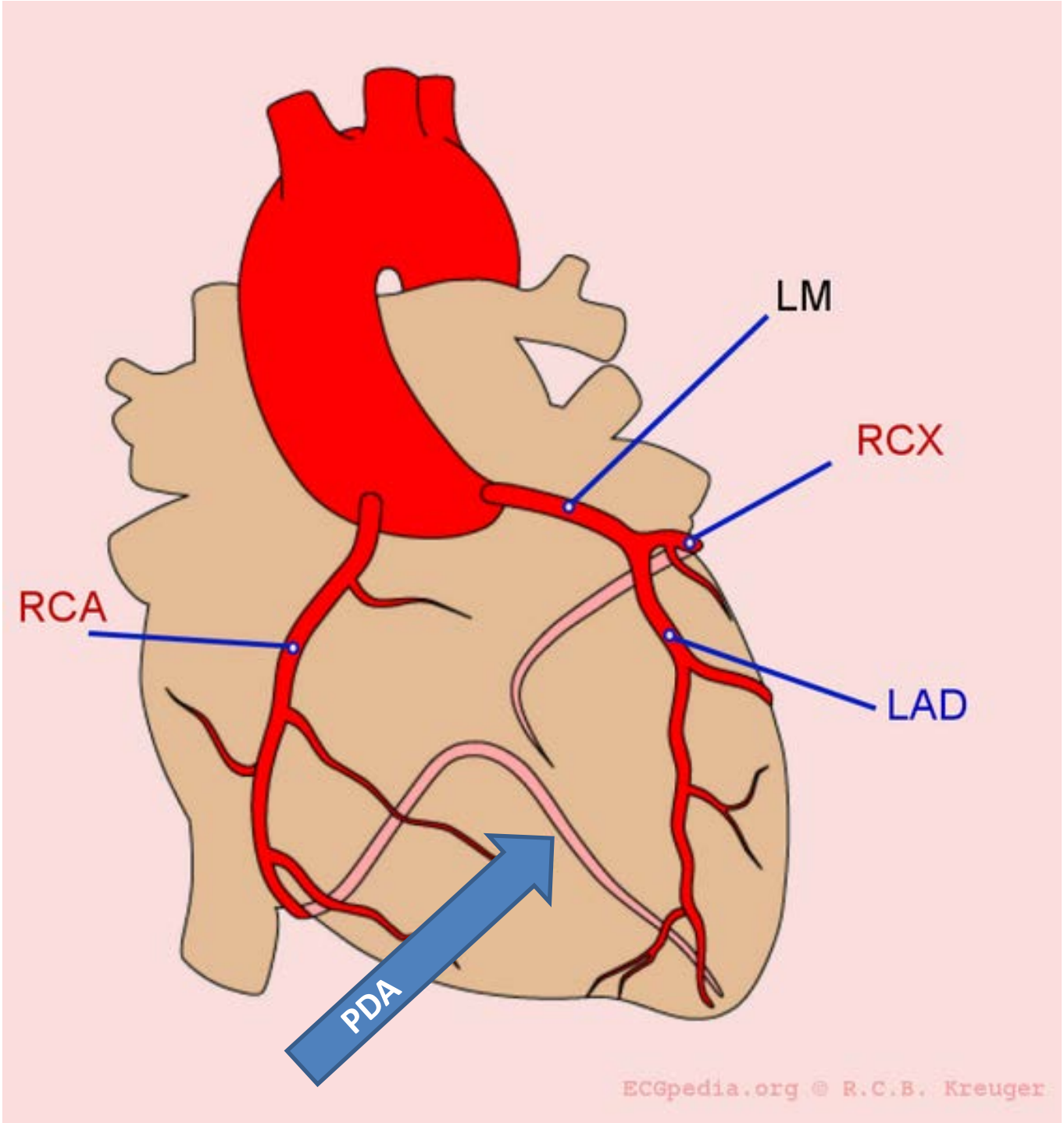
- Anterior: Leads V1-V4
- Lateral: Leads I, aVL and V5-V6
- Inferior: Leads II, III, aVF
- Posterior: Leads V1-V3

Inferior wall:
RIGHT CORONARY

Anterior wall:
LEFT CORONARY

Posterior wall:
RIGHT CORONARY

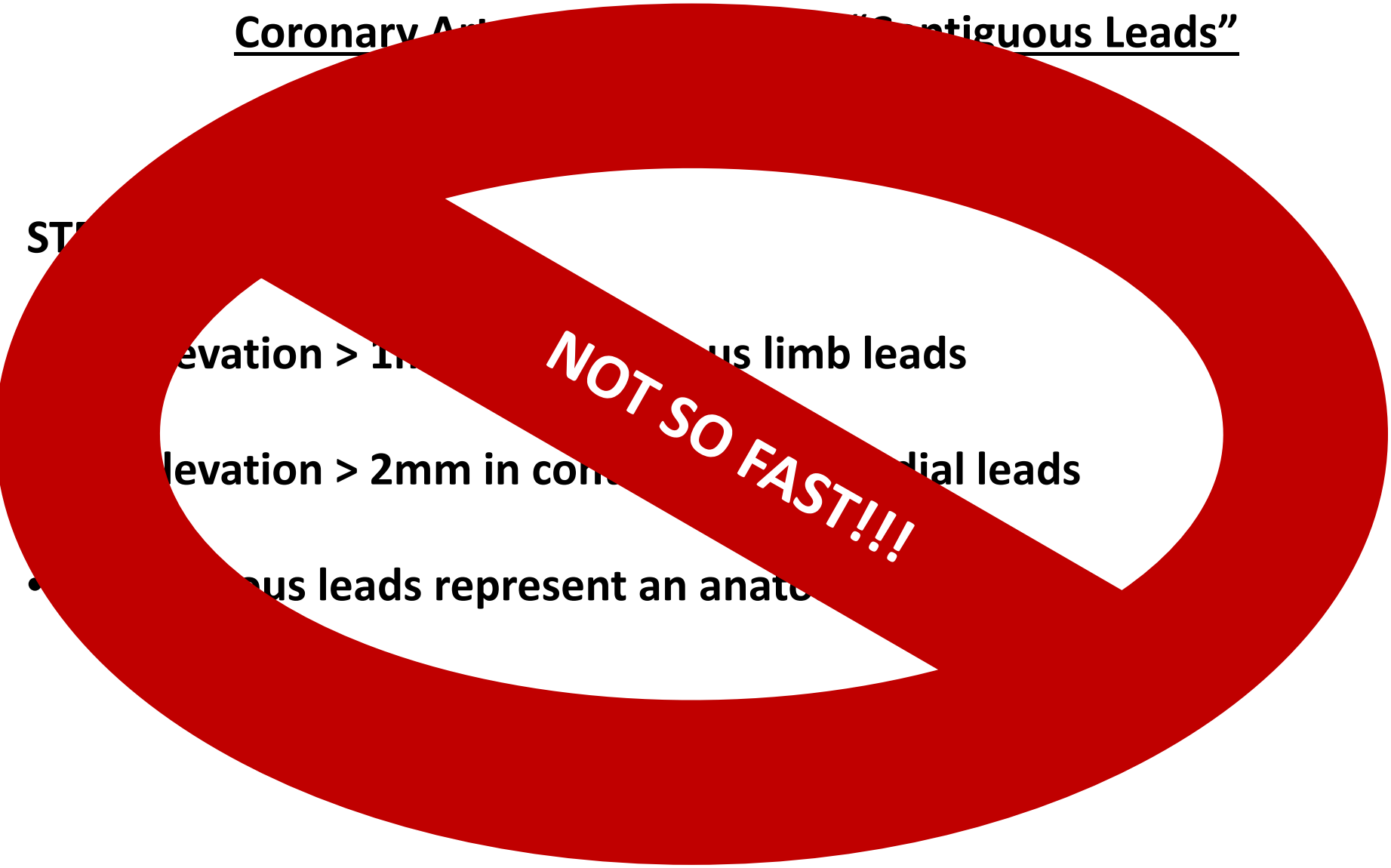
Anterior/lateral wall:
CIRCUMFLEX



Coronary Ar… …ntiguous Leads”

ST…

- **…evation > 1… …us limb leads**
- **…levation > 2mm in con… …dial leads**
- **… …us leads represent an anat…**



Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction: Executive Summary: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

UNIVERSAL STEMI DEFINITION

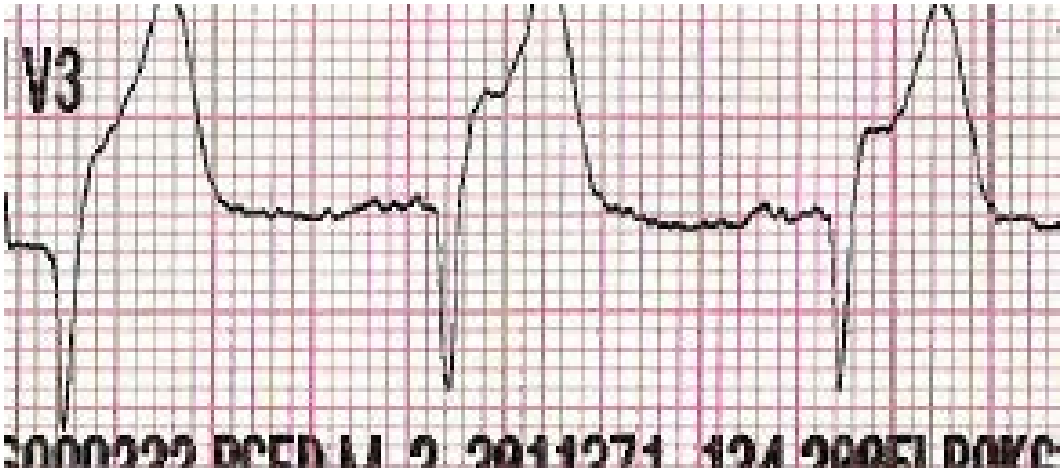
- Greater than 1 mm STE in 2 contiguous limb leads
- Greater than 2 mm of STE in V2-V3 for men
- Greater than 1.5 mm of STE in V2-v3 for women

HIGH RISK PRESENTATIONS

- STE in aVR with multi-lead ST depression
- STD in V2-V3 with tall R waves (posterior wall MI)

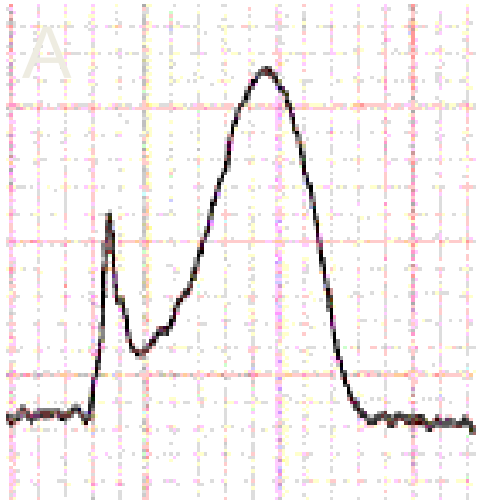
STEMI Guidelines 2013

- ST elevation measured at J point
- Posterior wall MI
- Multilevel ST depression with STE in aVR
- STE > 1 mm in contiguous limb leads
- STE > 2 mm in precordial leads
- ***Removal of LBBB***

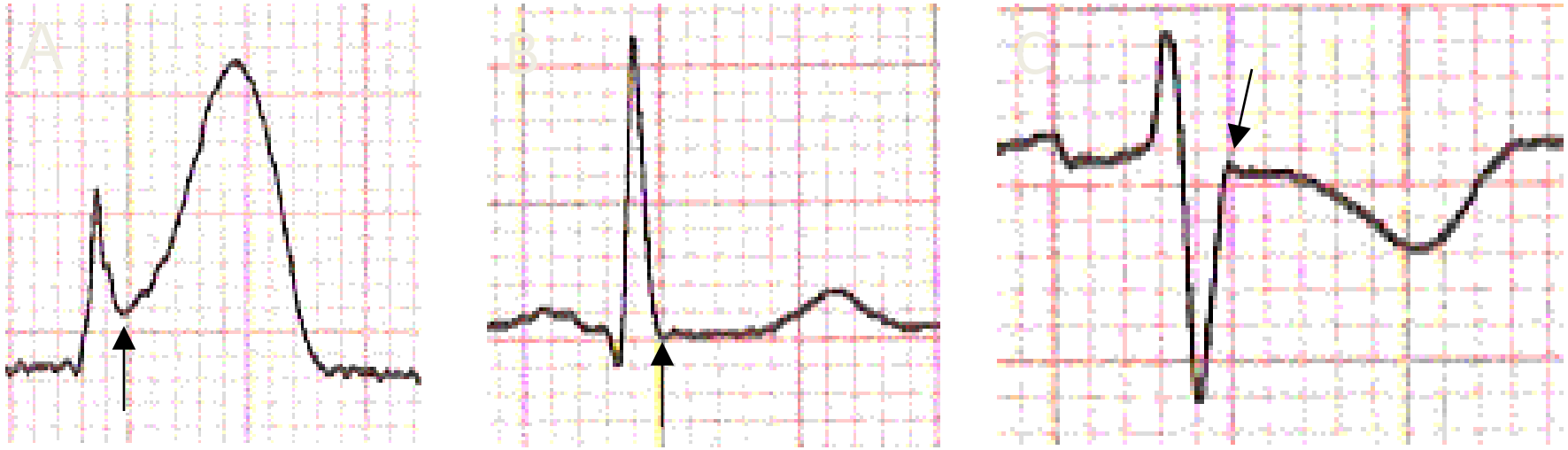


J Point: Where STEMI Begins

Locate the J point

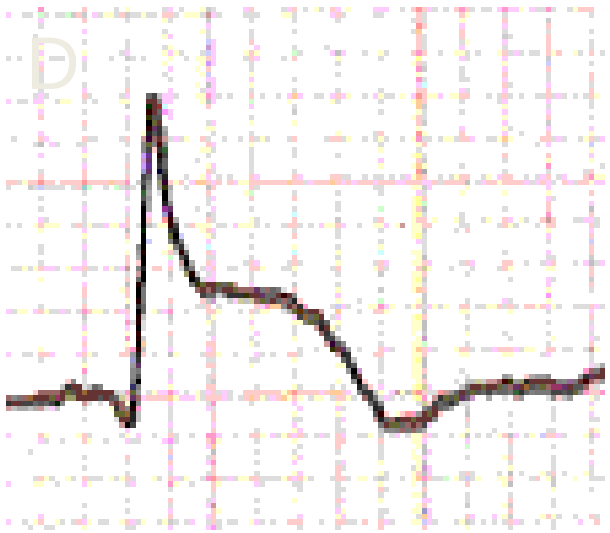


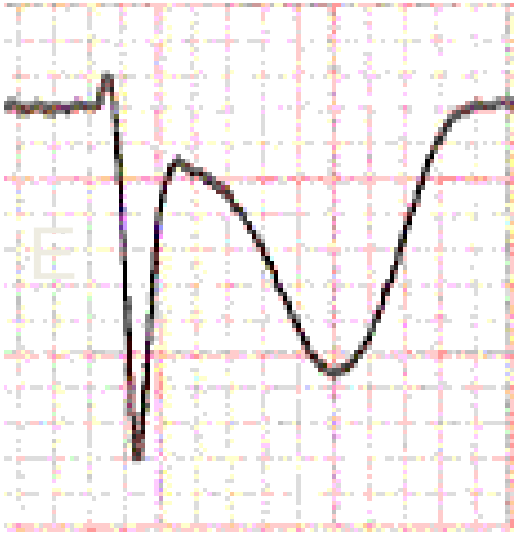
Locate the J point



J Point

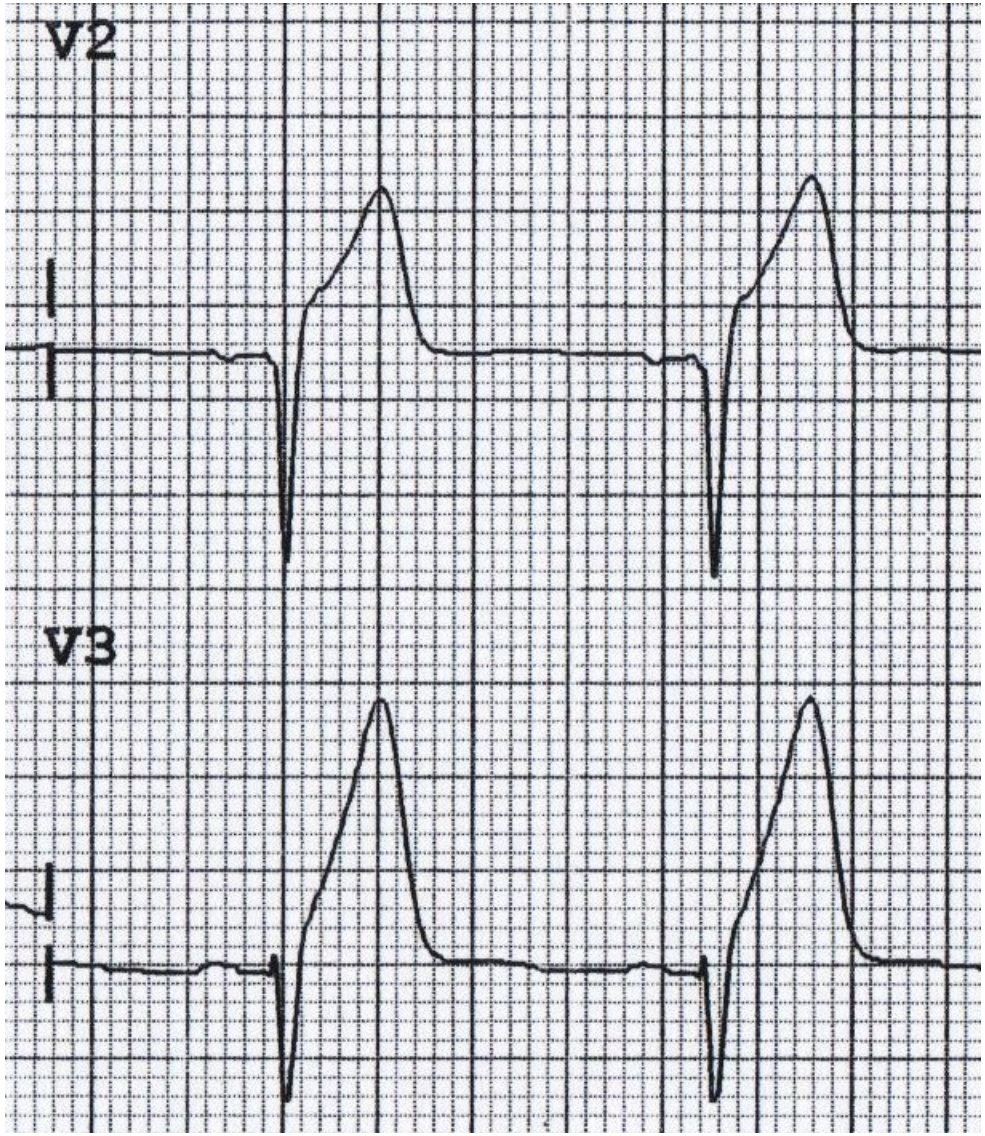
Locate the J point





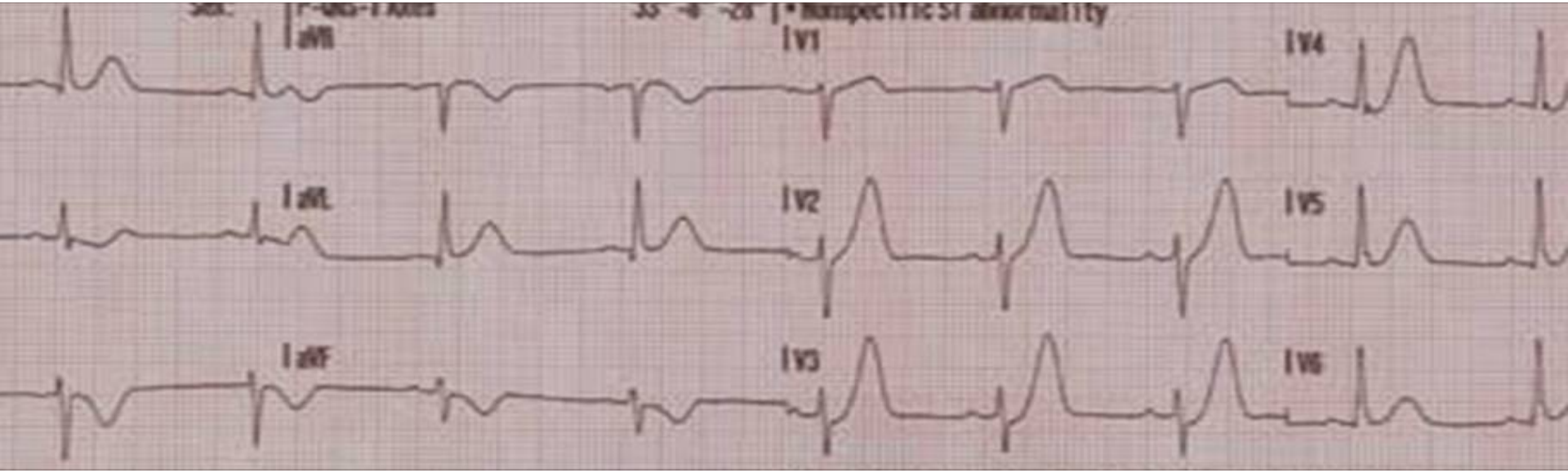
Locate the J point

ST Segment Ugliness: The Hyperacute T Wave

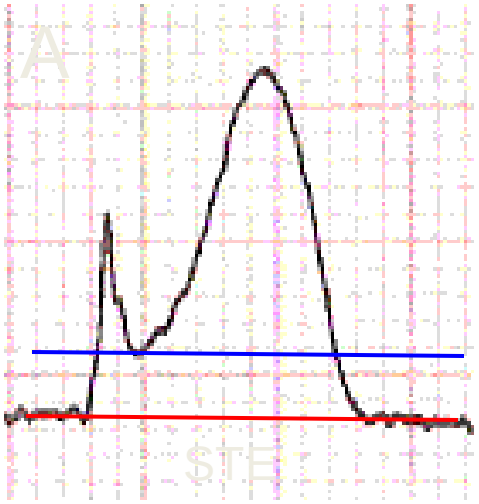


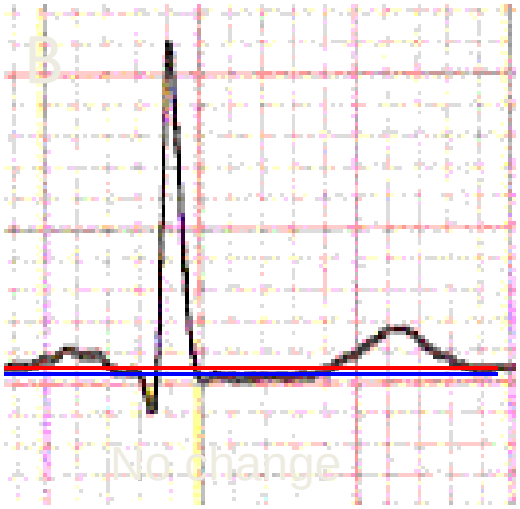
ST Segment Ugliness: The Hyperacute T Wave

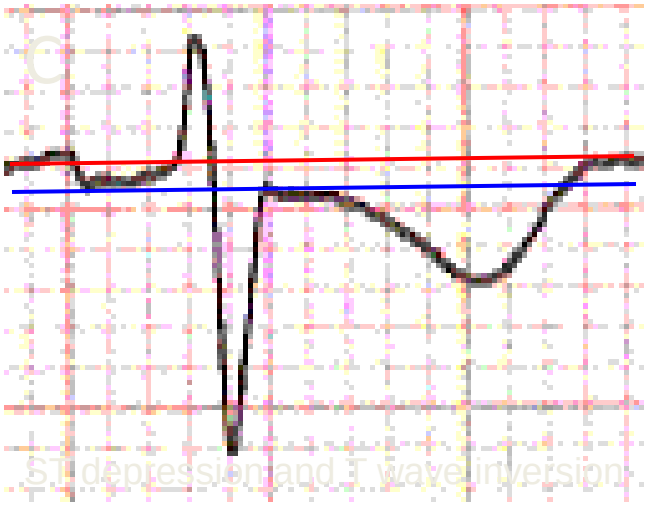
- Broad based and symmetric
- Large T waves
- Found in anatomic distribution



ST Segment Analysis



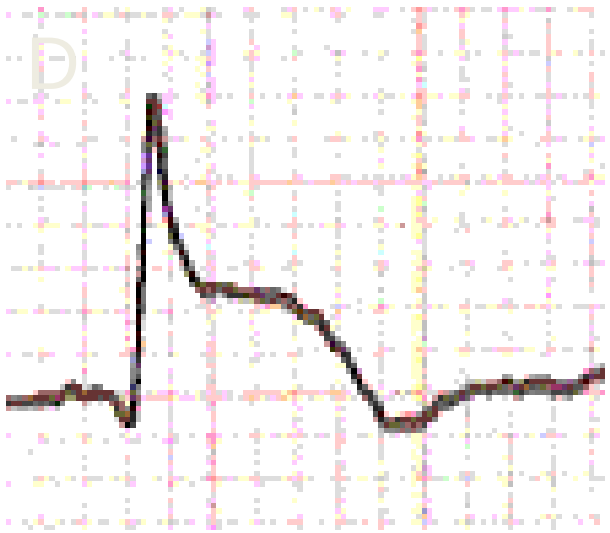


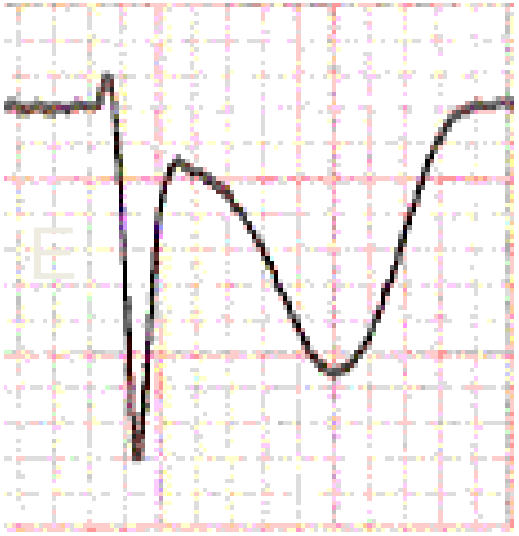


Red is isoelectric, Blue is J point

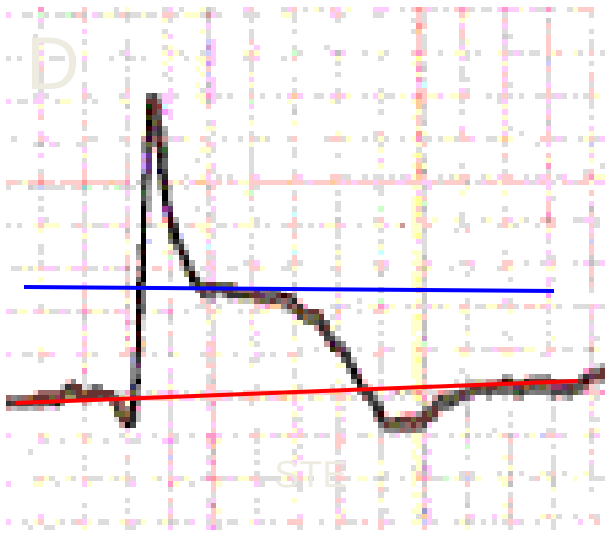
ST Segment Analysis

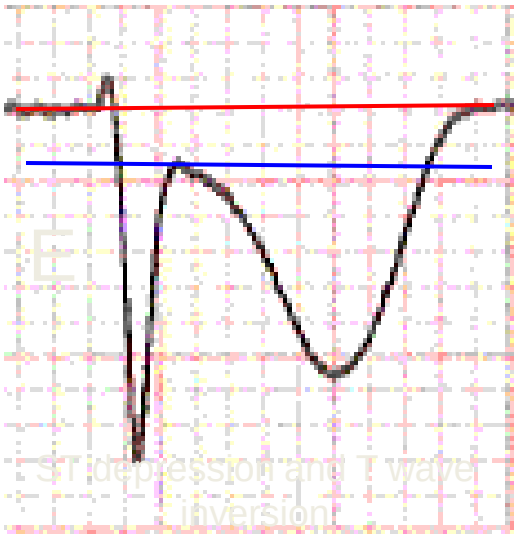
Determine if the tracing reveals STE, no change, ST depression and/or T wave inversion
Look for pattern of concordance, if QRS is upright, T-Wave should be upright.
If QRS is upright, and T-Wave is inverted, you have discordance.

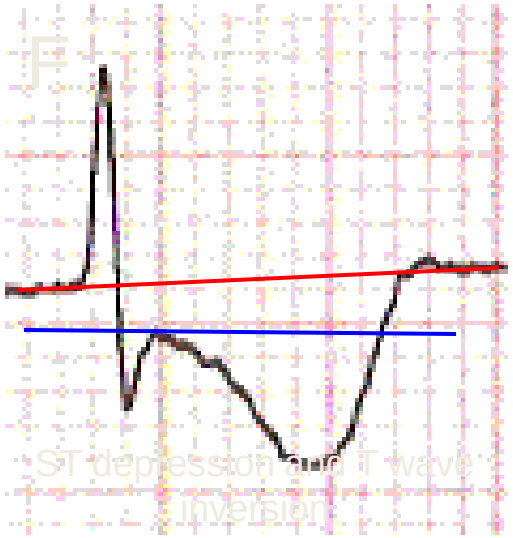




ST Segment Analysis





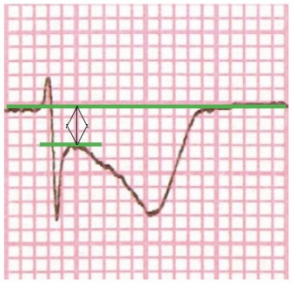


Red is isoelectric, Blue is J point

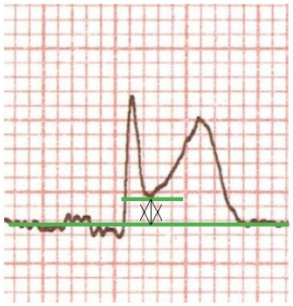
hopefully preventing evolution of the event to myocardial infarction.

The "J" Point

J point depression



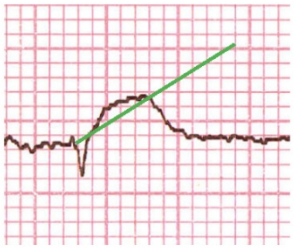
J point elevation

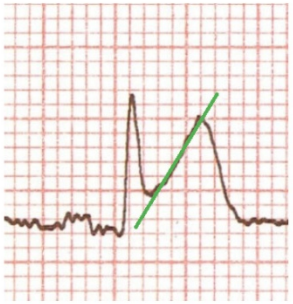


ST Segment

Morphology

Convex – a convex ST segment favors ischemia. Test for this by drawing a line from the J point to the peak of the T wave. If the line superimposes or if the T wave is above the line, the segment is convex.



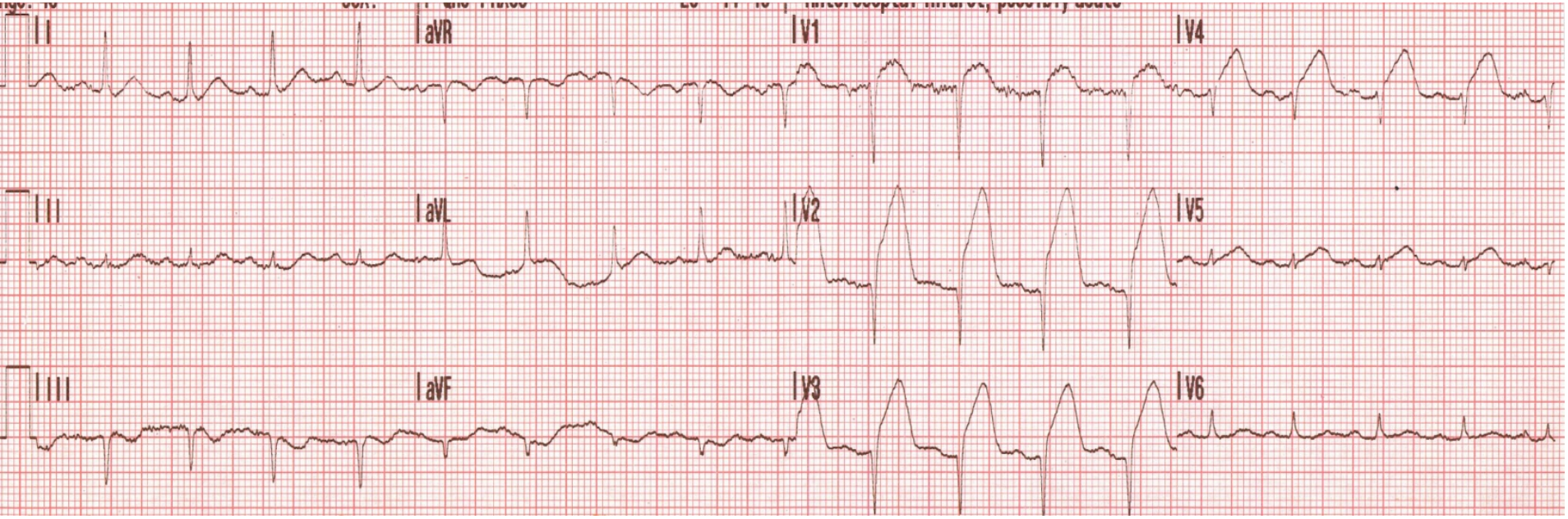


Concave – a concave ST segment favors benign conditions, but beware, ischemia can *also* manifest with this pattern, as seen in this STEMI.

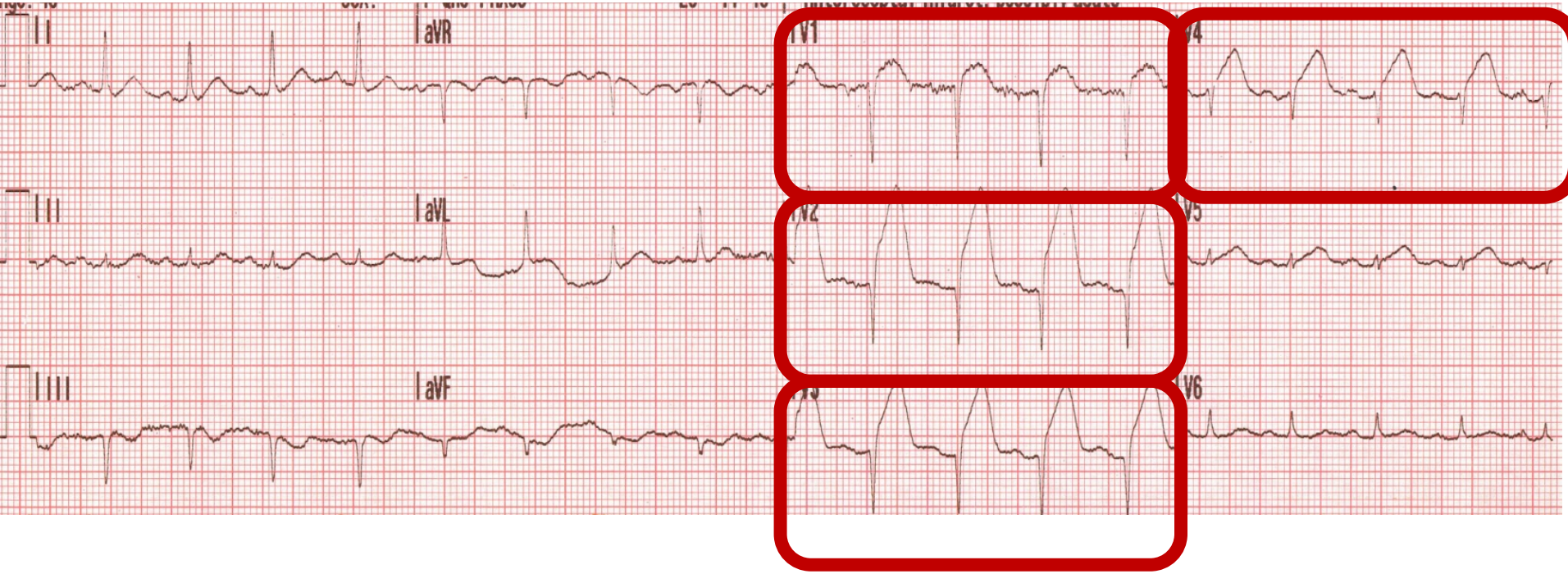
12 Lead ECG Interpretation and Localization

	ST Elevation	Reciprocal	Anatomy
Anterior	V2-V4 I, aVL	II, III, aVF	LMCA LAD
Inferior	II, III, aVF	I, aVL V2-V4	RCA
Lateral	I, aVL V5-V6	II, III, aVF	LAD LCx
Posterior	V7-V9 or V1-V3	N/A	RCA

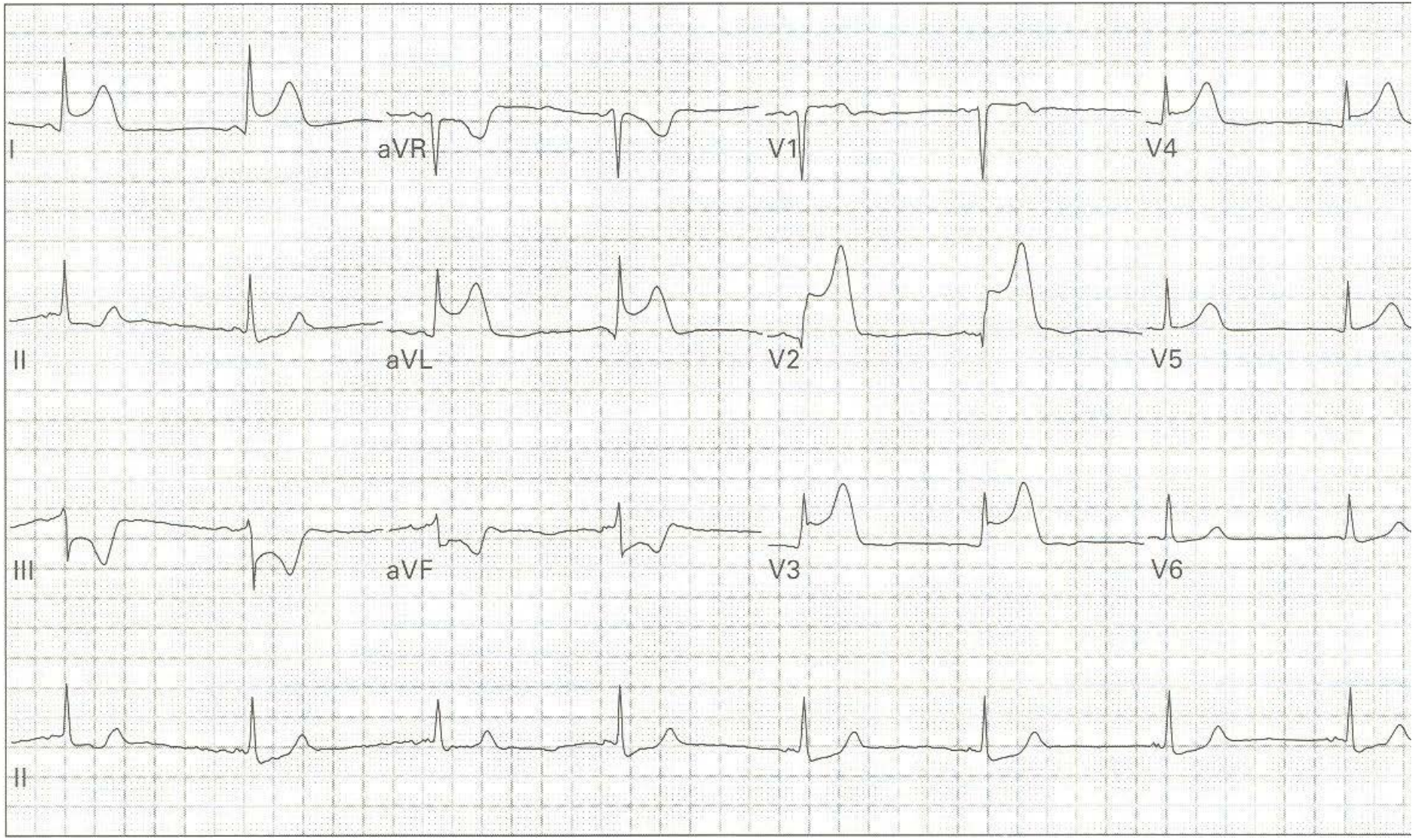
12 Lead ECGs


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

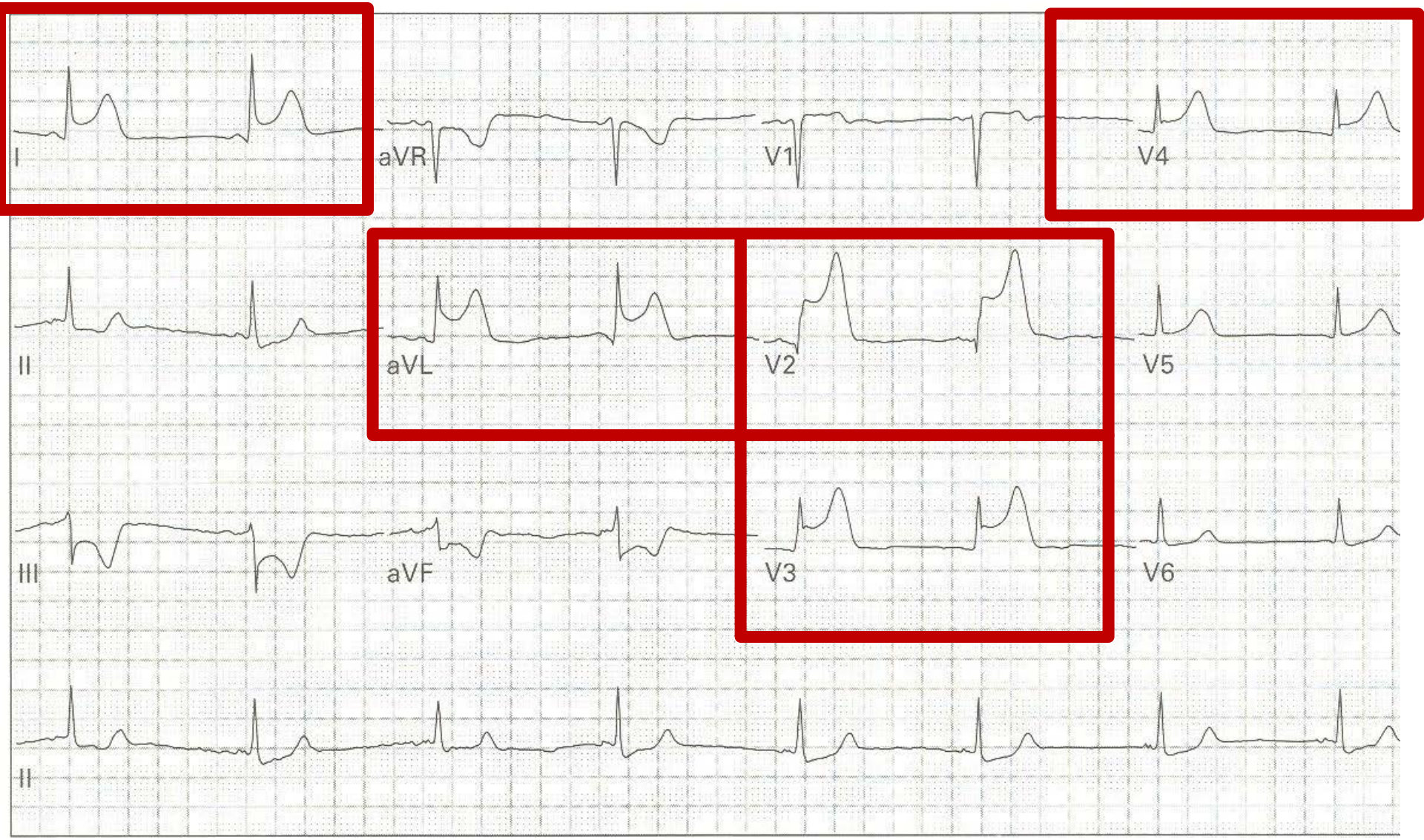
Anterior Wall STEMI



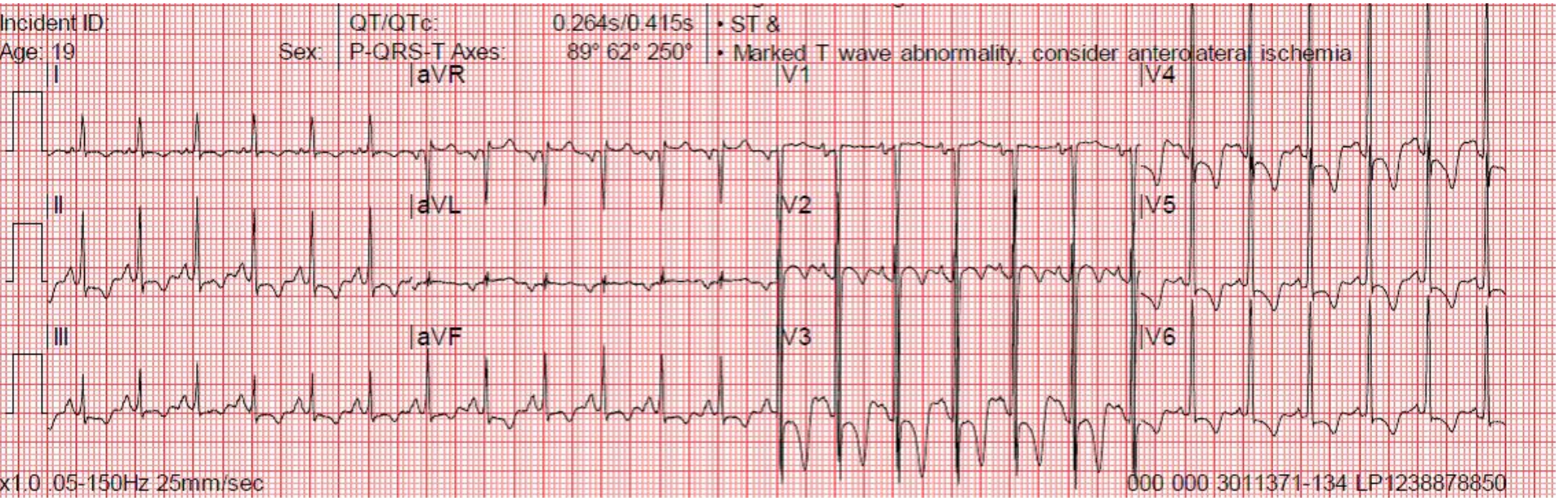
65 yo male, + CP



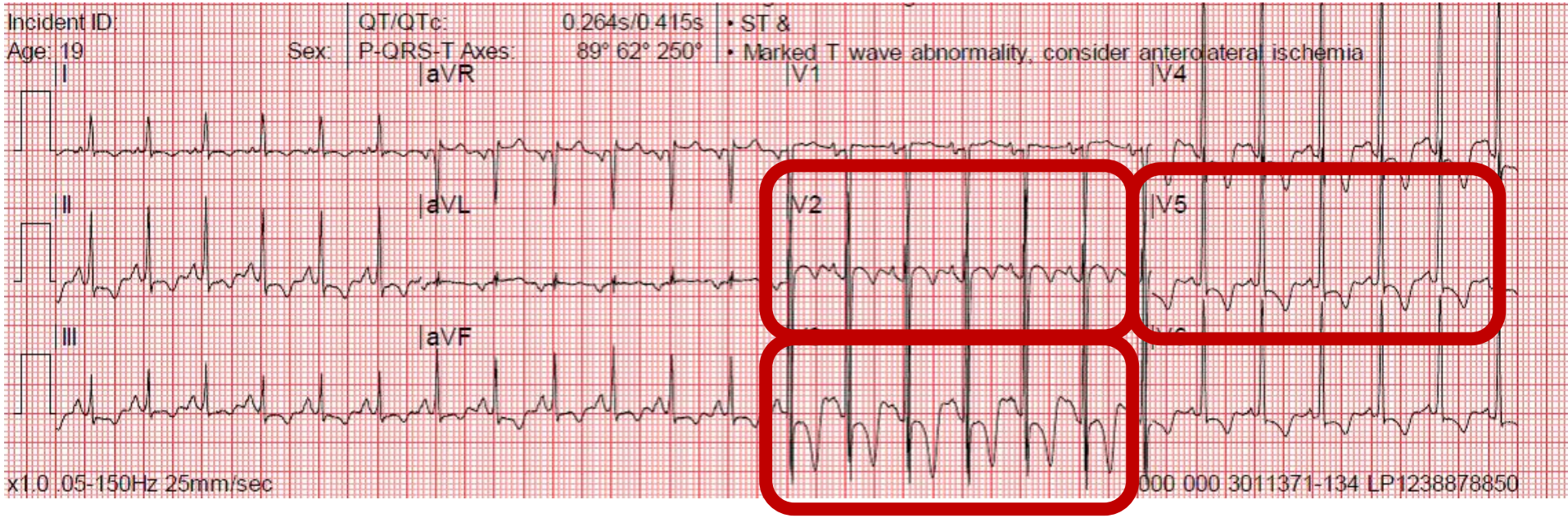
Antero-septal MI

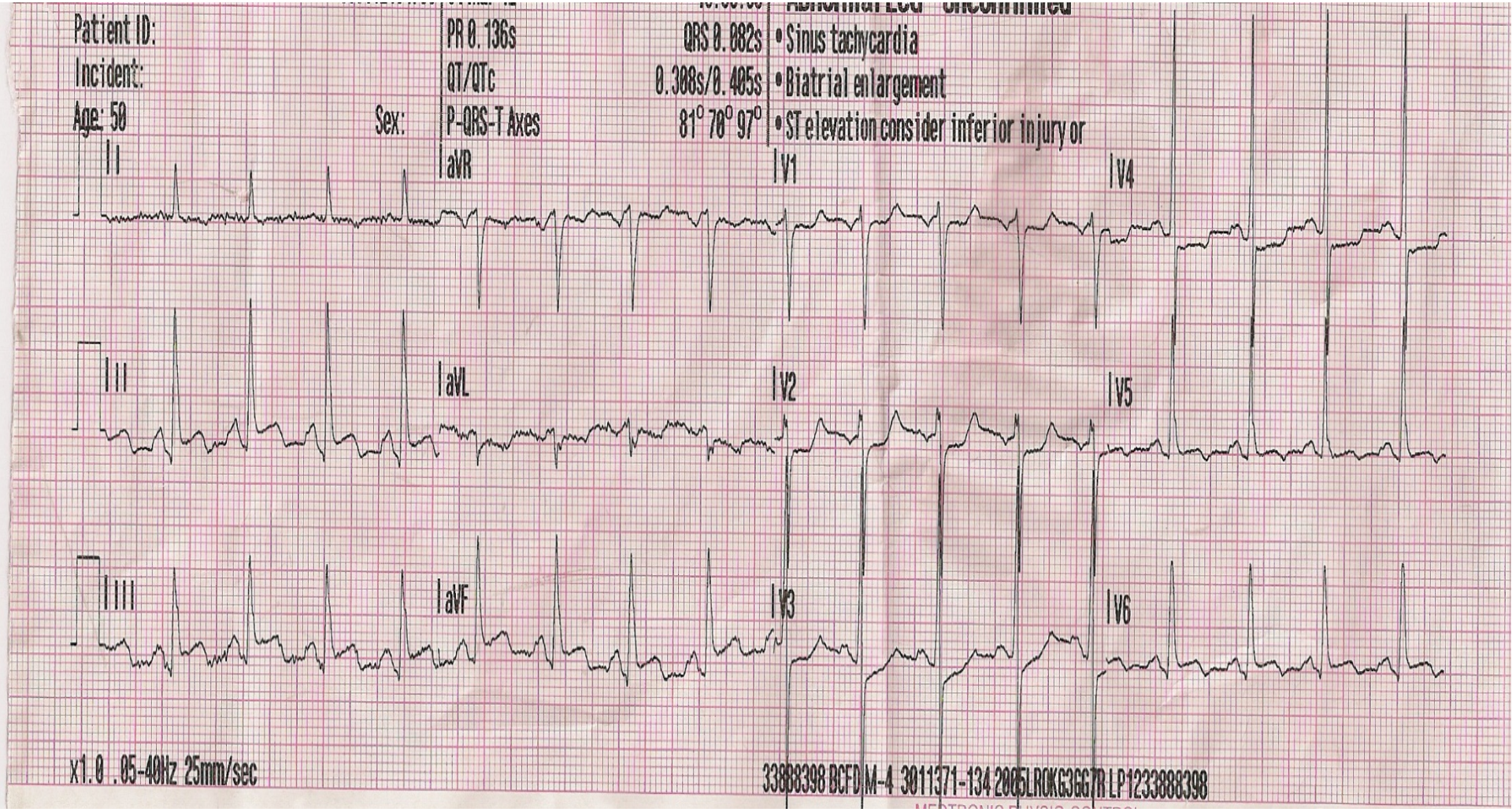


35 yo male, chest fluttering

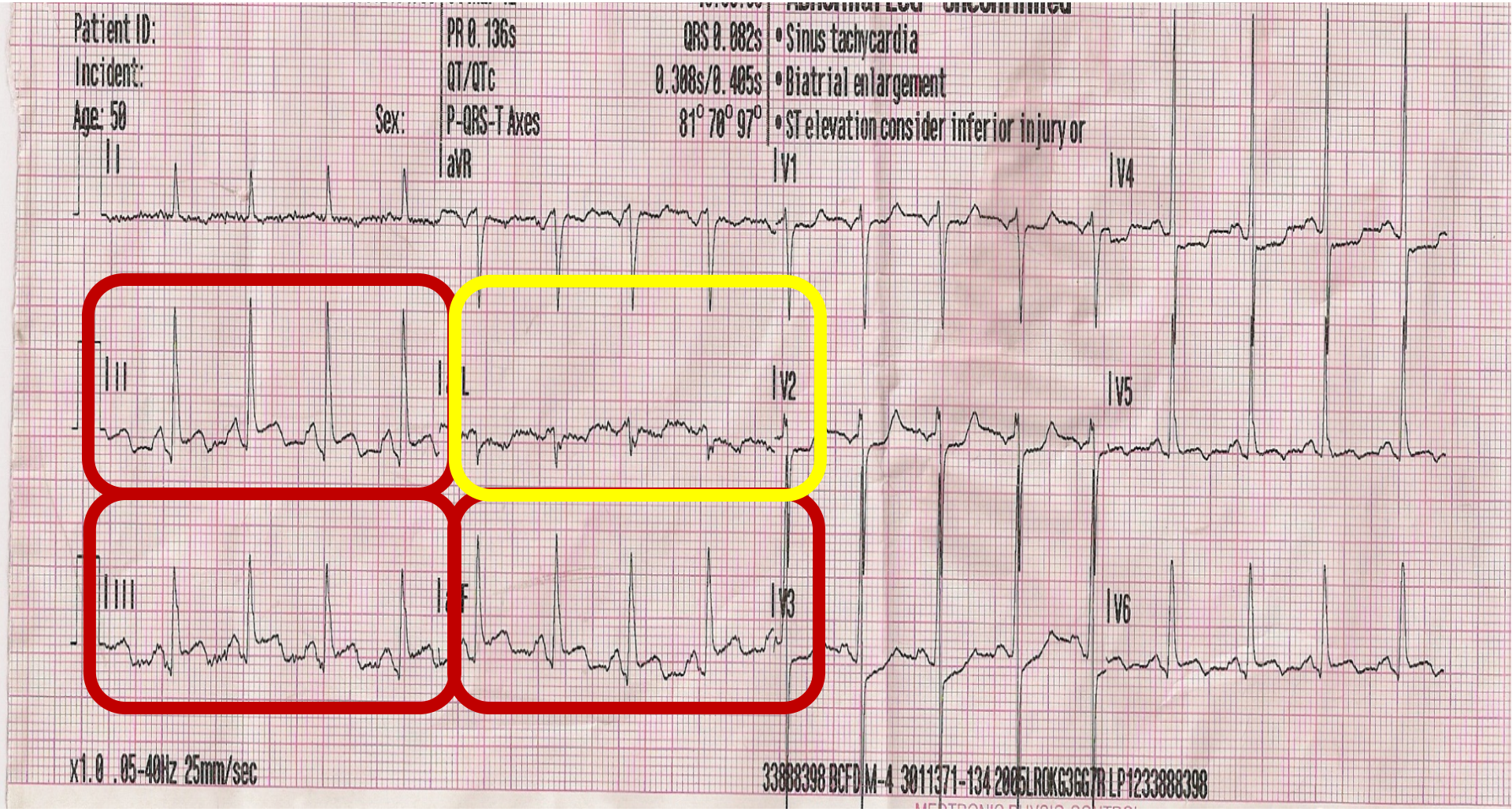


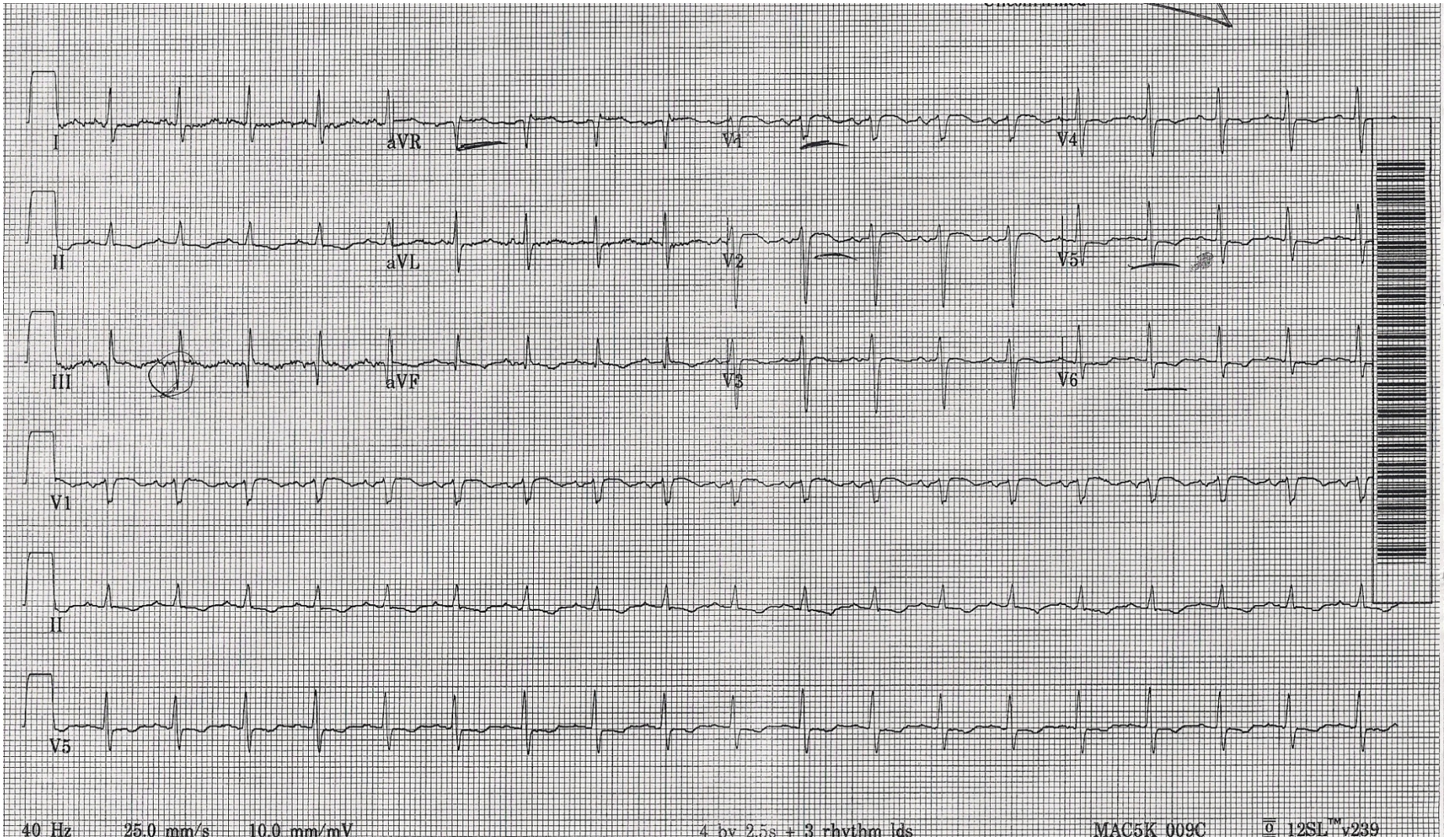
Sinus Tachycardia and T Wave Inversions



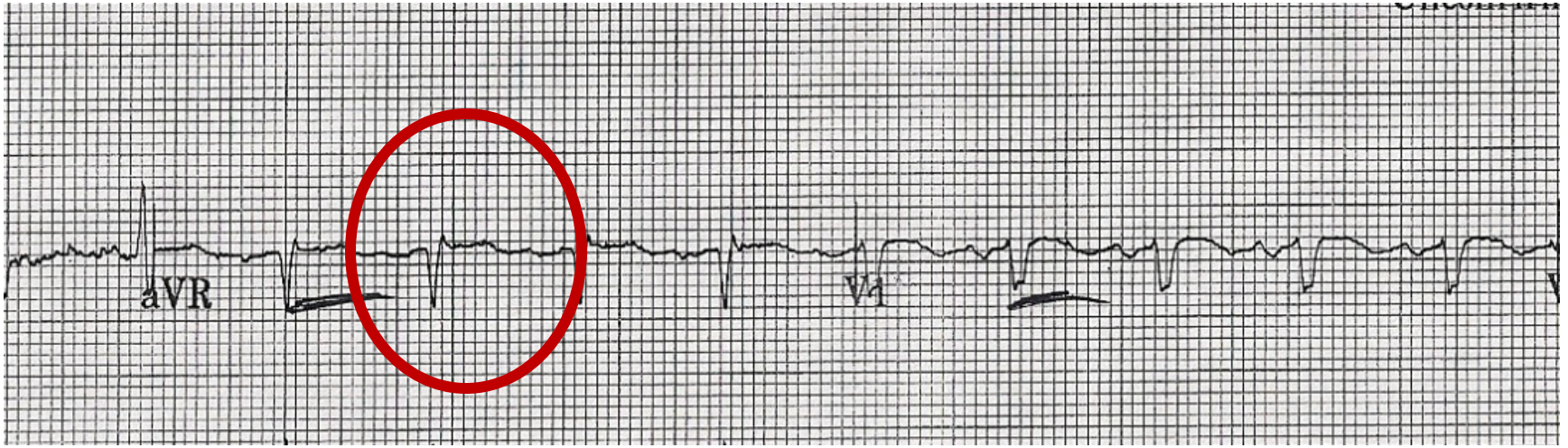

Patient ID:
Incident:
Age: 50
Sex:
PR 0.136s
QT/QTc
0.388s/0.405s
P-QRS-T Axes
81° 70° 97°
QRS 0.082s
• Sinus tachycardia
• Biatrial enlargement
• ST elevation consider inferior injury or
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
x1.0 .05-40Hz 25mm/sec
33888398 BCFD M-4 3011371-134 2005LROKG3GG7R LP1233888398

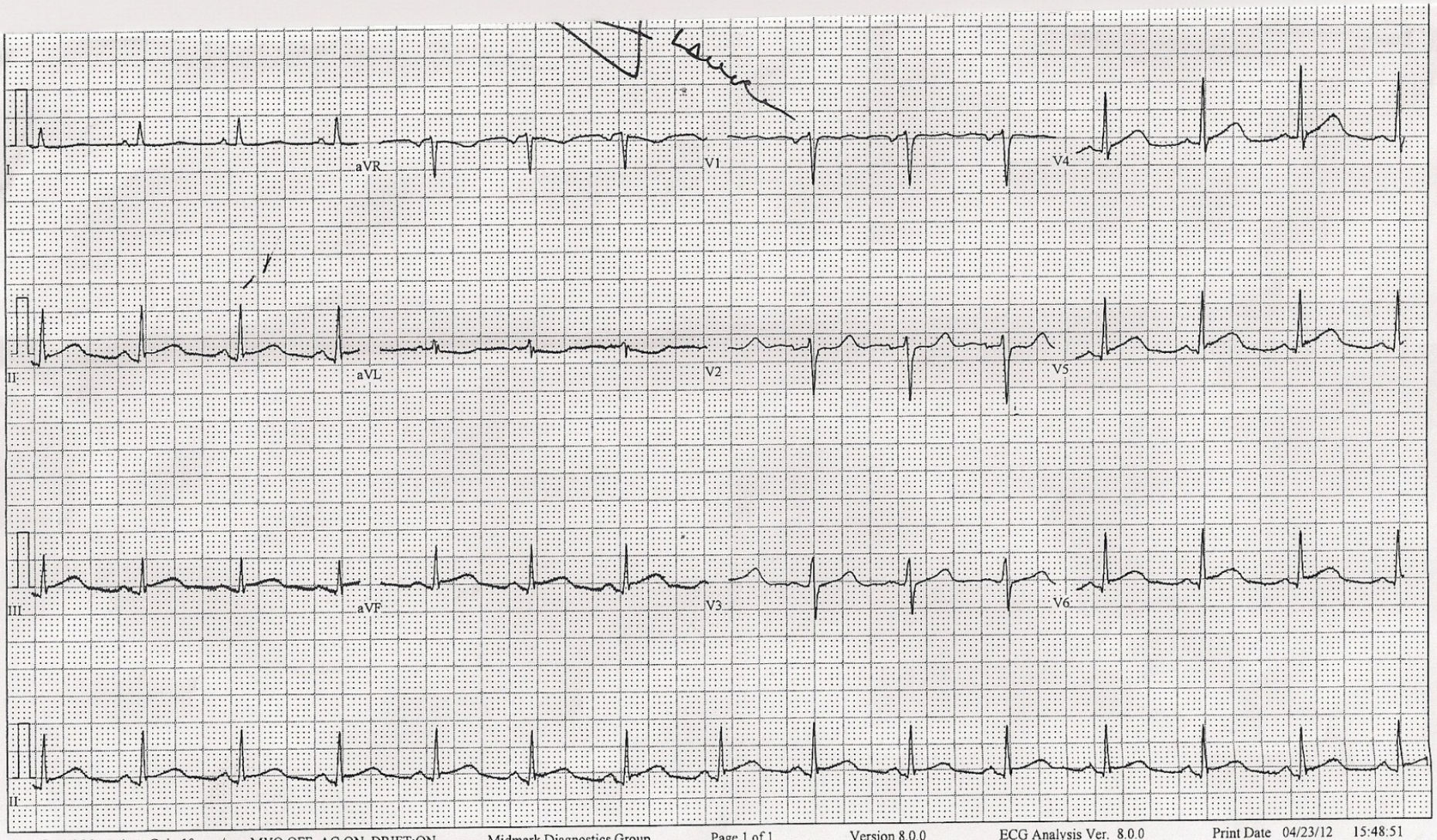
Inferior Wall STEMI




I
aVR
V4
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
II
V5
40 Hz
25.0 mm/s
10.0 mm/mV
4 by 2.5s + 3 rhythm lds
MAC5K 009C
12SL™ v239

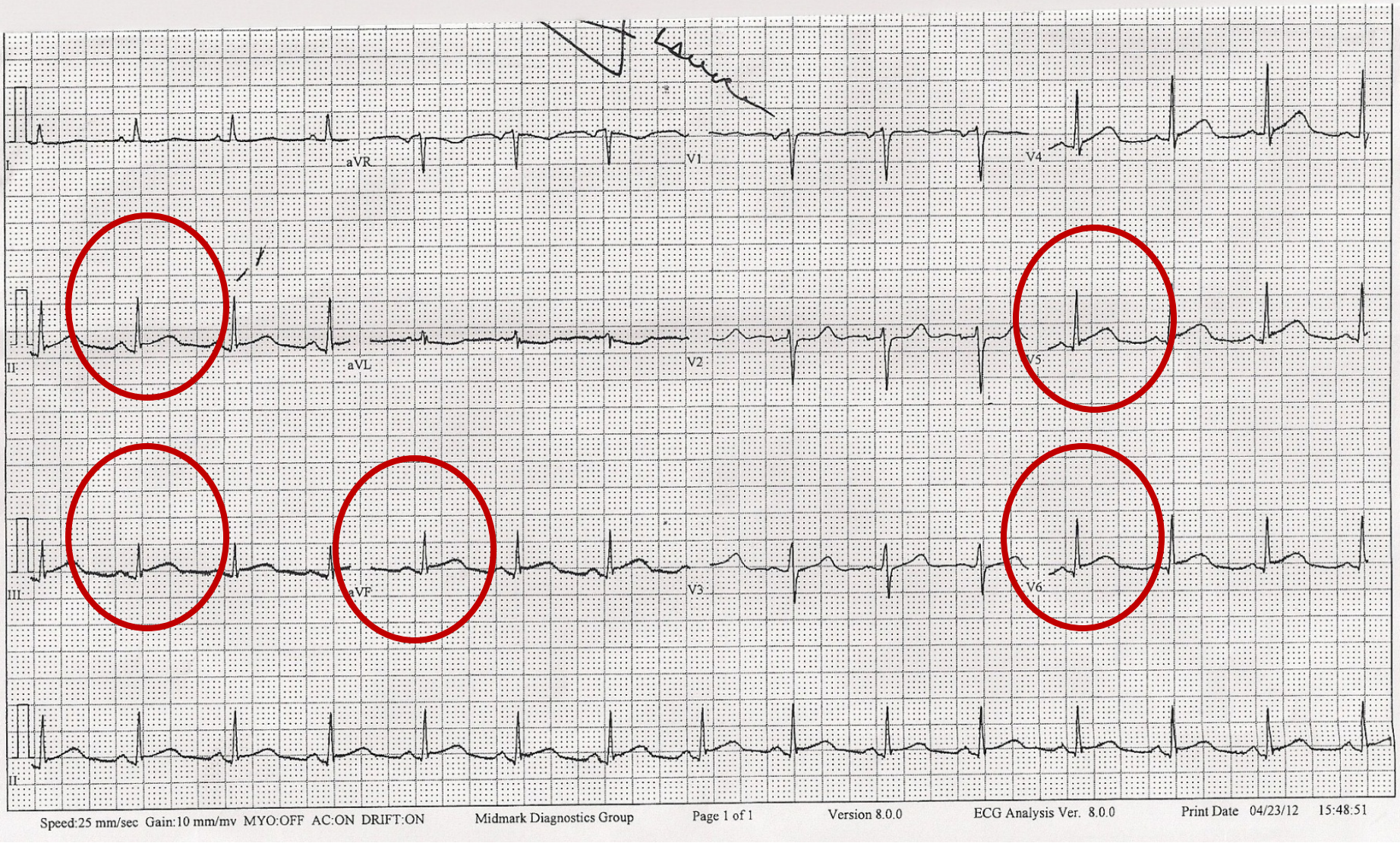
Focus on Leads aVR and V1



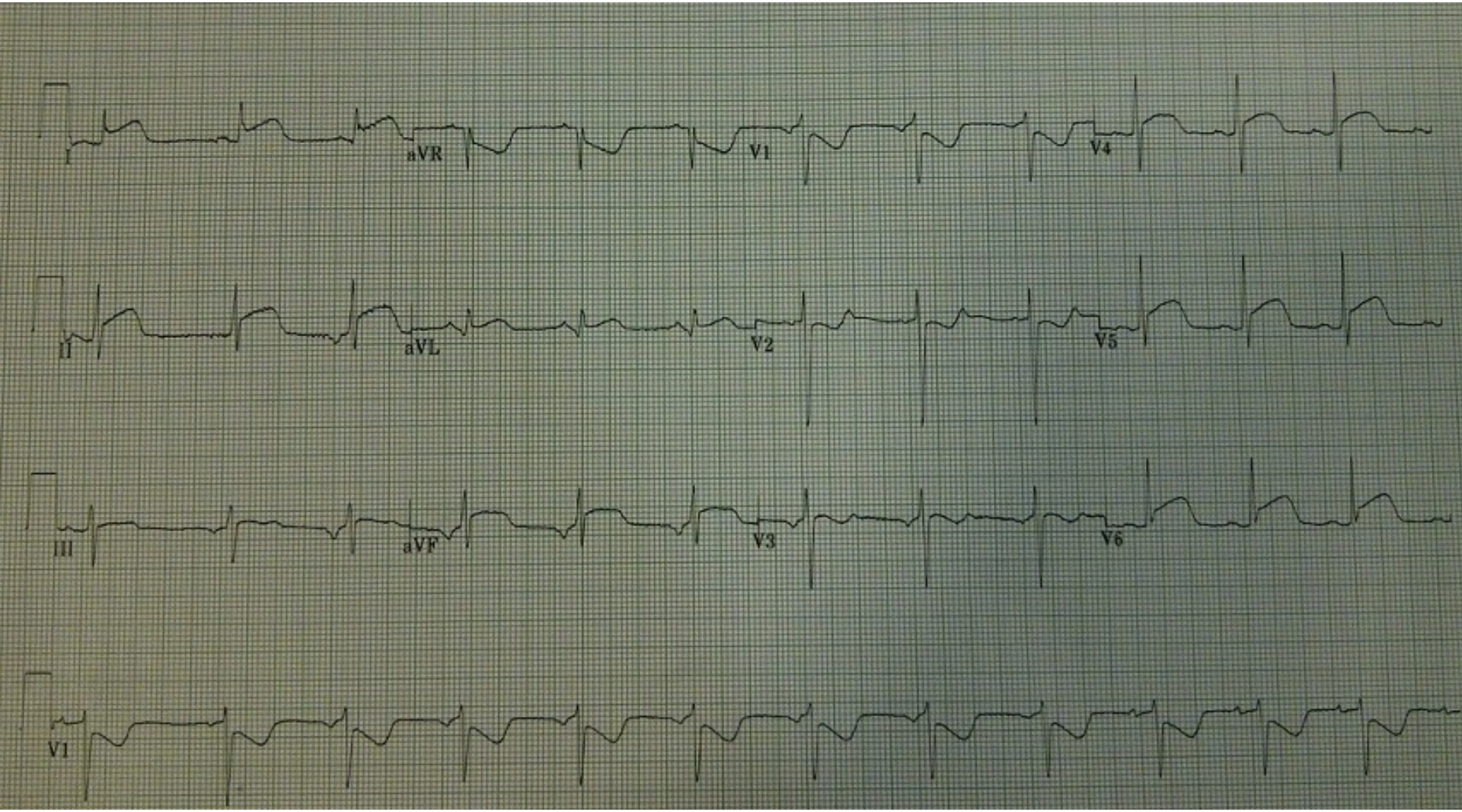


Speed:25 mm/sec Gain:10 mm/mv MYO:OFF AC:ON DRIFT:ON Midmark Diagnostics Group Page 1 of 1 Version 8.0.0 ECG Analysis Ver. 8.0.0 Print Date 04/23/12 15:48:51

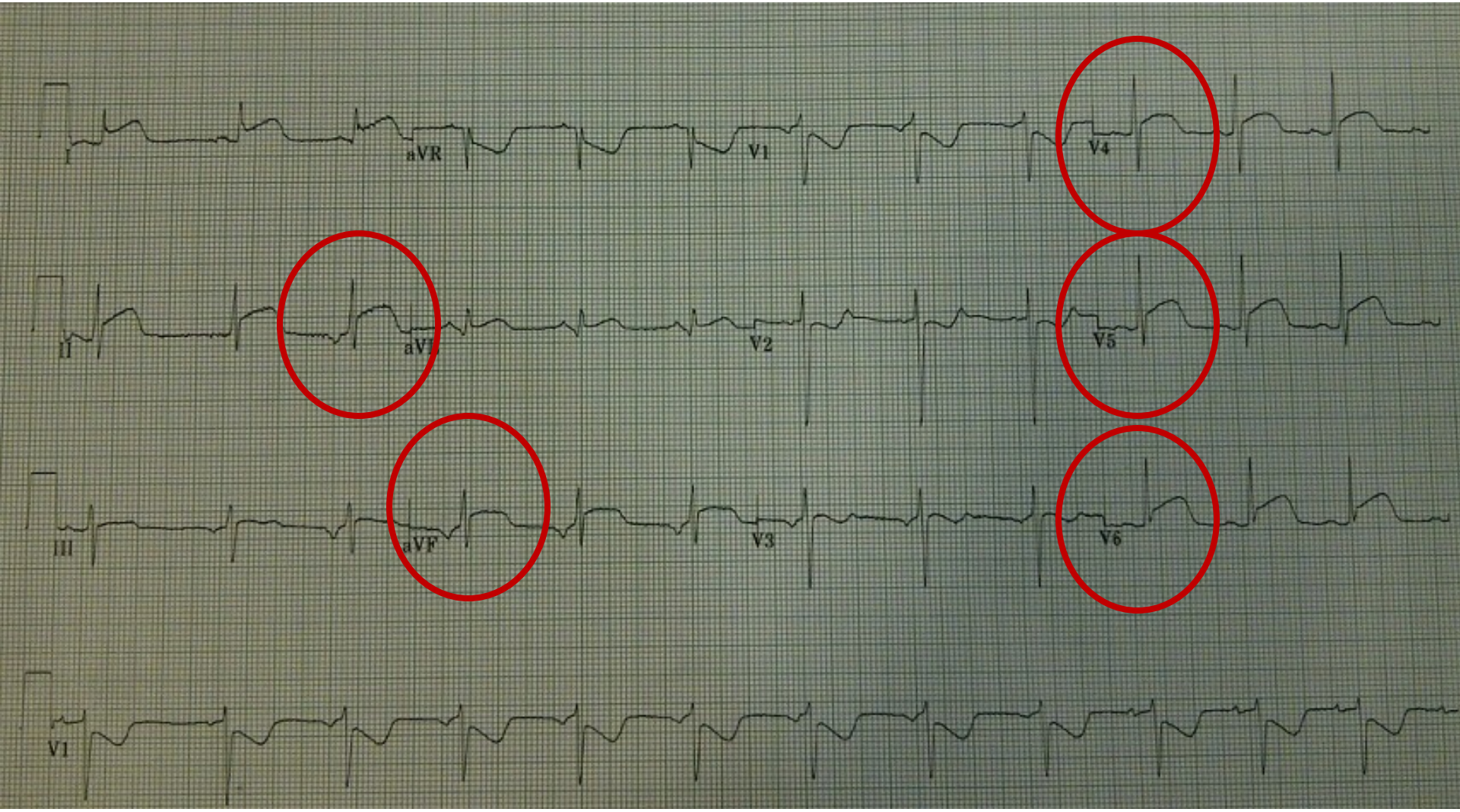
Sinus Rhythm, Inferio-lateral STEMI

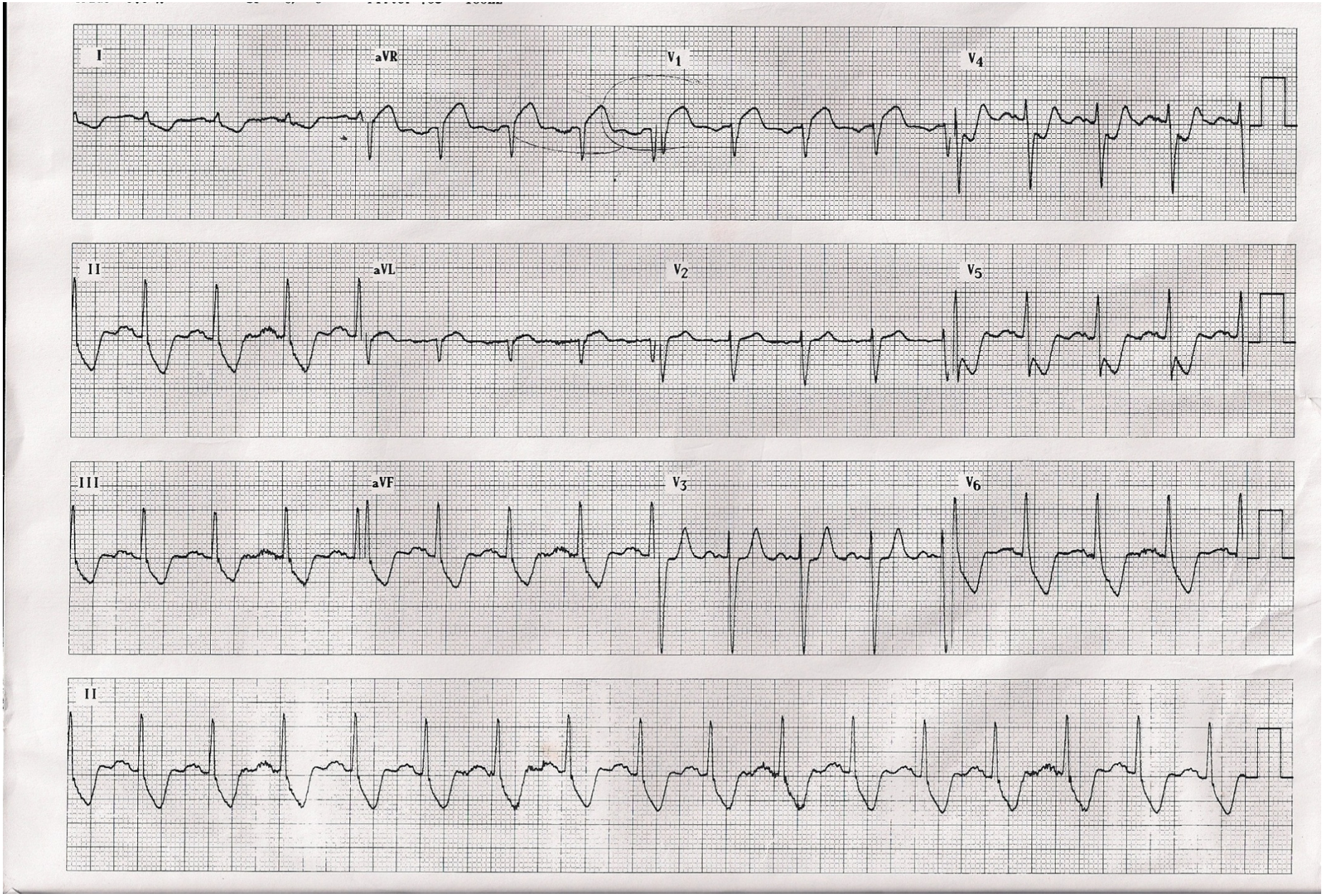


26 yo female, chest pain following IV EPI

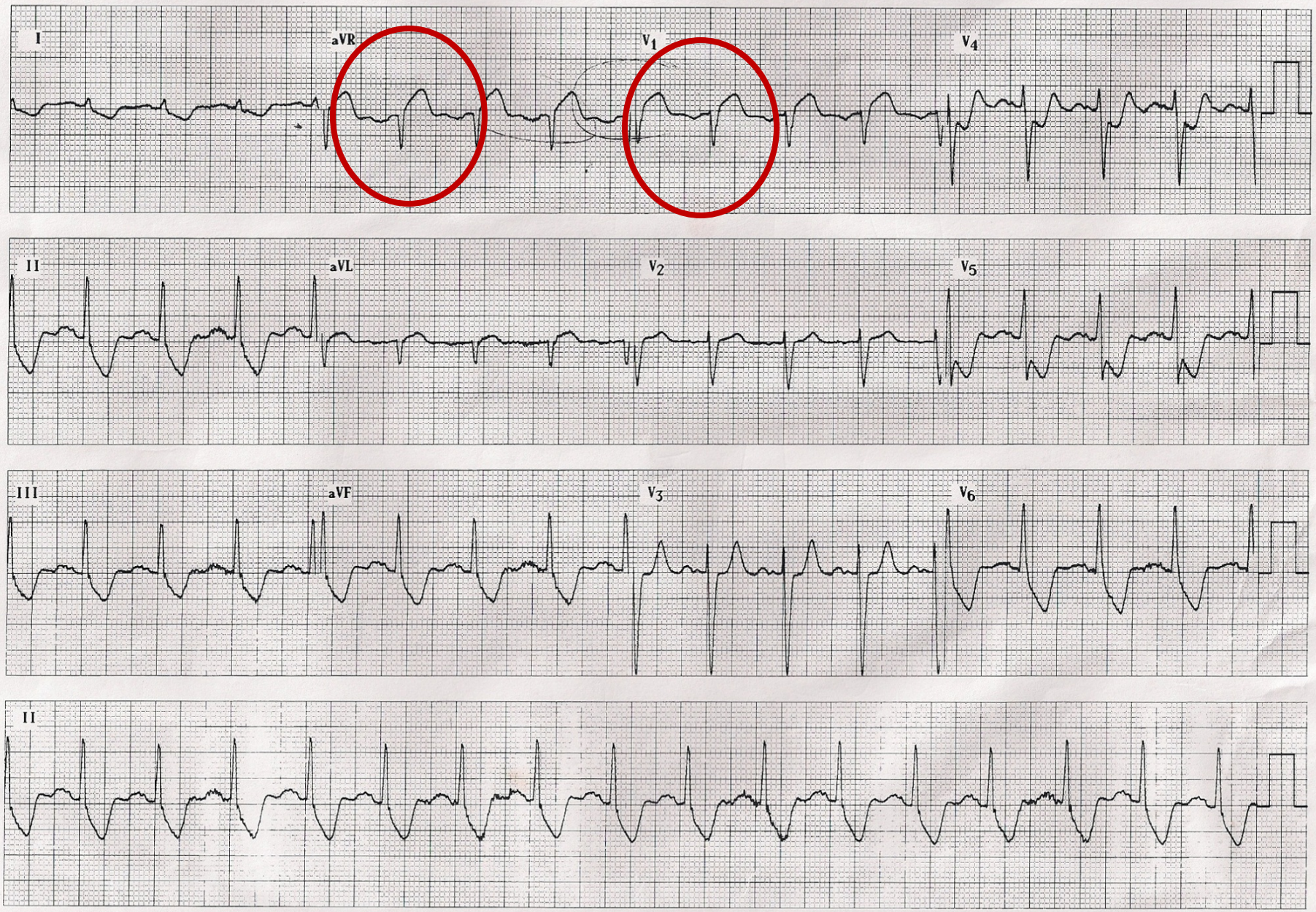


Diffuse ST segment elevation in all anatomic areas

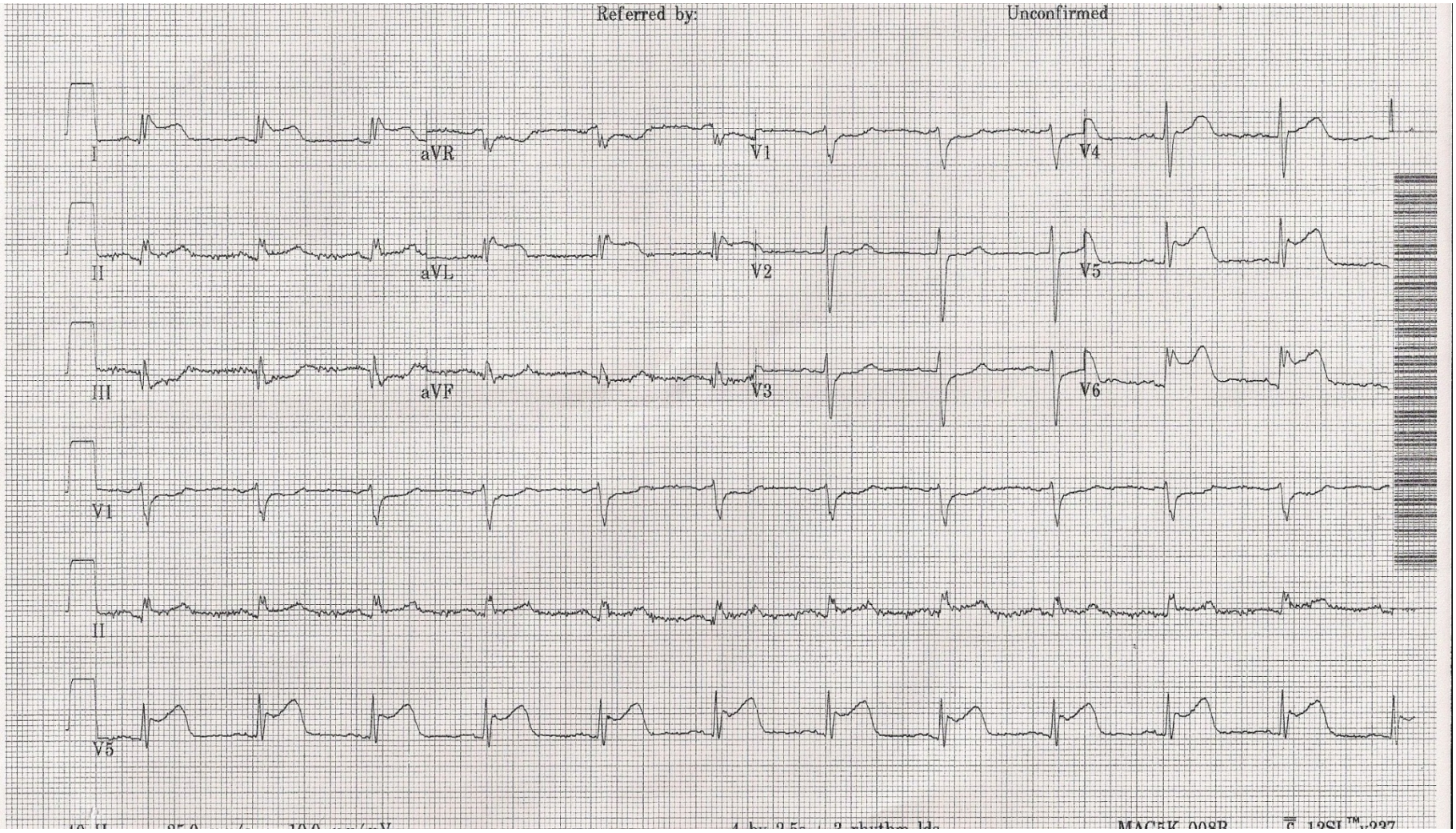




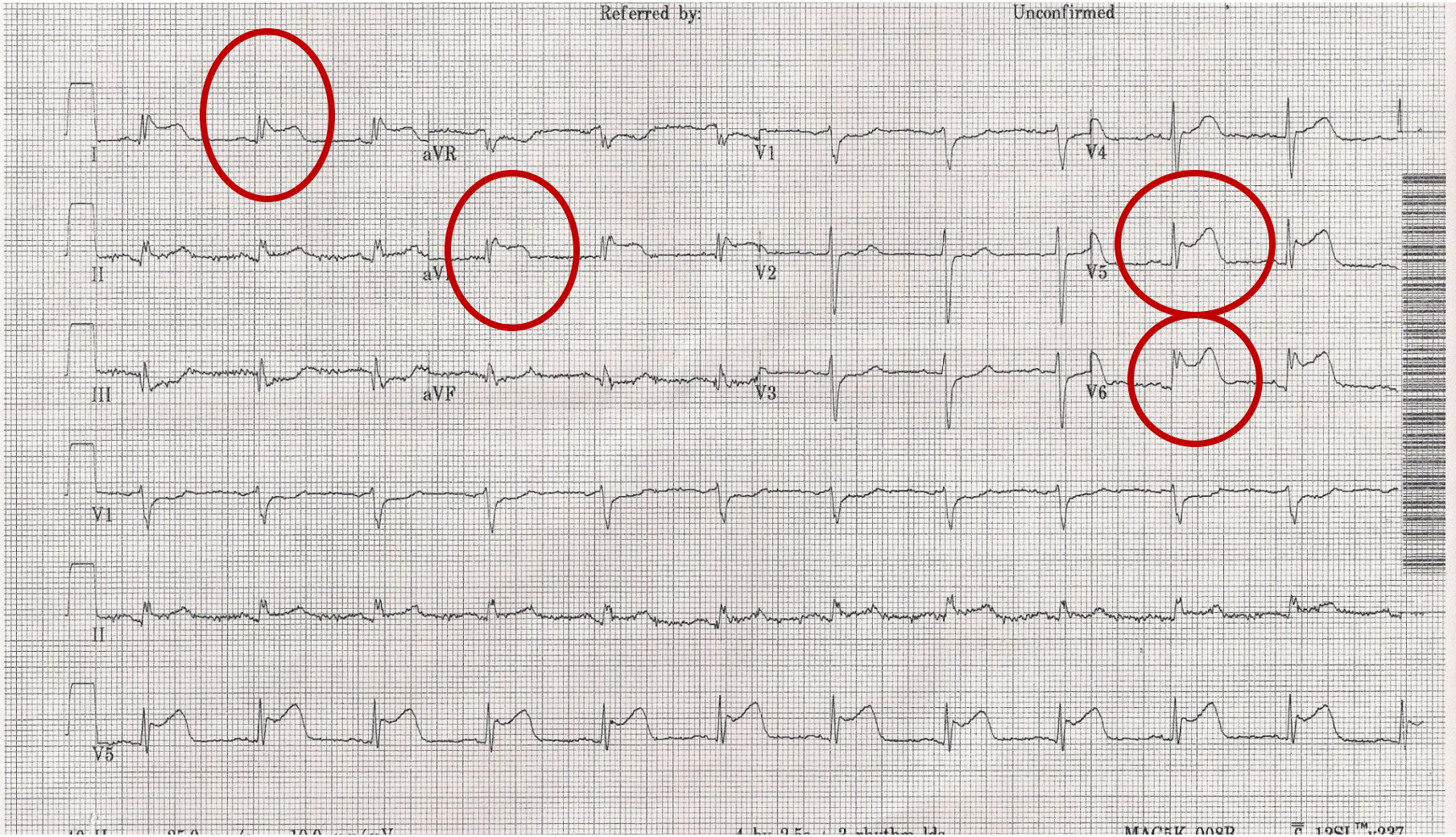
70 yo male, syncope during a stress test


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

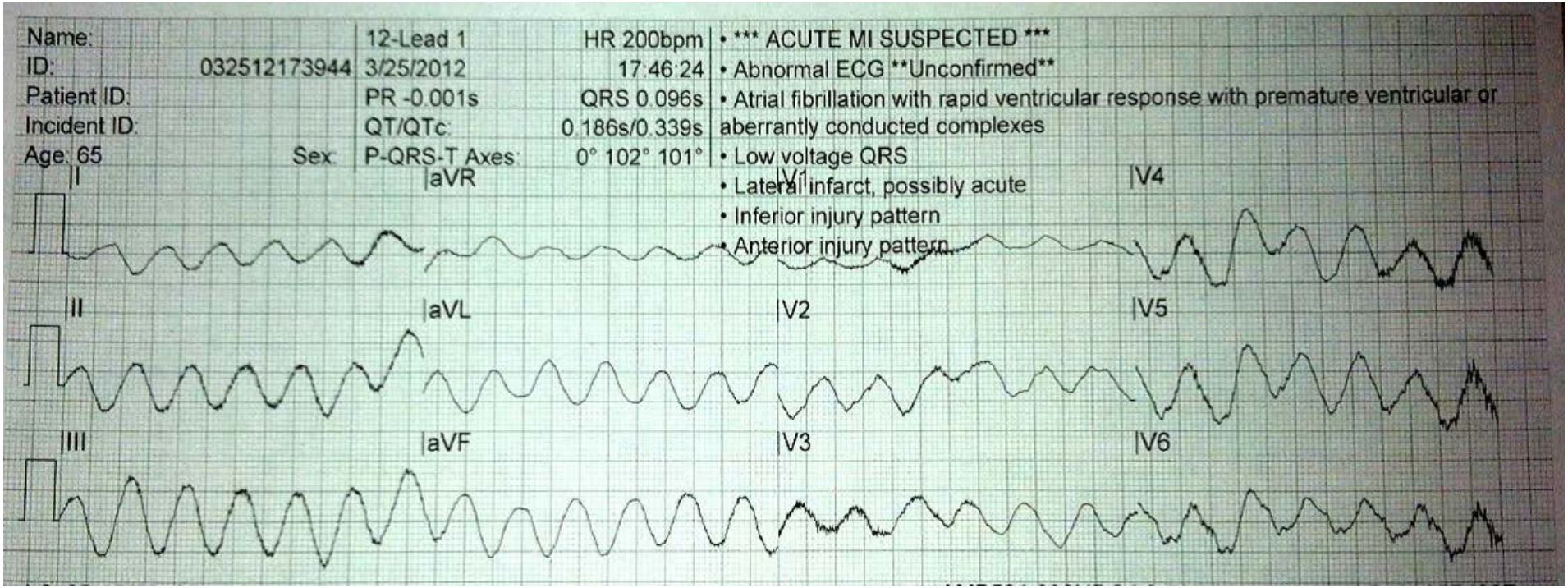
60 yo male, indigestion



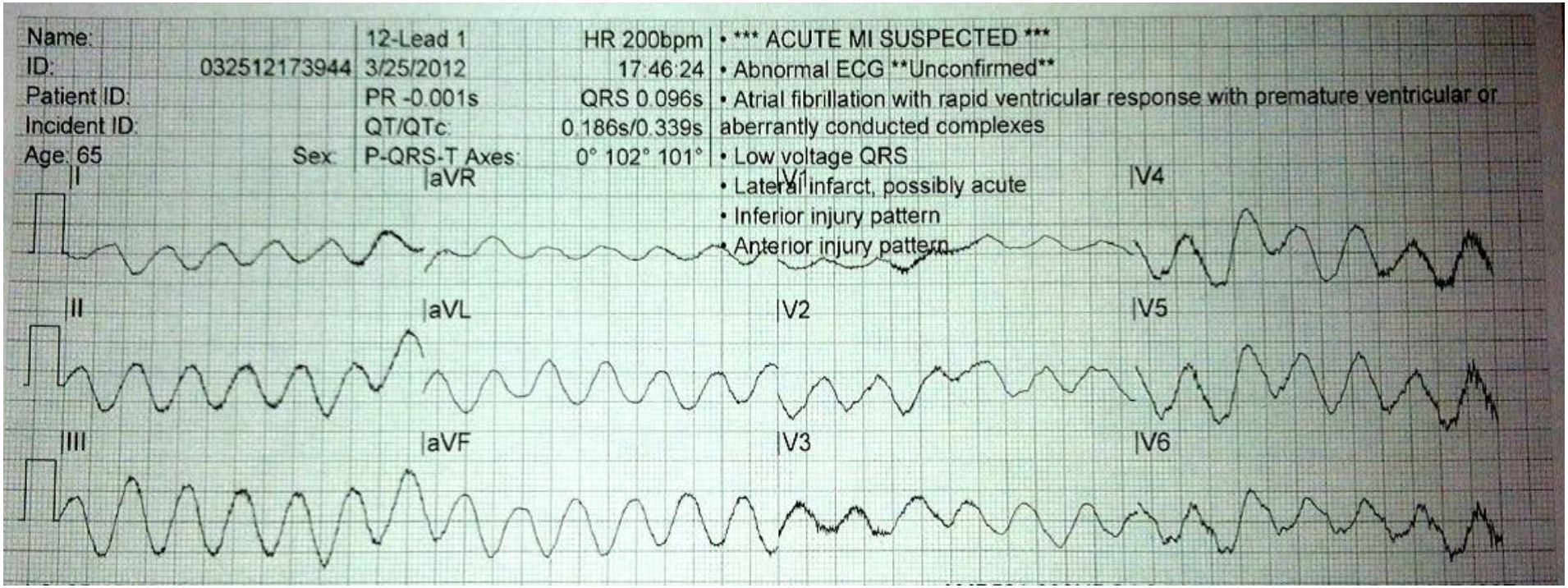
Lateral wall STEMI



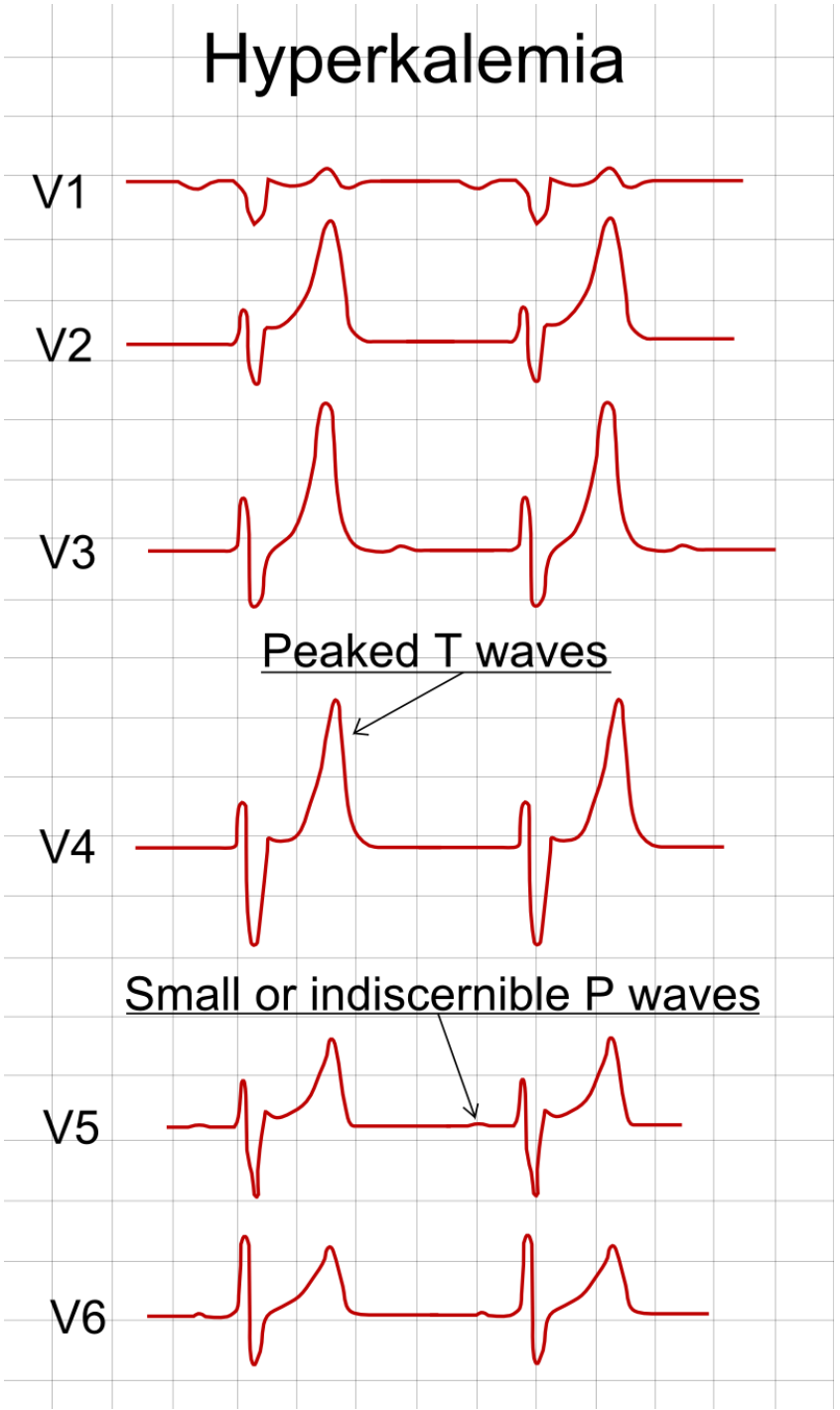
26 yo female, ESRD and weakness



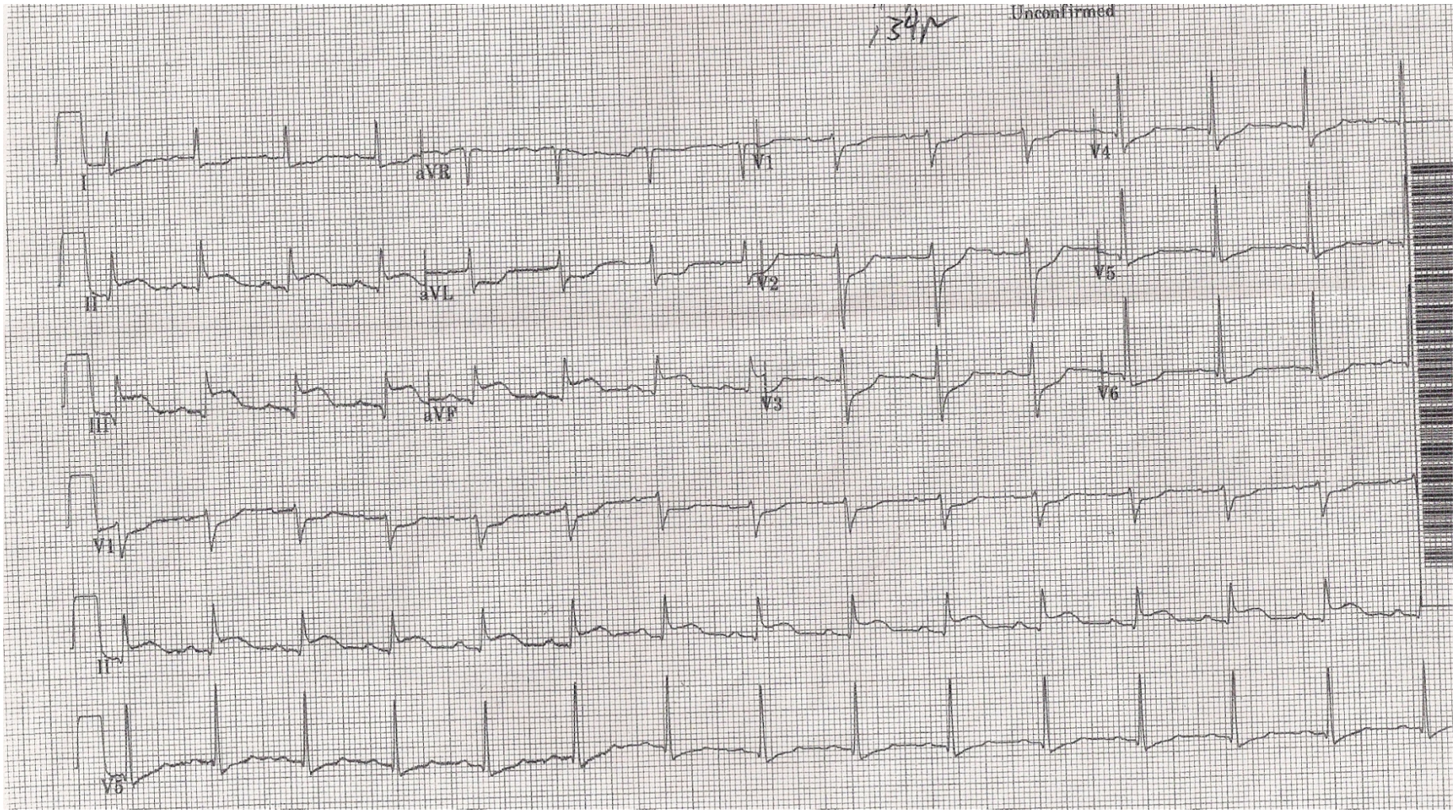
Severe Hyperkalemia 8.4 mEQ/L



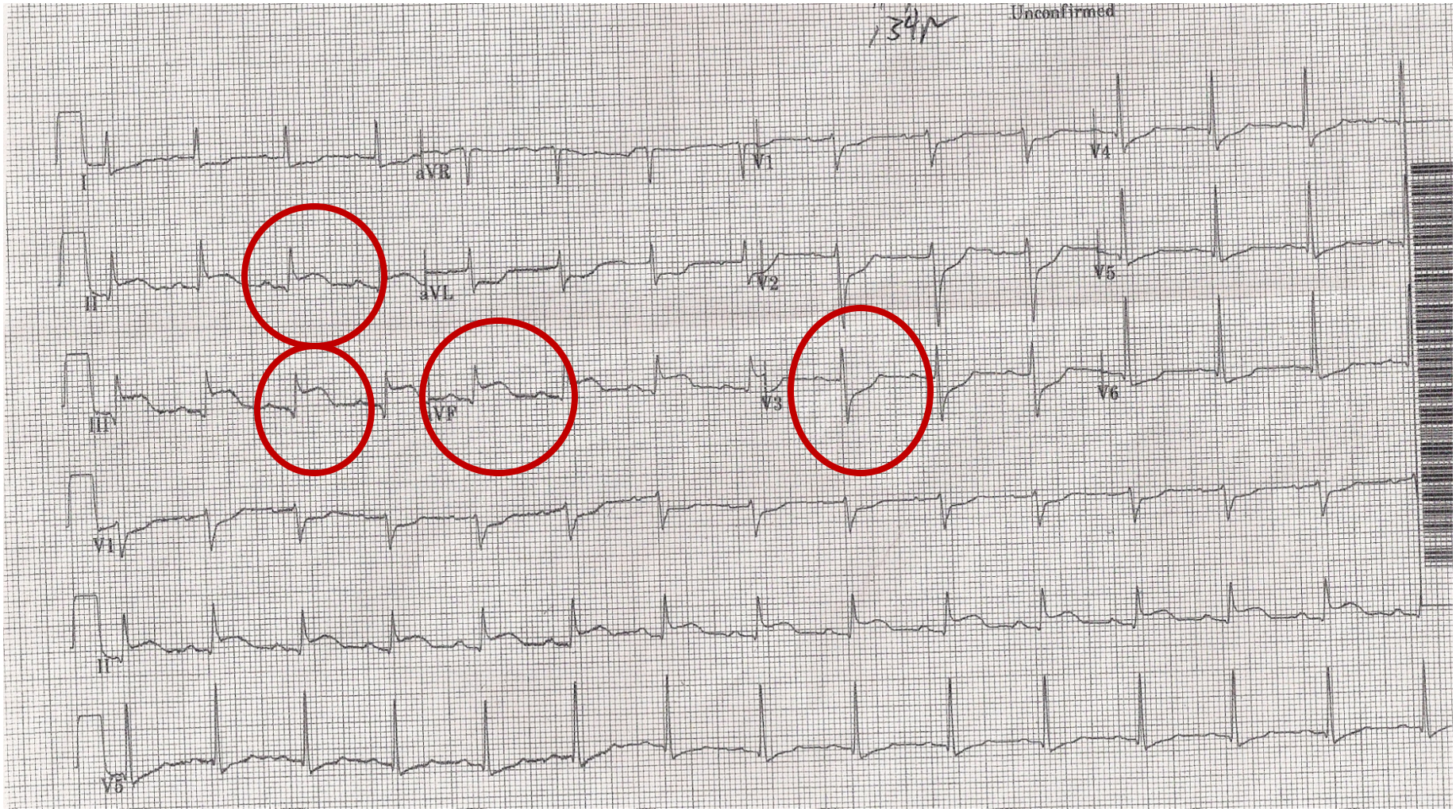
- Peaked T waves
- First degree block
- QRS widening
- ST segment elevation



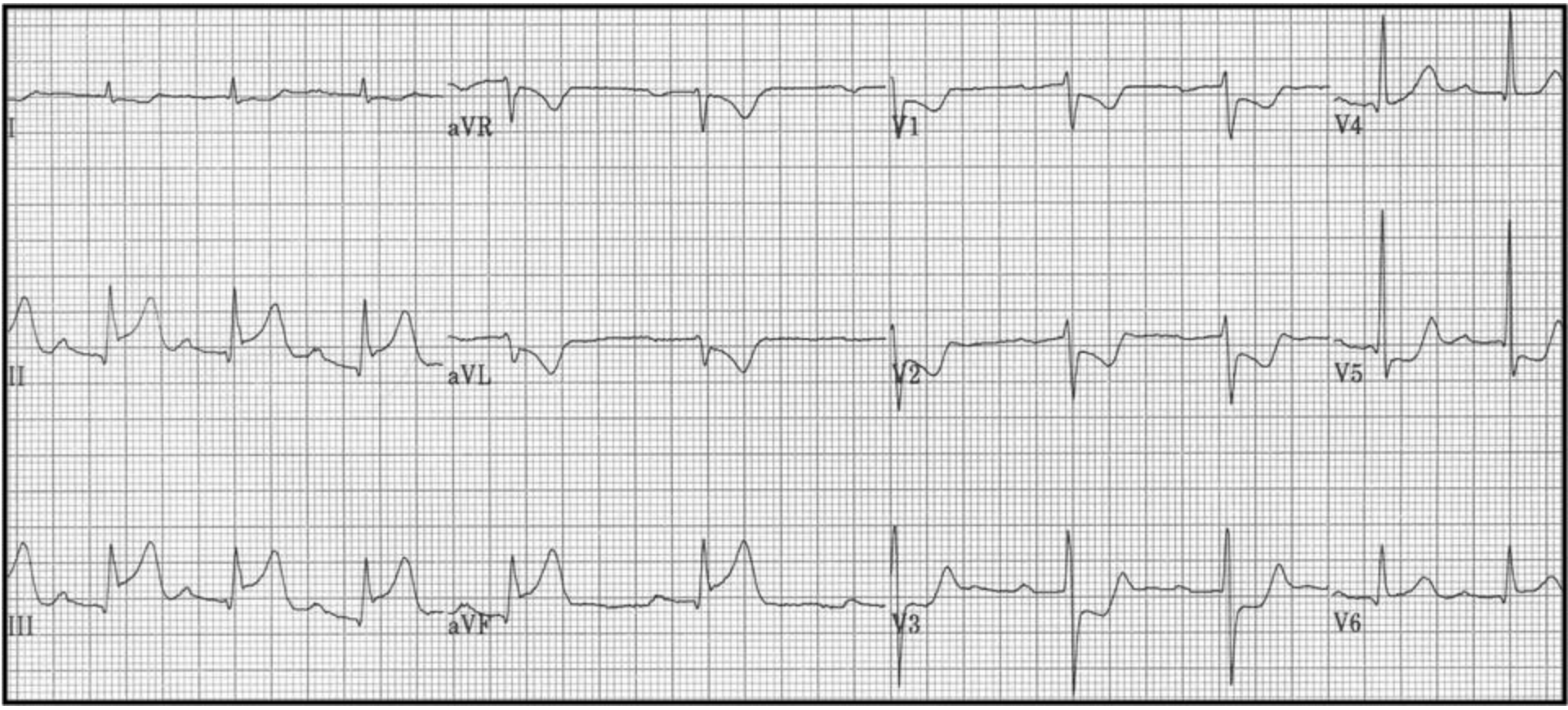
45 yo male, chest pain



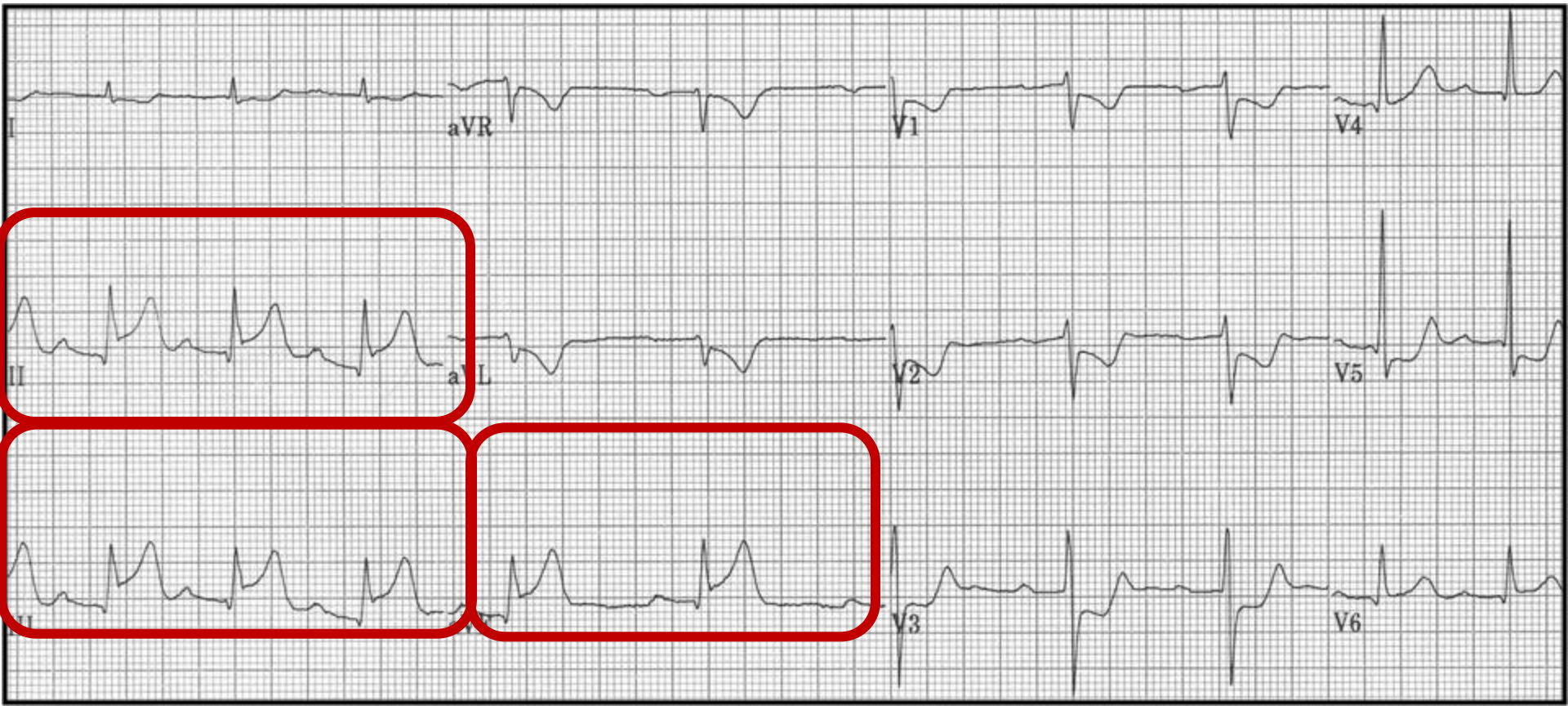
Inferior wall STEMI and deWinter's Wave



60 yo M, Nausea and Vomiting



Inferior wall MI with Posterior Ext

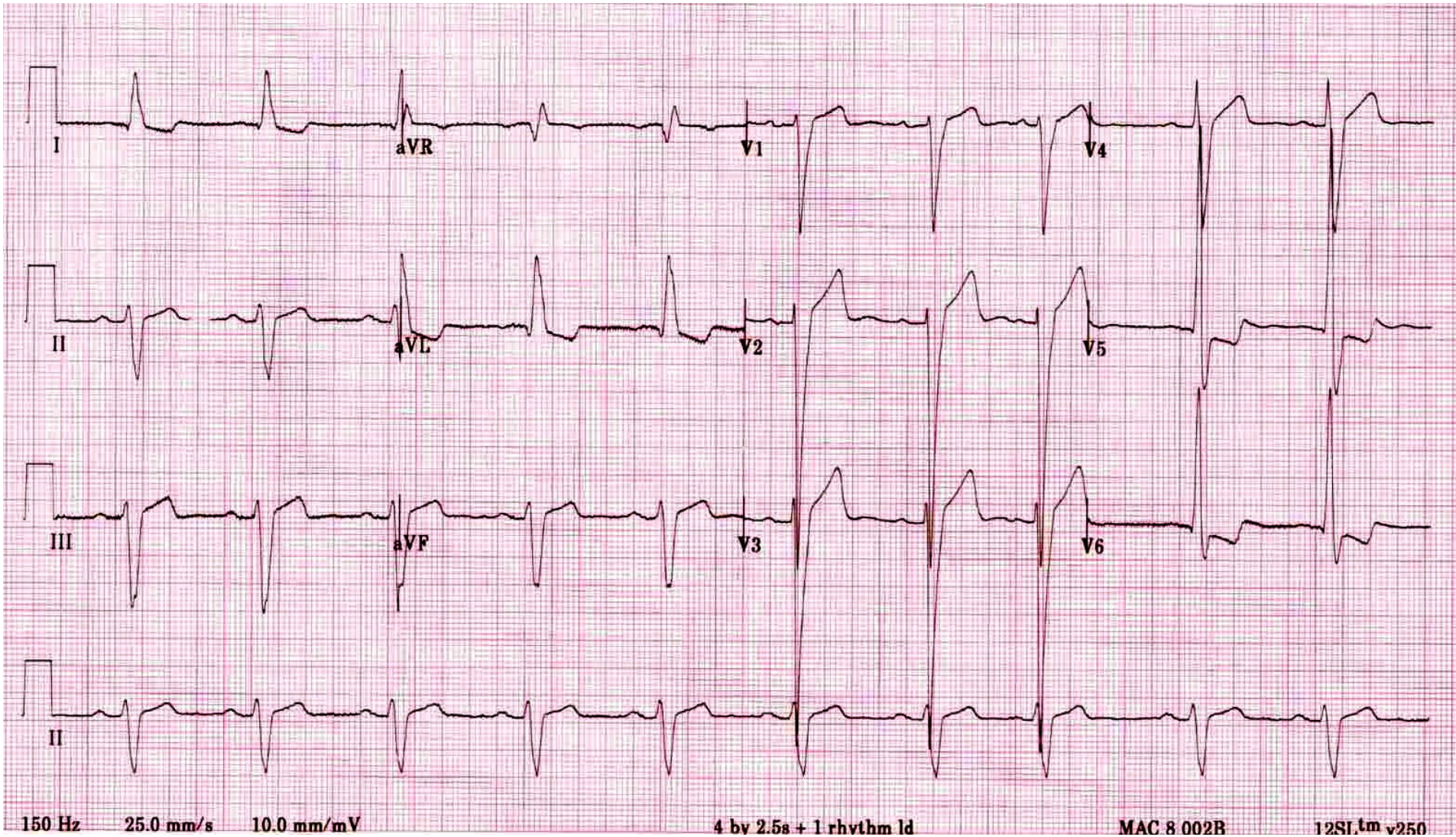


Posterior Extension

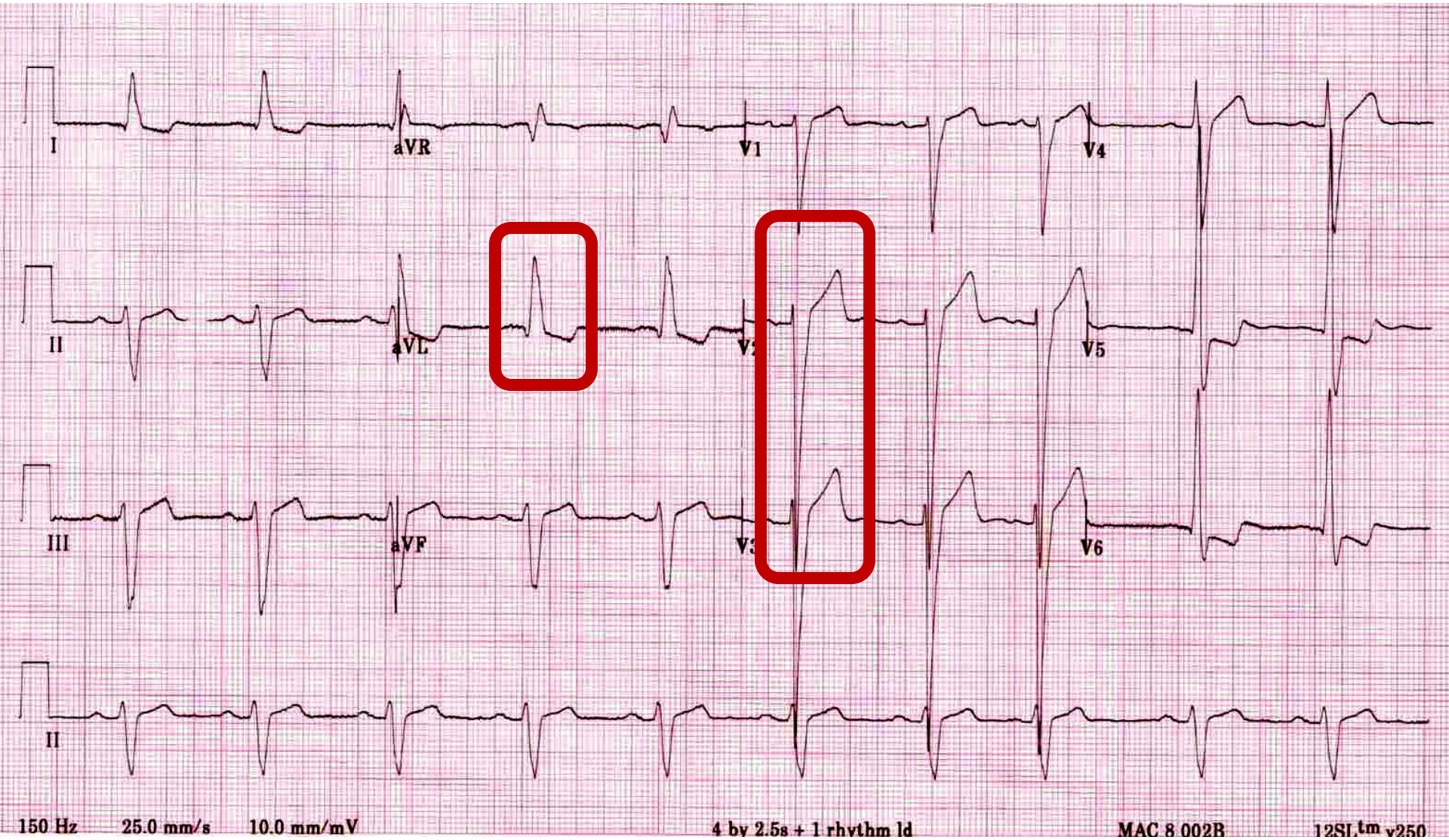
Tall R waves
ST segment depression

Tall R waves
ST segment depression
Terminally upright T wave

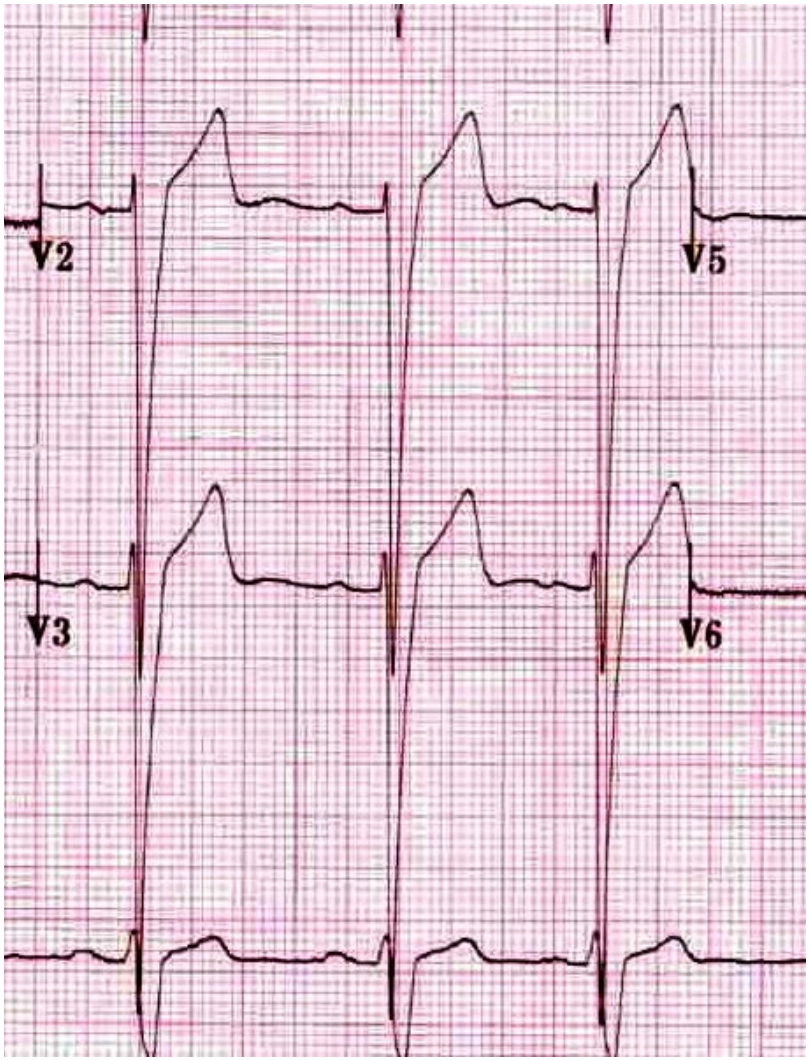
52 yo male, aching pain after lifting weights



Left ventricular hypertrophy

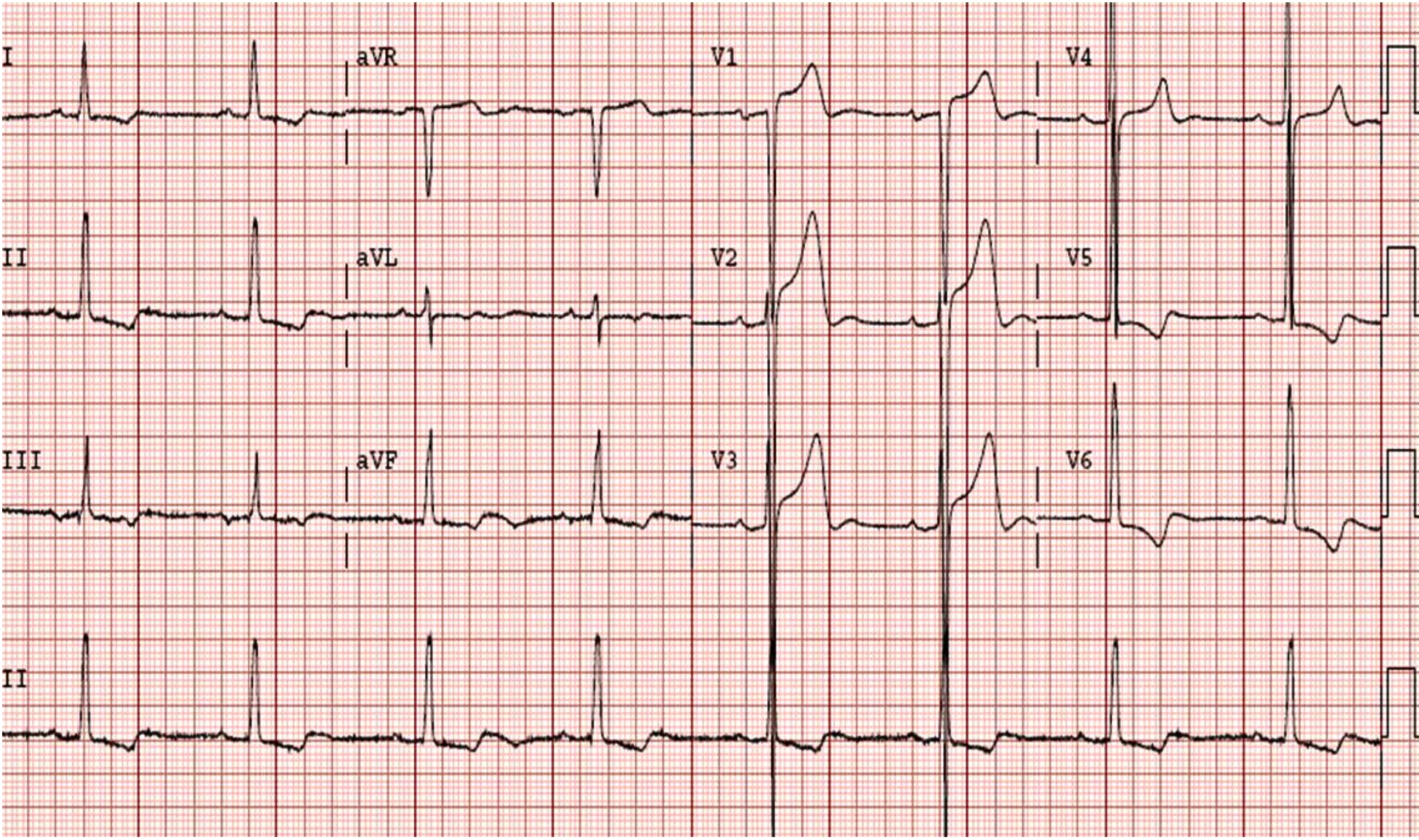


The Grand Mimicker

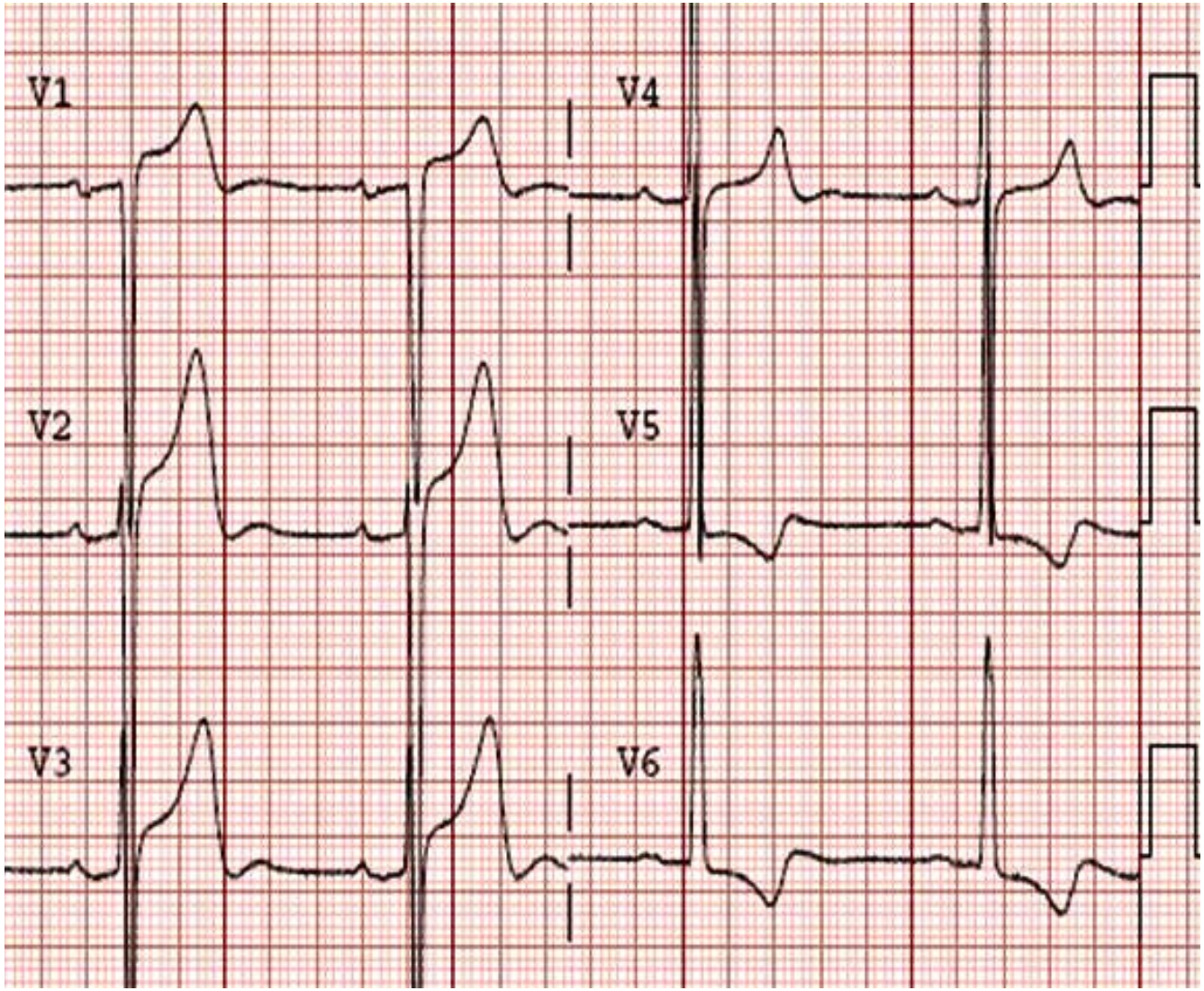


- Take a careful history
- ST elevation
- ST depression

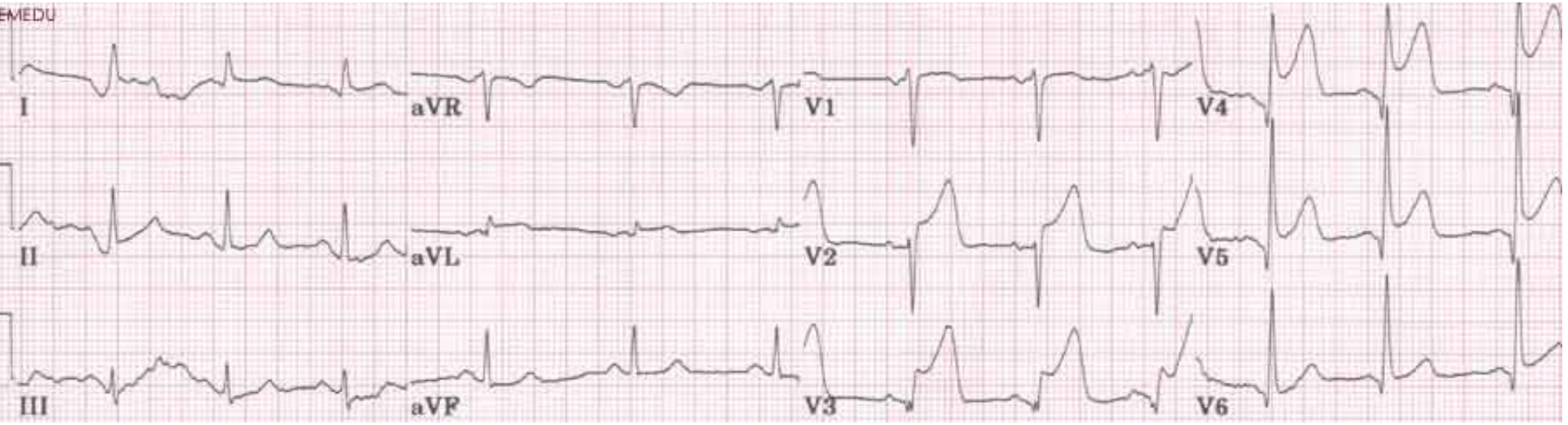
The “strain” of LVH



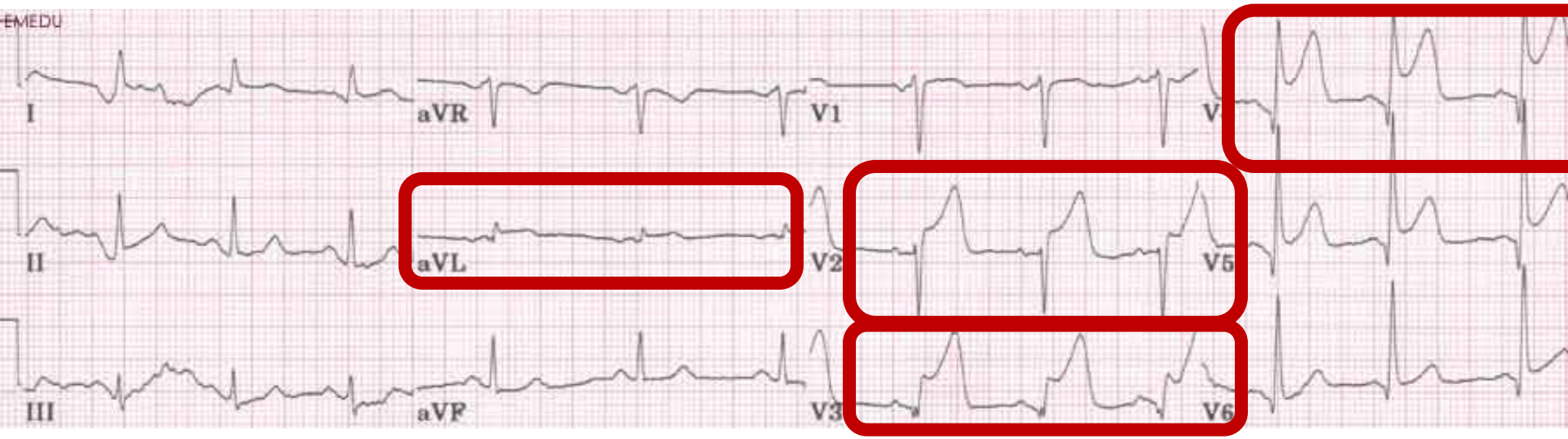
The “strain” of LVH



72 yo male, SOB



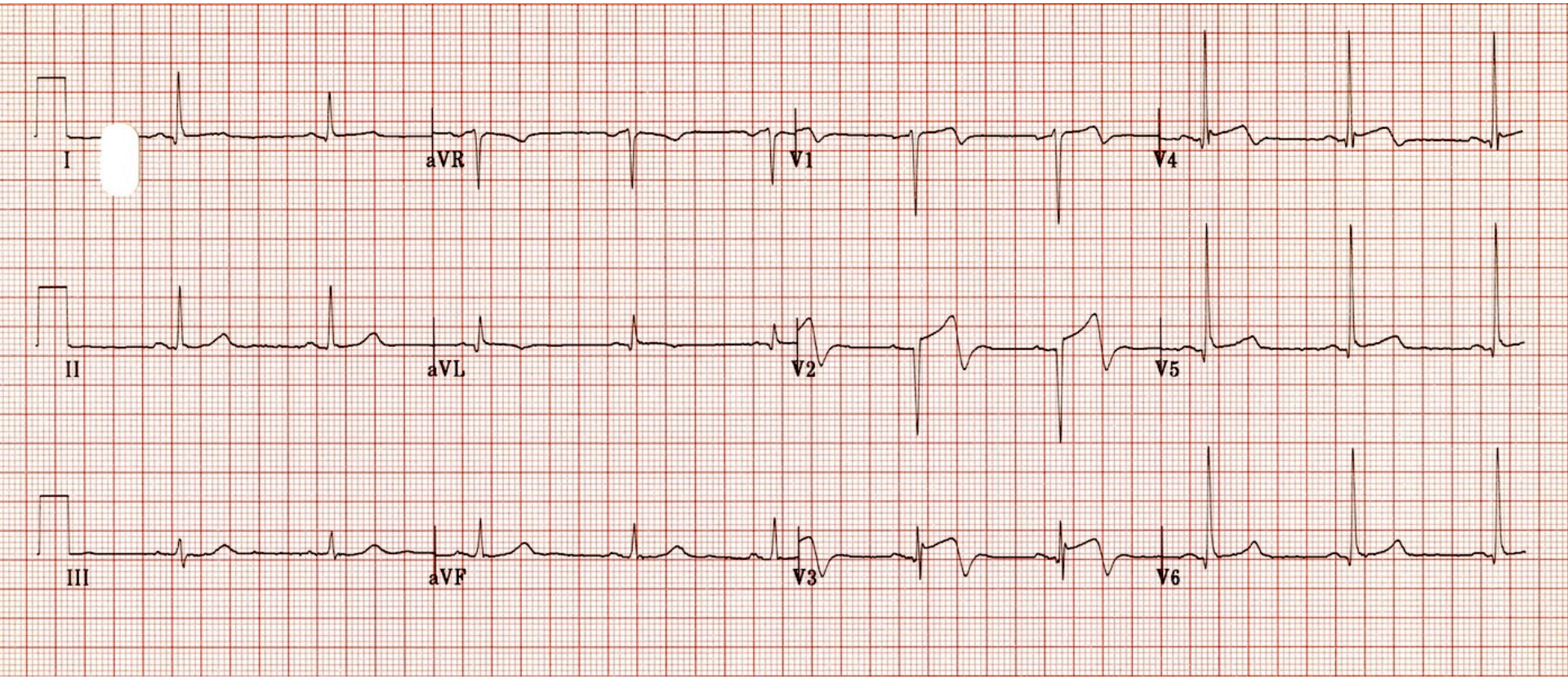
Massive anterior wall STEMI



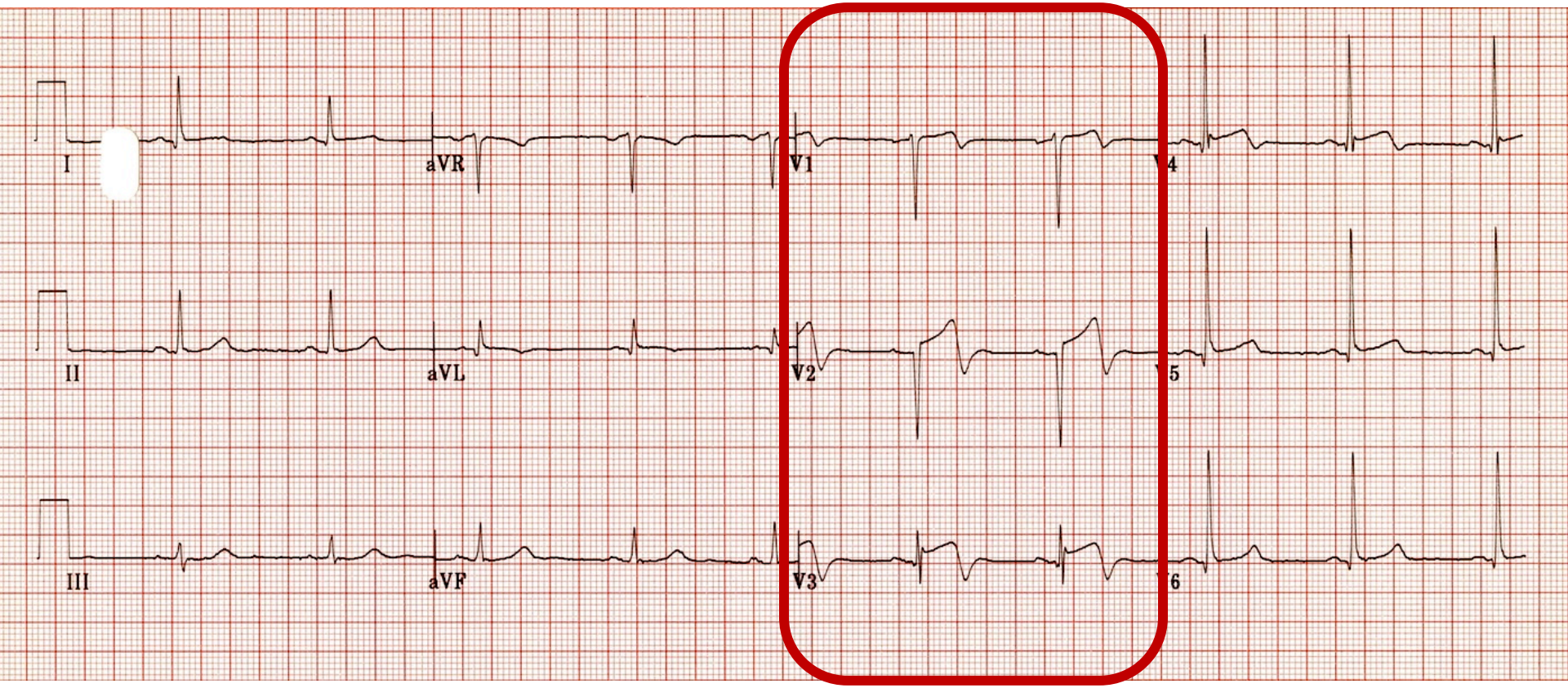
2 life threatening complications of massive anterior wall STEMIs:

→ cardiogenic shock / pulmonary edema
→ Ventricular dysrhythmia

62 yo F, Hx of CP, now pain free

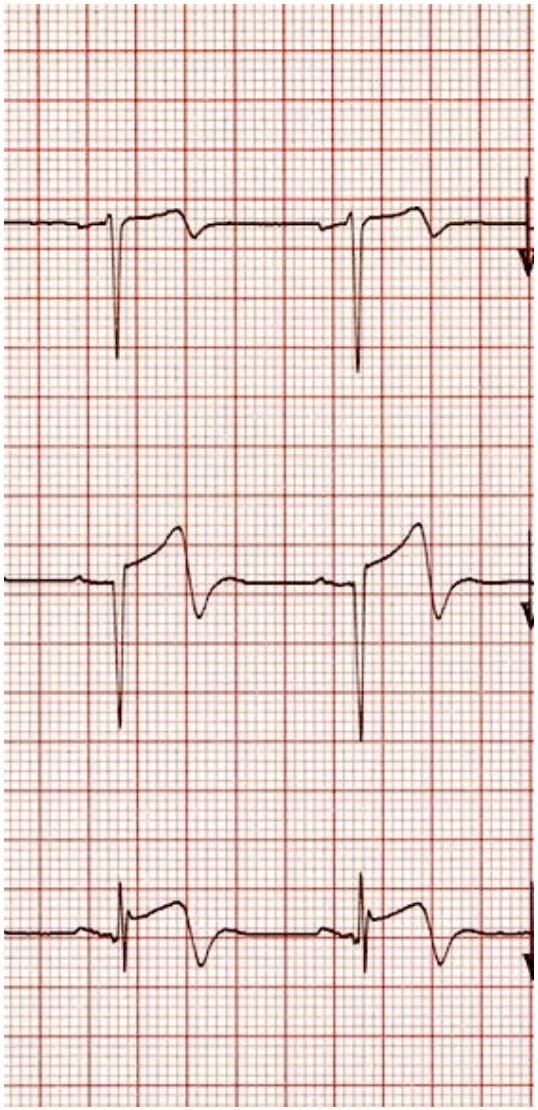


Wellens' Syndrome

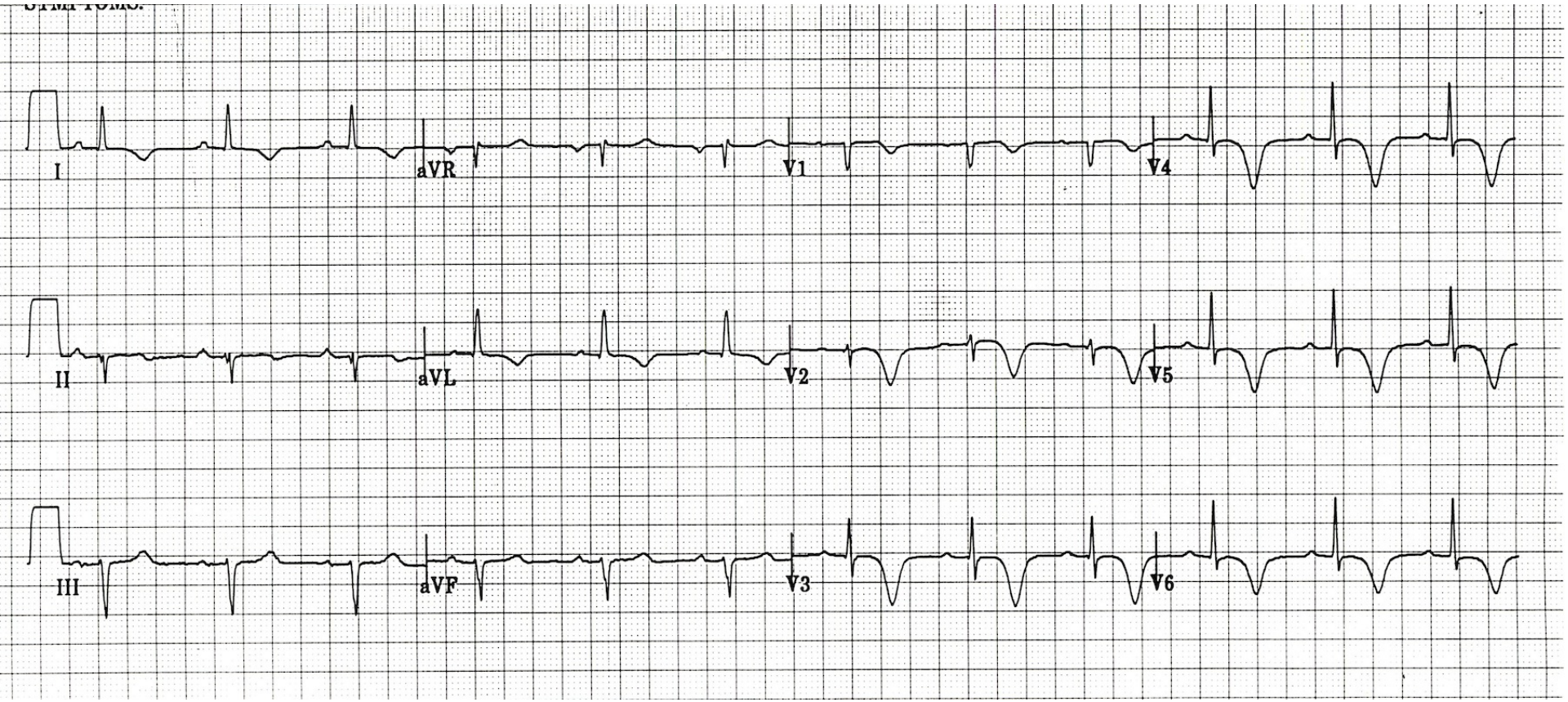


Wellens' Syndrome

- ECG changes persist in pain free state
- Suggestive of critical LAD disease
- Biphasic T waves in V1-V3

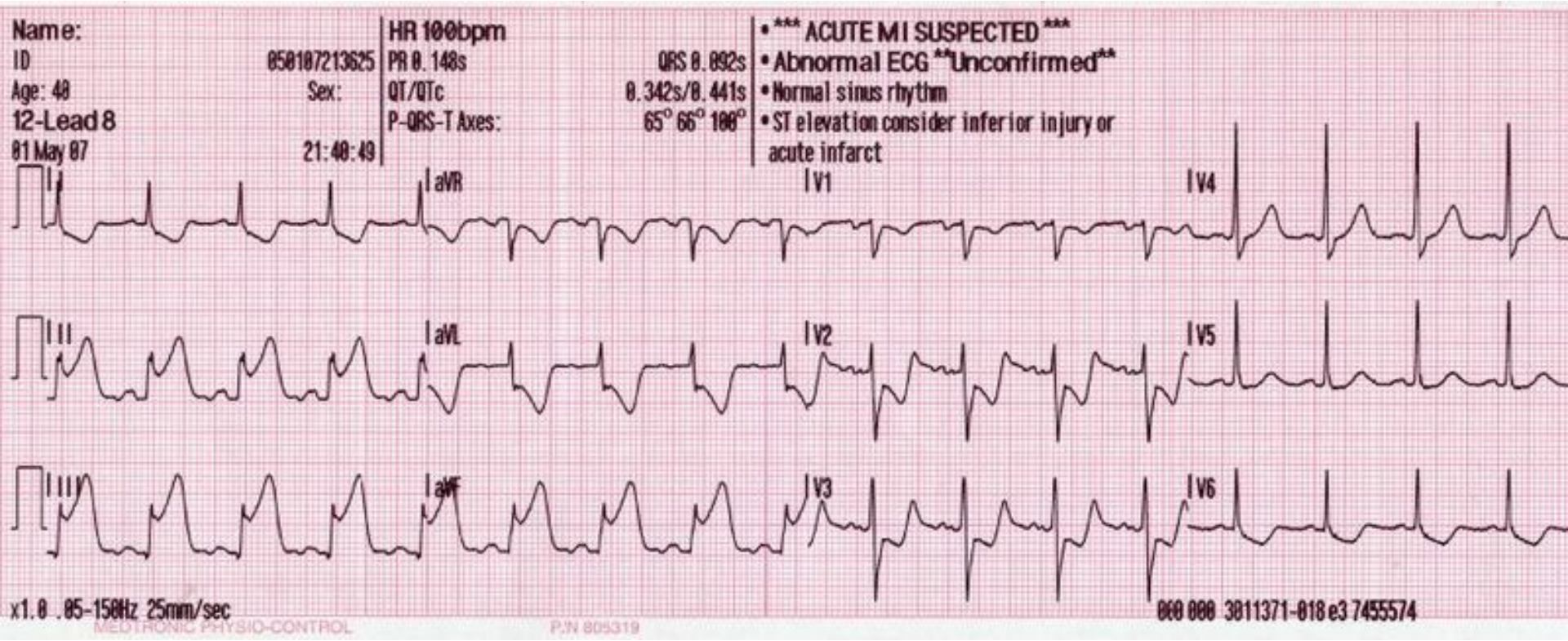


More Wellens' Syndrome

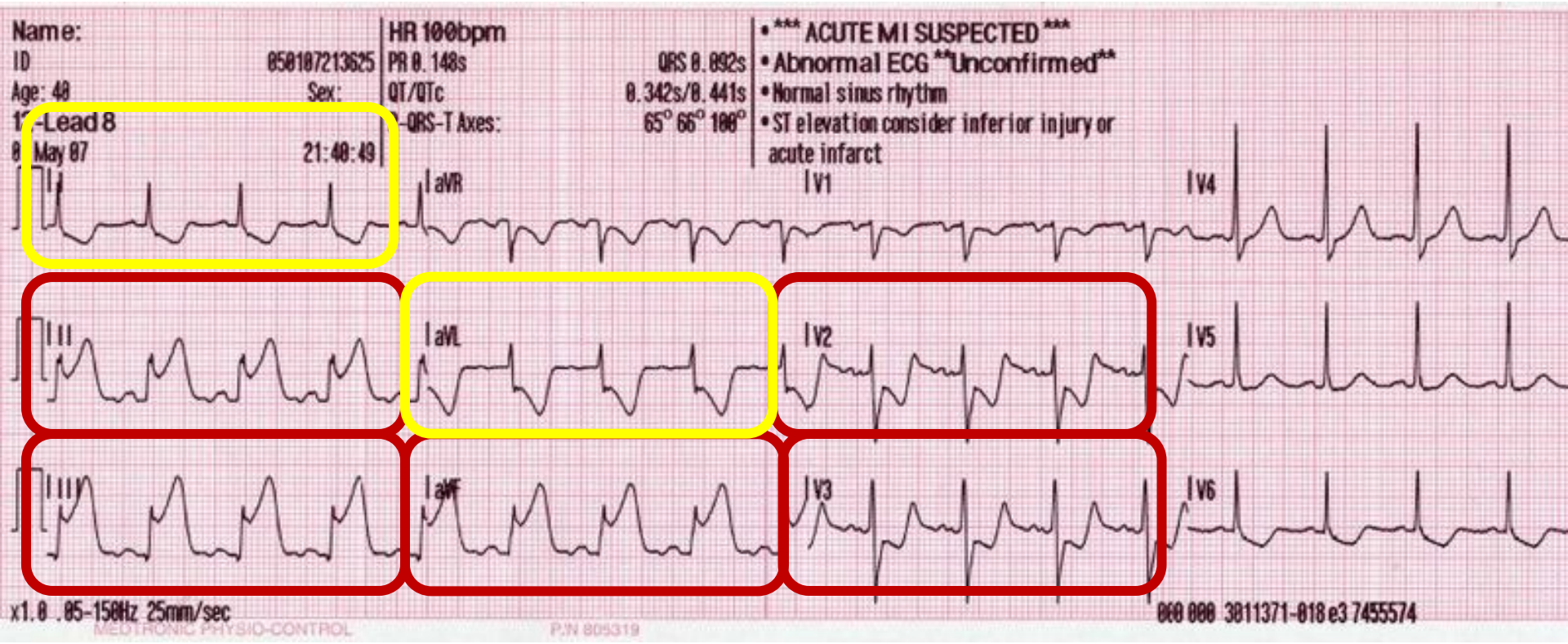


- Diffuse T wave inversions anteriorly
- Deeply inverted and largely symmetrical

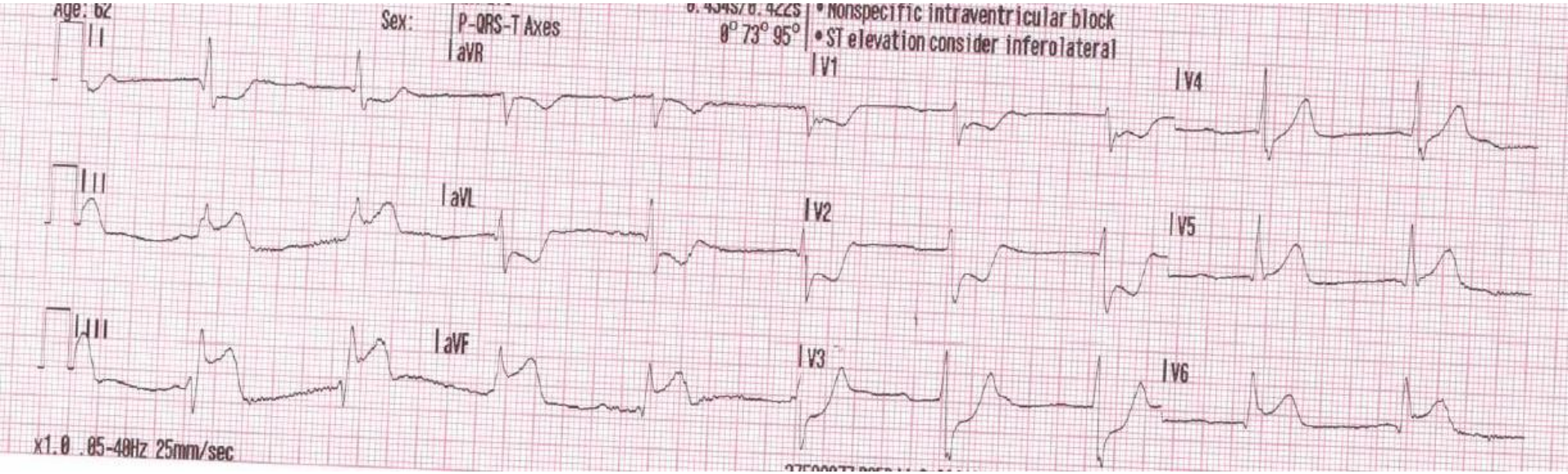
46 yo F, chest pressure



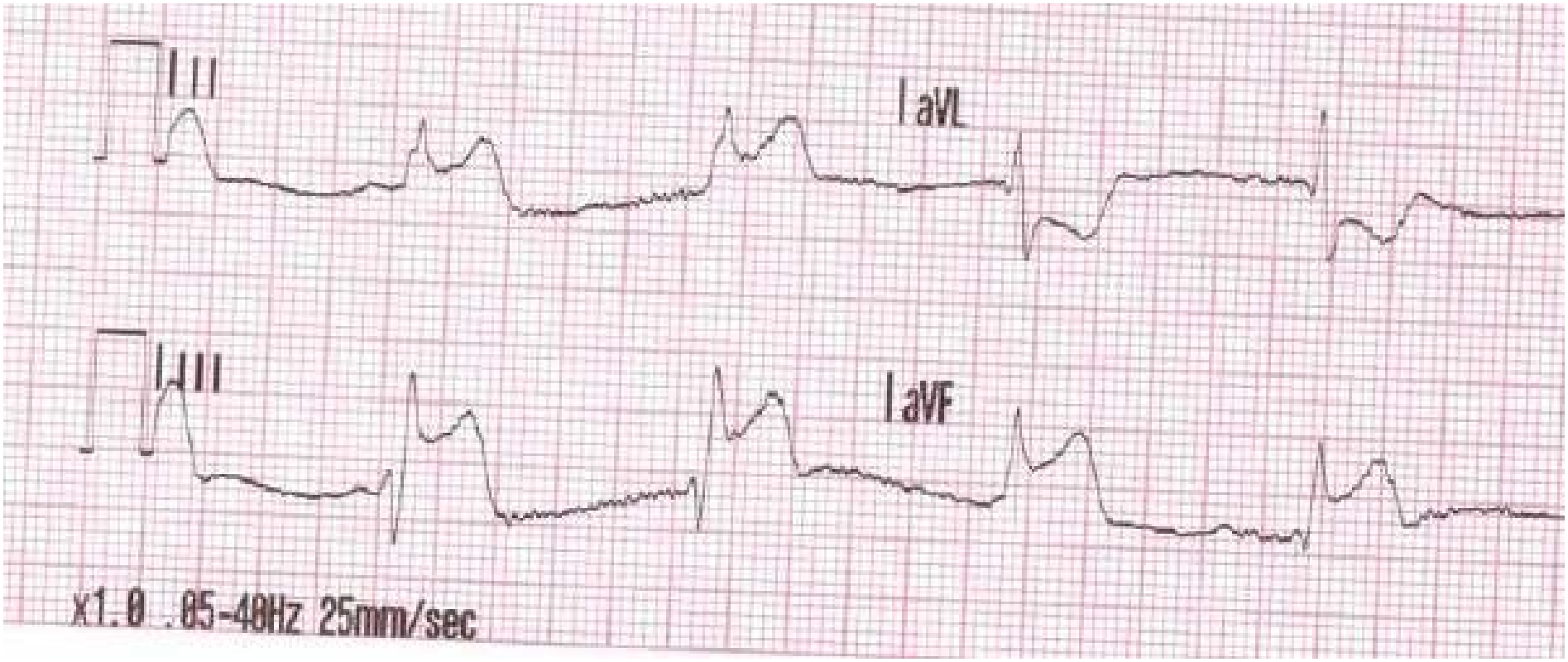
Inferior wall MI with posterior ext



Why so syncopal ?

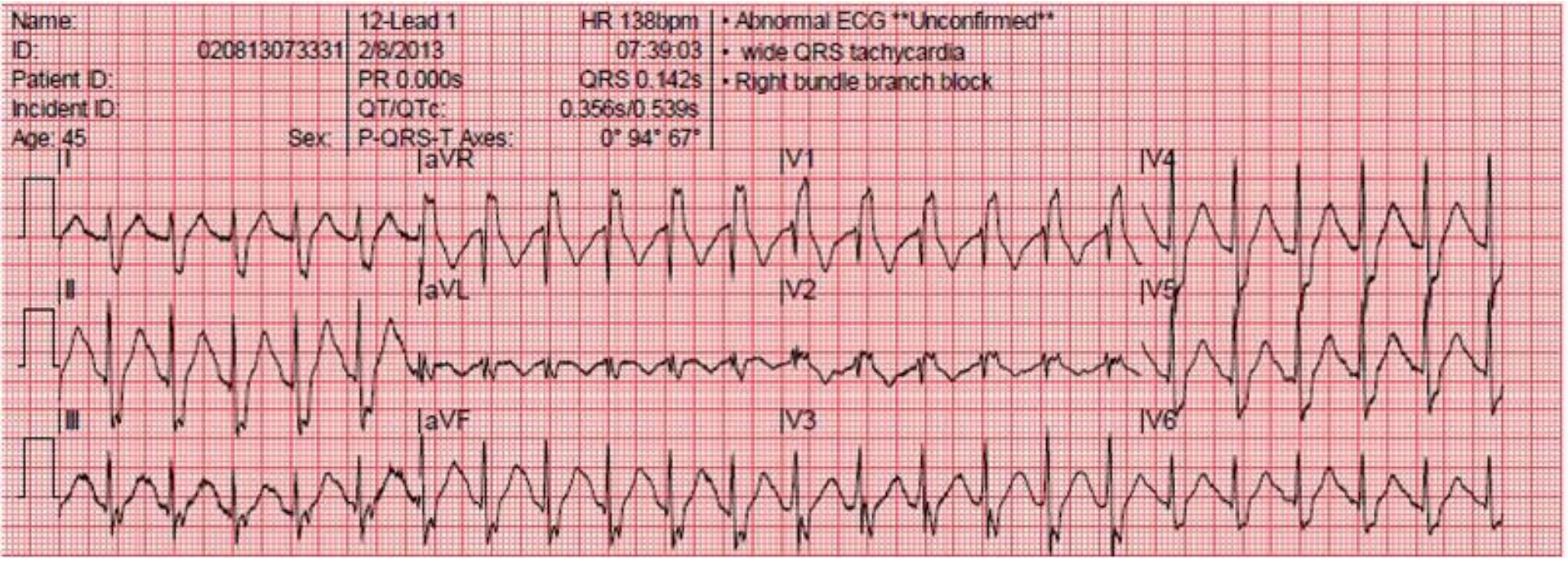


Why so syncopal ?

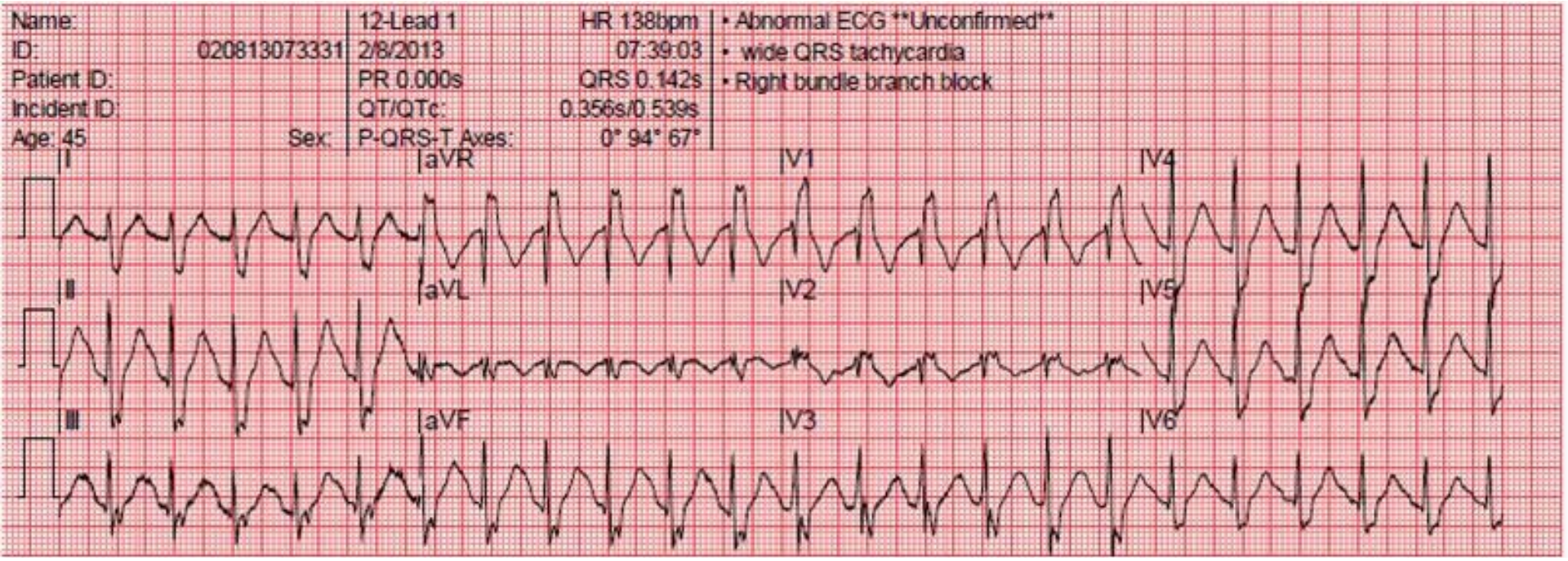


- **The RCA supplies the nodal artery**
- **Infarction results in conduction delays and blocks**
- **This is an inferior wall MI and third degree HB**

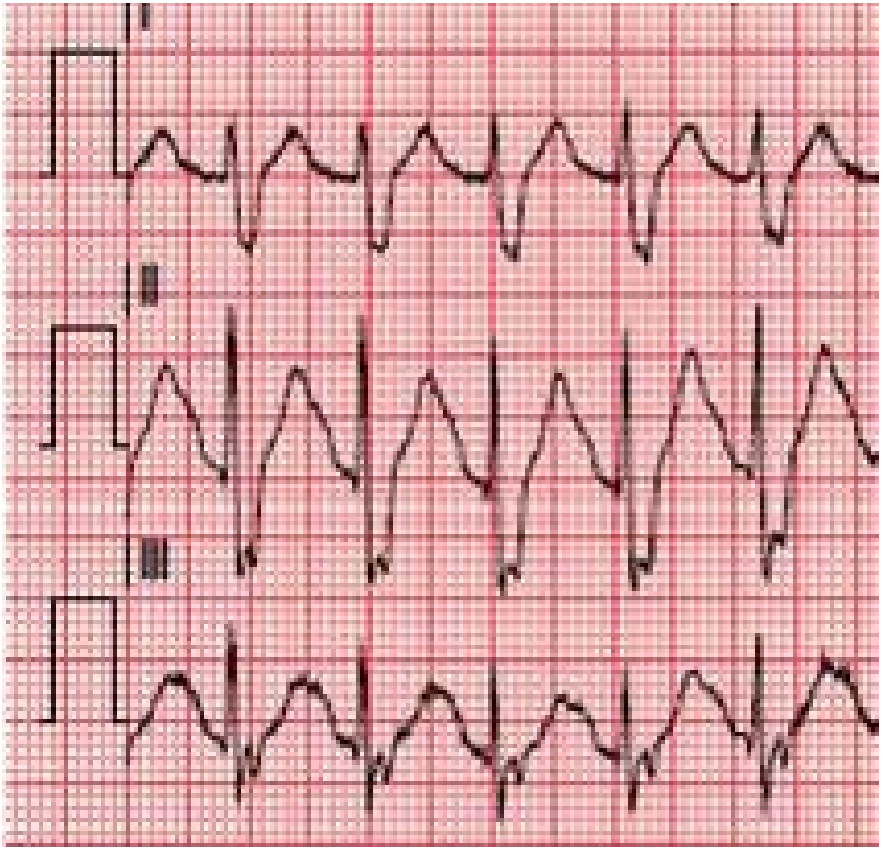
45 yo female, SOB

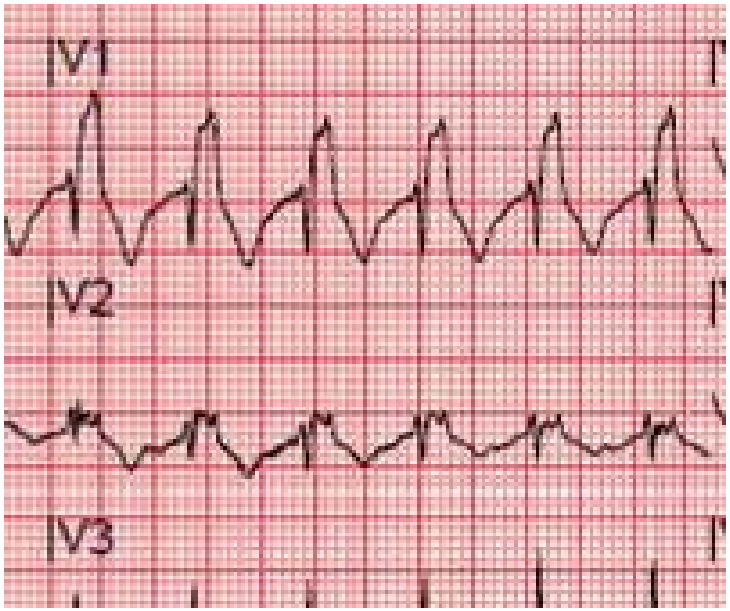


Pulmonary Embolism and Right Heart Strain



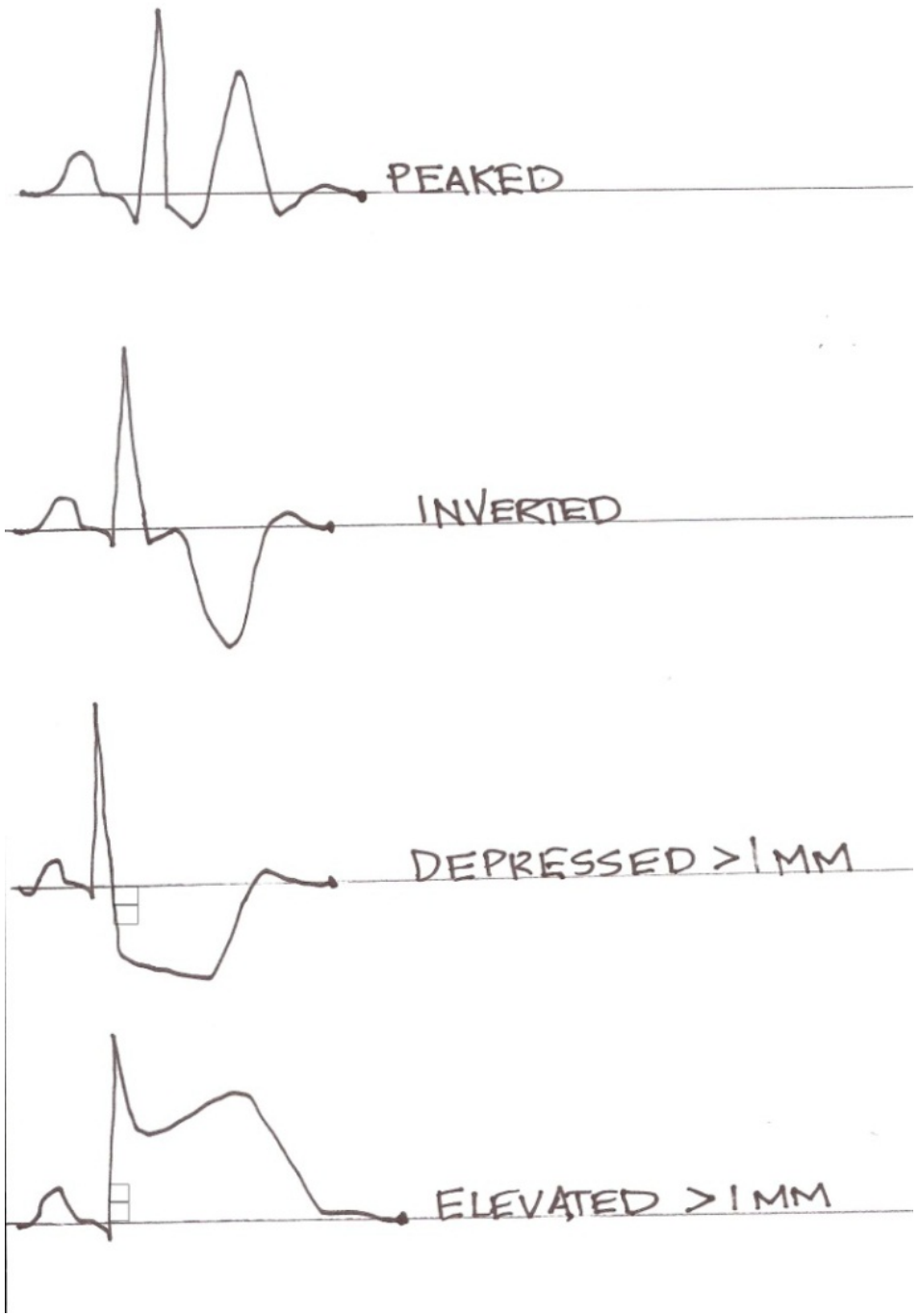
Pulmonary Embolism and Right Heart Strain





Approach to 12 Leads

- Rate (fast, slow, ok)
- Rhythm (sinus, ventricular)
- Injury (look at ST segment, Q waves)


PEAKED
INVERTED
DEPRESSED >1MM
ELEVATED >1MM

Thank You

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