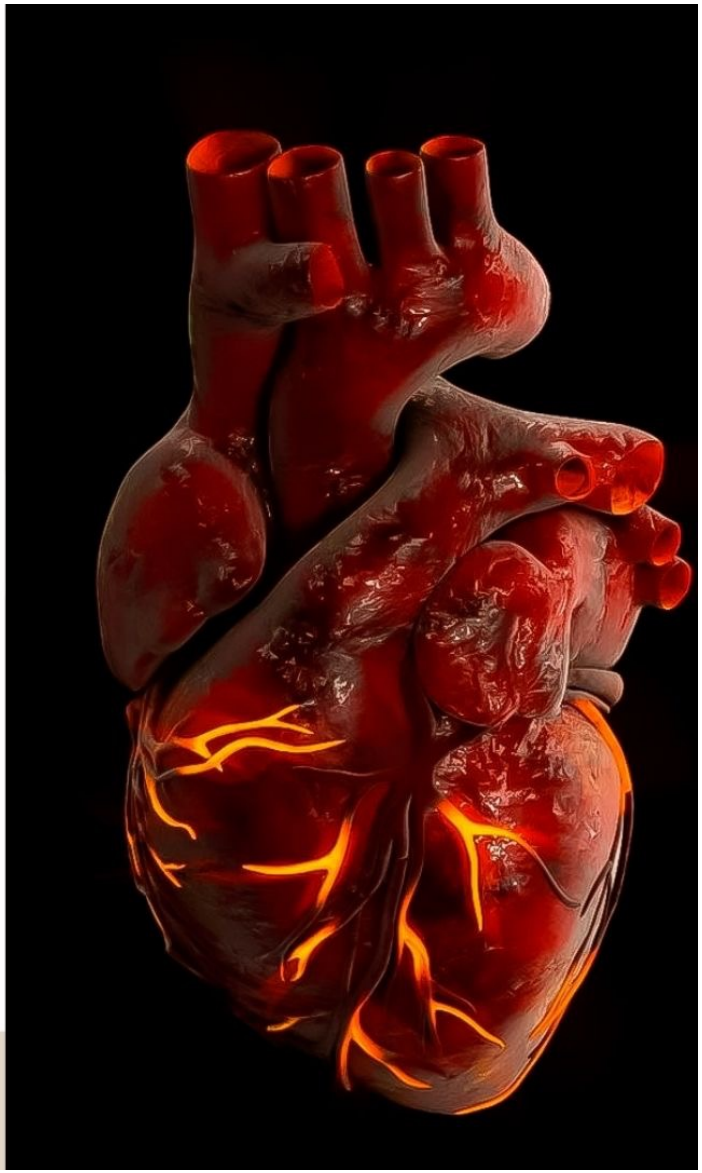
Killer Causes of Chest Pain

Jennifer Carlquist PA-C



DISCLOSURES

I have none.

OBJECTIVES

Identify 5 Causes of chest pain that can be lethal
Discuss subtle findings that may be ACS
Review what to look for when the machine software says "Non specific ST T wave changes"

And of course.....some cases to test our knowledge!

YOUR INSTRUCTOR

Cardiology PA
ER PA with CAQ
National lecturer
Former Medic

Jen Carlquist Pa-C

Upright in all leads except___ & ____
Last wave
Not pointy
Not too tall

QRS

Smooth
Not too tall
Not too close

T WAVE

P WAVE

Not too wide
Not notched
Not too big
Not too small

What are the chest pain differentials?

- ACS
- AAA
- PE
- Pericarditis
- Musculoskeletal
- GERD/Gastritis

Chest Pain

THE DIFFERENTIALS

What can we see on the EKG?

Worst first

Acs

AAA

Pericarditis

Pneumothorax

PE

Chest Pain

What can we see on the EKG?

FINDINGS:

ACS - flipped T waves Subtle/ STEMI

Pericarditis - Widespread ST Elevation

Cardiomyopathy - Flipped symmetrical T waves

PE - s1q3t3, flipped T's

Pneumothorax

CLUES TO LOOK FOR:

Sharp Pain
Localized pain
Unequal breath sounds
Tachycardia
May have **low** sat
CXR may be subtle
Hx: cough, trauma

Pneumothorax

AAA

CLUES TO LOOK FOR:

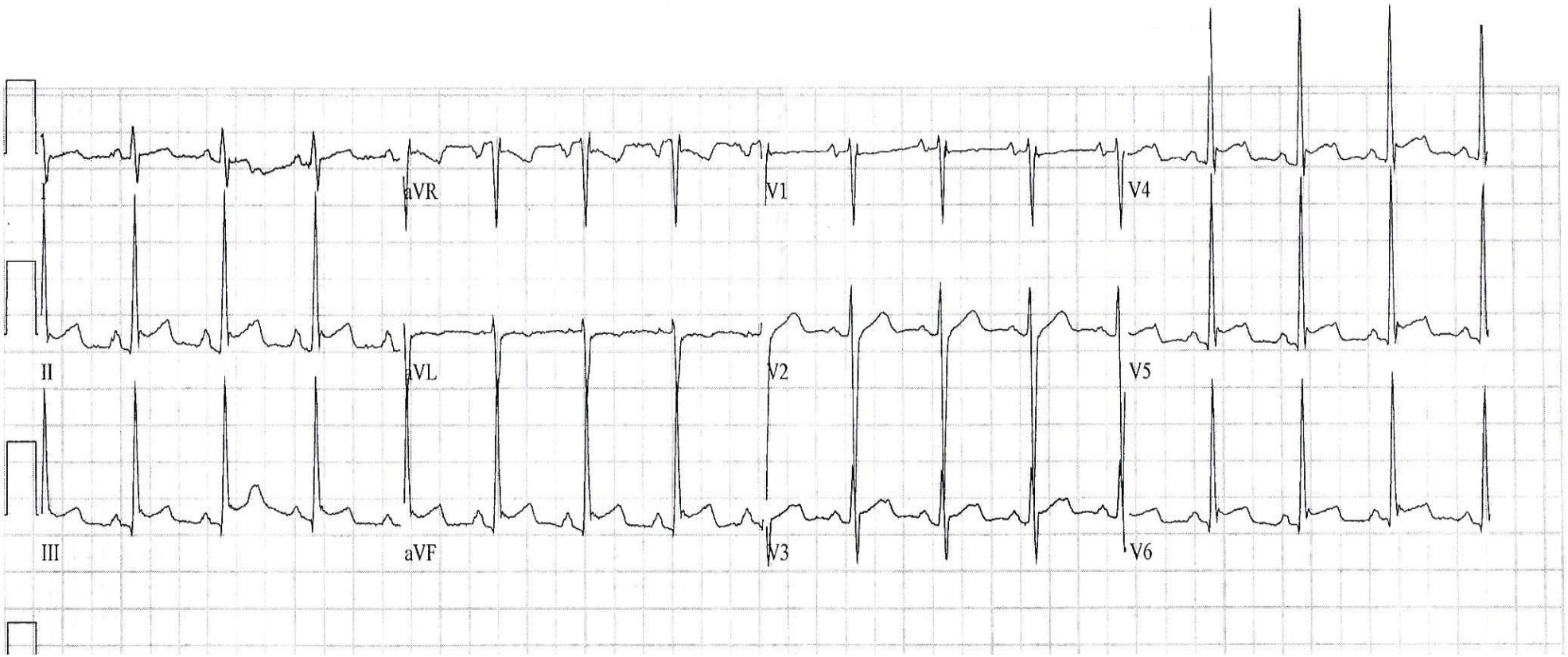
Ripping Tearing Pain
Radiates to back
Sudden onset
=Pulses
=+/- Masses
Hx: HTN, **Marfans**

Pericarditis

CLUES TO LOOK FOR:

Sharp Pain
Better leaning forward
Recent CABG
Tachycardia
Widespread STE
No reciprocal changes
Knuckle Sign
PR segment depression

Vent. rate	97	BPM	*** Critical Test Result: STEMI
PR interval	134	ms	NORMAL SINUS RHYTHM
QRS duration	82	ms	RIGHT ATRIAL ENLARGEMENT
QT/QTc	344/436	ms	ST ELEVATION CONSIDER INFEROLATERAL INJURY OR ACUTE INFARCT
P-R-T axes	62 85	66	** ** ACUTE MI / STEMI ** **



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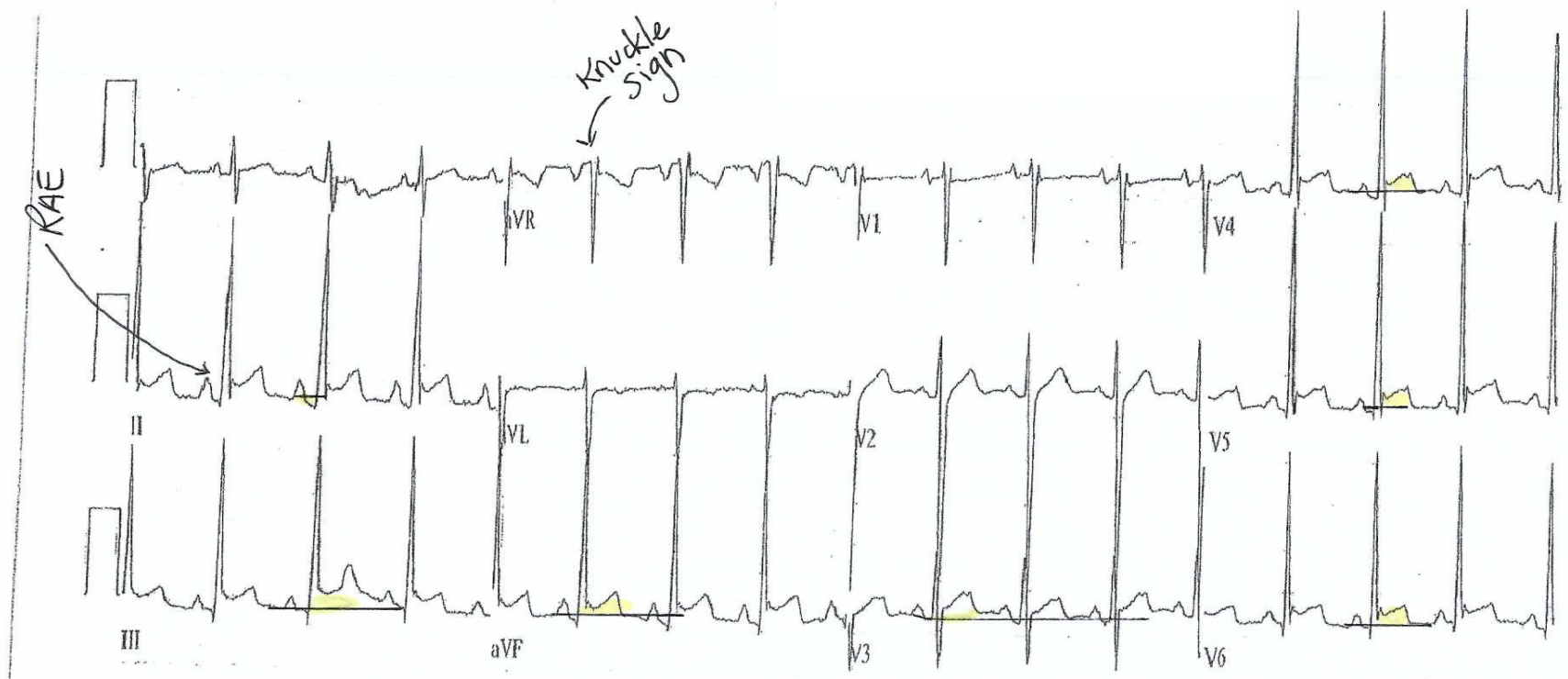
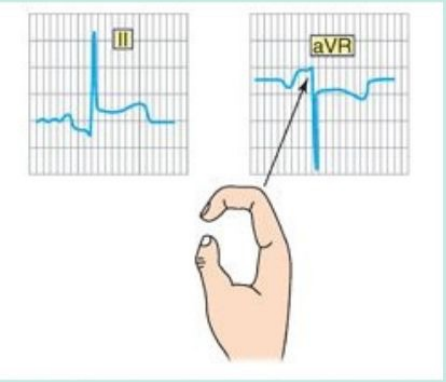
P-R-T axes	62 85	66	** ** ACUTE MI / STEMI ** **
			ABNORMAL ECG

FALSE!!



Pericarditis Clues



1. PR depression
2. DiffuseST elevation
3. Scooping,upwardly concave ST segments
4. ST elevation is variable—up to 4 or 5 mm
5. Tachycardia

Pulmonary Embolus

EKG: Pulmonary disease pattern

S1, q3, t3

Inverted symmetric T waves

Right axis deviation

Exam:

Tachycardic

Low 02 Sat

Unilateral LE swelling

COVID, BCP, Travel, (hypercoagulable)

CLUES TO LOOK FOR:

Q Wave Patterns To Worry About

WHICH IS BETTER

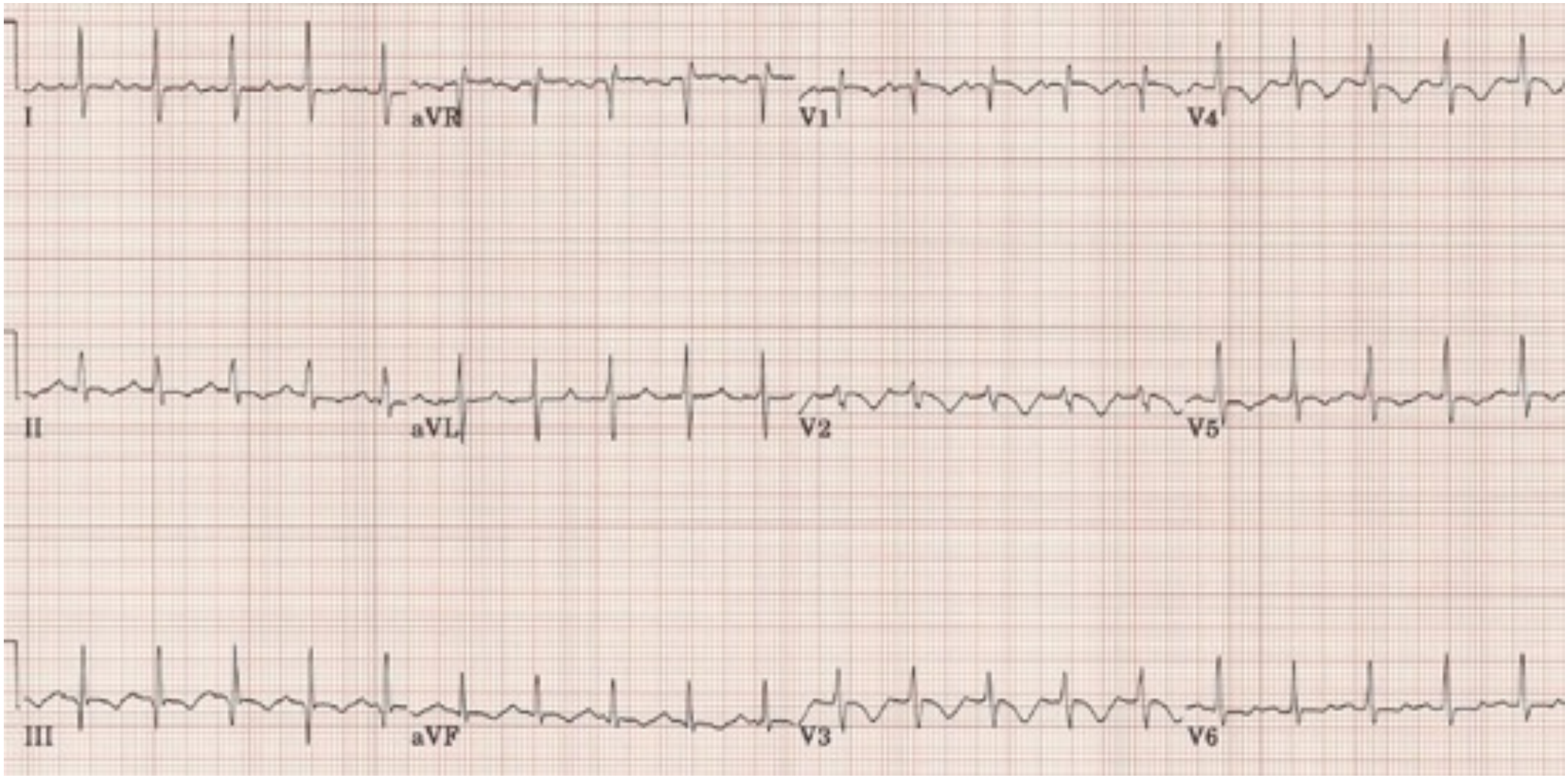
S1q3t3

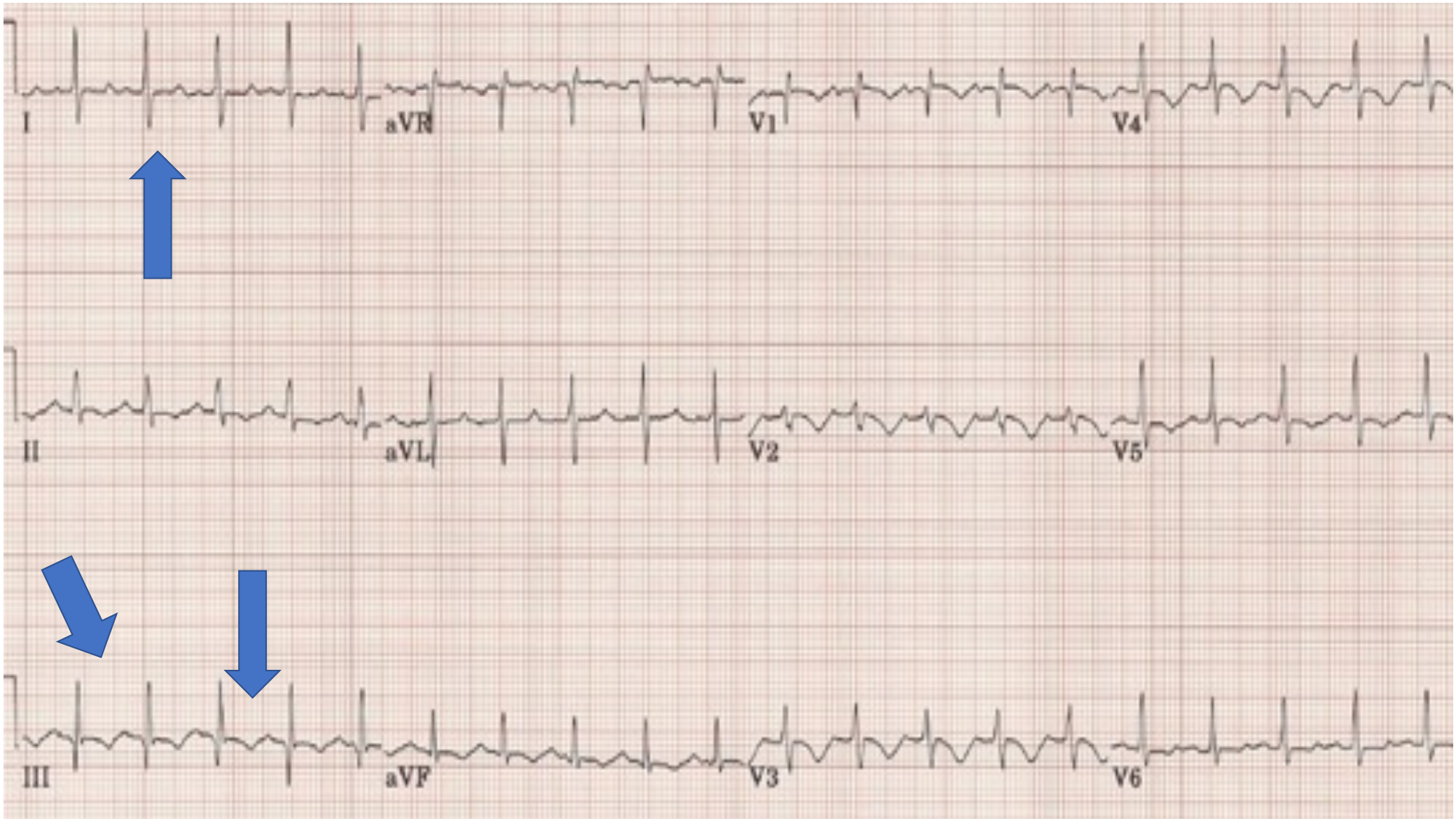
S wave in I
Q wave in lead III
Inverted T in lead III

HOCM

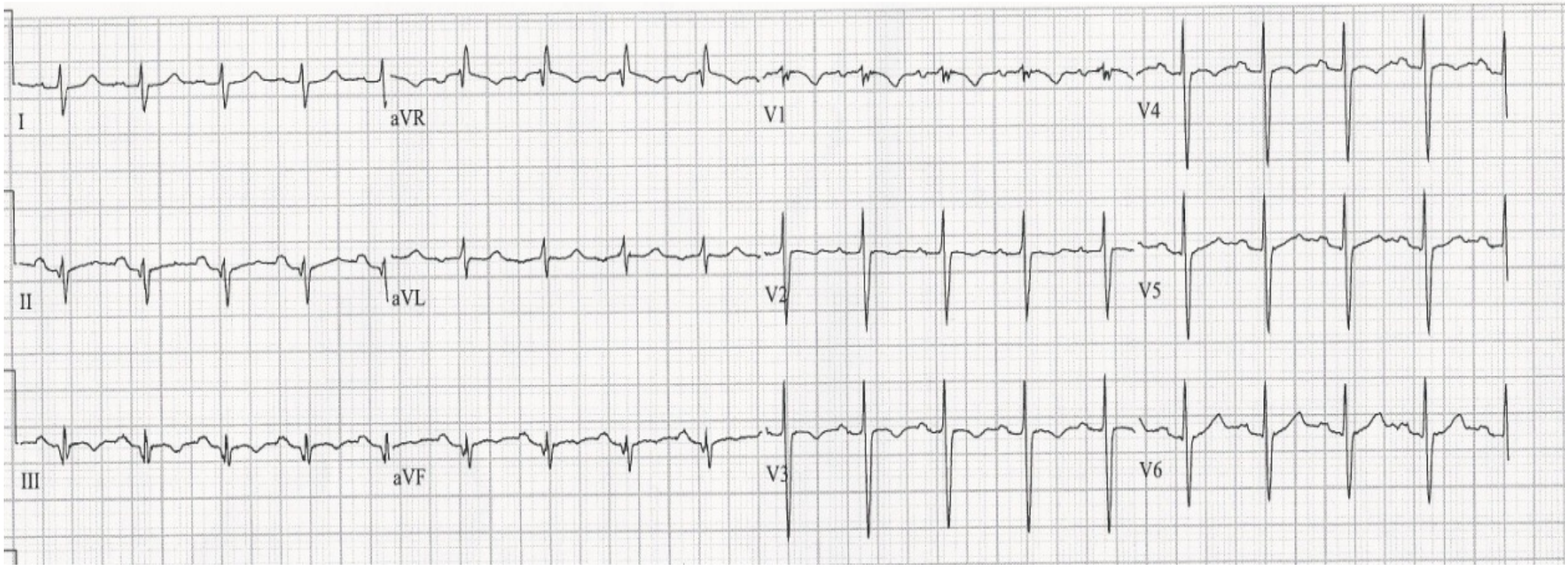
Q waves in leads:
I, AVL, V5, V6

42 y/o obese with DOE – can he go home?




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

Vent. rate	112	BPM	SINUS TACHYCARDIA
PR interval	150	ms	RIGHT SUPERIOR AXIS DEVIATION
QRS duration	88	ms	PULMONARY DISEASE PATTERN
QT/QTc	314/428	ms	INFERIOR INFARCT , AGE UNDETERMINED
P-R-T axes	76 232	42	ABNORMAL ECG

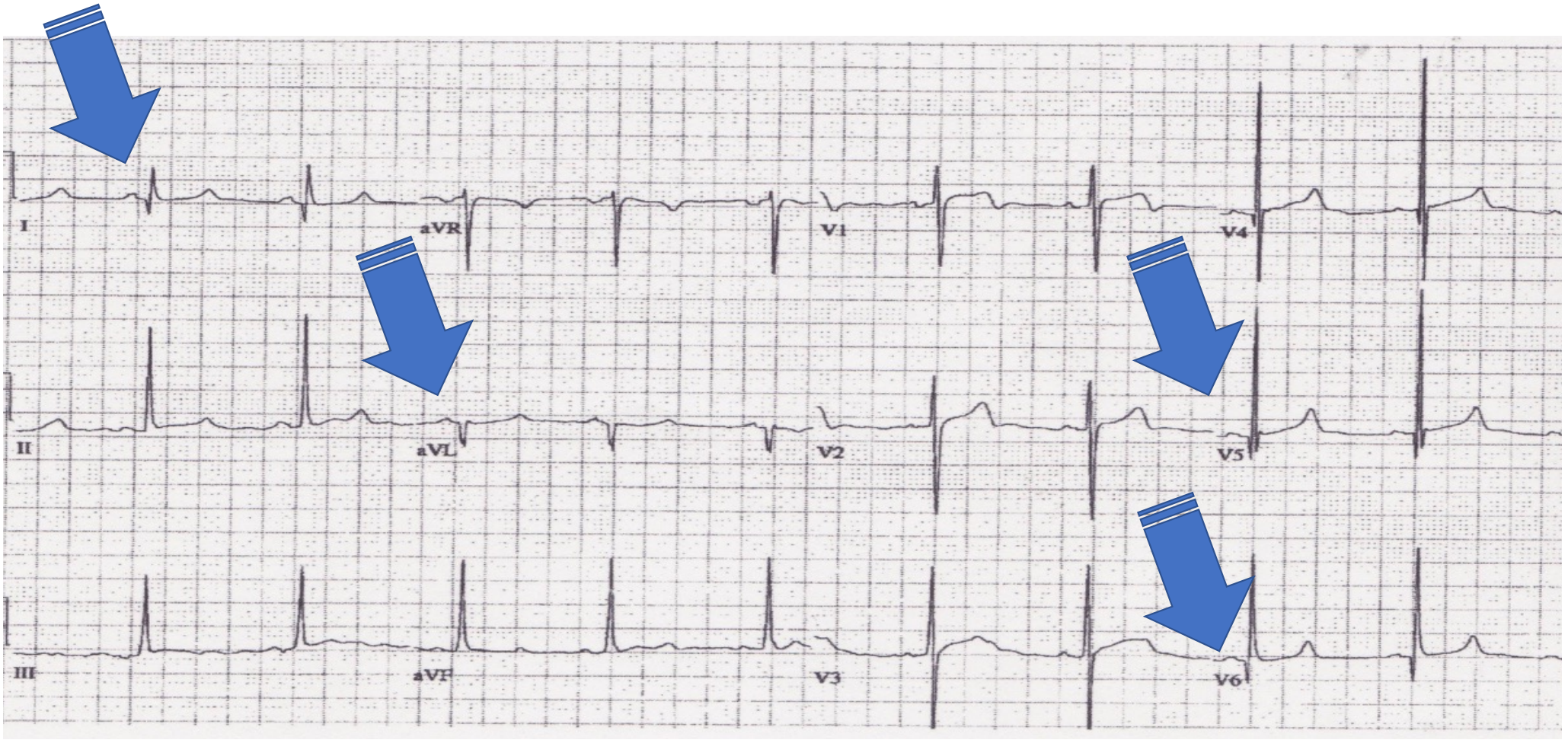


FINDINGS:

Normal size and configuration of the aorta with no evidence of aneurysm, dissection, injury, or stenosis.
There are central pulmonary emboli extending into every branch of the superior and inferior segment bilaterally. The right ventricle is dilated with diameter measuring up to 3.8 cm compared to the left ventricular diameter of 3 cm is consistent with right heart strain. No pericardial effusion. Heart size is normal. The imaged upper abdomen is unremarkable except to note a complex cyst measuring under 1 cm in the left kidney.

IMPRESSION: Diffuse bilateral central pulmonary emboli causing right heart strain.

Post syncope – can he go home?



ACS

Flipped T waves
Subtle/ STEMI

It is not always obvious!!!

Wellens - Biphasic T waves in v2, v3

Dewinters - STD of 1 mm with hyperacute T waves

Posterior MI- st depression in v2, v3

Hyperacute T waves - Big but not peaked

What is considered a STEMI?

- **2 or more** contiguous leads have ST elevation +
  Measured at the J joint…
- > 1mm (1 small box) of ST elevation (except V2/V3)
- V2/V3 → ≥ 2mm (men > 40 yo), ≥ 2.5mm (men < 40 yo)
  → ≥ 1.5mm for women

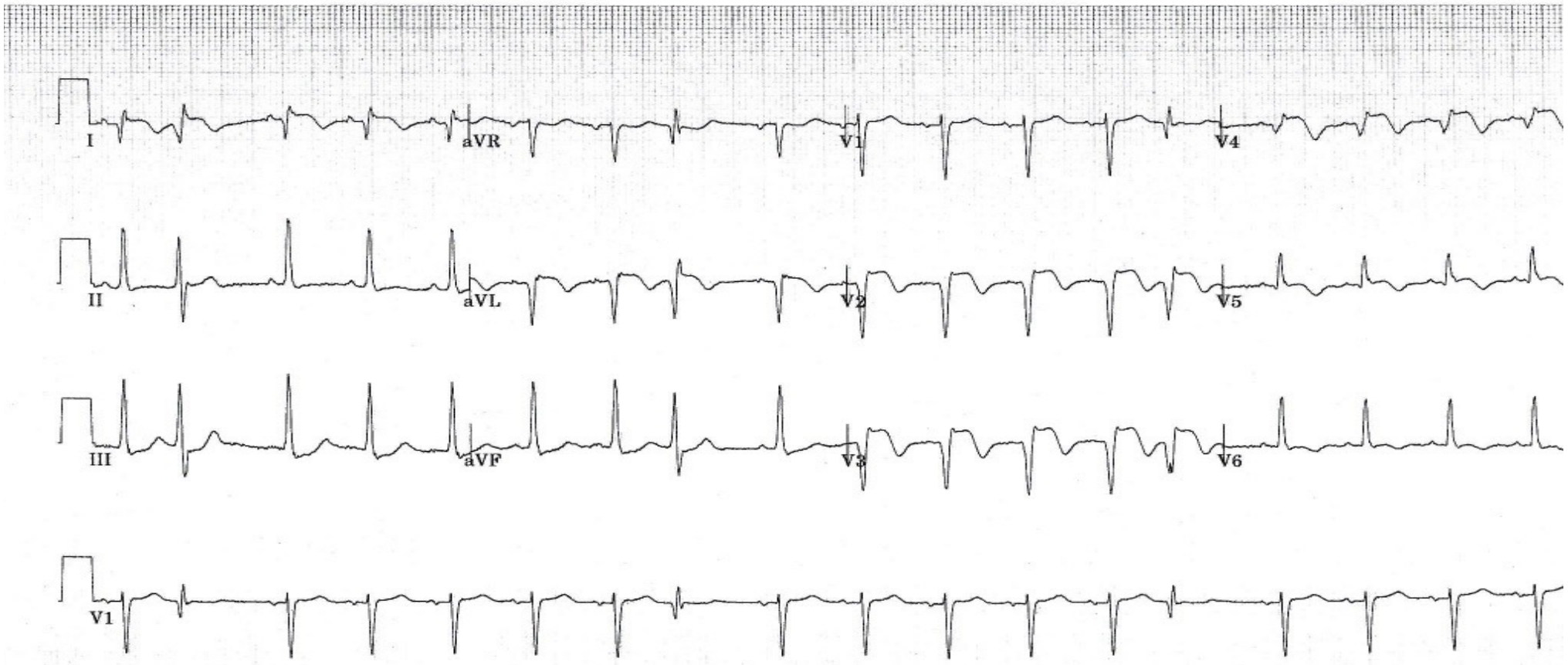
- Reciprocal changes!

- REMEMBER → New or presumed new LBBB = MI

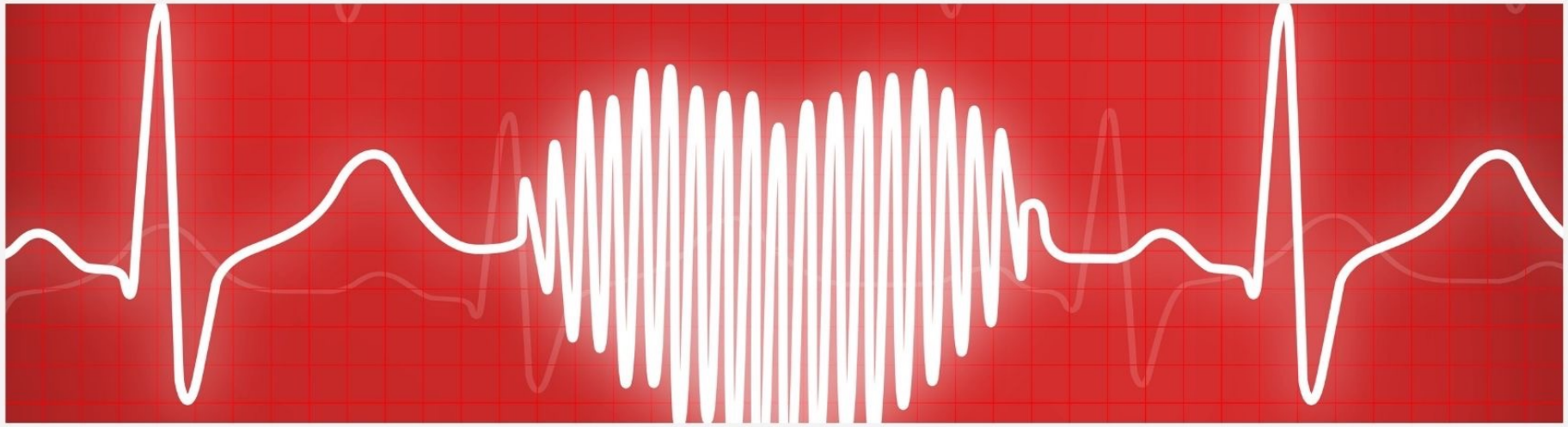
Slide by Nicole Reichart


"I feel weak"

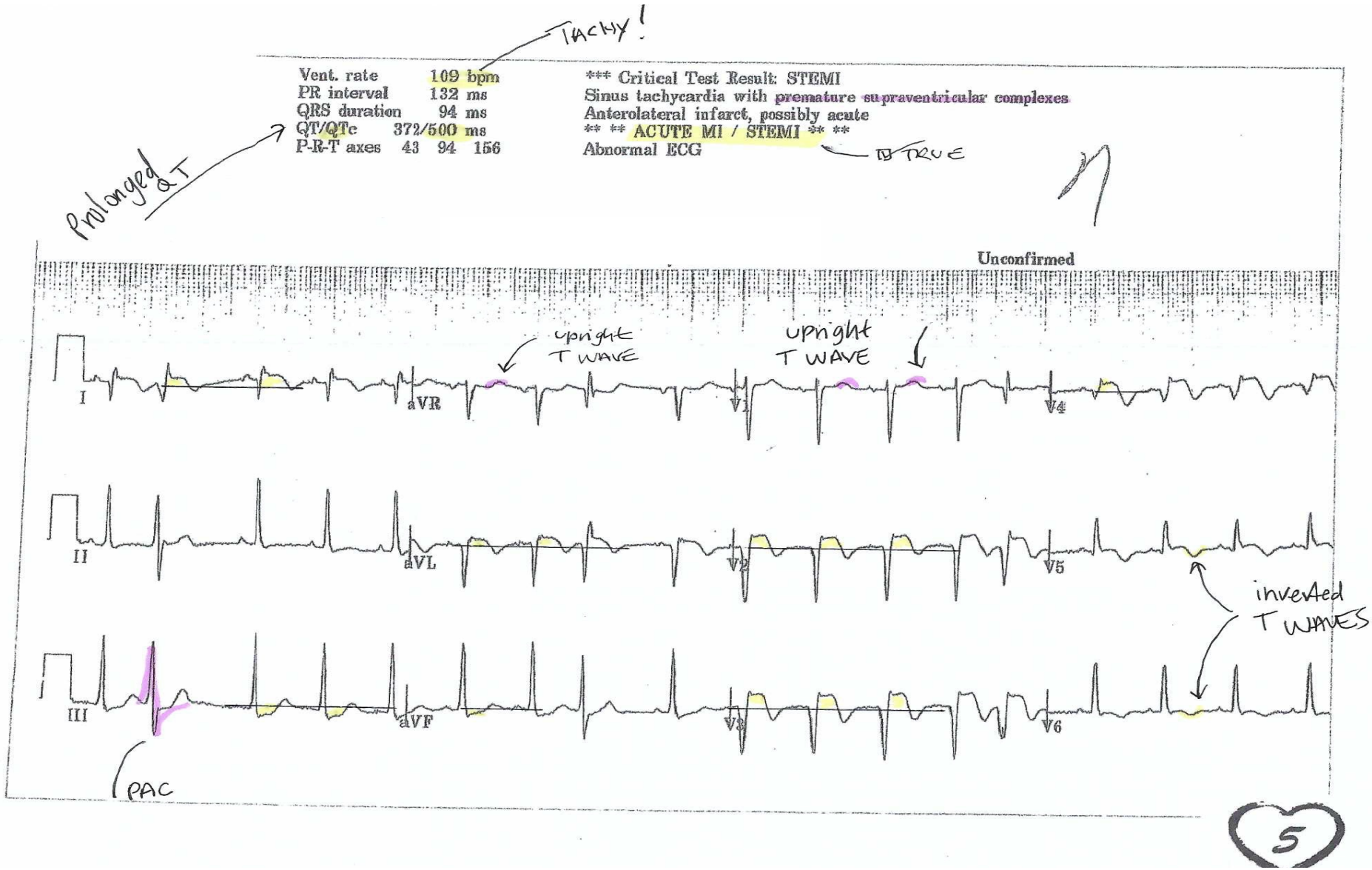
Vent. rate	109 bpm	*** Critical Test Result: STEMI
PR interval	132 ms	Sinus tachycardia with premature supraventricular complexes
QRS duration	94 ms	Anterolateral infarct, possibly acute
QT/QTc	372/500 ms	** ** ACUTE MI / STEMI ** **
P-R-T axes	43 94 156	Abnormal ECG



Cath Report



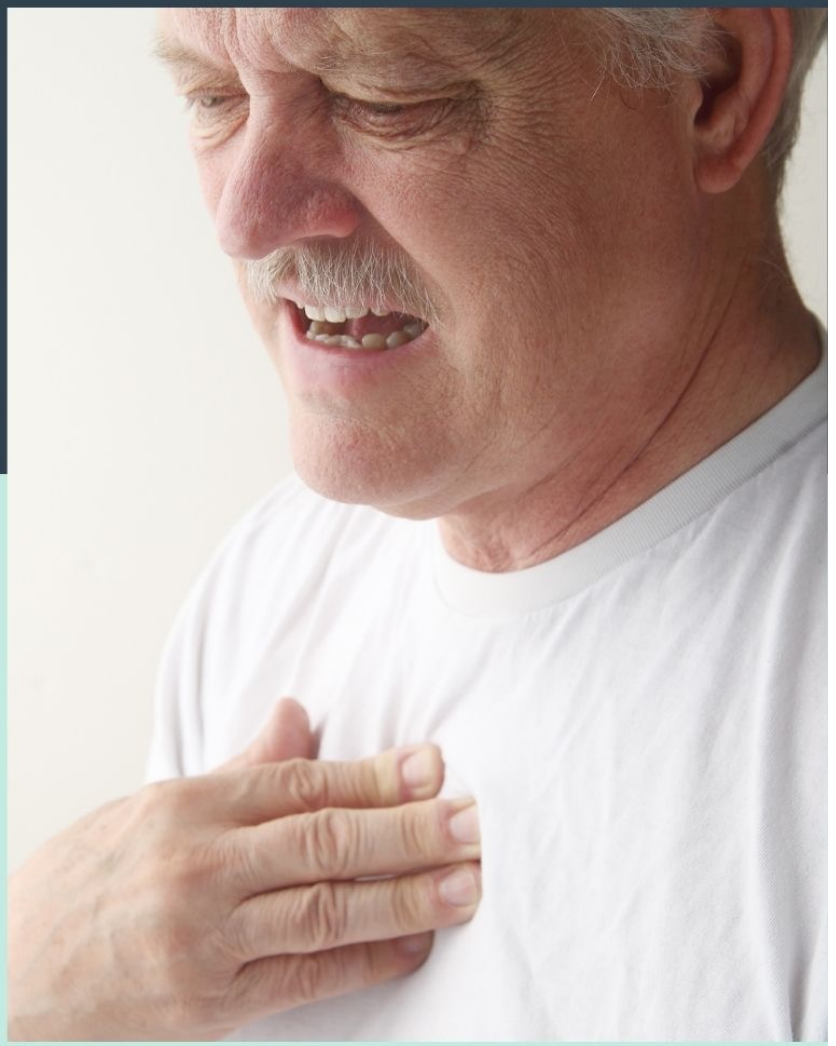
15% EF 100% OCCLUDED LAD CIRC 60%


TACHY!
Vent. rate 109 bpm
PR interval 132 ms
QRS duration 94 ms
QT/QTc 372/500 ms
P-R-T axes 43 94 156
*** Critical Test Result: STEMI
Sinus tachycardia with premature supraventricular complexes
Anterolateral infarct, possibly acute
** ** ACUTE MI / STEMI ** **
Abnormal ECG
TRUE
Prolonged QT
Unconfirmed
upright T WAVE
upright T WAVE
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
inverted T WAVES
PAC
5

71 Y/O M

Chest pain

P - *Lifted a heavy box*
Q - *"Like my last MI"*
R - *Jaw, back, left arm*
S - *7/10*
T - *3 days worse this morning*
PMHx: HTN, DM, cardiac stents
Lightheaded



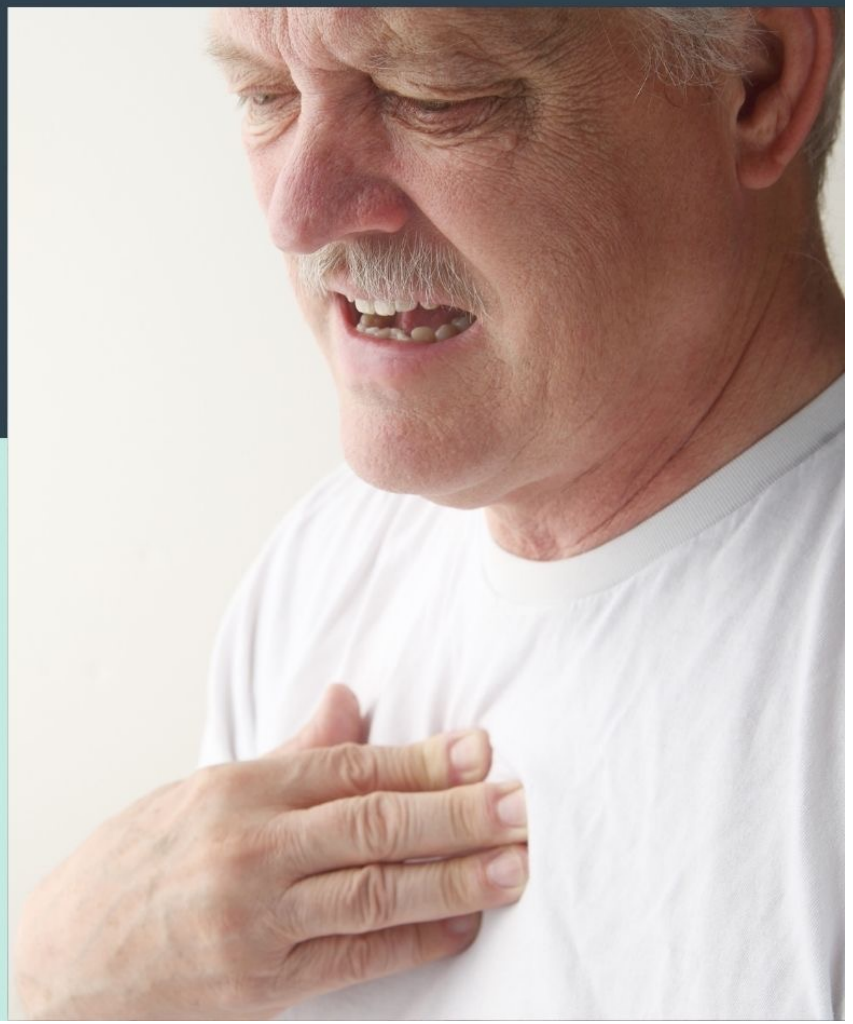
More on him

VS: 68/40, HR: 40 RR: 20 O2 sat 95%

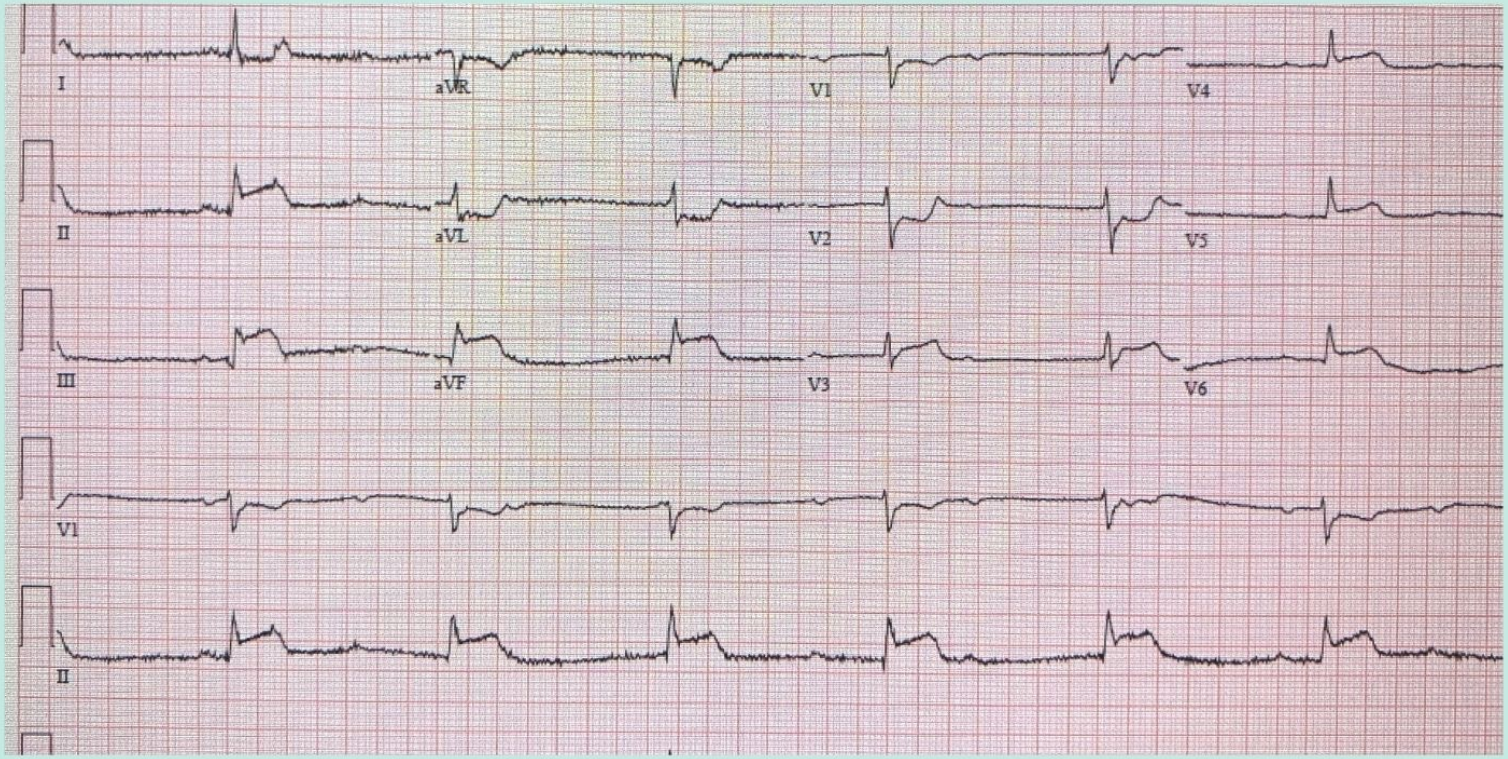
Labs:

TC: 108 **Tri:** 100 **HDL:** 22 **LDL:** 25

Trop: 6.058



His EKG



DO YOU AGREE?

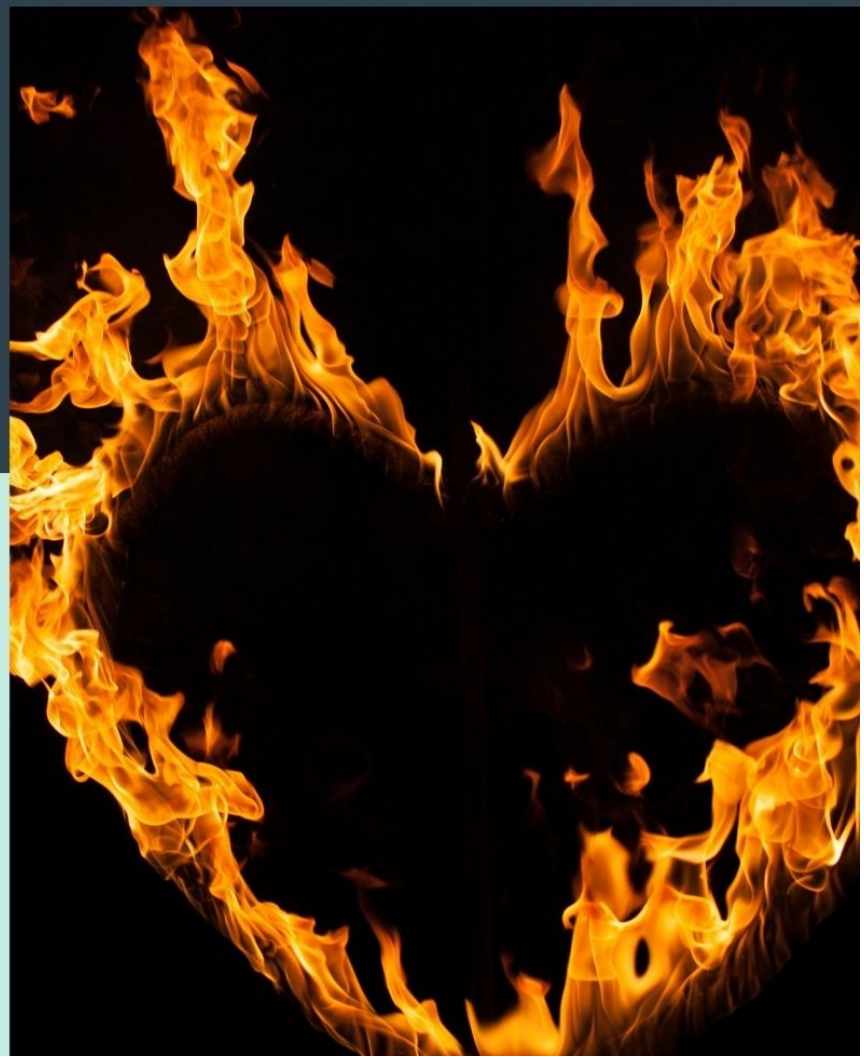
JUNCTIONAL BRADYCARDIA

INFERIOR INFARCT ACUTE

LATERAL INJURY PATTERN

** ** ACUTE MI / STEMI ** **

Consider right ventricular involvement in acute inferior infarct



His Echo

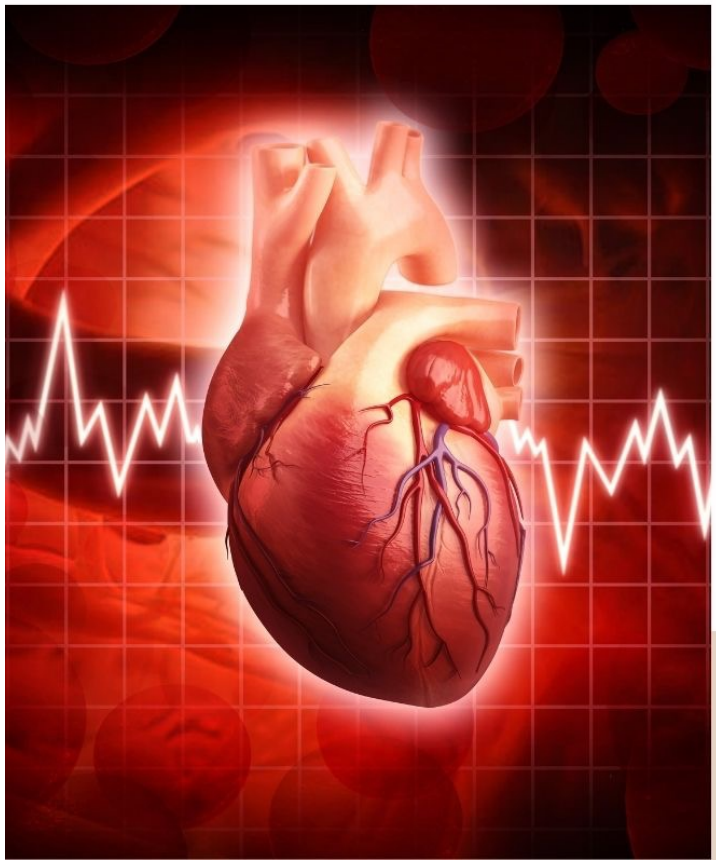
Left ventricular chamber size is mildly dilated.
There is mild concentric left ventricular hypertrophy.
Ejection fraction is visually estimated at 20-25%, severely globally decreased.
Indeterminate diastolic function.
Normal left atrial size.
Normal right ventricular size and function.
Normal right atrial size.
Cardiac valves are structurally normal. Trace TR noted.
The pericardium is normal.

The aorta is normal in size.

nsstw

The Most Lethal!

Non-Specific ST T wave changes



POSTERIOR MI

WIDESPREAD ST DEPRESSION

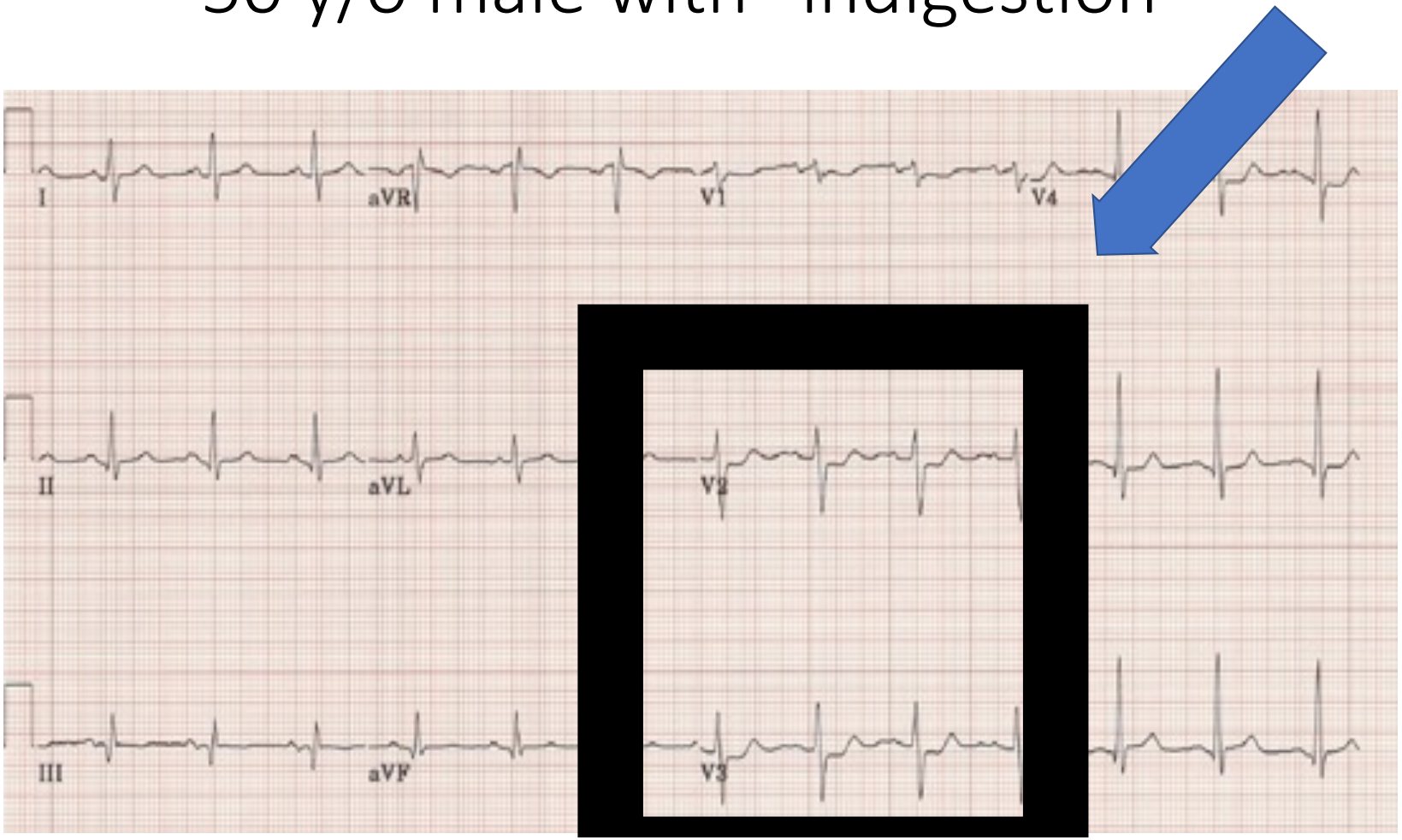
WELLENS

DE WINTERS

Vent. rate	68	BPM
PR interval	140	ms
QRS duration	118	ms
QT/QTc	434/461	ms
P–R–T axes	39 –37	139

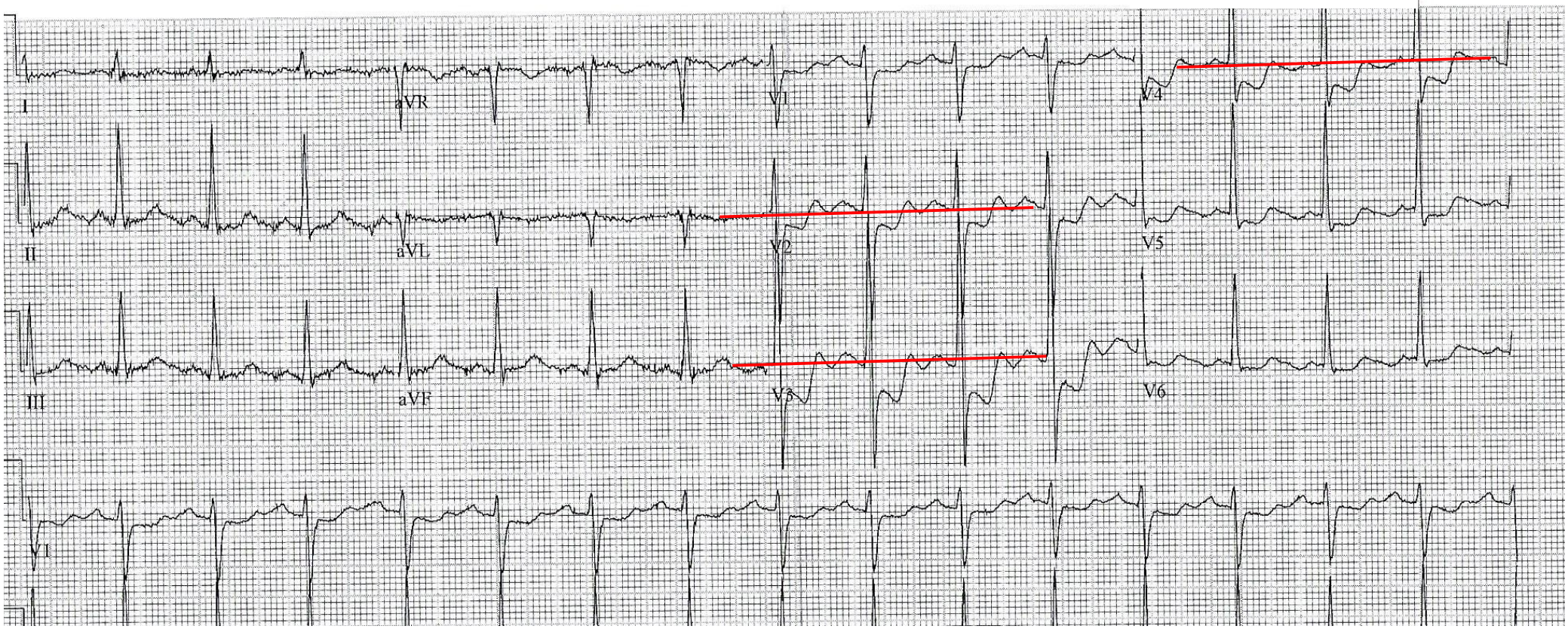
NORMAL SINUS RHYTHM WITH SINUS ARRHYTHMIA
LEFT AXIS DEVIATION
INFERIO[redacted]
T WAVE ABNORMALITY, CONSIDER ANTEROLATERAL ISCHEMIA
ABNORMAL ECG
WHEN COMPARED WITH ECG OF 28–JUN–2014 18:16, (UNCONFIRMED)
NONSPECIFIC T WAVE ABNORMALITY, IMPROVED IN INFERIOR LEADS

50 y/o male with “indigestion”

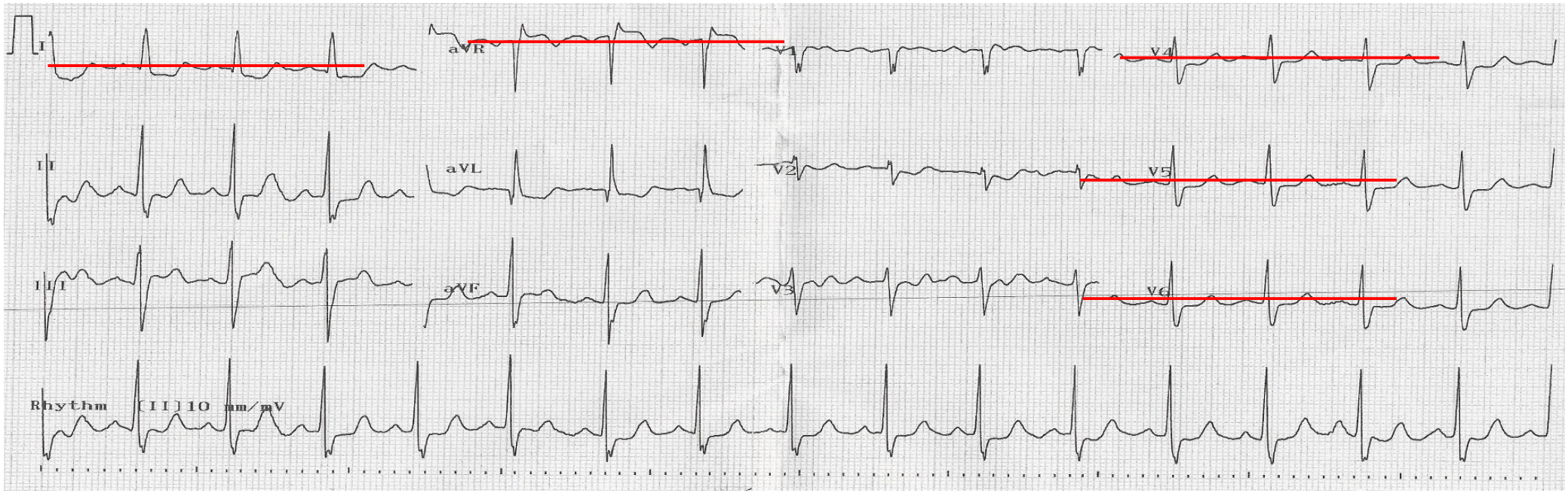


Vent. rate	96	BPM
PR interval	216	ms
QRS duration	96	ms
QT/QTc	376/475	ms
P-R-T axes	* 81	88

SINUS RHYTHM WITH 1ST DEGREE A-V BLOCK
MARKED ST ABNORMALITY, POSSIBLE ANTERSEPTAL SUBENDOCARDIAL INJURY
ABNORMAL ECG

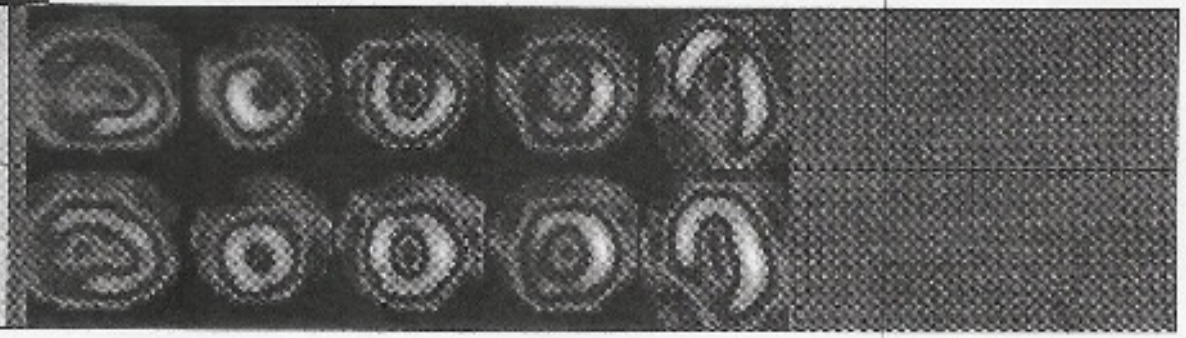


78 y/o male with shoulder pain when I work out



His stress test

PERFUSION FINDINGS

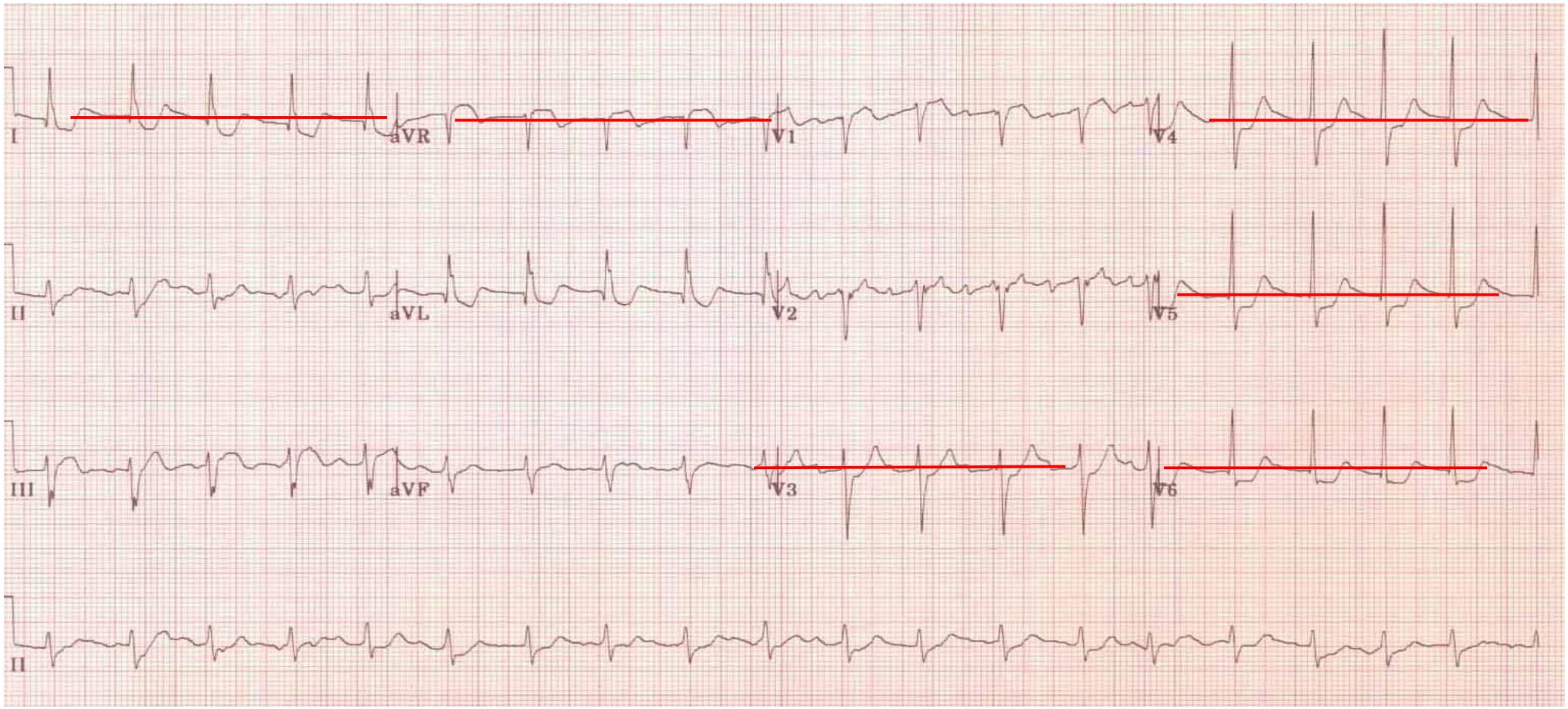
Stress Images	
Rest Images	

Overall Study Quality:	good
Extra Cardiac Activity:	normal
Study Artifacts:	None

LV Myocardial Perfusion Defects:
(1) Moderate sized moderate to severe anterolateral completely reversible defect consistent with ischemia in the territory typical of the mid LAD and or LCx.

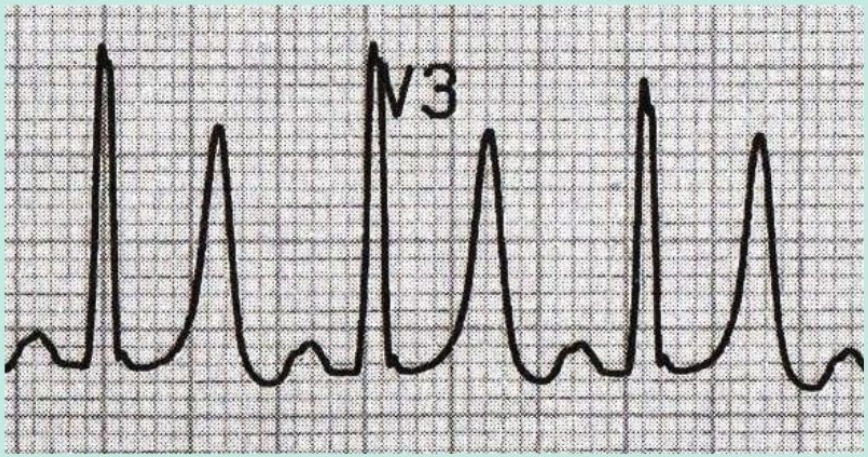
Scan Significance: abnormal and indicates an intermediate risk for hard cardiac events
Stress/Rest LV Volume Ratio: 0.97, normal

AVR



De Winters

Peaked T Waves

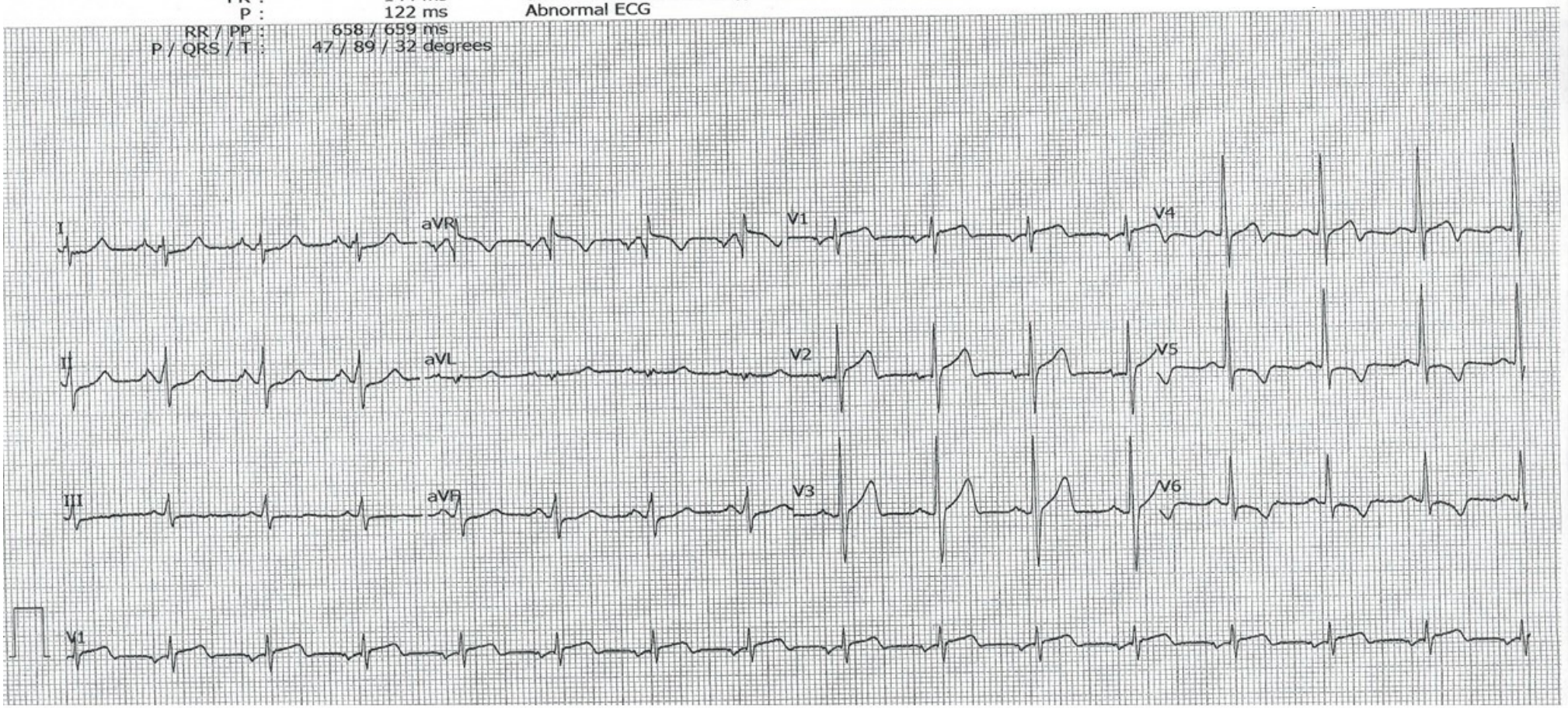


Hyperkalemia

Hyperacute T waves *- Broad based, assymetric peaked*

Ordering Ph:
Referring Ph:
Attending Ph:

QRS :	80 ms	Normal sinus rhythm
QT / QTcBaz :	348 / 428 ms	Possible Left atrial enlargement
PR :	144 ms	ST & T wave abnormality, consider lateral ischemia
P :	122 ms	Abnormal ECG
RR / PP :	658 / 659 ms	
P / QRS / T :	47 / 89 / 32 degrees	



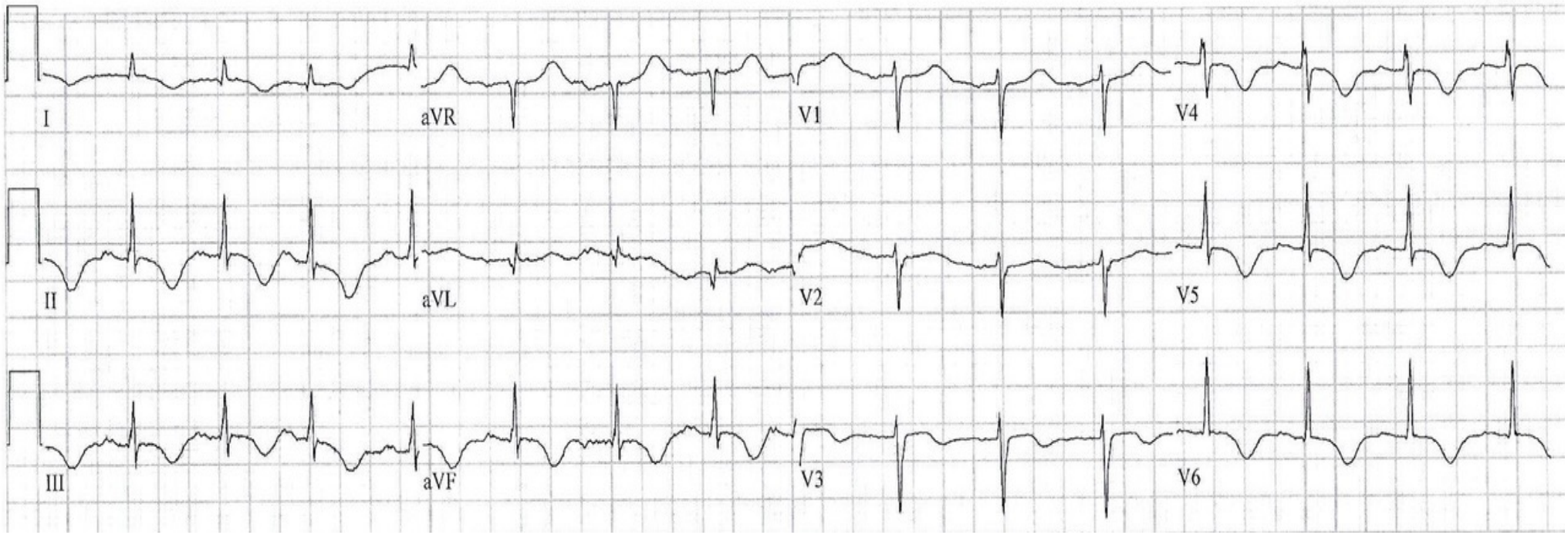
4 differentials for flipped T waves

1. ACS
2. PE
3. ICH
4. Cardiomyopathy

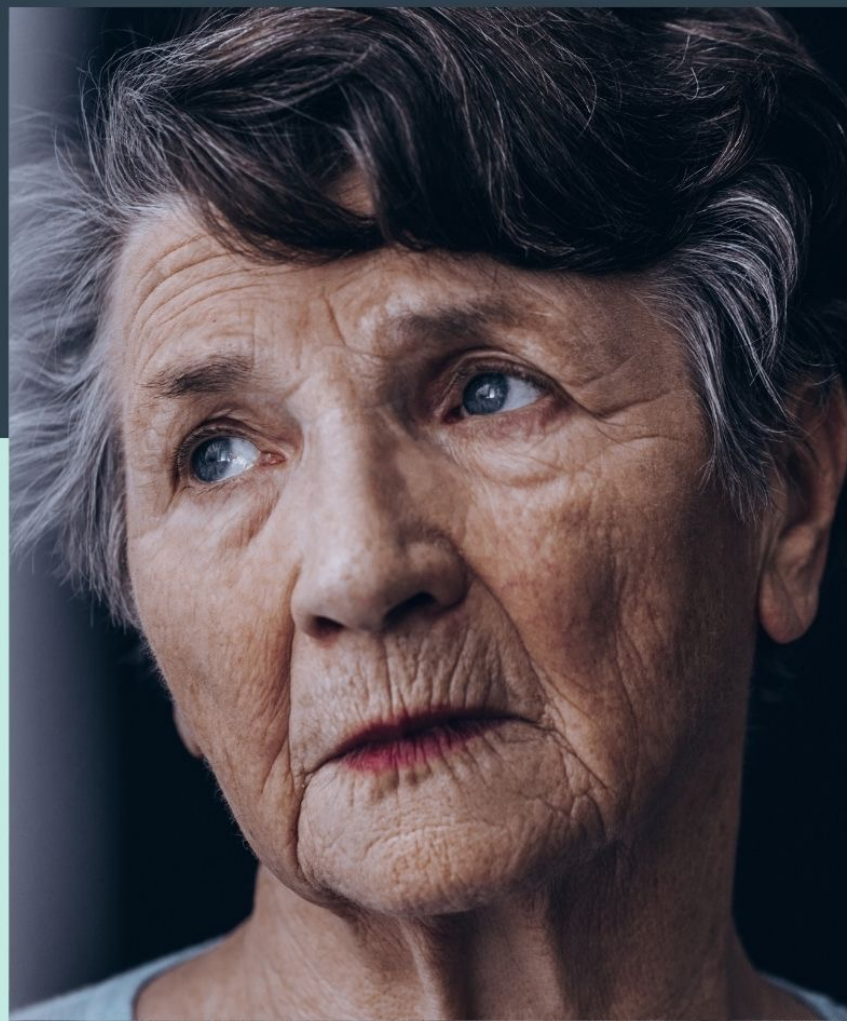
Vent. rate	92	BPM
PR interval	170	ms
QRS duration	80	ms
QT/QTc	420/519	ms
P-R-T axes	76 65	249

NORMAL SINUS RHYTHM
ST AND T WAVE ABNORMALITY, CONSIDER INFEROLATERAL ISCHEMIA
PROLONGED QT
ABNORMAL ECG

VENT. RATE HAS INCREASED BY 37 BPM
QUESTIONABLE CHANGE IN QRS AXIS
T WAVE INVERSION NOW EVIDENT IN INFERIOR LEADS
T WAVE INVERSION NOW EVIDENT IN LATERAL LEADS
QT HAS LENGTHENED ...



89 y/o F
"My blood pressure is high"



HPI: "I am weak"

- Was watching riots on CNN for 8 hours and felt "unwell"

- Neighbor checked BP it was 186/90

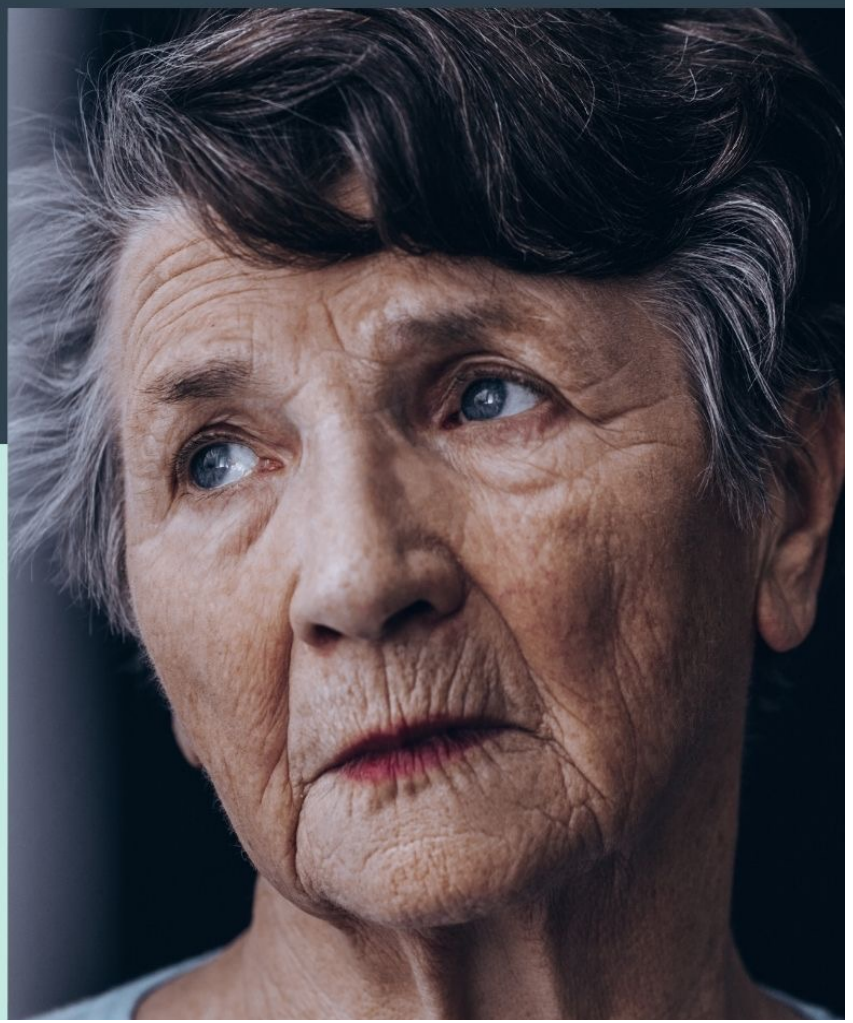
- "She said I should go to the ER"

What work up should she have?

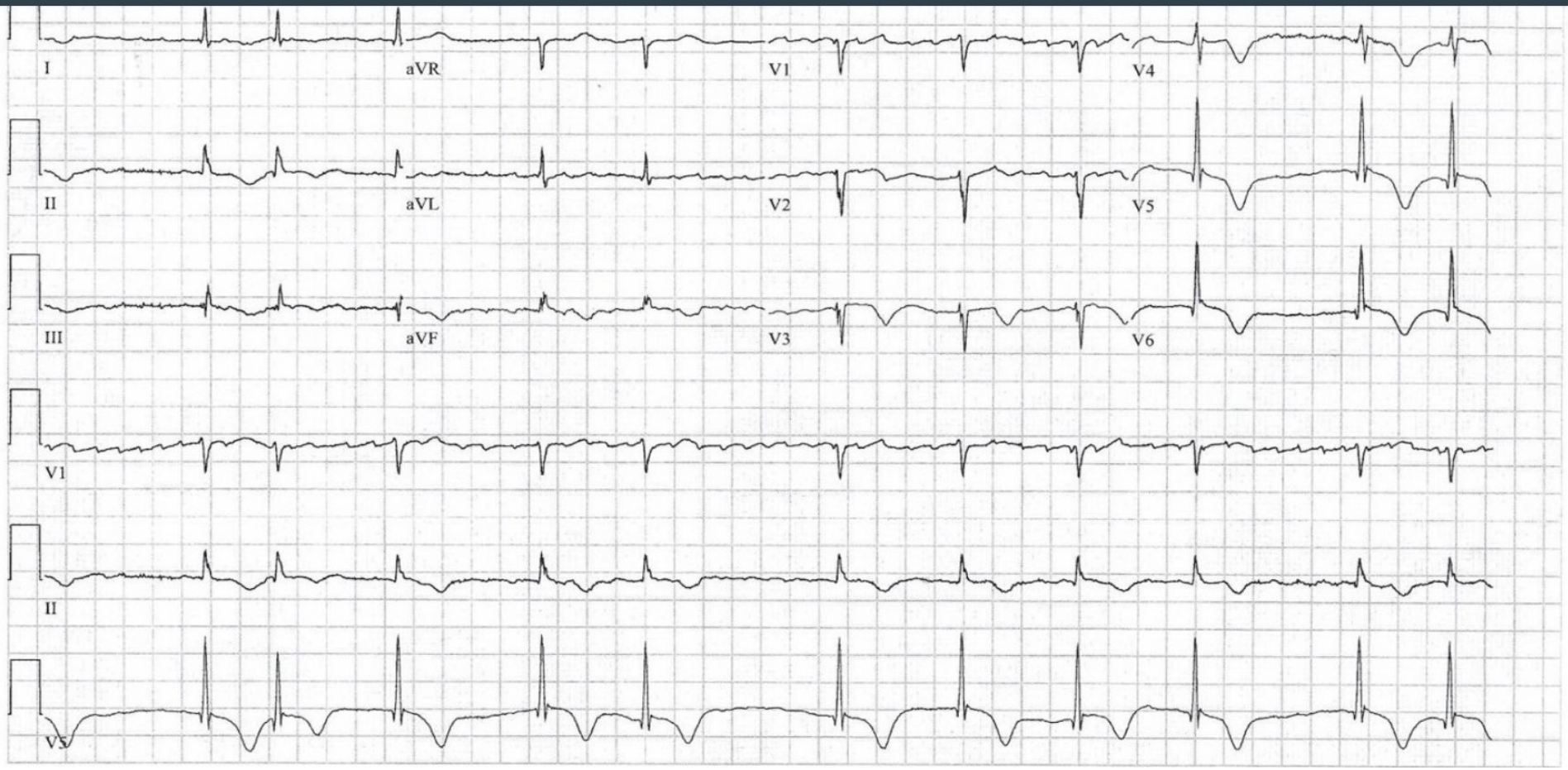
Labs?

Imaging?

Will the labs change our management with her ekg?

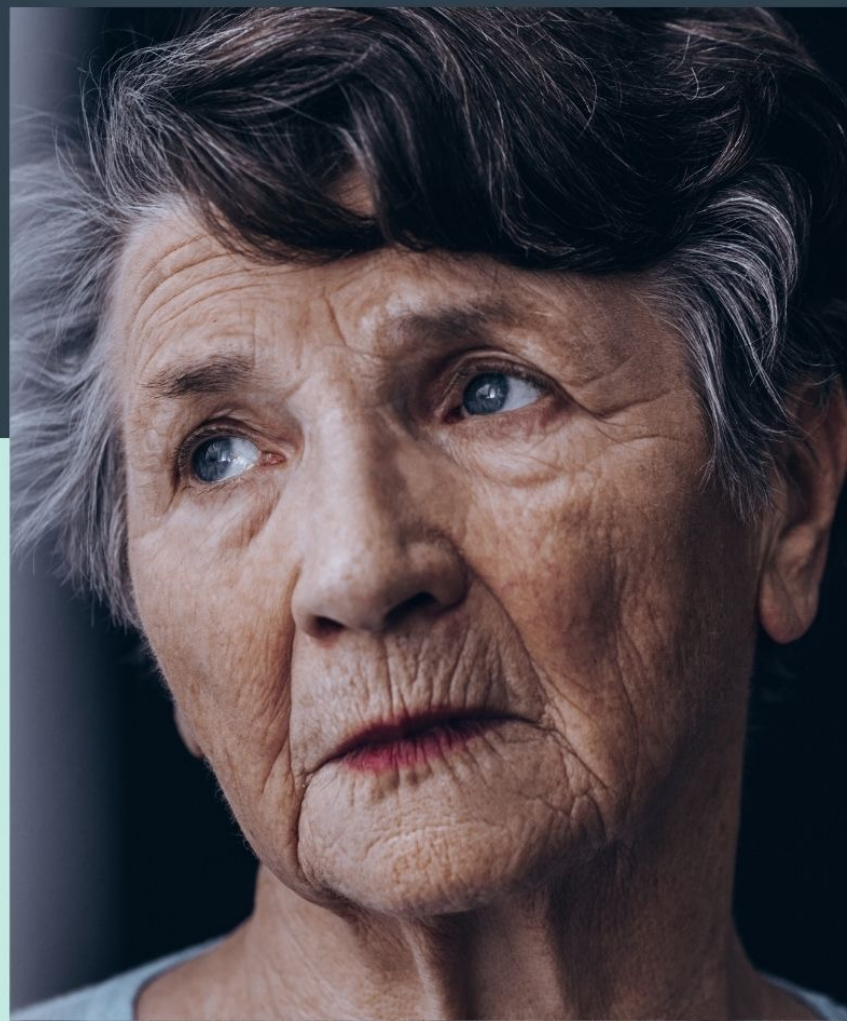


HER EKG



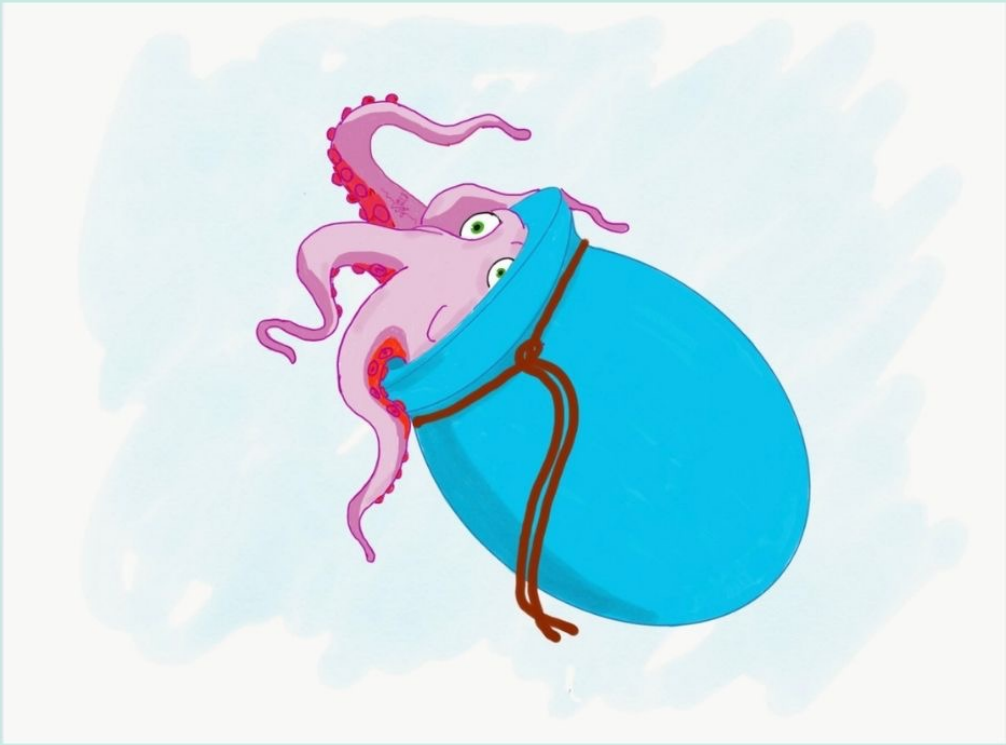
What do we do now?

What meds should she be discharged on?
What scores should we use to decide?
What will she need long term?
What devices if any should we use on DC?



Takatsubos

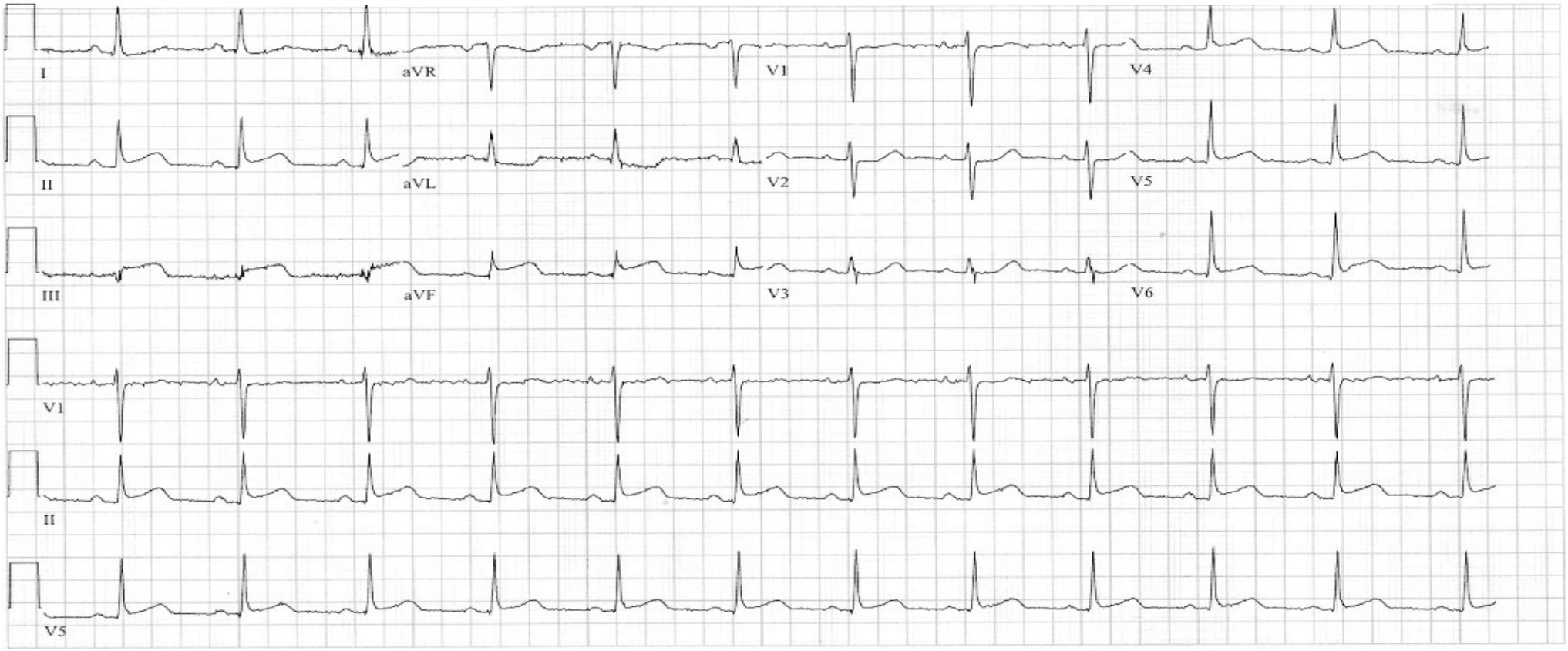
(Reversible diffuse impairment of coronary microcirculation leading to transient global myocardial ischemia, possibly due to a ***catecholamine surge****, is generally accepted as the mechanism producing this acute myocardial infarction picture)*



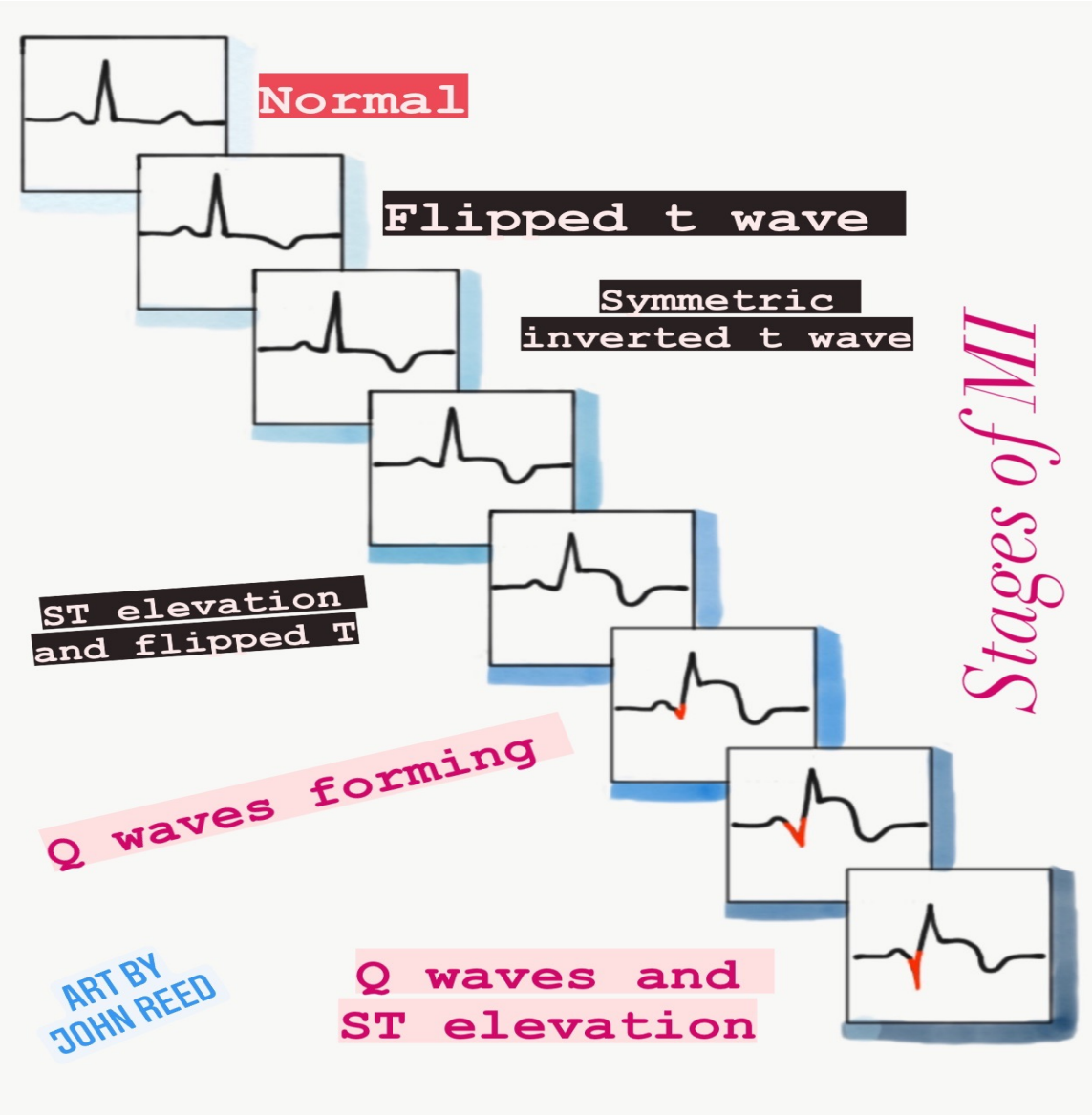
Beware of Subtle Changes

It's not just tigers hiding.... ST elevation can be subtle!

Vent. rate	71	BPM	*** Critical Test Result: STEMI
PR interval	164	ms	NORMAL SINUS RHYTHM
QRS duration	88	ms	ST ELEVATION CONSIDER INFERIOR INJURY OR ACUTE INFARCT
QT/QTc	426/462	ms	** ** ACUTE MI / STEMI ** **
P-R-T axes	27 31	83	Consider right ventricular involvement in acute inferior infarct
			ABNORMAL ECG



Q Waves

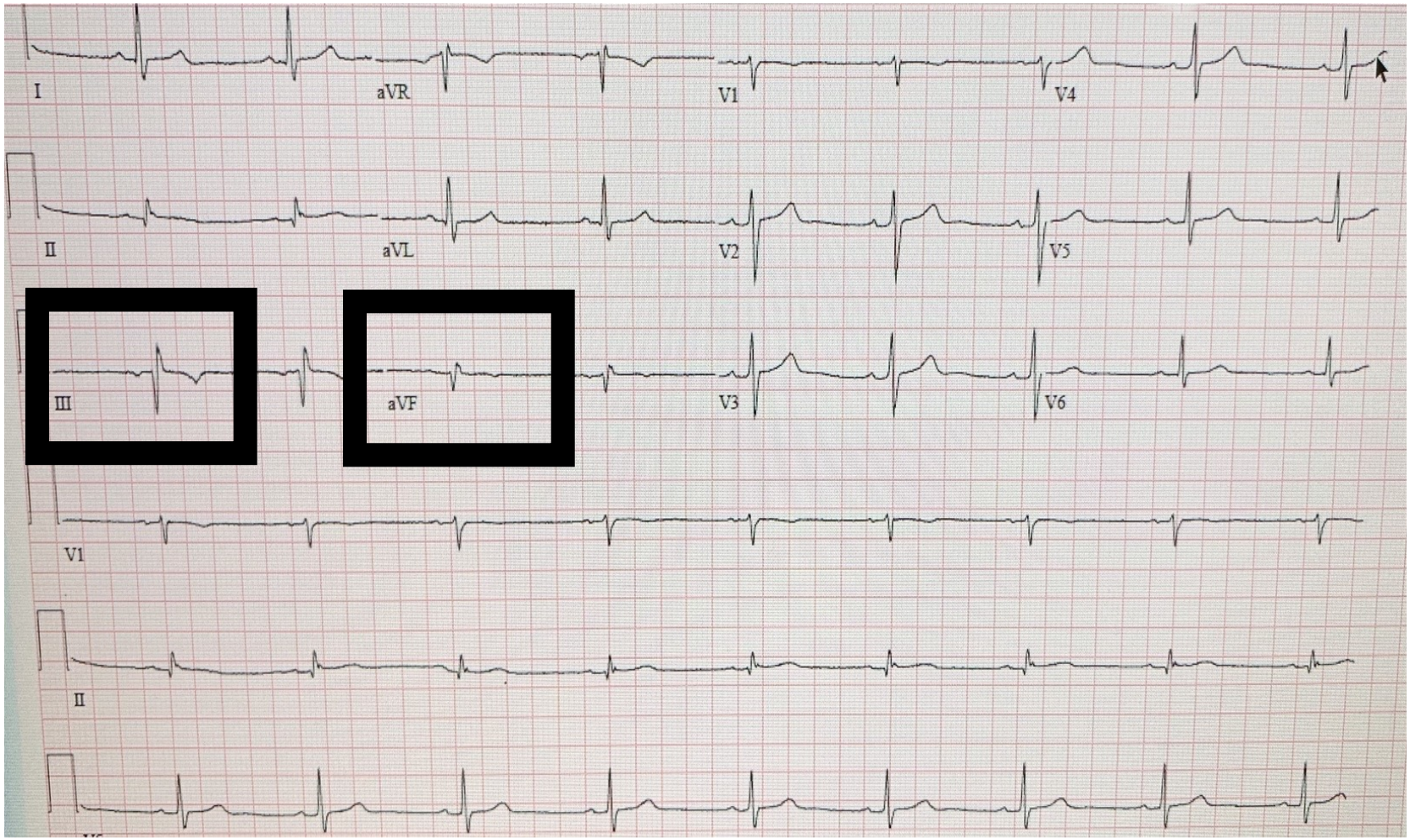

Normal
Flipped t wave
Symmetric inverted t wave
ST elevation and flipped T
Q waves forming
Q waves and ST elevation
ART BY JOHN REED
Stages of MI


"I have a cough"
Jim, Age 65

63 y/o M with chest pain when I cough x 10 d

63-year-old male presenting to the emergency room sent by his primary care PA for chest pain for the last 10 days. Patient's pain is only present when he exerts himself moderately or when he has a very "strong" cough.

His EKG

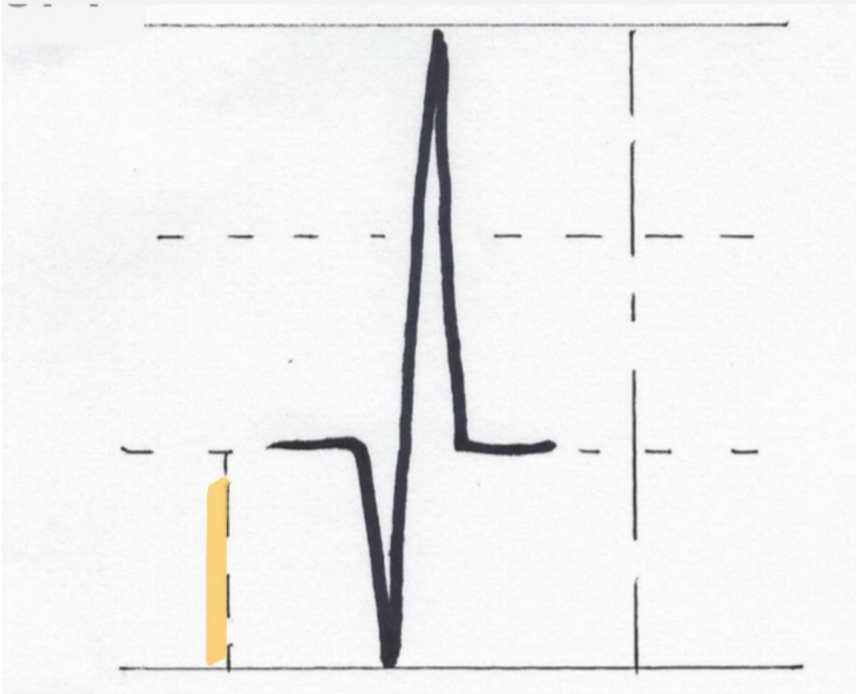


HIS LABS

- Total cholesterol: **149**
- Triglycerides: **189**
- LDL: **74**
- HDL **37**
- TSH: Normal
- Hemoglobin A1c 6.6
- Troponin

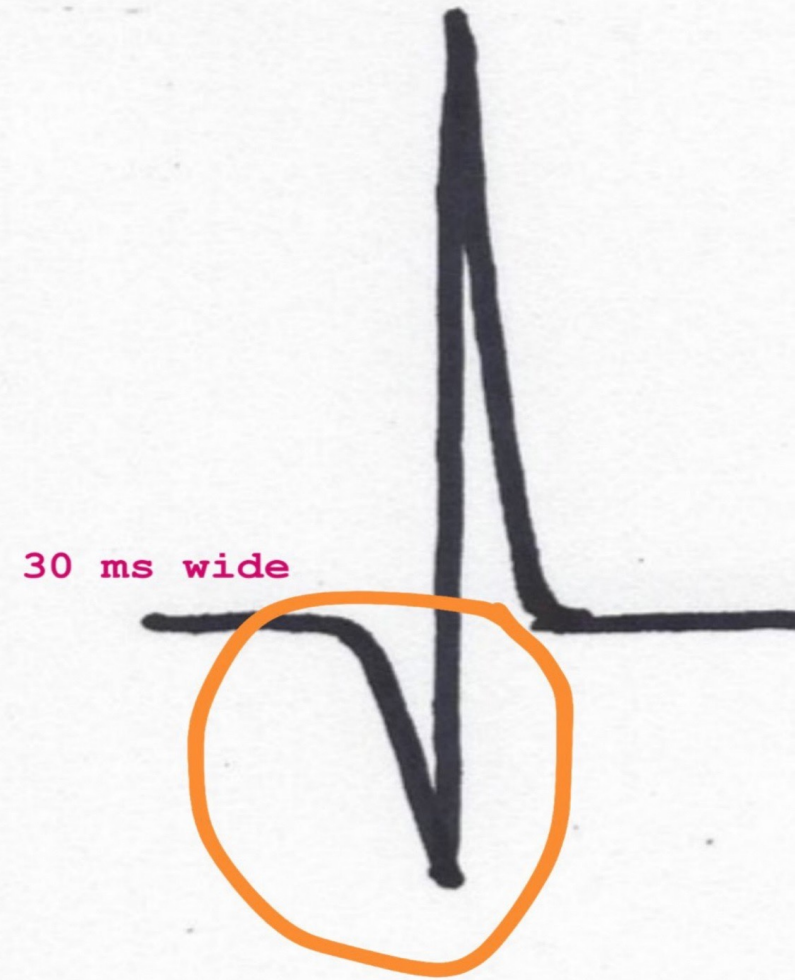
0.057 - 0.059 - 0.045 -0.027

Q WAVE



1/3 height of R wave

Pathologic Q Waves



Lexiscan Stress Test

CLINICAL FINDINGS: **CP during infusion**

IMPRESSION:

- 1. Abnormal myocardial perfusion study. Moderate sized, severe **inferior Ischemia in the RCA territory**.
- 2. Inferior hypokinesis. Normal LV size without transient ischemic dilatation.
- 3. Scan significance: suggestive of a(n) intermediate risk for hard cardiac events. EF 58%

Thank you!

Jennifer Carlquist

QUESTIONS?

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Jen Carlquist Pa-C