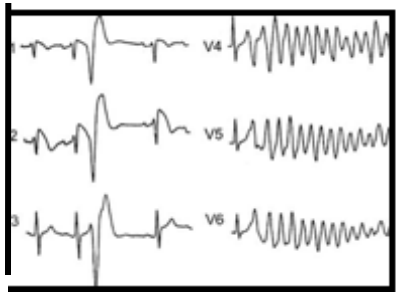
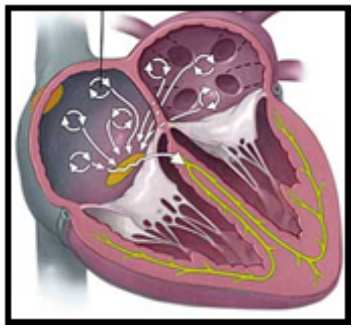
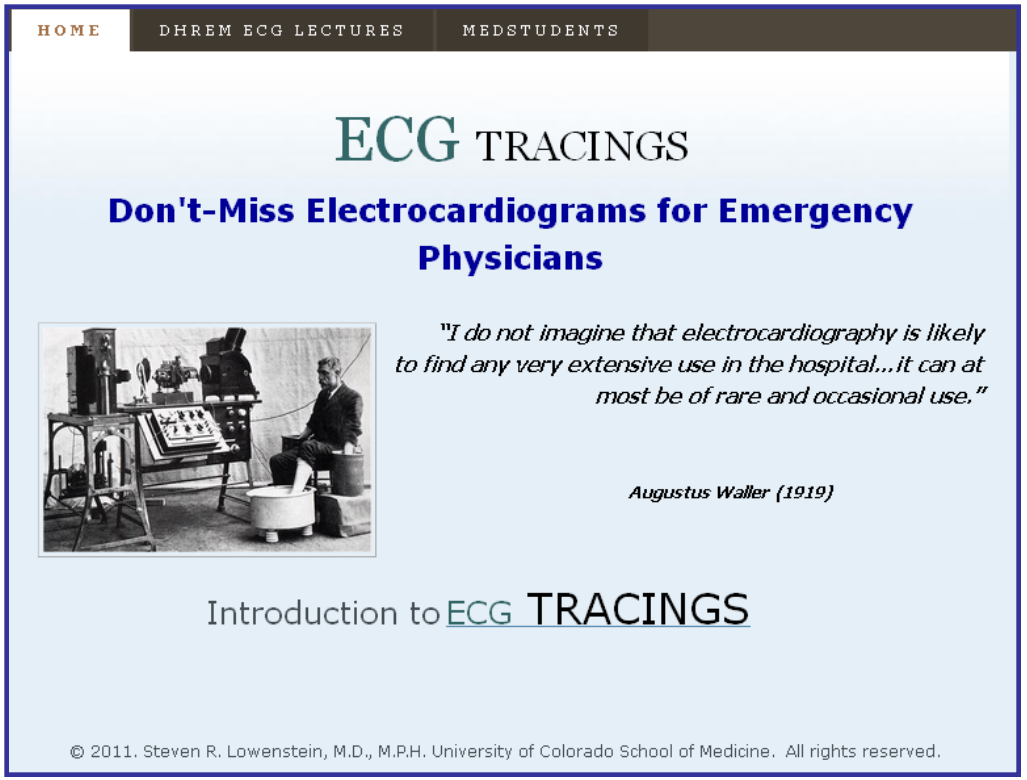
EKG Conferences – 2015 - 2017

Steven R. Lowenstein, MD, MPH







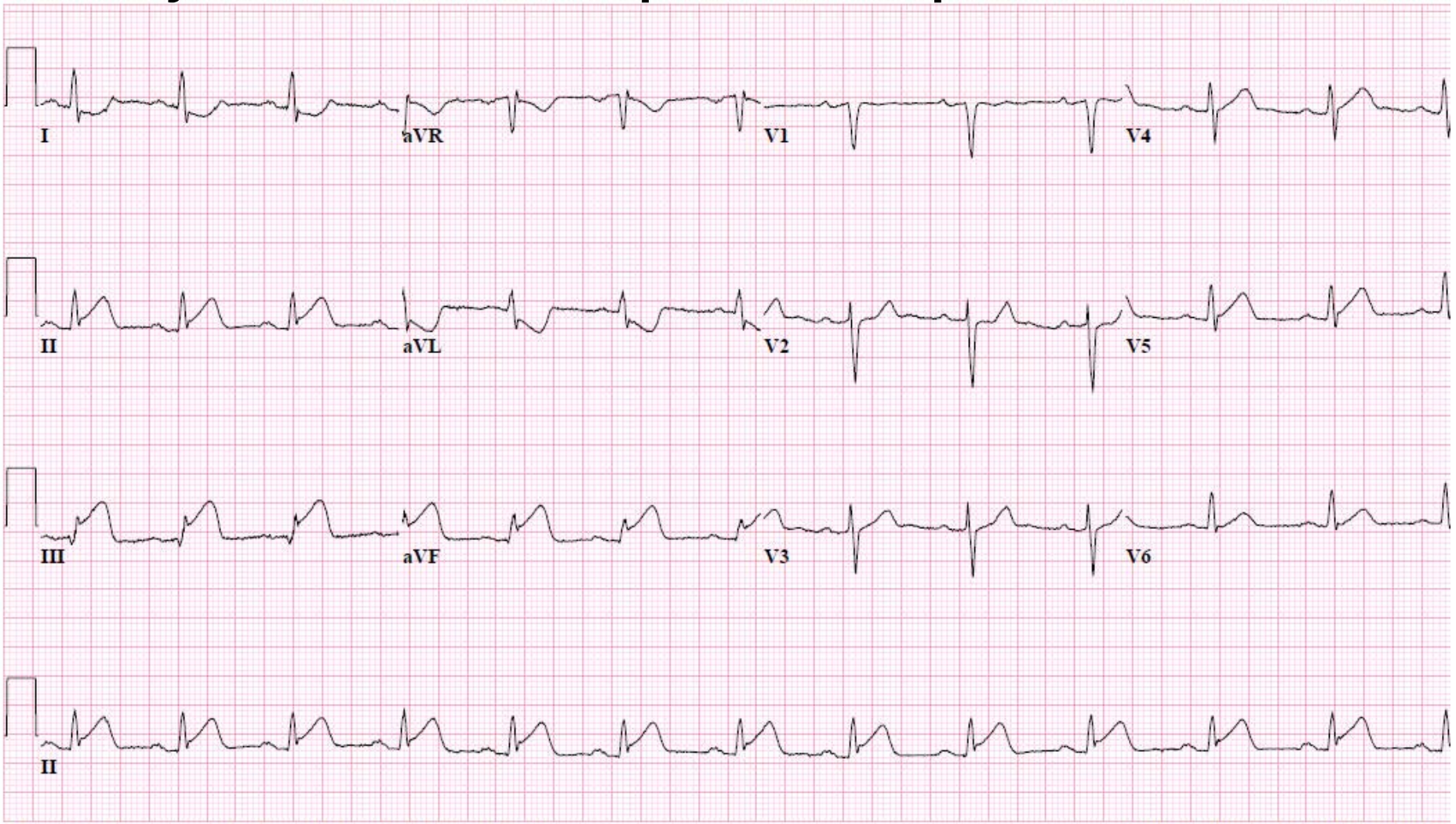
ECG TOPICS

- INFERIOR MI
- Anterior MI
- Posterior MI
- Shortness of breath
- ST- elevations*
- ST-T depressions*

***confusing conditions**

- Atrial fibrillation
- Supraventricular tachycardias
- Wide complex tachycardias
- Heart block and SCSD
- Syncope
- Review (Unknowns)

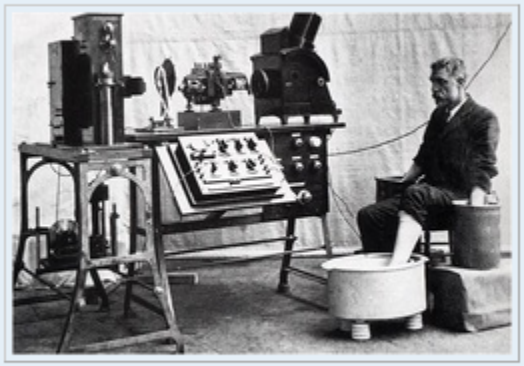
37 y.o. man with chest pain and diaphoresis



HOME | INTRODUCTION TO TRACINGS | DHREM ECG LECTURES

ECG TRACINGS

Don't-Miss Electrocardiograms for Emergency Physicians

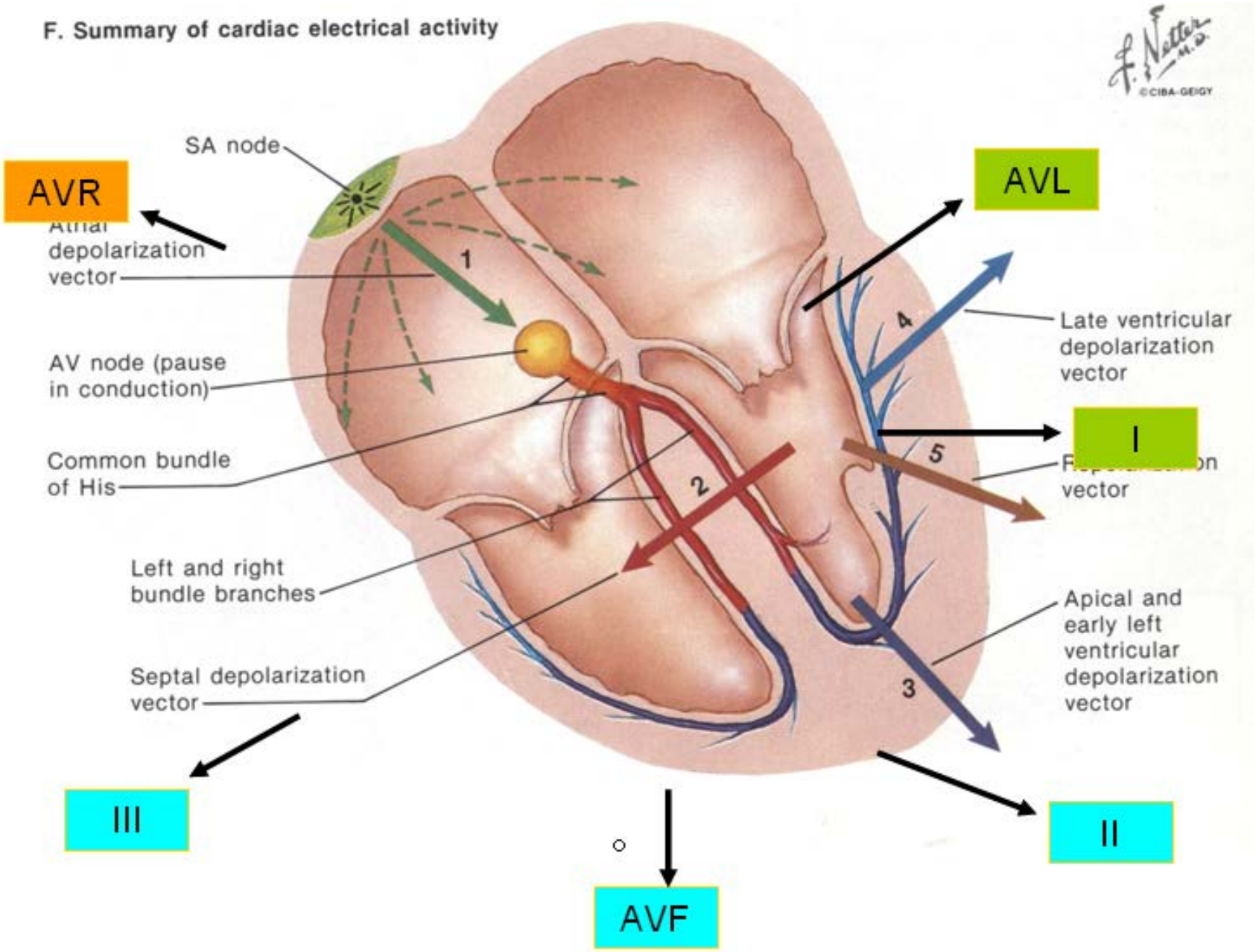


"I do not imagine that electrocardiography is likely to find any very extensive use in the hospital...it can at most be of rare and occasional use."

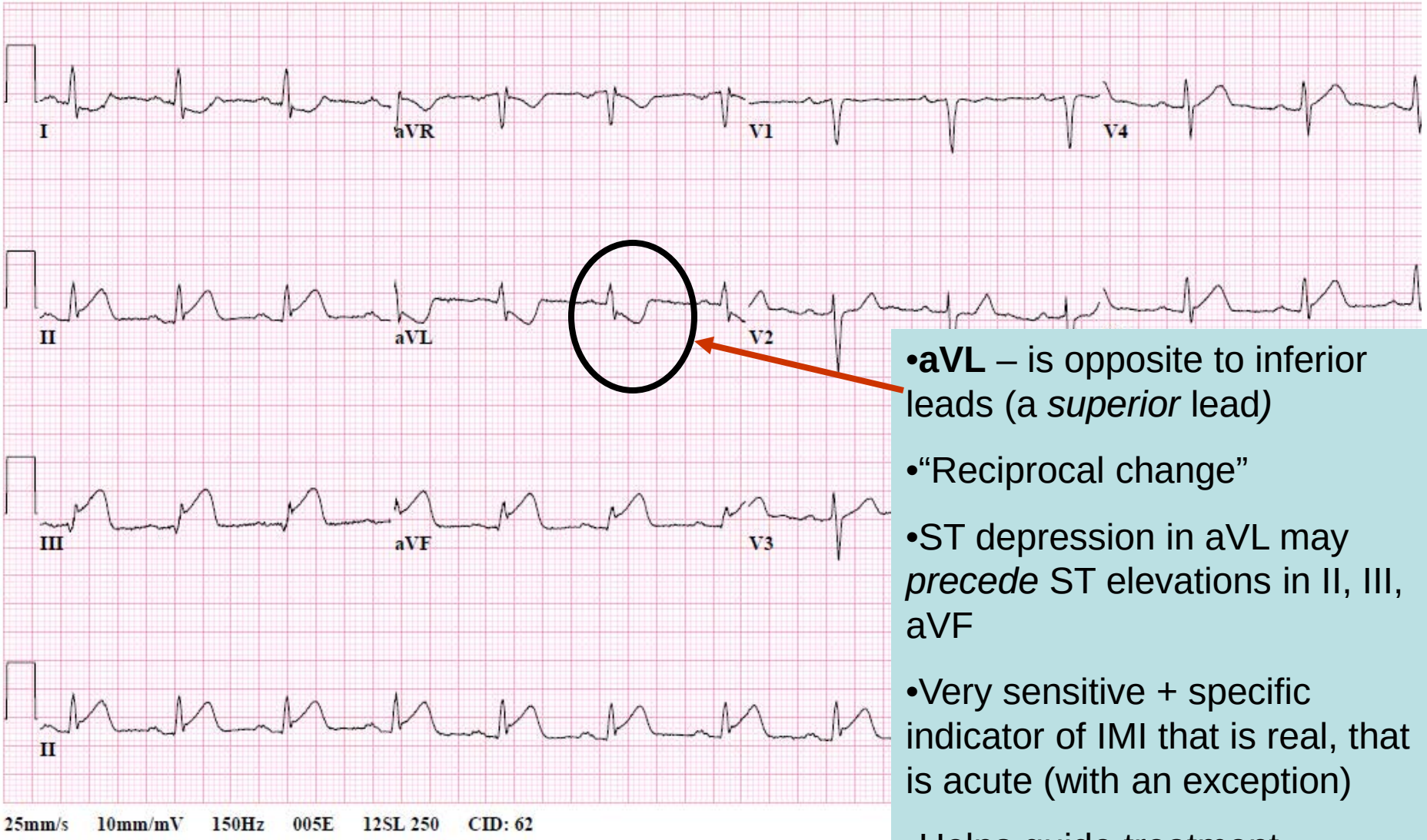
Augustus Waller (1919)

Special Point: It's not just about II, III and aVF

- aVL – clue to early, not-so-obvious IMI
- 3 key complications – EKG findings that change management
  - AV block
  - Posterior wall involvement
  - Right ventricular infarction
- Predicting the culprit artery
- Detecting IMI early, and in challenging conditions


F. Summary of cardiac electrical activity
©CIBA-GEIGY
SA node
AVR
AVL
I
III
II
AVF
Atrial depolarization vector
AV node (pause in conduction)
Common bundle of His
Left and right bundle branches
Septal depolarization vector
Late ventricular depolarization vector
Apical and early left ventricular depolarization vector
1
2
3
4
5

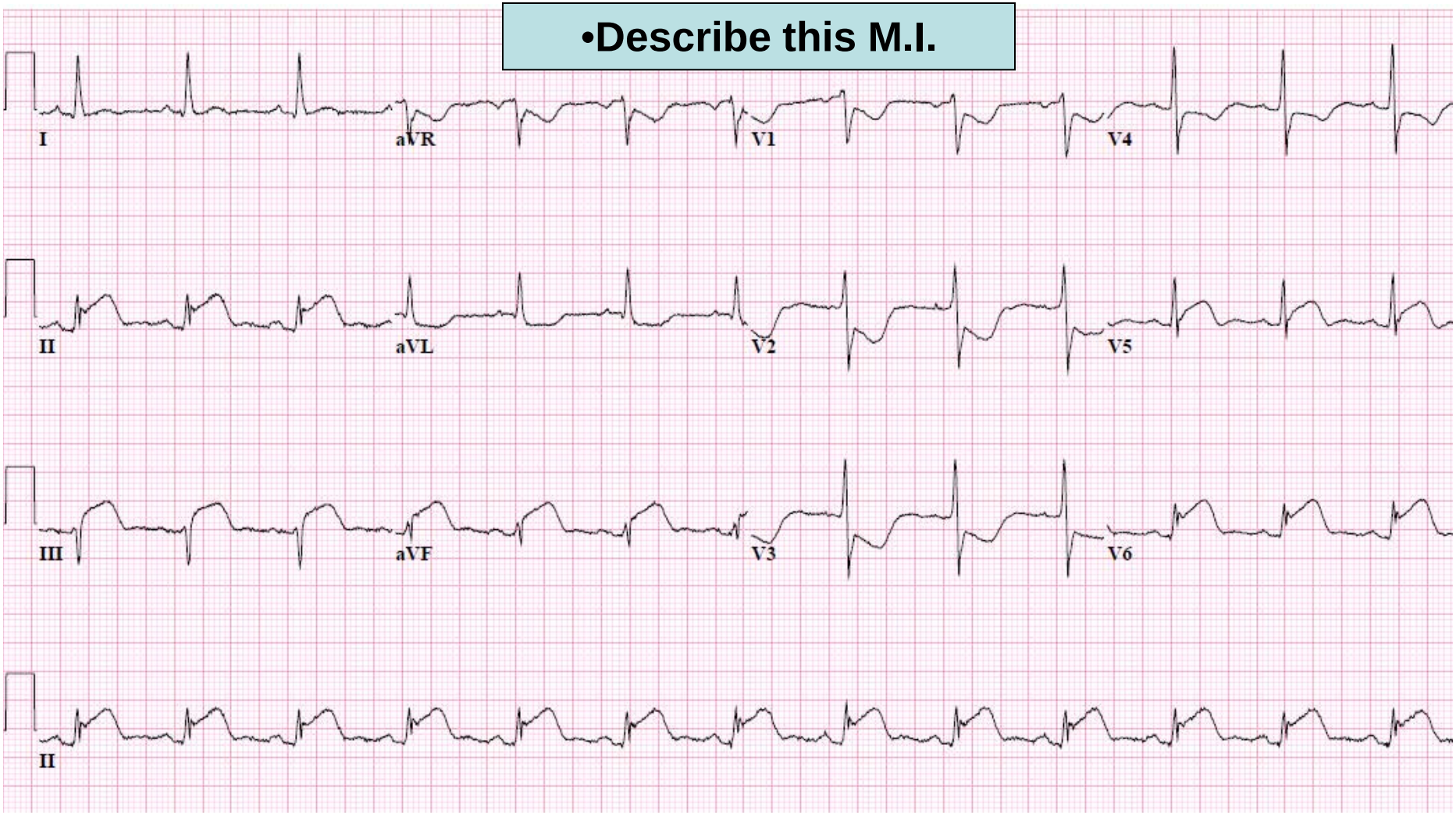
37 y.o. man with chest pain and diaphoresis

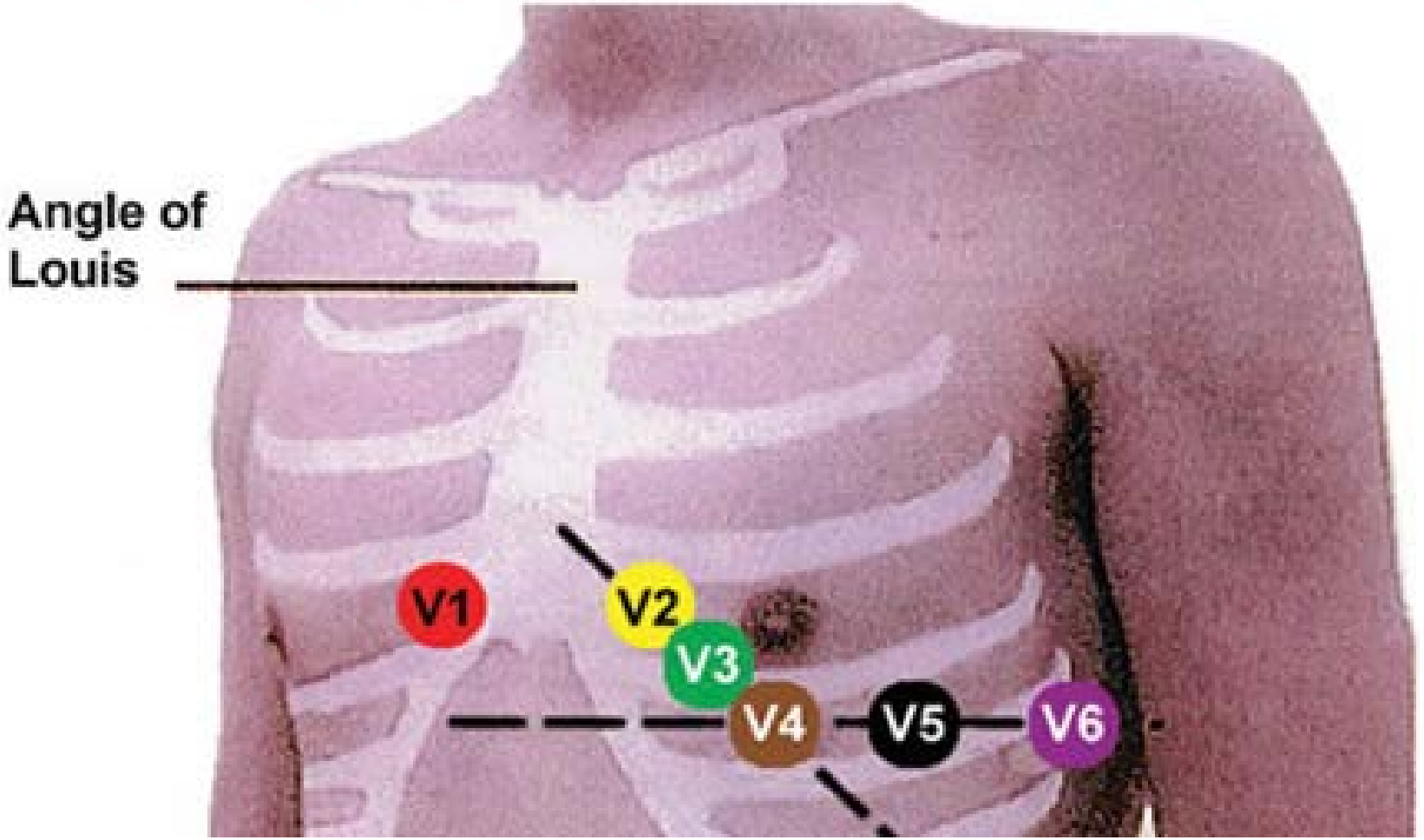


- **aVL** – is opposite to inferior leads (a *superior* lead)
- "Reciprocal change"
- ST depression in aVL may *precede* ST elevations in II, III, aVF
- Very sensitive + specific indicator of IMI that is real, that is acute (with an exception)
- Helps guide treatment

56 Y.O. man with chest pain

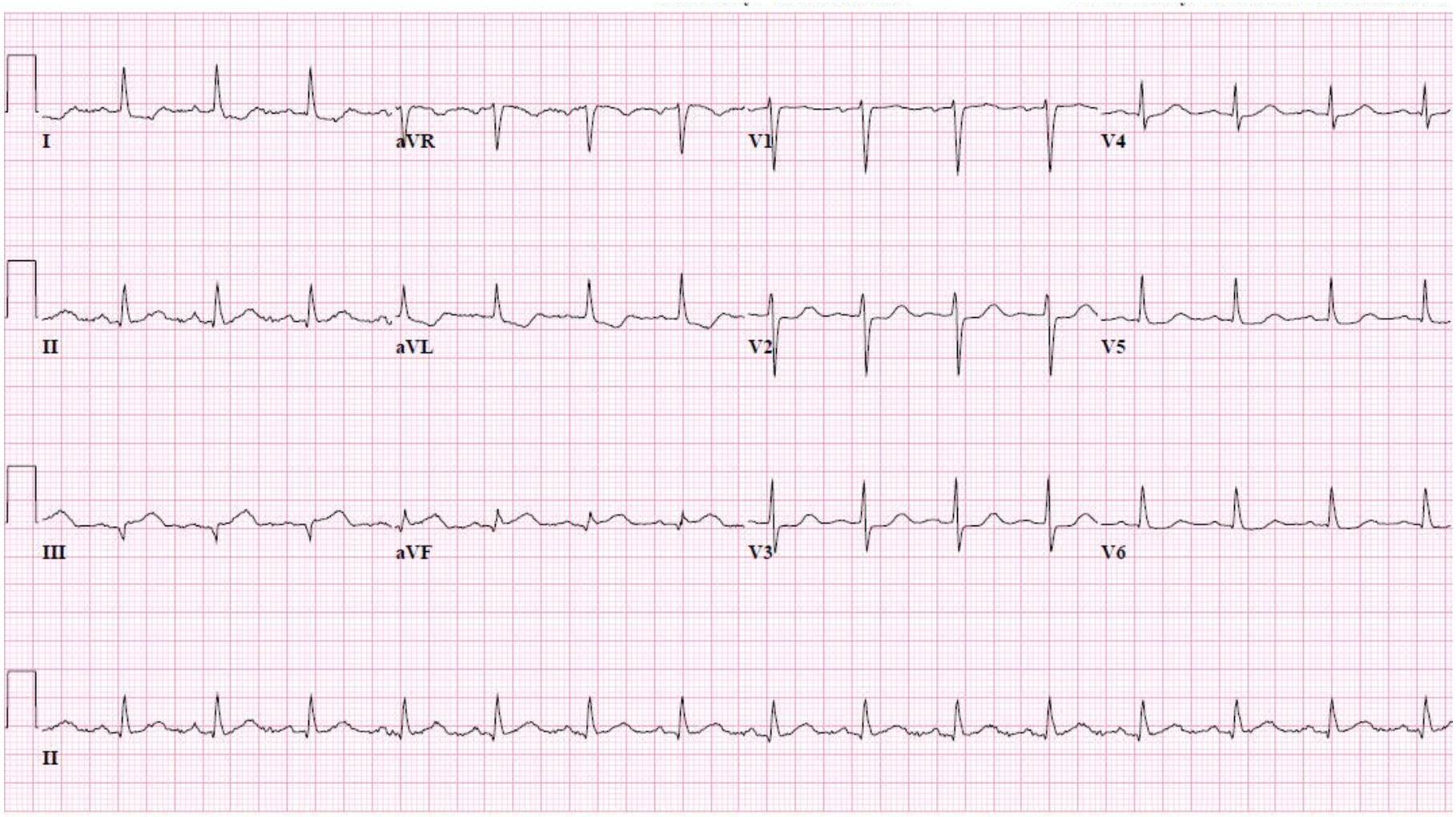
•Describe this M.I.

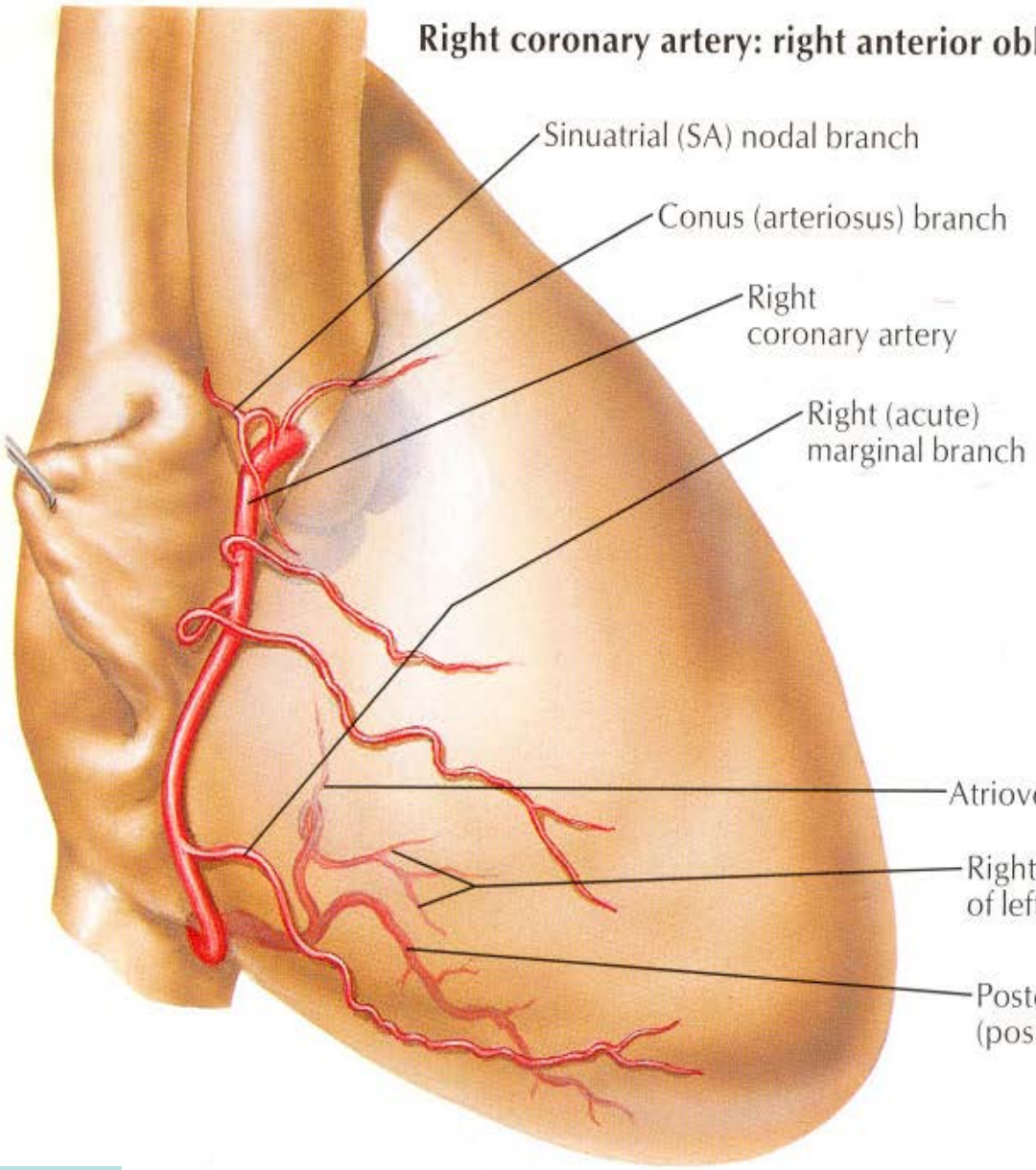



Angle of
Louis
V1
V2
V3
V4
V5
V6

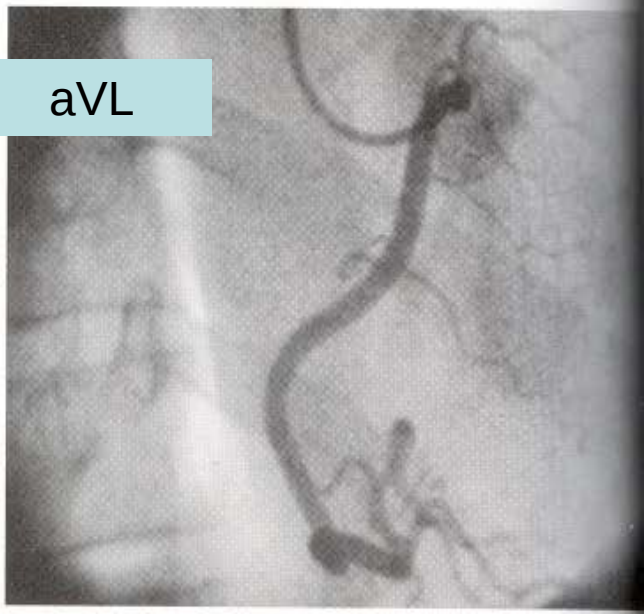
50 y.o. female with acute chest tightness;

Admitted as “possible MI”





aVL



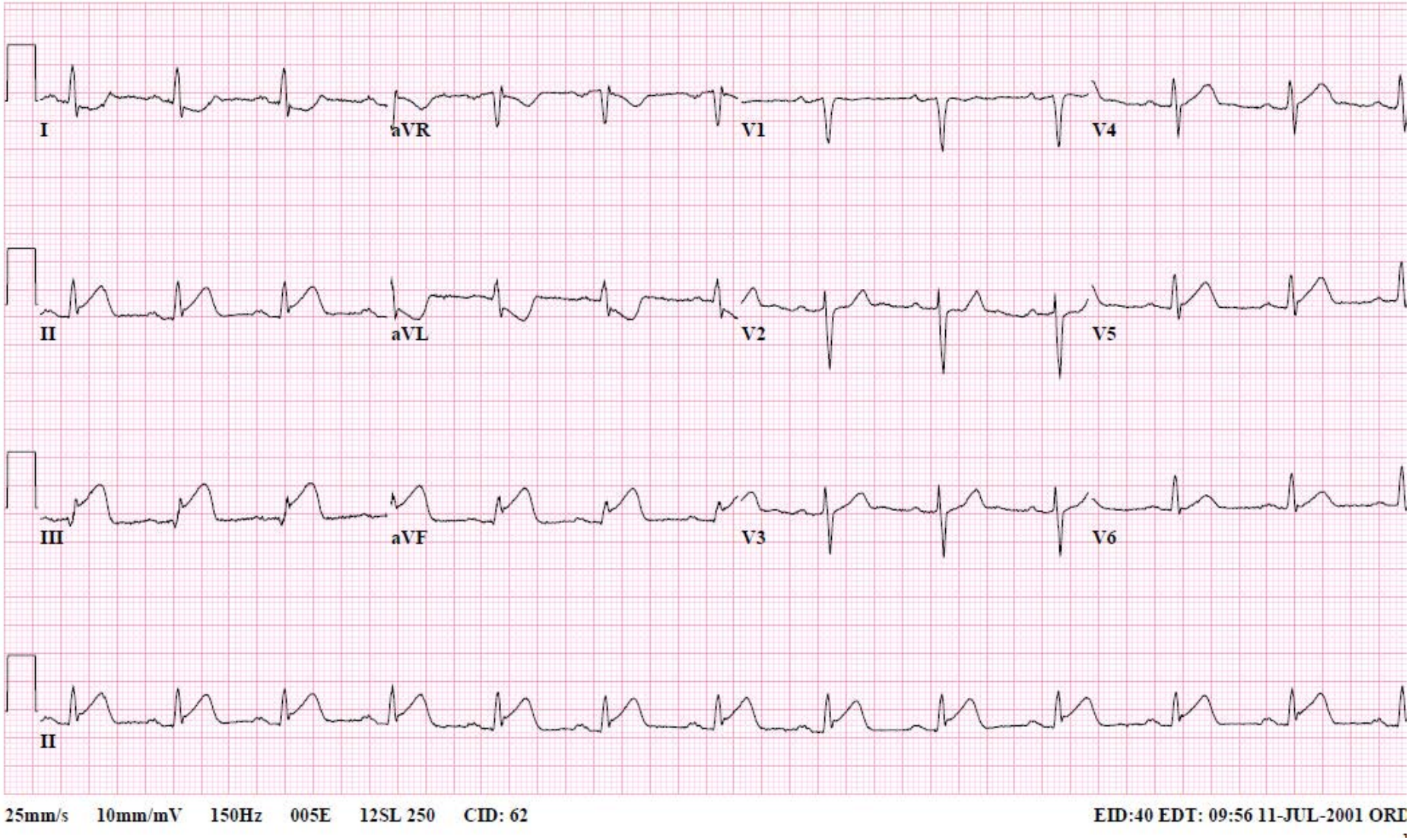
Arteriogram

Also → post-medial papillary m.

Lead III

Lead II

37 y.o. man with chest pain and diaphoresis: What is the culprit artery?



IMI: Clinical correlations

- **The Big Three***
  - RV MI
  - Posterior Extension
  - AV Block
    - 1st degree AV block
    - Wenckebach
    - Third degree block
- Each → More shock, early & late mortality

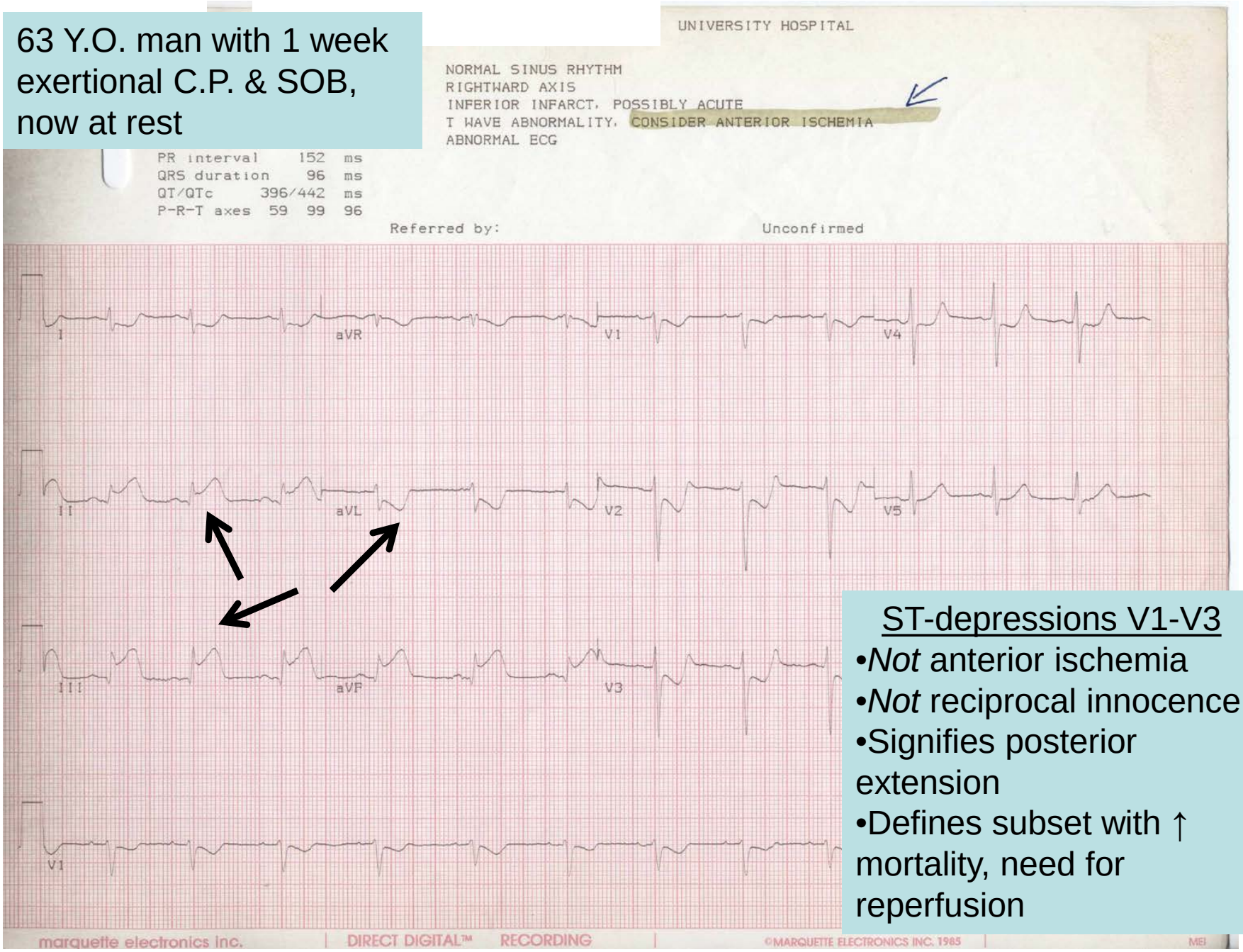
***Complete Reading of EKG**

- **IMI – Causes of shock**
  - AV block, bradycardia
  - RV Infarction
  - Extensive LV dysfunction
    - Inferior-posterior MI
  - Papillary muscle rupture
    - Postero-medial papillary muscle rupture most common
    - Single blood supply from posterior descending artery

Papillary Muscle Rupture

- *Can be devastating – Is a mechanical cause of cardiogenic shock*
  - Accounts for 5% of mortality from MIs
- More common with inferior MI, usually occurs days 2-7 and incidence likely lower with lytics and PCI treatments
- Posteromedial papillary muscle more commonly involved, due to single blood supply (PDA)
  - Anterolateral papillary muscle supplied by both the LAD and Left Circumflex
- **Often (not always) hear a pansystolic murmur; dx is easy with ECHO**
- **Treatment with vasodilators and often IABP bridge**

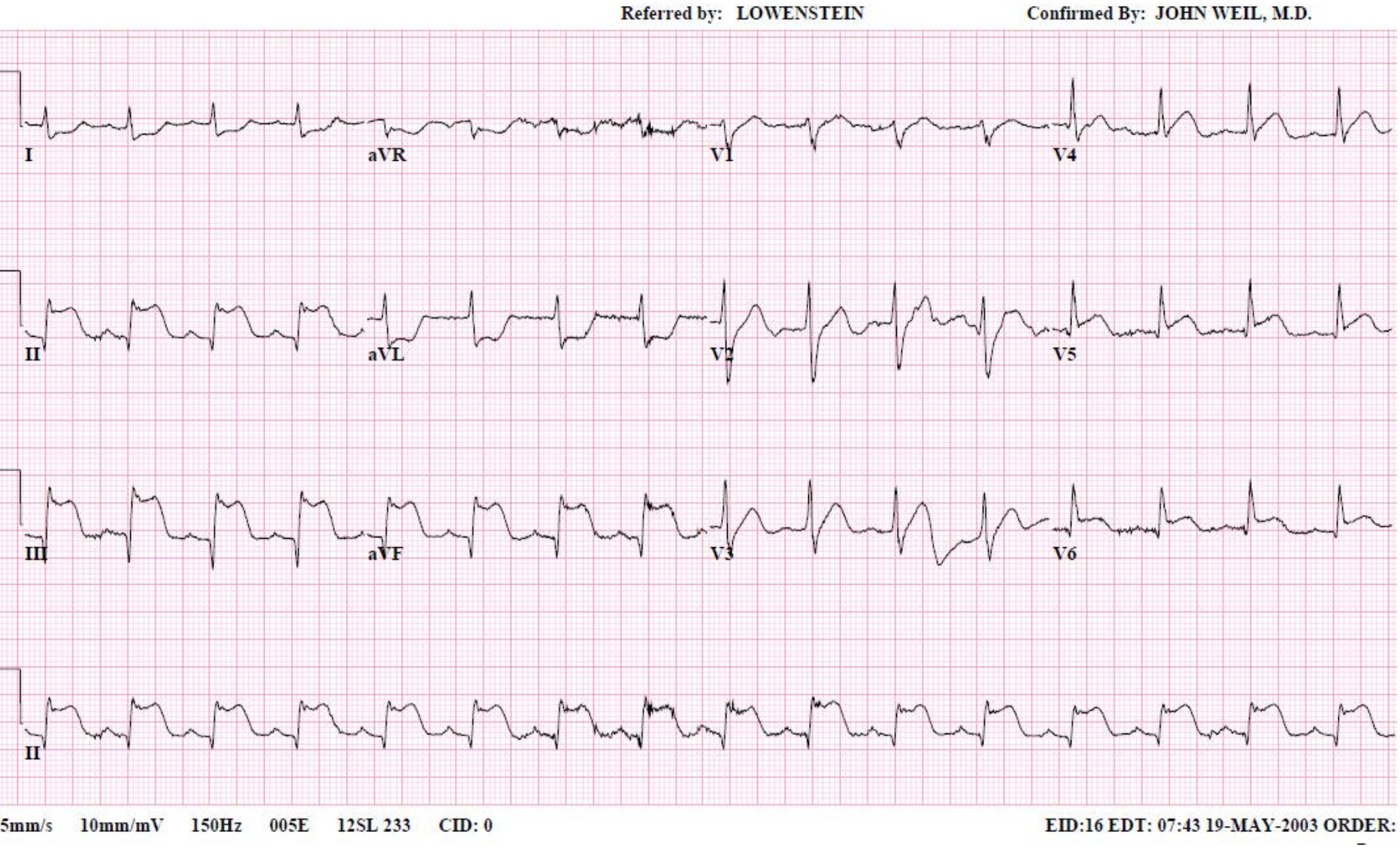
63 Y.O. man with 1 week exertional C.P. & SOB, now at rest



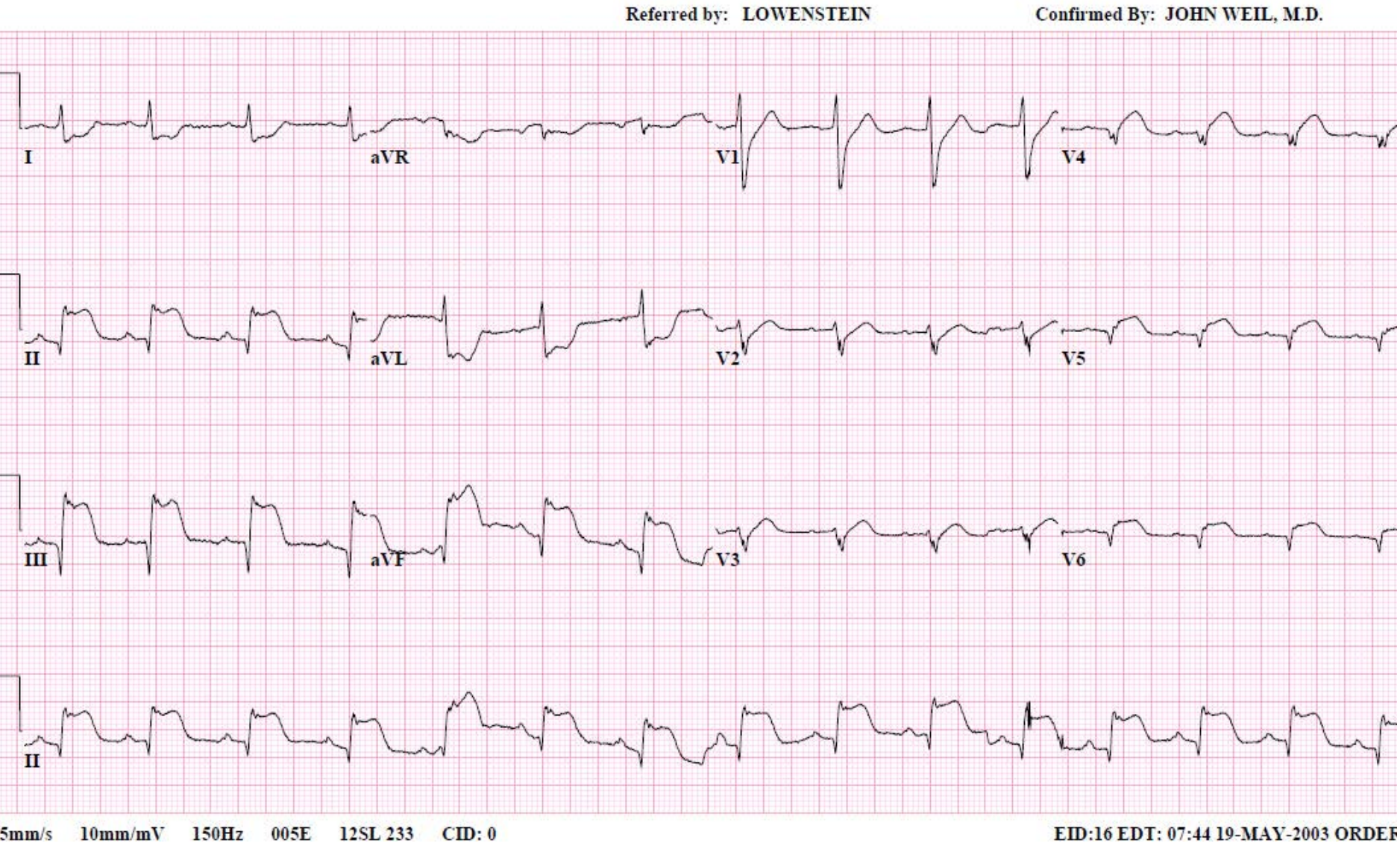
ST-depressions V1-V3

- *Not* anterior ischemia
- *Not* reciprocal innocence
- Signifies posterior extension
- Defines subset with ↑ mortality, need for reperfusion

35 Y.O. man with severe chest pain, radiation to jaw, N/V, SOB; MR murmur



RIGHT-SIDED LEADS



6-APR-1942 (48 yr)
Male

Room:
Loc:40 Option:7

Vent. rate	78	BPM
PR interval	148	ms
QRS duration	92	ms
QT/QTc	368/419	ms
P-R-T axes	63 -41	95

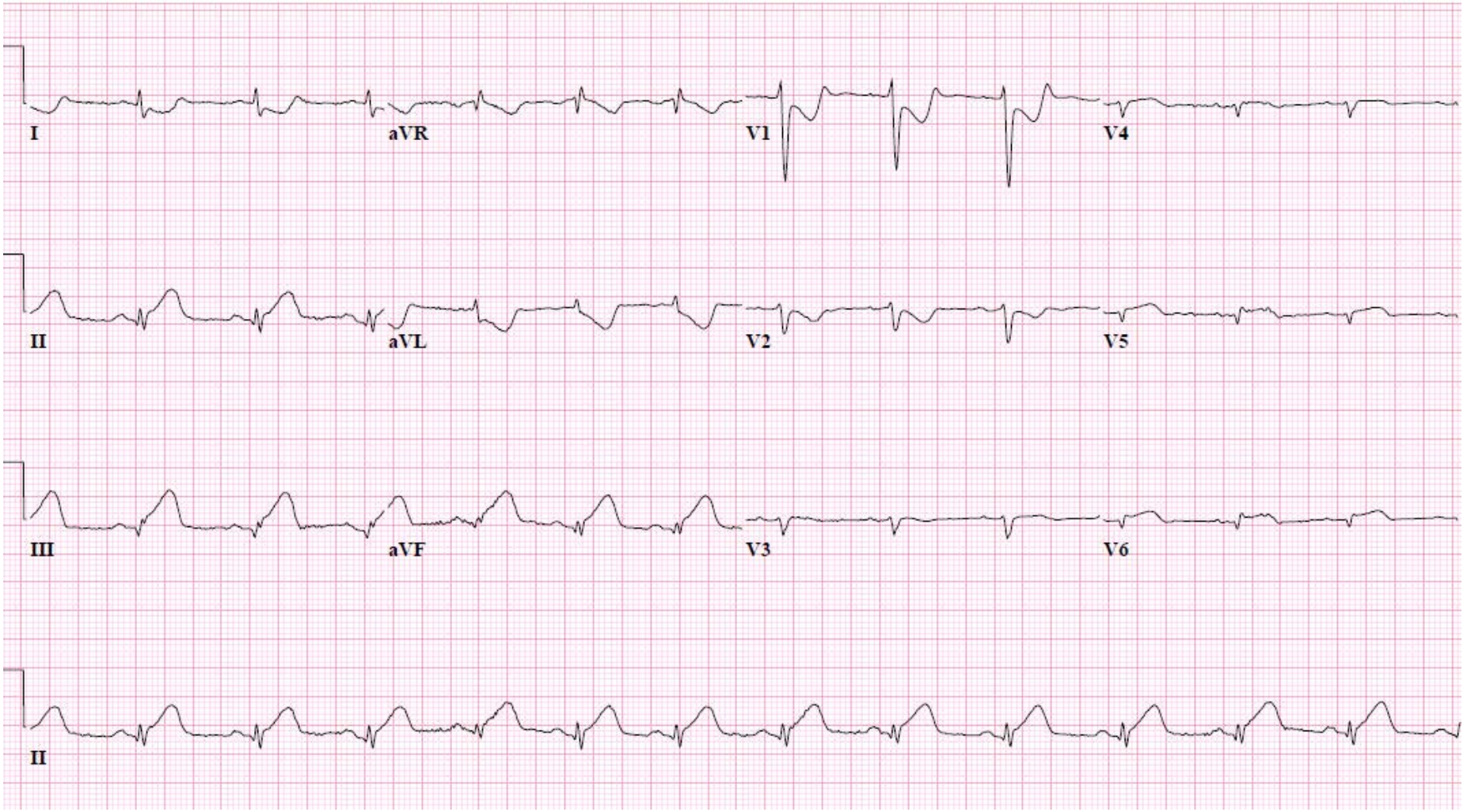
RIGHT SIDED LEADS
Right sided leads consistent with rv infarction

Technician ID: 0

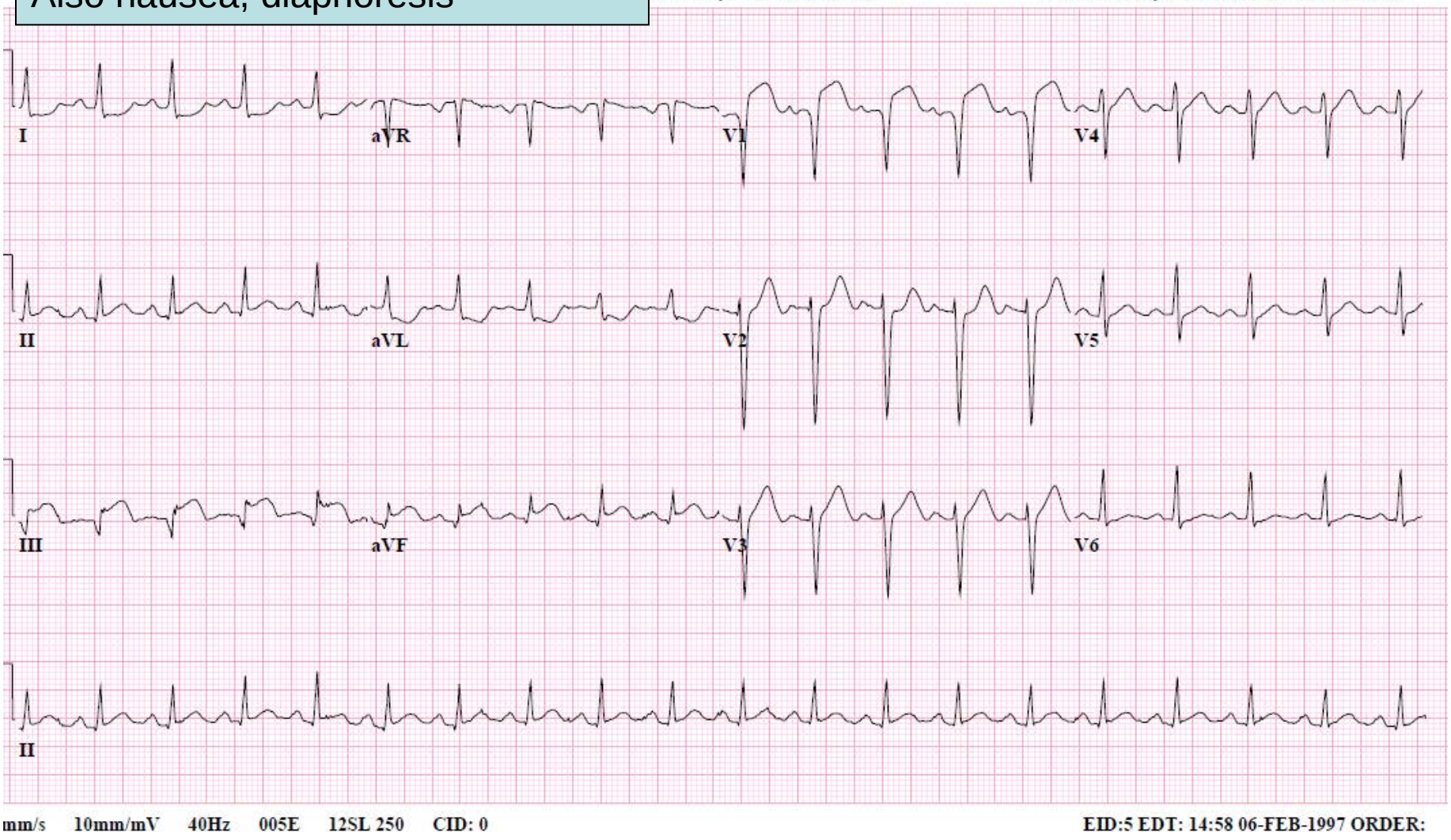
Med: Unknown

Referred by:

Confirmed By: JOANN LINDENFELD



52 Y.O. man with bilateral arm pain/numbness, fullness in throat. Also nausea, diaphoresis



Vent. rate	114	BPM
PR interval	162	ms
QRS duration	90	ms
QT/QTc	304/419	ms
P-R-T axes	39 30	102

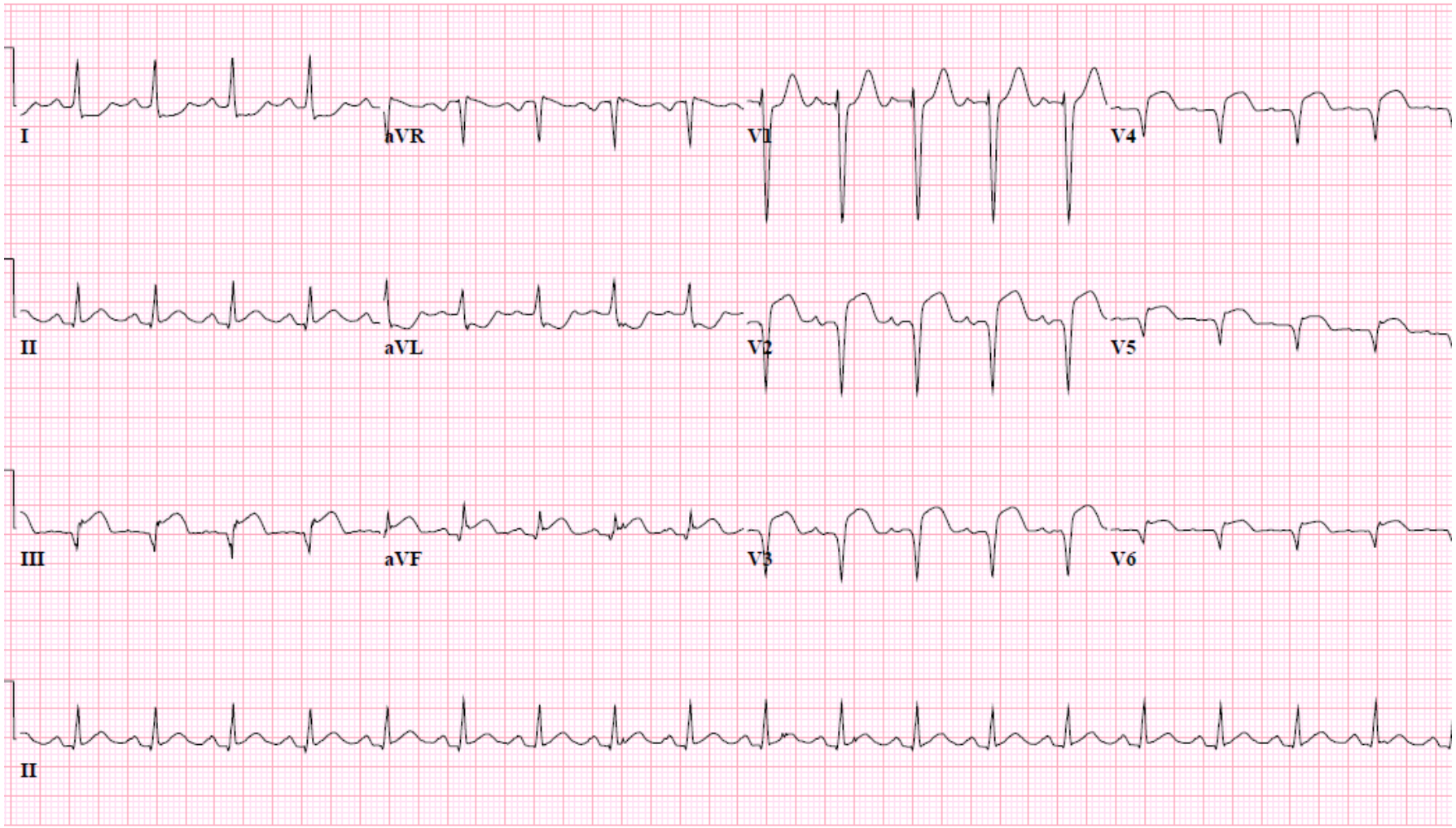
RIGHT SIDED LEADS
Right sided leads consistent with rv infarction
Sinus tachycardia
Acute Inferior infarct (cited on or before 06-FEB-1997)
** ** ** ** * ACUTE MI * ** ** ** **
Abnormal ECG

c:40

Technician: 666

Referred by: LOWENSTEIN

Confirmed By: BERTRON GROVES M.D.



mm/s 10mm/mV 40Hz 005E 12SL 250 CID: 0

EID:5 EDT: 14:59 06-FEB-1997 ORDE

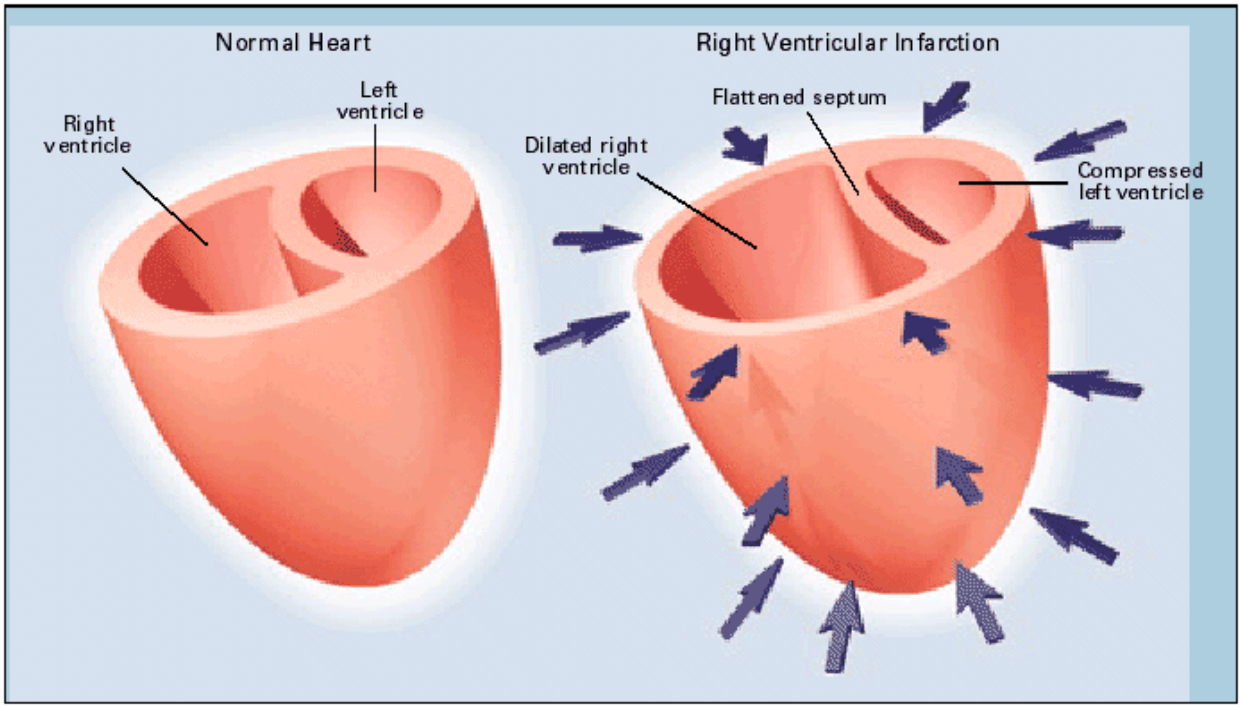
Who cares about right-sided leads?

- RVMI: Accompanies 30-50% of IMIs
- May depress RV systolic function ⇨
  - Under-filling of LV and decreased cardiac output
  - Often RV dyskinesis and dilatation are transient
- V4R ST-elevation is 80-90% specific & sensitive
  - ***Identifies subset with 7-fold higher rate of shock, mortality***
- Echo: RV cavity dilatation, impaired RV free wall motion
- Clinical triad often absent
  - JVP elevation, hypotension, clear lungs

Treatment principles

- Recognize RV failure:
  - ↓ pre-load to LV, ↓ LV Stroke volume
- Administer 200-300 cc *boluses of* fluids (to wedge pressure ~ 15)
- Avoid nitrates, diuretics, opiates
- Dilated RV bulges into inter-ventricular septum and impairs LV filling and cardiac output
    - Excessive IV fluids makes this worse
    - Dopamine (5 mcg/kg/min) or dobutamine recommended
- Correct bradycardia/heart block:
  - Worsens pump failure, because ischemic RV has *fixed stroke volume* and RV output is entirely rate dependent.

– IMMEDIATE coronary artery reperfusion



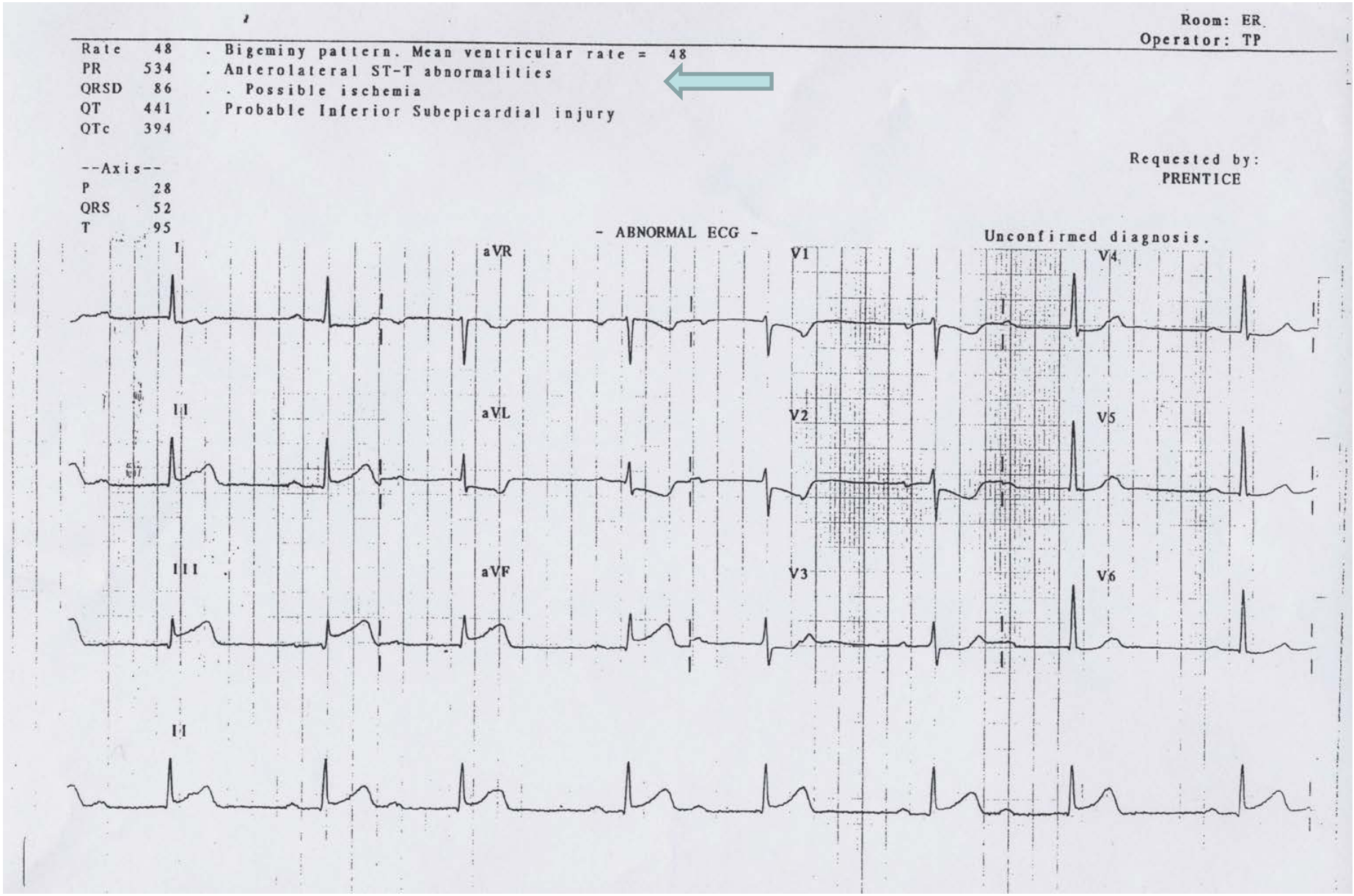
Pathophysiologic mechanism underlying the low-output state in right ventricular myocardial infarction.
The low-output state is mediated by ventricular interaction (resulting in a flattened septum) and the restraining effect of the pericardium (arrows) during acute right ventricular distention.

Reference: Dell'Italia LJ. Reperfusion for right ventricular infarction. N Engl J Med. 1998;338:978-980.

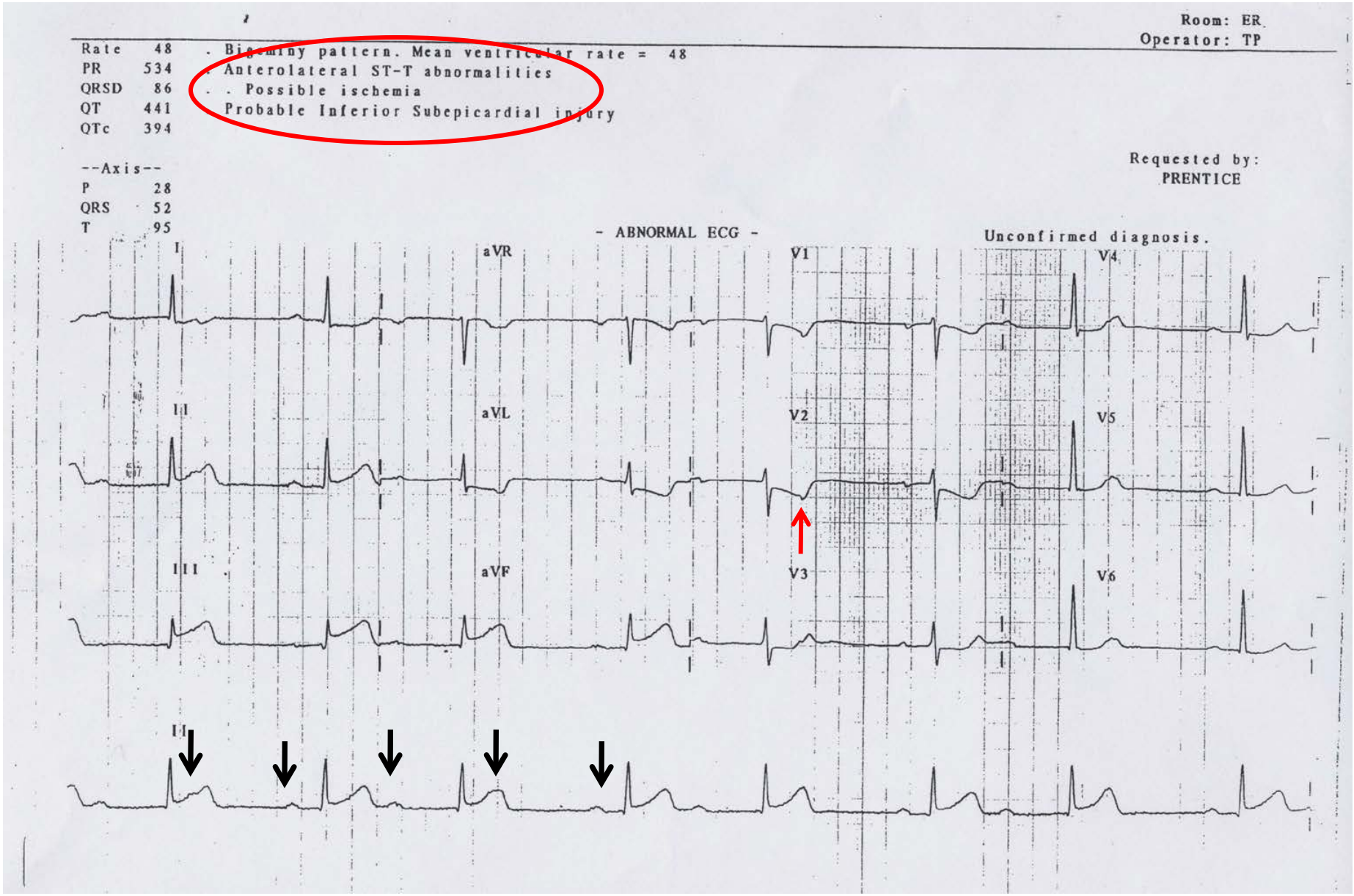
Miscellaneous complications of R.V. Infarction

- Tricuspid regurgitation
- RV thombus and pulmonary embolism
- Increased right atrial pressure → A.Fib.
- RV is thin-walled
  - Increased incidence of pericarditis
  - RV rupture

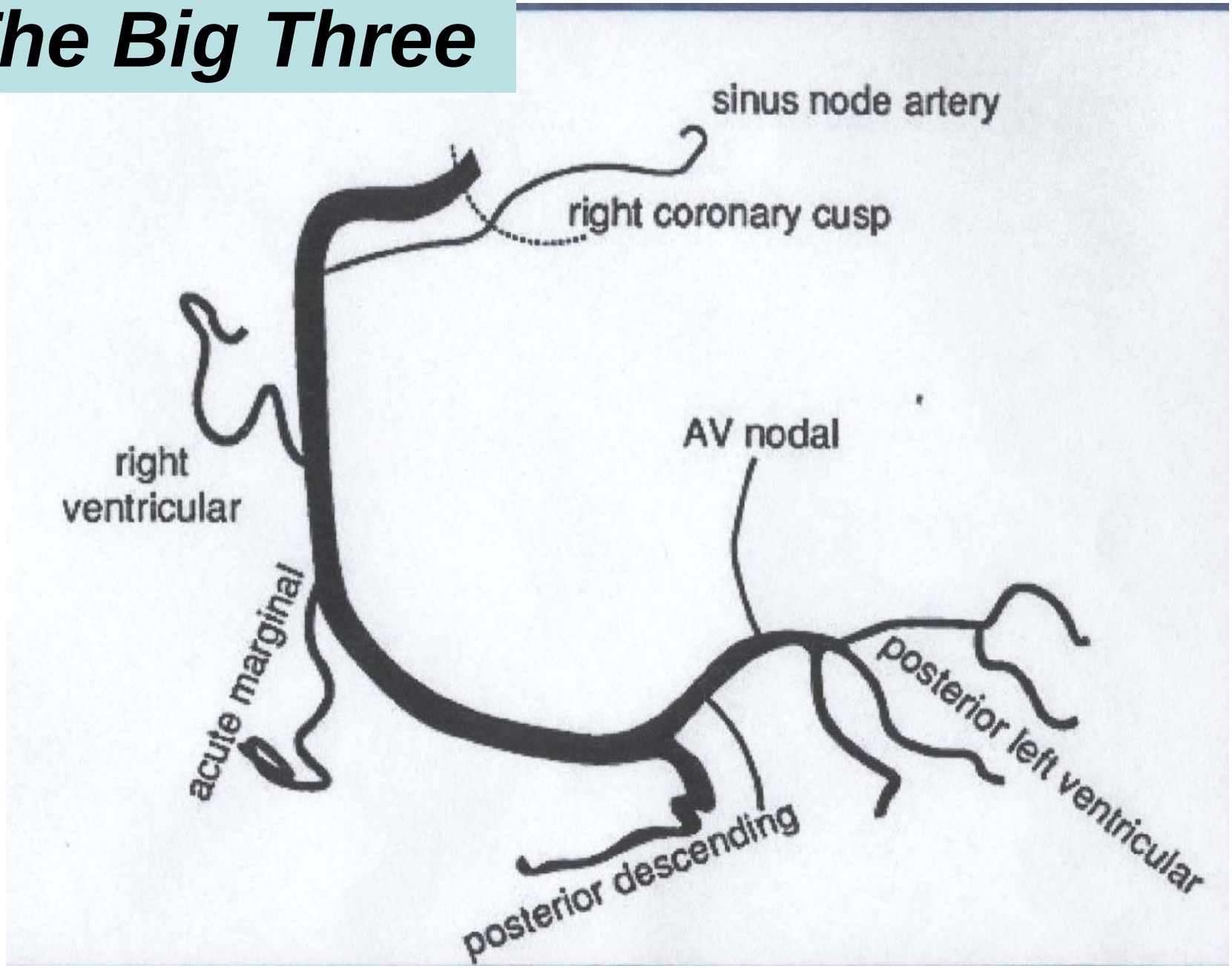
51 Y.O. Man with chest pain



51 Y.O. Man with chest pain



The Big Three



AV Block in Inferior MI

- Common (90% of people *right dominant*)
  - Develops in 20-30% (In ED: 8%)
- Often progresses in step-wise fashion
  - First-, second- and third-degree block
    - Second degree block is ~always Wenkebach
- Intra-nodal (AV nodal ischemia)
  - AV block is often transient, often pacing not needed
  - Escape rhythms narrow and adequate rate
    - Common escape: Accelerated Junctional
  - Usually responds to atropine

Less Obvious Inferior Infarcts

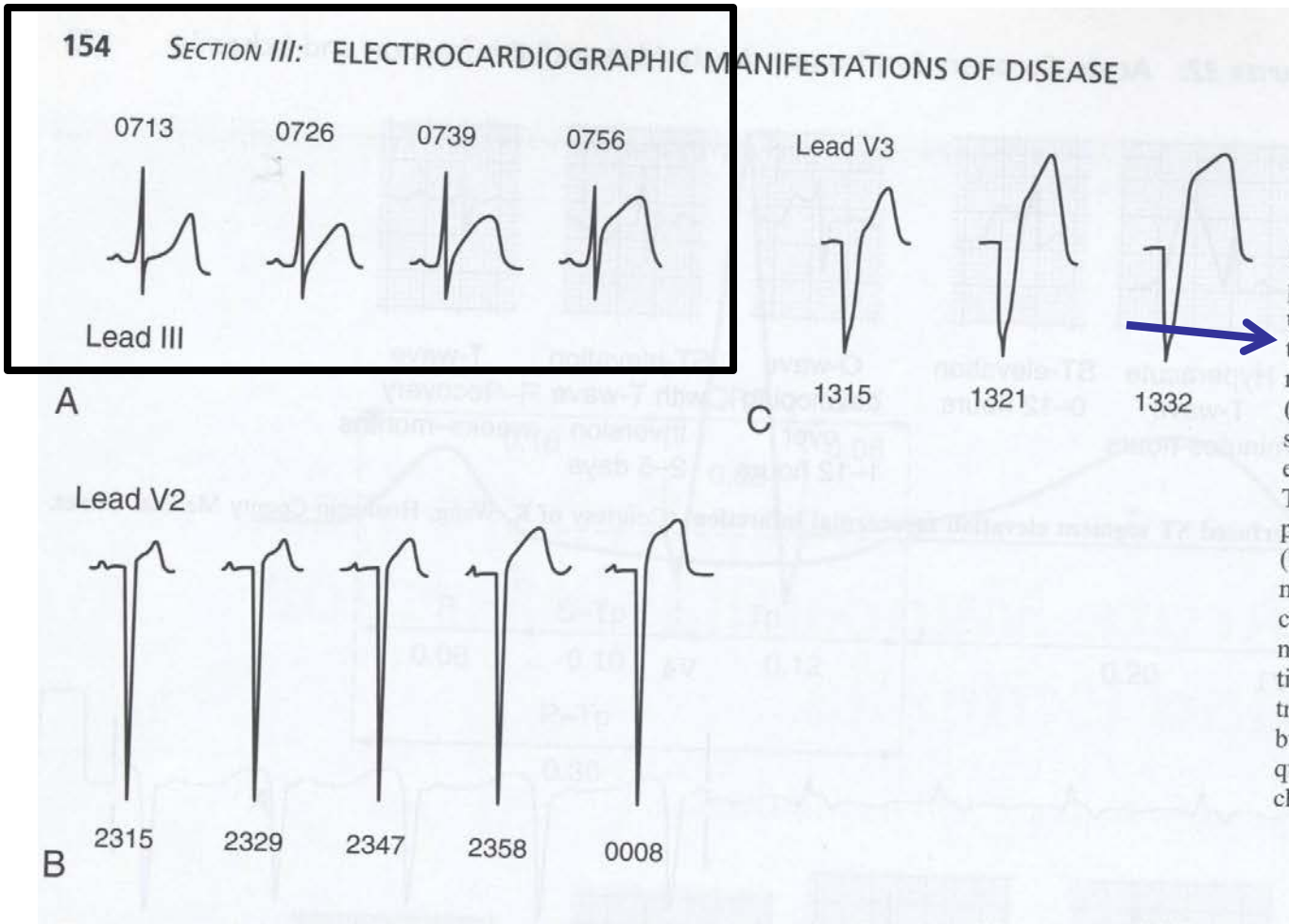


FIGURE 32-5 • Serial ECGs in three patients; time of tracing shown in parentheses. *A,* This rhythm strip demonstrates the evolution of the ST segment from normal concave upward (0713) to straight (0726) to convex (0739) to still more ST segment elevation, confirming ST segment elevation myocardial infarction (0756). *B,* This tracing demonstrates the typical morphology of left ventricular hypertrophy (LVH) in lead V_2. Serial tracings reveal morphology evolution from straight and convex, with increased height of ST segments, suggesting acute myocardial infarction (AMI) superimposed on LVH. *C,* This tracing shows typical morphology of left bundle branch block in lead V_3, with subsequent increased ST segment elevation. The change is diagnostic of superimposed AMI.

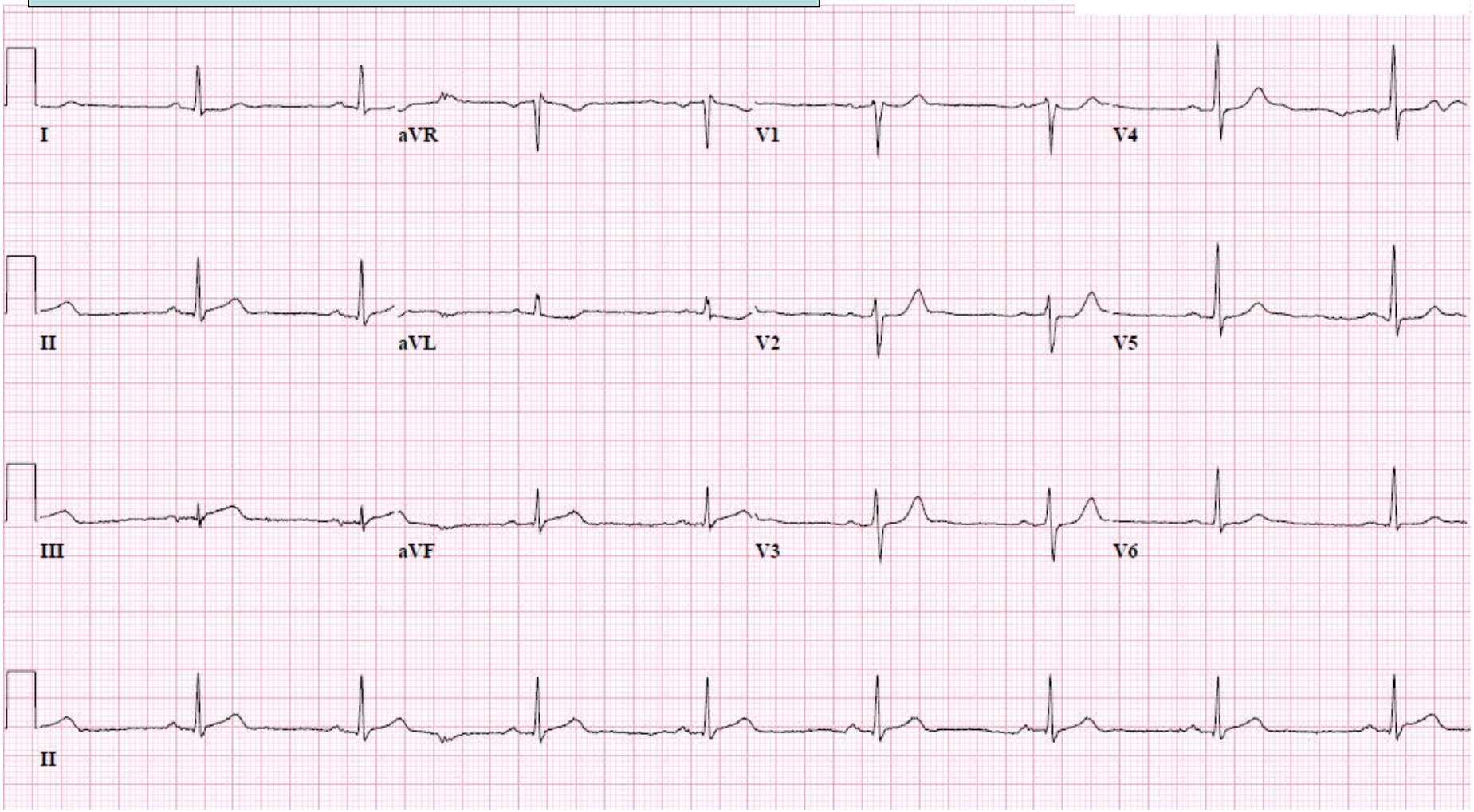
12-SEP-1947 (55 yr)
Male Caucasian

Loc:0

Vent. rate	57	BPM
PR interval	180	ms
QRS duration	100	ms
QT/QTc	430/418	ms
P-R-T axes	44 38	74

Sinus bradycardia with occasional Premature ventricular complexes
Otherwise normal ECG

55 Y.O. man with intermittent chest pain and mild dyspnea



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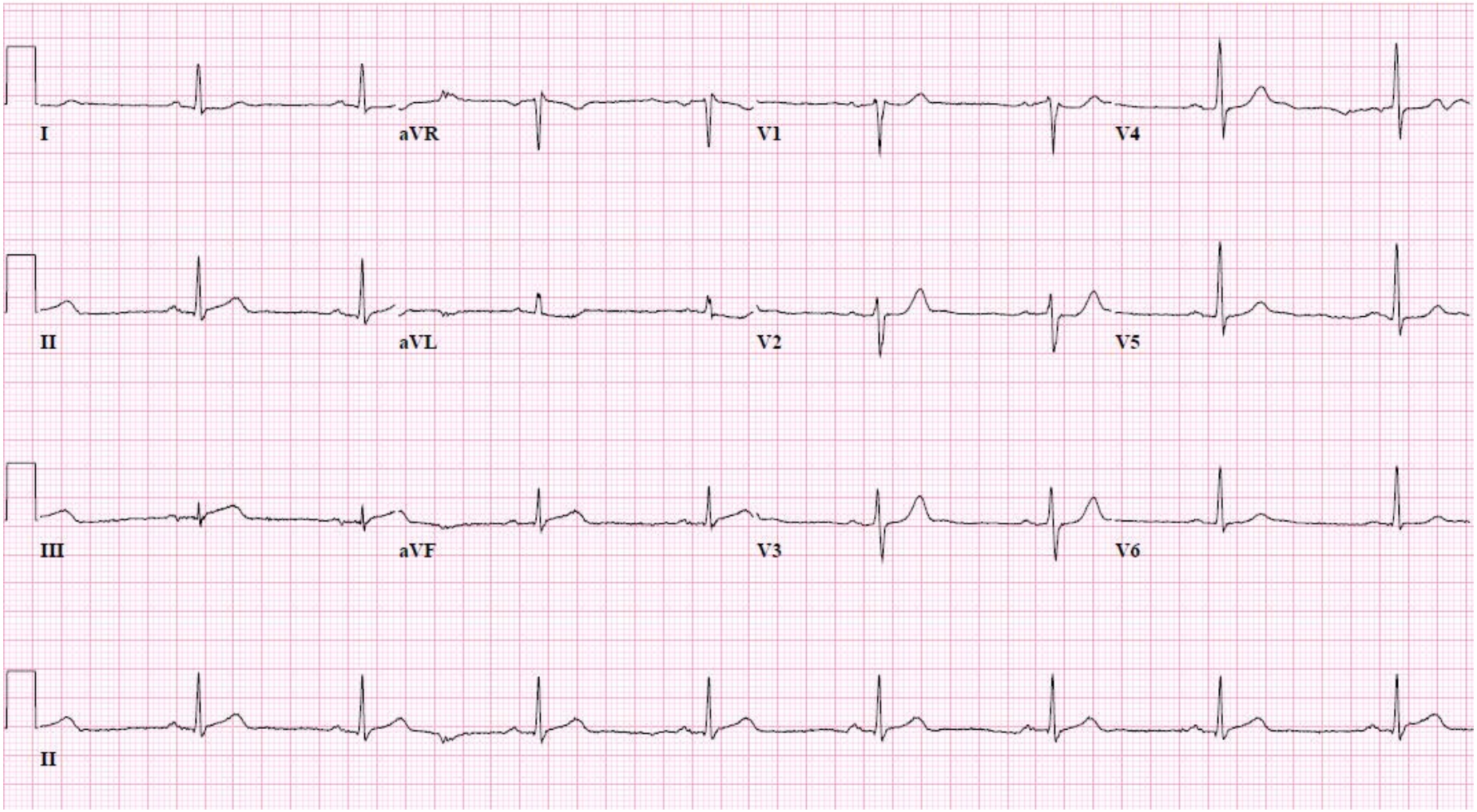
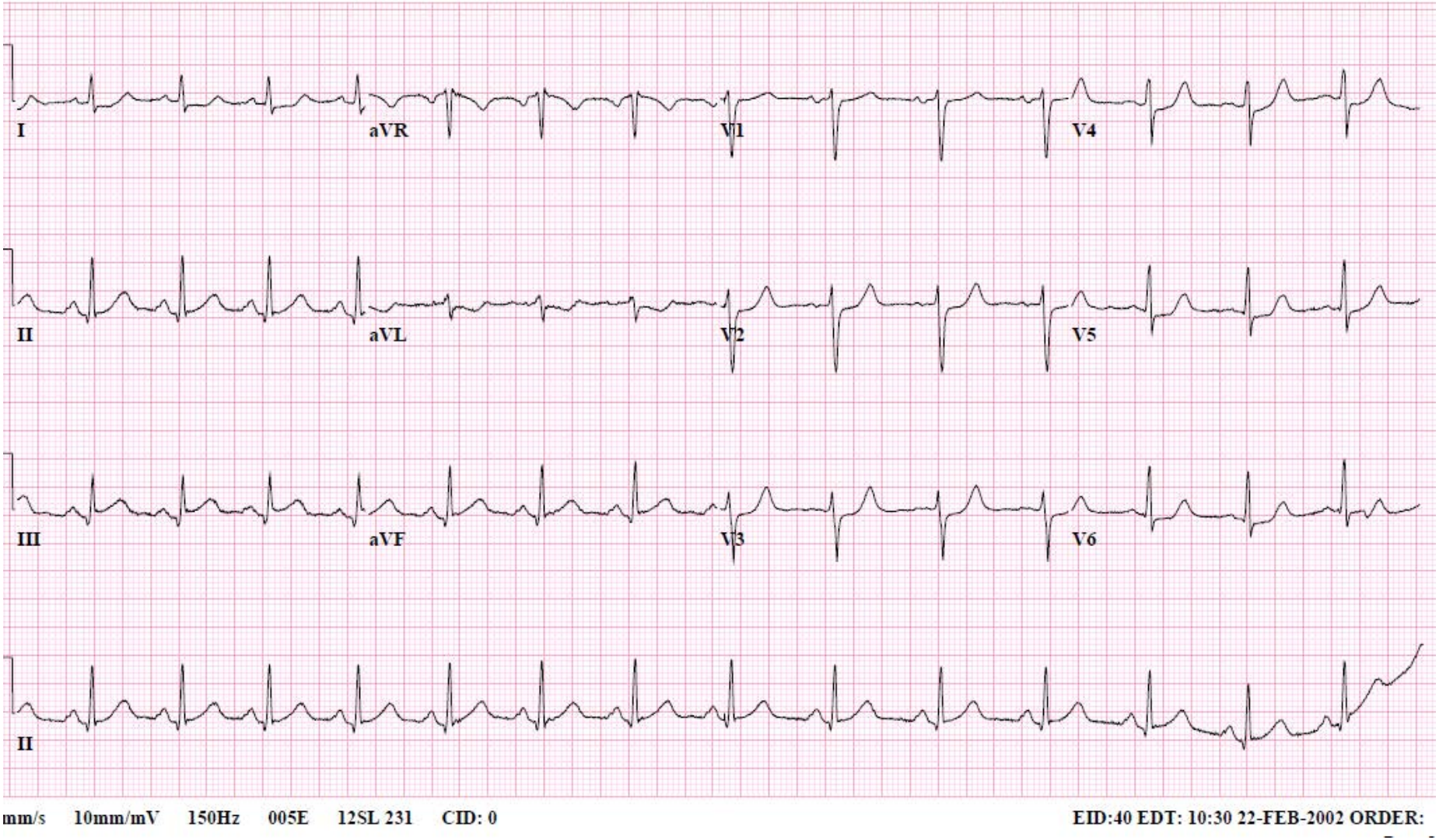
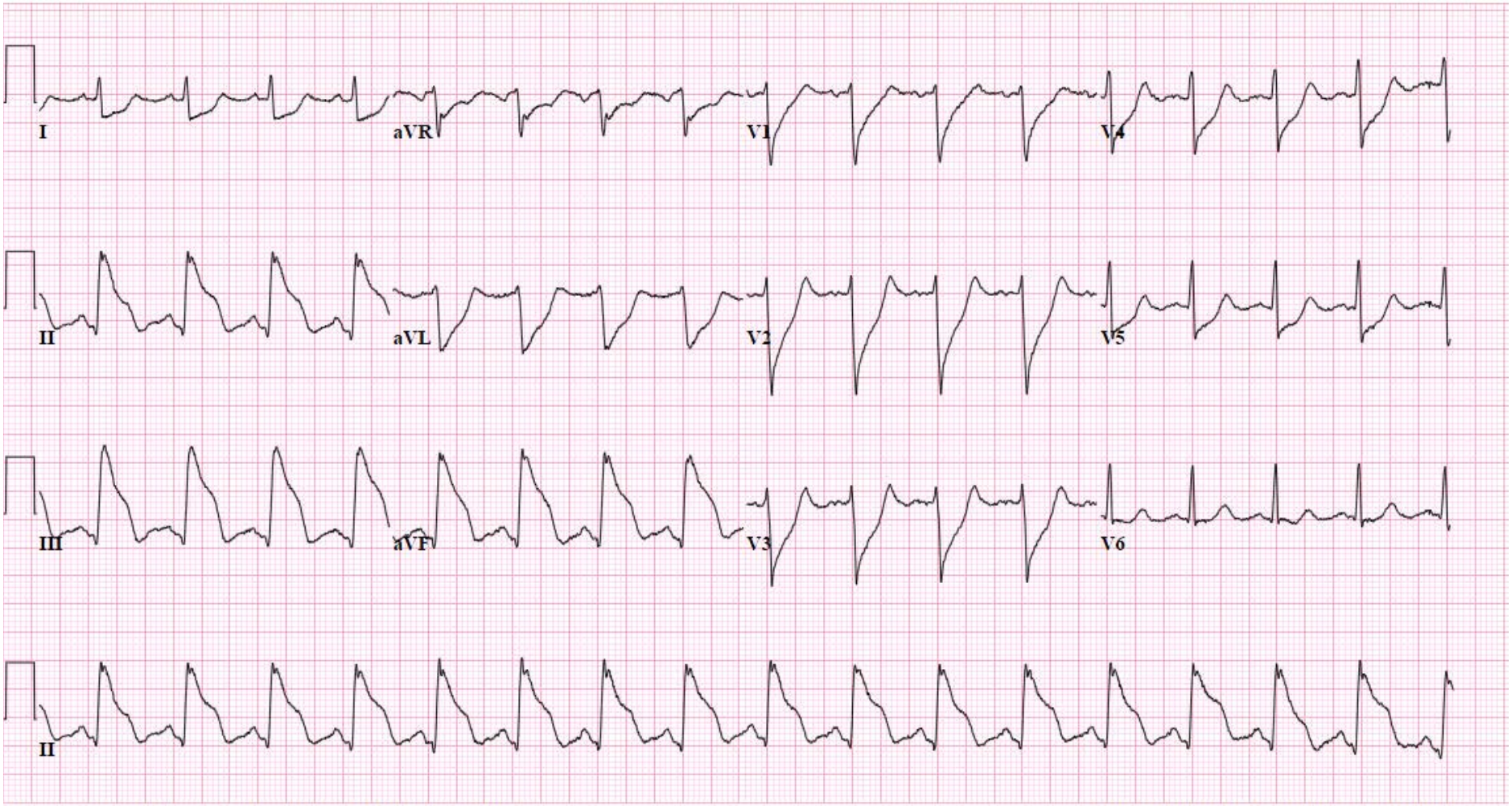


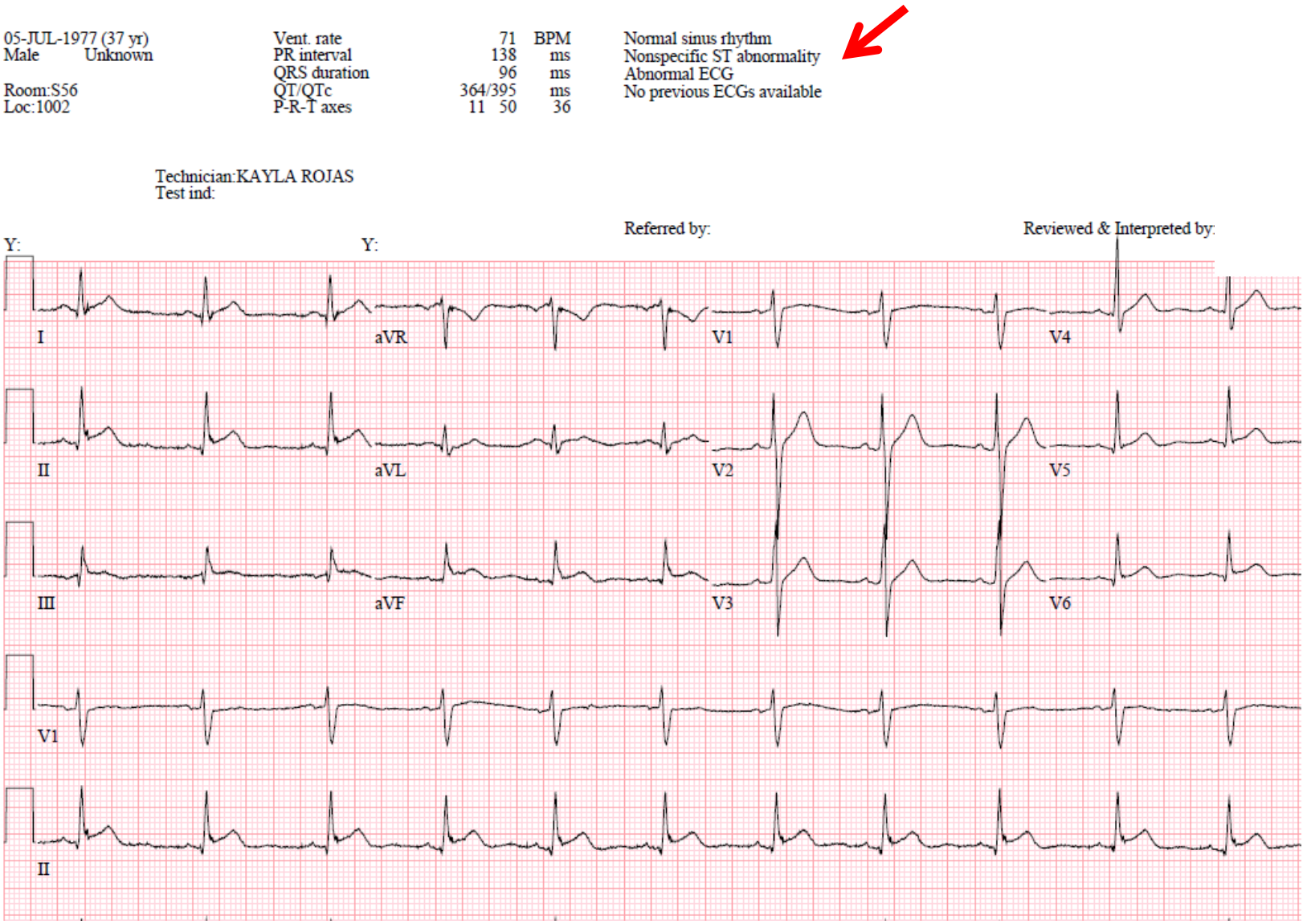
41 Y.O. female with 3 days of chest pain, cough – she attributed symptoms to sitting in front of computer all day. “Mild discomfort, slightly anxious.”



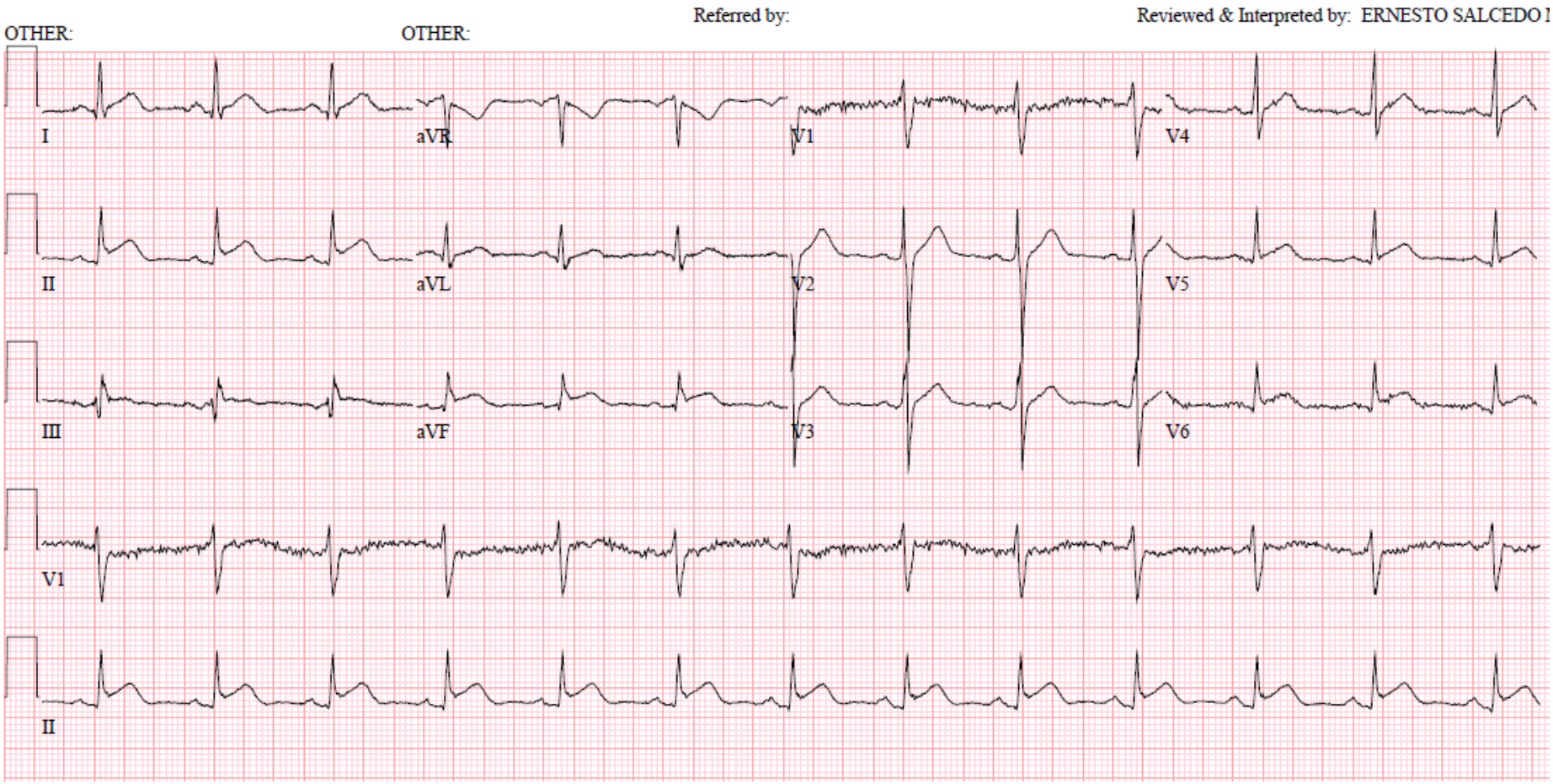
17 minutes later



37 year-old man without medical history, presented with severe sub-sternal chest pain radiating to left arm and throat, shortness of breath. (Intake ECG)

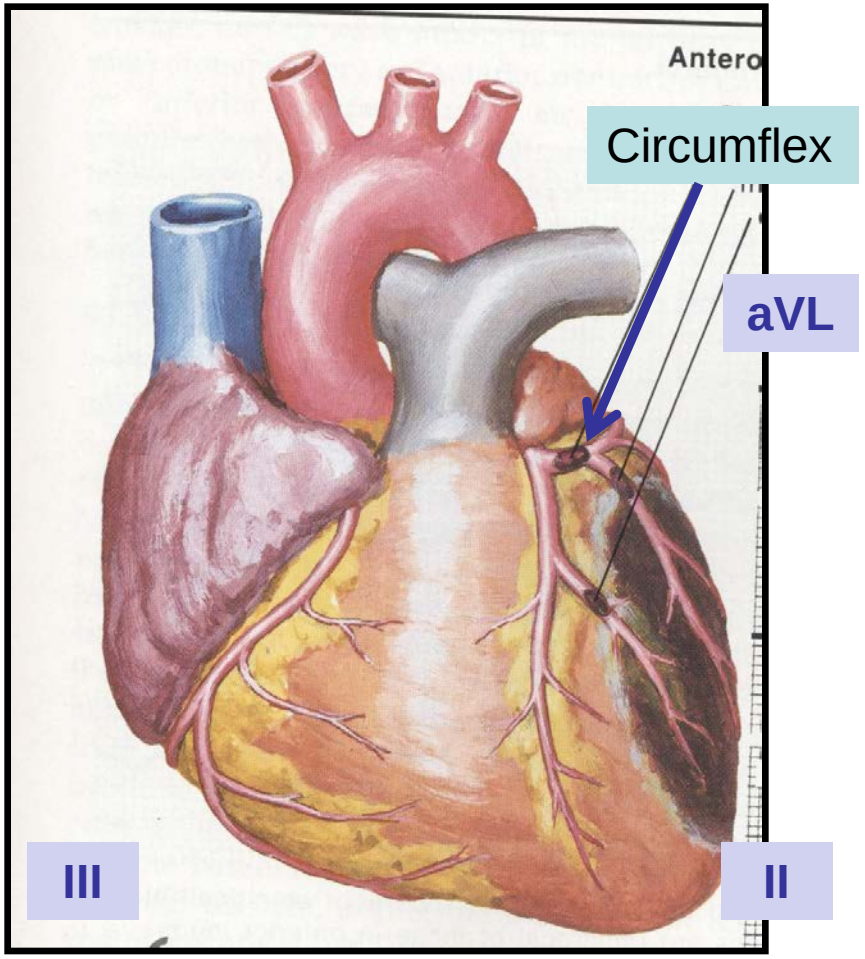


ECG taken 18 minutes later. First troponins: 0.00 and 0.02.



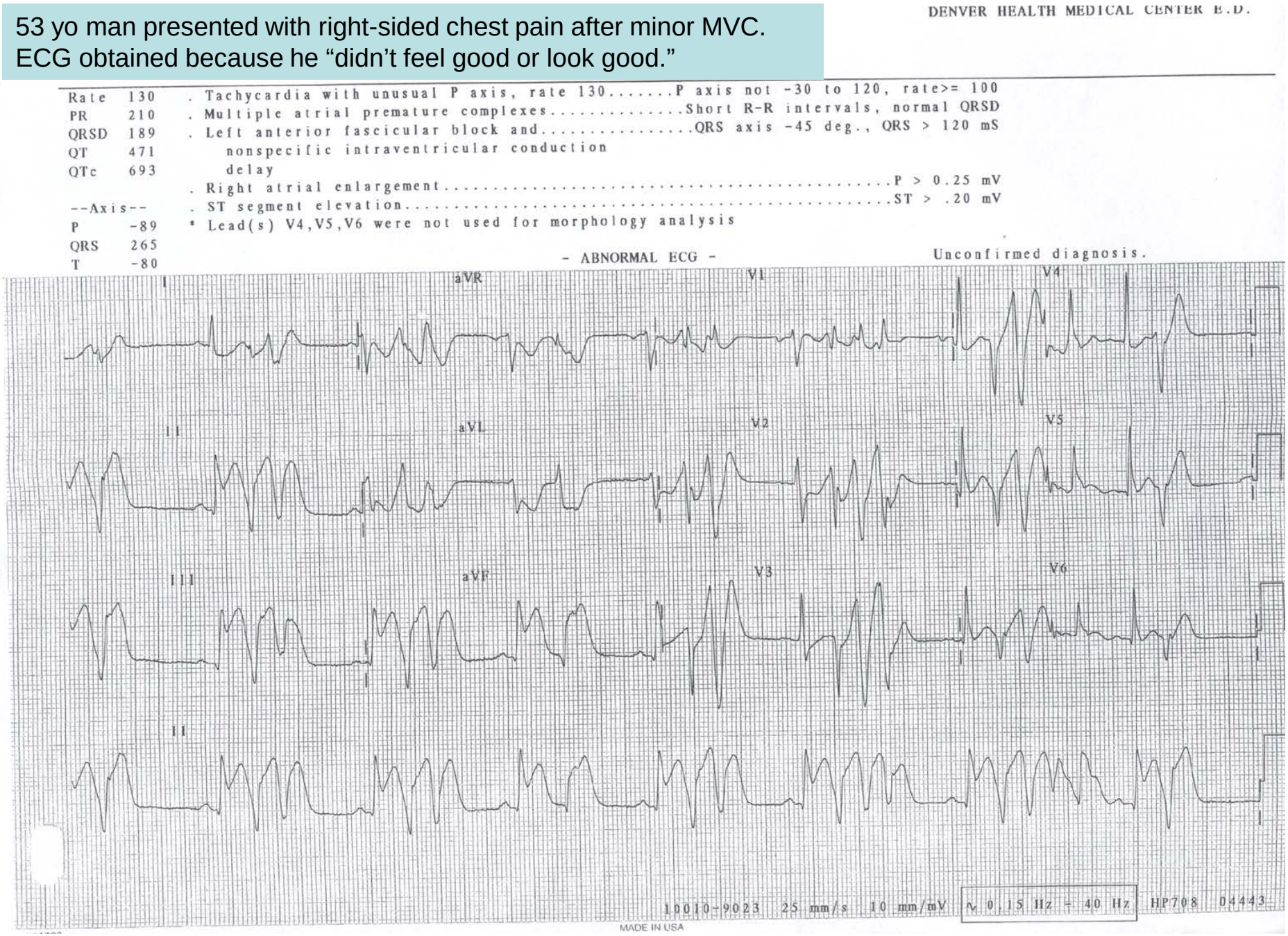
Inferior STEMIs without ST-depression in aVL

- Left circumflex artery occlusion (~ 20%)
- Injury current directed inferiorly *and leftward*
  - Toward lead II
  - Away from lead III
    - So, no ST-segment depressions in aVL



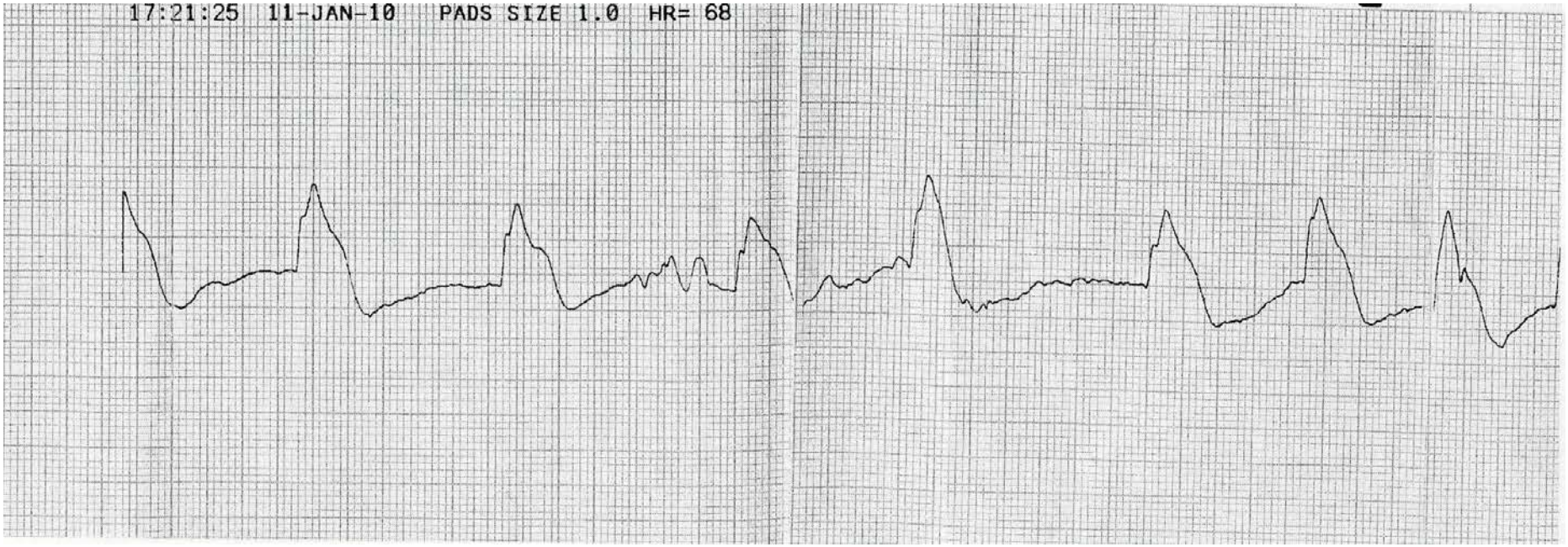
Special diagnostic challenges

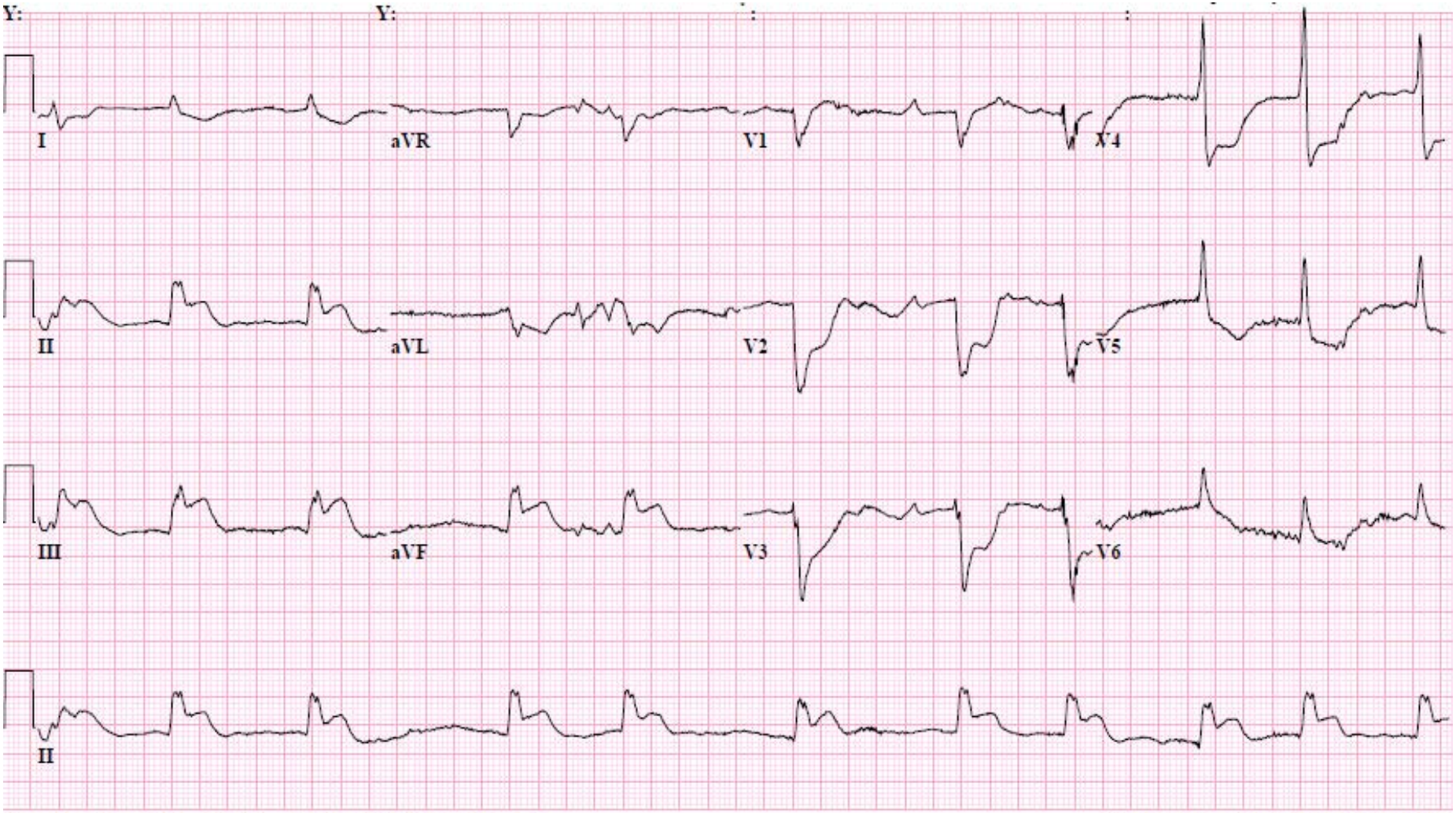
53 yo man presented with right-sided chest pain after minor MVC.
ECG obtained because he “didn’t feel good or look good.”



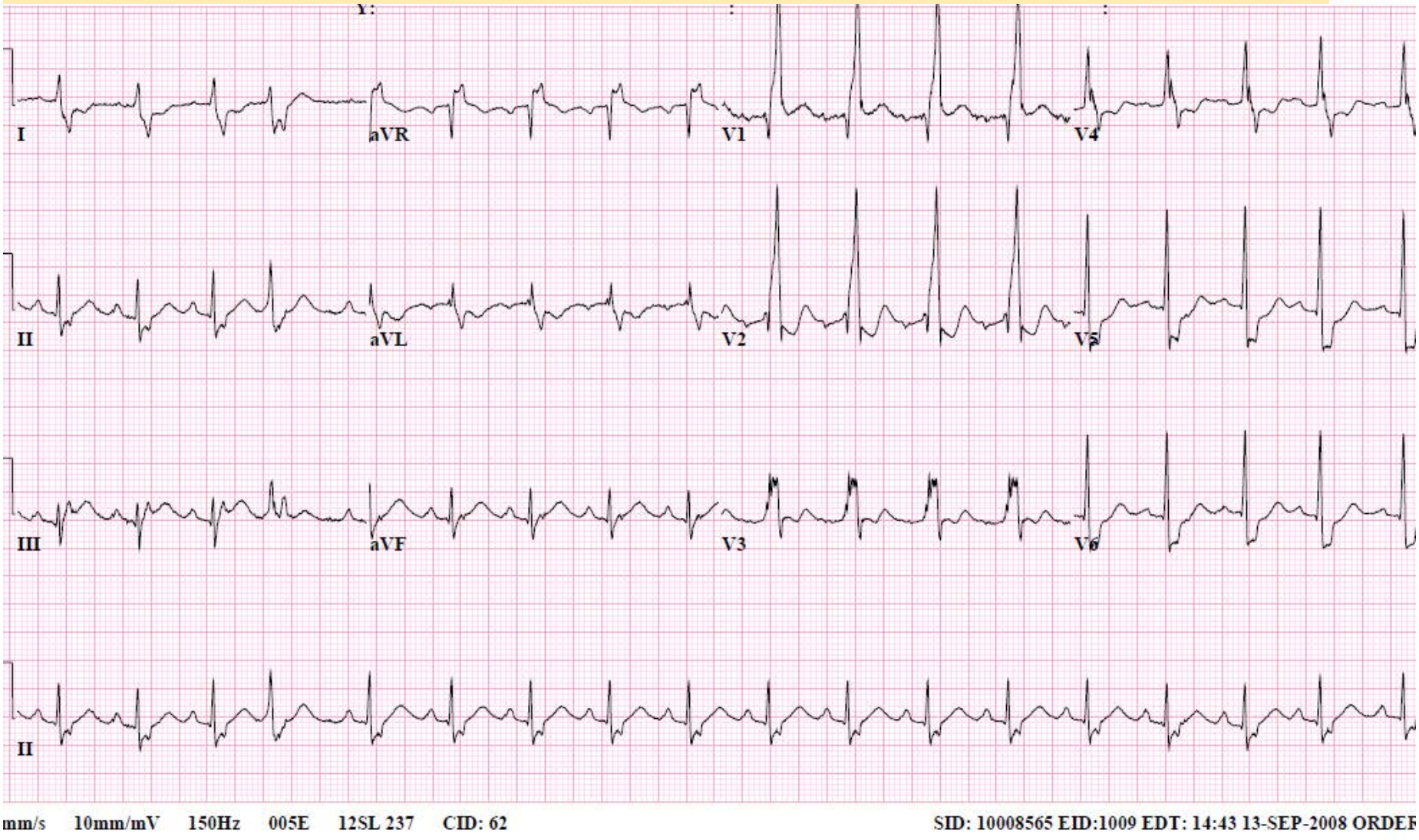
•~ 60 YEAR-OLD MAN PRESENTED IN CARDIAC ARREST

•RHYTHM STRIP TAKEN DURING 1 HOUR OF ATTEMPTED RESUSCITATION FROM CARDIAC ARREST

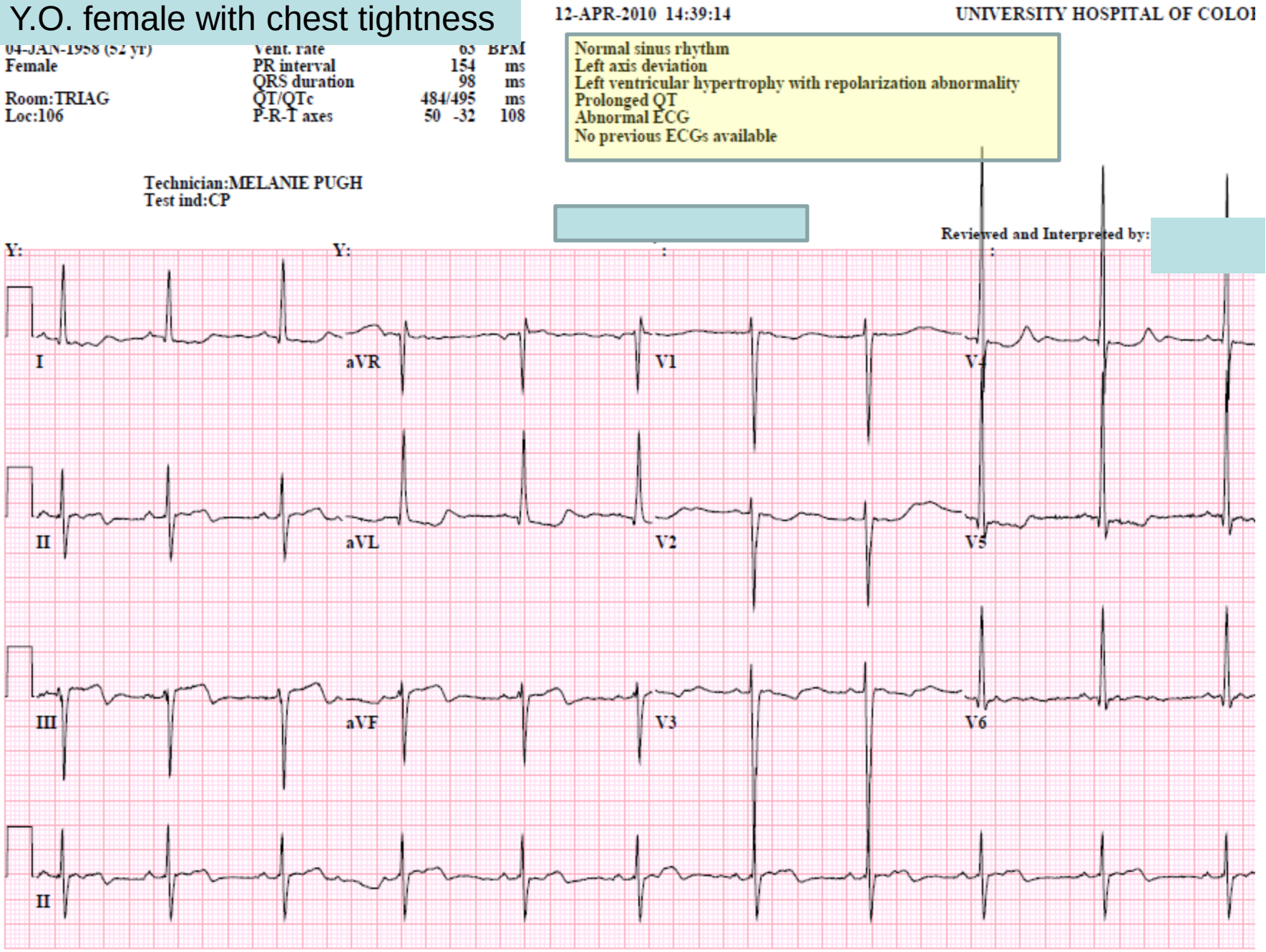



I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
25mm/s 10mm/mV 150Hz 005E 12SL 235 CID: 102
EID:2 EDT: 18:54 11-JAN-2010 ORDER:

63 Y.O. man with chest pain, SOB; WBC=18,000; Dx in ED with pneumonia. Initial troponin=0.3. ED note: *EKG shows RBBB and possible anterior ischemia and indeterminate trop – we will treat him for ACS and Non-STEMI*



52 Y.O. female with chest tightness



REVIEW TRACINGS

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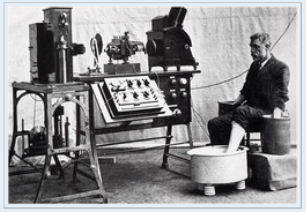
ECG TRACINGS

Don't-Miss Electrocardiograms for Emergency Physicians

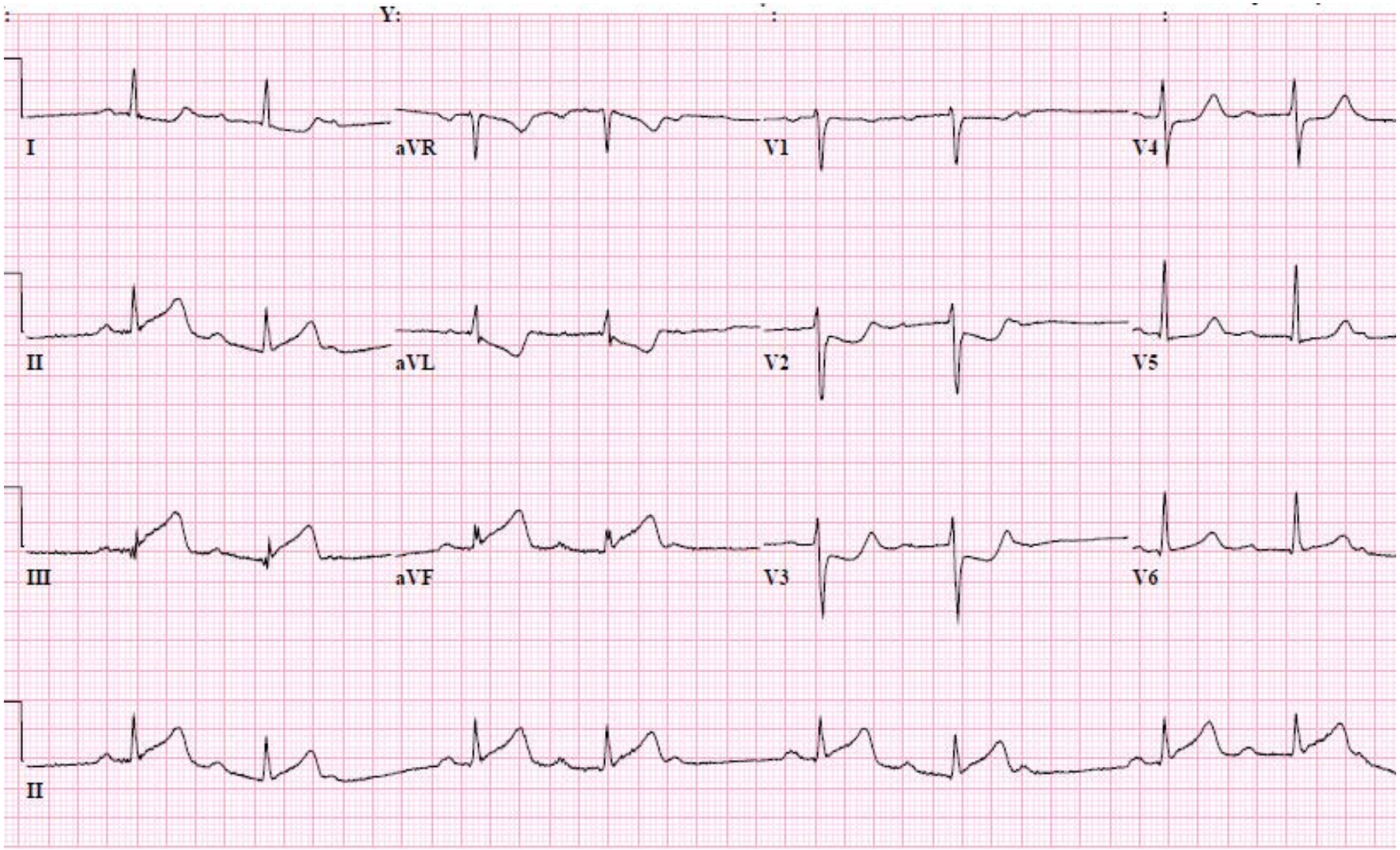


"I do not imagine that electrocardiography is likely to find any very extensive use in the hospital...it can at most be of rare and occasional use."

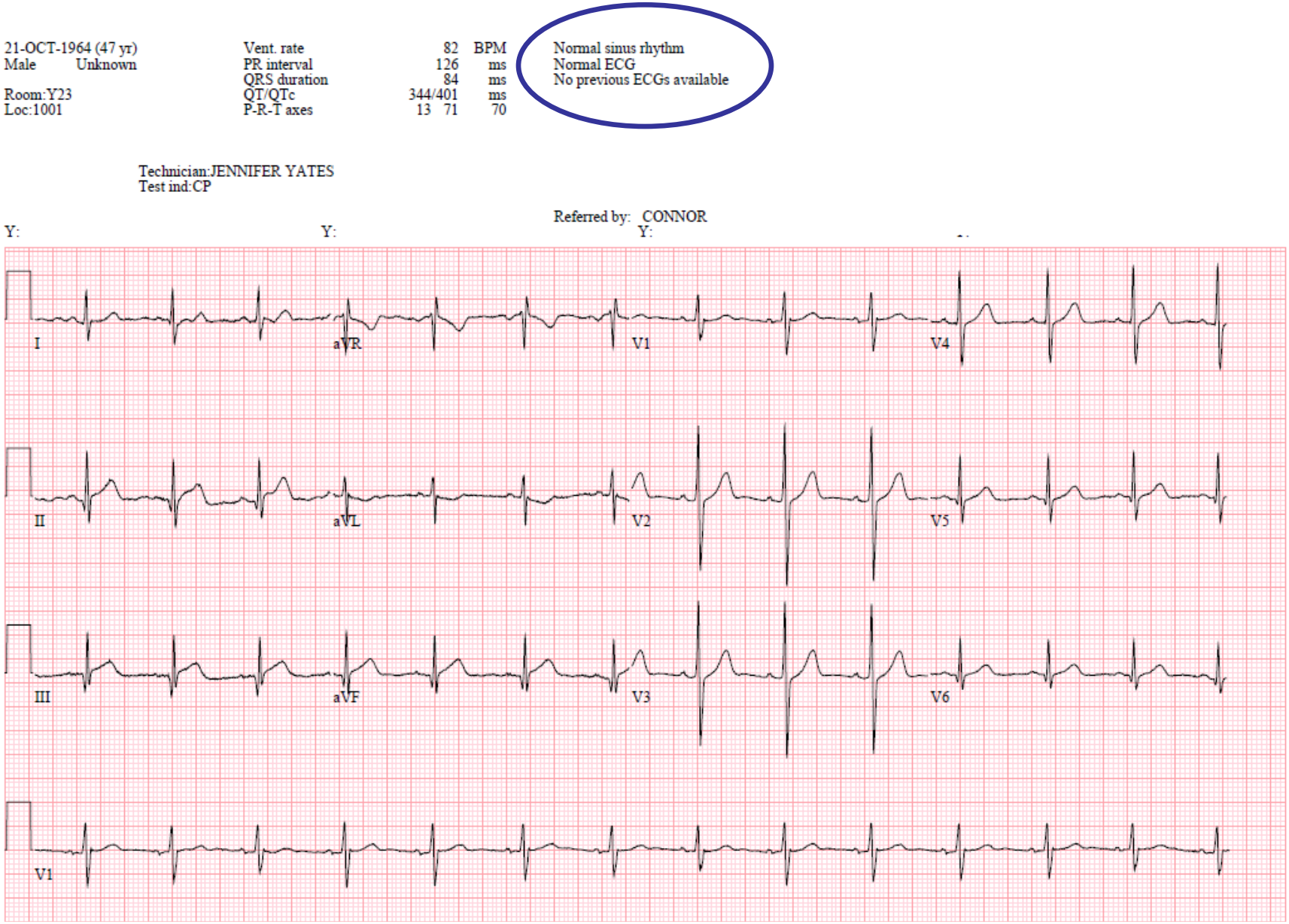
Augustus Waller (1919)

Introduction to ECG TRACINGS

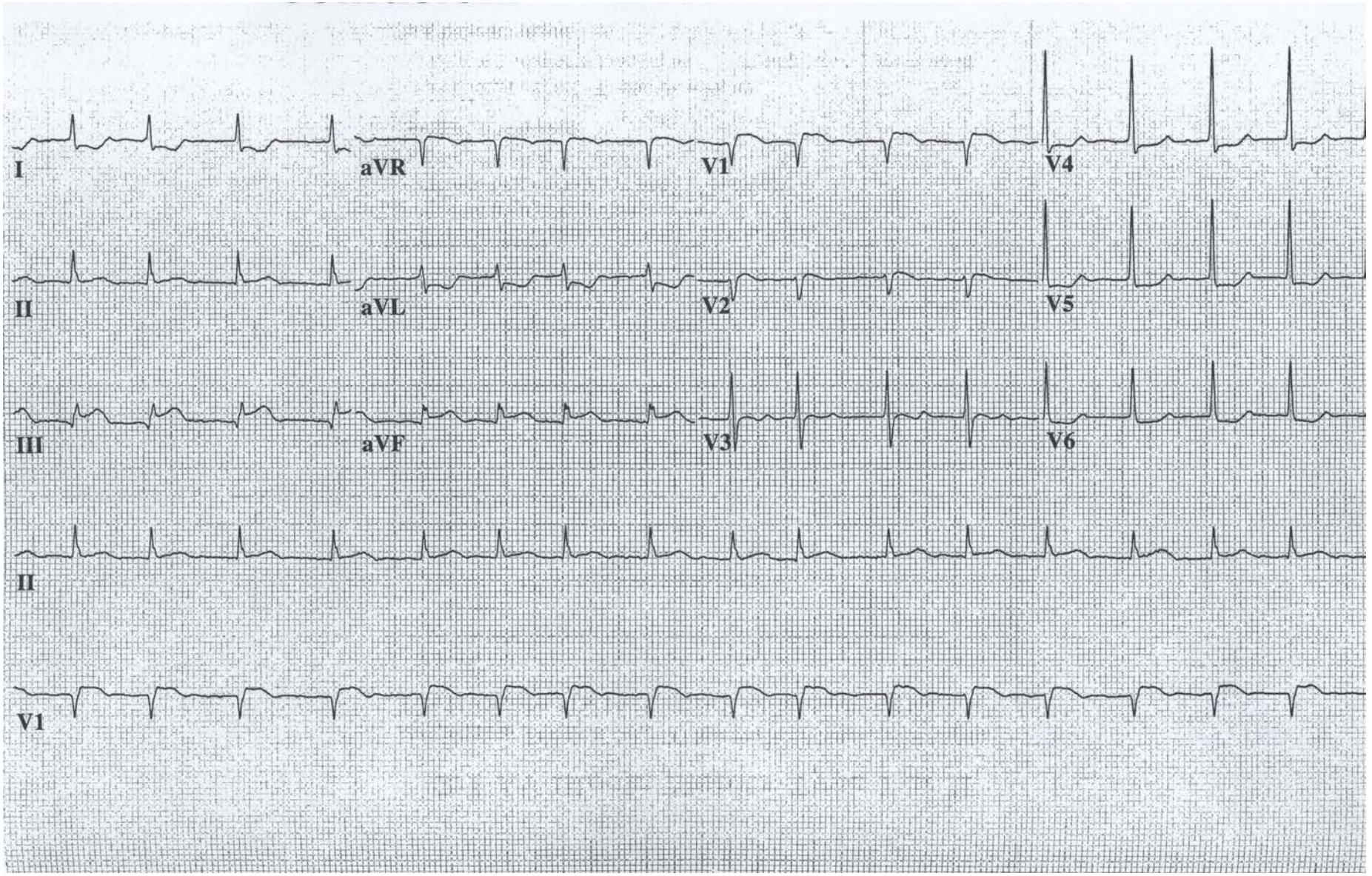
54 y.o. man from New York, with hypertension, diabetes, hypercholesterolemia. Had intermittent SSCP for two months, then acute, severe pain for past 4 hours.



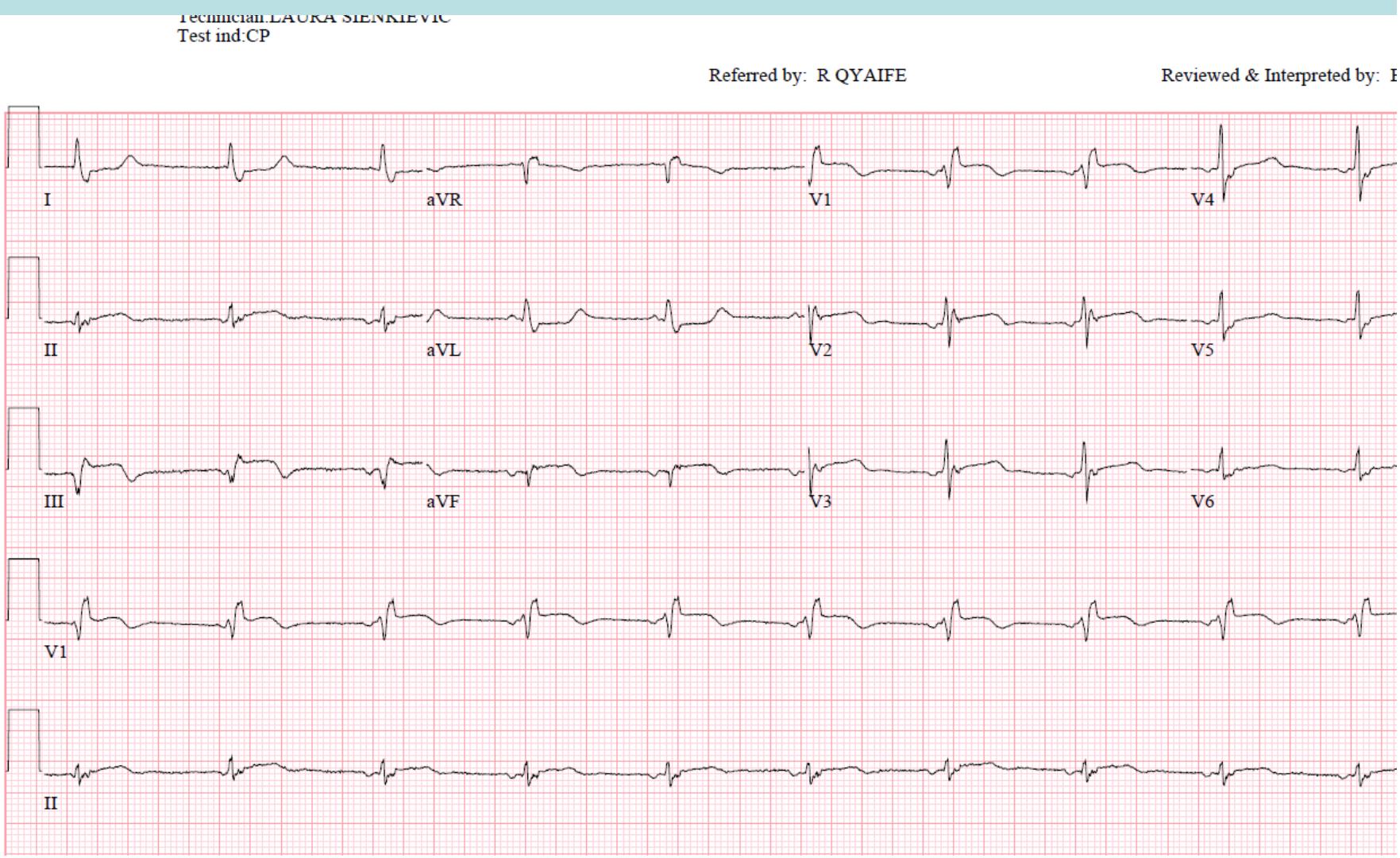
47 year old man with chest pain, some radiation to arms and right jaw, resolved after ASA, then returned.



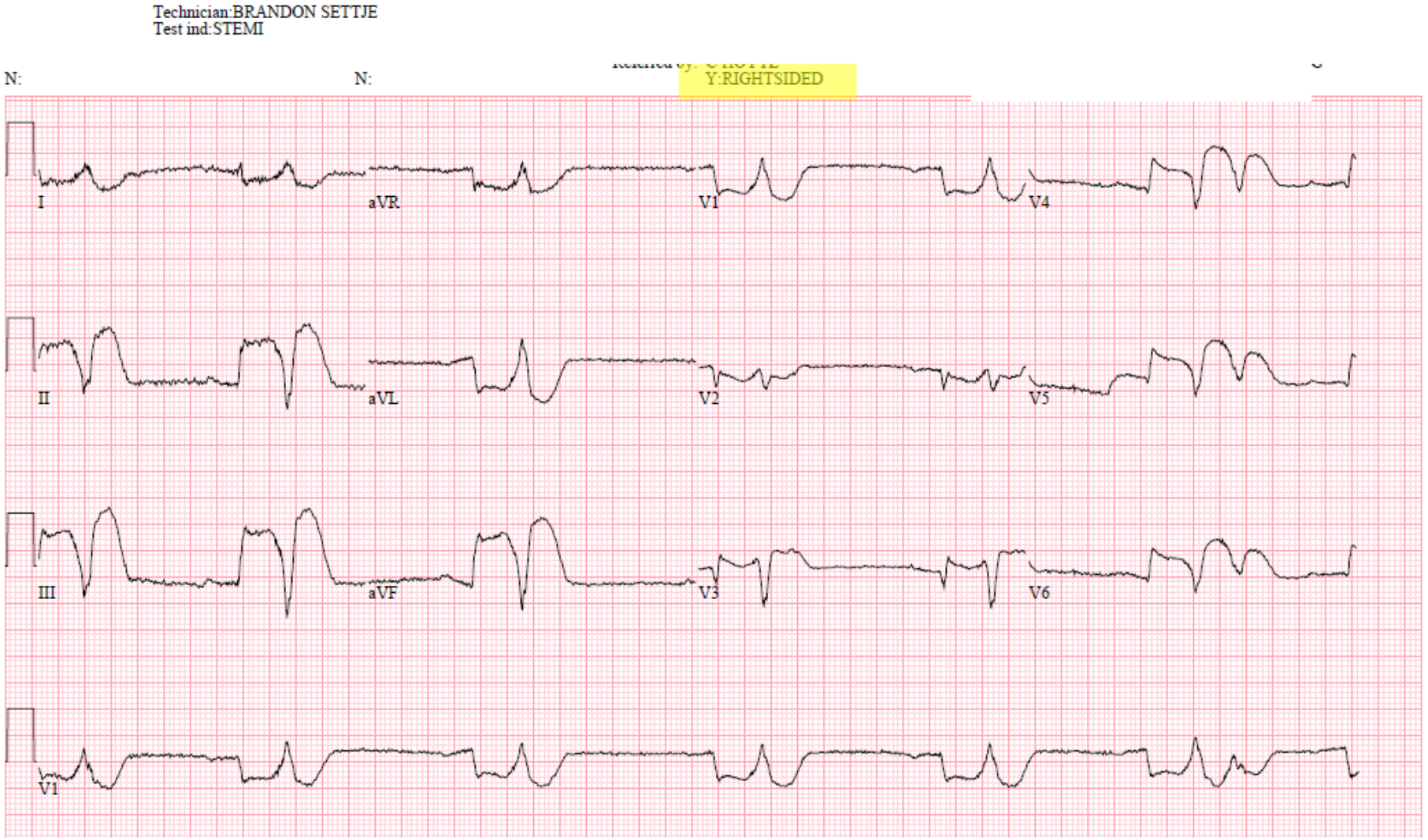
89 year old man with dyspnea and confusion



80 year old female with nausea and vomiting since early AM. History of hypertension and hypothyroidism. Normal cardiac nuclear stress test 1 year earlier. On exam, no distress. BP = 115/76; HR 65; 02 sat=94% on room air. Chest and heart examinations normal.



79 y.o. female with a history of hypertension, c/o chest pain, shortness of breath, diaphoresis. Awoke with severe substernal pressure at 3AM, with nausea.



45 y.o. man, heavy smoker, mild hypertension, no cardiac history. Presented with intermittent burning CP, episodes lasting 2-3 minutes. BP = 167/114.

30-AUG-1967 (45 yr)
Male Unknown

Room:02
Loc:1002

Vent. rate	72	BPM
PR interval	166	ms
QRS duration	94	ms
QT/QTc	360/394	ms
P-R-T axes	39 38	13

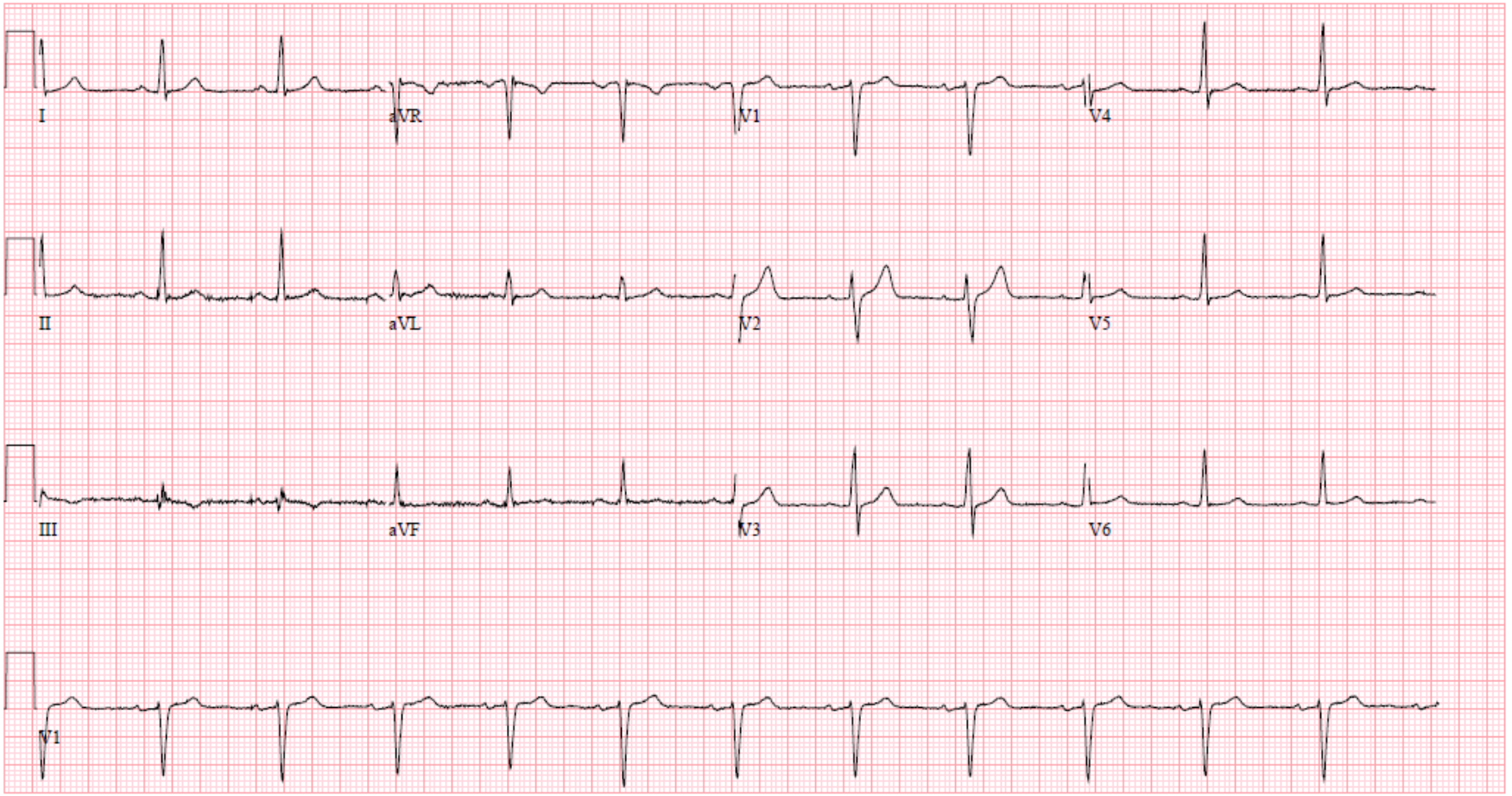
Normal sinus rhythm
Normal ECG
No previous ECGs available

Technician: 37576
Test ind:CP

Referred by: SELF

Reviewed & Interpreted by: PHILLIP S. WOLF M.D.

Y: Y:



Same patient – 1 hour, 12 minutes later; worsening chest pain, mild diaphoresis.

30-AUG-1967 (45 yr)
Male Unknown

Room:1003
Loc:1002

Vent. rate	80	BPM
PR interval	158	ms
QRS duration	116	ms
QT/QTc	342/394	ms
P-R-T axes	46 59	77

Normal sinus rhythm with sinus arrhythmia
ST elevation consider inferior injury or acute infarct
** ** ** ** * ACUTE MI * ** ** ** **
Abnormal ECG
When compared with ECG of 04-APR-2013 09:29,
ST elevation now present in in inferior leads
ST now depressed in Anterolateral leads

Technician:KELLY HAYZLETT
Test ind:CP

Referred by: SELF

Reviewed & Interpreted by: PHILLIP S. WOLF M.D.