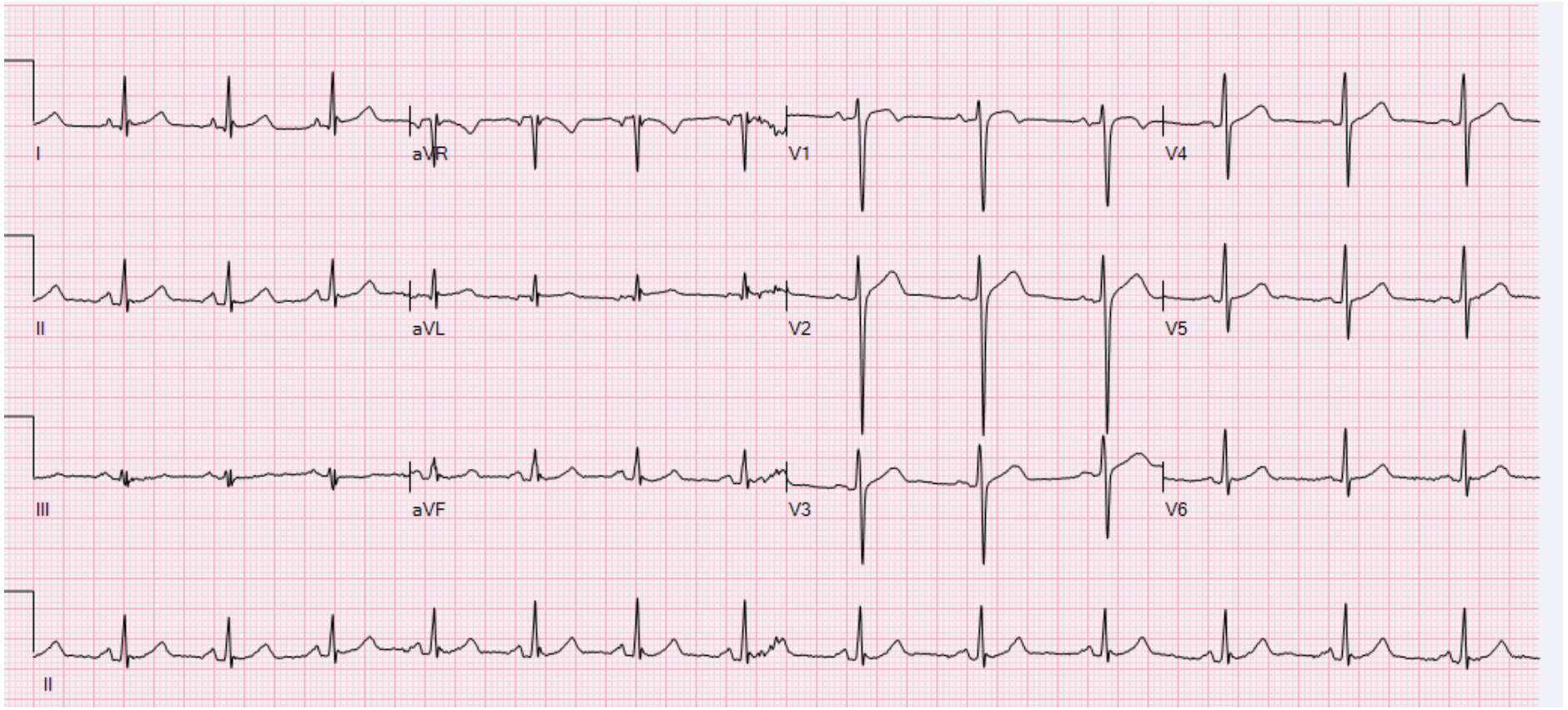
Cases/ECGs: the Cardiac Patient

Primary Care Update
Dept of Family and Community Medicine
October 17, 2020

UMAIR KHALID, MD
VIJAY NAMBI, MD
ARUNIMA MISRA, MD

No disclosures

Normal



Methodical Way to Approach ECG

Rate rhythm axis

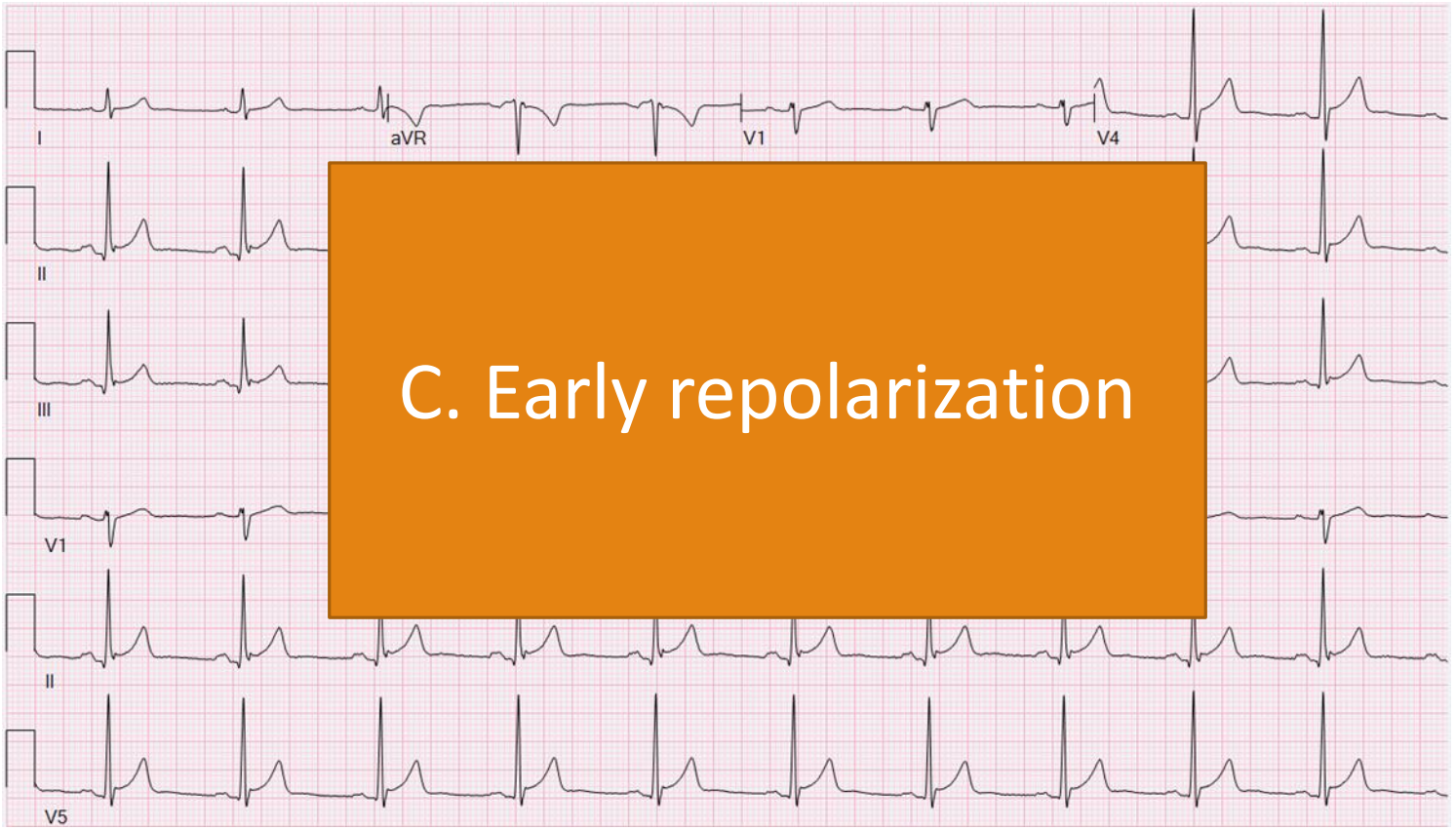
P wave and PR

QRS

ST and T waves

If find something abnormal, compare to old ECG to see if new changes

34 yo man with psychiatric problems including depression and PTSD presents with atypical chest pain. No history of HTN or other risk factors. No associated symptoms.

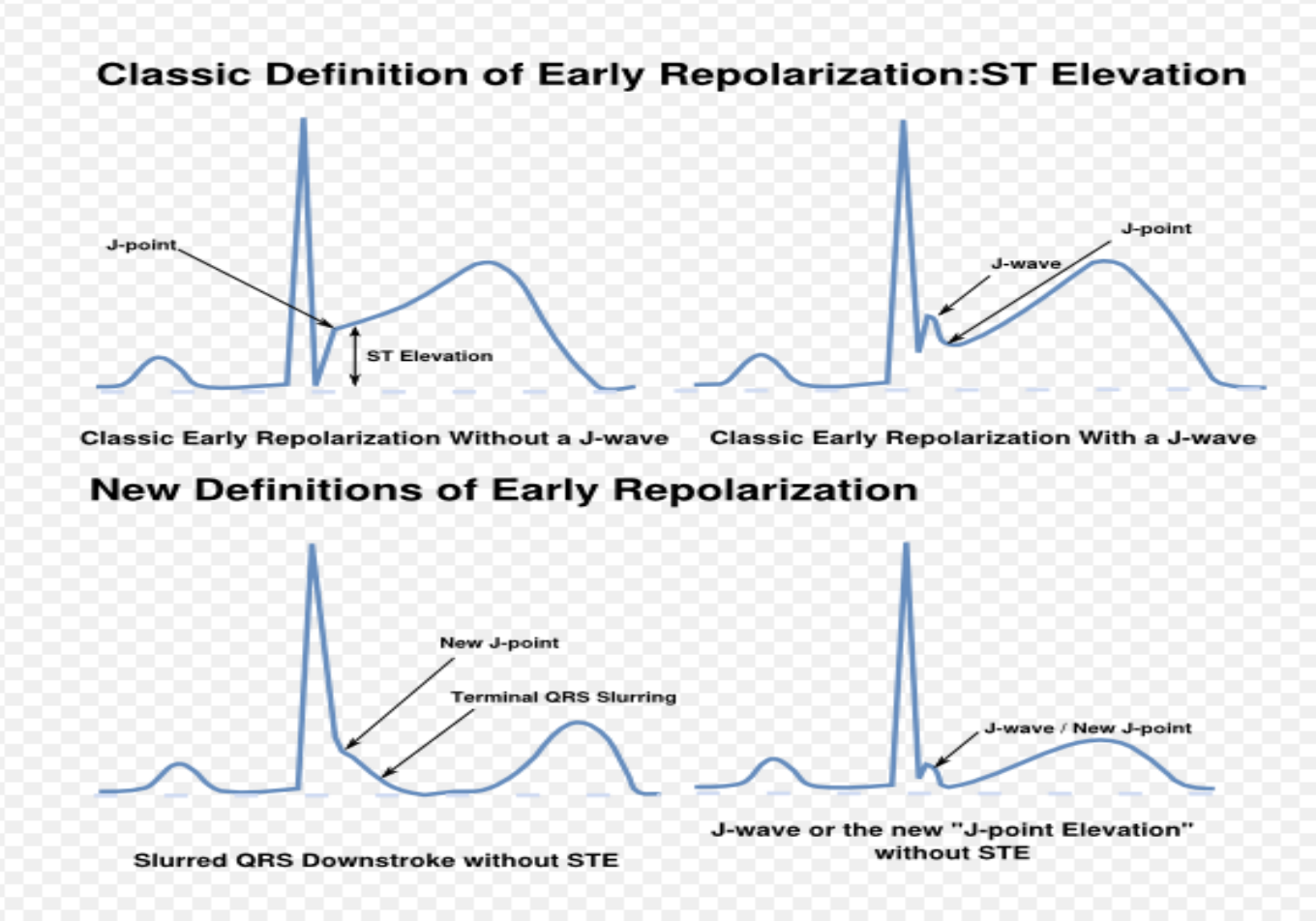


Anything concerning?

34 yo with atypical chest pain:

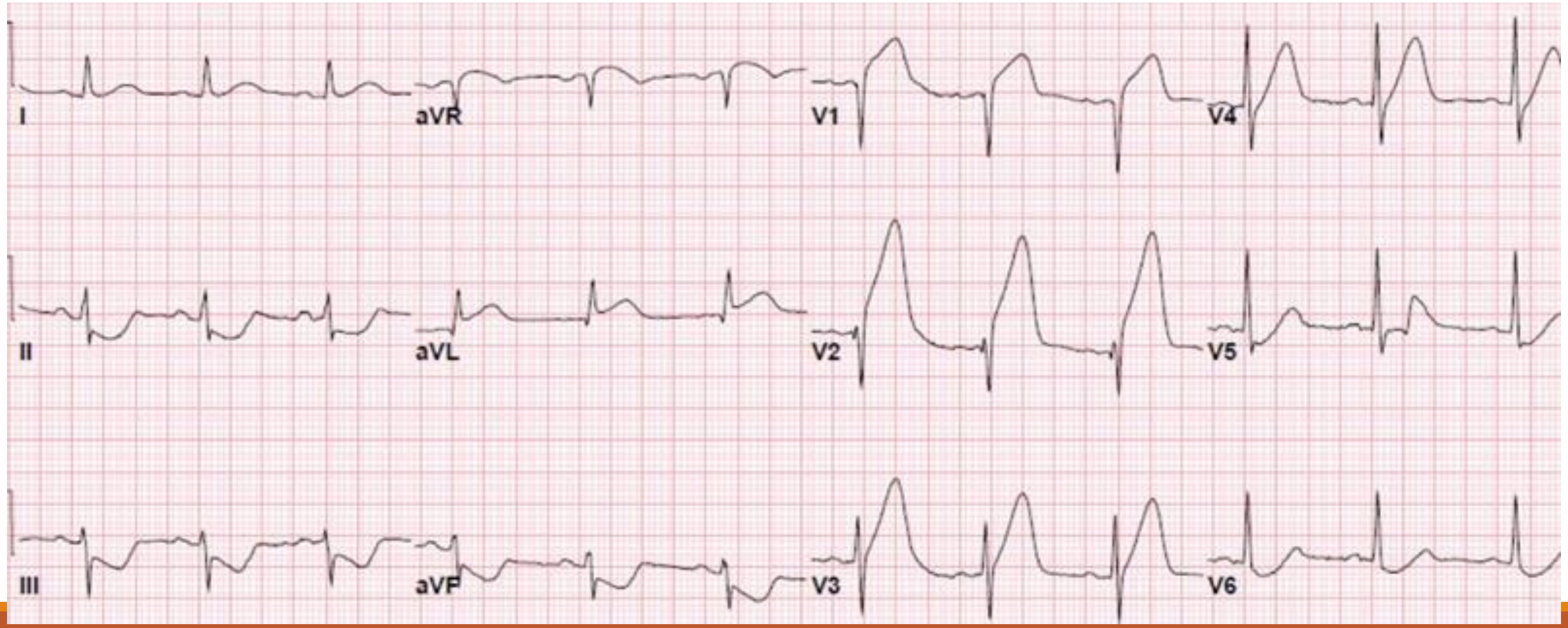
A. STEMI
B. LVH
C. Early repolarization
D. Pericarditis

Early Repolarization



https://en.ecgpedia.org

71M w diabetes, in clinic waiting area, collapses on the ground, clenching his chest.



Features of EKG favoring STEMI

Morphology of ST elevation

Reciprocal changes

Dynamic changes

Presence of Q waves (late)

ST elevation

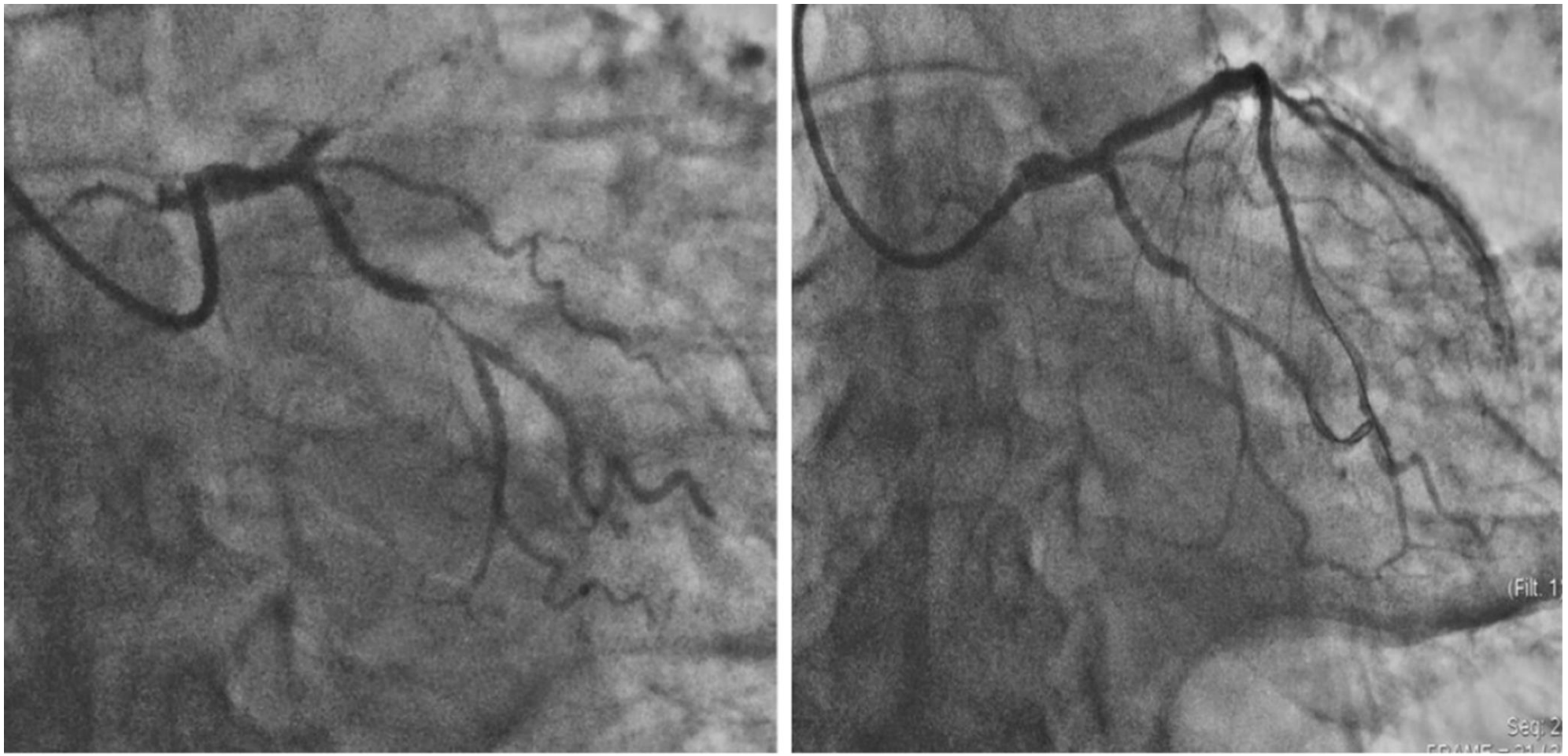
What to do?

When in doubt, compare with previous EKG. Can also repeat EKG.

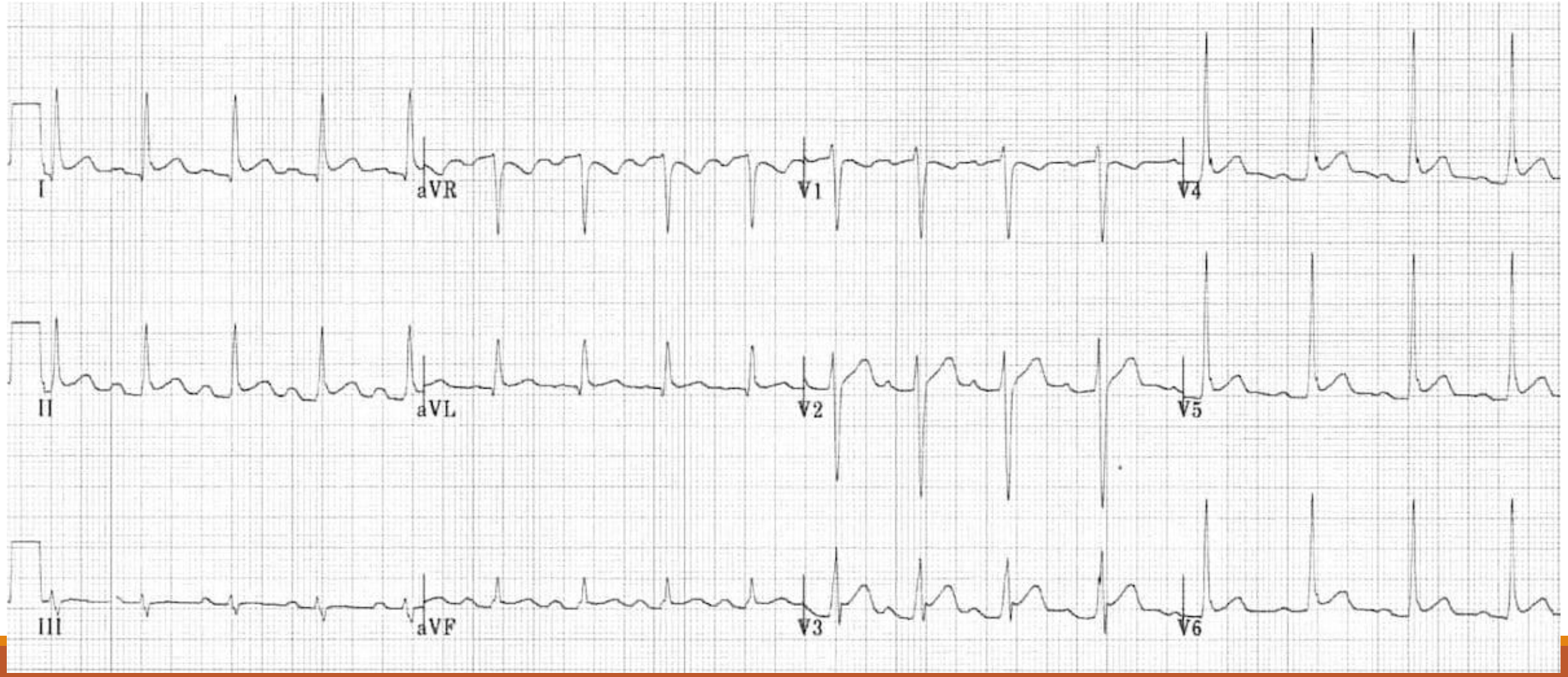
If concern for acute MI, active the STEMI pager and notify cardiology emergently

If the hospital/facility does not have PCI-capable cath lab, will have to immediately arrange for EMS

Coronary Angiogram



43 year old male, with intermittent sharp chest pain on breathing, gets better with leaning forward, gets worse with lying on back

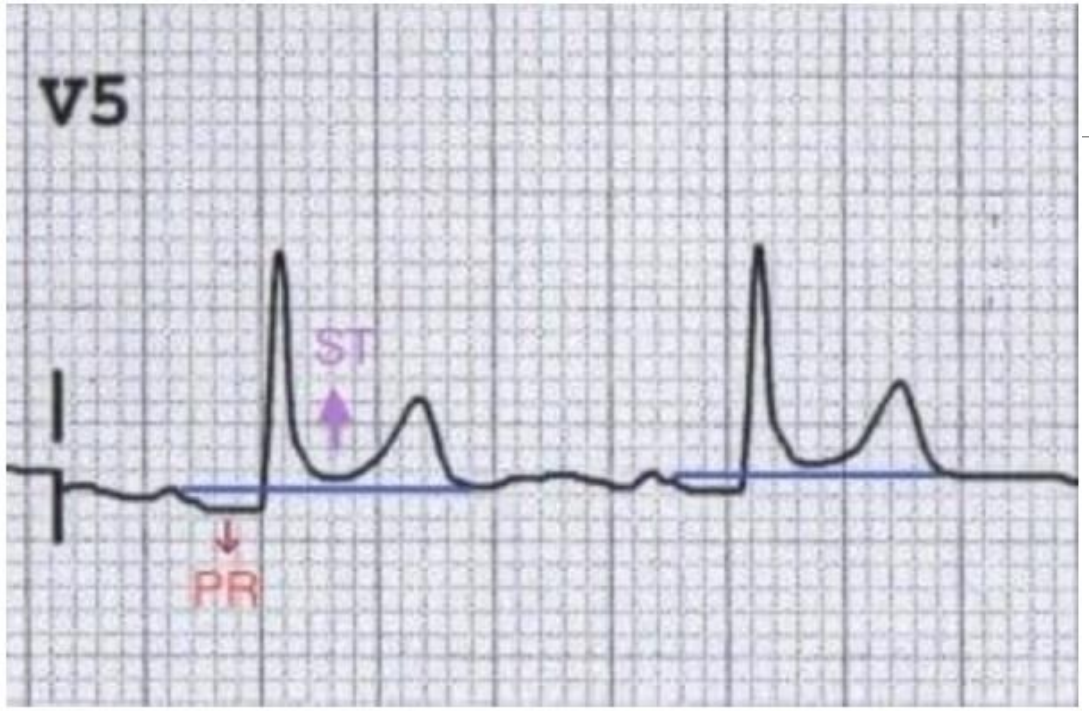


Features of Pericarditis

Widespread concave ST elevation and PR depression throughout most of the limb leads (I, II, III, aVL, aVF) and precordial leads (V2-6).

Reciprocal ST depression and PR elevation in lead aVR (± V1).

Sinus tachycardia is also common in acute pericarditis due to pain and/or pericardial effusion.



PR depression and ST elevation in V5

Reciprocal PR elevation and ST depression in aVR

Causes of Pericarditis

Infectious – mainly viral (e.g. coxsackie virus); occasionally bacterial, fungal, TB.

Immunological – SLE, rheumatic fever

Uremia

Post-myocardial infarction / Dressler's syndrome

Trauma

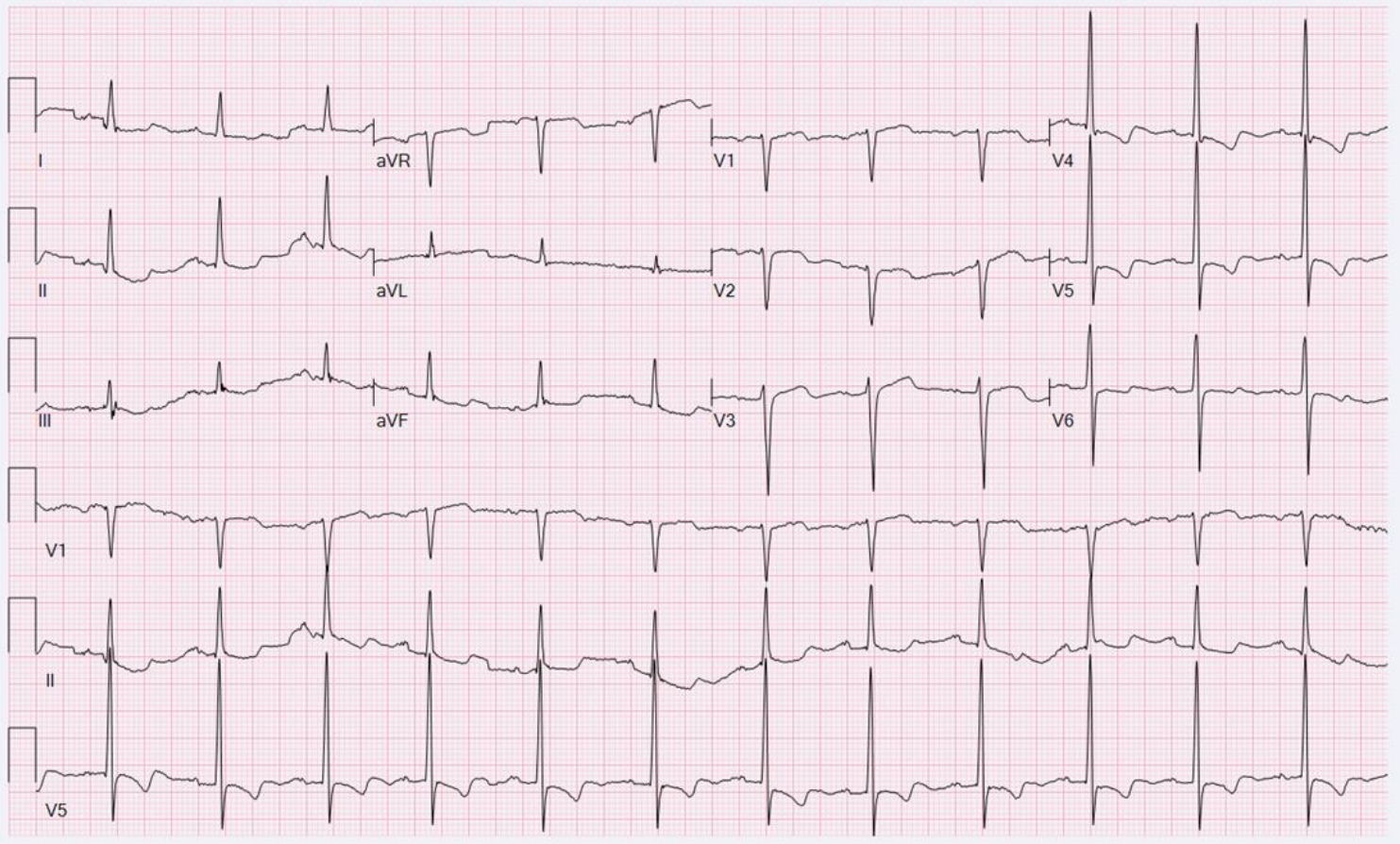
Following cardiac surgery (post pericardiotomy syndrome)

Paraneoplastic syndromes

Drug-induced (e.g. isoniazid, cyclosporin)

Post-radiotherapy

79 yo man complaining of blurred vision and headache and presented to the ED. No chest pain or SOB.



What do you think about ECG?

A. STEMI
B. NSTEMI
C. Concern
D. Concern

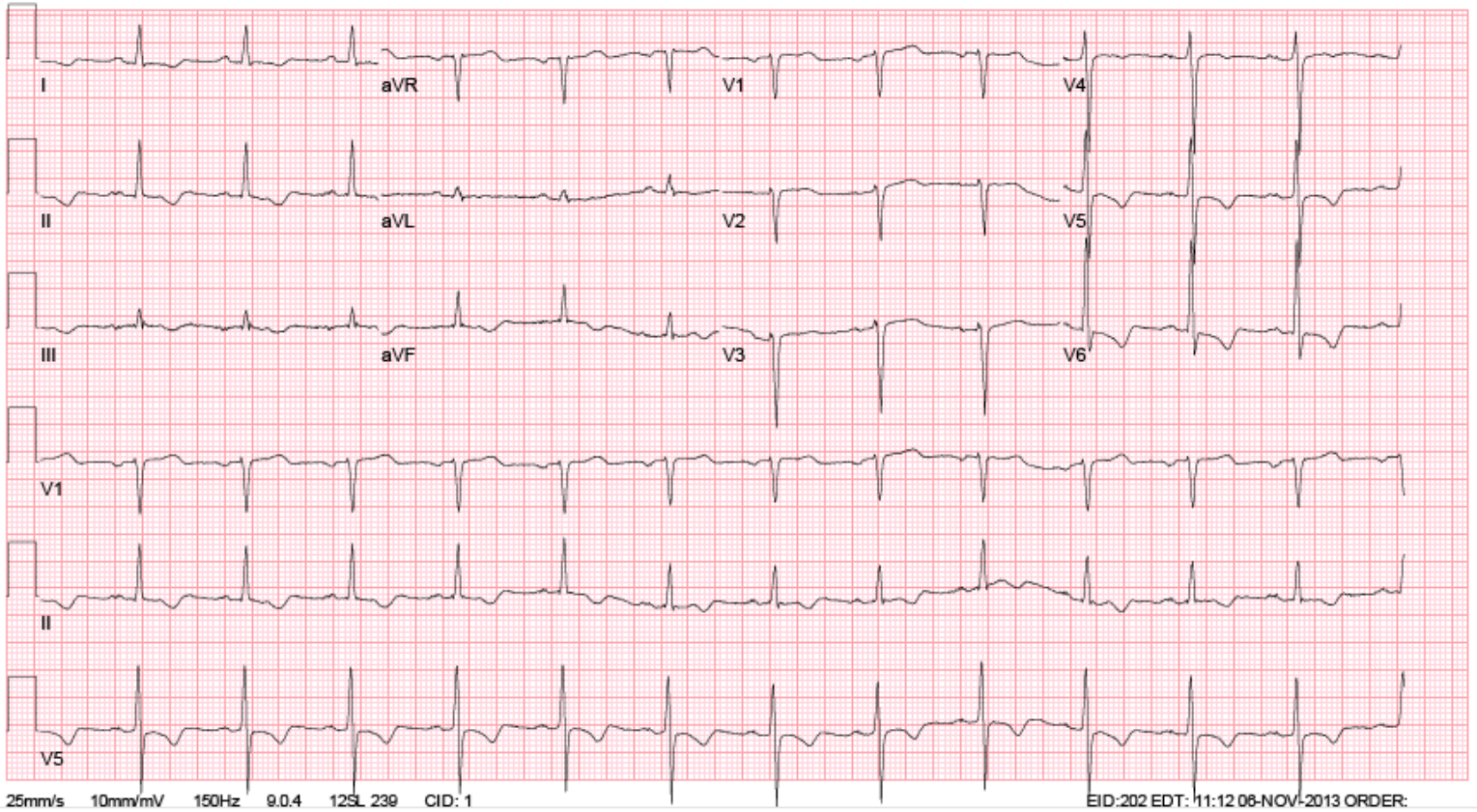
D. Concern for ischemia

What would you do next?

Choose one or more of the following:

A. Nothing since pt is not having chest pain
B. Compare the ECG to previous ECGs
C. Check a troponin
D. Repeat another ECG

Next steps



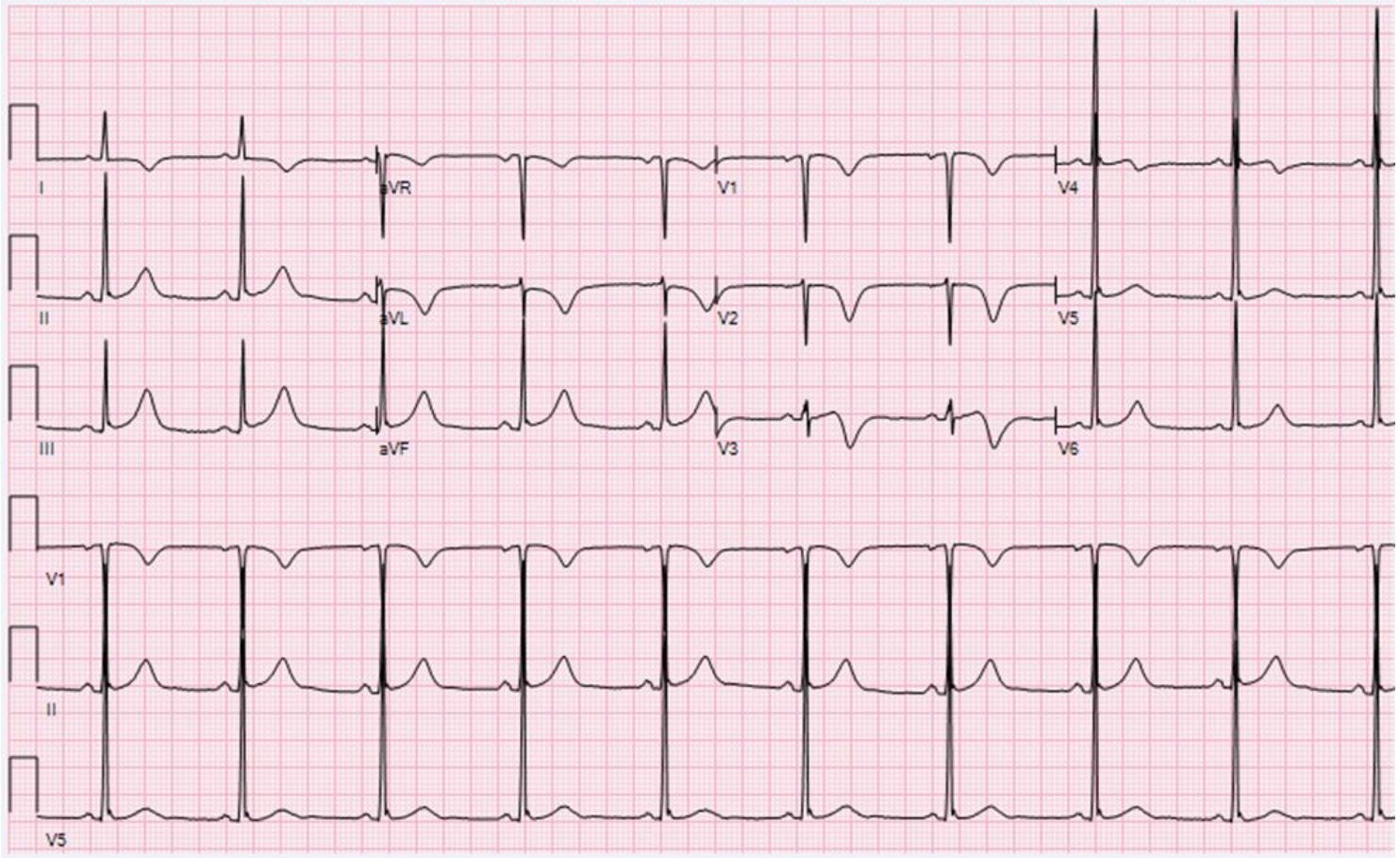
Previous ECG evaluated

No repeat ECG was done since old ECG was exactly the same

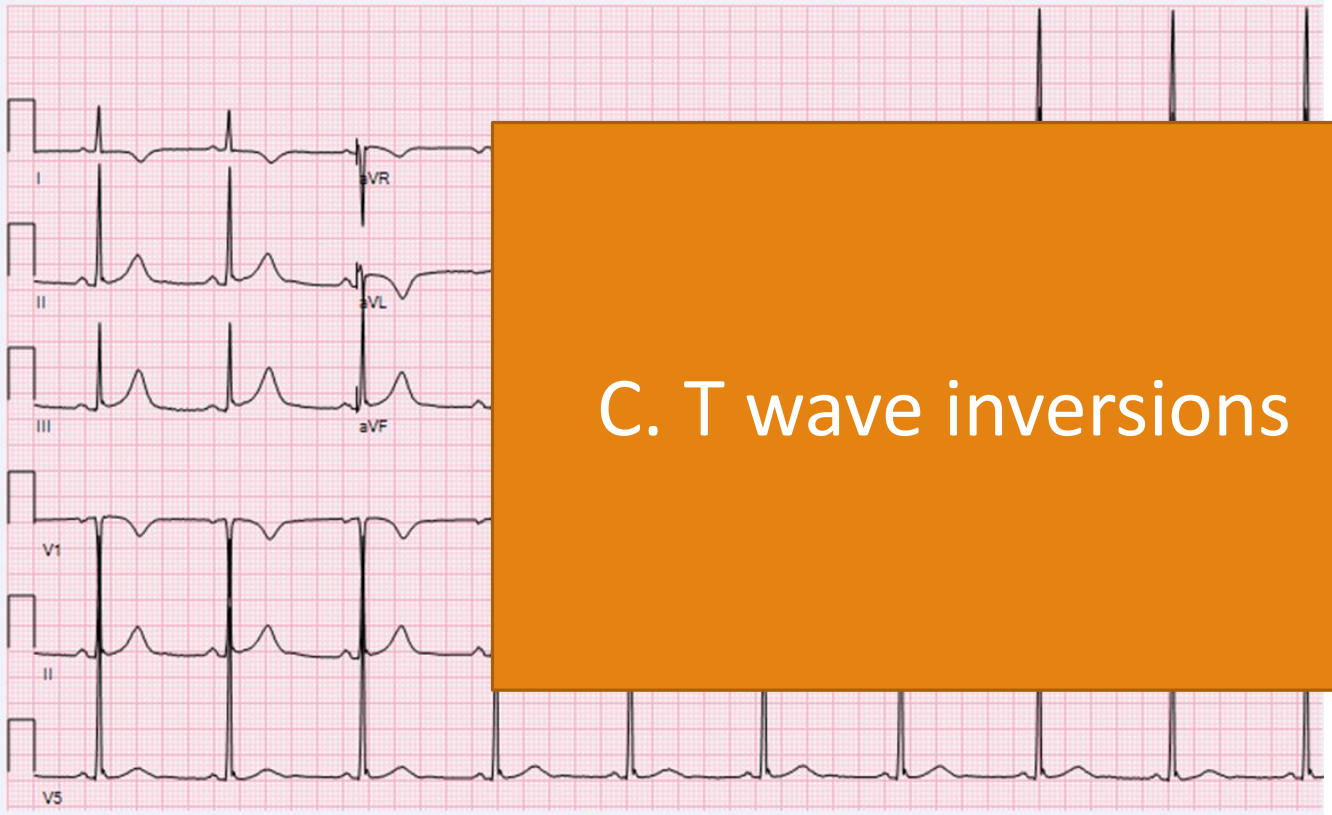
Troponin <0.03

Recommend echo and NST for risk stratification given findings (he never had)

59 y/o AAM w/ PMHx of Tobacco use, polysubstance abuse presenting to ER w/ c/o feeling like throat tightening and closing, little heart burn sensation intermittently over the last 2 days. Pt states some intermittent SOB.



What is concerning on the ECG?

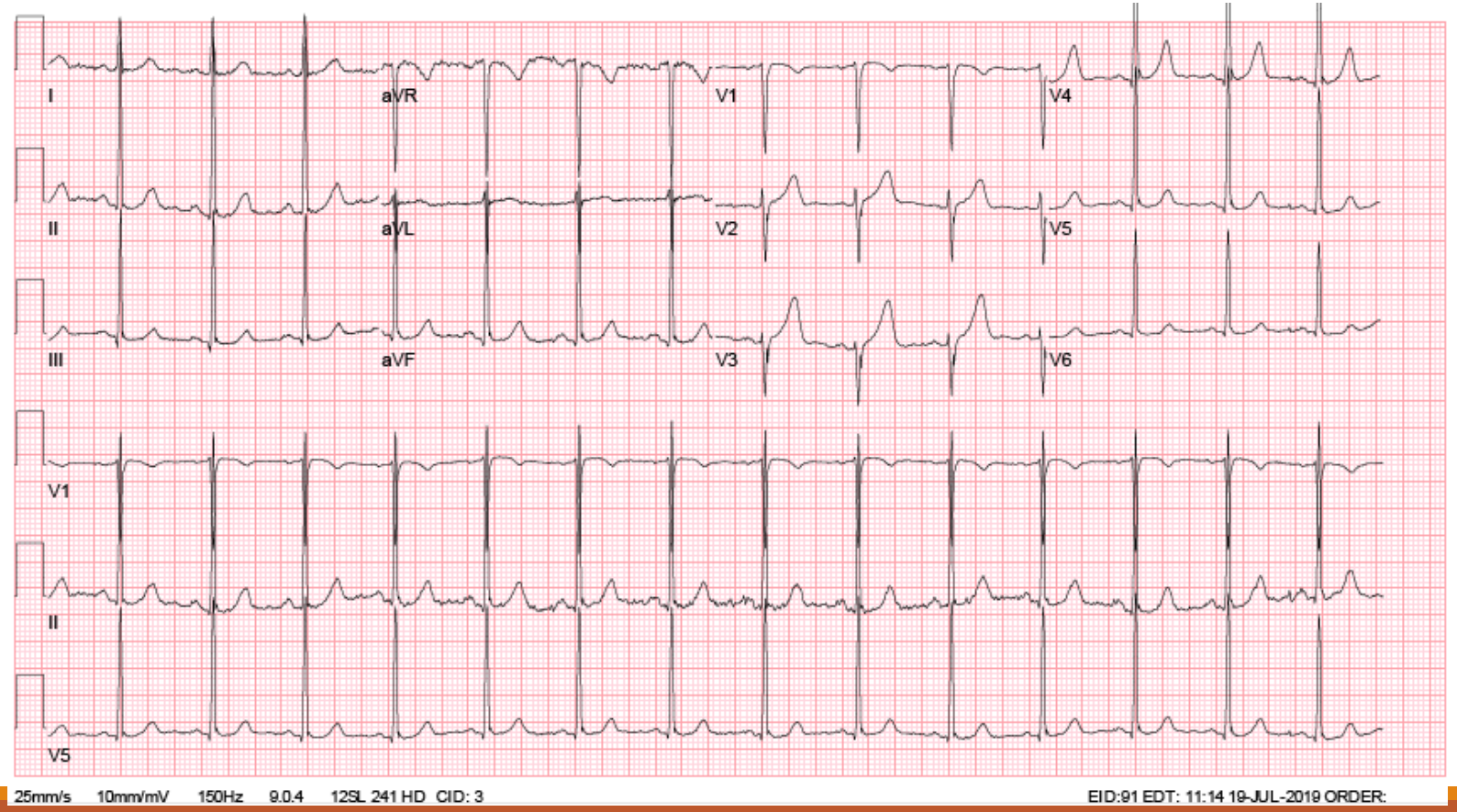


C. T wave inversions

A. ST elevation
B. ST depression
C. T wave inversions
D. No concerning changes

What should you do?

Compare with previous/old ECG and see if changes are new

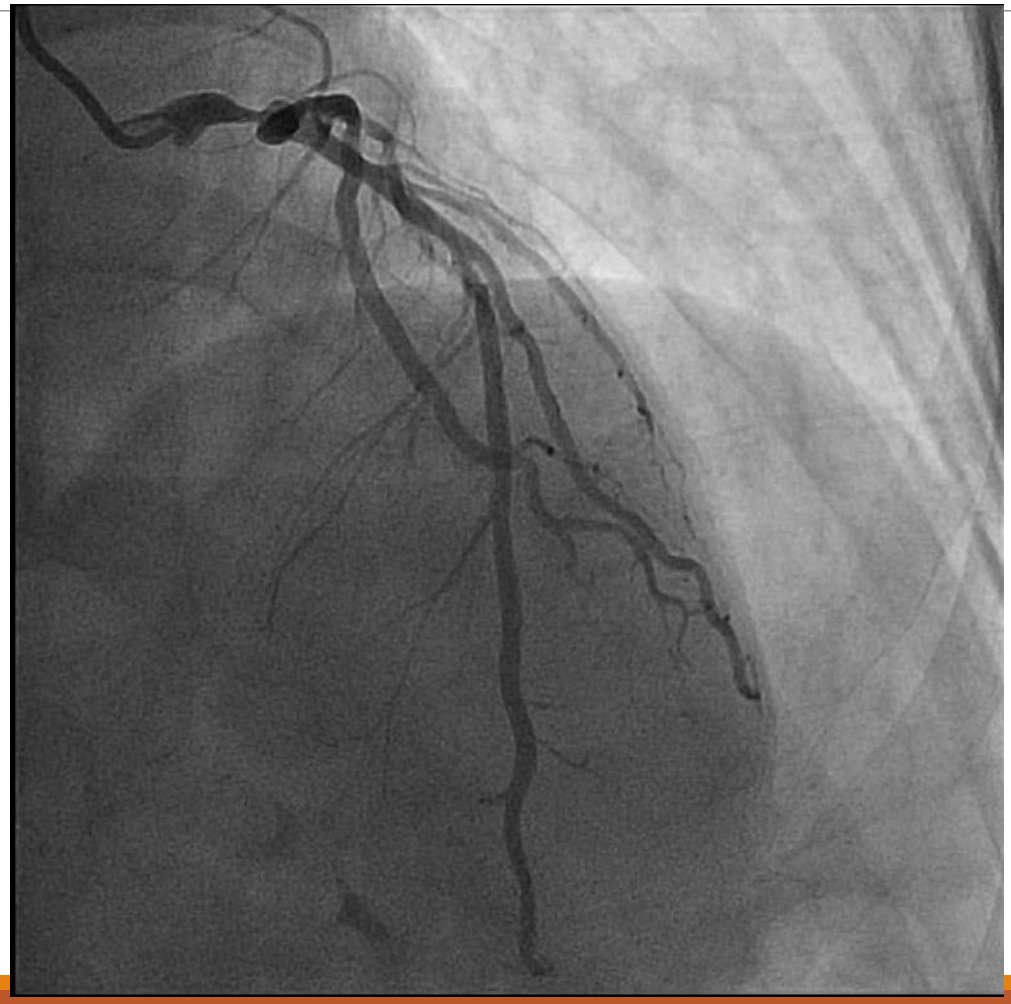


Send pt to ED by ambulance

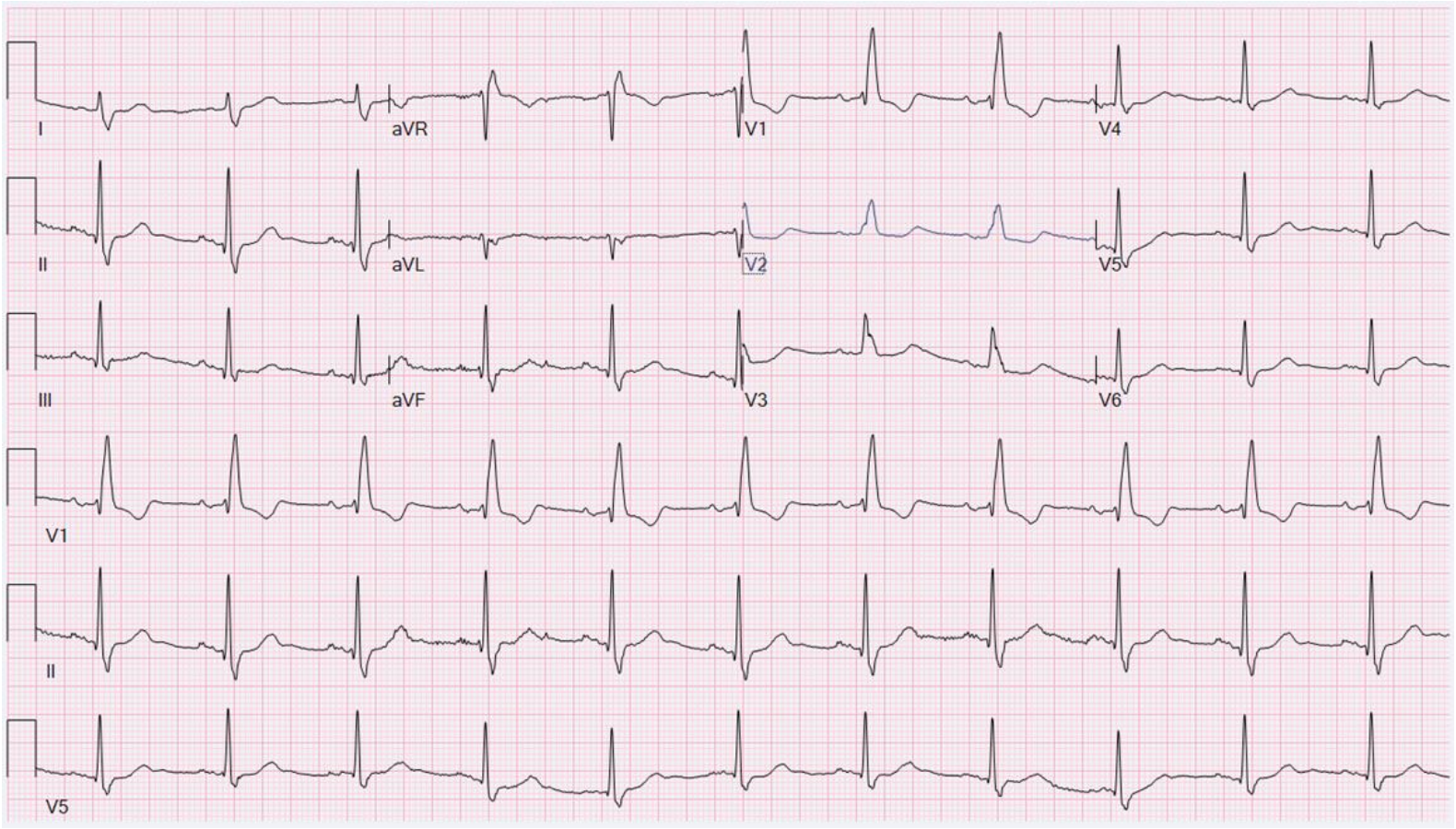
Troponin 1.26

Went to cath lab

70% LM and sent for CABG



76 yo man with HLD, HTN, CAD, s/p PCI to RCA and LCx and mild ICMP with EF of 45% presents for preop assessment of cataract surgery. No CP or SOB. Good functional status



Should we be concerned?

What is the abnormality on the ECG?

A. LBBB
B. LVH
C. RBBB
D. ST depression concerning of ischemia

RBBB: ECG criteria for a right bundle branch block include the following:

QRS duration greater than 120 milliseconds

rsR' "bunny ear" pattern in the anterior precordial leads (leads V1-V3) but no beyond

Slurred S waves in leads I, aVL and frequently V5 and V6

RBBB

IMPLICATIONS OF RBBB

Damage or abnormality in the conduction system involving the fibers in the right bundle of the heart

Can be congenital or acquired

May not always be pathological

An echocardiogram may be helpful

CAUSES OF RBBB

Congenital heart disease such as atrial septal defect

Myocardial infarction

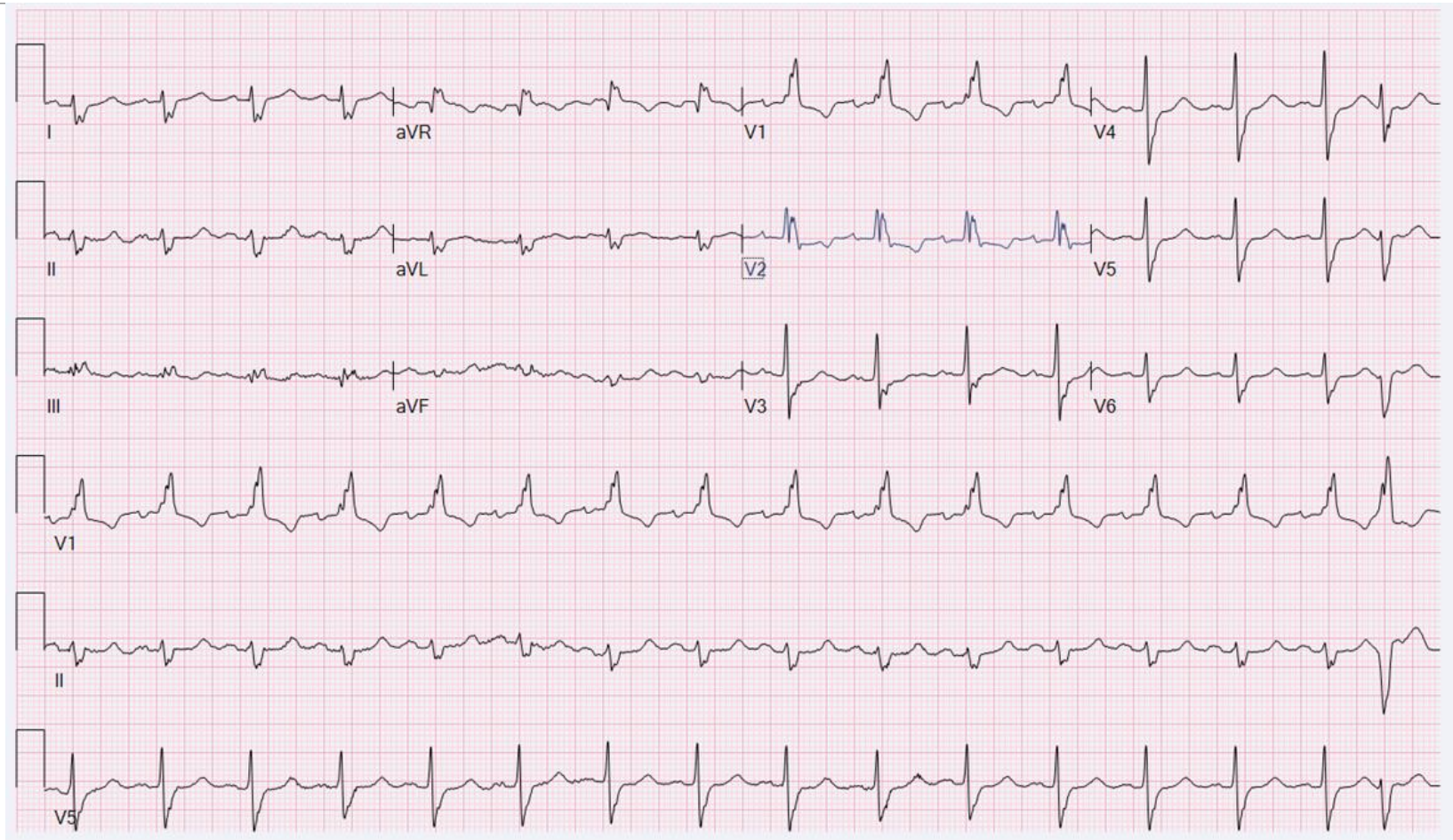
Myocarditis

Pulmonary hypertension

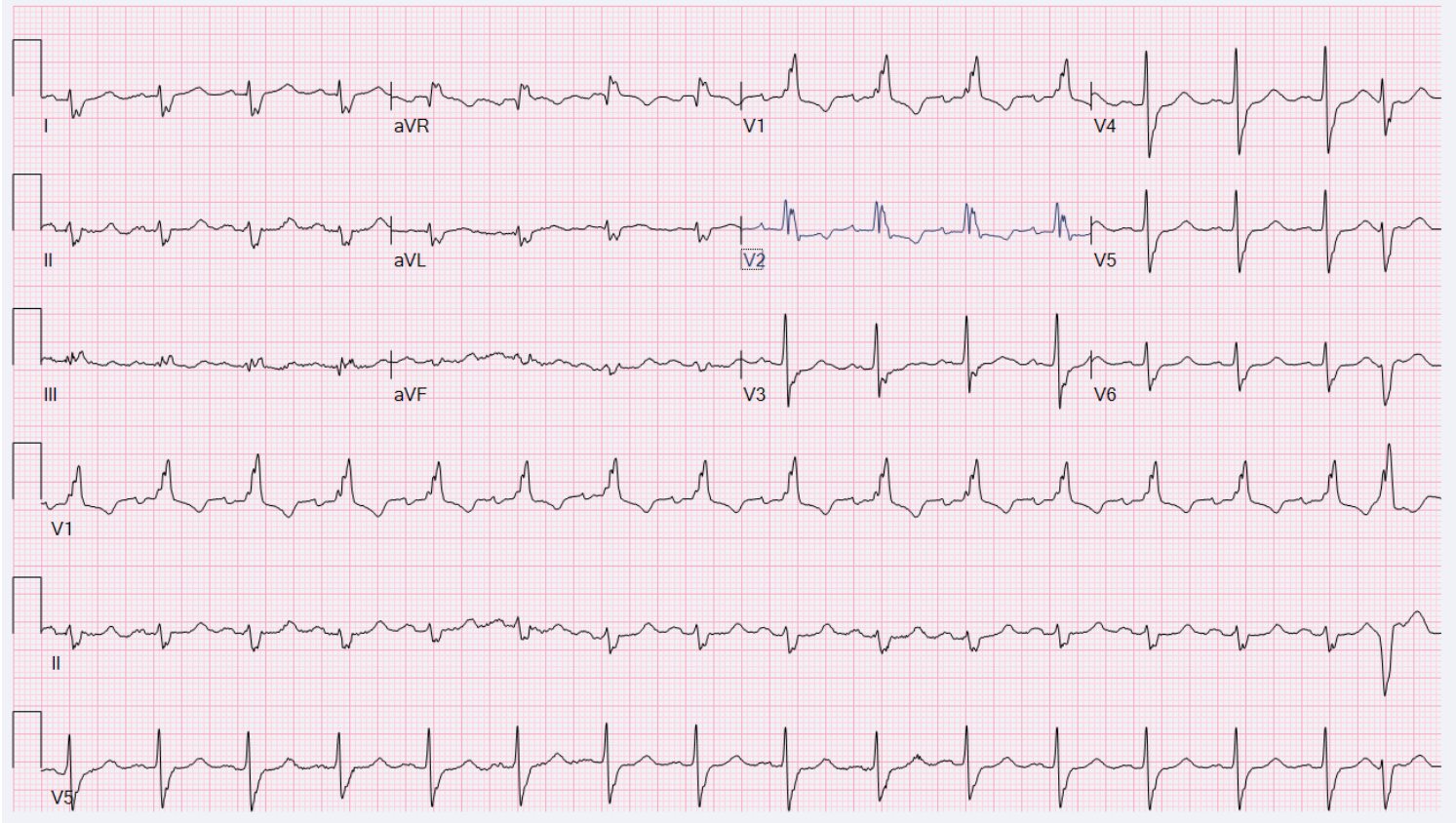
Pulmonary embolus

Mayo Clinic.org

71 yo man paraplegic, PAD, hx of DVT, presents with cholecystitis and s/p cholecystectomy with acute hypoxia and tachycardia



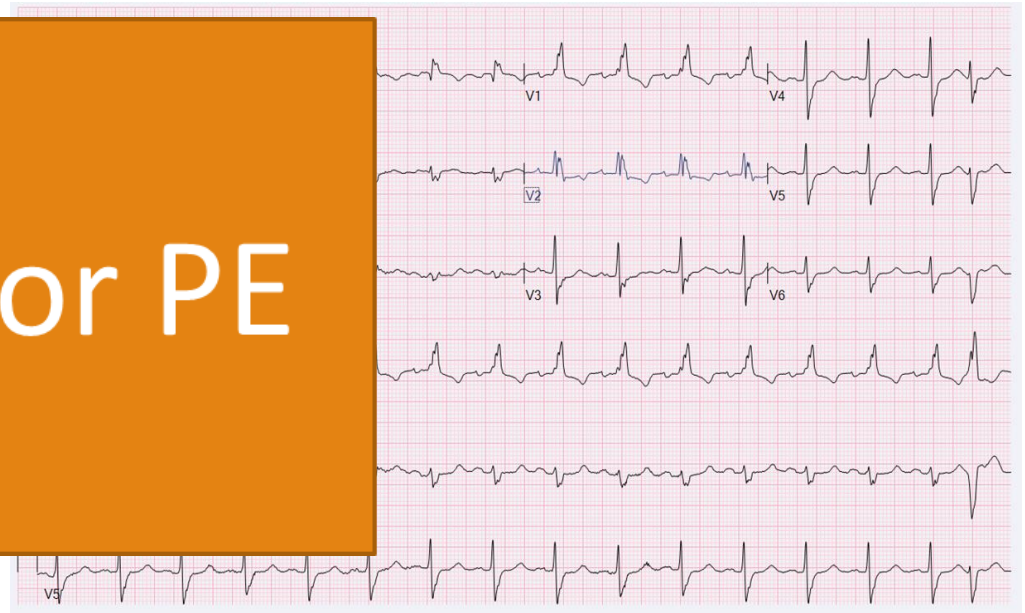
Pulmonary embolus or not?



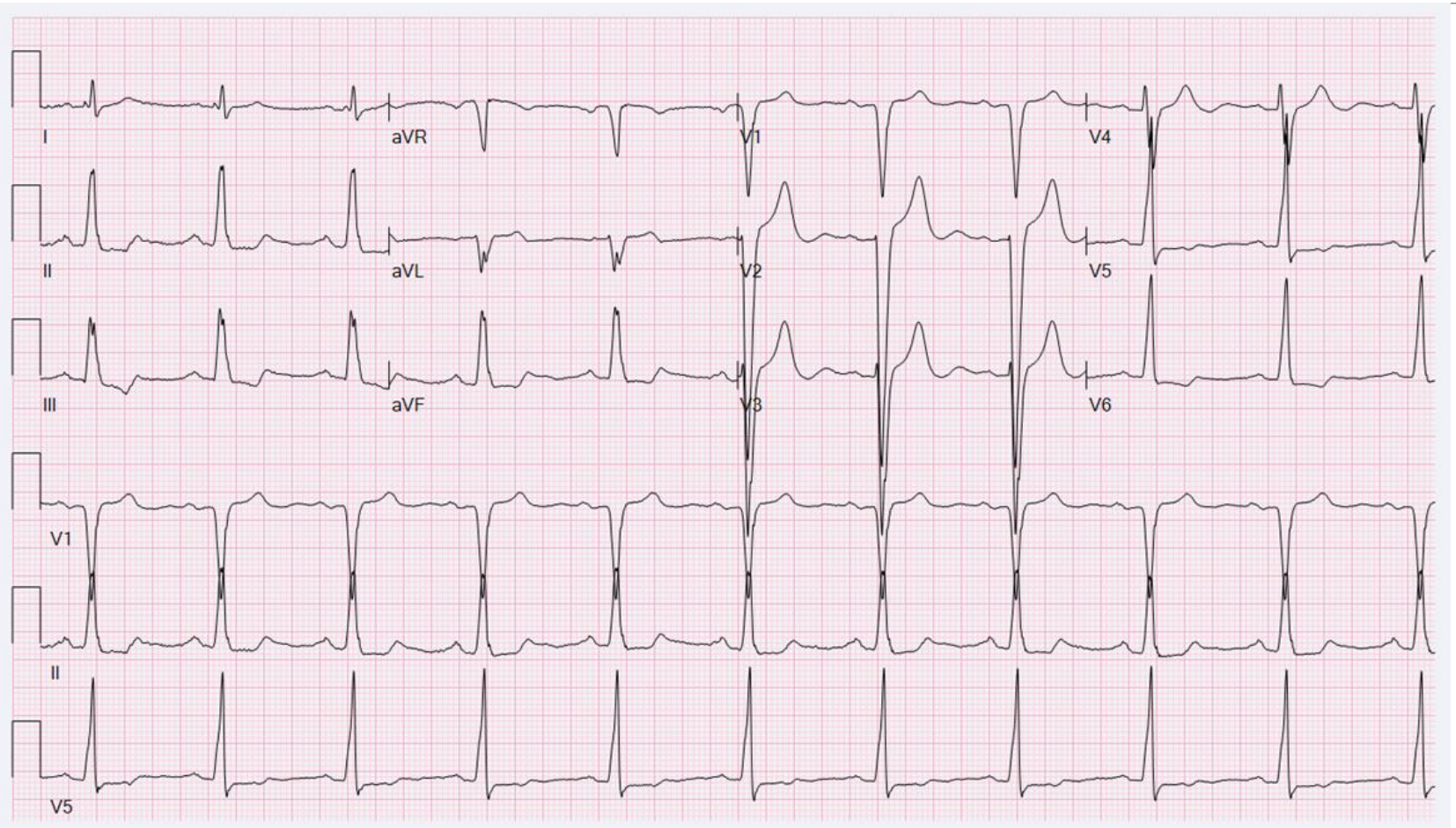
ECG findings for PE

- Sinus tachycardia
- Complete or i
- Right ventricu
  in V1-4 and/o
- Right axis dev
- Dominant R w
- Right atrial enlargement (leas II with 2.5 mm P wave)

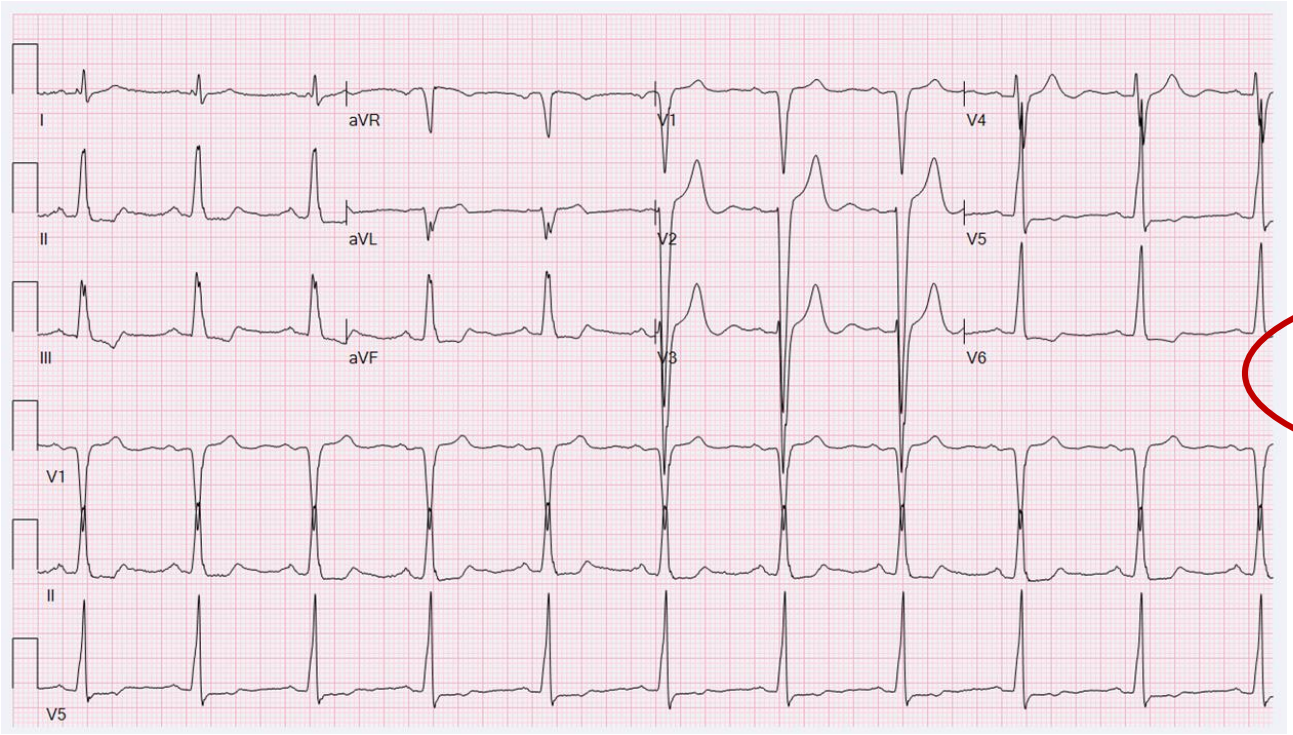
CT negative for PE



84 y/o M with PMH of DM, HTN, HLD, CAD, BPH, hx of seizure and severe right hip osteoarthritis
ECG done as preop assessment



What is the diagnosis?



A. ST depression suggestive of ischemia
B. LBBB
C. LVH with repolarization changes
D. STEMI

LVH Criteria

Voltage criteria

Repolarization changes
- ST depression, limb and V4-6
- Discordant ST elevation in V1-3

Left atrial enlargement

Left axis deviation

QRS widening

Multiple criteria for increased voltage

Limb Leads

R wave in lead I + S wave in lead III > 25 mm

R wave in aVL > 11 mm (most specific)

R wave in aVF > 20 mm

S wave in aVR > 14 mm

Precordial Leads

R wave in V4, V5 or V6 > 26 mm

R wave in V5 or V6 plus S wave in V1 > 35 mm

Largest R wave plus largest S wave in precordial leads > 45 mm

https://litfl.com/left-ventricular-hypertrophy-lvh-ecg-library/

Causes of LVH

Hypertension (most common cause)

Aortic stenosis

Aortic regurgitation

Mitral regurgitation

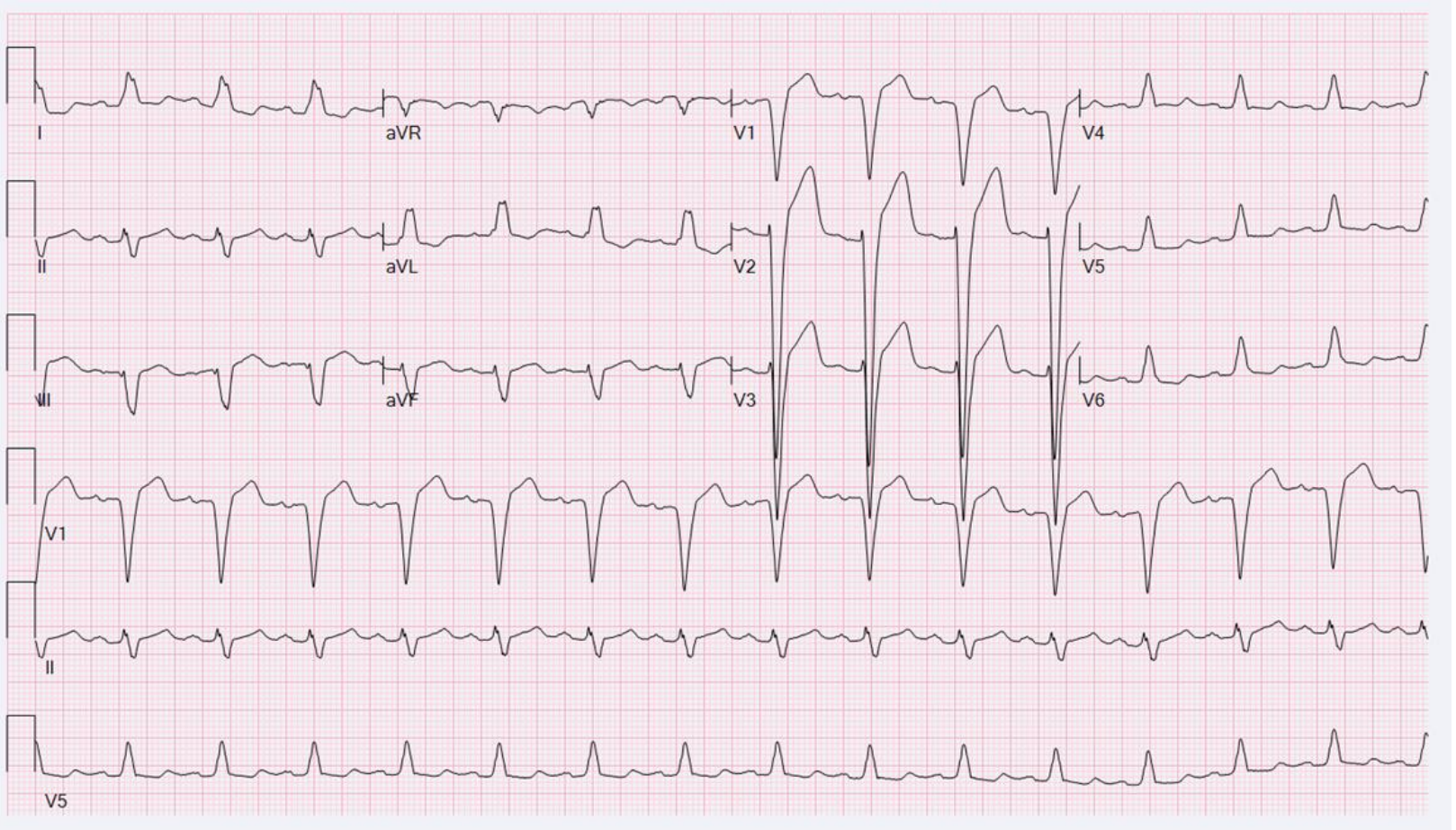
Coarctation of the aorta

Hypertrophic cardiomyopathy

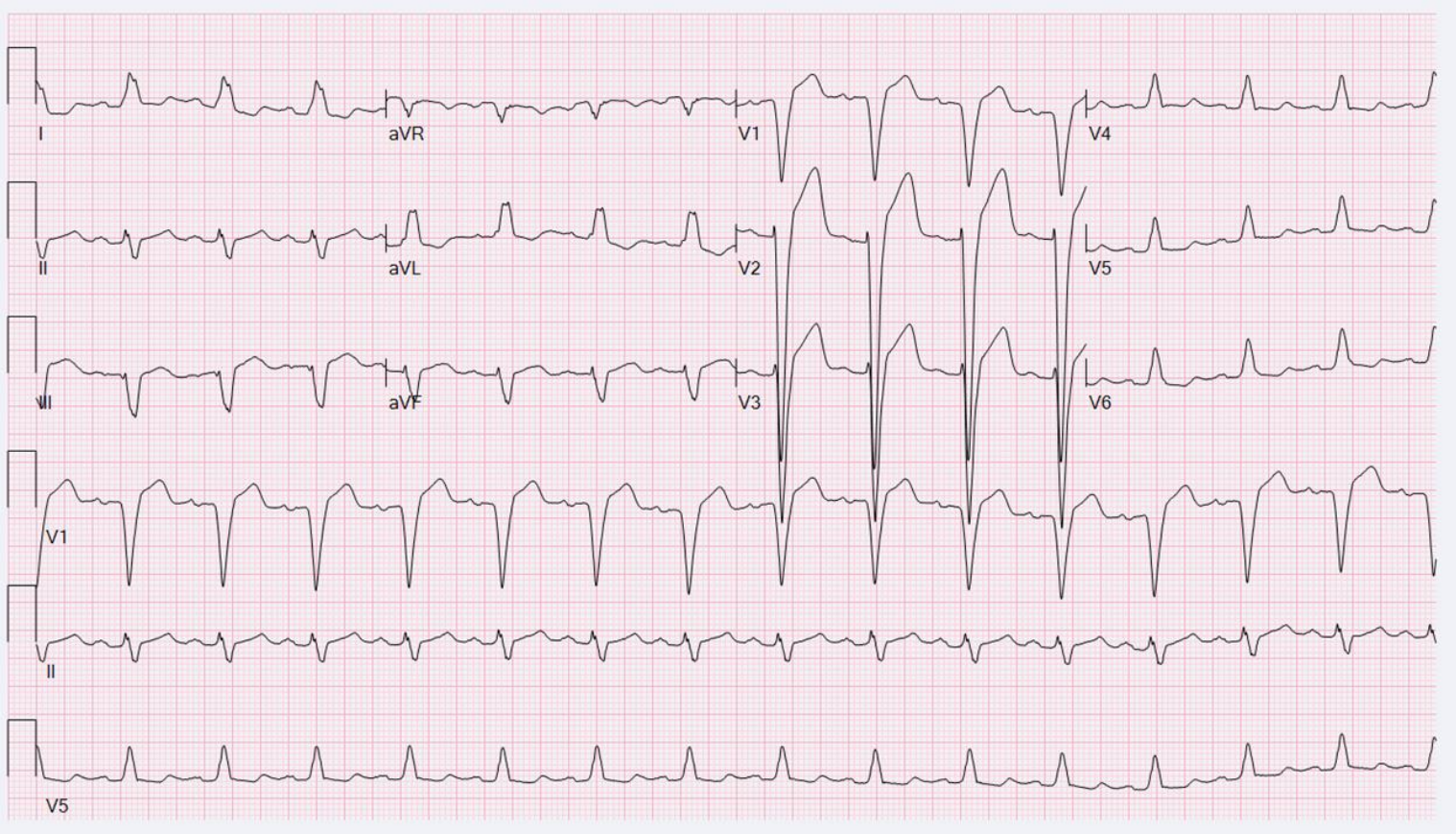
Voltage criteria alone are not diagnostic of LVH

ECG changes are an insensitive means of detecting LVH (patients with clinically significant left ventricular hypertrophy seen on echocardiography may still have a relatively normal ECG) or vice versa (not specific unless meet all criteria)

71 yo man with HTN, DM, HLD and exertional dyspnea for past few months. He can push a lawn mower for 5-6 min. Also with fatigue.



What is wrong with the ECG?



A. Ventricular tachycardia
B. LBBB
C. RBBB
D. STEMI

LBBB

CRITERIA

QRS duration of > 120 ms

Dominant S wave in V1

Broad monophasic R wave in lateral leads (I, aVL, V5-V6)

Absence of Q waves in lateral leads (I, V5-V6; small Q waves are still allowed in aVL)

Prolonged R wave peak time > 60ms in left precordial leads (V5-6)

ASSOCIATED FINDINGS

Appropriate discordance: the ST segments and T waves always go in the opposite direction to the main vector of the QRS complex

Poor R wave progression in the chest leads

Left axis deviation

Causes of LBBB

Myocardial infarction

Cardiomyopathy

Myocarditis

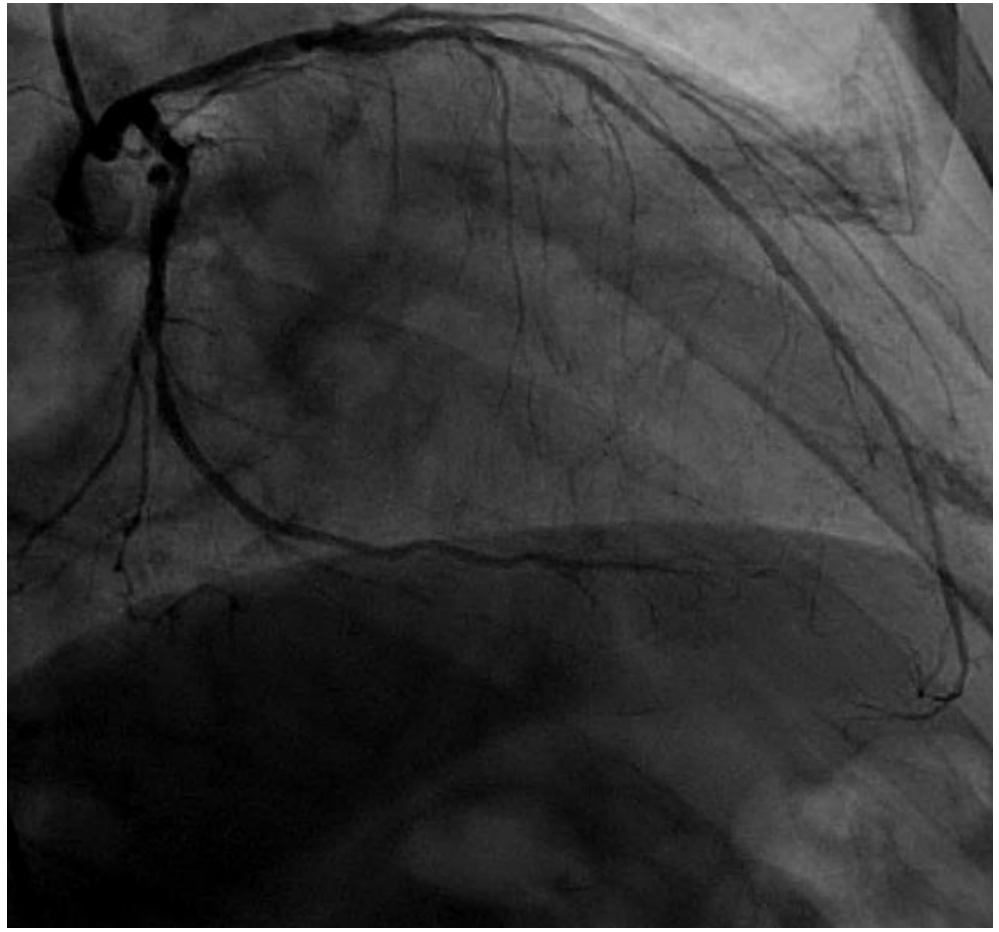
Hypertension (LVH with extreme QRW widening progression)

Our case

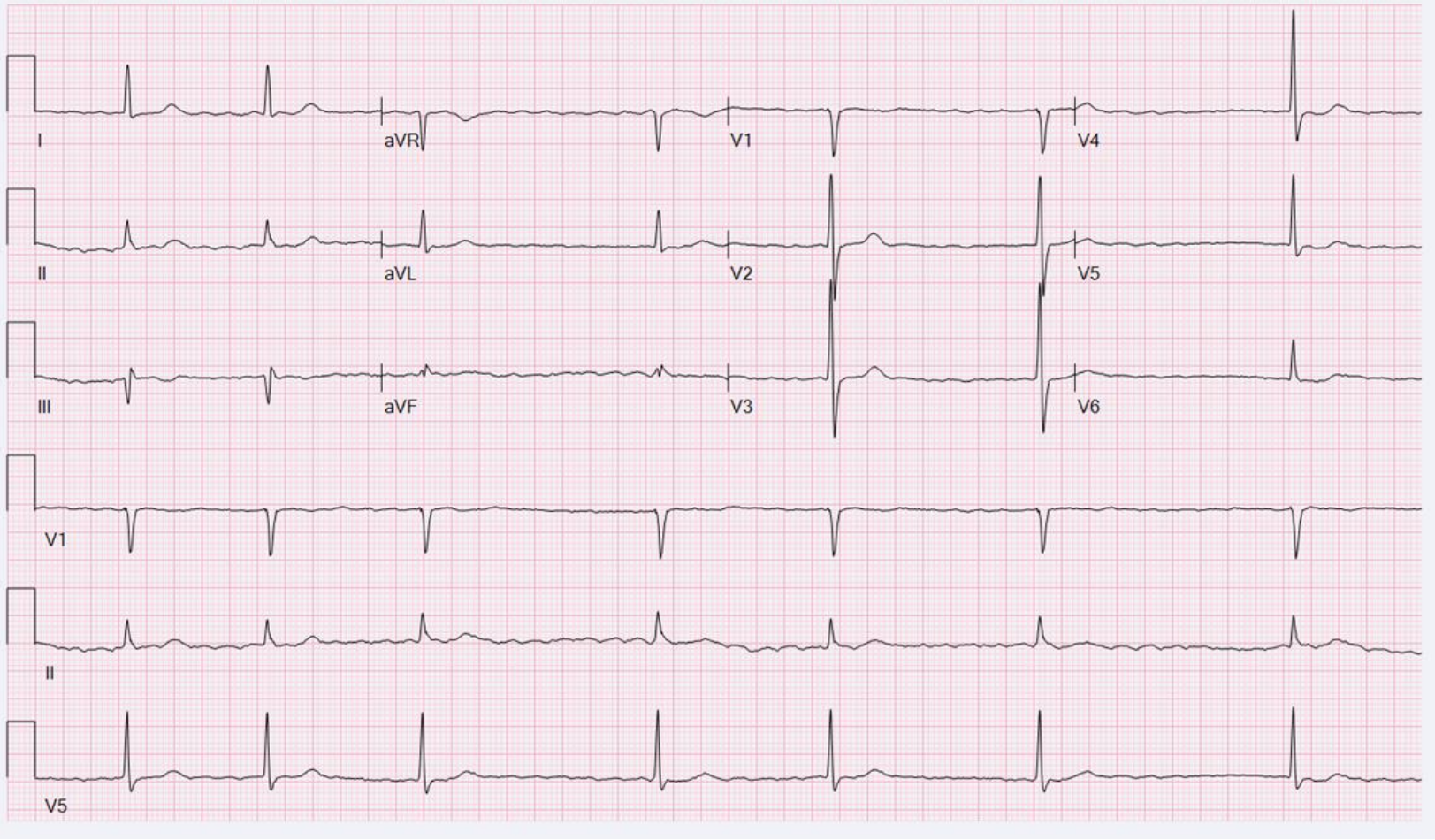
CAD

LVH

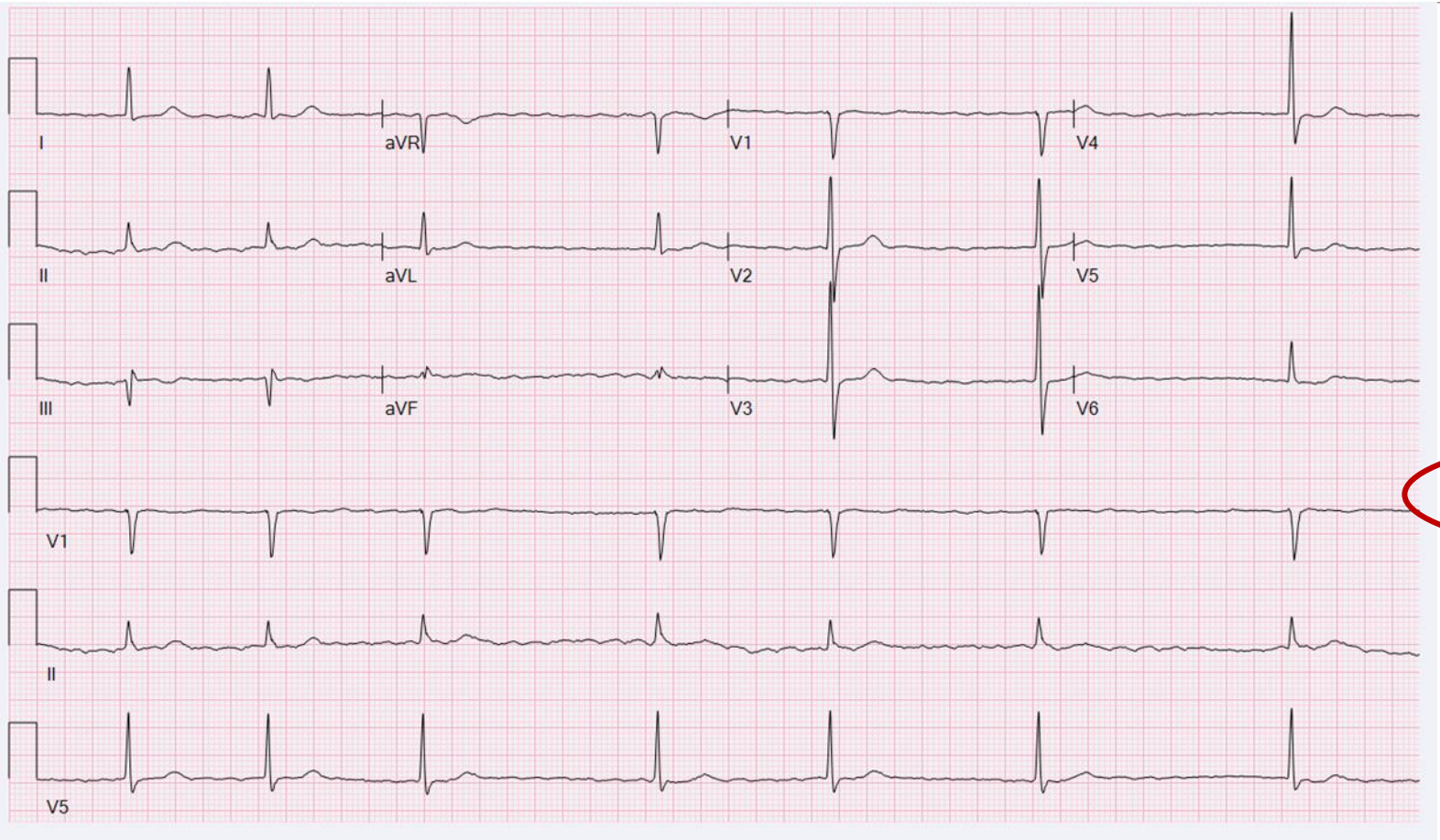
Underwent CABG



88 yo M w/ Parkinson's disease, BPH, CAD w/ prior CABG (1989) presents with UTI and also has chest pain

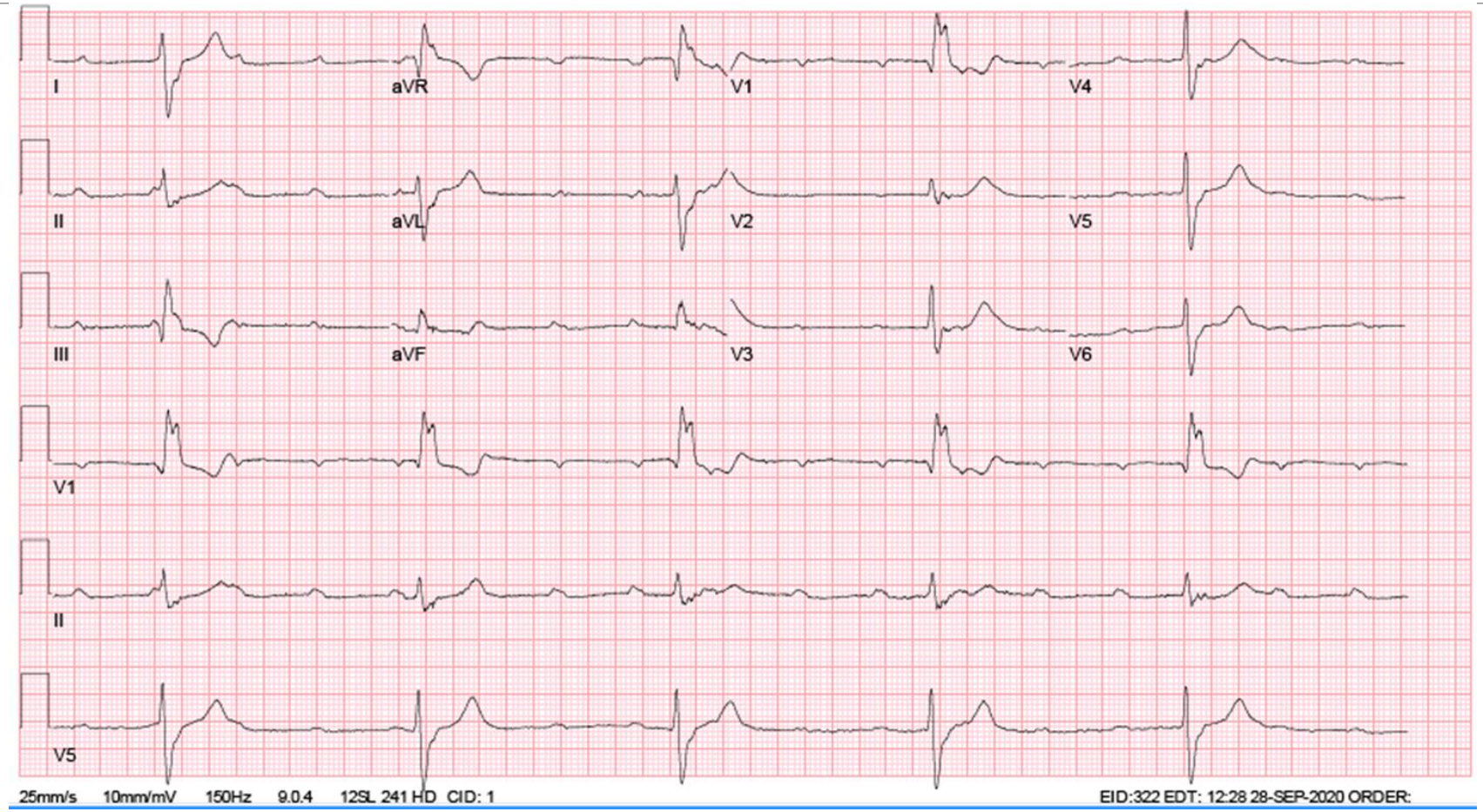


What is the diagnosis?

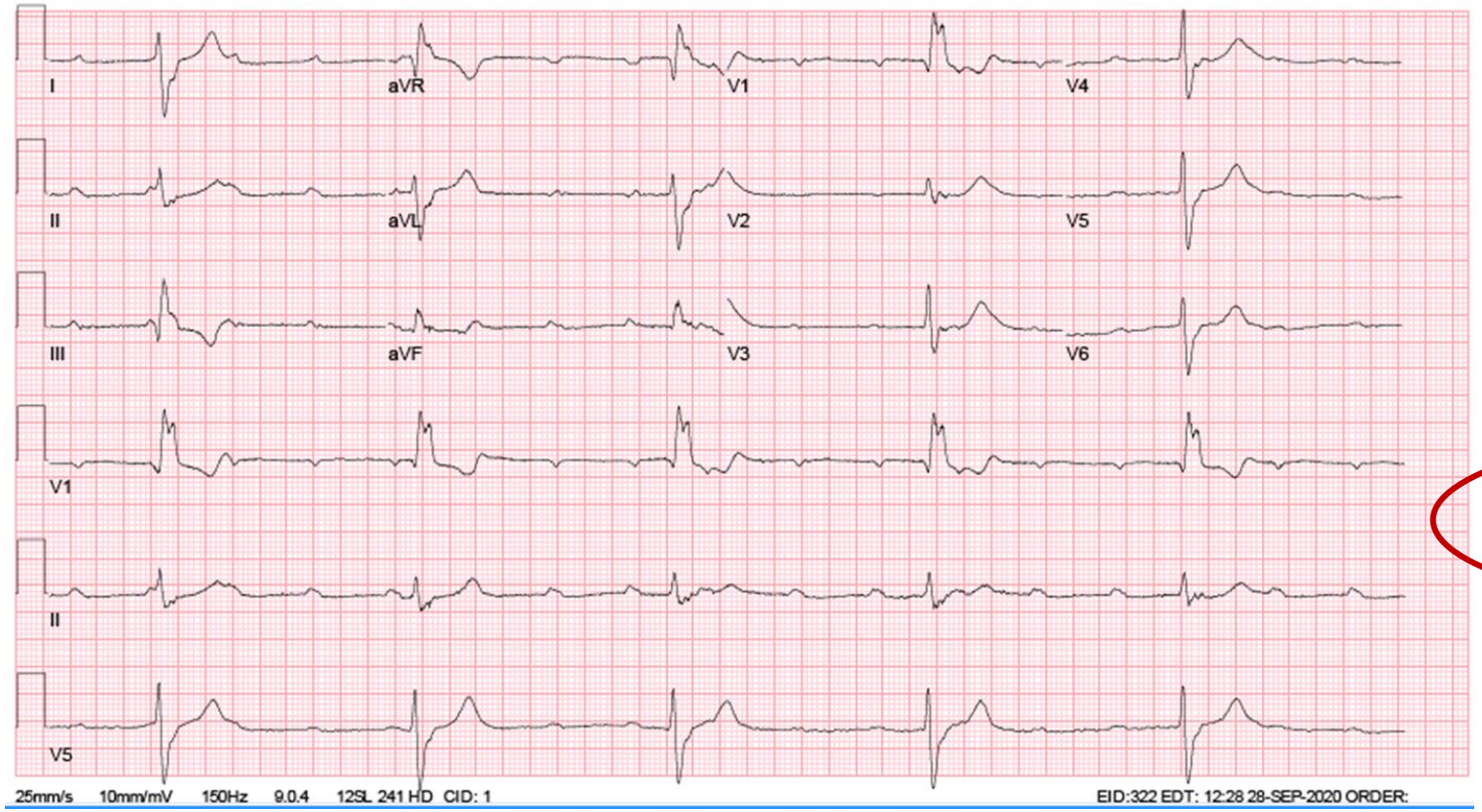


A. Sinus bradycardia
B. Complete heart block
C. Ectopic atrial rhythm
D. Atrial fibrillation

81 y/o M with PMH of HTN, BPH, C3-5 cervical fusion, who presented 1 week after LOC with fall with 3-4 days of generalized weakness and SOB.



What's the diagnosis?



A. Atrial fibrillation with slow ventricular response
B. Myocardial infarction
C. Complete heart block
D. Pacemaker malfunction

Complete heart block

DEFINITION

Complete absence of AV conduction; no relationship between P wave and QRS complexes

P rate is faster than R to R rate

Generally, there is junctional or ventricular escape rhythm

If inadequate escape rhythm, there may be syncope if self –terminated or death if prolonged

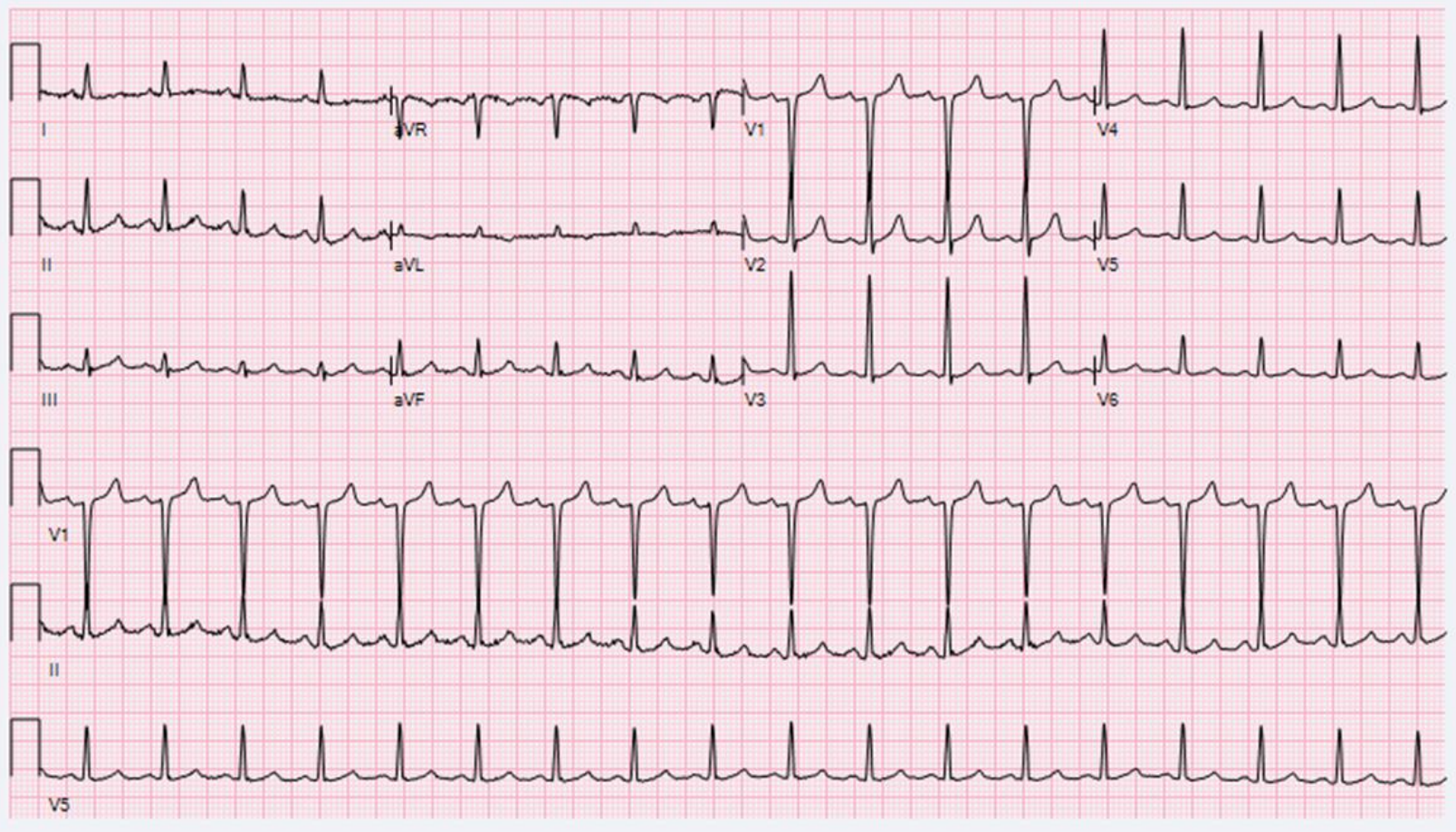
CAUSES

Myocardial infarction (inferior with increase in vagal tone or anterior if entire septum is infarcted

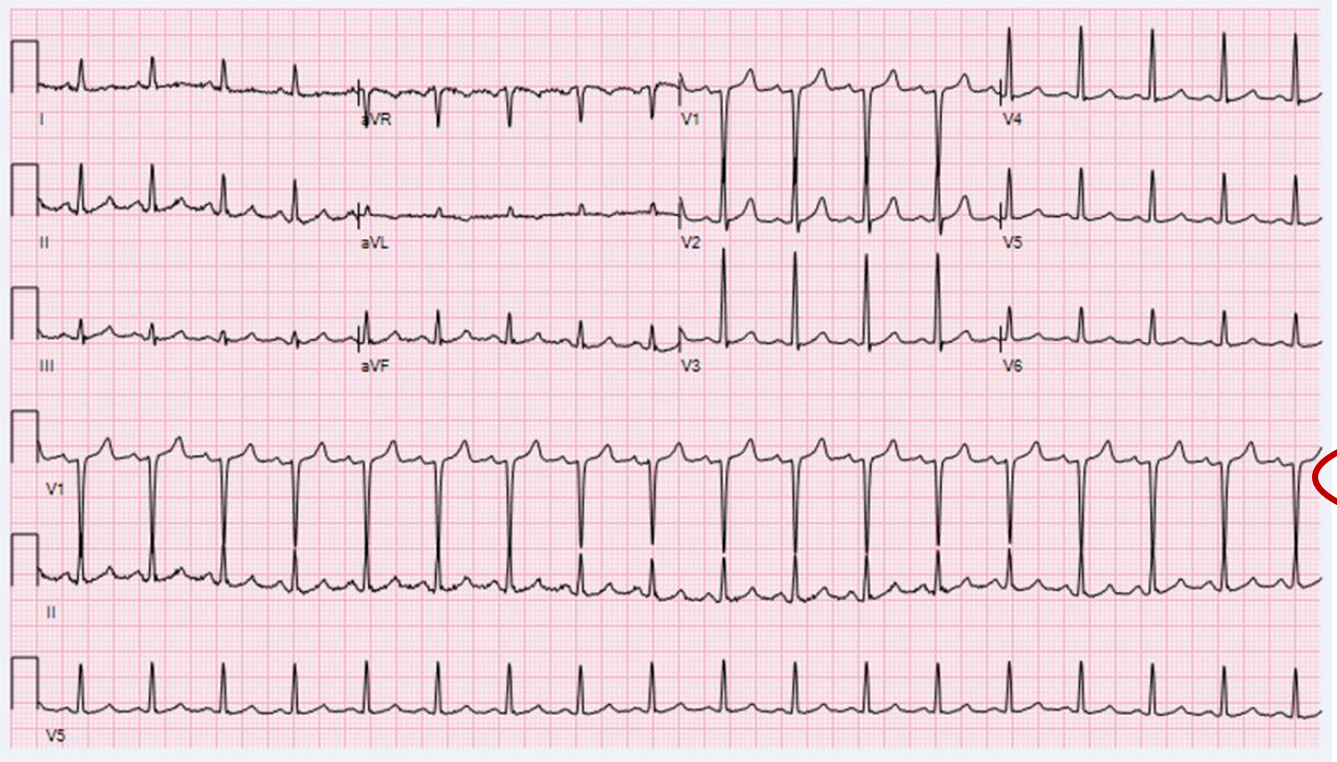
Medications: CCB, BB or digoxin

Idiopathic degeneration of the conducting system (Lenegre's or Lev's disease)

71 year old MALE with current tobacco smoker with h/o CVA, HTN, T2DM, paroxysmal aflutter w/ RVR presented from nursing home for feeling dizzy



What does the ECG show?



A. Atrial flutter
B. Atrial tachycardia
C. Atrial fibrillation
D. Sinus tachycardia

Causes of Sinus Tachycardia

Drugs (methamphetamines, amphetamines, cocaine)

Caffeine

Alcohol

Hyperthyroidism

Fever

Infection

Volume depletion

Anemia

Heart failure

rction

olus

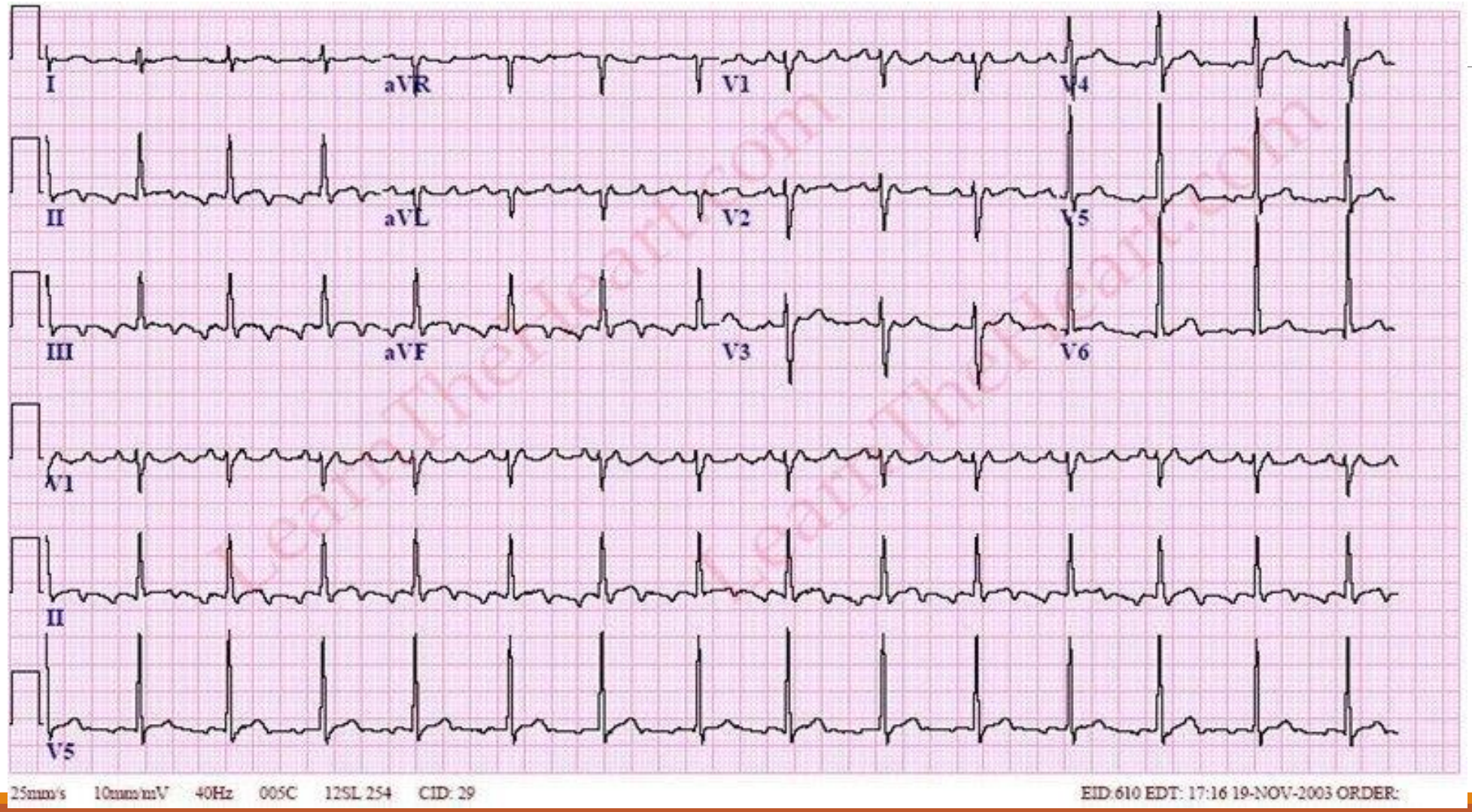
inus tachycardia (least

t 1.2% of the

have)

Our patient had hemoglobin of 6.1

74M with prior hx of CABG, presented with palpitations



Features of Atrial Flutter

Narrow complex tachycardia

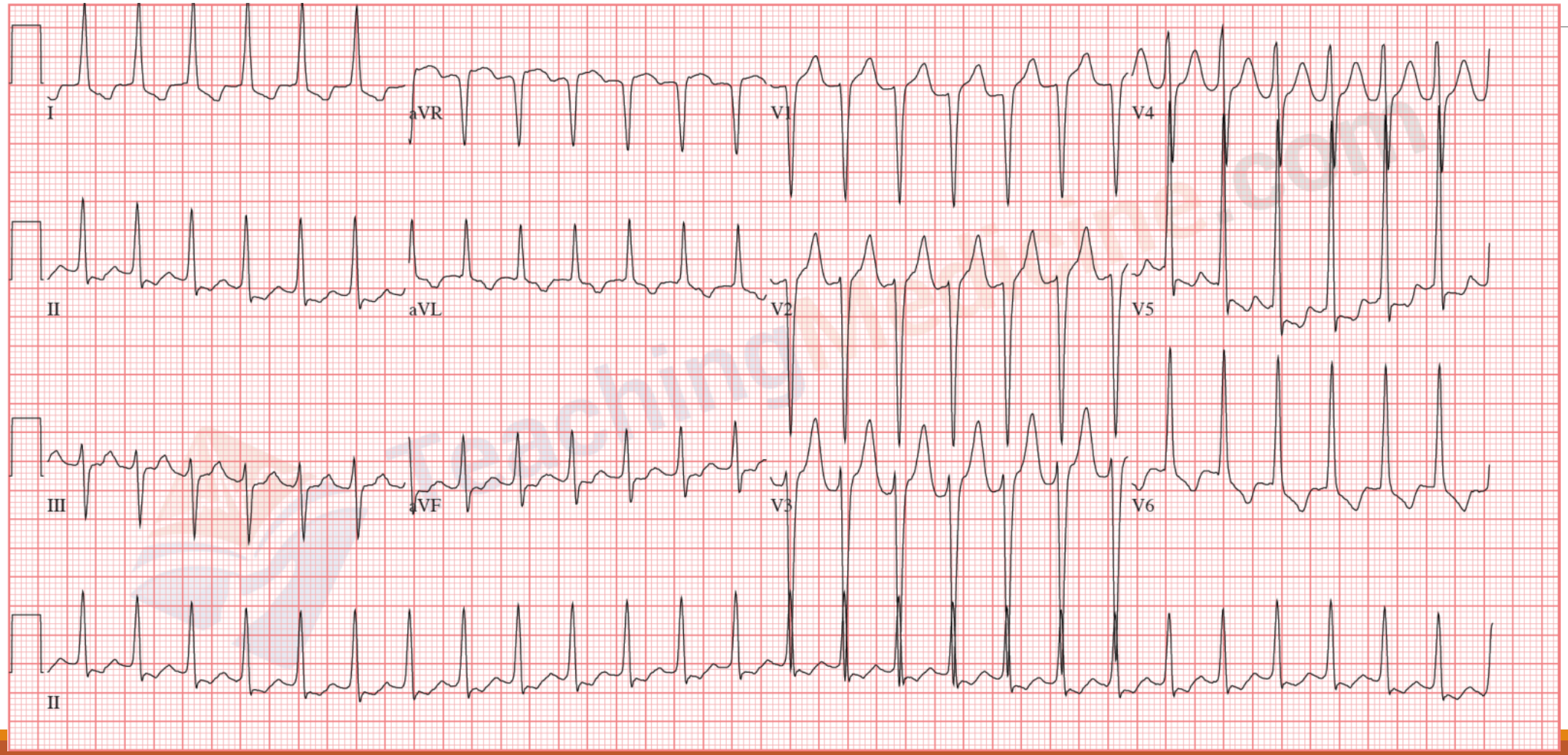
Regular atrial activity at ~300 bpm

Flutter waves (“saw-tooth” pattern) best seen in leads II, III, aVF — may be more easily spotted by turning the ECG upside down!

Flutter waves in V1 may resemble P waves

Loss of the isoelectric baseline

23 year old pregnant female with sudden onset palpitations



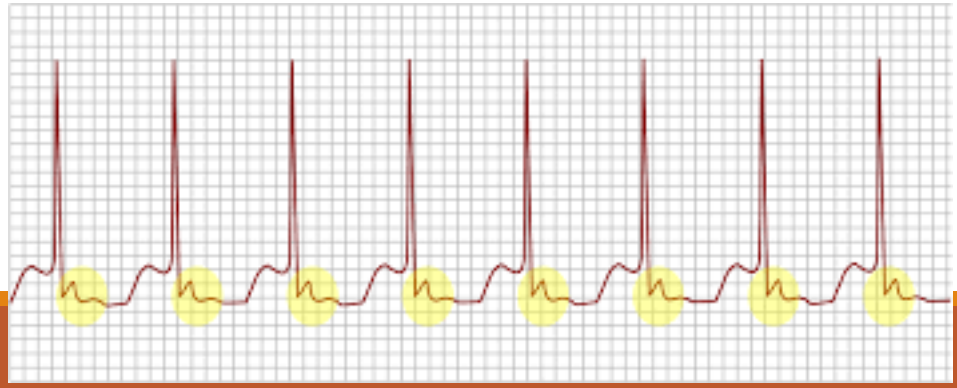
Supraventricular Tachycardia

Regular narrow complex tachycardia (often the rate = ~150 bpm)

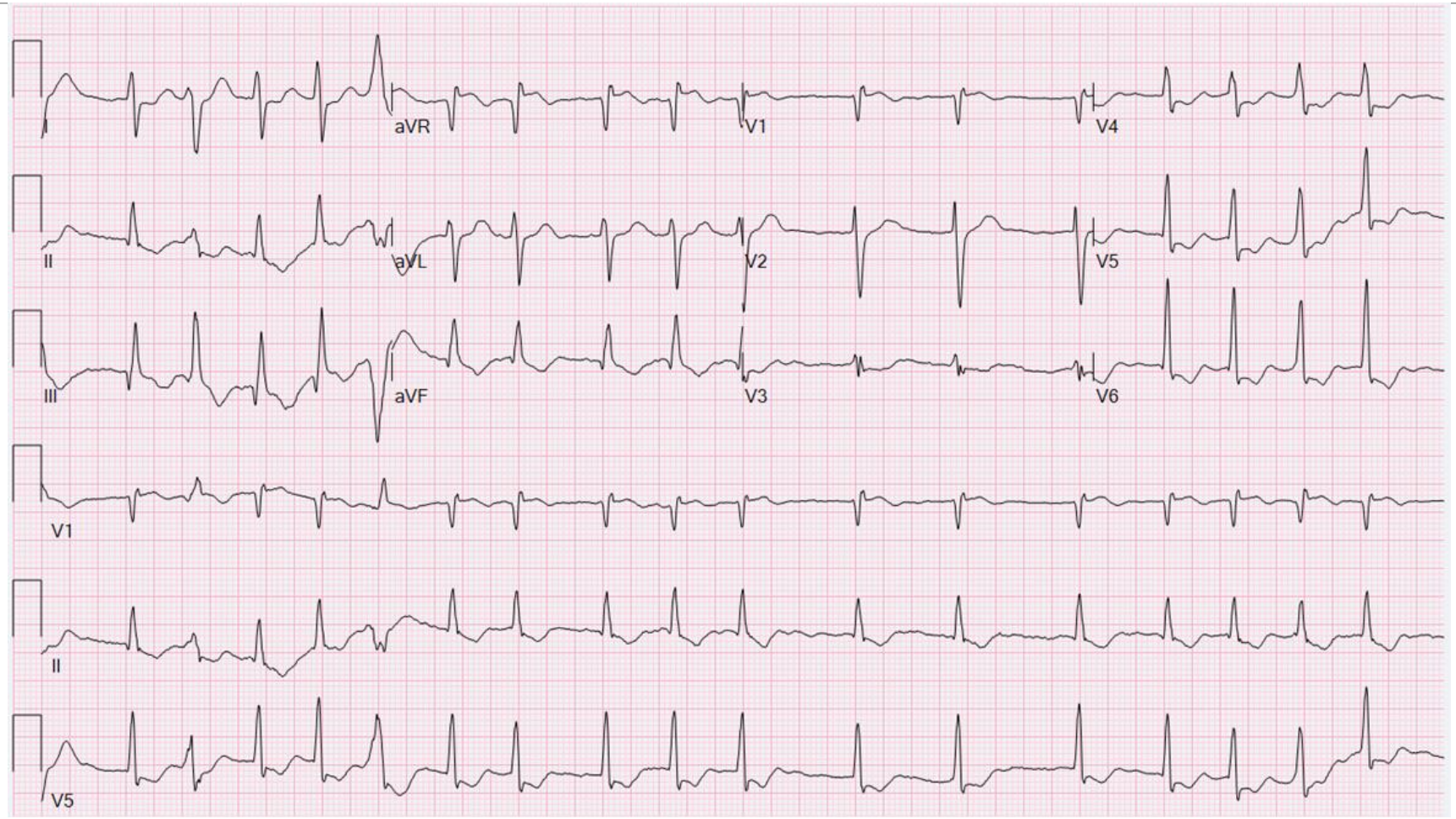
QRS complexes usually narrow (< 120 ms) unless pre-existing bundle branch block, accessory pathway, or rate related aberrant conduction.

ST-segment depression may be seen with or without underlying coronary artery disease.

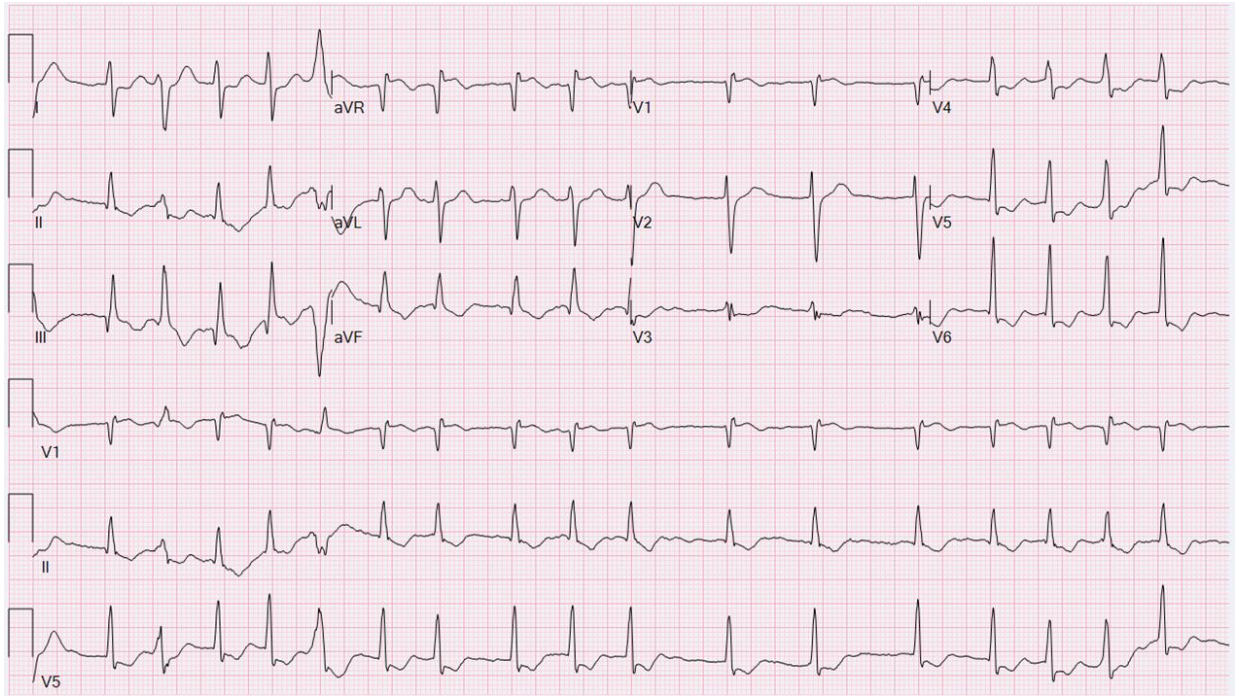
P waves if visible exhibit retrograde conduction P waves may be buried in the QRS complex, visible after the QRS complex, or very rarely visible before the QRS complex.



69 year old male with PMH significant for HTN, HLD, DM, HFrEF, VT w/ cardiac arrest s/p AICD, CAD s/p PCI (LAD) presents with palpitations after running out of meds

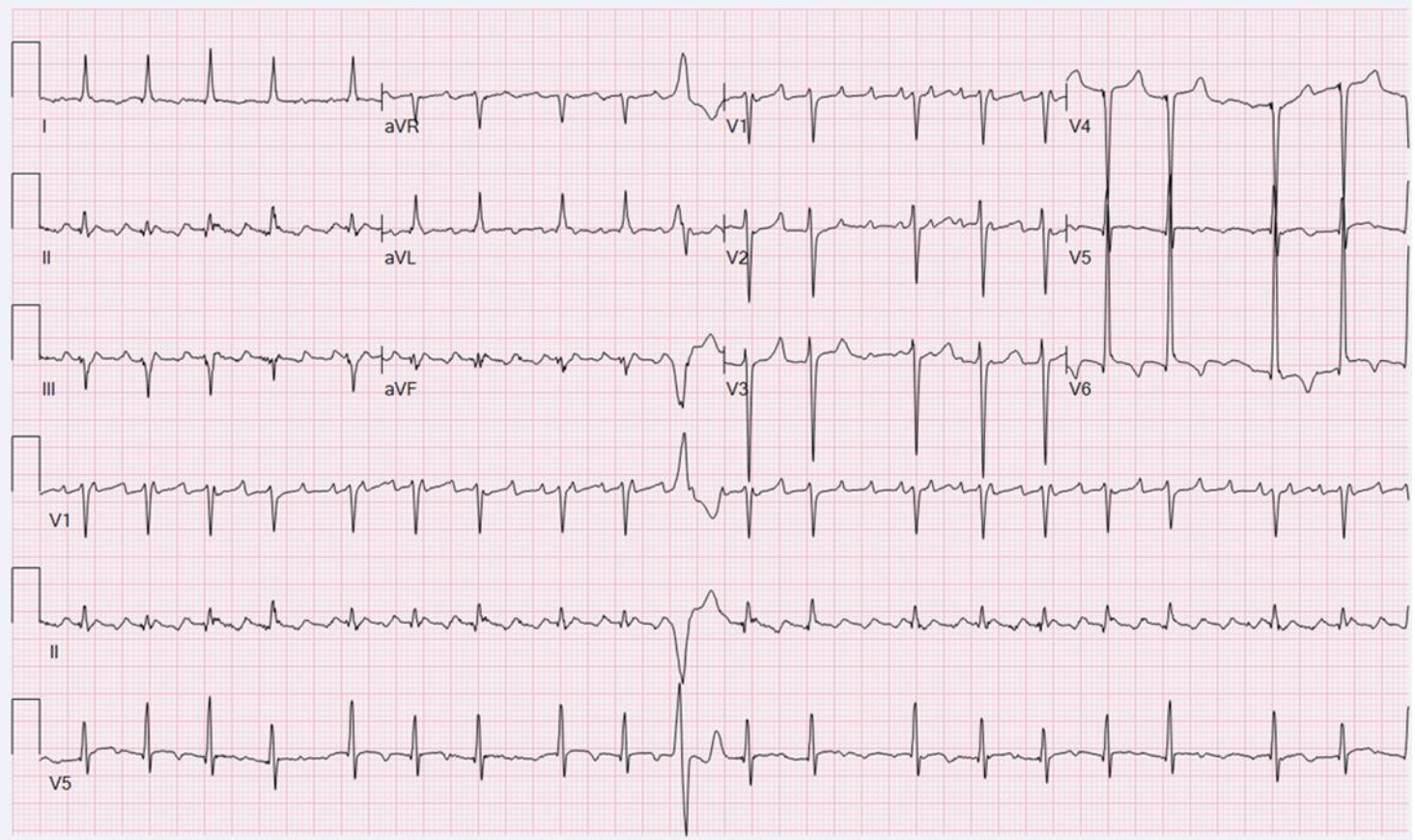


What's the diagnosis?



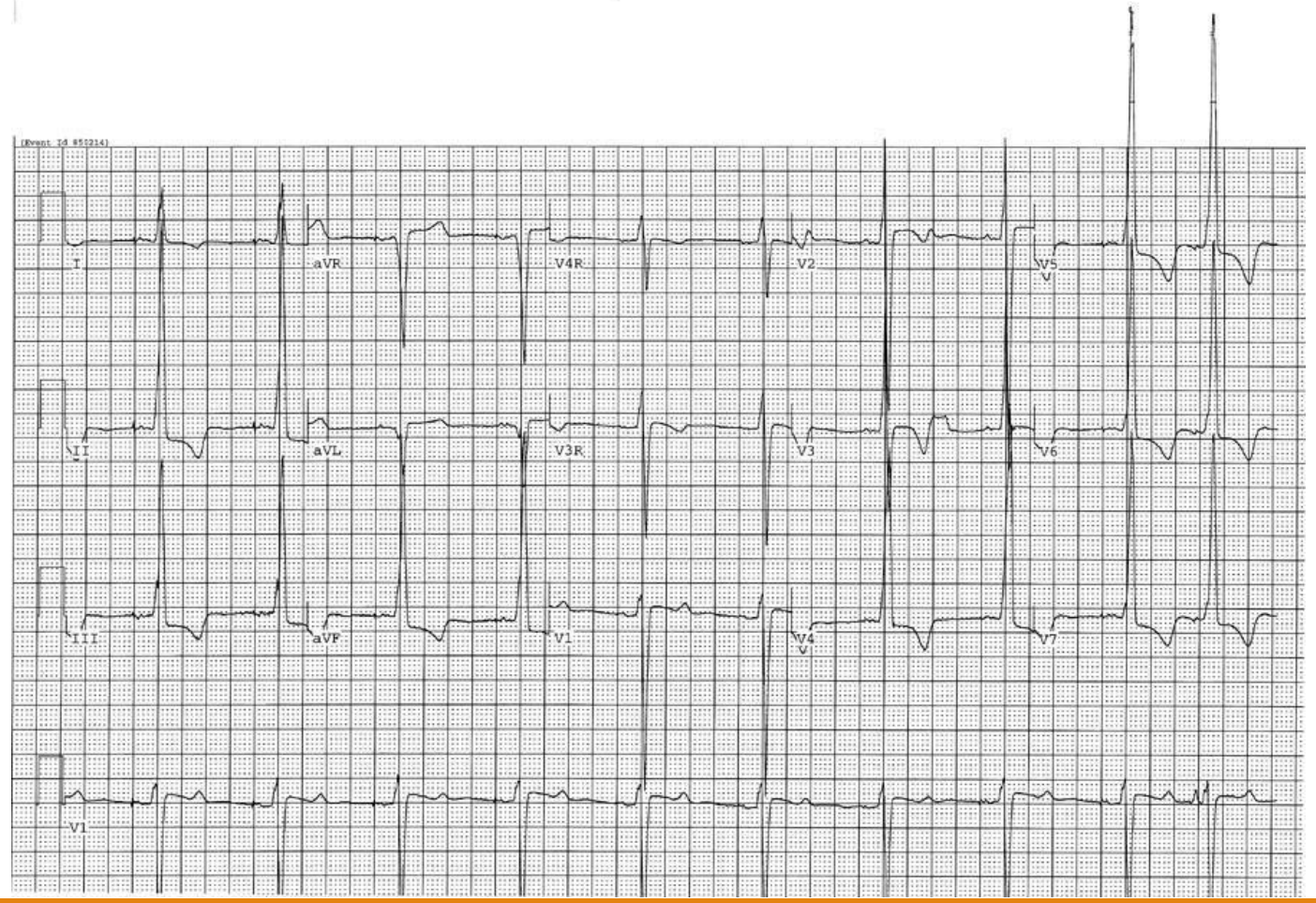
A. Multifocal atrial tachycardia
B. Atrial fibrillation
C. Atrial flutter
D. Atrial tachycardia

62 yrs old male with ESRD on HD, stage IV colon cancer, HF, PHTN, Hep C who complains of worsening SOB and found to have pneumonia



A. Atrial tachycardia
B. Atrial fibrillation
C. Atrial flutter
D. Multifocal atrial tachycardia

16 yo coming for high school physical

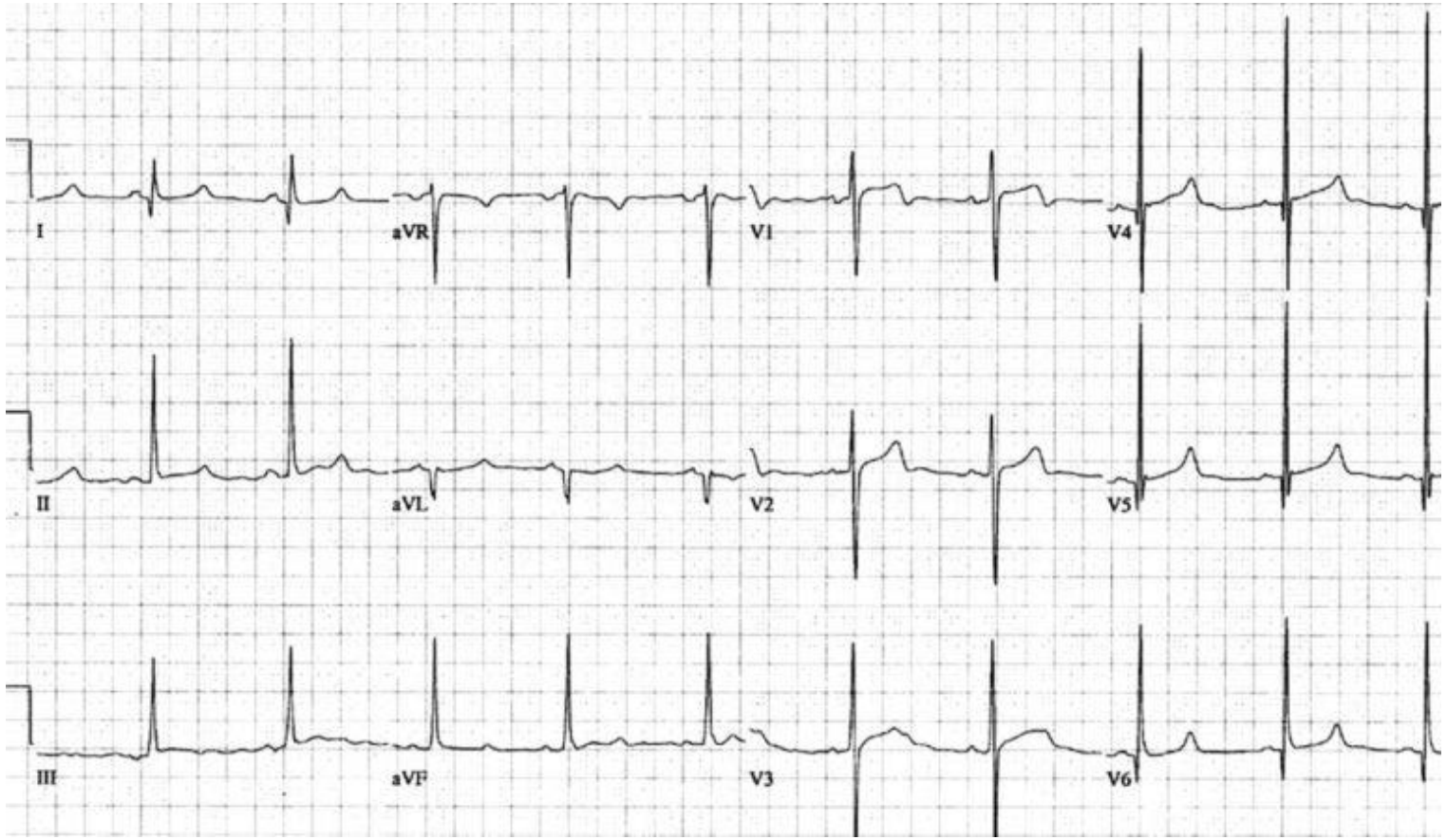


ECG features to look for:

1. LVH
2. Q waves (very narrow)
3. ST depression/T wave inversions to suggest repolarization changes
4. Left atrial enlargement
5. Pre-excitation

https://medscape.com

30 yo presented with exertional lightheadness and palpitations

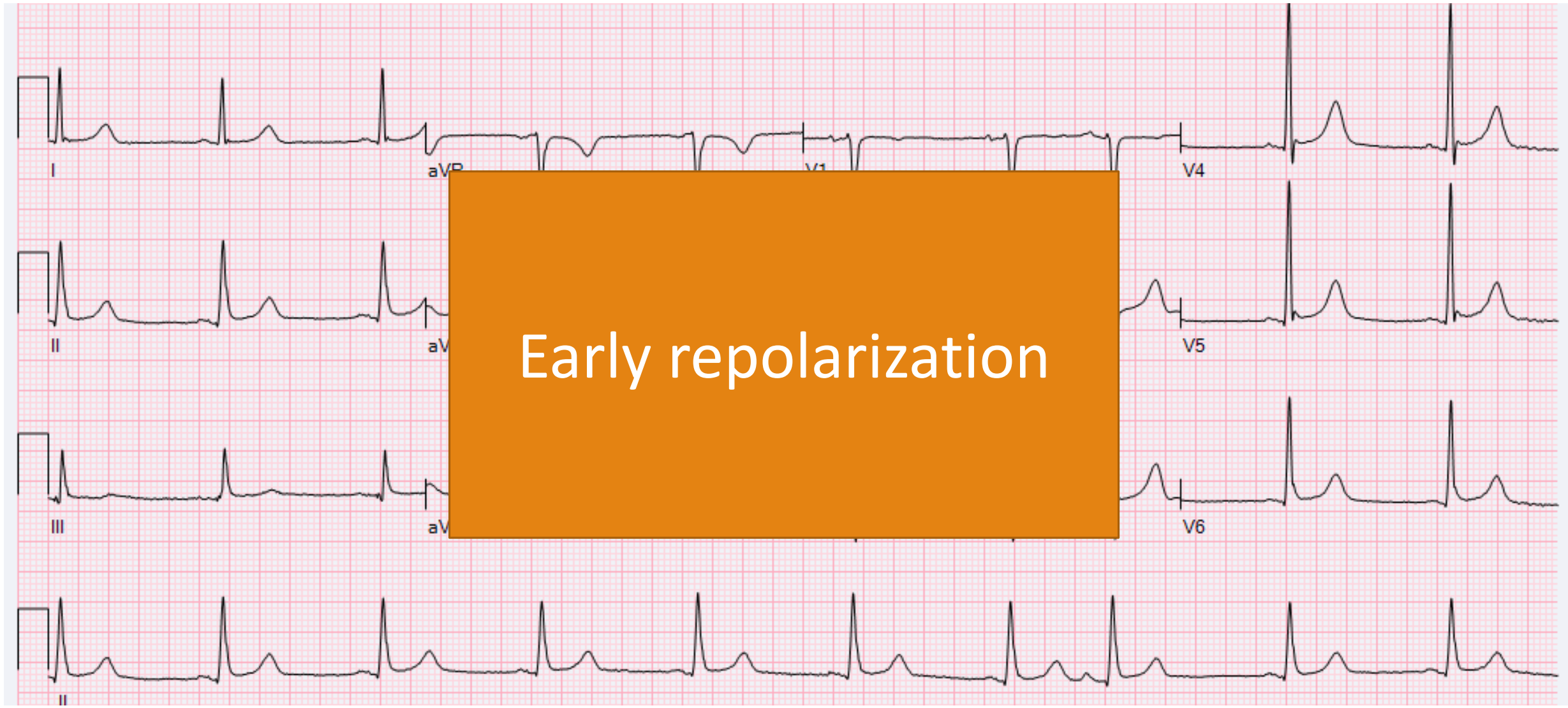


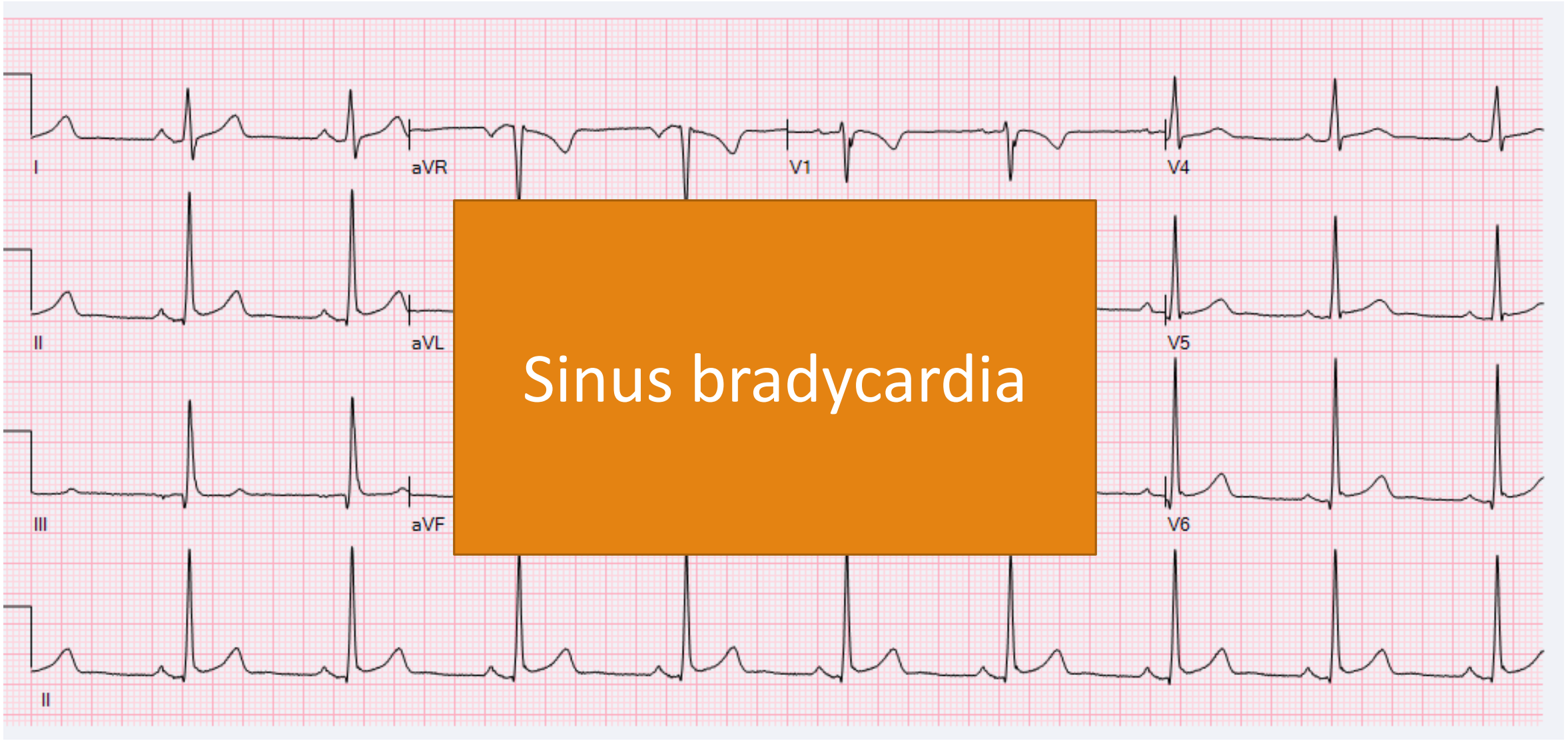
LVH

Narrow Q waves in I, V4-V6

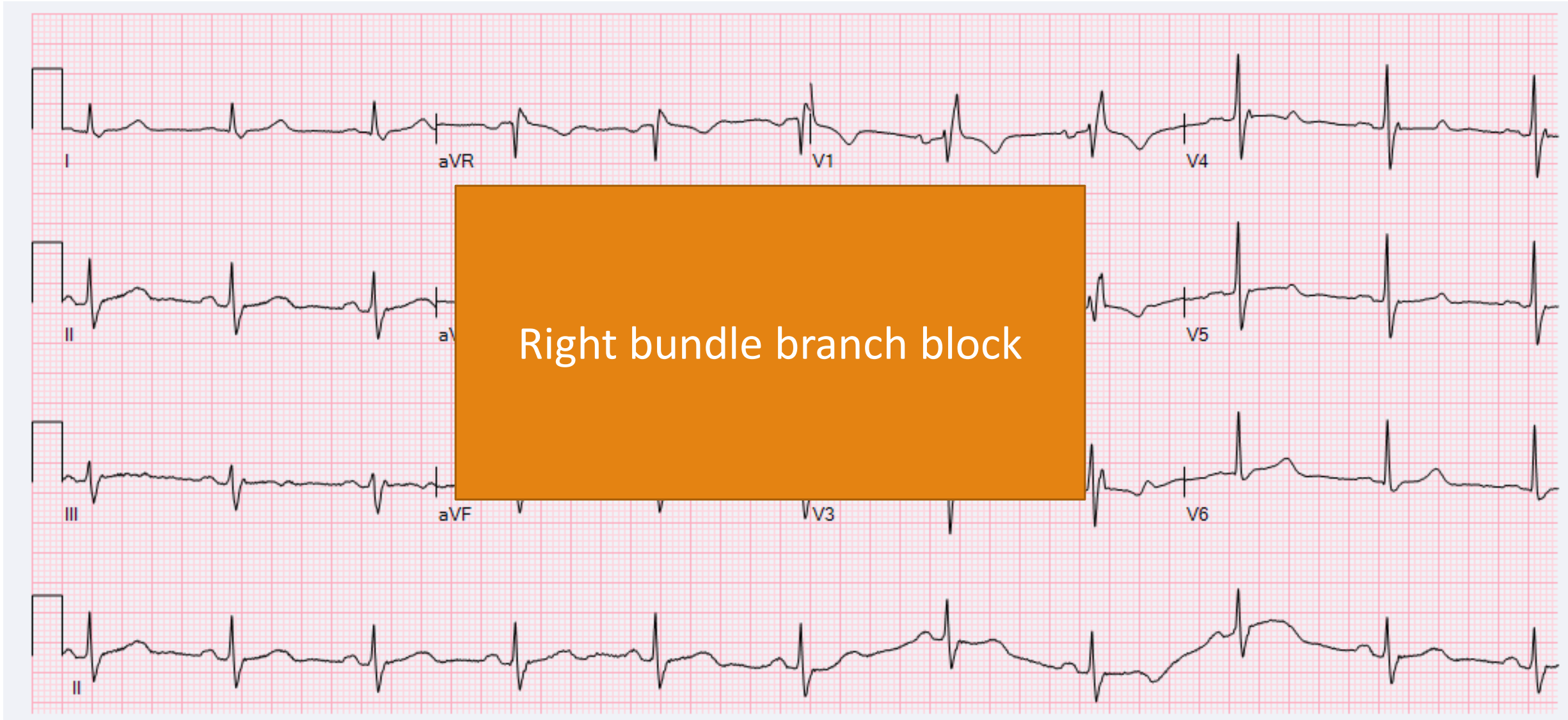
Classic HCM with septal hypertrophy

https://litfl.com


I
II
III
V4
V5
V6
Early repolarization

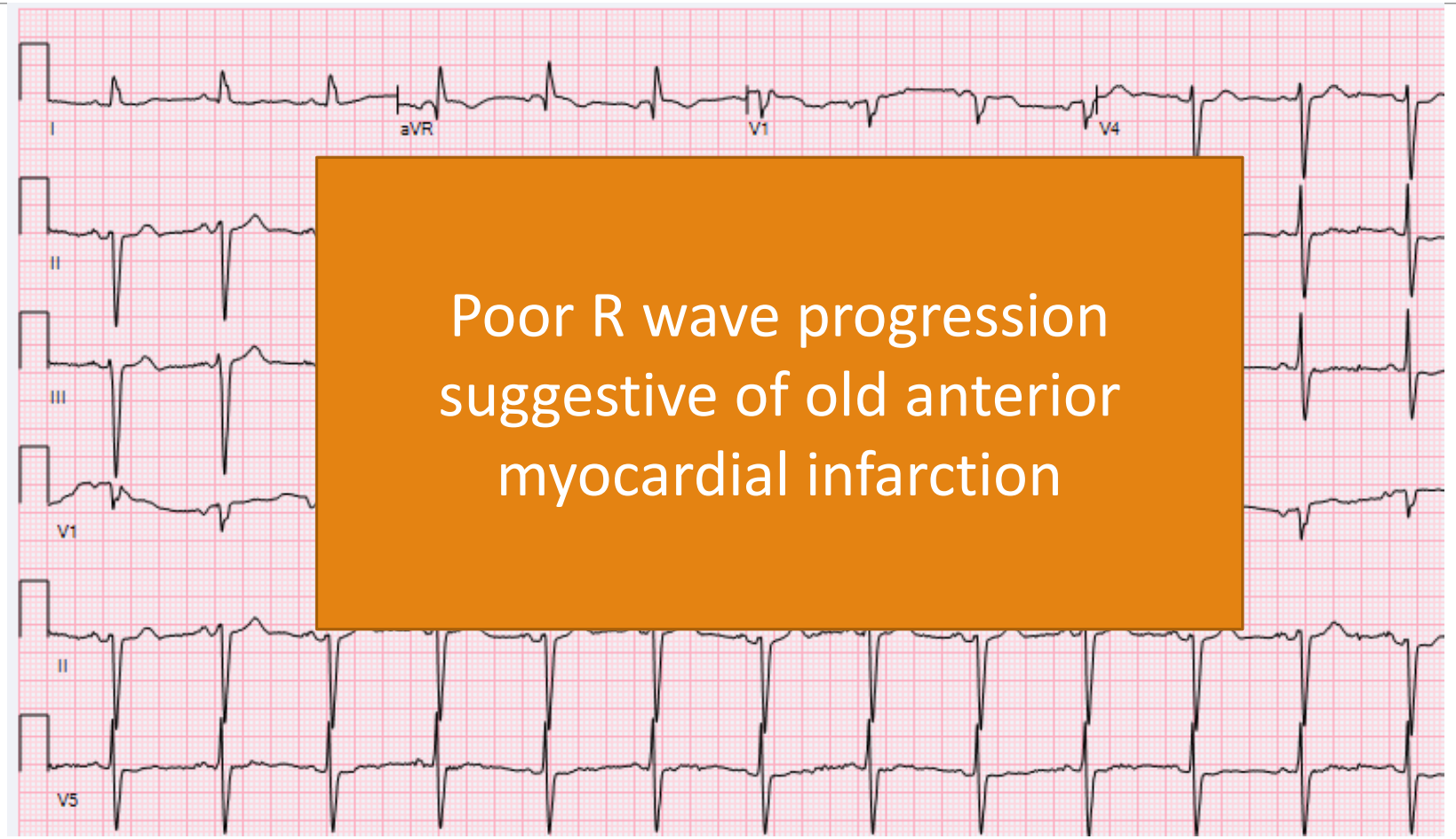


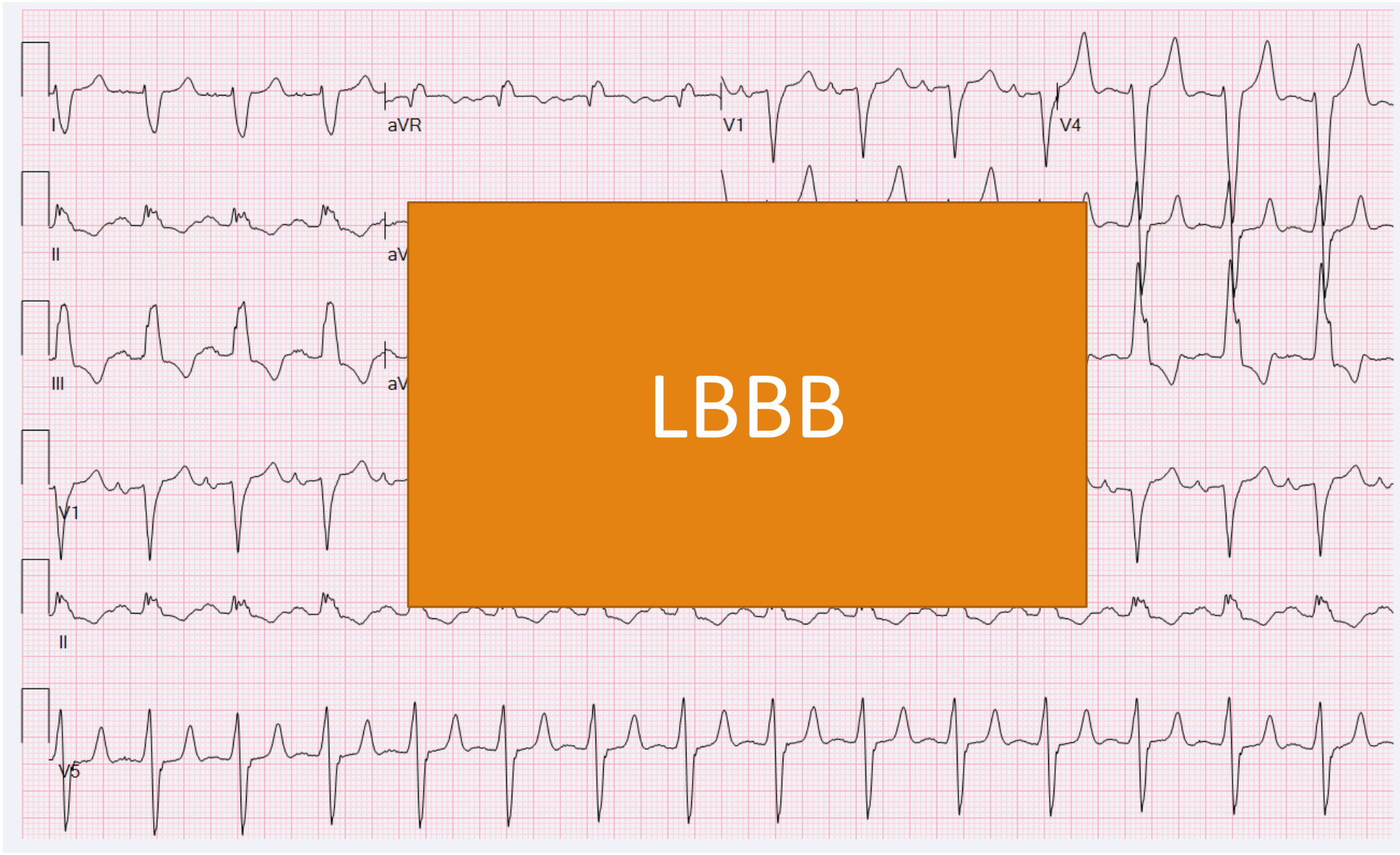
Sinus bradycardia



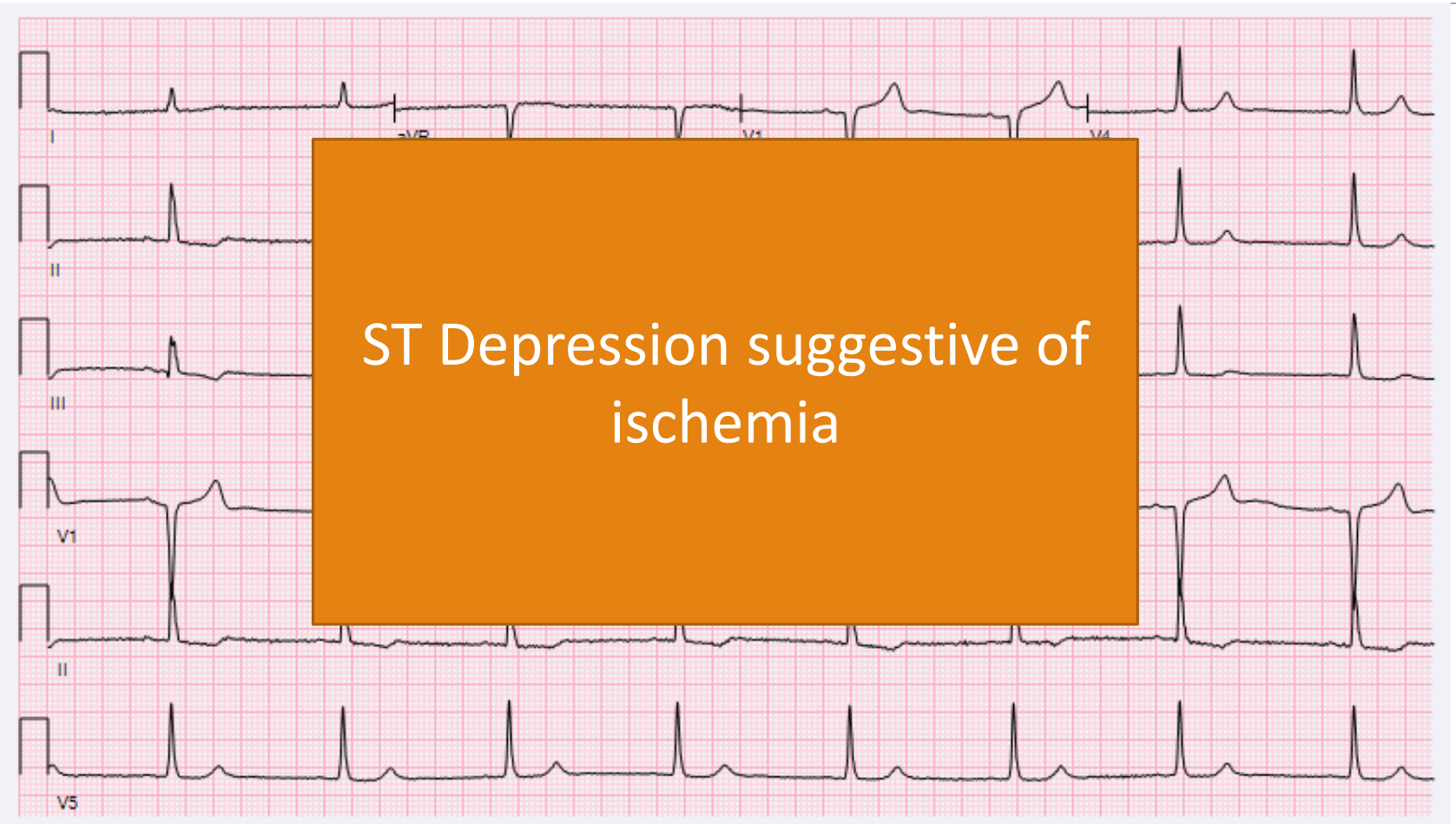
Right bundle branch block

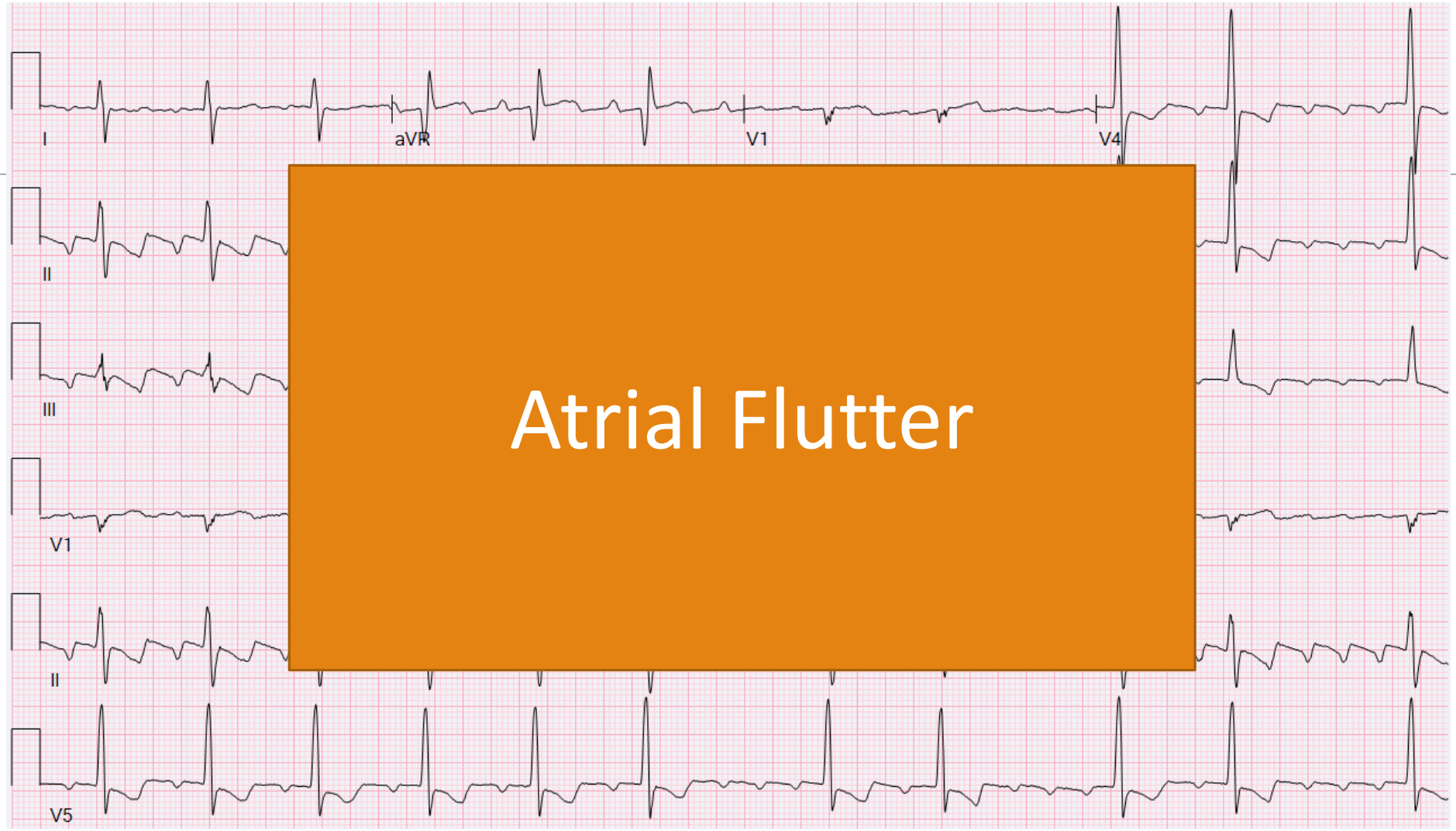
Pt with history of CP



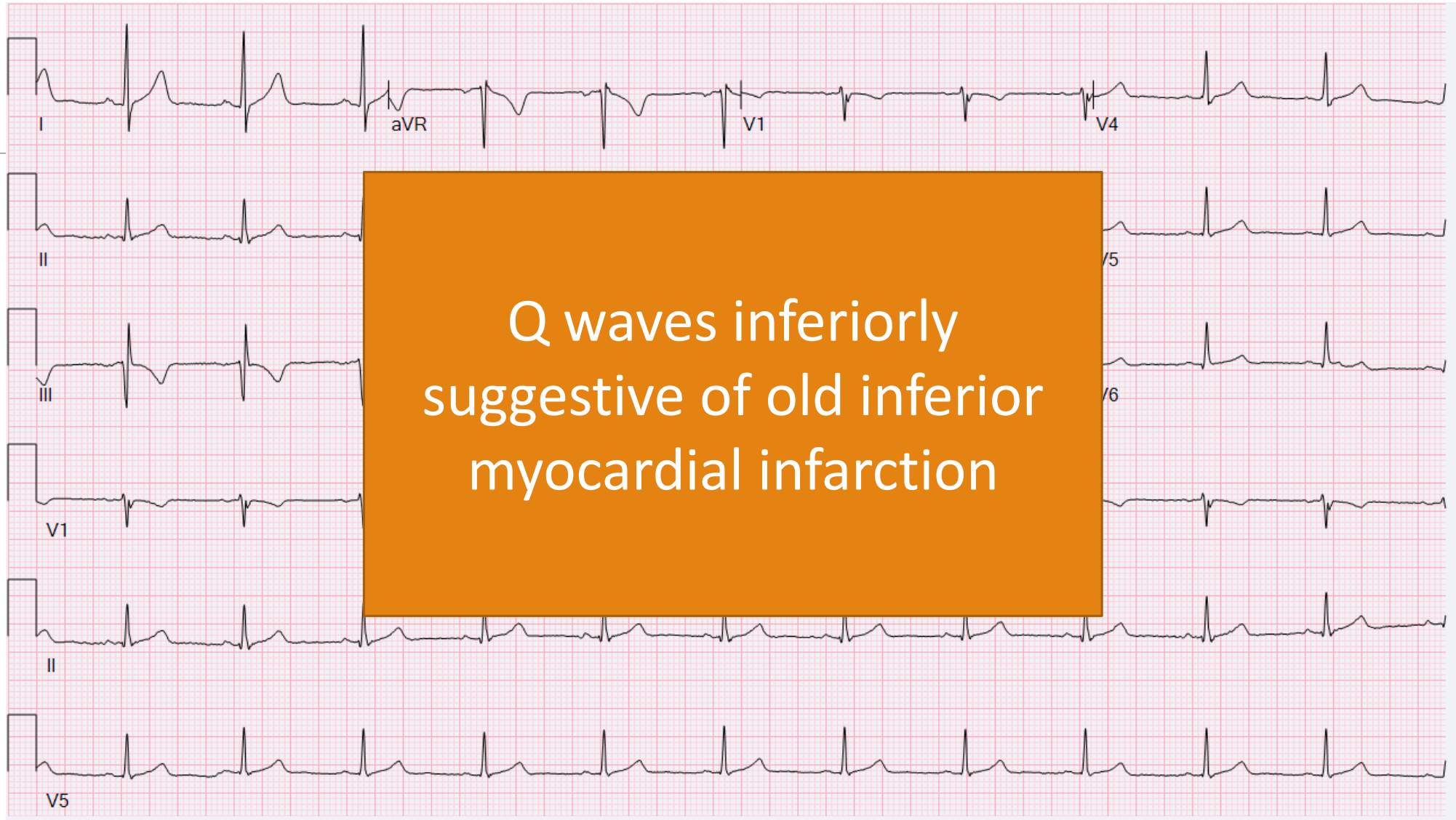

I
aVR
V1
V4
II
III
V1
II
V5
LBBB

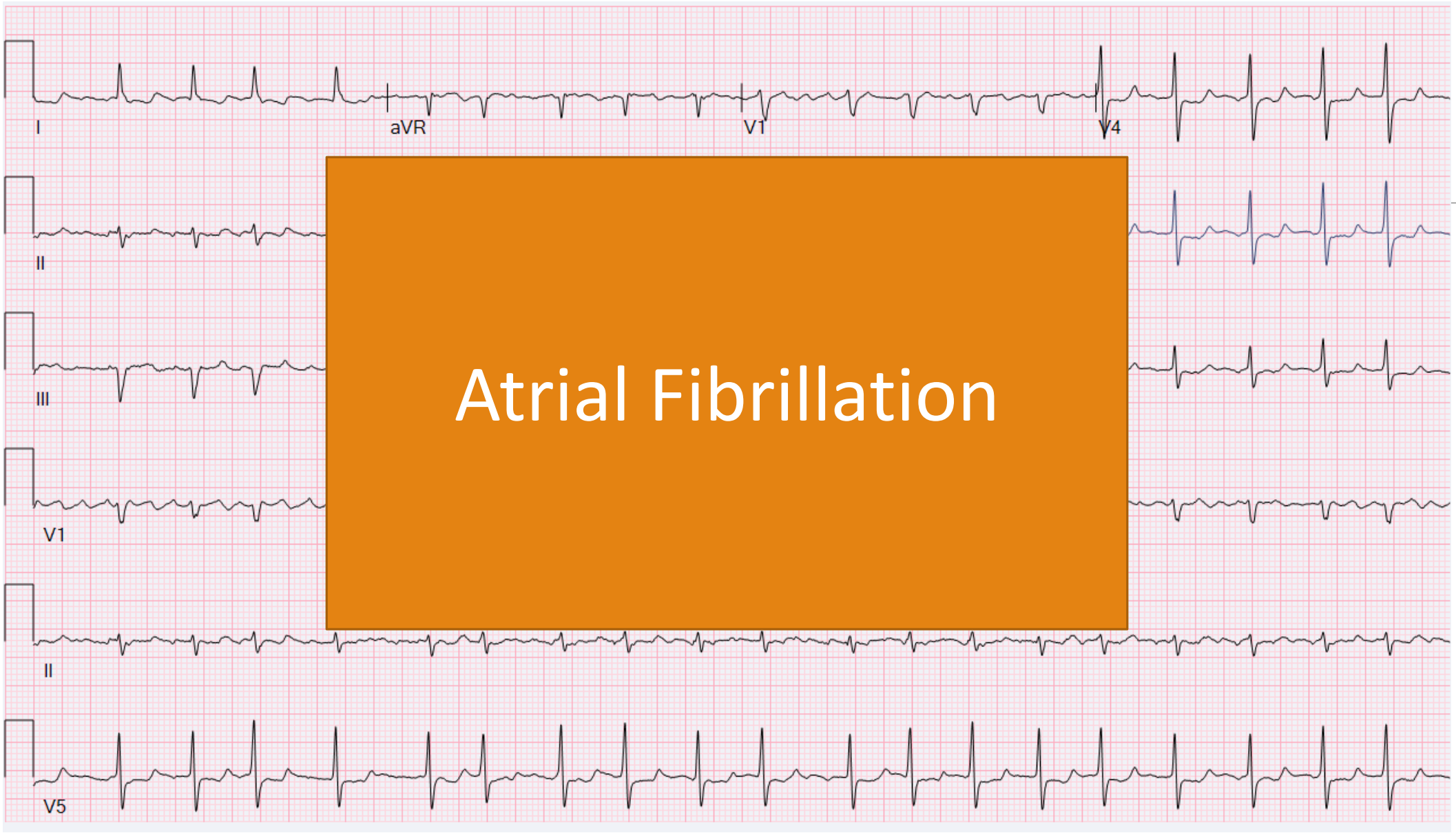
CP



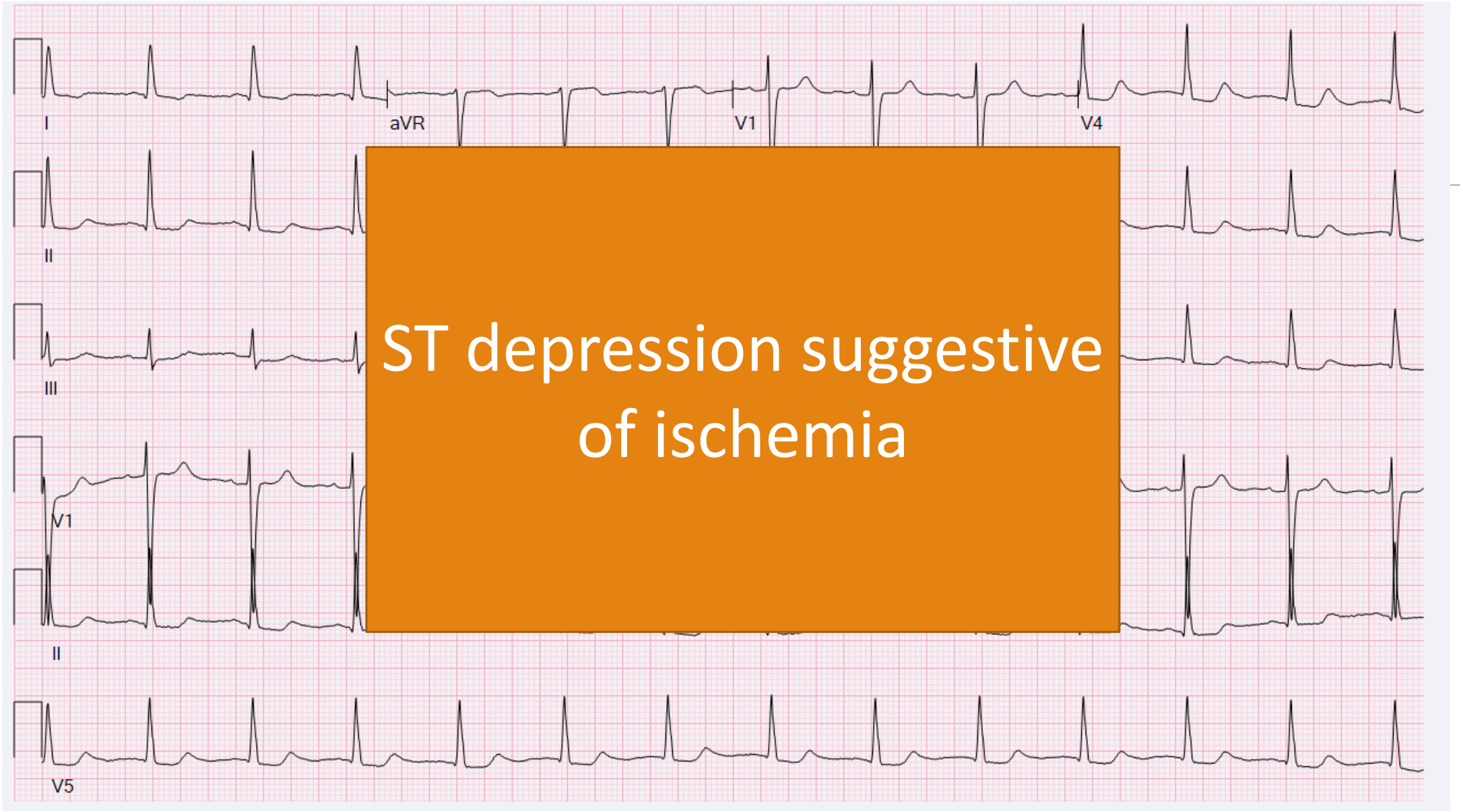


Atrial Flutter

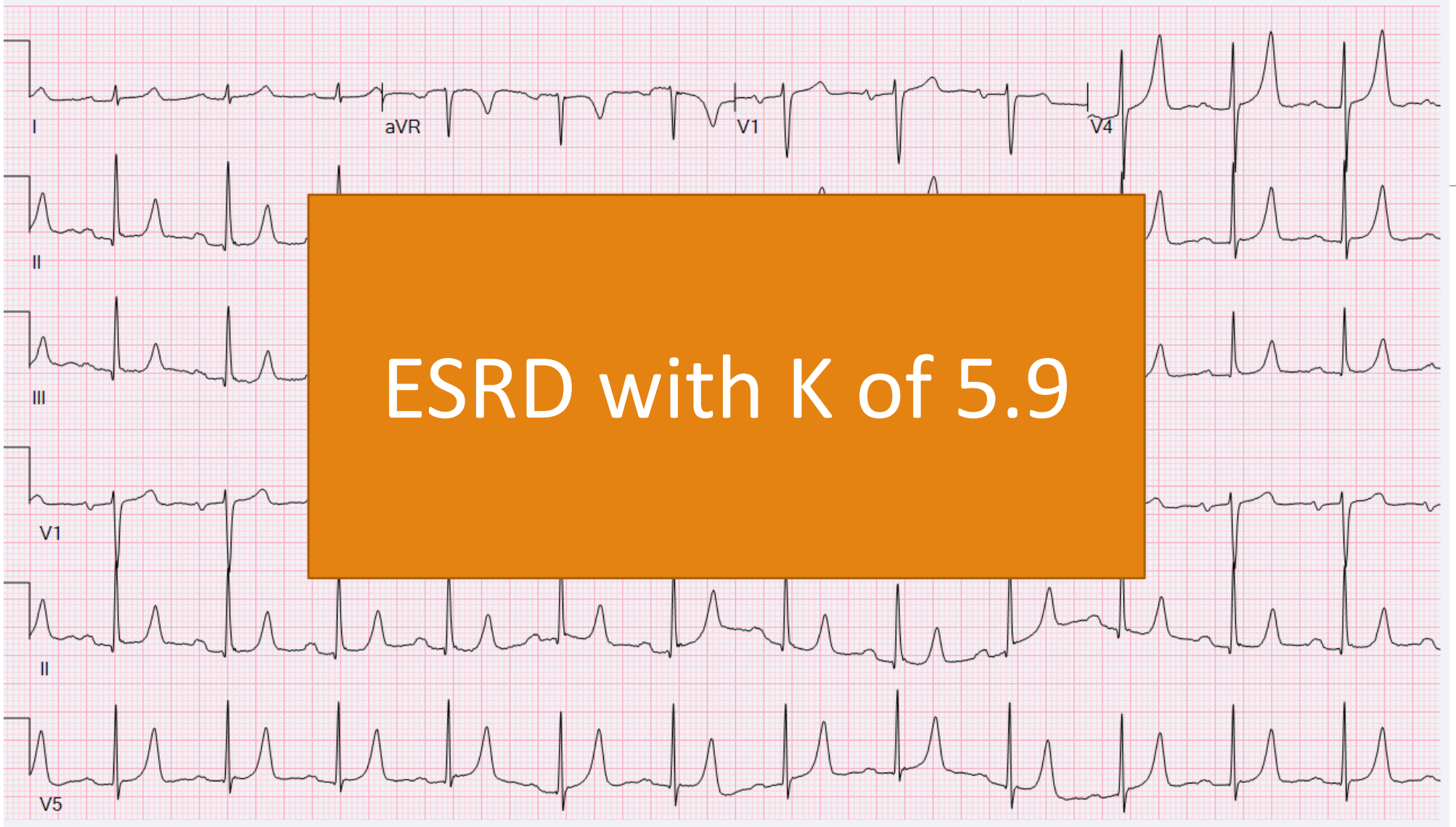

I
aVR
V1
V4
II
V5
III
V6
V1
II
V5
Q waves inferiorly suggestive of old inferior myocardial infarction



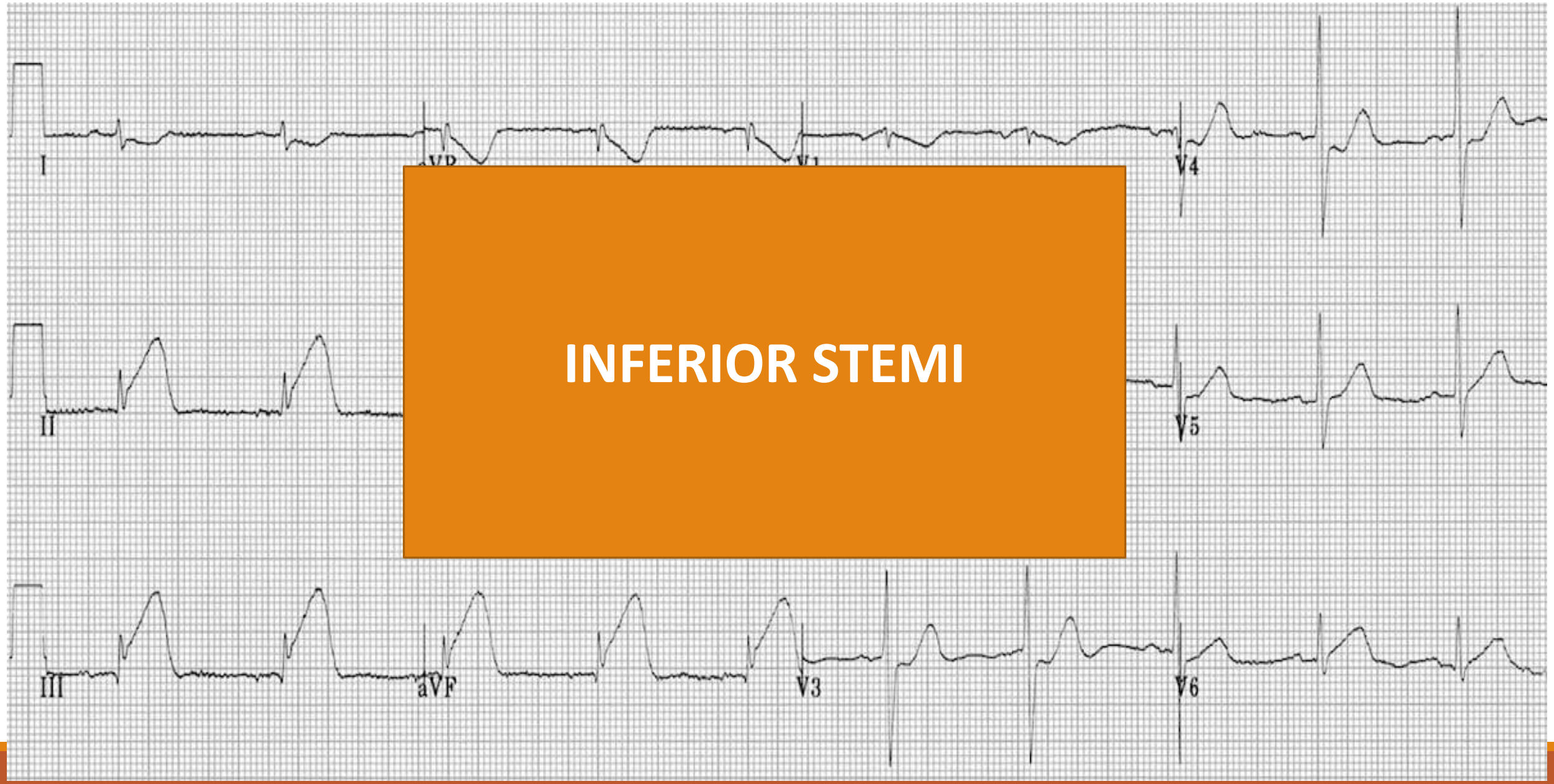
Atrial Fibrillation



ST depression suggestive of ischemia



ESRD with K of 5.9



INFERIOR STEMI

Pre: 100% Mid RCA occlusion

Post: TIMI III flow restored