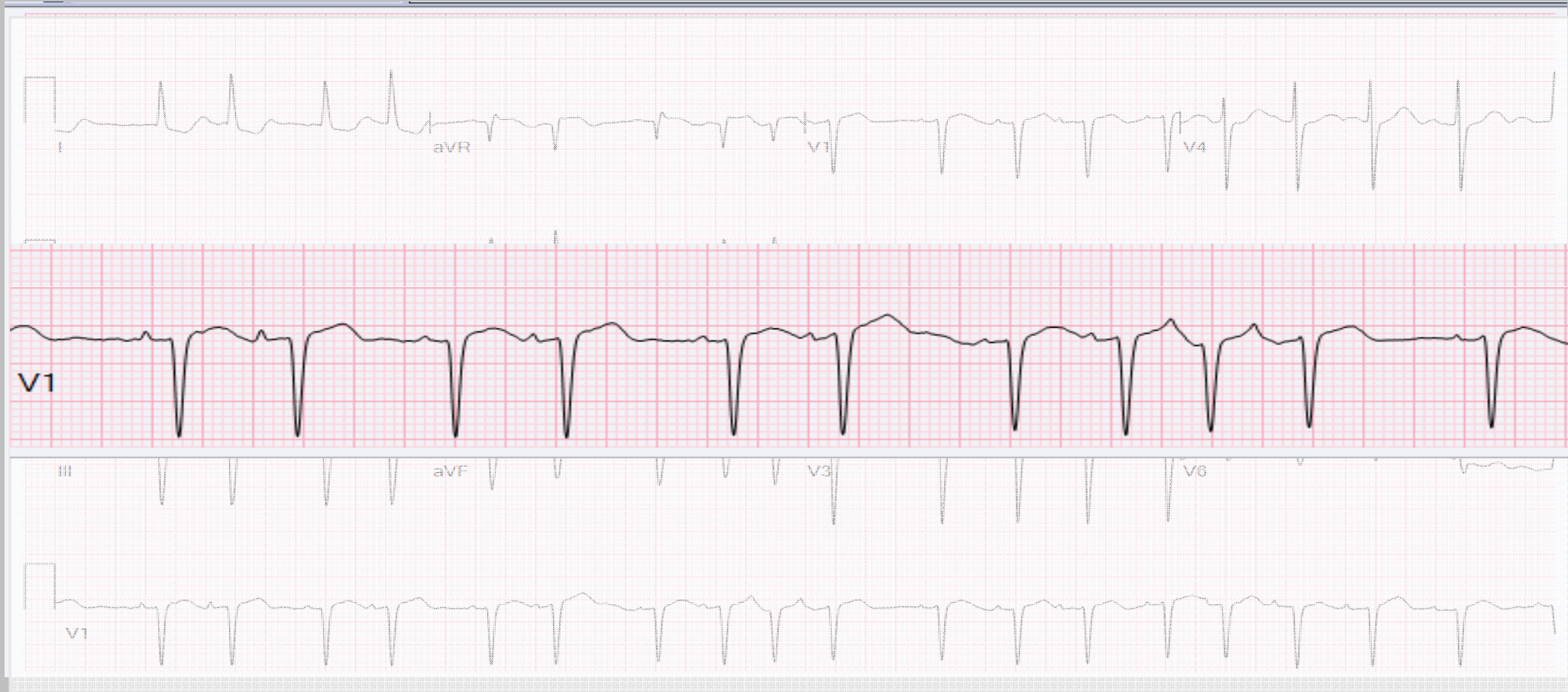
The background of the slide is a stylized American flag with red and white stripes and a blue field with white stars. The flag is slightly wavy and has a subtle halftone or dot pattern.

Disease States of America: ECG Manifestations of Systemic Disease

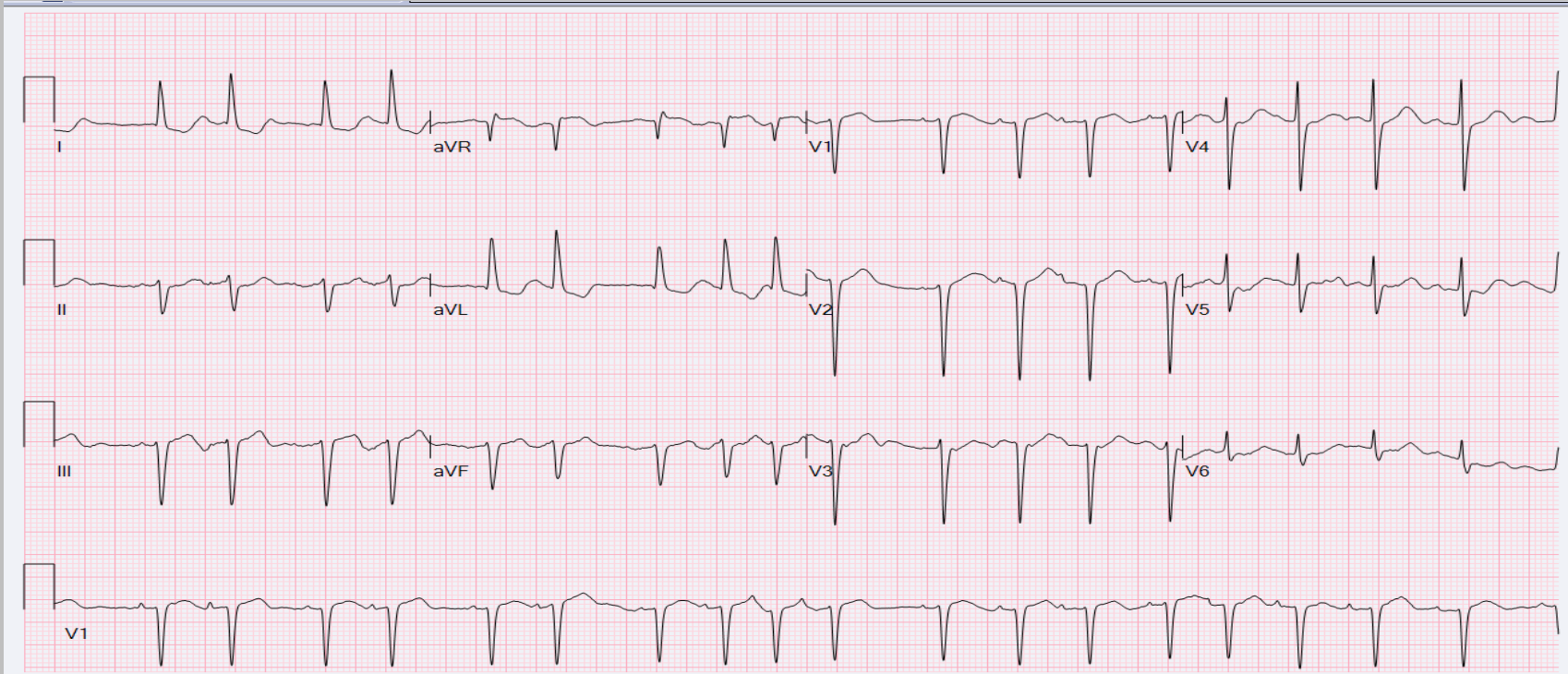
David A. Sandler, MD, FACC, FHRS
Director, Heart Rhythm Service
Oklahoma Heart Institute
Tulsa, OK

ECG 1

63 year old with shortness of breath



COPD

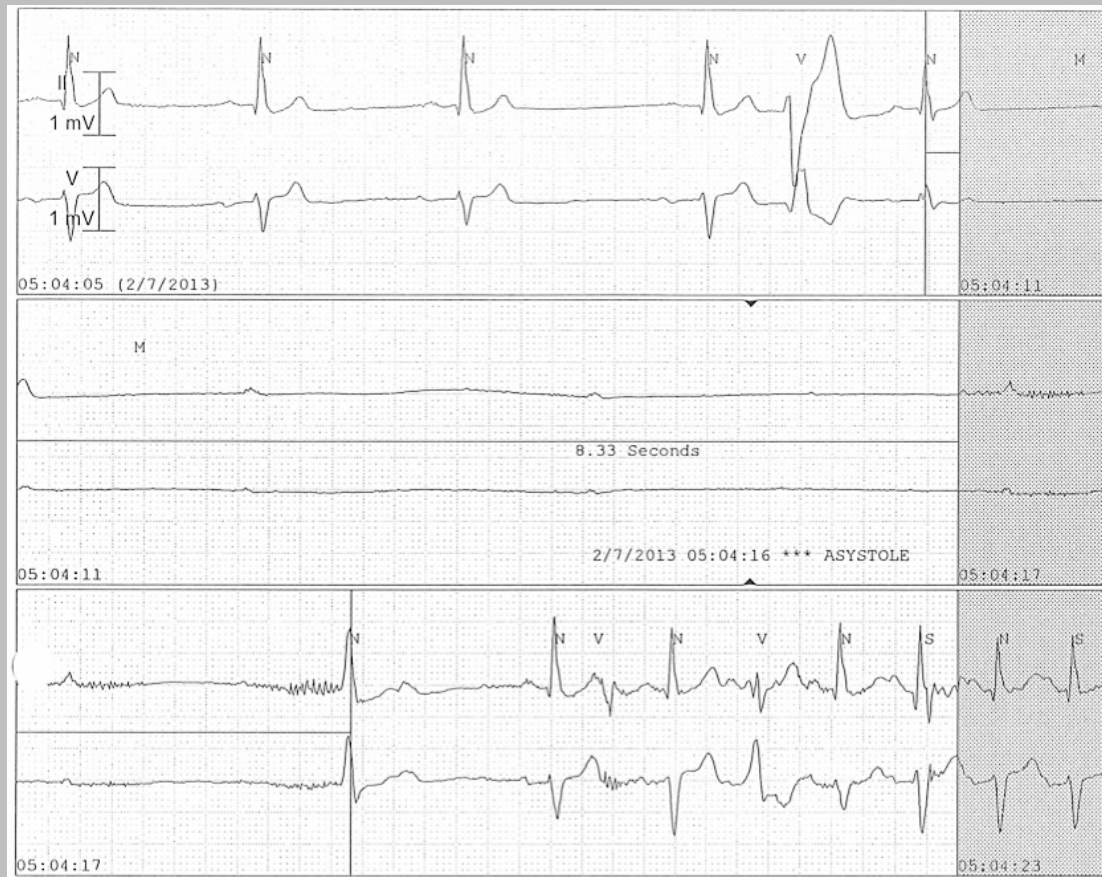


Multifocal atrial tachycardia

- Often misdiagnosed as atrial fibrillation (MAT does NOT require anticoagulation!)
- Treatment is generally supportive – beta blockers/diltiazem may be used

ECG 2

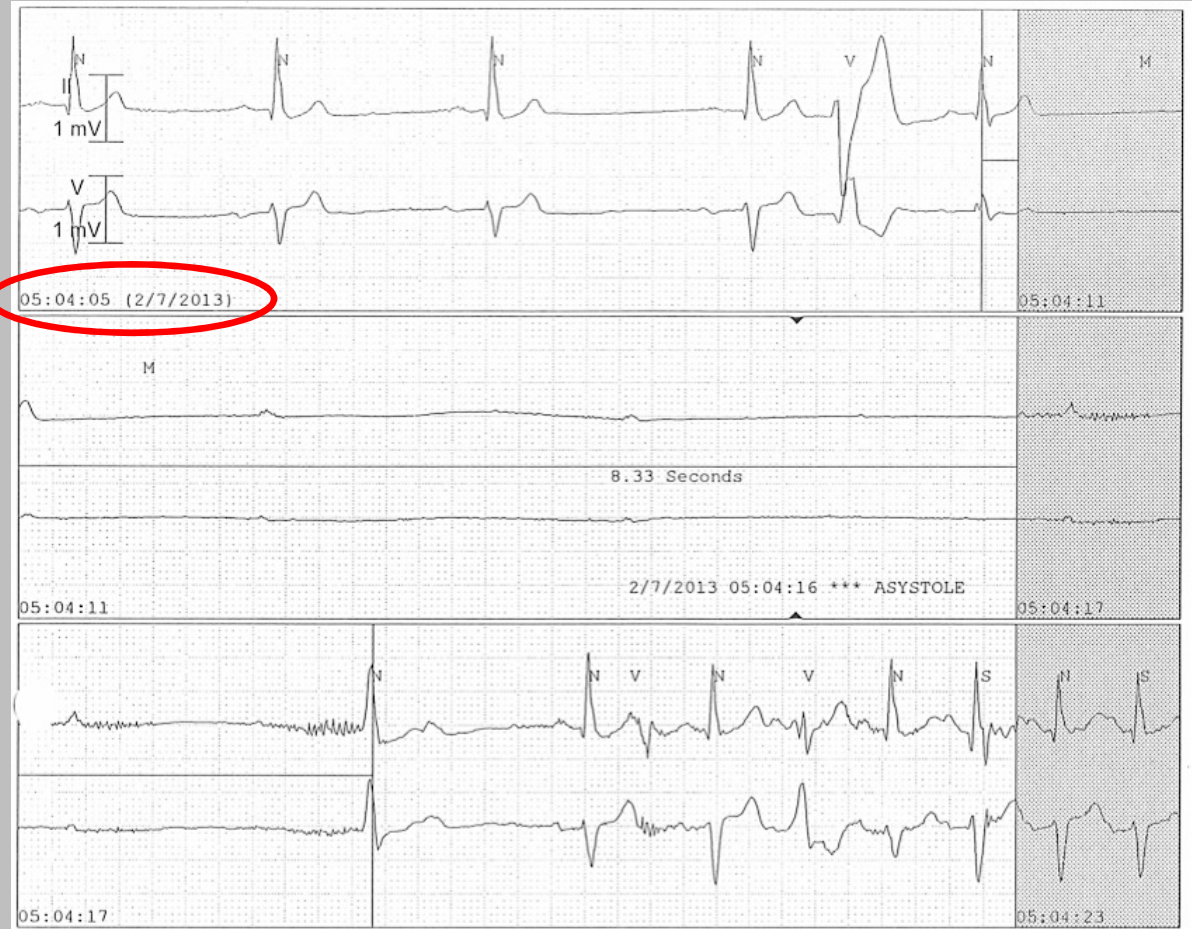
68 year old morbidly obese patient on telemetry



Obstructive Sleep Apnea Syndrome

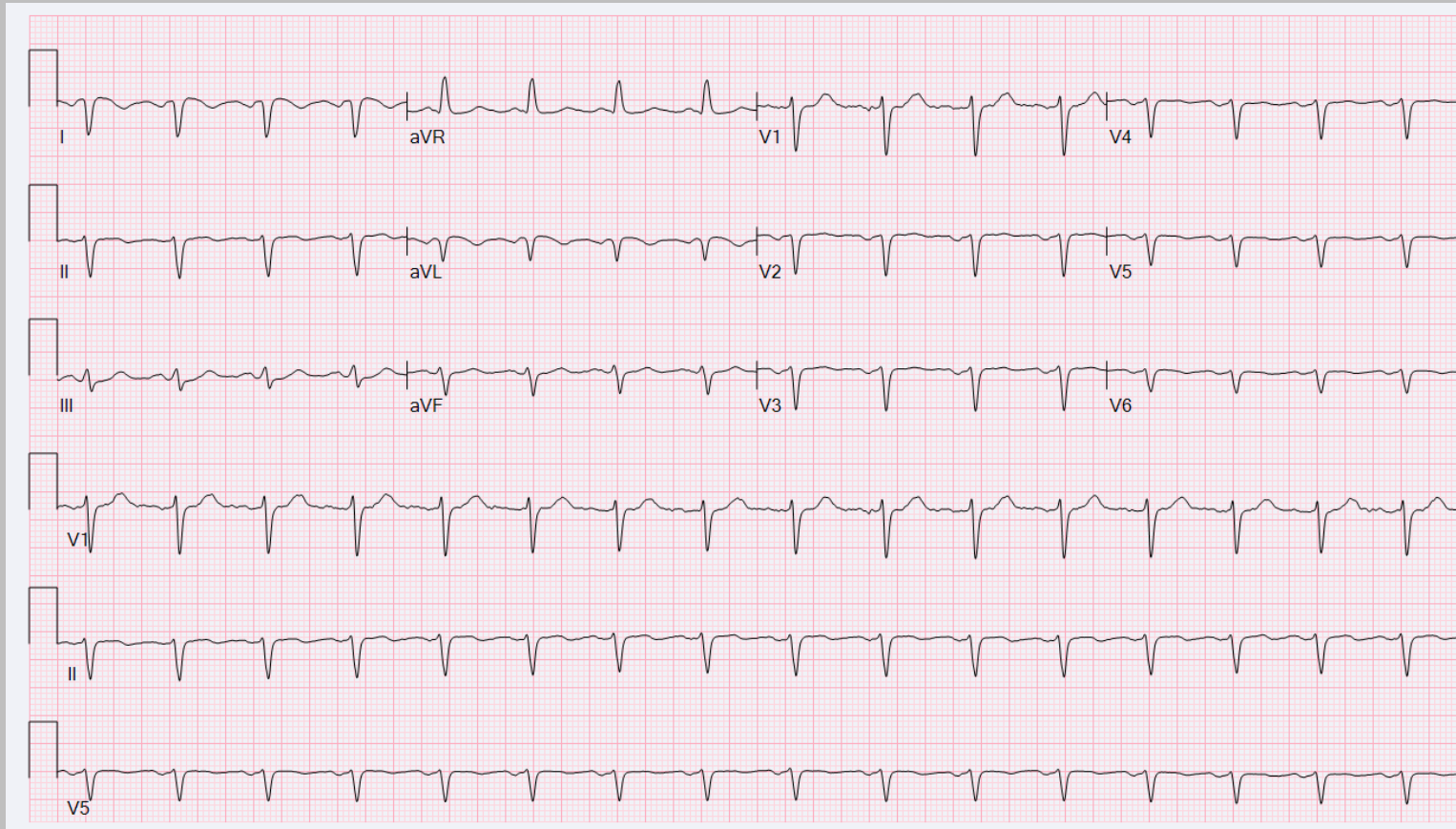
Vagal AV Block

- Sinus slowing **AND** AV Block
- Treatment should be directed at OSAS



ECG 3

35 year-old routine pre-op ECG

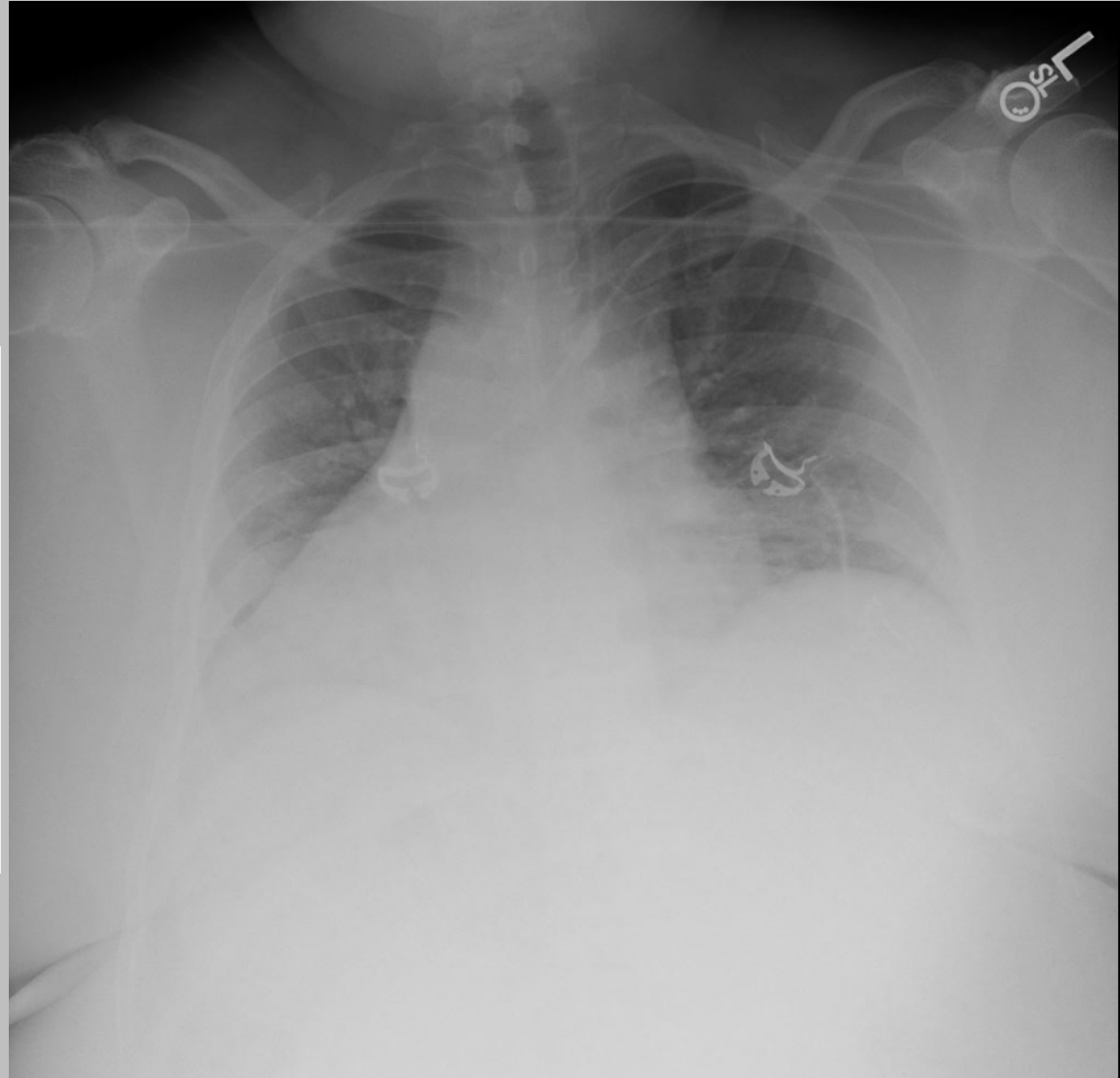
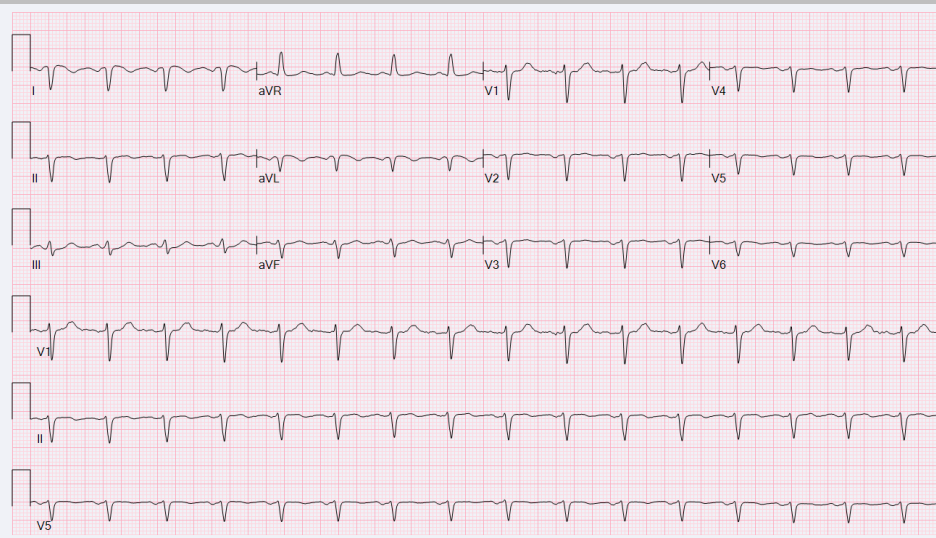


The background of the slide is a stylized American flag with red and white stripes and a blue field with white stars. The flag is slightly wavy and has a subtle halftone dot pattern.

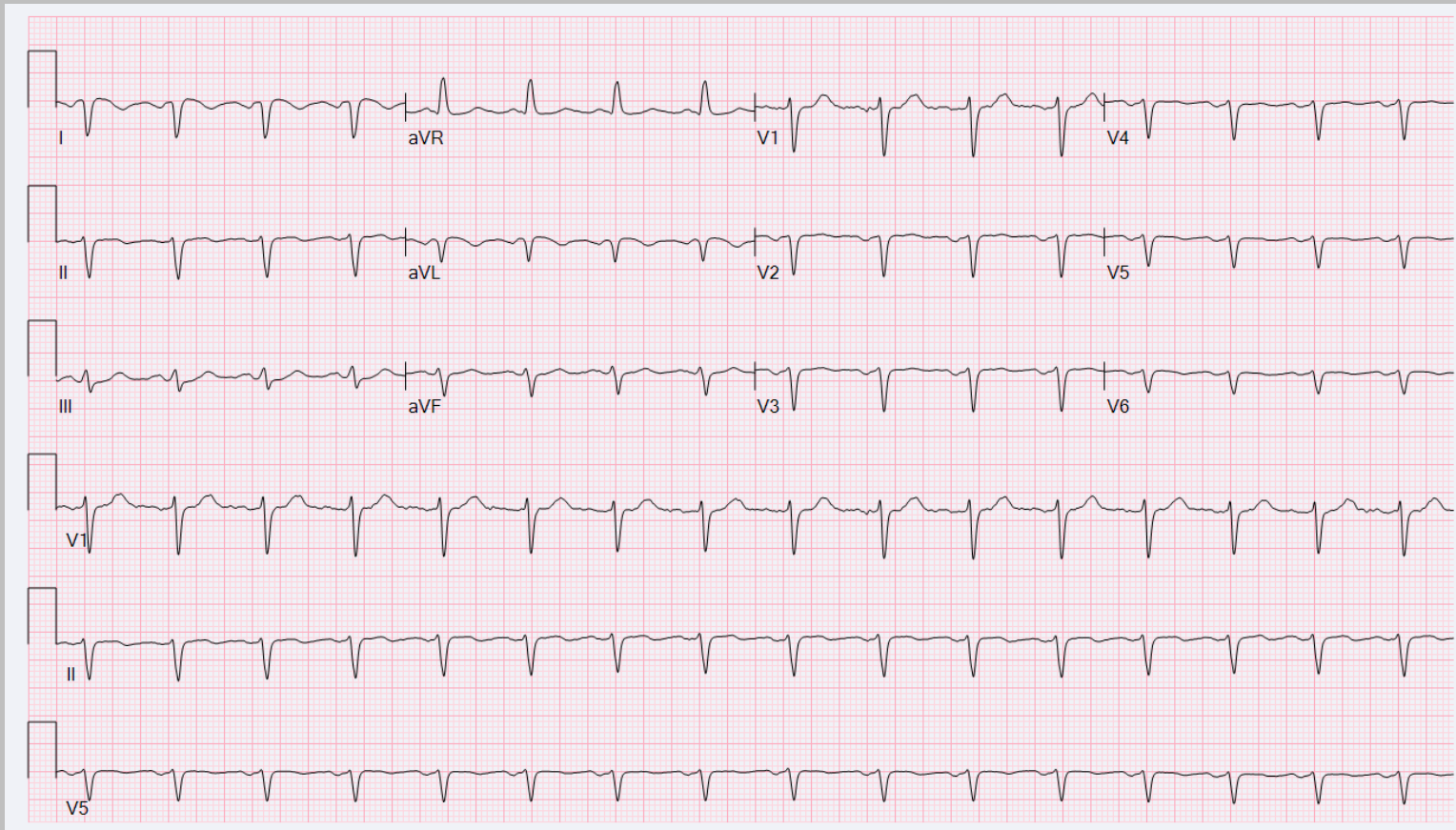
35 year-old routine pre-op ECG

1. Normal ECG
2. Limb lead reversal
3. Lateral MI
4. Dextrocardia

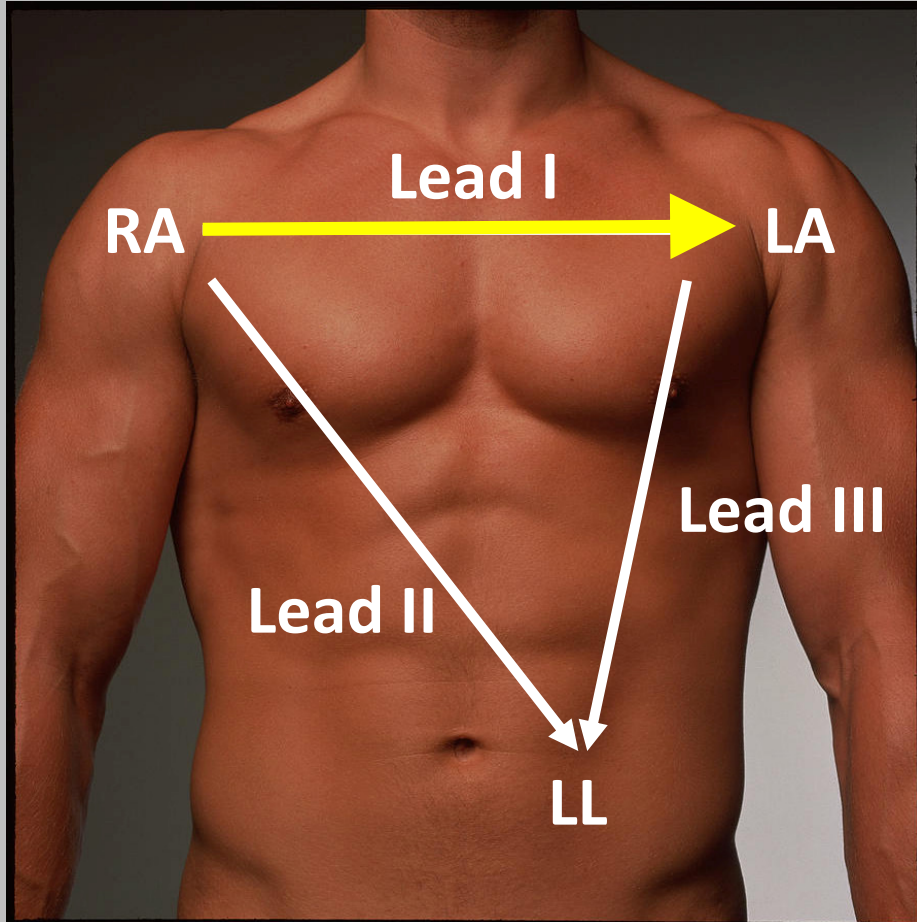
CXR



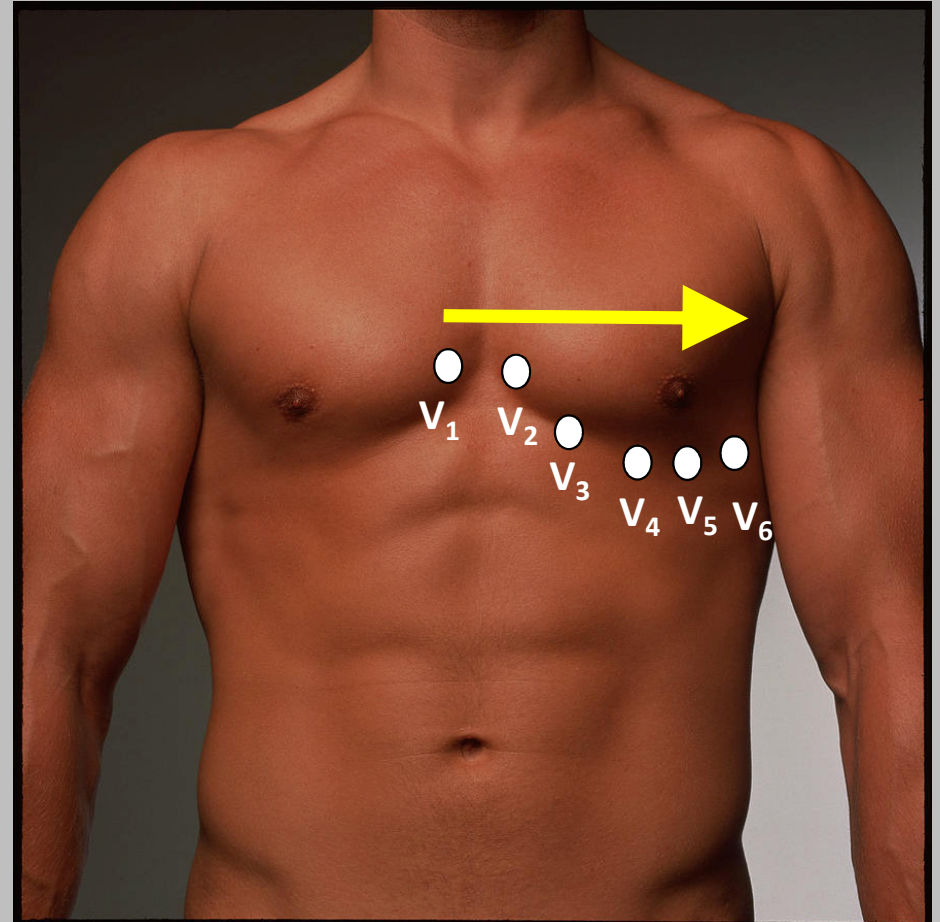
Dextrocardia



Limb Leads



Precordial Leads



Lead I

V6

Normal



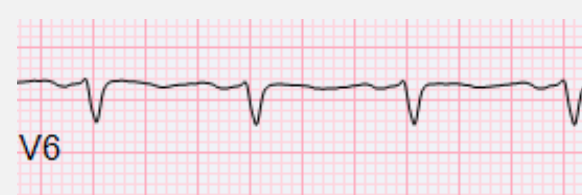
Limb Lead Reversal



Old Lateral MI

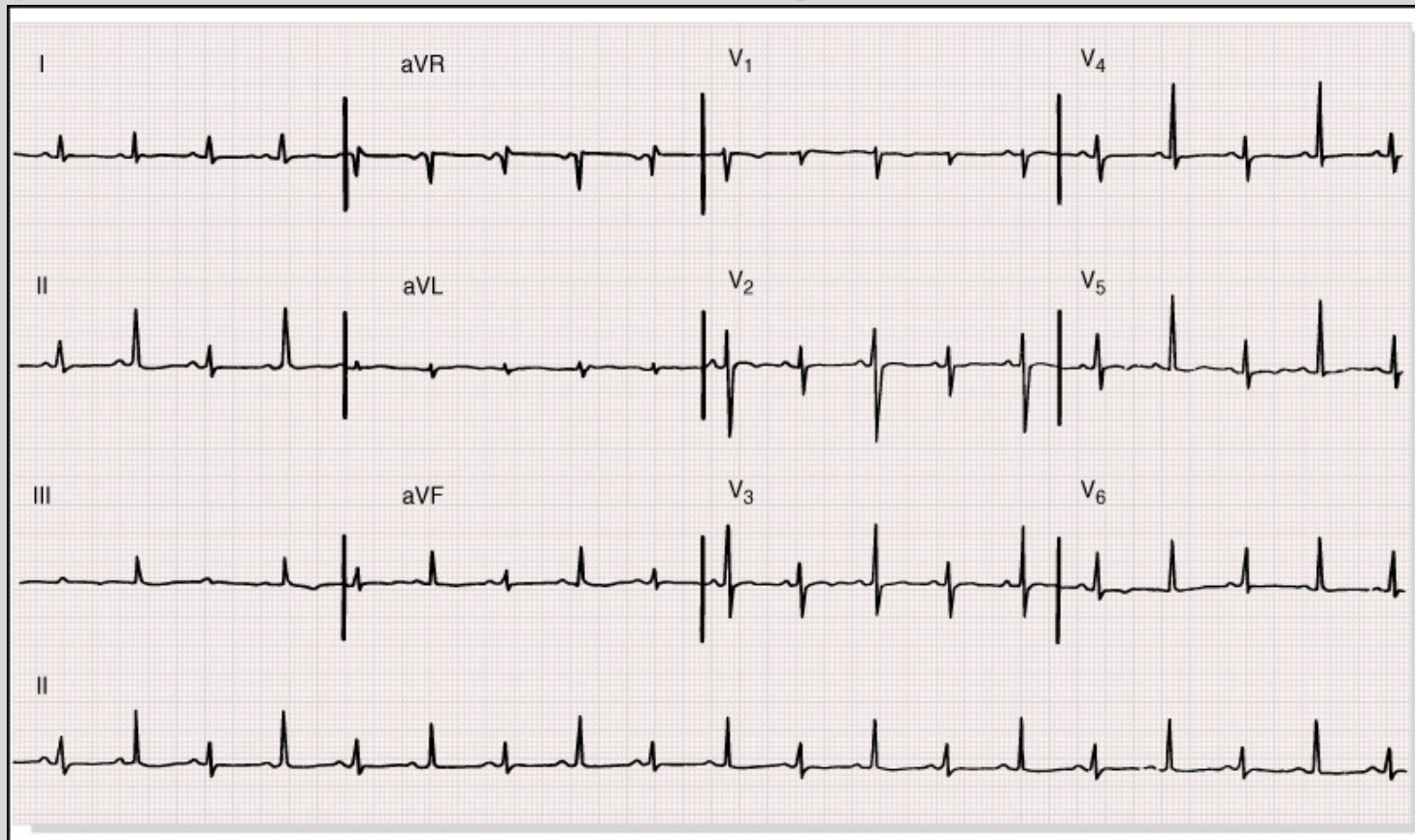


Dextrocardia

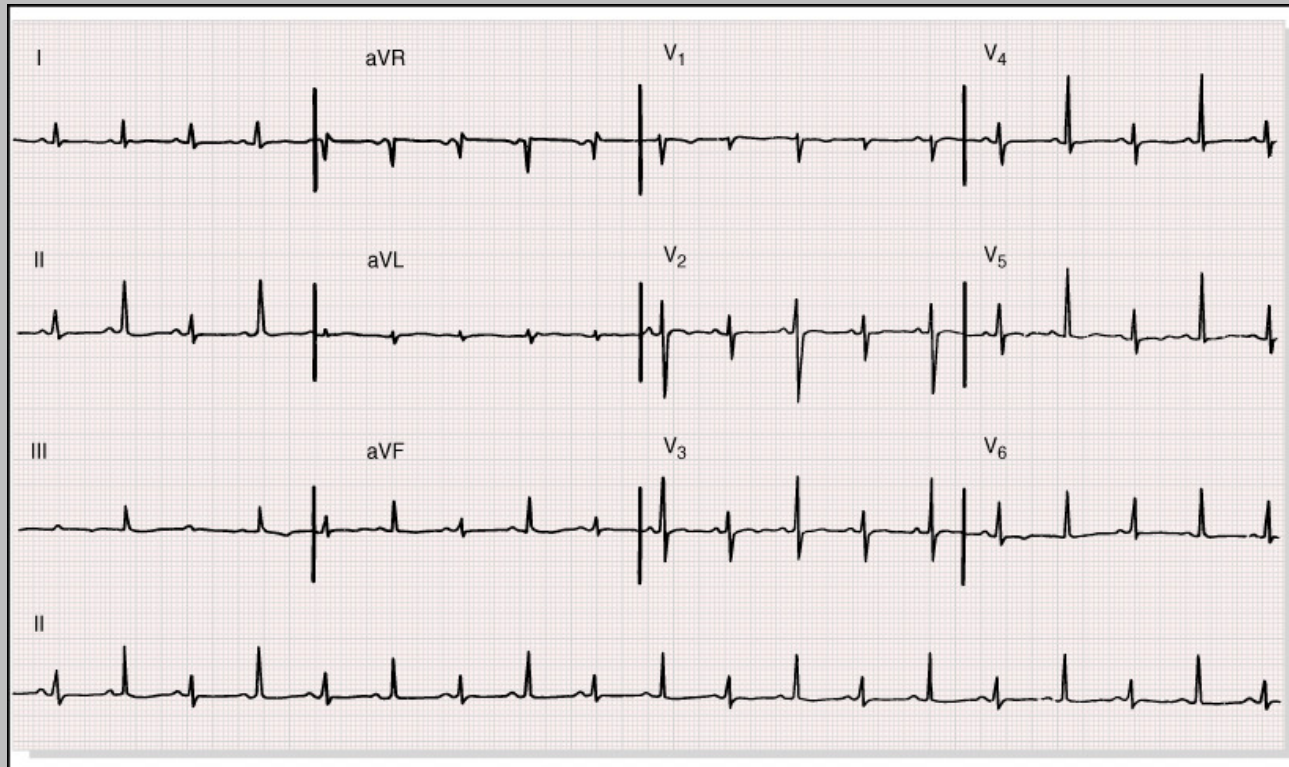


ECG 4

55 year old with cancer presents with SOB



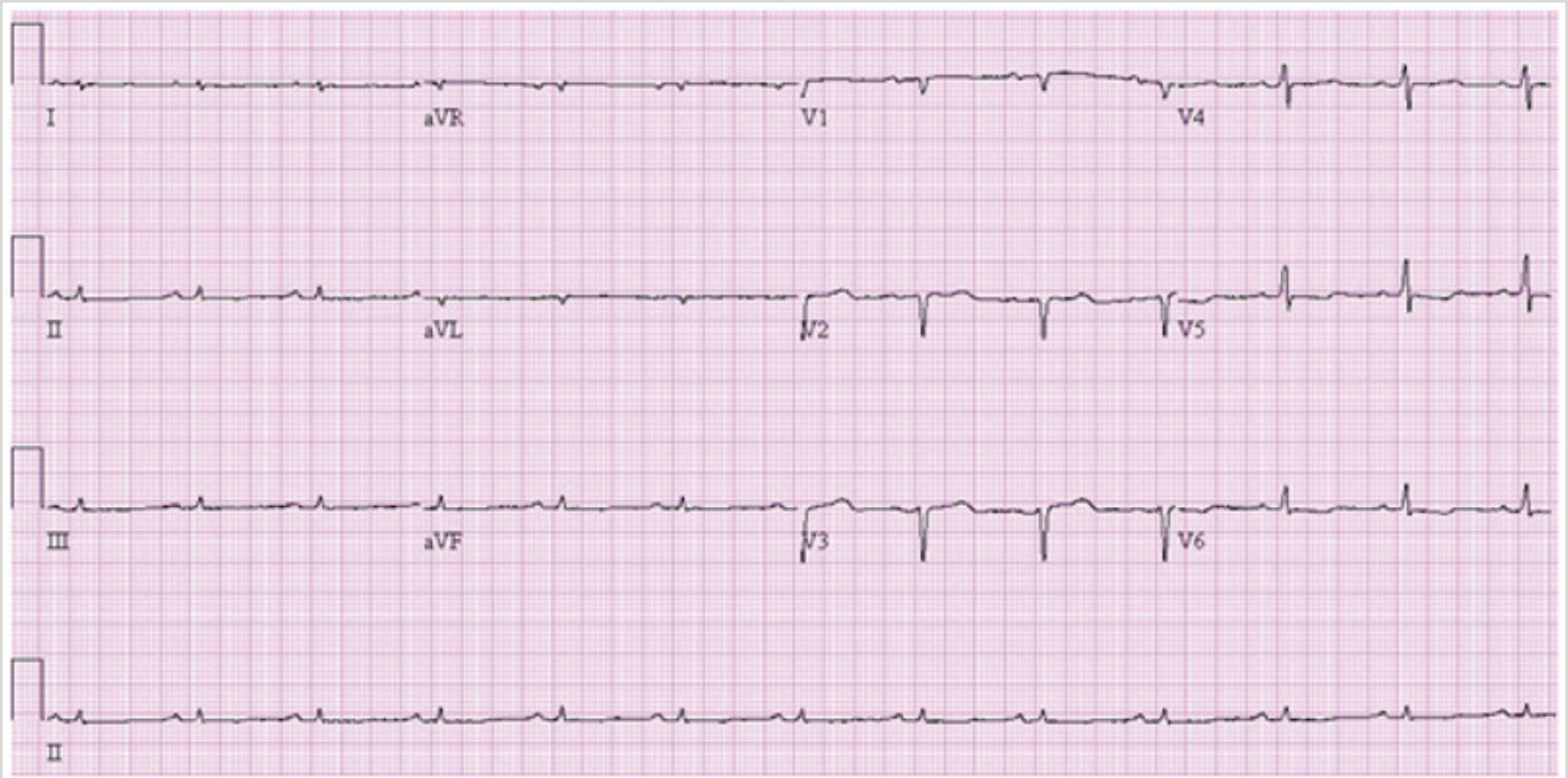
Large Pericardial Effusion with Tamponade



- Electrical alternans
- Low voltage
- Tachycardia

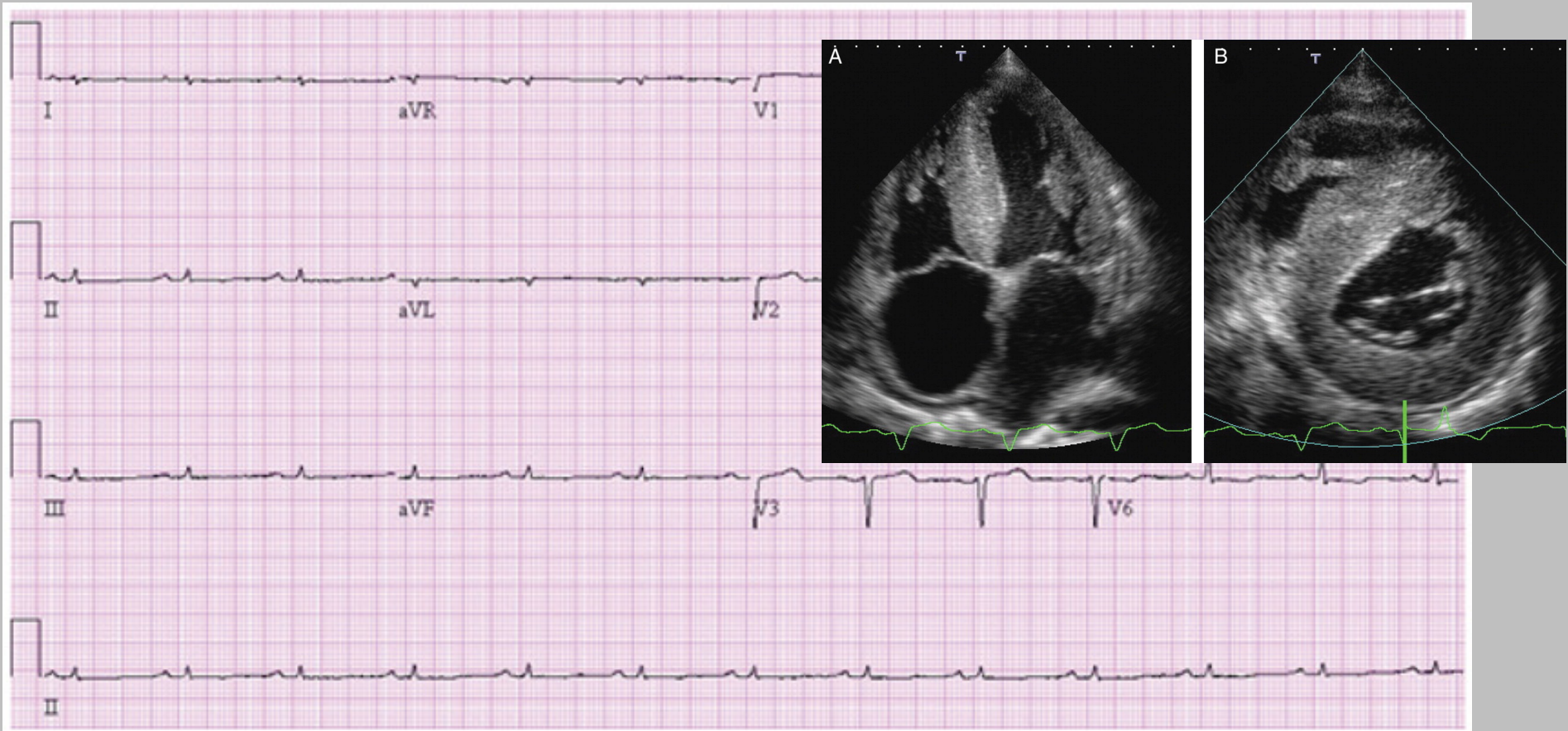
ECG 5

77 year old with fatigue, dyspnea

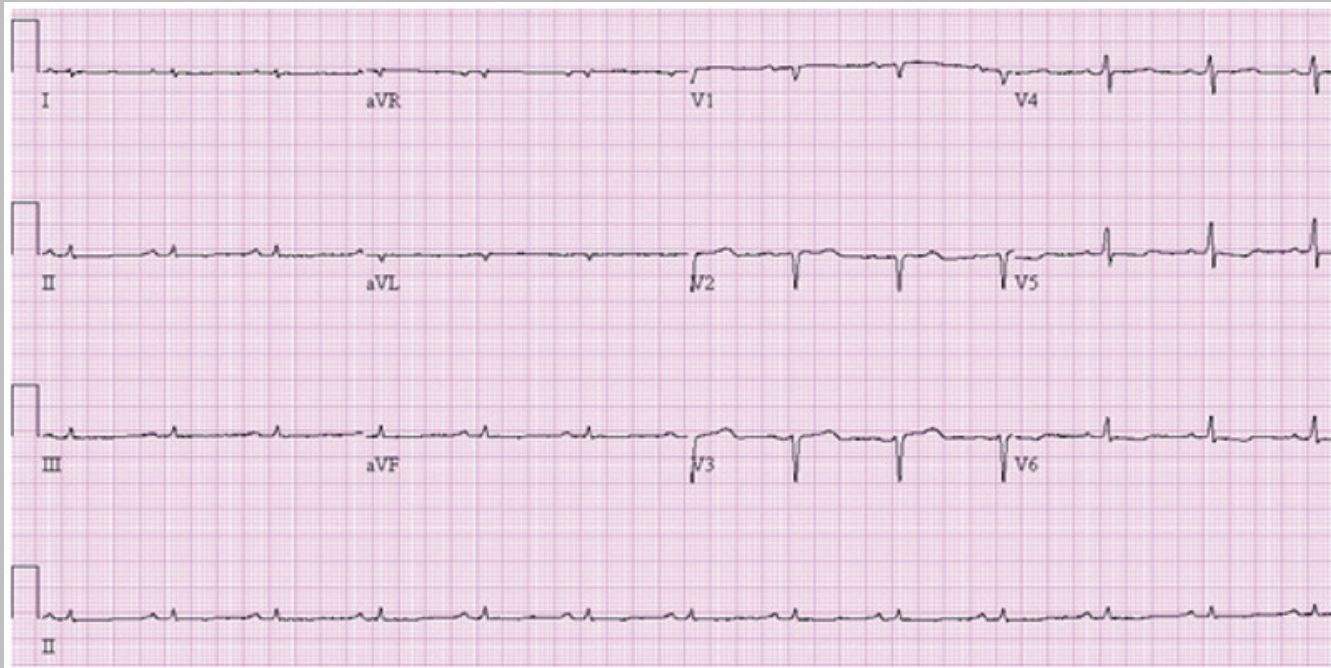


ECG 5

77 year old with fatigue, dyspnea

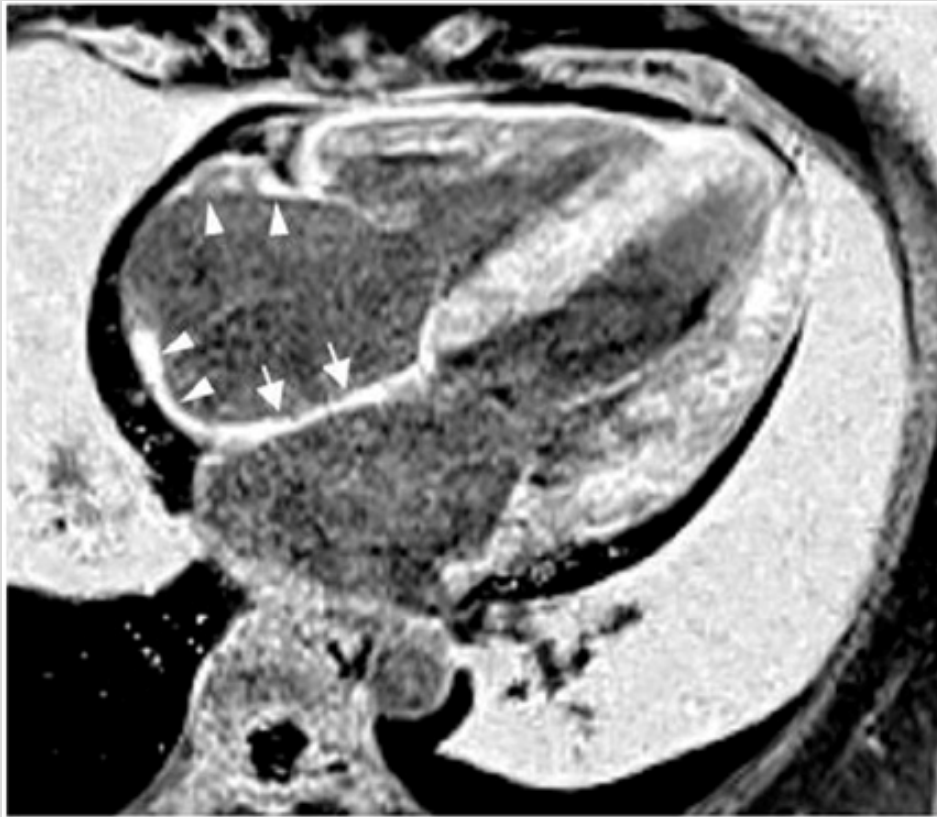


Cardiac Amyloidosis

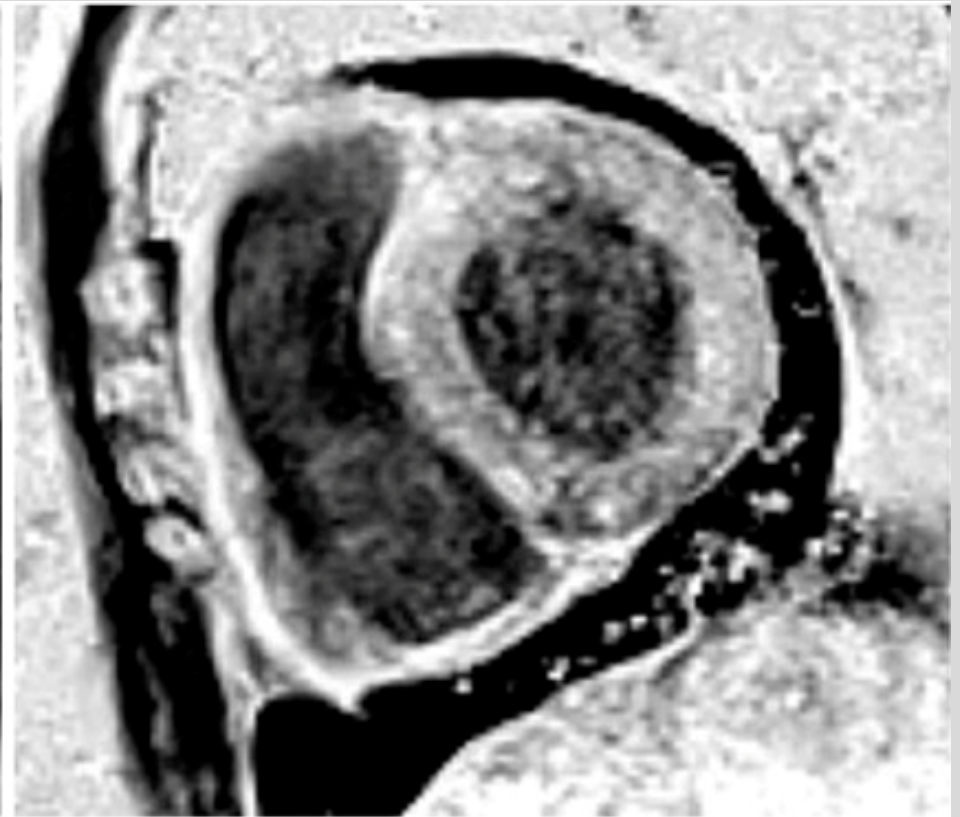


- Many forms can be associated with cardiac involvement
- Significant advances in diagnosis and treatment in last decade
- Low-voltage EKG with cardiac hypertrophy is clue
- AF, VT, varying degrees of AV block, sinus brady are also seen

MRI of Amyloid



a



b

ECG 6

50 year old with 2 hours of palpitation

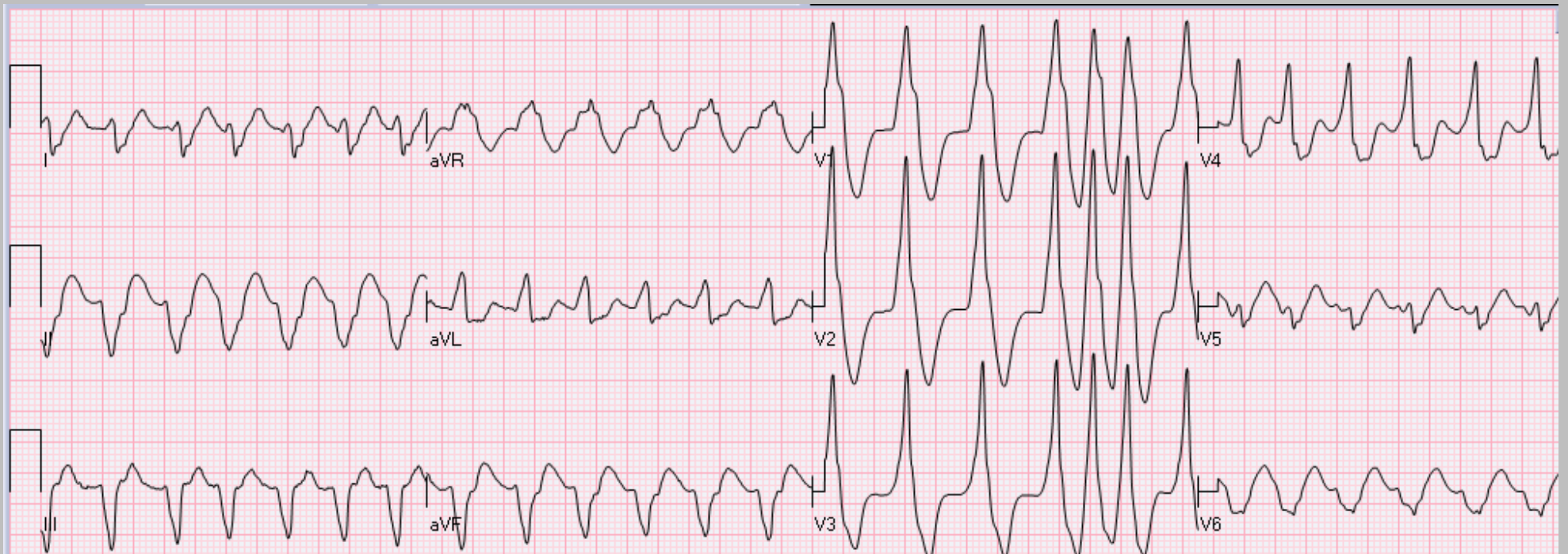


The background of the slide is a stylized American flag with red and white stripes and a blue field with white stars. The flag is slightly wavy and has a subtle halftone dot pattern.

50 year old with 2 hours of palpitation

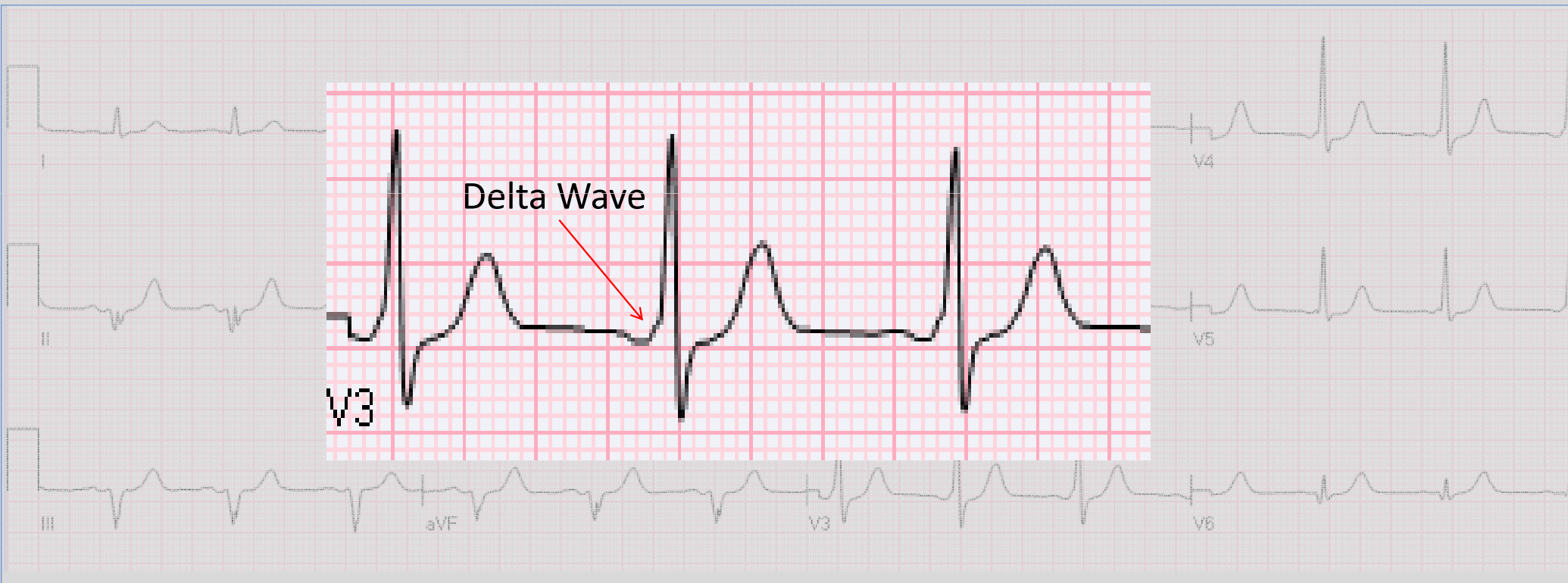
1. Torsades de Pointes
2. Atrial fibrillation with WPW
3. Monomorphic VT
4. Artifact

Wolff-Parkinson-White (with atrial fibrillation)



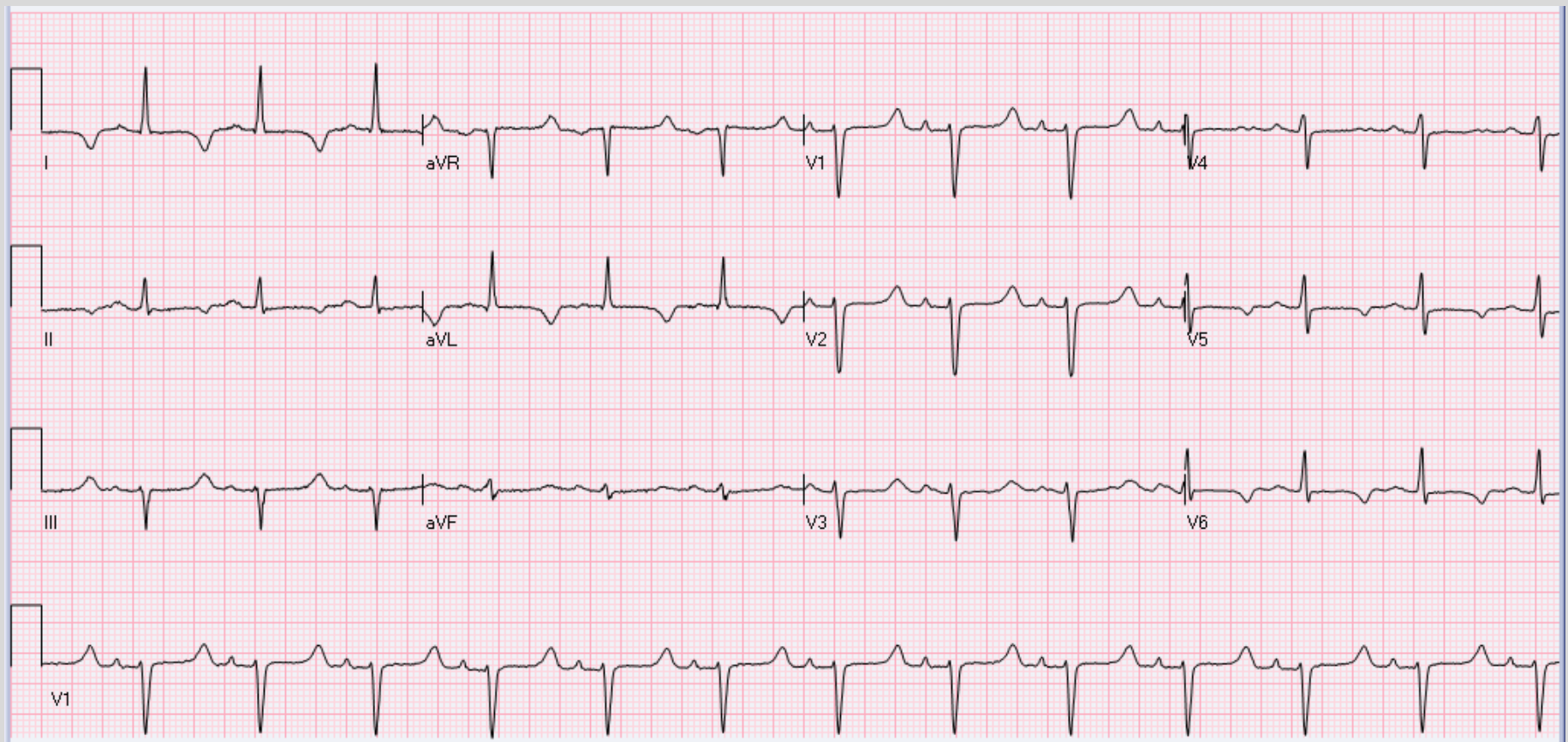
- Variable pre-excitation
- Often confused for ventricular tachycardia

Post-Conversion ECG

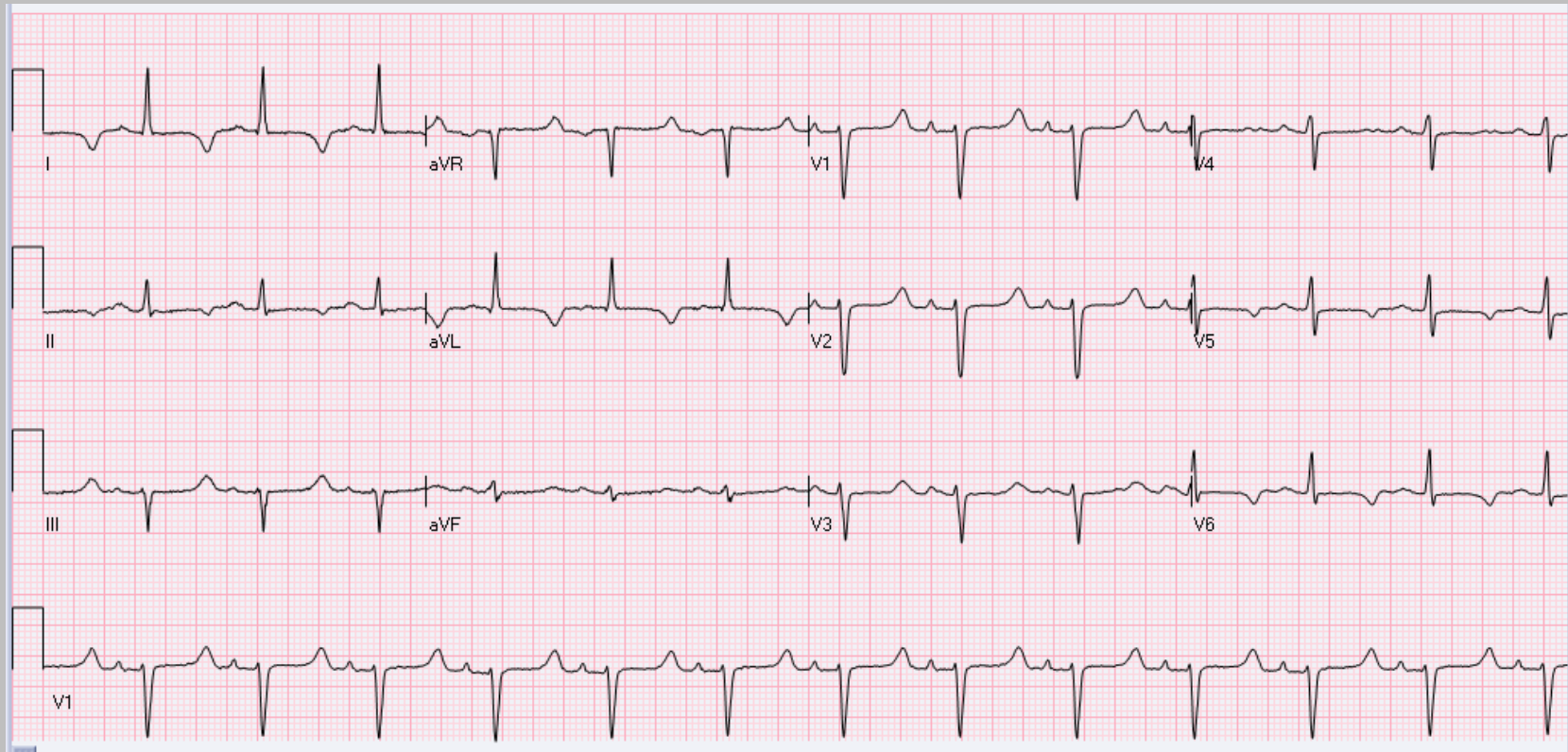


ECG 7

55 year old with recent neck surgery



Hypocalcemia/hypoparathyroidism



- Prolonged QT - Hypoparathyroidism (absence of PTH secretion)
 - Postoperative
 - Autoimmune (isolated or part of polyglandular autoimmune syndrome)
 - Congenital (mutations of CaSR, PTH, and parathyroid aplasia)

QT Prolongation



T Wave Prolongation – Drugs, Ischemia



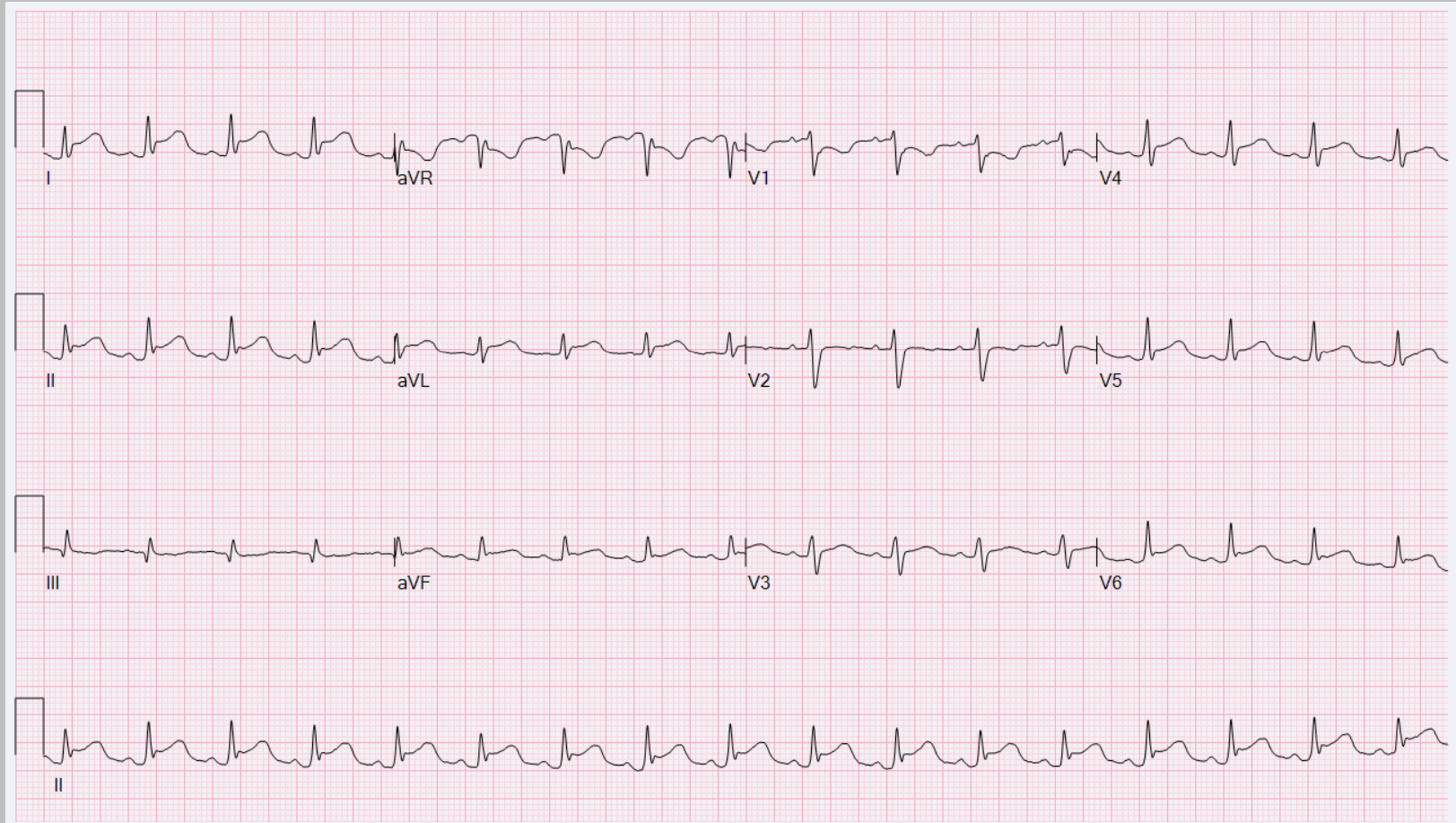
QRS Prolongation – IVCDs



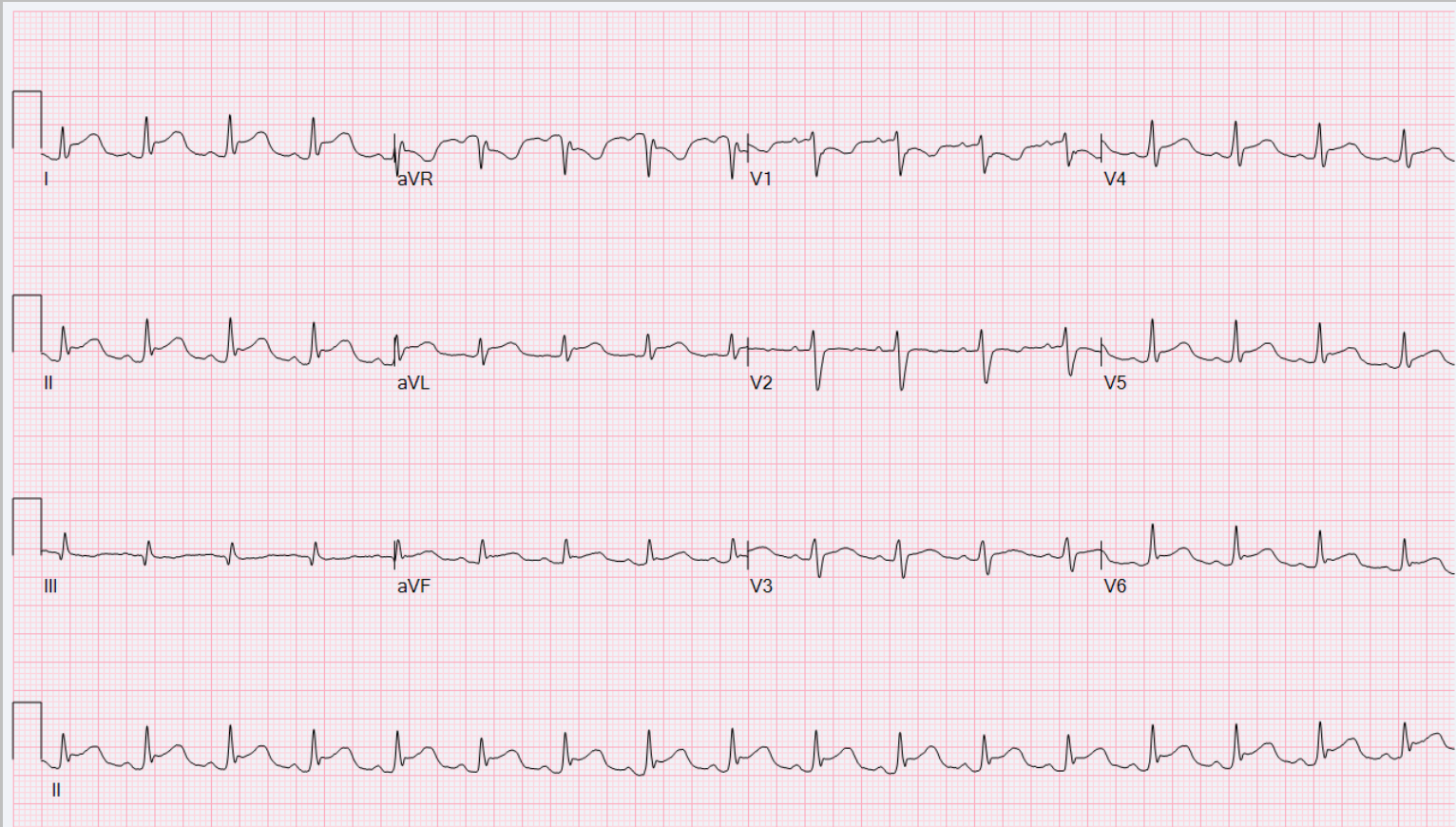
ST Prolongation - Hypocalcemia

ECG 8

21 year old with pleuritic chest pain

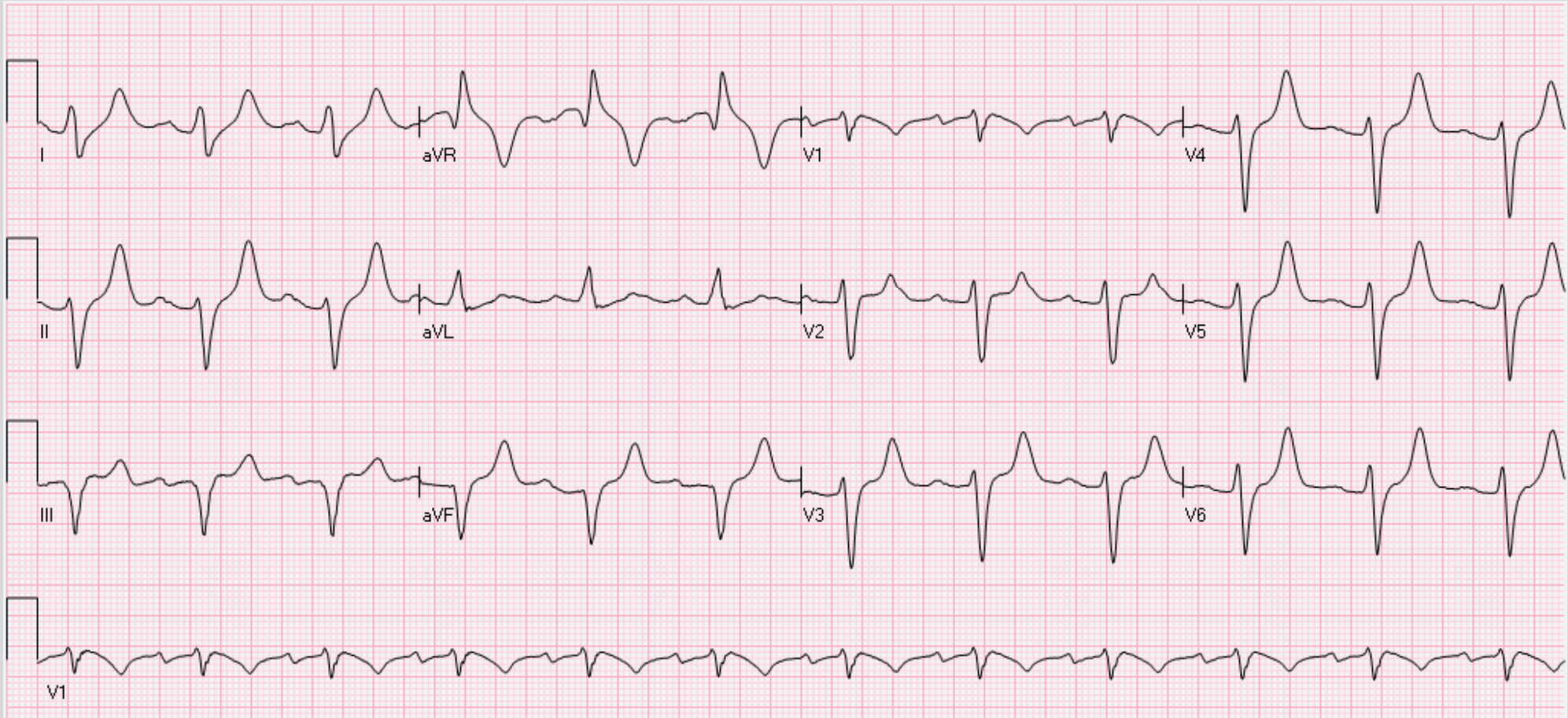


Pericarditis

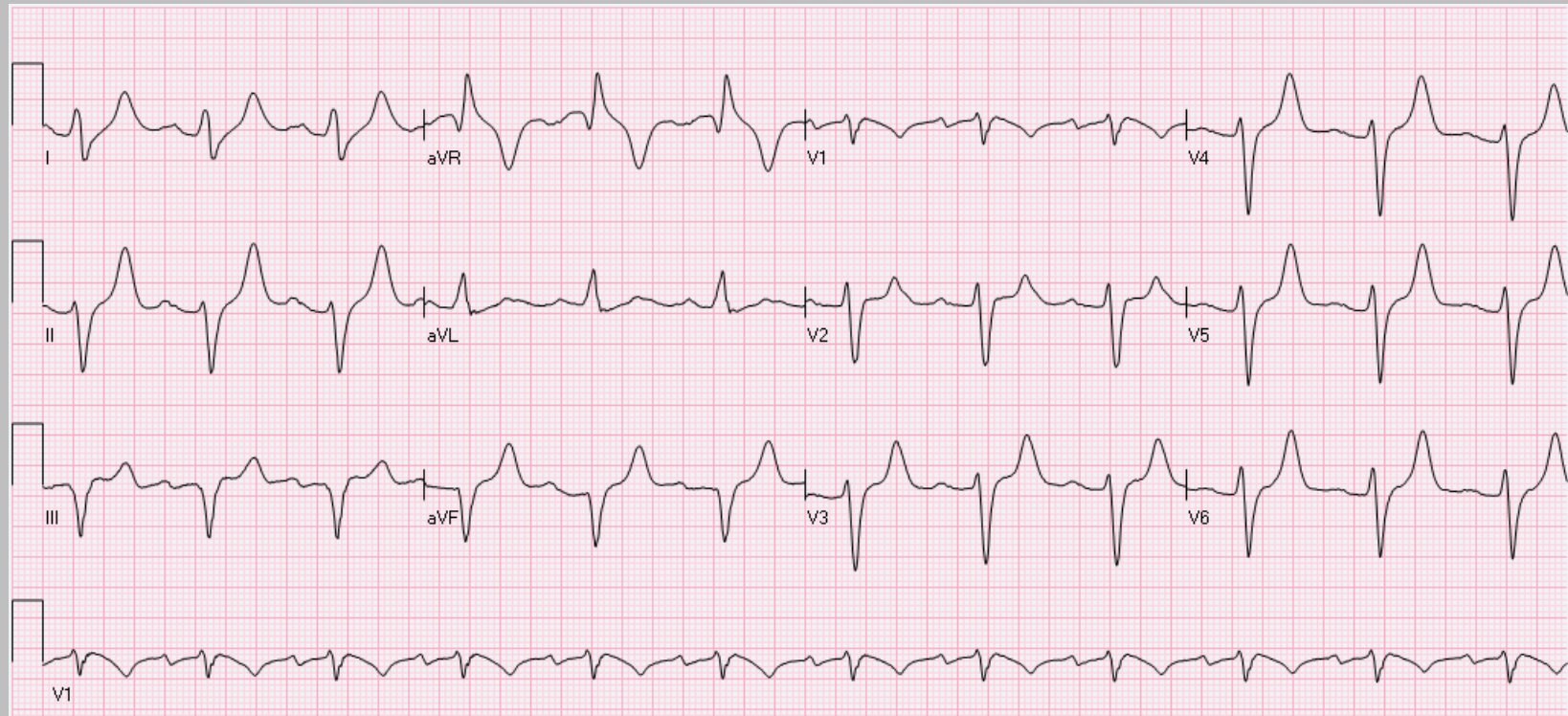


- Diffuse concave ST elevation
- PR depression

ECG 9
35 year old with dyspnea, edema

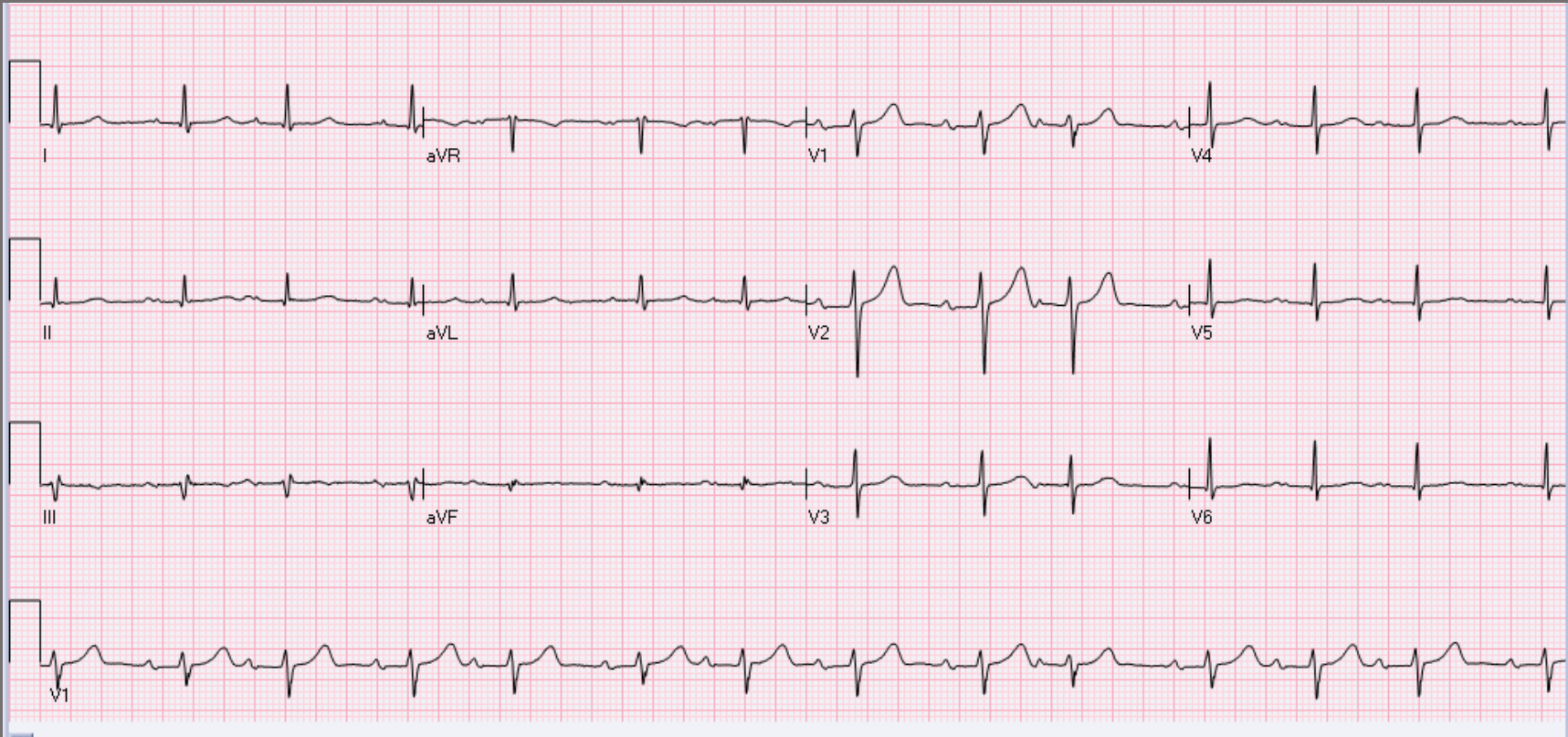


Acute Kidney Injury (hyperkalemia)



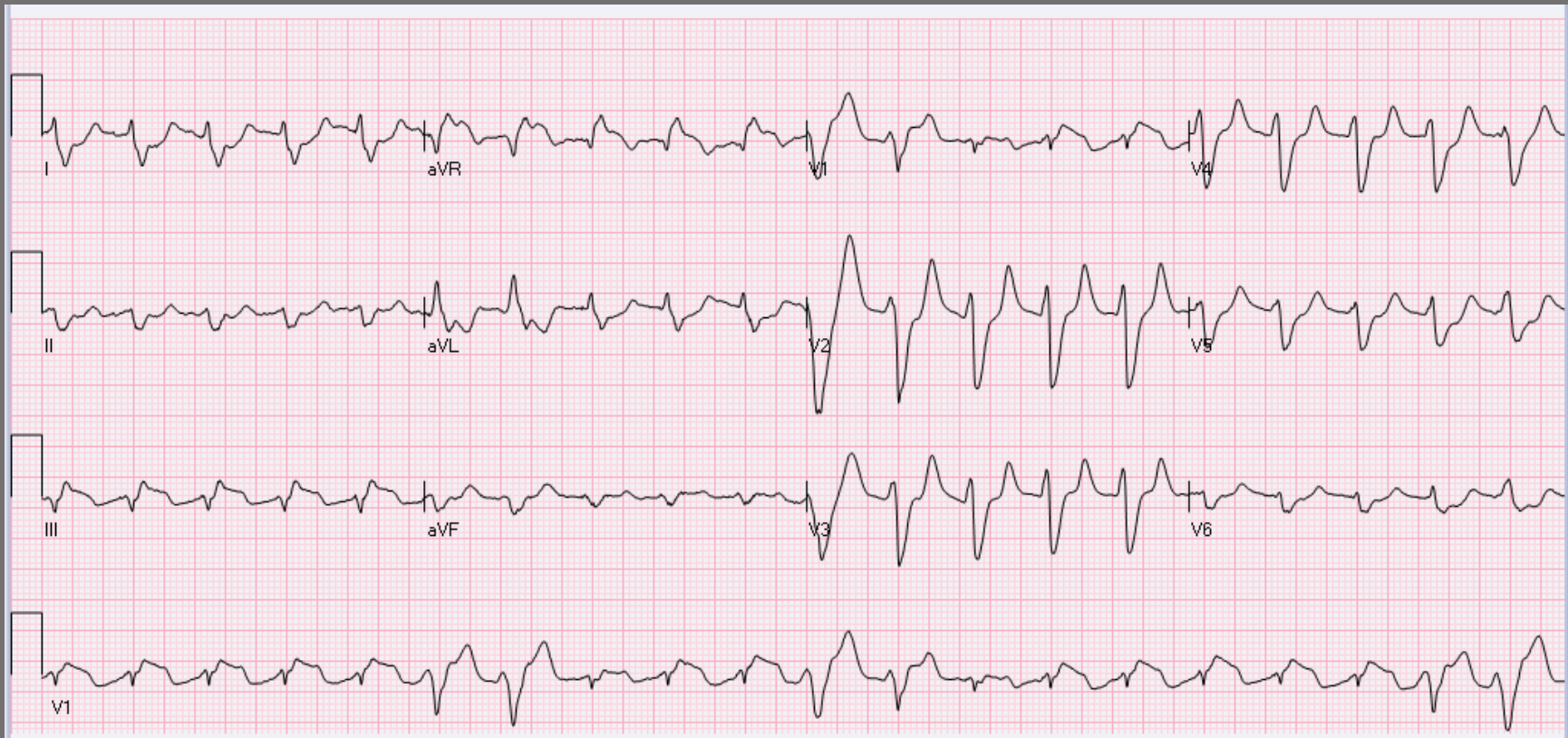
- QRS widening
- Peaked T waves
- Flattened P waves

Baseline ECG



9:03:37

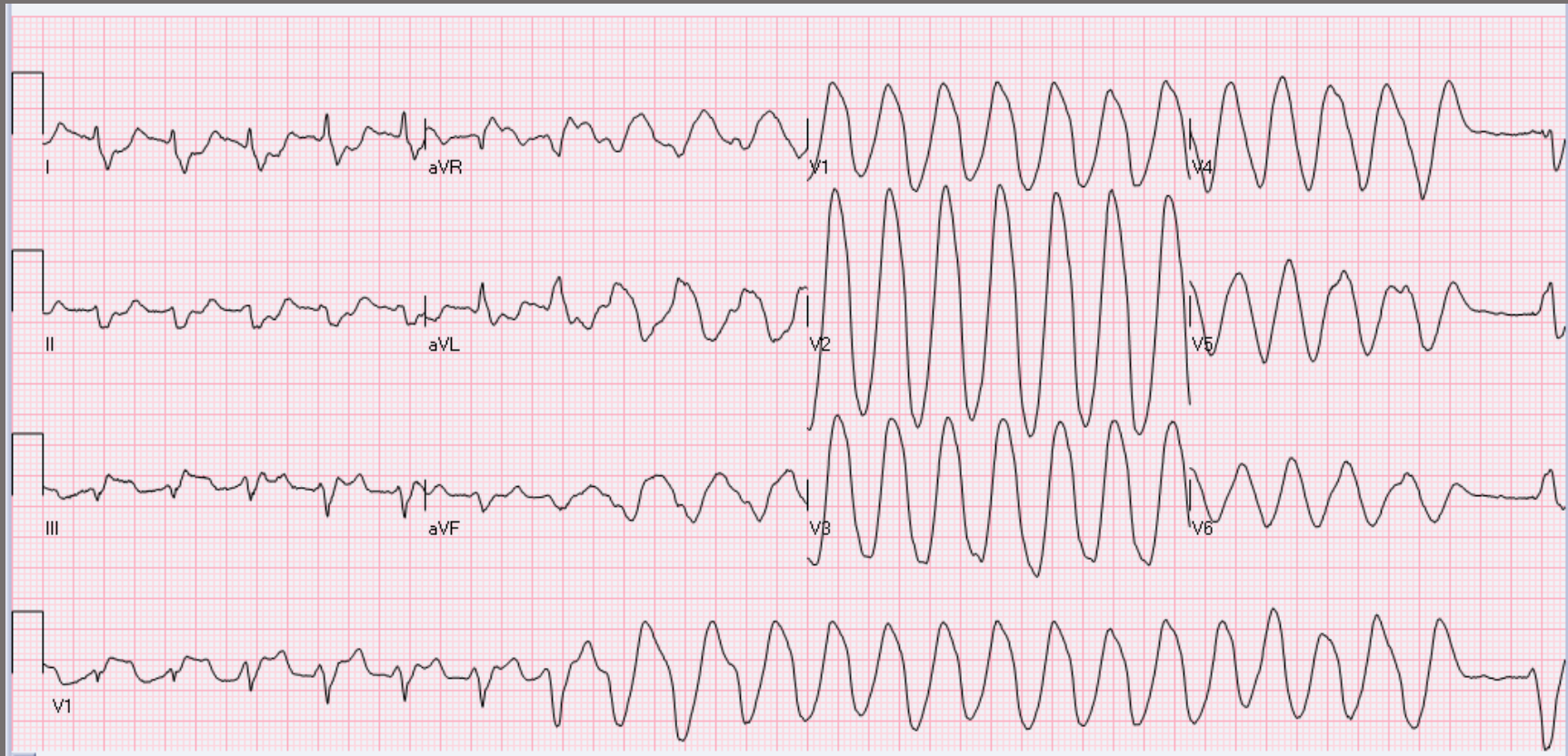
K = 8.9



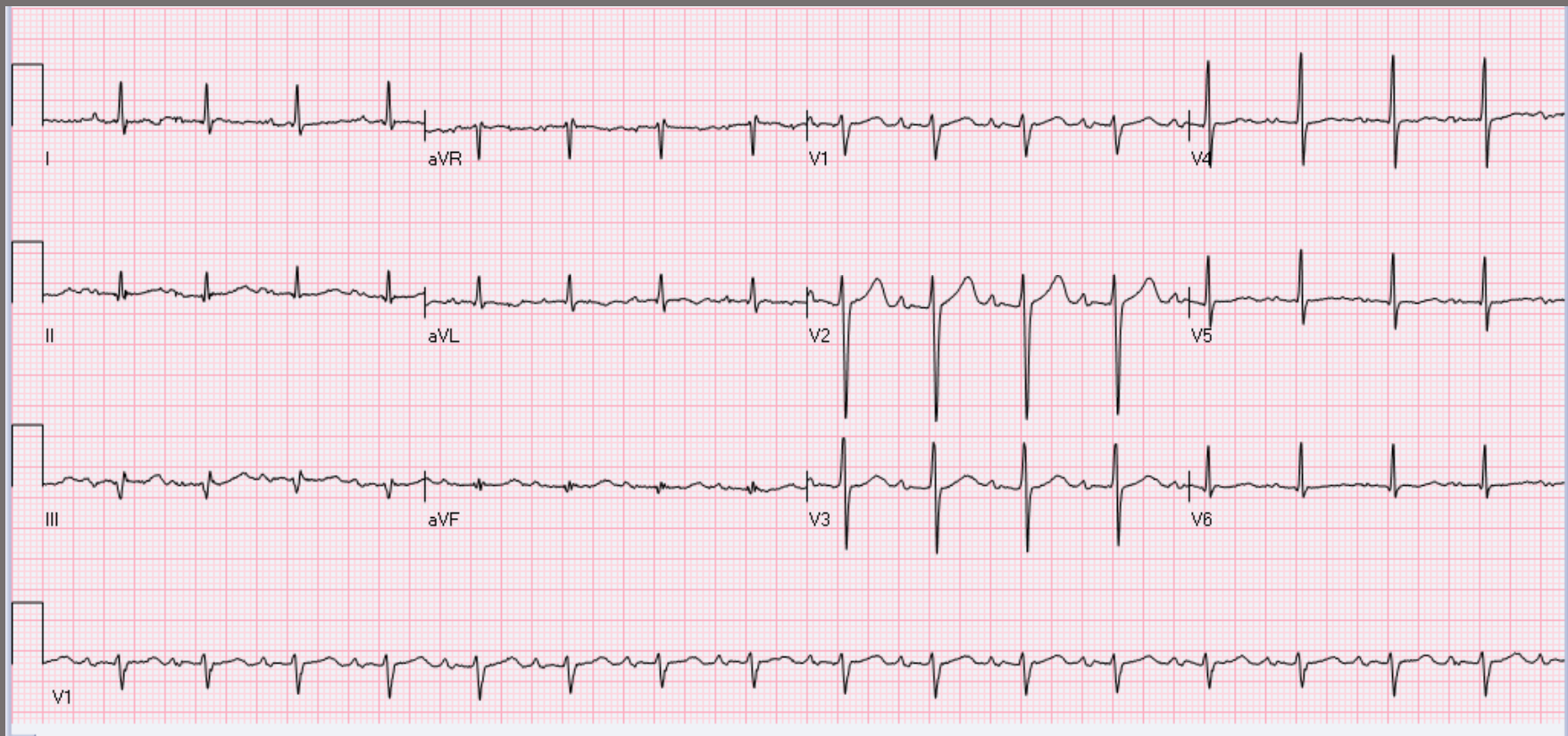
9:04:58



9:09:19

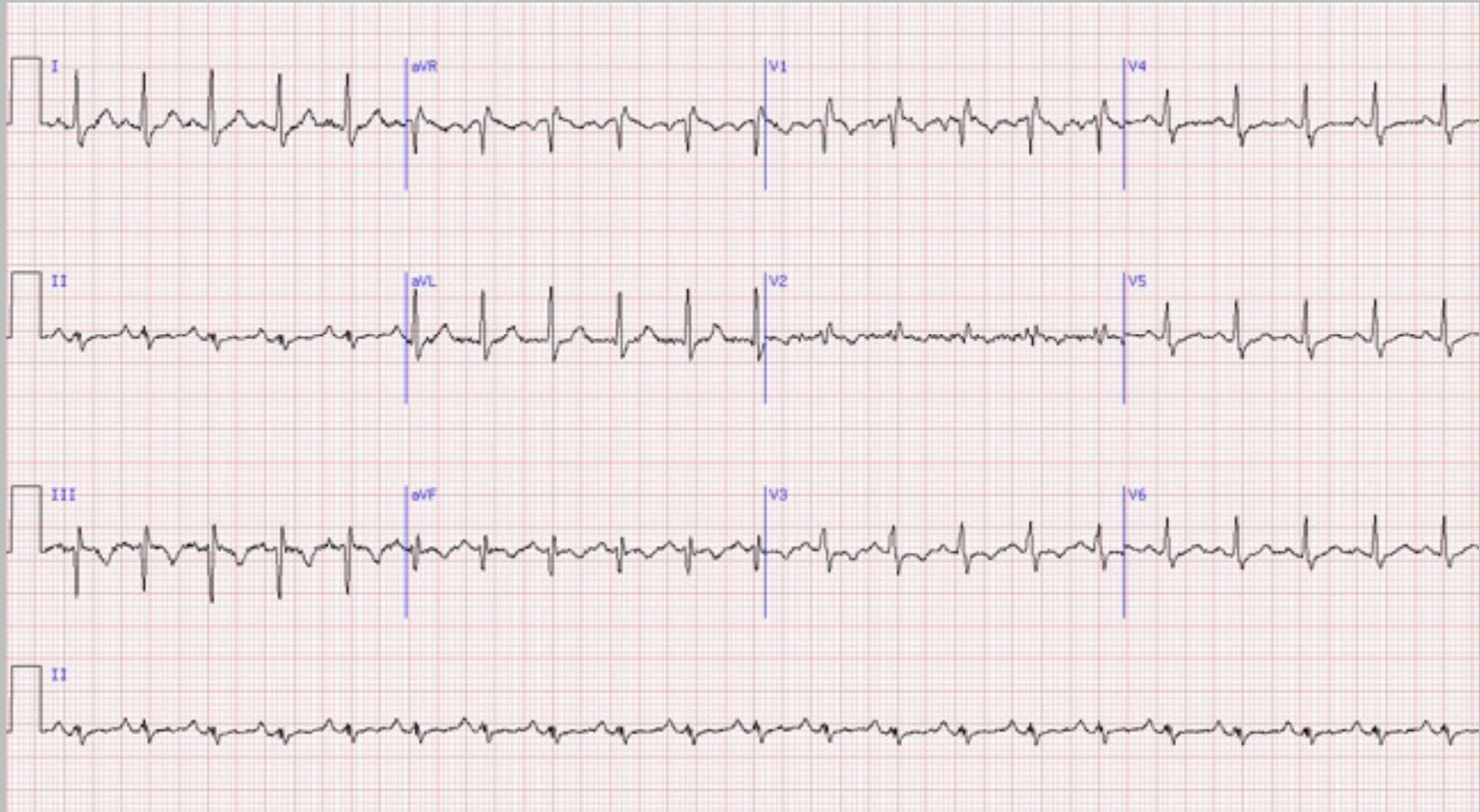


Post Dialysis

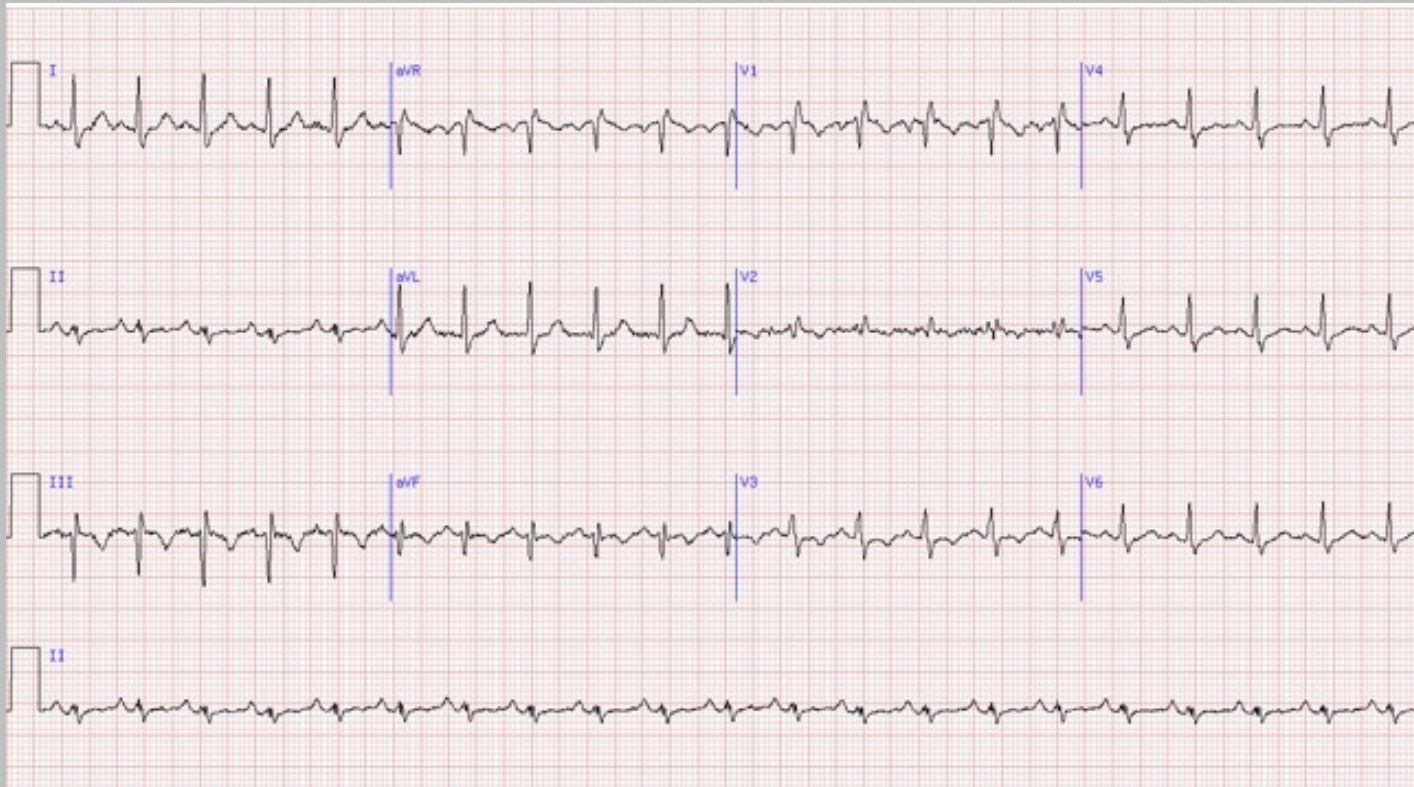


ECG 10

45 year old with chest pain and dyspnea

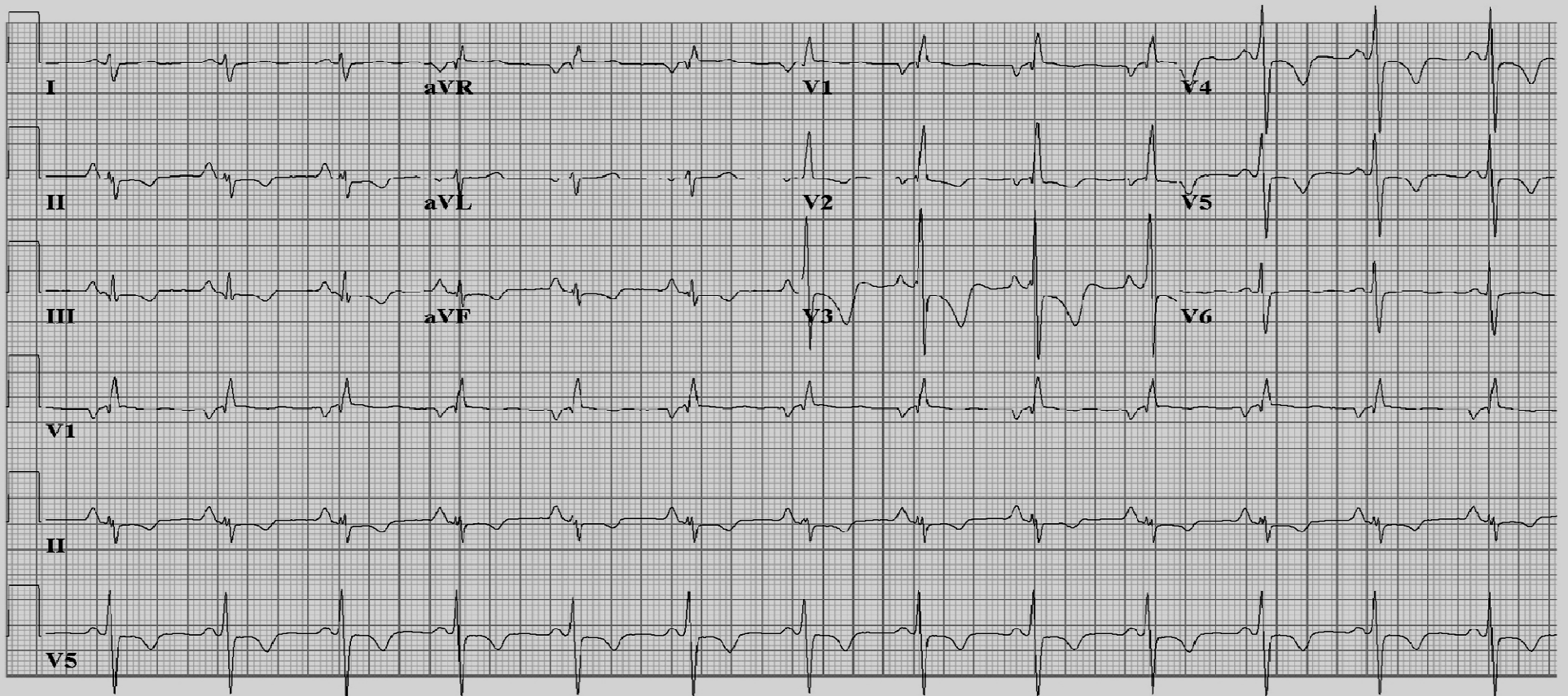


Pulmonary Embolism



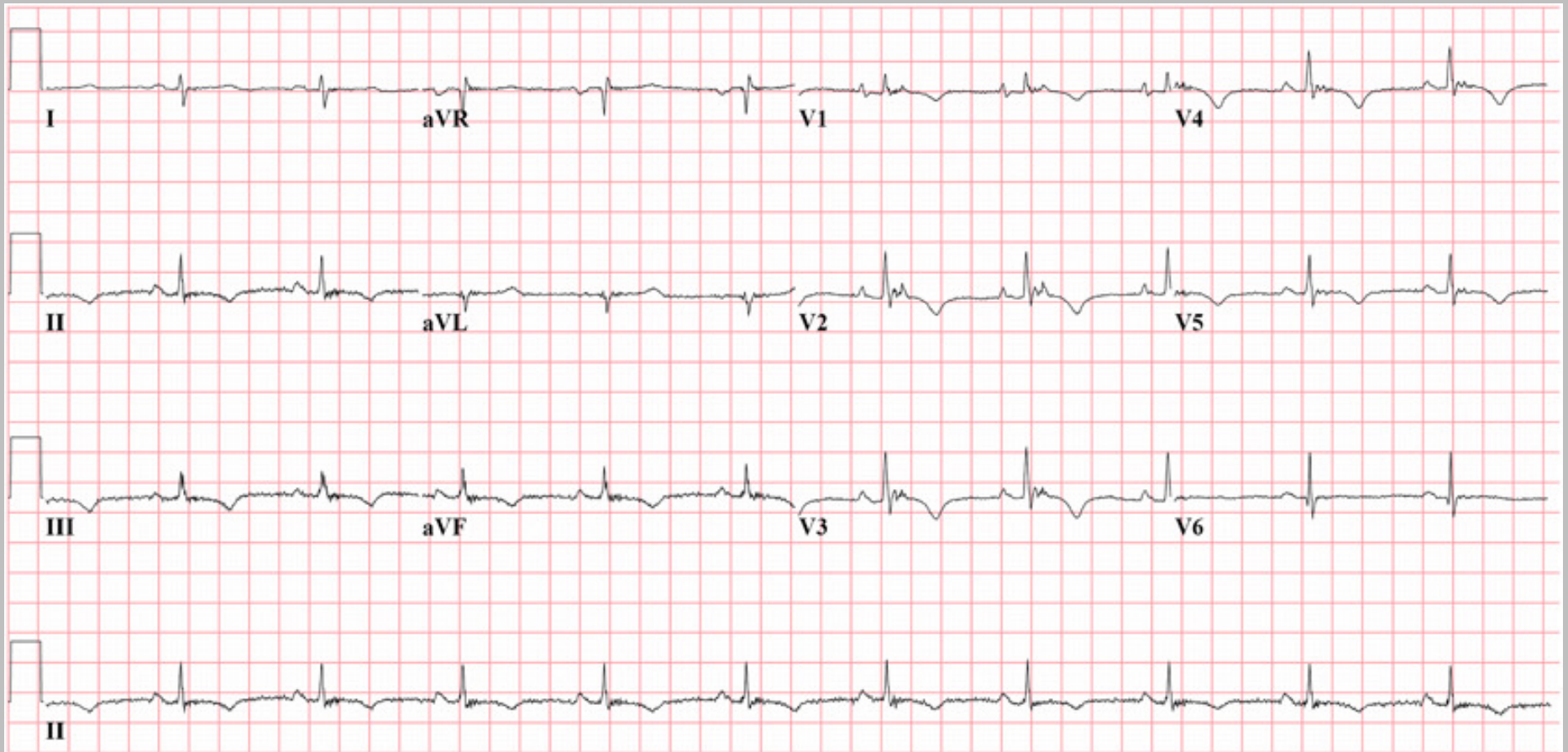
- Most commonly – sinus tachycardia
- S wave in lead I, Q wave and T wave inversion in lead III (S1Q3T3)
- If chronic, right axis deviation, RV hypertrophy

Chronic pulmonary embolism

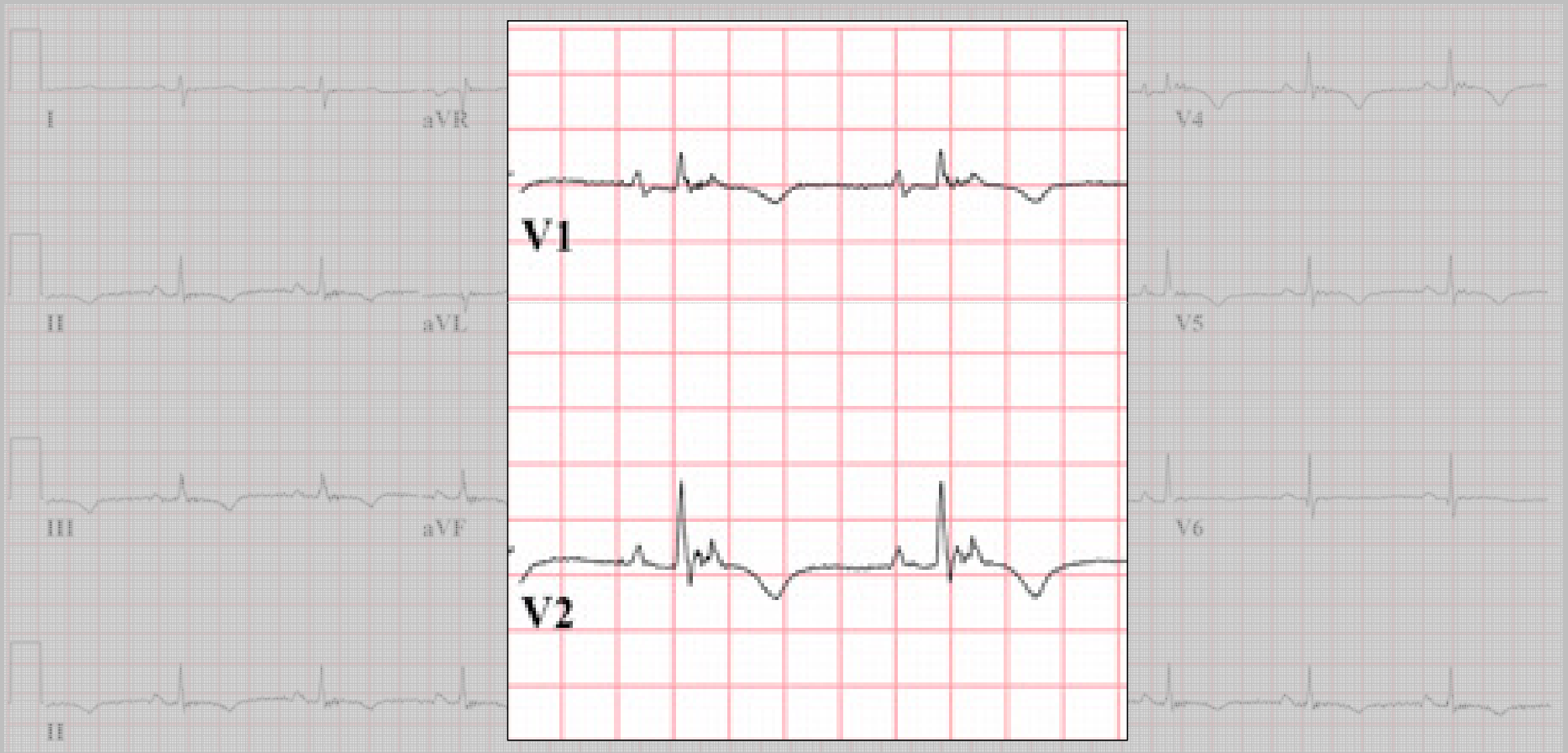


ECG 11

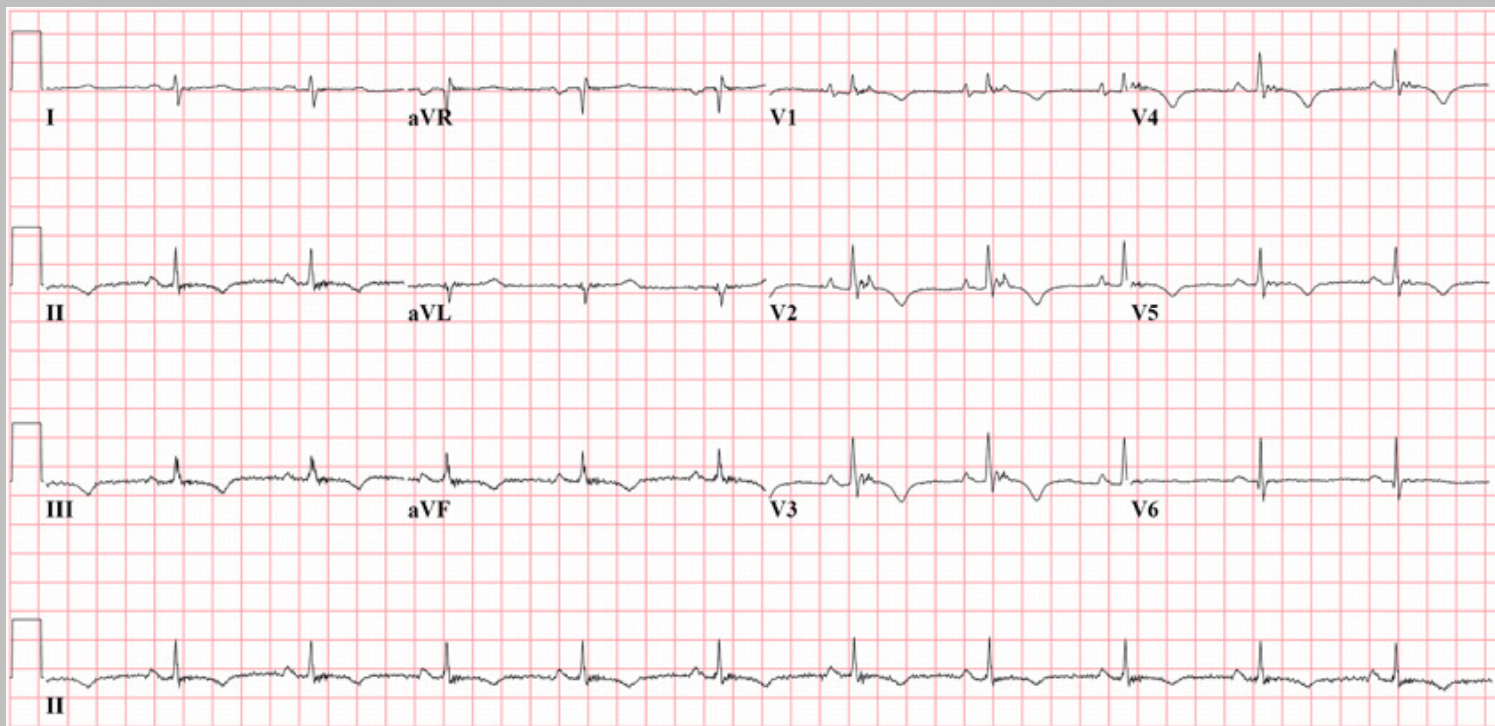
27 year old with syncope



27 year old with syncope

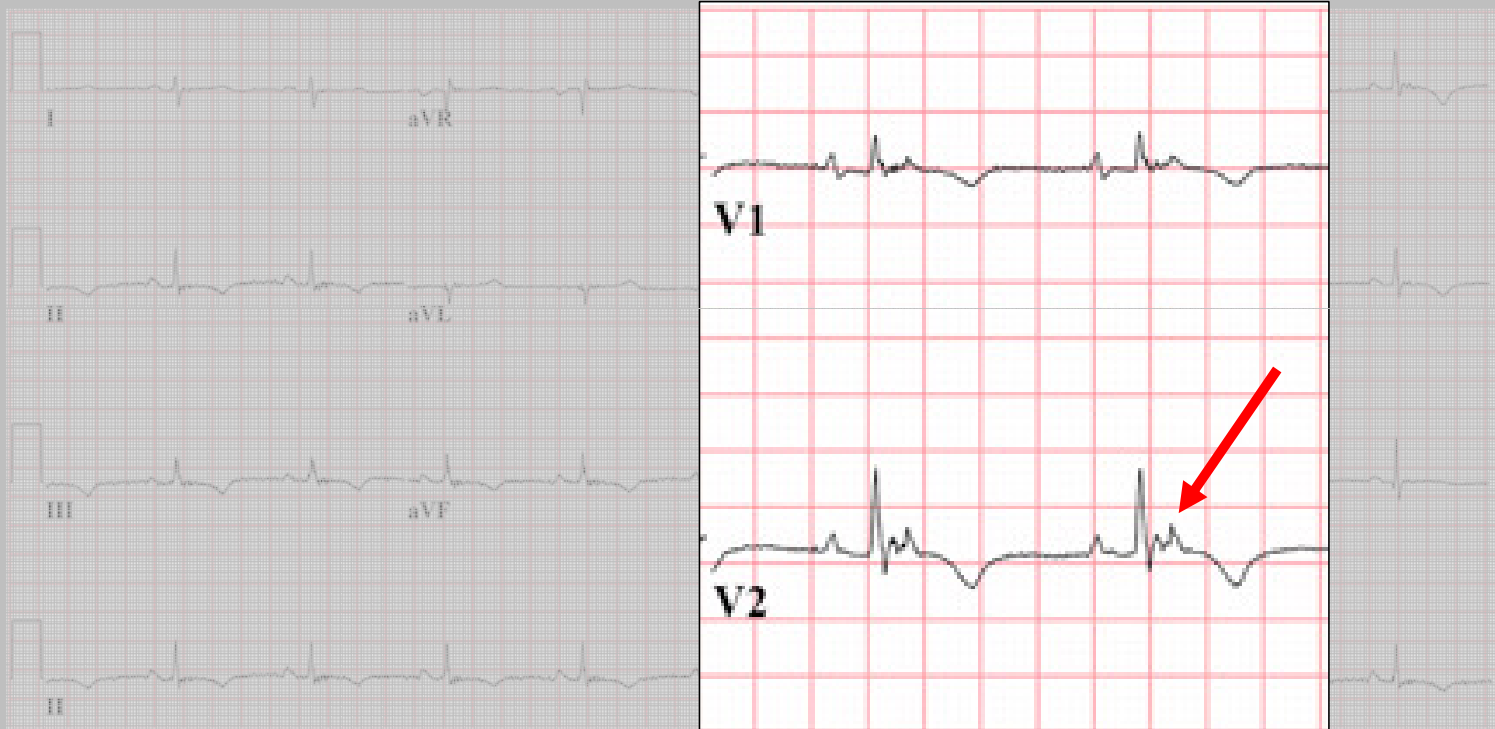


Arrhythmogenic Right Ventricular Dysplasia/Cardiomyopathy – ARVD/C



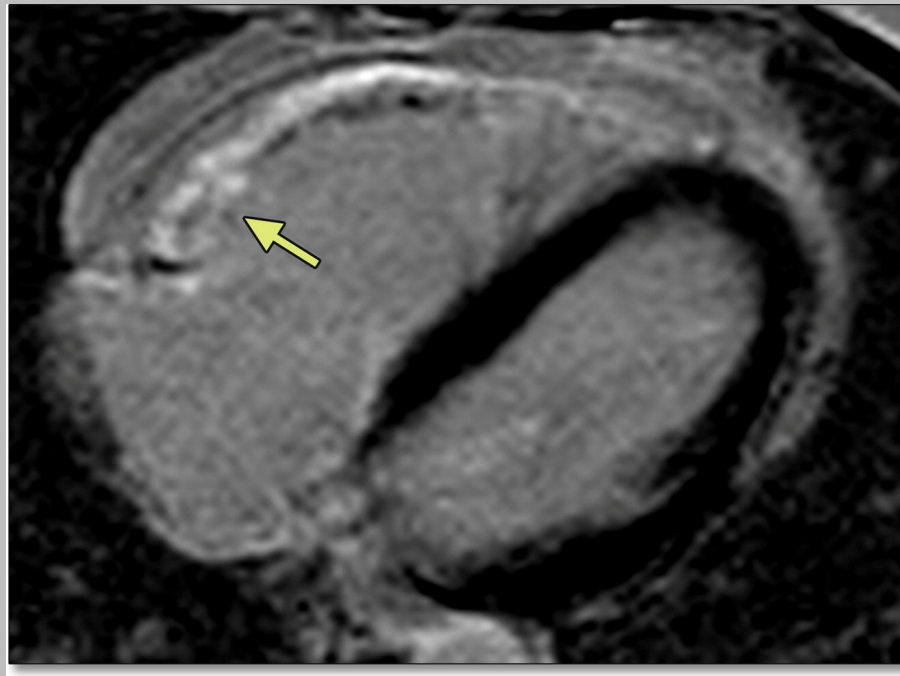
- Epsilon wave
- Anterior T wave inversions

Arrhythmogenic Right Ventricular Dysplasia/Cardiomyopathy – ARVD/C



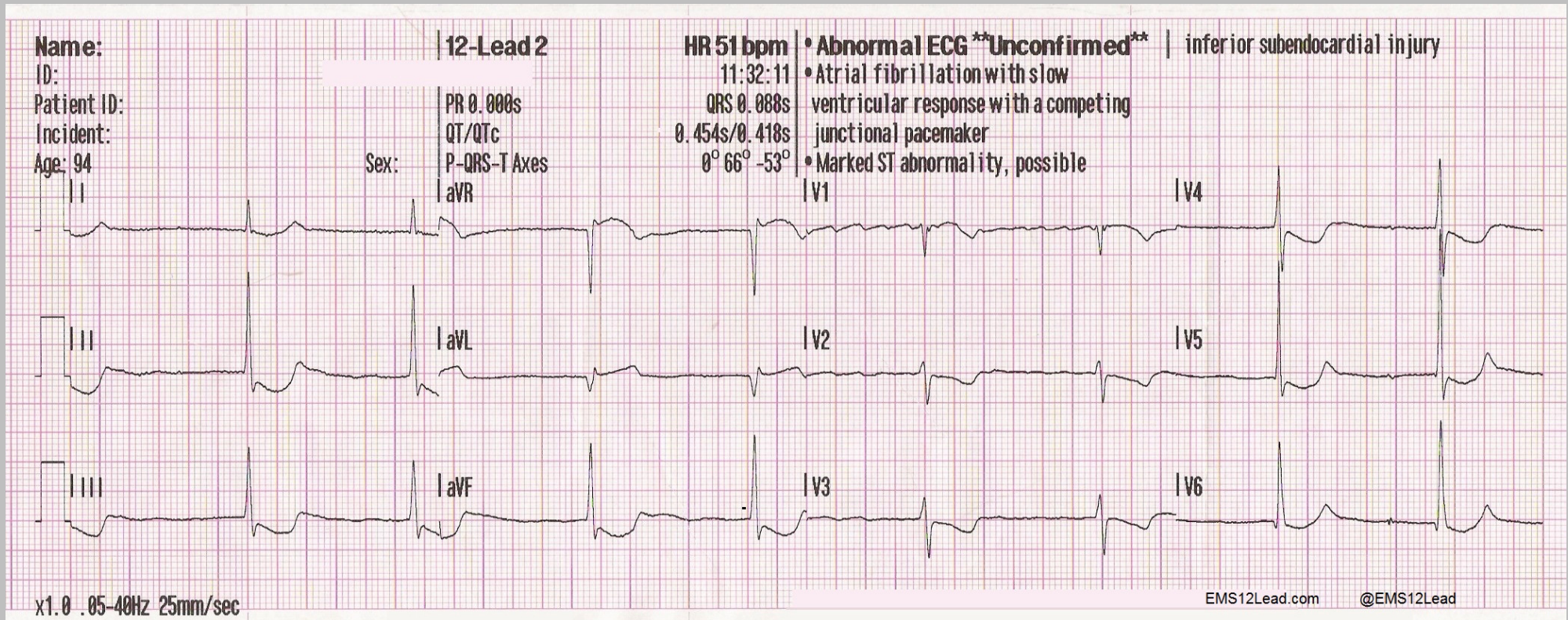
- Epsilon wave
- Anterior T wave inversions

MRI of ARVD



ECG 12

80 year old woman with nausea, visual changes

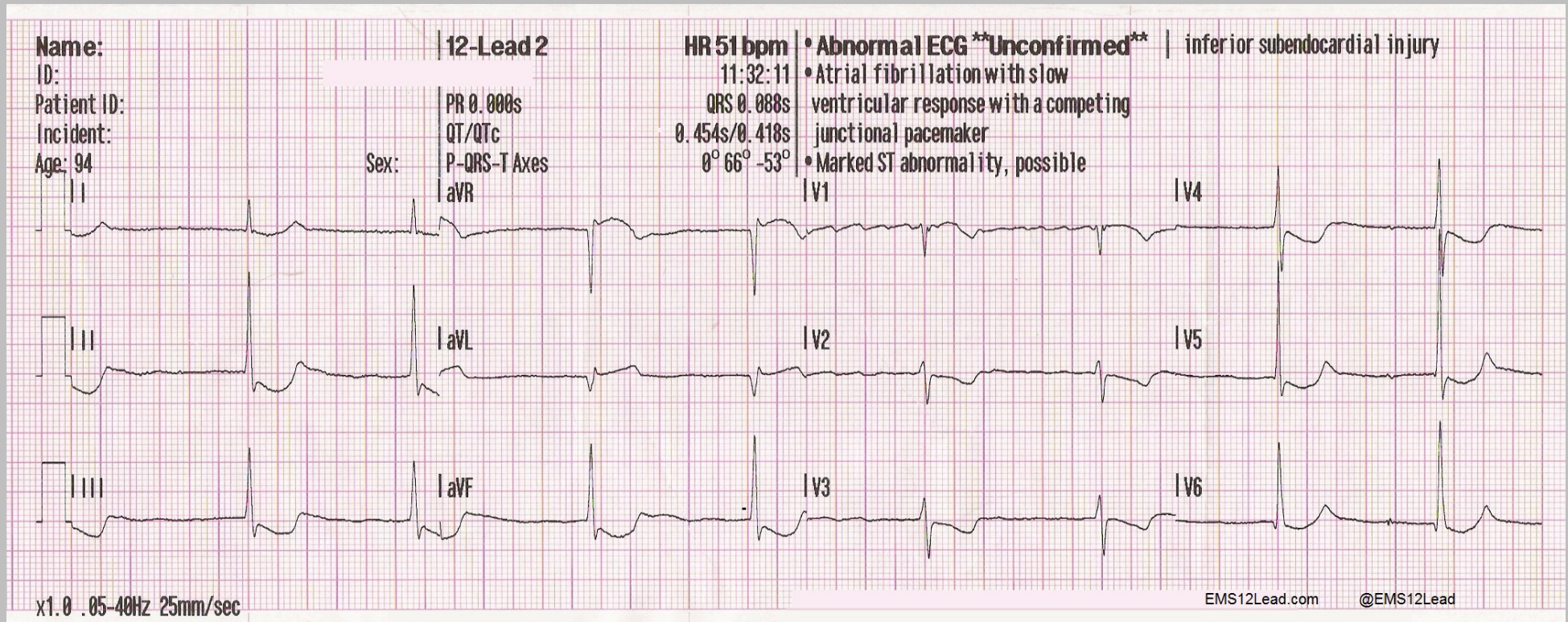


The background of the slide is a stylized American flag with red and white stripes and a blue field with white stars. The flag is slightly wavy and has a subtle halftone or dot pattern overlay.

80 year old woman with nausea, visual changes

1. Digoxin toxicity
2. TCA overdose
3. Hyperkalemia
4. Long QT Syndrome

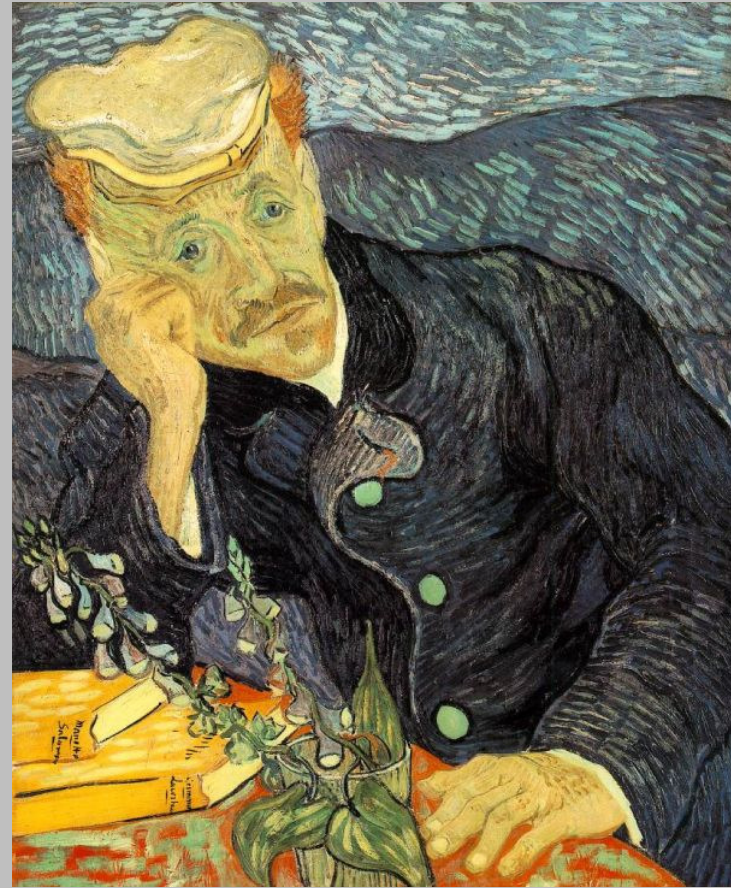
Digoxin Toxicity



- Atrial fibrillation with regular slow response
- Accelerated junctional rhythm
- ST abnormalities (“reverse check”)



Foxglove, ear of wheat and vine
Vincent Van Gogh

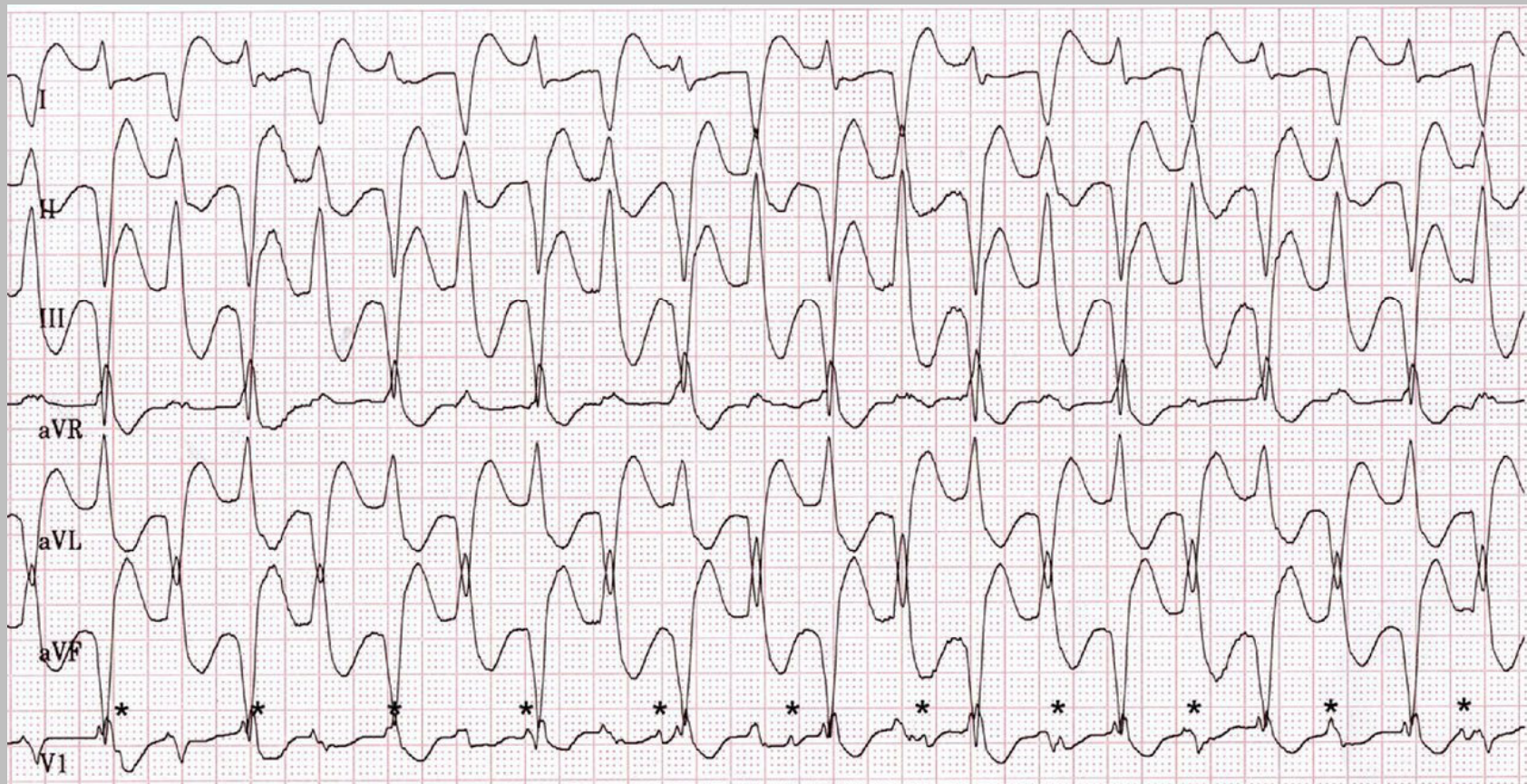


Portrait of Dr. Gachet
Vincent Van Gogh, 1890



ECG 13

78 year old with palpitation and nausea



Digoxin Toxicity



Bidirectional Ventricular Tachycardia

- Digoxin toxicity
- Catecholaminergic Polymorphic VT (CPVT)

Bidirectional VT Chatecholaminergic Polymorphic VT (CPVT)



ECG 14

60 year old found unresponsive



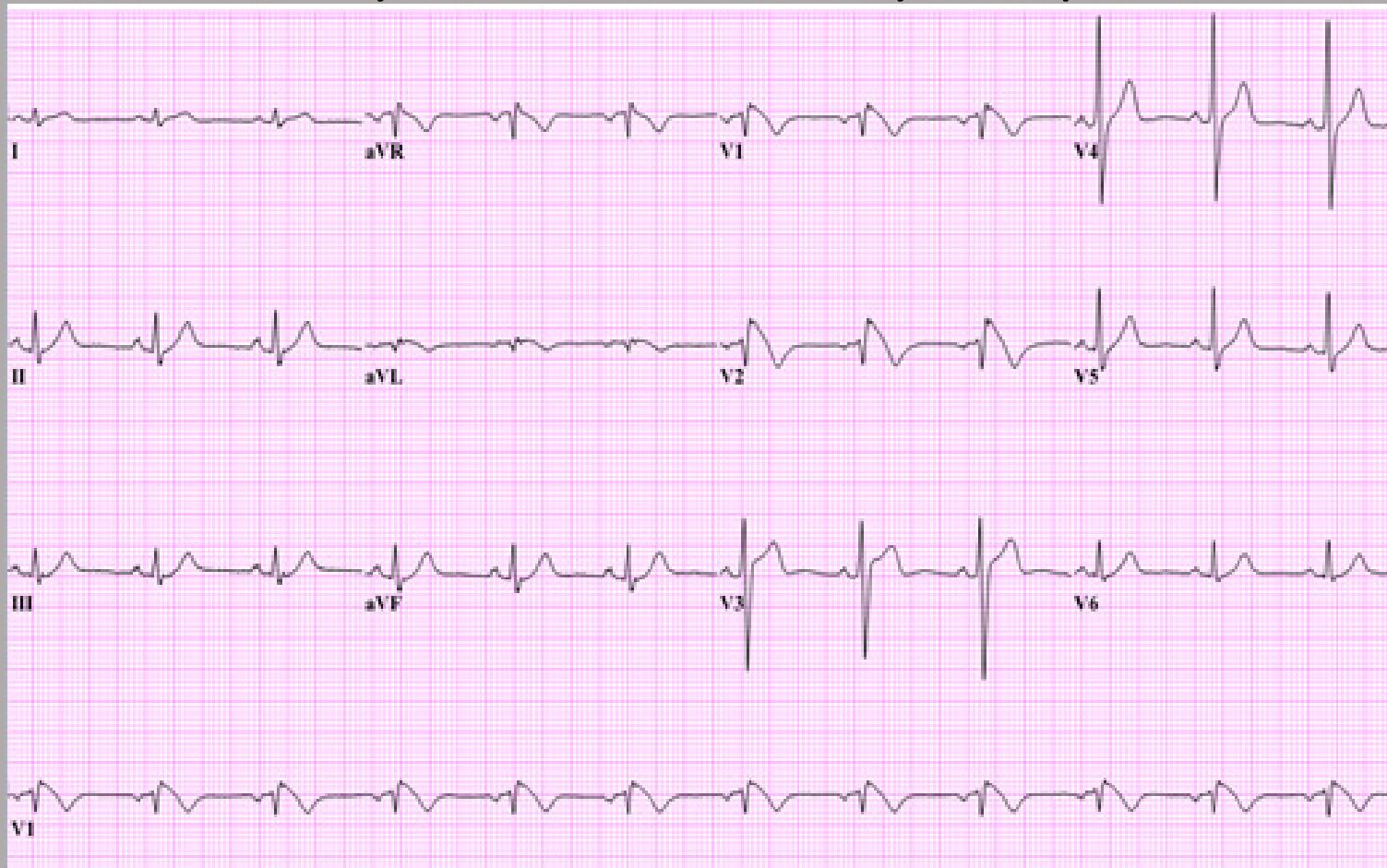
Hypothermia



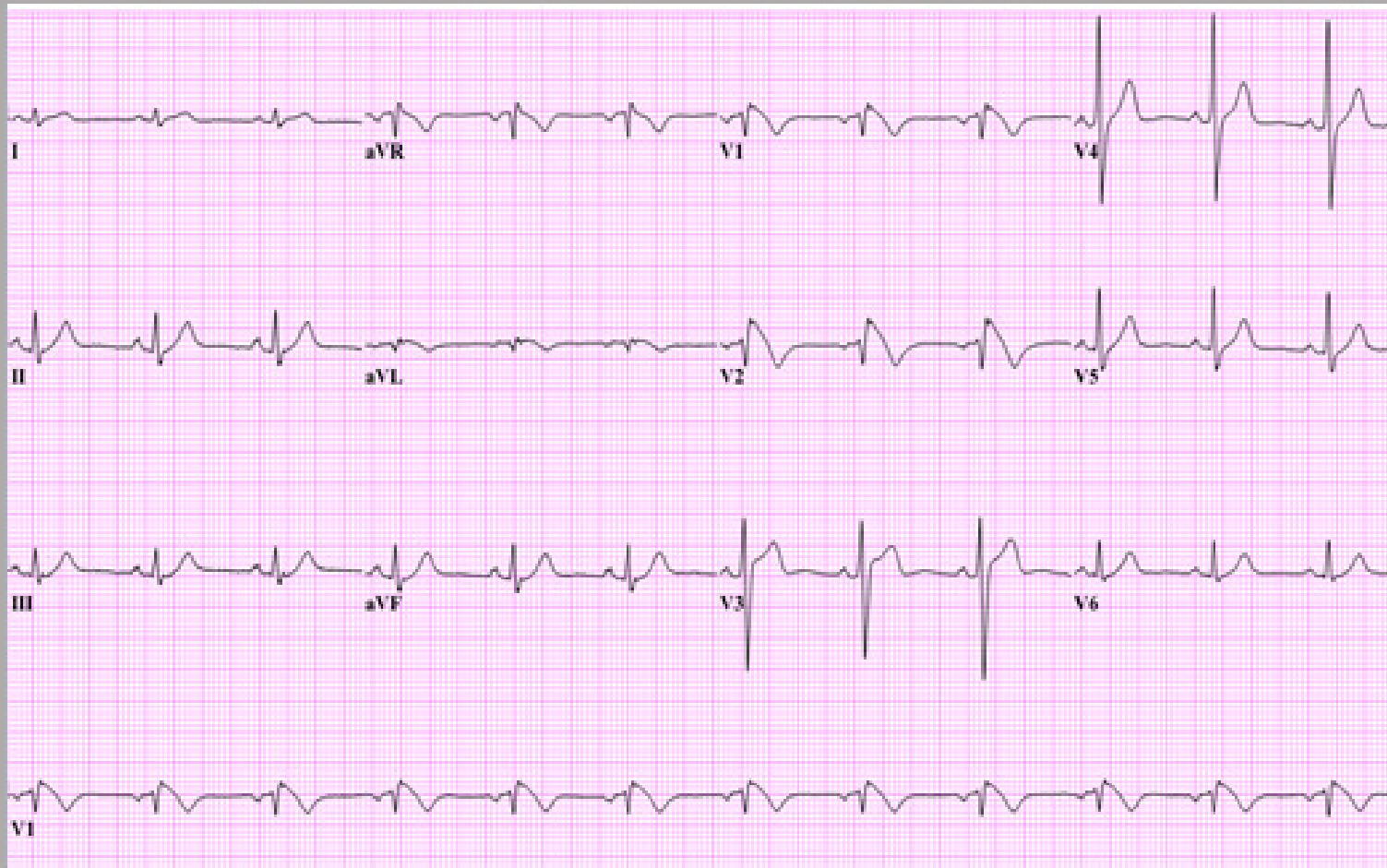
- Prolongation of the PR, QRS, and QT intervals
- Muscle tremor artifact - even in the absence of clinical shivering
- Secondary deflection on the terminal portion of the QRS complex (Osborn wave)

ECG 15

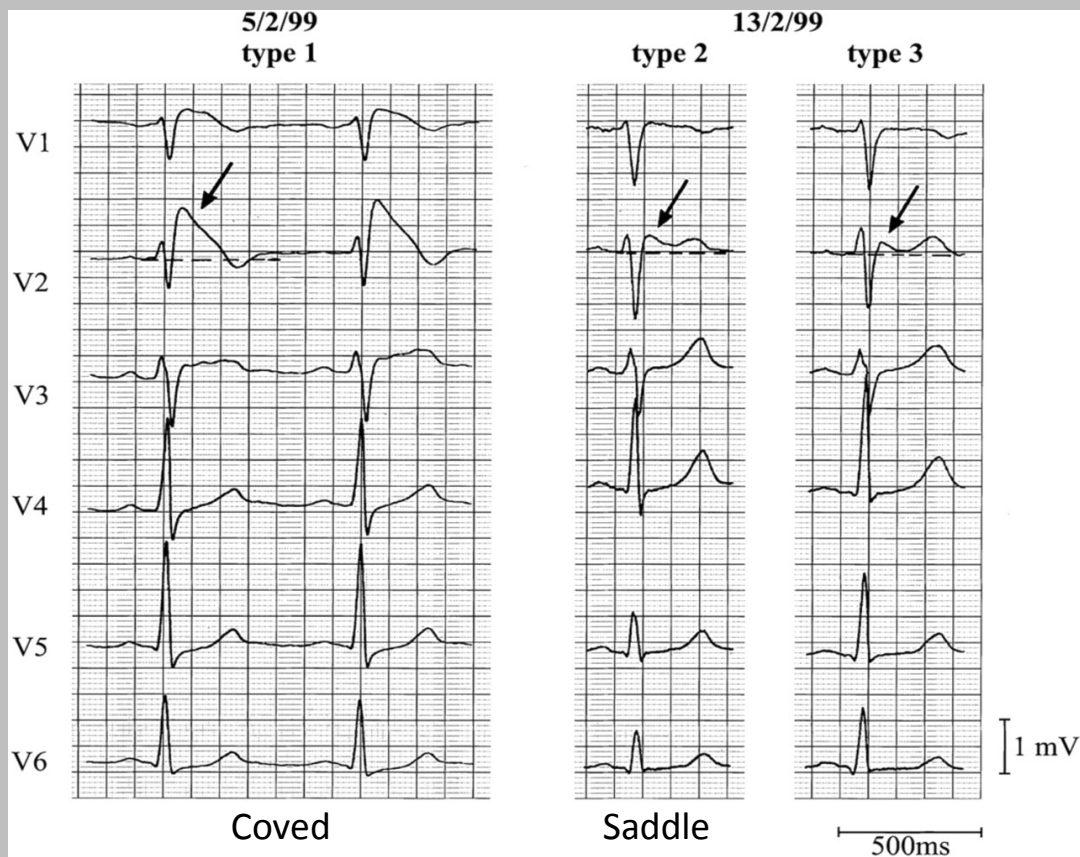
28 year old with syncope



Brugada Syndrome



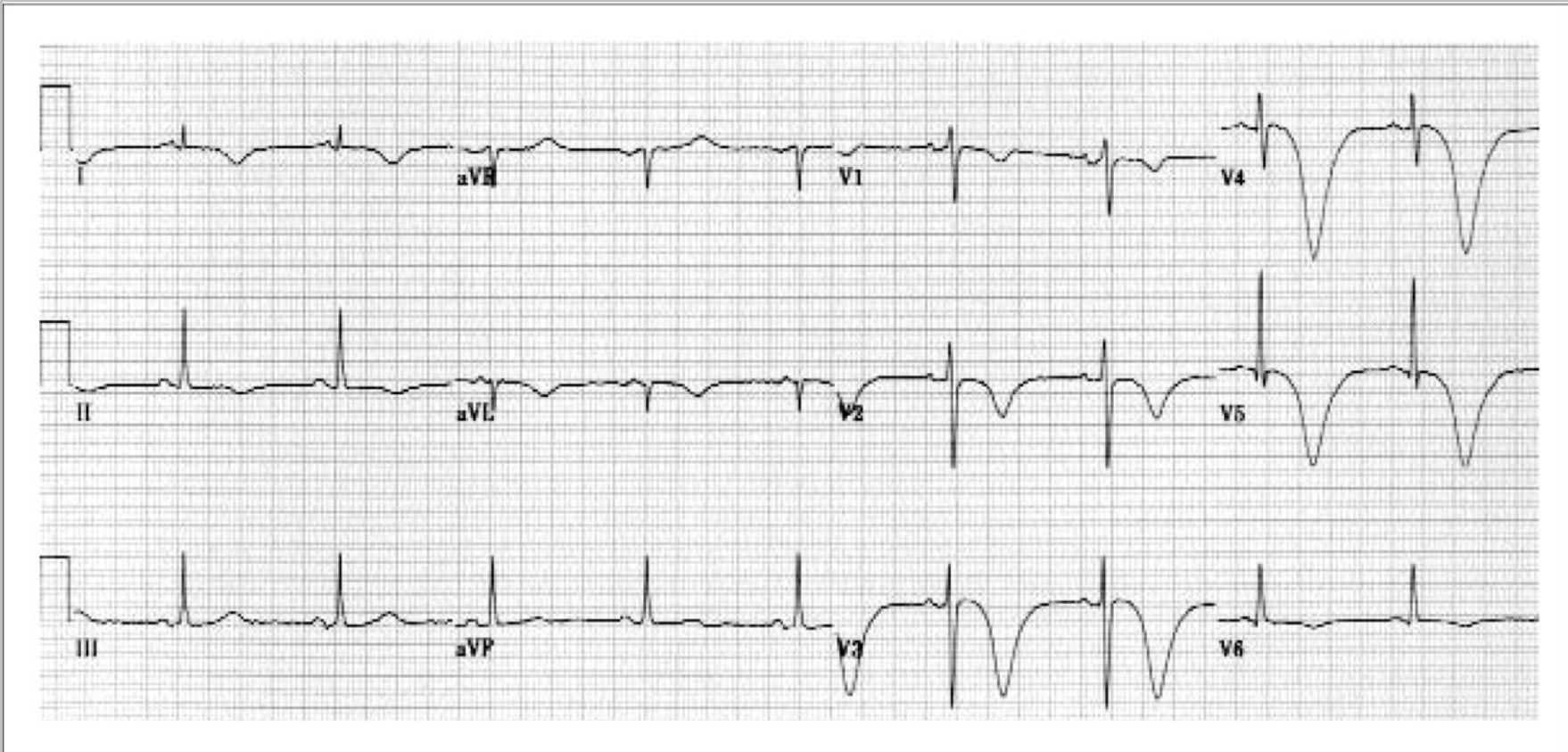
Brugada Syndrome



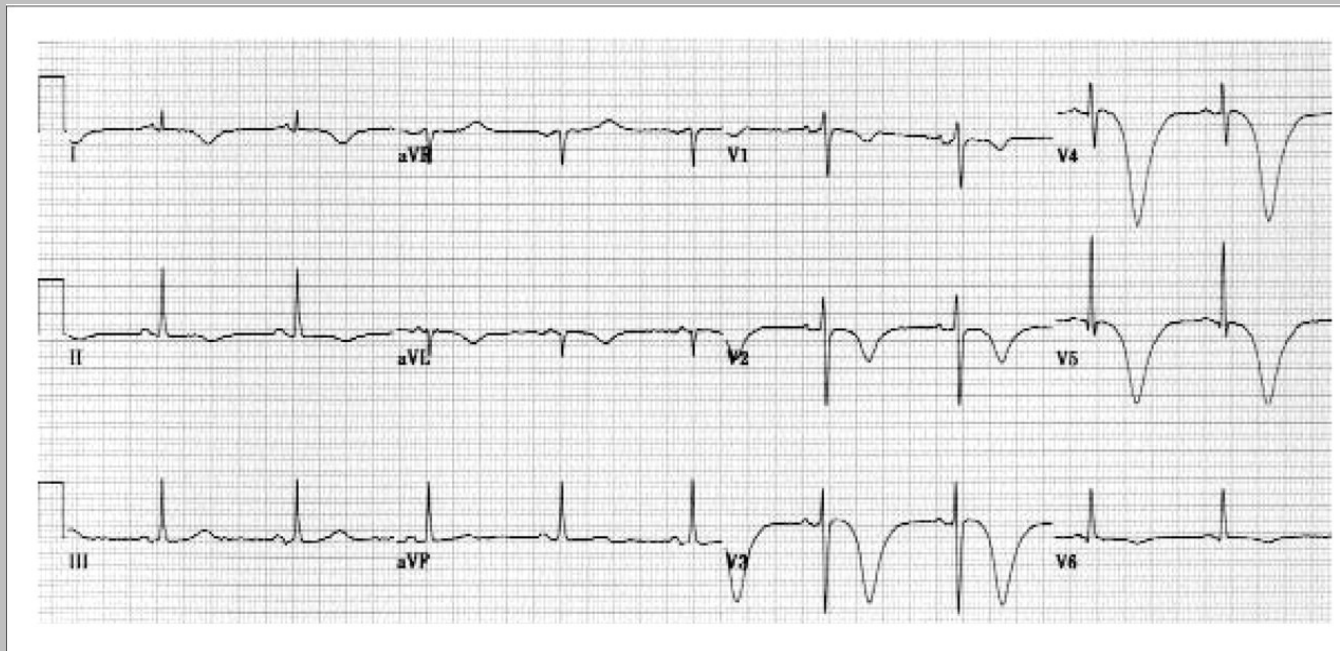
- Genetic disease with increased risk of sudden cardiac death
- More common in males
- More common in Asians
- Typically causes SCD in sleep/fever

ECG 16

58 year old with headache, mental status change



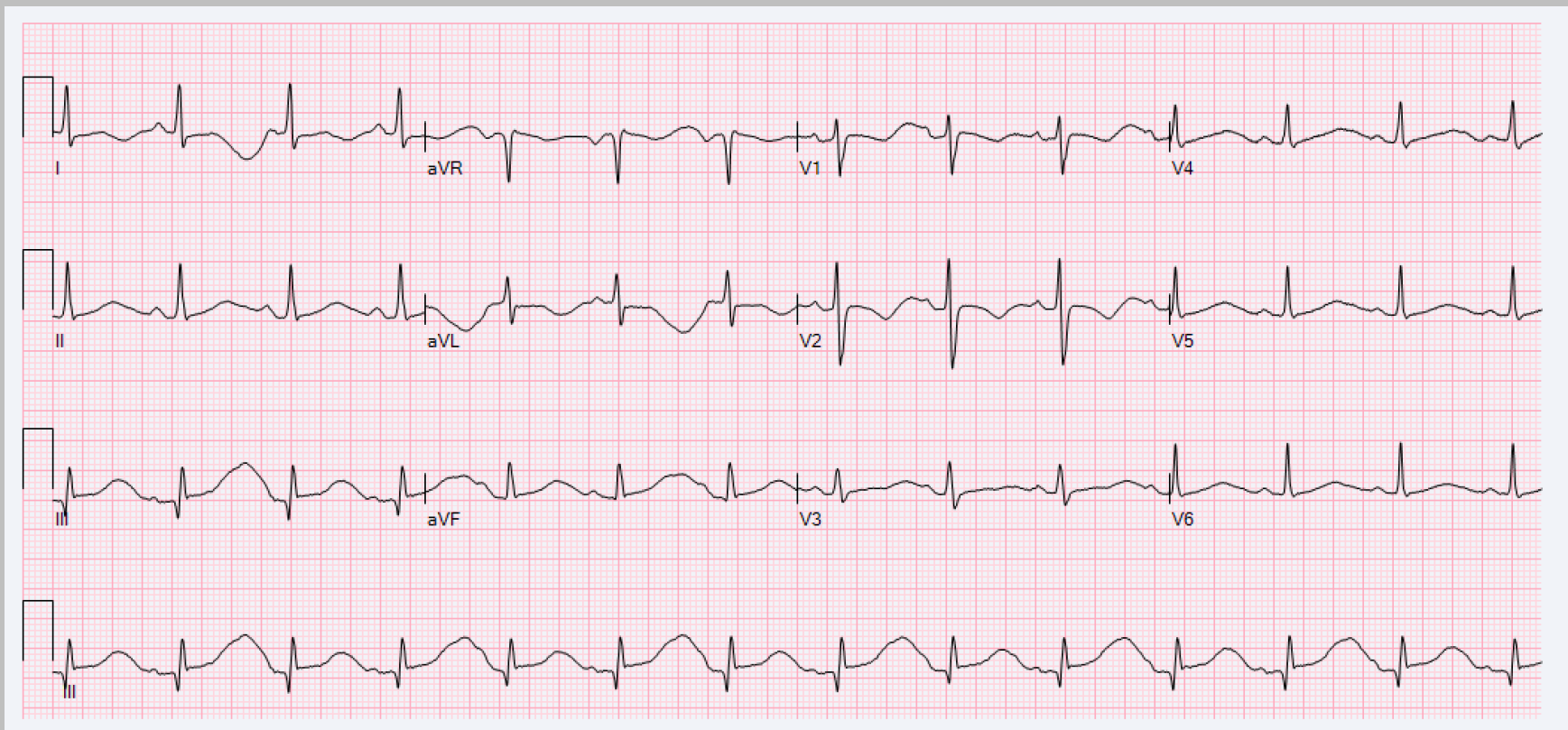
Subarachnoid Bleed/Brain Injury



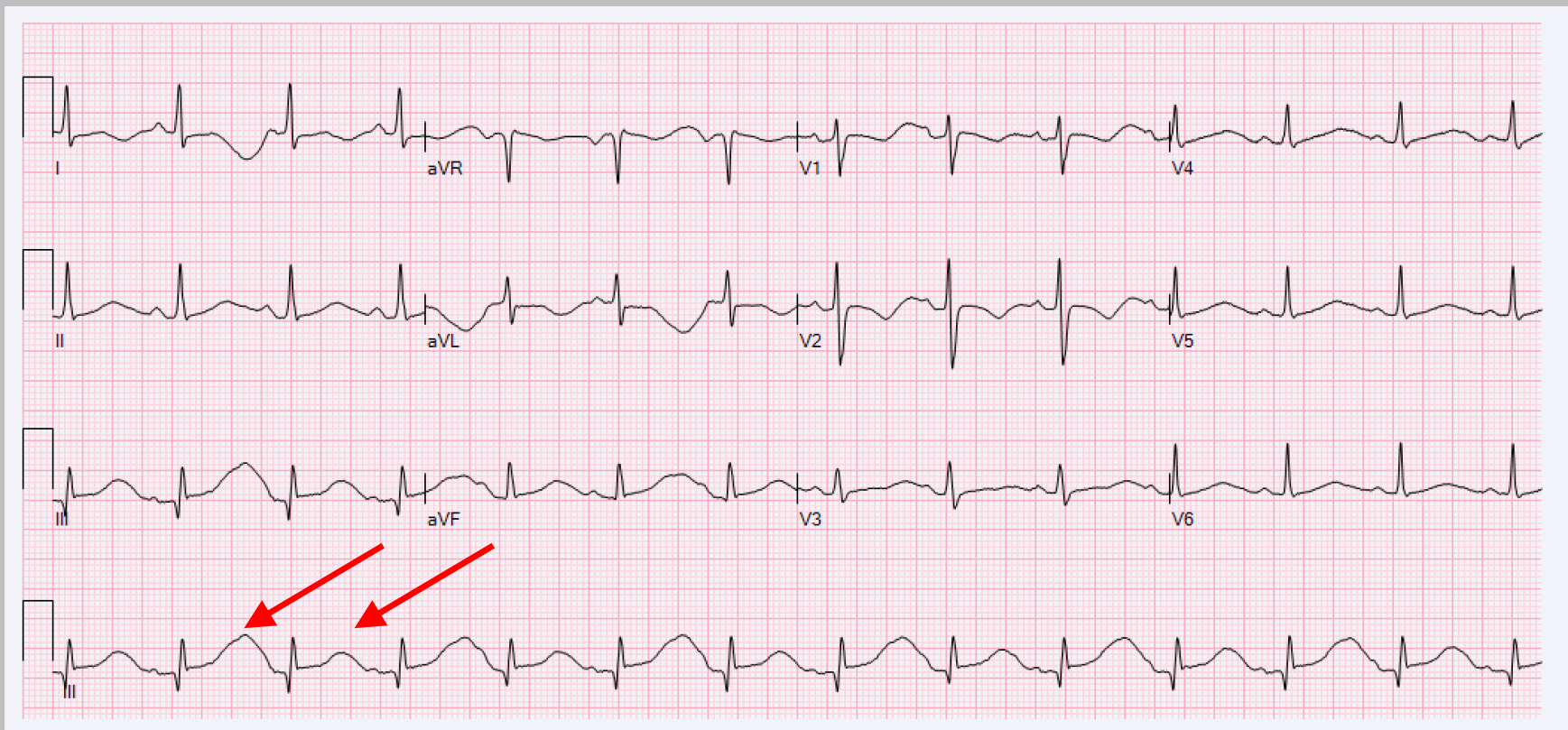
- Q waves, ST elevation/depression, T wave changes, prolonged QT-interval/ prominent u-waves
- Frequently seen after SAH, also in subdural hematoma, ischemic CVA, Guillain Barre, severe migraine

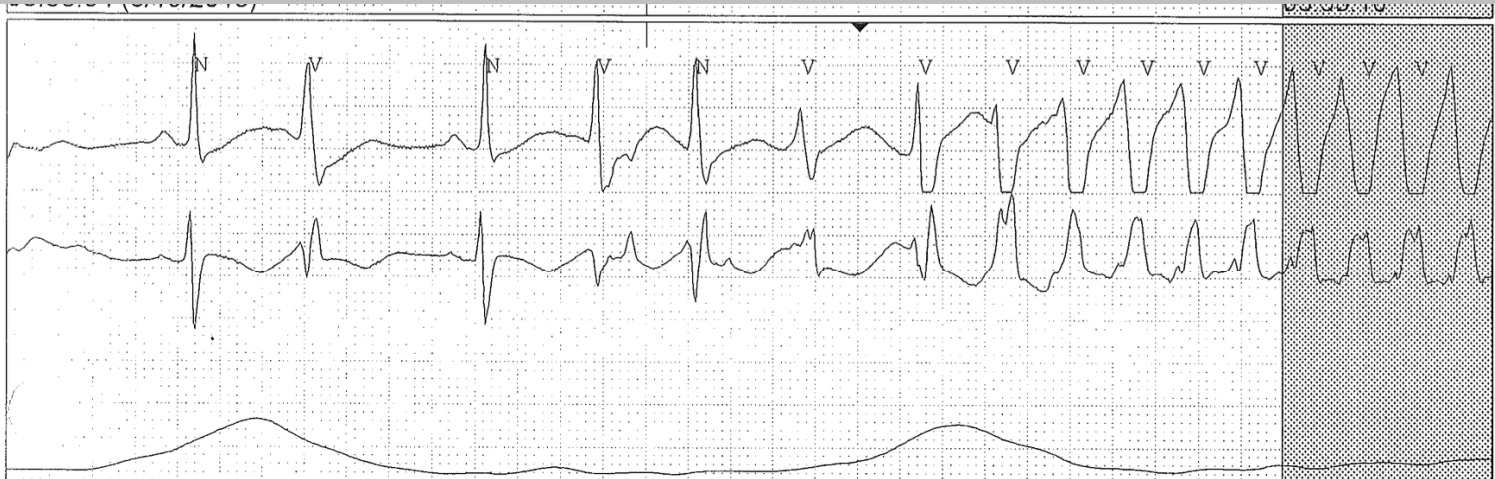
ECG 17

23 year old with cardiac arrest



Long QT Syndrome with T-Wave Alternans





03:53:10

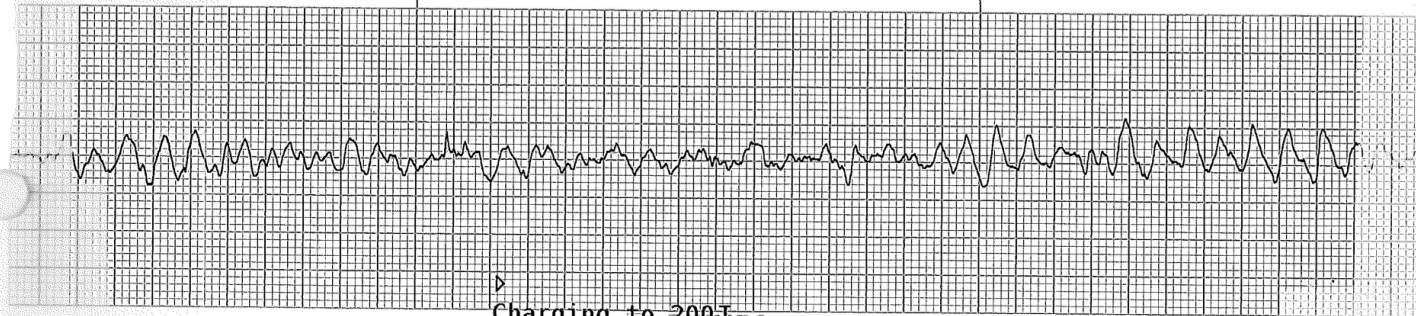
03:53:16



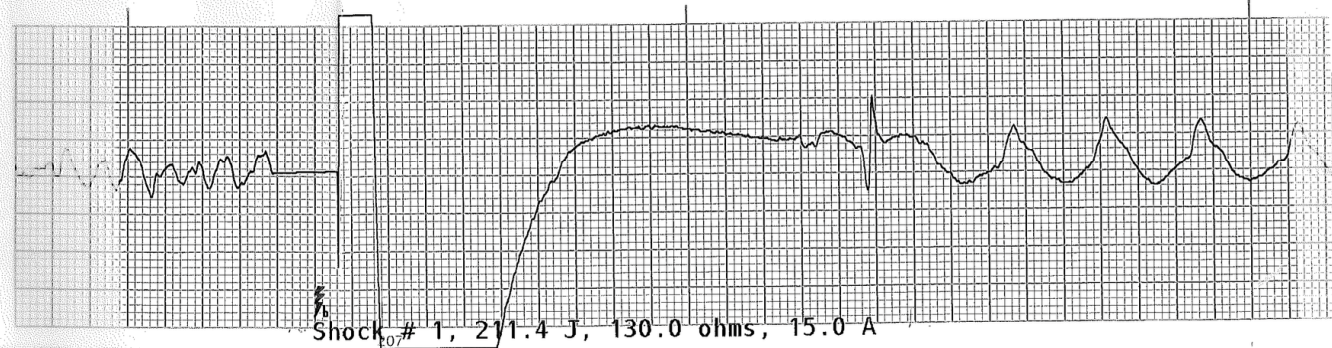
03:53:16

03:53:22

REORDER # 40457C/40457D

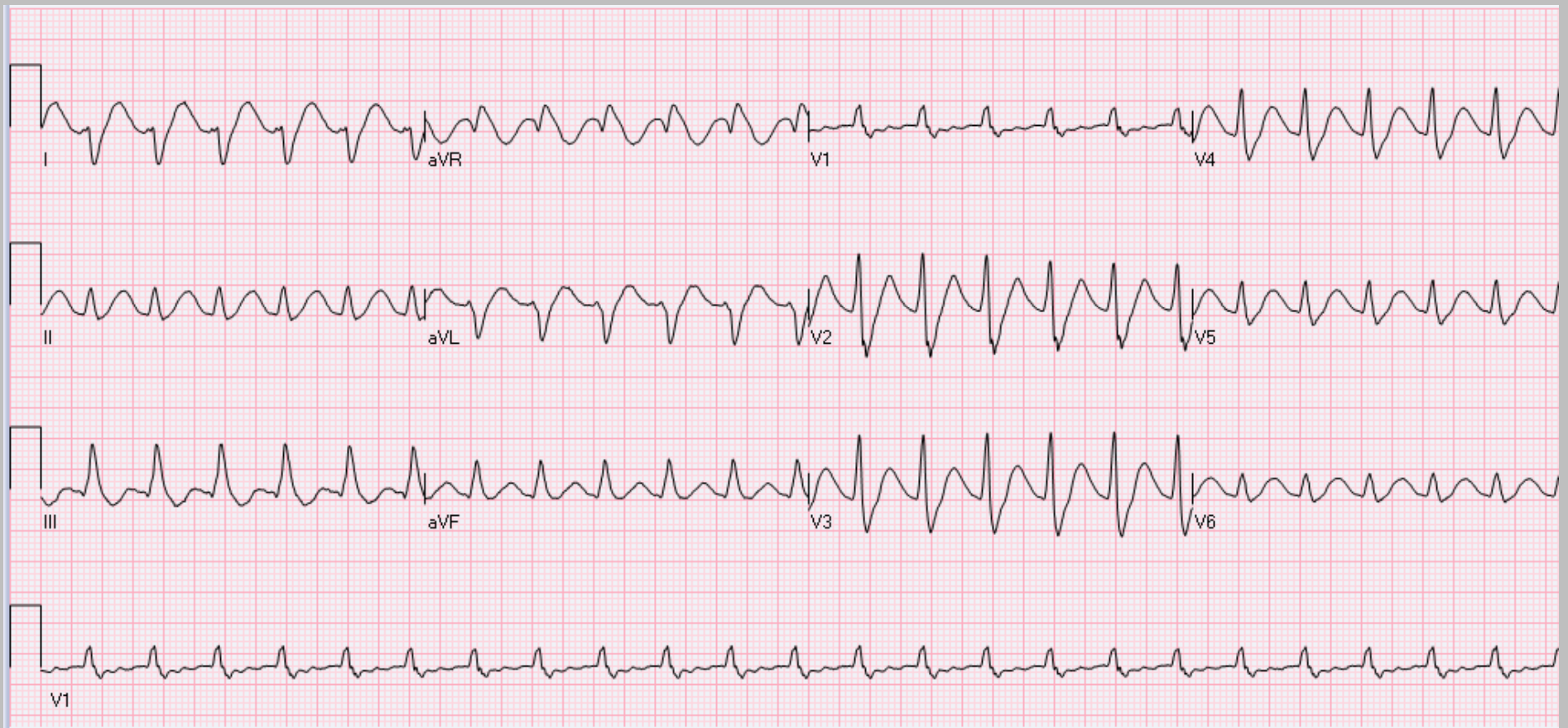


REORDER # 40457C/40457D



ECG 18

43 year old with altered mental status

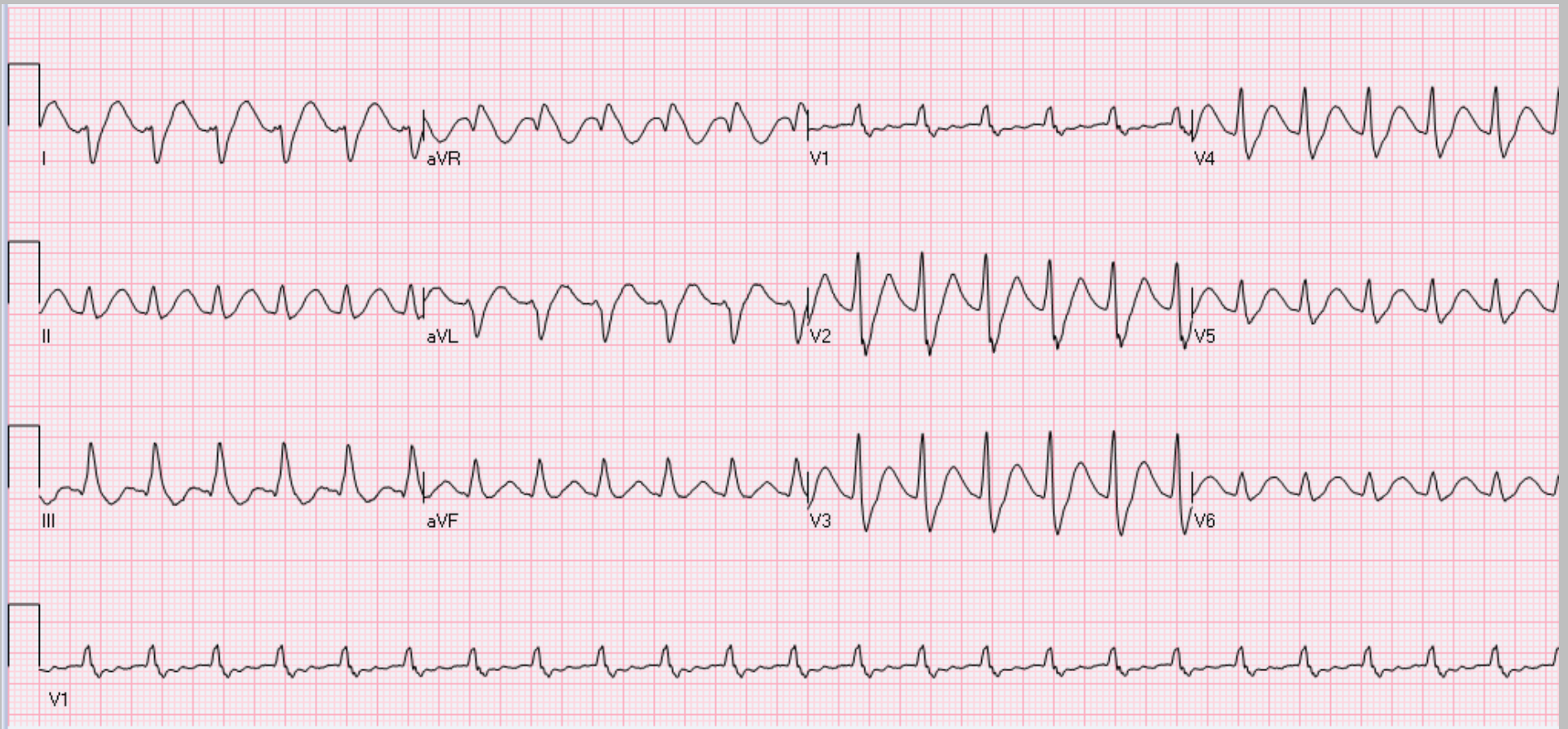


The background of the slide is a stylized American flag with red and white stripes and a blue field with white stars. The flag is slightly wavy and has a subtle texture.

43 year old with altered mental status

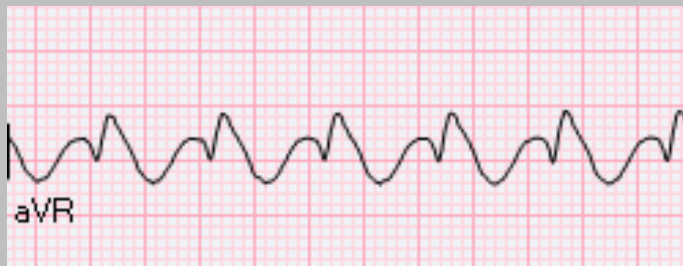
1. TCA overdose
2. Intracranial bleed
3. Renal failure
4. Atrial fibrillation
5. WPW

Tricyclic antidepressant (TCA) Overdose

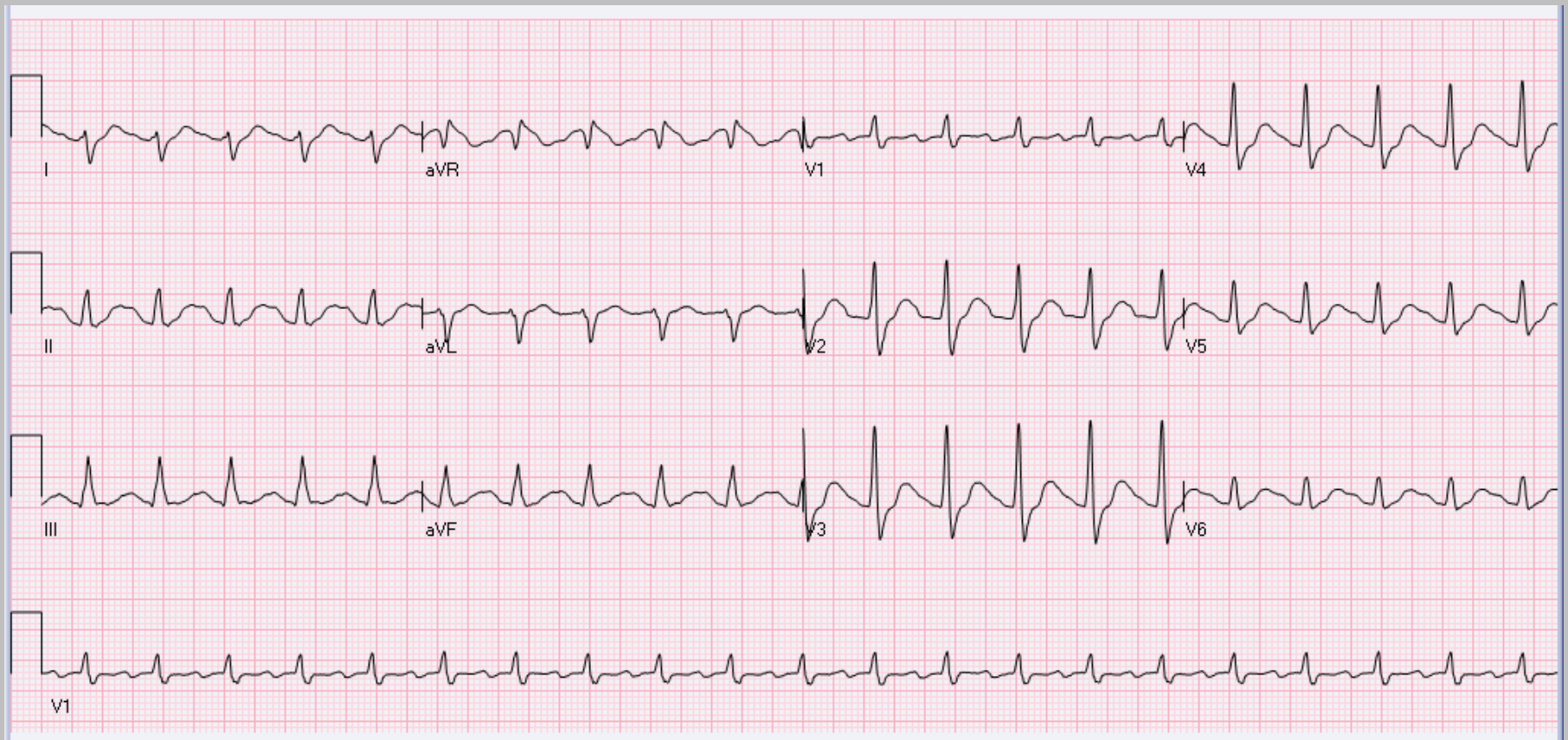


Tricyclic Antidepressant Overdose

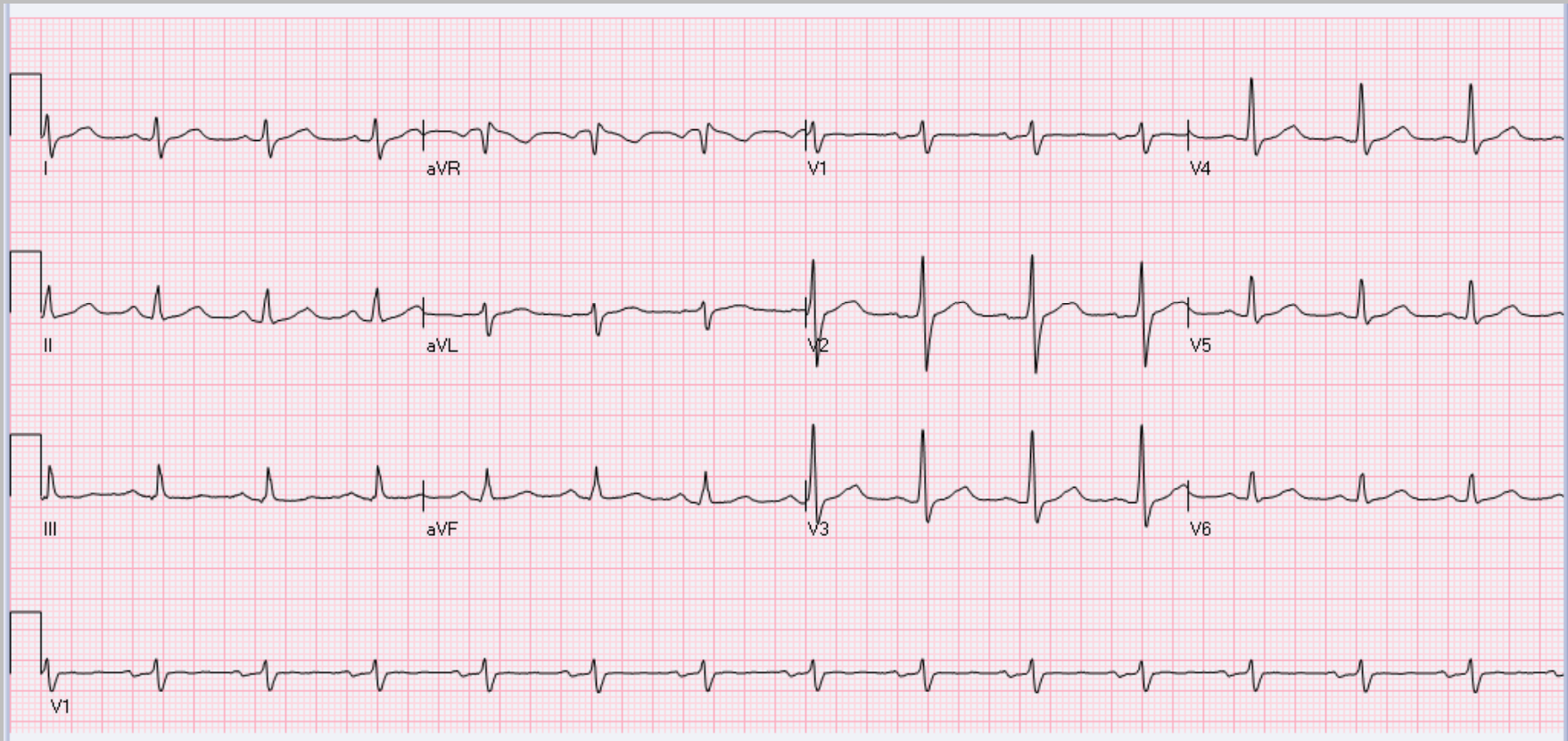
- Intraventricular conduction delay
 - QRS > 100
- Right axis deviation of the terminal QRS
 - aVR terminal R wave > 3mm
 - R/S > 0.7 in aVR



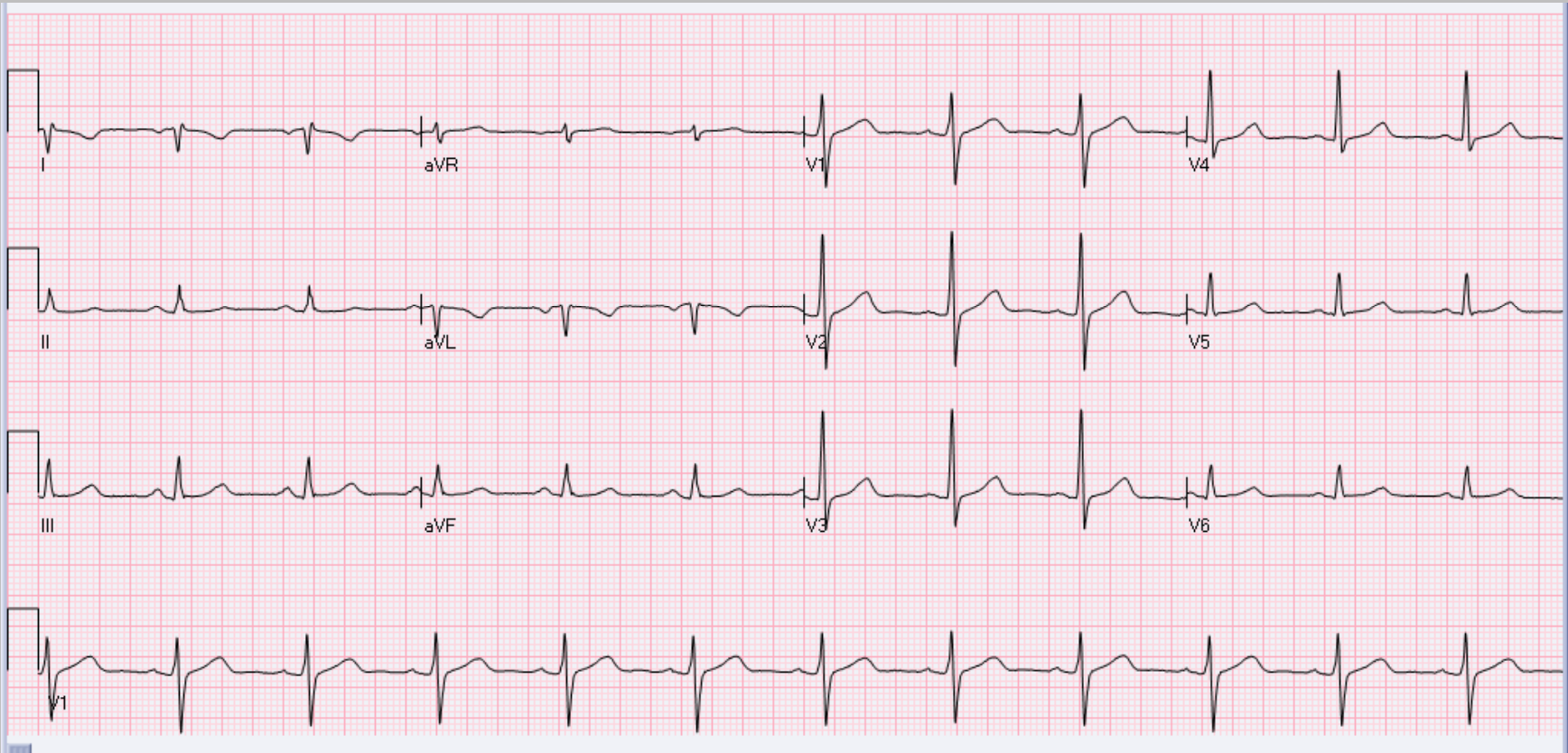
Day 2



Day 3

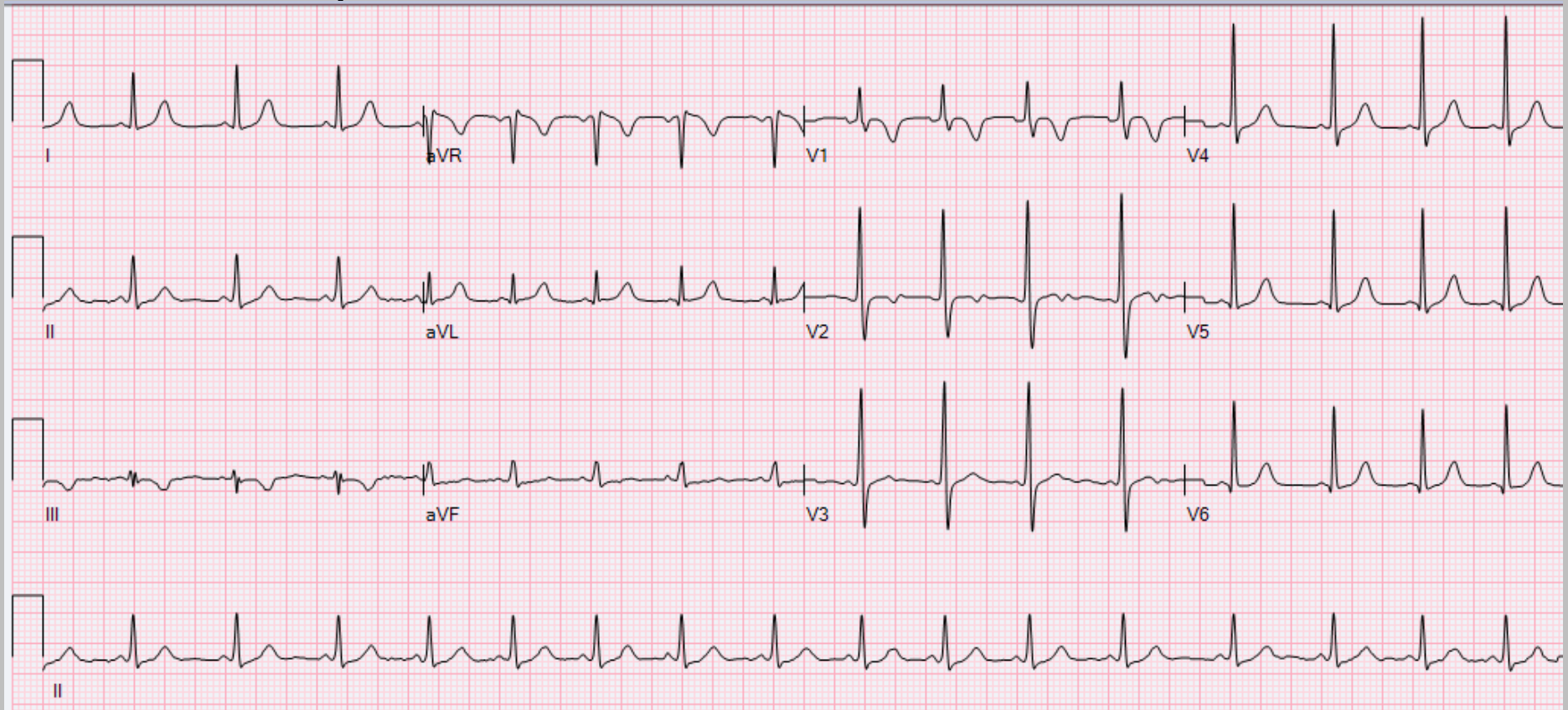


Day 4

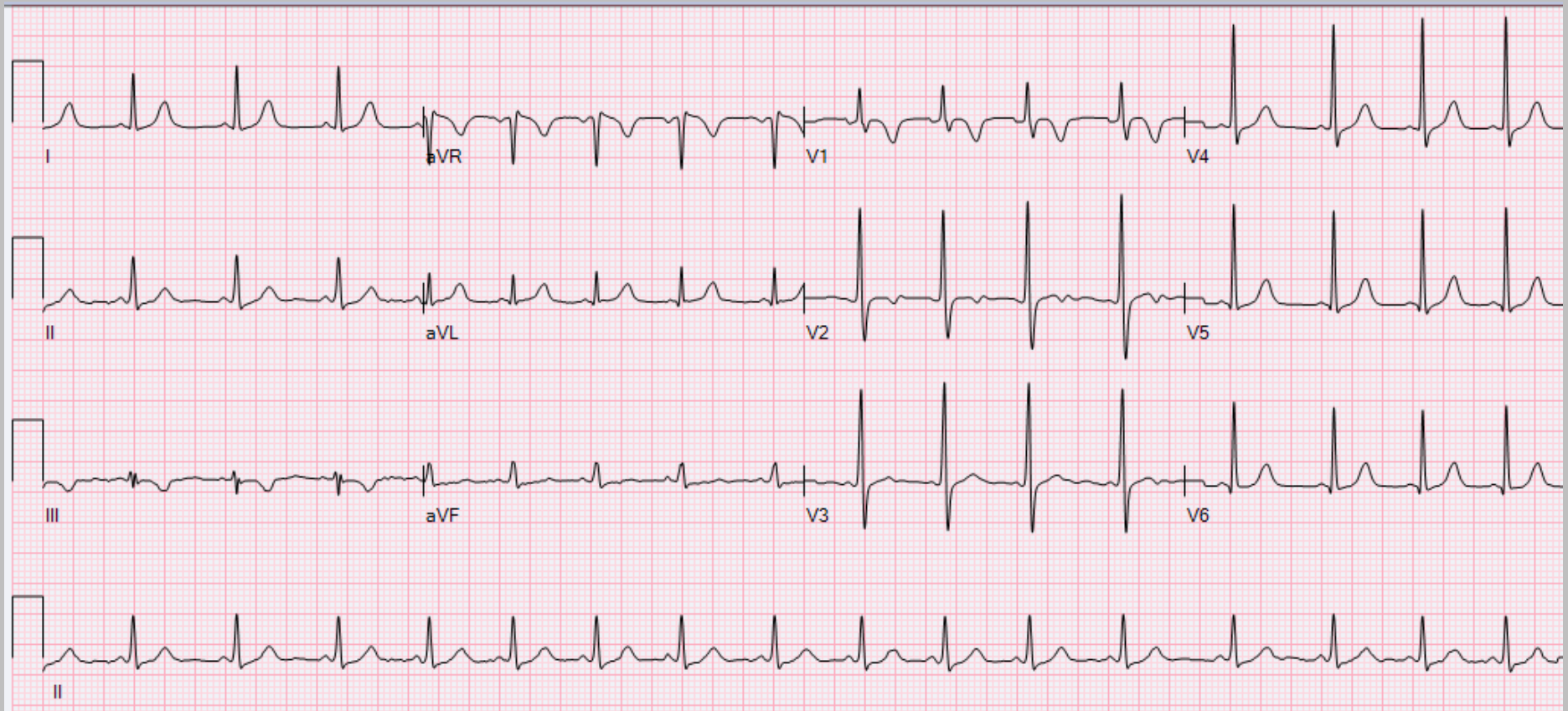


ECG 19

15 year old with muscle weakness



Duchenne Muscular Dystrophy

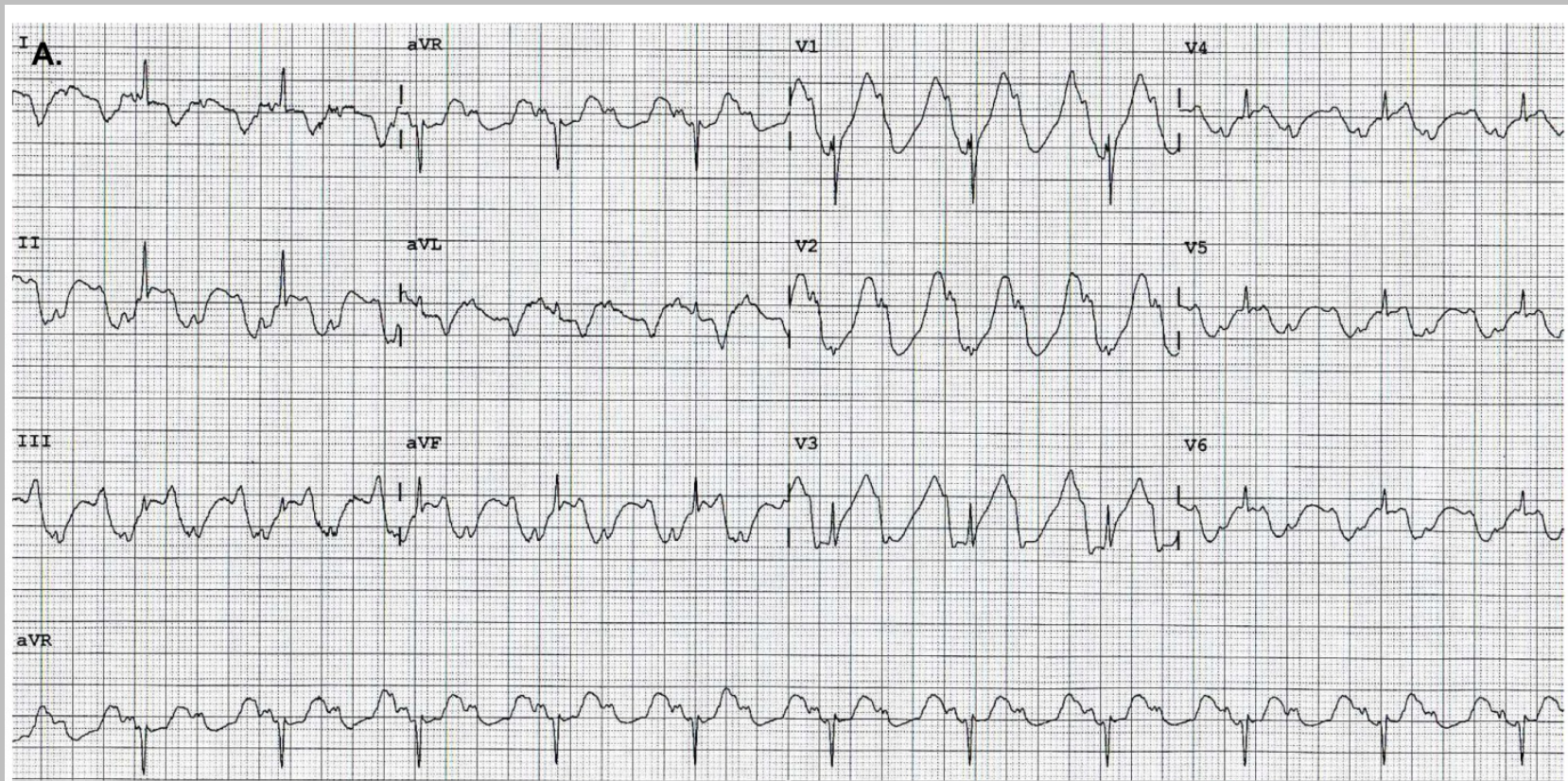


Tall R wave in V1

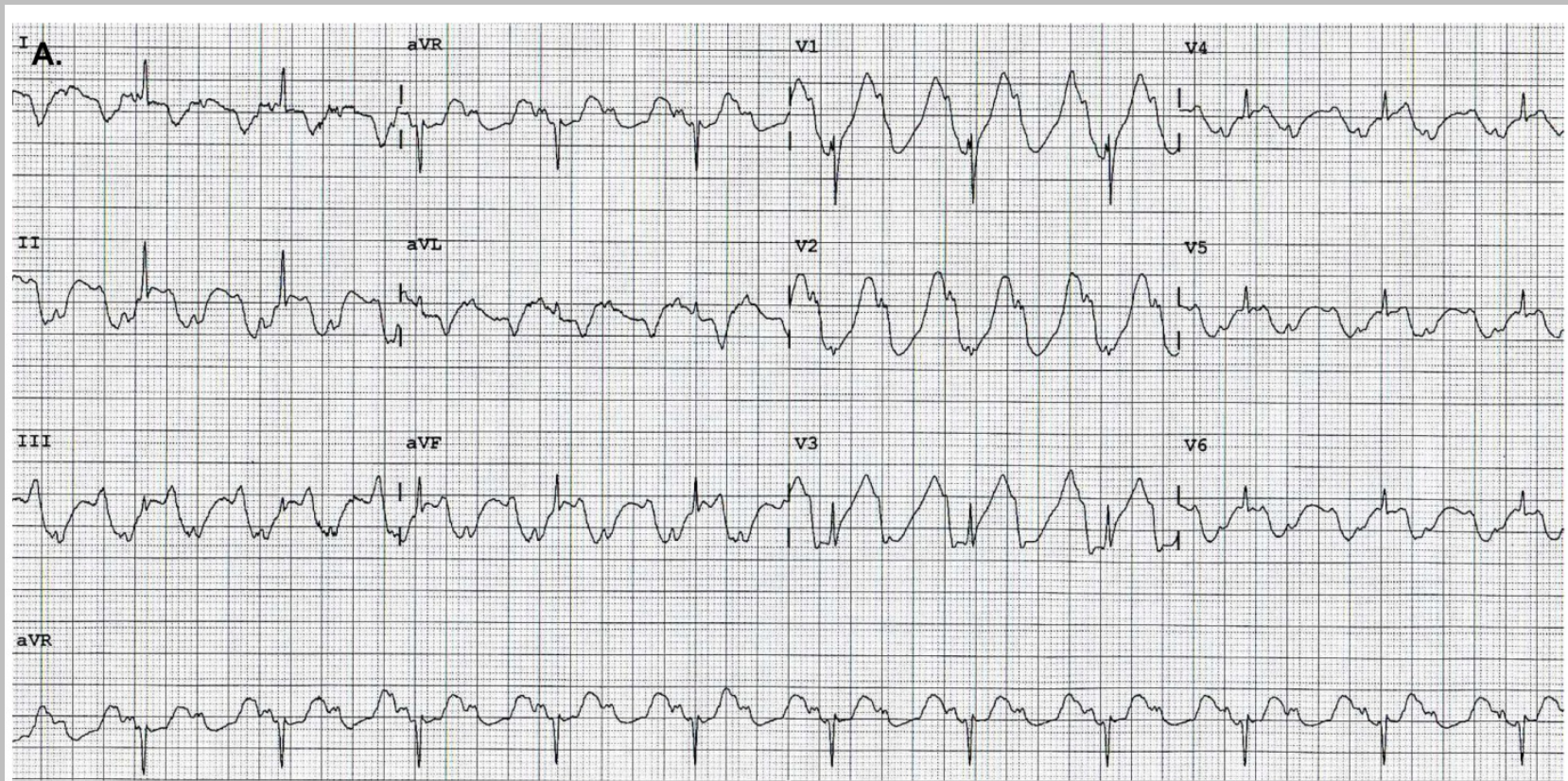
- RBBB
- Right ventricular hypertrophy
- Posterior MI
- WPW
- Duchenne muscular dystrophy
- Normal variant

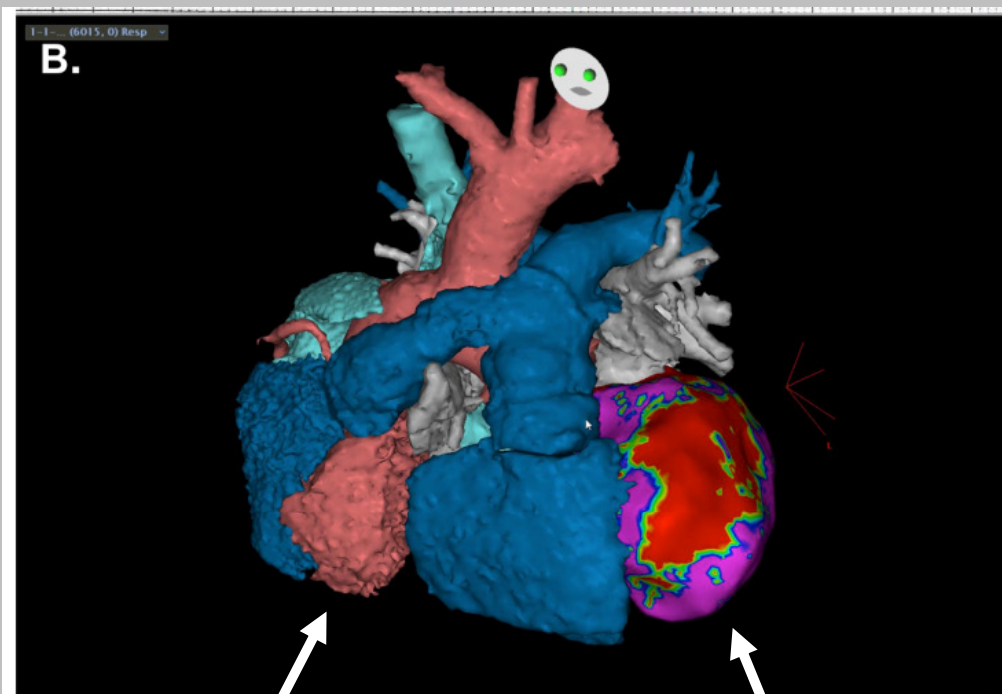
ECG 20

79 year old with prior cardiac surgery with SOB



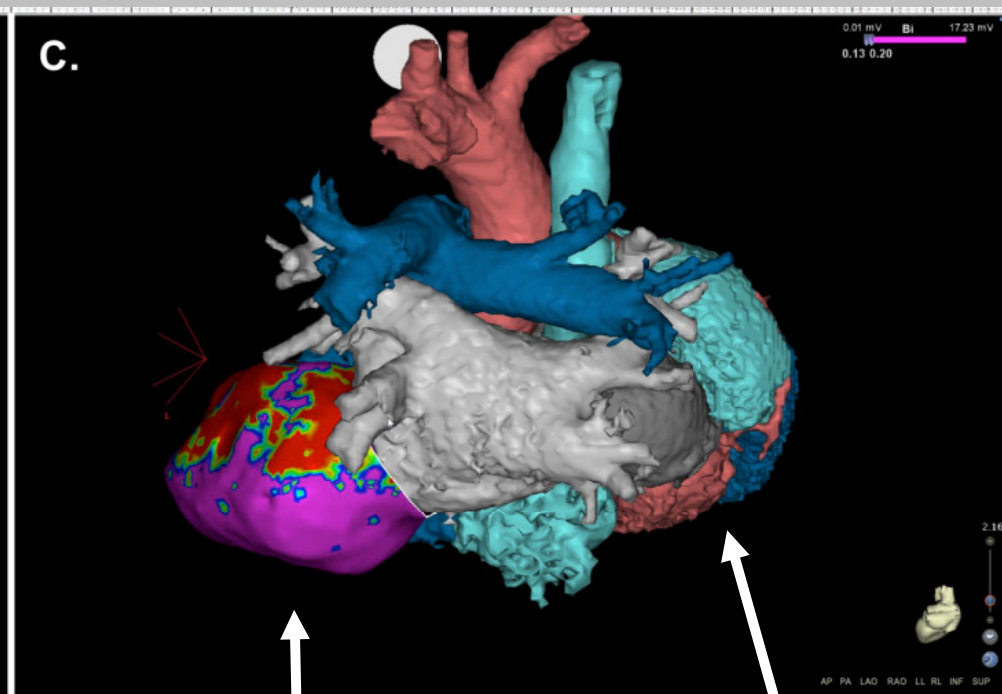
Ventricular tachycardia in a patient with heterotopic heart transplantation






Donor Heart

Recipient Heart



Recipient Heart

Donor Heart

The background of the slide is a stylized American flag with red and white stripes and a blue field with white stars. The flag is slightly wavy and has a semi-transparent white rectangular area in the center where the text is located.

Disease States of America: ECG Manifestations of Systemic Disease

David A. Sandler, MD, FACC, FHRS
Director, Heart Rhythm Service
Oklahoma Heart Institute
Tulsa, OK