



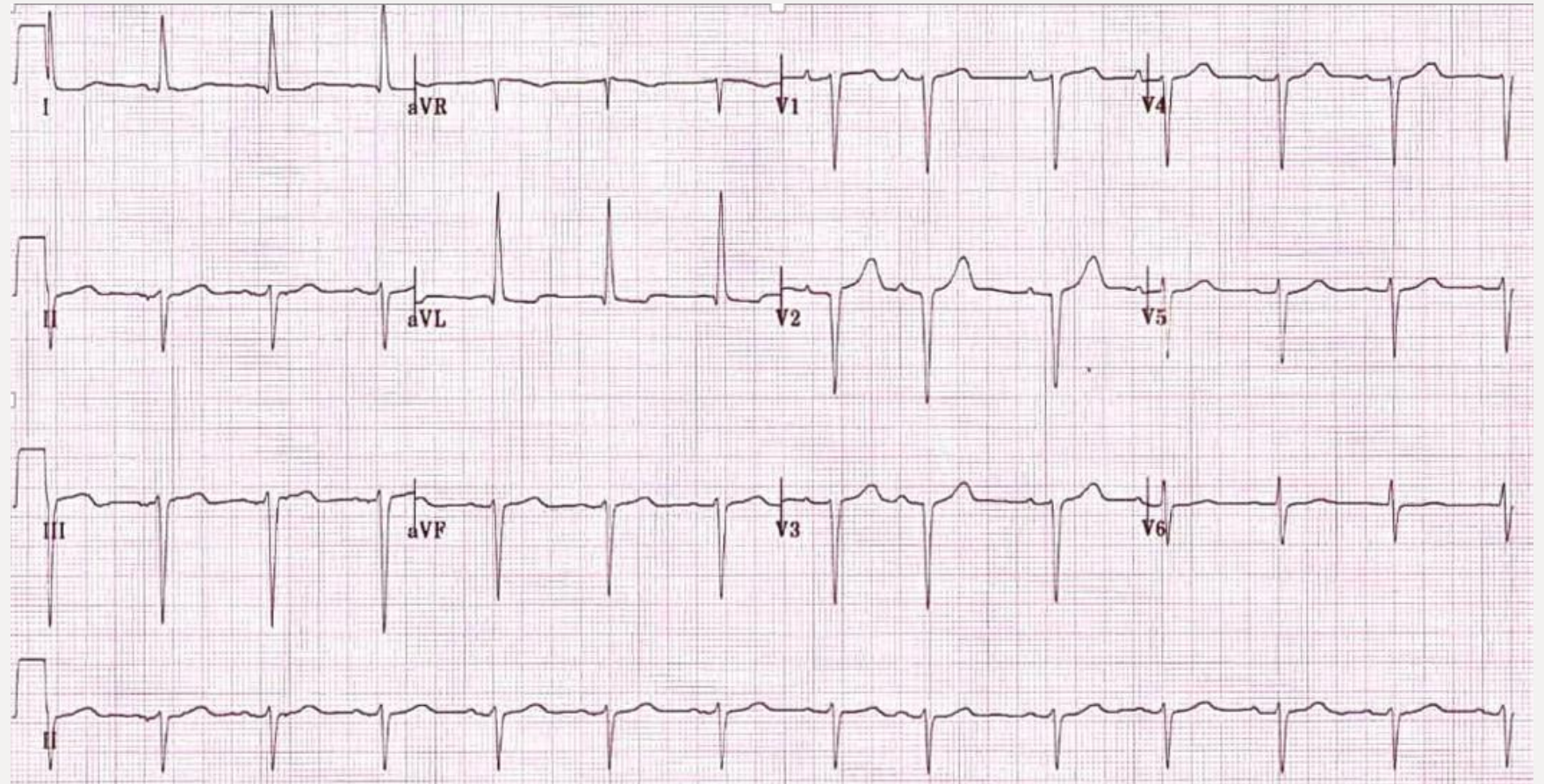
# ECG made easy Part 2 – ECG Quiz

**Presented by:**

Dr Randall Hendriks, Interventional Cardiologist – Western Australia

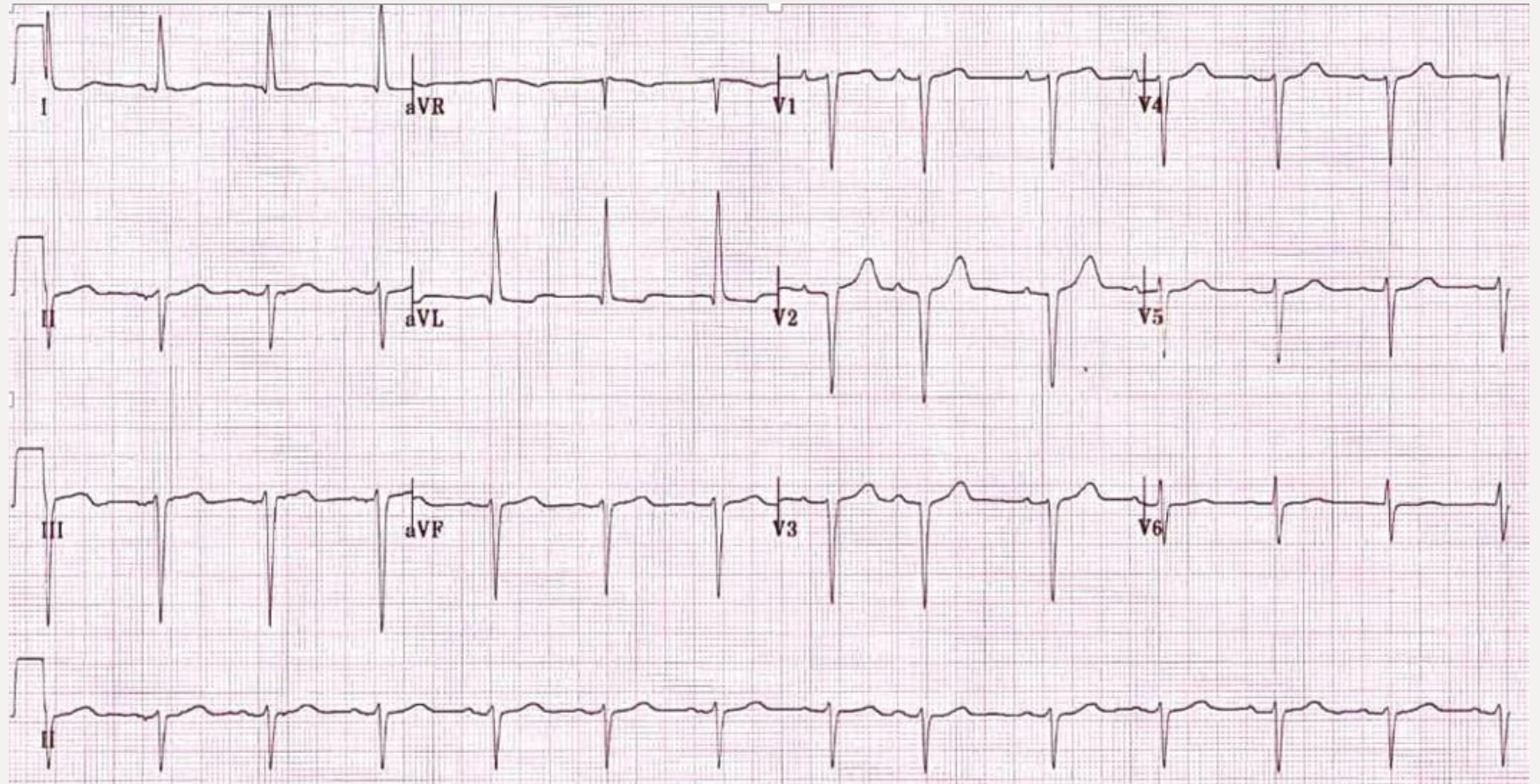
# ? Axis

1. Left
2. Right
3. Indeterminate



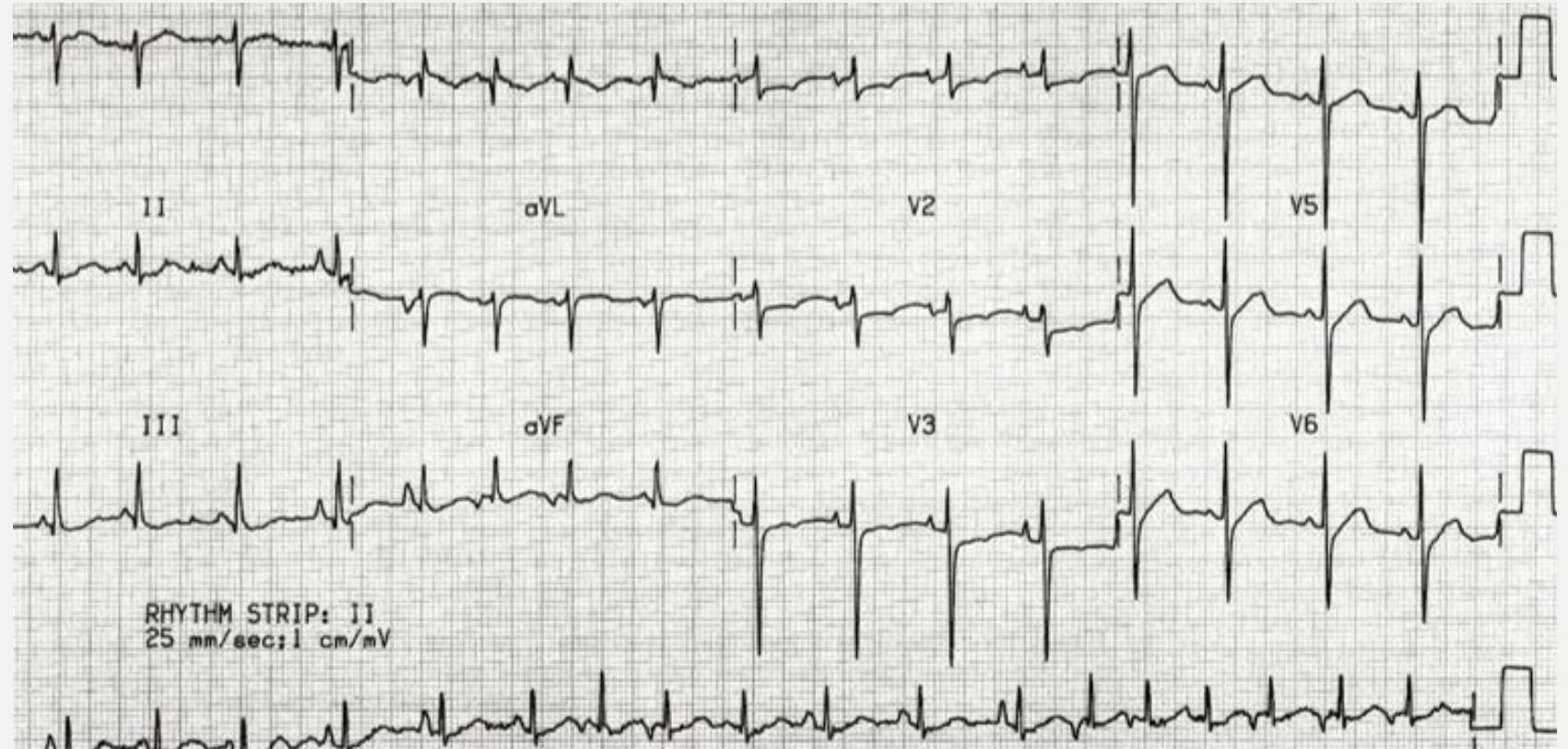
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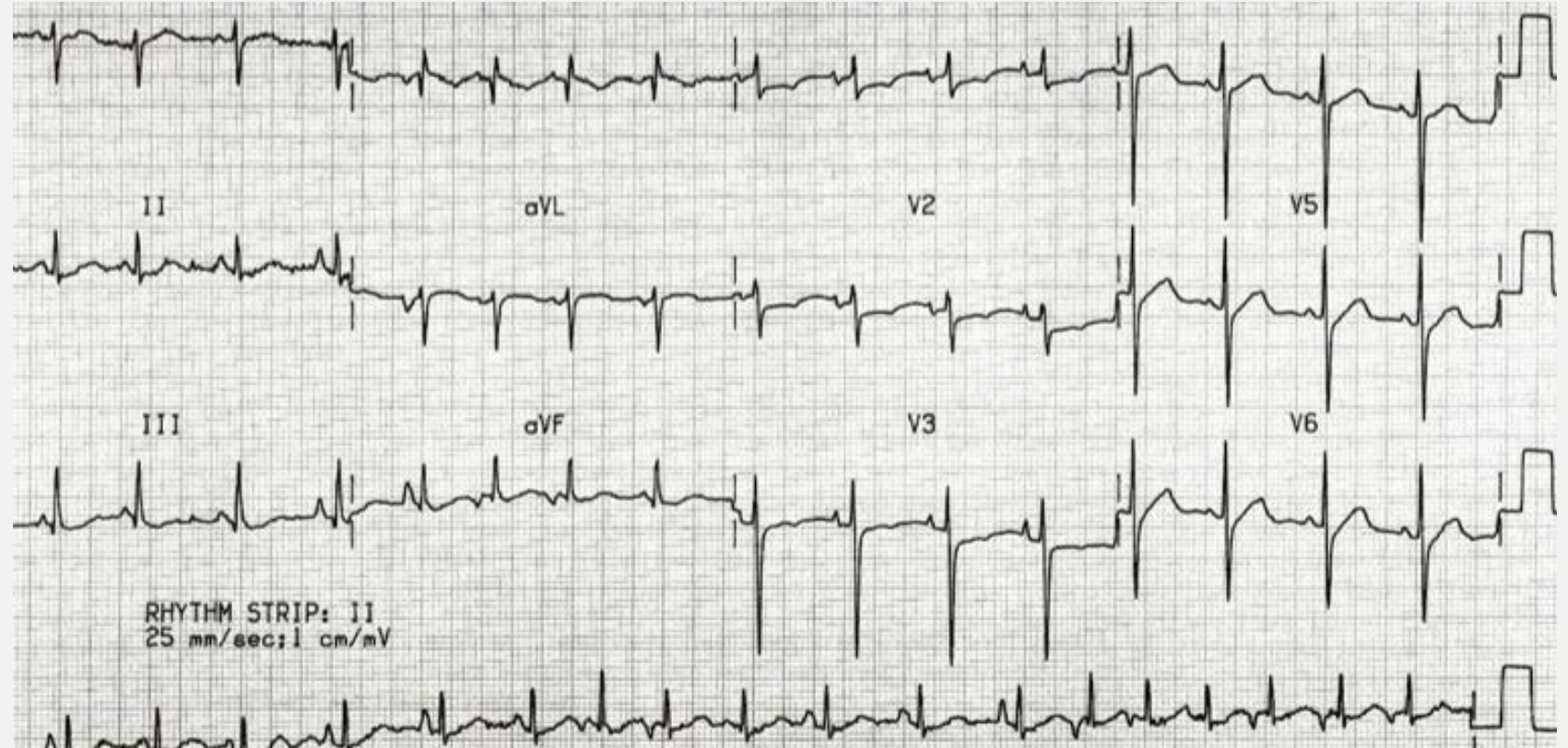
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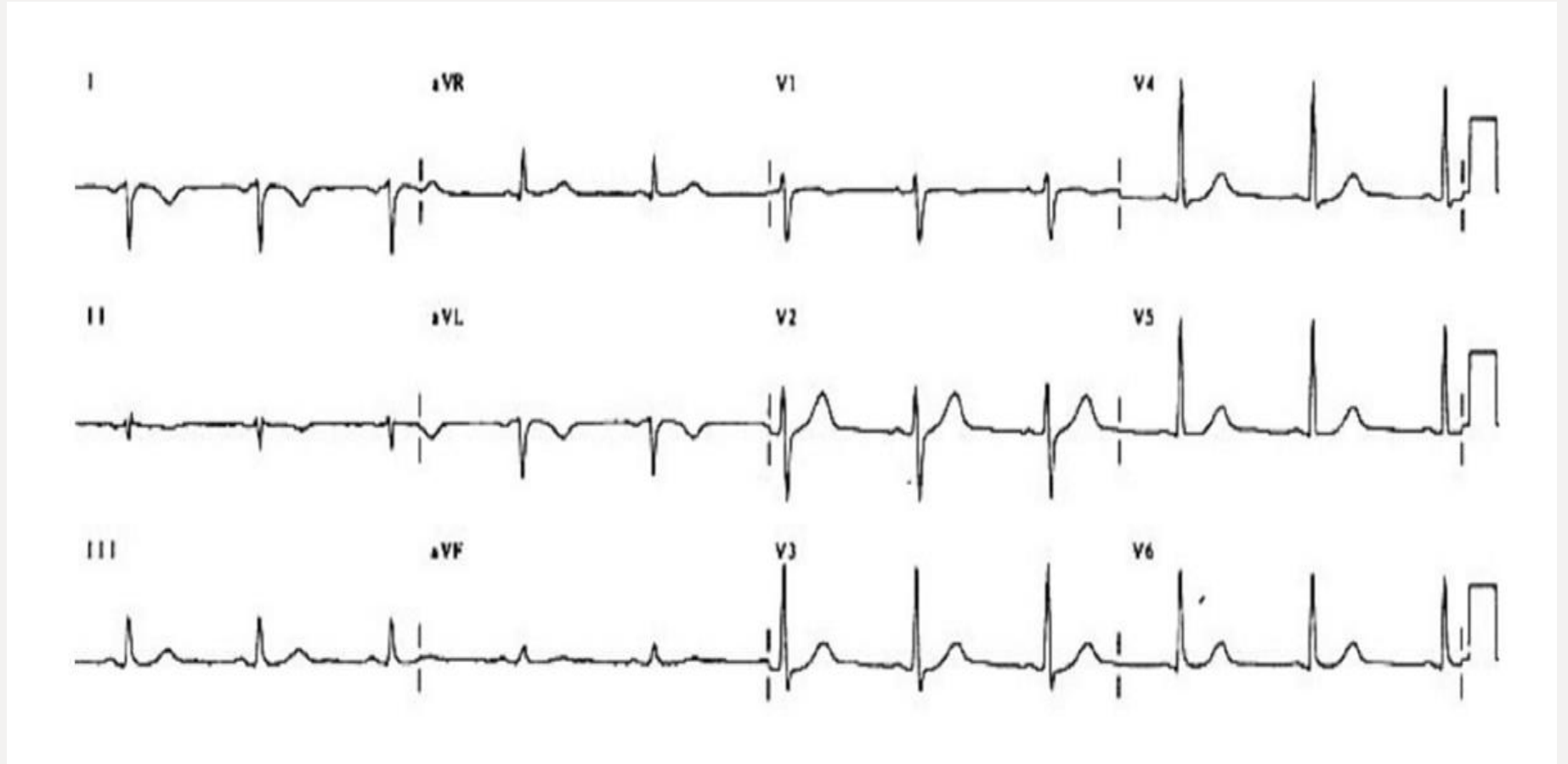
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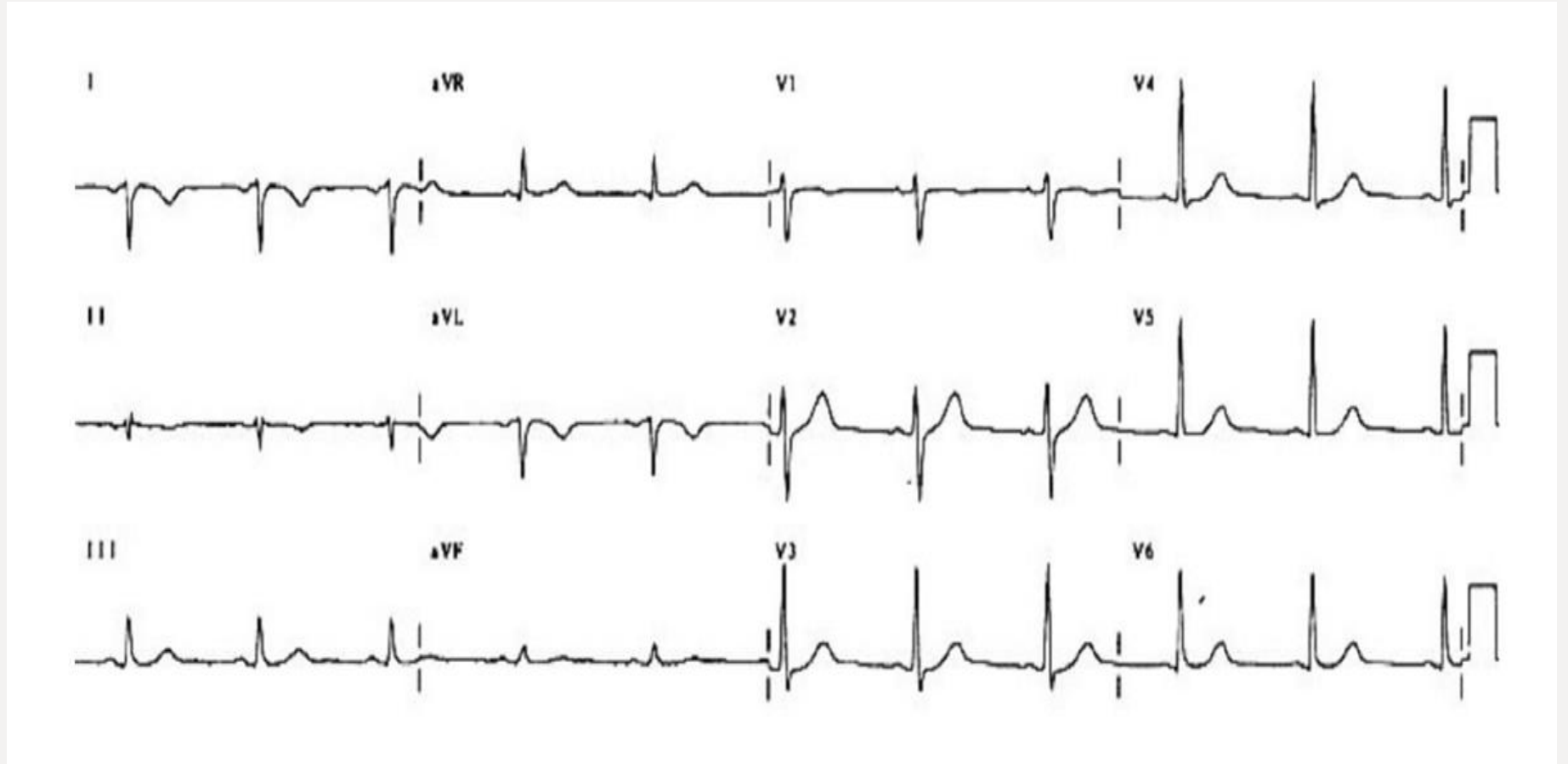
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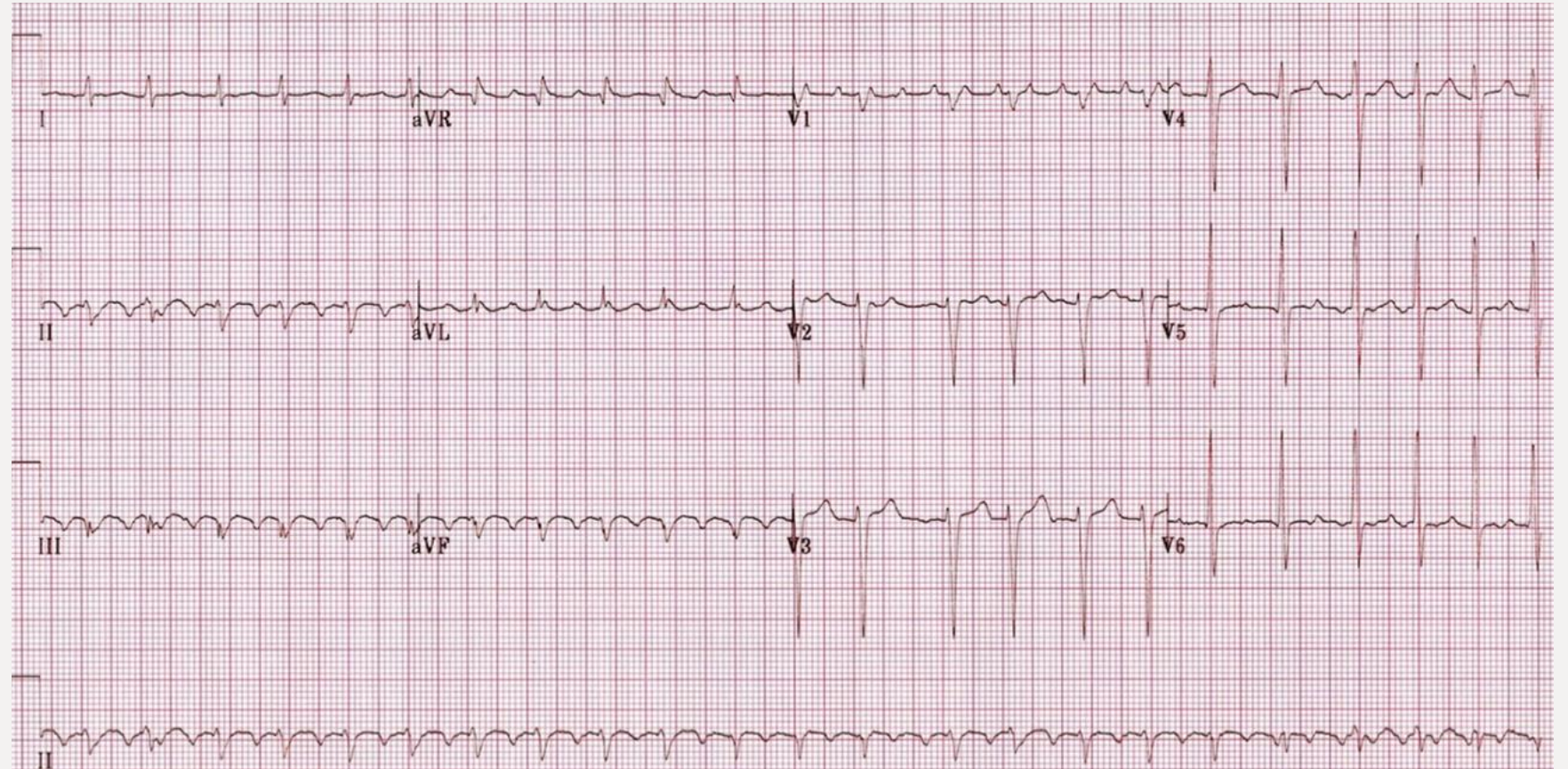
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Standard limb lead reversal!

# Tachycardia

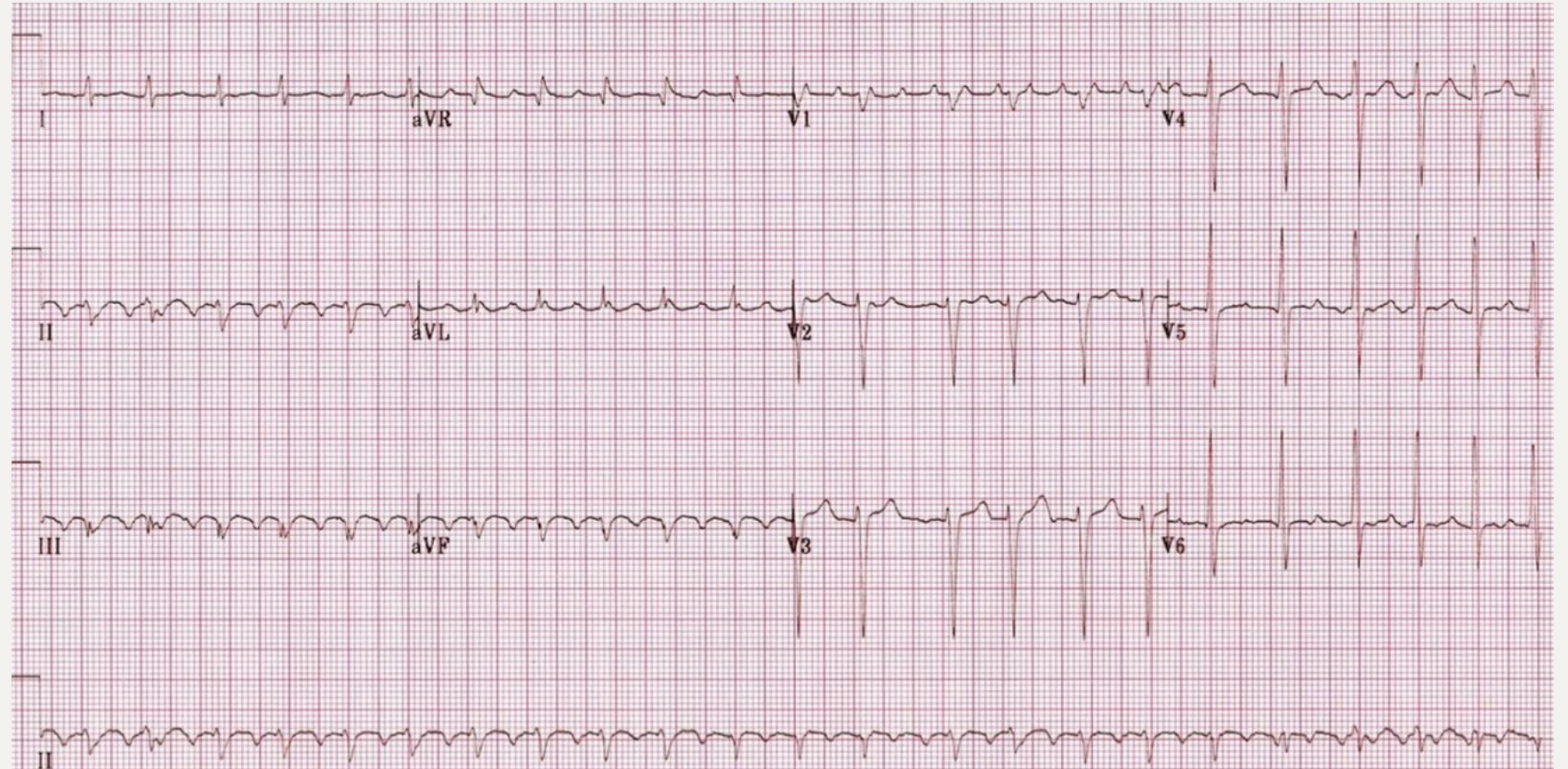
1. Atrial fibrillation
2. Atrial flutter
3. SVT
4. Sinus tachycardia
5. Junctional





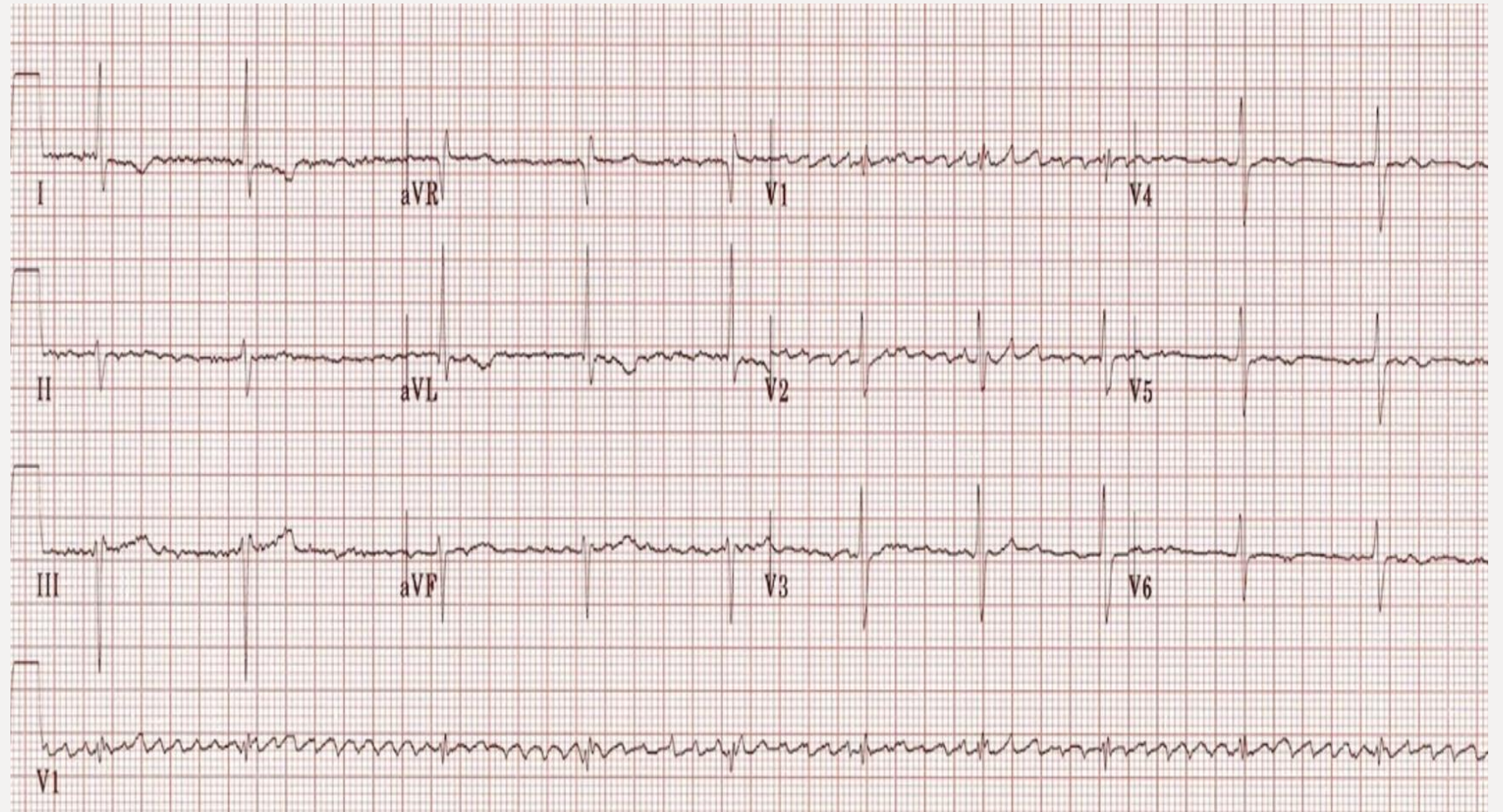
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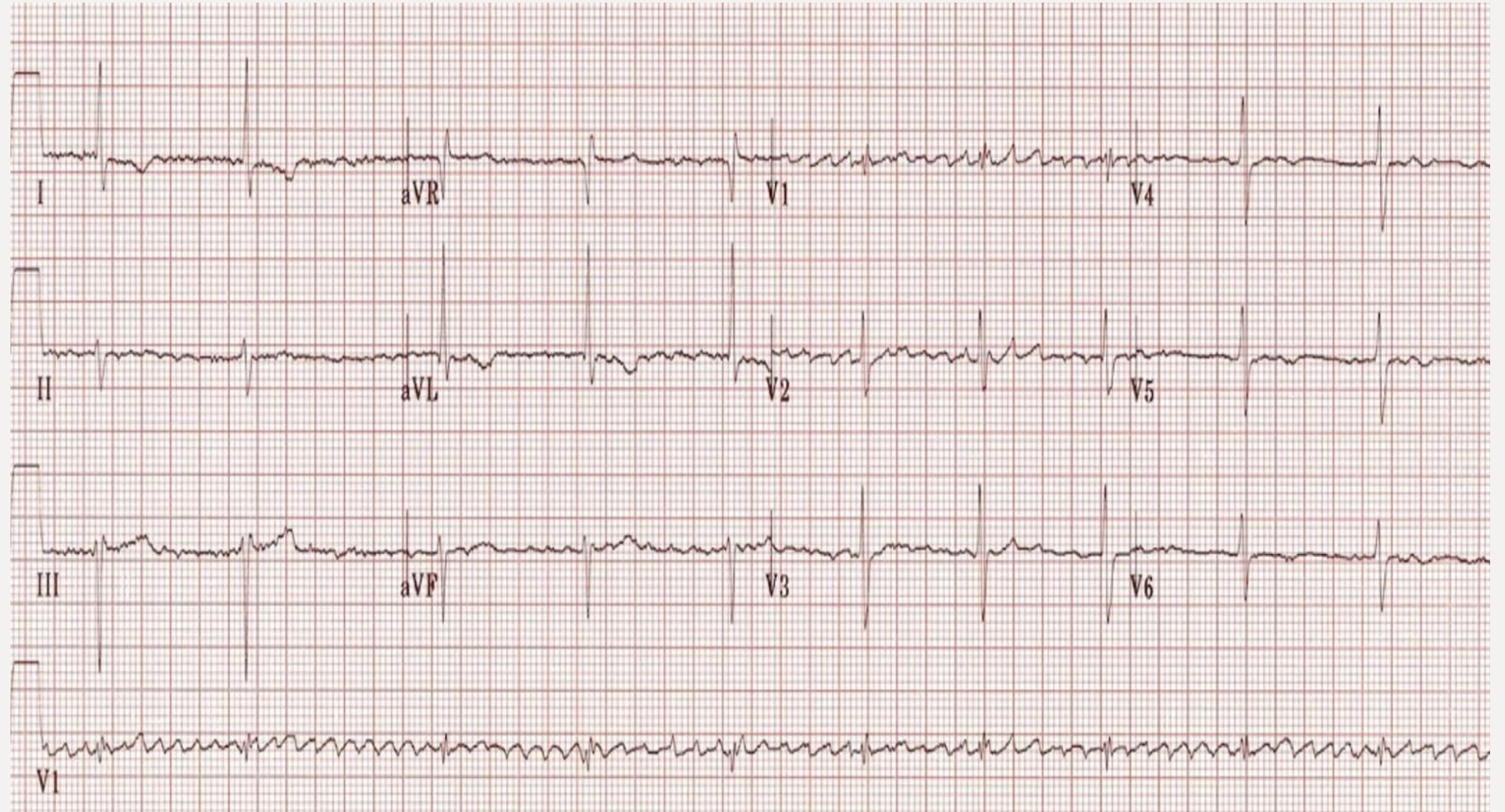
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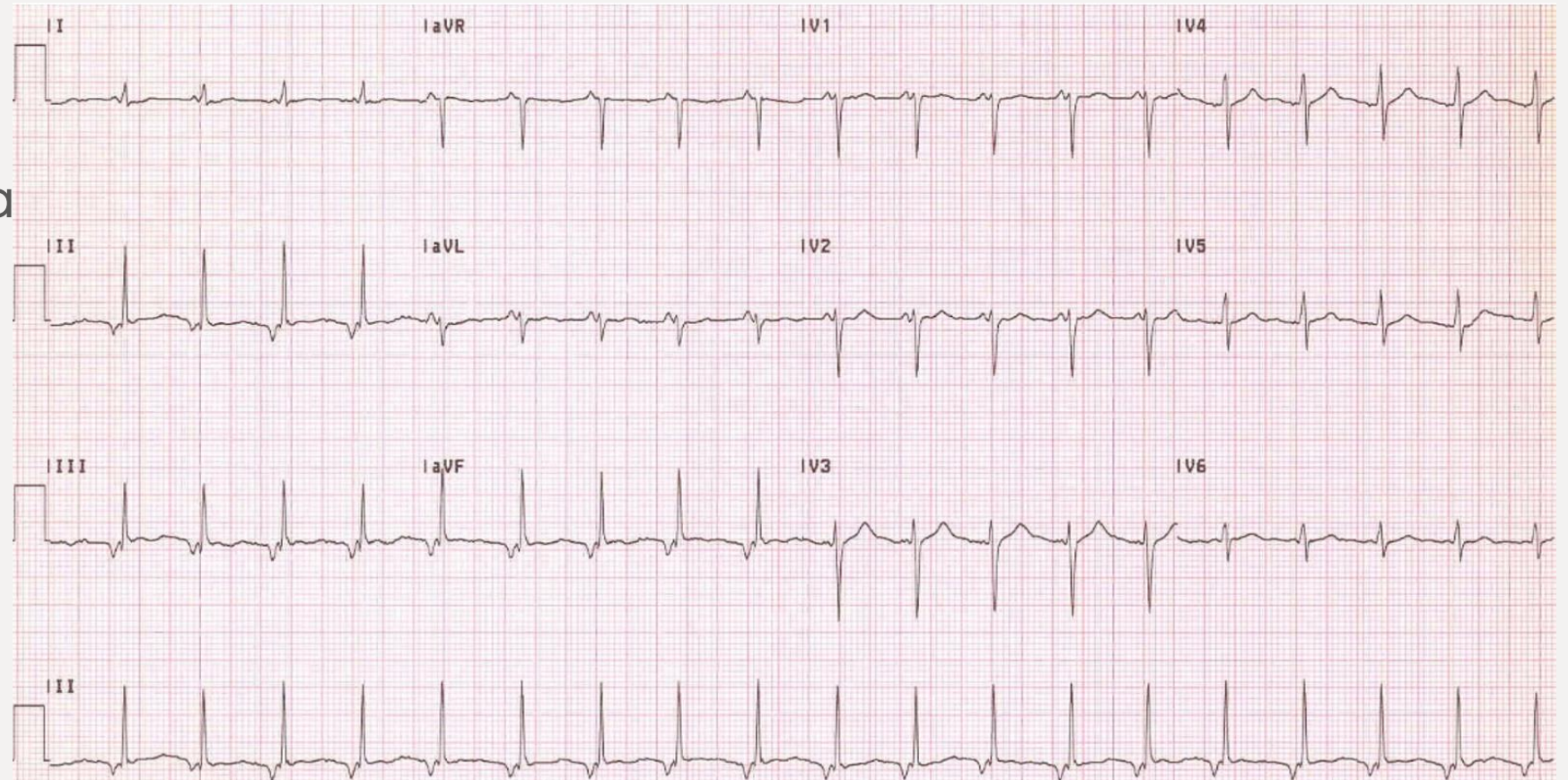
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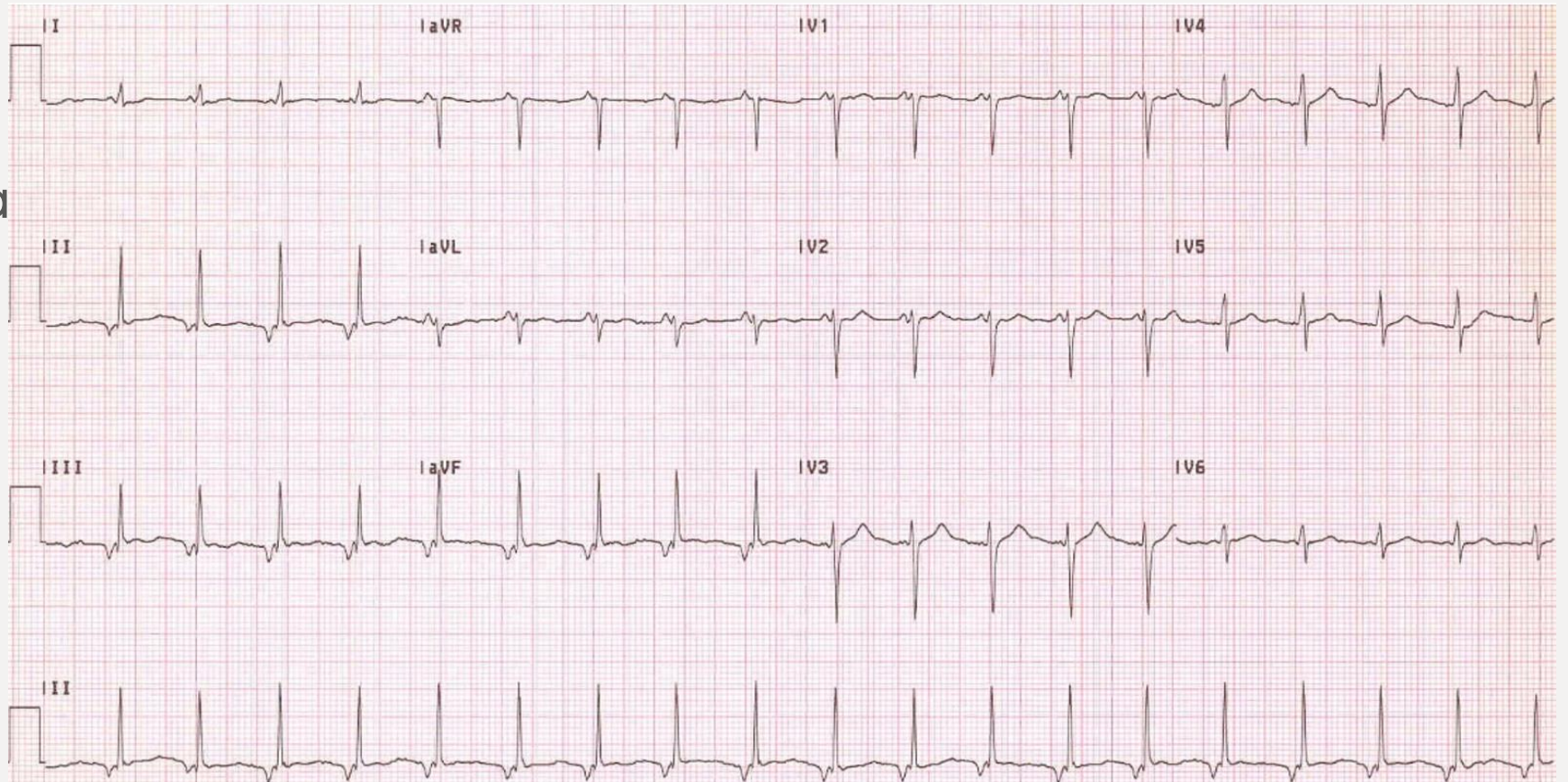
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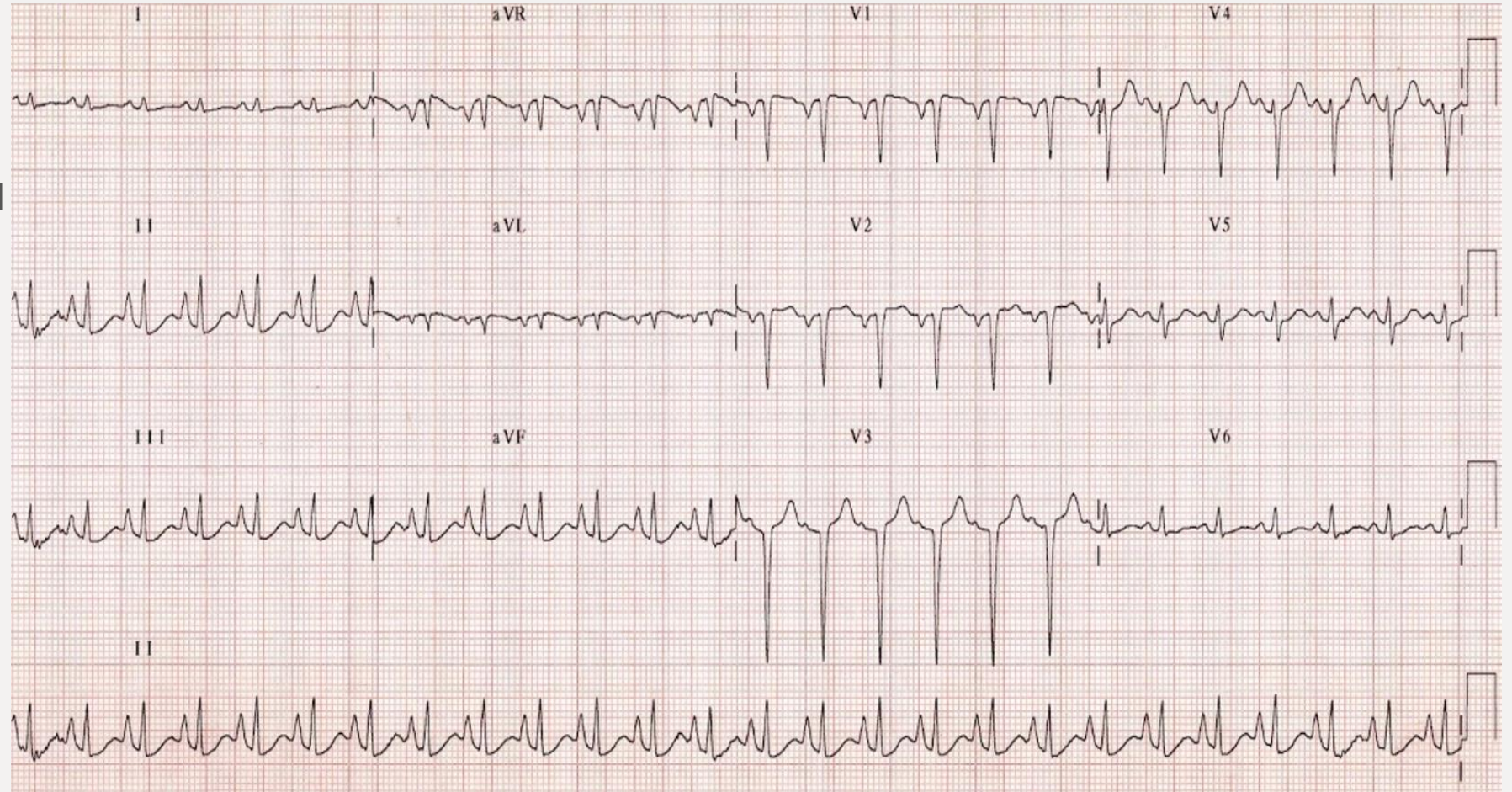
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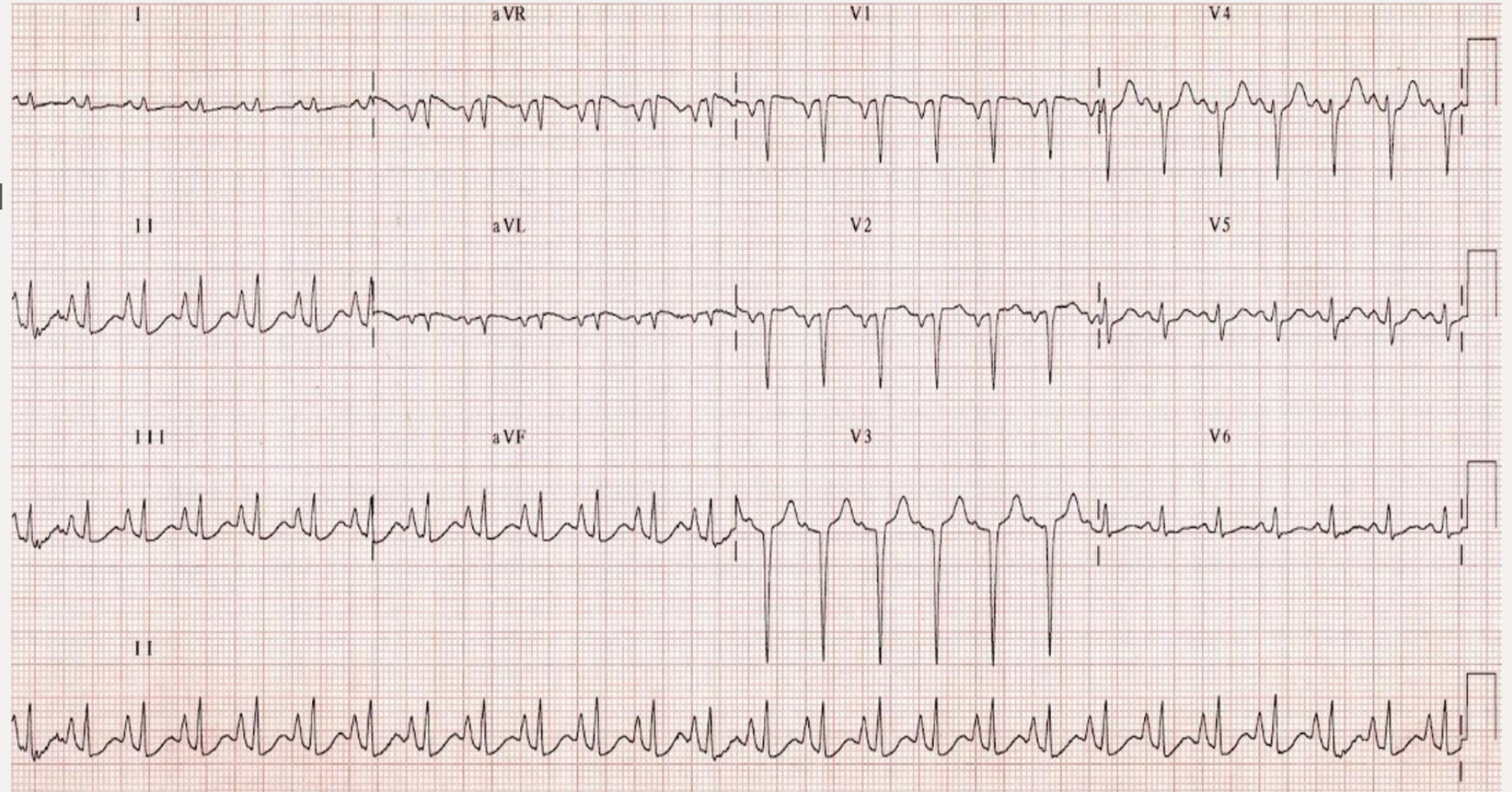
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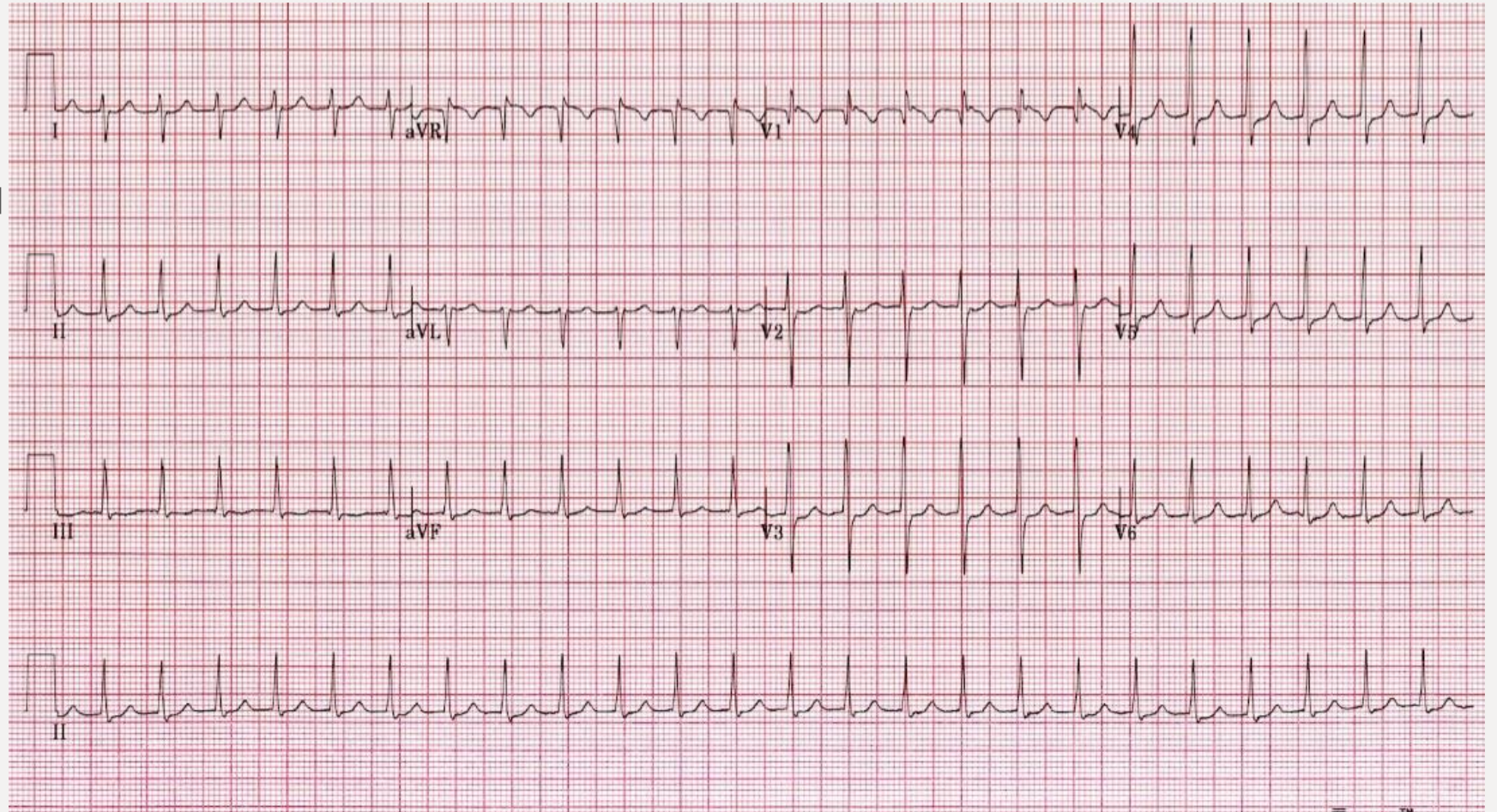
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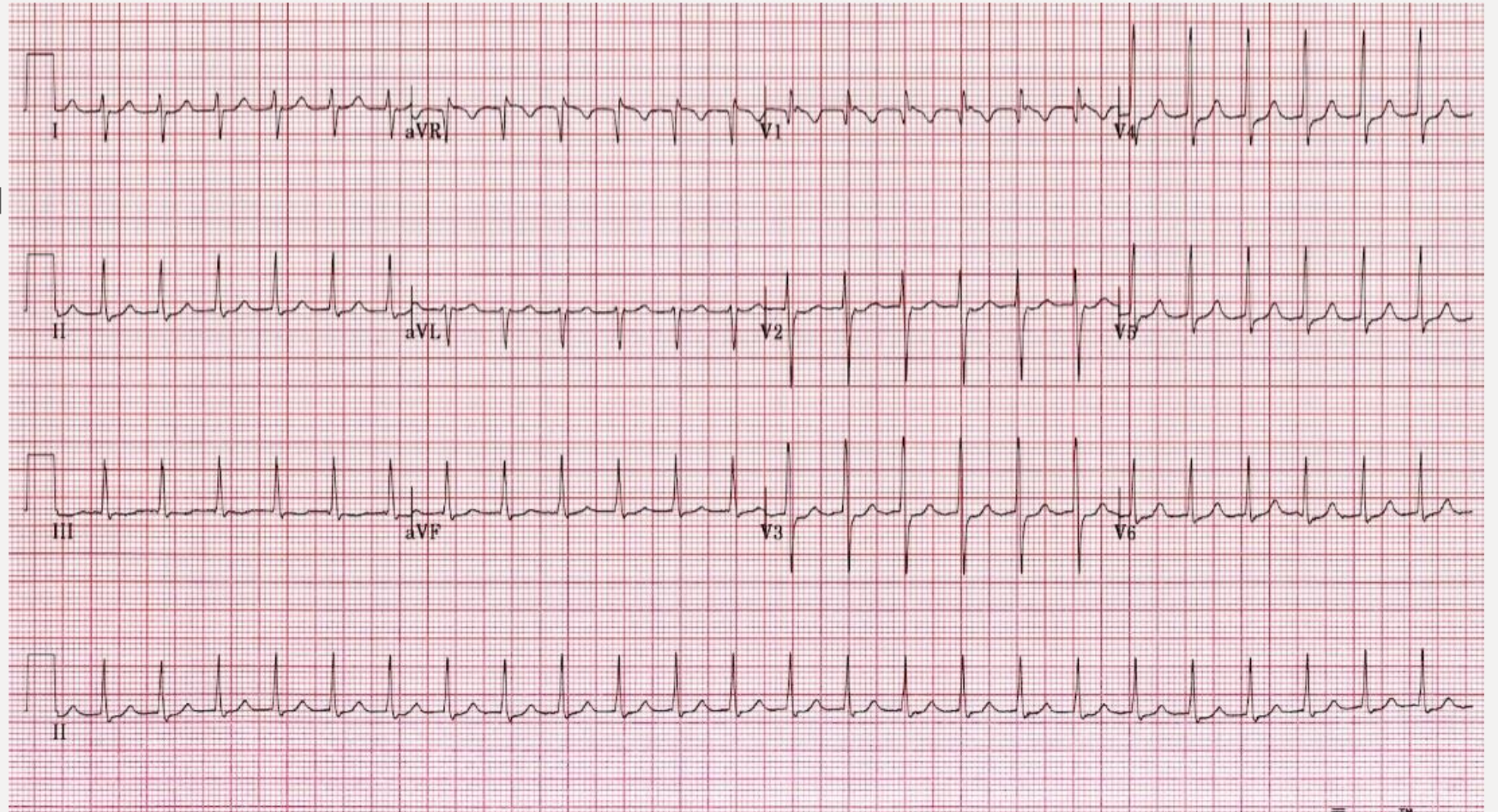
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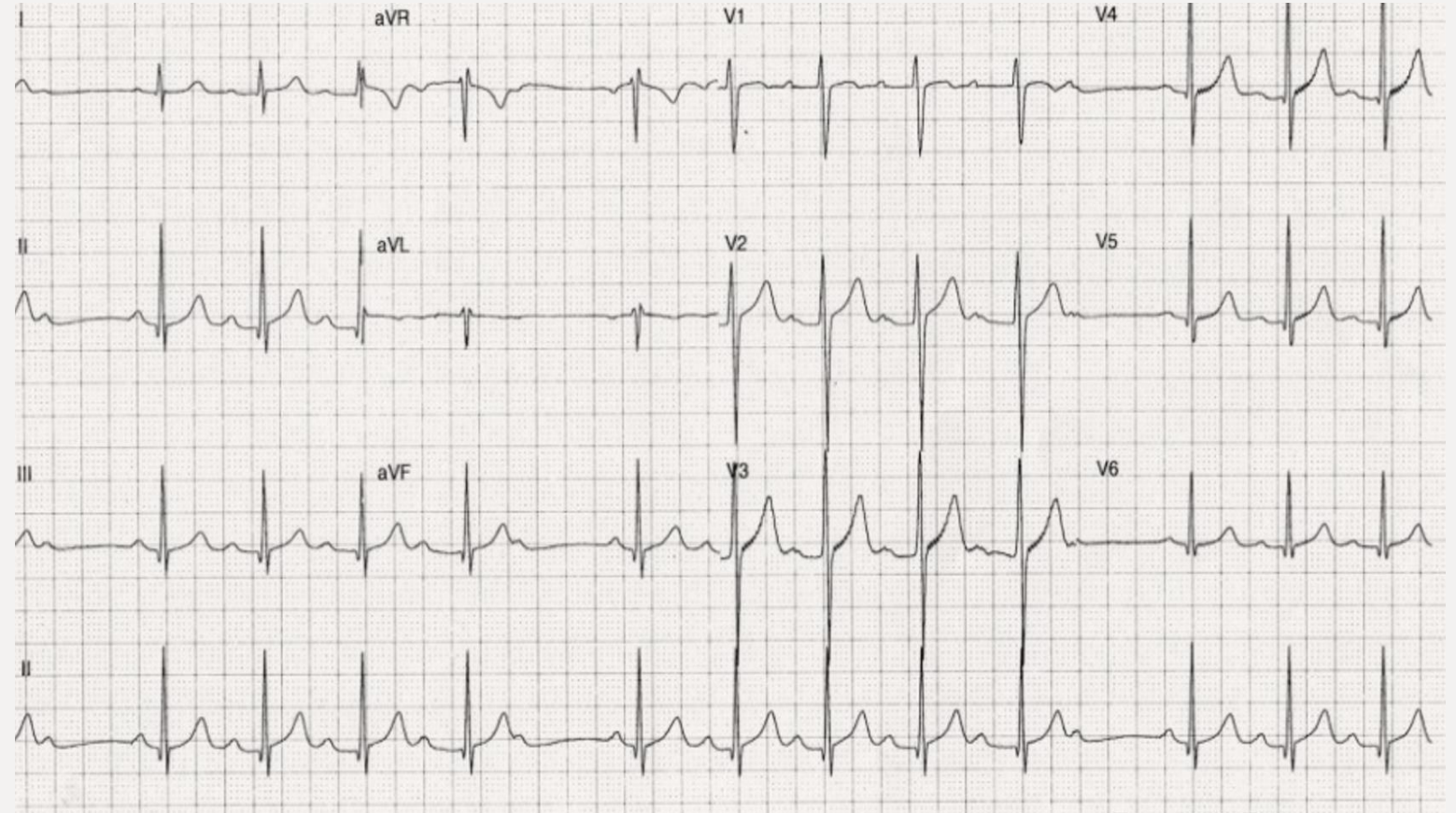
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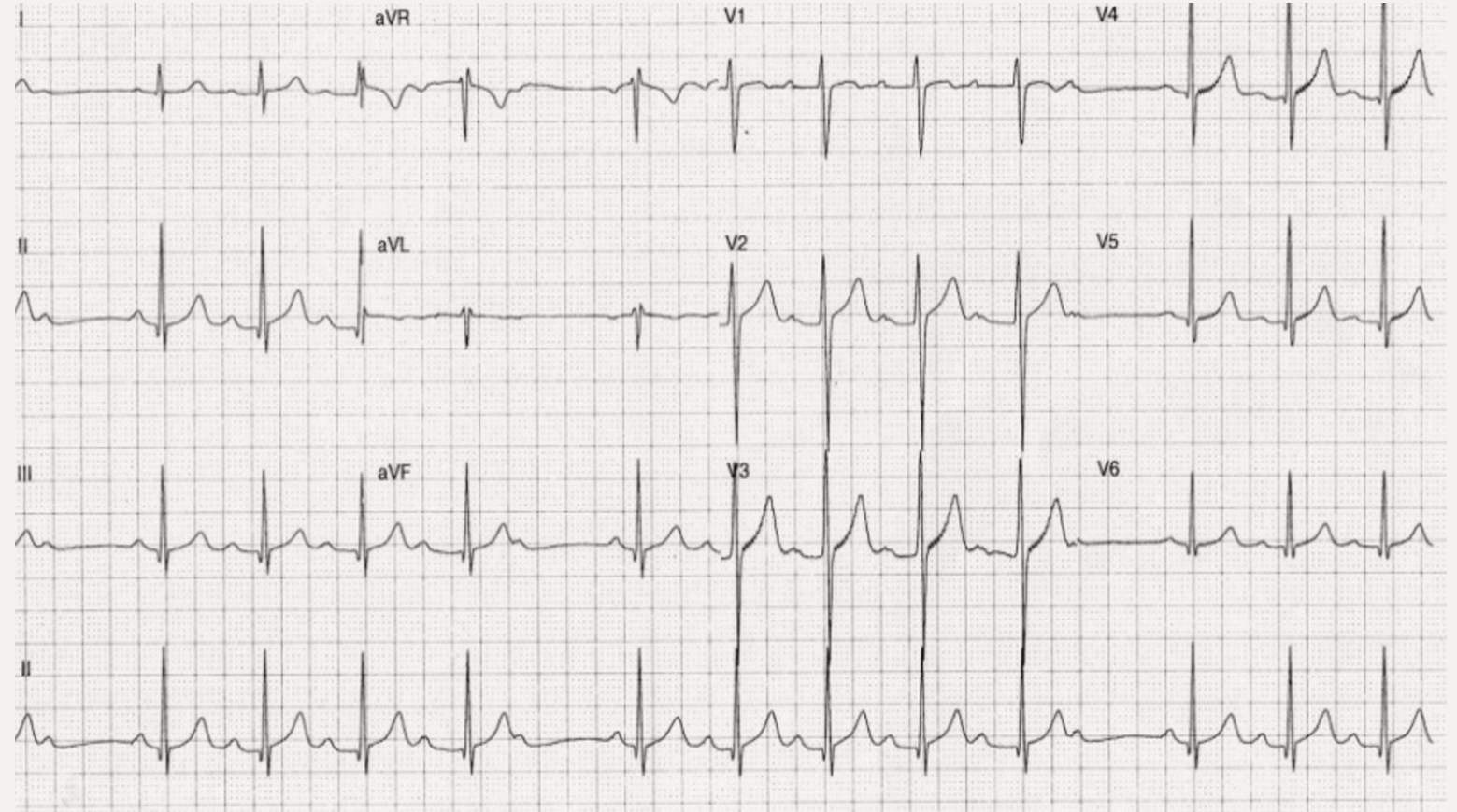
# Bradycardia

1. Sinus bradycardia
2. First degree AV block
3. Mobitz Type I (Wenckebach)
4. Mobitz Type 2
5. Complete heart block



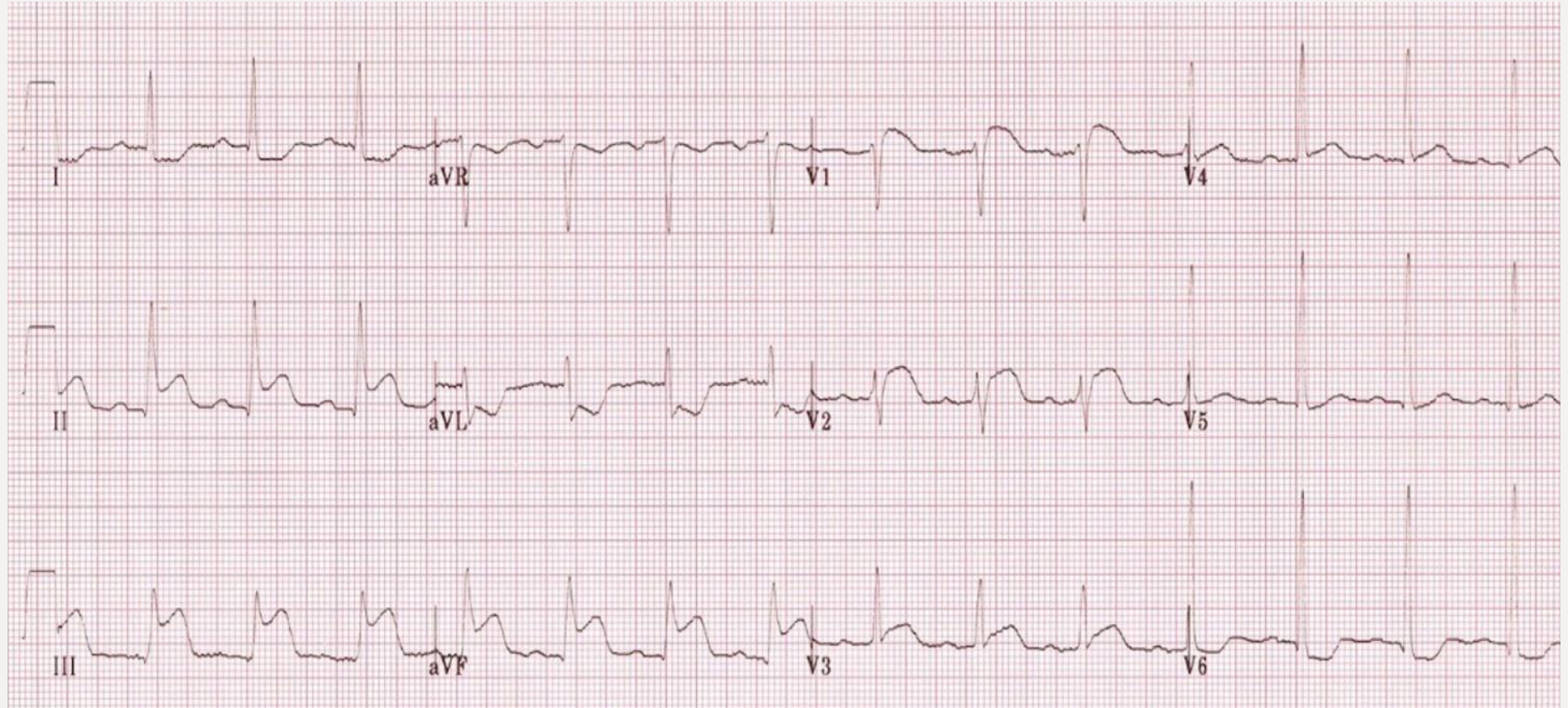
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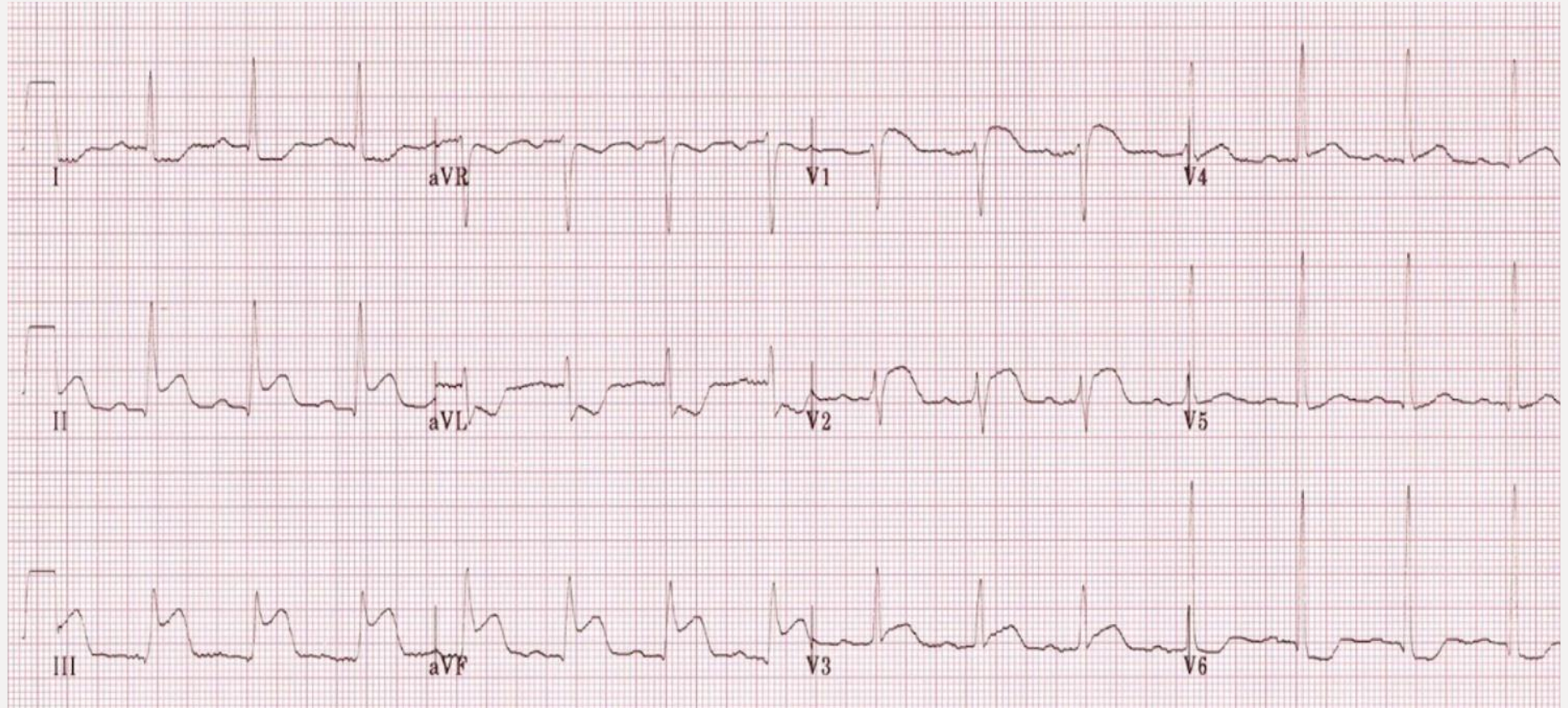
# ST elevation MI

1. Inferior
2. Anterior
3. Lateral
4. Posterior
5. IPL



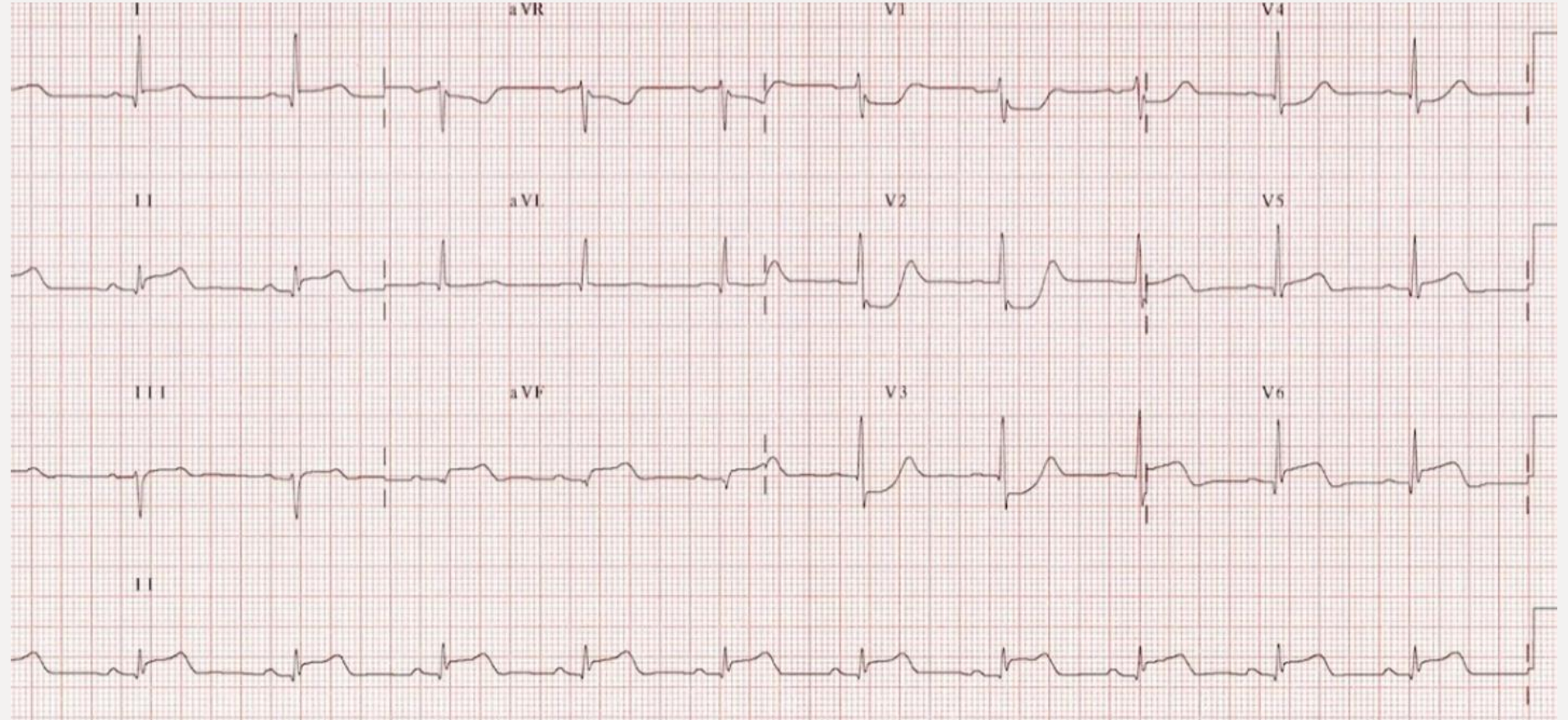
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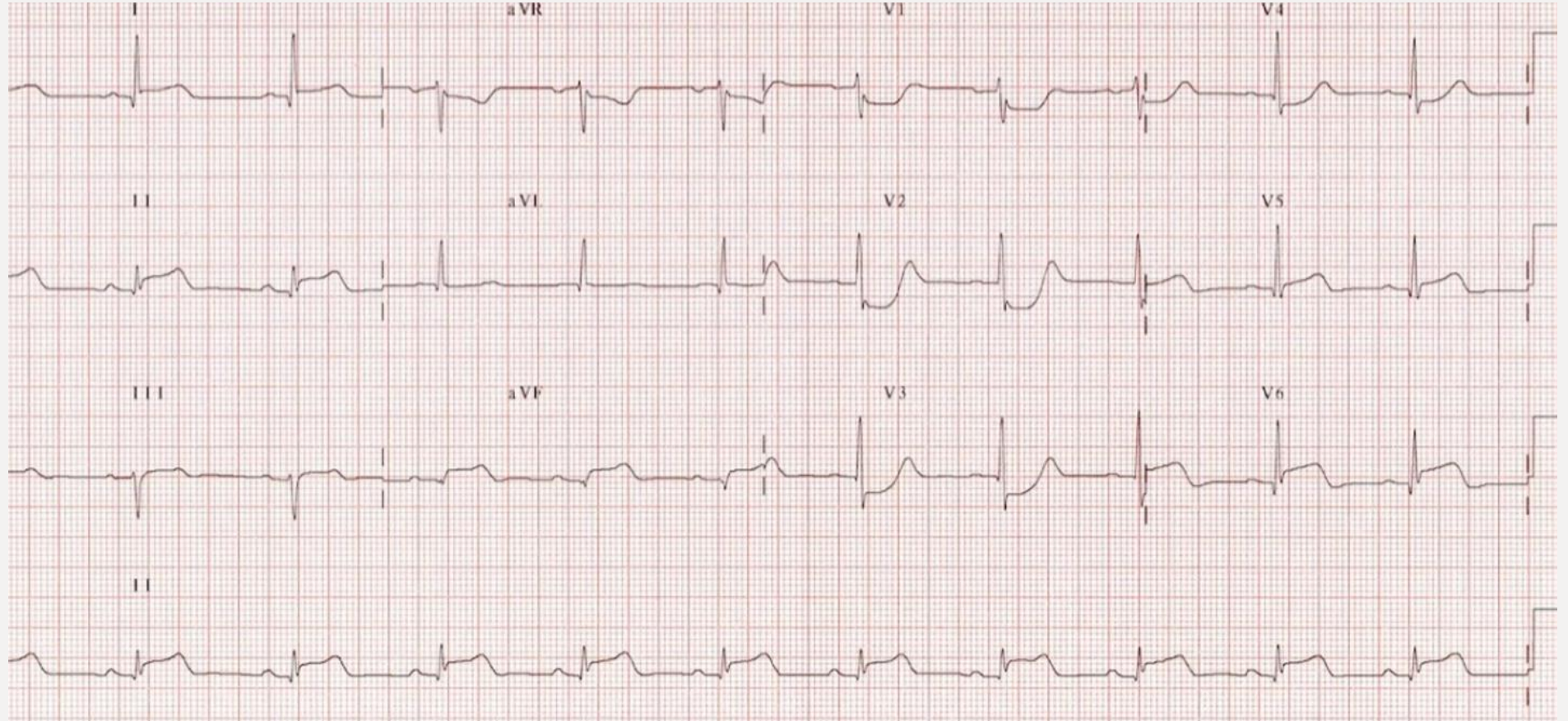
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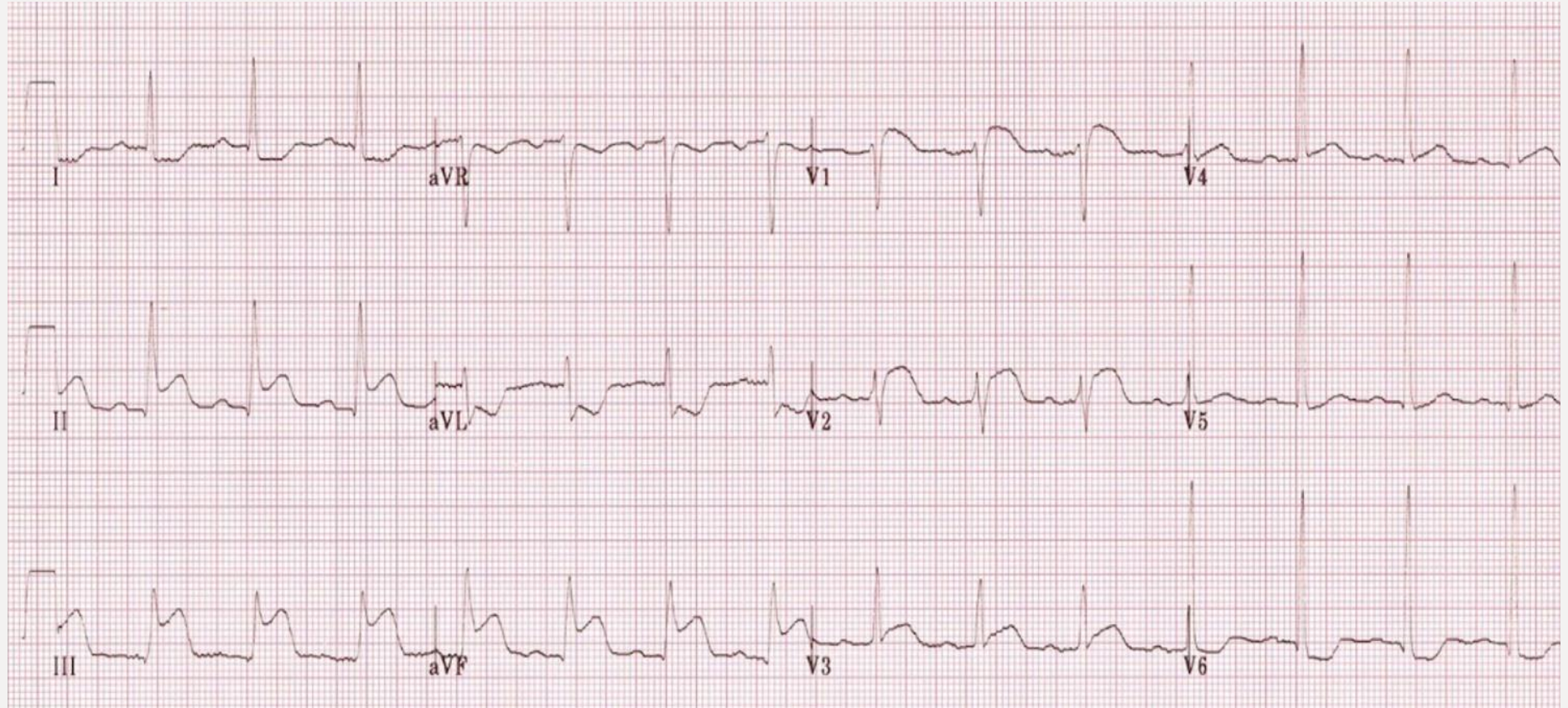
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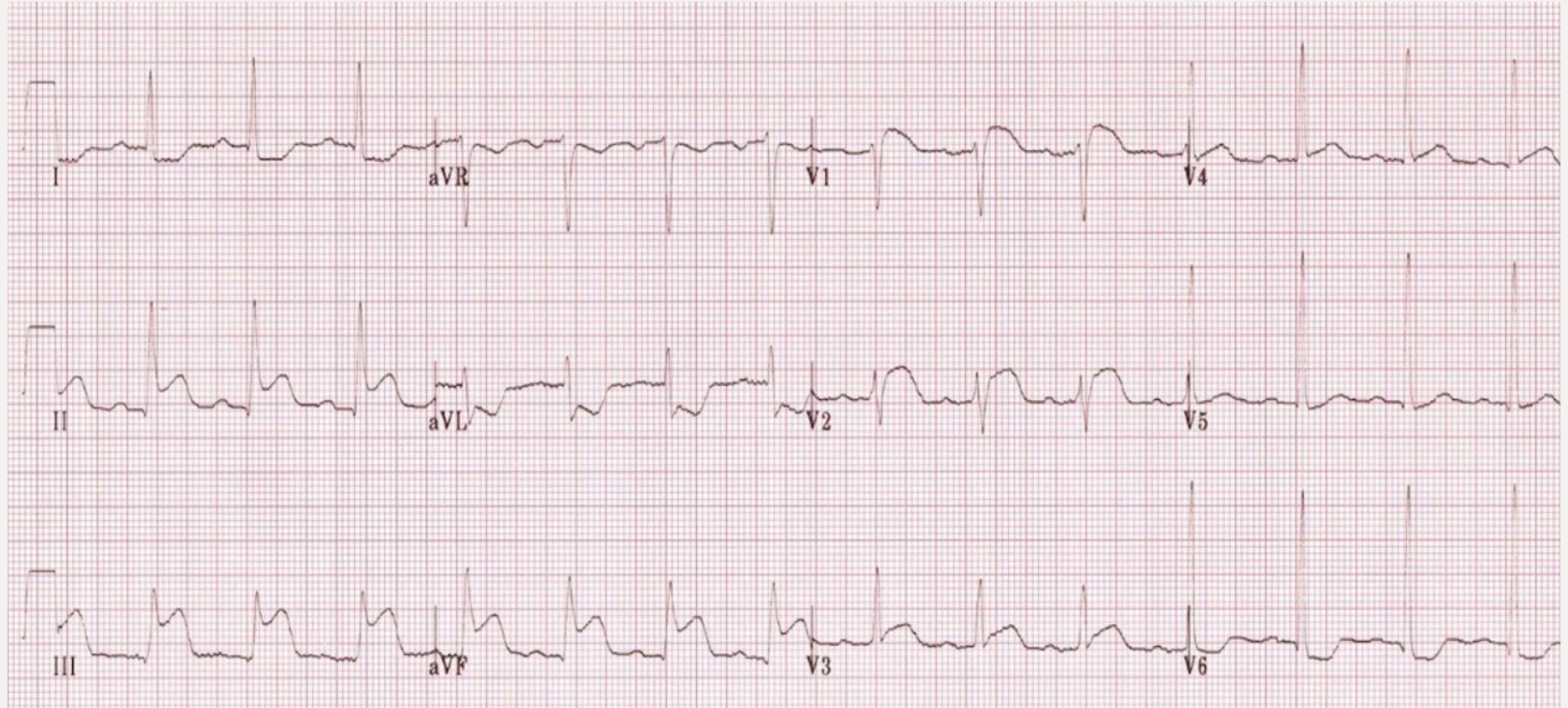
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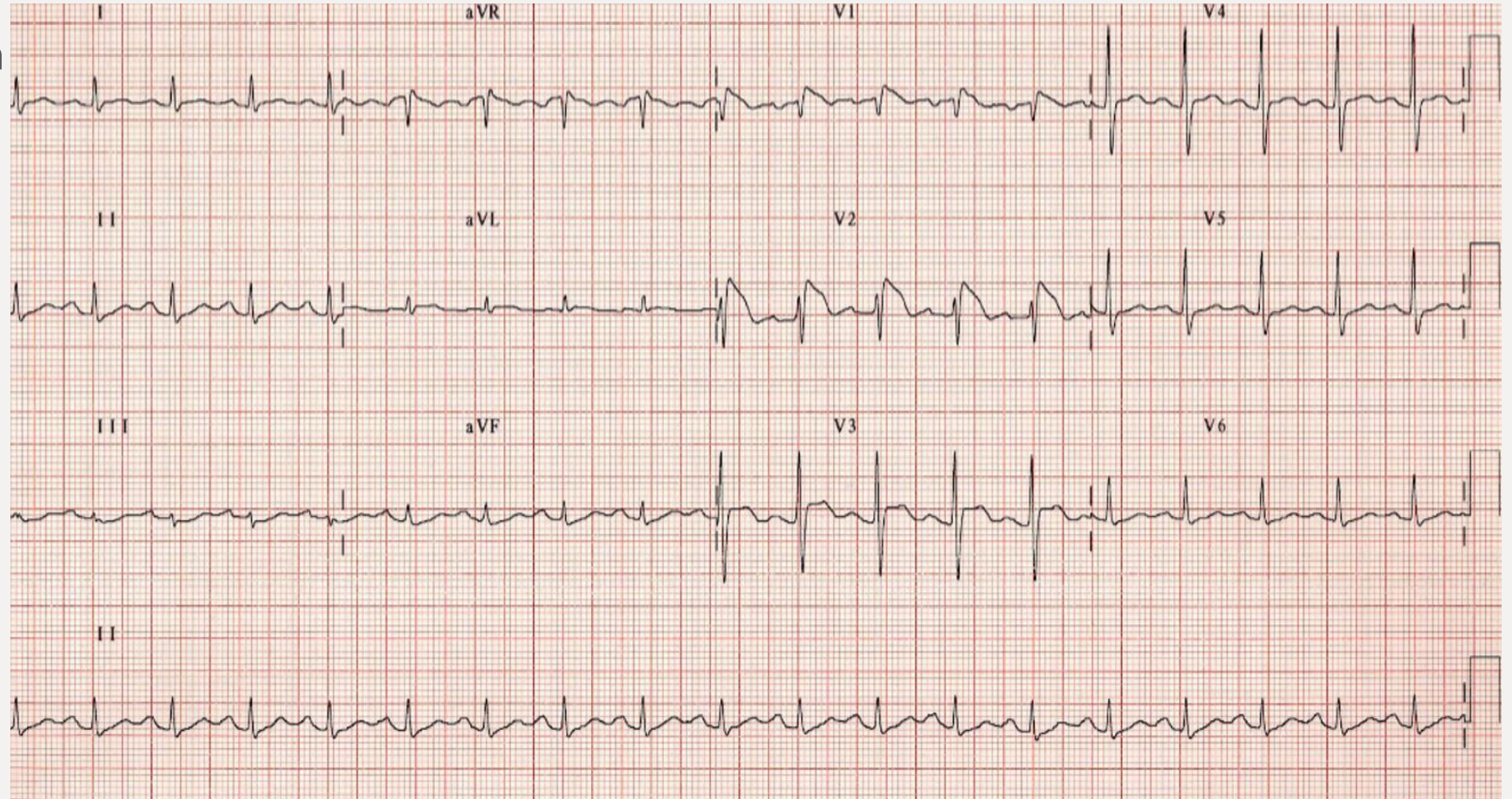
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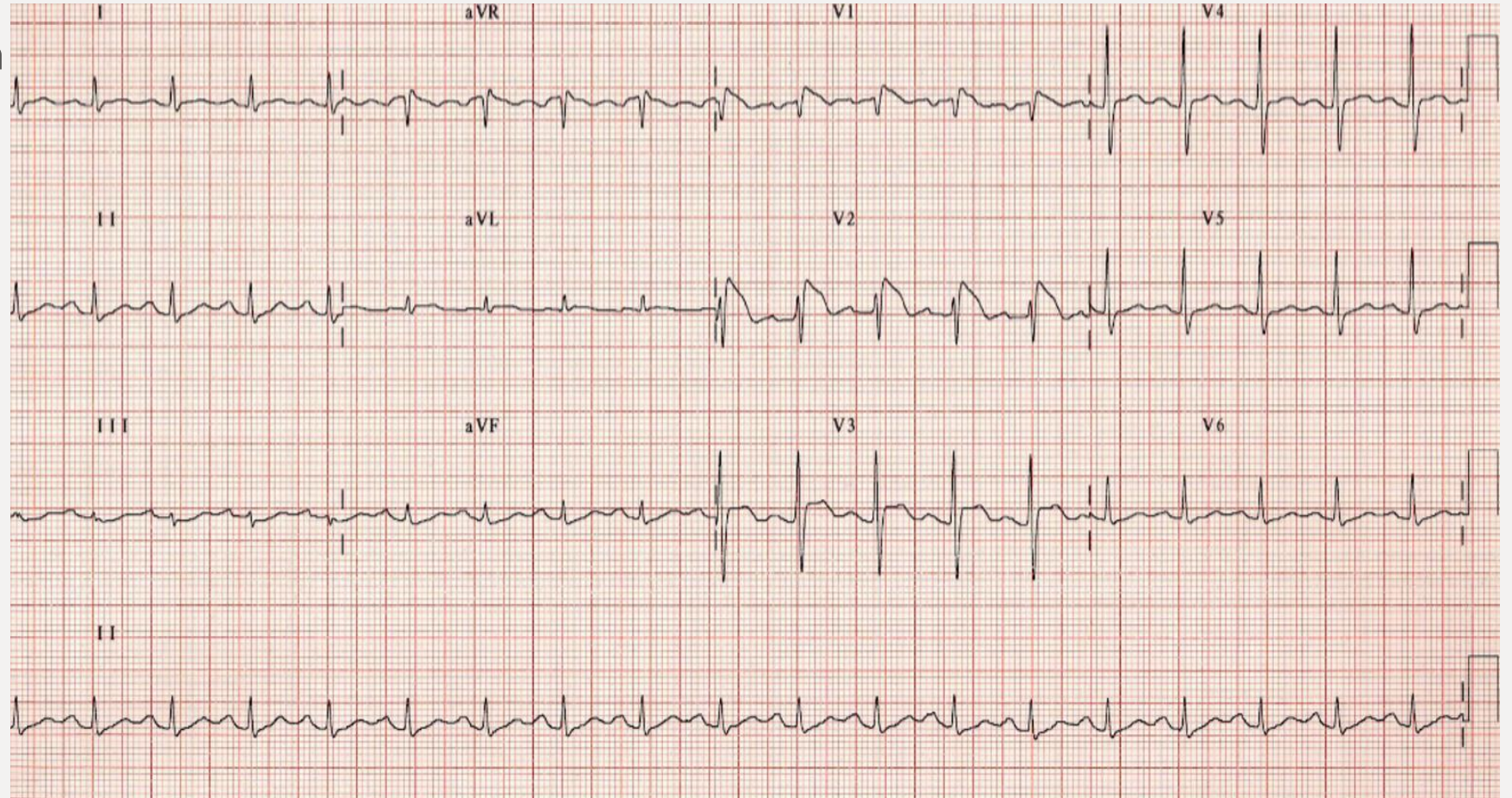
# ST elevation – 30 year old Thai man with syncope

1. Anterior MI
2. Normal repolarisation
3. LV aneurysm
4. Pericarditis
5. Brugada syndrome



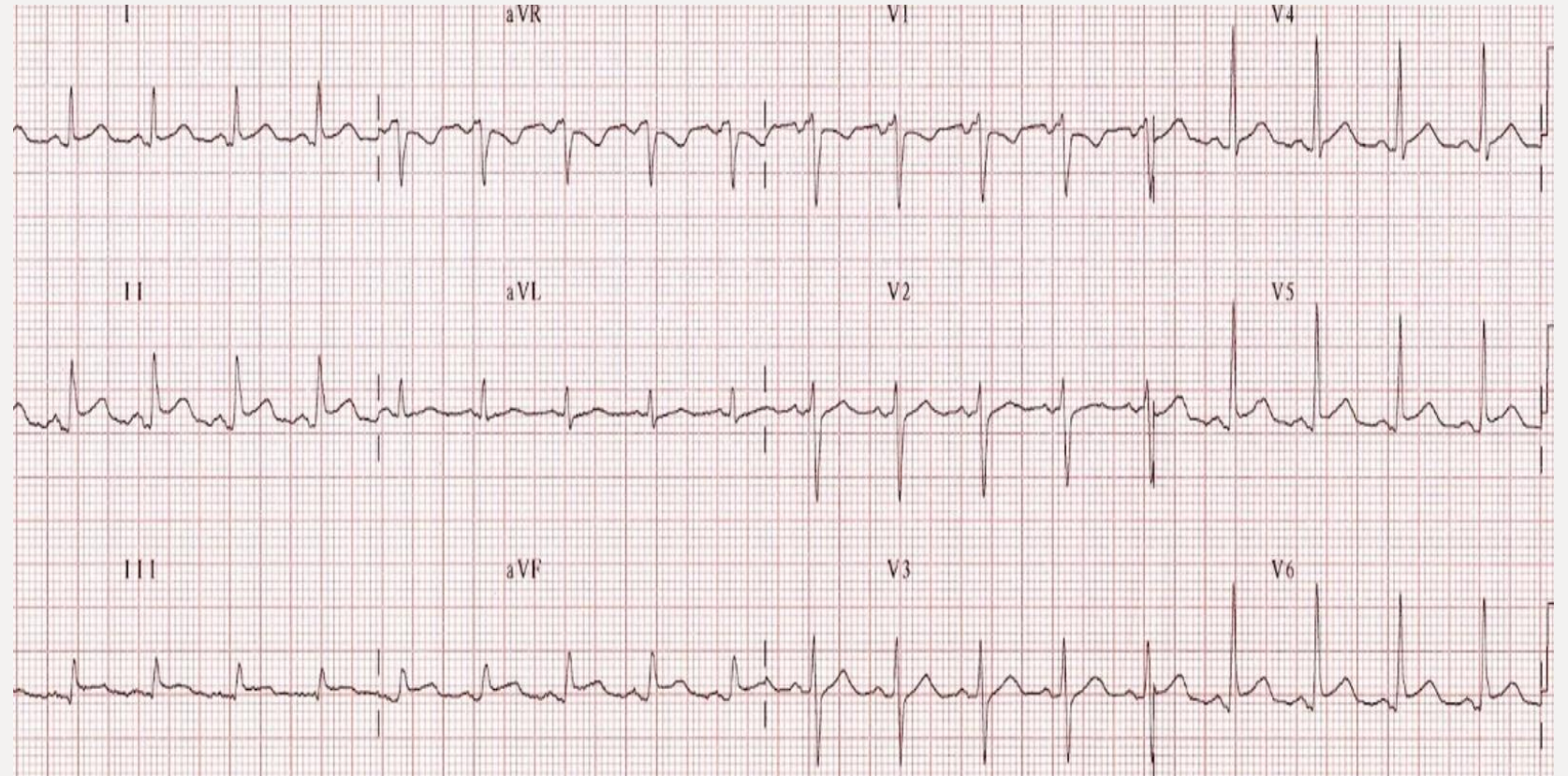
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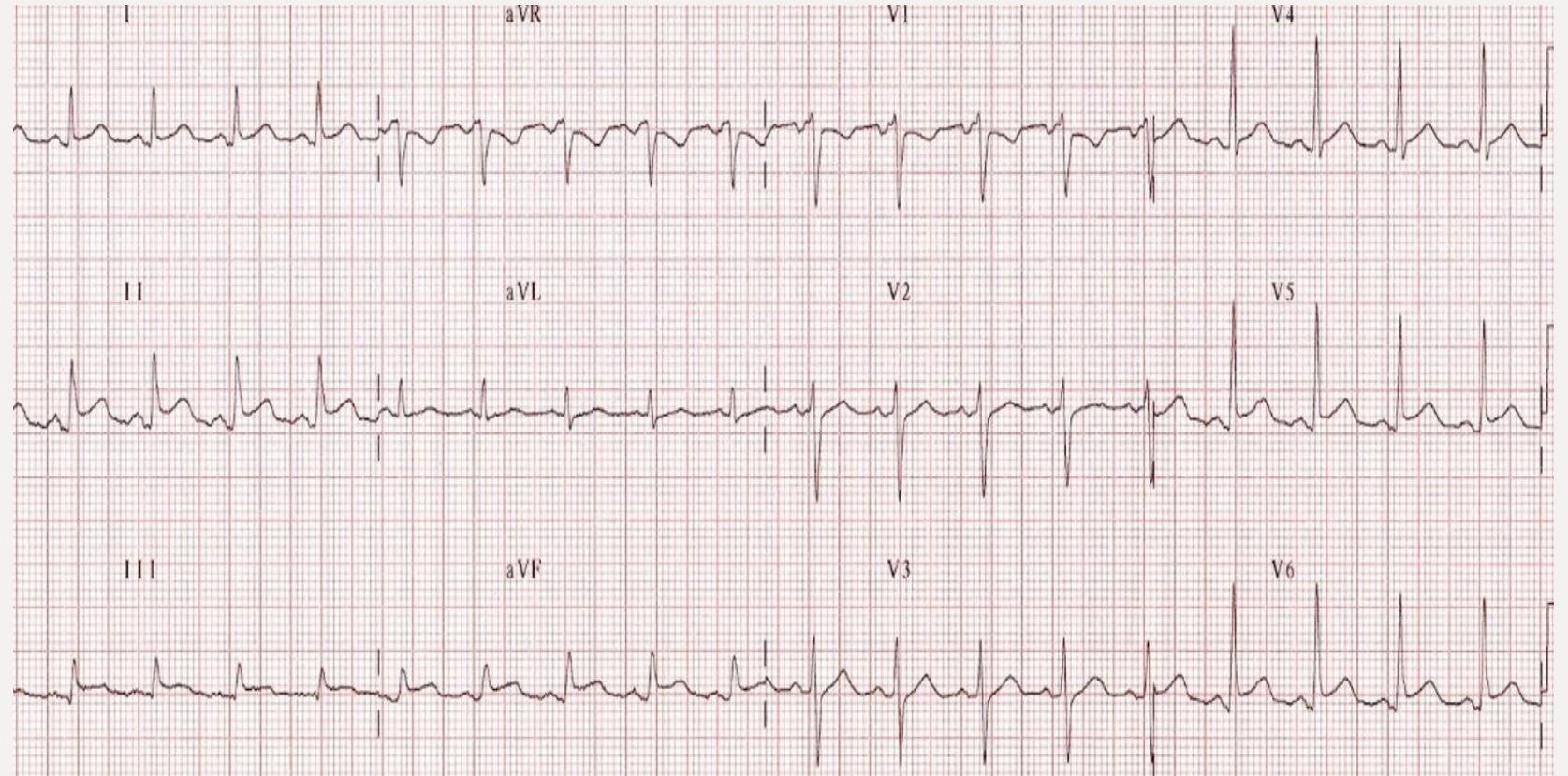
# ST elevation – young adult patient with pleuritic chest pain

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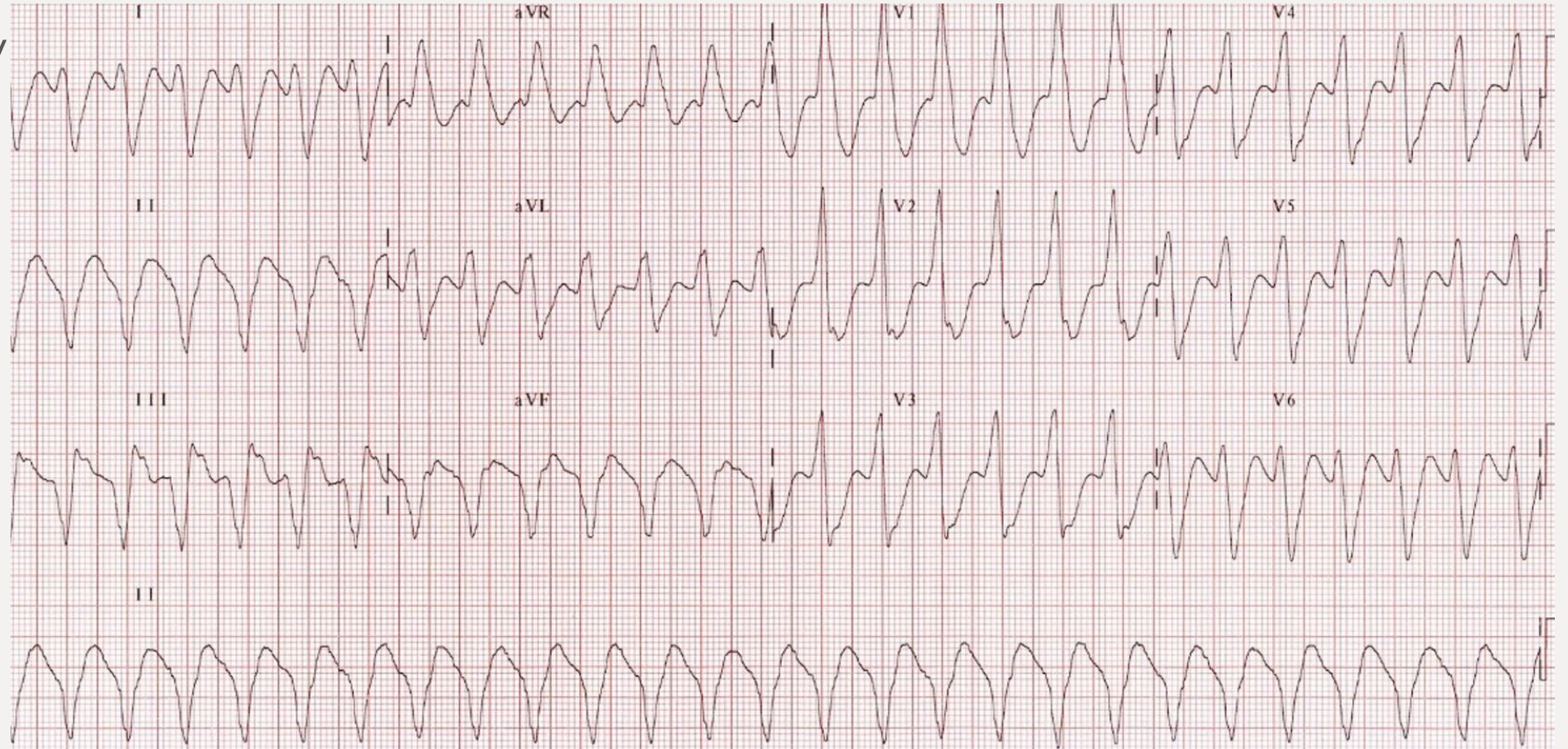
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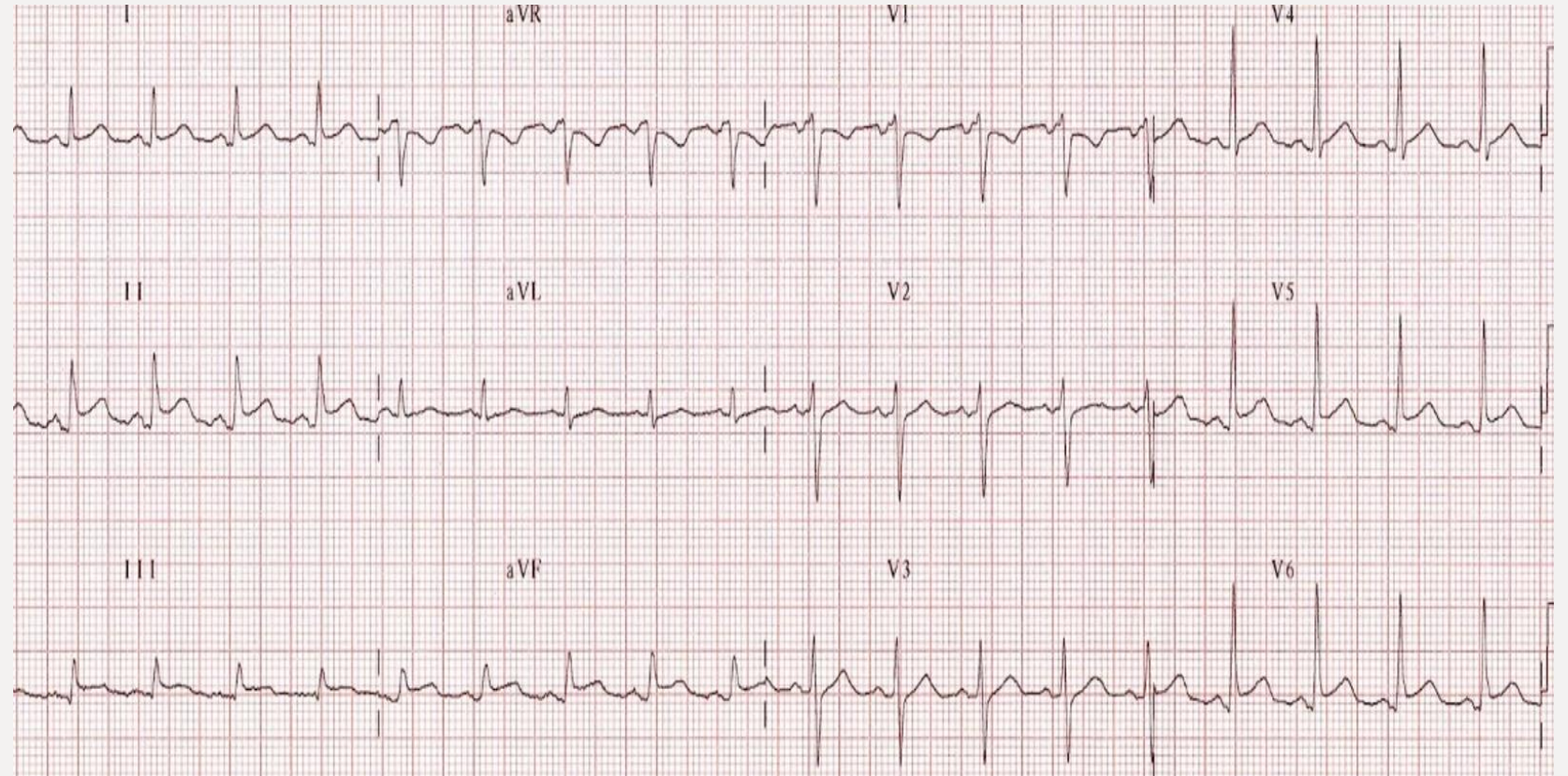
# Palpitations

1. VT
2. SVT with aberrancy



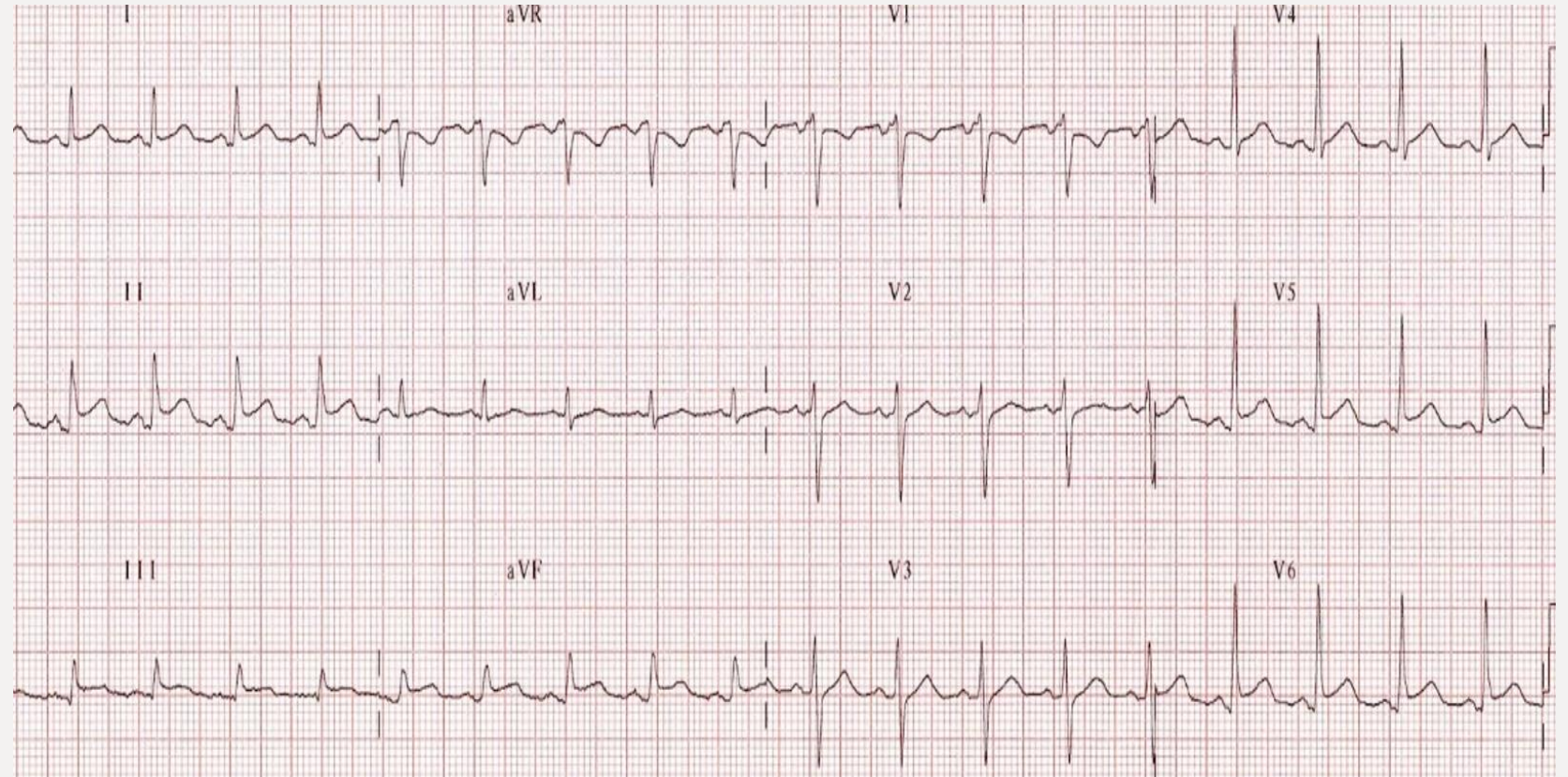
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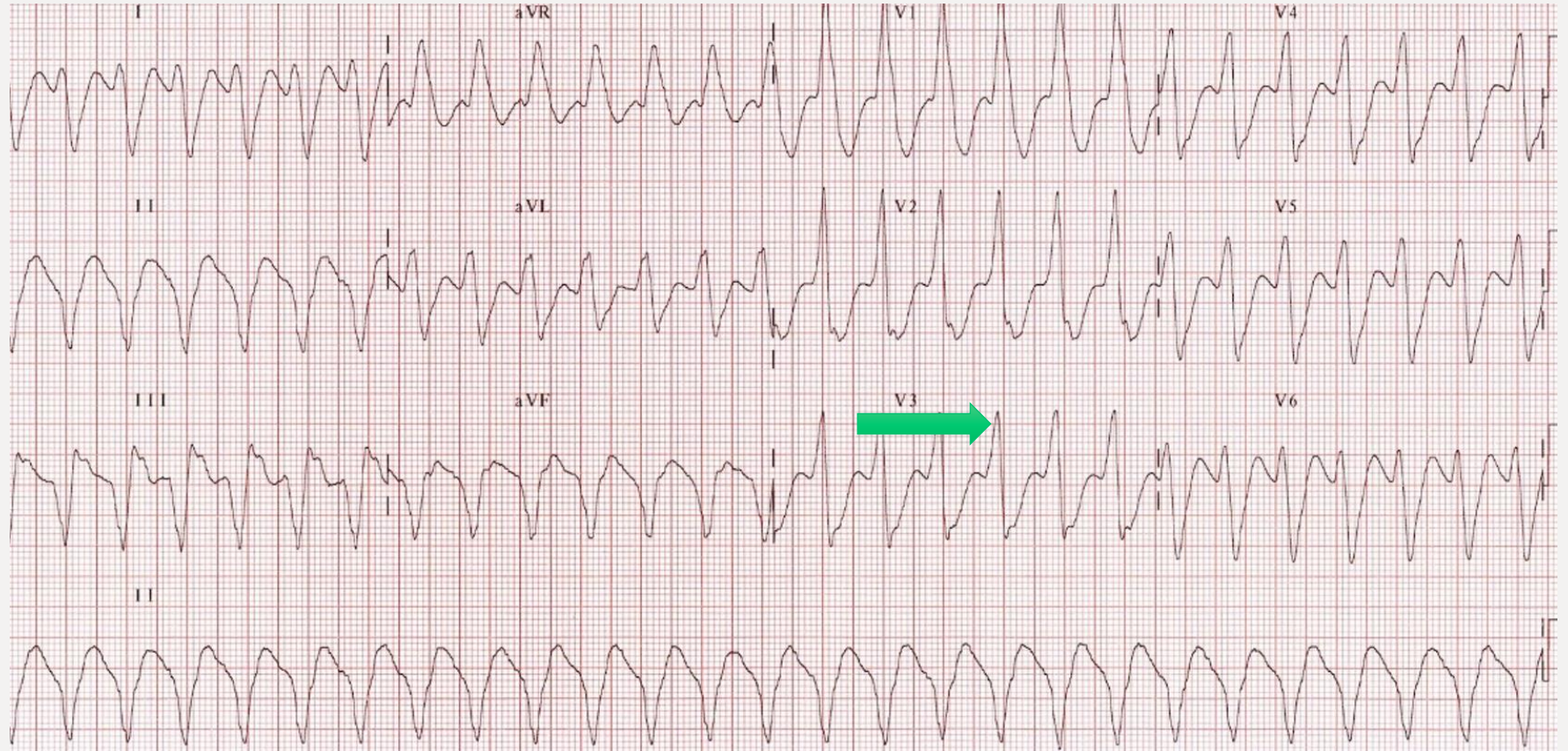
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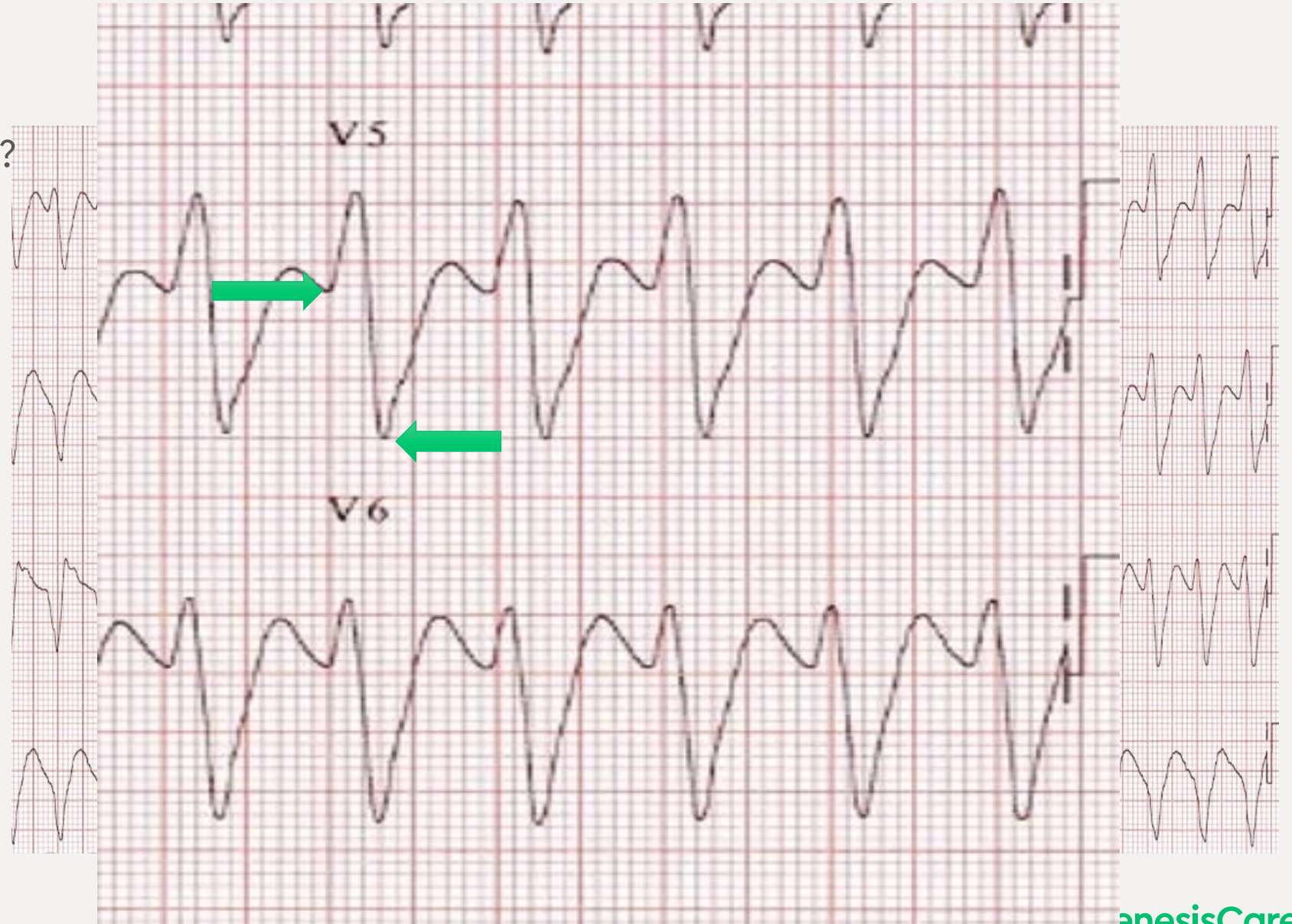
# Palpitations

1. Absence of RS?
2. No – next question



# Palpitations

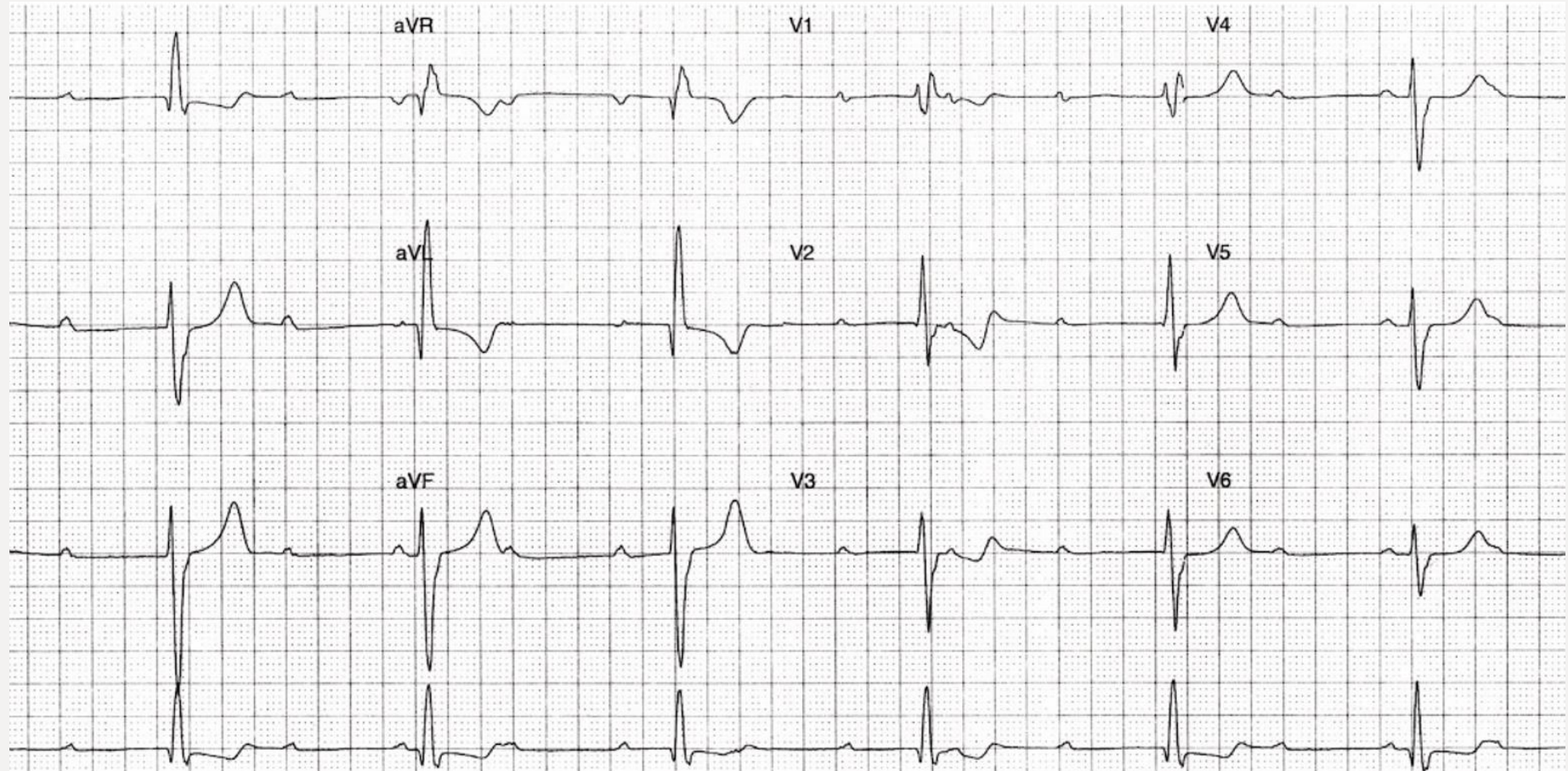
1. R/S interval > 100msec?
2. Yes - VT



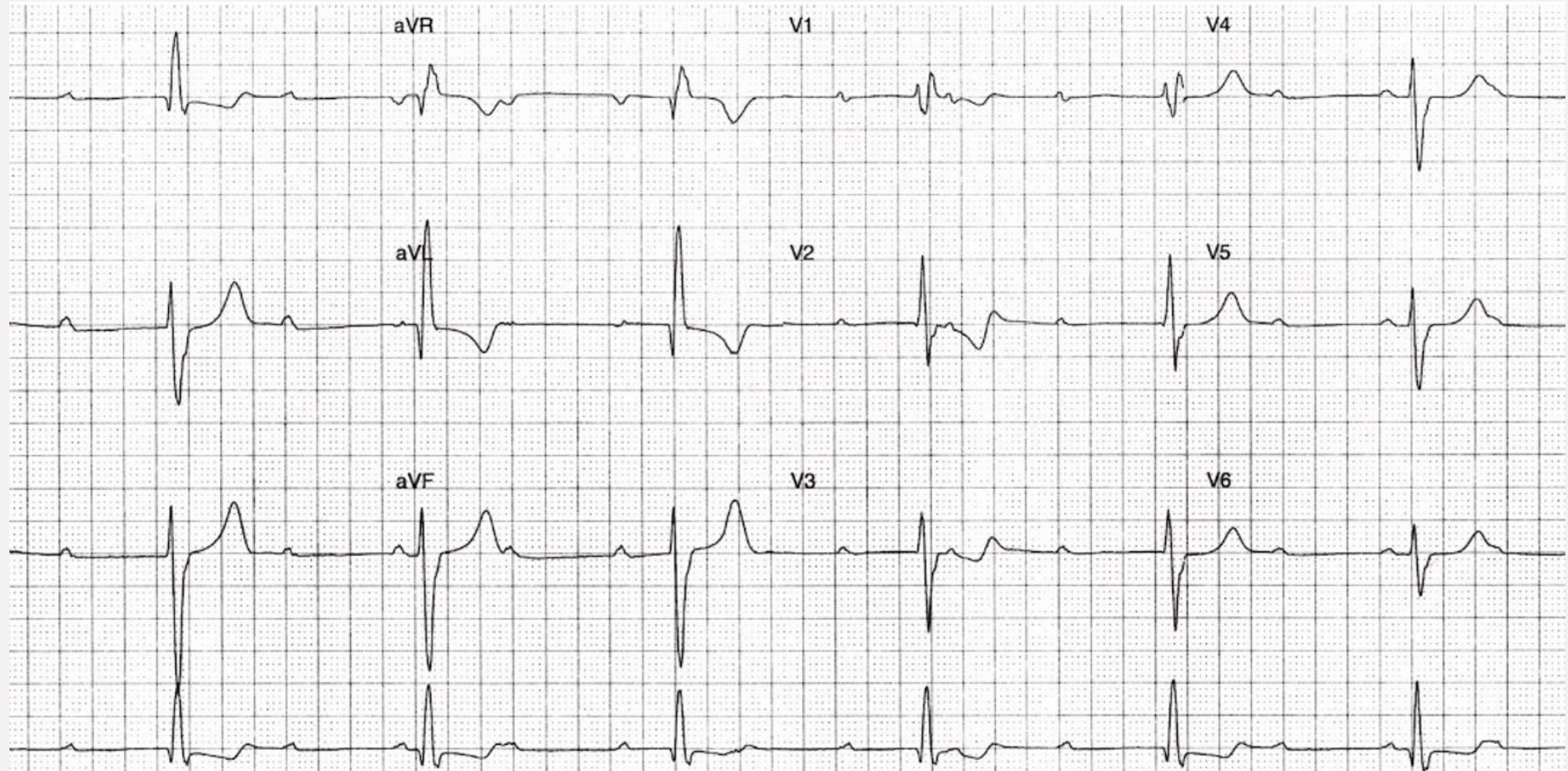


# Can't miss-life threatening ECGs

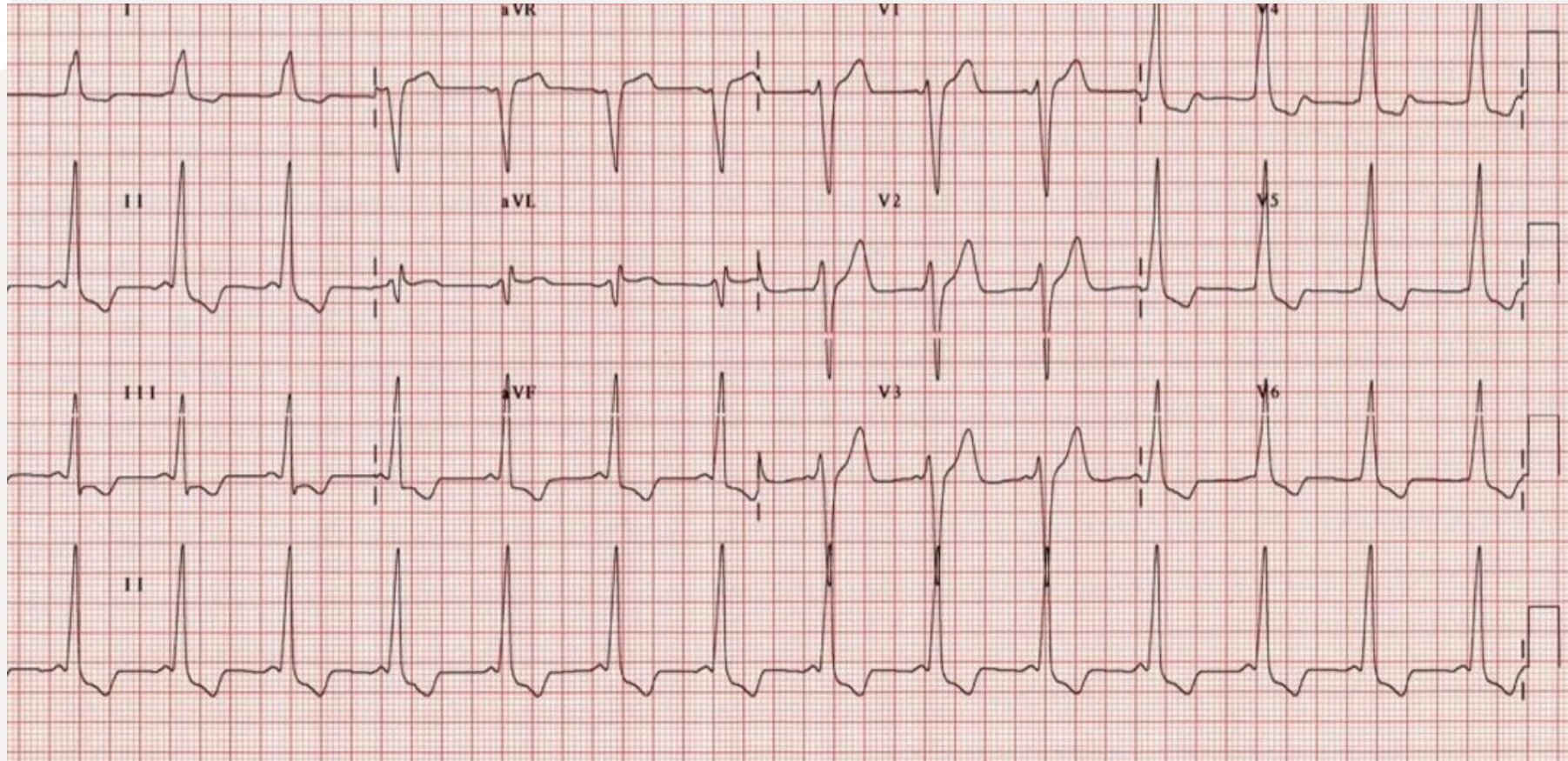
# Bradycardia and hypotensive in ED

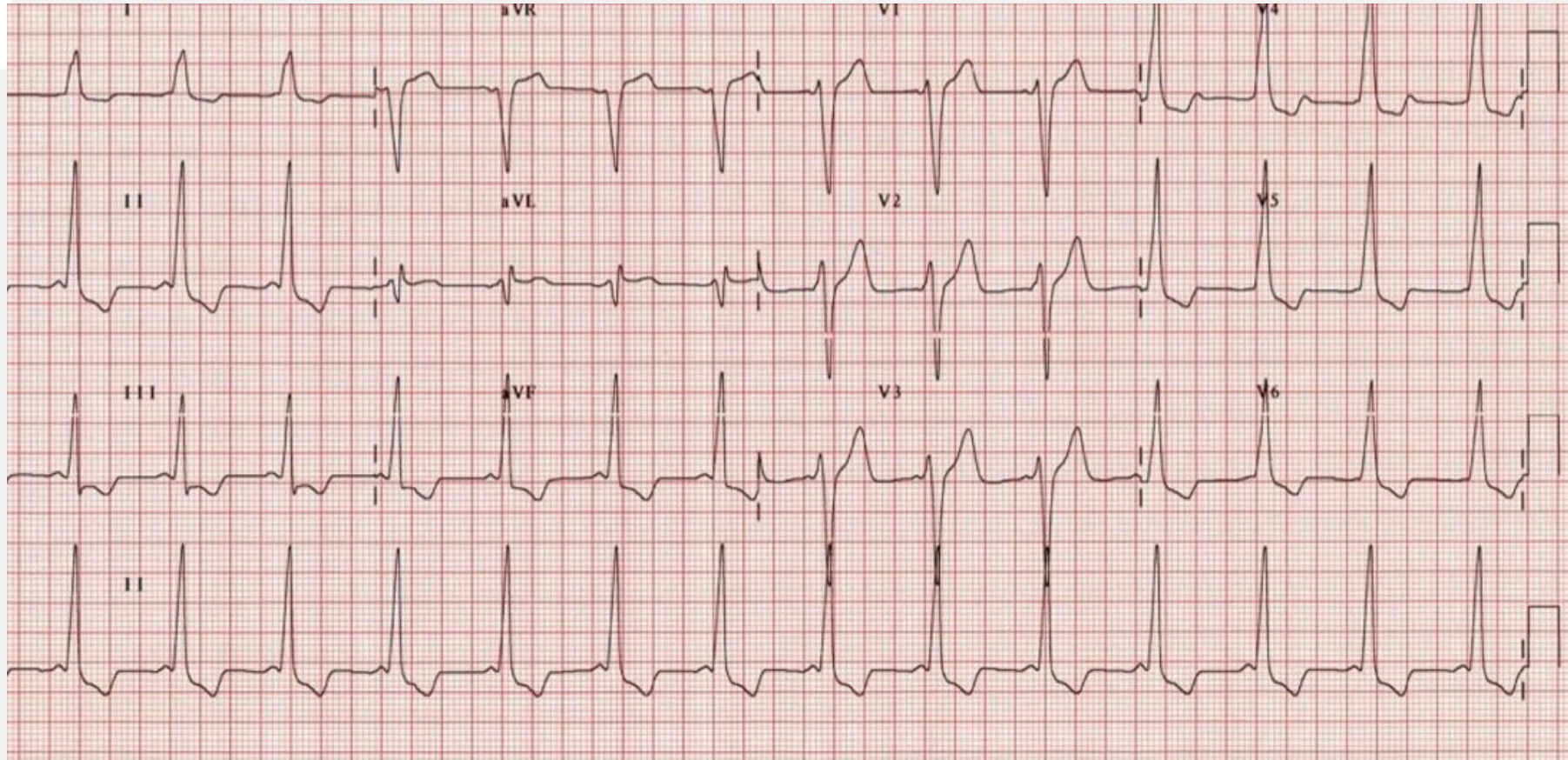


# Bradycardia and hypotensive in ED



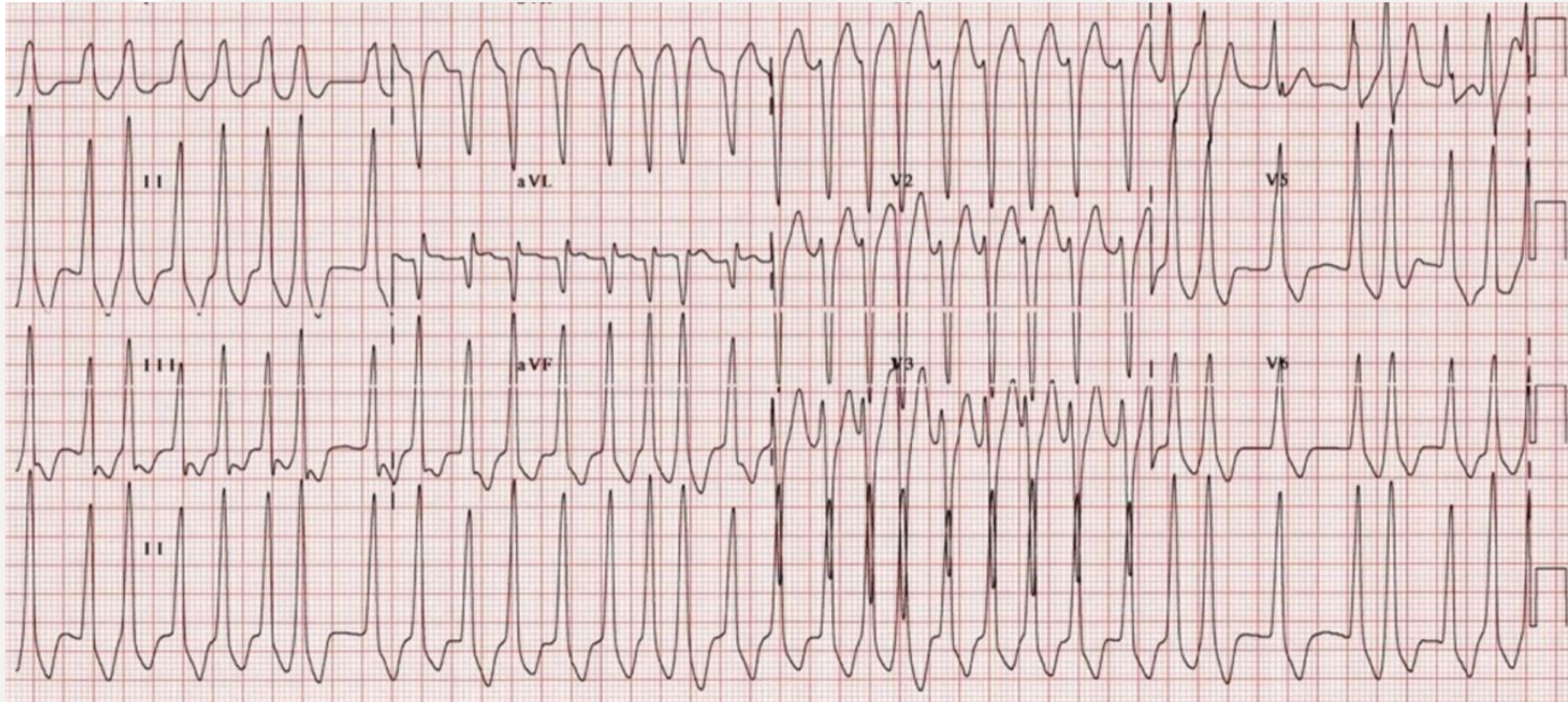
Complete heart block





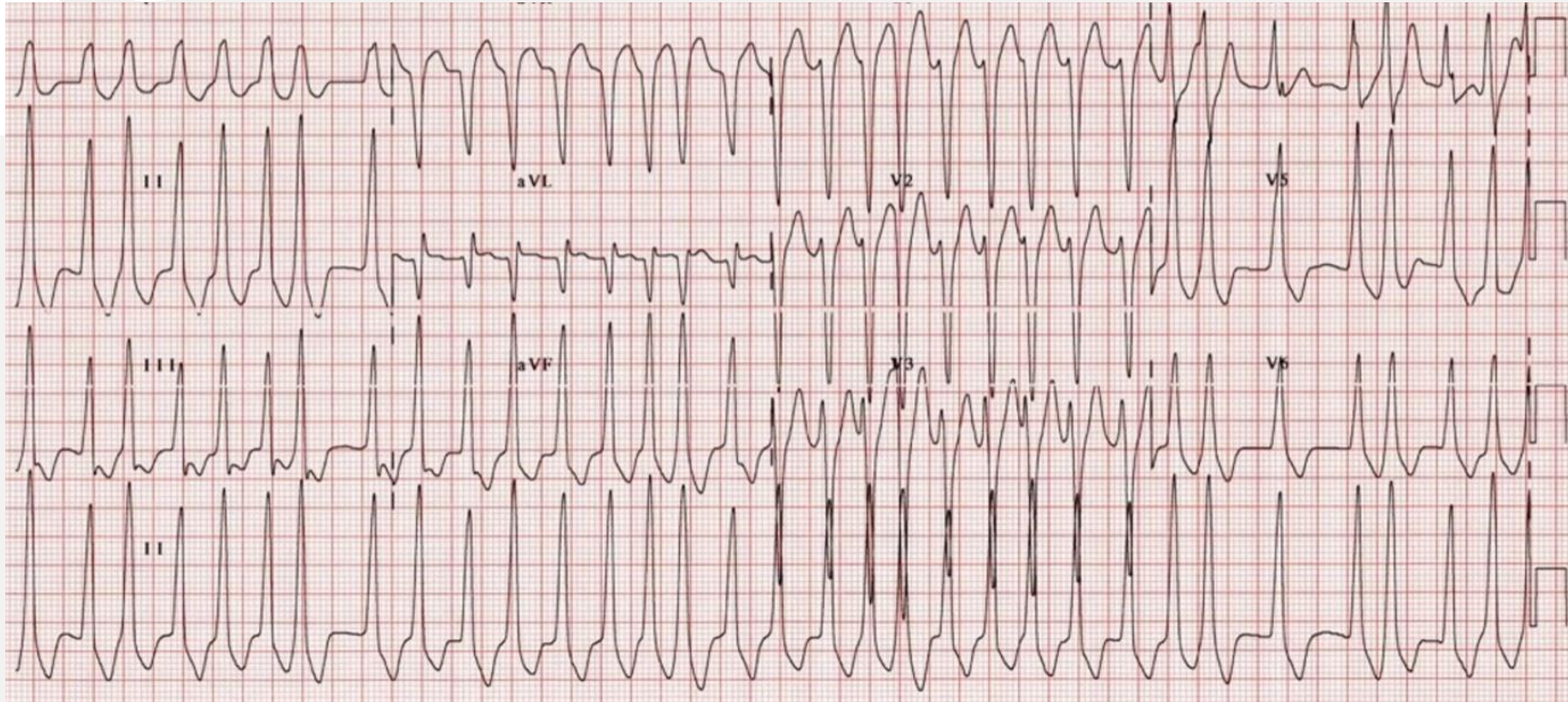
Wolff-Parkinson-White syndrome

# Palpitations: 20 year old female with presyncope



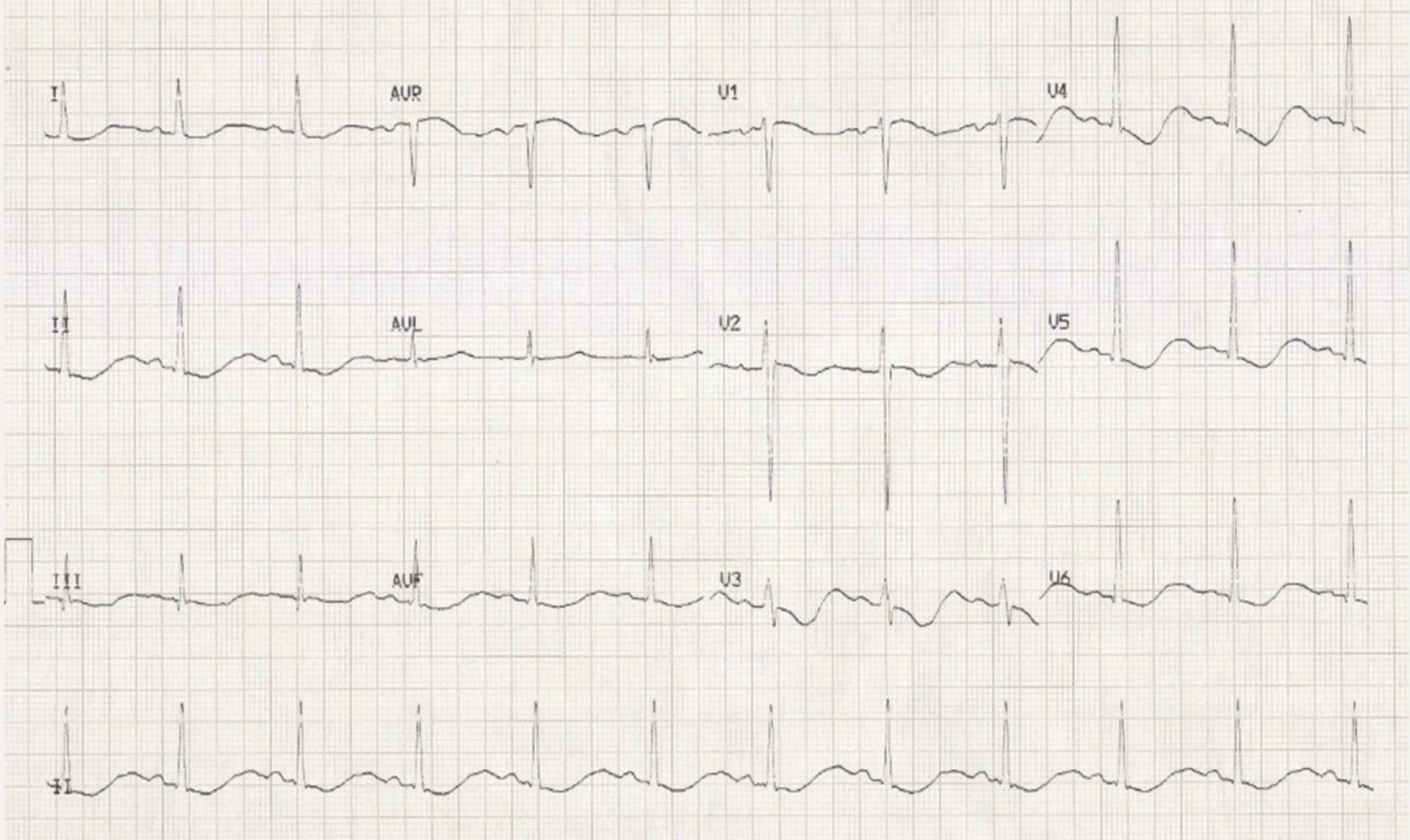


## Palpitations: 20 year old female with presyncope

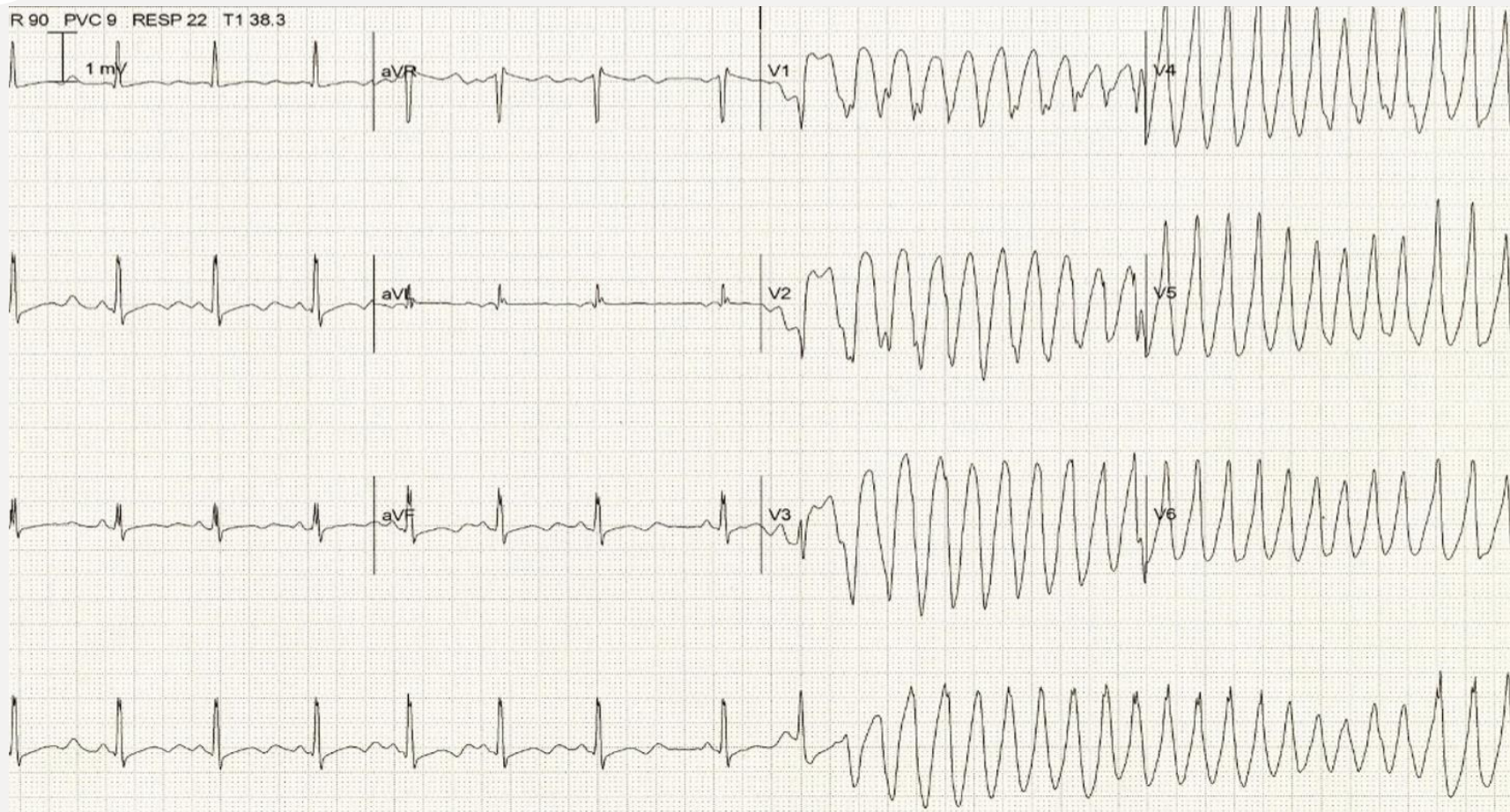


Pre-excited AF

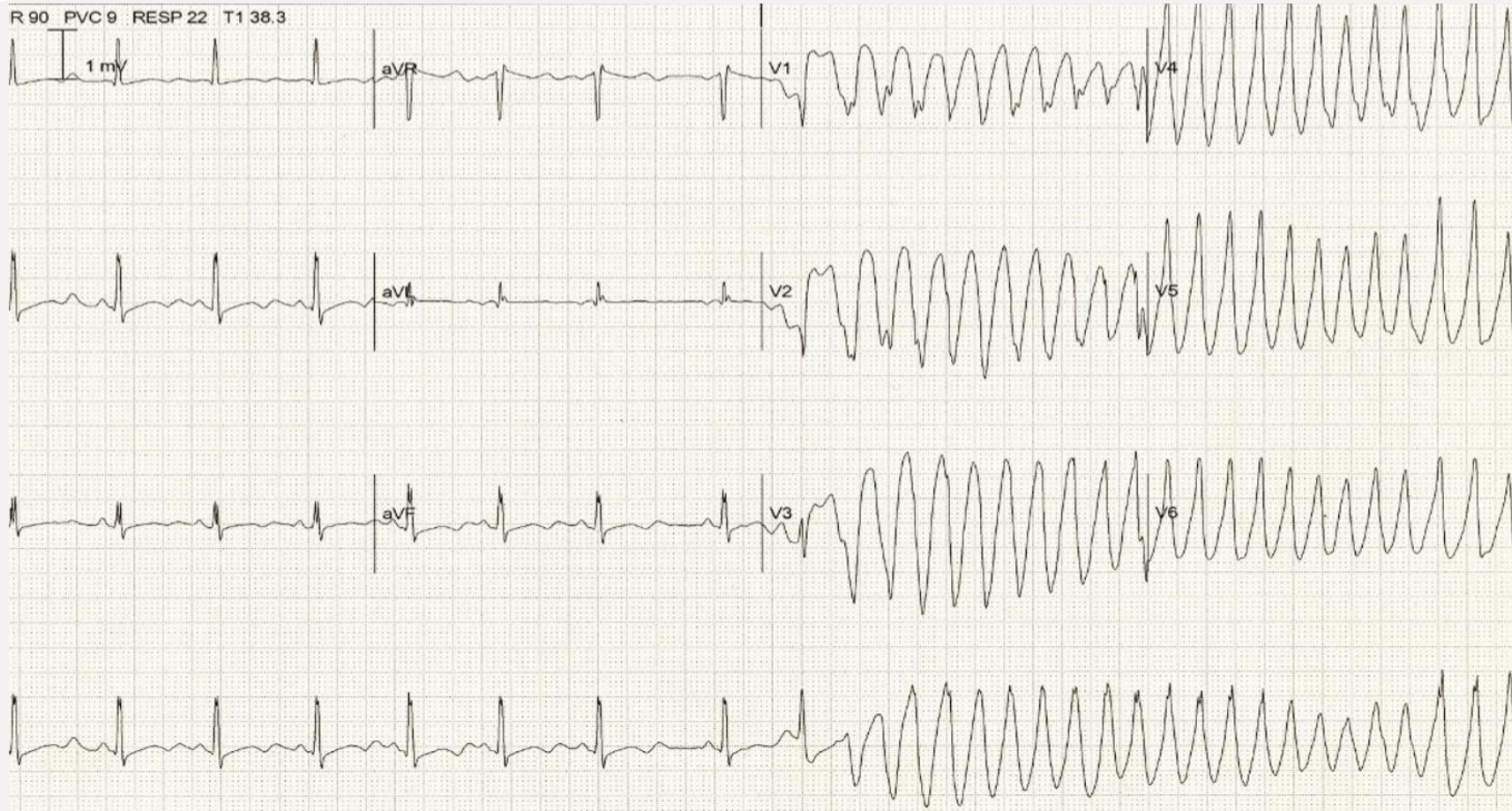
# Hypokalaemia



# Broad complex tachycardia – diagnosis?



# Broad complex tachycardia – diagnosis?



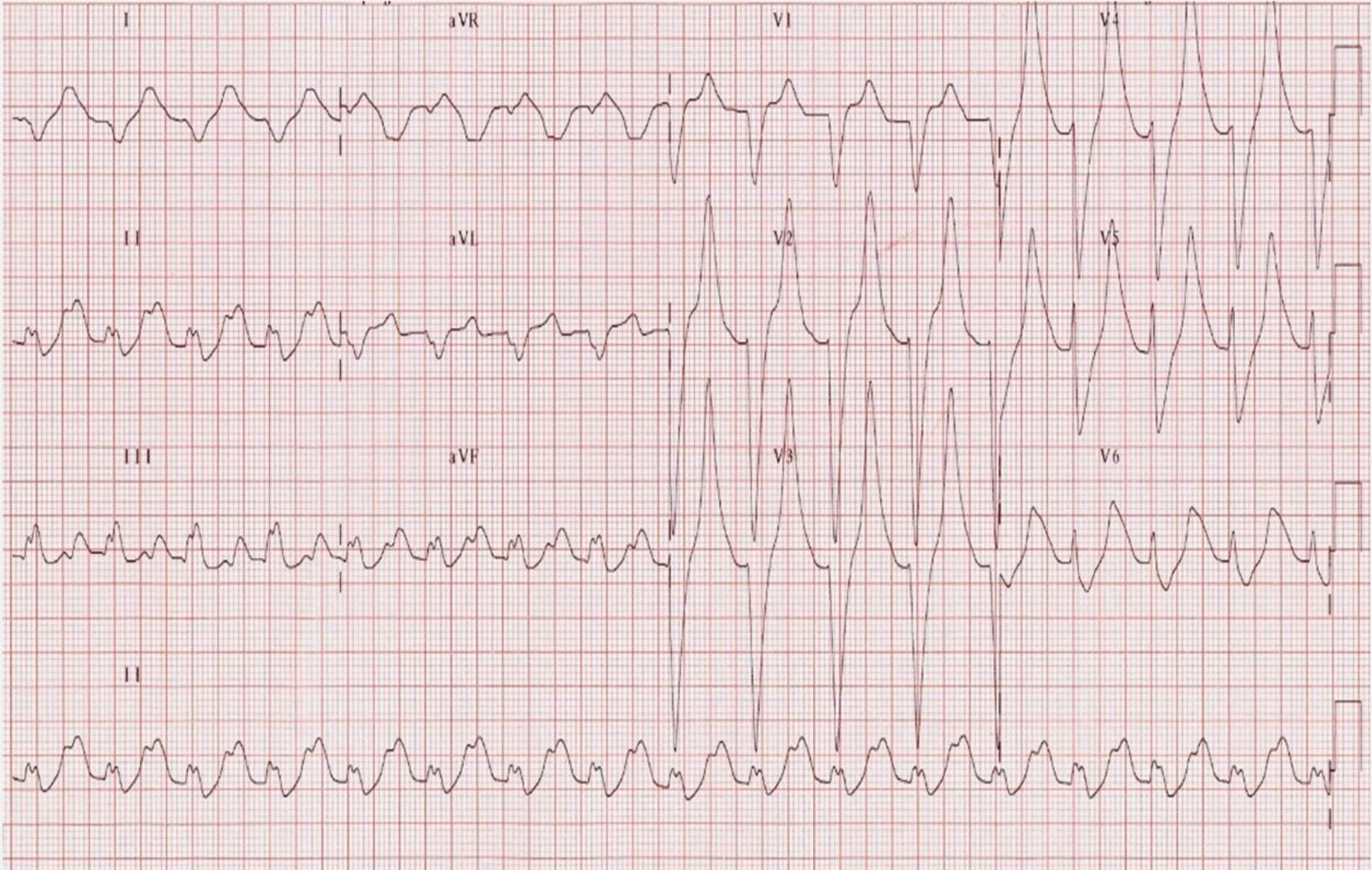
Torsades de Pointes – QT prolongation



# Hypokalaemia

- Decreased extracellular K – hyperexcitability: re-entrant arrhythmias
- Increase amplitude and width of P wave
- Prolonged PR interval
- T flattening / inversion
- ST depression
- Prominent U waves
- Apparent long QT (QTU fusion)
- SVEs, VPBs
- SVT (AF, atrial flutter, atrial tachy)
- VT, VF and Torsades de Pointes

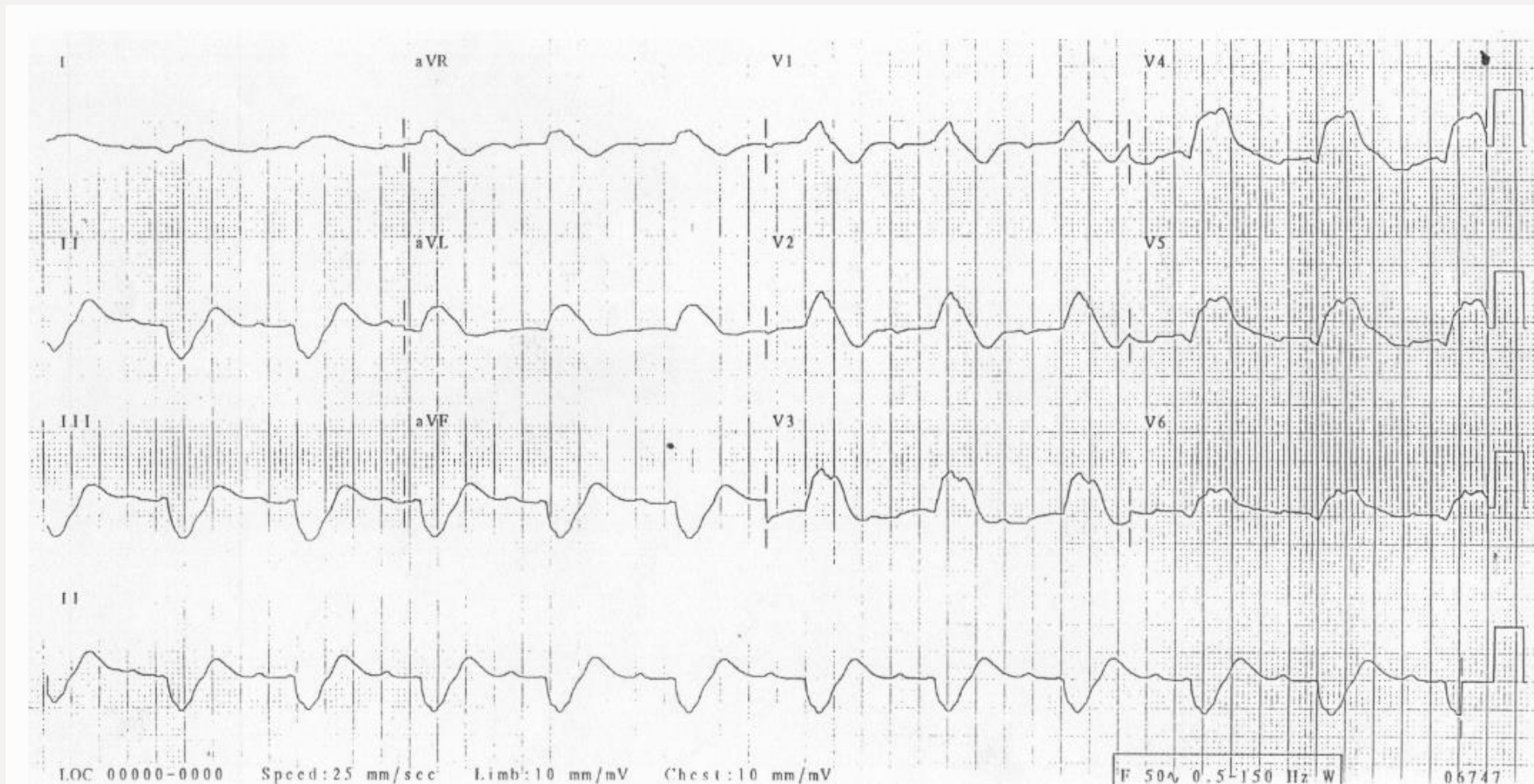
# Hyperkalaemia



# Hyperkalaemia

- Increased extracellular K – reduces myocardial excitability
- Repolarisation changes:
  - Peaked T waves
- Atrial paralysis:
  - P wave widens and flattens
  - PR prolongation
  - P wave disappears
- Conduction abnormality and bradycardia:
  - QRS prolongs / bizarre
  - High grade AV block, junctional and ventricular escape rhythms
  - Sinus brady or slow AF
  - Sine wave (pre terminal)
- Cardiac arrest:
  - Asystole
  - VF
  - PEA with bizarre wide QRS

# Hyperkalaemia

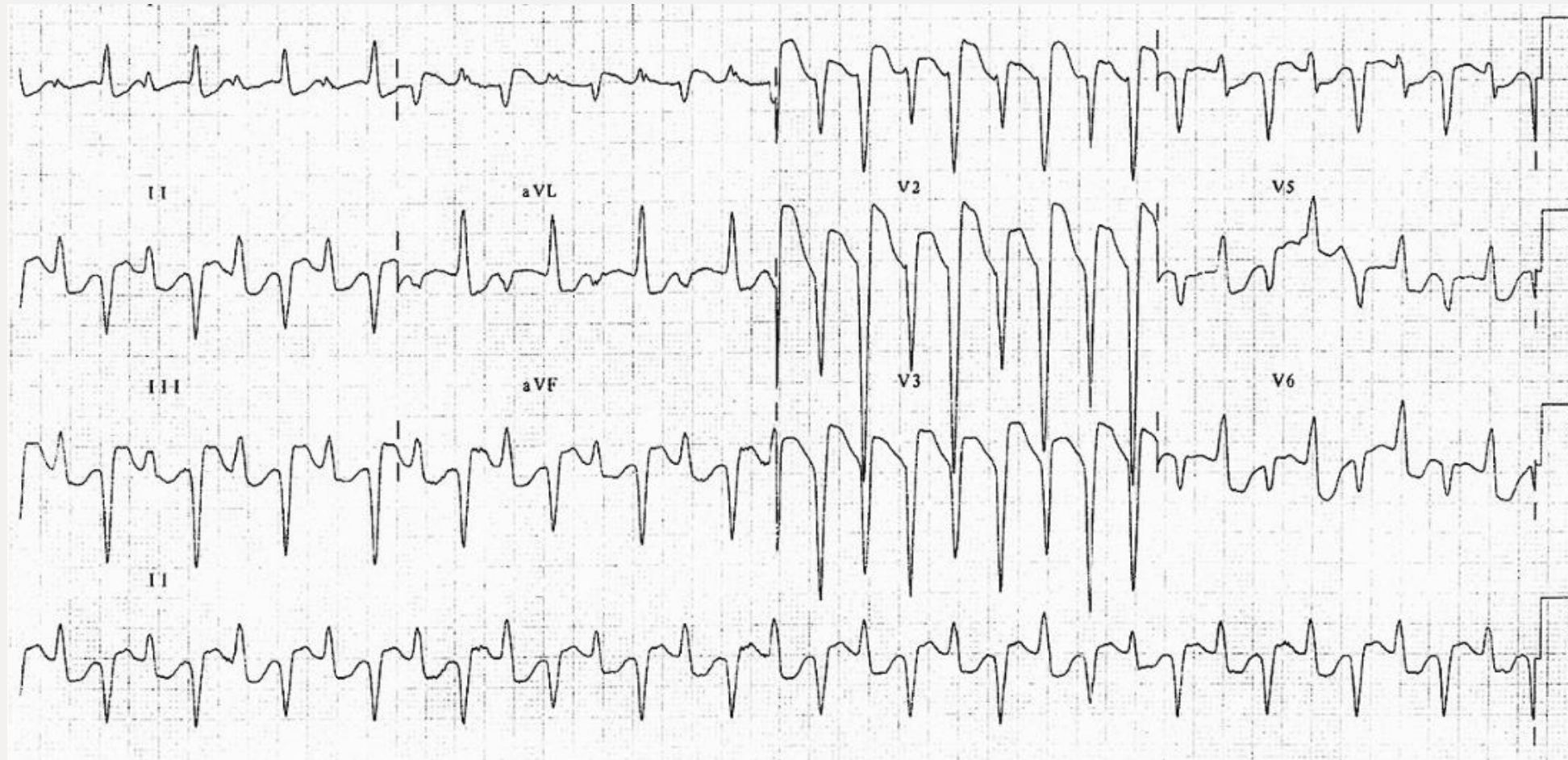




# Digoxin toxicity – PAT with block and VPBs



# Bidirectional VT – digoxin toxicity

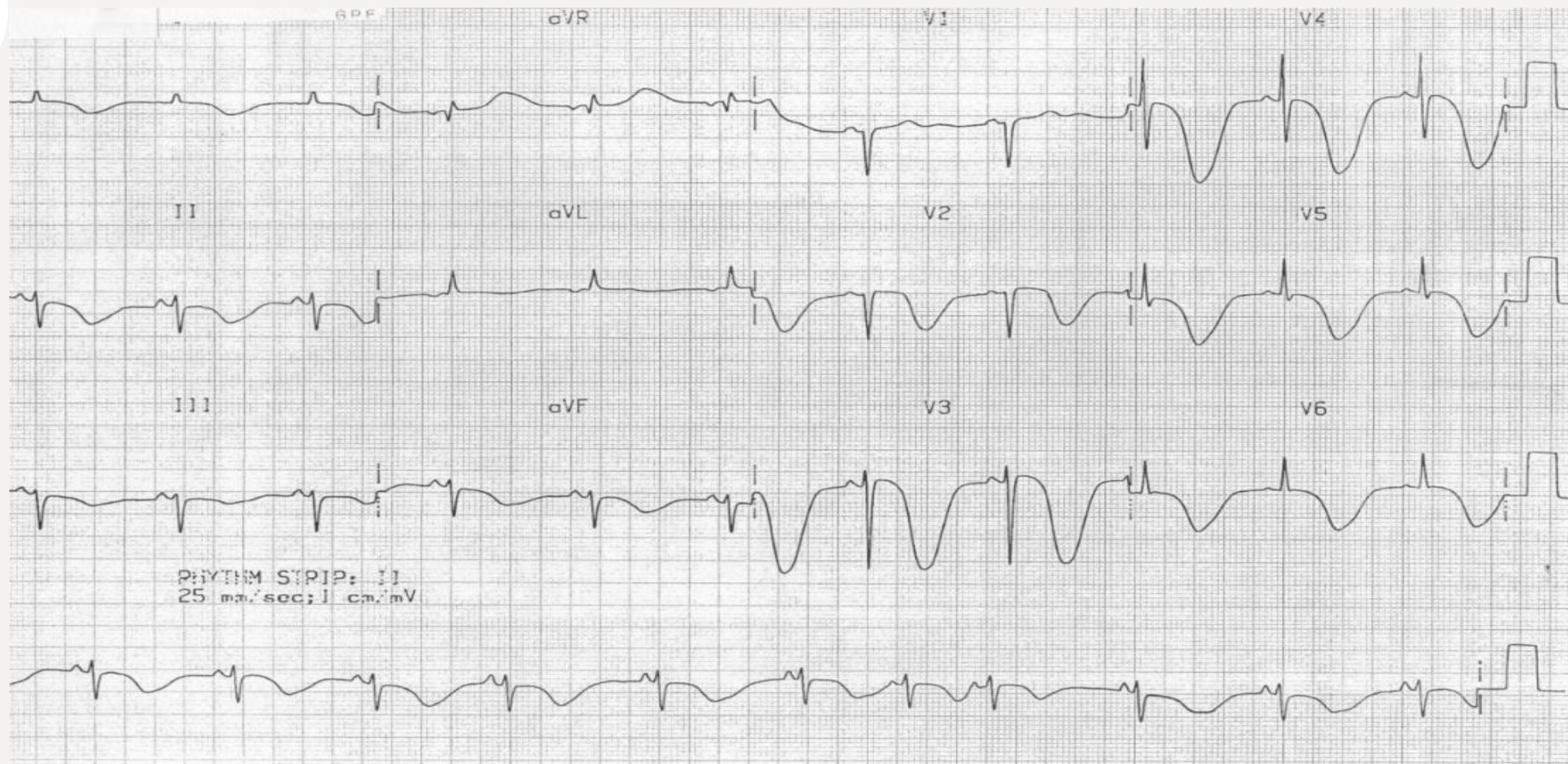




## Digoxin toxicity

- Increased automaticity / decreased AV conduction:  
SVT with slow ventricular response
- PVC's, sinus brady, AF
- Any type of AV block
- Regularised AF (AF with CHB)
- VT (polymorphic or bidirectional)

# Intracranial haemorrhage

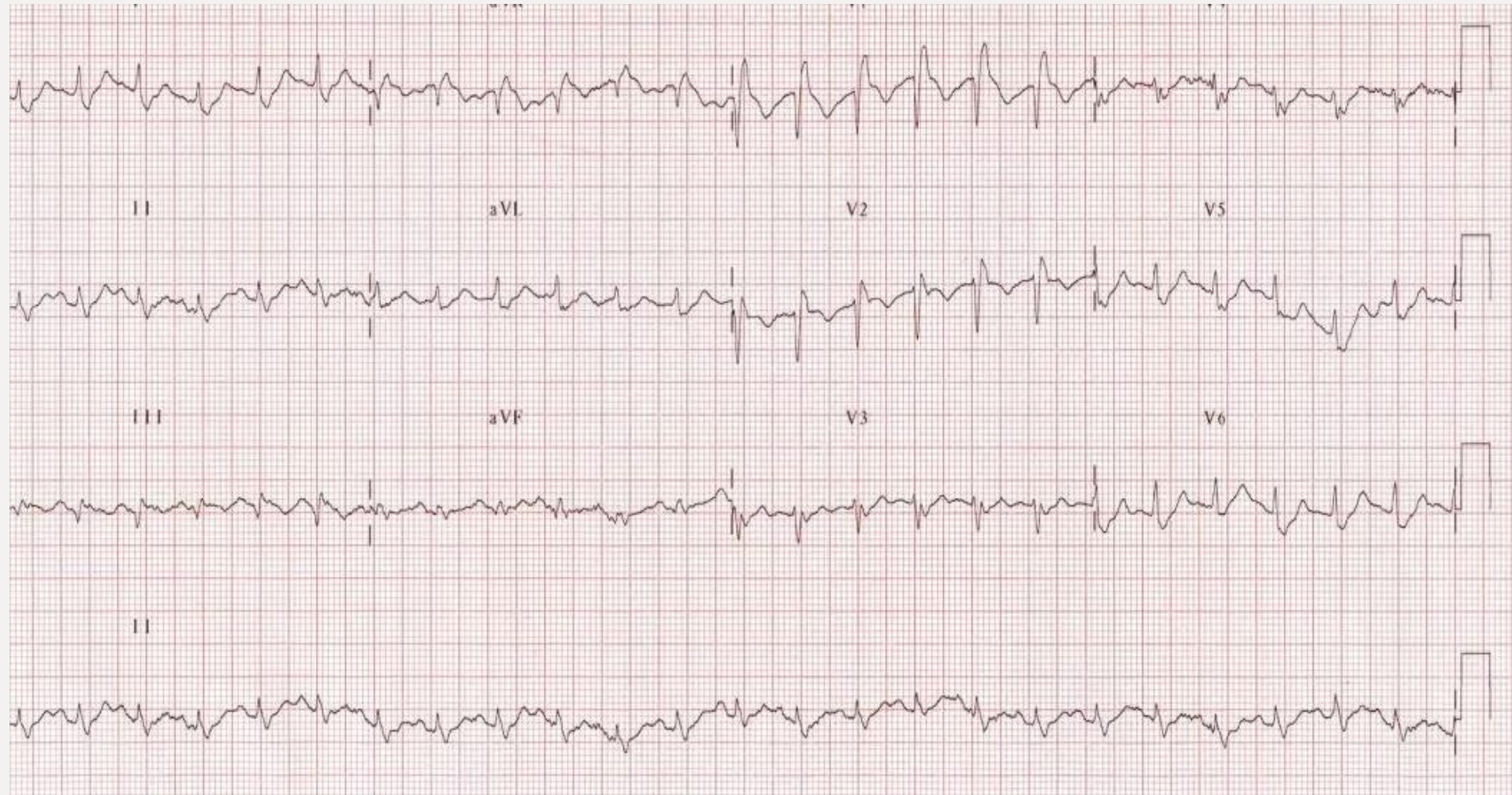




## Intracranial haemorrhage

- Widespread giant T inversion
- QT prolongation
- Bradycardia (Cushing reflex – brain stem herniation)
- ST elevation or depression
- Increased U wave amplitude
- ST, junctional, VPBs, AF
- (? Hypothalamic stimulation / autonomic dysregulation)

# Massive pulmonary embolism

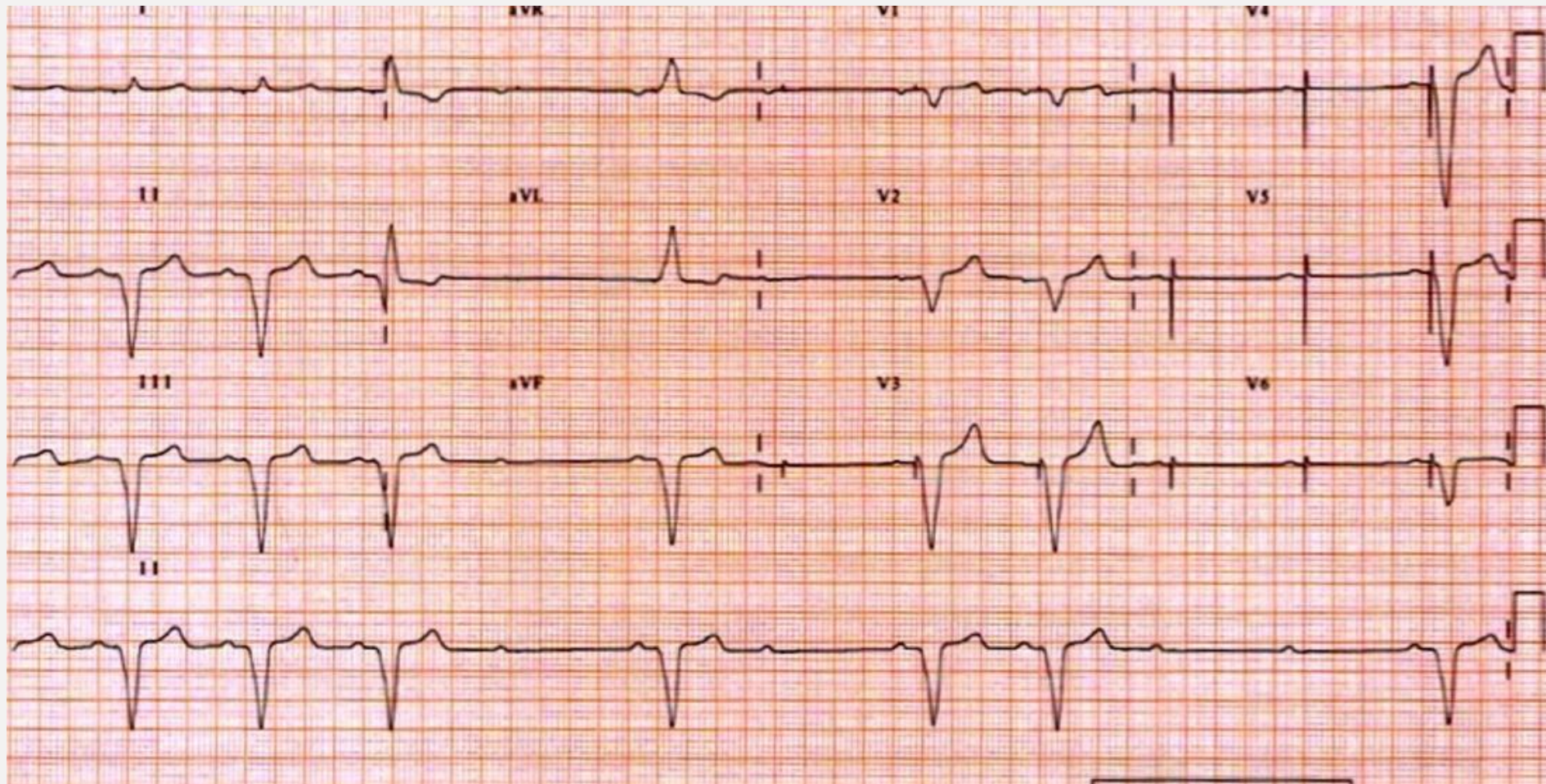




# Massive pulmonary embolism

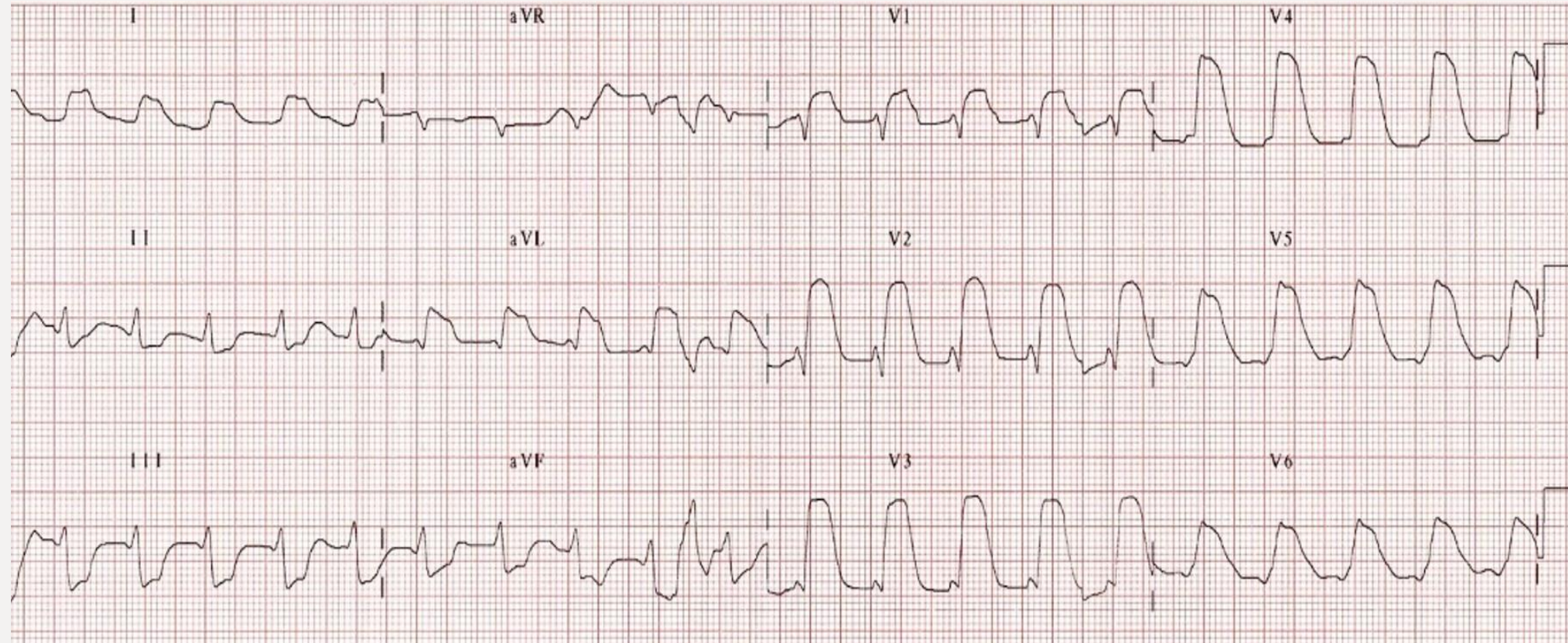
- Sinus tachycardia
- Complete or incomplete RBBB
- RV strain
  - T inversion V1-4, II,III,aVF
- Right axis deviation
- Dominant R V1
- P pulmonale
- SI, QIII, TIII in 20% only
- Clockwise rotation
- Atrial arrhythmias
- Non specific ST/T changes

# Pacemaker malfunction

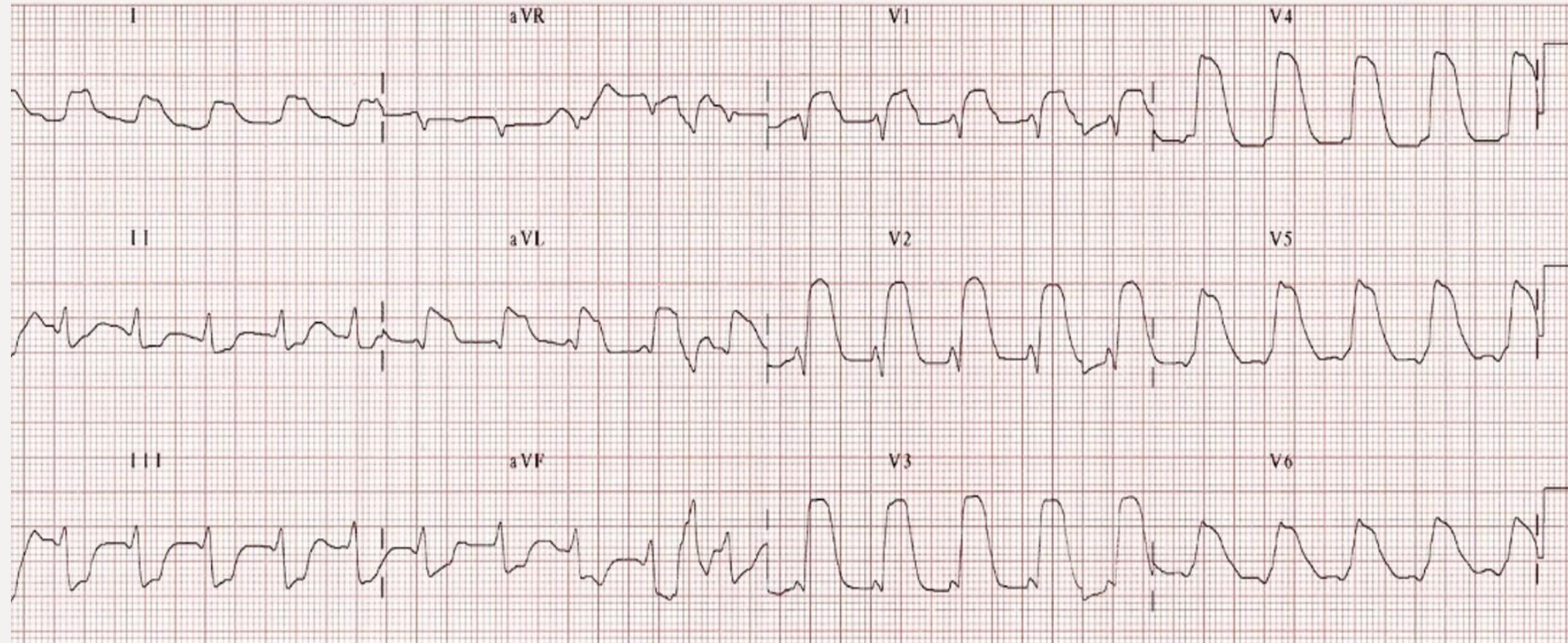




# 70 year old, chest pain and diaphoresis

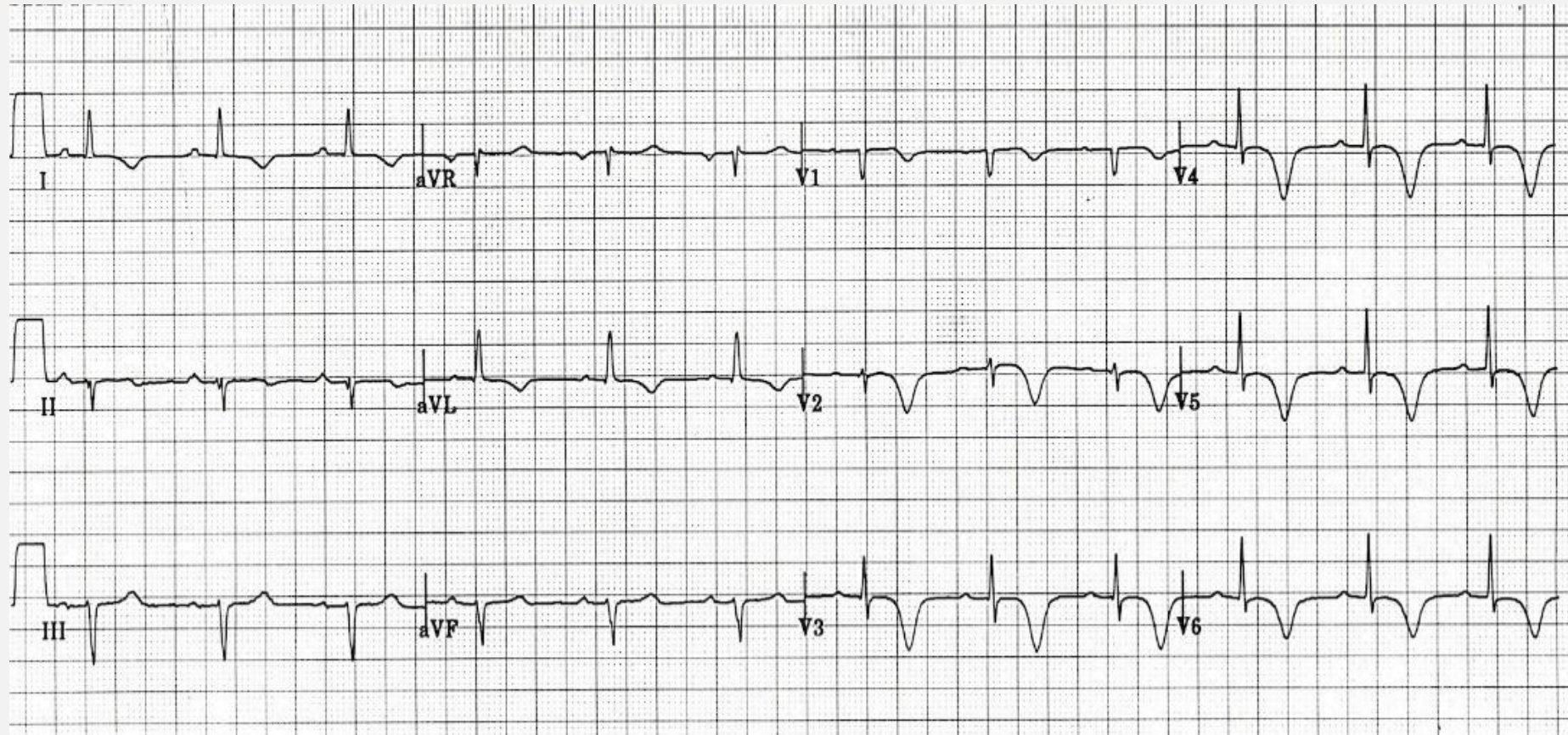


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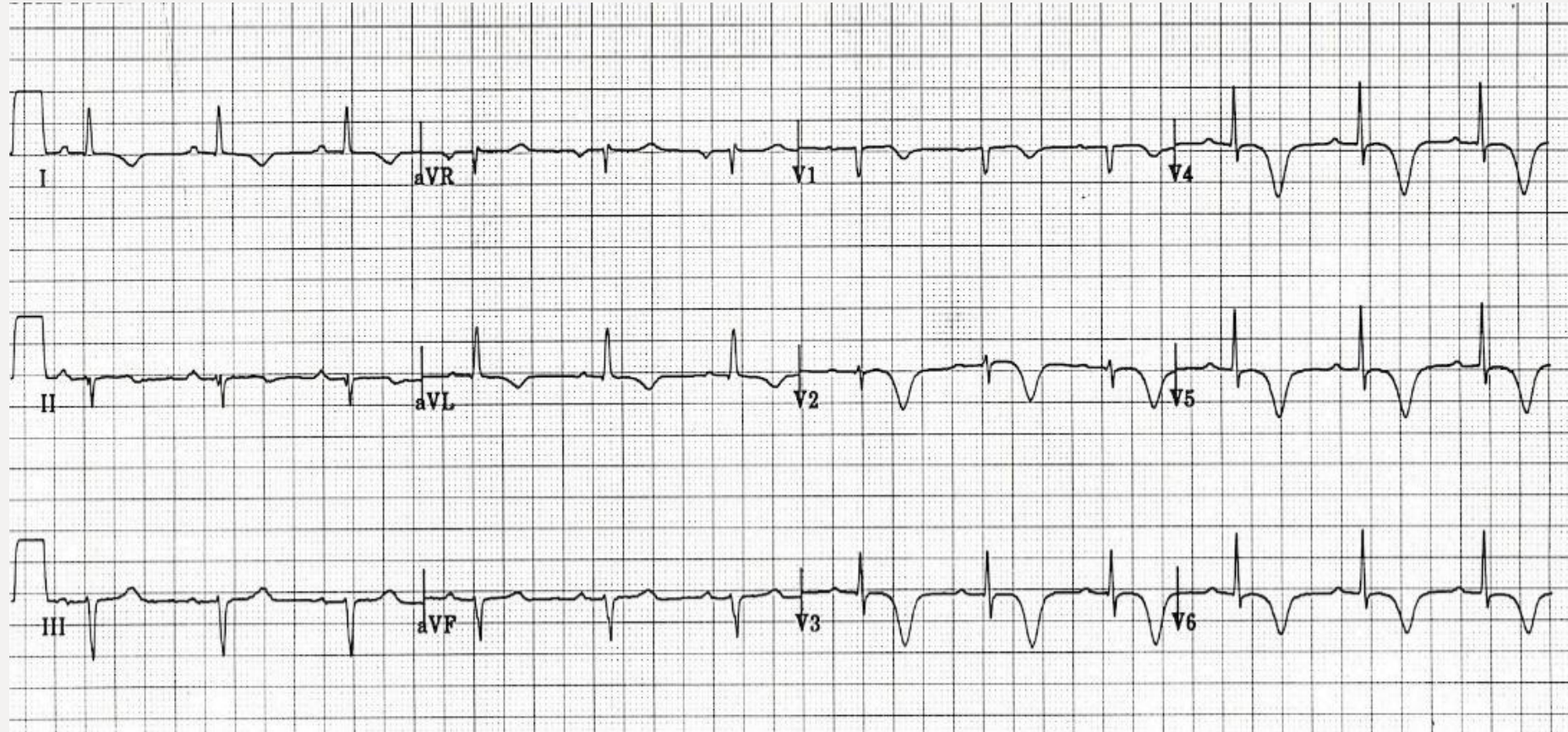


Extensive anterior MI ('tombstoning' pattern)

# Ischaemic sounding chest pain

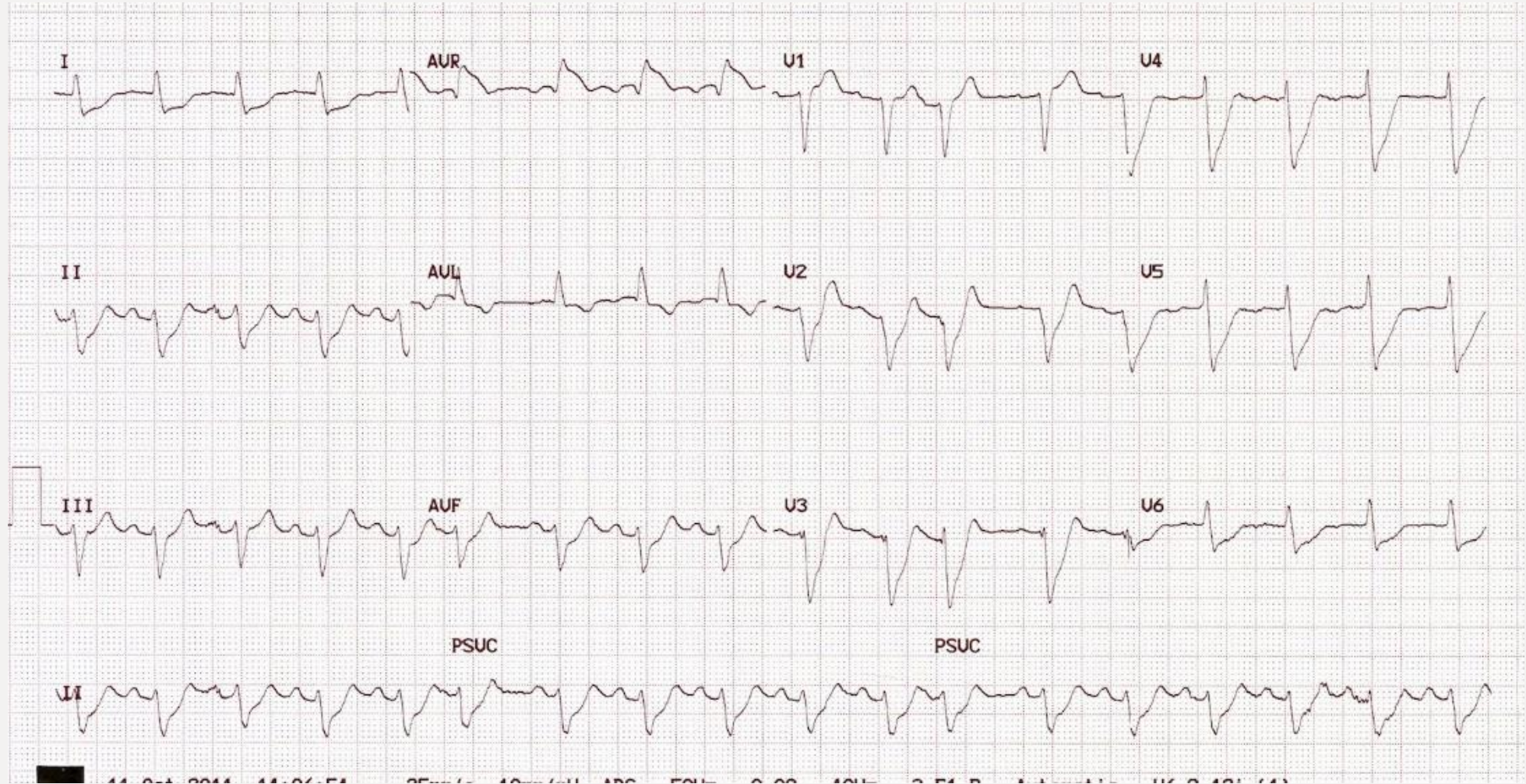


# Ischaemic sounding chest pain



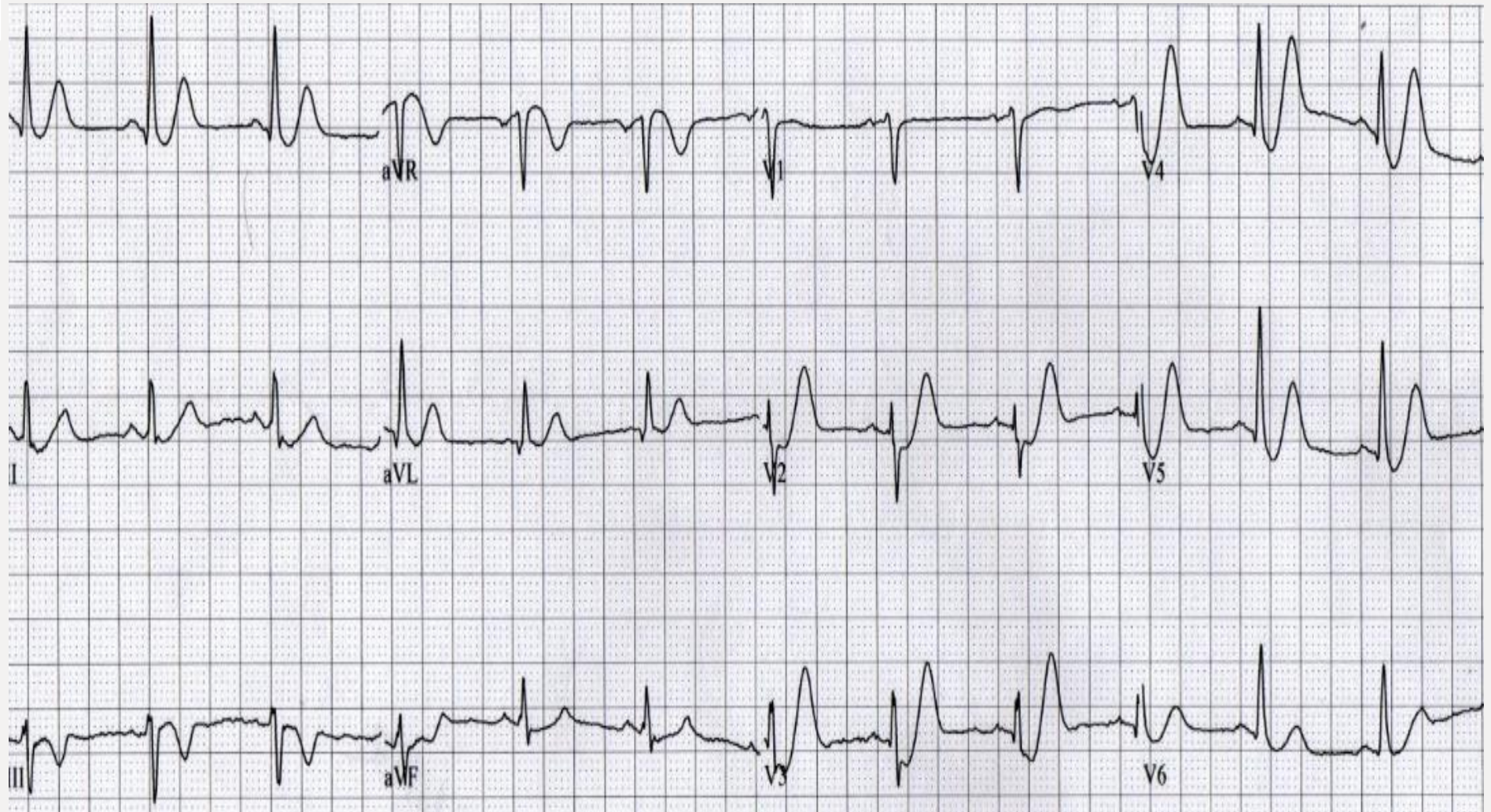
Wellens' Syndrome – proximal LAD stenosis

# LMCA occlusion



## LMCA occlusion

- Widespread ST depression (leads I, II, V4 – 6)
- ST elevation aVR  $\geq$  1mm
- ST elevation aVR  $\geq$  V1
  
- Can also see in:
  - prox LAD occlusion
  - severe triple vessel disease
  - diffuse subendocardial ischaemia (ie. post resuscitation)
  
- aVR records electrical activity right upper portion of heart, including RVOT and basal IV septum



## De Winter's T wave

Anterior STEMI equivalent  
ST depression and peaked T waves in  
precordial leads  
Seen in ~ 2% acute LAD occlusions  
Younger / male / hypercholesterolaemia

Code STEMI





Middle aged female presents with dyspnoea, prior mastectomy for breast cancer.



Middle aged female presents with dyspnoea, prior mastectomy for breast cancer.



QRS alternans – pericardial effusion

# Ventricular flutter



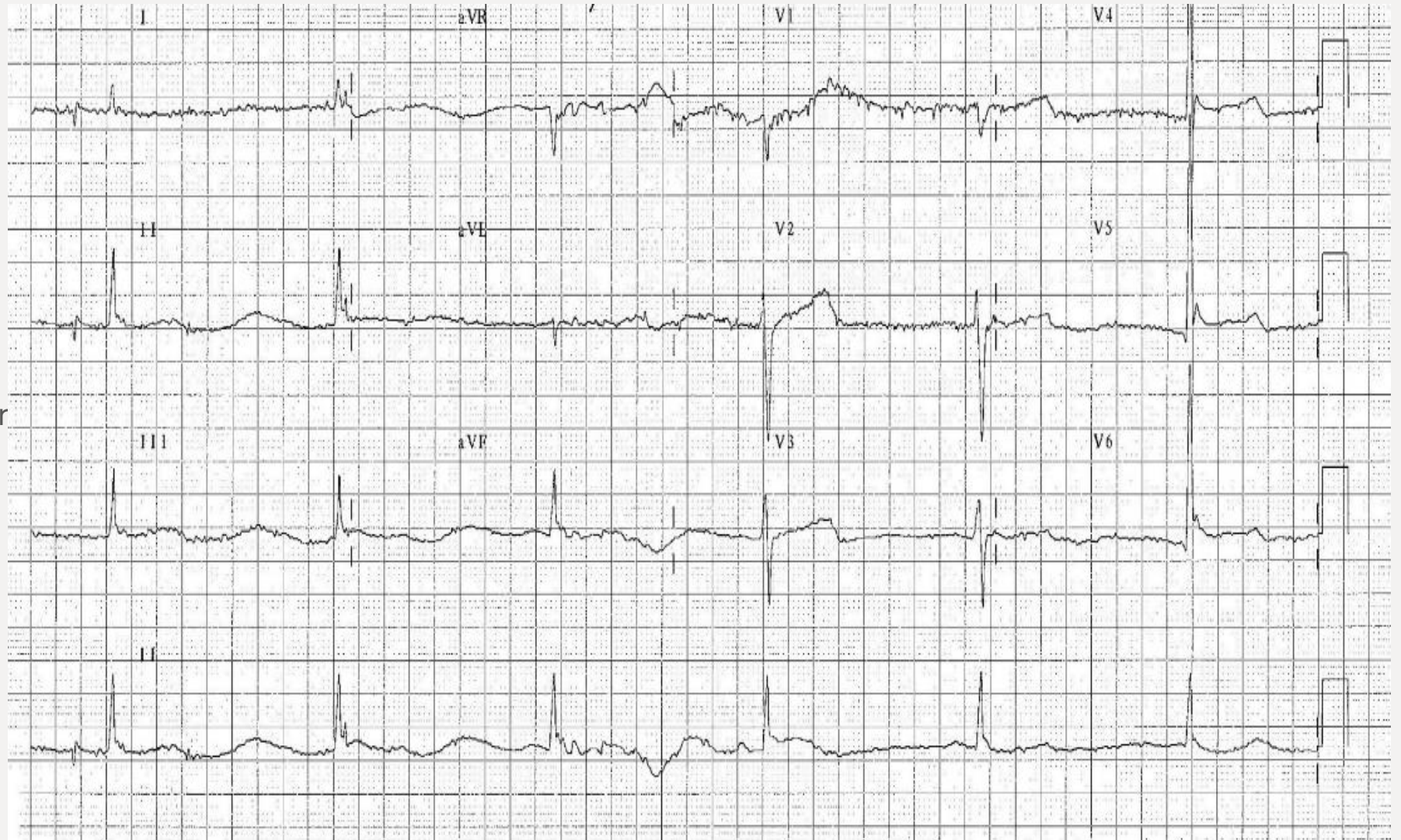


# Ventricular flutter

- Continuous monomorphic sine wave
- No identifiable P, QRS or T wave
- Rate >200
- Extreme form of VT
- Rapid degeneration into VF

# Hypothermia

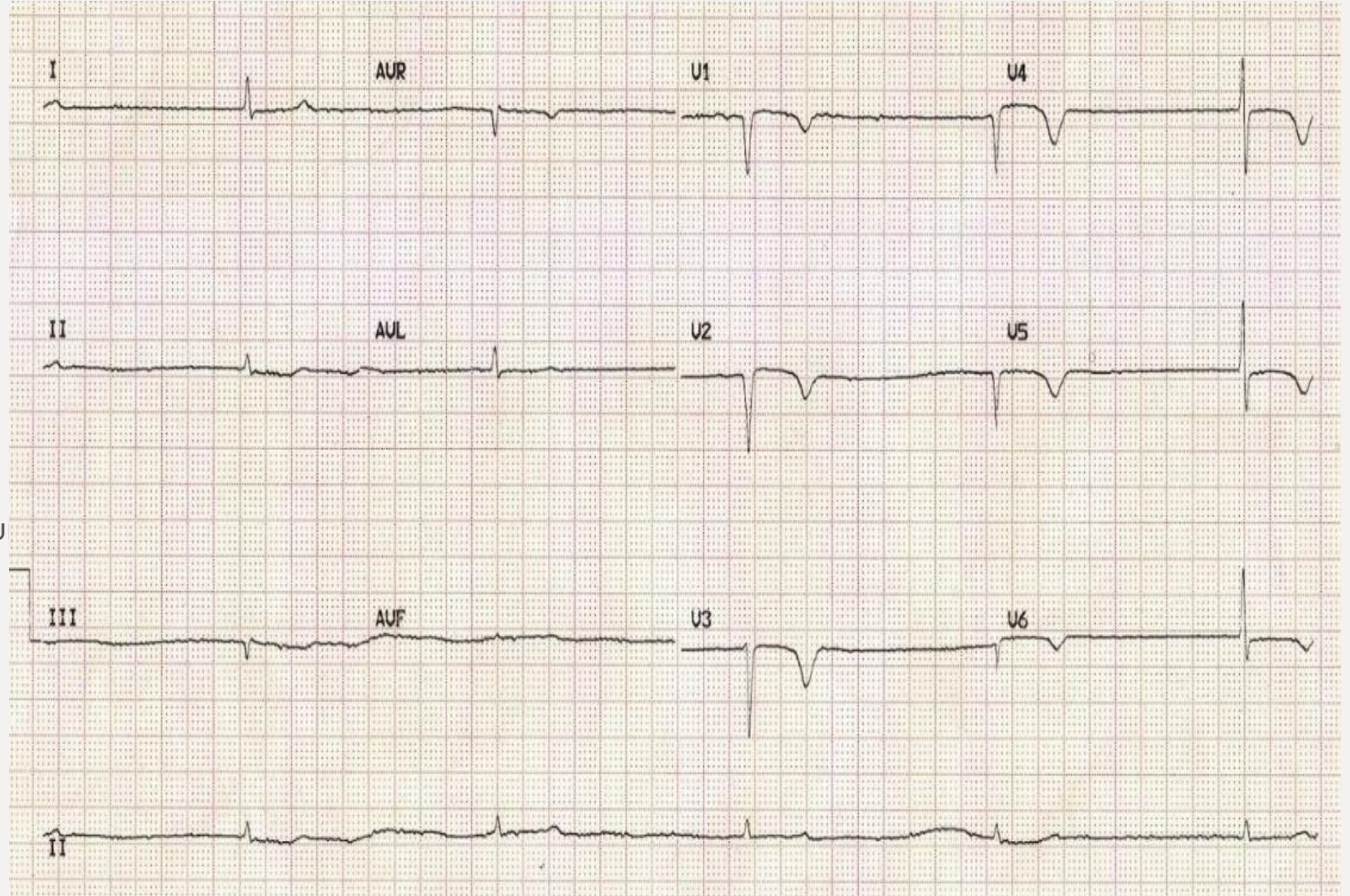
Bradycarrhythmias (any)  
Osborn waves (= J waves = positive deflection at J point)  
Prolonged PR, QRS and QT  
Shivering artefact  
VPBs  
Cardiac arrest due to VT, VF or asystole



# Hypothyroidism

- Bradycardia
- Low QRS voltage
- Widespread T wave inversion
- QT prolongation
- First degree AV block
- IVCDs

- Myxoedematous deposits in myocardium
- Decreased SNS activity
- Less thyroxine - decreased inotropy / chronotropy





**The End**