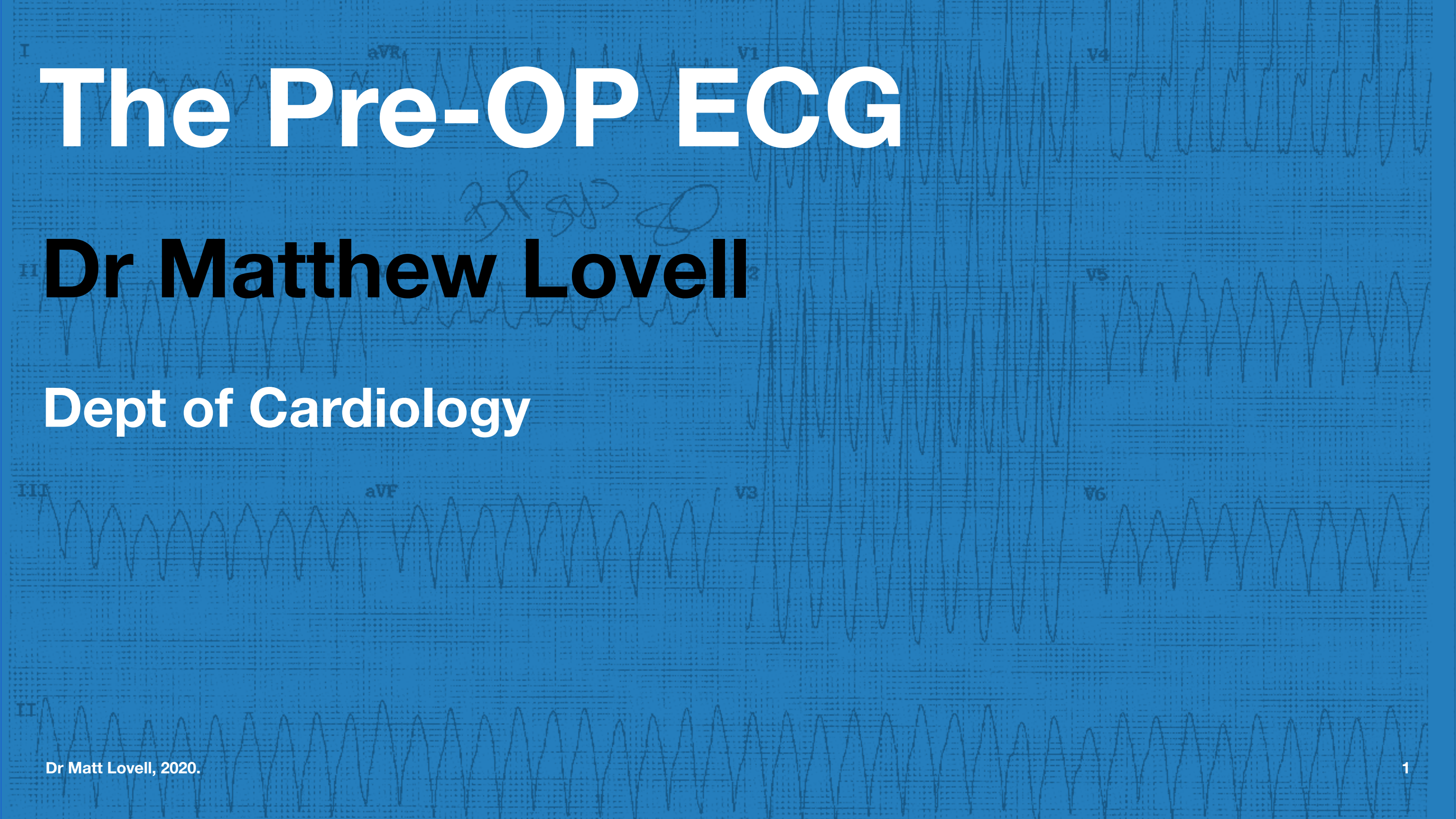




The Pre-OP ECG

Dr Matthew Lovell

Dept of Cardiology

ECG Pre-OP Non-NICE Approach

- **ECG for all with known:**
 - **CVD**
 - **Significant Arrhythmia**
 - **Significant Structural Heart Disease**
 - **Unless the patient is undergoing low-risk surgery**
- **Preoperative ECG in stable patients also useful as baseline ECG should postoperative ECG be abnormal**

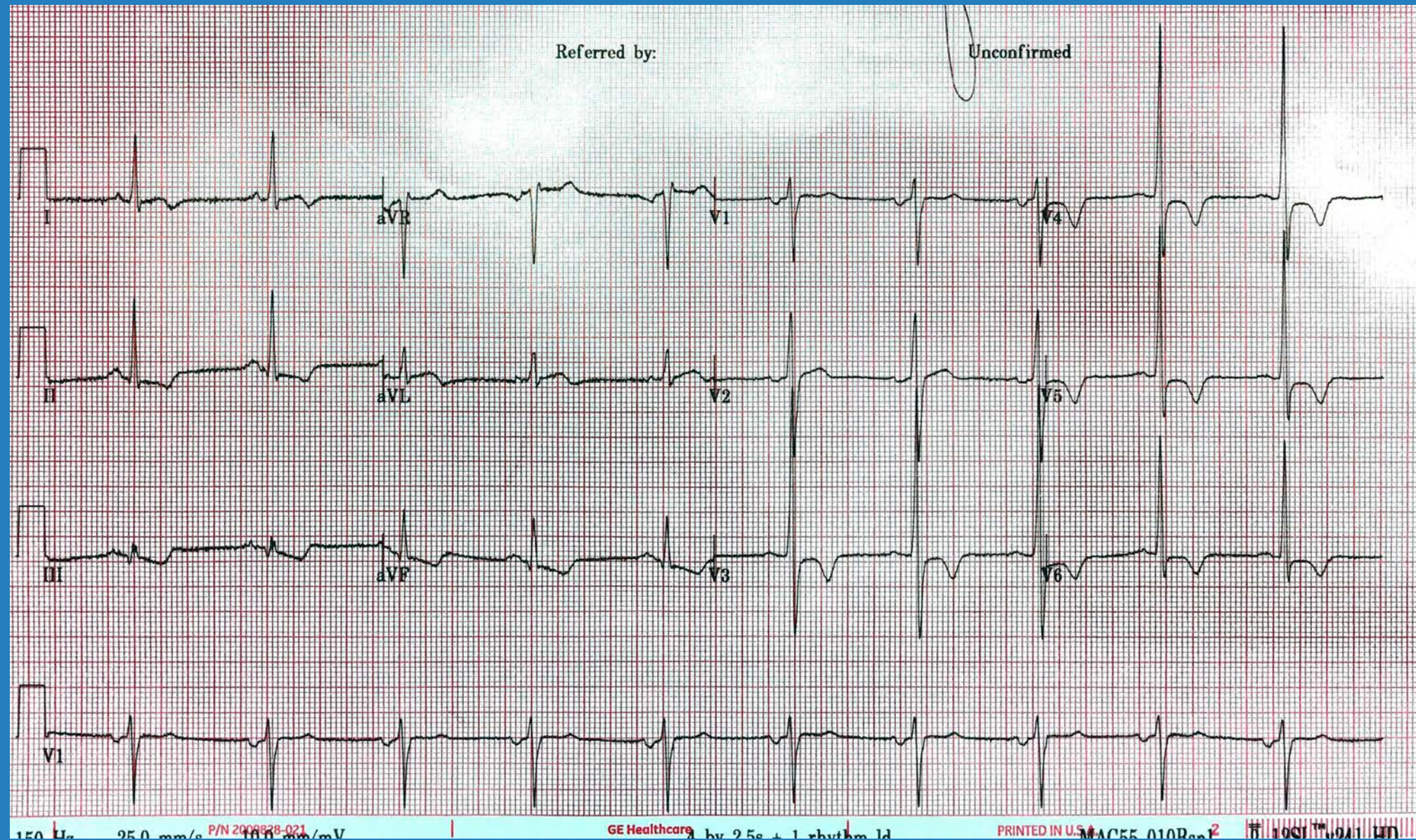
Decisions on ECG Abnormality Made in Context

- **Is the abnormality new or old?**
- **Hx of cardiovascular disease?**
- **Active cardiovascular symptoms?**
- **Functional class?**
- **Procedure elective or emergency?**

Left Ventricular Hypertrophy

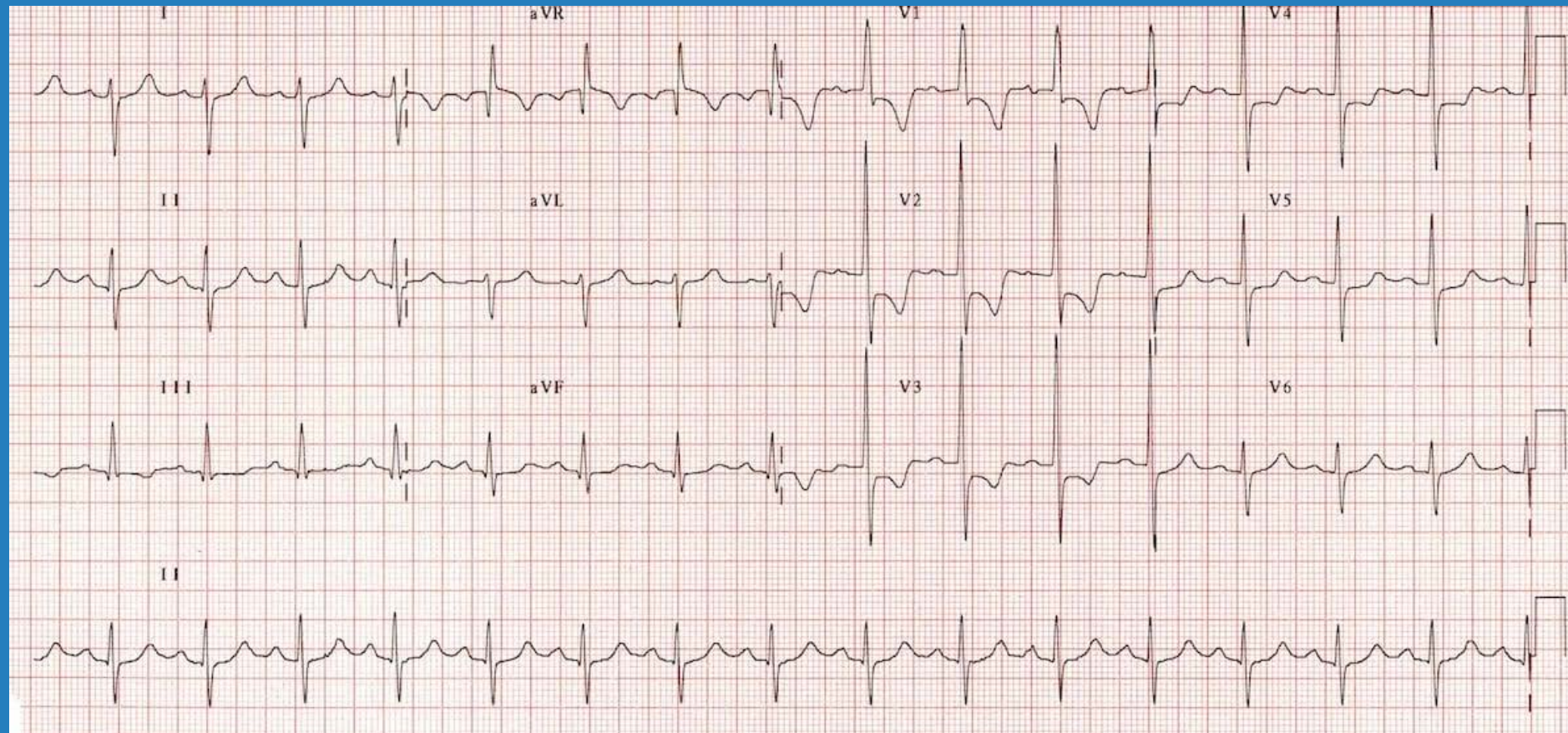
- **$S V1 + R V5/6 > 35 \text{ mm}$**
- **Sustained pressure/volume load**
- **Aortic stenosis**
- **Systemic hypertension**
- **Often have diastolic dysfunction and preload dependency**
- **Risk for subendocardial ischemia, exacerbated by:**
 - **hypovolaemia**
 - **low systemic vascular resistance**
 - **tachycardia**

LVH with Strain Pattern



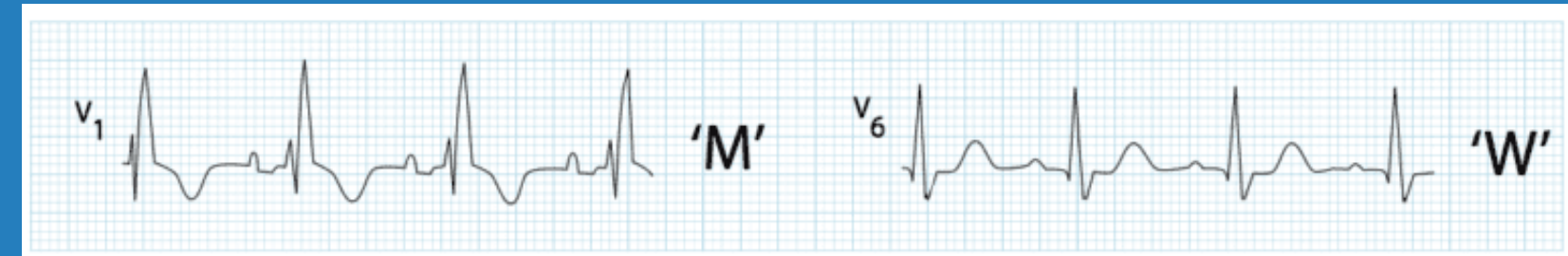
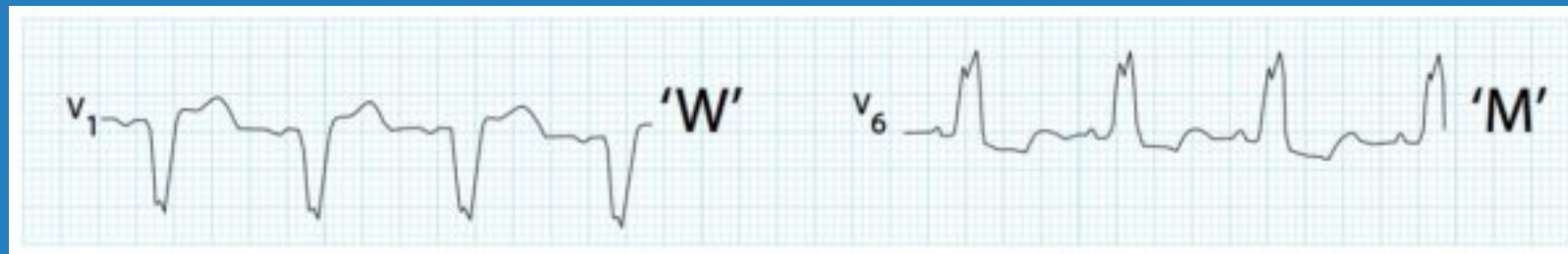
RVH

- R/S Ratio V1 > 1
- Pulmonic stenosis/pulmonary hypertension/PE
- Need evaluation for cardiac or pulmonary risk prior to surgery



Bundle Branch Block

— QRS duration >120 ms & pattern of QRS morphology



Bundle Branch Block

- Chronic left or right axis BBB reflects a history of cardiac disease
 - Ischaemic heart disease
 - Hypertension
 - Valvular heart disease
 - Cardiomyopathies

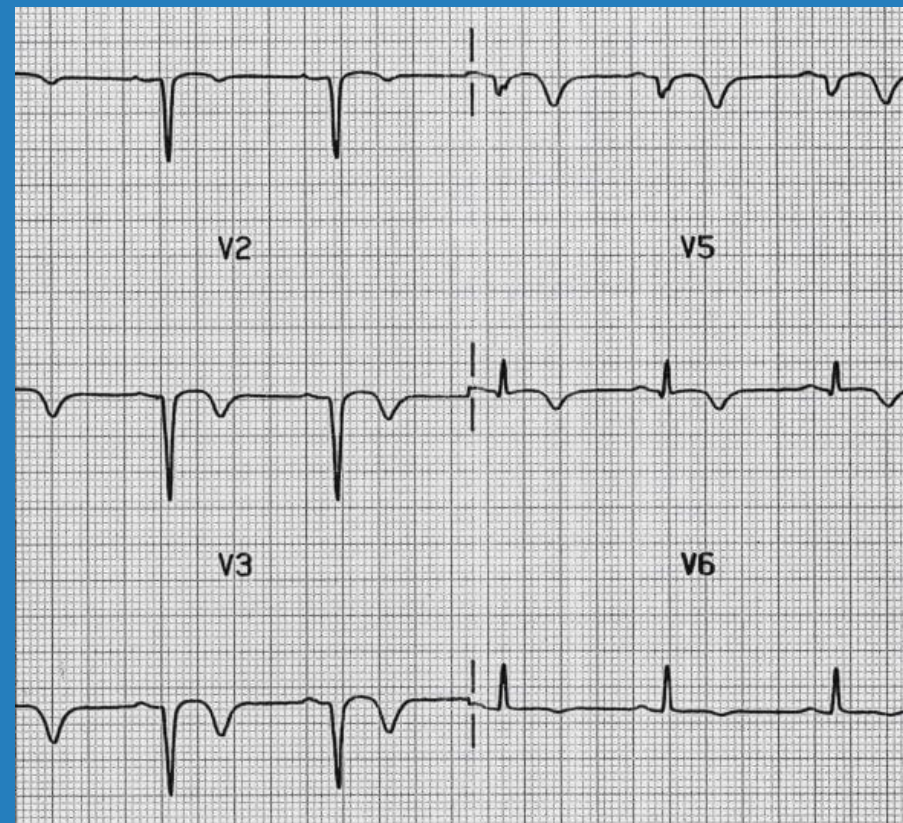
In asymptomatic patients with chronic left or right BBB, postponement not necessary

New BBB

- **New or acute BBB warrants investigation of potential causes**

Q waves

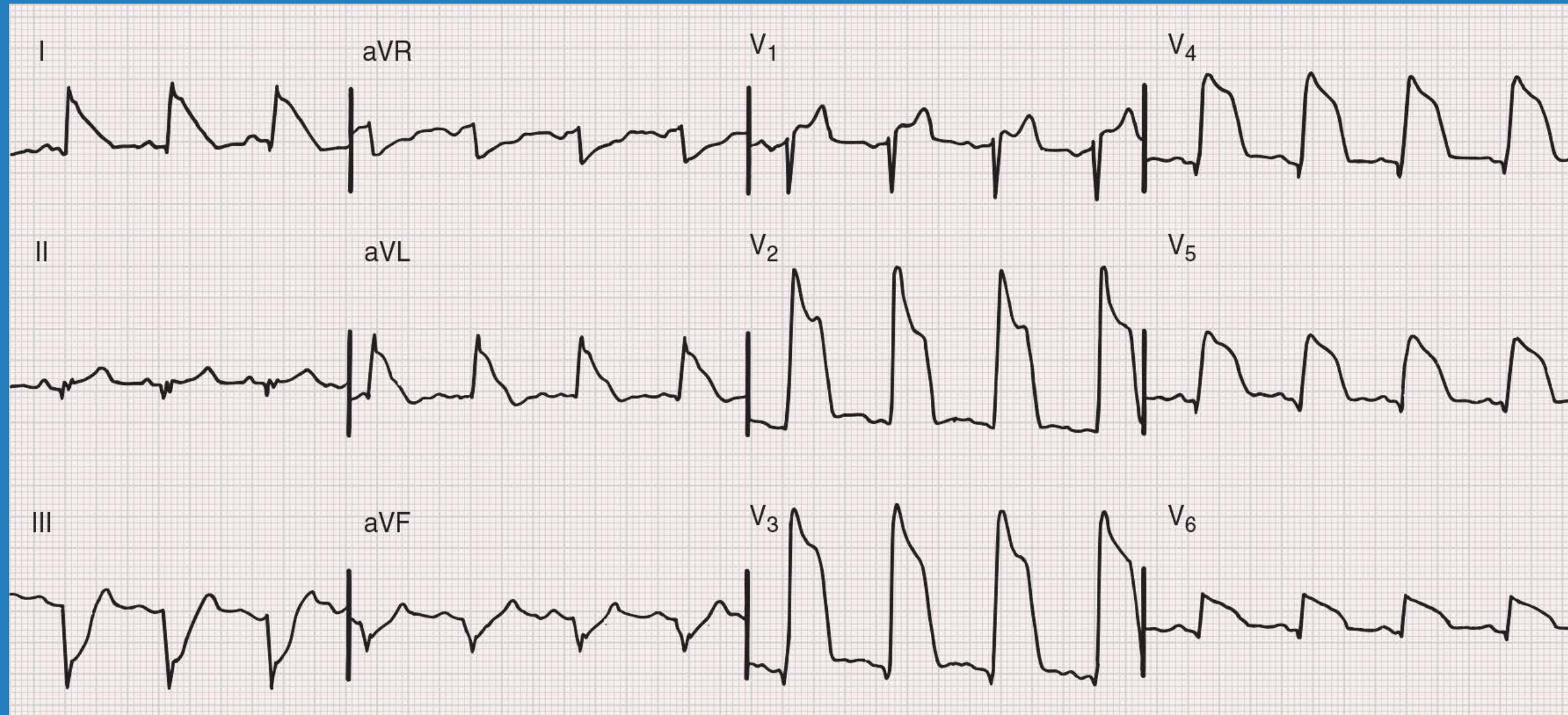
- Q waves that are deep >1 mm, broad >0.04 seconds
- Present in two or more consecutive leads
- Suggest prior MI, particularly if T wave changes
- Postponement of surgery is unnecessary if chronic and patient asymptomatic



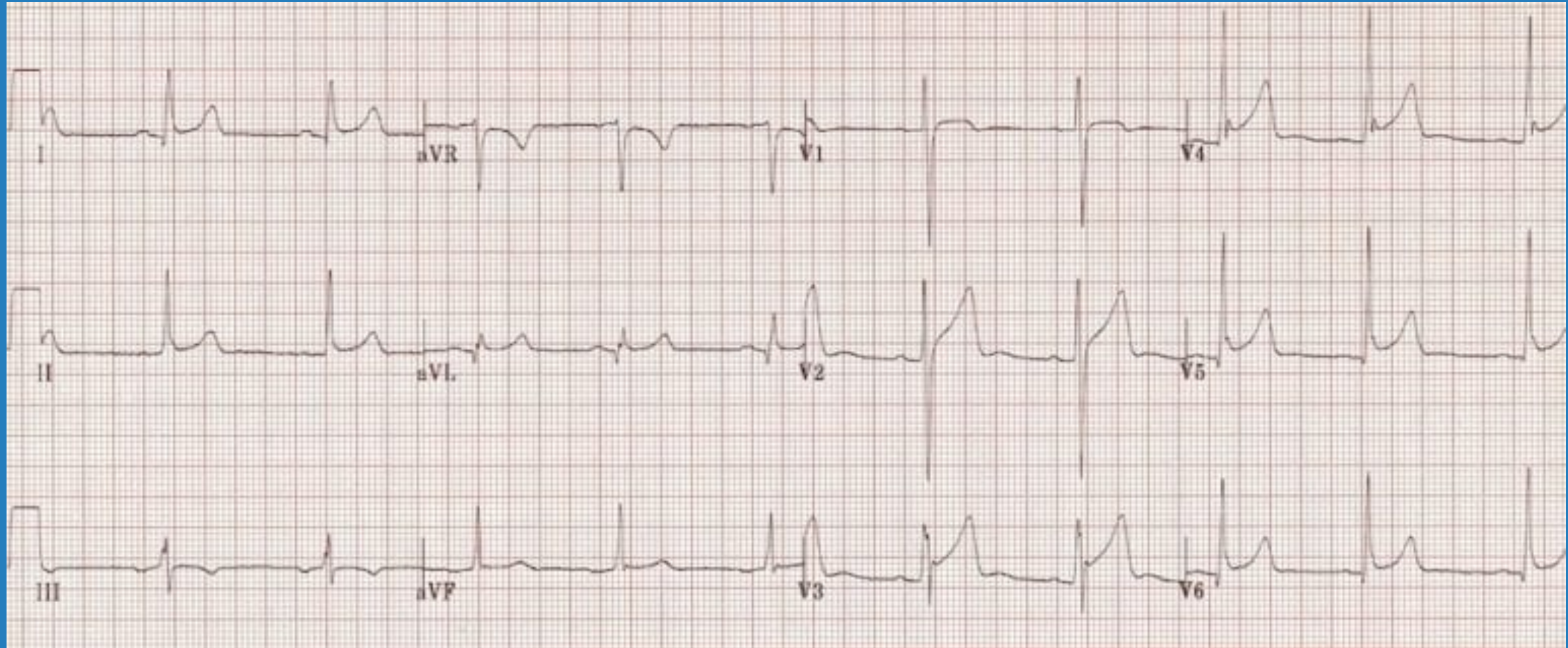
ST-Segment Elevation

- **STEMI**
- **Or High take off?**
- **Convex ST segment elevation in two or more consecutive leads is the hallmark of acute ST-elevation myocardial infarction (STEMI)**

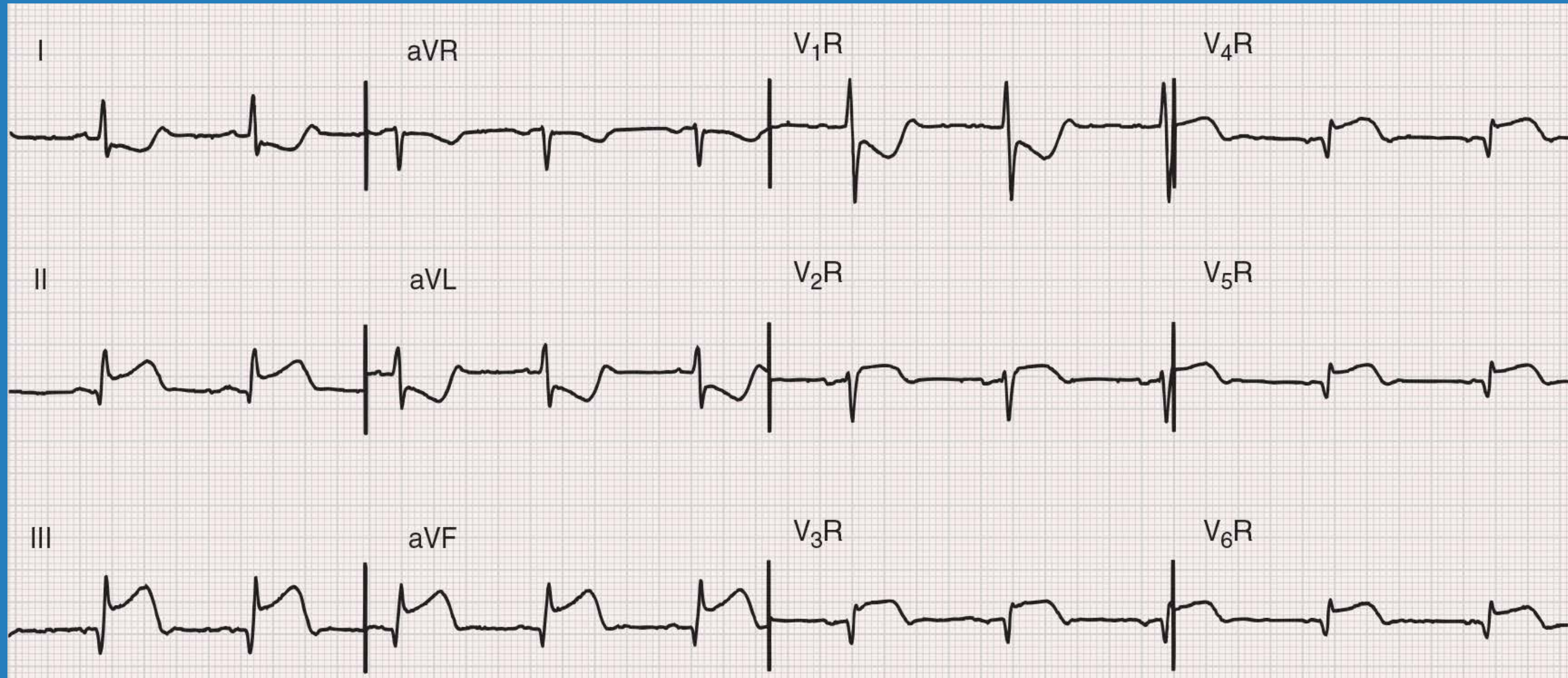
STEMI ECG 1



Early Repolarisation

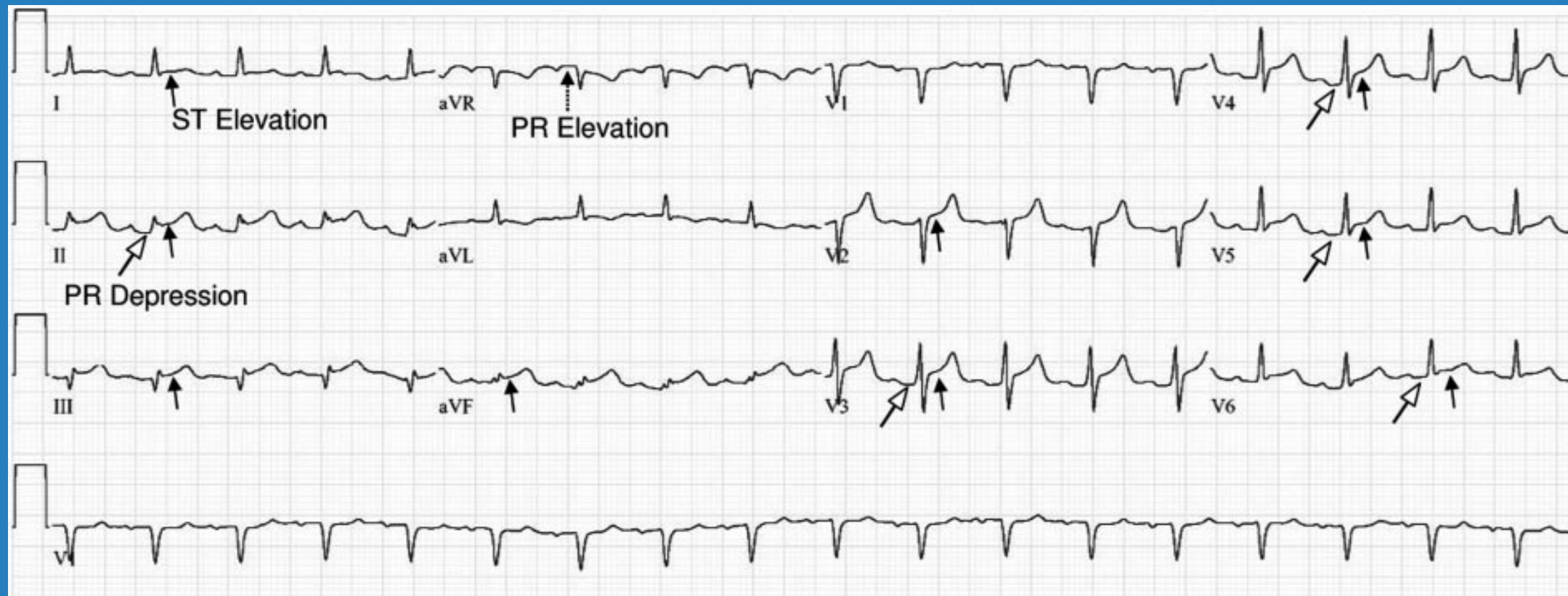


STEMI ECG 2



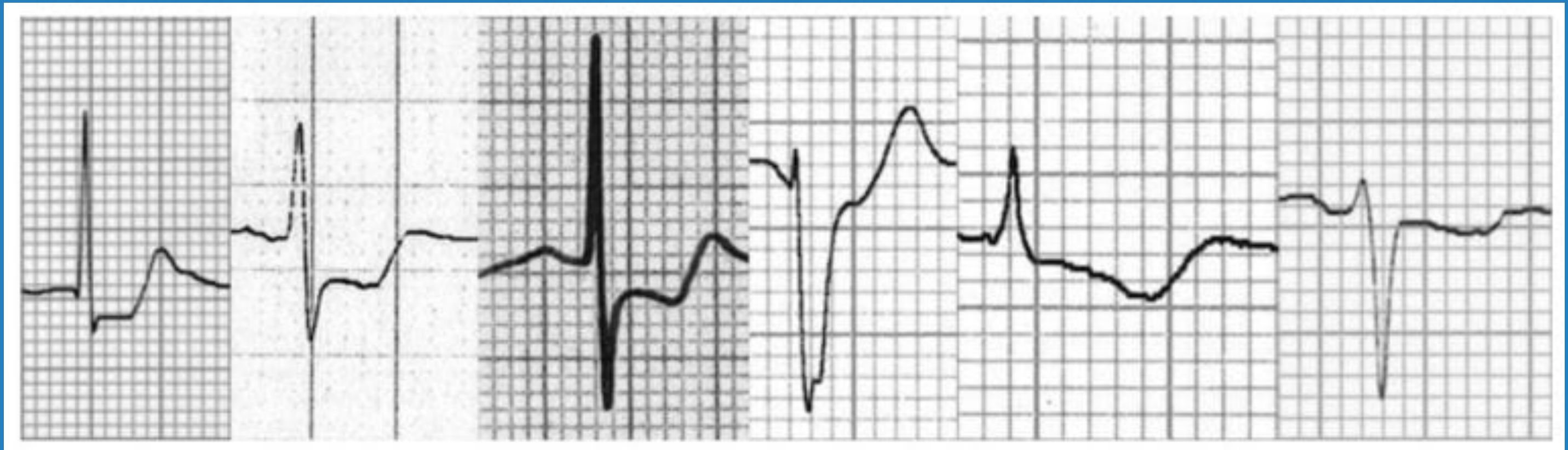
Pericarditis

- Widespread saddle shaped ST elevation
- PR depression
- Elective surgery should be postponed until resolution of symptoms.
- Urgent/emergency surgery can proceed once presence of significant pericardial effusion is excluded



ST-segment Depression

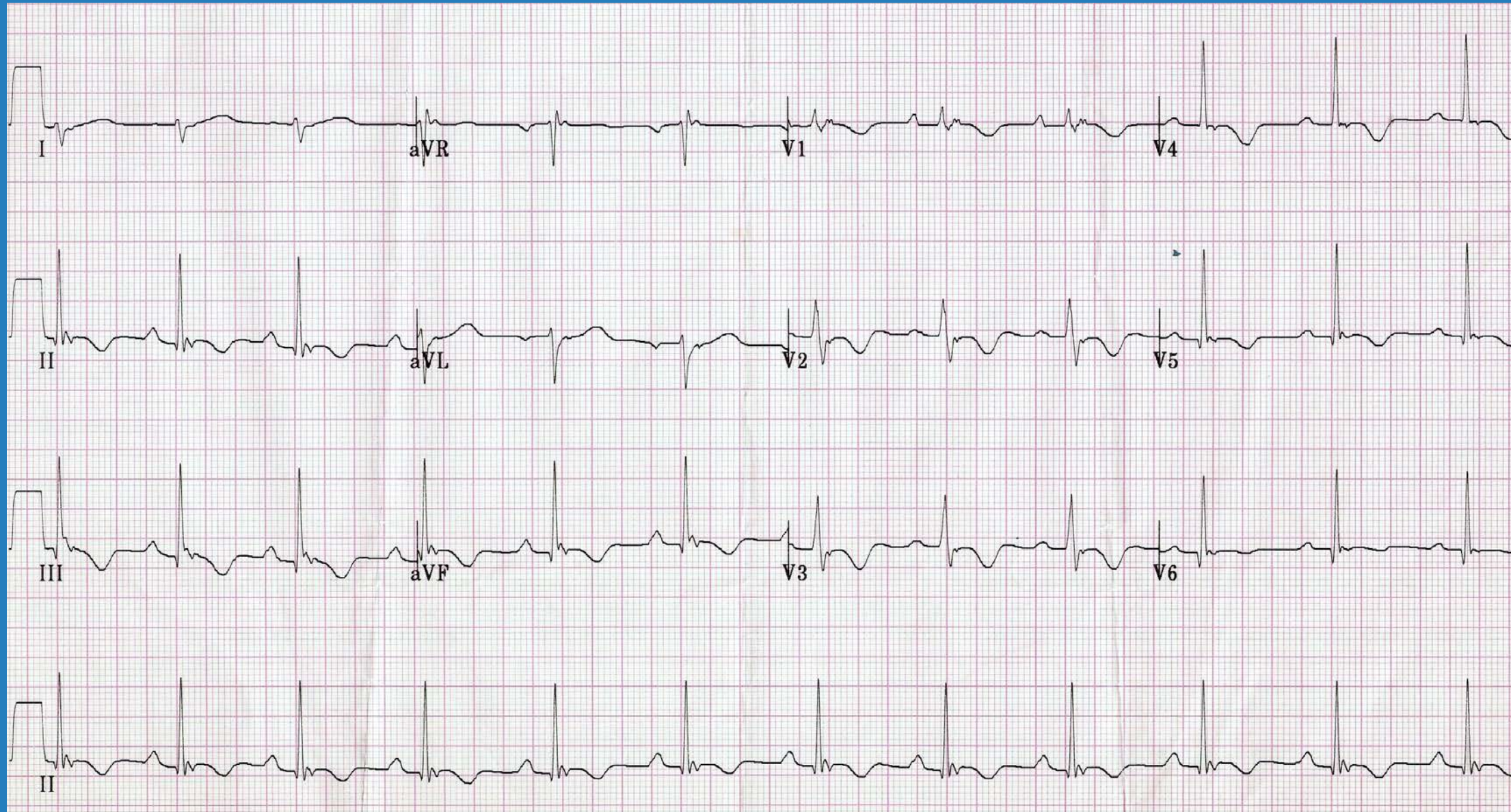
- ST-segment that is depressed ≥ 0.05 mV
- Measured at 0.08 seconds after the J point, in two contiguous leads
- Acute ST-segment depression in multiple leads often indicates myocardial ischemia or injury and warrants consultation with the cardiology service



T wave Inversion

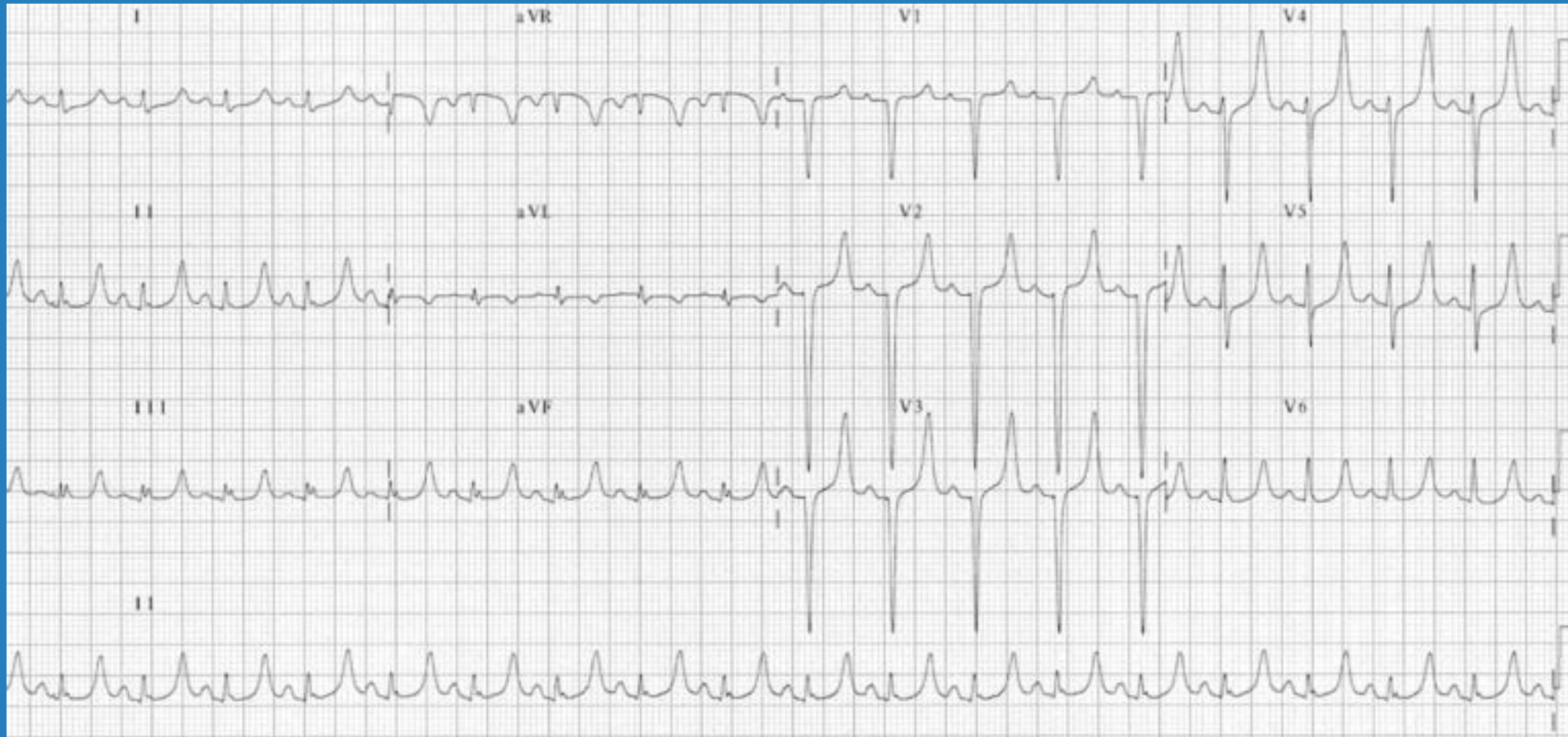
- **T wave inversion when chronic does not typically warrant Invx**
- **Acute dynamic changes in T wave may indicate acute ischaemia and warrant postponement**

Mystery ECG - ARVC with Epsilon wave, RBBB



Tall peaked T waves

— Early sign of hyperkalaemia



QT Interval Prolongation

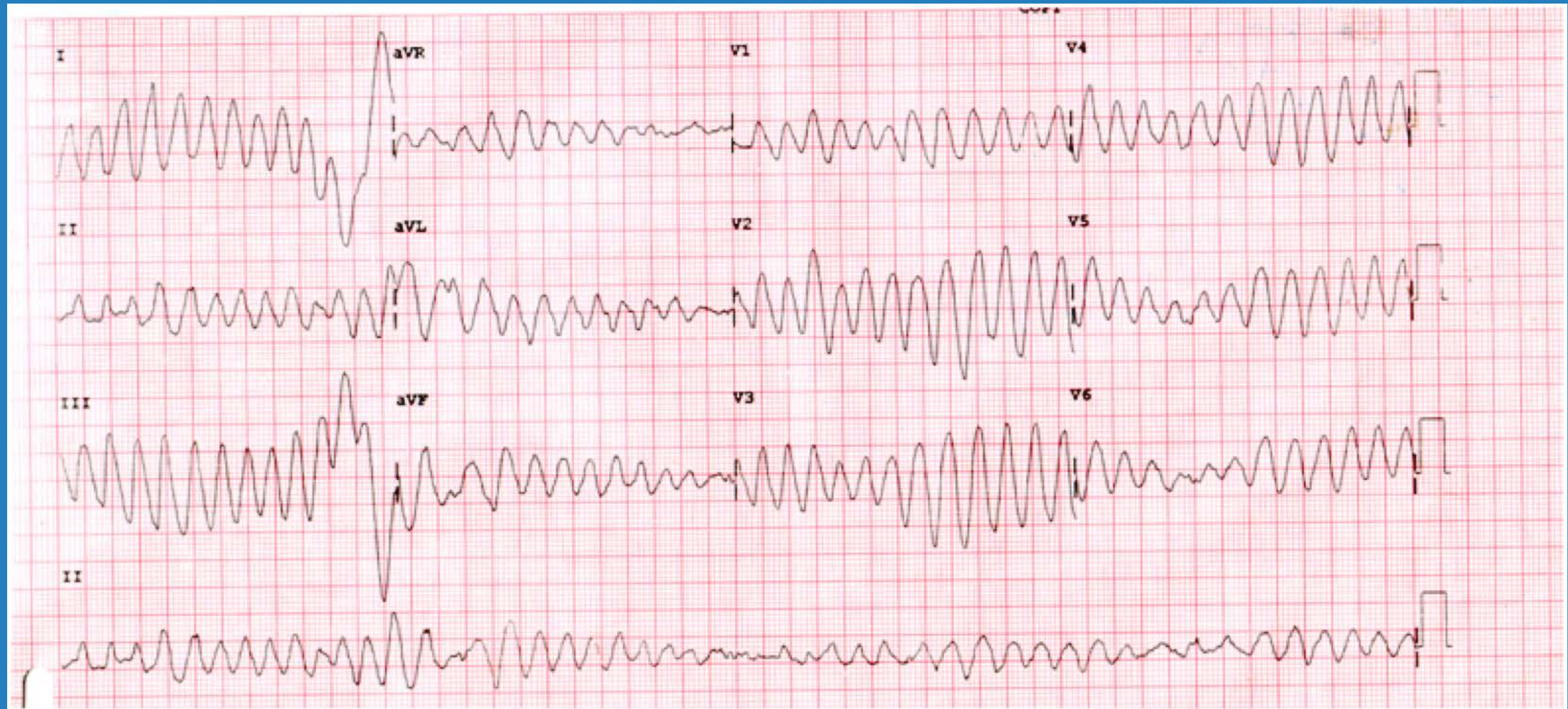
- < 440 msec in men
- < 460 msec in women
- A QTc >500 ms is highly abnormal for both men and women
- Newly discovered congenital long QT syndromes -> referred to Cardiology



QT Interval Prolongation in Anaesthesia

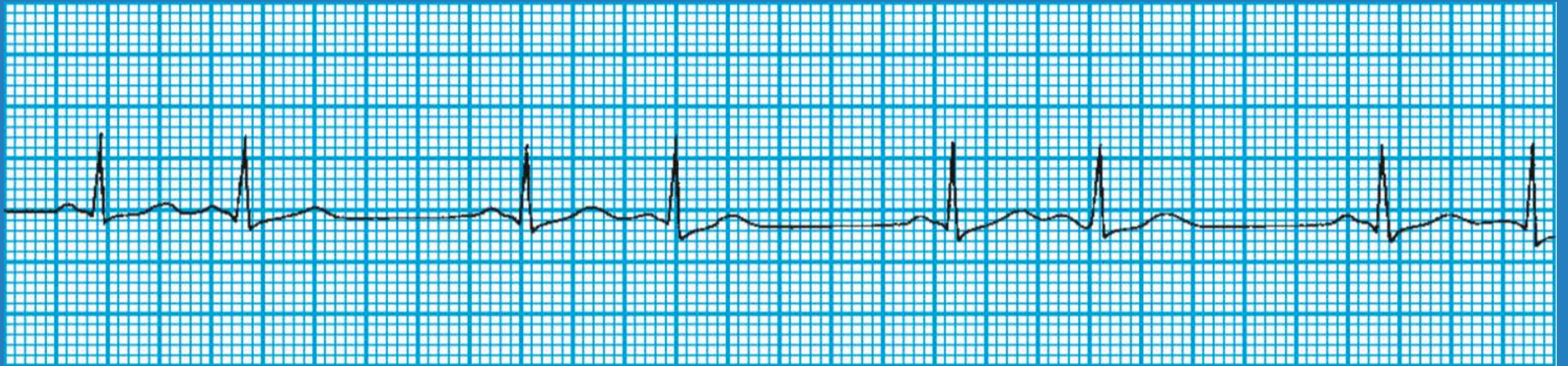
- **Avoid QT prolonging drugs**
- **Avoid the halogenated volatile anesthetics isoflurane and halothane**
- **Propofol has the least effect on QT interval**
- **Beta adrenergic blocking agents may have a protective role**
- **Low potassium, magnesium, or calcium should be avoided**
- **Intraoperative hyperventilation avoided -> respiratory alkalosis -> hypokalemia & hypocalcemia**

Torsades



Atrial Premature Beats

- Usually benign, often normal hearts
- Assoc with increased sympathetic tone from smoking or alcohol
- COPD
- IHD, Cardiomyopathy, Valvular heart disease
- Planned surgery and anaesthetic care should not change



Supraventricular Tachyarrhythmias

- Usually have a narrow QRS complex <120 ms
- Sinus tachycardia
- AVRT
- AVNRT
- AT

Caution with SVT and HR >90 bpm

- Underlying causes of a preoperative SVT should be identified and treated prior to elective surgery
- Elevated preoperative HR ≥ 90 bpm increased risk of myocardial injury after major noncardiac surgery
- Termination of the SVT or achievement of ventricular rate control results in resolution of any symptoms
- Refer to cardiology

Sinus Tachycardia

- Preoperative mild to moderate sinus tachycardia (eg, a rate of 100 to 125 bpm) is usually physiological
 - anxiety
 - pain
 - hypovolemia
 - sepsis, fever

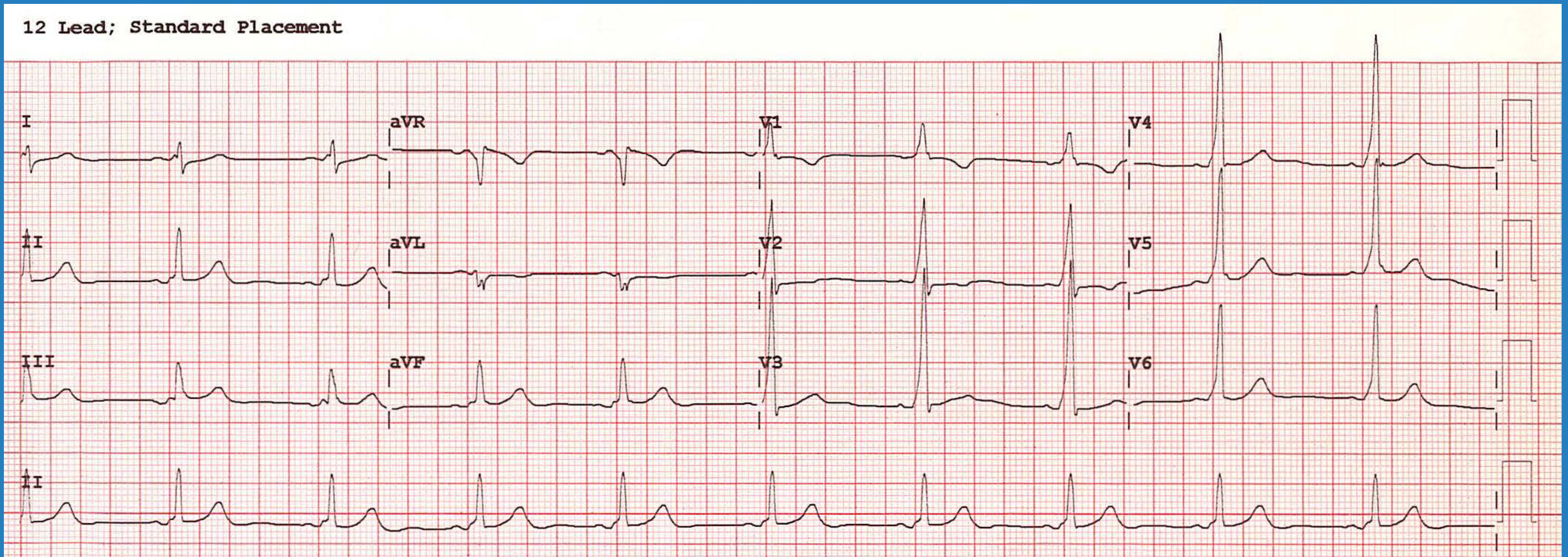
Other possible preoperative causes:

- drugs stopped preop
 - hypoxaemia
 - hypercarbia
 - myocardial ischemia
- Surgery and anesthetic care are not typically altered if the cause identified and managed

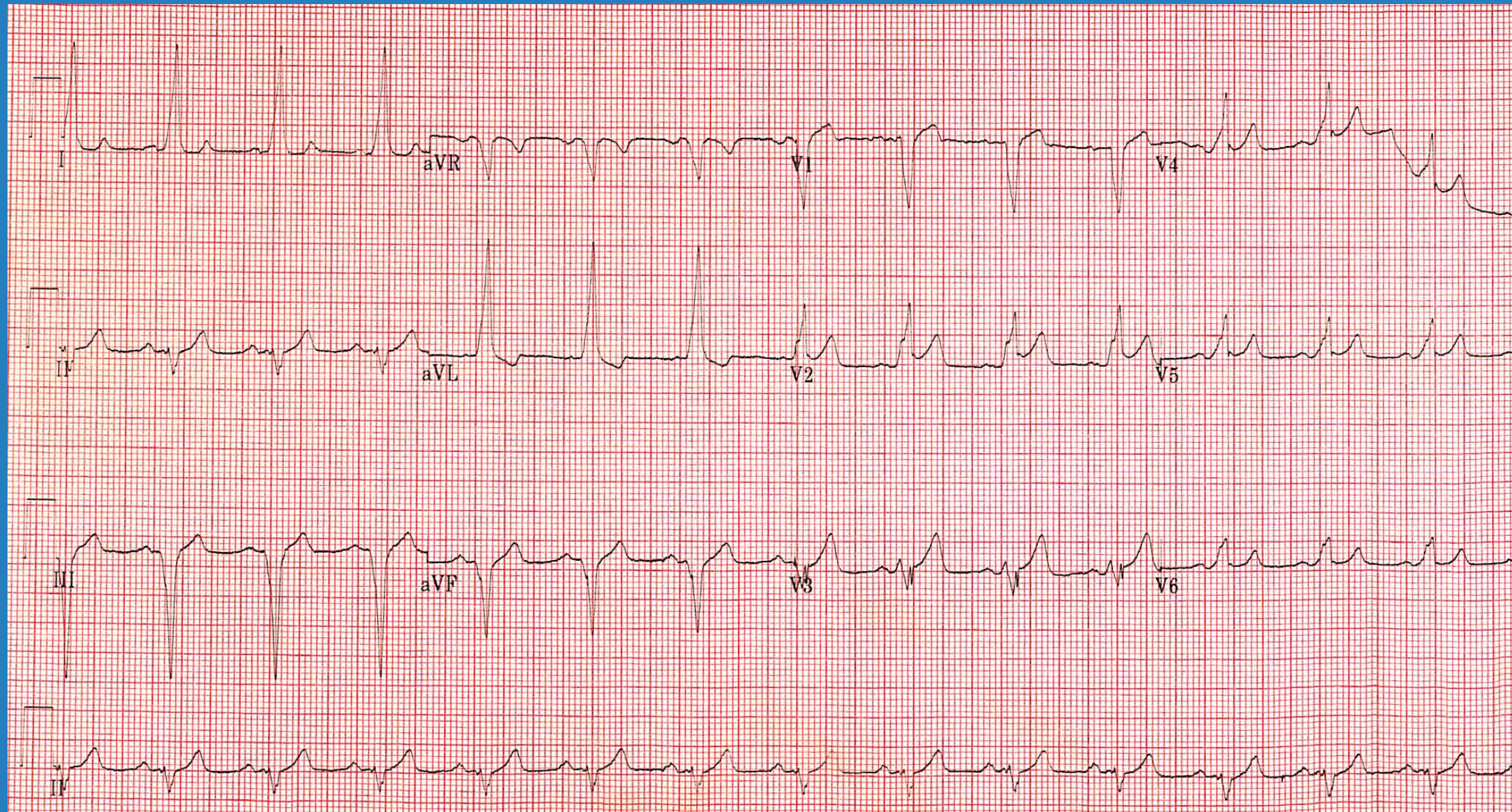
Wolff-Parkinson-White Syndrome

- Pre-excitation syndrome via accessory pathway
- Short PR interval with slowly conducted "delta waves"
- Risk of SVT
- Risk of VF
- Techniques such as a high spinal block or IV agents that increase vagal tone (eg, succinylcholine, neostigmine) used cautiously
- May promote conduction of impulses down the accessory pathway

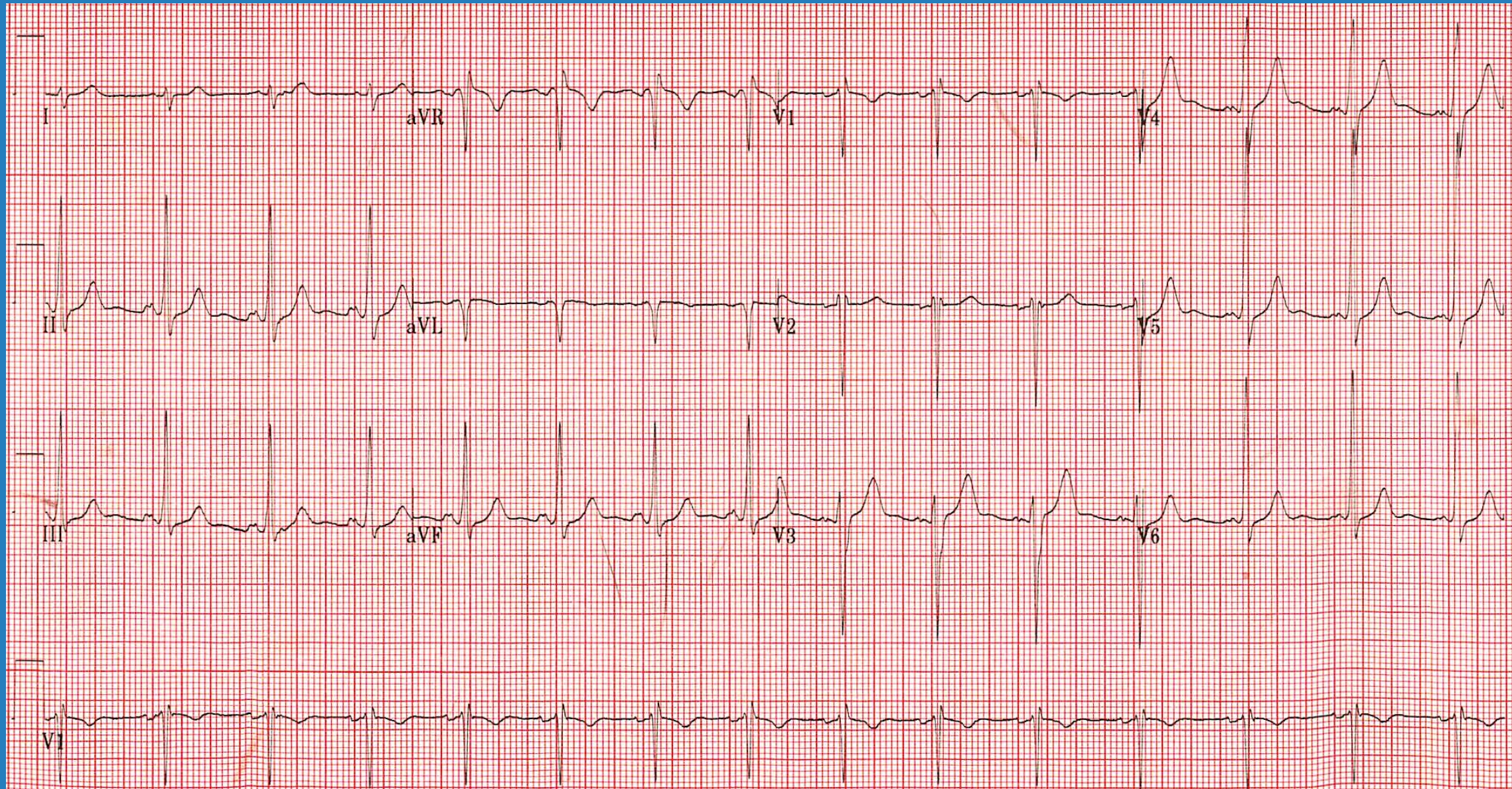
Pre-excitation/WPW



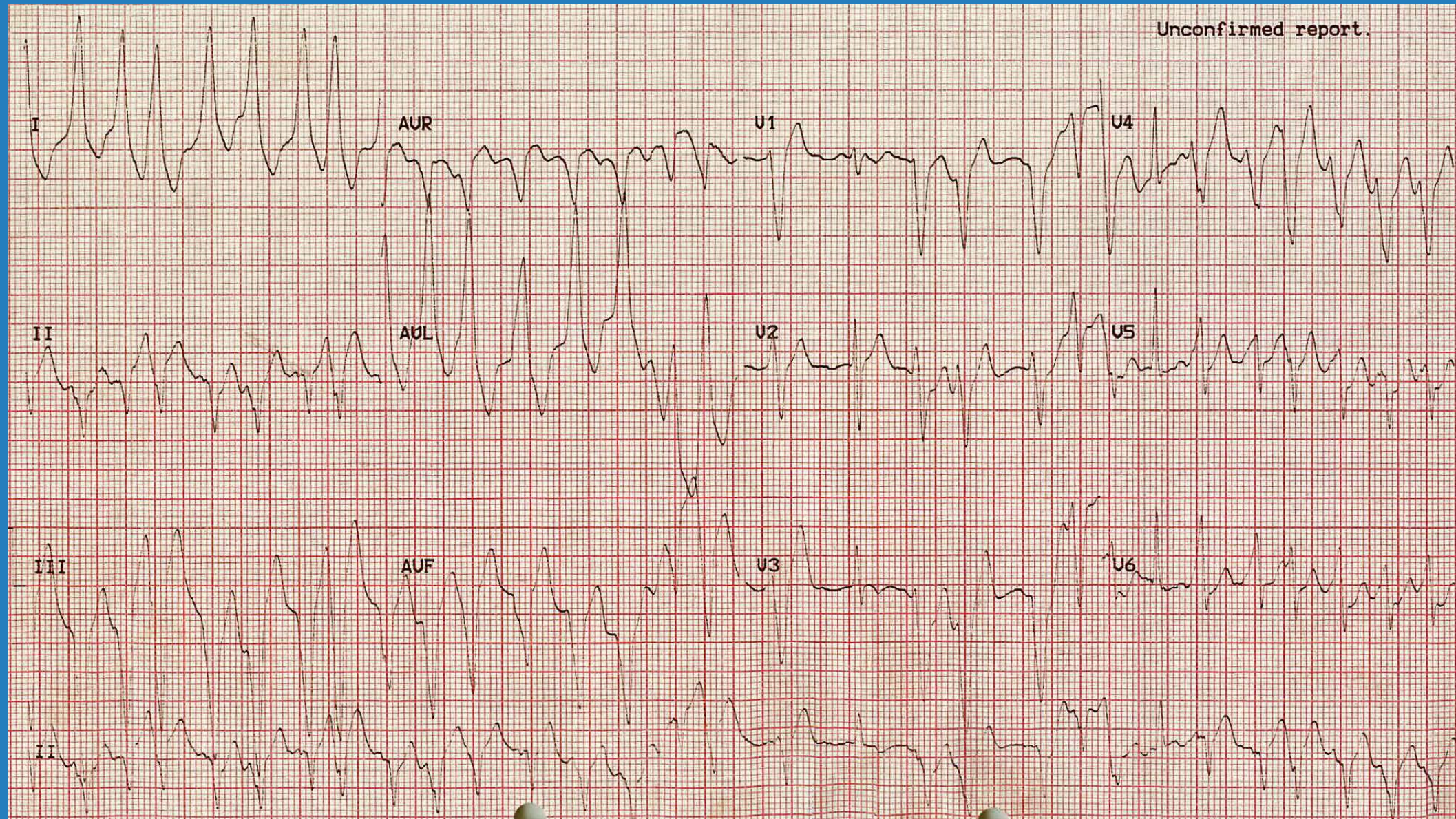
Pre-excitation ECG 2



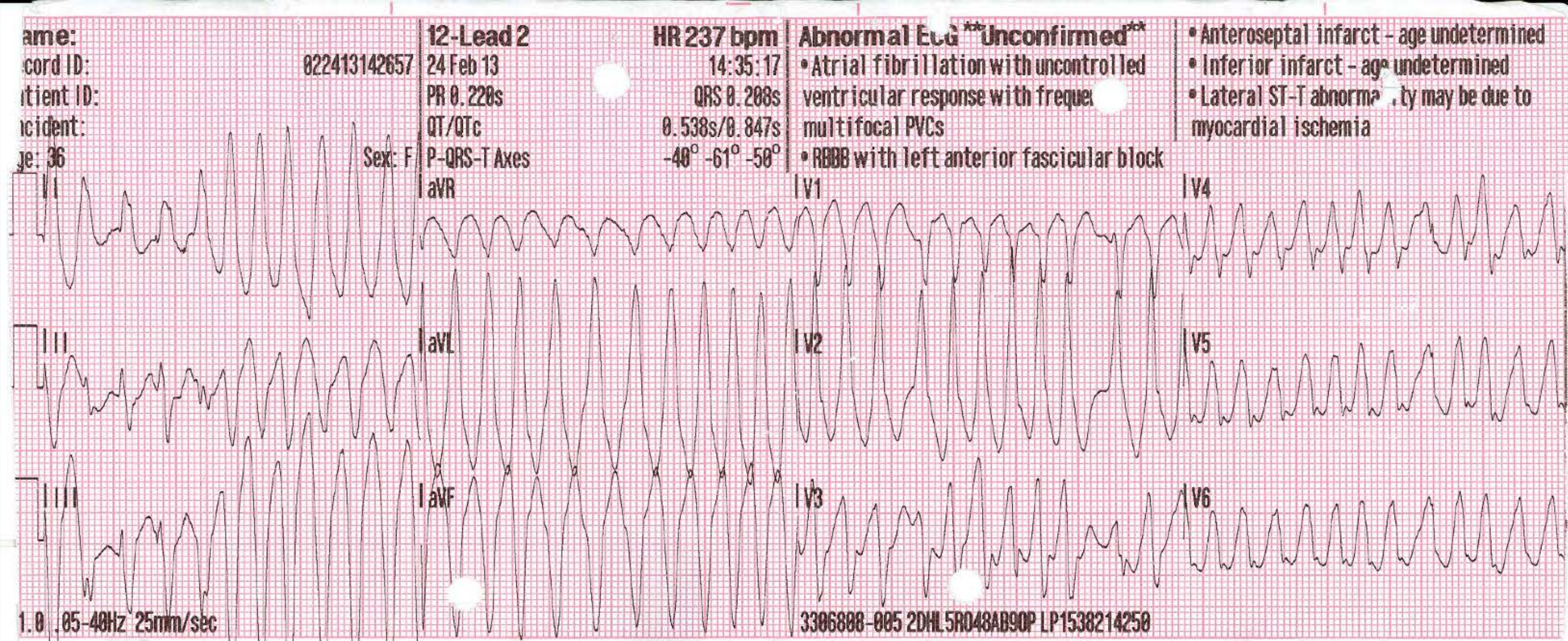
Pre-excitation ECG 3



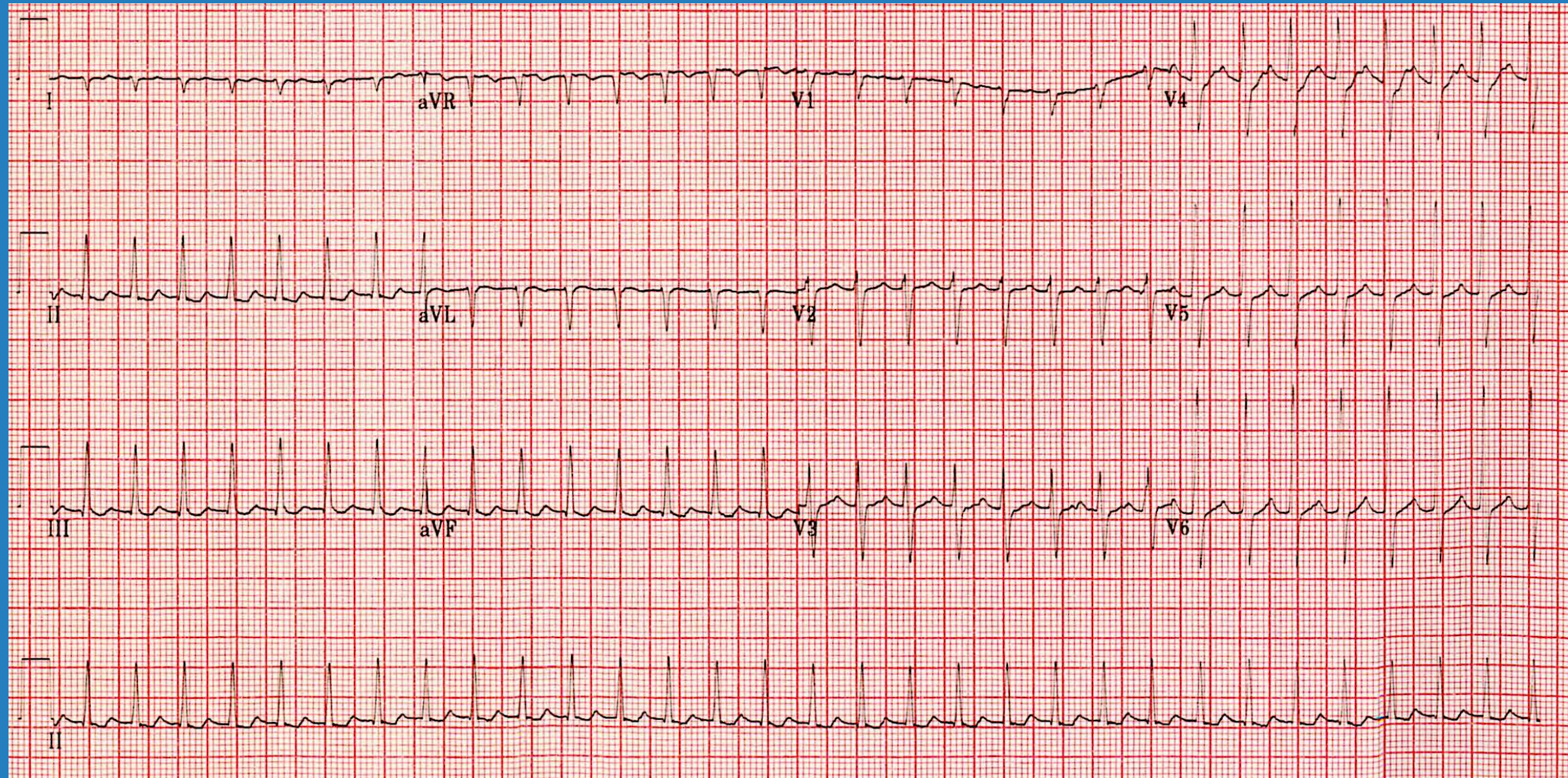
Mystery ECG (Pre-excited AF)



Pre-excited AF



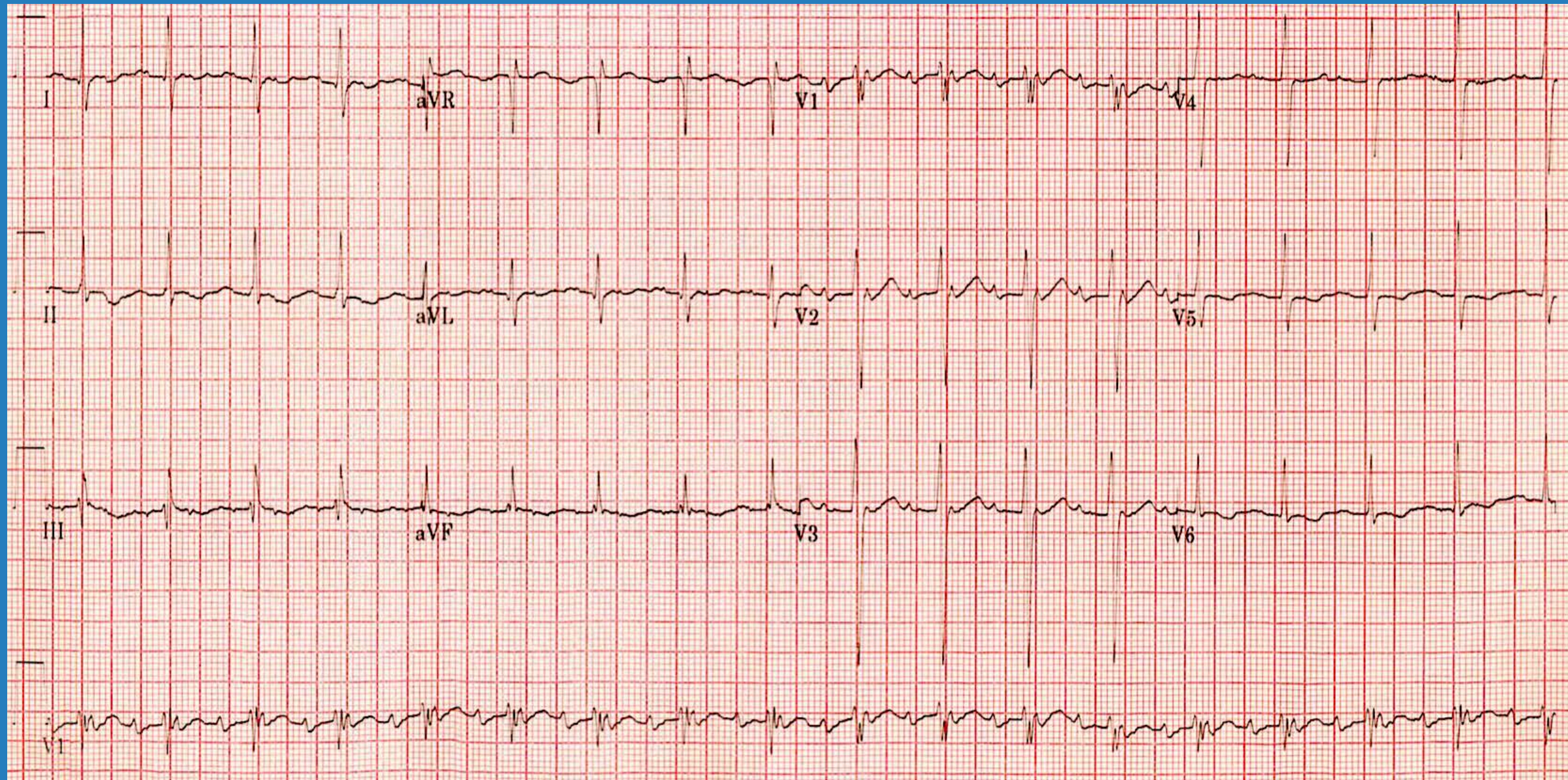
SVT ECG



Atrioventricular Nodal Reentrant Tachycardia (AVNRT)

- Paroxysmal SVT due to a reentry circuit within atrioventricular (AV) node
- Tachycardia can be triggered by increases in adrenergic tone
- Vagal maneuvers may be attempted
- Intravenous (IV) adenosine or a calcium channel blocker may
- Elective surgery is postponed in patients who do not convert to sinus rhythm with initial efforts

Atrial Tachycardia ECG



Atrial tachycardia AT

- Atrial rhythm with a HR >100 bpm that originates outside sinus node
- Chronic structural heart disease
- Hypoxia, or hypokalaemia
- Hemodynamically stable patients whose surgery cannot be delayed are treated with a BB or nondihydropyridine calcium channel blocker
- Elective surgery is postponed if control is not achieved or hemodynamic instability develops.

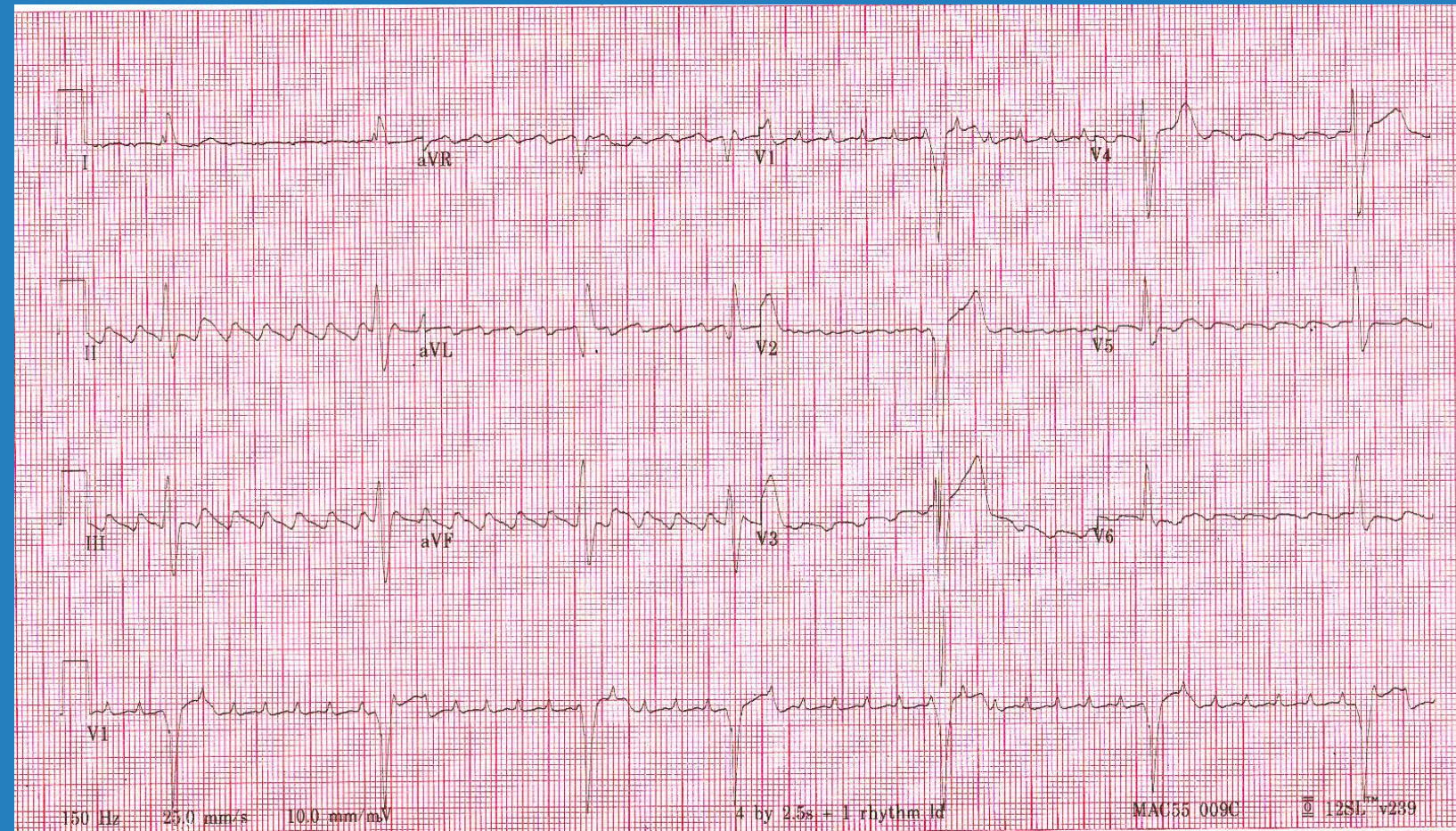
AF

- Atrial fibrillation manifests as irregularly irregular beats and absent P waves



Atrial Flutter

- Flutter waves, saw tooth deflections
- 2:1 AV conduction is common with ventricular rate of 150 bpm



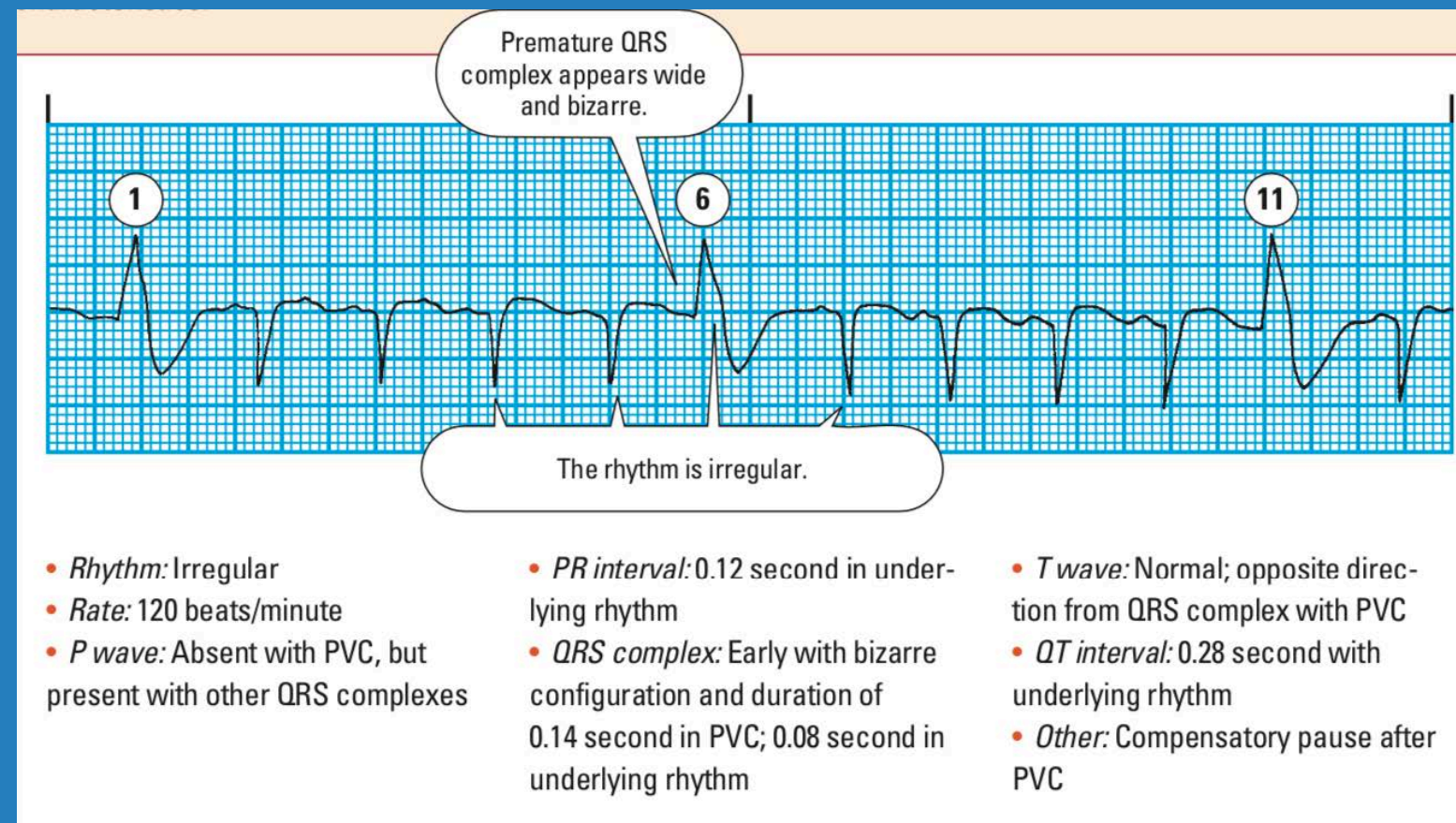
Treating AF and Flutter

- **Assess need for Anticoagulation**
- **Rate control**
- **DCCV**

New onset of atrial fibrillation or flutter warrants postponement of elective surgery for evaluation and management by the cardiology service.

Ventricular Premature Beats (VPBs)

- Common in the general population
- Usually clinically insignificant
- Esp in healthy patients without cardiac disease



Non-sustained VT

- **3 or more consecutive ventricular beats occur at a rate >120 bpm lasting <30 seconds**
- **Surgery is not typically postponed in such patients.**
- **Approach may vary**
 - **New onset or frequent NSVT, a period of continuous ECG monitoring + cardiac review**
 - **Triplets in a patient with reduced EF and Hx of ICD may not need assessment**

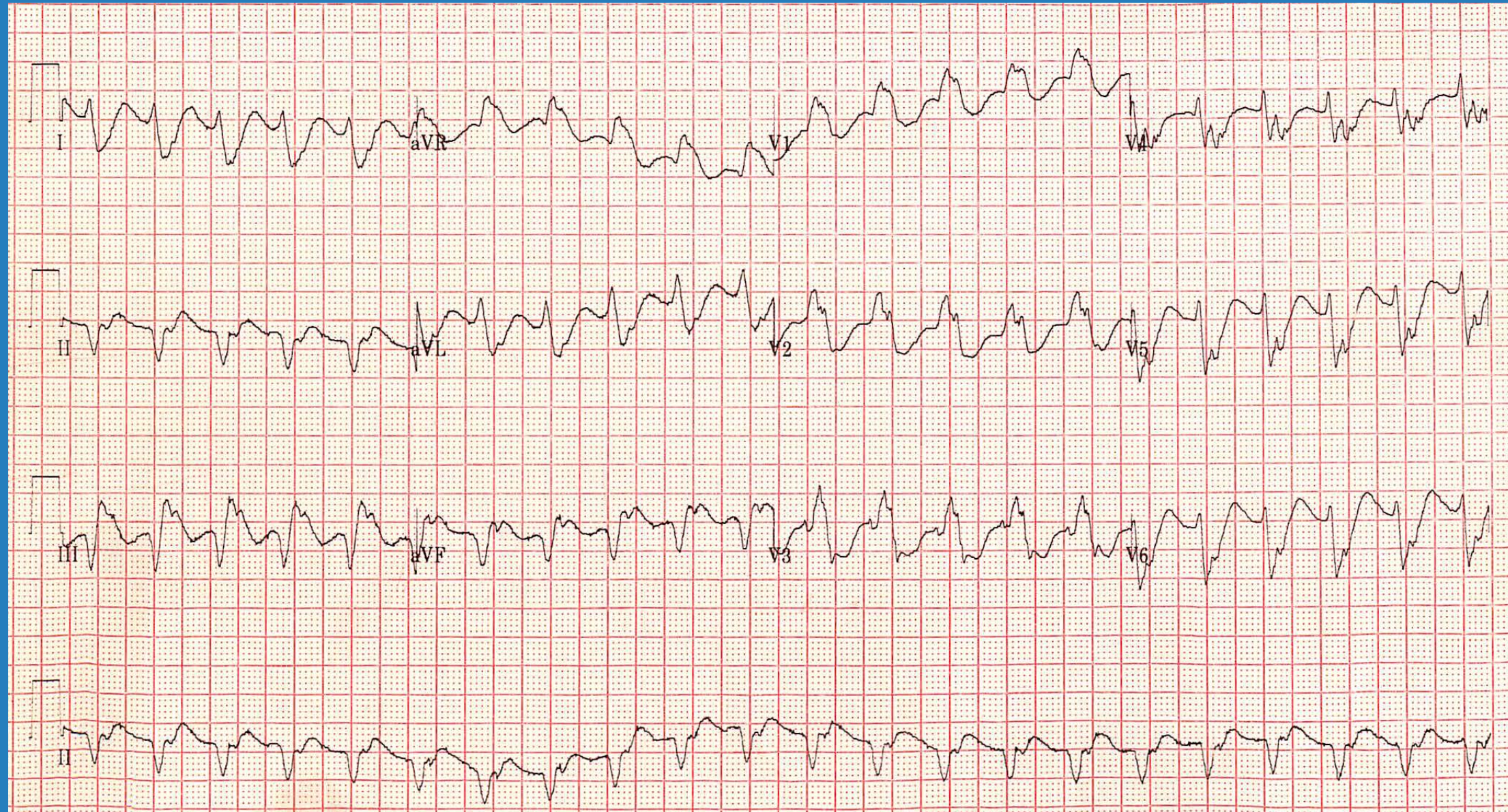
NSVT



Wide complex tachyarrhythmias

- QRS complexes are wide (ie, ≥ 120 ms)
- HR is > 100 bpm
- Usually VT
- WCT on preoperative ECG should have surgery postponed
- Needs cardiology review

VT ECG



Sinus bradycardia

- Normal ECG but HR <50 bpm
- May be normal
- Increased vagal tone
- Negative chronotropic drugs (eg, beta blockers, calcium channel blockers)
- Or sinus node dysfunction
- Asymptomatic and HR ≥ 45 bpm with stable haemodynamics may proceed with procedure

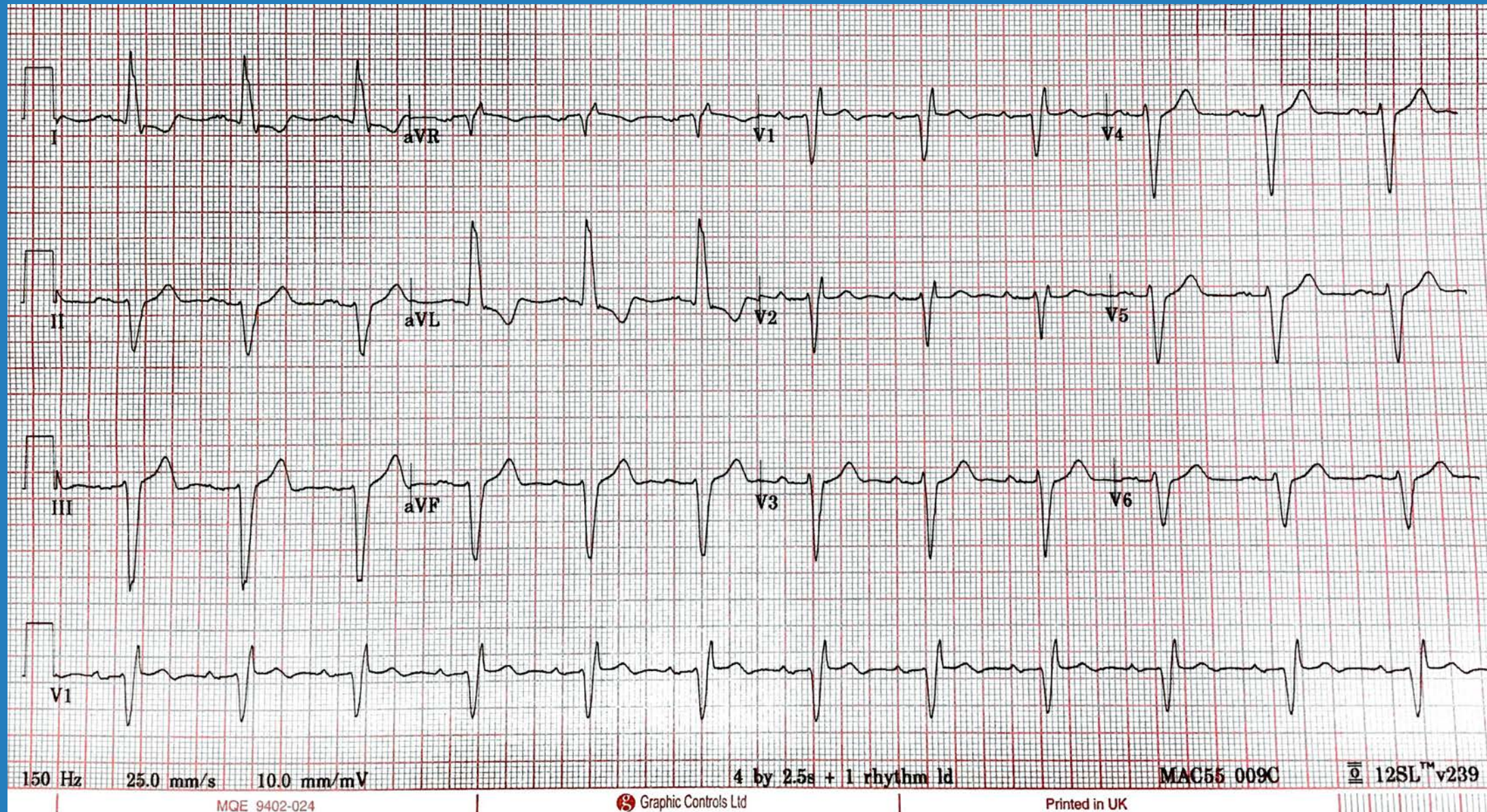


First Degree AV Block

- Prolonged PR interval >200 milliseconds
- Surgery not delayed



Mystery ECG (Trifasicular block)



Second Degree AV Block

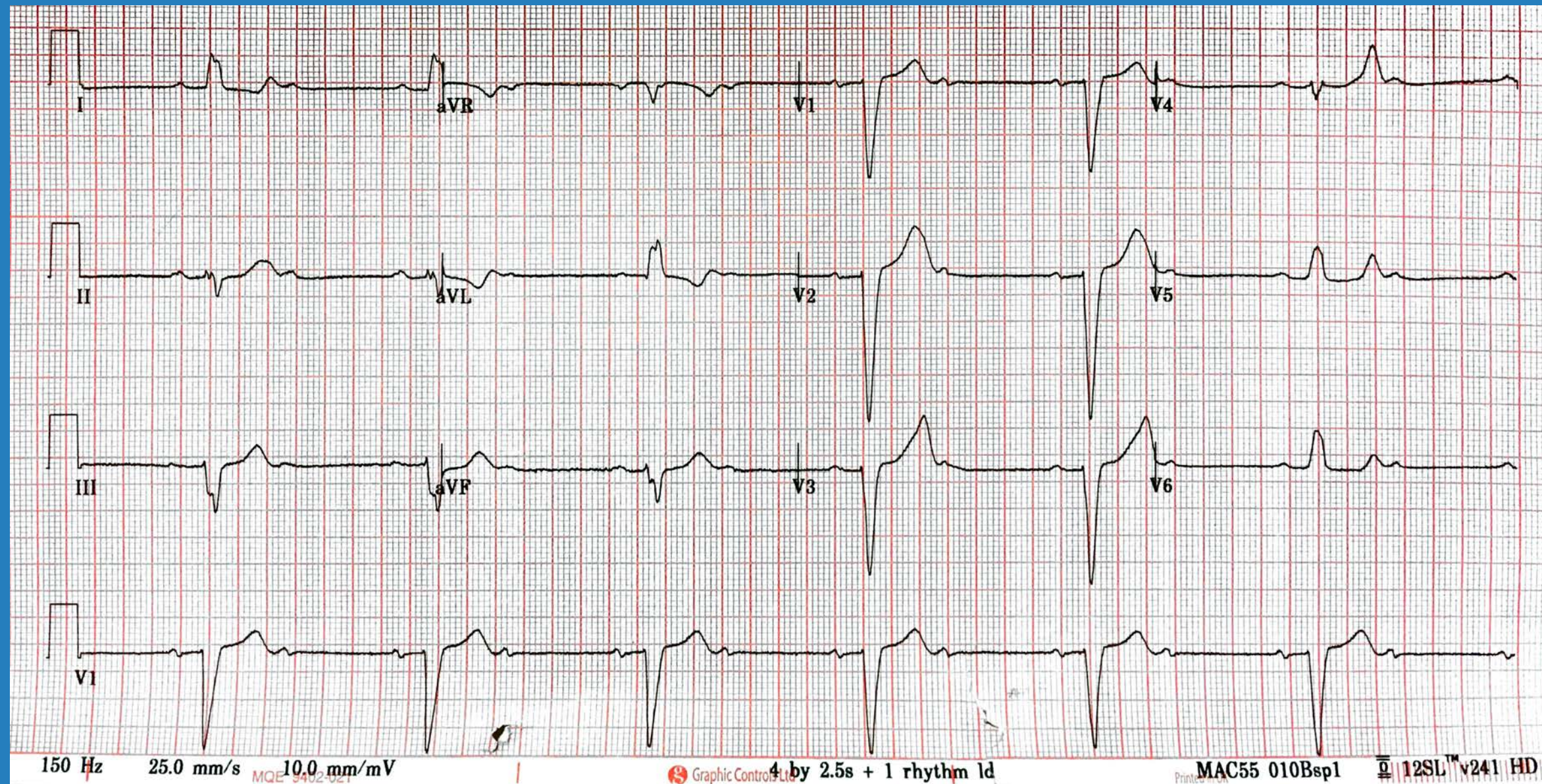
- Block is classified at Mobitz Type I or II
- Mobitz Type I (Wenckebach) - benign
- Mobitz Type II - risk

Mobitz Type I

- With Mobitz Type I (Wenckebach) second degree AV block
- Progressive prolongation of the PR interval until ventricular beat dropped
- Benign condition with low risk of progression to complete heart block
- Surgery not delayed



Mobitz Type II



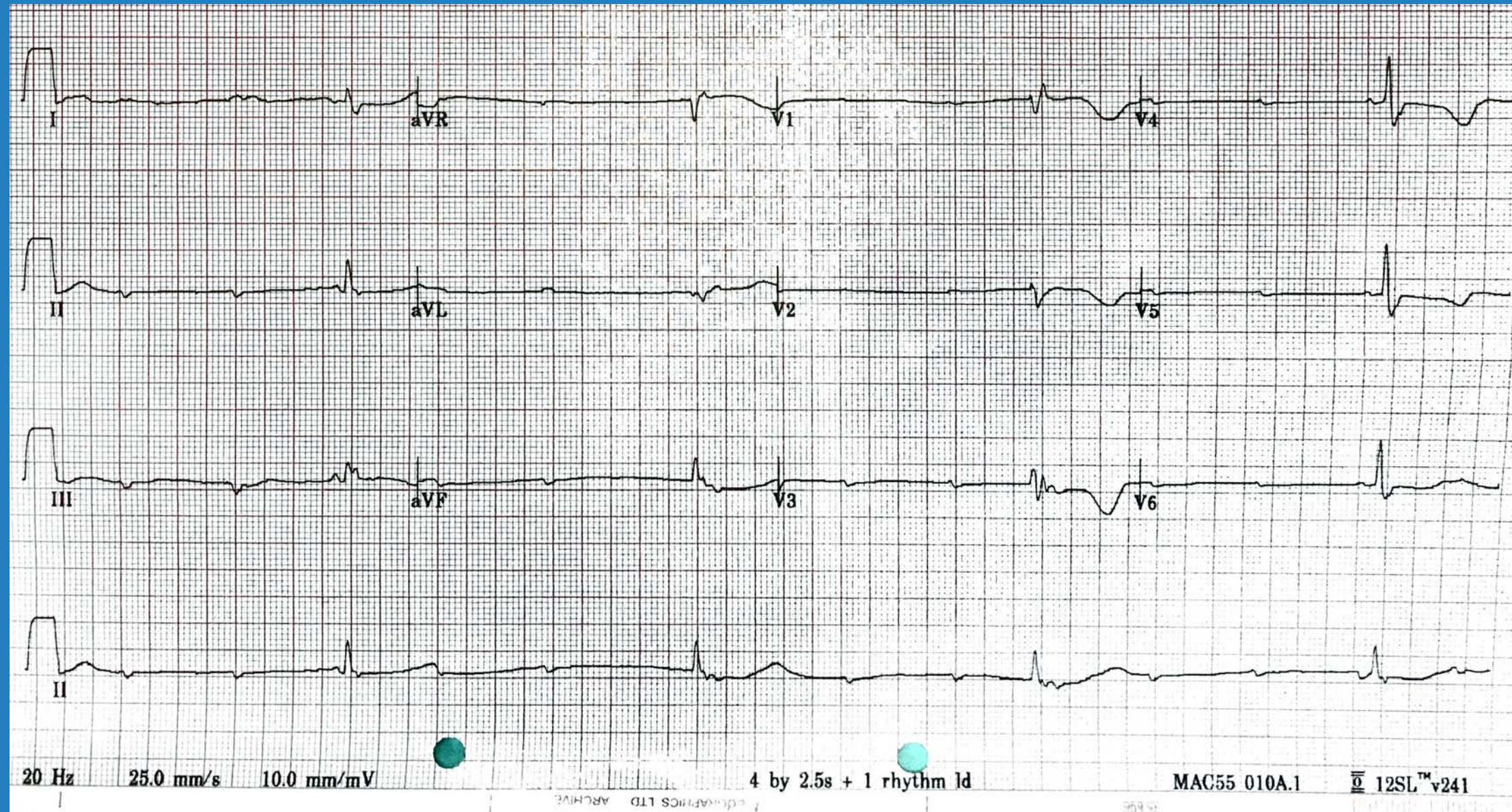
Mobitz Type II

- Likely symptomatic bradycardia
- Risk progression to complete heart block
- Elective surgery is postponed
- If urgent or emergency surgery necessary
 - vagal manoeuvres and anaesthetic and other agents that increase vagal tone should be avoided
 - atropine first line
 - epinephrine, dopamine, dobutamine, isoproterenol
 - temporary pacing may be necessary

Third Degree AV Block/Complete Heart Block

- Immediate cardiology referral
- Elective surgery is postponed
- If urgent or emergency surgery is necessary temporary pacing wire inserted

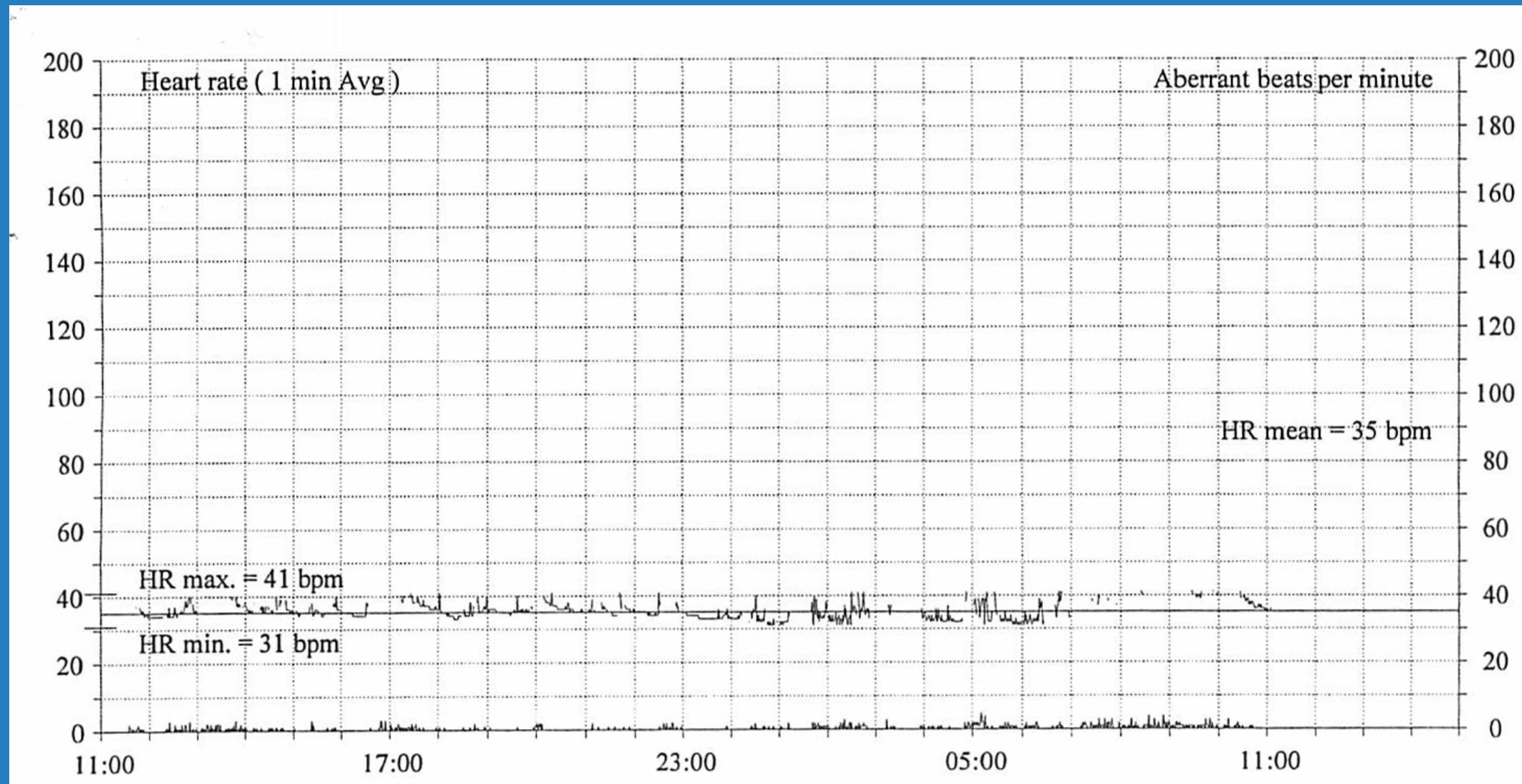
CHB



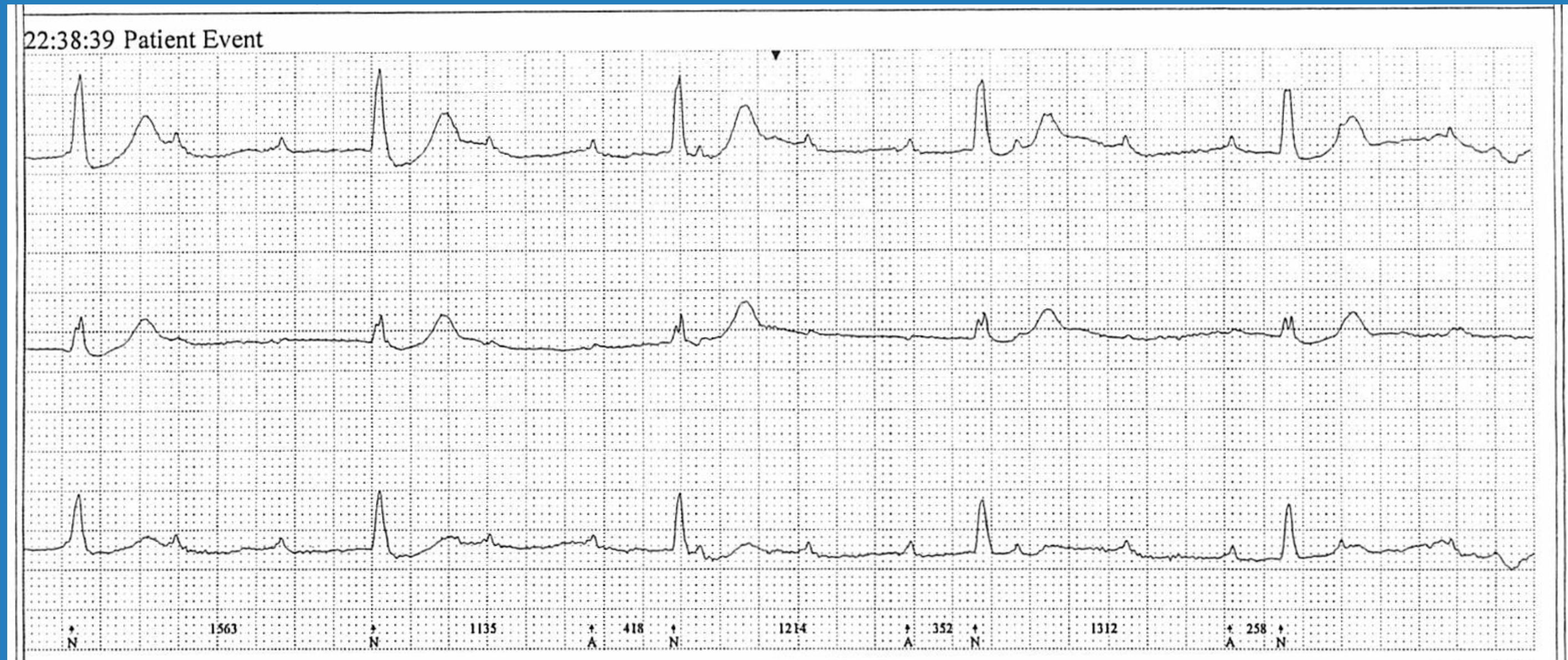
Ventricular Standstill



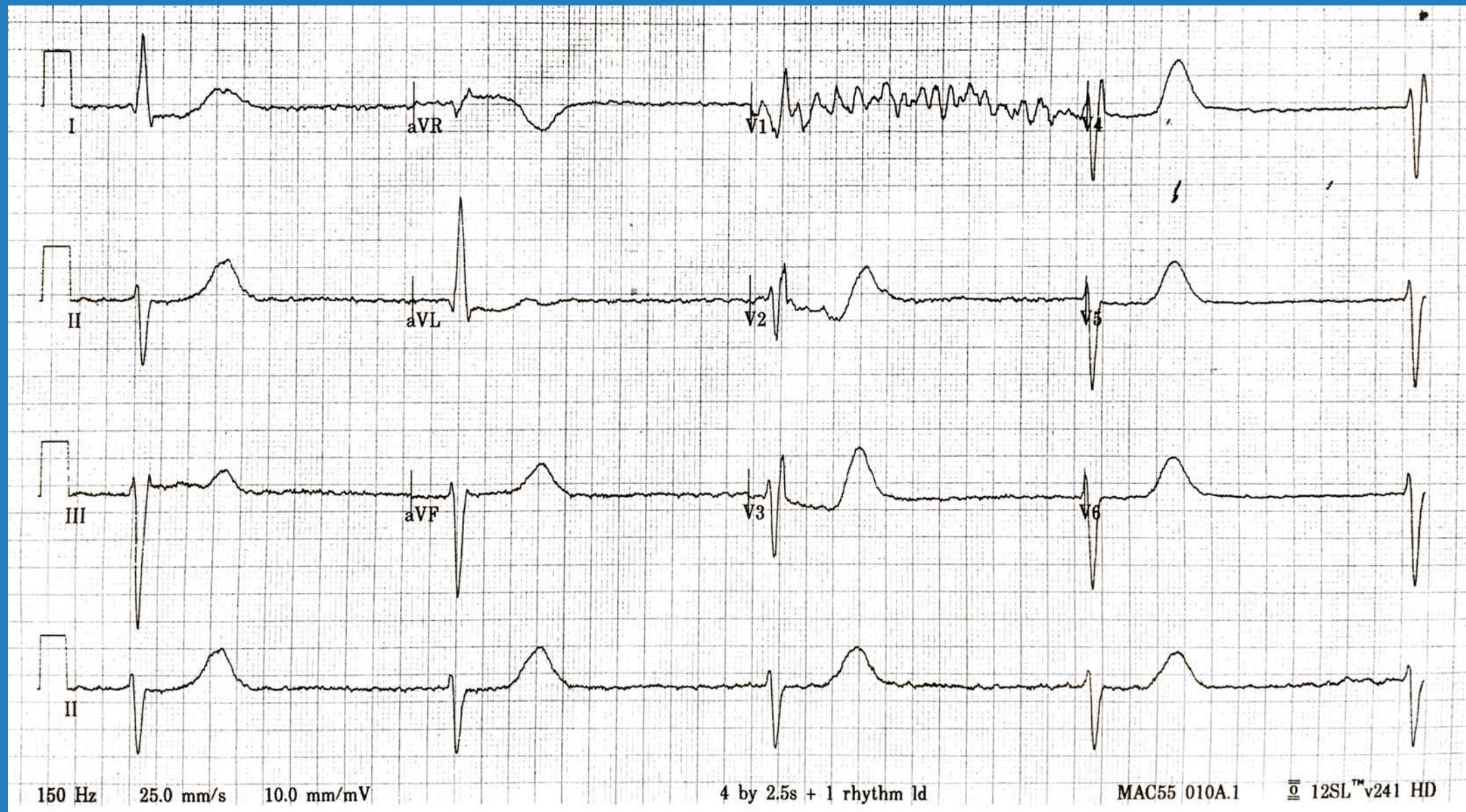
CHB on Holter Histogram



CHB on Holter Monitor



CHB? Yes this is AF with CHB



Summary

Warrant cancellation of elective surgery:

- 1. New bundle branch block (BBB)**
- 2. Acute ST-segment elevation in acute ST-elevation myocardial infarction (STEMI) or acute pericarditis**
- 3. Acute ST-segment depression in multiple leads often indicating myocardial ischemia or subendocardial injury**
- 4. Type II second degree atrioventricular (AV) block or third degree AV block**
- 5. Tall peaked T waves**
- 6. Prolongation of the corrected QT (QTc) interval**
- 7. Narrow complex supraventricular tachyarrhythmias (SVTs)**
- 8. Wide complex tachycardia**
- 9. Acute axis deviation**

Caution Without Postponing Surgery?

Left ventricular hypertrophy

- Hypertension, aortic stenosis, HCM
- Plan to minimise hypovolemia, hypotension, and tachycardia

Sinus bradycardia at a heart rate ≥ 45 bpm, first degree AV block, or Type I second degree AV block

- Avoid exacerbation of bradycardia due to vagal reflexes, a high spinal block,
- Or agents that increase vagal tone (eg, opioids, negative chronotropic agents, vasoconstrictors, anticholinesterase agents coadministered with an inadequate dose of an anticholinergic vagolytic agent).
- Vagolytic (eg, atropine) and chronotropic (eg, ephedrine) agents should be immediately available

The END