
and slow
FAST TIMES
AT RIDGEMONT HIGH
Telemetry Monitoring 101
Jordan Brewster, MD

Disclosures

- No relevant disclosures

Overview

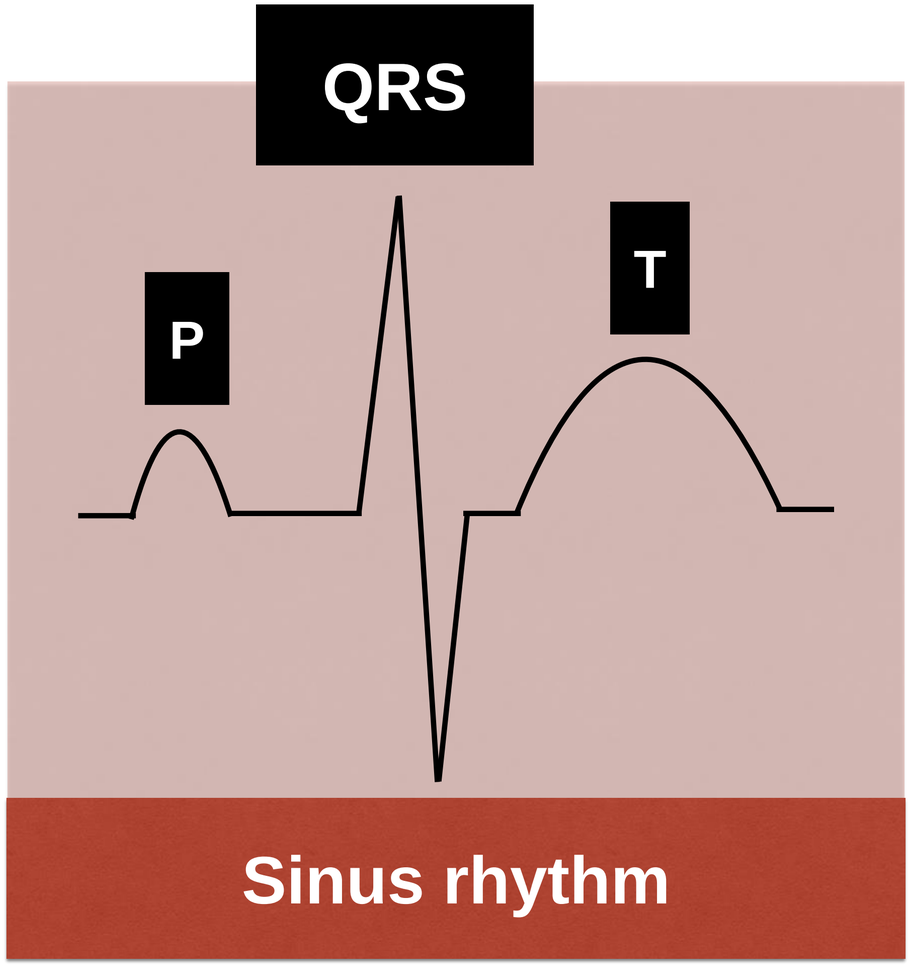
- Review basic approach to telemetry data
- Evaluate common bradyarrhythmias
- Evaluate common tachyarrhythmias
- Review some special cases

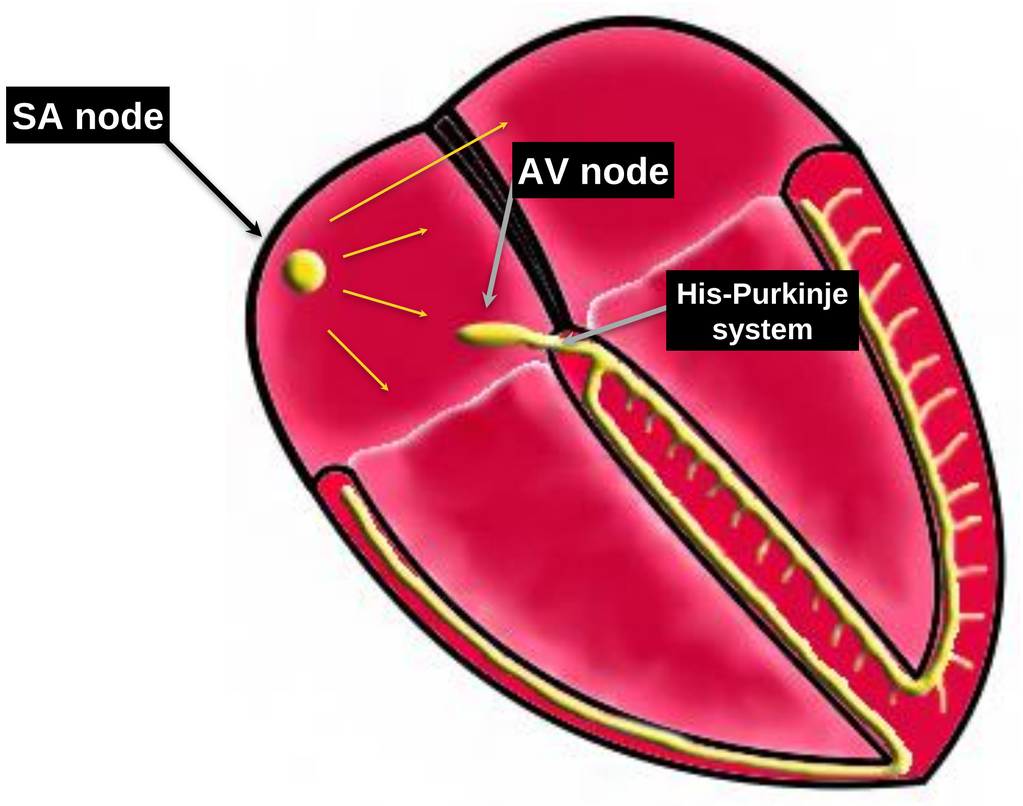
Analysis of the data

- Understand normal sinus rhythm
- HR trend
- Gain settings
- Sweep speed

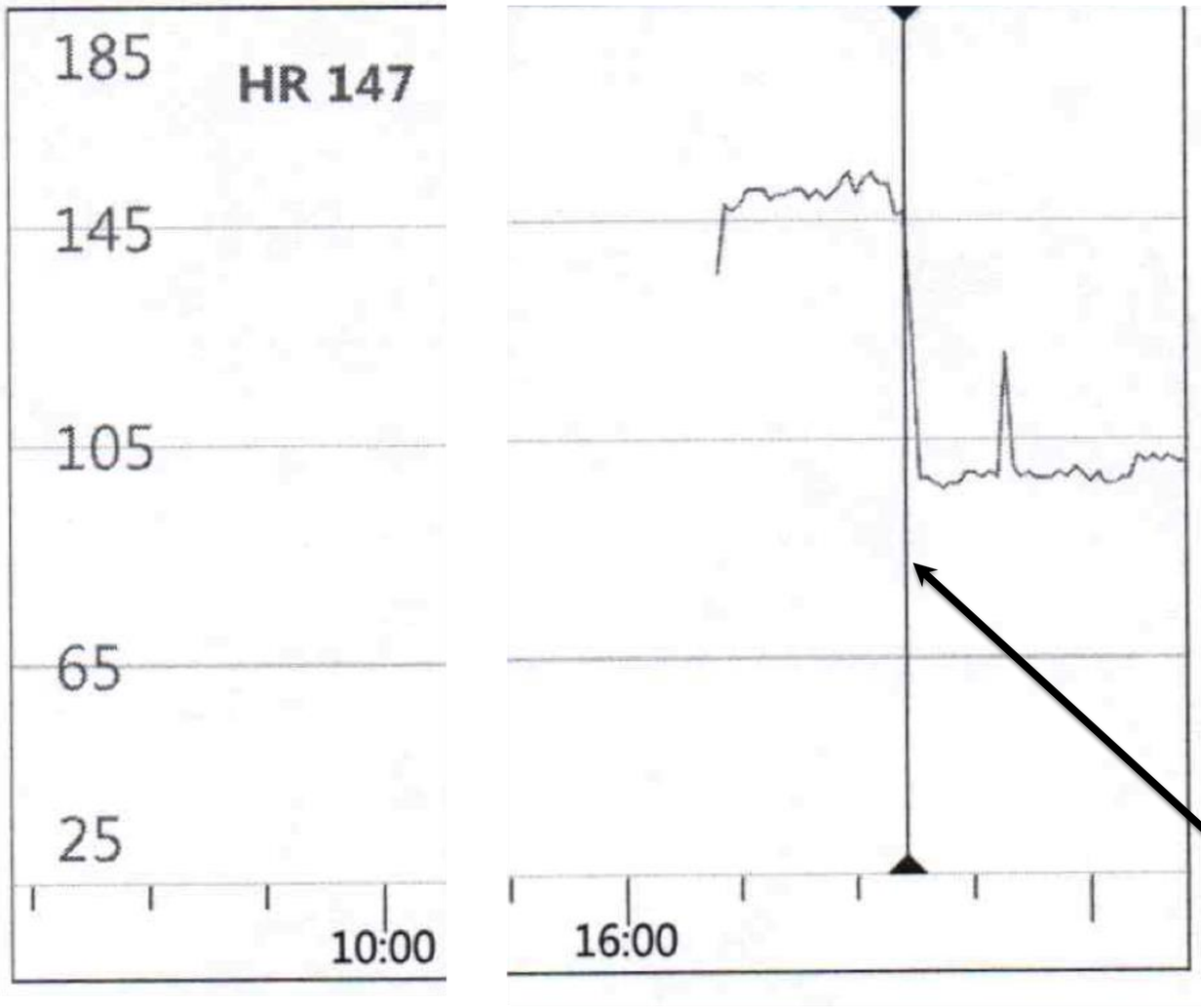
All I need are some tasty waves…

Sinus Rhythm





Utilize the HR trend



The heart rate trend line offers quick assessment for the onset and offset of tachycardia

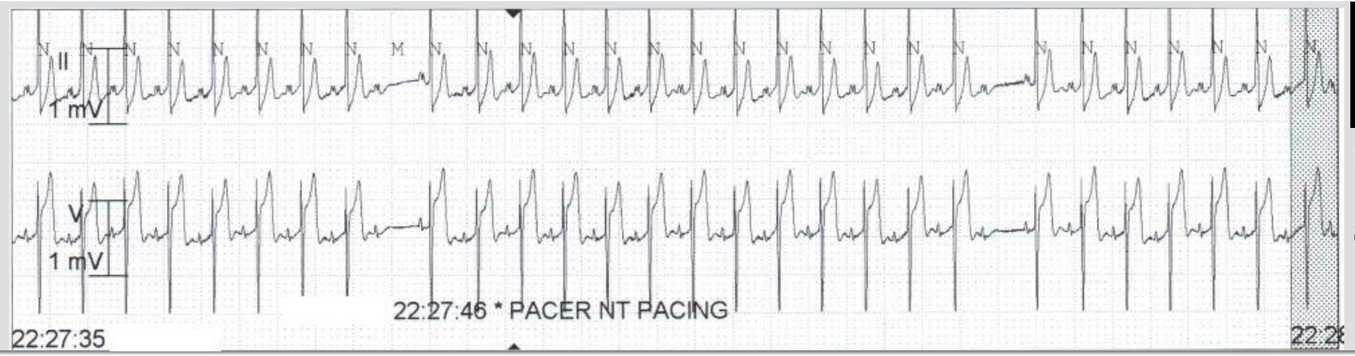
Termination of tachycardia

Optimize gain settings

Increasing gain can highlight subtle findings on the tracing

Useful for finding **P waves**

Adjust sweep speed

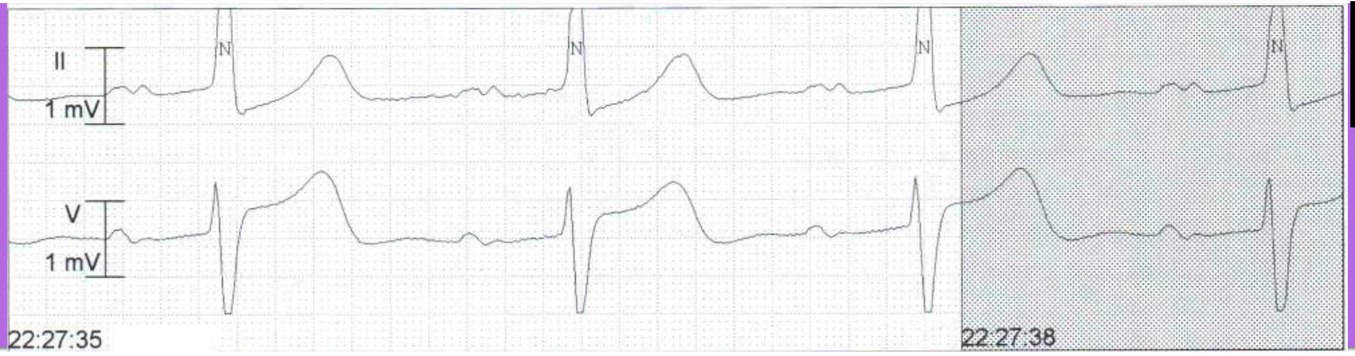


6.25 mm/sec

Useful to assess overall trend and uncommon events

25 mm/sec

Most common speed for general evaluation



50 mm/sec

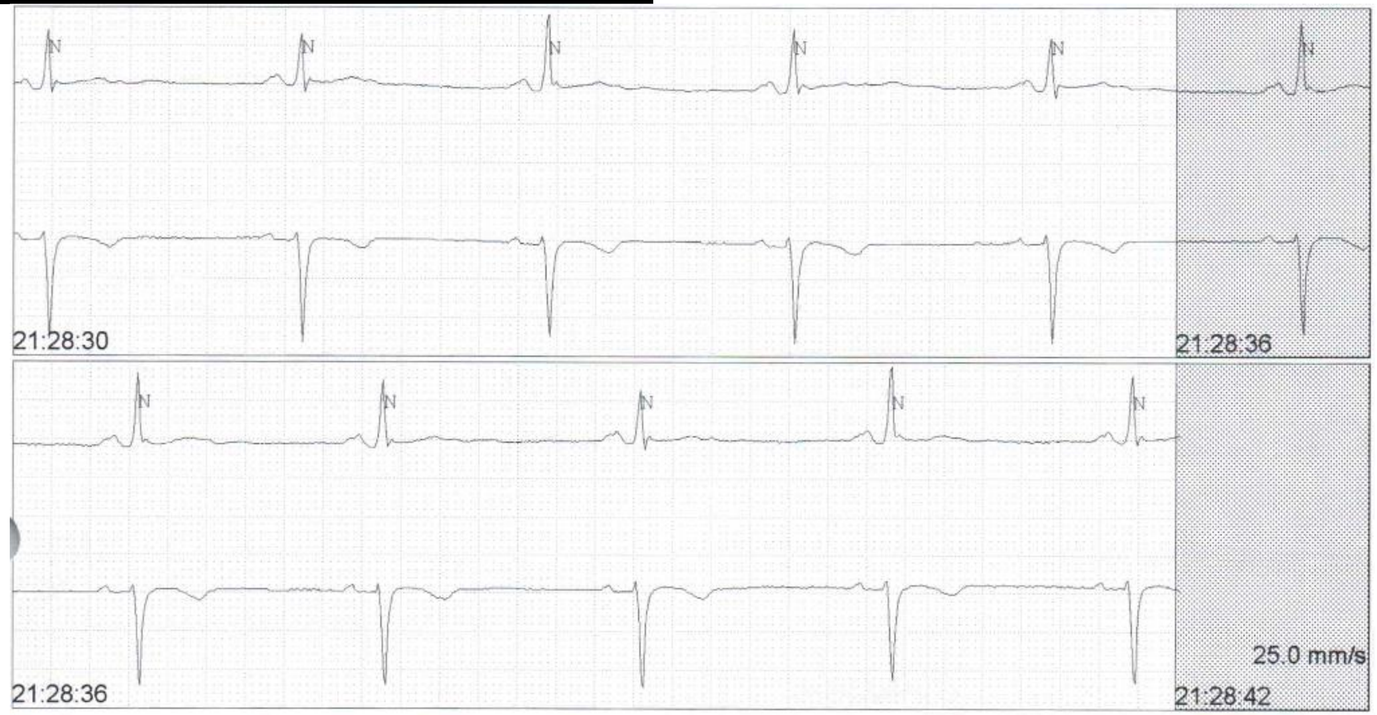
Useful for evaluating high frequency signals and P waves

Bradycardia

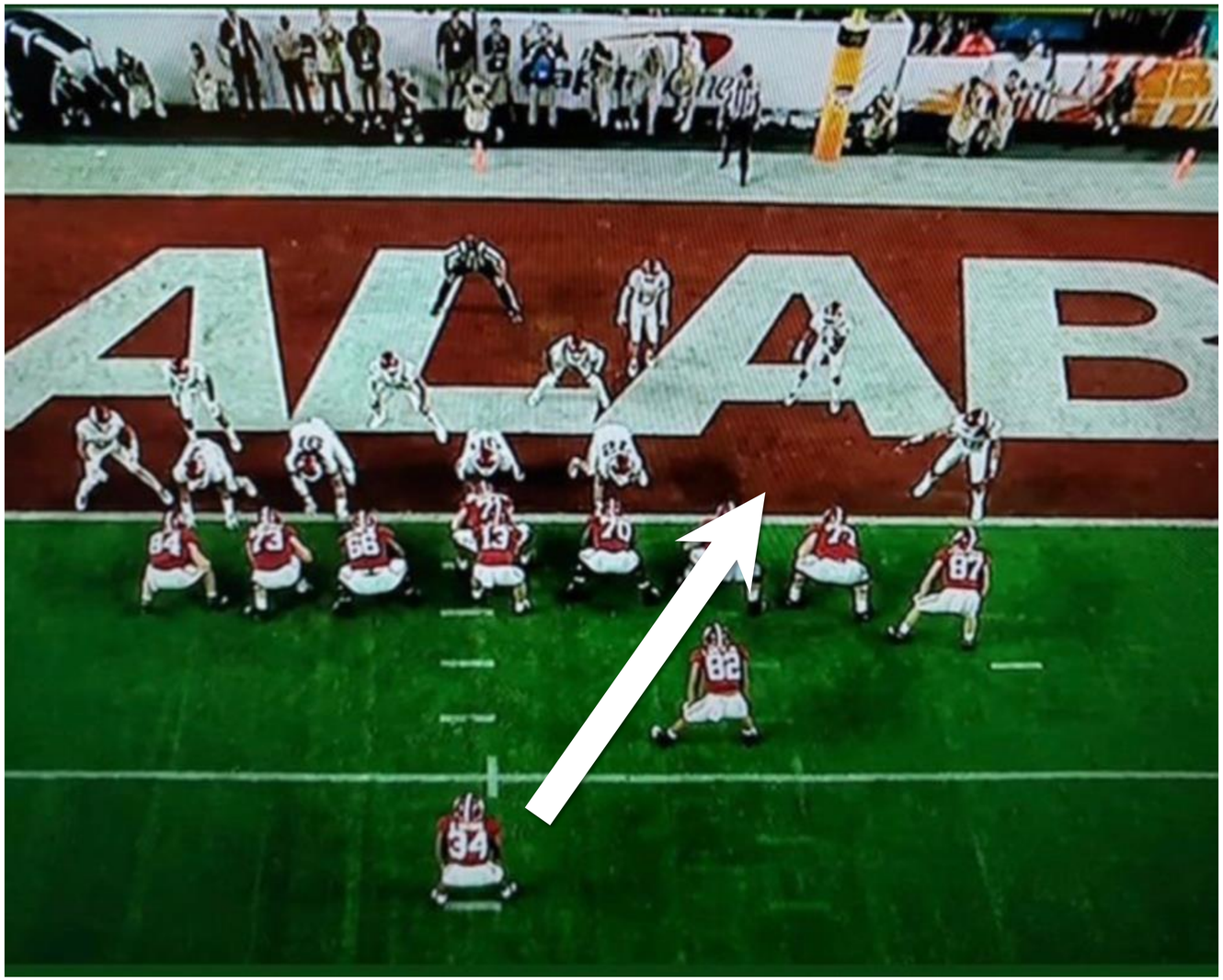
- Two primary mechanisms:
  - Failure of **impulse formation**
    - Sinus bradycardia
  - Failure of **impulse transmission**
    - AV conduction disturbance

Sinus bradycardia

Sinus rhythm, HR < 60 bpm

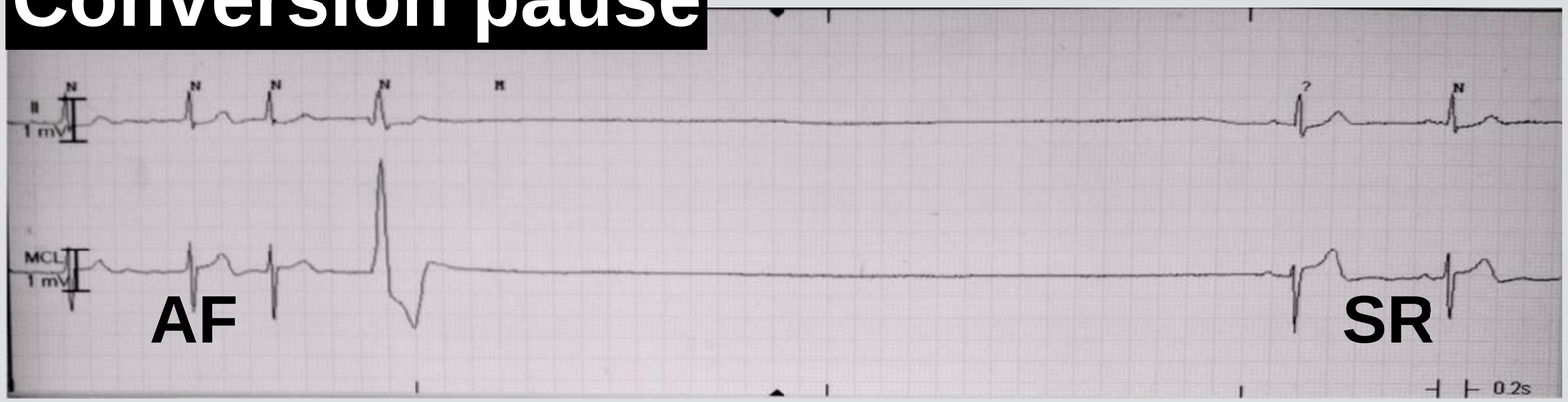


Easy!



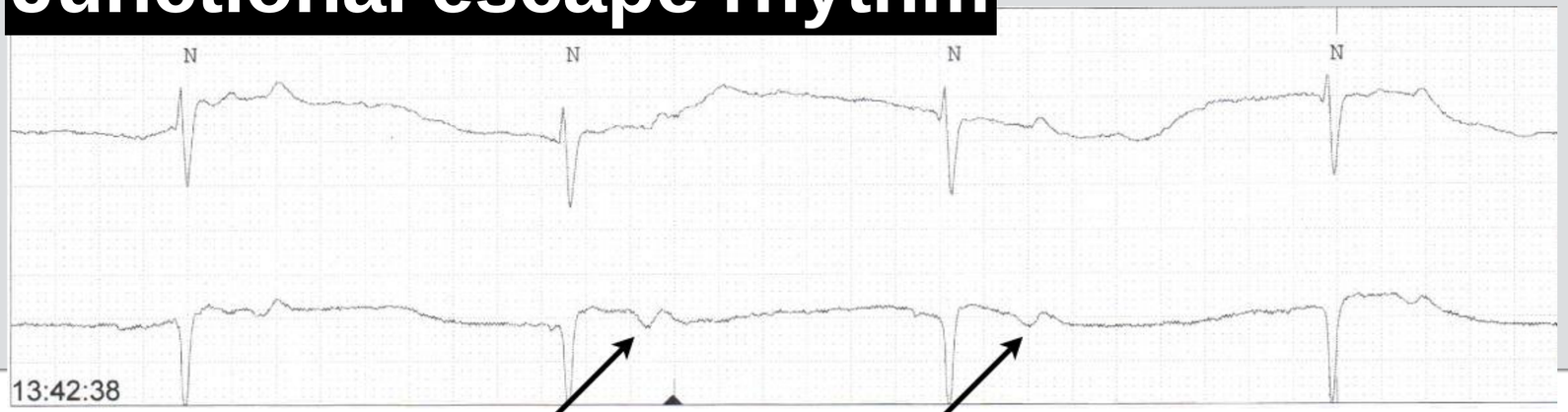
Sinus node dysfunction

Conversion pause



Offset pause; spontaneous termination of AF

Junctional escape rhythm

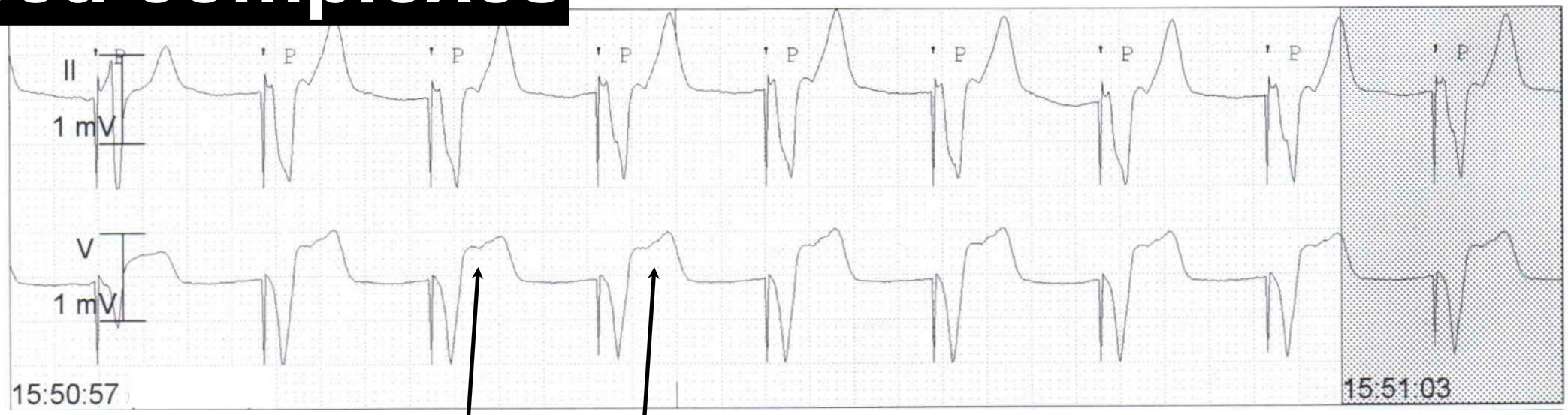


P waves retrogradely conducted

Typical junctional rate: 40-60 bpm

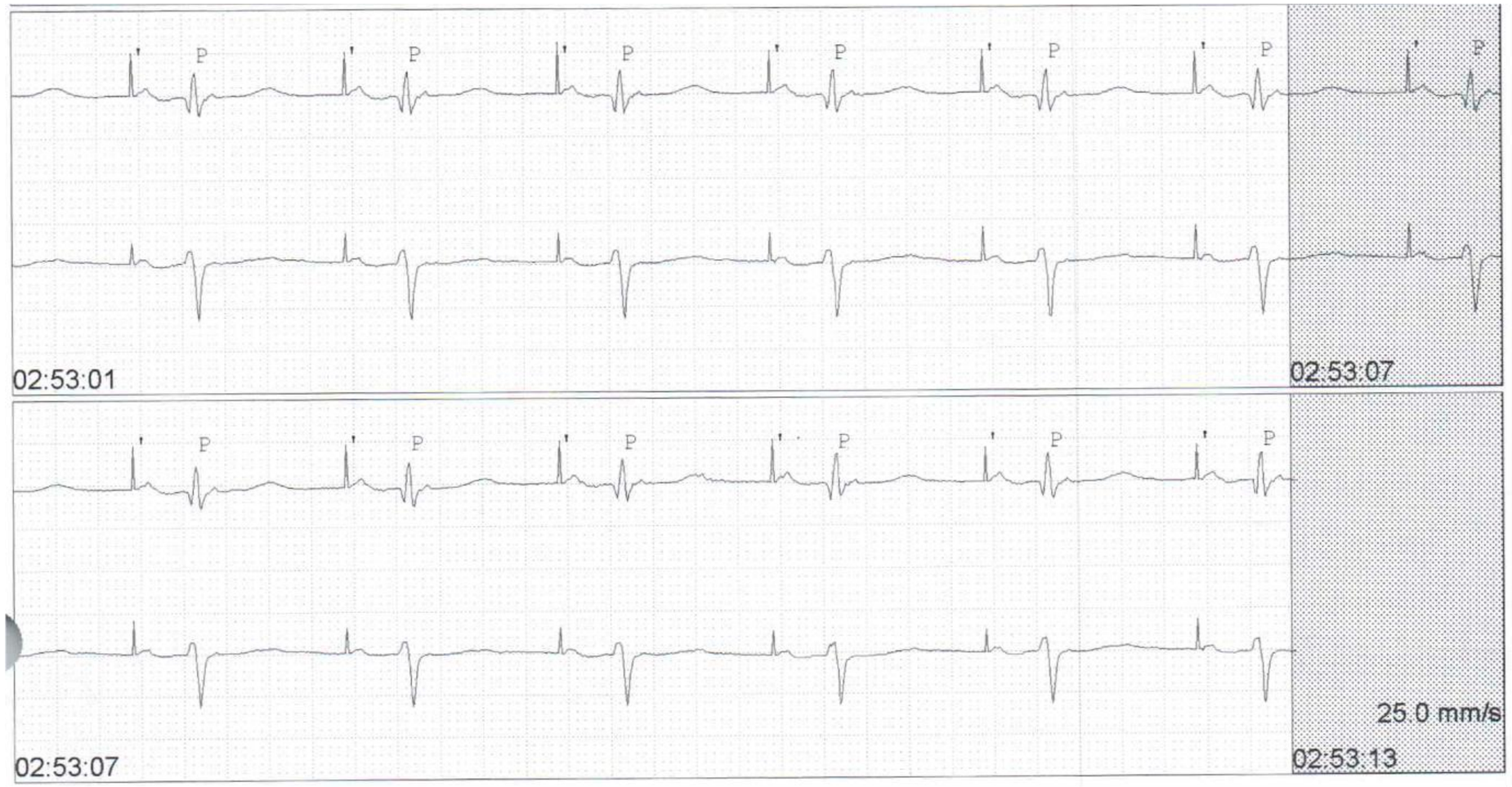
Ventricular paced rhythm

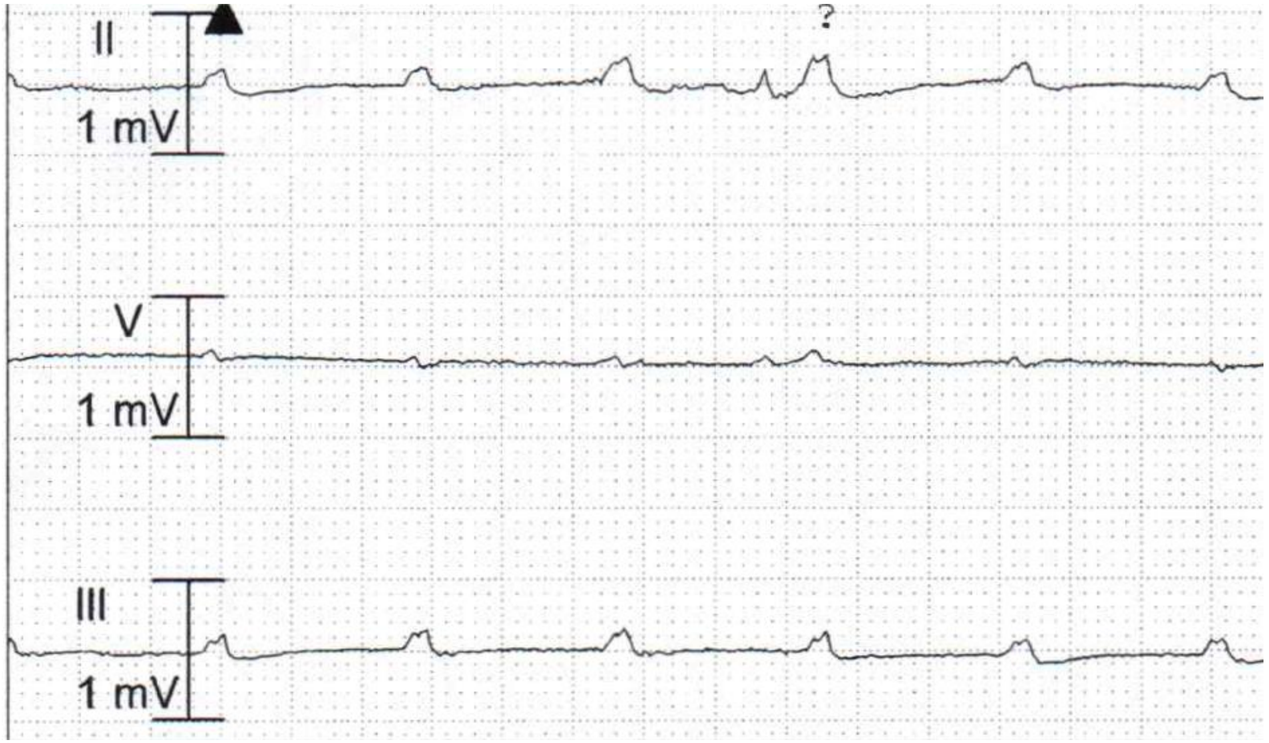
Paced complexes



P waves retrogradely conducted

Atrial pacing for sinus node dysfunction



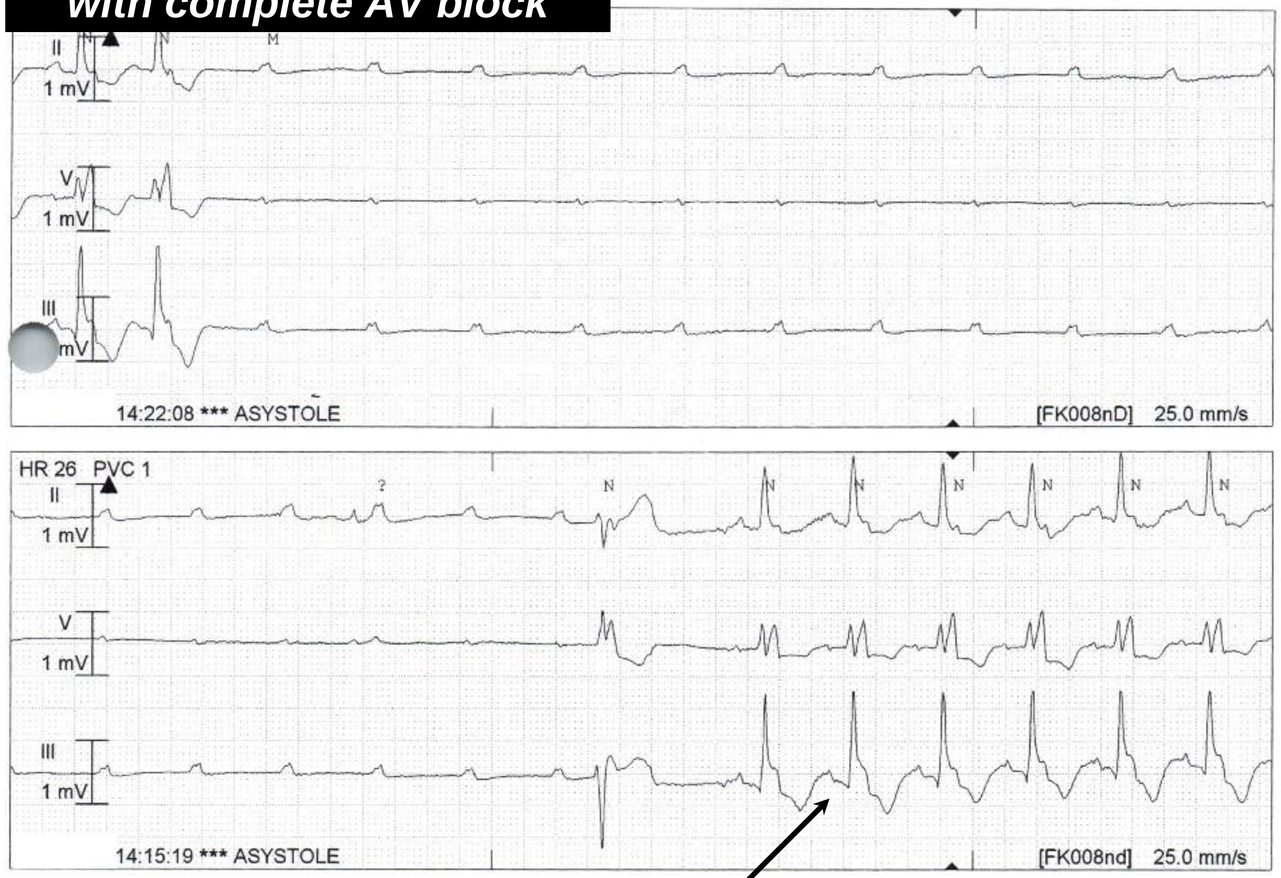


Q1: What is this rhythm?

Select the best answer:

A. Atrial flutter
B. Atrial tachycardia
C. Ventricular tachycardia
D. Junctional tachycardia
E. None of the above

Sinus tachycardia
with complete AV block



Wide QRS confirms His-Purkinje disease

Q1: What is this rhythm?

Select the best answer:

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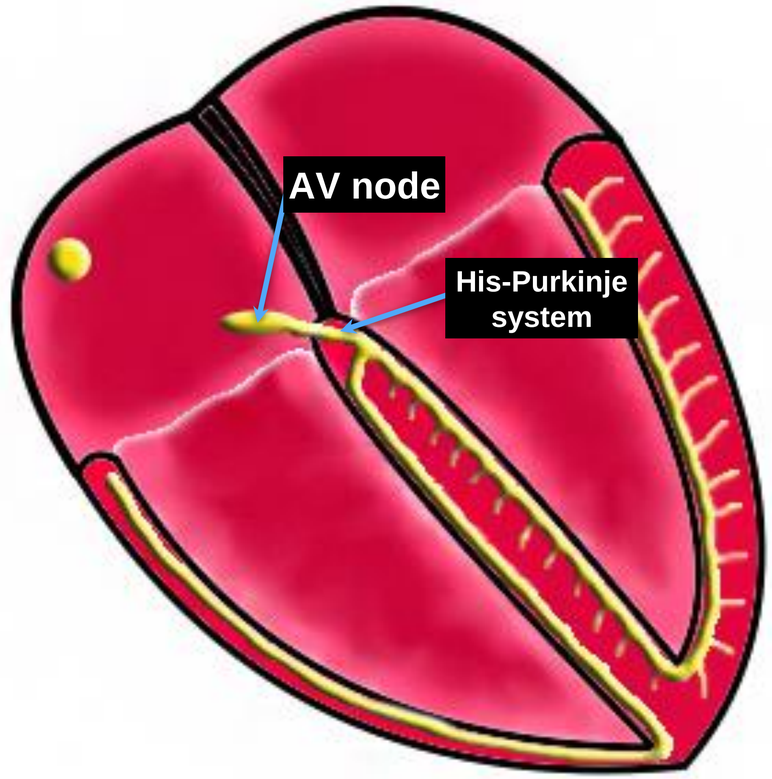
B. Atrial tachycardia
C. Ventricular tachycardia
D. Junctional tachycardia
E. None of the above

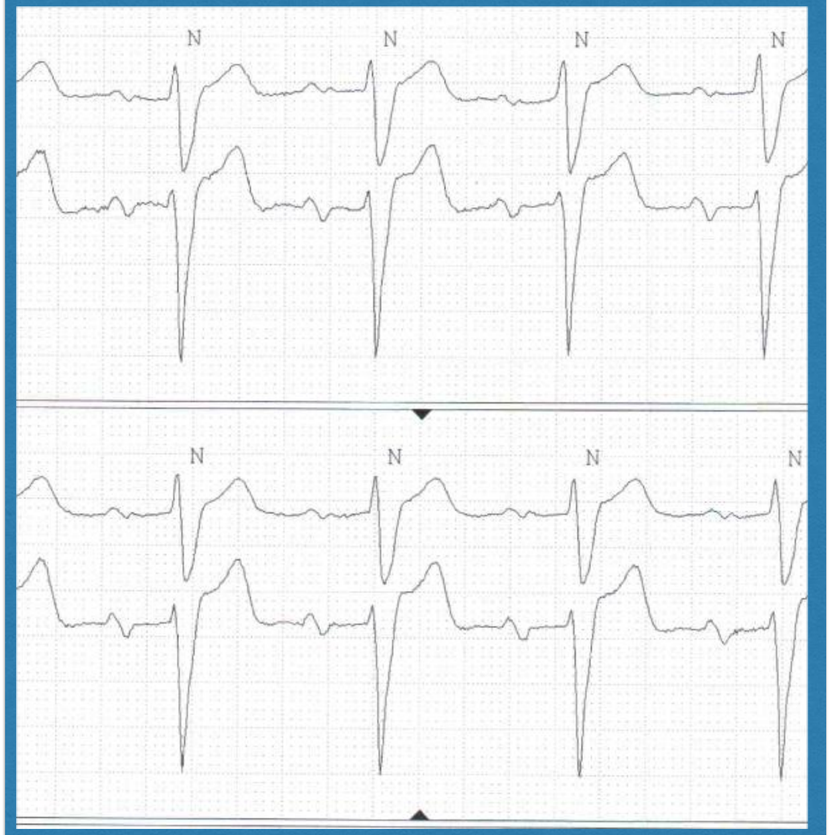
Transmission failure: AV block

- **First degree**
  - Conduction delay, PR > 200 ms
  - Typically delay in **AV node** - wide QRS - concern for infra-nodal conduction disturbance
- **Second degree**
  - *Intermittent* failure of AV conduction
    - Mobitz I (Wenckebach) - variable PR intervals; typically block in **AV node**
    - Mobitz II - constant PR intervals; **usually infra-nodal level block**
    - 2:1 AV block
- **Third degree**
  - *Complete* failure of AV conduction



AV block

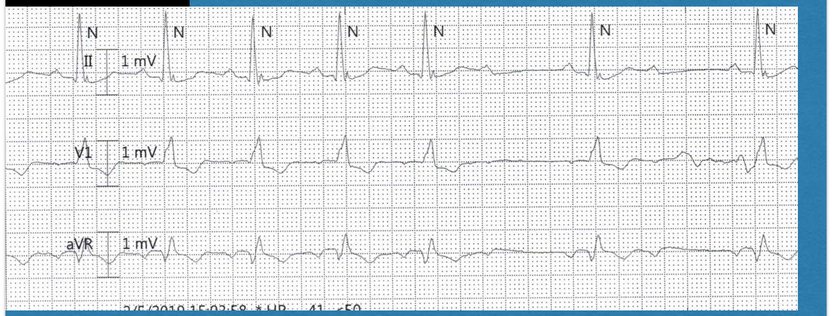
1st degree AV delay



Second degree

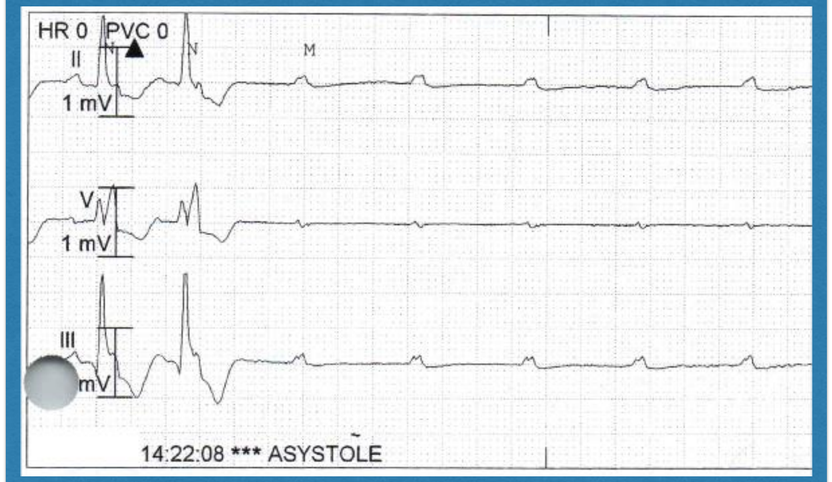
Mobitz I (Wenckebach)

Mobitz II



2:1 AV block

3rd degree (complete)



Tachycardia

- Abnormal impulse formation
  - Focal - automatic, triggered, microreentry
  - Macroreentry
  - Fibrillatory
- Abnormal impulse transmission between atrium and ventricle
- Artificial or pacemaker-mediated tachycardia

Q2: What is this rhythm?

Select the best answer:

A. Atrial flutter
B. Atrial fibrillation
C. Ventricular tachycardia
D. Junctional tachycardia
E. More information needed

Q2: What is this rhythm?

Select the best answer:

A. Atrial flutter

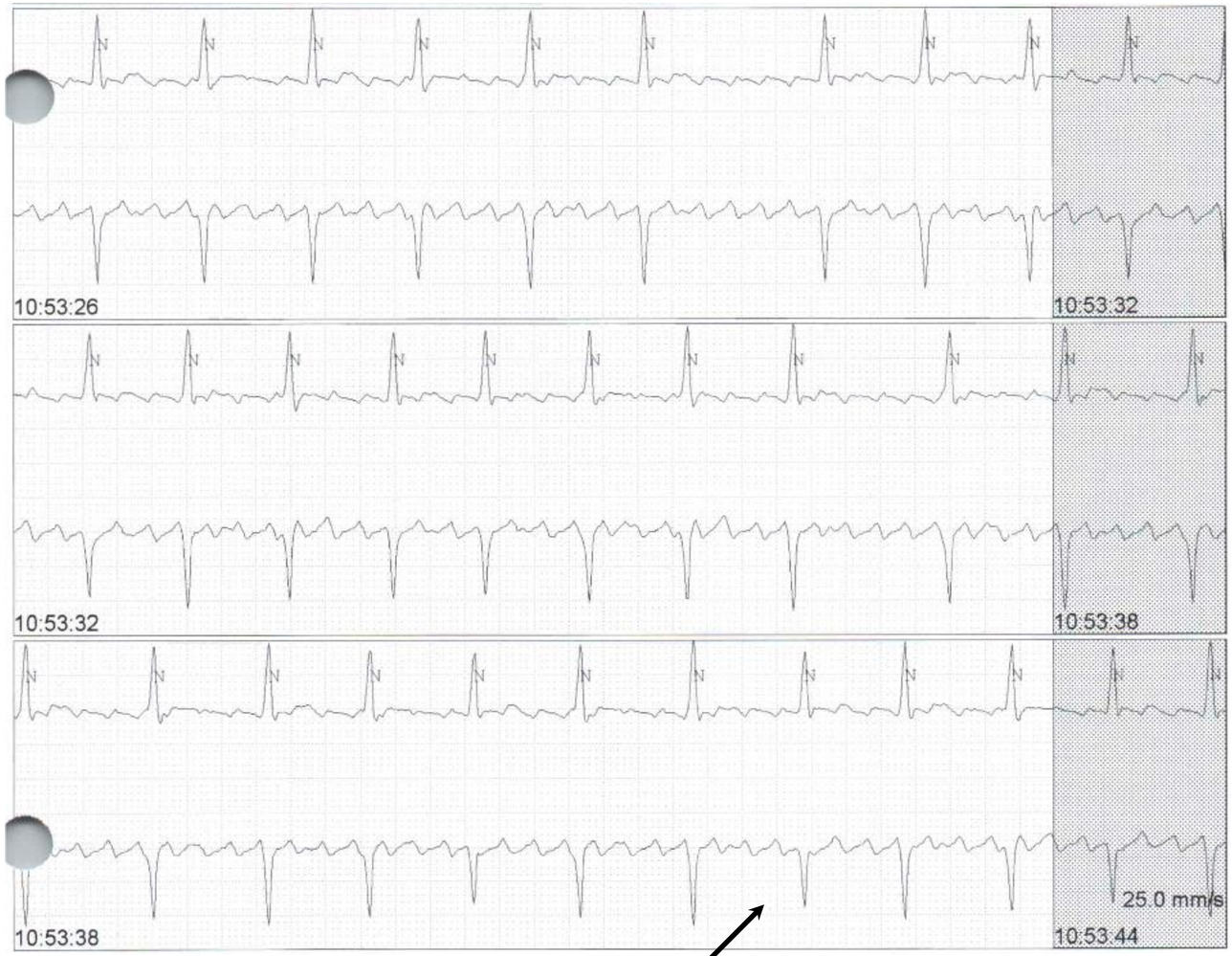
B. Atrial fibrillation

C. Ventricular tachycardia

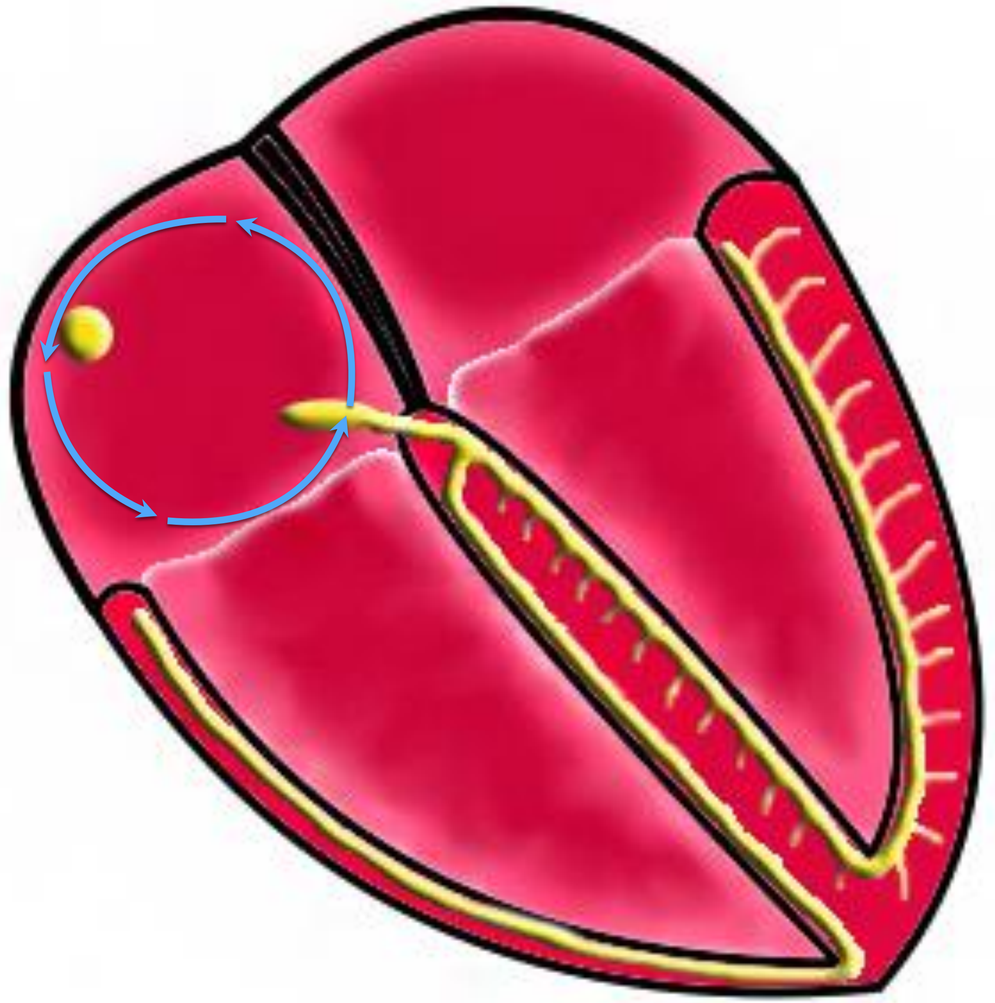
D. Junctional tachycardia

E. More information needed

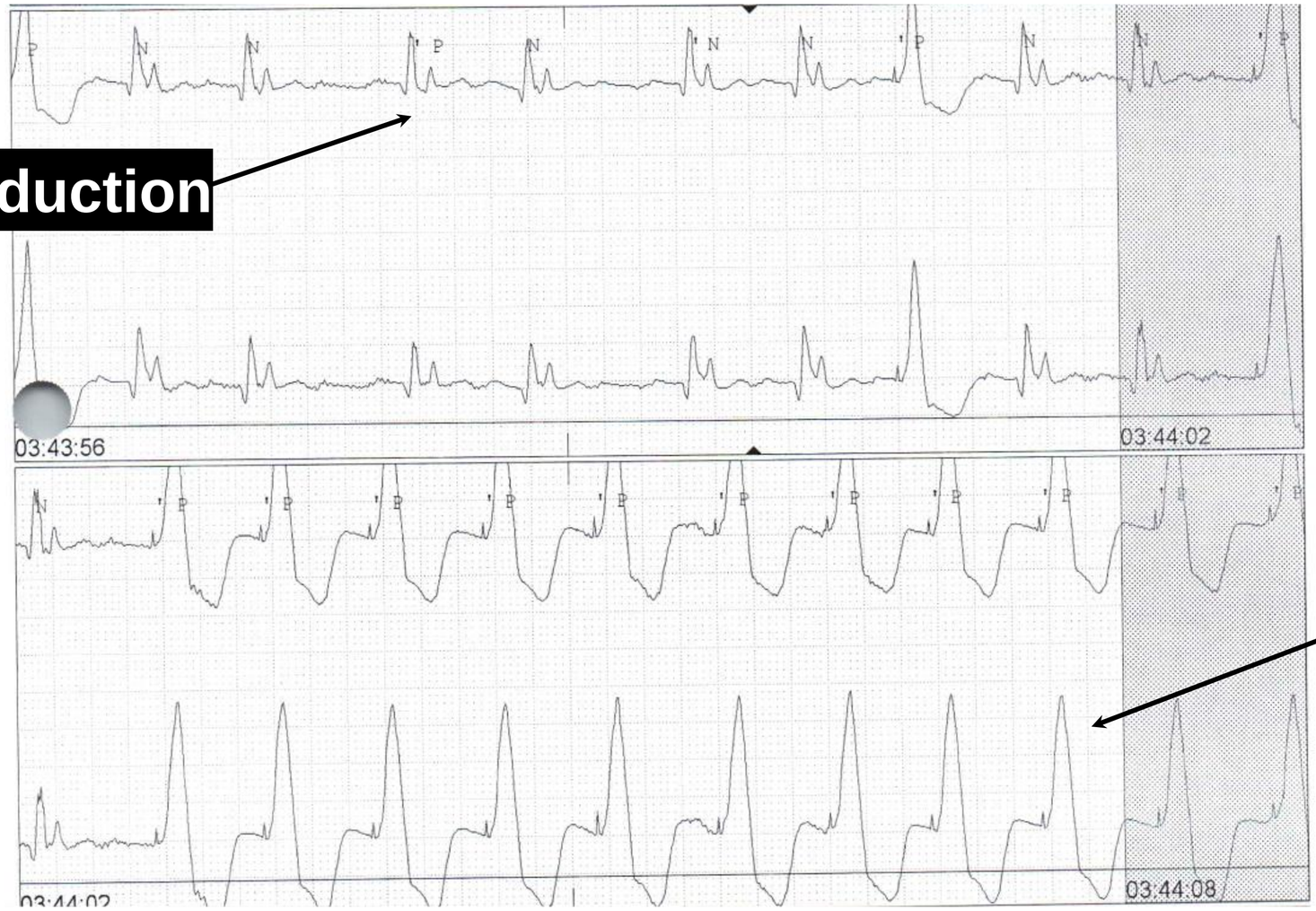
Atrial flutter



Variable AVN conduction



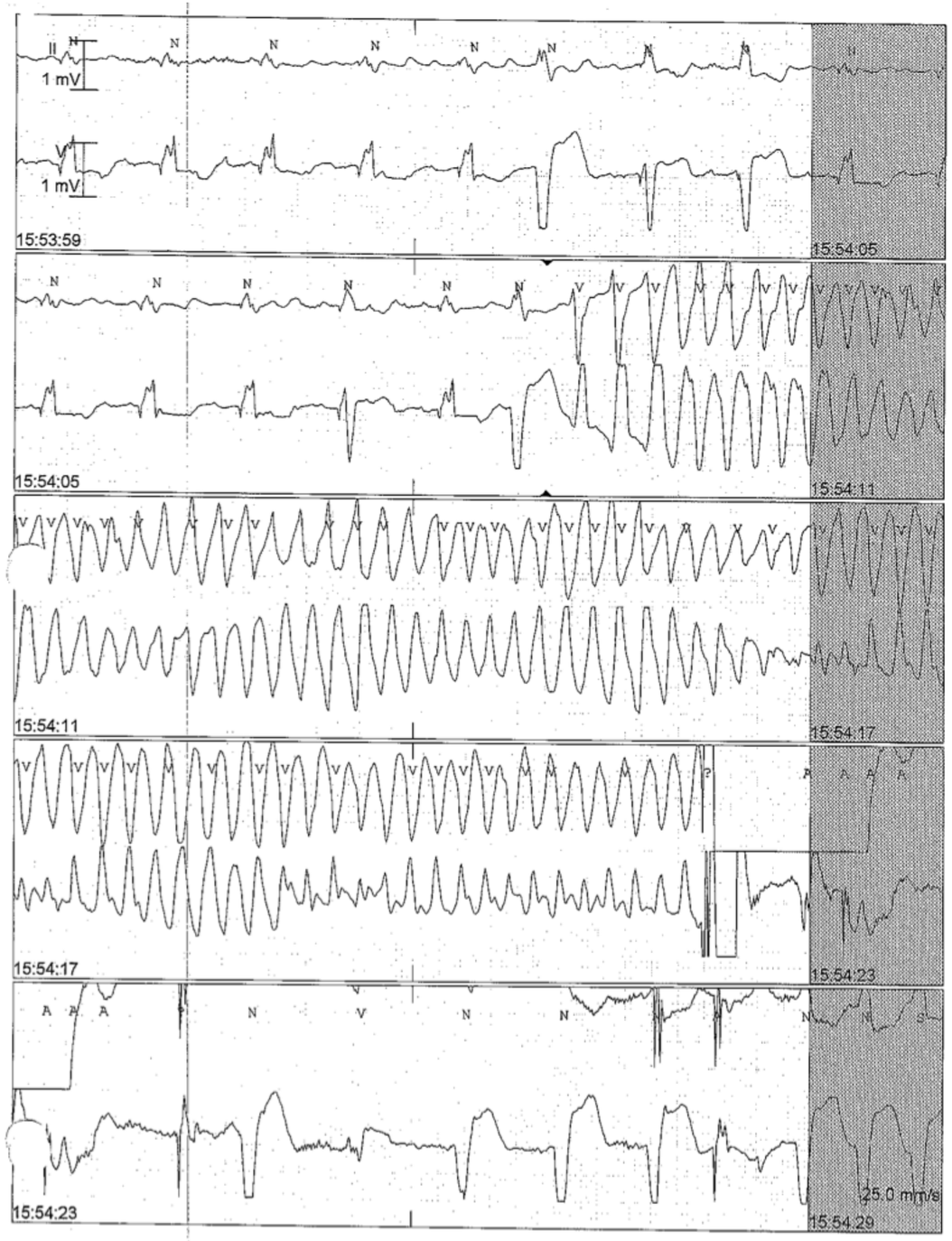
Pacemaker “tracking” atrial flutter



Consequences of asynchronous ventricular pacing

Paced complex falls on T wave after PVC

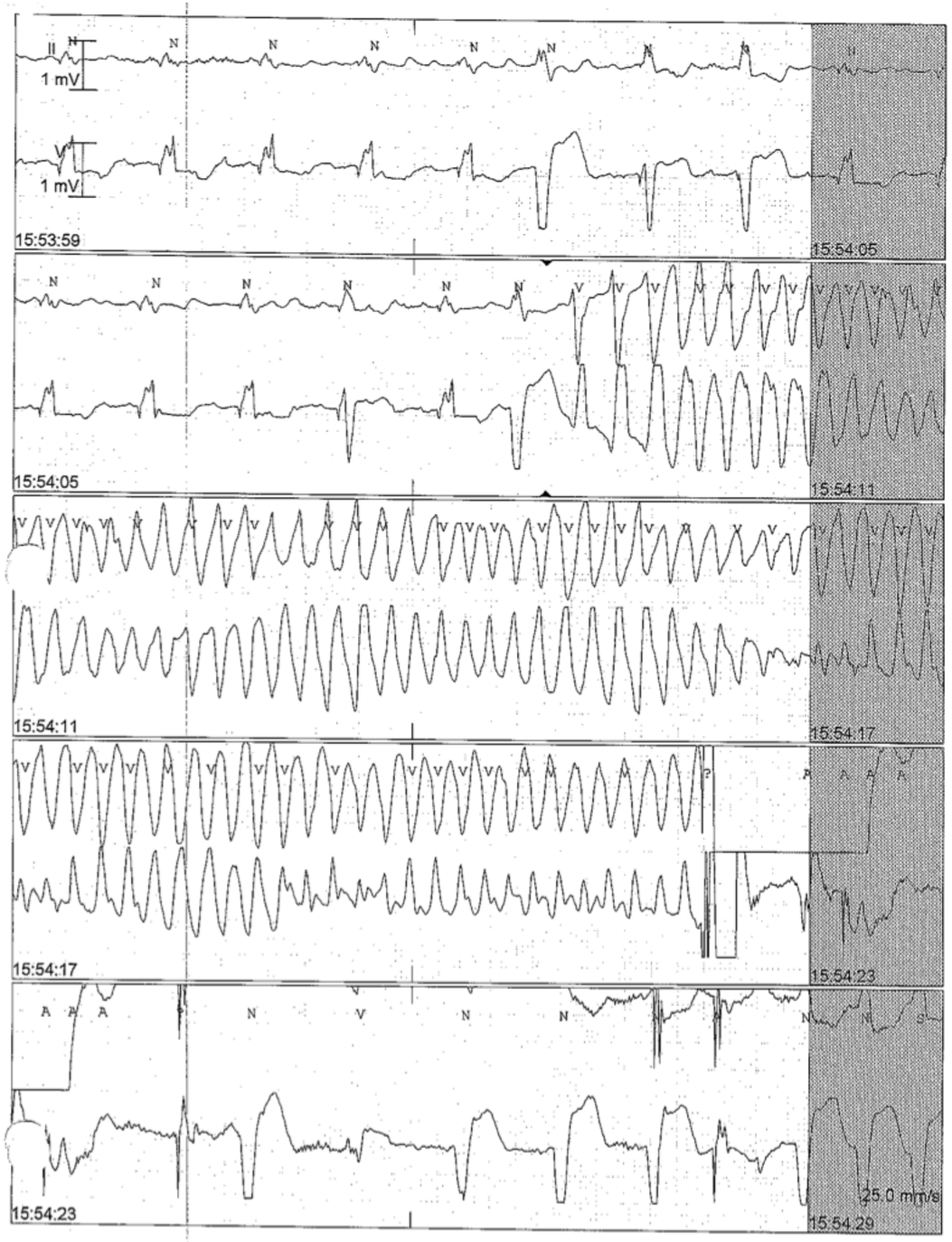
Torsades de pointes (TDP) degenerates into VF



Q3: Which of the following is LEAST likely to be associated with this event?

Select the best answer:

A. Hypokalemia
B. Myocardial ischemia
C. Dilated cardiomyopathy
D. Underlying atrial flutter
E. Levofloxacin administration



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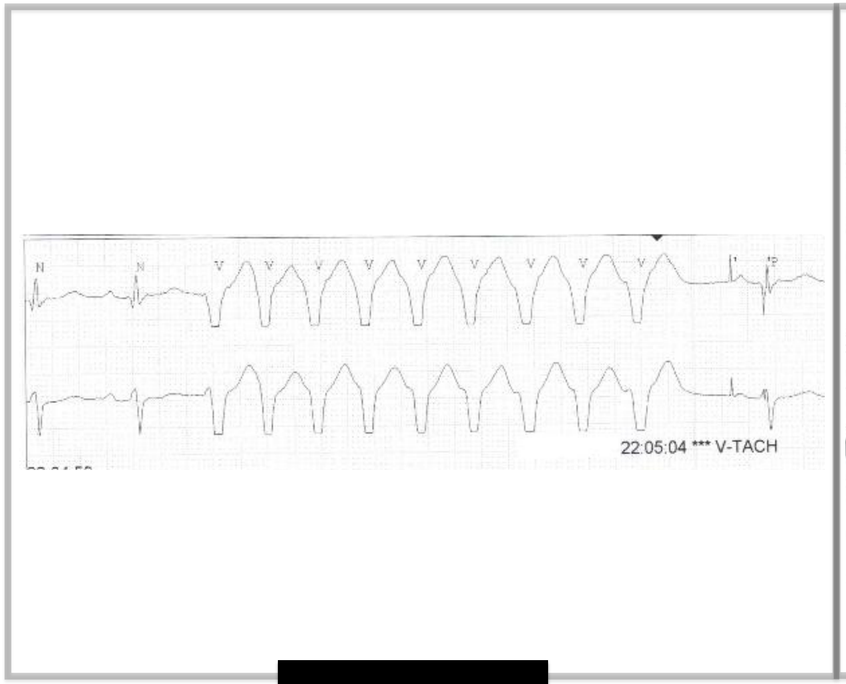
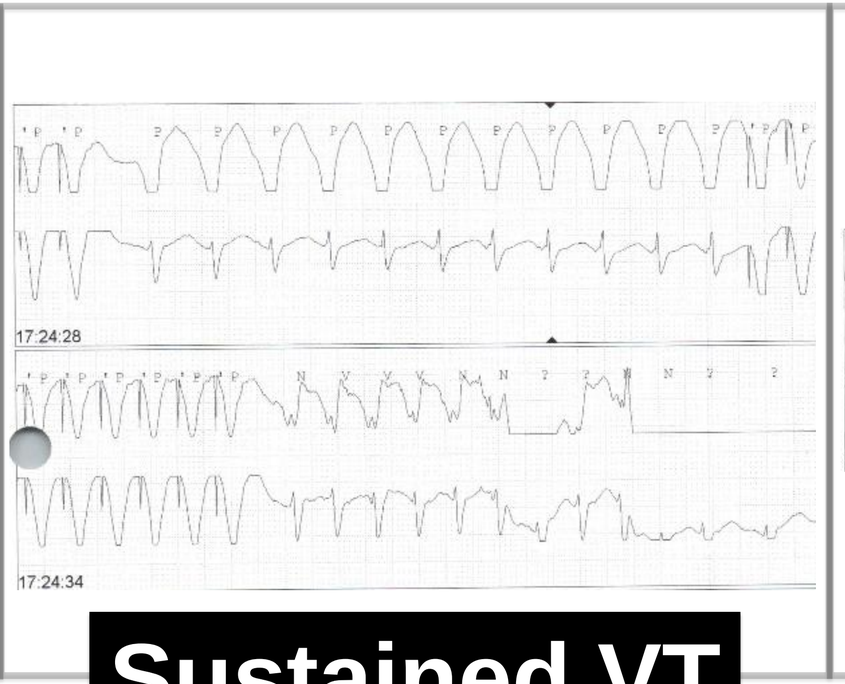
***TDP** encouraged by bradycardia, prolonged QT interval, and sick myocardium - CHF and ischemia*

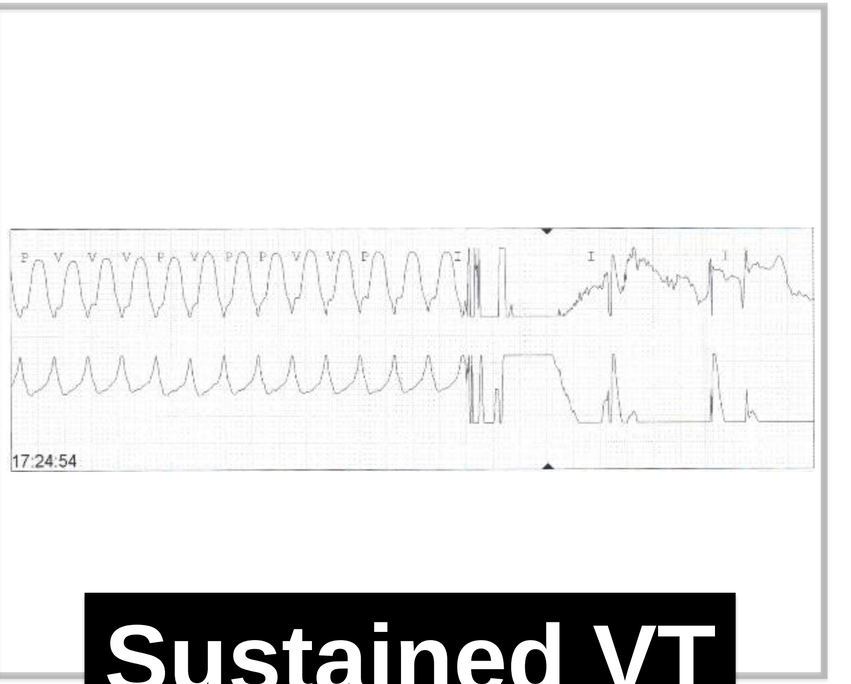
Ventricular tachycardia in ischemic heart disease



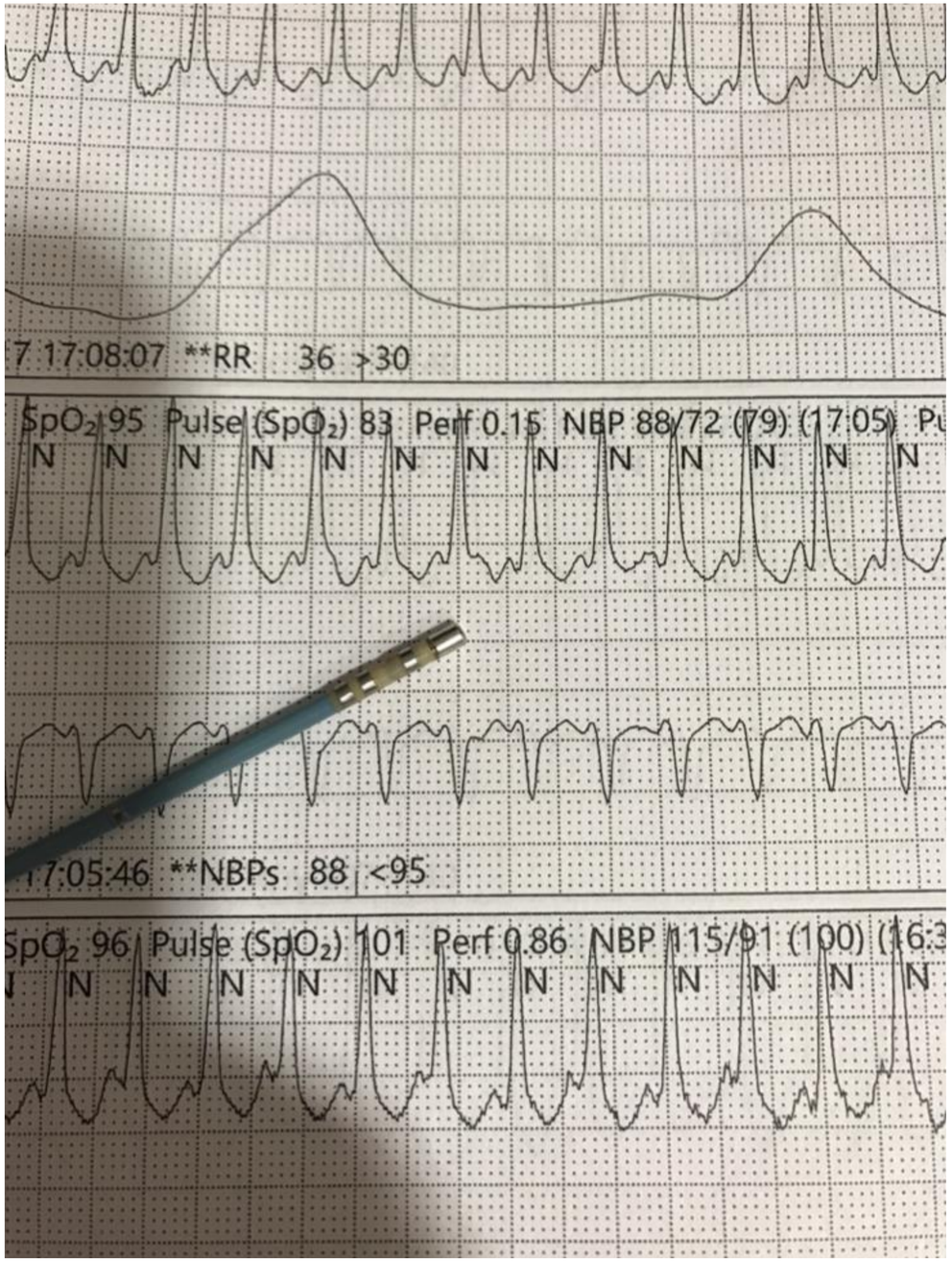
NSVT



Sustained VT
ineffective ATP



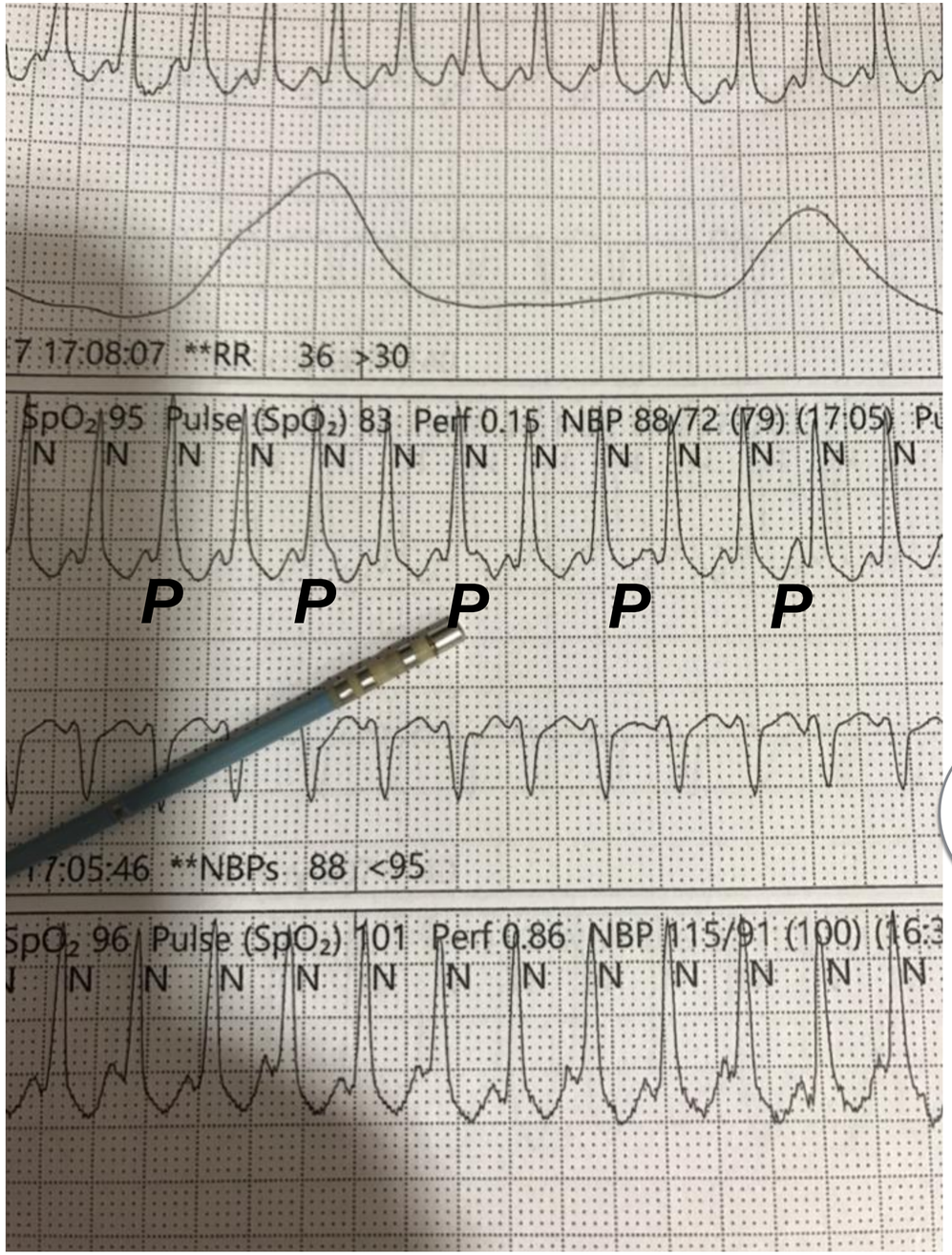
Sustained VT
ICD shock



Q4: What is this rhythm?

Select the best answer:

A. Sinus tachycardia
B. Supraventricular tachycardia (SVT)
C. Ventricular tachycardia
D. Atrial flutter
E. Artifact



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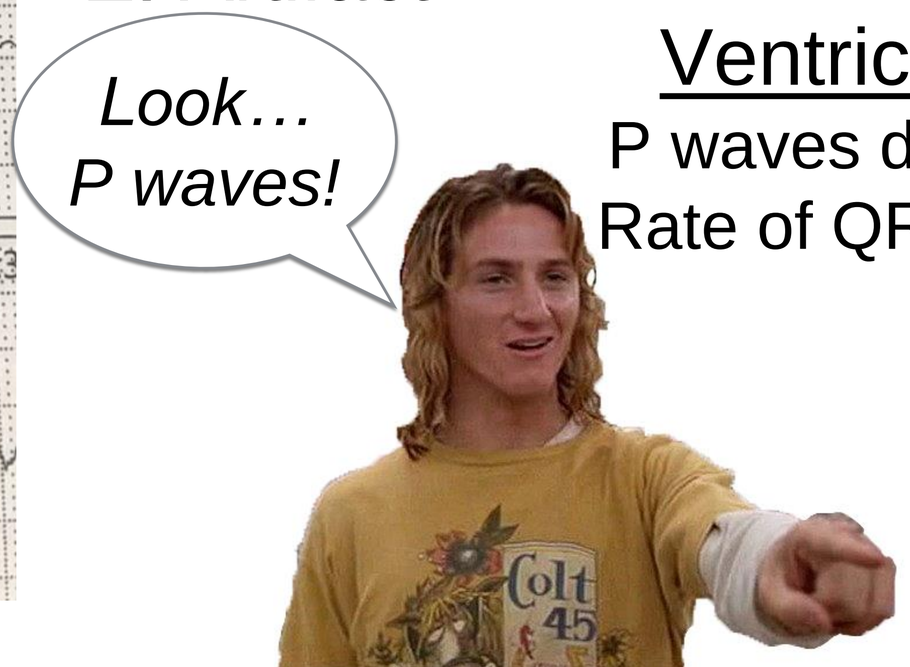
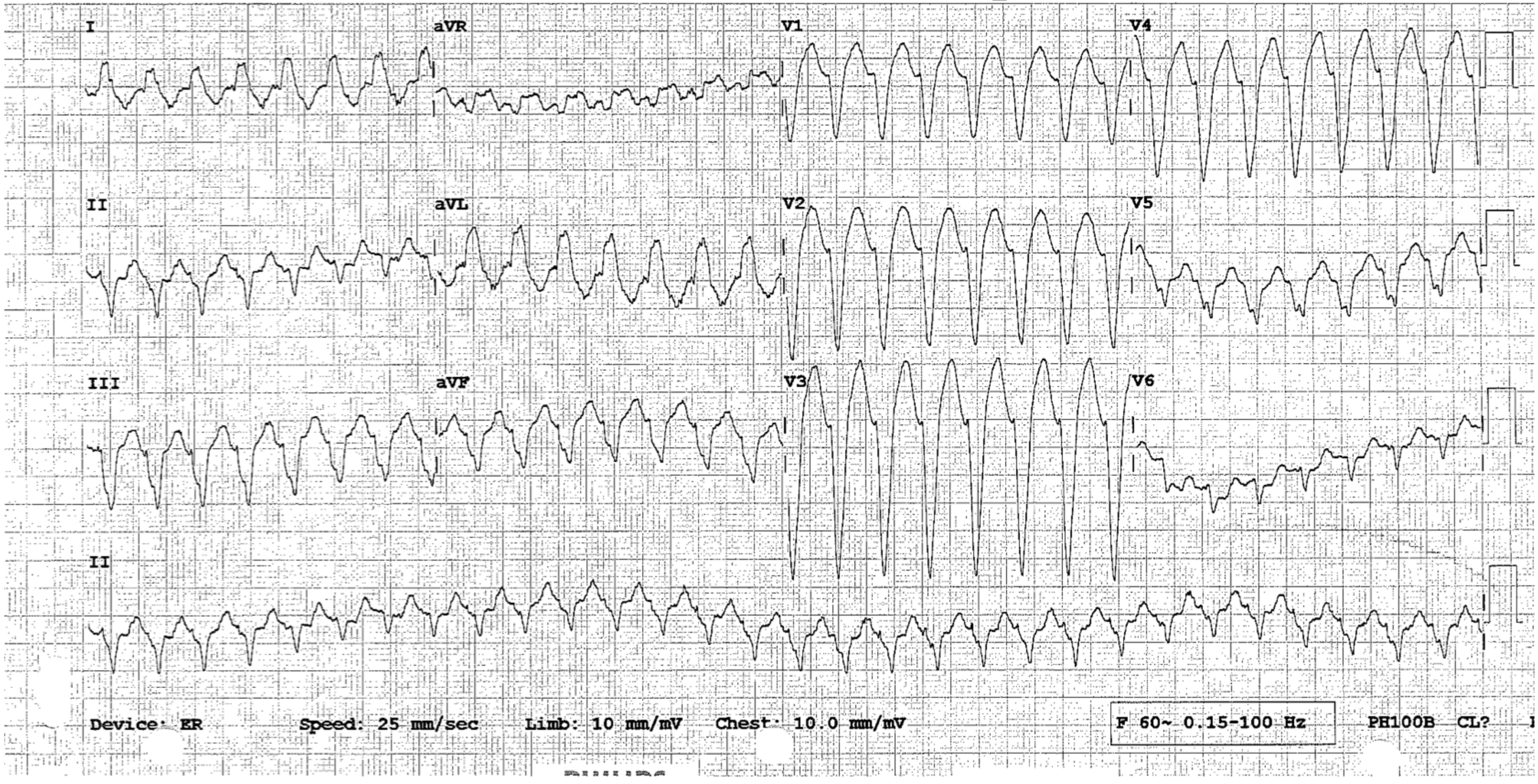


Ventricular tachycardia

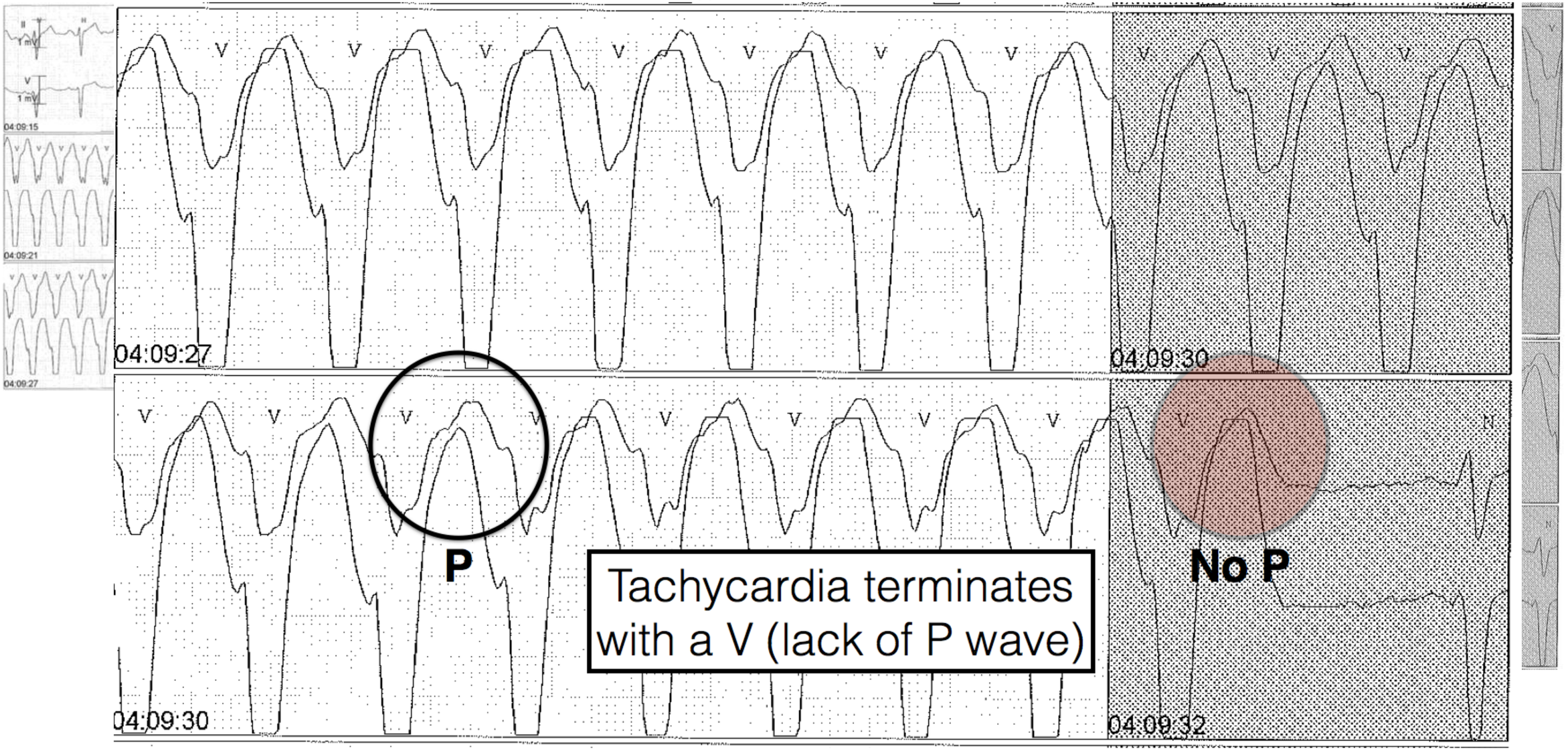
P waves dissociated from QRS

Rate of QRS > Rate of P waves

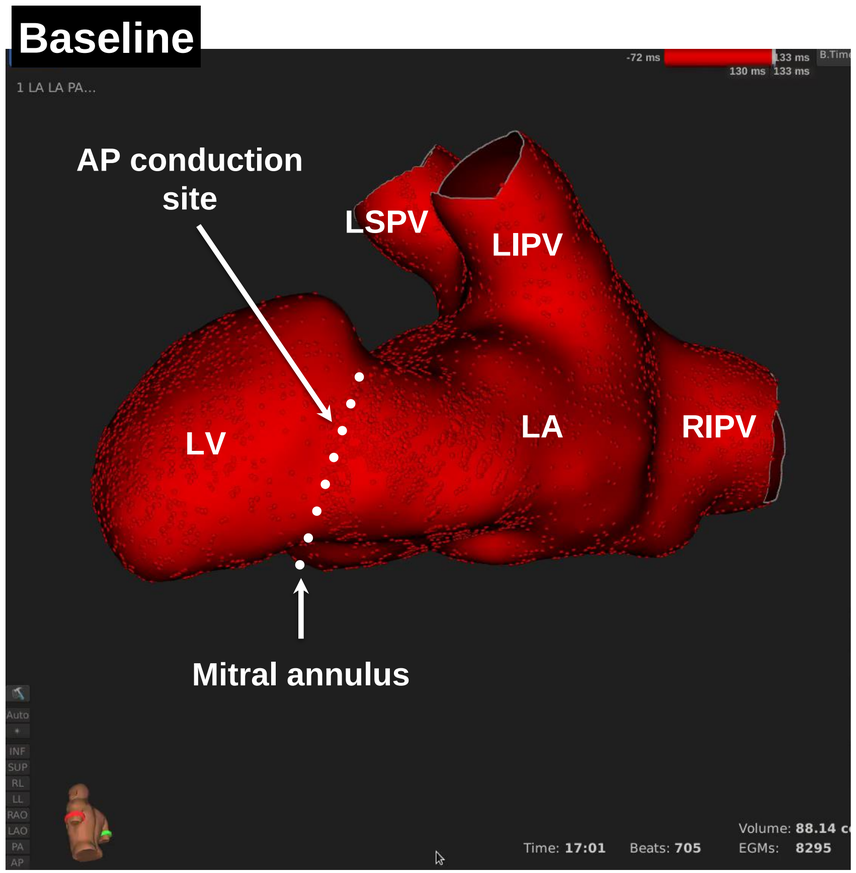
Another example…

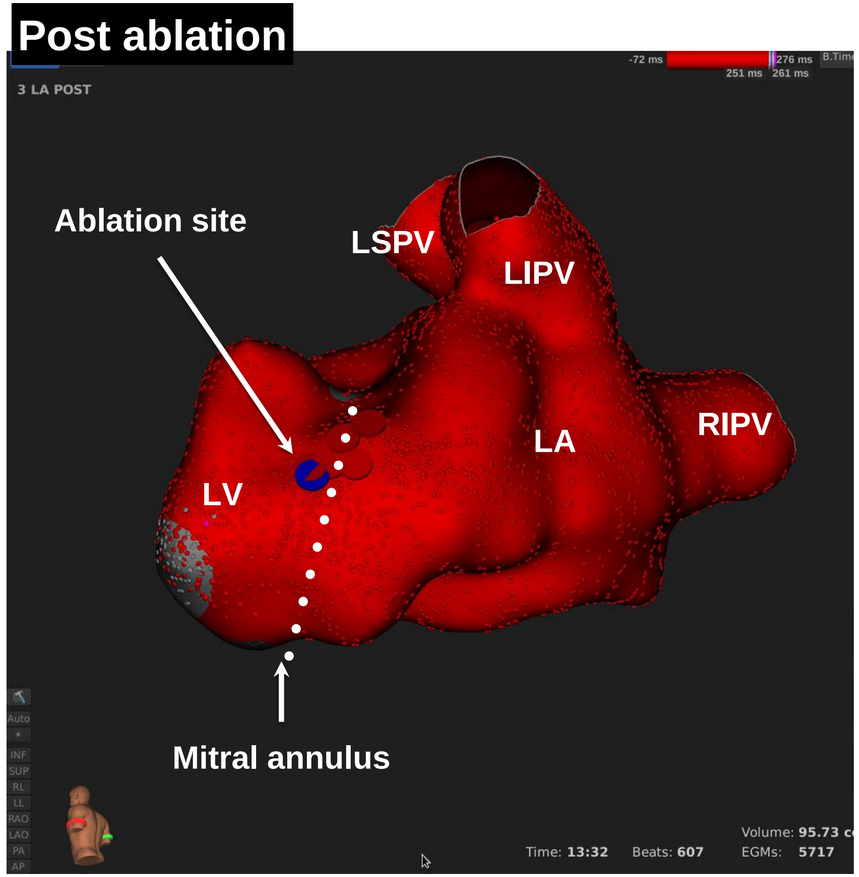


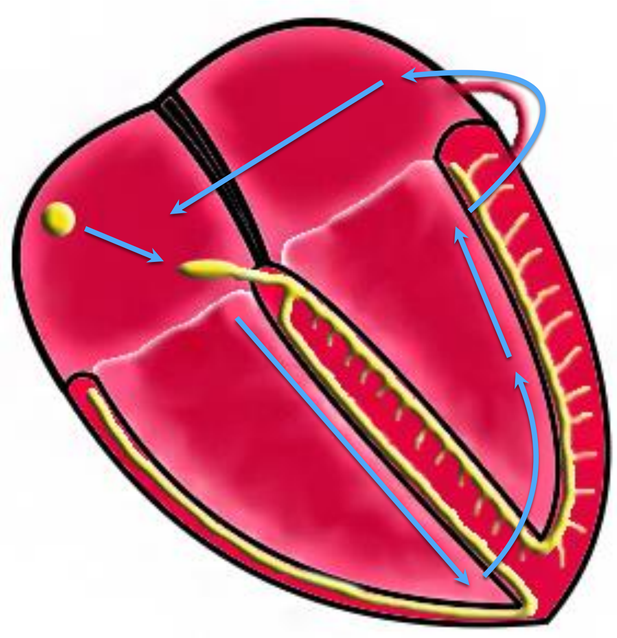
Analyze this…



Left lateral accessory pathway - RV pacing

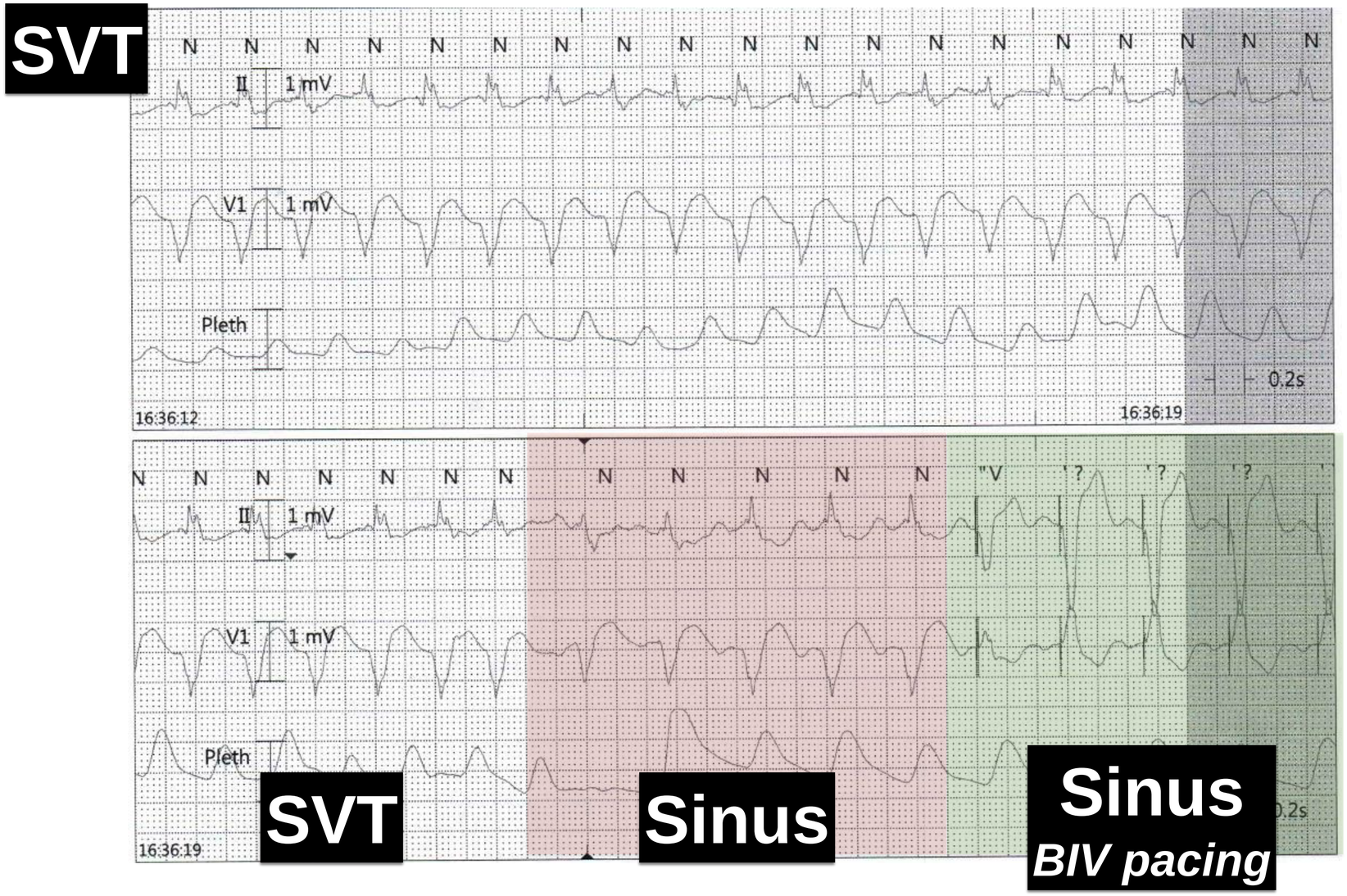




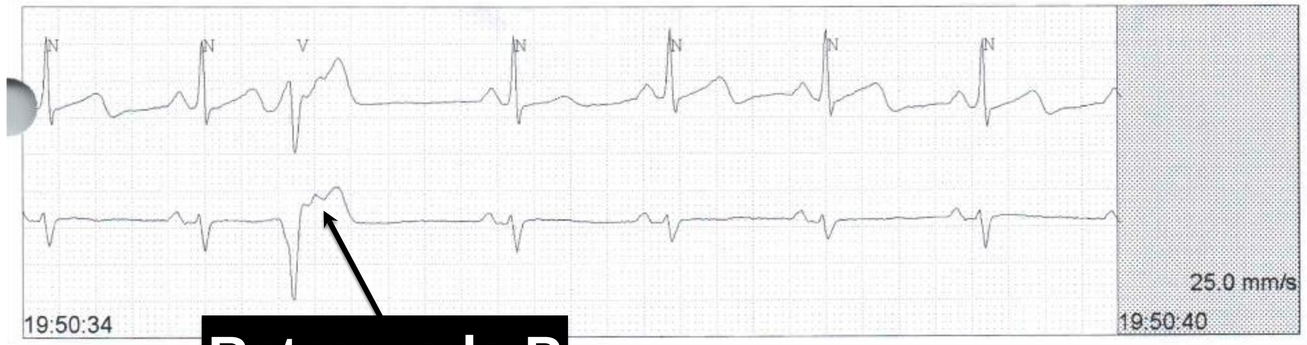


Orthodromic AVRT

AV nodal reentry with aberrancy



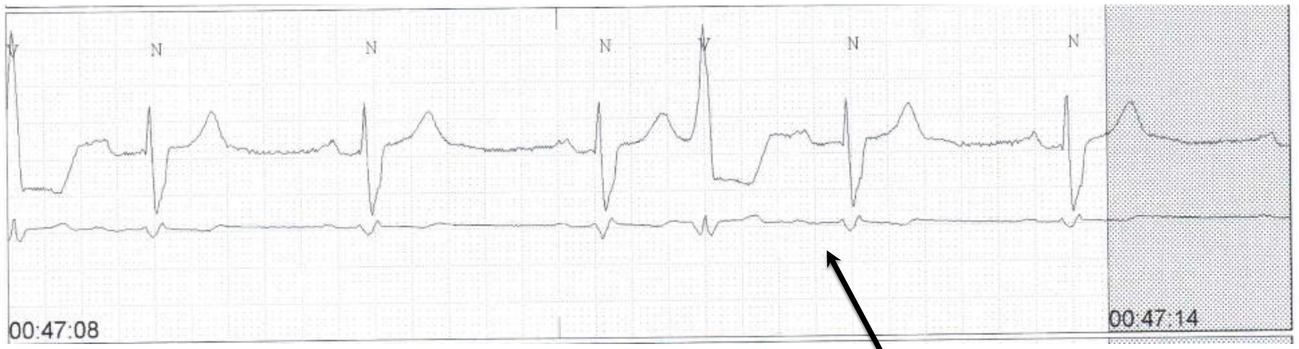
Analyzing VA conduction



Retrograde P

PVC conducts to the atrium

underlies some mechanisms of SVT and pacemaker-mediated tachycardia



Prolonged post PVC PR interval

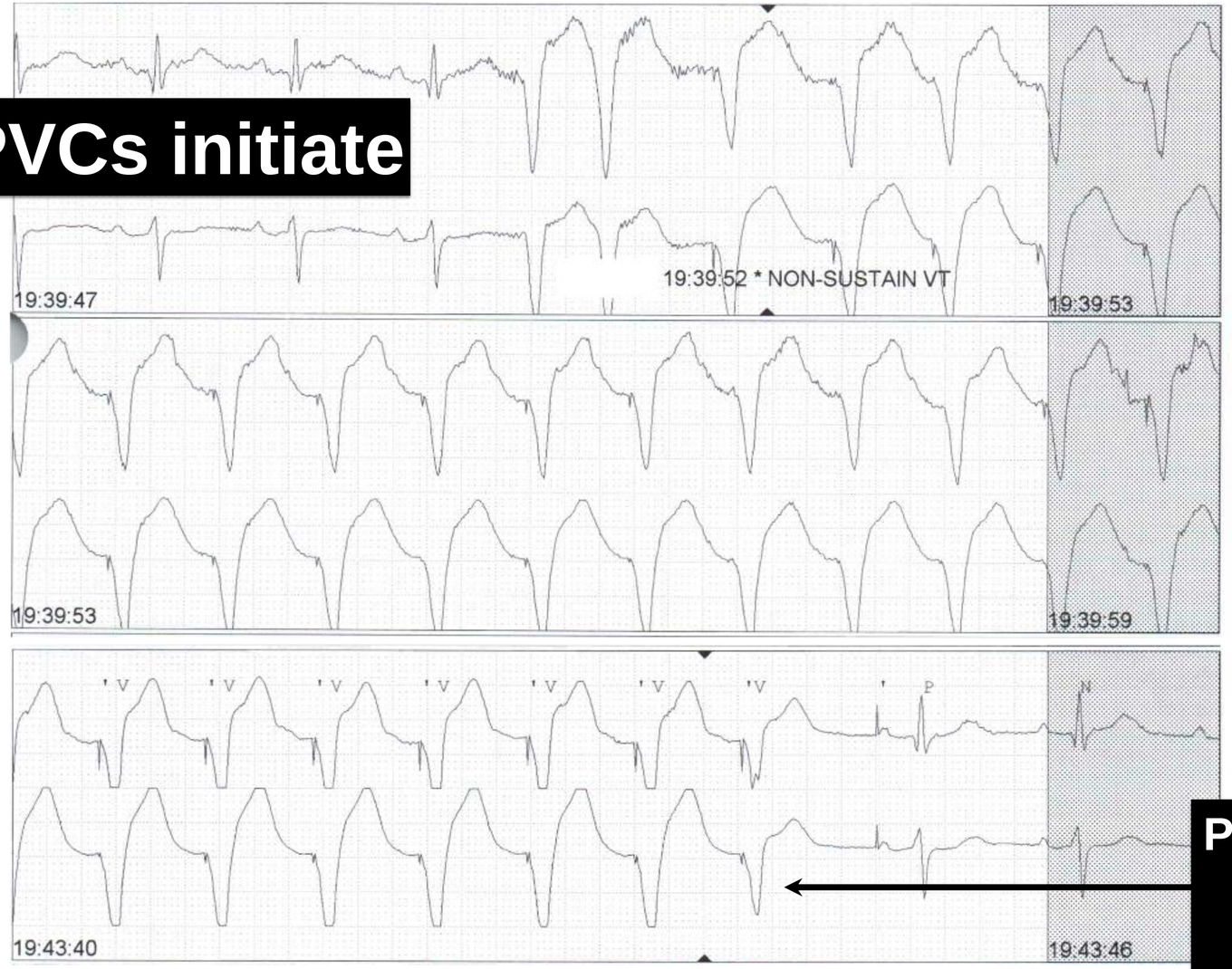
PVC blocks in AVN

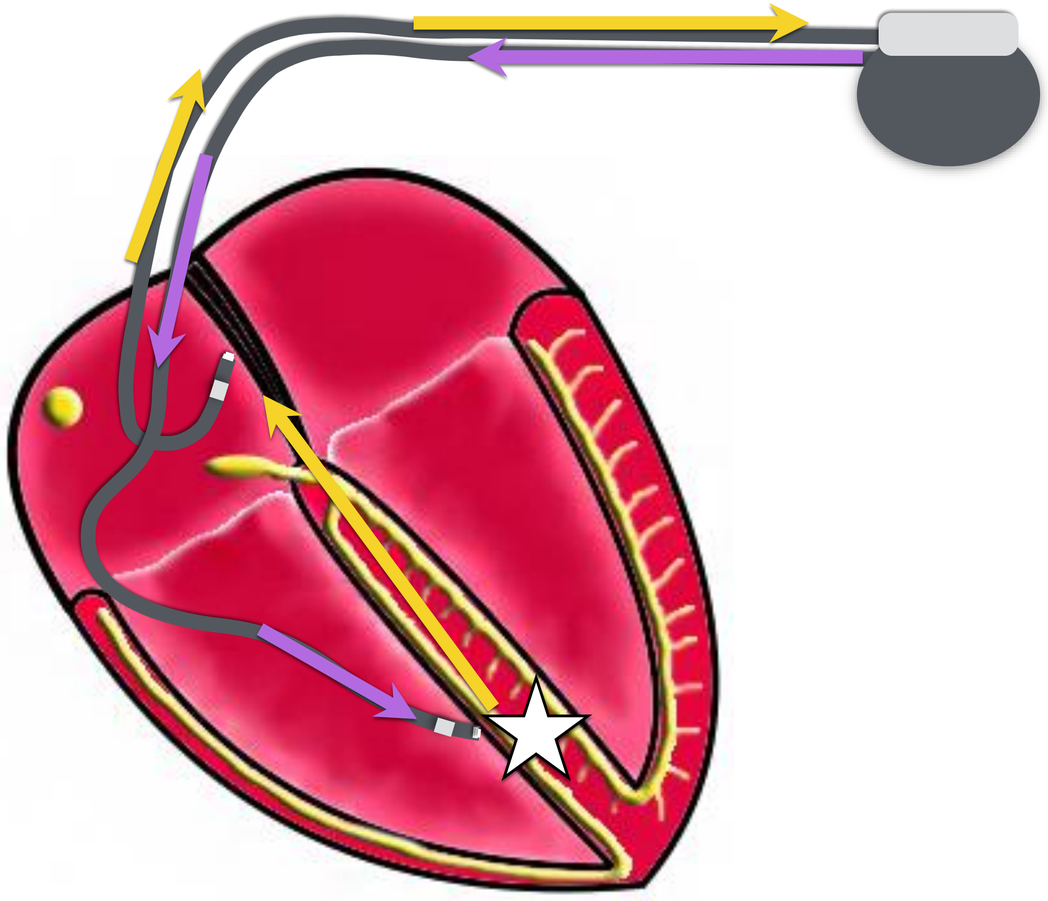
concealed conduction into AVN

PVC initiates SVT

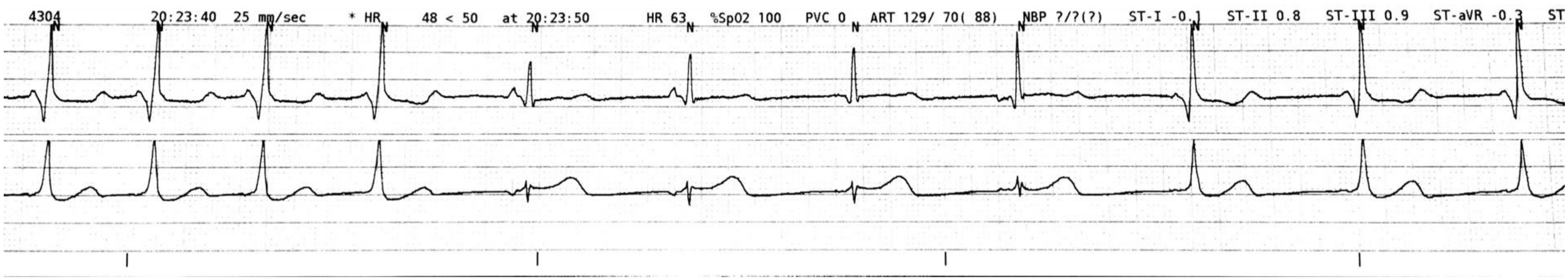
Pacemaker mediated tachycardia (PMT)

PVCs initiate





Probably terminates with fused PVC and loss of retrograde P



Q5: What explains the wide complex beats?

Select the best answer:

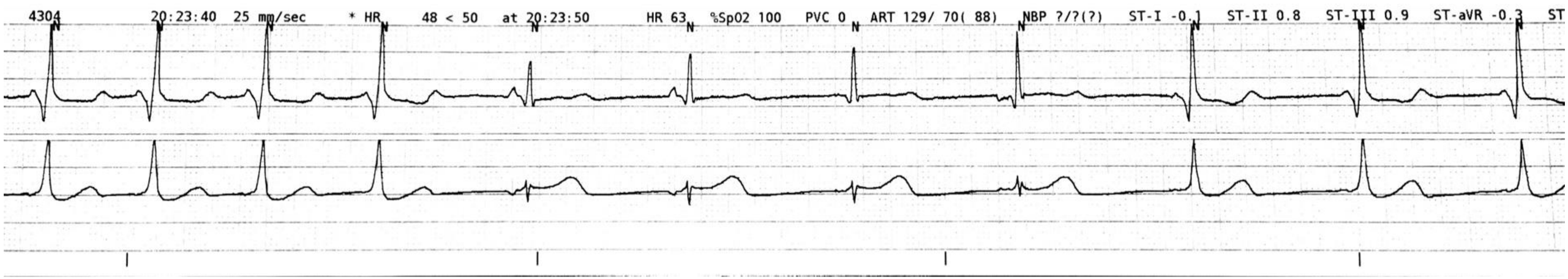
A. Idioventricular rhythm

B. Right bundle branch block

C. Left bundle branch block

D. Wolff-Parkinson-White (WPW) pattern

E. Myocardial infarction



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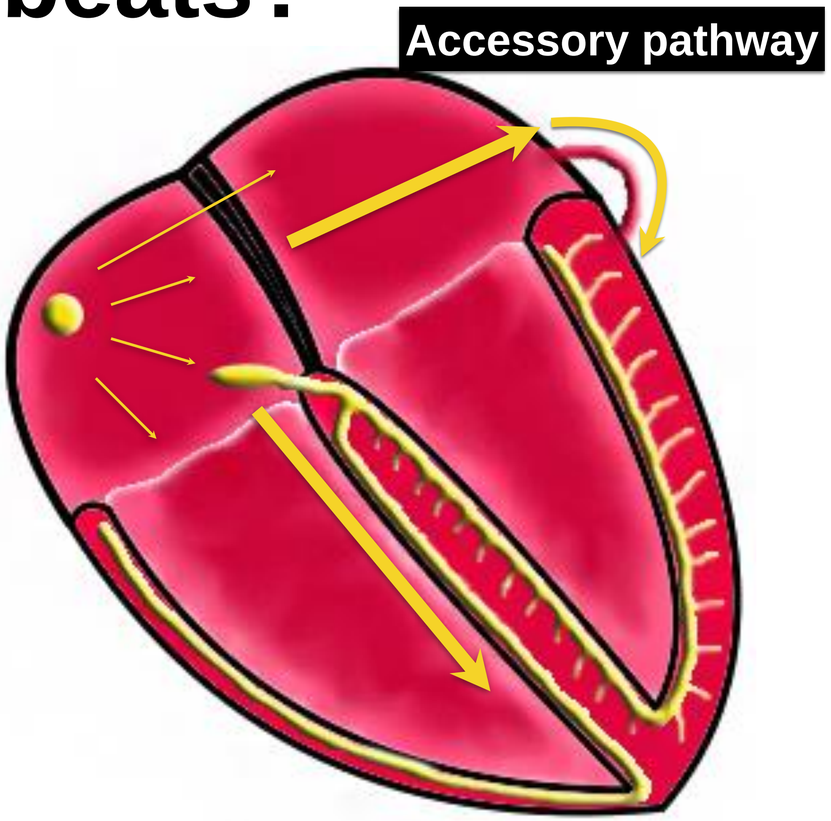
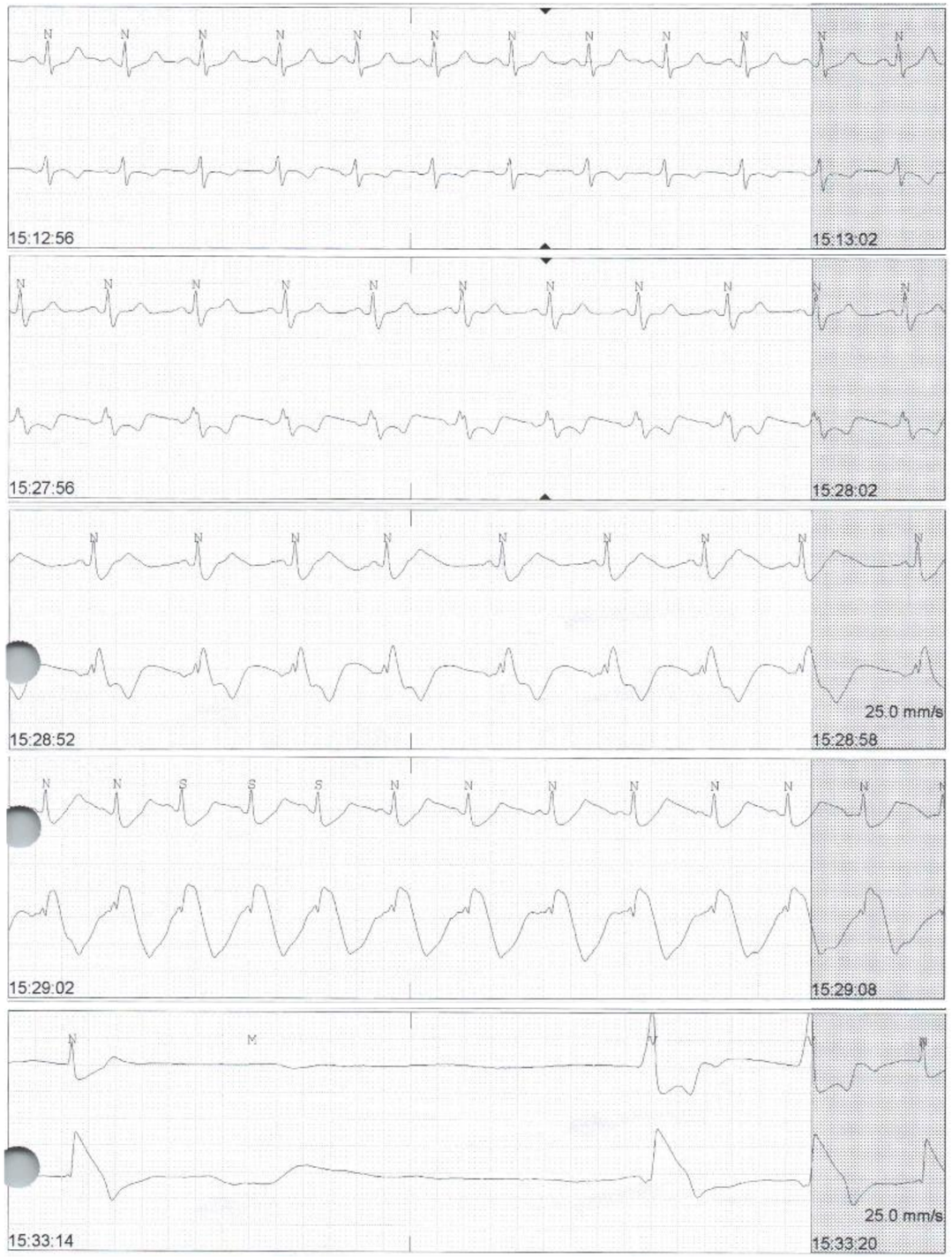




1

2

3

4

5

Systemic shock

<u>EKG changes, progressive:</u>

- hypoperfusion
- acidemia
- hyperkalemia

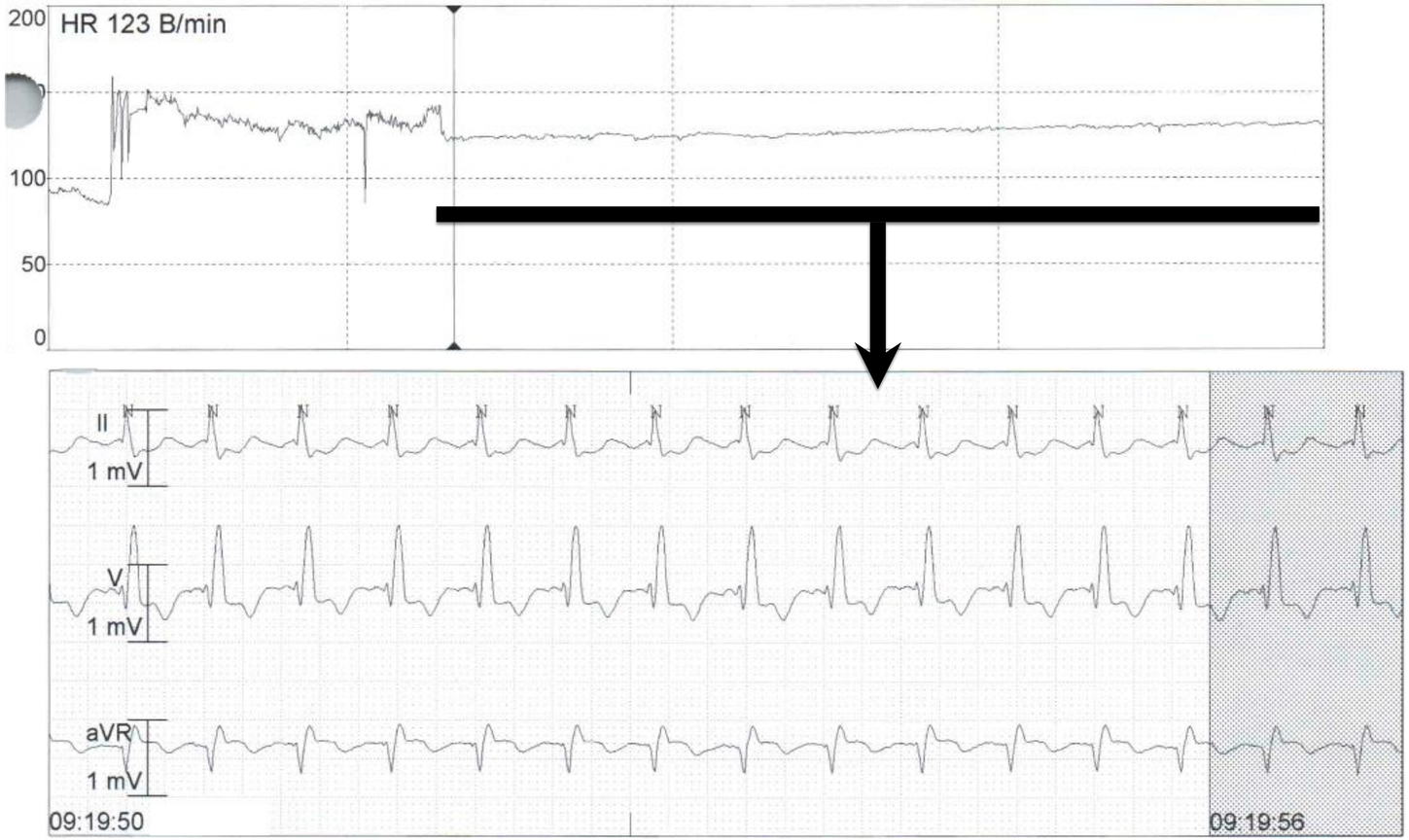
QRS widening

ST-T changes

Rate variability (ultimate slowing)

AV conduction failure

Putting it together

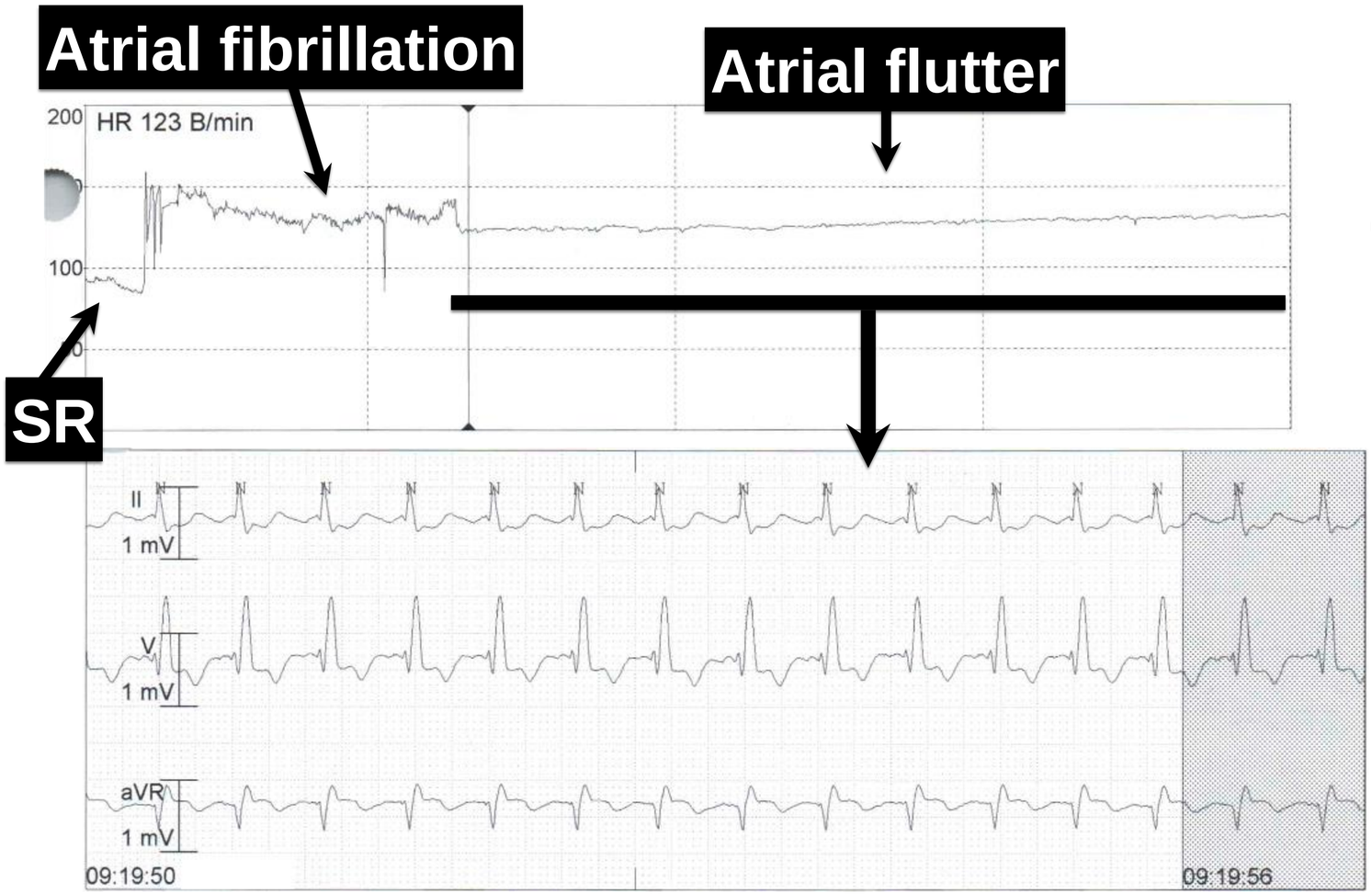


<u>Q6:</u> What is the rhythm shown here?

<u>Select the best answer:</u>

A. Sinus tachycardia
B. Atrial flutter
C. Atrial fibrillation
D. Ventricular tachycardia
E. Torsades de pointes

Putting it together



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