

# **ECG**

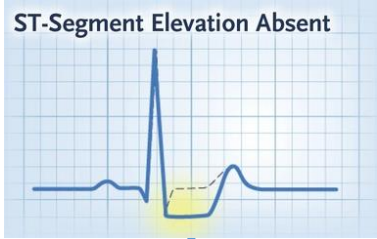
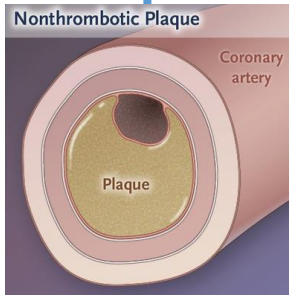
# **in Ischemic Heart Disease**

**Busan Paik Hospital**  
**Division of Cardiology**  
**Young-Ah Park**

# ECG changes in Ischemia/Infarction

Ischemic discomfort

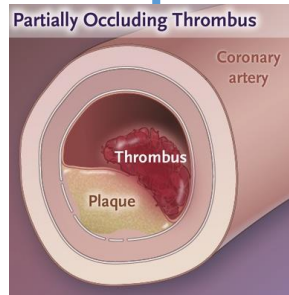
Supply-demand imbalance  
(predominantly nonthrombotic)



Unstable Angina  
(Demand-related)

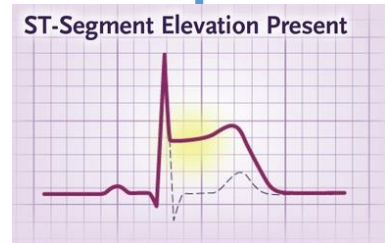
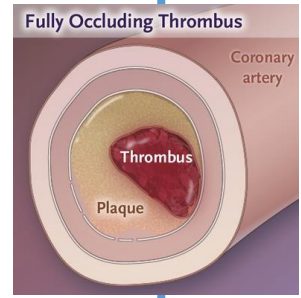
NSTEMI  
(type 2)

Acute coronary syndrome  
(atherothrombotic)



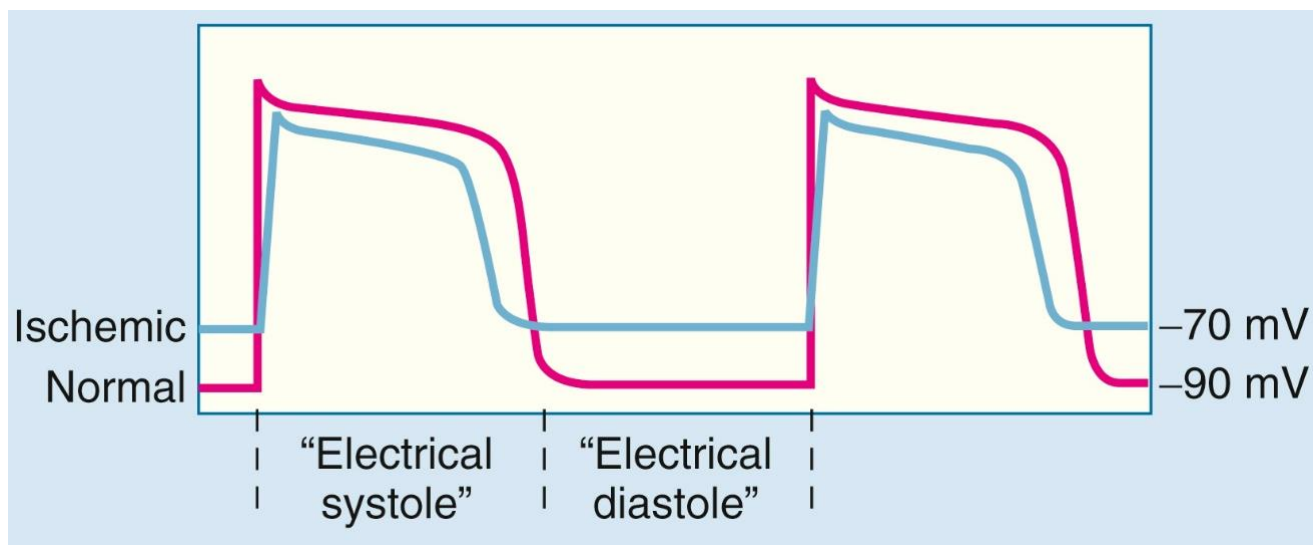
Unstable angina  
(thrombosis mediated)

NSTEMI  
(type 1)



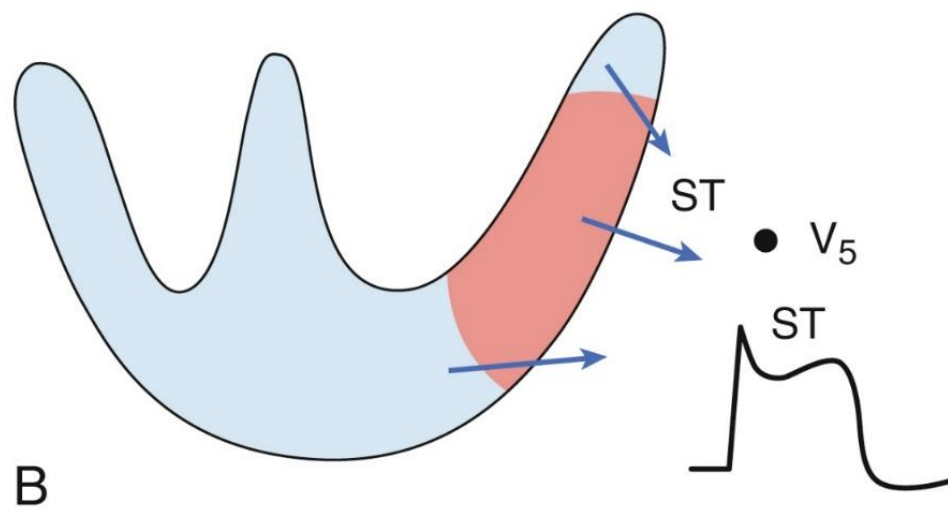
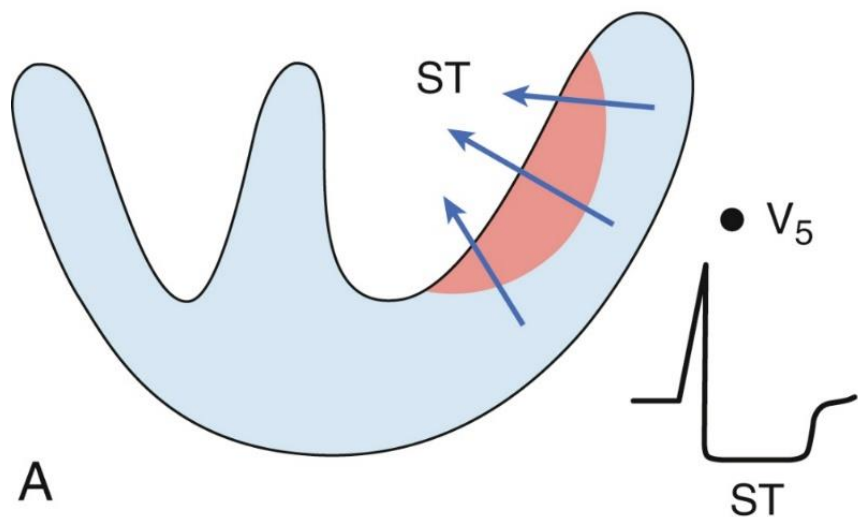
STEMI

# ECG in ischemic heart disease

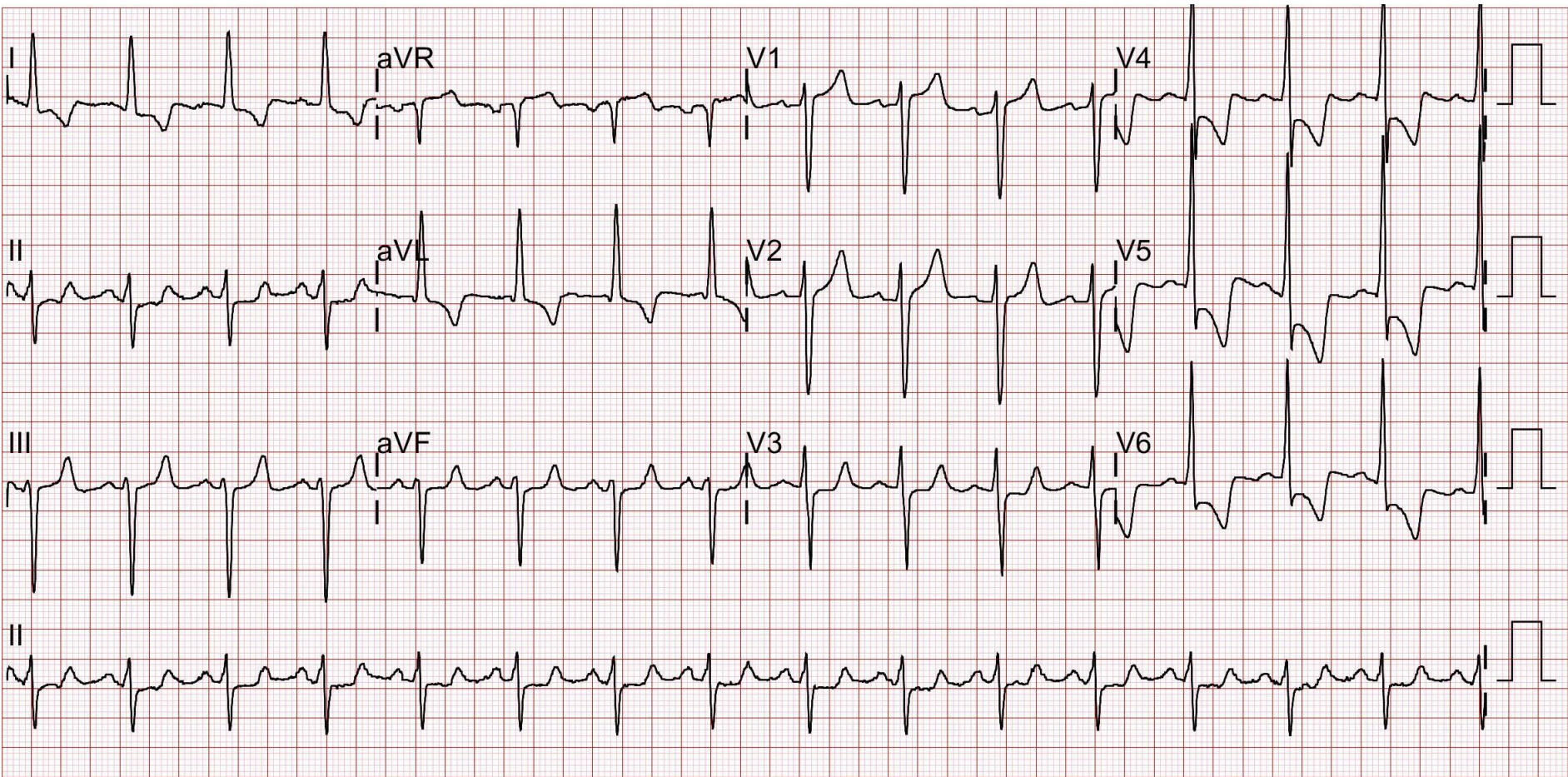


Subendocardial Injury:  
ST Depression

Transmural (Epicardial) Injury:  
ST Elevation



# ST depression



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

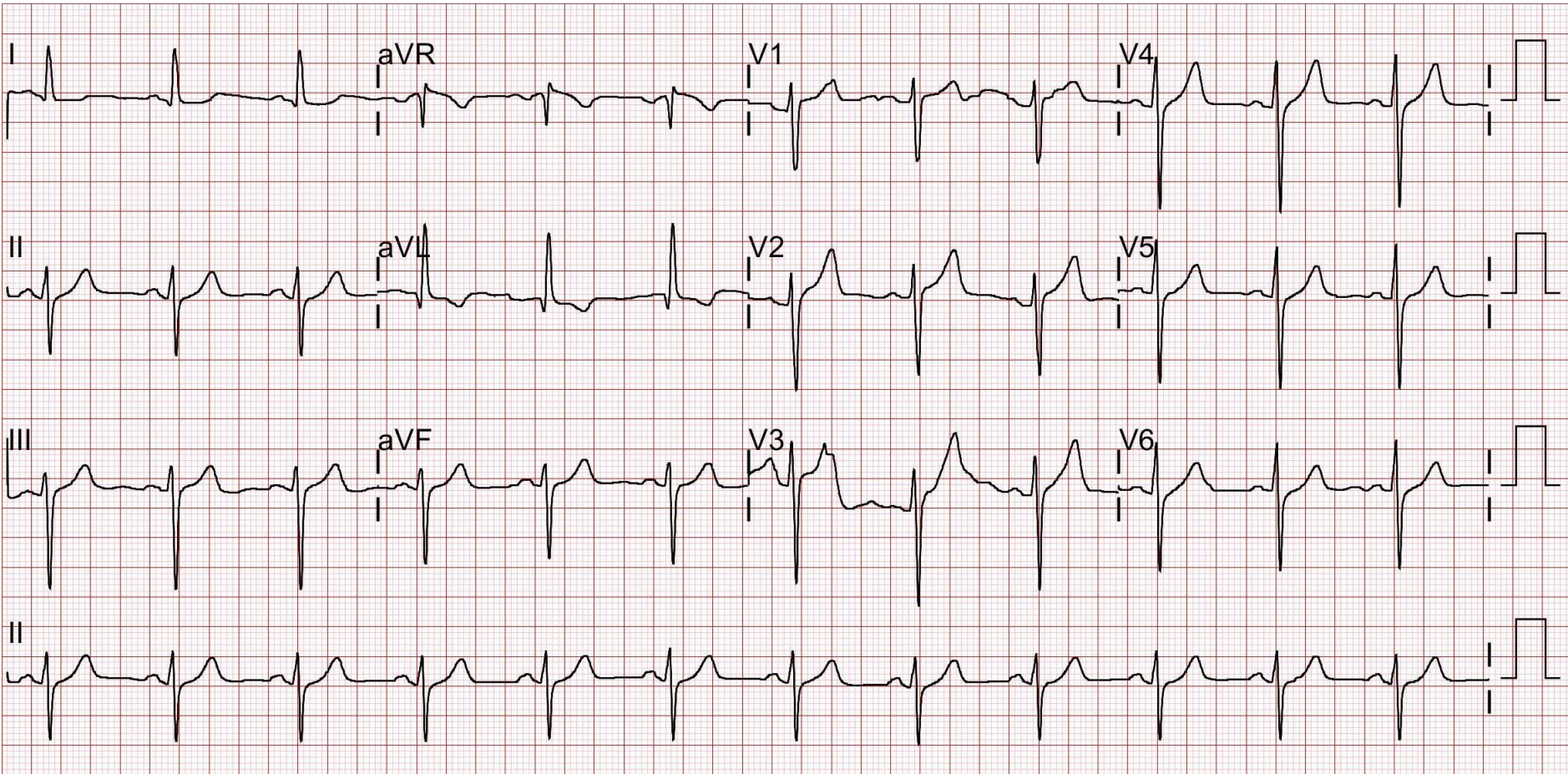
0.05 - 150 Hz

STD 12 LEAD

PH090A

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# Restoration of ST depression



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

0.05 - 150 Hz

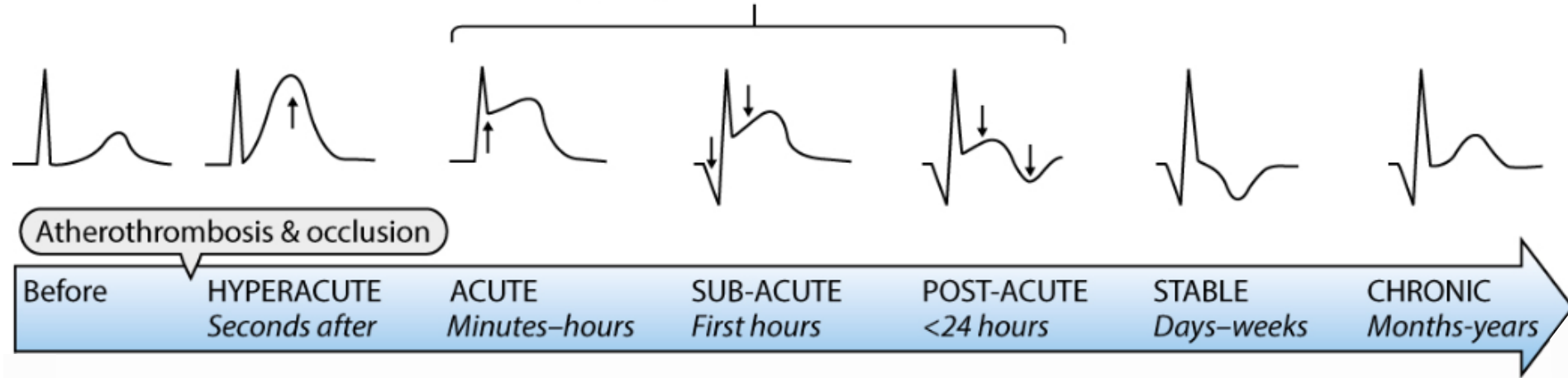
STD 12 LEAD

PH090A

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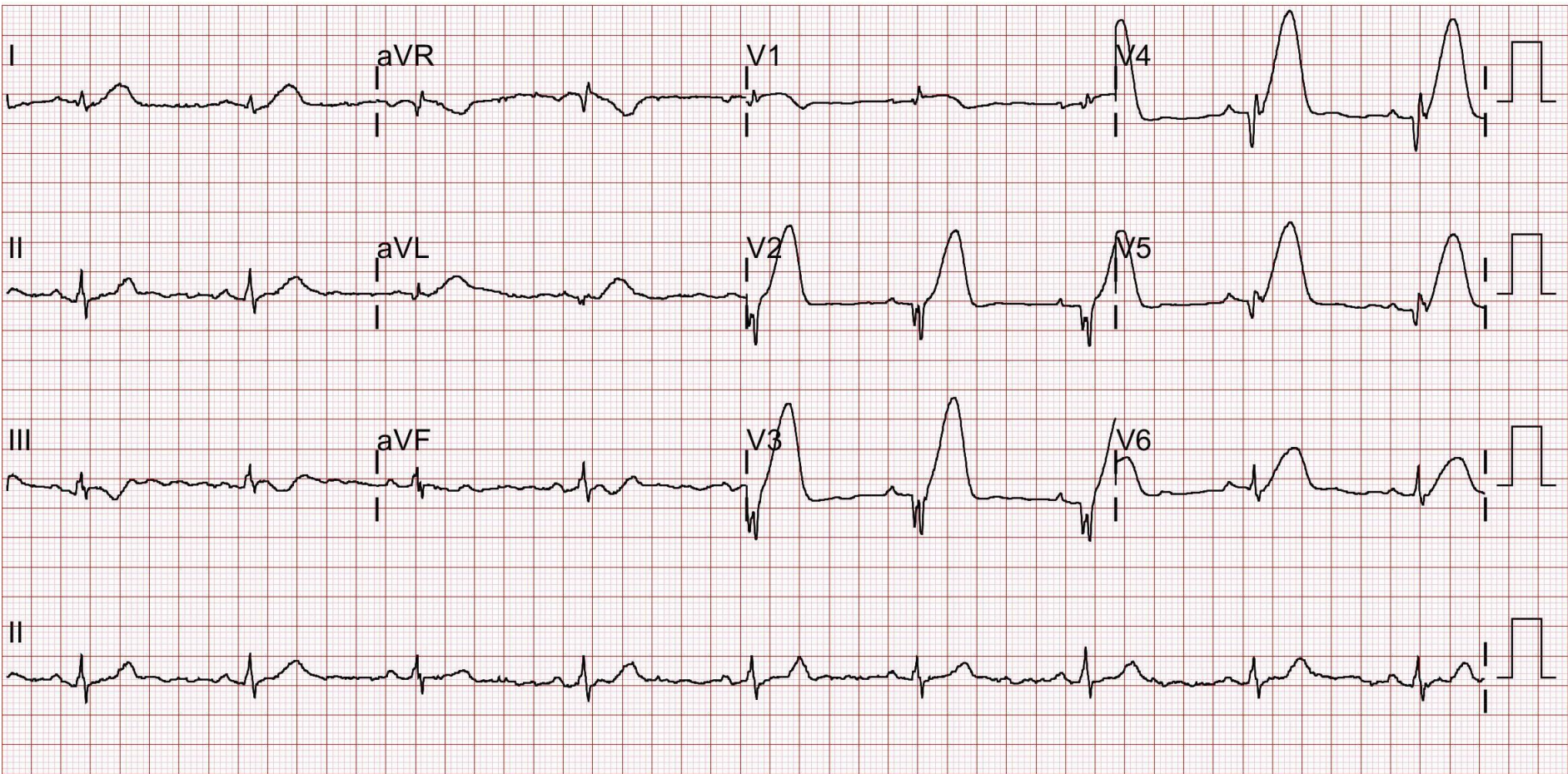
# Temporal ECG changes in STEMI

The patient typically presents somewhere between these



수 초~수 분	수 분~	6-16시간	<24시간	수 일~수 주	~수 년
Tall T	ST elevation	Pathologic Q ST elevation ↓	ST elevation ↓ Q deeper T inversion	Remained pathologic Q T inversion	T inversion 호 전, Q는 보통 지속

# Hyperacute T



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

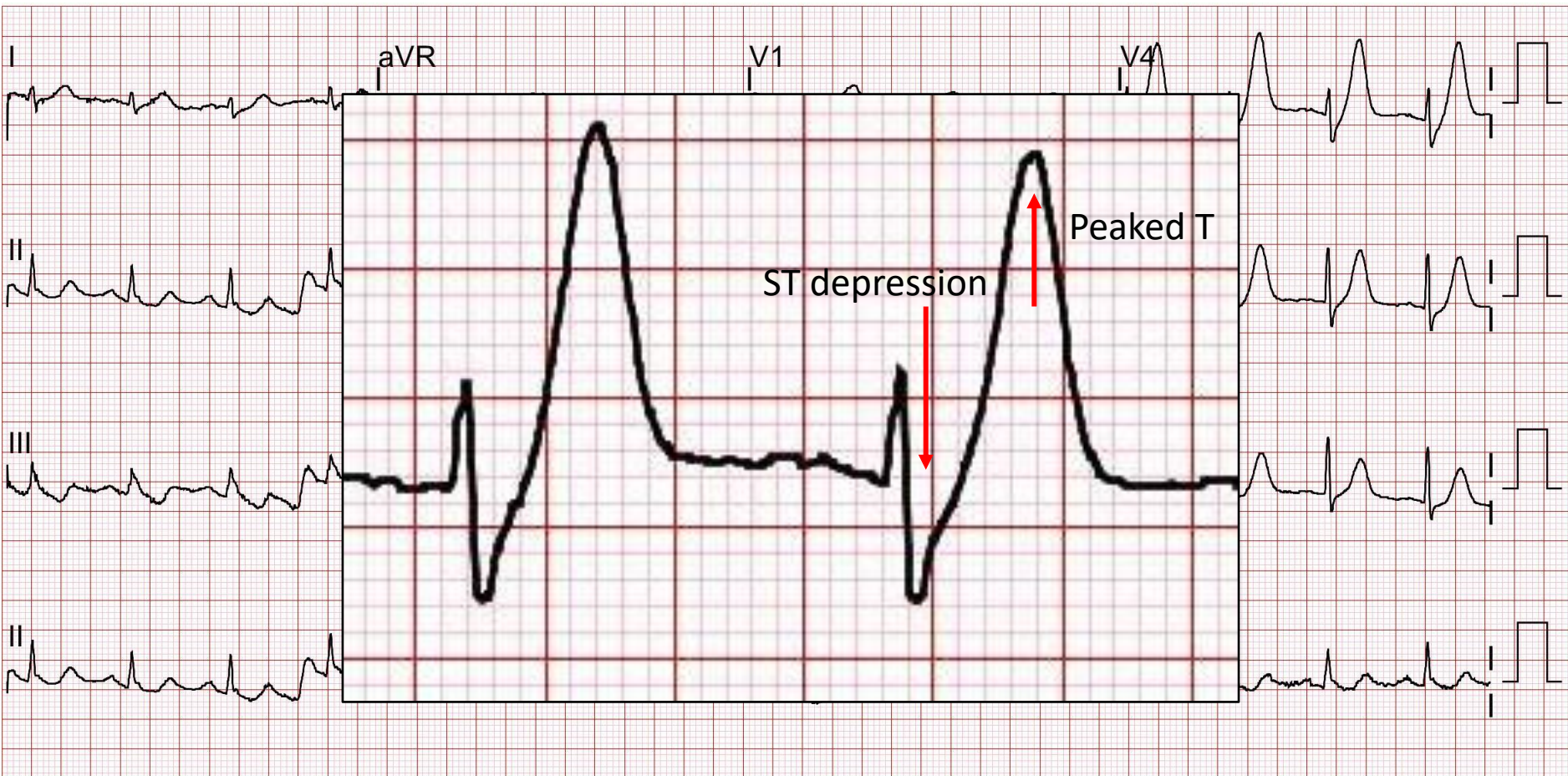
0.05 - 150 Hz

STD 12 LEAD

PH090A

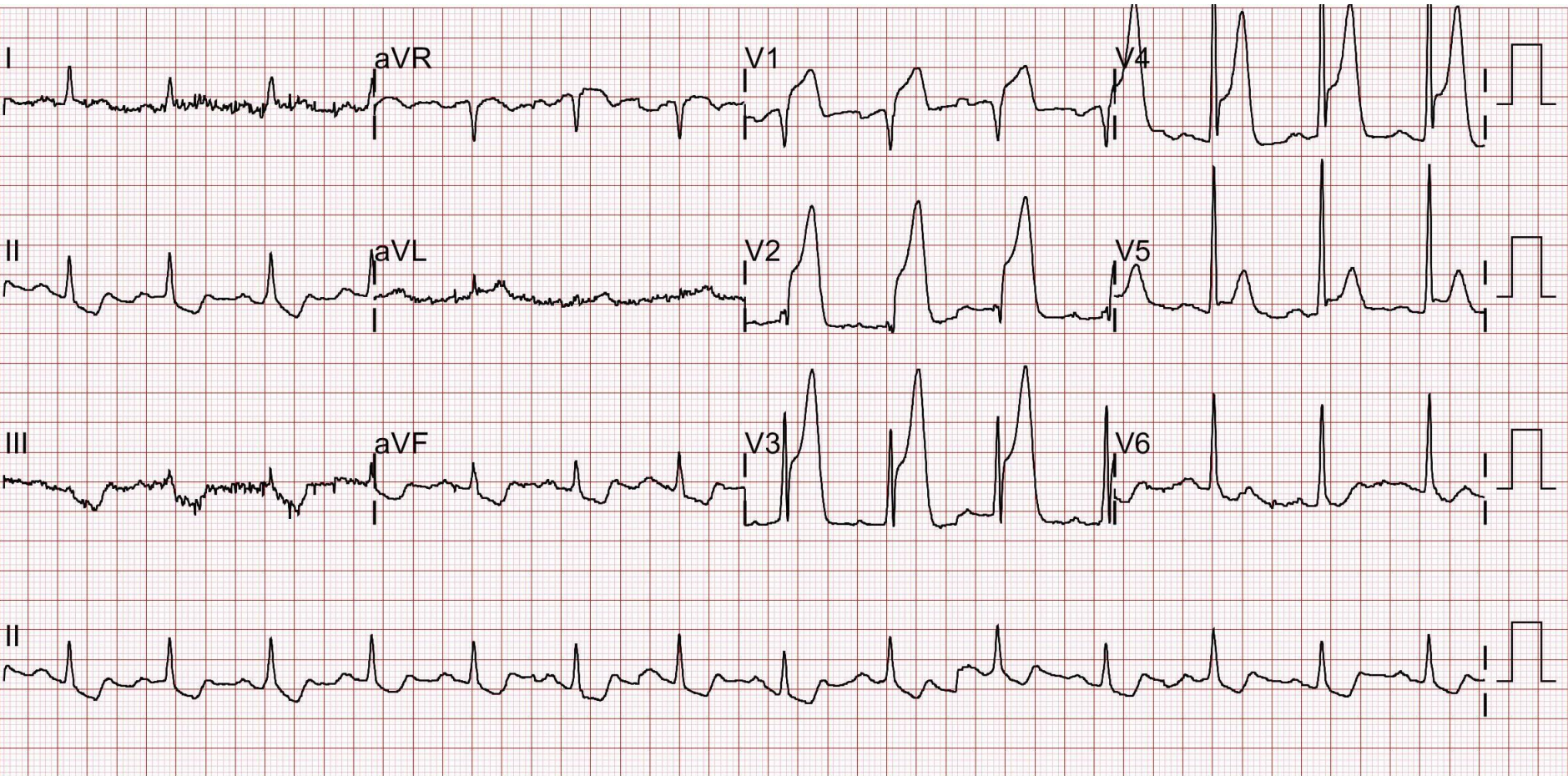
P?

# De winter T wave





# ST-segment Elevation MI



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

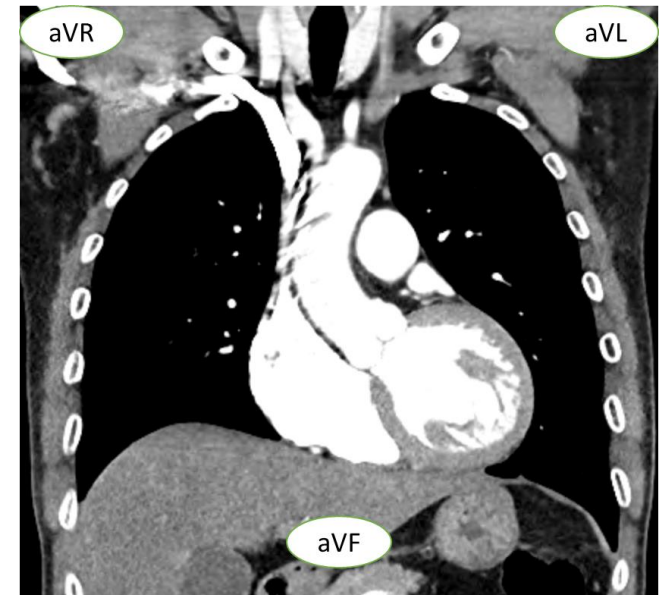
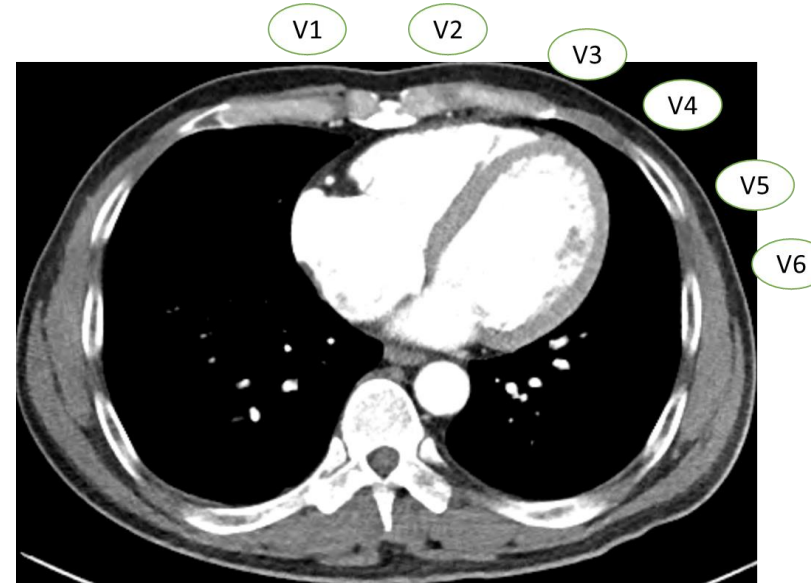
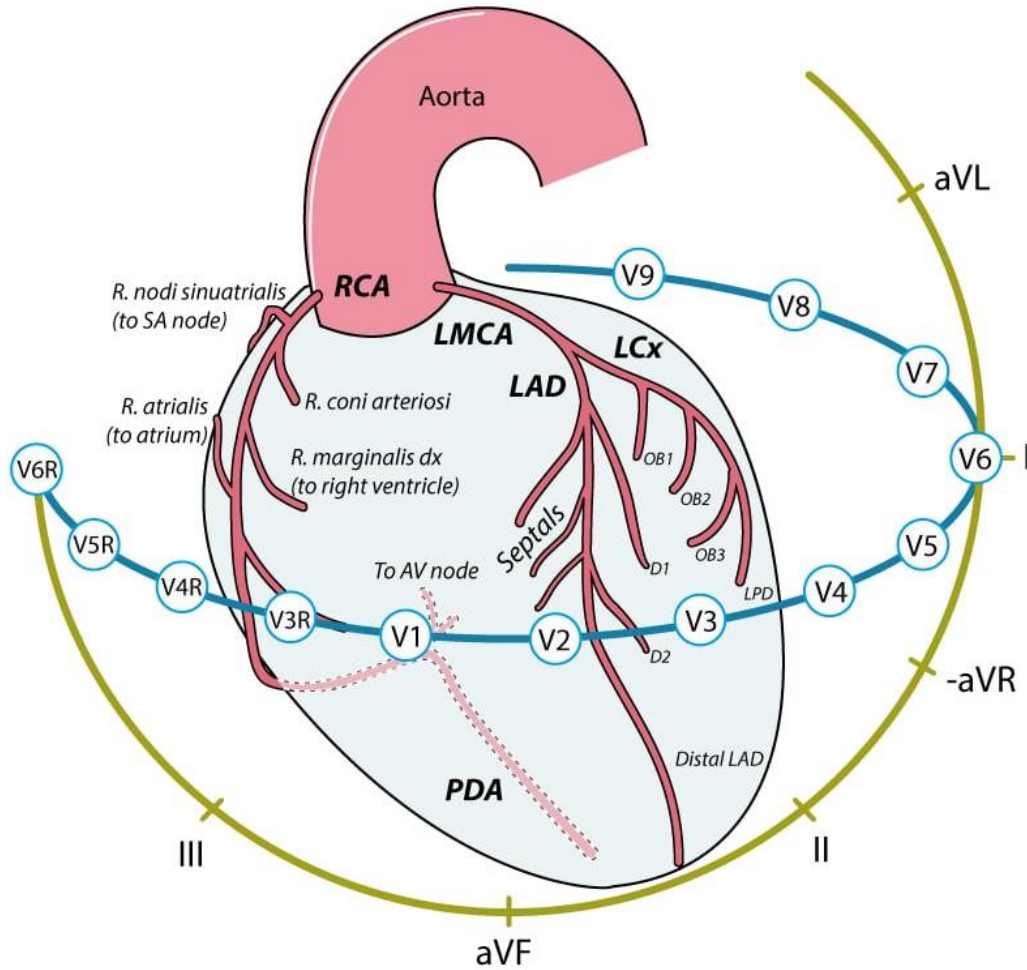
0.05 - 150 Hz

STD 12 LEAD

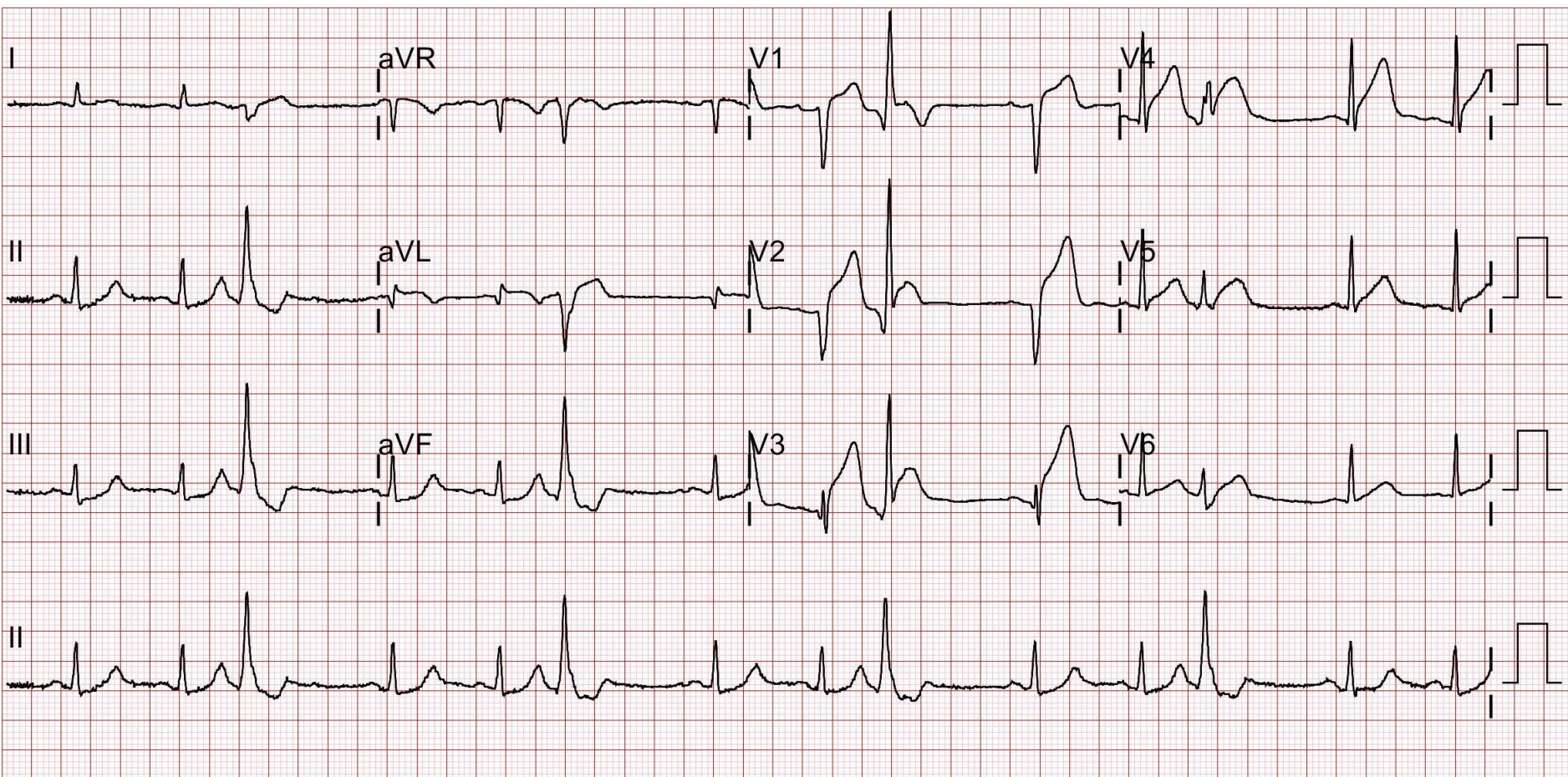
PH090A

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# Coronary Artery Territory



# Anteroseptal MI



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

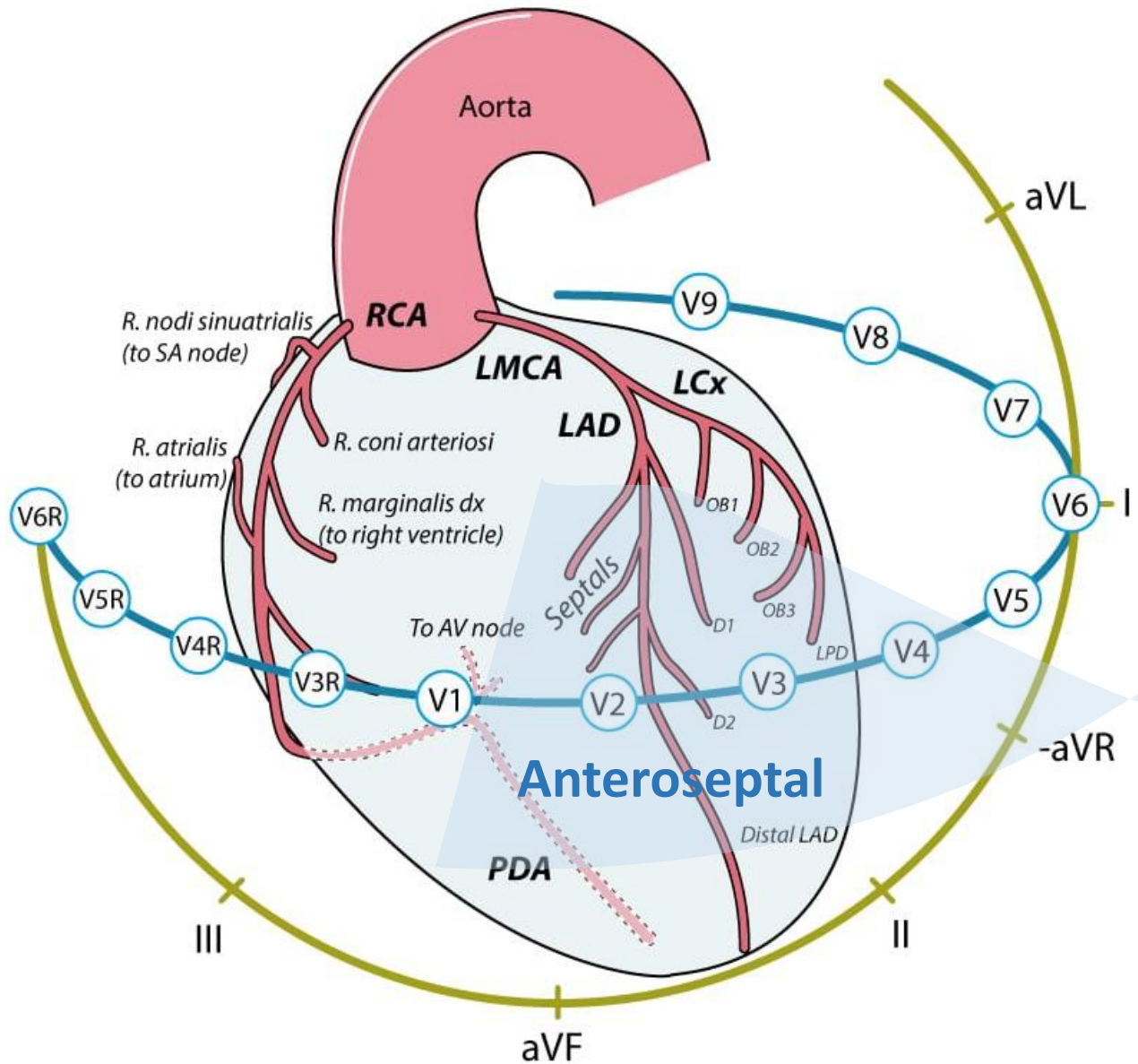
0.05 - 150 Hz

STD 12 LEAD

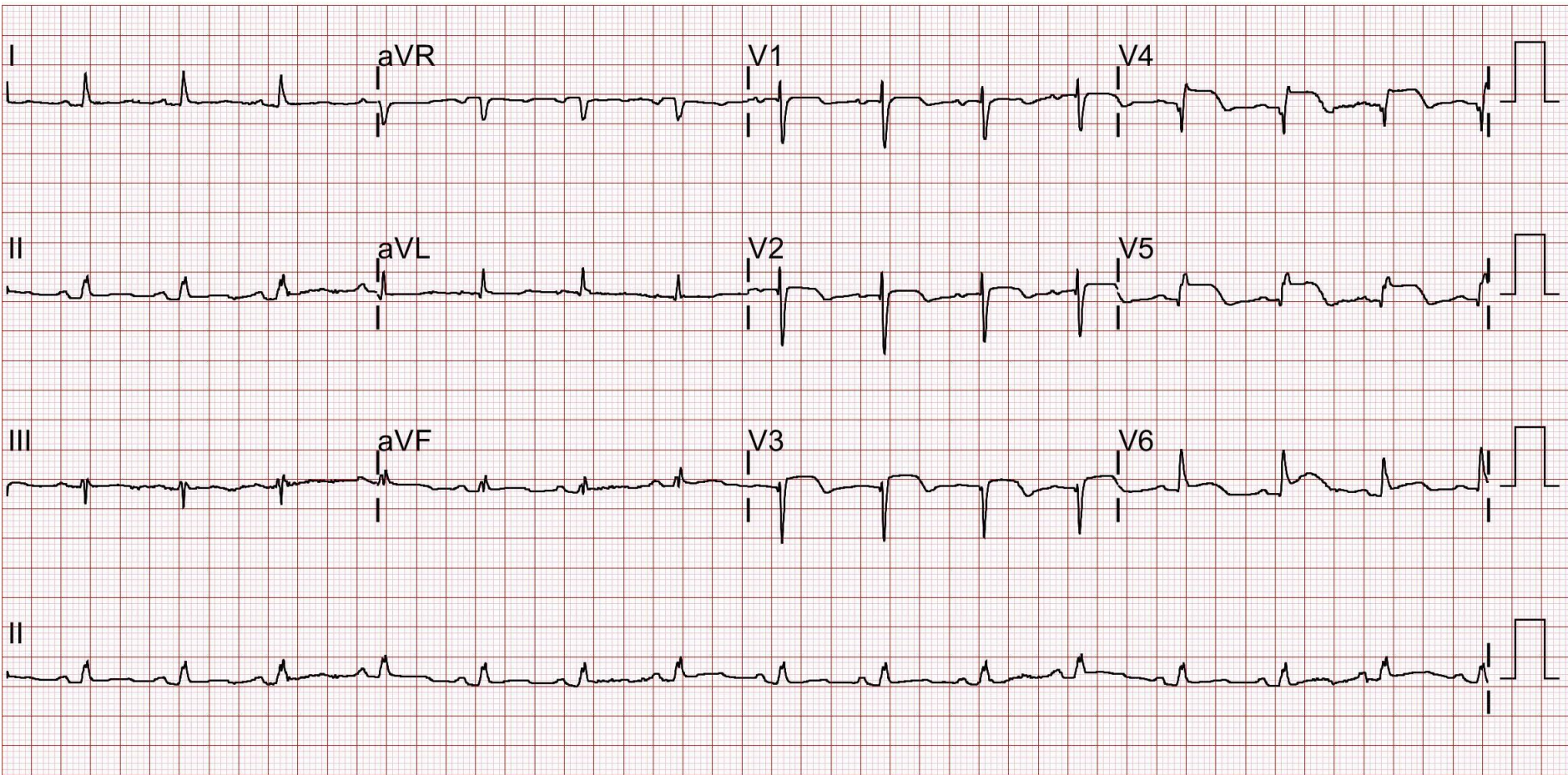
PH090A

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# Coronary Artery Territory



# Anterolateral MI



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

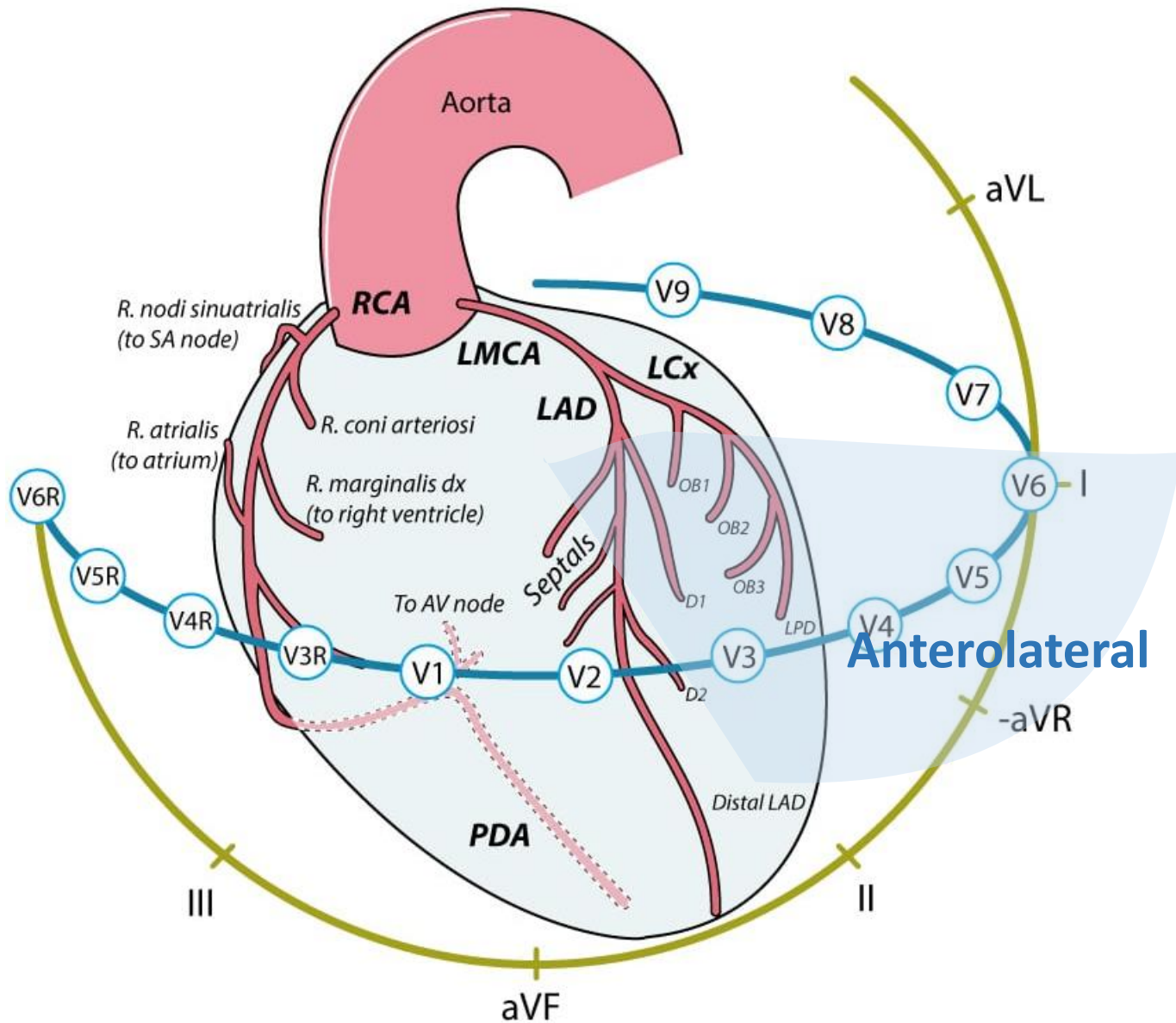
0.05 - 150 Hz

STD 12 LEAD

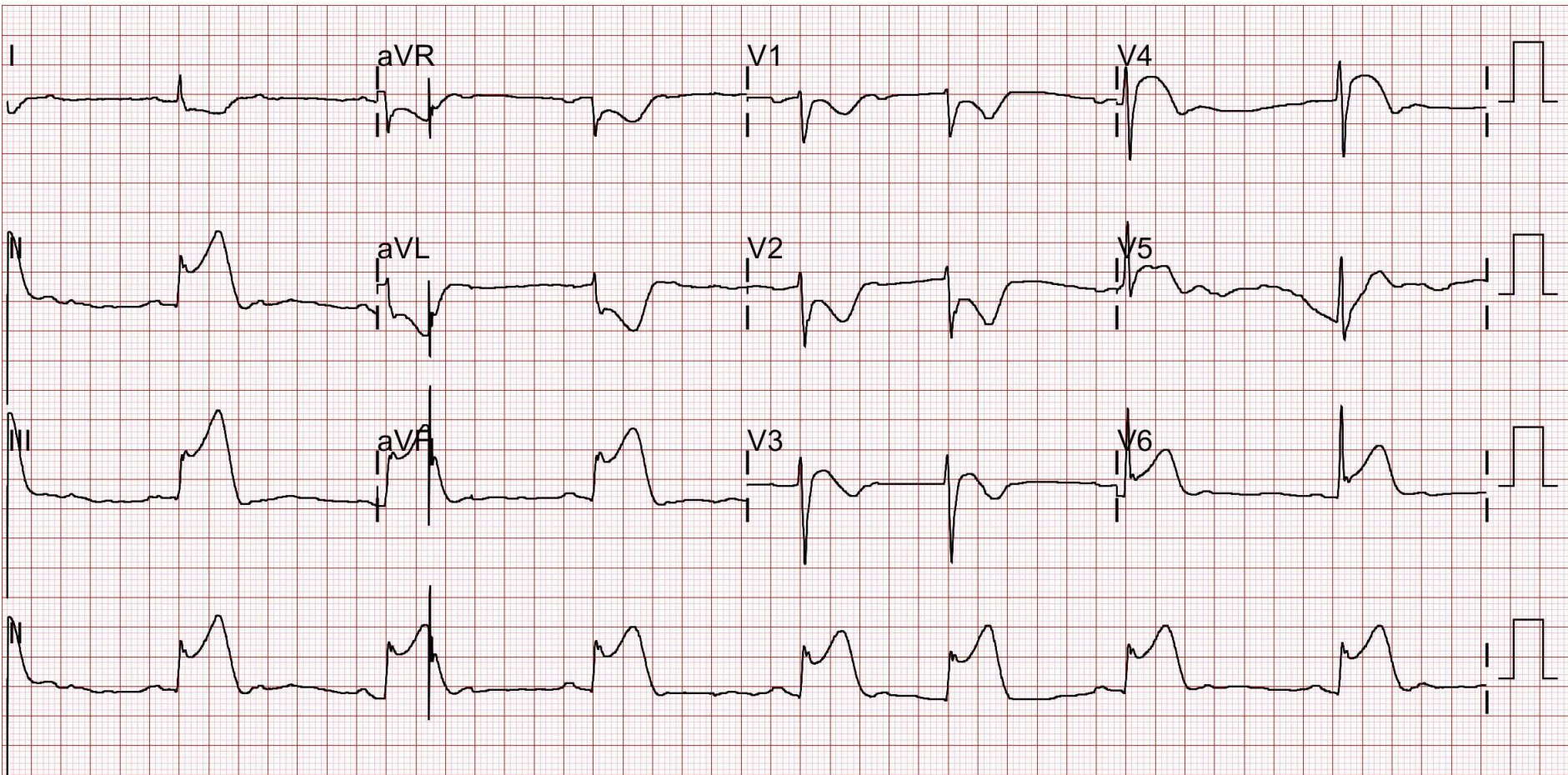
PH090A

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# Coronary Artery Territory



# Inferior/Lateral MI



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

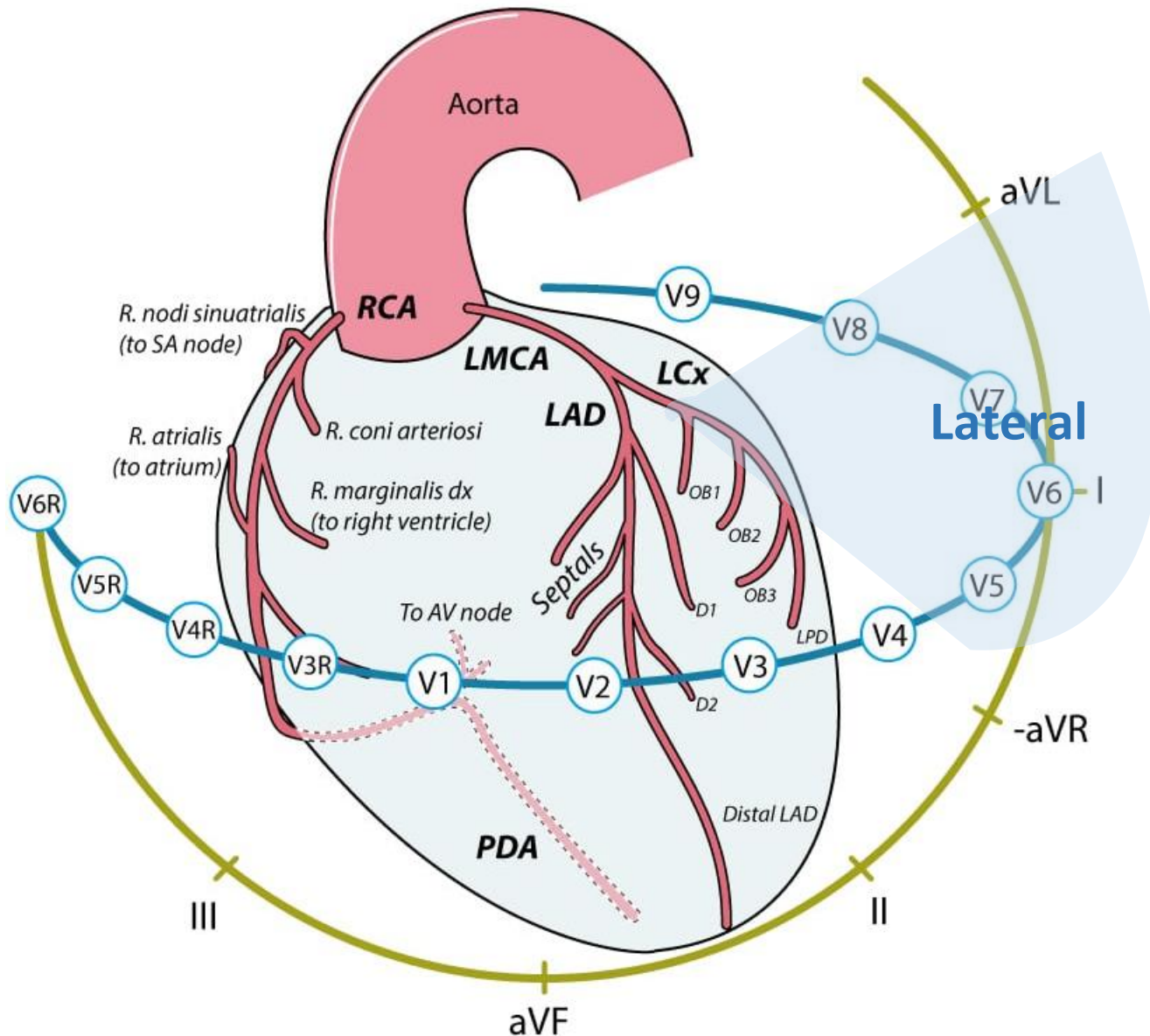
0.05 - 150 Hz

STD 12 LEAD

PH090A

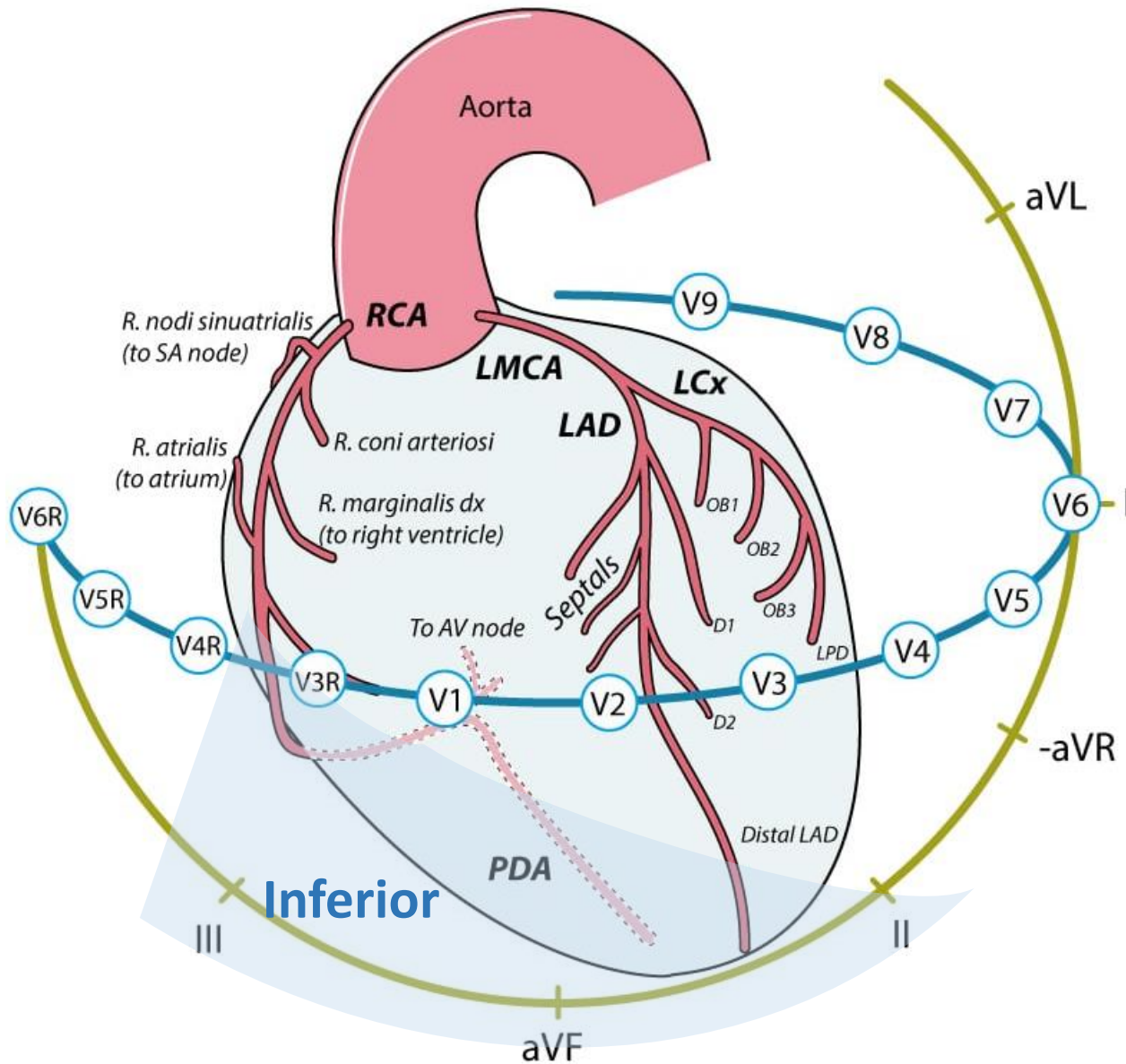
P?

# Coronary Artery Territory

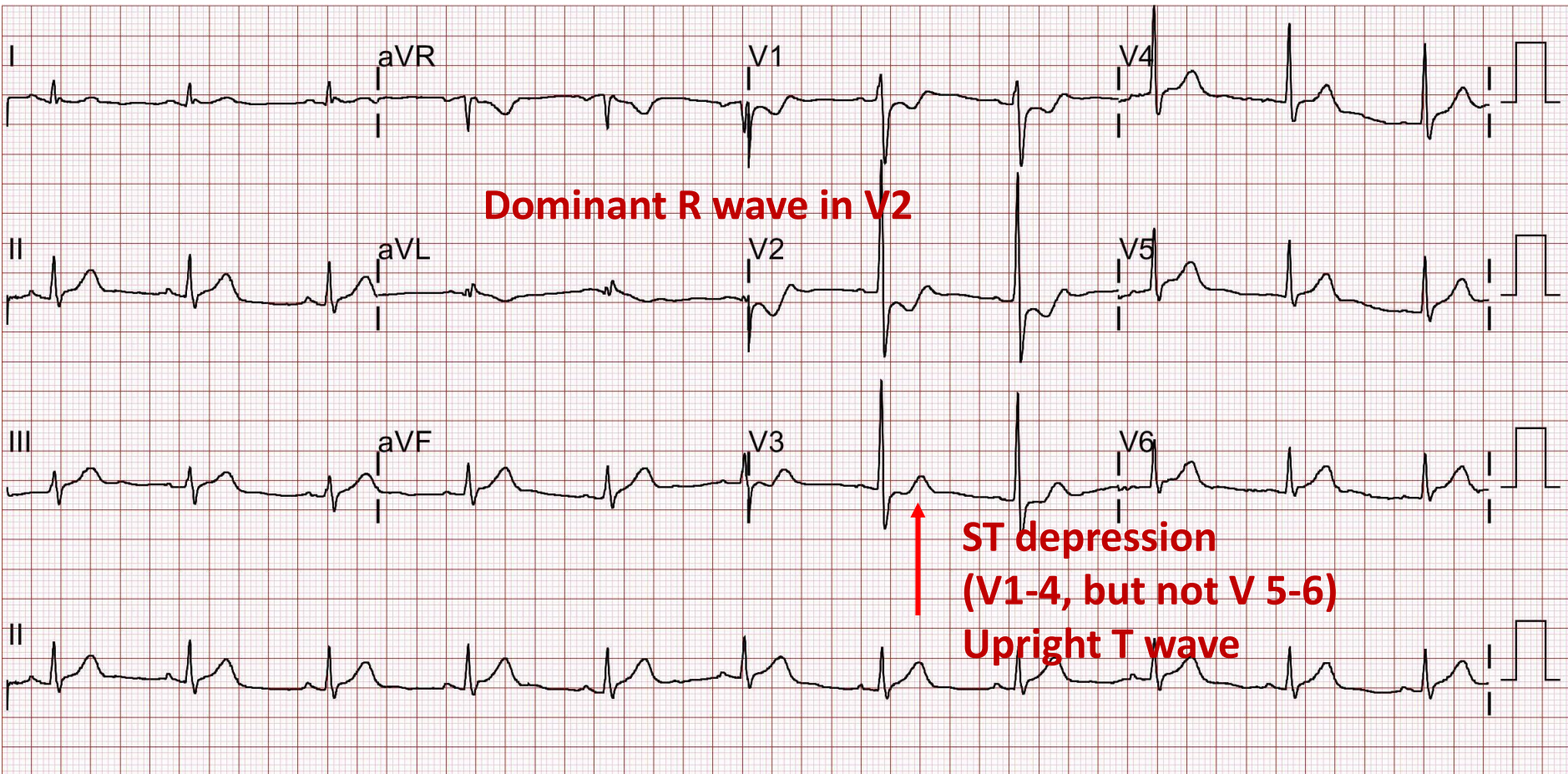




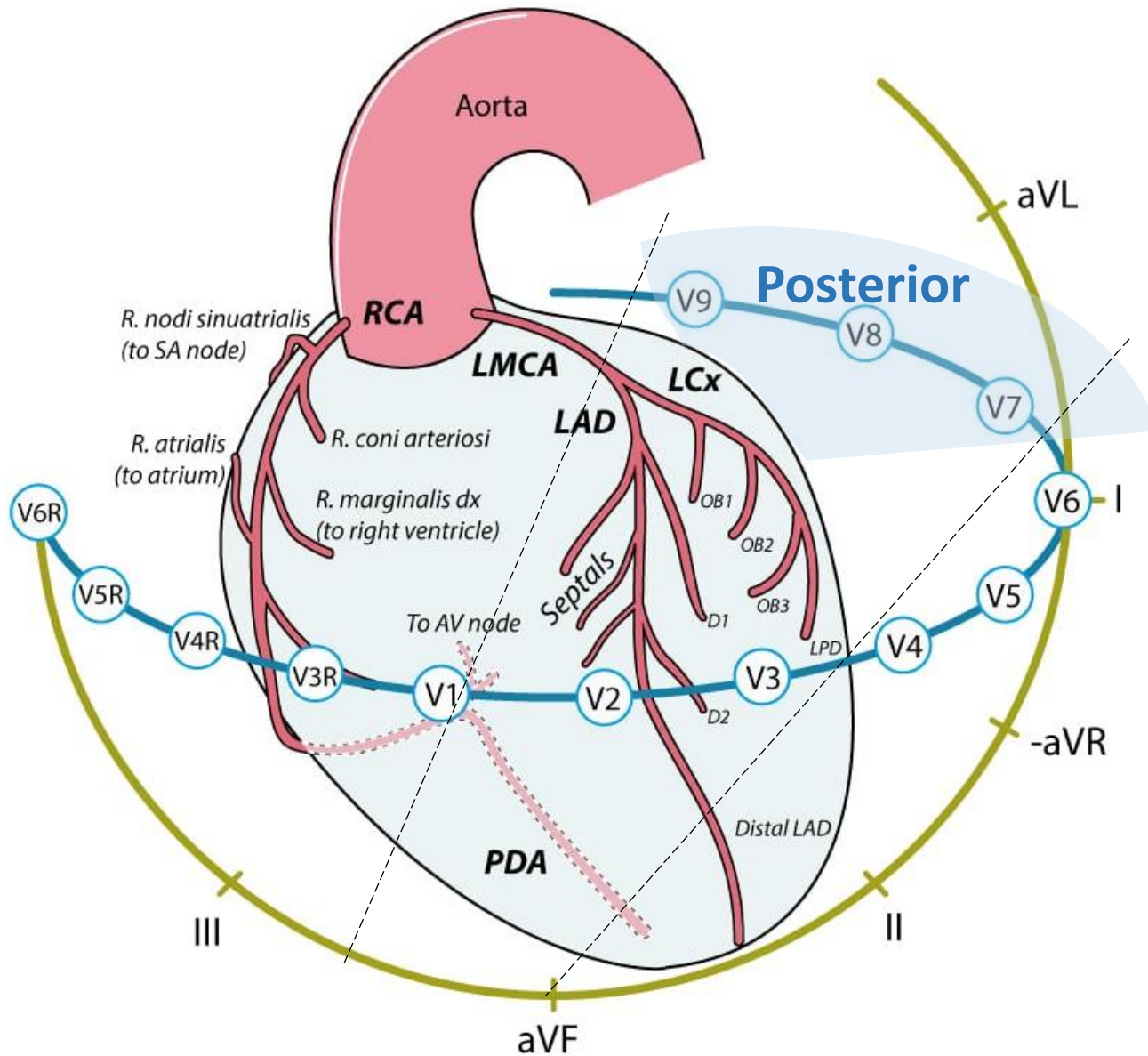
# Coronary Artery Territory



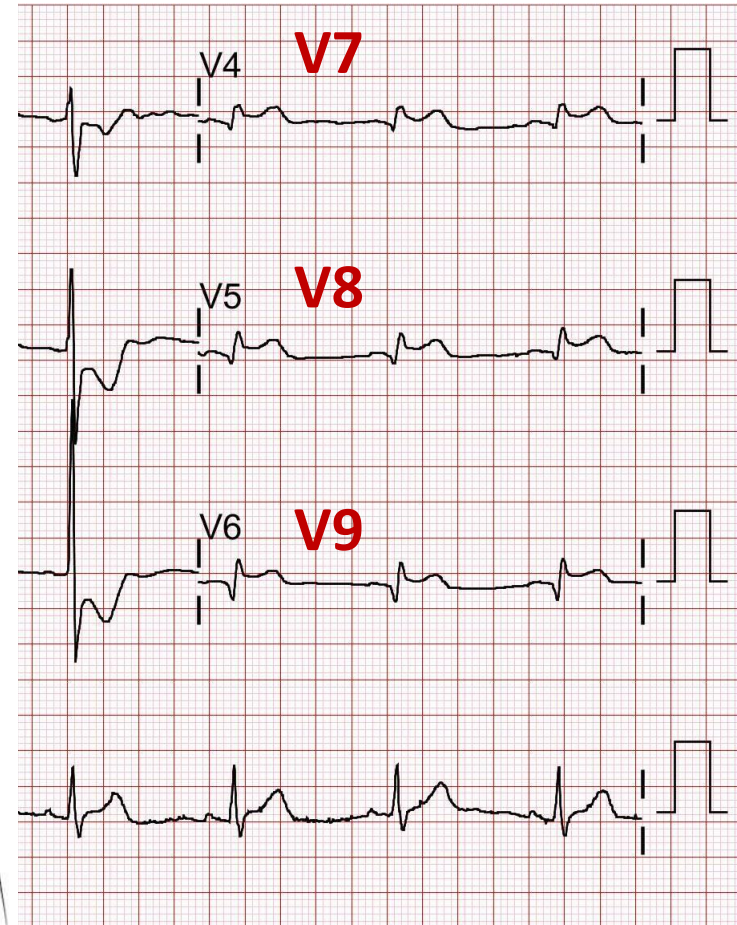
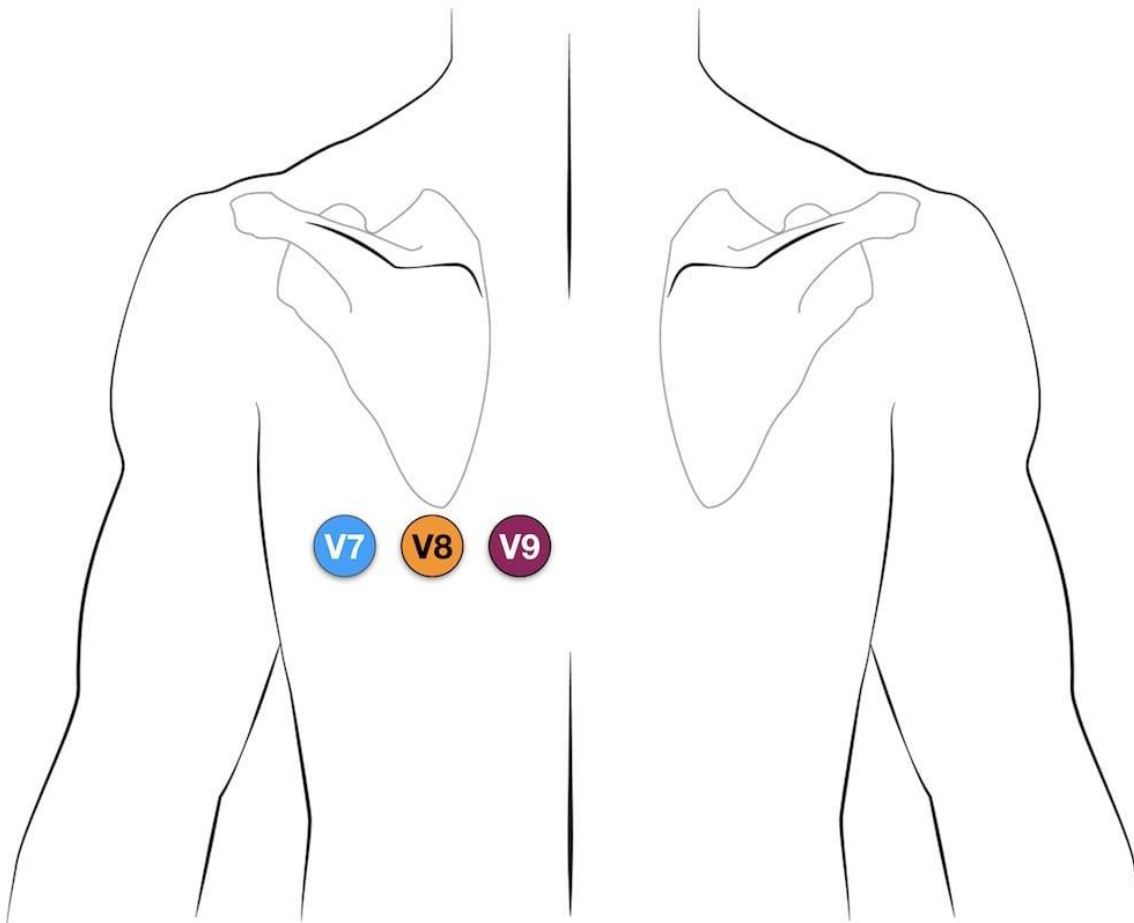
# Posterior MI



# Coronary Artery Territory



# Posterior MI



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

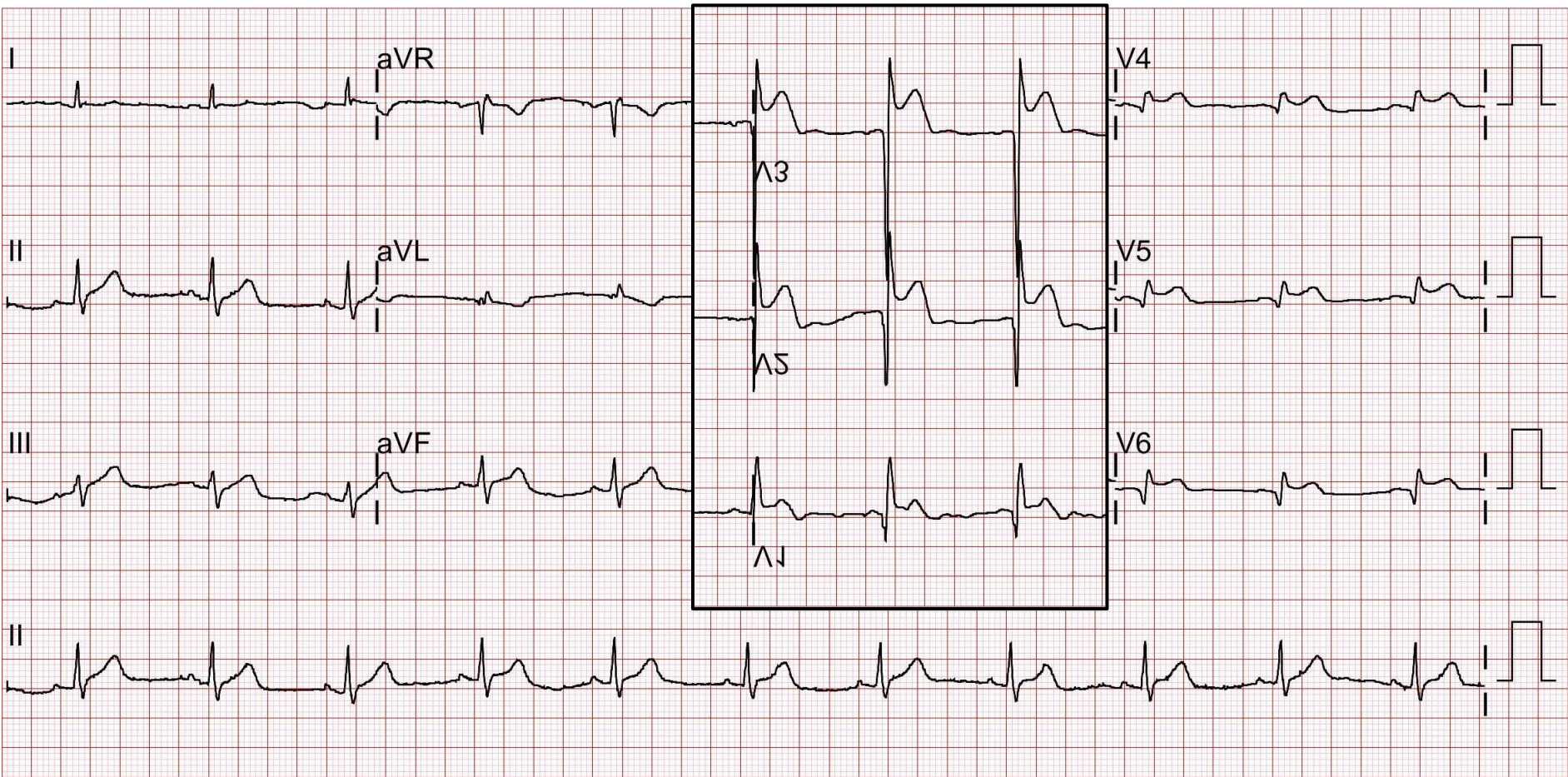
60~ 0.05 - 150 Hz

STD-12

PH100B

P?

# Posterior MI



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

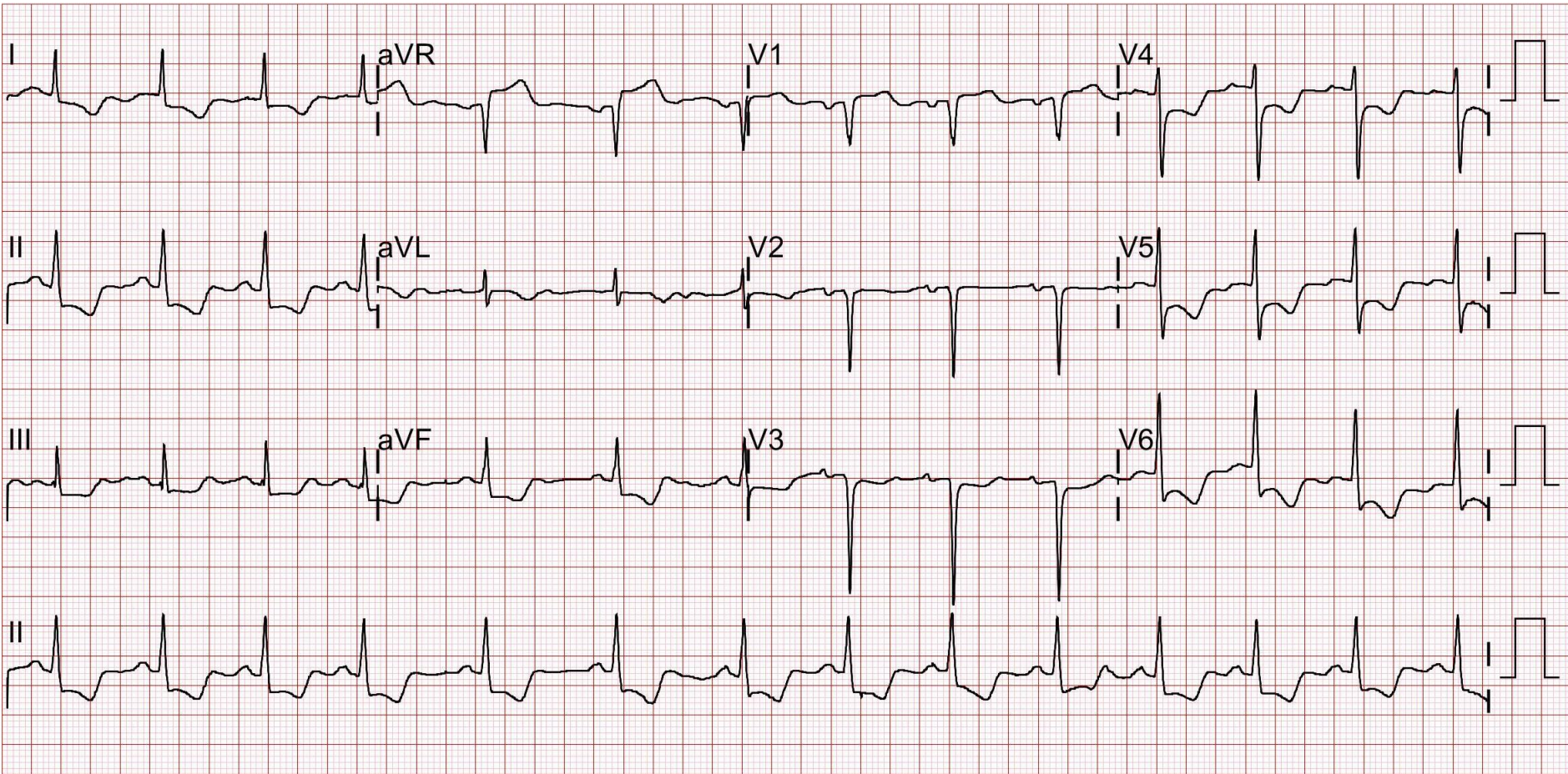
60~ 0.05 - 150 Hz

STD-12

PH100B

P?

# Lt. Main Disease



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

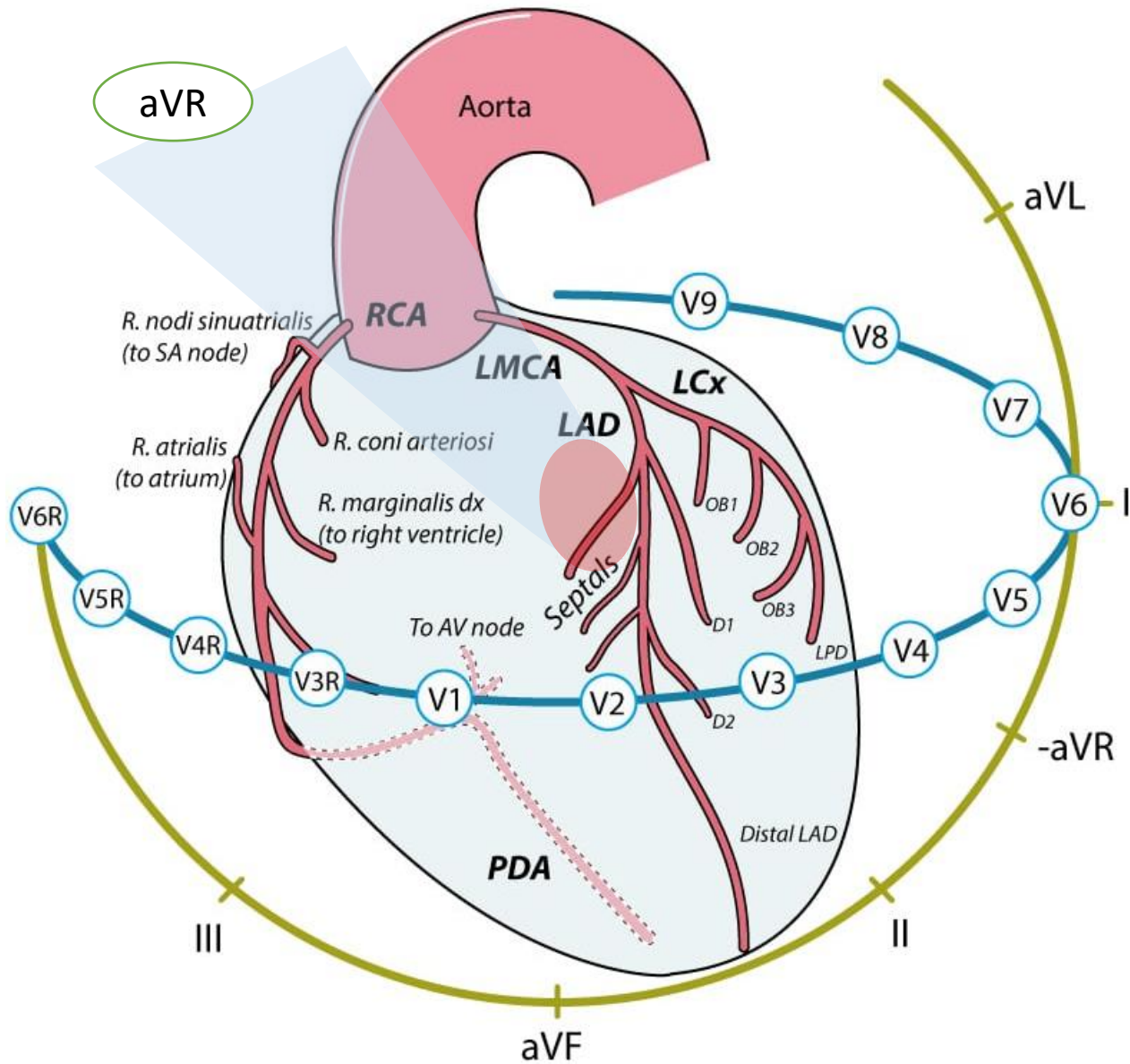
0.05 - 150 Hz

STD 12 LEAD

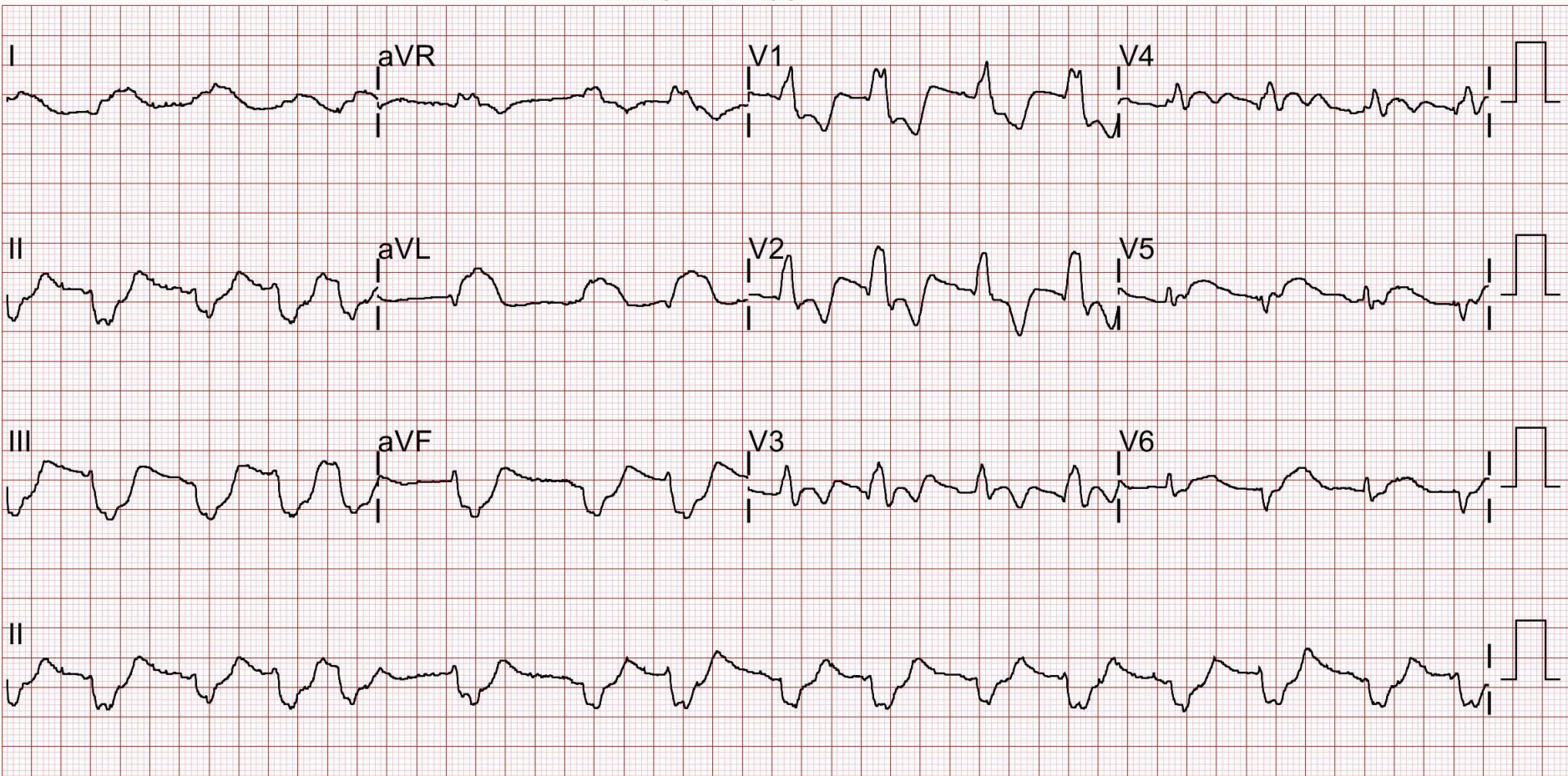
PH090A

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# Lt. Main Disease



# Lt. Main Disease



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

0.05 - 150 Hz

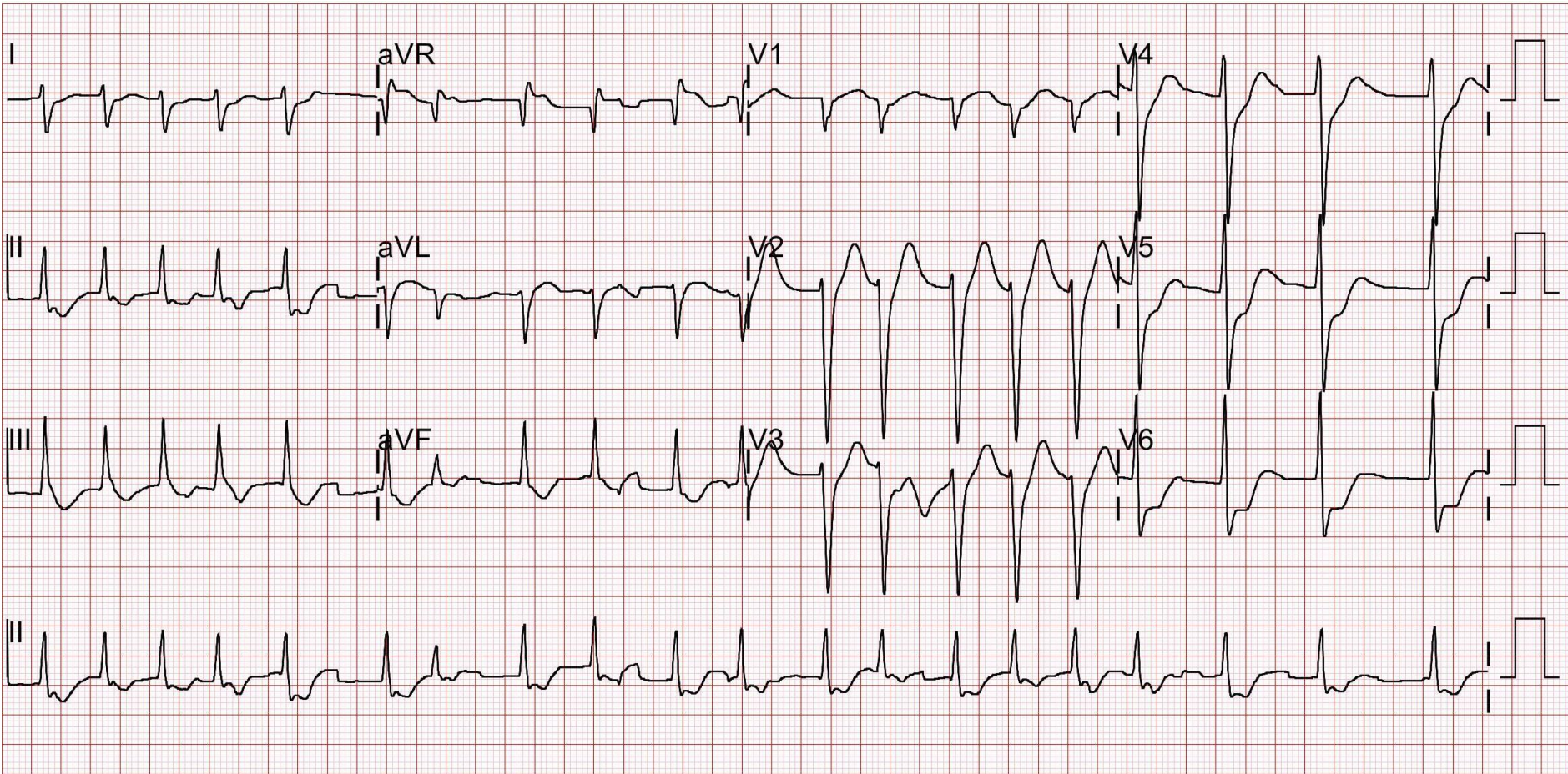
STD 12 LEAD

PH090A

P?



# SAH



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

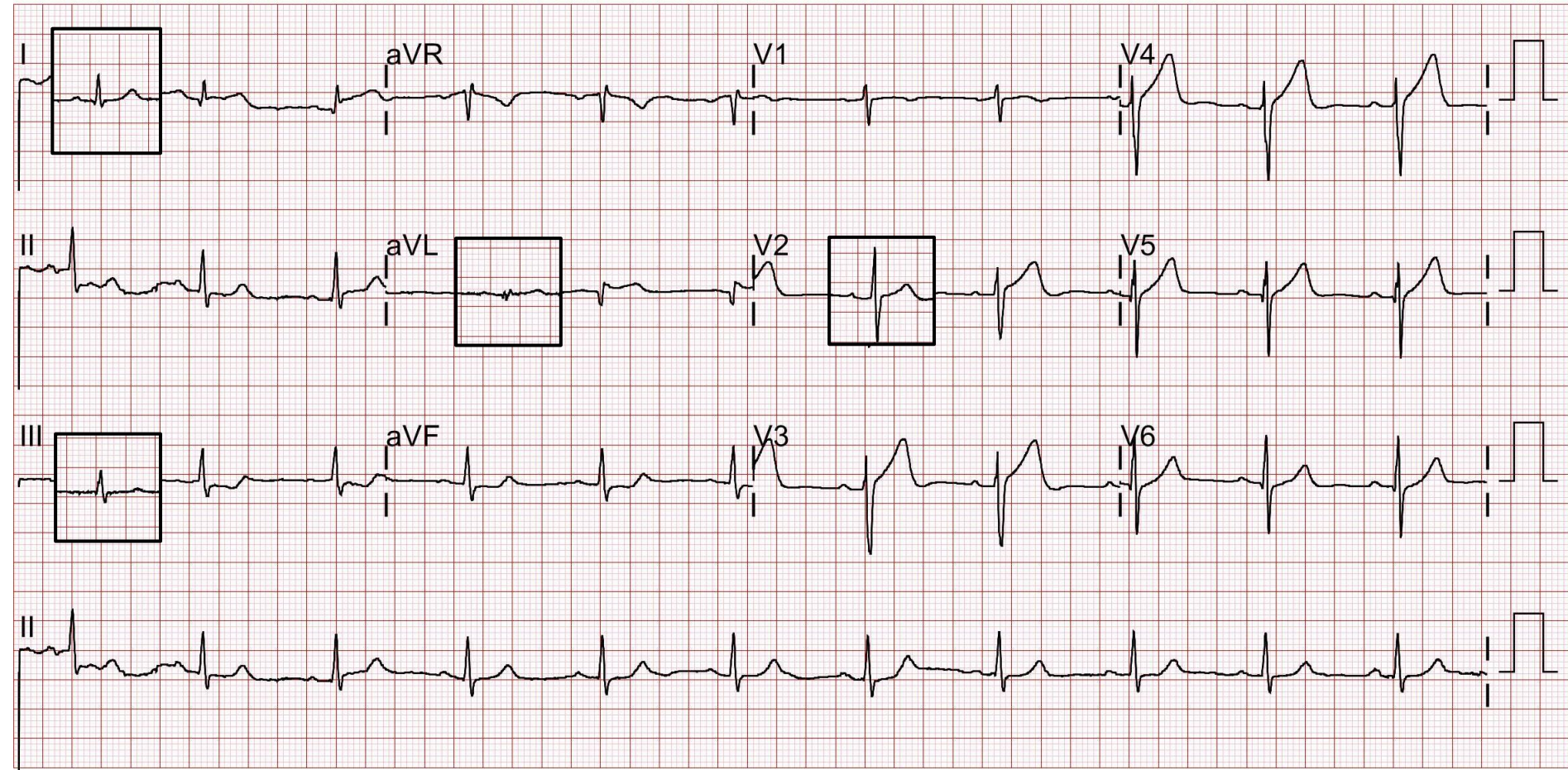
0.05 - 150 Hz

STD 12 LEAD

PH090A

P?

# South Africa Flag sign



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

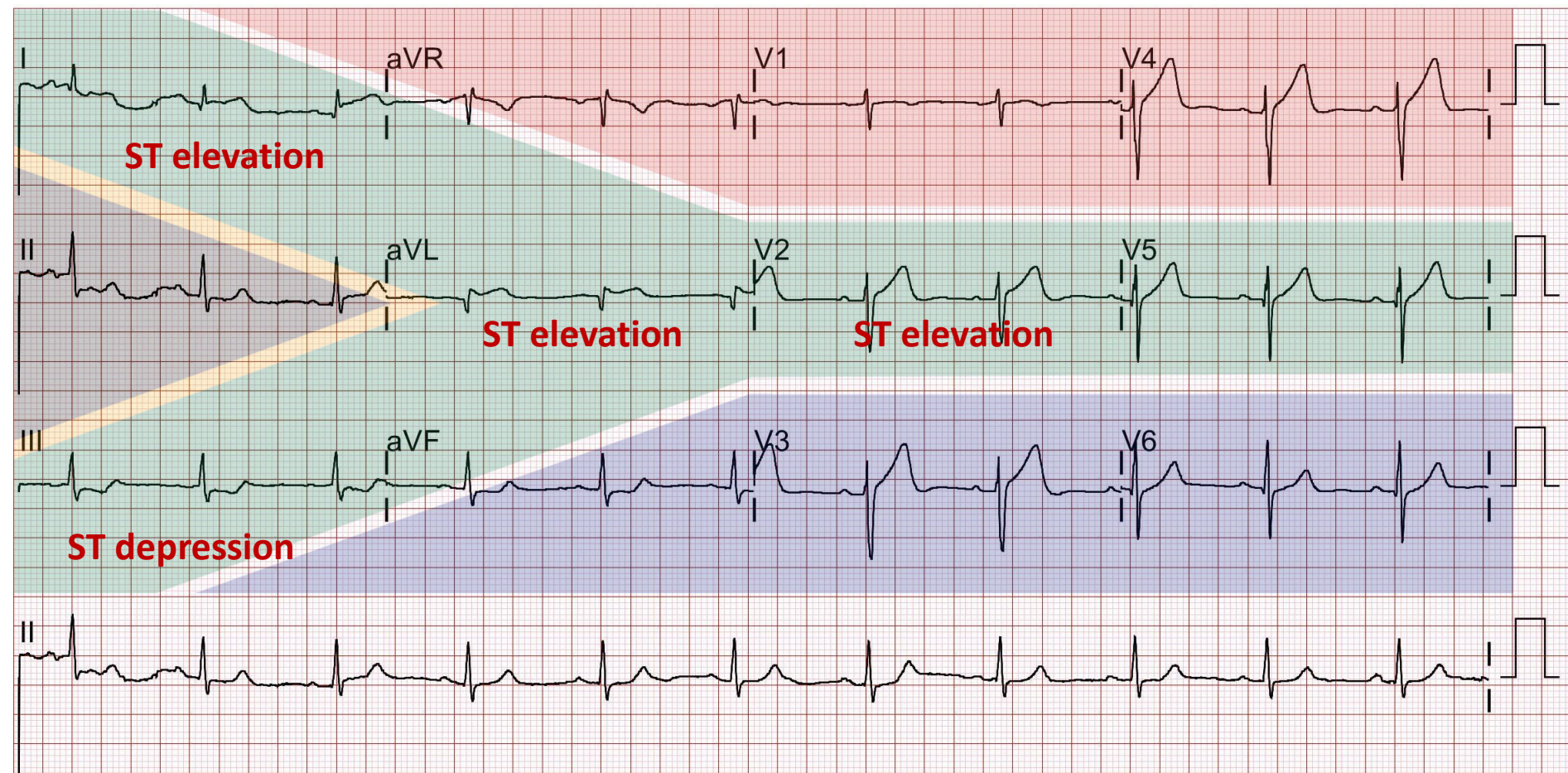
0.05 - 150 Hz

STD 12 LEAD

PH090A

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# South Africa Flag sign



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

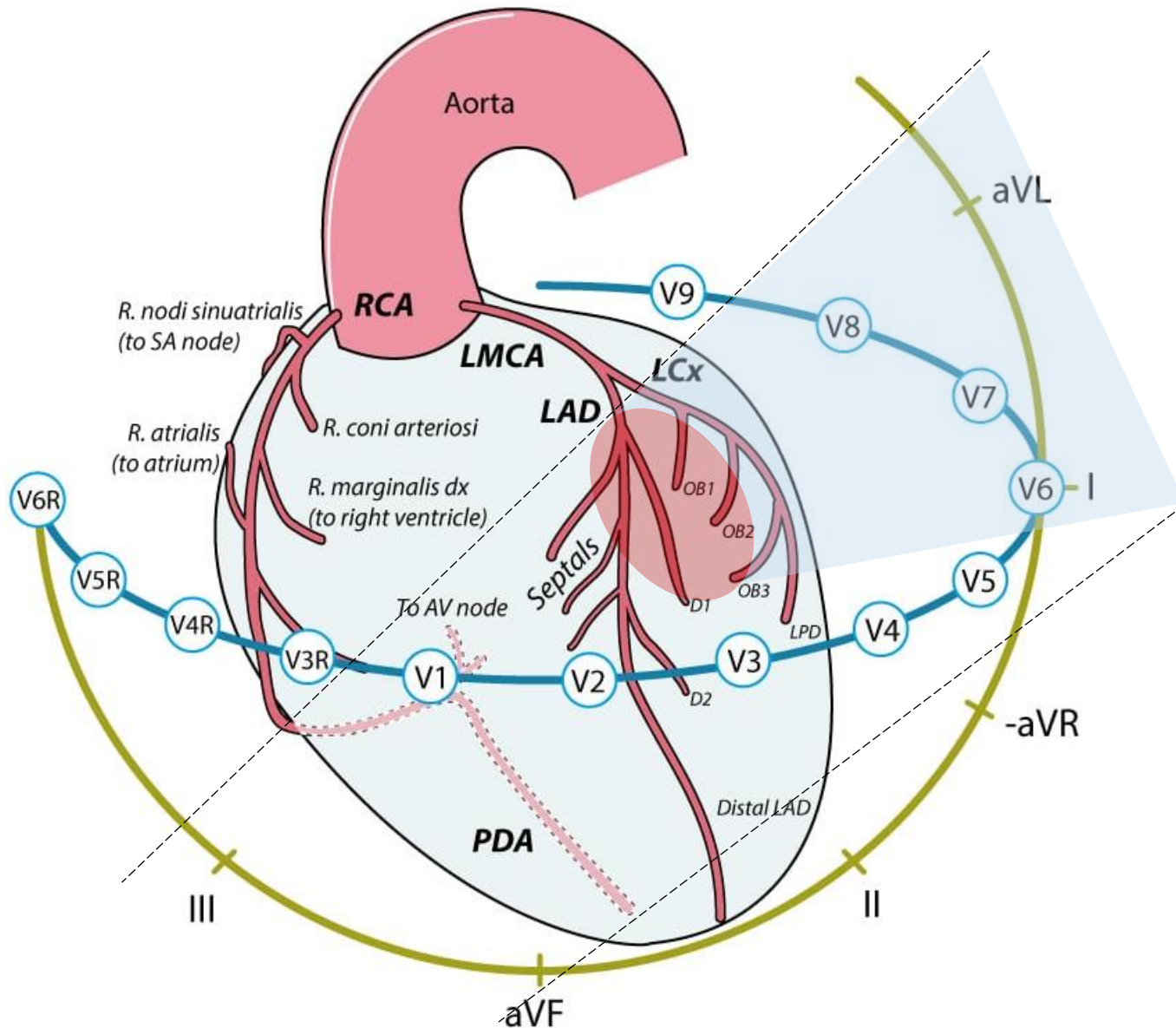
0.05 - 150 Hz

STD 12 LEAD

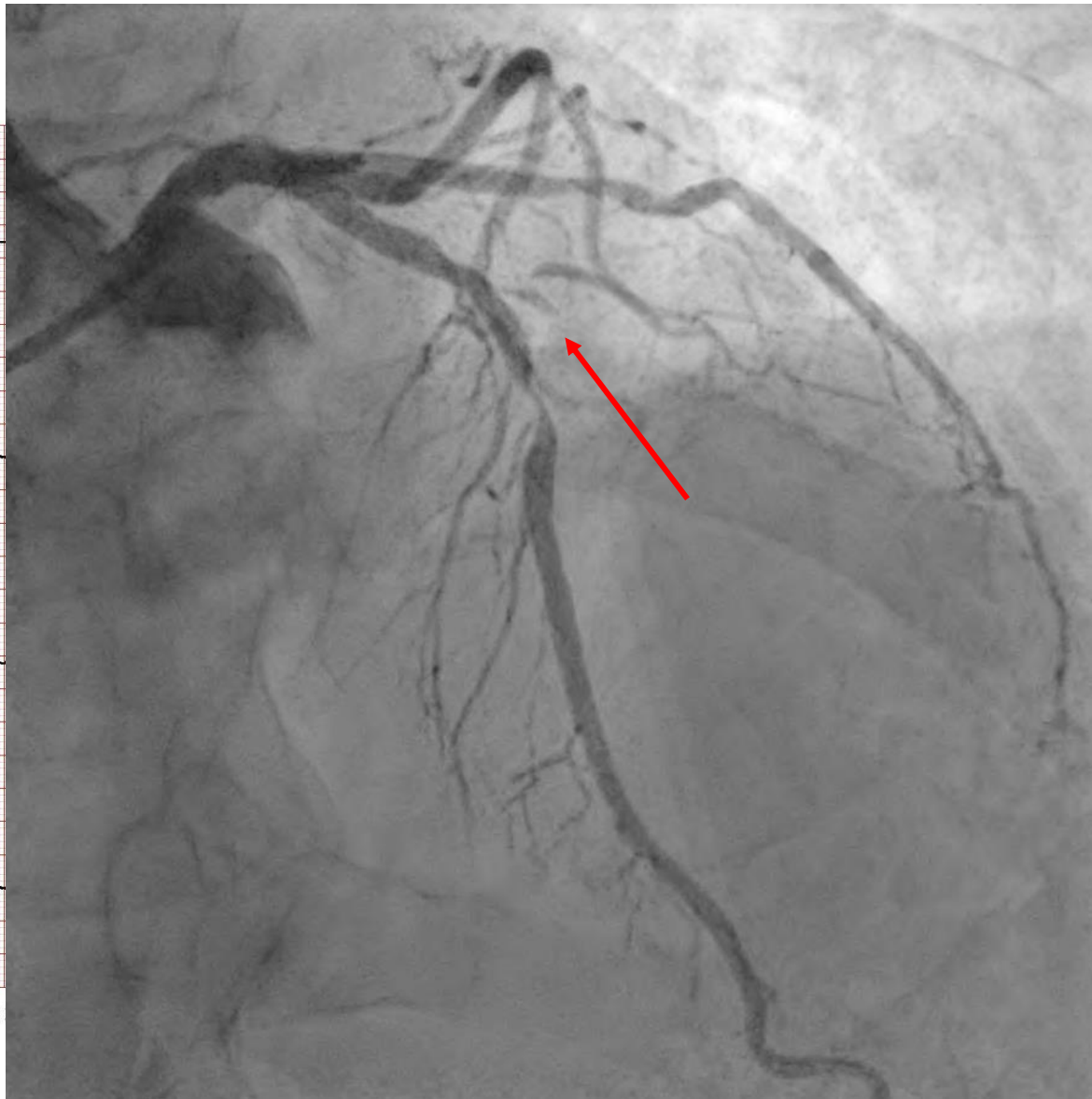
PH090A

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# High Lateral MI

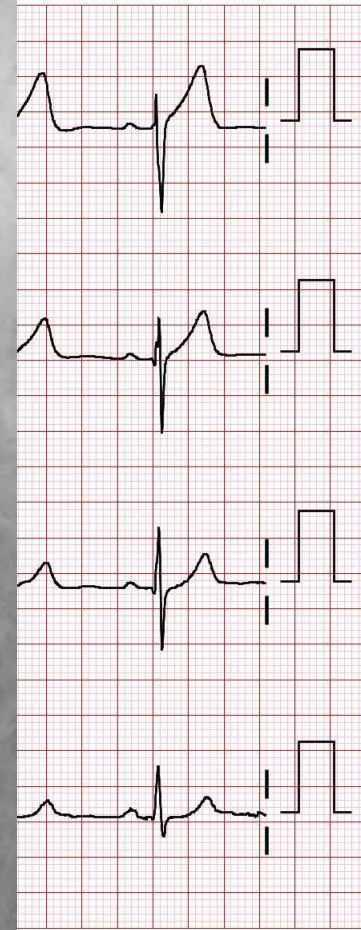


# South Africa Flag sign



Dev

Speed:



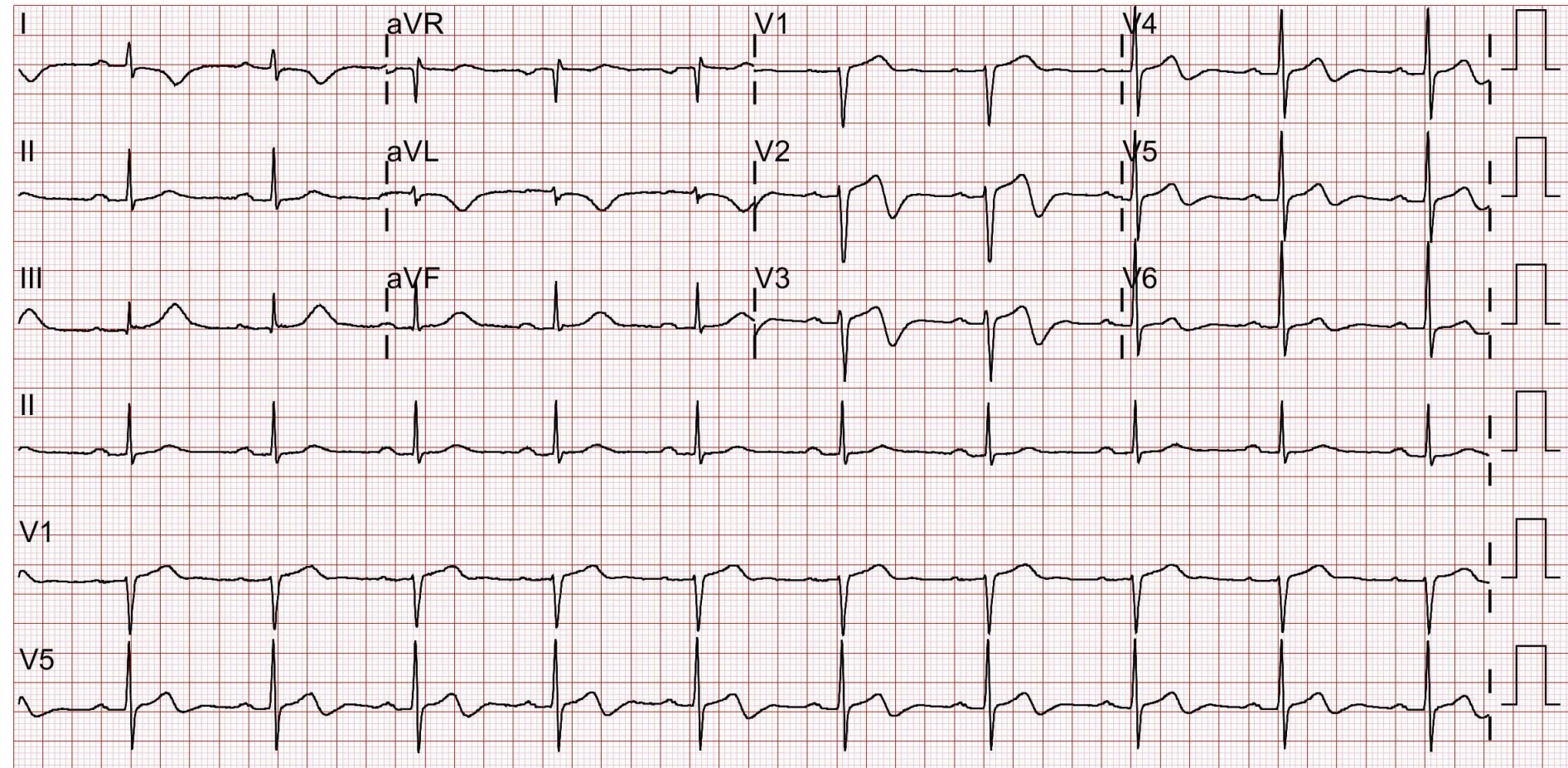
ND

PH090A

P?

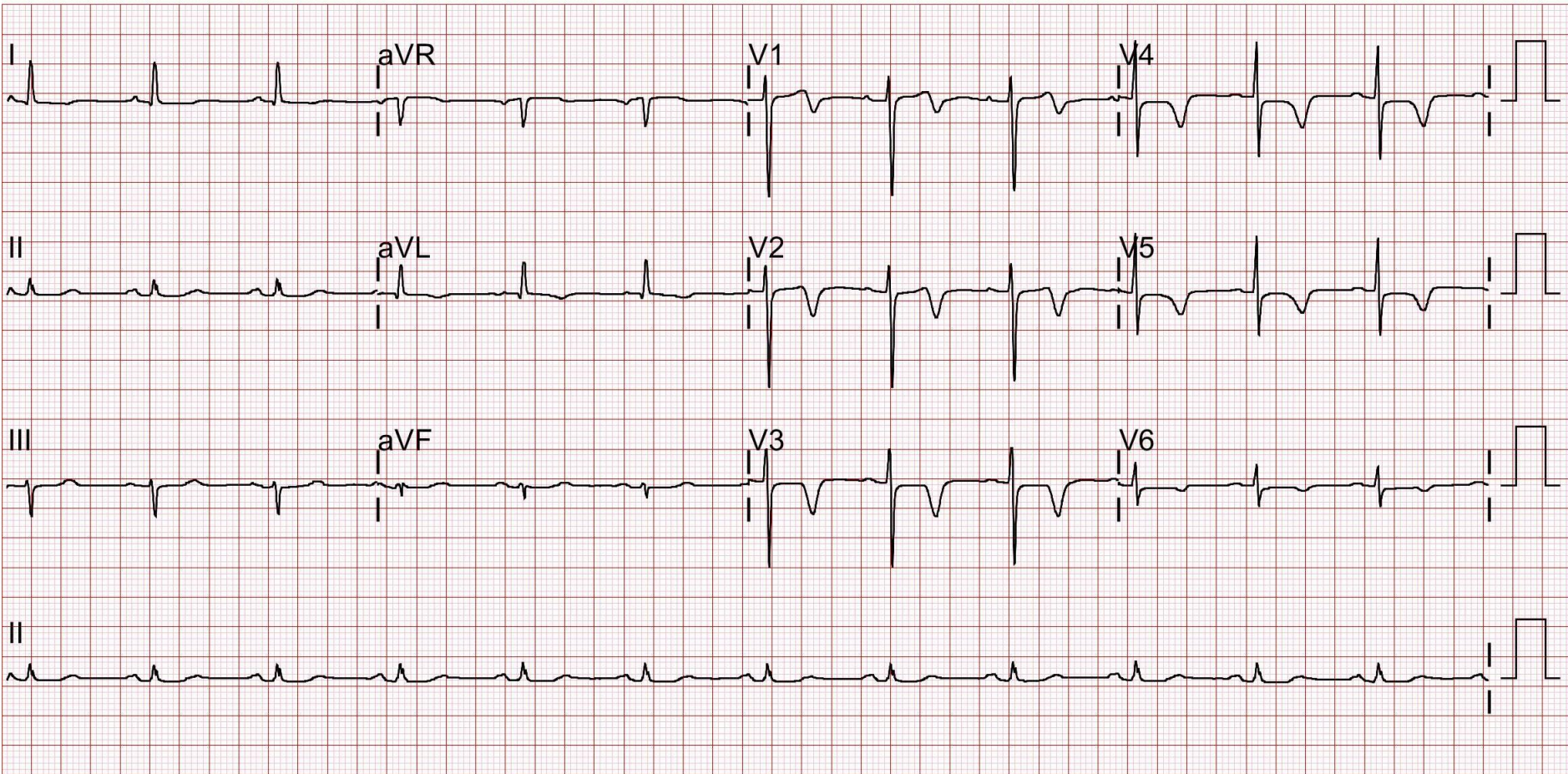
# Wellens Syndrome

A: Biphasic T wave in V2-3



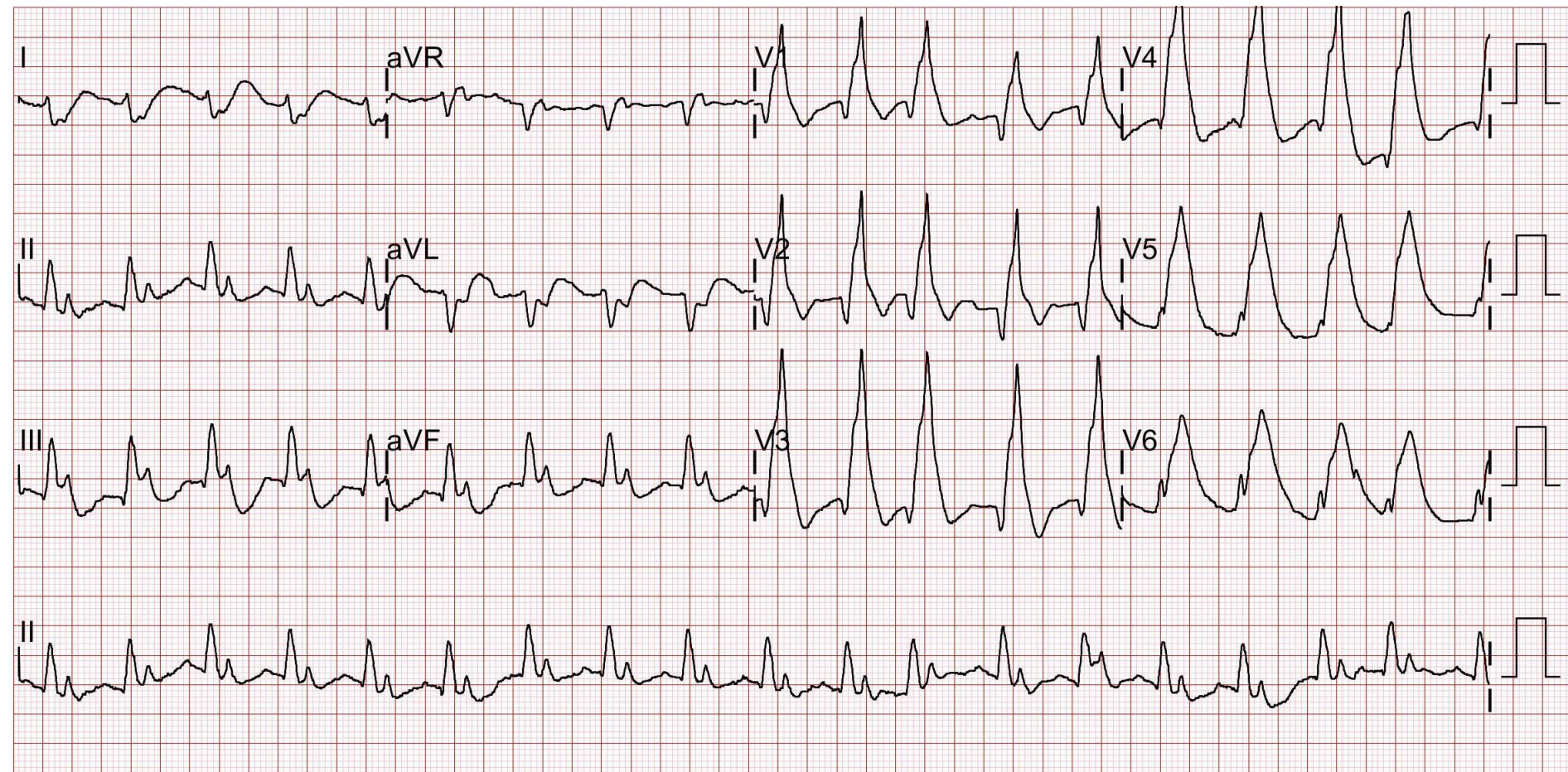
# Wellens Syndrome

B : Deeply inverted T wave in V2-3



# Shark's Fin Sign

Deadly MI



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

0.05 - 150 Hz

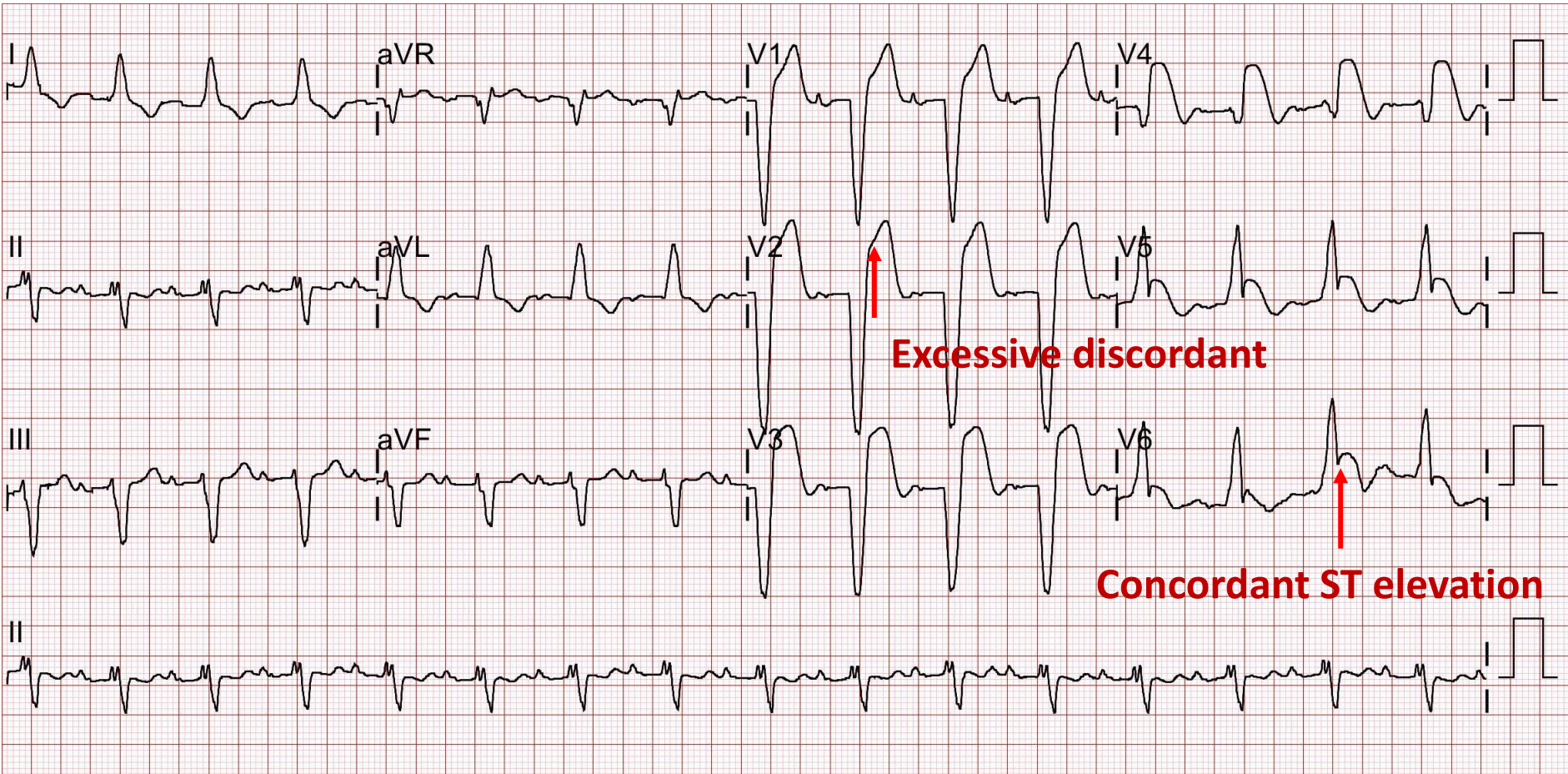
STD 12 LEAD

PH090A

P?



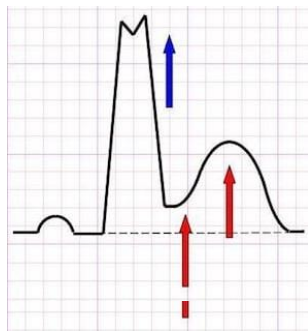
# STEMI in LBBB



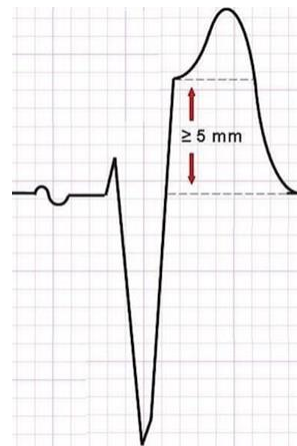
# STEMI in LBBB; Sgarbossa's Criteria

Criterion	Score
ST-segment elevation $\geq 1$ mm & concordant with QRS complex	5
ST-segment depression $\geq 1$ mm in lead V1, V2 or V3	3
ST-segment elevation $\geq 5$ mm & discordant with QRS complex	2

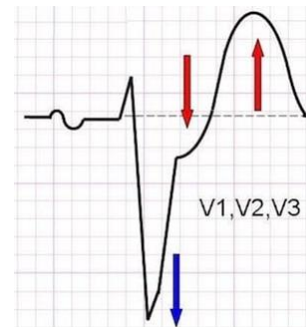
If Sgarbossa's score  $\geq 5$ , sensitivity 78%, specificity 90%



**Concordant**

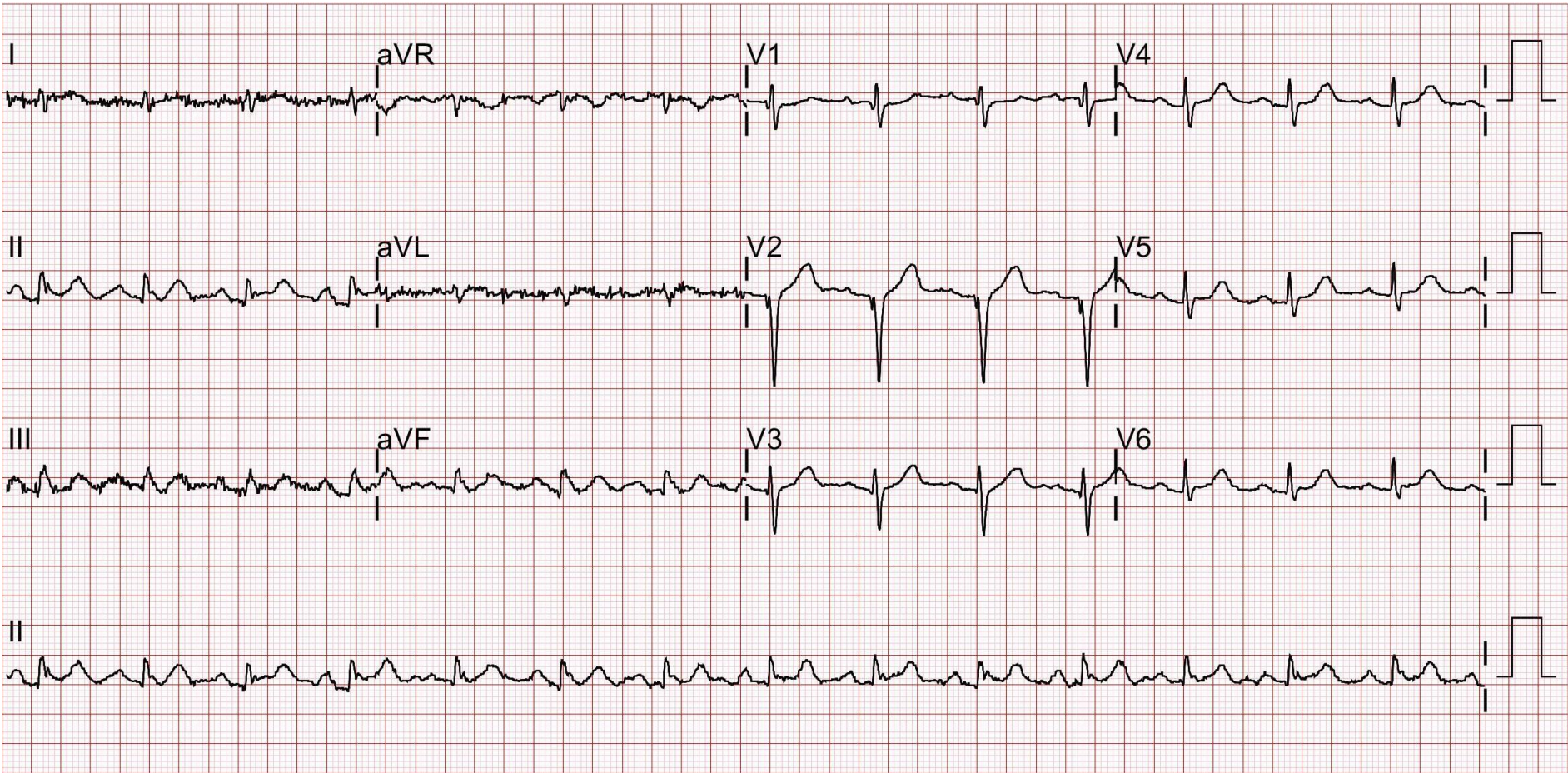


**Discordant**



**Concordant**

# Q wave



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

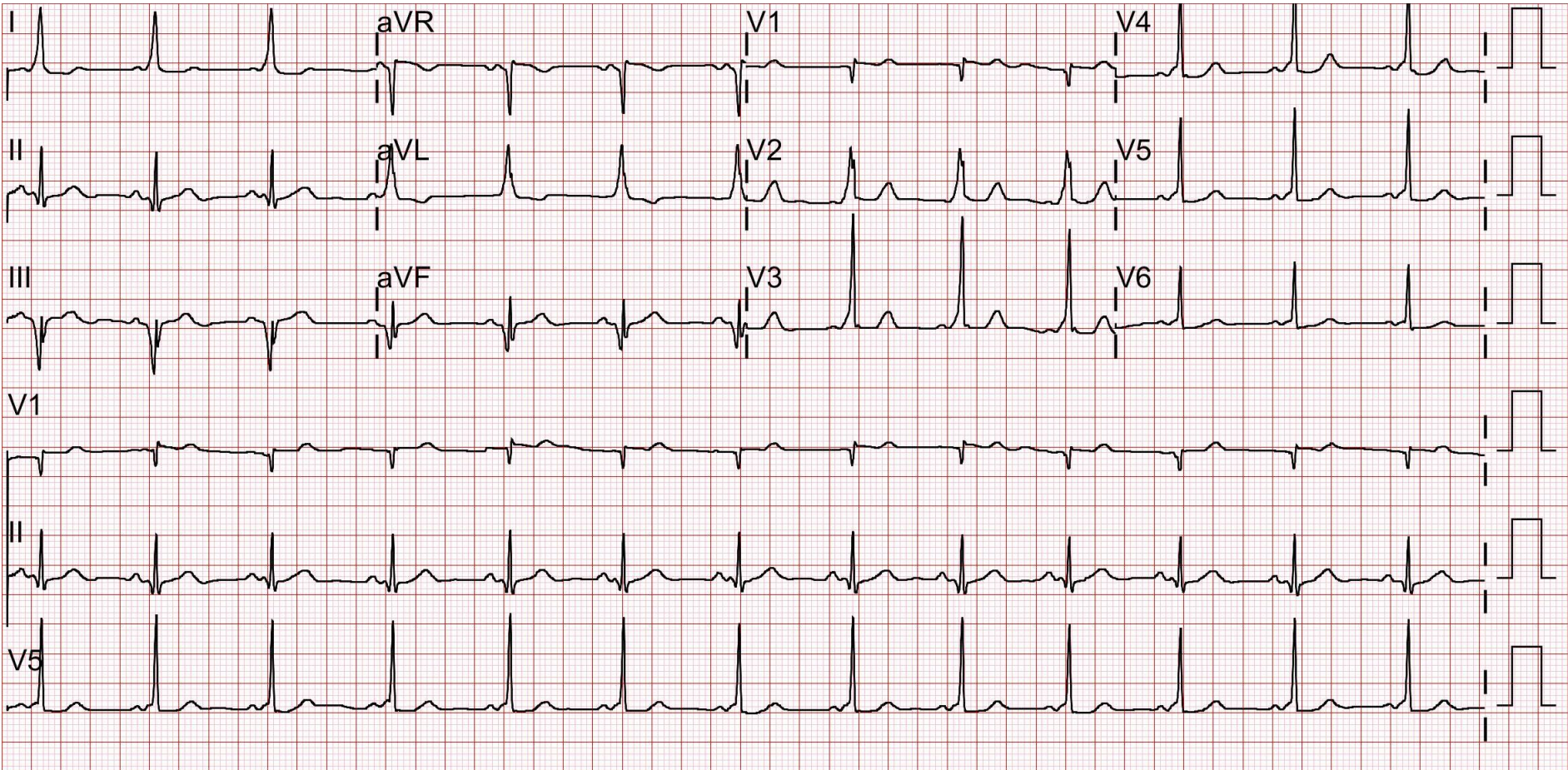
60~ 0.05 - 150 Hz

STD-12

PH100B

P?

# WPW



Dev

Speed: 25 mm/sec

Limb: 10.00 mm/mV

Chest: 10.00 mm/mV

60~ 0.05 - 150 Hz

STD-12

PH100B

P?

# Summary

- 4 Major Factors
  - 1) the duration of the ischemic process
  - 2) extent (transmural vs nontransmural)
  - 3) topography
  - 4) the presence of other underlying abnormality
- Try to obtain previous ECG, if possible
- Serial ECG
- Consider aVR lead, posterior MI, STEMI equivalent

**Thank You for Your Attention**