



AKUT KORONER SENDROMDA EKG



Akut Koroner Sendrom

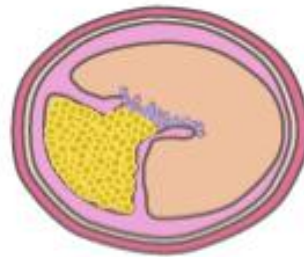


- ✓ Koroner kan akımında ani azalmaya bağlı gelişen, akut miyokard iskemisi ve/veya infarktı ile uyumlu çeşitli durumları tanımlayan bir terimdir

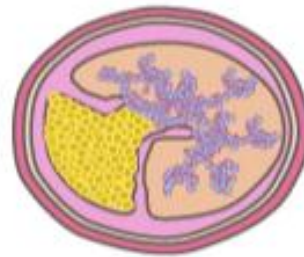
Akut Koroner Sendrom



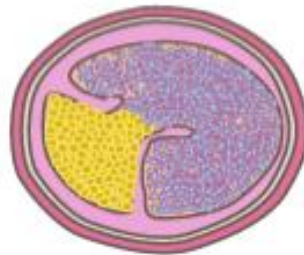
Image: Thrombus Formation



Platelet Adhesion



Platelet Aggregation

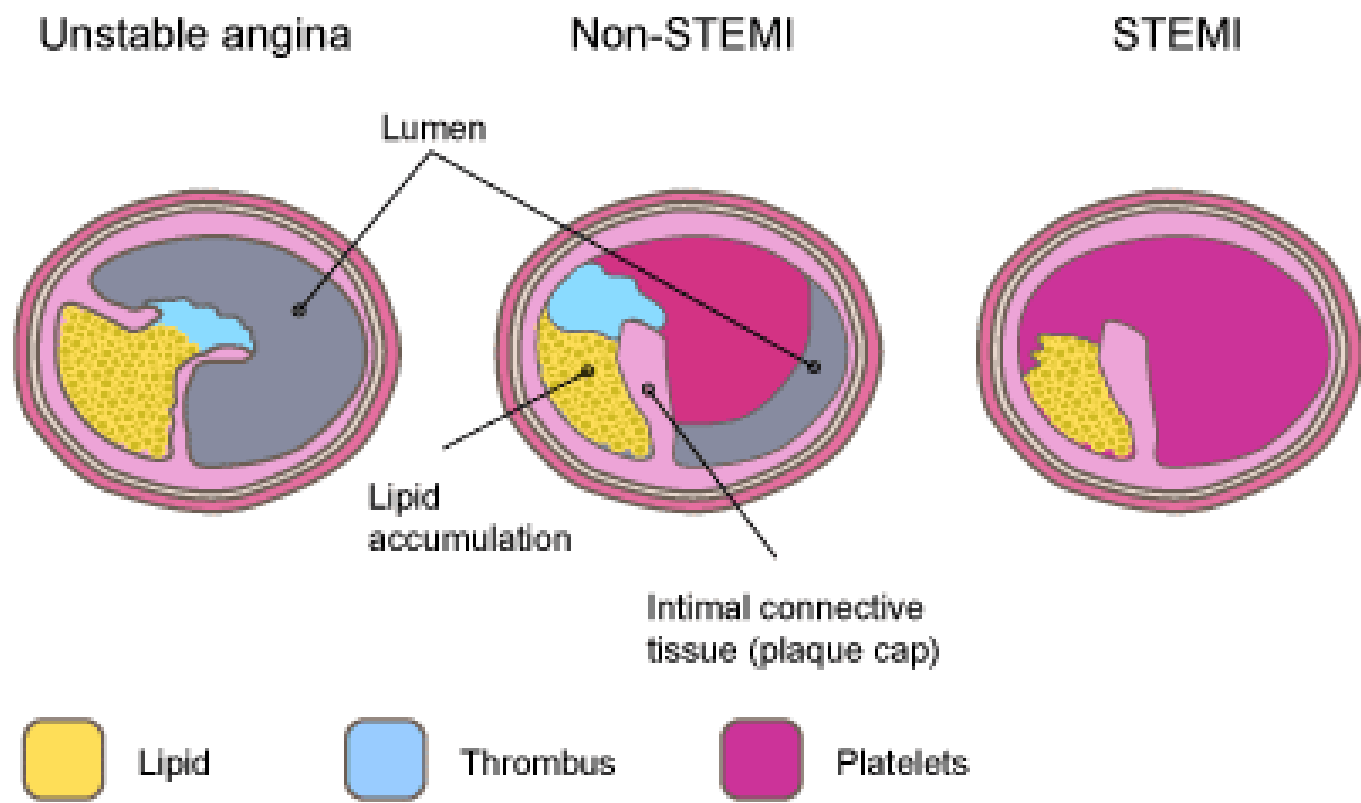


Complete Occlusion

Akut Koroner Sendrom



Image: Acute Coronary Syndromes





ECG

NSTE-ACS

No significant ST-segment elevations.



DIAGNOSTIC CRITERIA: All acute coronary syndromes without significant ST elevations are classified as NSTE-ACS. In most cases there are ST-segment depressions and/or T-wave inversions. A minority of patients with NSTE-ACS display normal ECG through the course.

PATHOPHYSIOLOGY: Partial occlusion causing ischemia located to the subendocardium (black area in figure above).

STE-ACS

Significant ST-segment elevations



DIAGNOSTIC CRITERIA: All acute coronary syndromes with significant ST elevations are classified as STE-ACS. The ECG will usually also display ST-segment depressions and/or T-wave inversions.

PATHOPHYSIOLOGY: Total occlusion in a coronary artery. This causes extensive ischemia which is transmural (i.e stretches from the endocardium to the epicardium). These infarctions are large and usually lead to development of pathological Q-waves in leads with ST elevations.

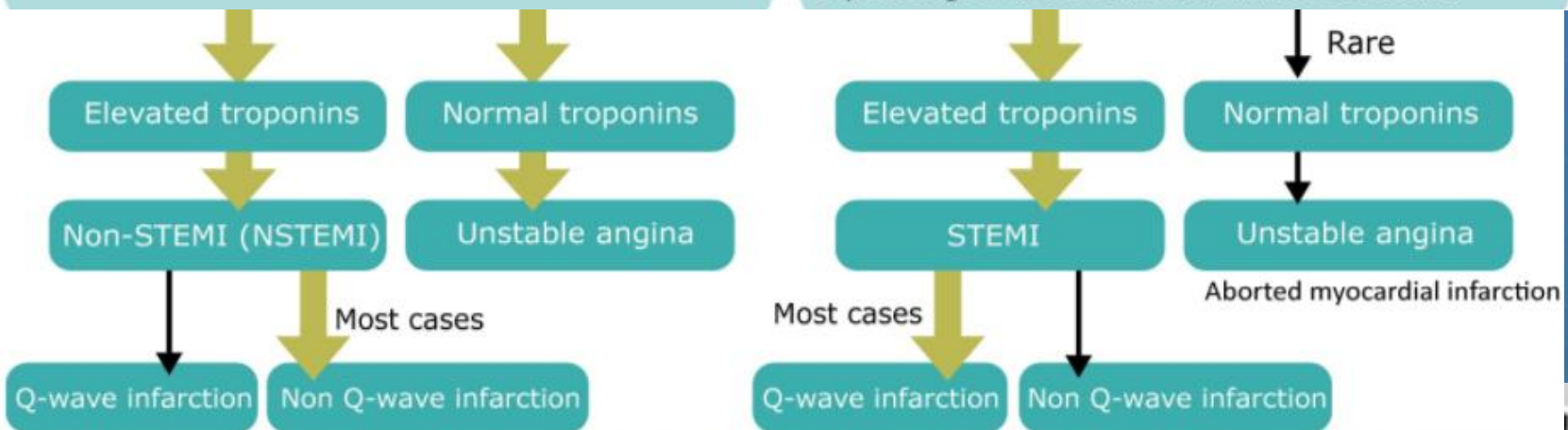
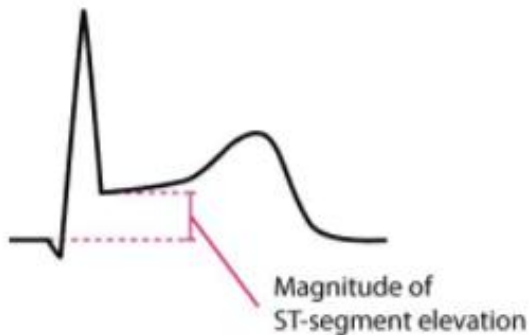


Figure 1. Flow-chart showing the natural course of coronary artery disease and classification of acute coronary syndromes into STEMI, NSTEMI and unstable angina using ECG criteria.

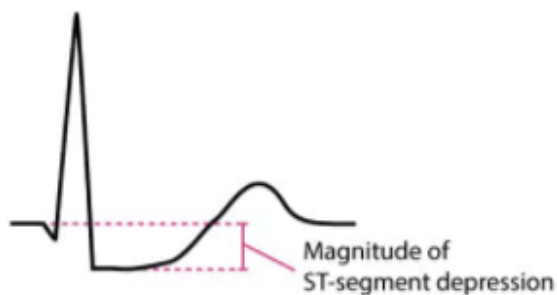
Akut Koroner Sendrom



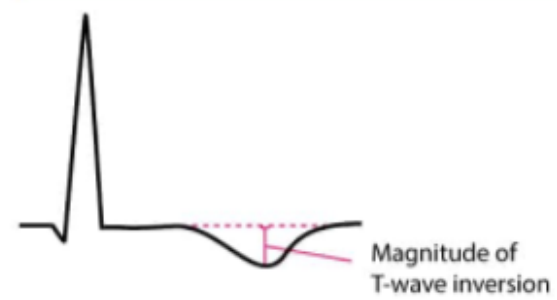
ST segment elevation



ST segment depression



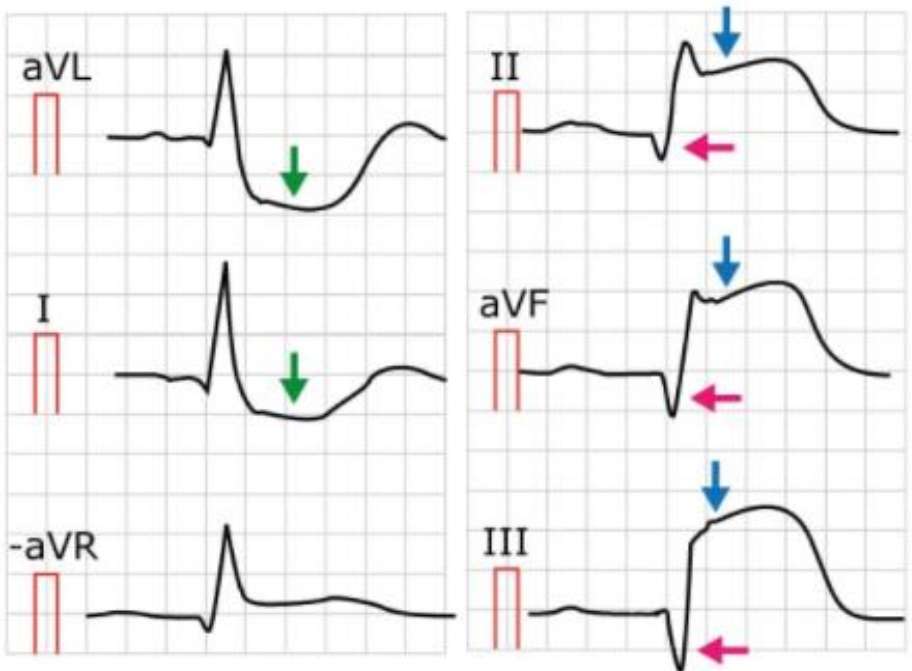
T-wave inversion



Akut Koroner Sendrom

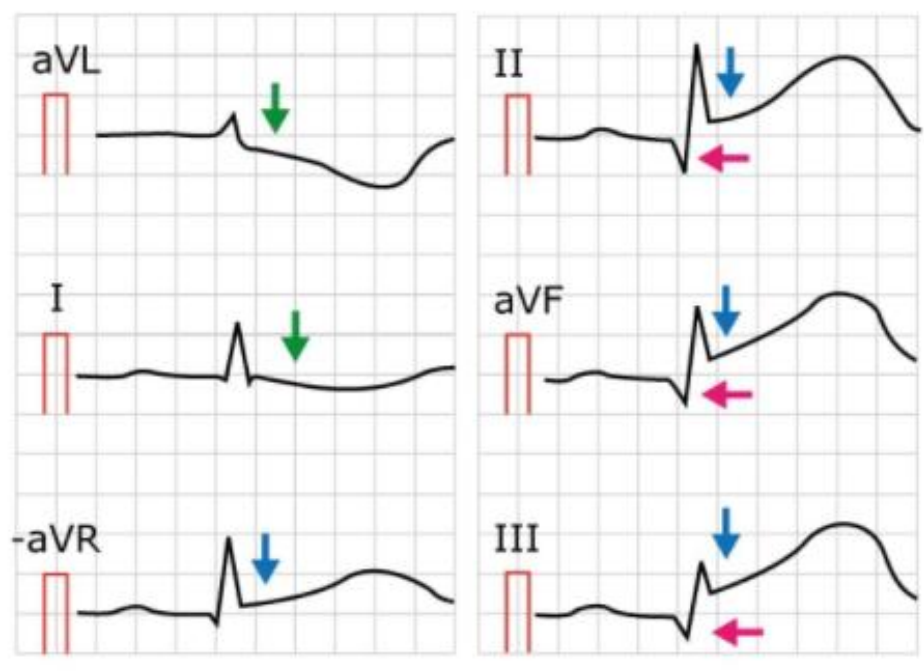


A Acute STE-ACS (STEMI) example 1



60 year old male with retrosternal chest pain. ECG shows ST segment elevations in inferior leads (II, aVF and III). There are reciprocal ST segment depressions in aVL and I. There are also pathological Q-waves in the inferior leads.

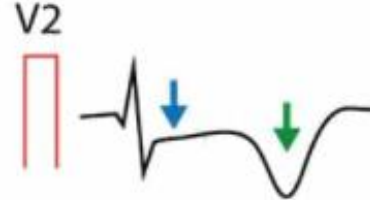
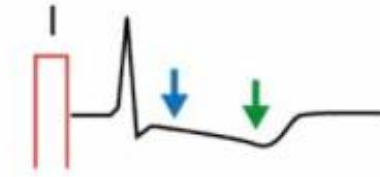
B Acute STE-ACS (STEMI) example 2



65 year old diabetic with 3 hours duration of chest pain. ECG shows ST-segment elevations, reciprocal depressions and pathological Q-waves.



NSTEMI



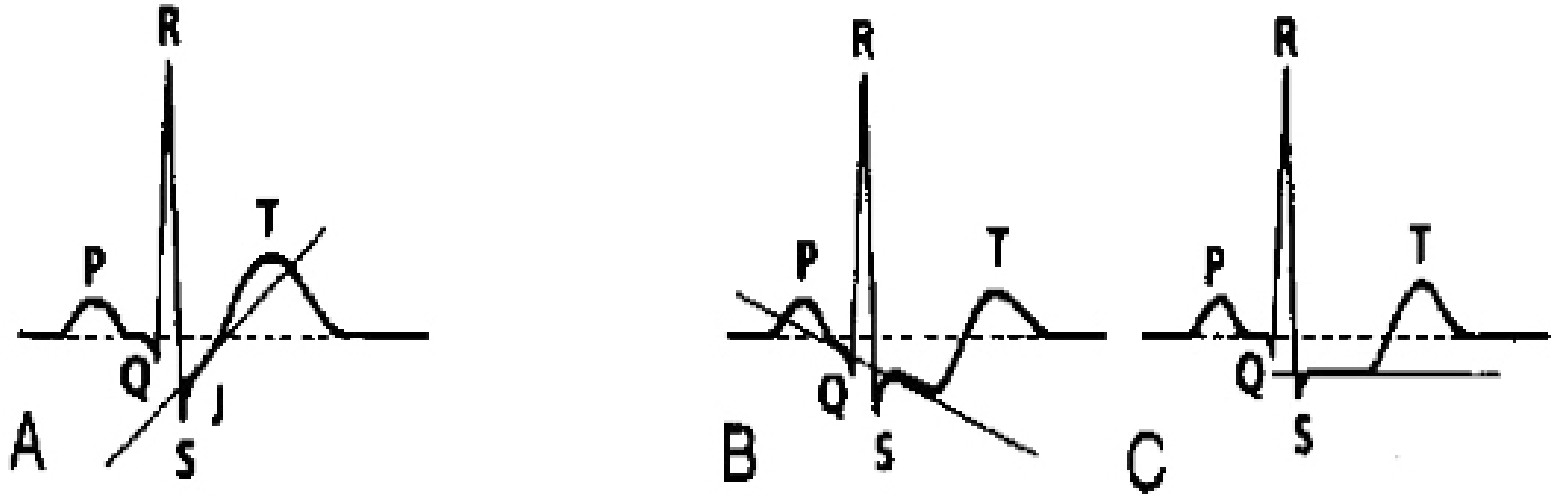
→ ST segment depression

→ T-wave inversions (negative T-waves)

NSTEACS



- ✓ ST segment depresyonu
- ✓ T dalga düzleşmesi veya inversiyonu
- ✓ U dalga inversiyonu



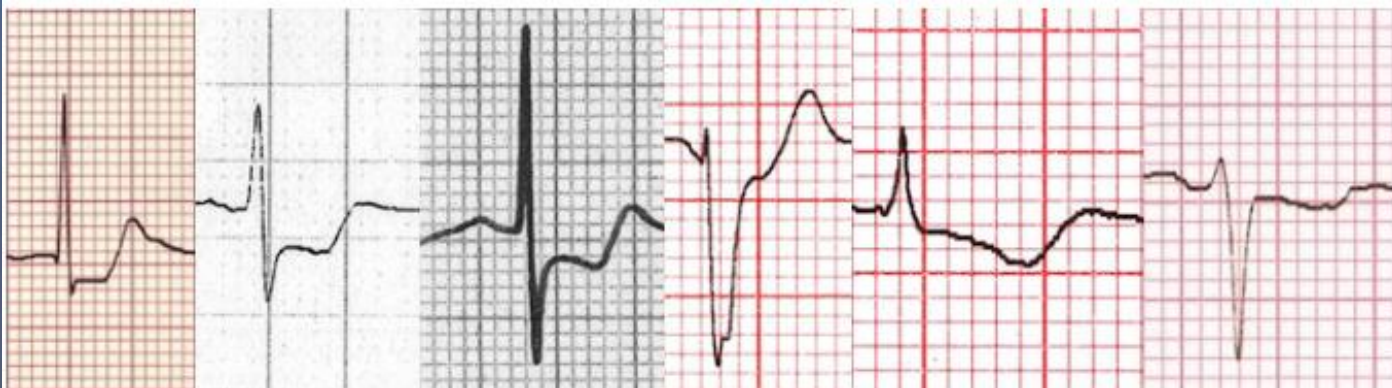
ST depresyonu: yukarı eğimli (A), aşağı eğimli (B), horizontal (C)

- ✓ Yukarıya eğimli ST depresyonu miyokardiyal iskemi için özgül değildir
- ✓ ≥ 2 birbirini takip eden derivasyonda J noktasında ≥ 0.5 mm horizontal veya aşağı doğru giden ST depresyonu miyokardiyal iskemiye işaret etmektedir

NSTEACS



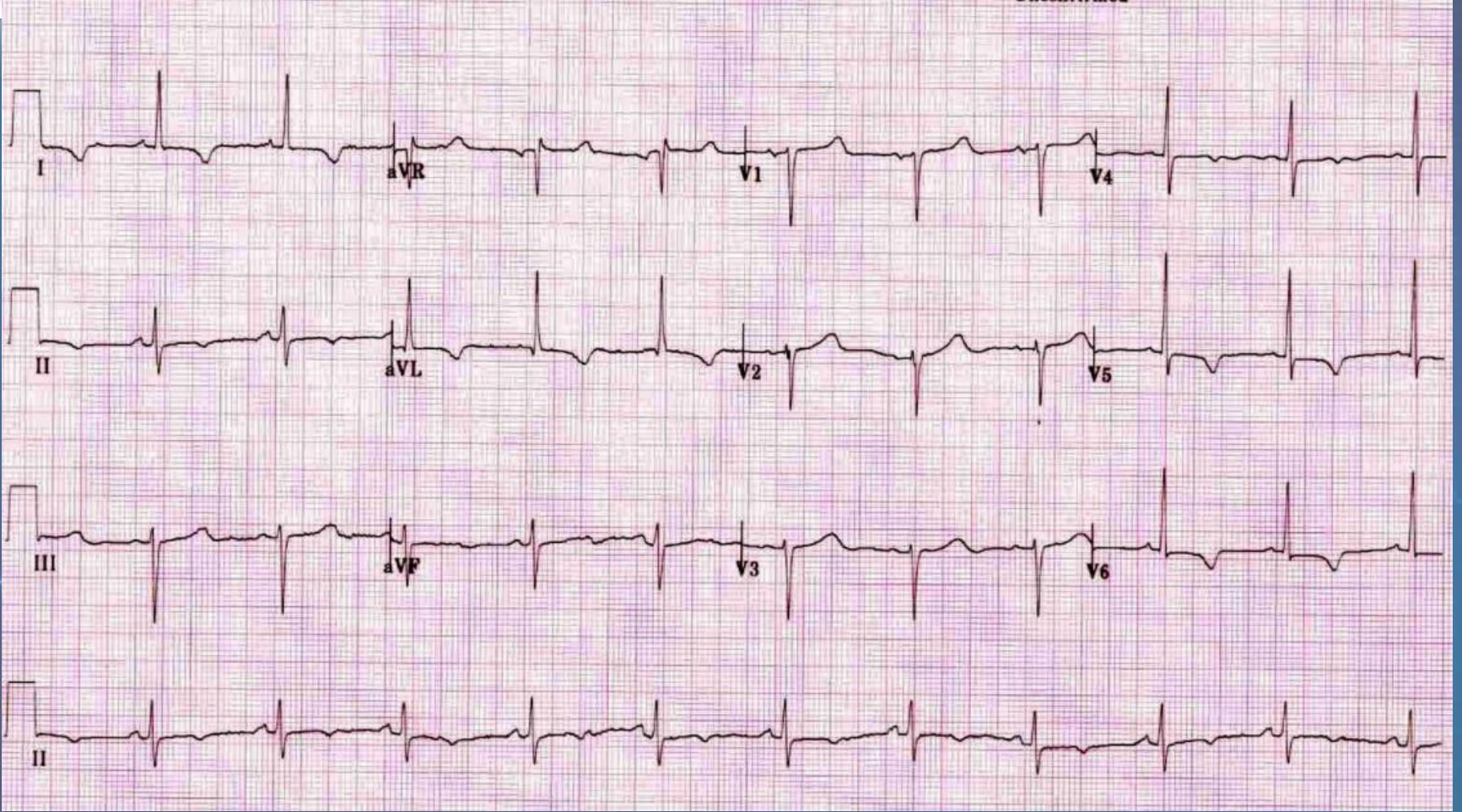
- ✓ ≥ 1 mm ST depresyonu daha özgündür ve daha kötü prognozu ifade eder
- ✓ ≥ 3 derivasyonda ≥ 2 mm ST depresyonu yüksek NSTEMI olasılığı ile birlikte ve anlamlı bir mortaliteyi gösterir (30 gün içerisinde %35 mortalite)



NSTEACS



- ✓ T dalga inversiyonu aşağıdaki durumlarda miyokardiyal iskeminin kanıtıdır
 - ✓ En az 1 mm derinliğinde
 - ✓ Baskın R dalgaları olan (R/S oranı >1) ≥ 2 birbirini takip eden derivasyonda mevcut
 - ✓ Dinamik – eski EKG’de yok veya zaman içerisinde değişiyor ise
- ✓ III, aVR ve V1’de T dalga inversiyonu normal bir varyanttır



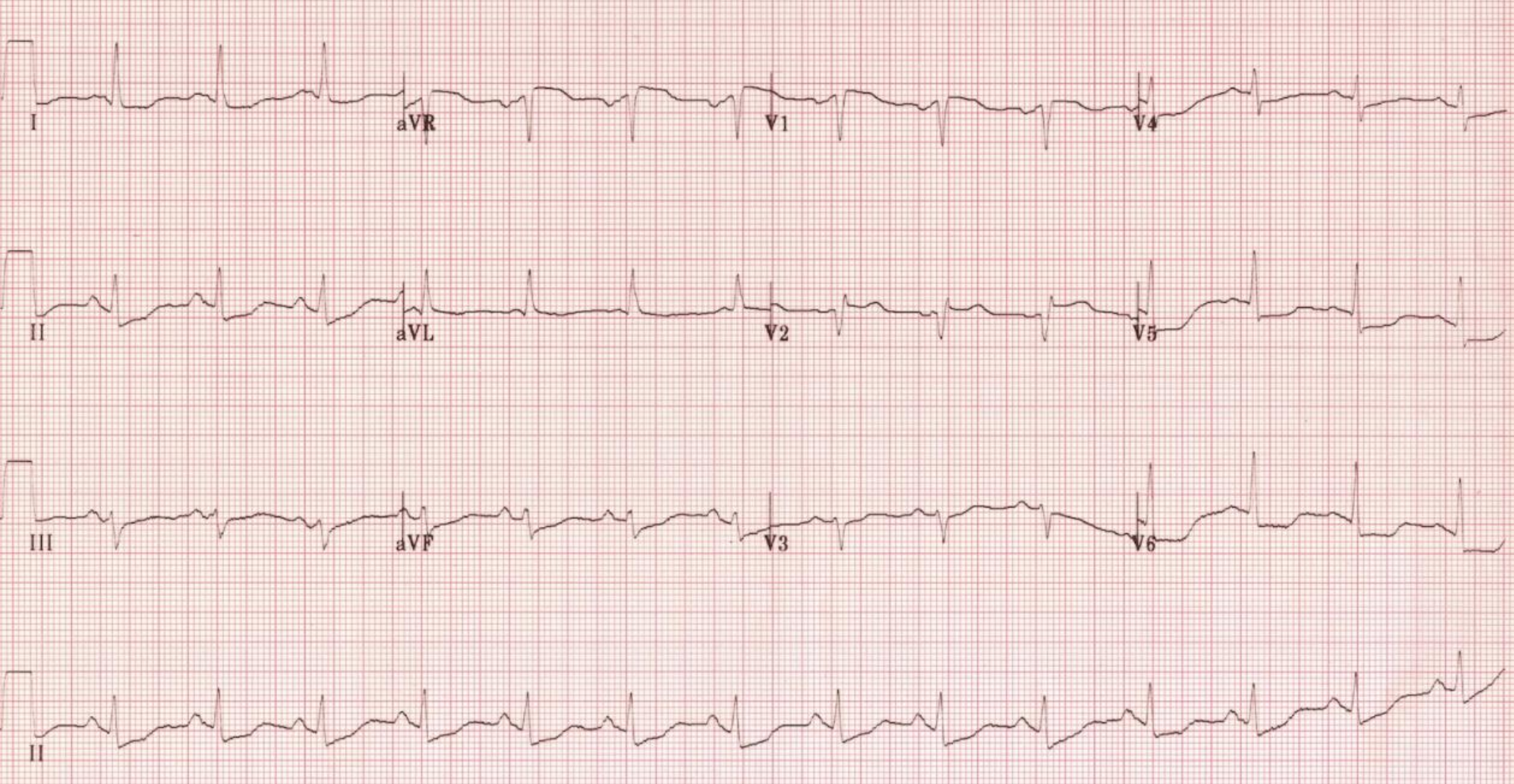
*Miyokardiyal iskemiye baęlı yaygın T dalga
inversiyonu*



Non spesifik ST-T deęişiklikleri

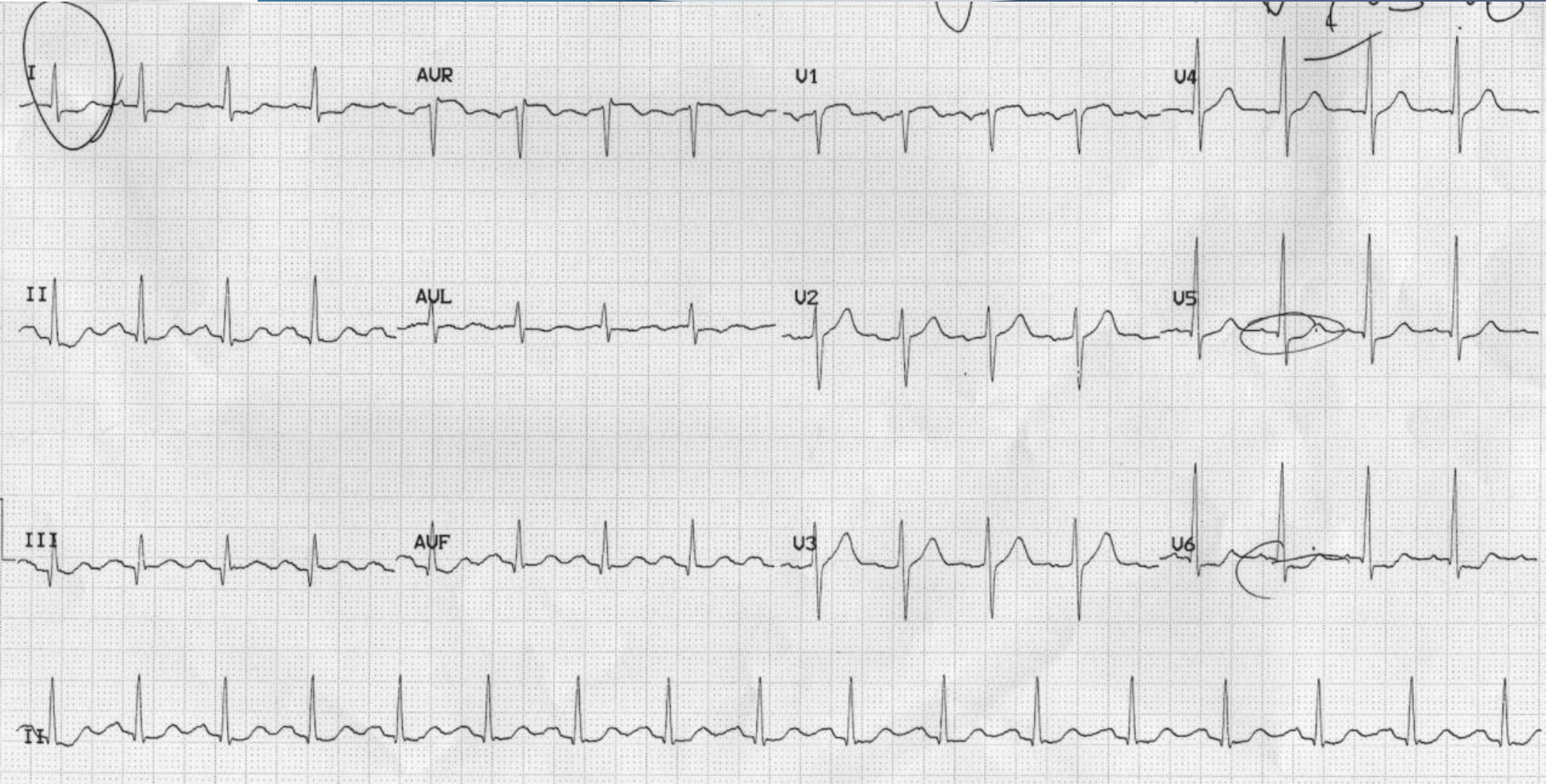
- ✓ < 0.5 mm ST çökmesi
- ✓ < 1 mm T dalga inversiyonu
- ✓ T dalga düzleşmesi
- ✓ Yukarı eğimli ST çökmesi

NSTEACS



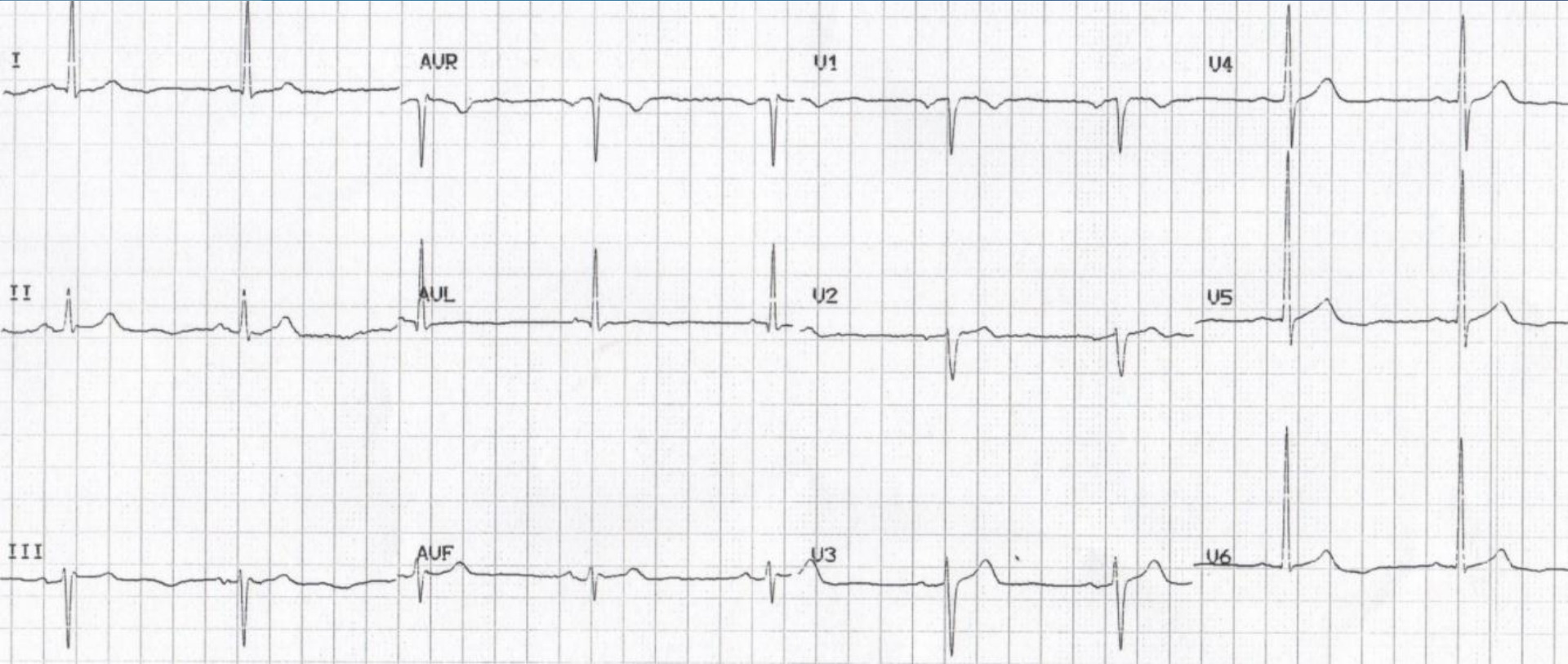
Subendokardiyal iskemi

NSTEACS



Subendokardiyal iskemi

NSTEACS



- ✓ *V5-6'da U dalga inversiyonu*
- ✓ *Nadir fakat iskeminin spesifik bir bulgusu*

Anatomik (Septal)



I Lateral	aVR None	V₁ Septal	V₄ Anterior
II Inferior	aVL Lateral	V₂ Septal	V₅ Lateral
III Inferior	aVF Inferior	V₃ Anterior	V₆ Lateral

Anatomik (Anterior)



I Lateral	aVR None	V₁ Septal	V₄ Anterior
II Inferior	aVL Lateral	V₂ Septal	V₅ Lateral
III Inferior	aVF Inferior	V₃ Anterior	V₆ Lateral

Anatomik (Lateral)



I Lateral	aVR None	V₁ Septal	V₄ Anterior
II Inferior	aVL Lateral	V₂ Septal	V₅ Lateral
III Inferior	aVF Inferior	V₃ Anterior	V₆ Lateral

Anatomik (inferior)



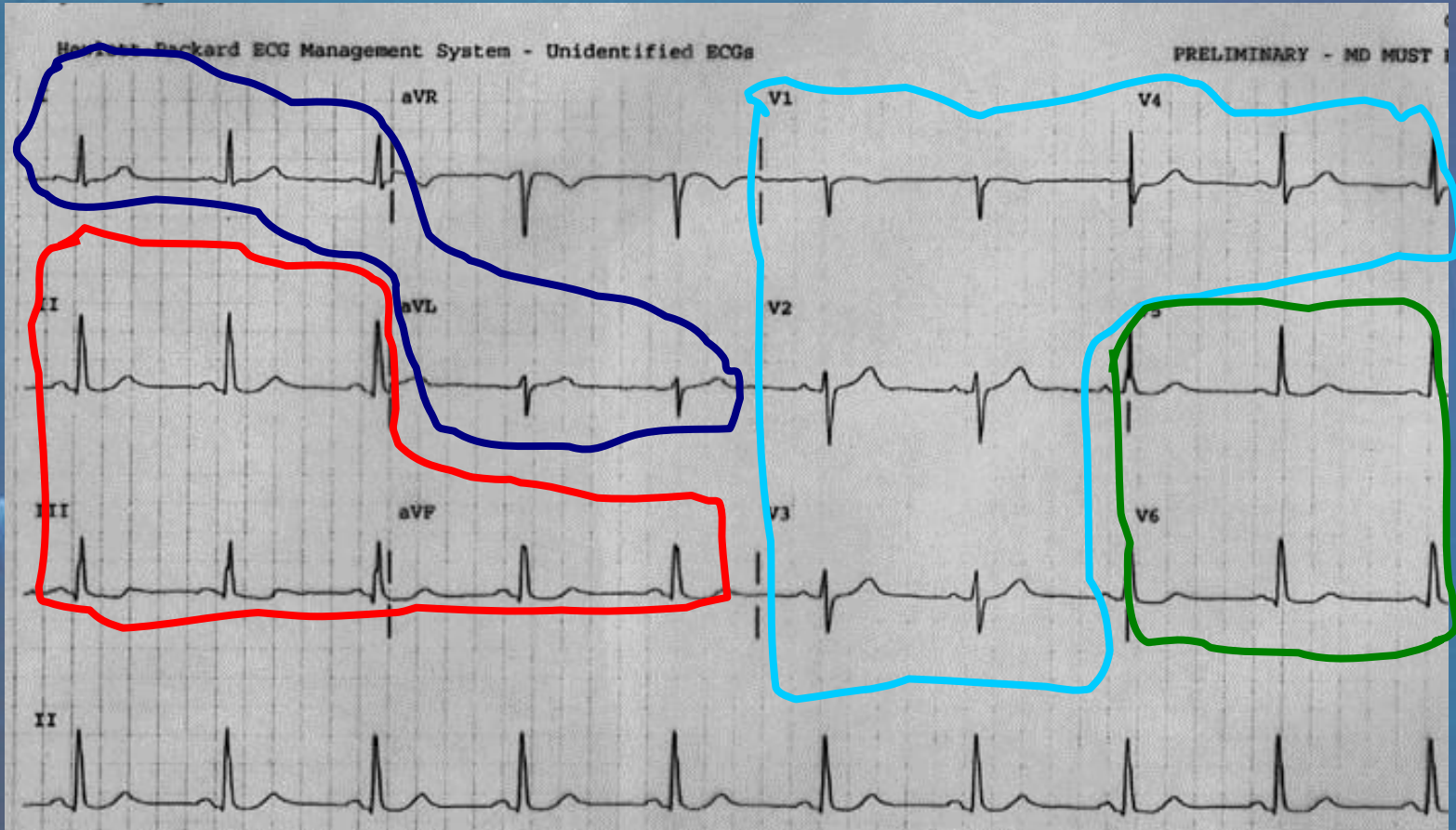
I Lateral	aVR None	V ₁ Septal	V ₄ Anterior
II Inferior	aVL Lateral	V ₂ Septal	V ₅ Lateral
III Inferior	aVF Inferior	V ₃ Anterior	V ₆ Lateral

Anatomik



I Lateral	aVR None	V₁ Septal	V₄ Anterior
II Inferior	aVL Lateral	V₂ Septal	V₅ Lateral
III Inferior	aVF Inferior	V₃ Anterior	V₆ Lateral

Anatomik



Patolojik Q Dalgası



- ✓ > 1 mm genişlikte
- ✓ > 2 mm derinlikte
- ✓ QRS kompleksinin derinliğinden > %25
- ✓ >2 mm'den derin Q dalgası III ve aVR normal varyant olarak görülebilir

ST Elevasyonu

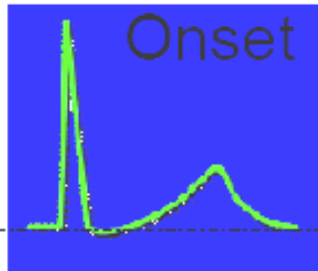


- ✓ 2 komşu derivasyonda J noktasında ≥ 0.1 mV yeni ST elevasyonu (V2-3 dışında)
- ✓ V2-V3 derivasyonlarında
 - ✓ <40 yaş erkeklerde ≥ 0.25 mV
 - ✓ >40 yaş erkeklerde ≥ 0.20 mV
 - ✓ Bayanlarda ≥ 0.15 mV

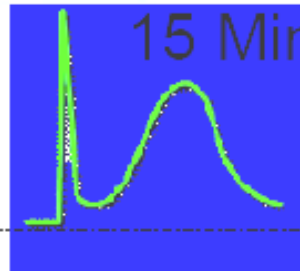
NSTEACS



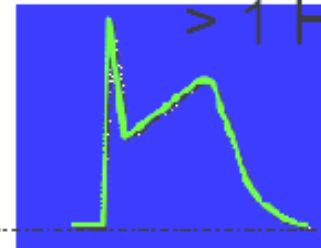
A.



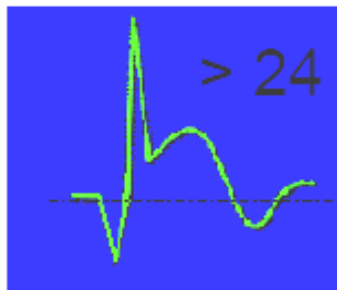
B.



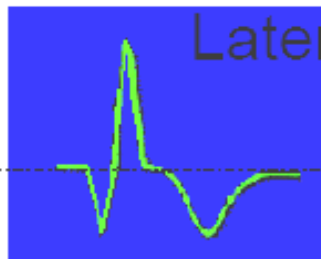
C.



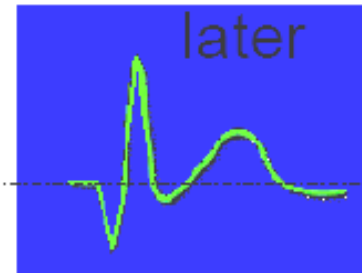
D.



E.



F.



Anterior STEMI



- ✓ Sol ön inen arterin (LAD) tıkanıklığı sonucu
- ✓ Enfarkt alanı geniş
- ✓ Sol ana koroner arter (LMCA) ve Wellens sendromu da anterior iskemi ile seyreder

Anterior STEMI



- ✓ Prekordiyal derivasyonlarda (V1-6) ve (\pm) yüksek lateral derivasyonlarda (I ve aVL) Q dalga formasyonu ile ST segment elevasyonu
- ✓ Inferior derivasyonlarda resiprokal ST çökmesi (özellikle III ve aVF'de)

Anterior STEMI

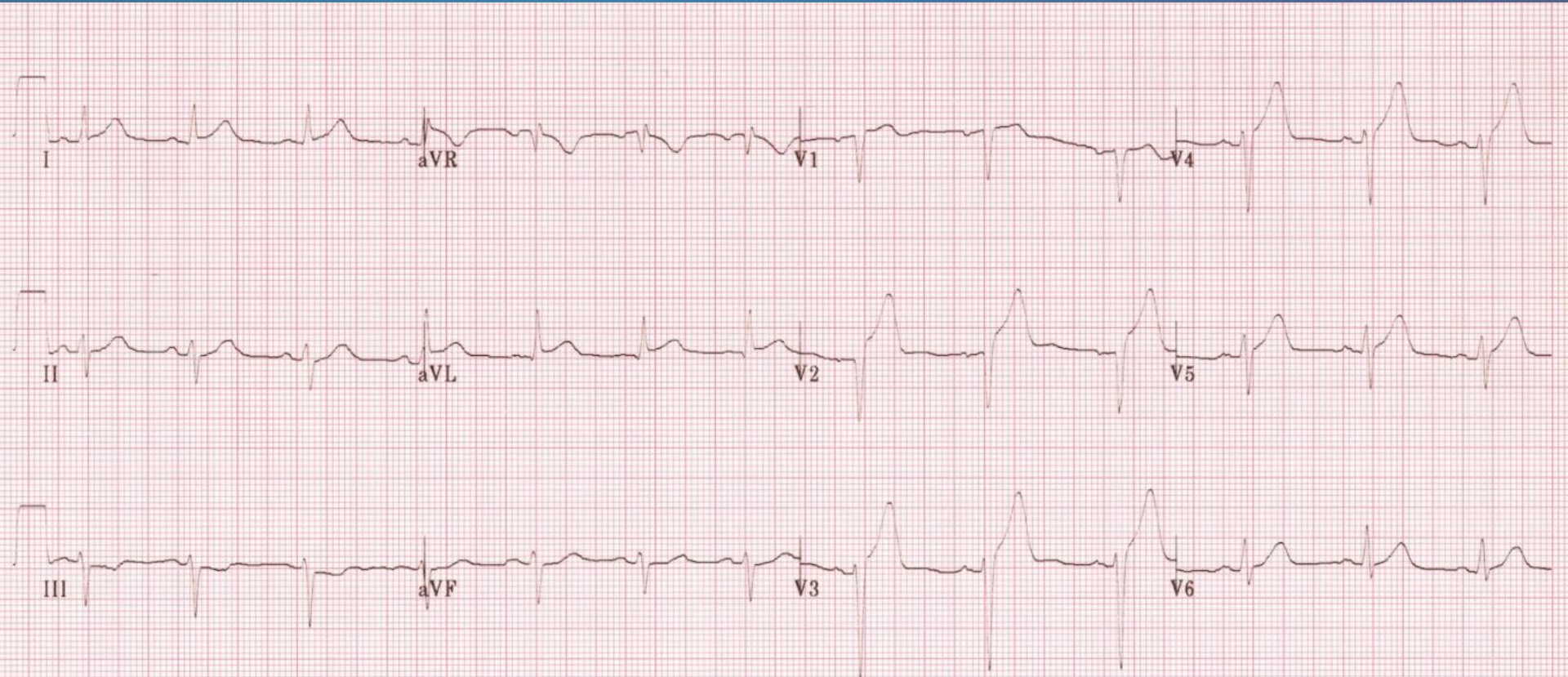


Anterior infarction

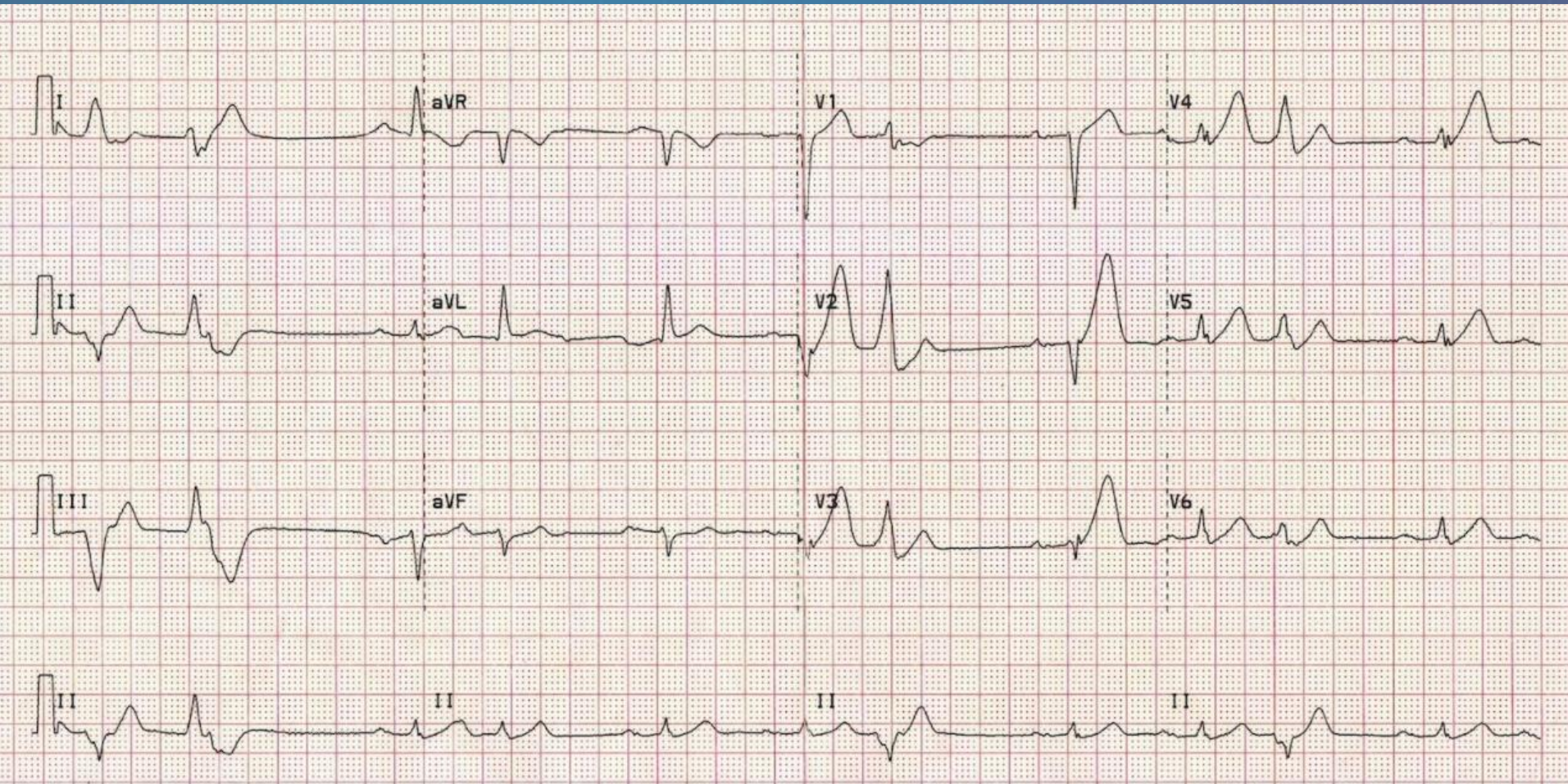


Left coronary artery

Hiperakut Anterior STEMI



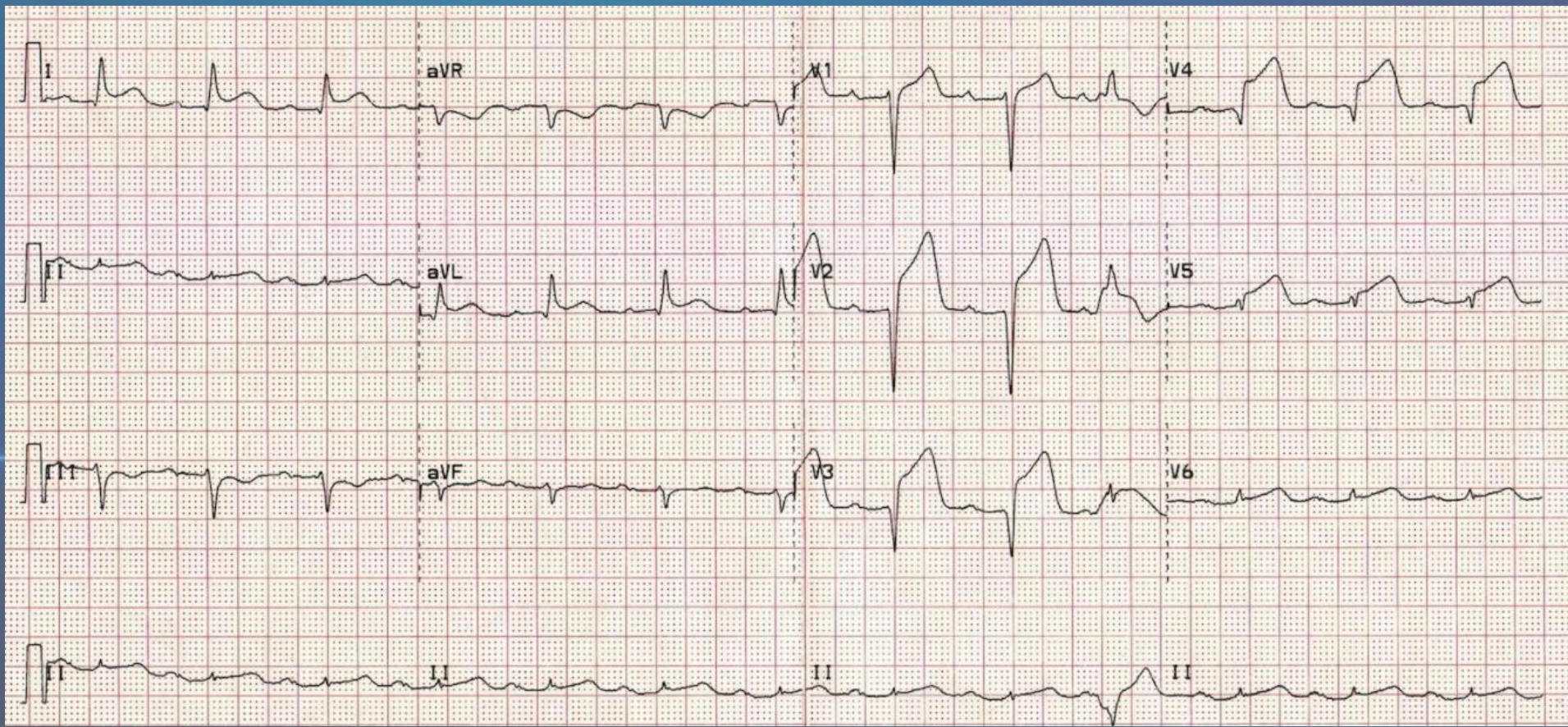
Hiperakut Anterior STEMI



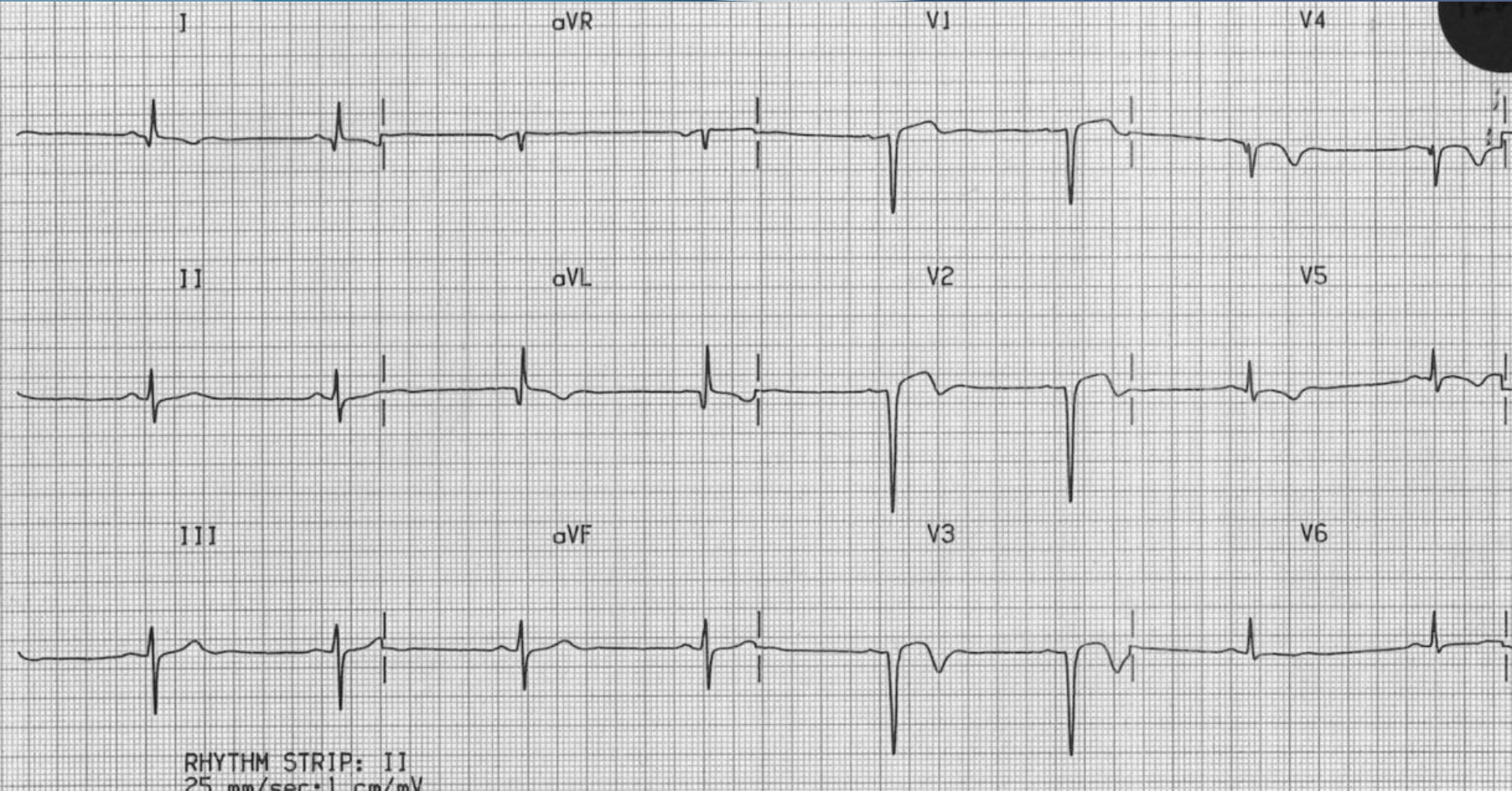


Akut Anterior STEMI

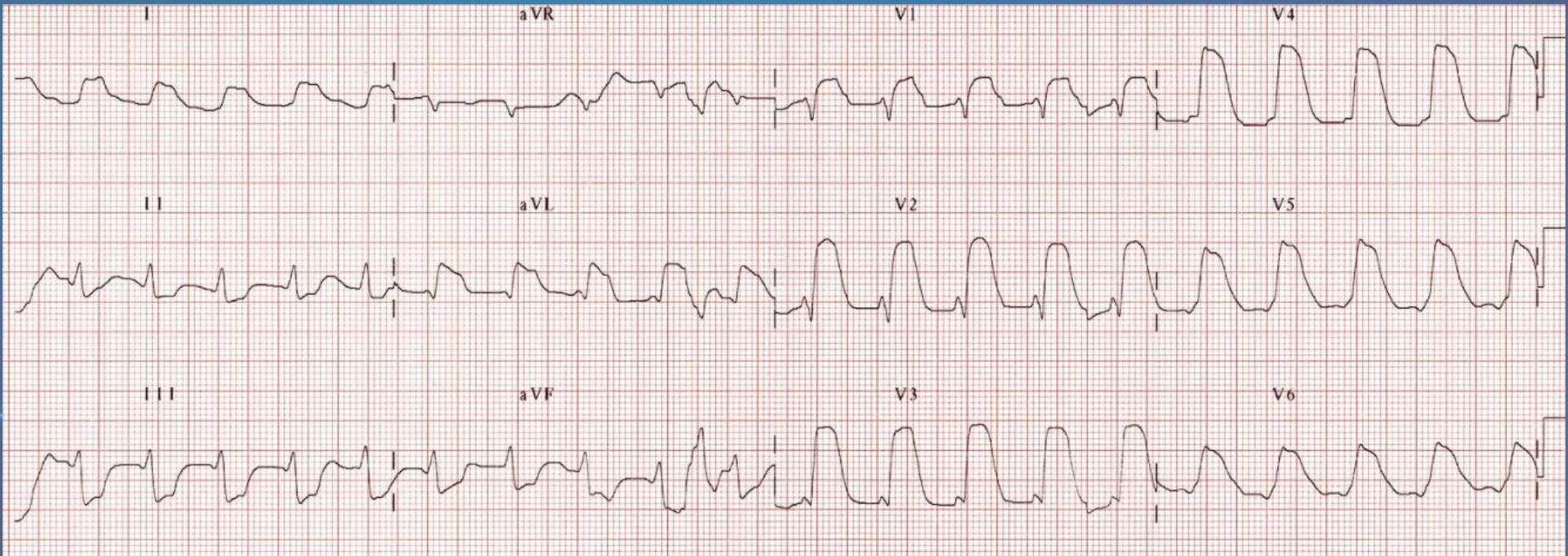
45 dk sonra



Geçirilmiş Anterolateral MI

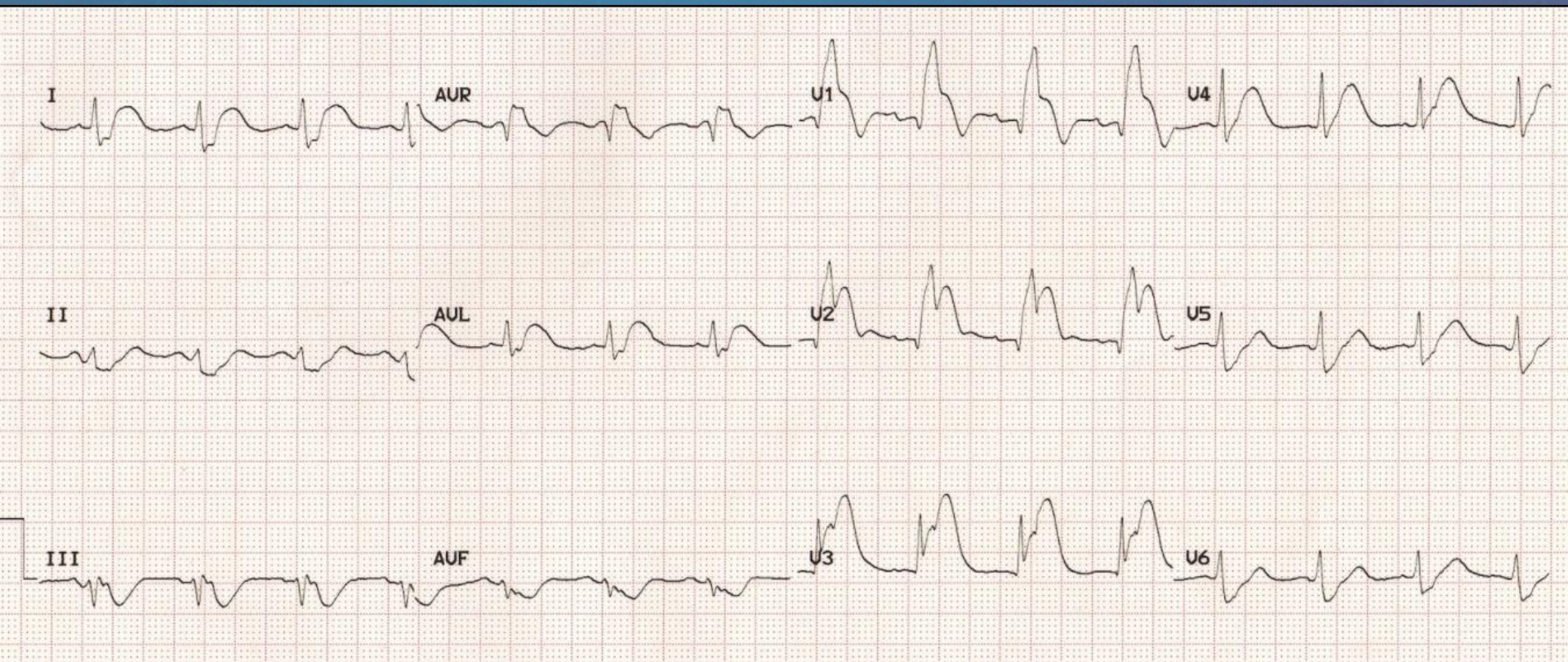


Akut Yaygın Anterolateral STEMI



Mezar taşı paterni

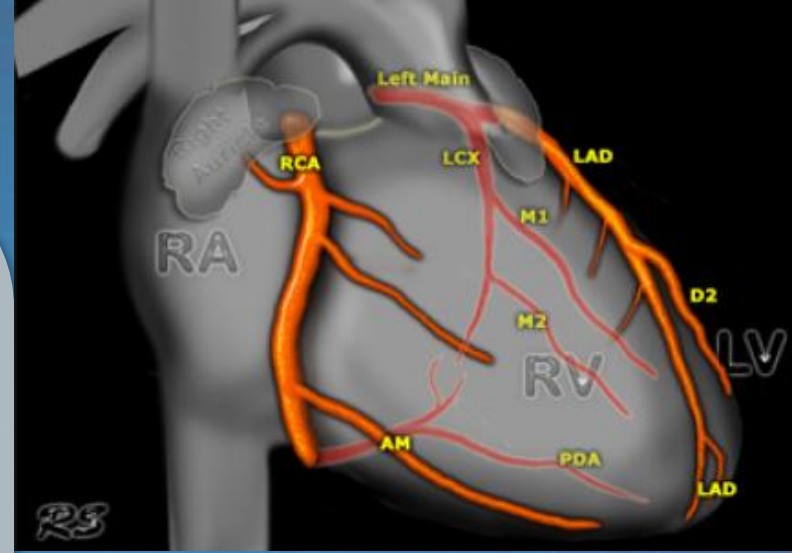
Septal STEMI



Lateral STEMI



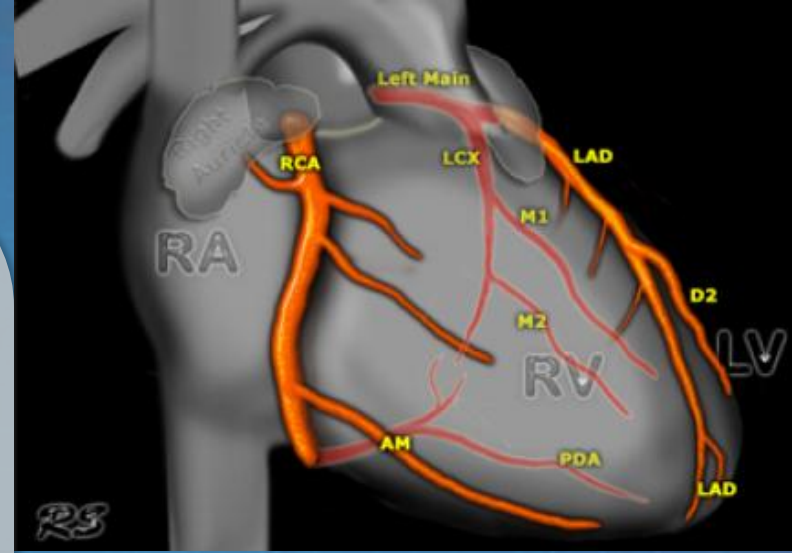
- ✓ Sol ventrikül lateral duvarı LAD ve Cx ile beslenir
- ✓ Genellikle anterior MI ile birlikte
- ✓ Lateral derivasyonlarda ST elevasyonu (I, aVL, V5-6)
- ✓ İnferior derivasyonlarda resiprokal ST depresyonu (III ve aVF)



Lateral STEMI



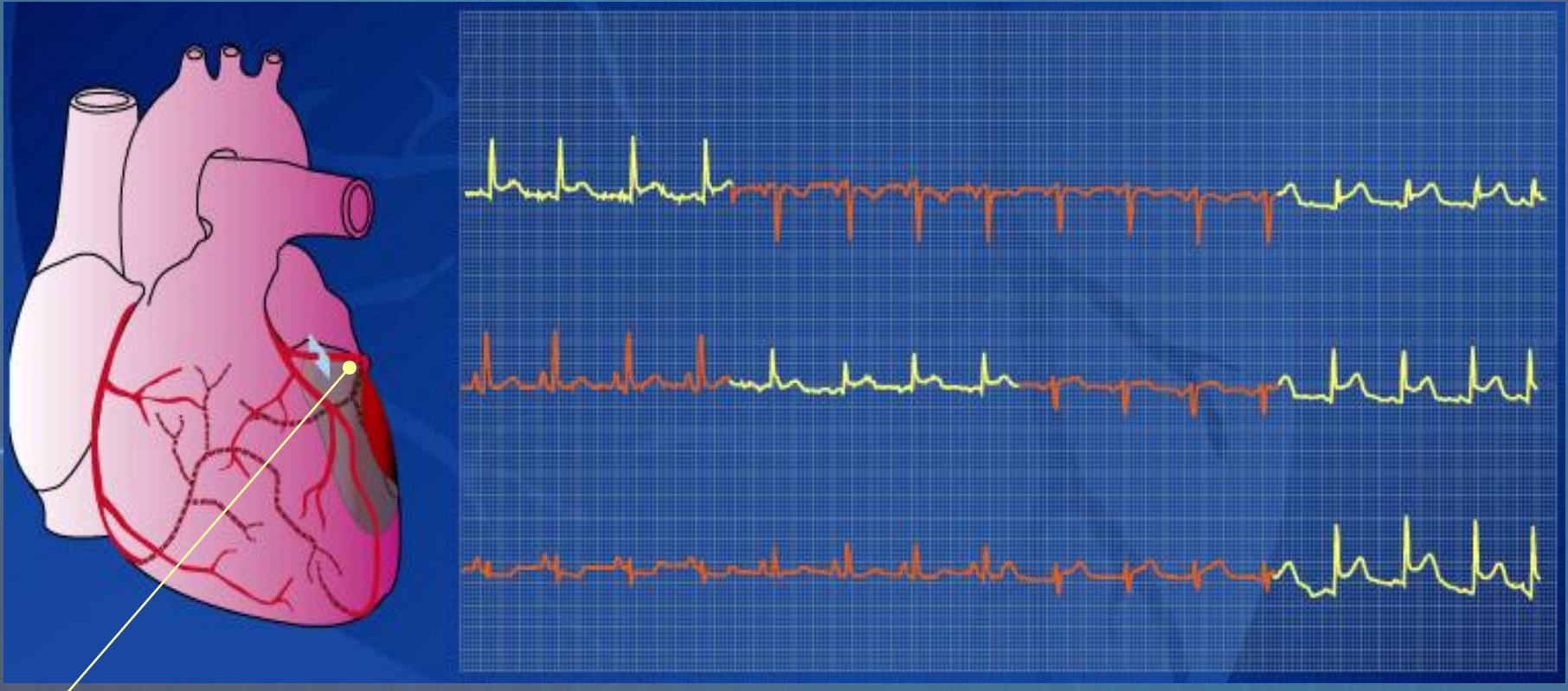
- ✓ LAD tıkanıklığına bağlı **anterolateral** STEMI
- ✓ Cx tıkanıklığına bağlı **inferior-posterior-lateral** STEMI
- ✓ D1, OM veya ramus intermedius gibi daha ufak dal arterlerinde tıkanıklığa bağlı **izole lateral** infarkt



Lateral STEMI

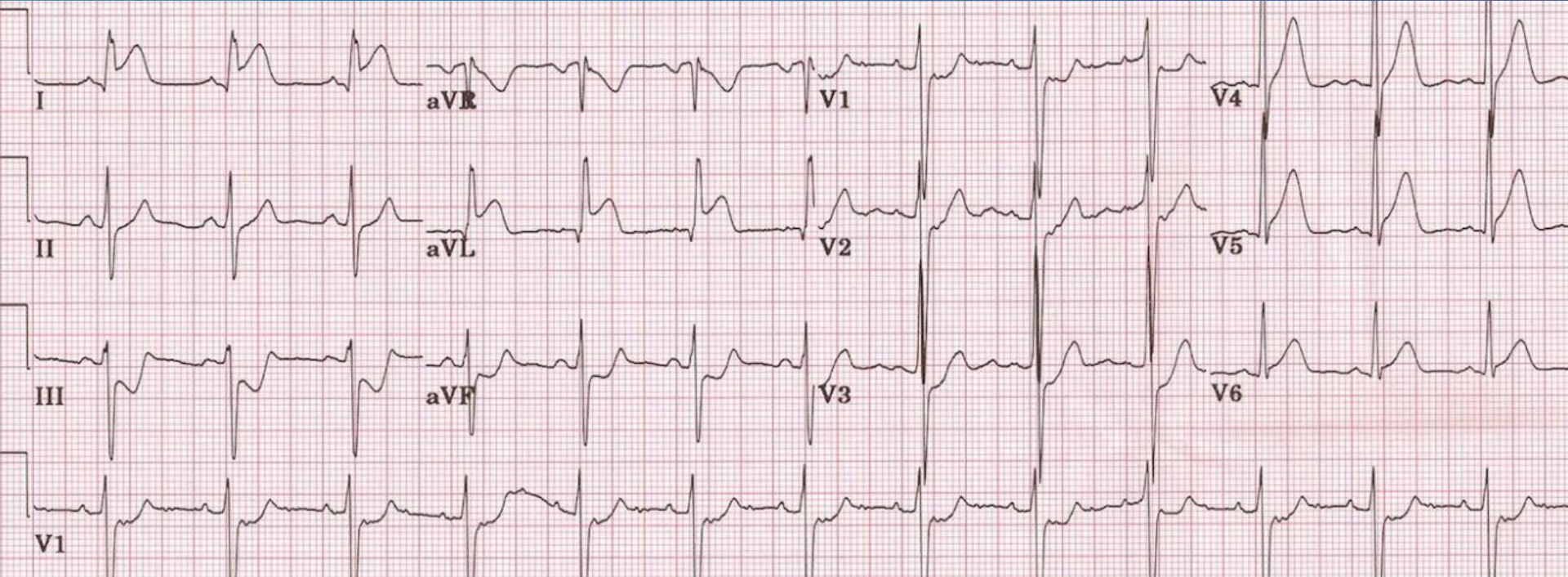


Lateral infarction



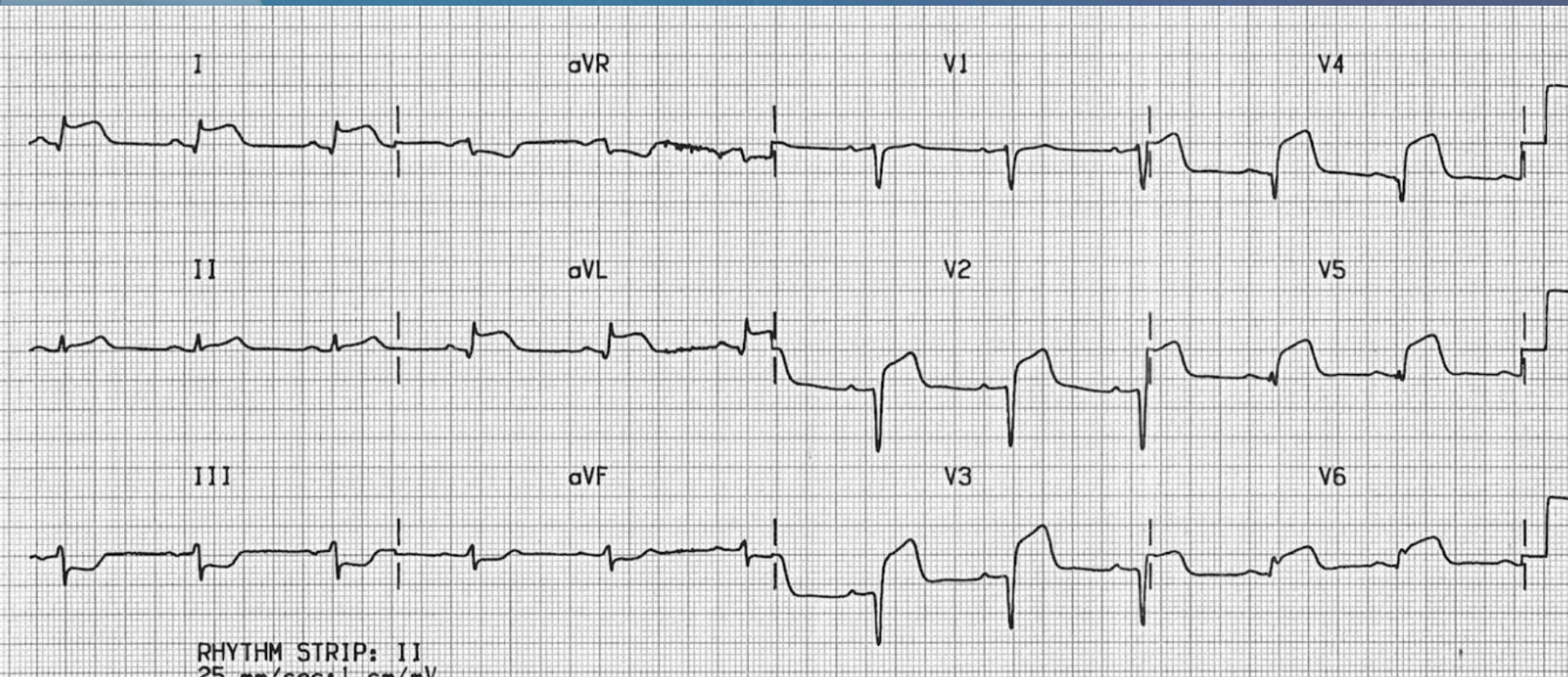
Left circumflex
coronary artery (Cx)

Yüksek Lateral STEMI



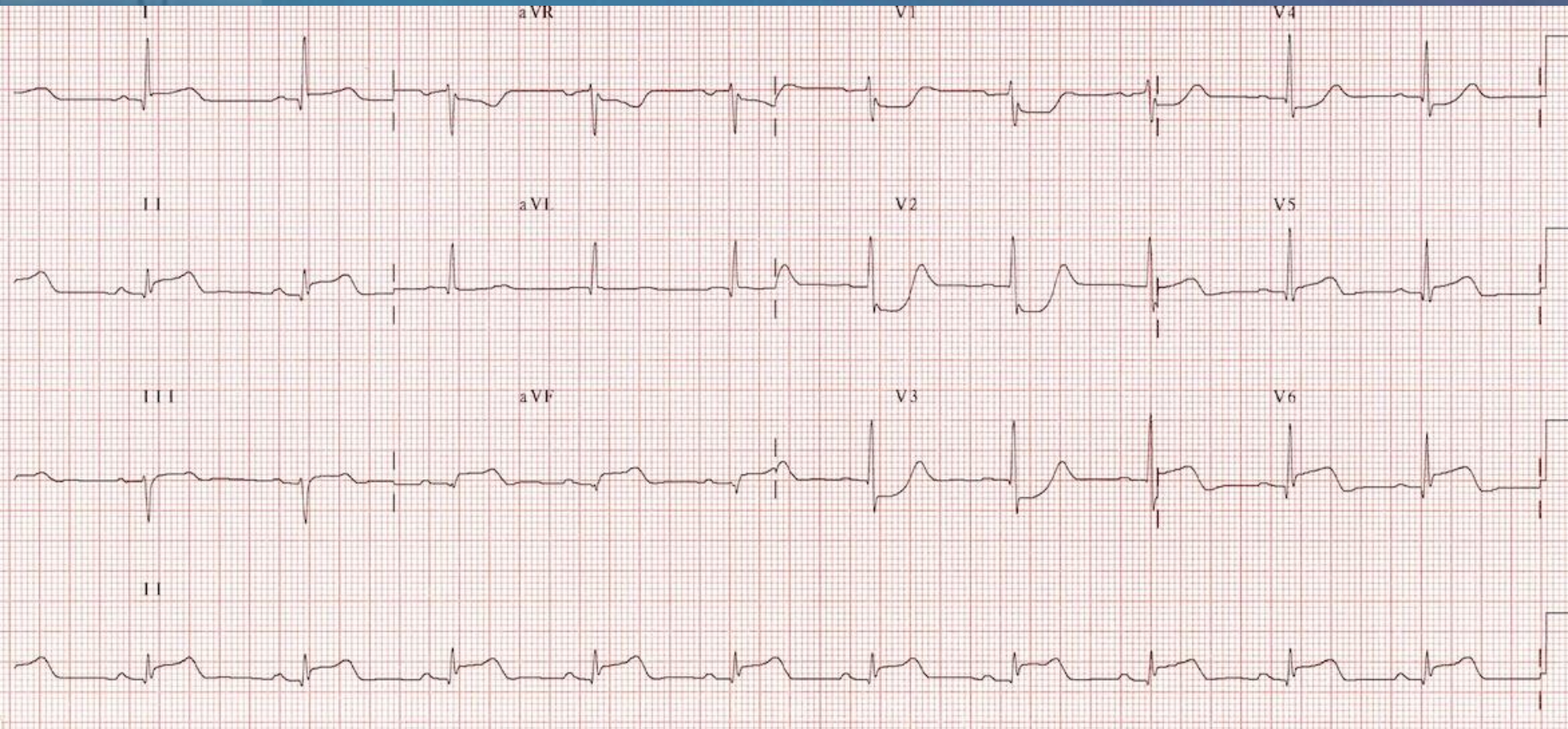
LAD D1

Anterolateral STEMI



✓ LAD proksimal lezyonu

infero-postero-lateral STEMI

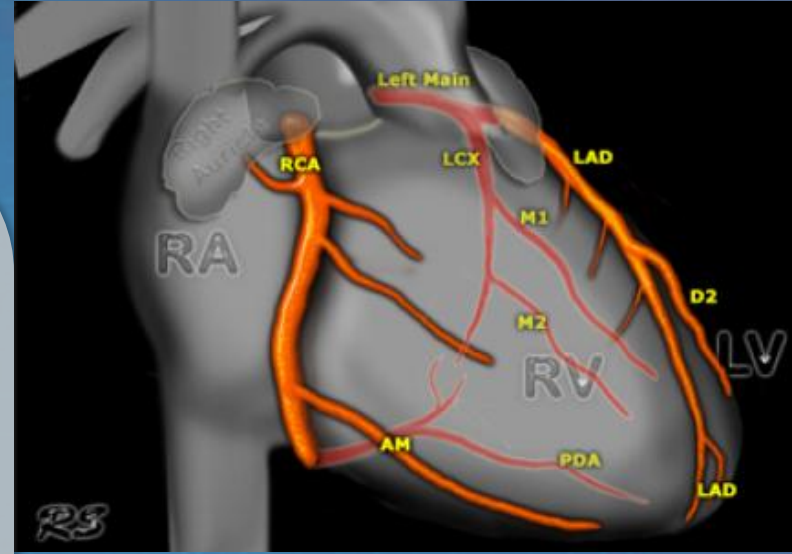


✓ Cx lezyonu

İnferior STEMI



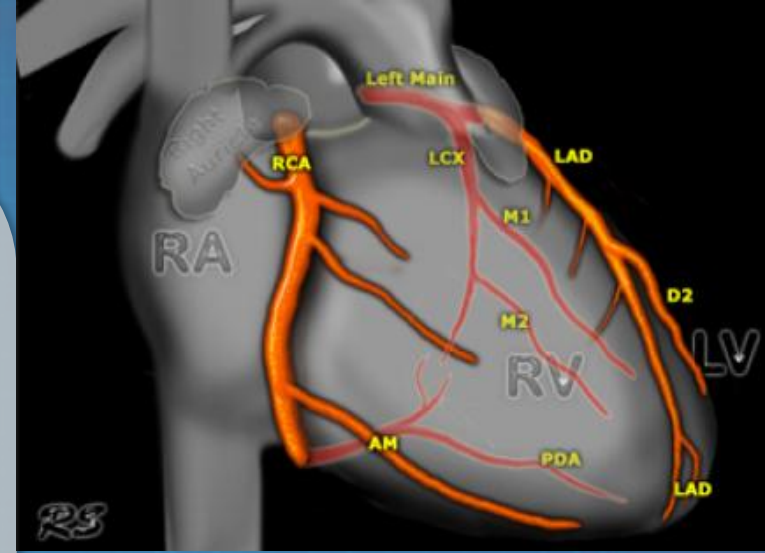
- ✓ Tüm MI'ların %40-50'sini oluşturur
- ✓ %40'ında eş zamanlı sağ ventrikül infaktı, nitratlara bağlı ciddi hipotansiyon
- ✓ %20'sinde 2. veya 3. derece AV blok ve bradikardi



inferior STEMI



- ✓ II, III, aVF derivasyonlarında ST elevasyonu
- ✓ II, III, aVF'de ilerleyici Q dalga gelişimi
- ✓ aVL'de resiprokal ST depresyonu (+/- I. derivasyon)
- ✓ %80 RCA ve %18 Cx lezyonu



Inferior MI

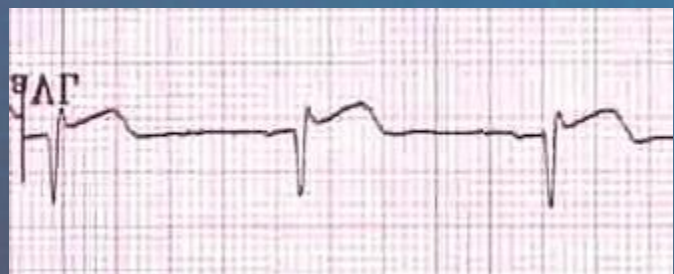
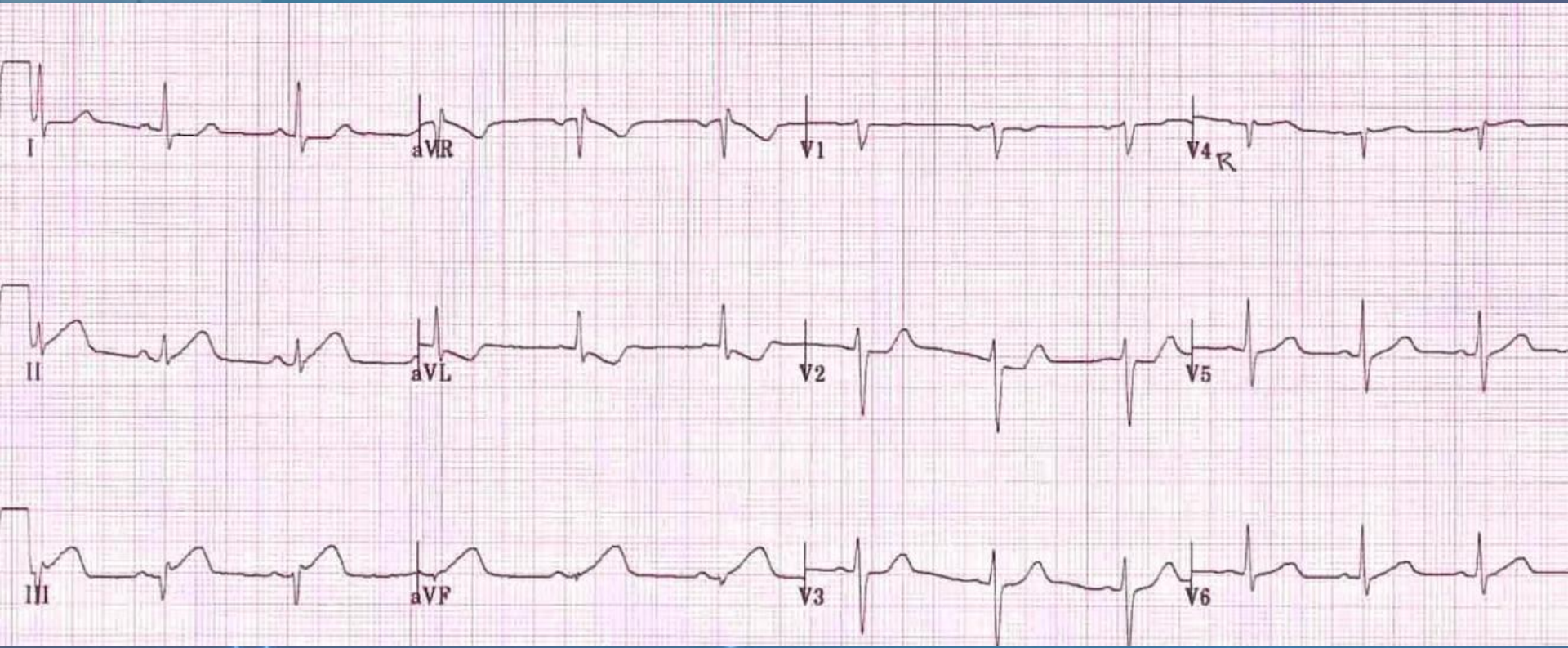


Inferior infarction

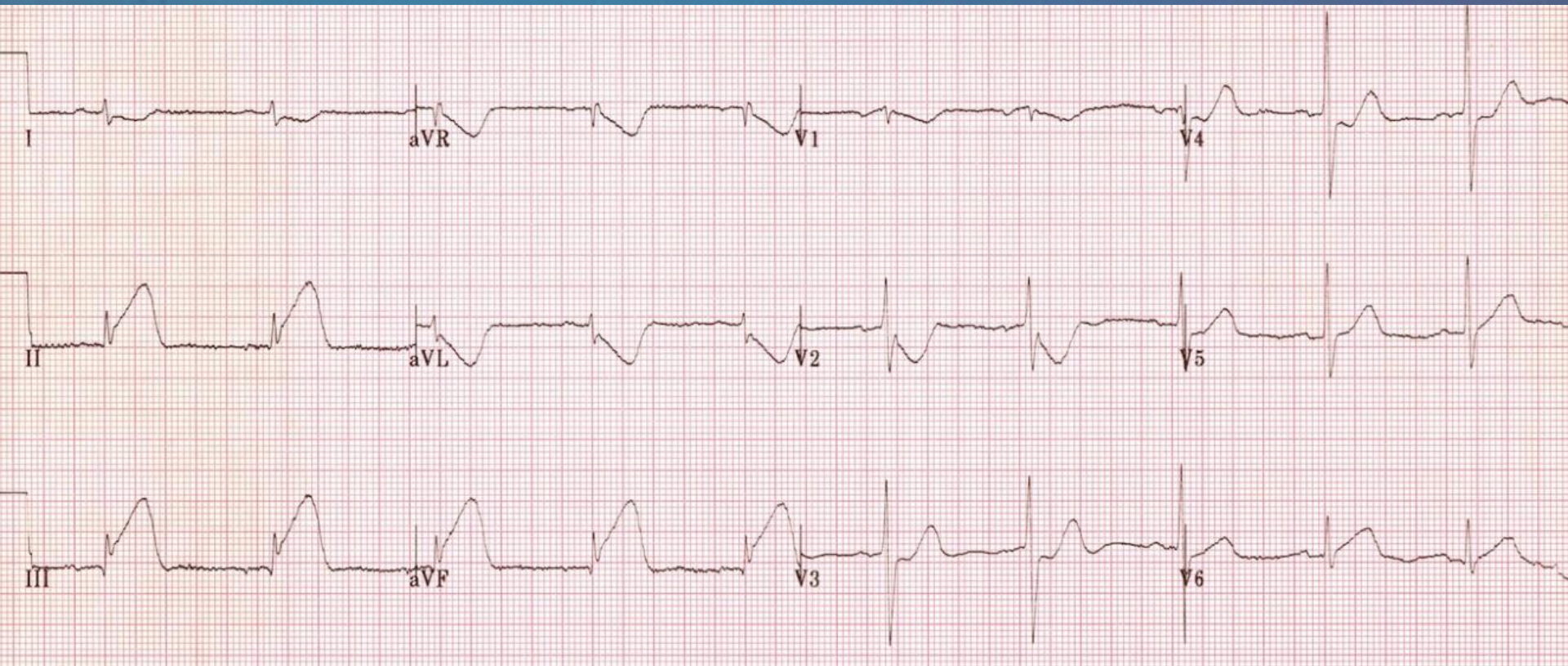


Right coronary artery

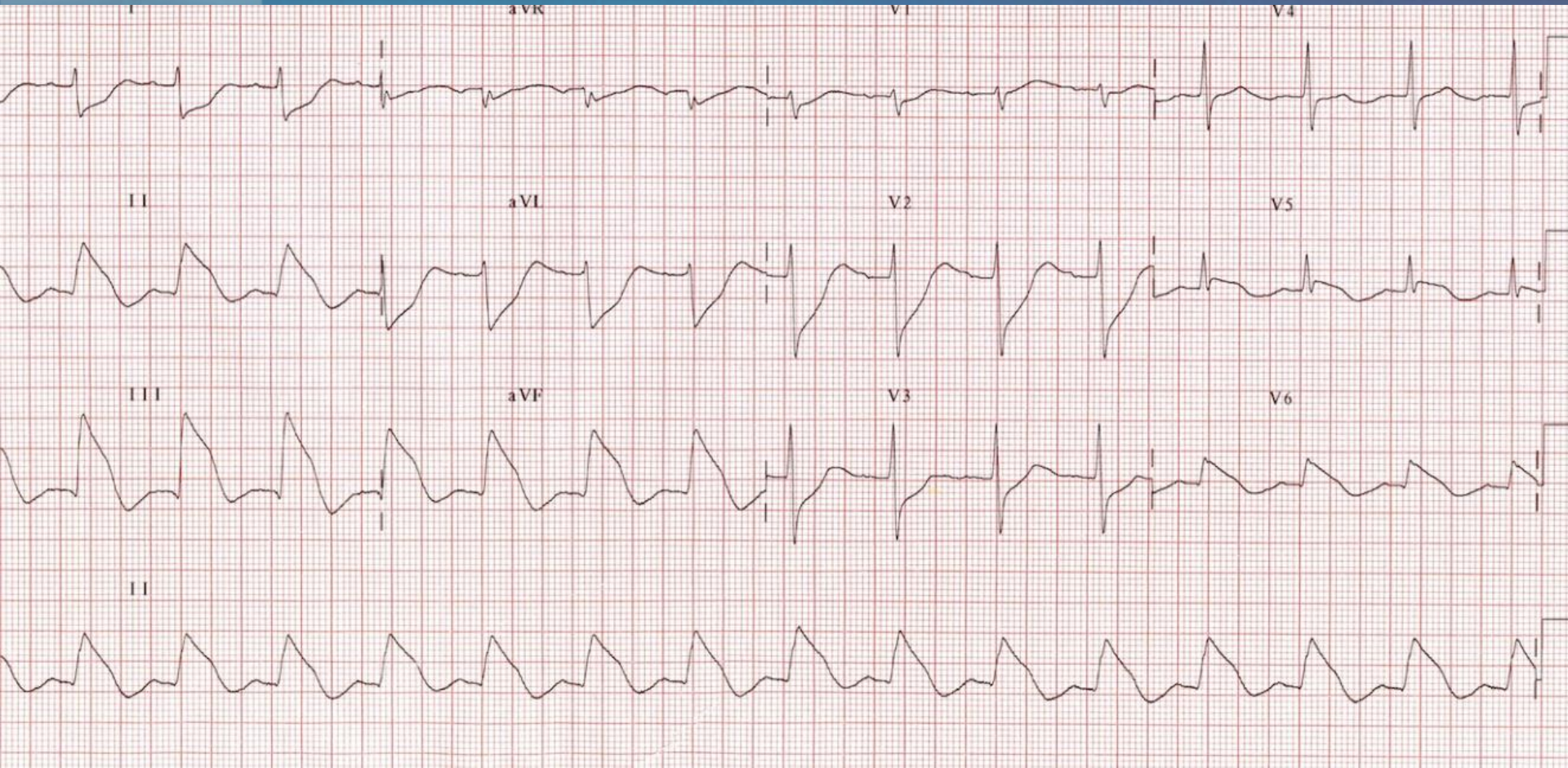
Erken inferior STEMI



Hiperakut inferior STEMI

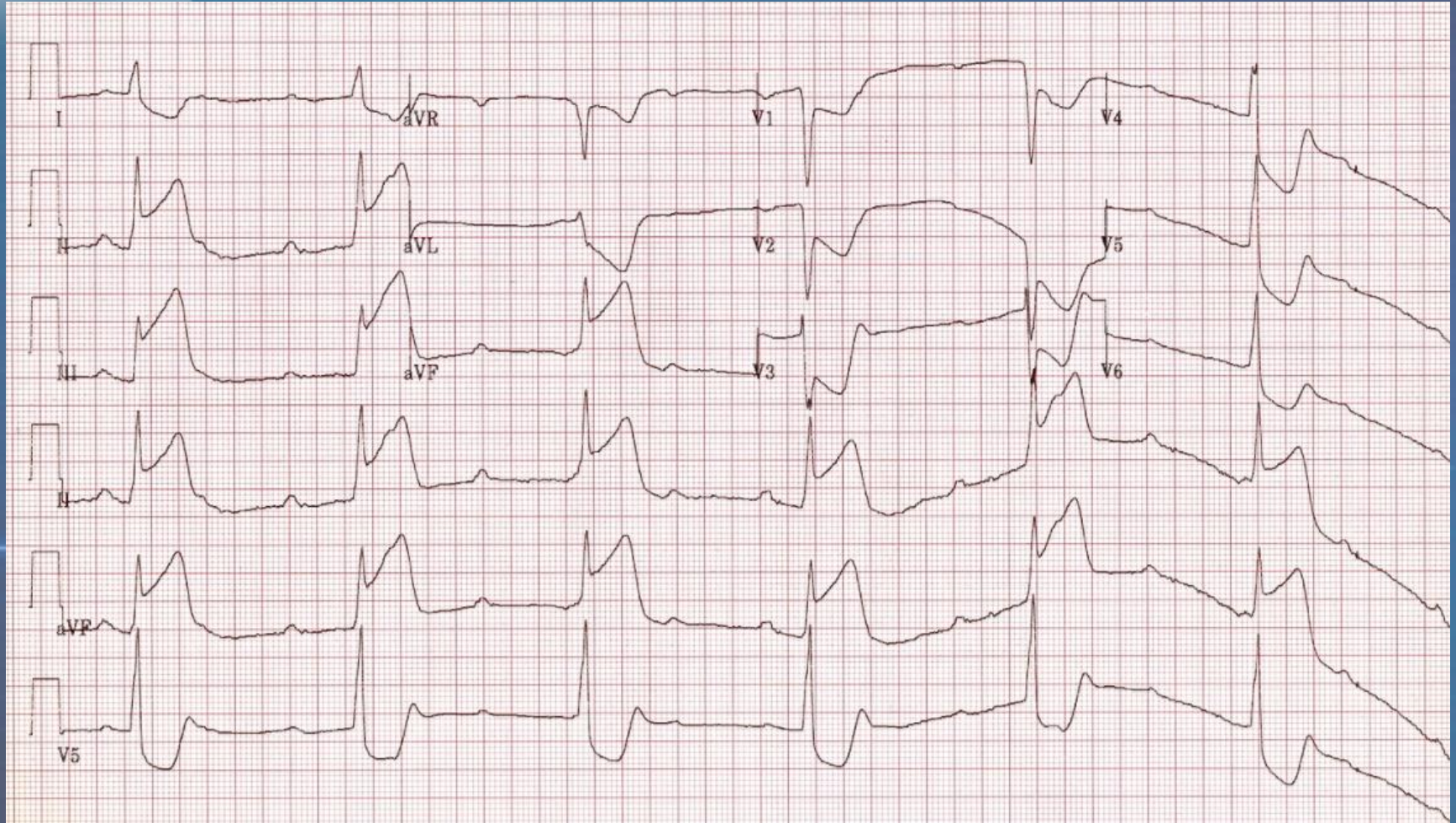


inferolateral STEMI



Mezar taşı görünümü, geniş enfarkt alanı

AV tam blok +inferior STEMI

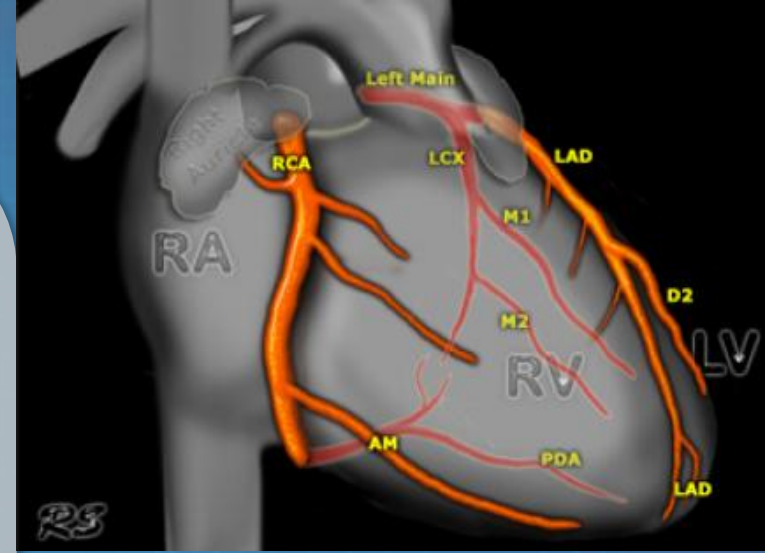


AV blok genellikle geçicidir ve Atropin'e yanıt verir

Sağ Ventrikül STEMI



- ✓ %40 inferior MI ile birlikte
- ✓ İzole olarak nadirdir
- ✓ Nitrat veya diğer preload azaltıcı ajanlara yanıt olarak ciddi hipotansiyon meydana getirir
- ✓ Sağ ventriküler infarkt'ta hipotansiyon sıvı yüklemesi ile tedavi edilmektedir
- ✓ Nitratlar konrendikedir



Sağ Ventrikül STEMI



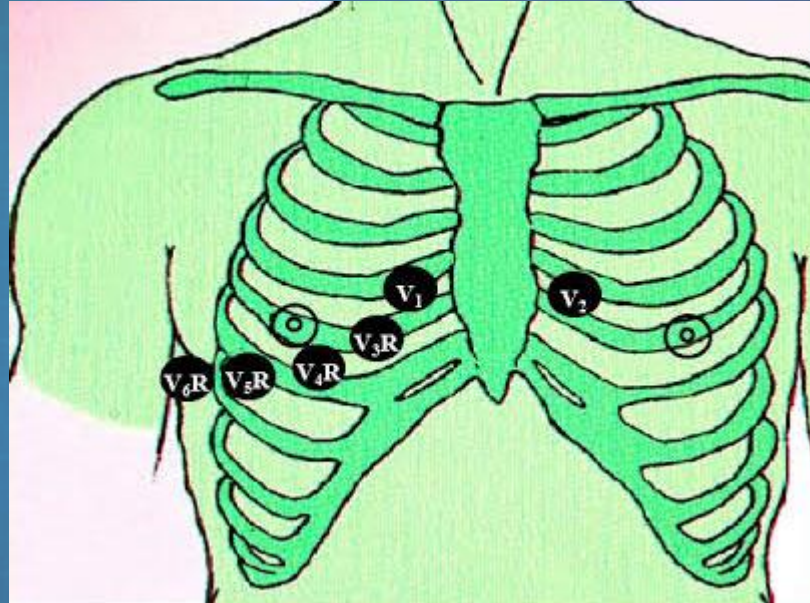
- ✓ Tanı için ilk olarak şüphe gerekli
- ✓ İnferior MI varlığında
 - ✓ **V1'de ST elevasyonu** – direkt olarak sağ ventriküle bakan tek standart EKG derivasyonu
 - ✓ **III. derivasyonda > II. derivasyondan ST elevasyonu** – III. derivasyon II. derivasyondan daha sağ tarafa dönük olduğundan sağ ventrikül tarafından üretilen hasar akımına daha duyarlıdır

Sağ Ventrikül STEMI



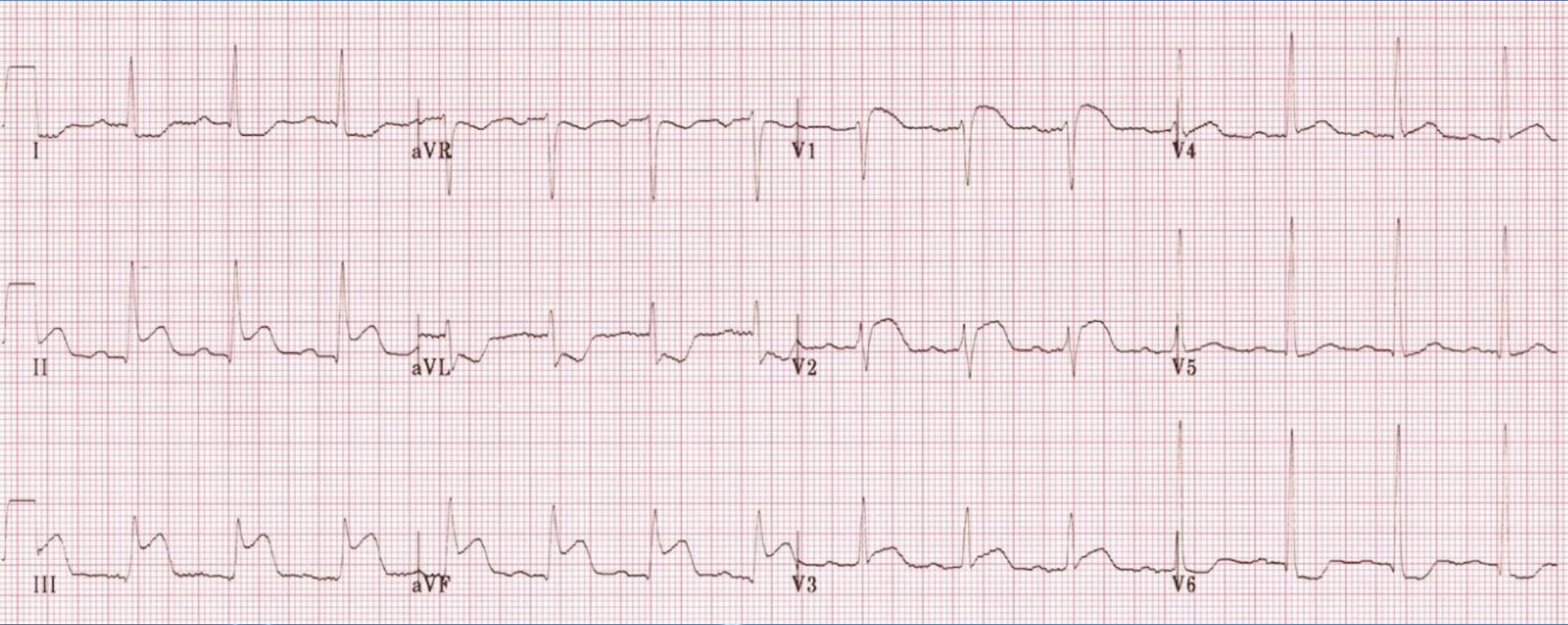
- ✓ ST elevasyonu $V1 > V2$
- ✓ **$V1$ 'de ST elevasyonu + $V2$ 'de ST çökmesi** birlikteliği sağ ventriküler MI için oldukça özgüdür
- ✓ $V1$ 'de ST segmenti izoelektrik hatta ve $V2$ 'de ST segmenti belirgin olarak çökmüş ise
- ✓ Sağ ventriküler infarkt sağ taraf derivasyonlarında ($V3R-V6R$) ST elevasyonu varlığı ile doğrulanır

Sağ Ventrikül STEMI



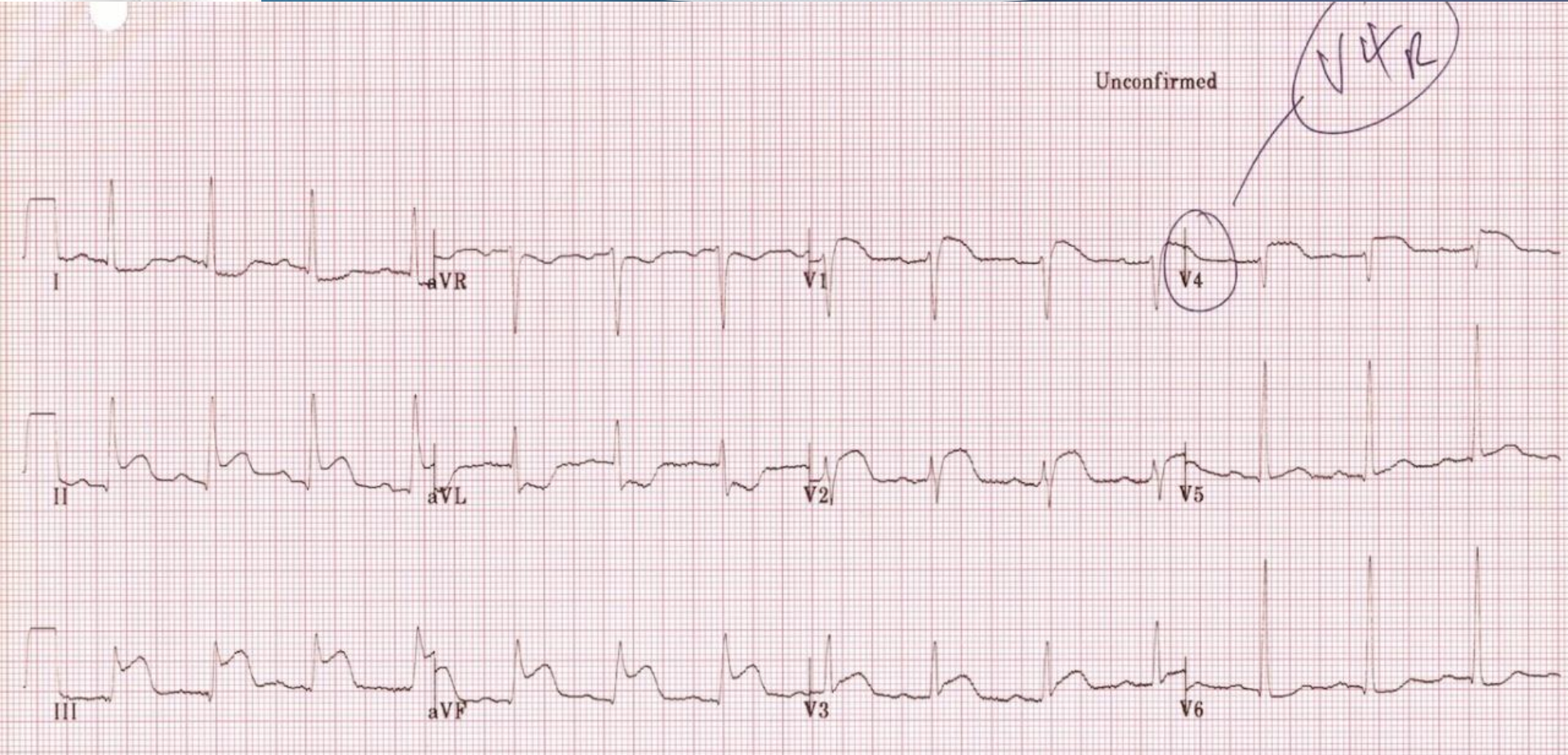
- ✓ V4R'de ST elevasyonunun sağ ventrikül MI tanısında duyarlılığı %88, özgüllüğü %78 ve tanısal doğruluğu %83'tür

Sağ Ventrikül STEMI



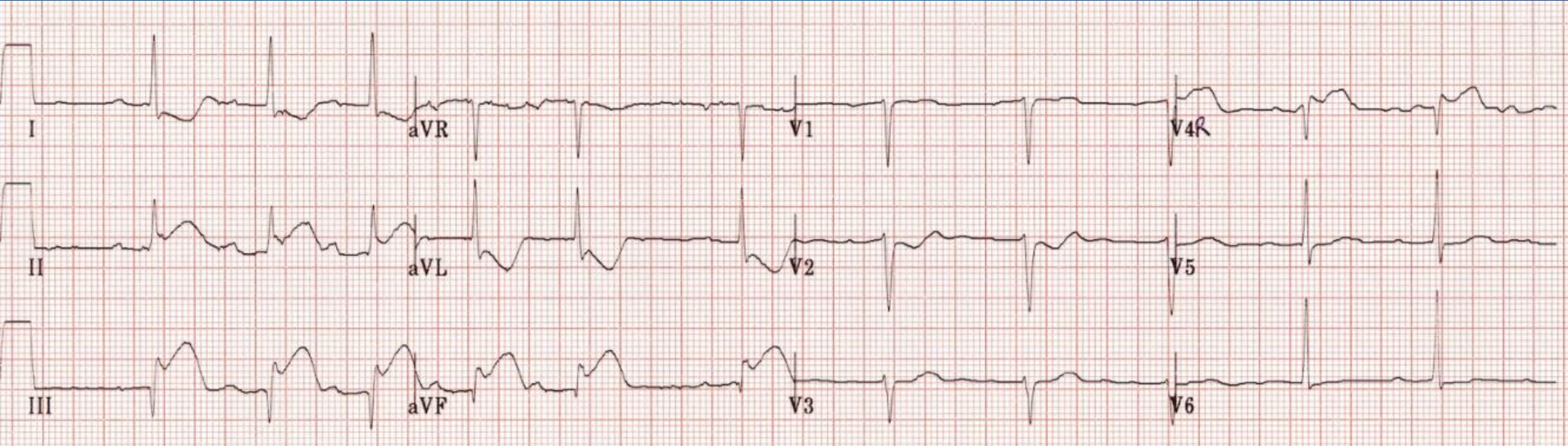
- ✓ Akut inferior STEMI
- ✓ V1'de ST elevasyonu, ST elevasyonu III>II

Sağ Ventrikül STEMI



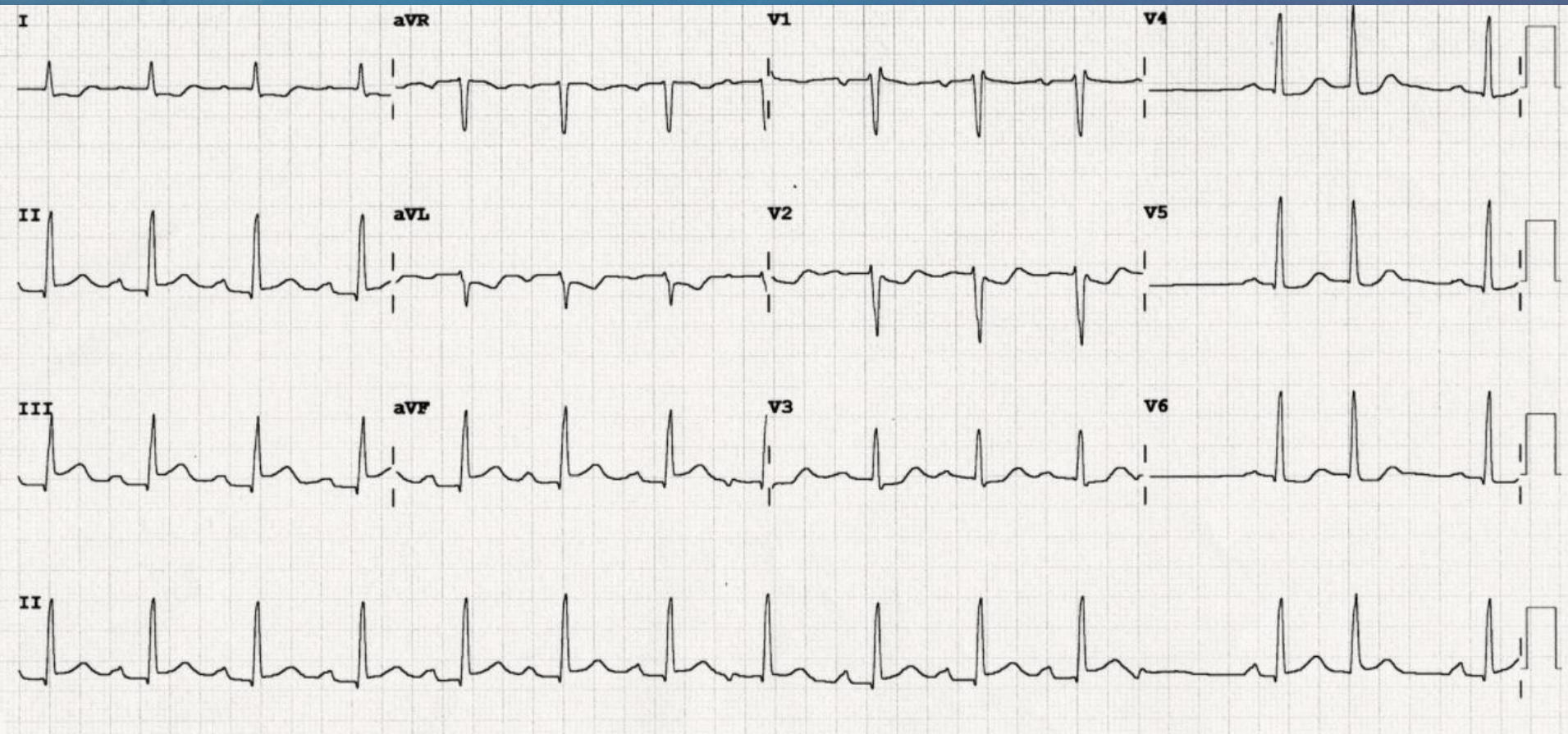
- ✓ Aynı hasta, akut inferior STEMI
- ✓ V4R'de ST elevasyonu

Sağ Ventrikül STEMI



- ✓ Akut inferior STEMI, ST elevasyonu III>II
- ✓ V1'de ST izoelektrik hatta+ V2'de ST çökmesi
- ✓ V4R'de ST elevasyonu

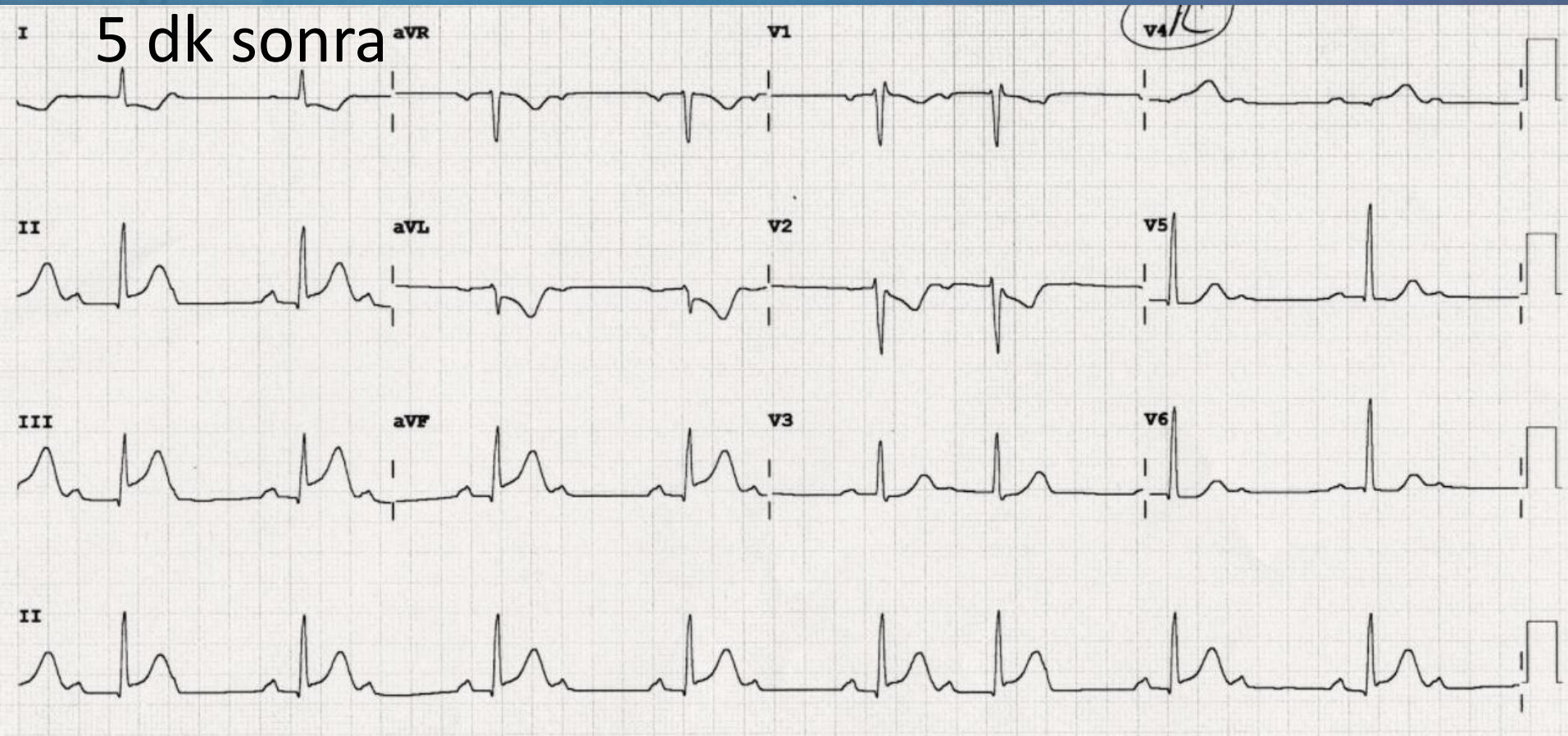
Sağ Ventrikül STEMI



Sağ Ventrikül STEMI



5 dk sonra



Posterior STEMI

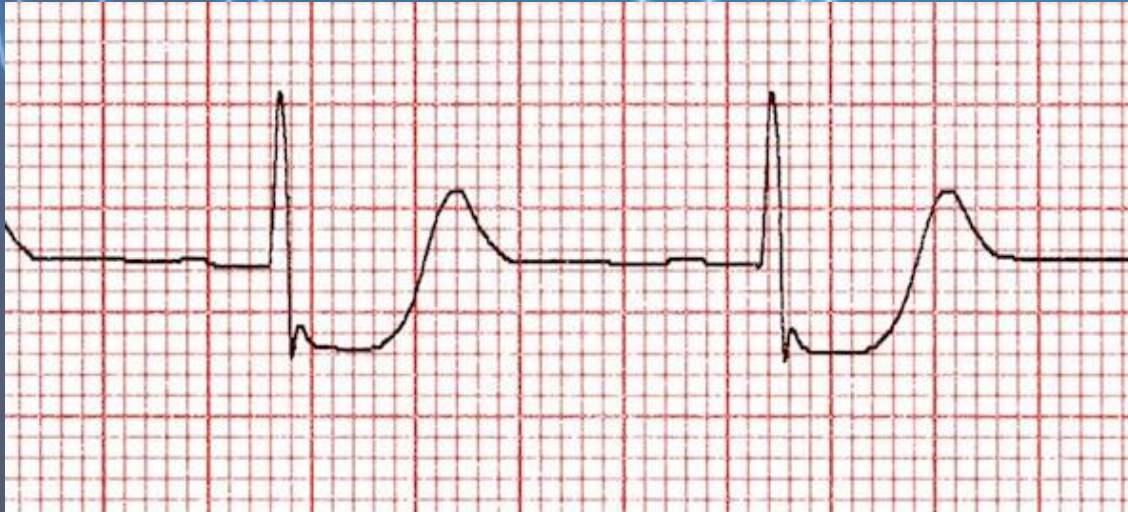


- ✓ Posterior infarktüs STEMI'lerin %10-15'i
- ✓ Inferior veya lateral infarkt'larla birliktelik sıktır ve geniş bir miyokard hasarının göstergesi
- ✓ Posterior miyokard 12 derivasyonlu EKG'de görülemez

Posterior STEMI



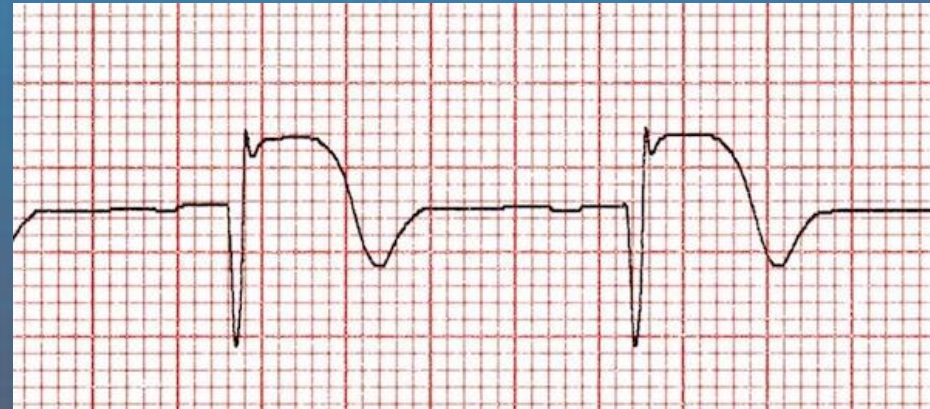
- ✓ Posterior MI V1-3'te aşağıdaki değişiklikler aracılığı ile desteklenmektedir:
 - ✓ Horizontal ST depresyonu
 - ✓ Uzun ve geniş R dalgaları (> 30 ms)
 - ✓ Yukarı dönük T dalgaları
 - ✓ V2'de dominant R dalgası (R/S oranı > 1)



Posterior STEMI



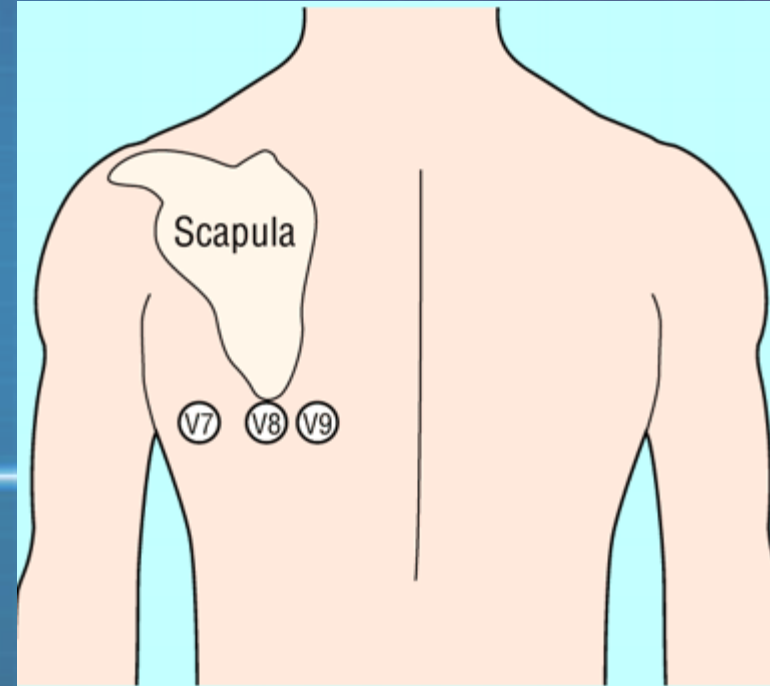
- ✓ Posterior duvar önden kaydedildiği için görüntü ters döner
 - ✓ ST elevasyonu ST çökmesine döner
 - ✓ Q dalgaları R dalgaları haline gelir
 - ✓ T dalgası sonundaki inversiyon yukarı dönük T dalgası haline gelir



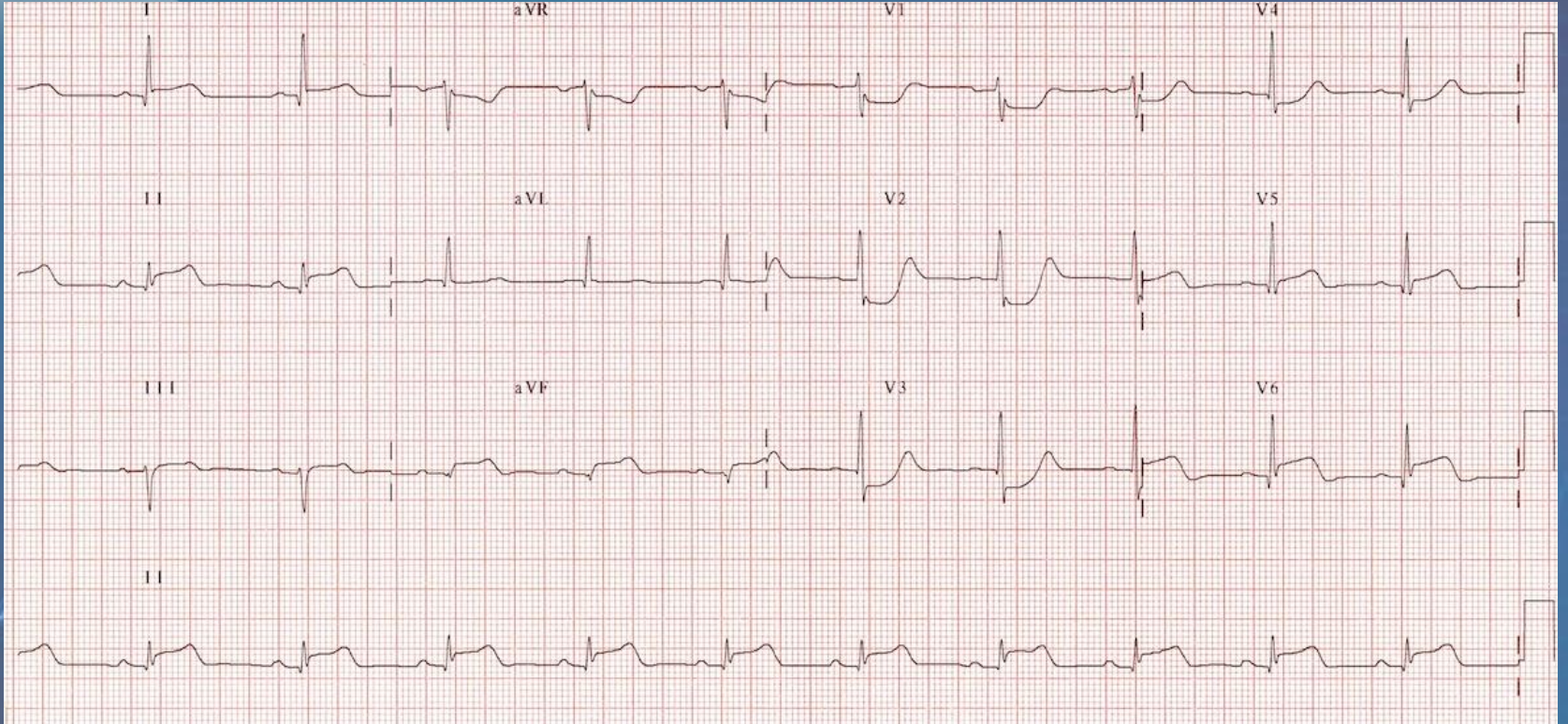
Posterior STEMI



- ✓ V7 – sol posterior aksiler hat
- ✓ V8 – sol skapulanın alt köşesi
- ✓ V9 – sol paraspinal bölge
- ✓ Hepsi V6 ile aynı horizontal düzlem
- ✓ MI tanısı için 0,5 mm ST elevasyonu olması yeterli

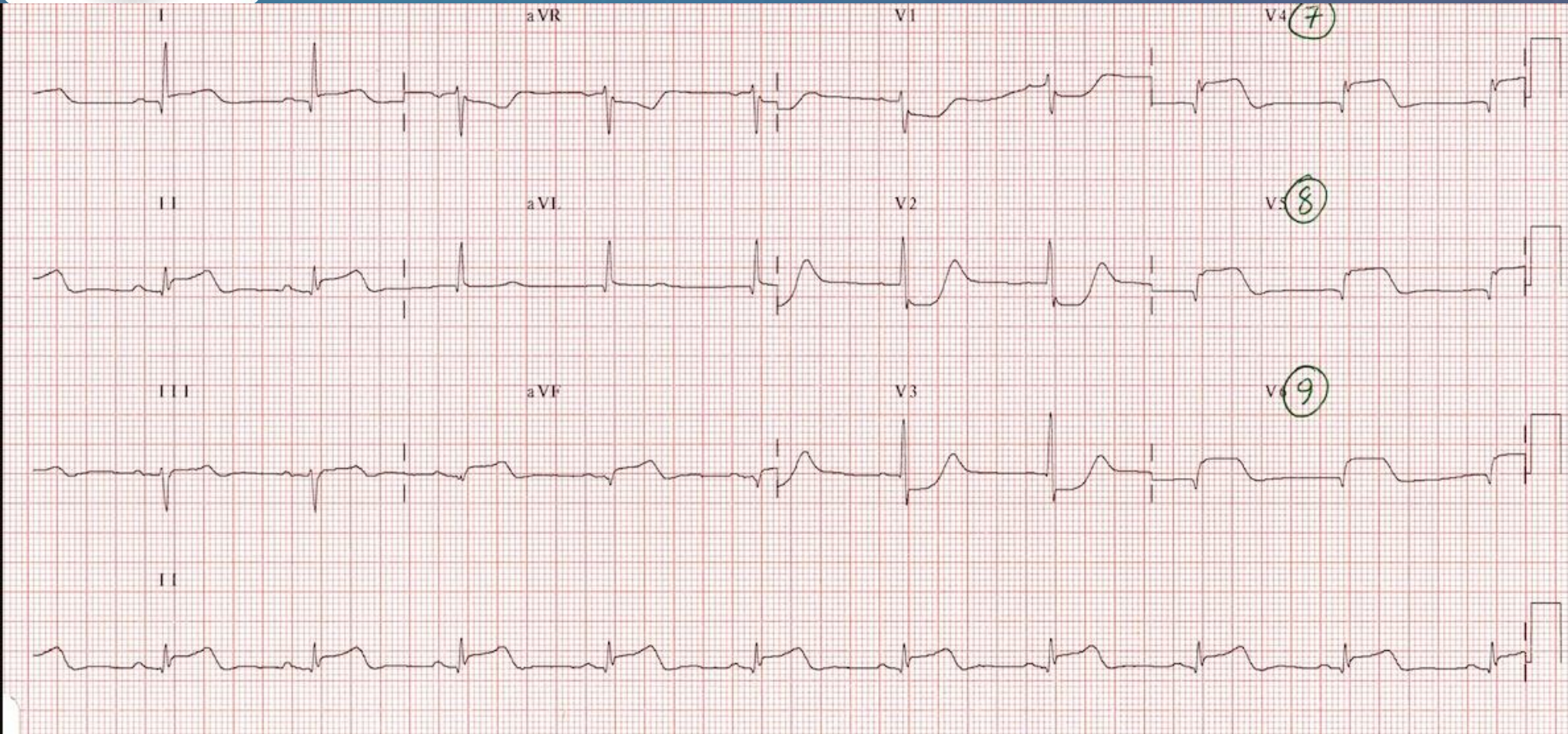


Posterior STEMI



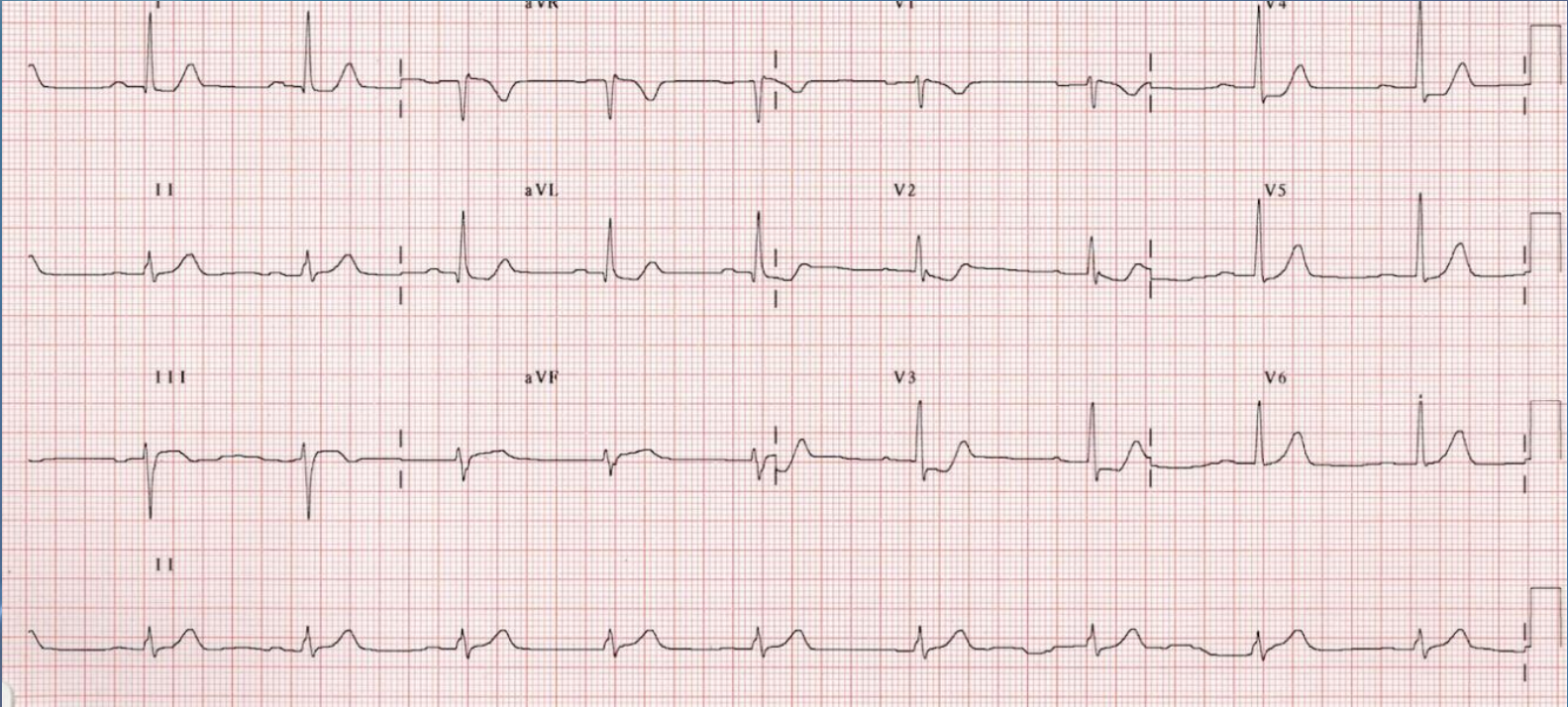
- ✓ Akut inferolateral STEMI, V1-3'de horizontal ST çökmesi
- ✓ V2-3'te uzun ve geniş (>30 ms) R dalgaları
- ✓ V2'de dominant R dalgası (R/S oranı > 1)
- ✓ V2-3'te yukarı dönük T dalgaları

Posterior STEMI



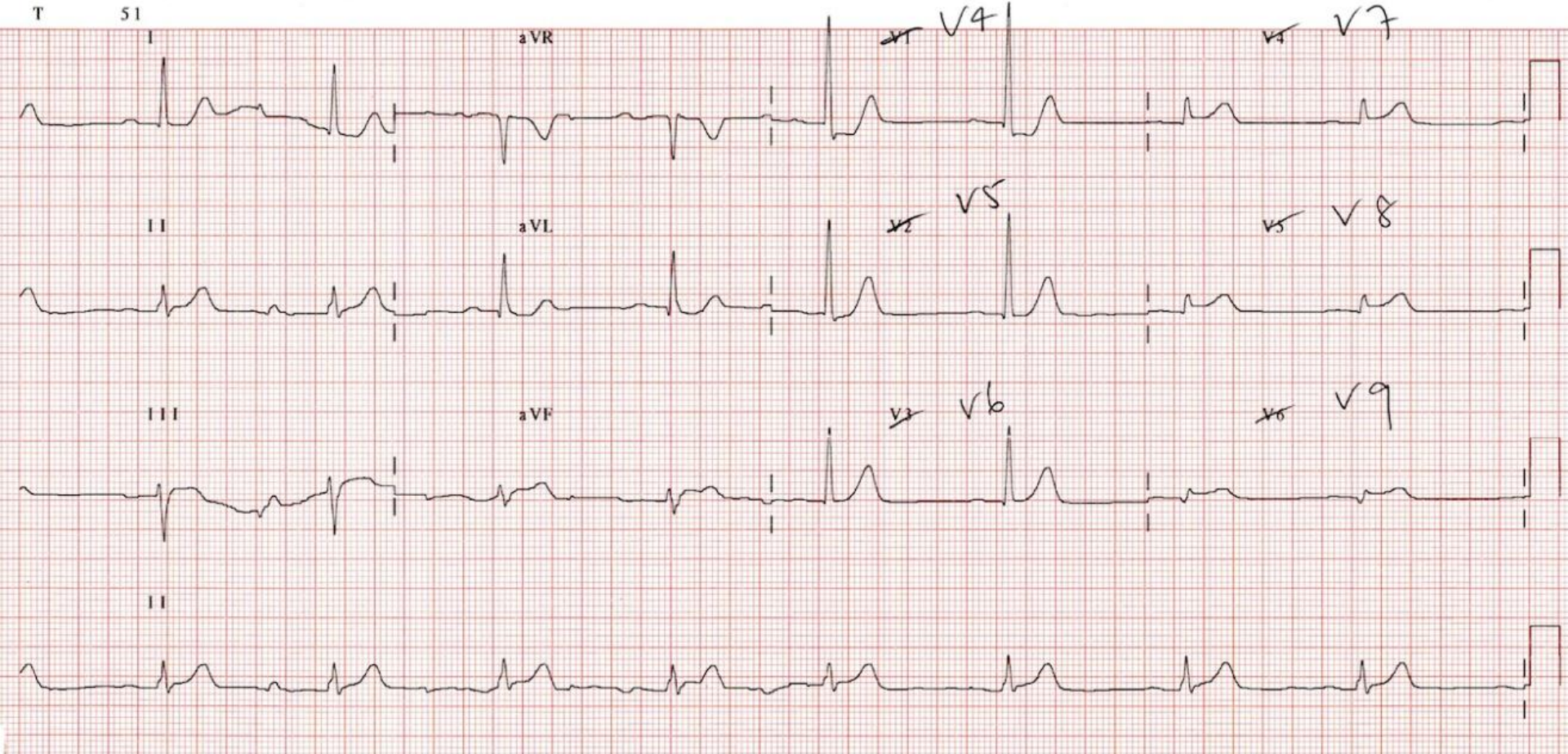
✓ Büyük bölge infartı:
infero-postero-lateral STEMI

Posterior STEMI



- ✓ V2-3'de ST çökmesi
- ✓ V2-3'te uzun ve geniş (>30 ms) R dalgaları
- ✓ V2'de dominant R dalgası (R/S oranı > 1)
- ✓ V2-3'te yukarı dönük T dalgaları

Posterior STEMI





meiji



TEŞEKKÜRLER...



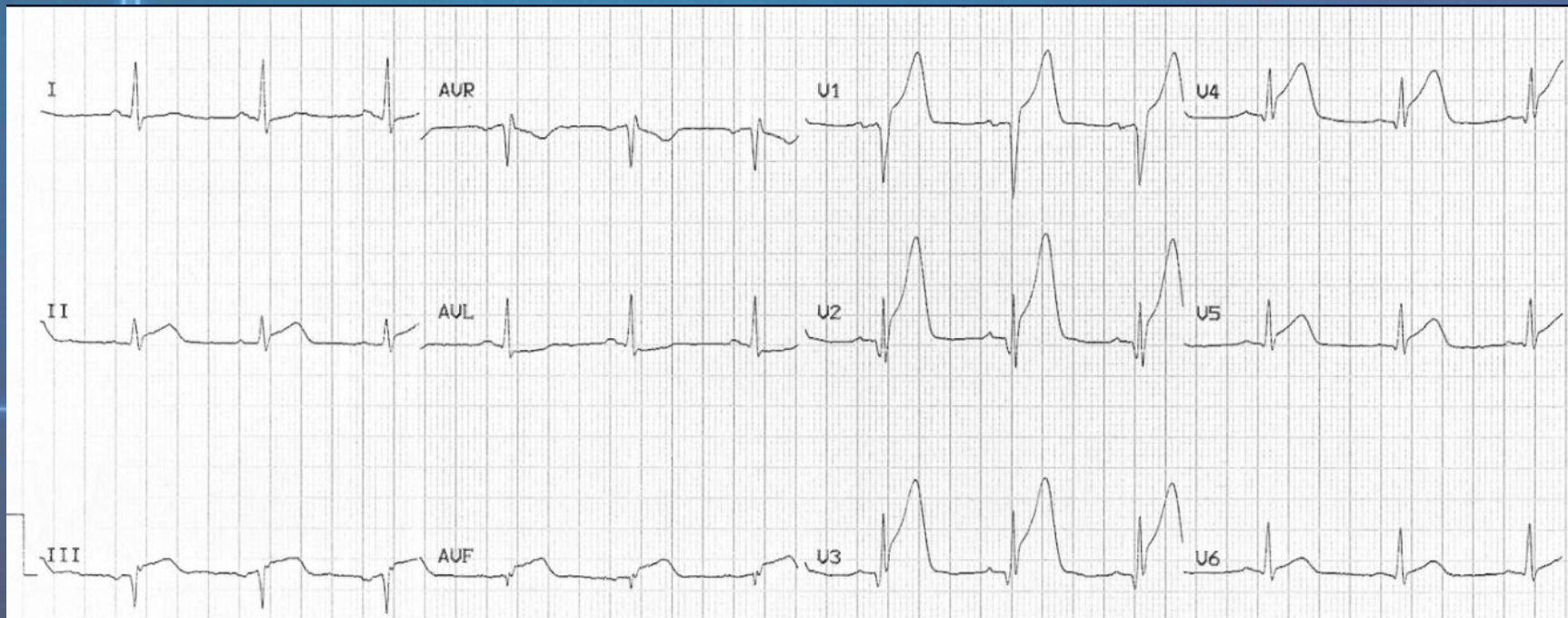
Soru?

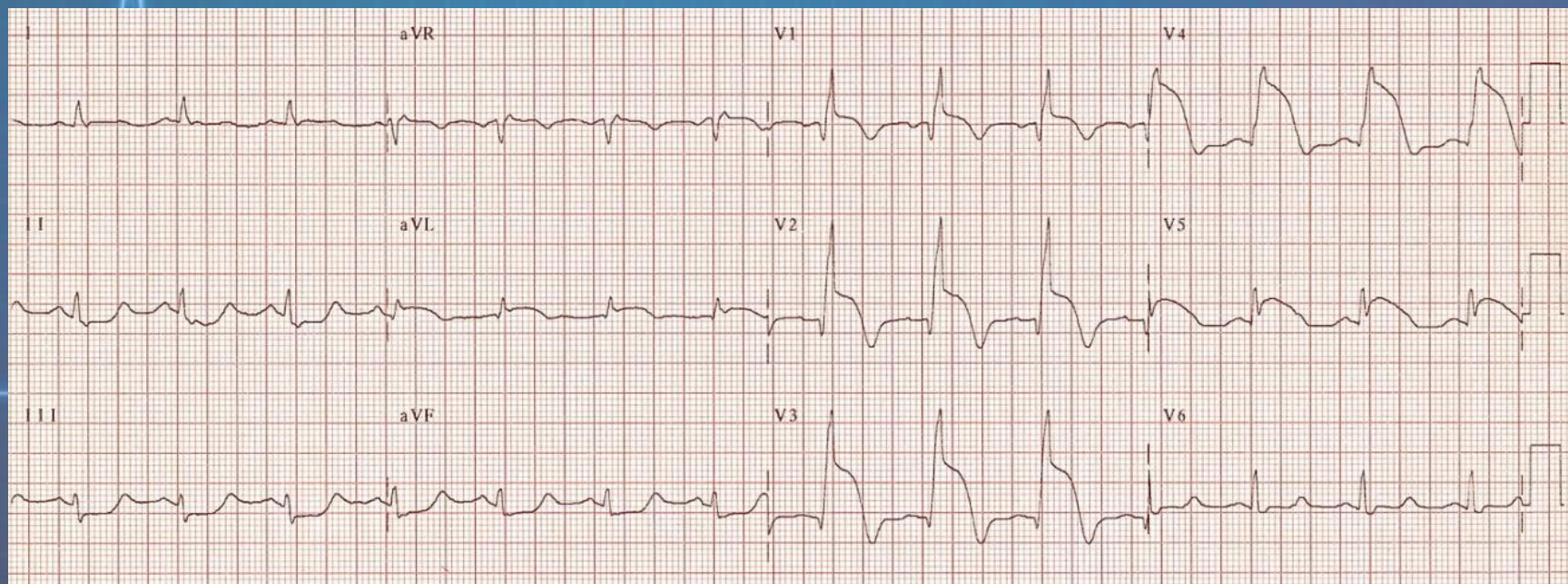
Katkı?



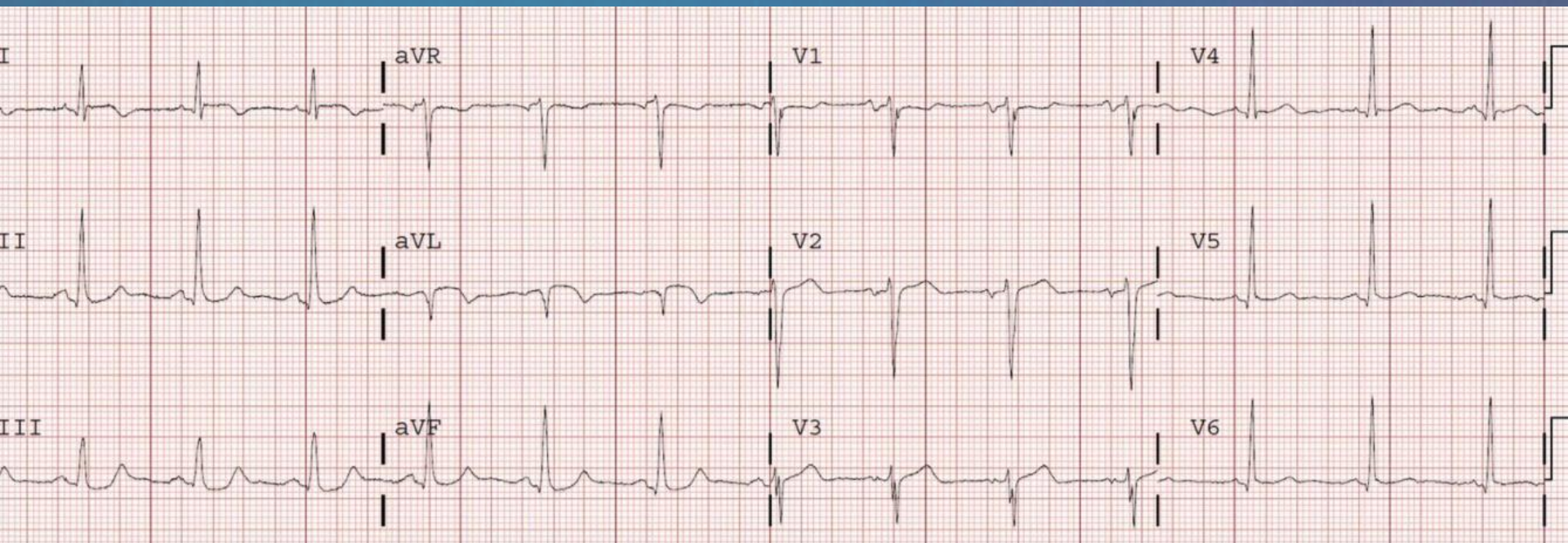
PRATİK İÇİN EKG ÖRNEKLERİ

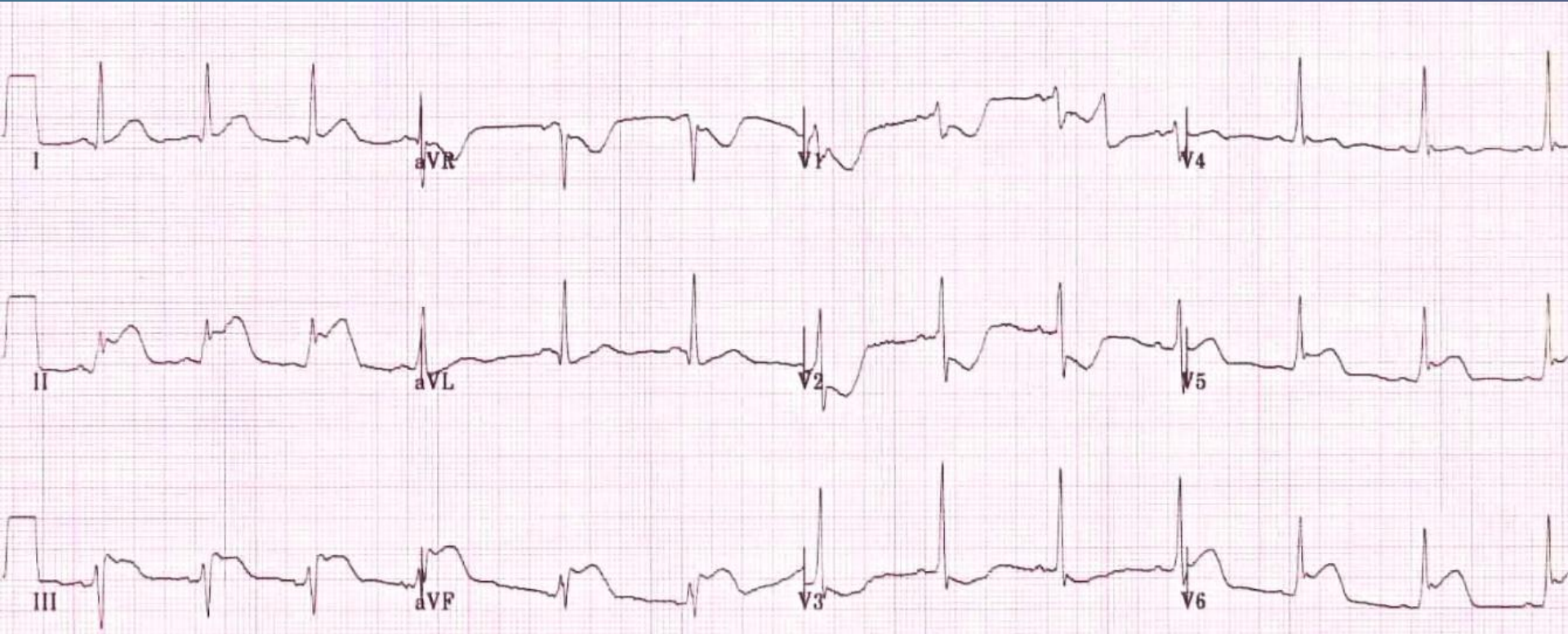


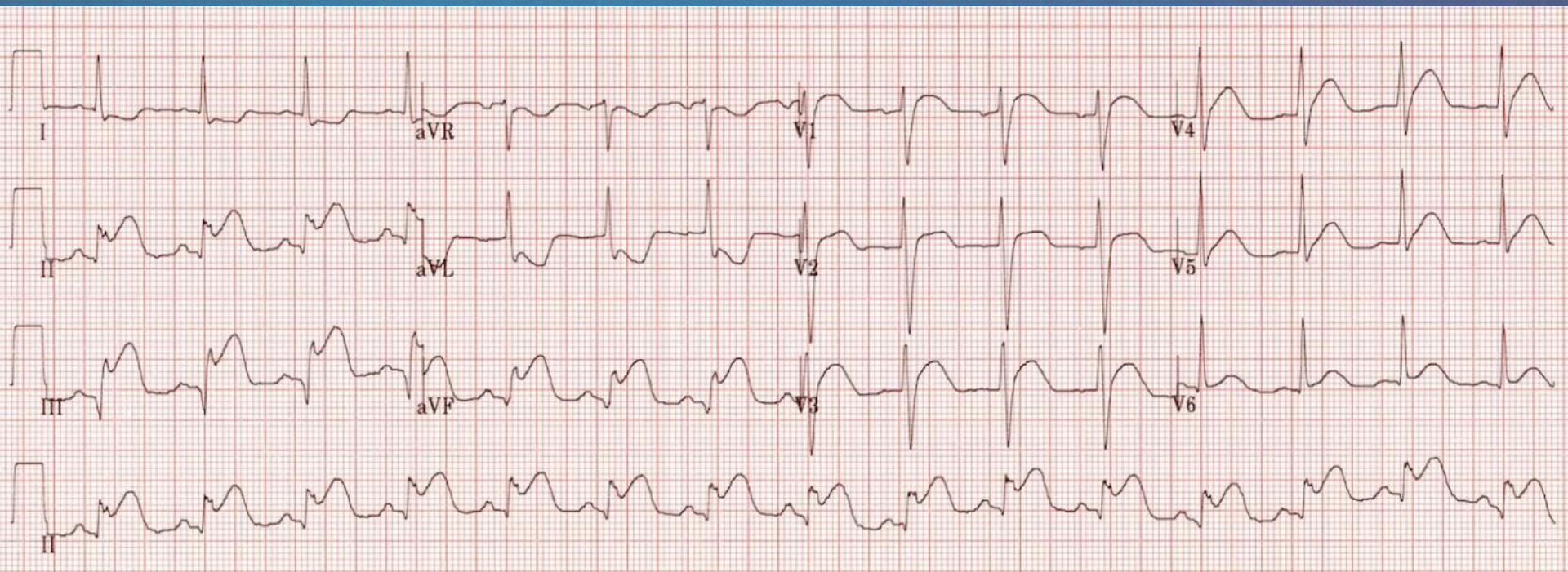


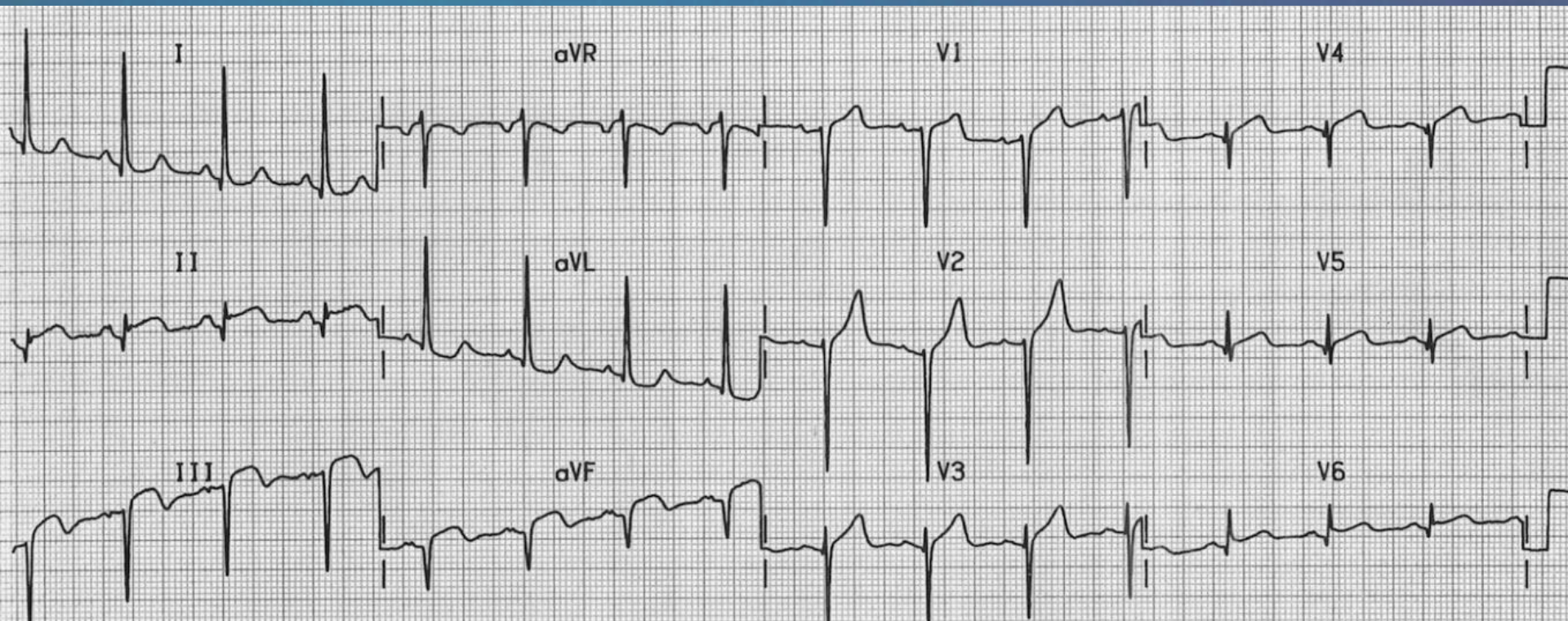












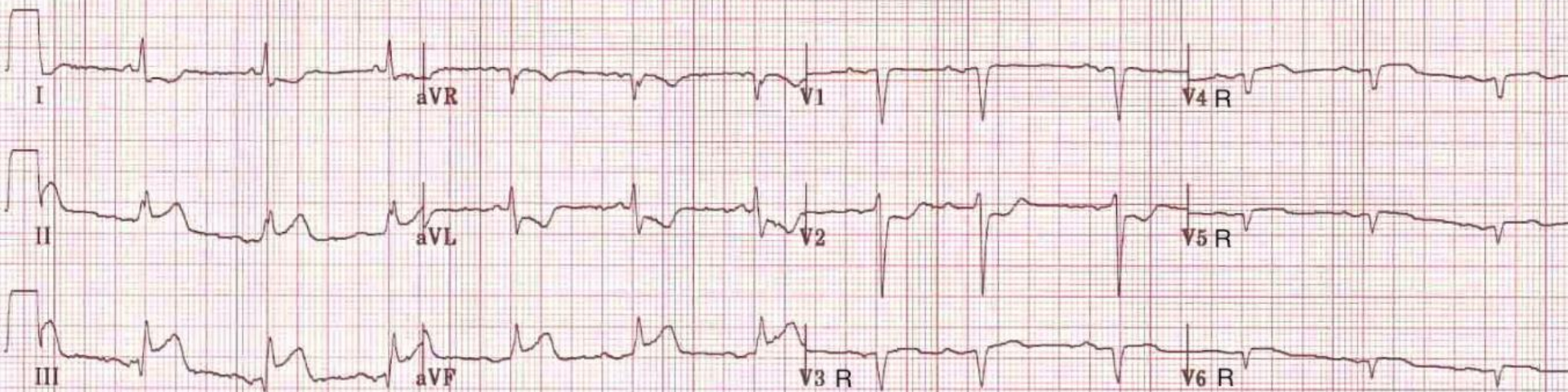


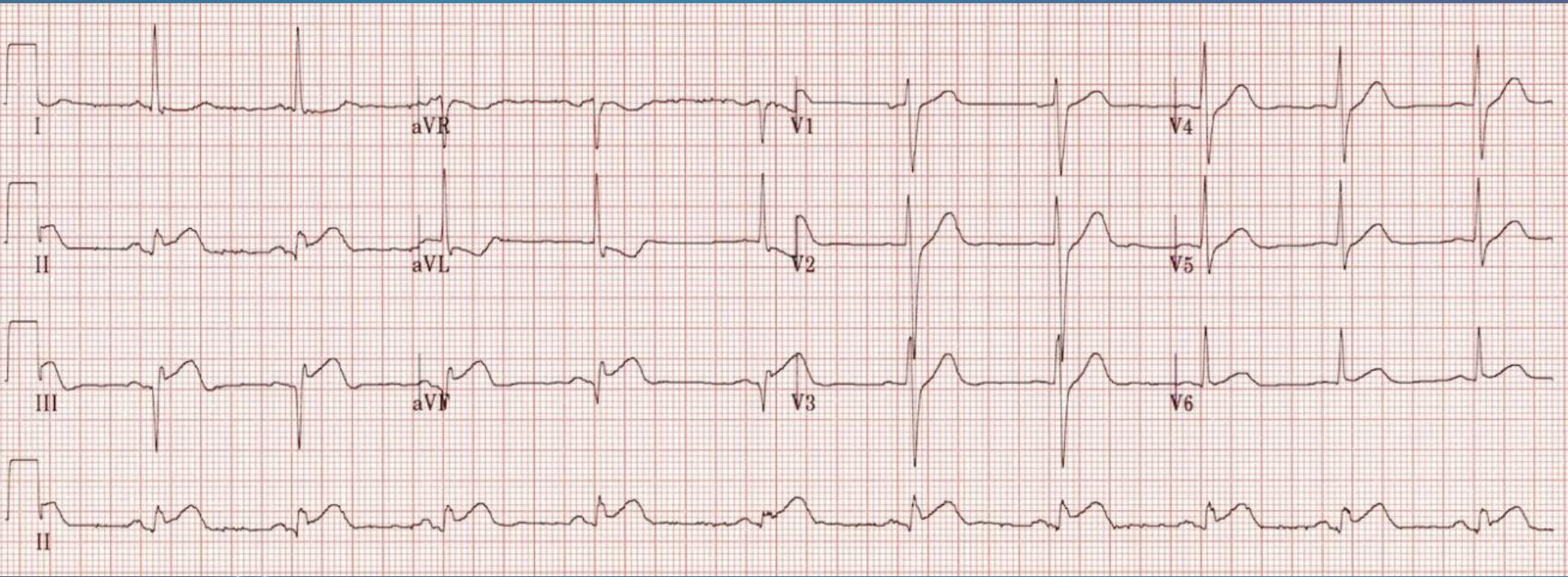
Test ind:

Referred by:

Unconfirmed

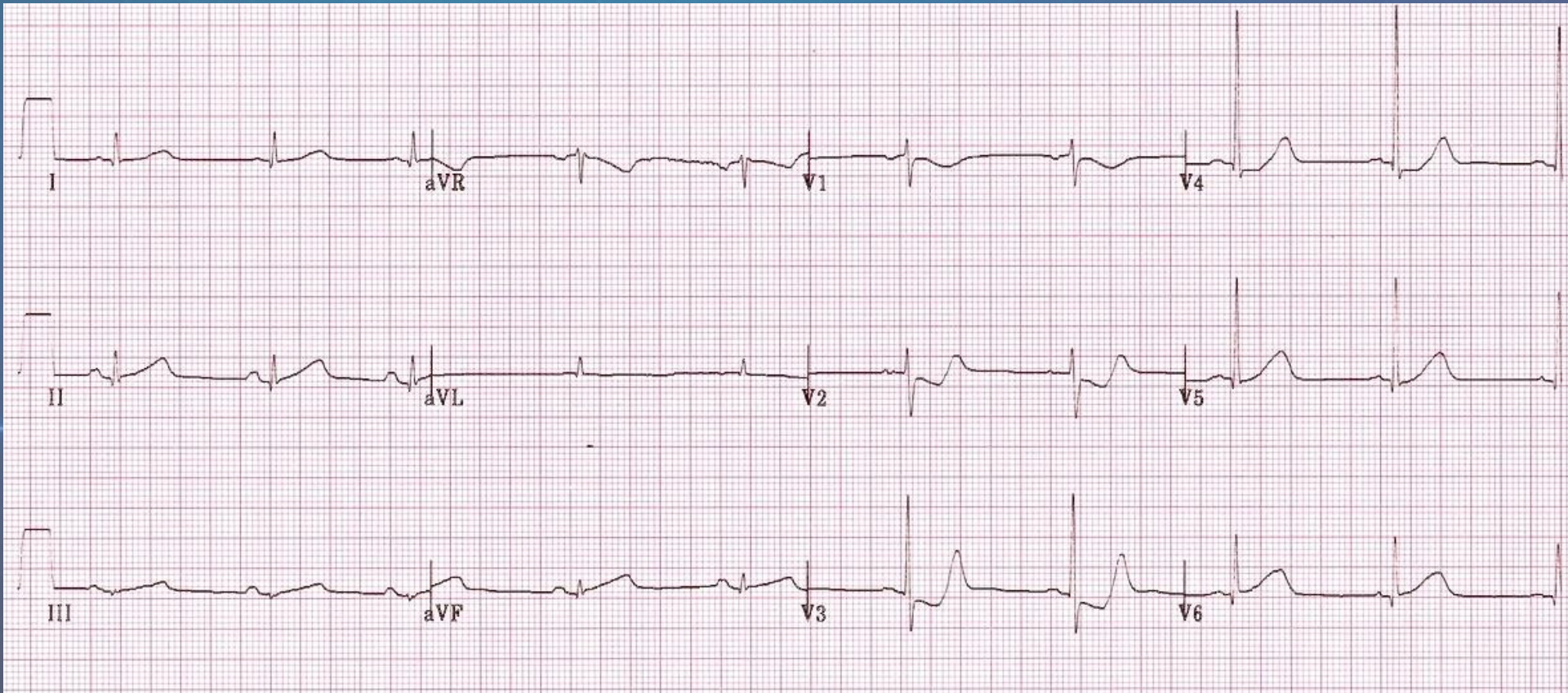
② leads



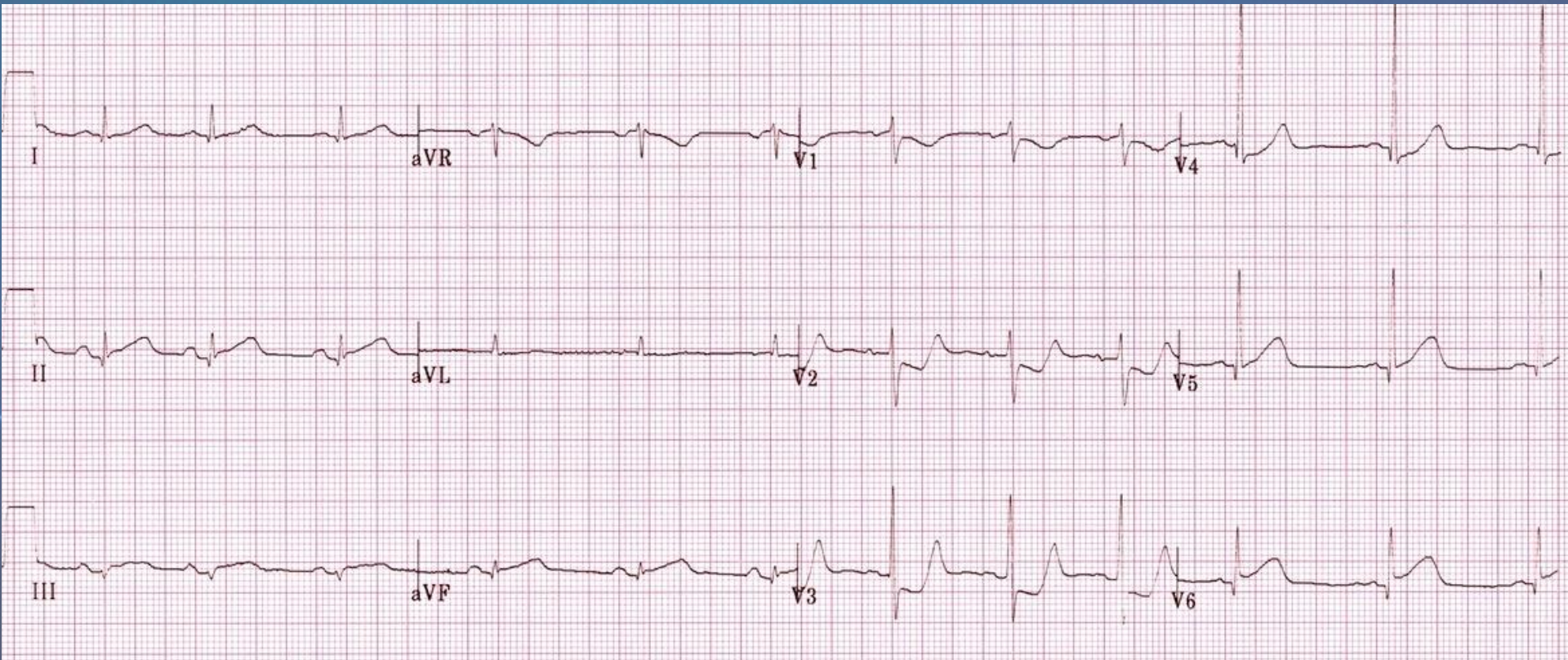


Göğüs ağrısı ile gelen hasta

1. EKG

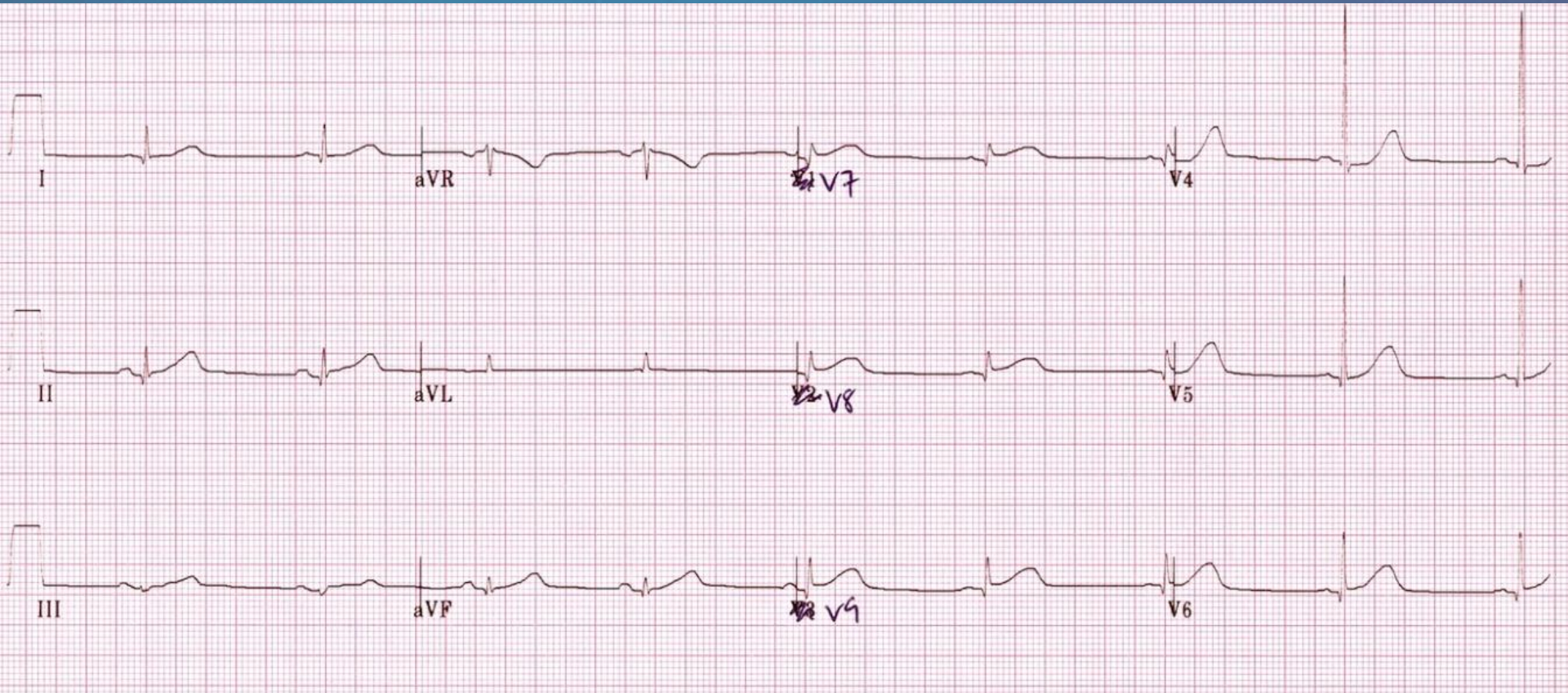


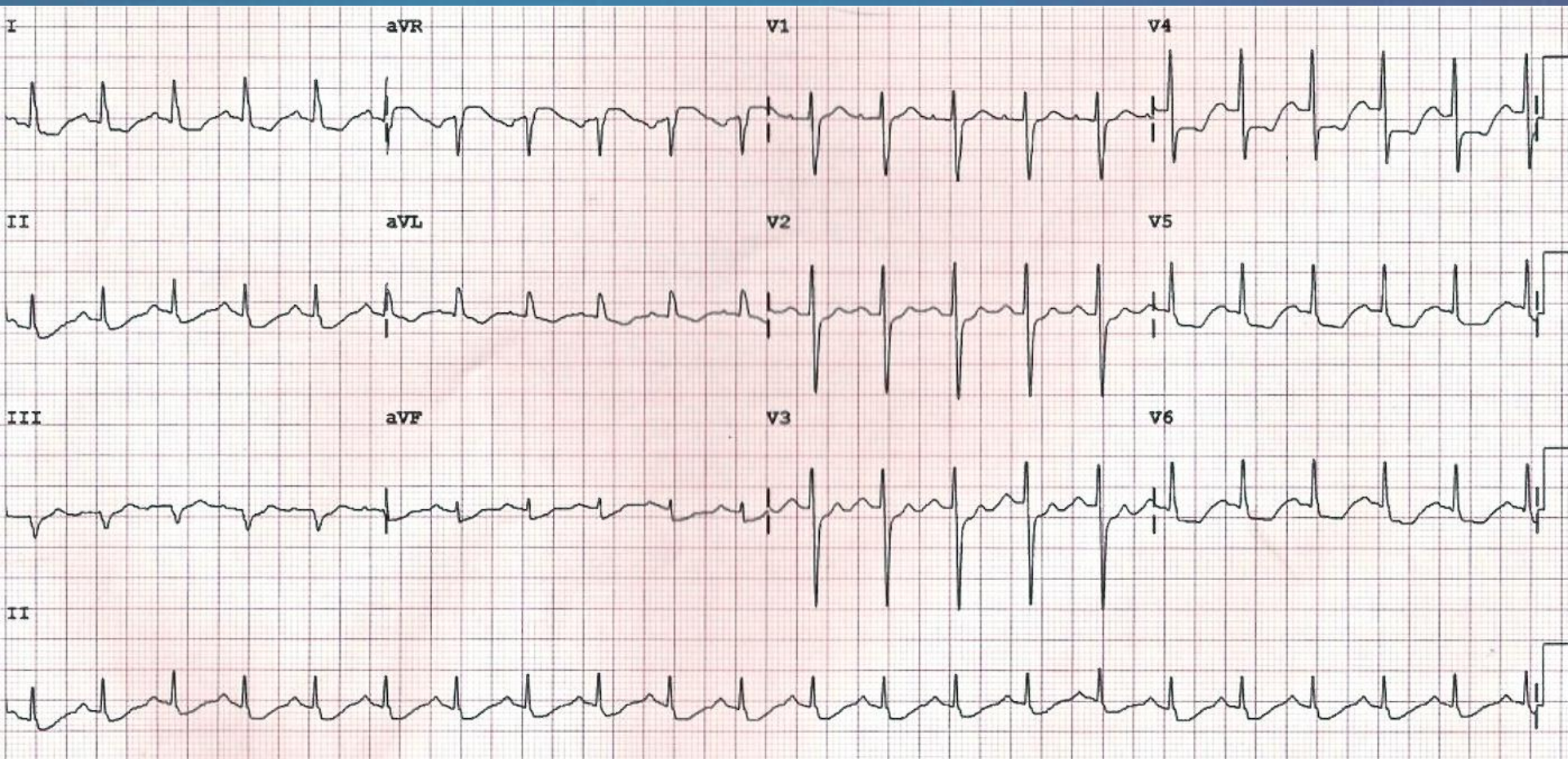
Göğüs ağrısı ile gelen hasta 30 dk sonra 2. EKG

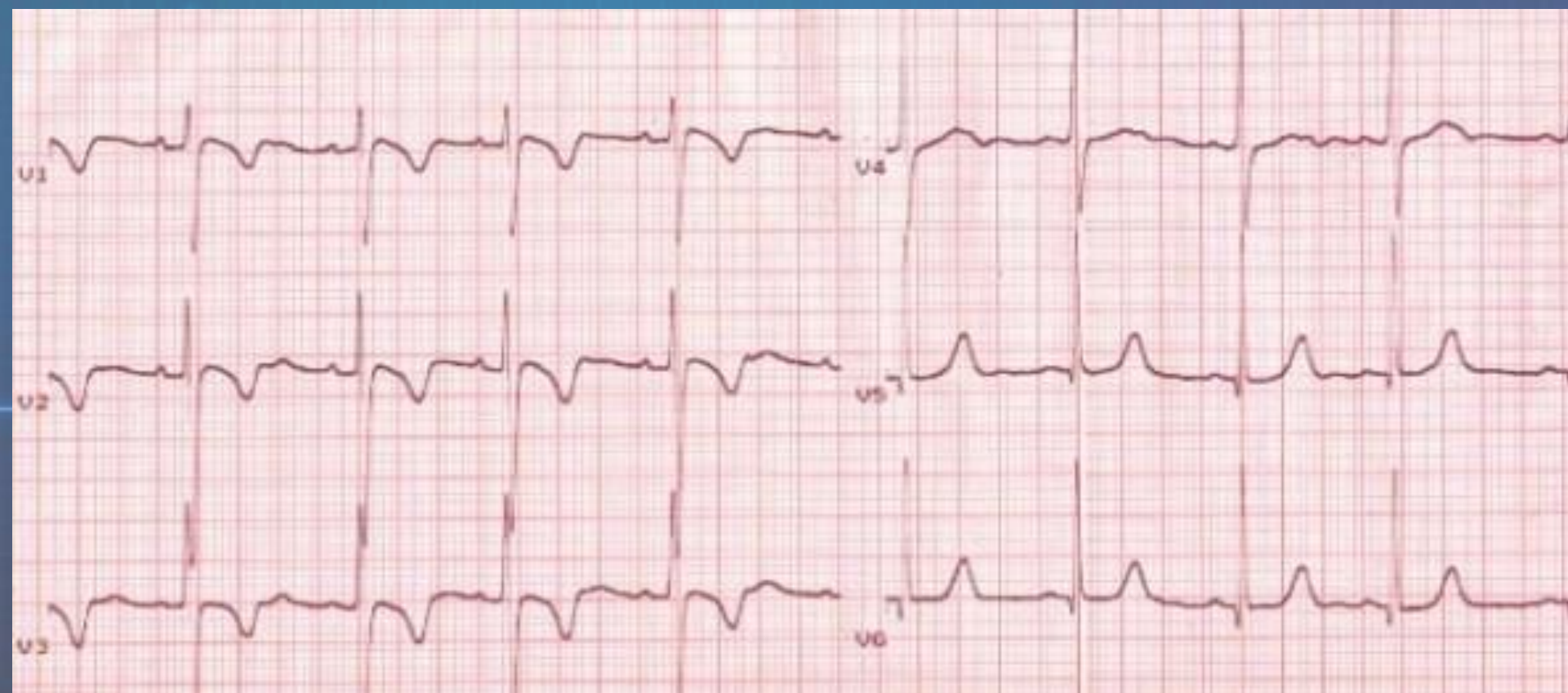


Göğüs ağrısı ile gelen hasta

3. posterior derivasyonlu EKG







EMERGENCY ROOM

Teşekkürler

