

# **EKG'de Temel Kavramlar**

**Dr. Ercan Tutar**

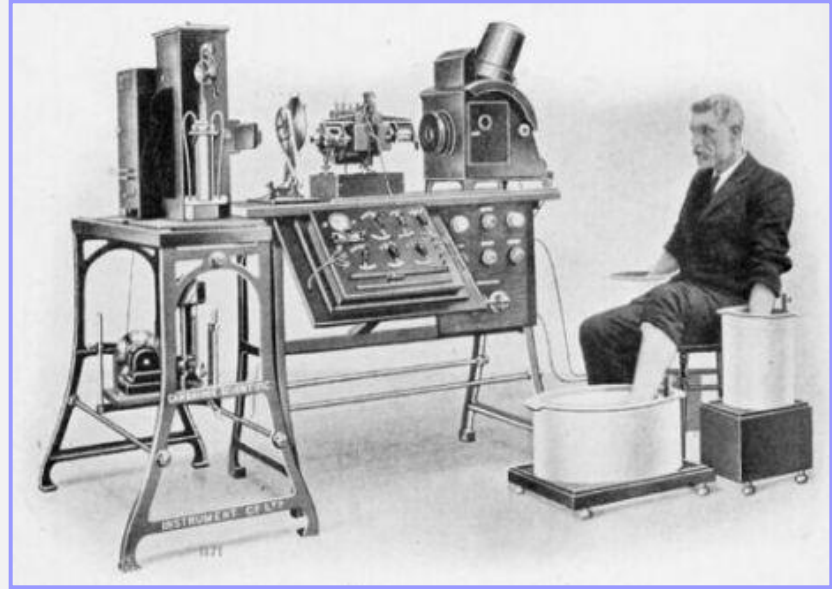
**Ankara Üniversitesi Tıp Fakültesi Çocuk Kardiyolojisi BD**

# Elektrokardiyografi (EKG)

- **Kalbin elektriksel etkinliği**
  - **Disritmi ve iletim bozukluklarında**
  - **DKH ve edinilmiş kalp hastalıkları**
    - Tanıya götürecekt ipuçları
    - Olayın şiddeti
  - **Kalbin yerleşimi**
  - **Miyokardiyal hasar**

- 20.yy başında Einthoven: İlk EKG kaydı

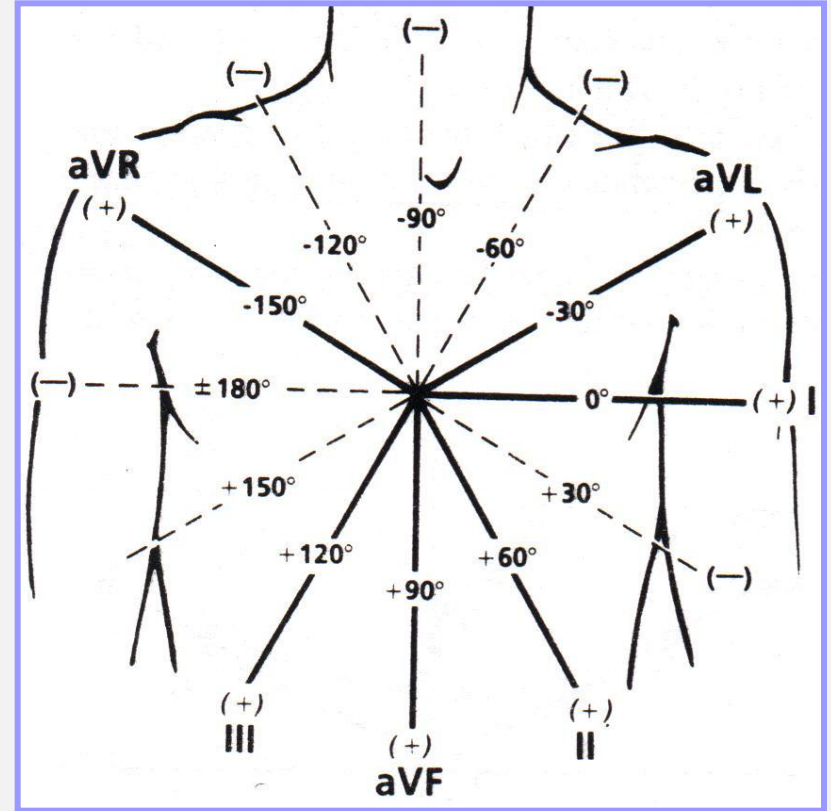
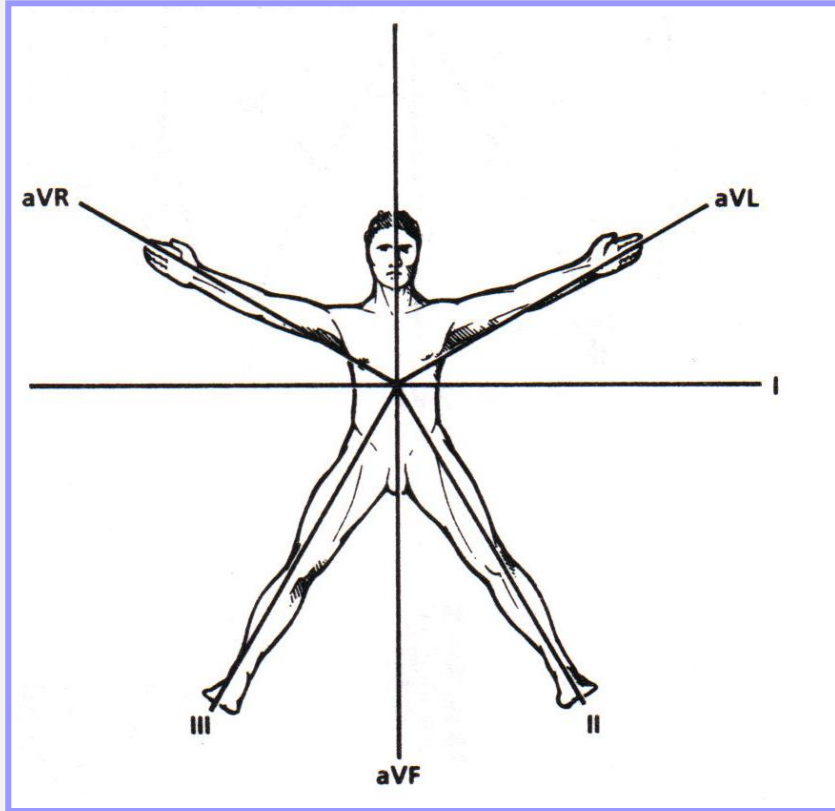
- Amplifikatör
- Galvanometre
- Kaydedici



- **Hastanın adı soyadı**
- **Yaşı**
  - **Kalp hızı**
  - **Ventrikül egemenliği**
- **Öykü**
  - **İlaç kullanımı**
- **Fizik inceleme**

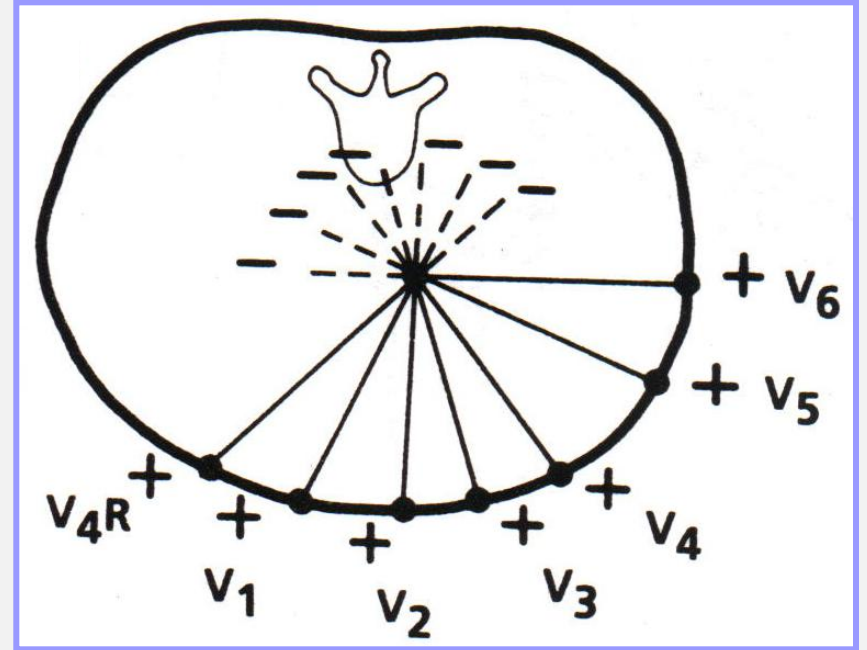
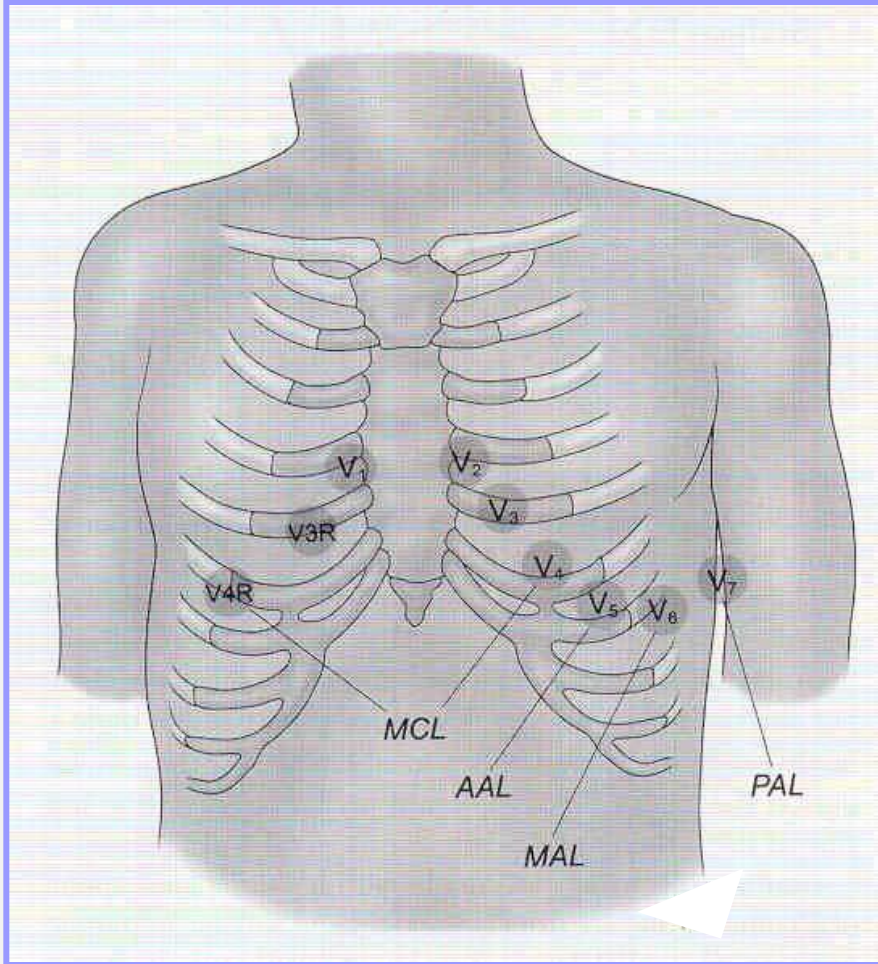
# Elektrot Sistemi ve Kayıt Tekniği

## Ekstremiteler Elektrotları



# Elektrot Sistemi ve Kayıt Tekniđi

## Göđüs (Prekordiyal) Elektrotları



# Kalibrasyon

- 12,5 – 25 – 50 mm/s hızlarda

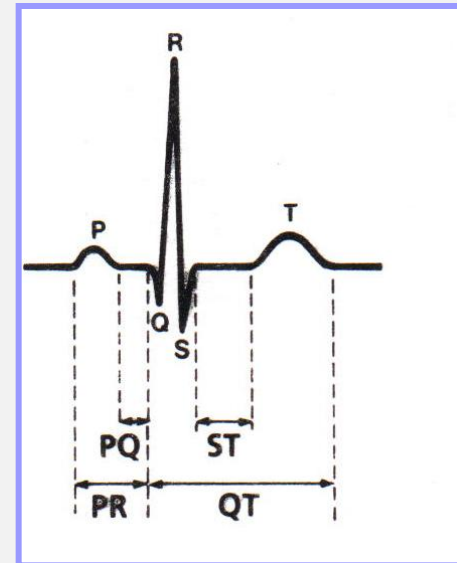
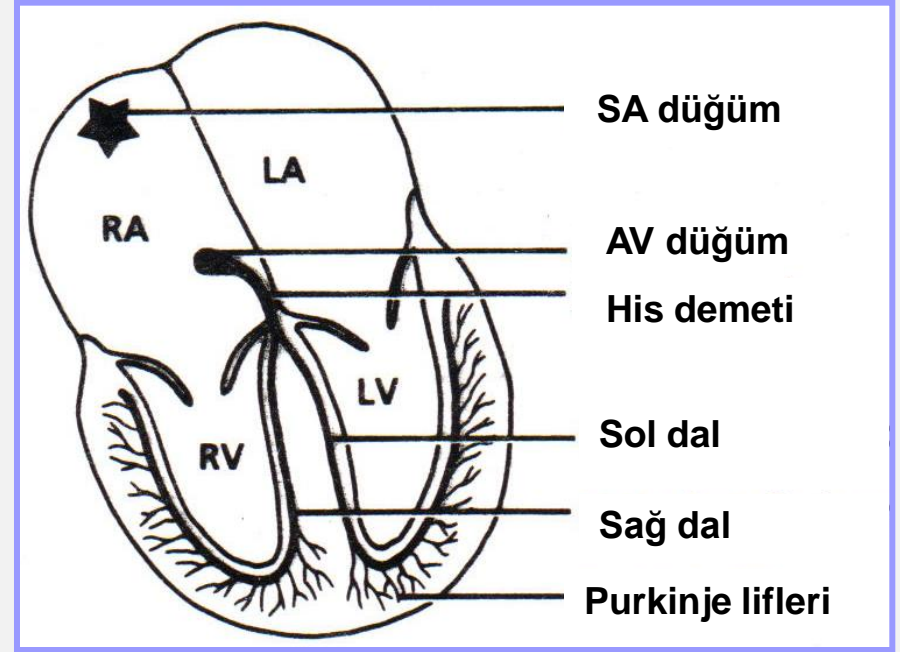
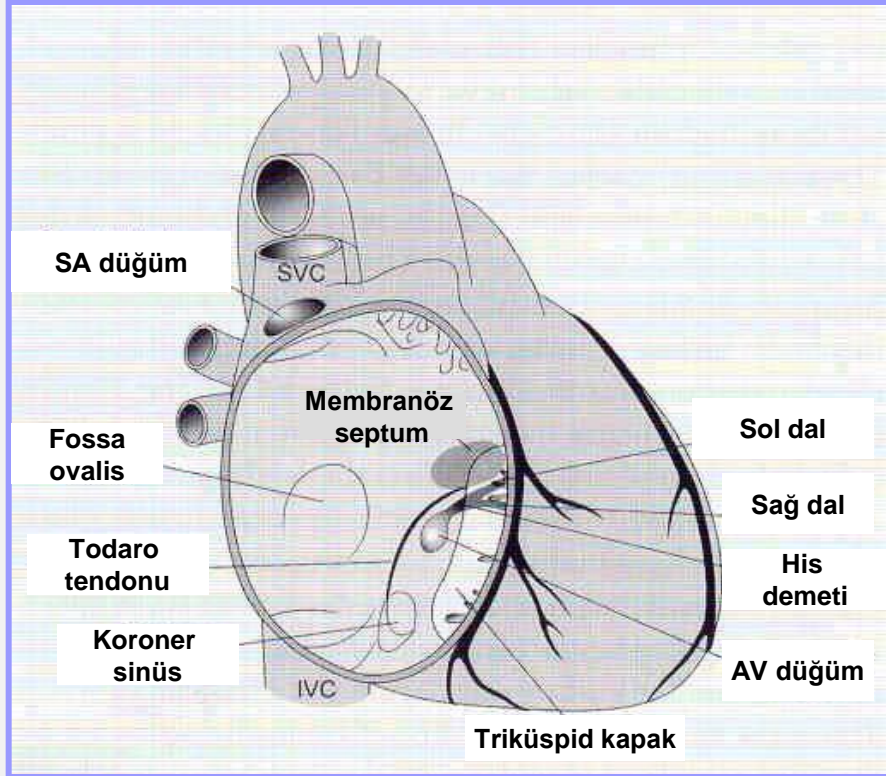
- 0,25 – 0,5 – 1 – 2 cm / 1 mV

- Standart EKG

- 25 mm/s hızda
- 1 cm/1 mV

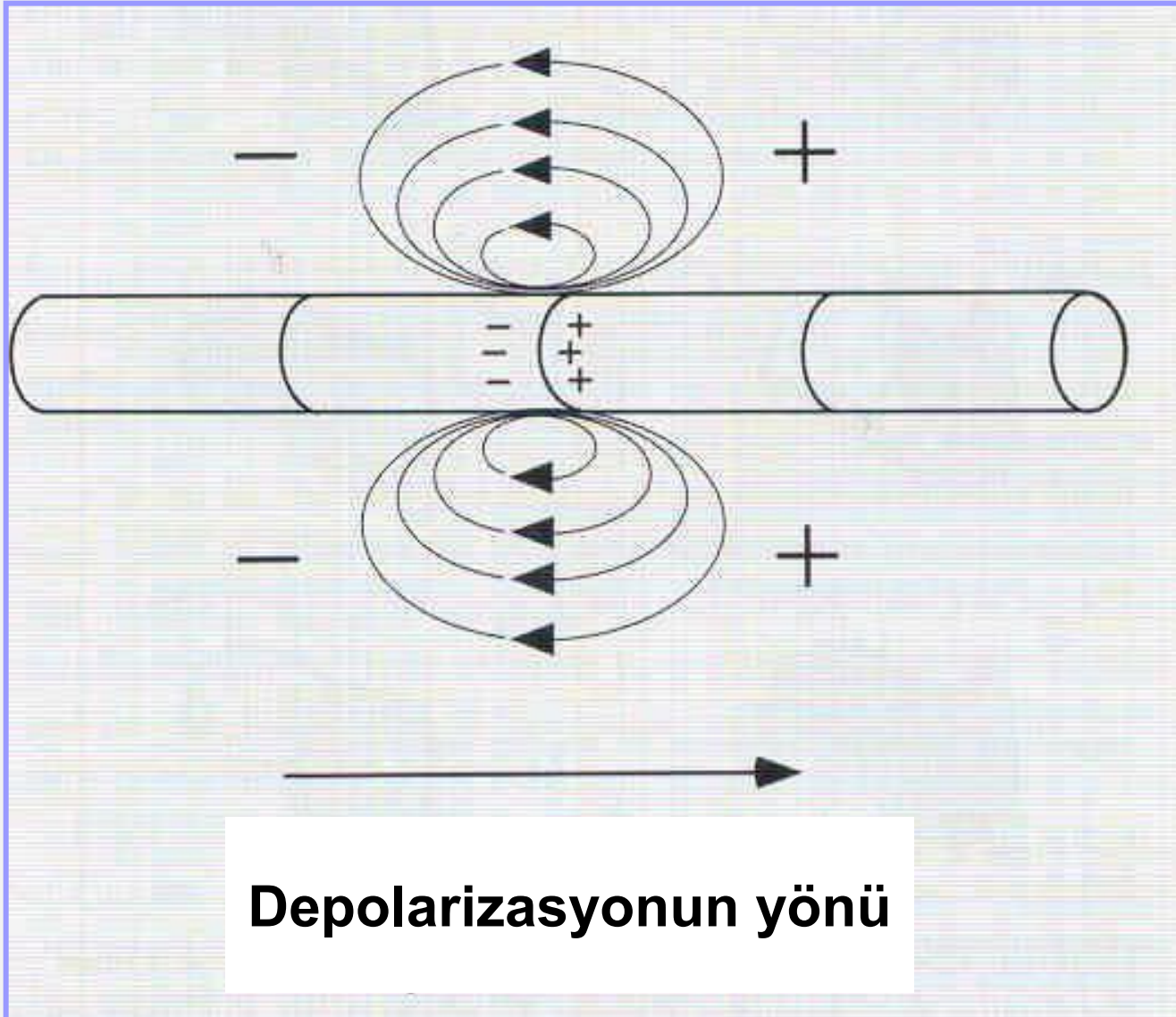


# Normal kalpte iletim





# Kalbin elektriksel etkinliđinin grafik kaydı



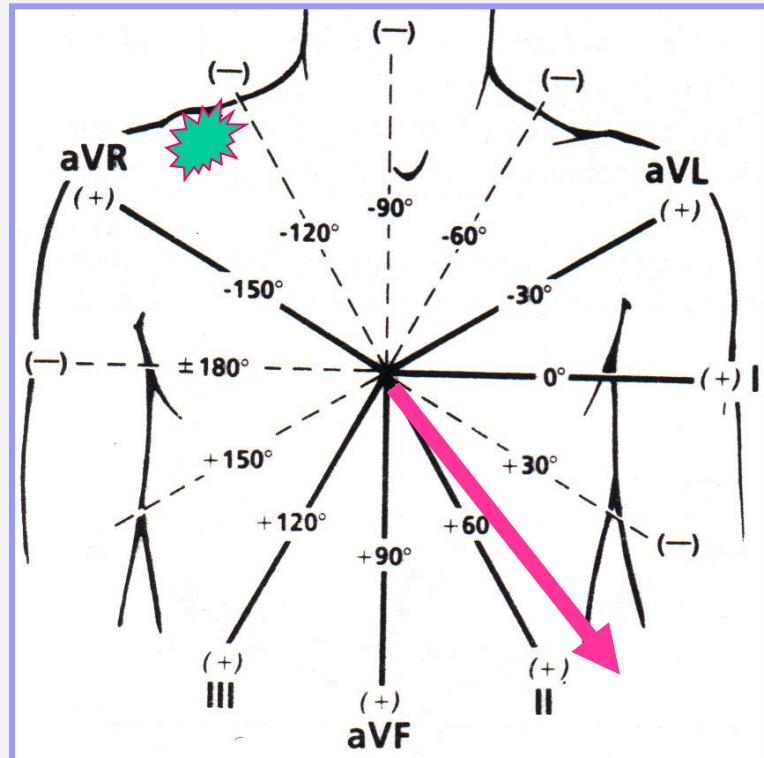
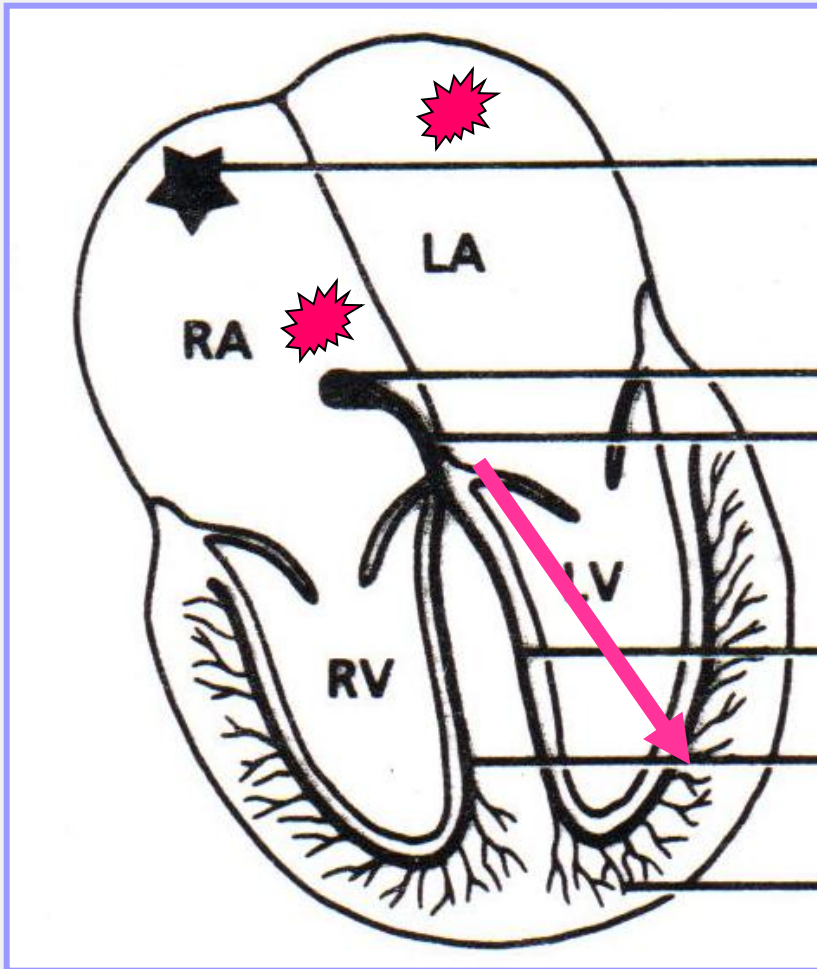
# Normal EKG

Normal sinüs ritmi mi?

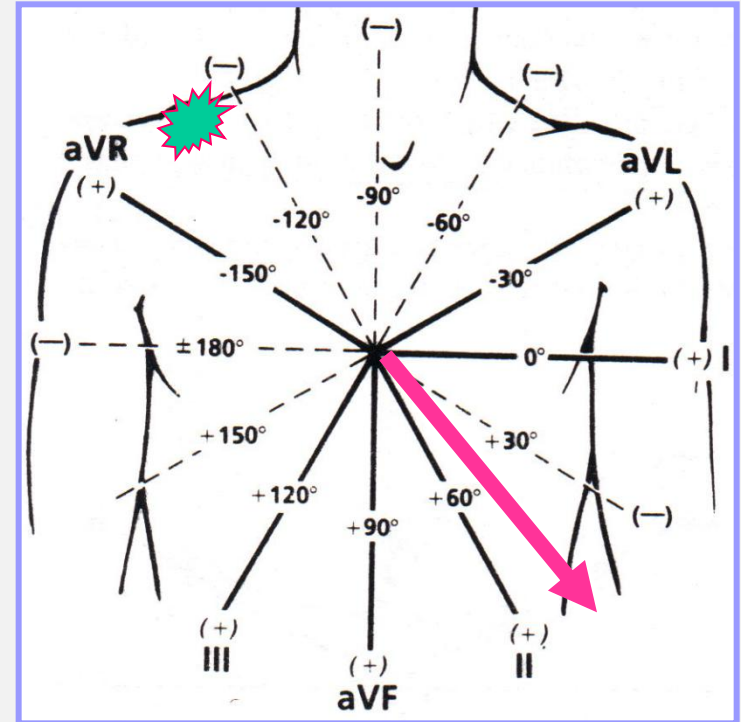
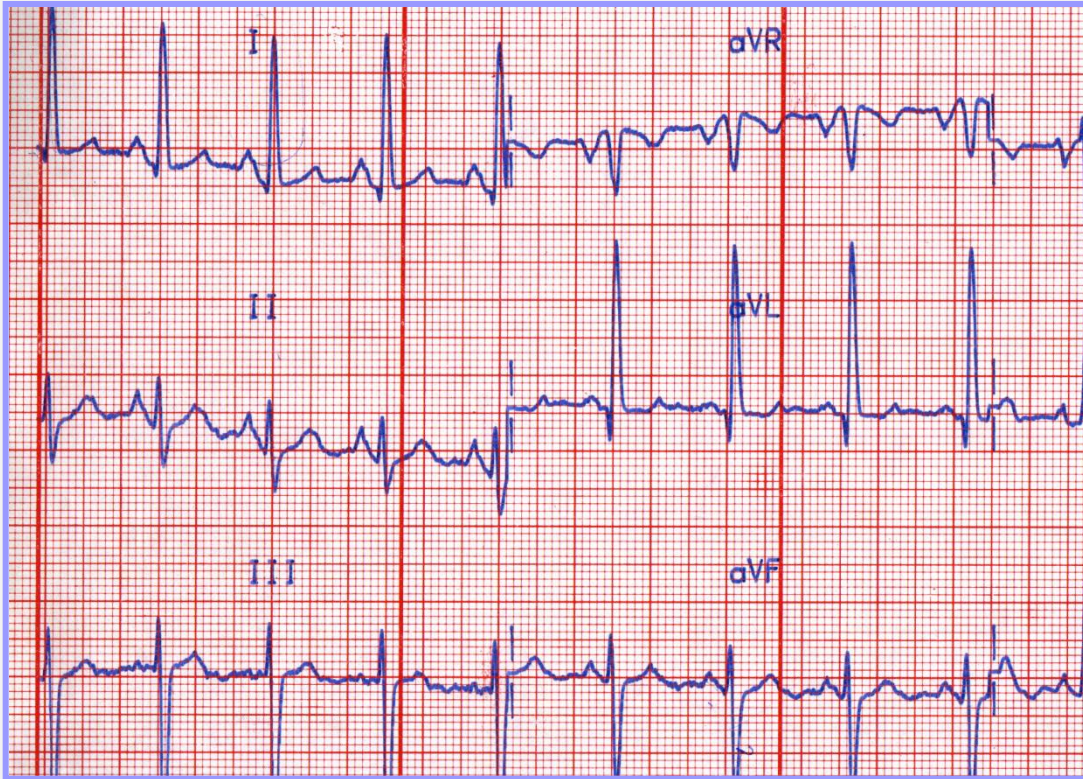
P → QRS

PR sabit

Hız normal



# Normal EKG

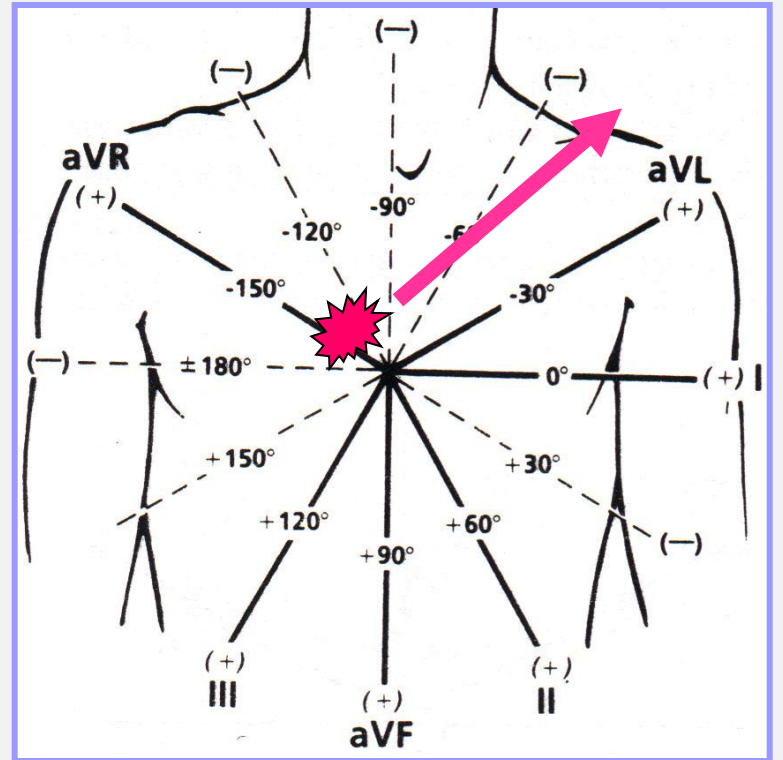
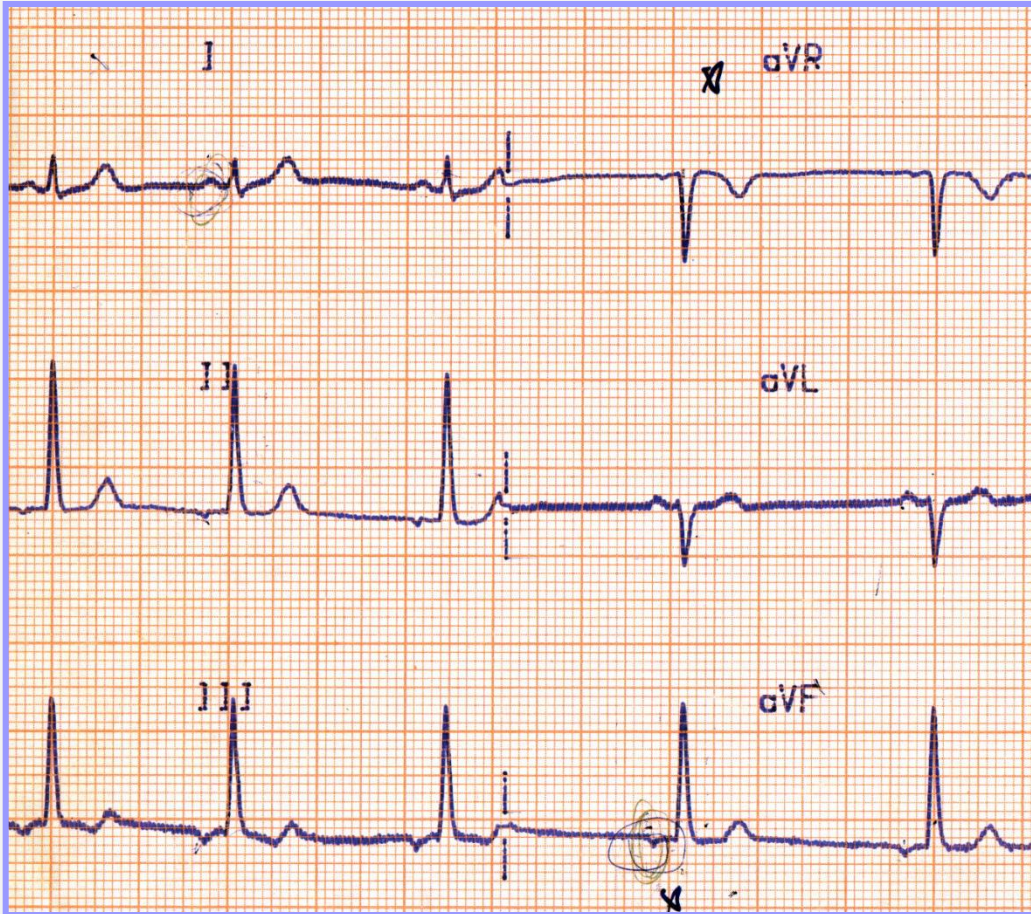


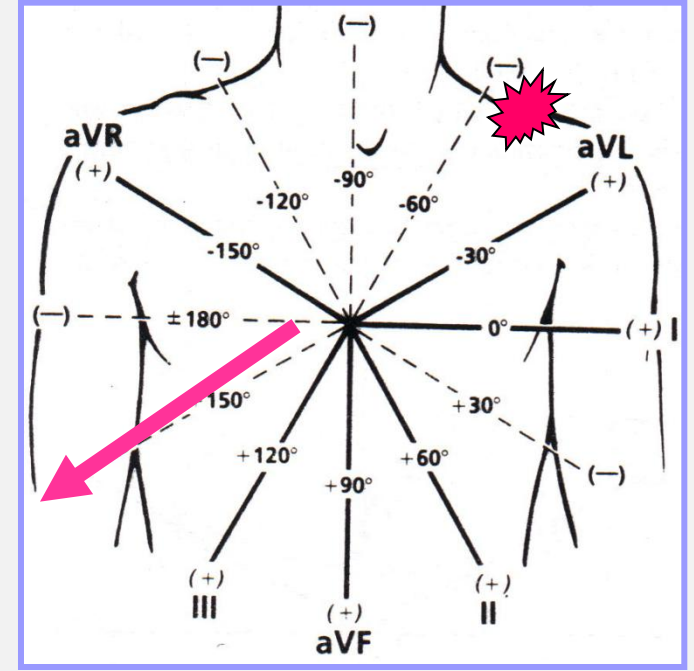
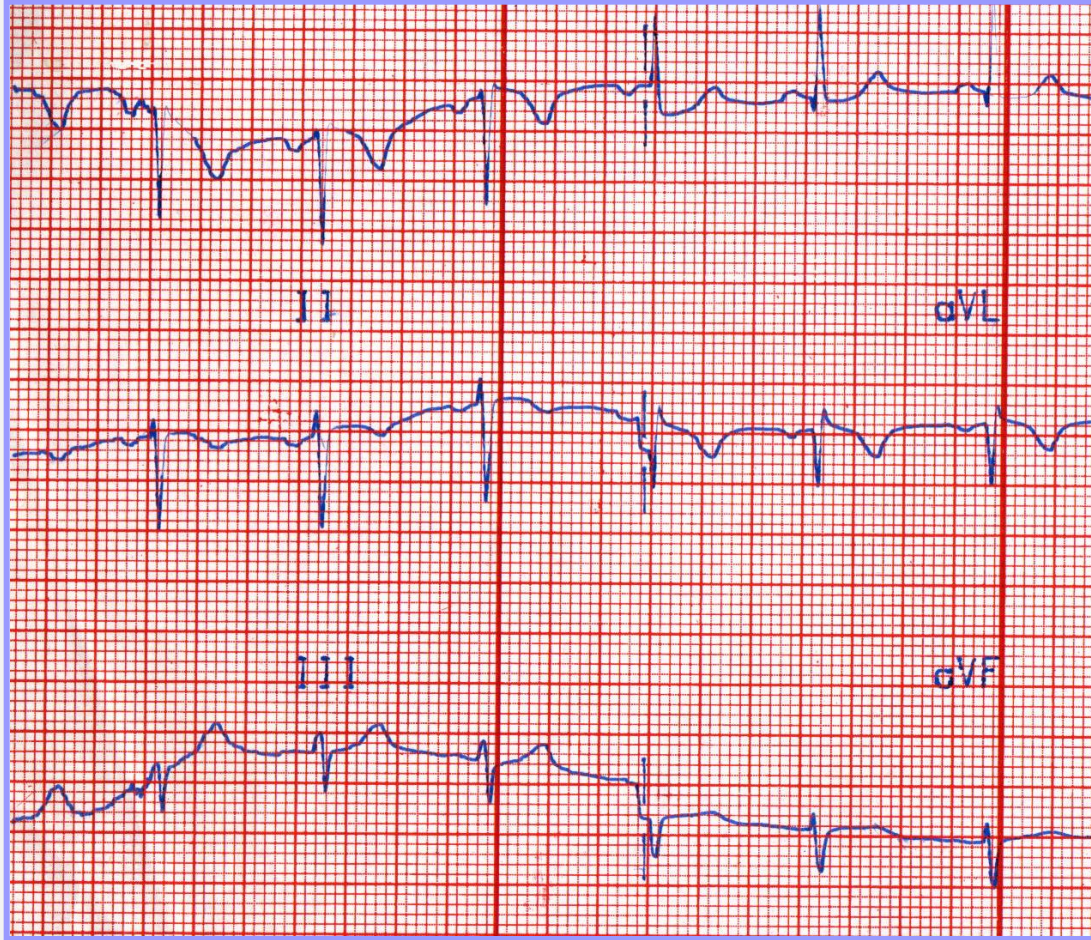
**P → QRS**

**PR sabit**

**Hız normal**

**P aksı normal**





**Ters bağlantı**

**Ektopik LA odak**

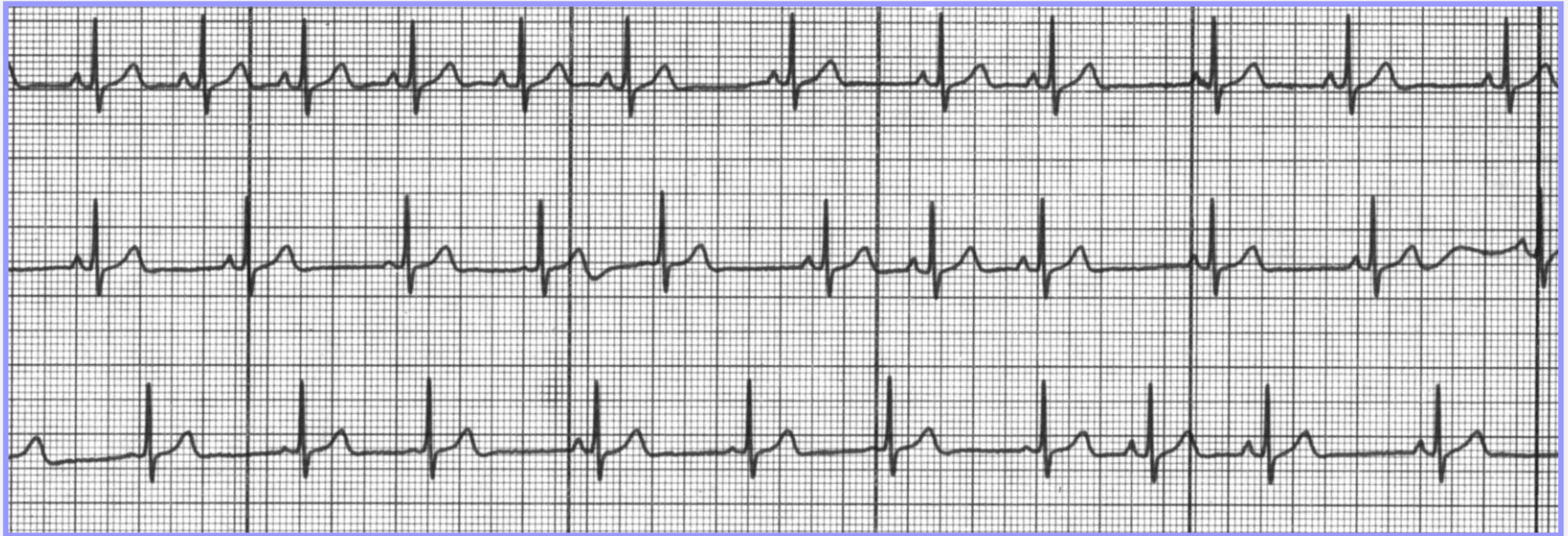
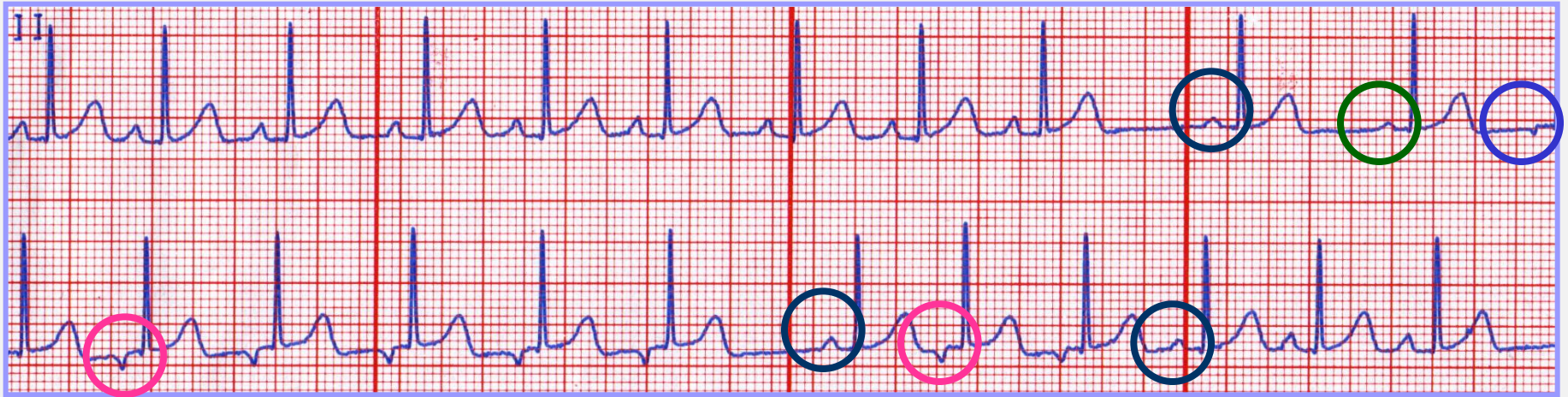
**DEKSTROKARDİ**

# Normal EKG



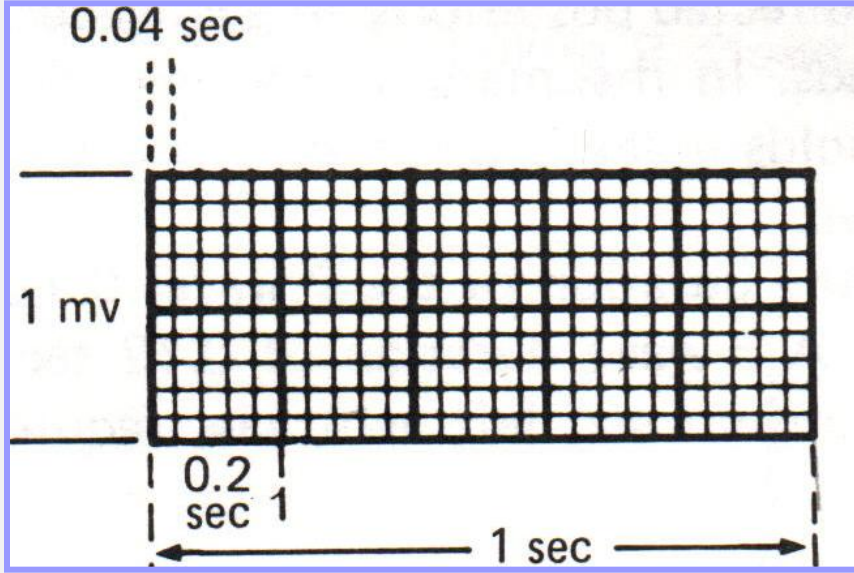
**Sinüs Aritmisi**

# Normal EKG



**Gezici (Wandering) Atriyal Pacemaker**

# Hız Ölçümü



**YD:  $140 \pm 20$  /dk**

**S.Ç.:  $120 \pm 20$  /dk**

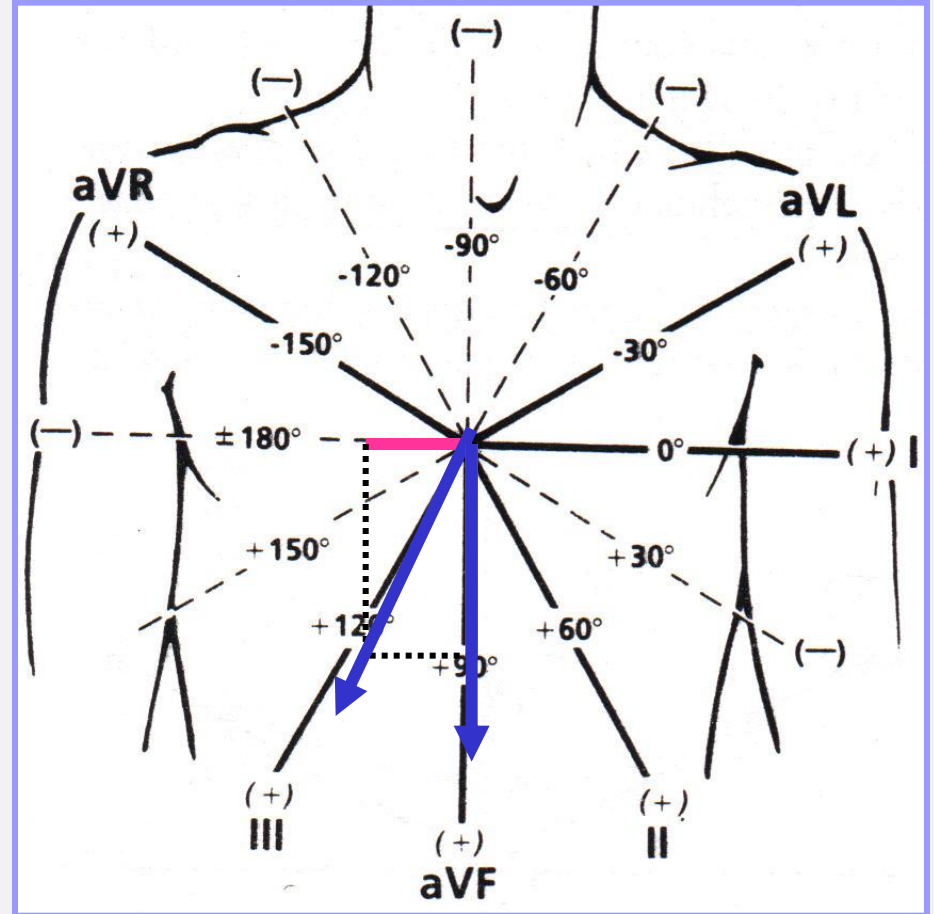
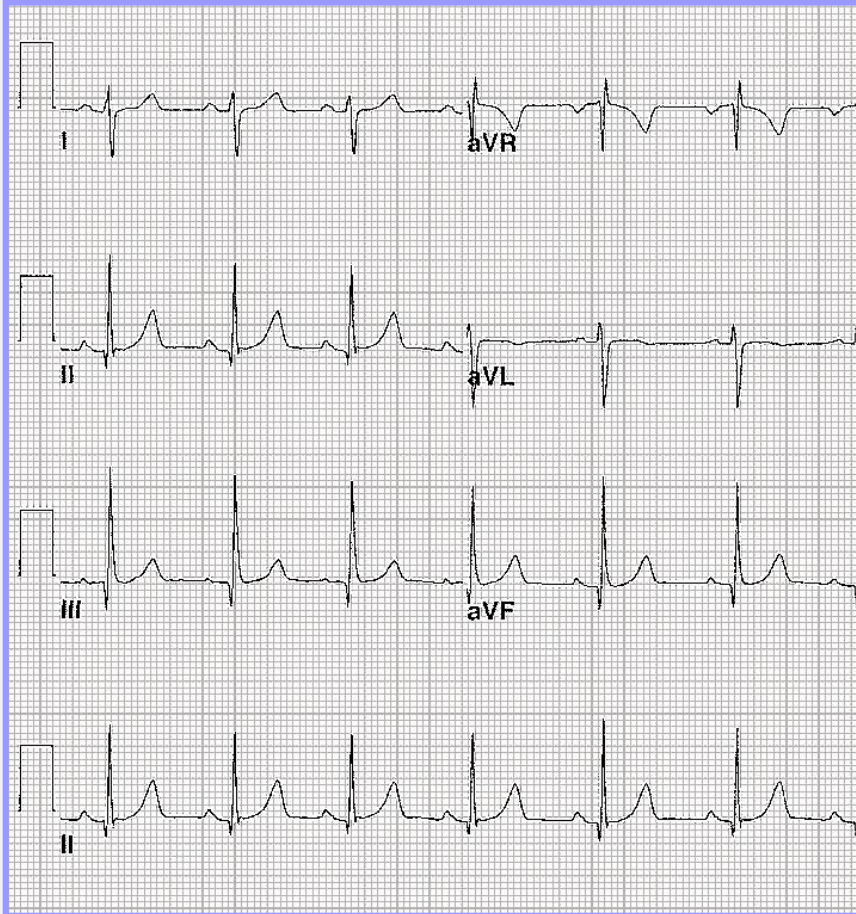
**Oyun çocuğu:  $100 \pm 20$  /dk**

**Okul çocuğu:  $80 \pm 20$  /dk**








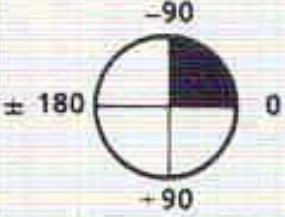


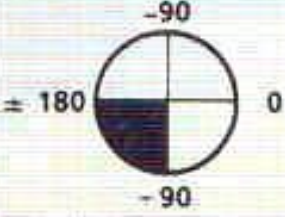
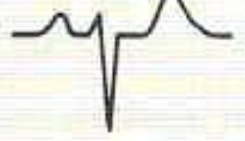

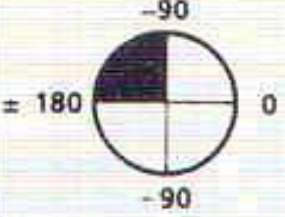


# QRS Aksi

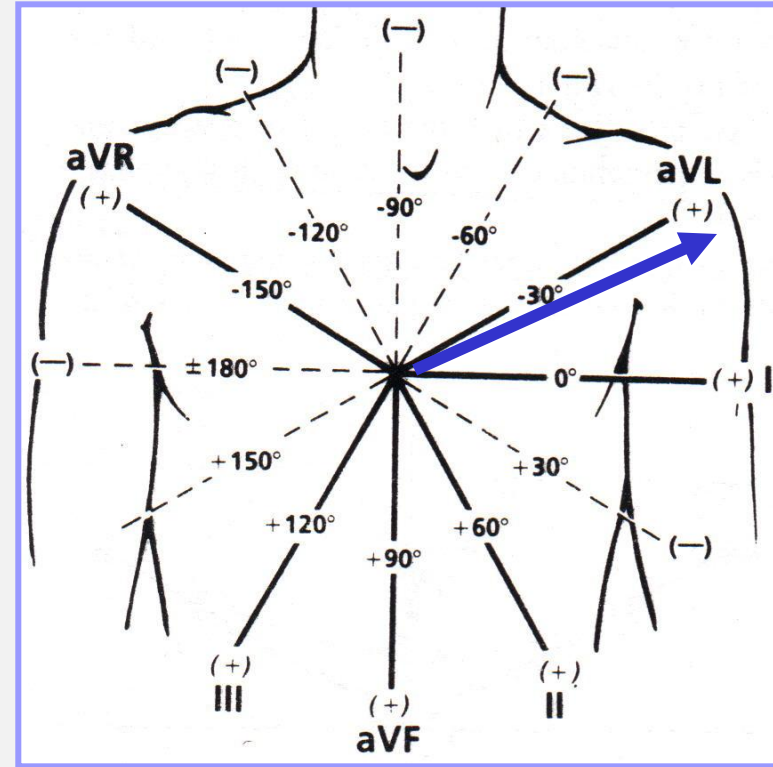
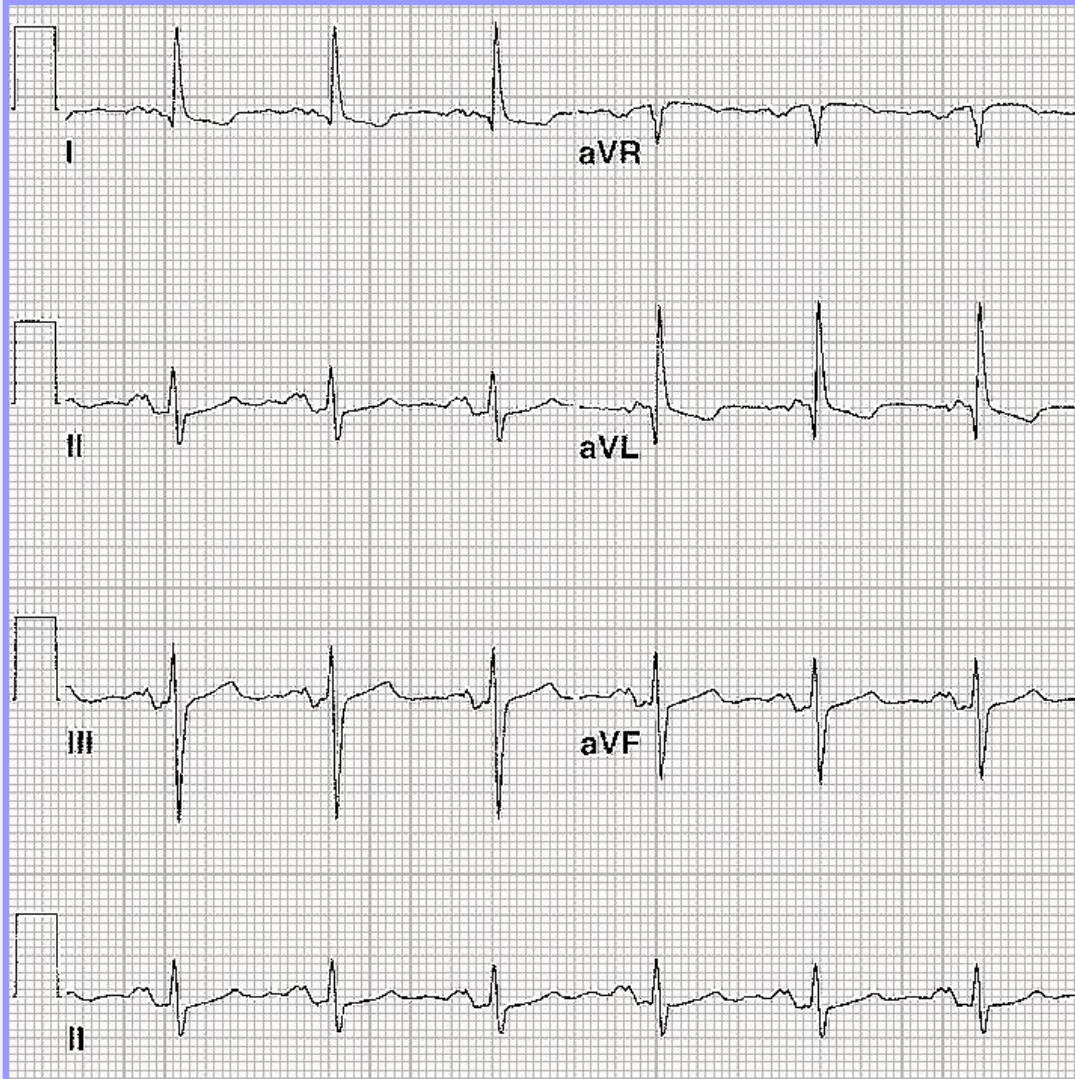


# QRS Aksi

I                      aVF

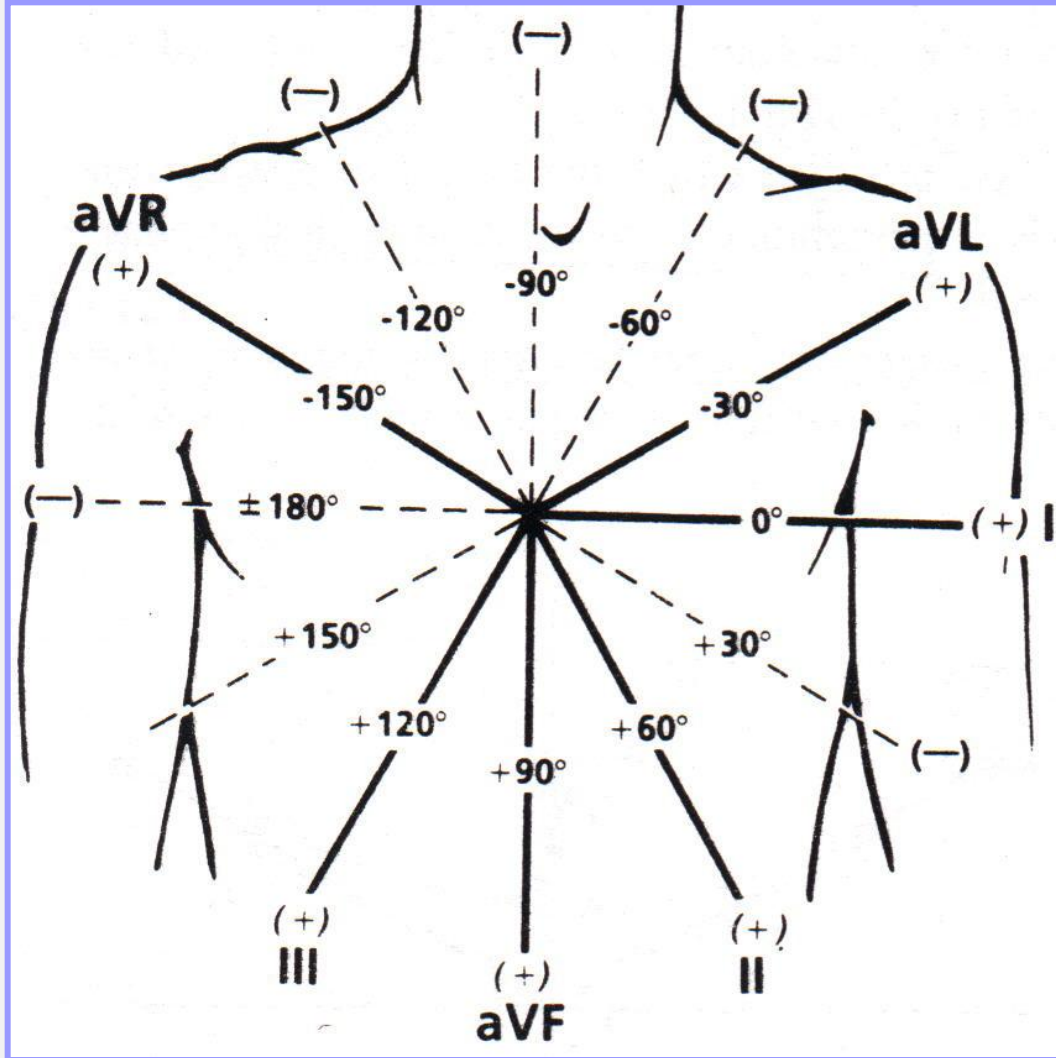
$0^\circ - +90^\circ$			
$0^\circ - -90^\circ$			
$+90^\circ - \pm 180^\circ$			
$-90^\circ - \pm 180^\circ$			

# QRS Aksisi





# QRS Aksı



**YD: (+50)-(+180)**

**3. Ay: (+30)-(+120)**

**> 6 ay: 0 - (+110)**

**Erişkin: (-30)-(+110)**

# QRS Aksı

## Anormal QRS aksı

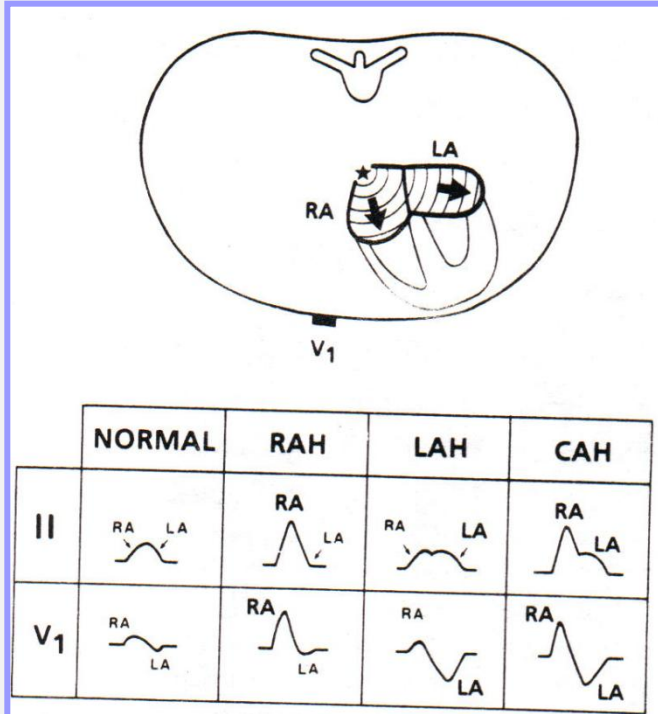
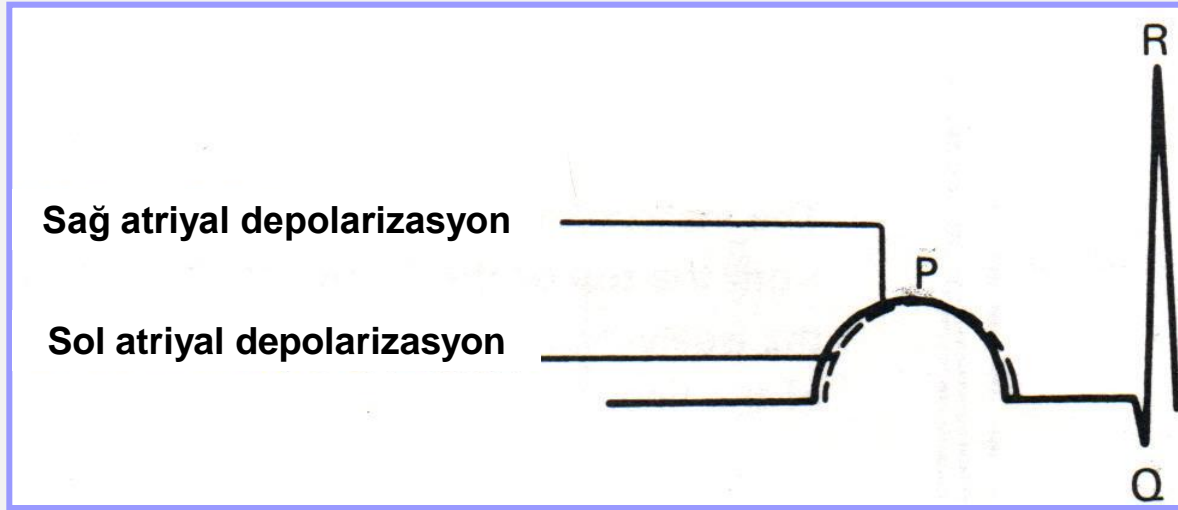
### •Sol aks sapması

- Sol dal bloğu
- Sol anterior hemiblok
  - **Triküspid atrezisi**
  - **AVSD**
- Sol ventrikül hipertrofisi

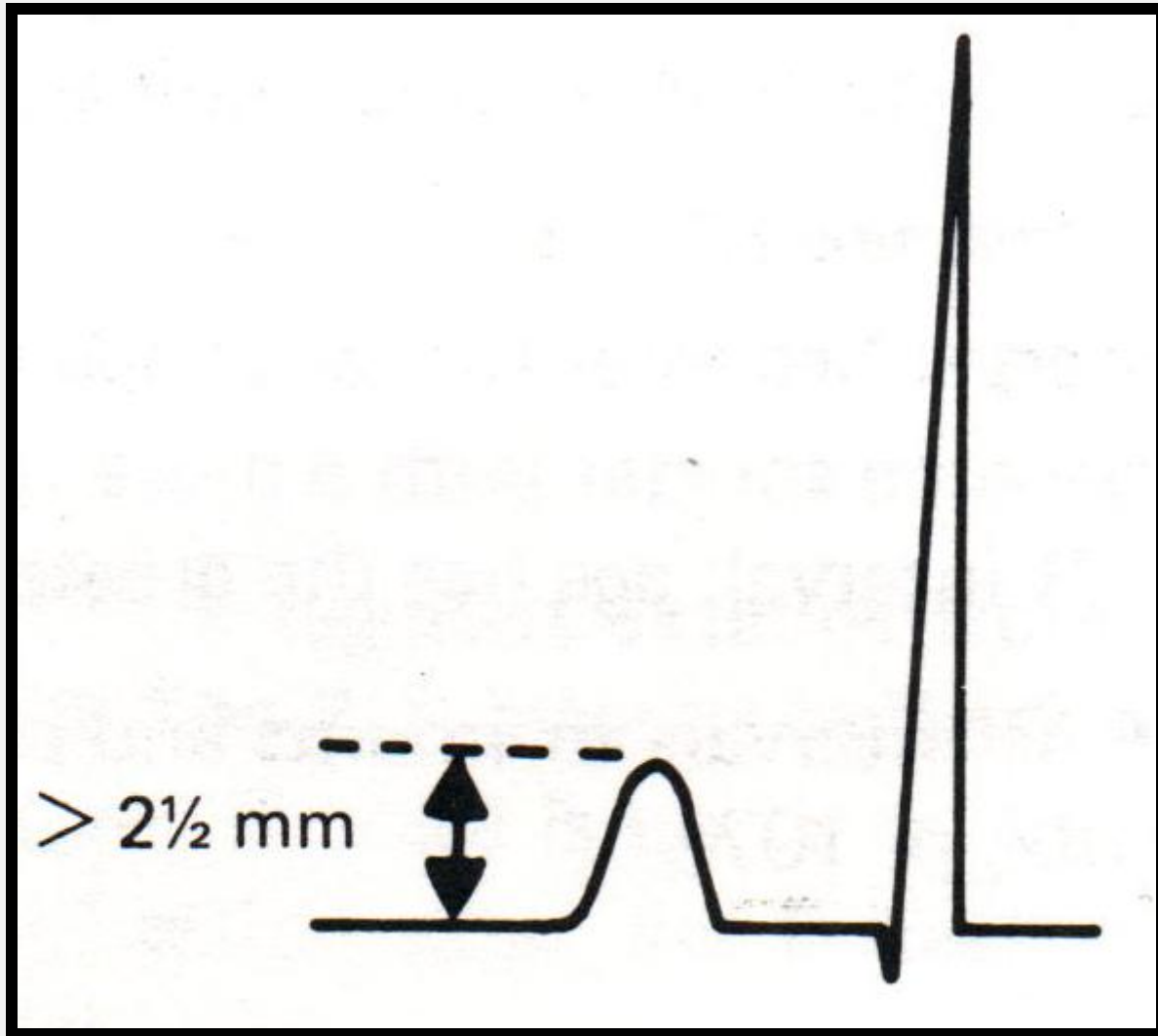
### •Sağ aks sapması

- Sağ ventrikül hipertrofisi
- Sağ dal bloğu

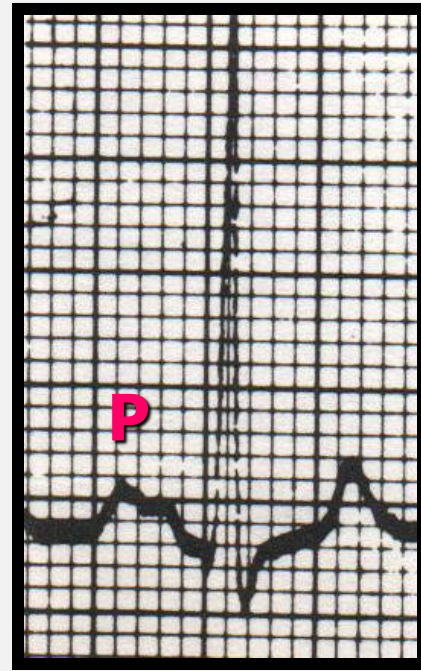
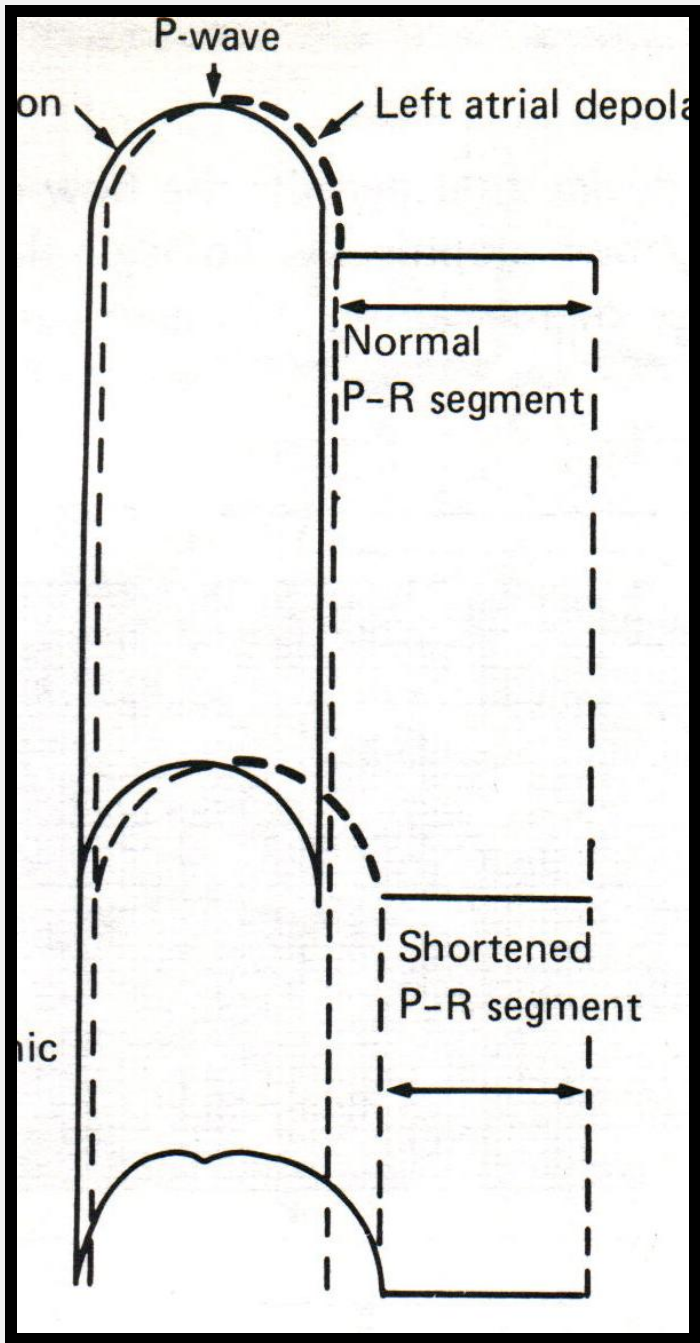
# P dalgası



- P yüksekliği
  - En fazla 2.5 mm
- P süresi
  - < 1 yaş: en fazla 0.08 sn
  - Çocuk: en fazla 0.10 sn







# PR aralığı

Rate	0-1 mo	1-6 mo	6 mo-1 yr	1-3 yr	3-8 yr	8-12 yr	12-16 yr	Adult
<60						0.16(0.18)	0.16(0.19)	0.17(0.21)
60-80					0.15(0.17)	0.15(0.17)	0.15(0.18)	0.16(0.21)
80-100	0.10(0.12)				0.14(0.16)	0.15(0.16)	0.15(0.17)	0.15(0.20)
100-120	0.10(0.12)			(0.15)	0.13(0.16)	0.14(0.15)	0.15(0.16)	0.15(0.19)
120-140	0.10(0.11)	0.11(0.14)	0.11(0.14)	0.12(0.14)	0.13(0.15)	0.14(0.15)		0.15(0.18)
140-160	0.09(0.11)	0.10(0.13)	0.11(0.13)	0.11(0.14)	0.12(0.14)			(0.17)
160-180	0.10(0.11)	0.10(0.12)	0.10(0.12)	0.10(0.12)				
>180	0.09	0.09(0.11)	0.10(0.11)					

## Alt sınırları:

< 3 yaş : 0.08 sn

3-16 yaş: 0.10 sn

> 16 yaş: 0.12 sn

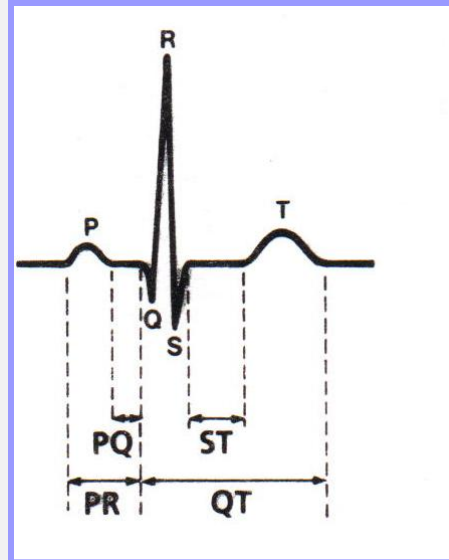
## Kısa PR:

WPW sendromu

LGL sendromu

Glikojen Depo Hastalığı

Aşağı atriyal ektopik ritm



## Uzun PR:

Miyokardit

Bazı DKH (AVSD, ASD, Ebstein)

Toksisite (Digoksin, kinidin)

Hiperpotasemi

İskemi veya aşırı hipoksi

# QRS Süresi

	0–1 mo	1–6 mo	6 mo–1 yr	1–3 yr	3–8 yr	8–12 yr	12–16 yr	Adult
Seconds	0.05(0.065)	0.05(0.07)	0.05(0.07)	0.06(0.07)	0.07(0.08)	0.07(0.09)	0.07(0.10)	0.08(0.10)

## QRS genişlemesi

**Dal blokları**

**Şiddetli ventrikül hipertrofisi**

**WPW sendromu**

**İntraventriküler blok**

**Ventrikül kökenli aritmiler**

**Ventriküler piller**

# QRS Voltaji

**R Voltages According to Lead and Age: Mean (and Upper Limits)\***

Lead	0–1 mo	1–6 mo	6 mo–1 yr	1–3 yr	3–8 yr	8–12 yr	12–16 yr	Young Adults
I	4 (8)	7 (13)	8 (16)	8 (16)	7 (15)	7 (15)	6 (13)	6 (13)
II	6 (14)	13 (24)	13 (27)	13 (23)	13 (22)	14 (24)	14 (24)	9 (25)
III	8 (16)	9 (20)	9 (20)	9 (20)	9 (20)	9 (24)	9 (24)	6 (22)
aVR	3 (7)	3 (6)	3 (6)	2 (6)	2 (5)	2 (4)	2 (4)	1 (4)
aVL	2 (7)	4 (8)	5 (10)	5 (10)	3 (10)	3 (10)	3 (12)	3 (9)
aVF	7 (14)	10 (20)	10 (16)	8 (20)	10 (19)	10 (20)	11 (21)	5 (23)
V4R	6 (12)	5 (10)	4 (8)	4 (8)	3 (8)	3 (7)	3 (7)	
V1	15 (25)	11 (20)	10 (20)	9 (18)	7 (18)	6 (16)	5 (16)	3 (14)
V2	21 (30)	21 (30)	19 (28)	16 (25)	13 (28)	10 (22)	9 (19)	6 (21)
V5	12 (30)	17 (30)	18 (30)	19 (36)	21 (36)	22 (36)	18 (33)	12 (33)
V6	6 (21)	10 (20)	13 (20)	12 (24)	14 (24)	14 (24)	14 (22)	10 (21)

**S Voltages According to Lead and Age: Mean (and Upper Limits)\***

I	5 (10)	4 (9)	4 (9)	3 (8)	2 (8)	2 (8)	2 (8)	1 (6)
V4R	4 (9)	4 (12)	5 (12)	5 (12)	5 (14)	6 (20)	6 (20)	
V1	10 (20)	7 (18)	8 (16)	13 (27)	14 (30)	16 (26)	15 (24)	10 (23)
V2	20 (35)	16 (30)	17 (30)	21 (34)	23 (38)	23 (38)	23 (48)	14 (36)
V5	9 (30)	9 (26)	8 (20)	6 (16)	5 (14)	5 (17)	5 (16)	
V6	4 (12)	2 (7)	2 (6)	2 (6)	1 (5)	1 (4)	1 (5)	1 (13)

**RV1 + SV6**

**V4 R+S**



# QRS Voltajı

## Anormal yüksek ya da derin QRS voltajı

- Ventrikül hipertrofisi
- Ventriküler iletim bozuklukları

Sağ ve sol dal bloğu

WPW sendromu

Ventriküler piller

# QRS Voltajı

## Düşük QRS voltajı

**Ekstremitte < 5 mm, göğüs < 8 mm**

- **Miyokardit**
- **Perikardiyal sıvı**
- **Kronik konstriktif perikardit**
- **Hipotiroidi**
- **Amiloidozis**
- **Kalın göğüs duvarı**
- **Normal YD bebekler**

# Q dalgası

**Q Voltages According to Lead and Age: Mean (and Upper Limits)\***

Lead	0–1 mo	1–6 mo	6 mo–1 yr	1–3 yr	3–8 yr	8–12 yr	12–16 yr	Adult
III	2 (5)	3 (8)	3 (8)	3 (8)	1.5 (6)	1 (5)	1 (4)	0.5 (4)
aVF	2 (4)	2 (5)	2 (6)	1.5 (5)	1 (5)	1 (3)	1 (3)	0.5 (2)
V5	1.5 (5)	1.5 (4)	2 (5)	2 (6)	2 (6)	2 (4.5)	1 (4)	0.5 (3.5)
V6	1.5 (4)	1.5 (4)	2 (5)	2 (4.5)	1.5 (4.5)	1.5 (4)	1 (2.5)	0.5 (3)

**Q dalgası: I, II, III, aVF de genellikle var**

**V5, V6 da mutlaka var**

**V1'de q yok**

**II, aVF, V5, V6 Q dalgası: < 5 mm**

**DIII Q: 5-8 mm olabilir**

**Q süresi 0.03 sn geçmez**



# QT aralığı

$$QTc_{(sn)} = QT_{(sn)} / \sqrt{RR_{(sn)}}$$

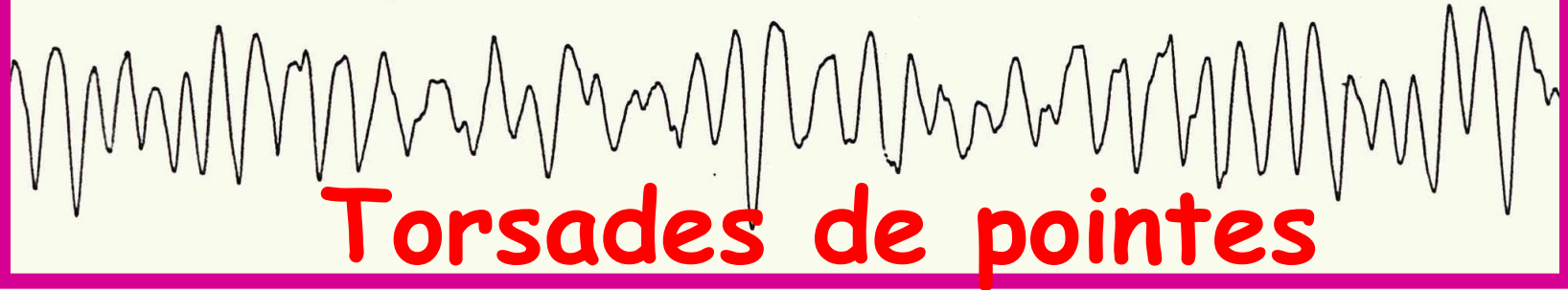
> 0.44 sn uzun



QTc = 0,613 sn



QTc = 613 ms



Torsades de pointes

IV Magnezyum  
Defibrilasyon

# ST segmenti

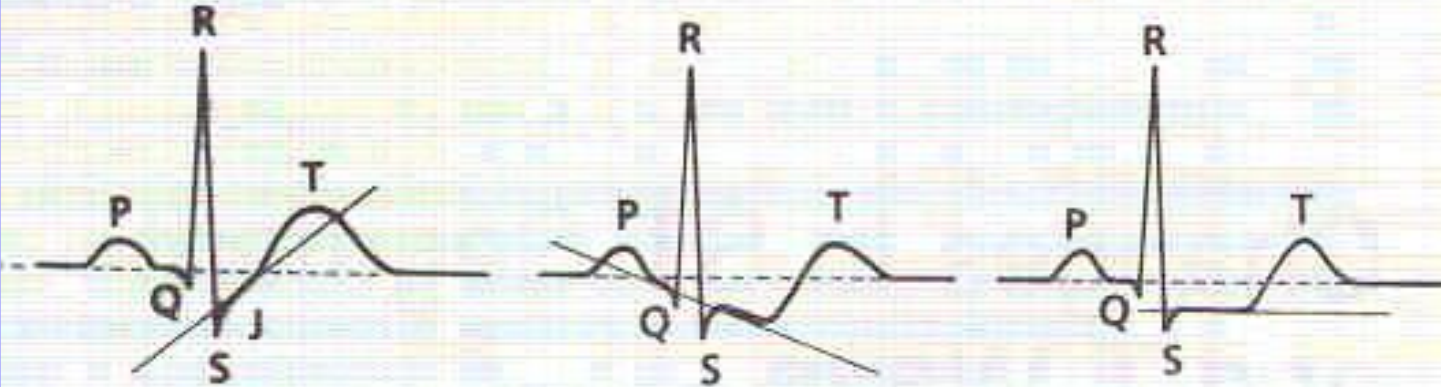
Aksiyon potansiyeli faz 2'yi gösterir

İzoelektrik olması beklenir

- Ekstremitte derivasyonlarında 1 mm
- Sol prekordiyal derivasyonlarda 2 mm

**J çökmesi**

**Anormal ST çökmesi**



# ST segmenti

## Anormal ST segmenti

- Perikardit
- Miyokardit
- Akut MI veya iskemi
- Hiper, hipopotasemi
- Ağır VH (strain örneği)
- İlaç etkisi (Digoksin)
- Kafa içi patolojiler

# T dalgası

## Ventrikül repolarizasyonu

> 48 saat bebek

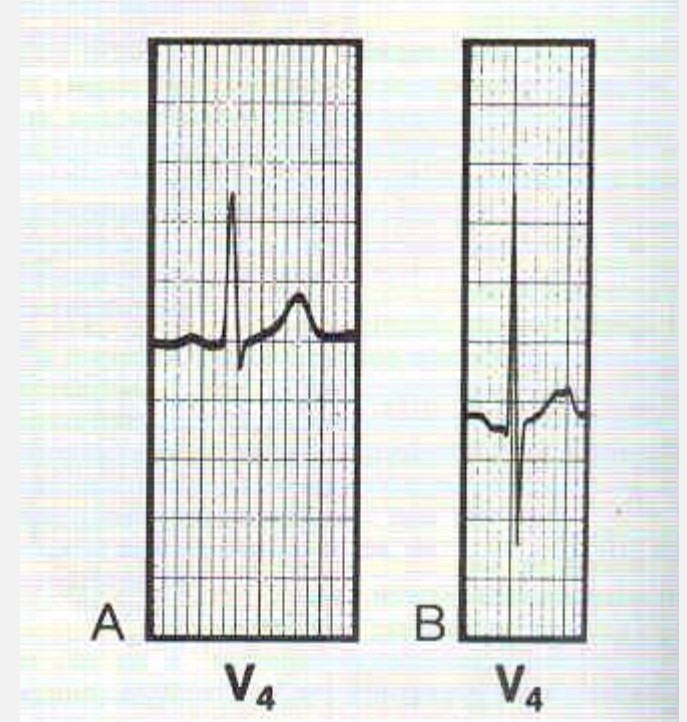
I, II, V6'da > 2 mm T olmalı

Ekstremitte derivasyonları < 7 mm

Göğüs derivasyonları < 10 mm

Yaşamın ilk 7 günü V1 T (+)

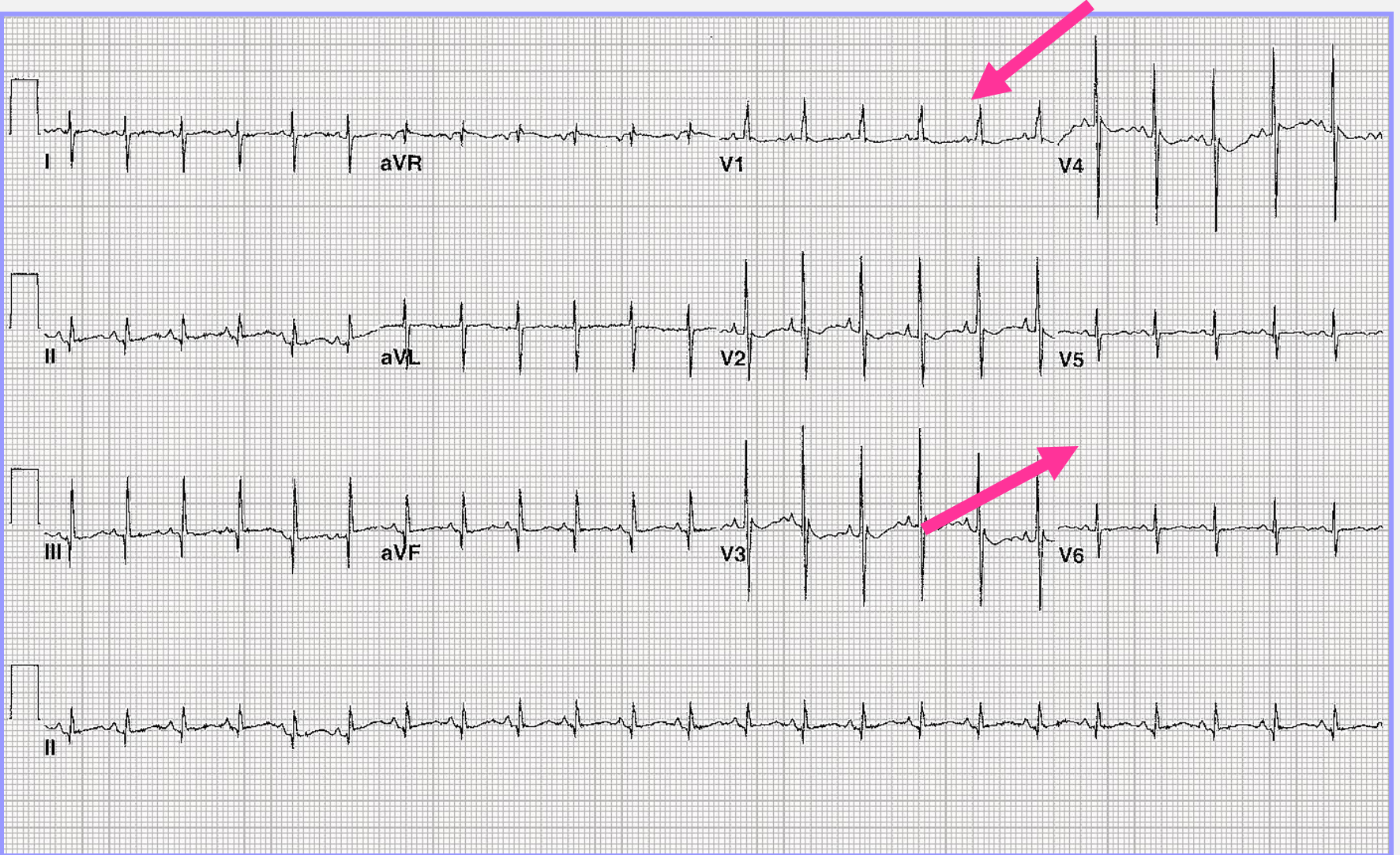
Erken ergenliğe kadar (-) kalır



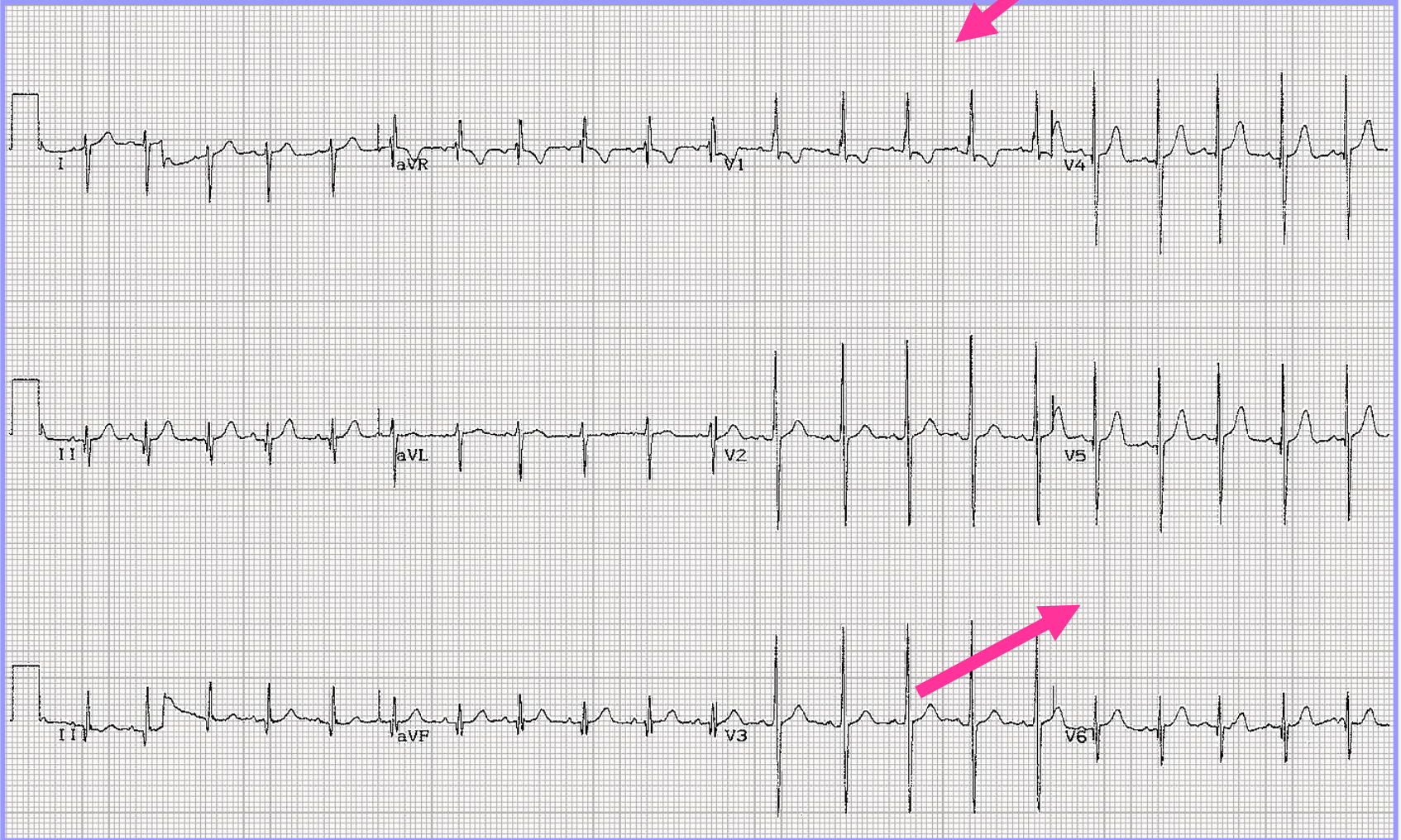
# Yaşa Bağlı Değişiklikler

- **< 1 ay :** Sağ ventrikül egemenliği, sağ aks
- **> 3 yaş:** Erişkin EKG örneği
- **1 ay- 3 yaş:** Geçiş dönemi (Ne sağ ne sol)

# 1 günlük YD bebek

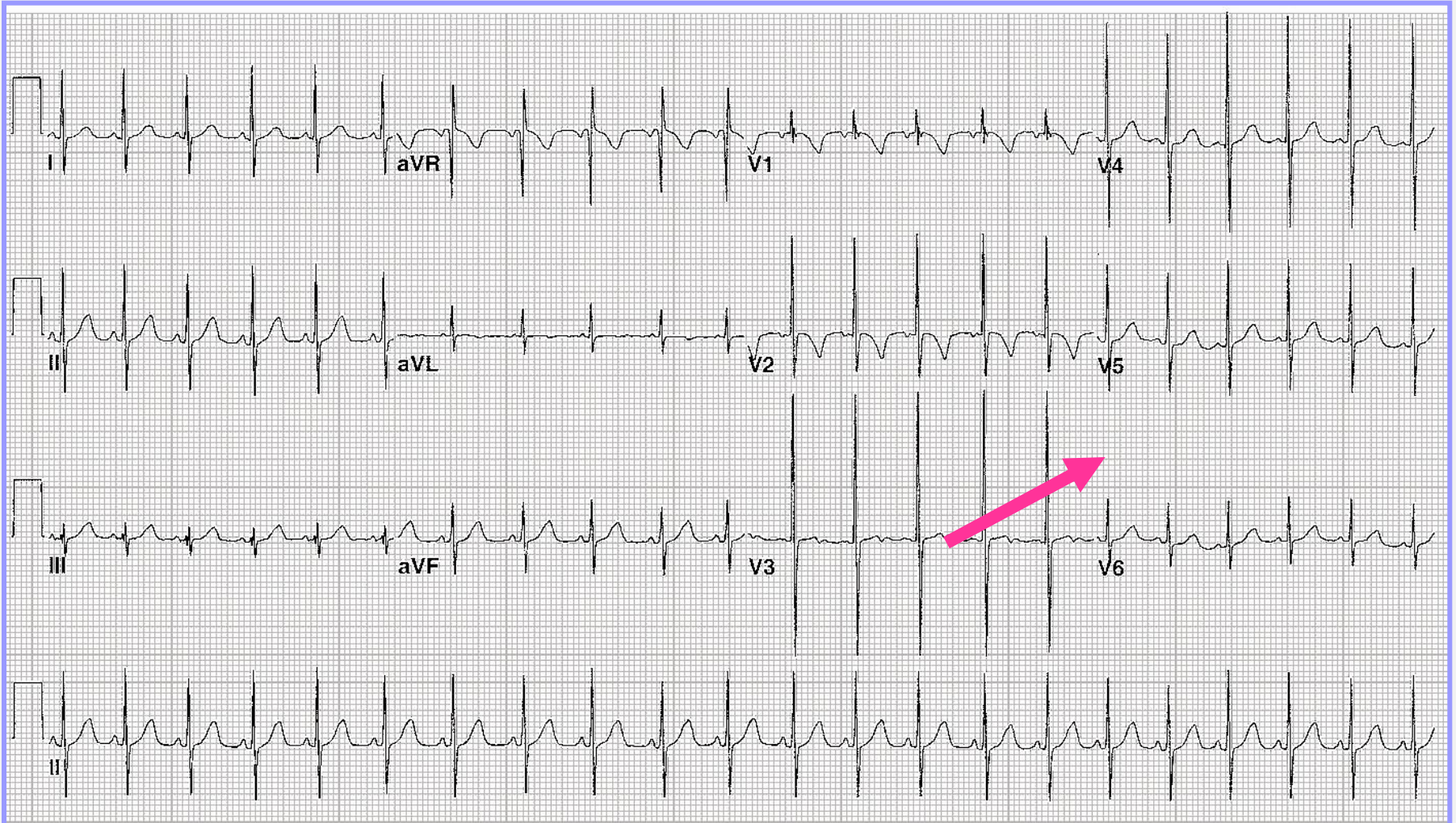


# 2 haftalık YD bebek

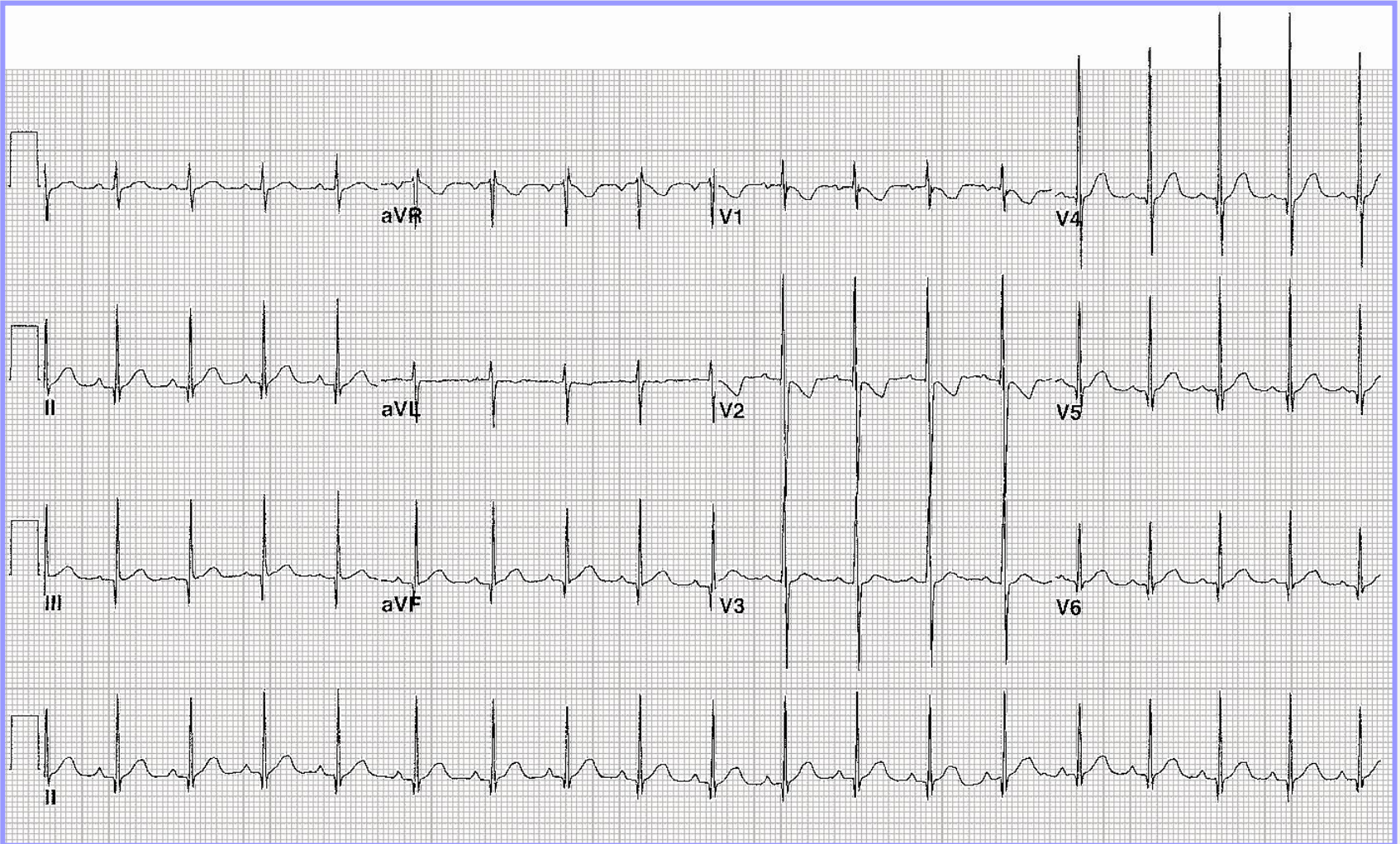




# 5 aylık bebek



# 1 yaşında bebek



# 5 yaşında çocuk

