

**Zahedan university of medical science**

**تفسير نوار قلب**

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**master of critical care nurse**

**2022**

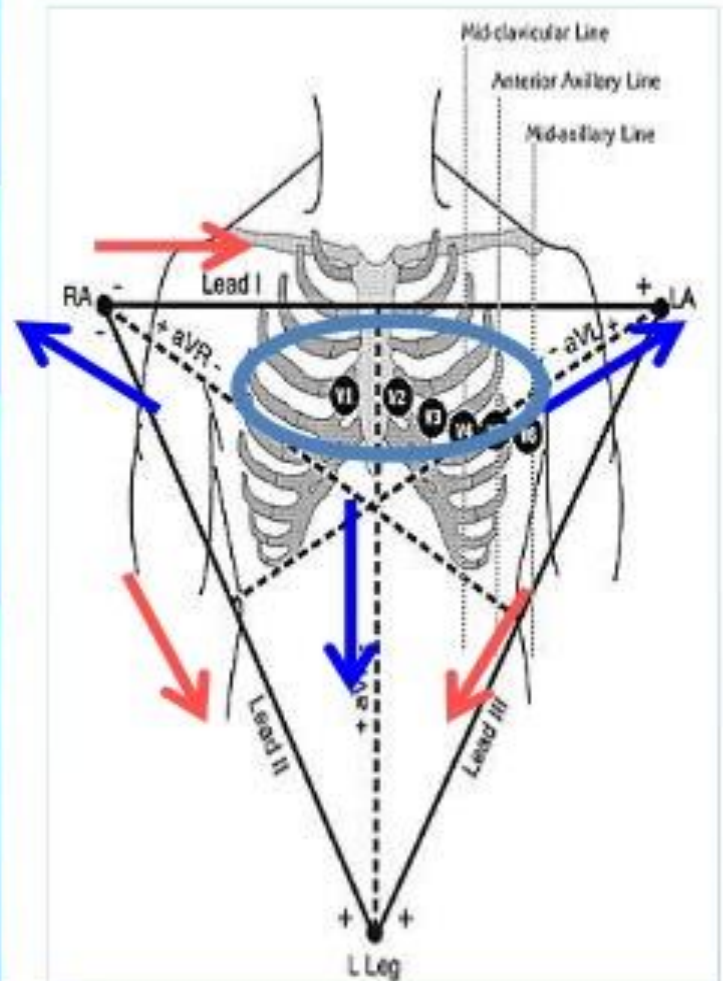
# The 12-Leads

The 12-leads include:

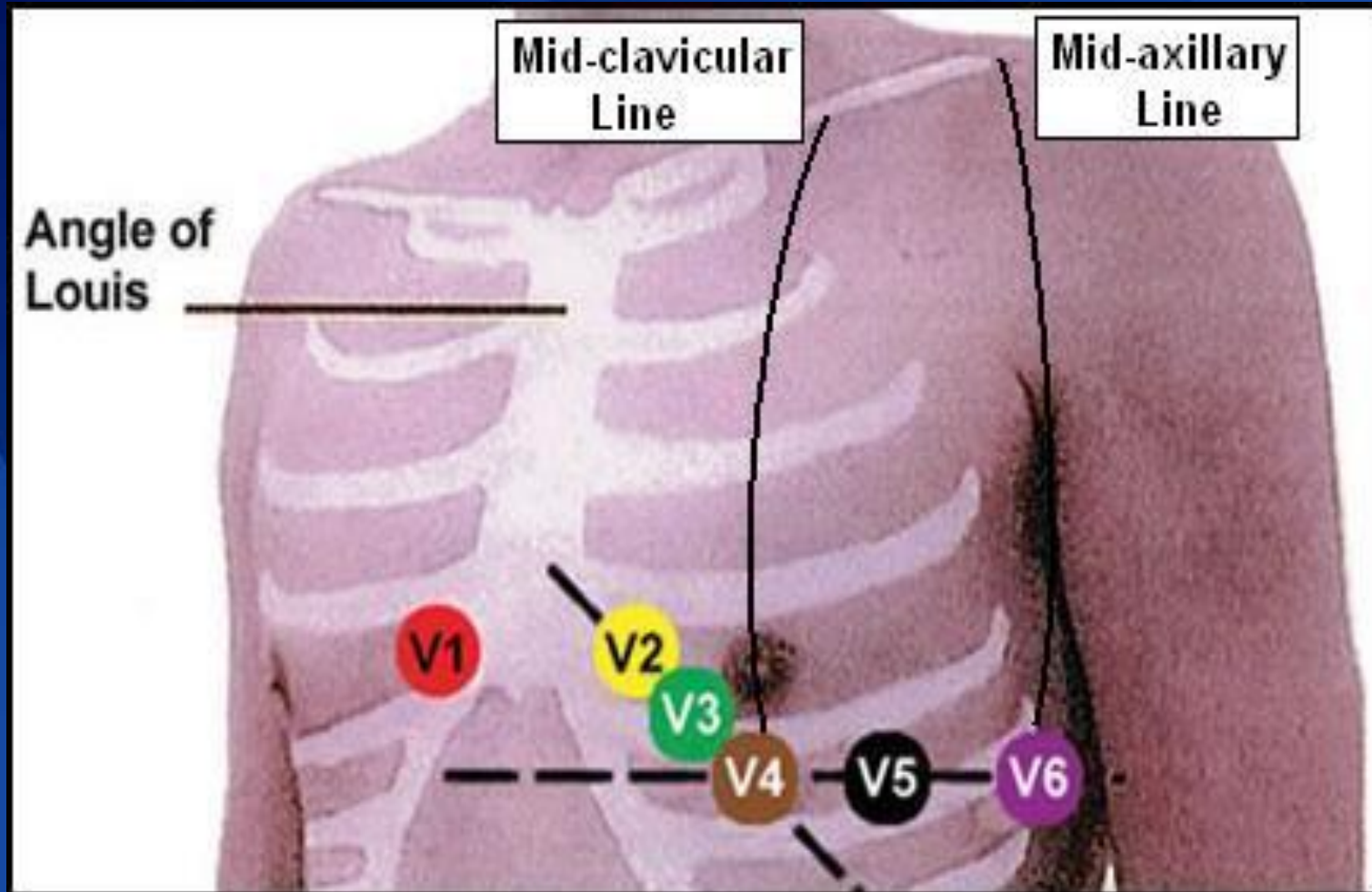
- 3 Limb leads  
(I, II, III)

- 3 Augmented leads  
(aVR, aVL, aVF)

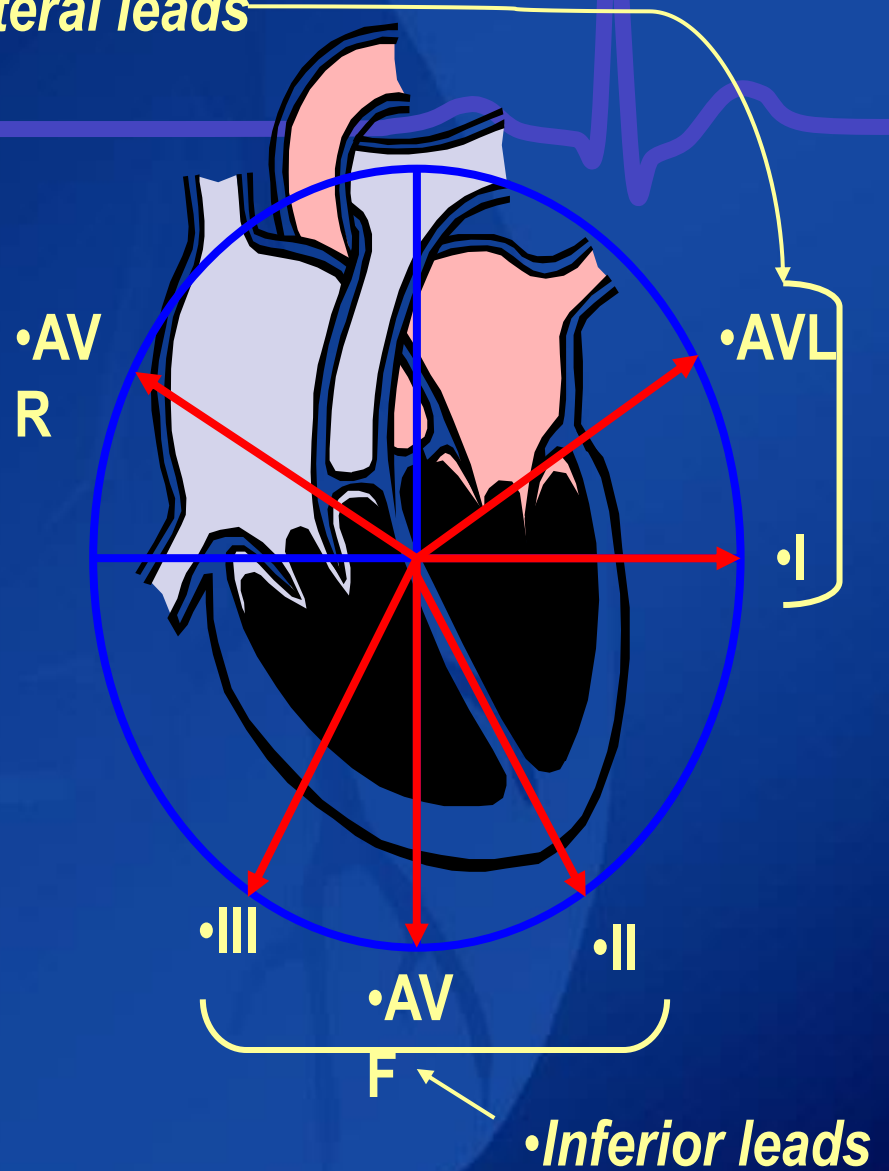
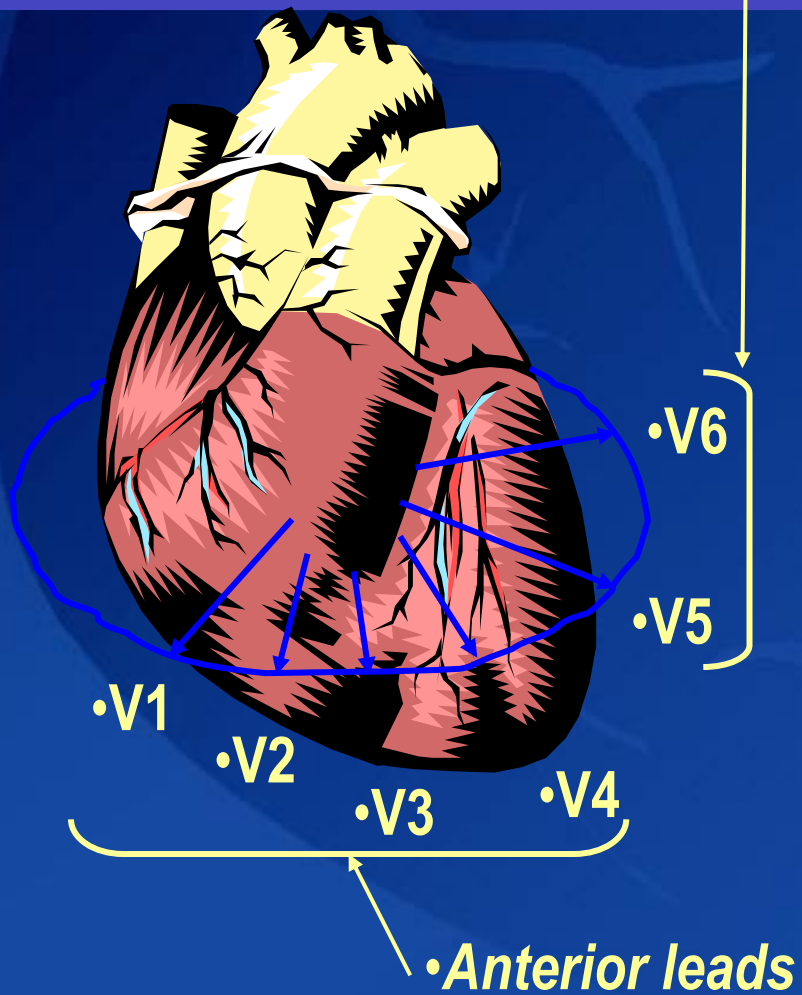
- 6 Precordial leads  
(V<sub>1</sub>- V<sub>6</sub>)



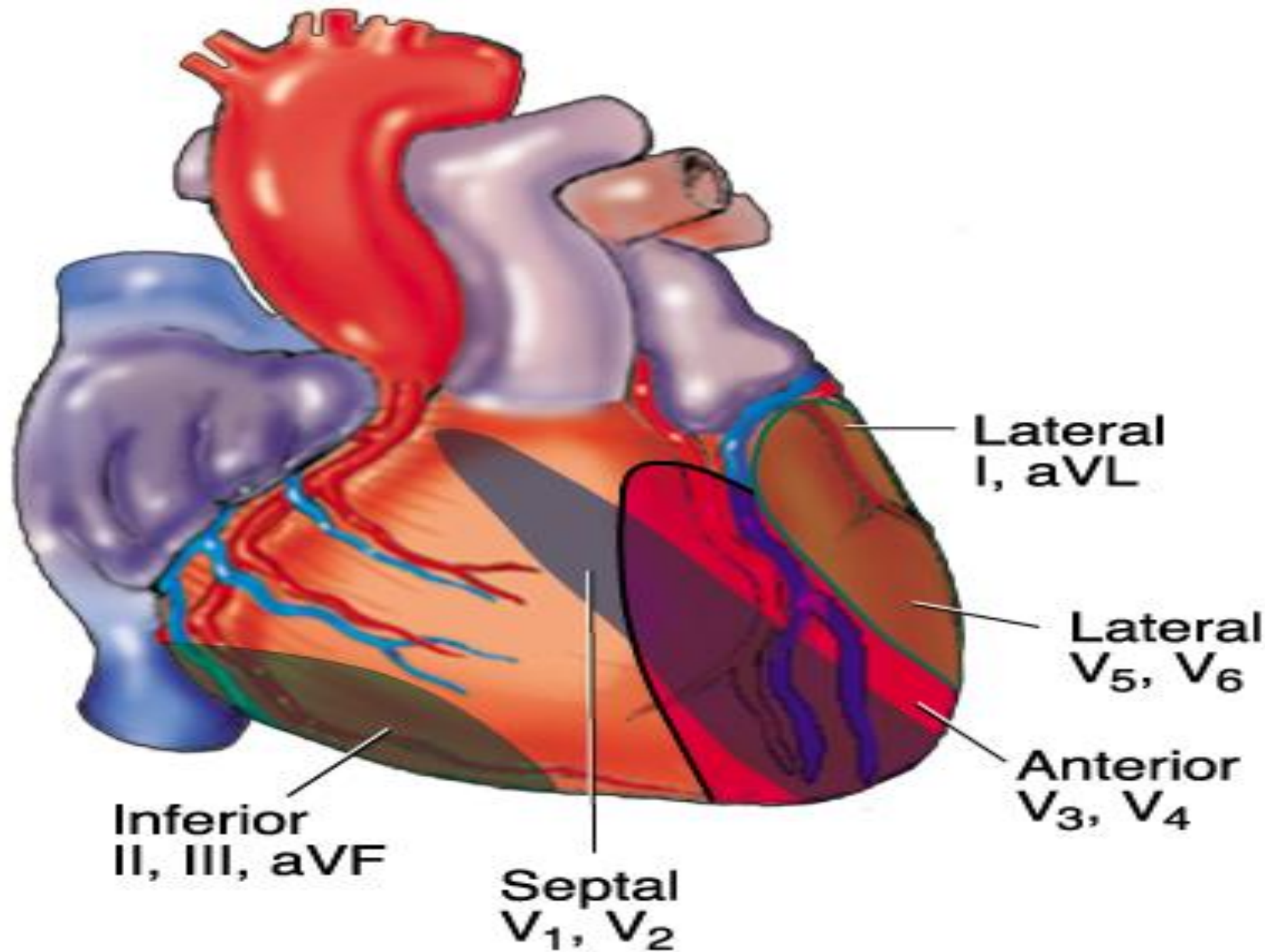
# Precordial Leads



# Anatomic Groups: •Lateral leads







**Lateral**

**Anterior / Septal**

**Inferior**

**Lateral**

aVR

aVL

aVF

V2

V3

V5

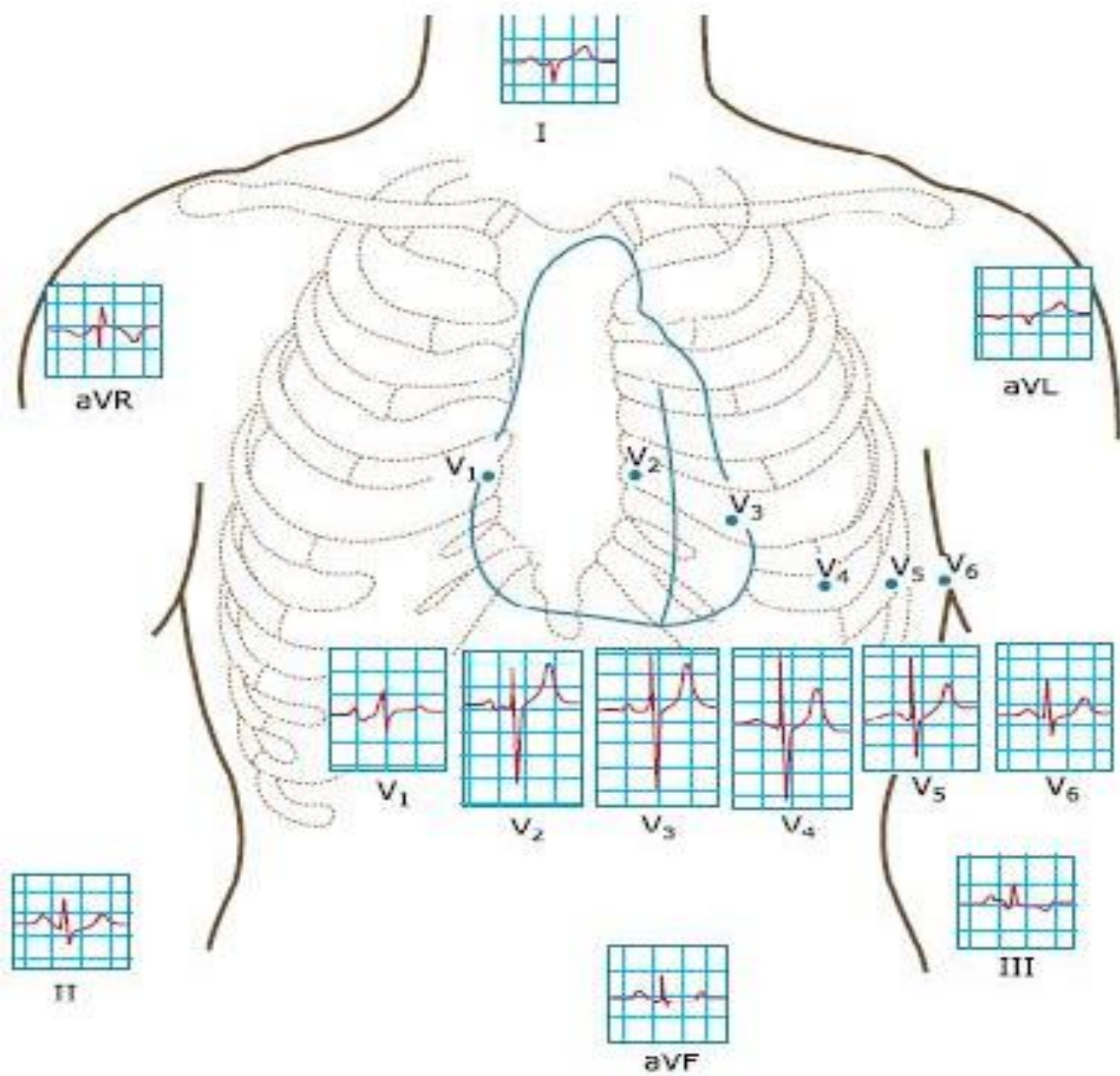
V6

II

III

II





I

Lateral

aVR

None

V<sub>1</sub>

Septal

V<sub>4</sub>

Anterior

II

Inferior

aVL

Lateral

V<sub>2</sub>

Septal

V<sub>5</sub>

Lateral

III

Inferior

aVF

Inferior

V<sub>3</sub>

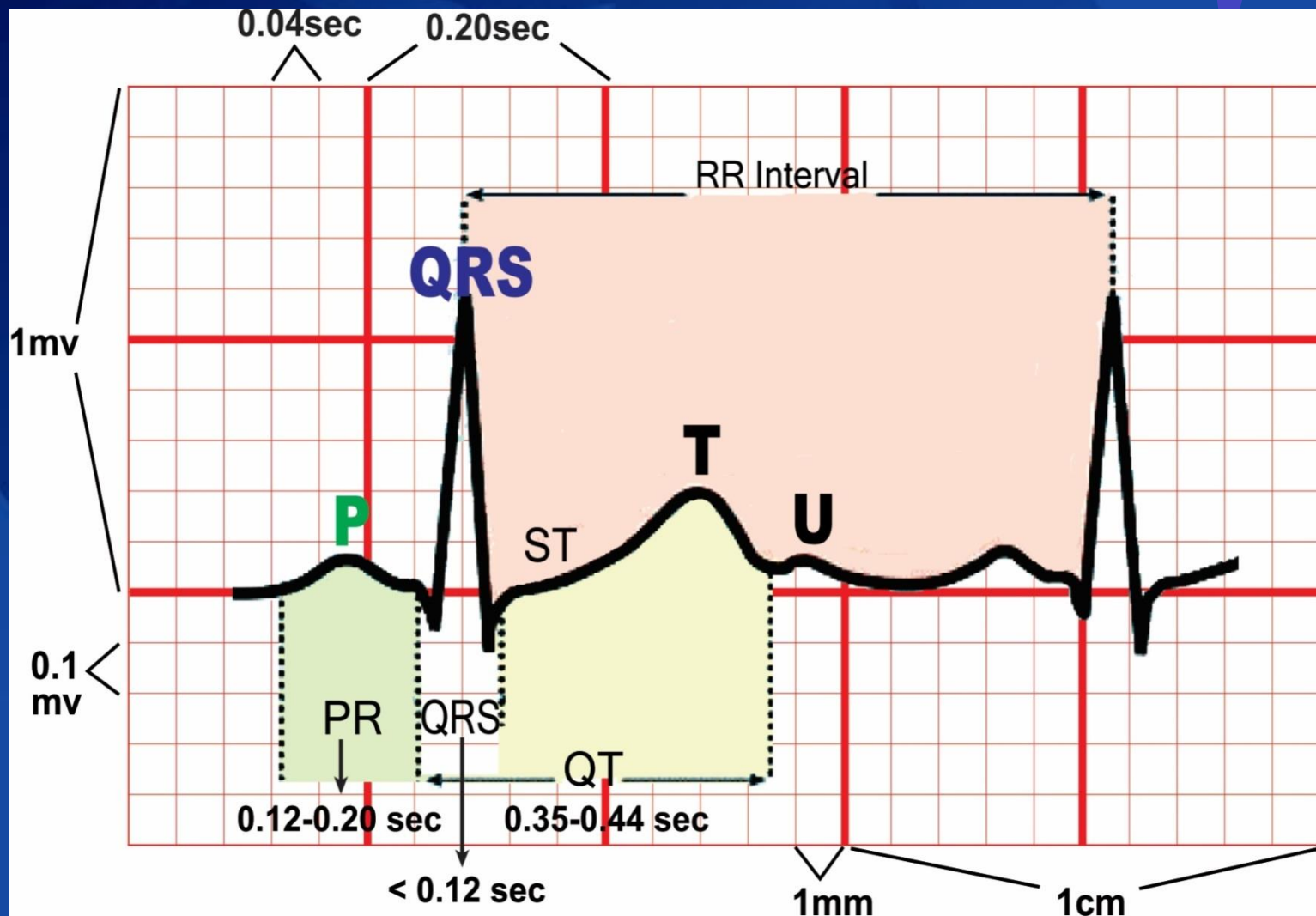
Anterior

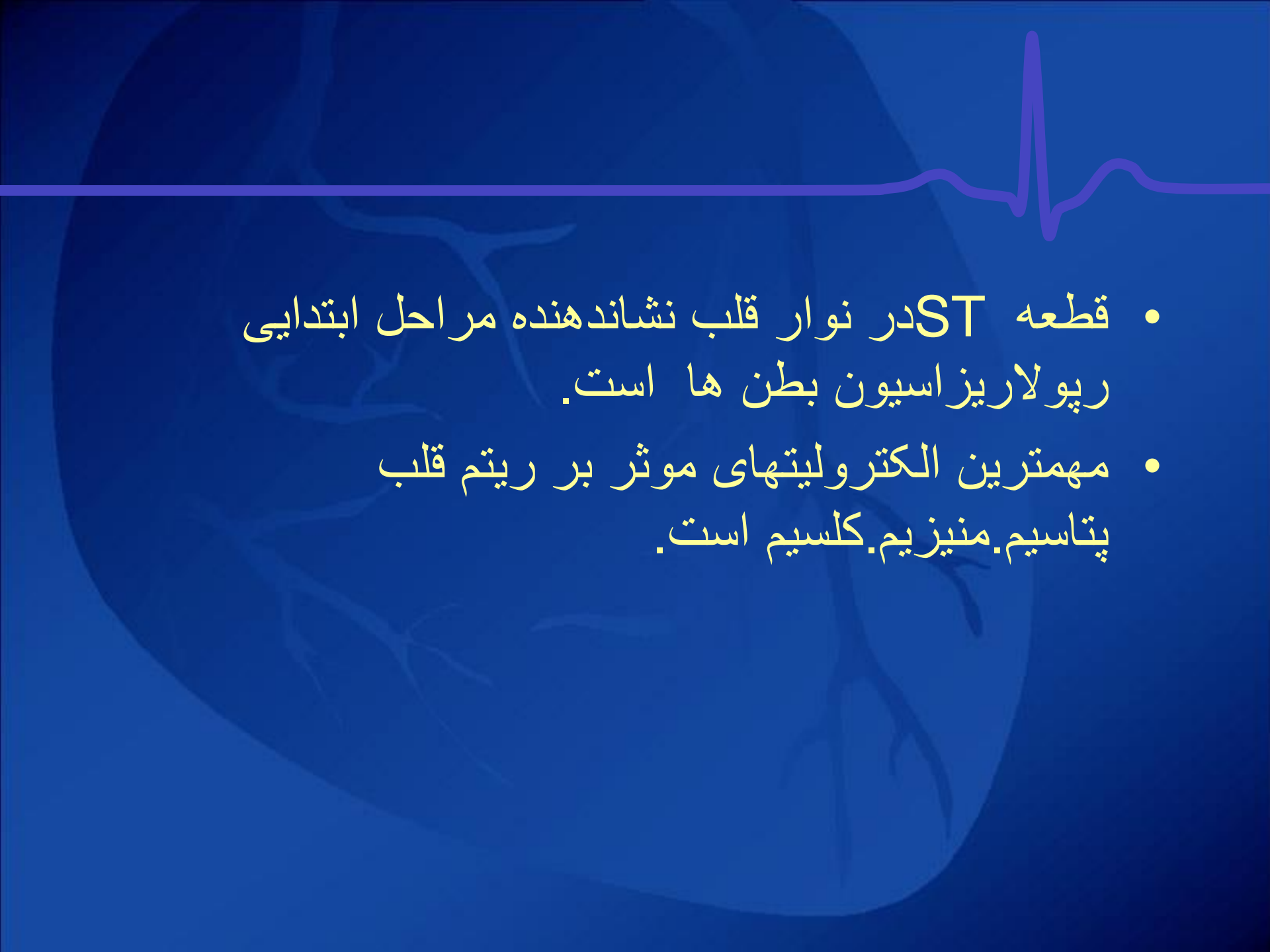
V<sub>6</sub>

Lateral

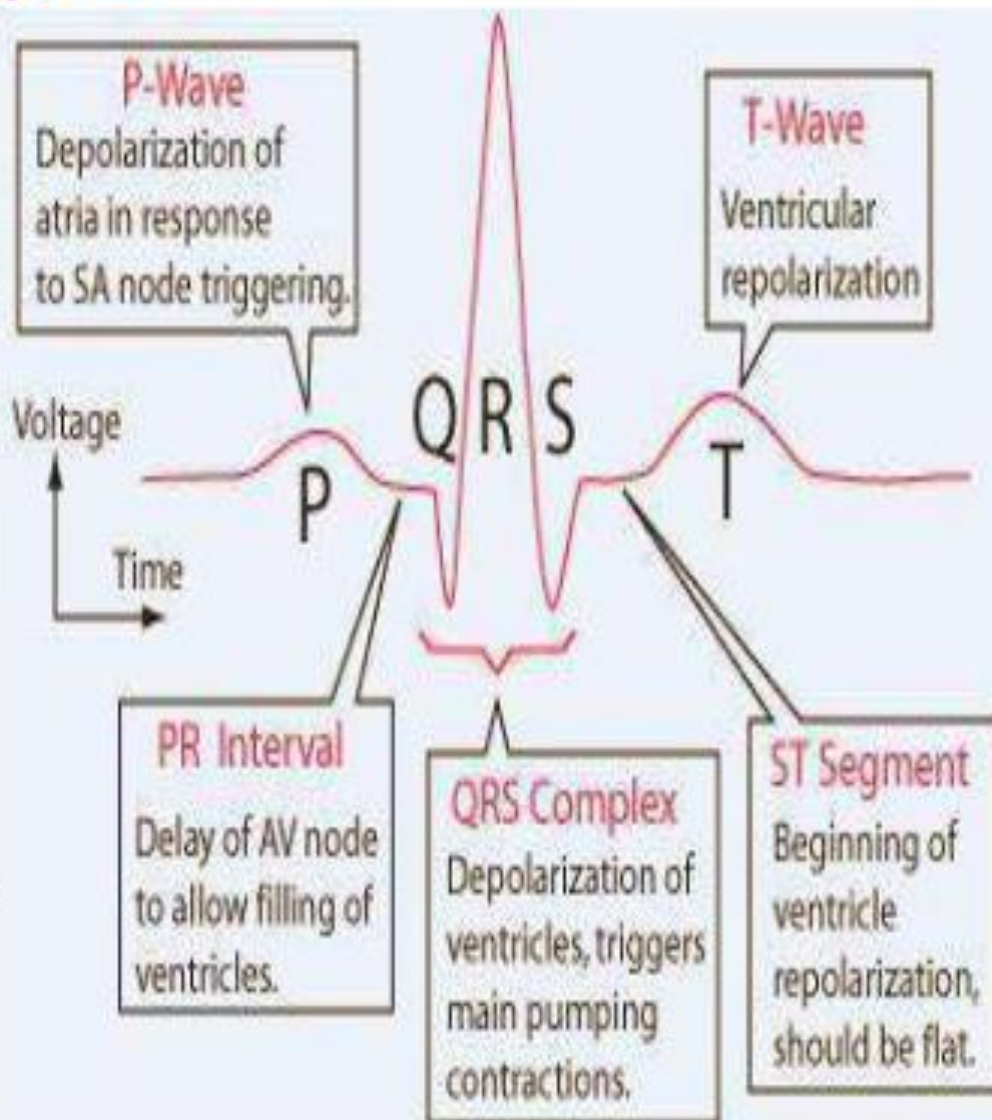
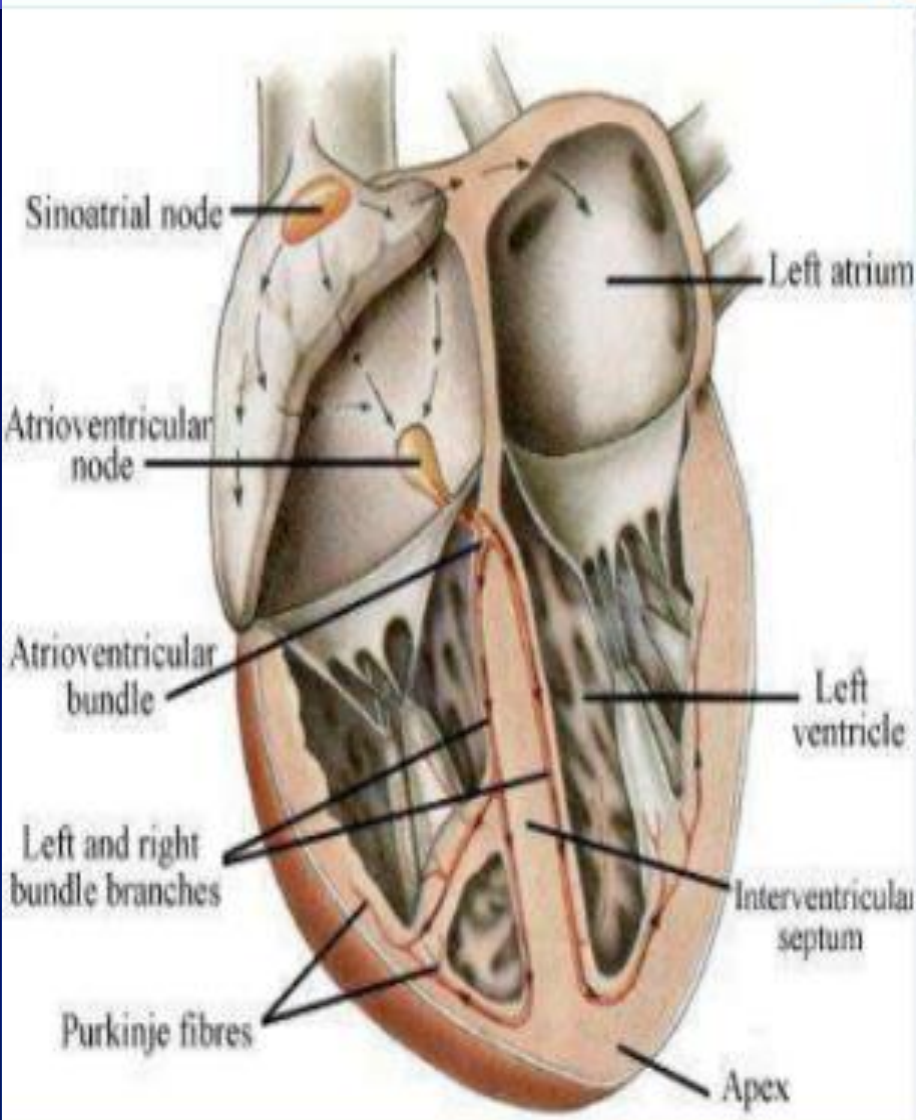


# Normal Intervals:



- 
- قطعه ST در نوار قلب نشاندهنده مراحل ابتدایی ریو لاریزاسیون بطن ها است.
  - مهمترین الکترولیت های موثر بر ریتم قلب پتاسیم، منیزیم، کلسیم است.

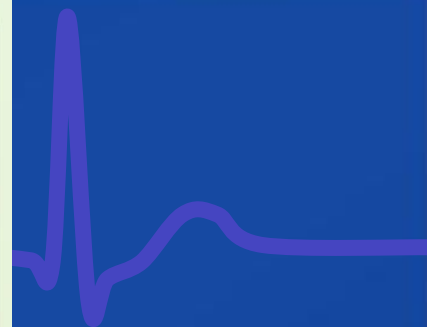
# Anatomy of Heart Conduction and ECG signal





## مرور سریع ECG به روش ۹ مرحله ای

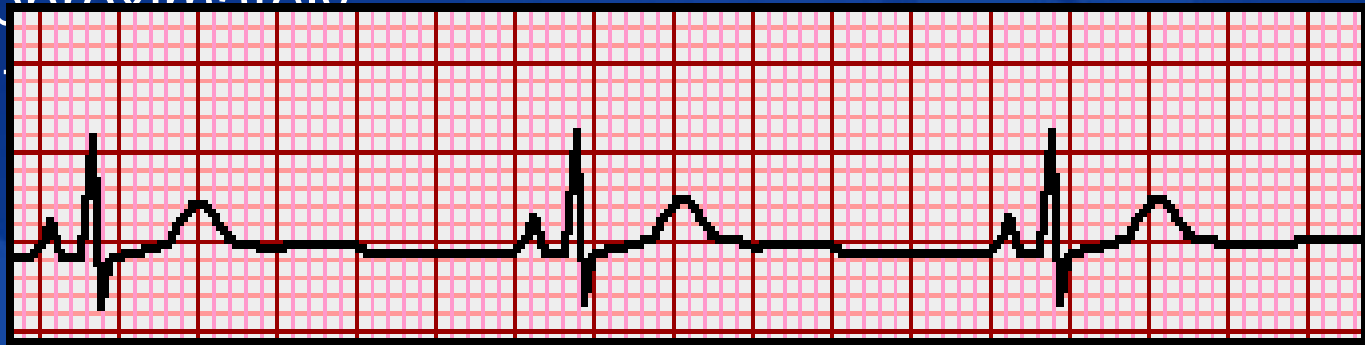
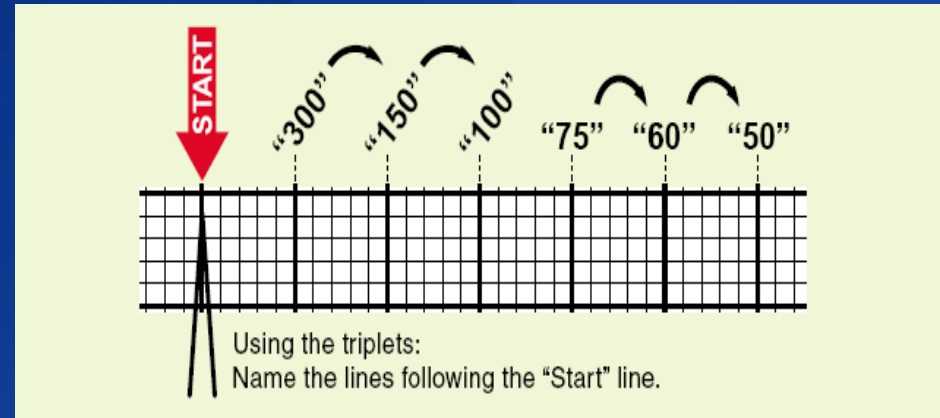
۱. بررسی نظم و تعداد ضربان قلب
۲. بررسی موج P (تشخیص هایپرטרופی دهلیزی)
۳. بررسی فاصله PR (تشخیص تاخیر هدایتی AV)
۴. بررسی کمپلکس QRS و محور قلب (تشخیص تاخیر هدایتی و هایپرטרופی بطن ها ، موج Q پاتولوژیک و عدم افزایش ولتاژ موج R در لیدهای پره کوردیال)
۵. بررسی قطعه ST (تشخیص ایسکمی یا انفارکتوس)
۶. بررسی موج T (تشخیص ایسکمی و سایر اختلالات)
۷. بررسی موج U (تشخیص سایر اختلالات)
۸. بررسی فاصله QT (تشخیص سایر اختلالات)
- ۹- بررسی نهایی، تشخیص ریتم و تفسیر نوار قلبی



# Determining the Heart Rate:

## 1- Rule of 300:

Take the number of “big boxes” between neighboring QRS complexes, and divide this into 300. The result will be approximately equal to



$$(300 / 6) = 50 \text{ bpm}$$

## 2- 10 Second Rule:

As most EKGs record 10 seconds of rhythm per page, one can simply count the number of beats present on the EKG and multiply by 6 to get the number of beats per 60 seconds.



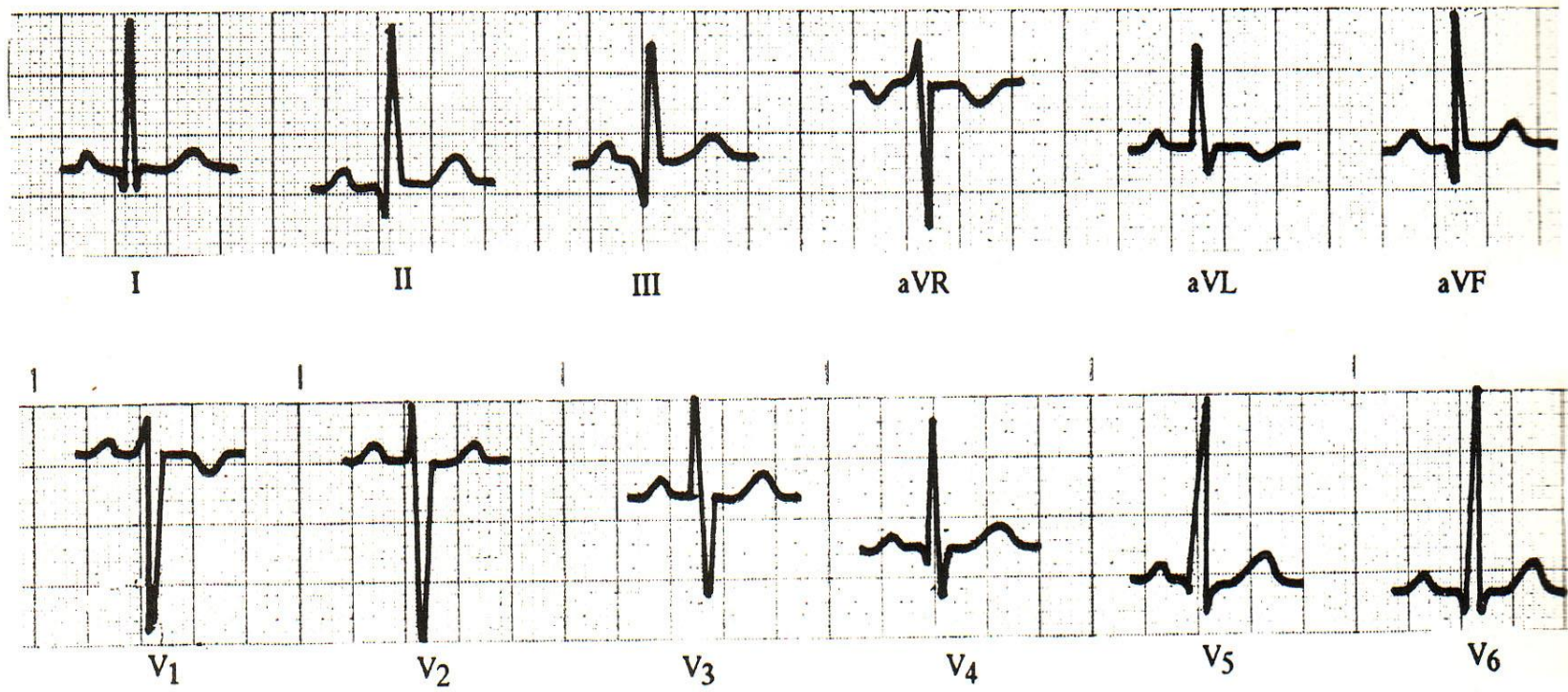
$$33 \times 6 = 198 \text{ bpm}$$



# Electrical Impulses :



- SA Node (inherent rate of 60 – 100)
- Atrial foci (inherent rate of 60 – 80)
- Junctional foci (inherent rate of 40 – 60)
- Ventricular foci (inherent rate of 20 – 40)



یک الکتروکاردیوگرام طبیعی



# Sinus Rhythms

## Normal Sinus Rhythm



Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
60 - 100	Regular	Before each QRS, Identical	.12 - .20	<.12

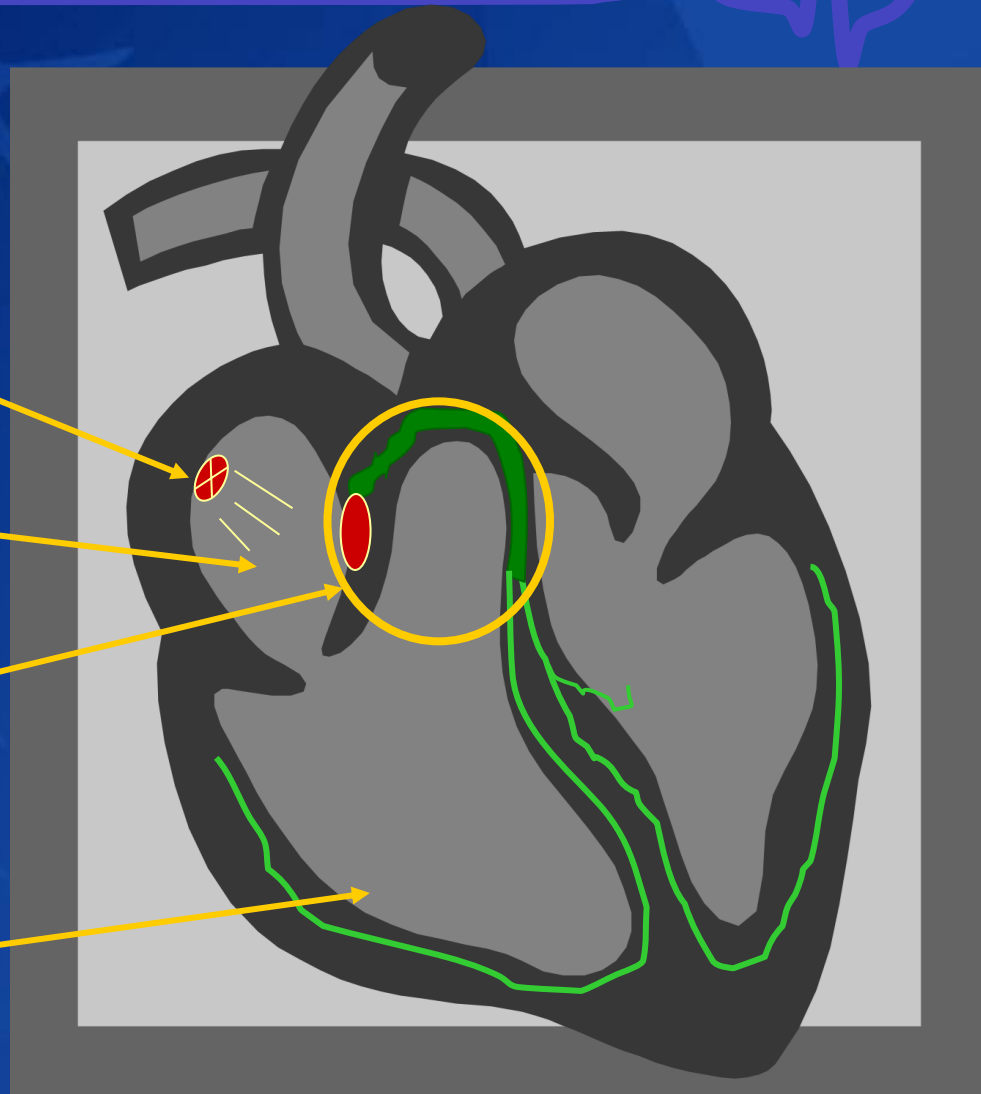
- The SA node has generated an impulse that followed the normal pathway of the electrical conduction system



# Sinus Node Dysfunction

- Sinus
- Atrial
- Junctional
- Ventricula

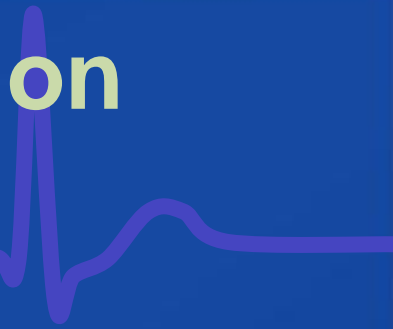
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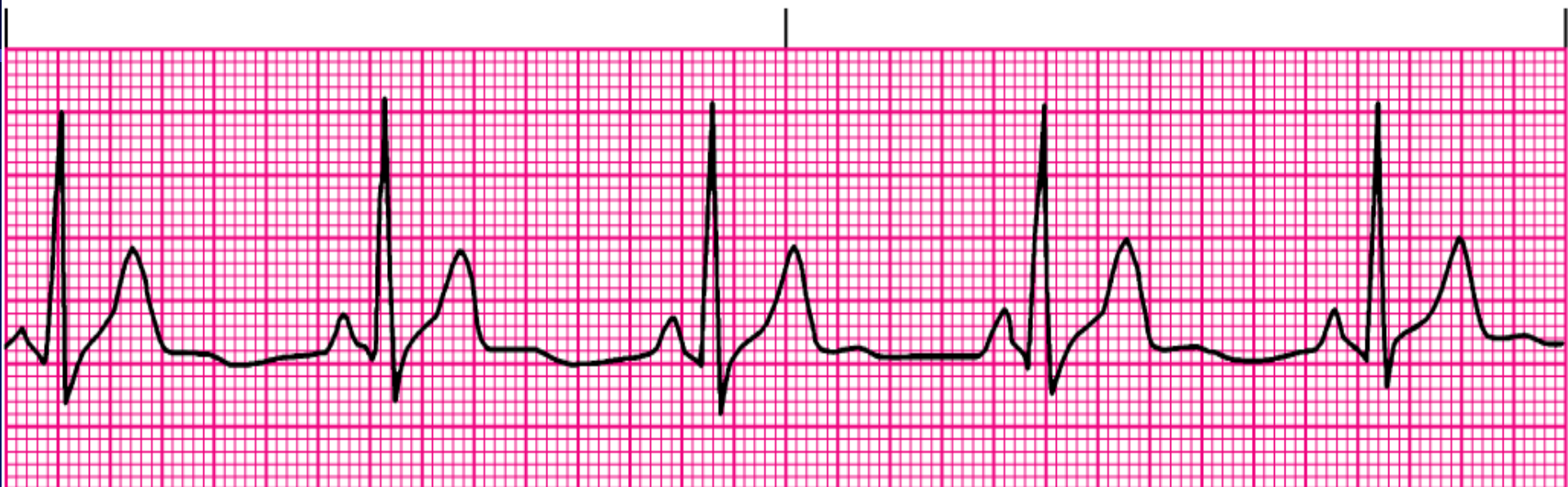
# Types of Sinus Node Dysfunction

:

- Sinus Bradycardia
- Sinus Tachycardia
- Sinus Arrhythmia
- Sinus Arrest
- Sinoatrial Exit Block
- Sick Sinus Syndrome  
(Brady-Tachy Syndrome)



# Sinus bradycardia



## Rhythm

- Regular

## Rate

- Less than 60 beats/minute

## P wave

- Normal size
- Normal configuration
- P wave before each QRS complex

## PR interval

- Within normal limits
- Constant

## QRS complex

- Normal duration
- Normal configuration

## T wave

- Normal size
- Normal configuration

## QT interval

- Within normal limits
- Possibly prolonged

## Other

- None



# Sinus Bradycardia is seen in:



- During sleep
- As an effect of medications
- In young healthy adults
- After heart transplantation
- In anorexia nervosa
- Increased intracranial pressure
- Myxedema
- Hypothermia
- Mental depression
- Coronary artery disease

# Sinus tachycardia



## Rhythm

- Regular

## Rate

- Greater than 100 beats/minute

## P wave

- Normal size
- Normal configuration
- May increase in amplitude
- Precedes each QRS complex
- As heart rate increases, possibly superimposed on preceding T wave and difficult to identify

## PR interval

- Within normal limits
- Constant

## QRS complex

- Normal duration
- Normal configuration

## T wave

- Normal size
- Normal configuration

## QT interval

- Within normal limits
- Commonly shortened

## Other

- None

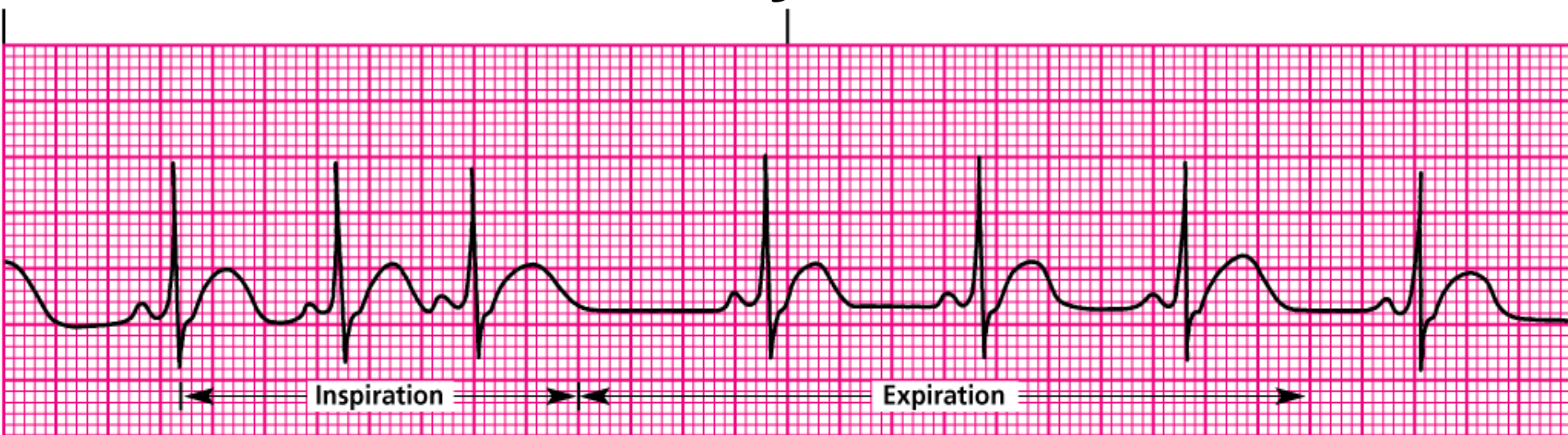
# Sinus Tachycardia is seen in:



- As an effect of medications
- Anxiety
- Pain
- Fever
- Hyperthermia
- Hypotension&shock
- Hypoxia



# Sinus arrhythmia



## Rhythm

- Irregular
- Corresponds to the respiratory cycle
- P-P interval and R-R interval shorter during inspiration; longer during expiration
- Difference between the longest and the shortest P-P interval exceeds 0.12 second

## Rate

- Usually within normal limits (60 to 100 beats/minute); rate may be less than 60 beats/minute
- Varies with respiration
- Increases during inspiration
- Decreases during expiration

## P wave

- Normal size
- Normal configuration

## PR interval

- May vary slightly
- Within normal limits

## QRS complex

- Preceded by P wave
- Normal configuration

## T wave

- Normal size
- Normal configuration

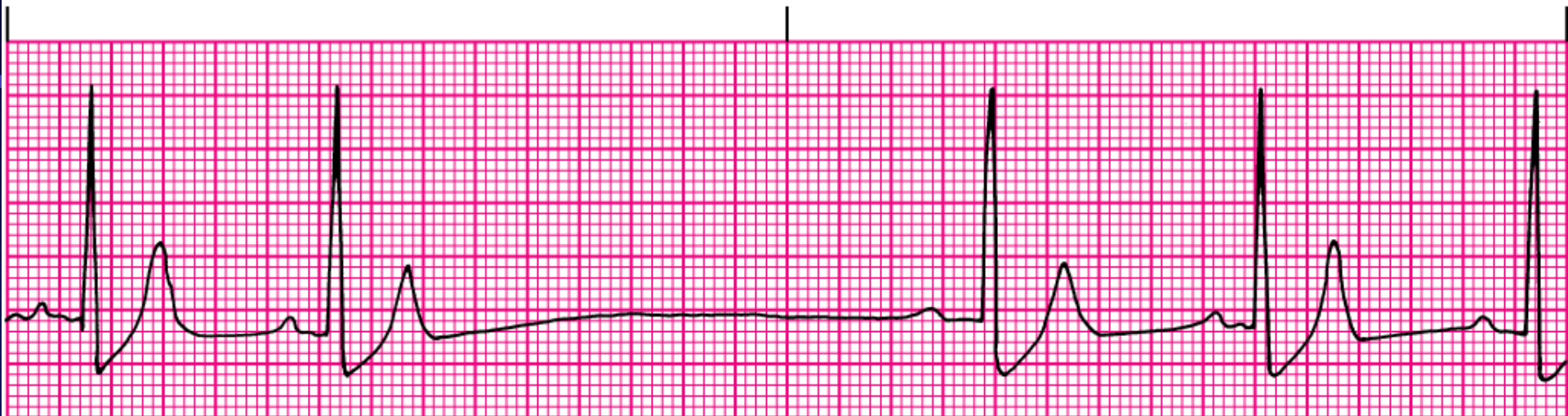
## QT interval

- May vary slightly
- Usually within normal limits

## Other

- Phasic slowing and quickening

# Sinus arrest



## Rhythm

- Regular except during arrest (irregular as a result of missing complexes)

## Rate

- Usually within normal limits (60 to 100 beats/minute) before arrest
- Length or frequency of pause may result in bradycardia

## P wave

- Periodically absent, with entire PQRST complexes missing
- When present, normal size and configuration
- Precedes each QRS complex

## PR interval

- Within normal limits when a P wave is present
- Constant when a P wave is present

## QRS complex

- Normal duration
- Normal configuration
- Absent during arrest

## T wave

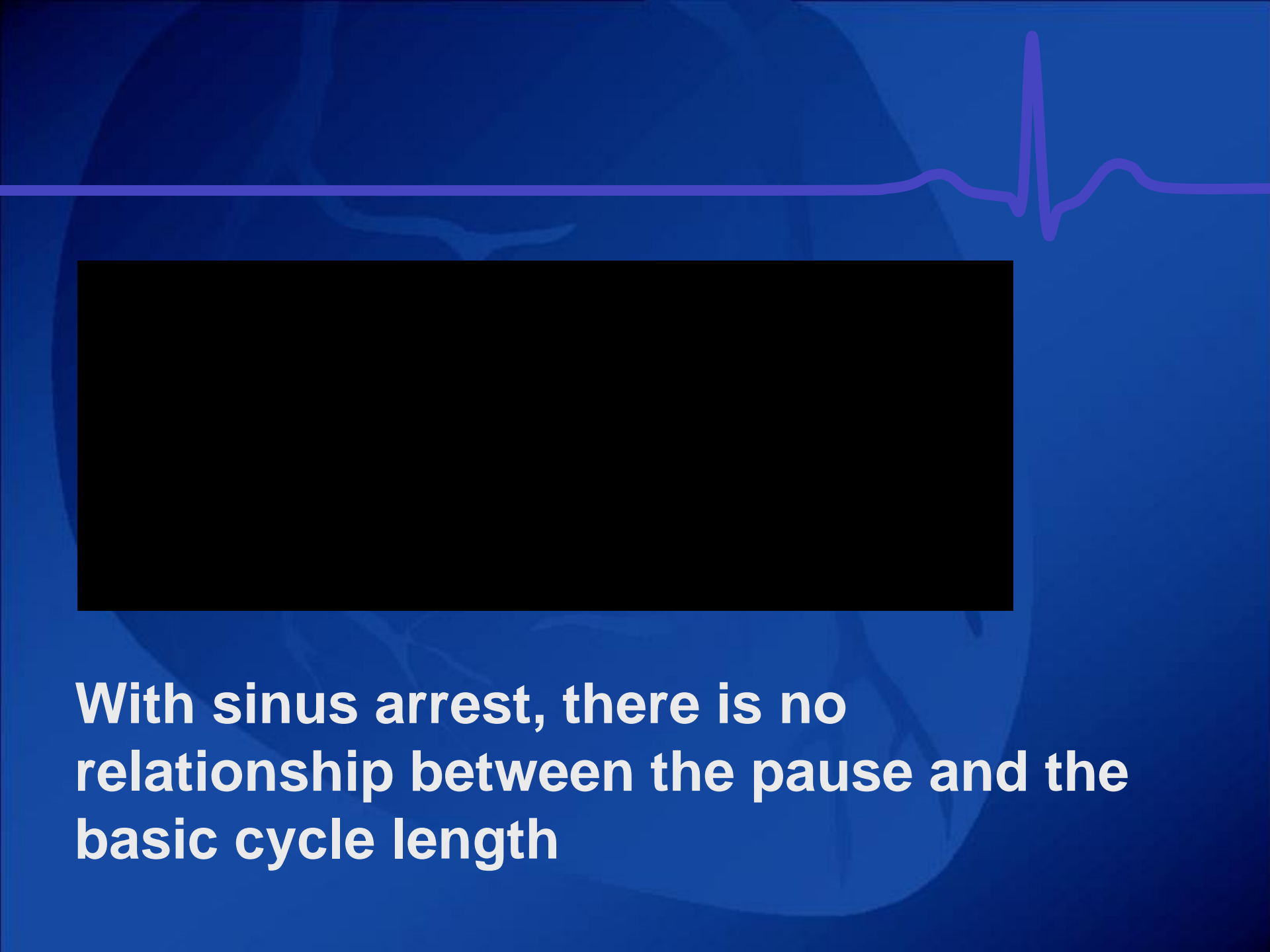
- Normal size
- Normal configuration
- Absent during arrest

## QT interval

- Within normal limits
- Absent during arrest

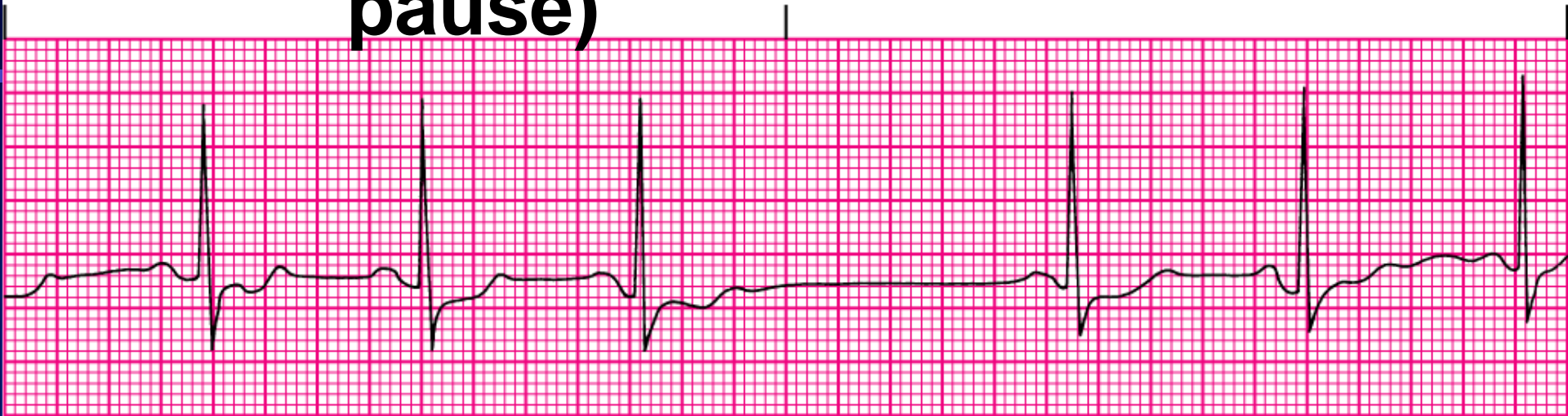
## Other

- The pause isn't a multiple of the underlying P-P intervals

The background of the slide is a dark blue gradient. In the upper right corner, there is a white ECG (heart rate) line. The line shows a regular rhythm with a small pause or irregularity. A large, solid black rectangular box is positioned in the center of the slide, partially obscuring the ECG line and the text below it.

**With sinus arrest, there is no relationship between the pause and the basic cycle length**

# Sinoatrial exit block (sinus pause)



## Rhythm

- Regular except during pause (irregular as result of pause)

## Rate

- Usually within normal limits (60 to 100 beats/minute) before pause
- Length or frequency of pause may result in bradycardia

## P wave

- Periodically absent, with entire PQRST complexes missing
- When present, normal size and configuration and precedes each QRS complex

## PR interval

- Within normal limits
- Constant when a P wave is present

## QRS complex

- Normal duration
- Normal configuration
- Absent during a pause

## T wave

- Normal size
- Normal configuration
- Absent during a pause

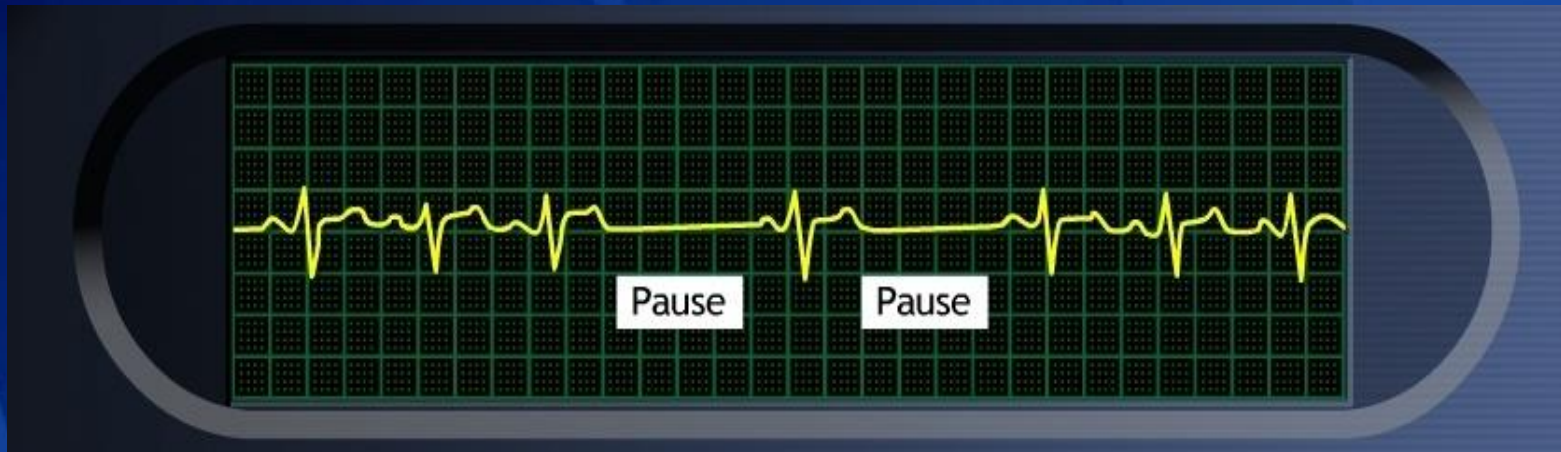
## QT interval

- Within normal limits
- Absent during a pause

## Other

- The pause is a multiple of the underlying P-P interval

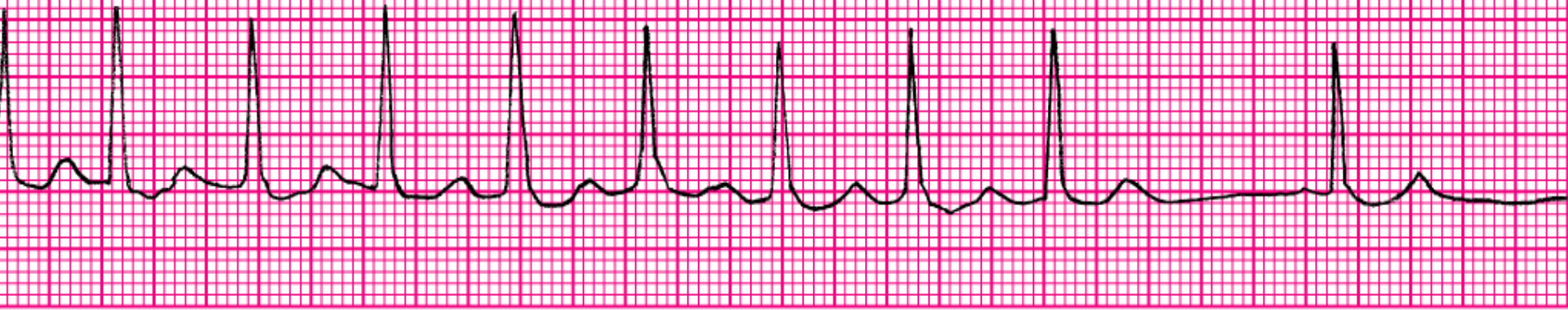




- Is recognized by a pause which is a multiple of the basic p-p interval



# Sick sinus syndrome (Brady/tachy syndrome)



## Rhythm

- Irregular with sinus pauses

## Rate

- Fast, slow, or alternating
- Abrupt rate changes
- Interrupted by a long sinus pause

## P wave

- Varies with rhythm changes
- May be normal size and configuration
- May be absent
- Usually precedes each QRS complex

## PR interval

- Usually within normal limits
- Varies with rhythm changes

## QRS complex

- Duration within normal limits
- Varies with rhythm changes
- Normal configuration

## T wave

- Normal size
- Normal configuration

## QT interval

- Usually within normal limits
- Varies with rhythm changes

## Other

- Usually more than one arrhythmia on a 6-second strip

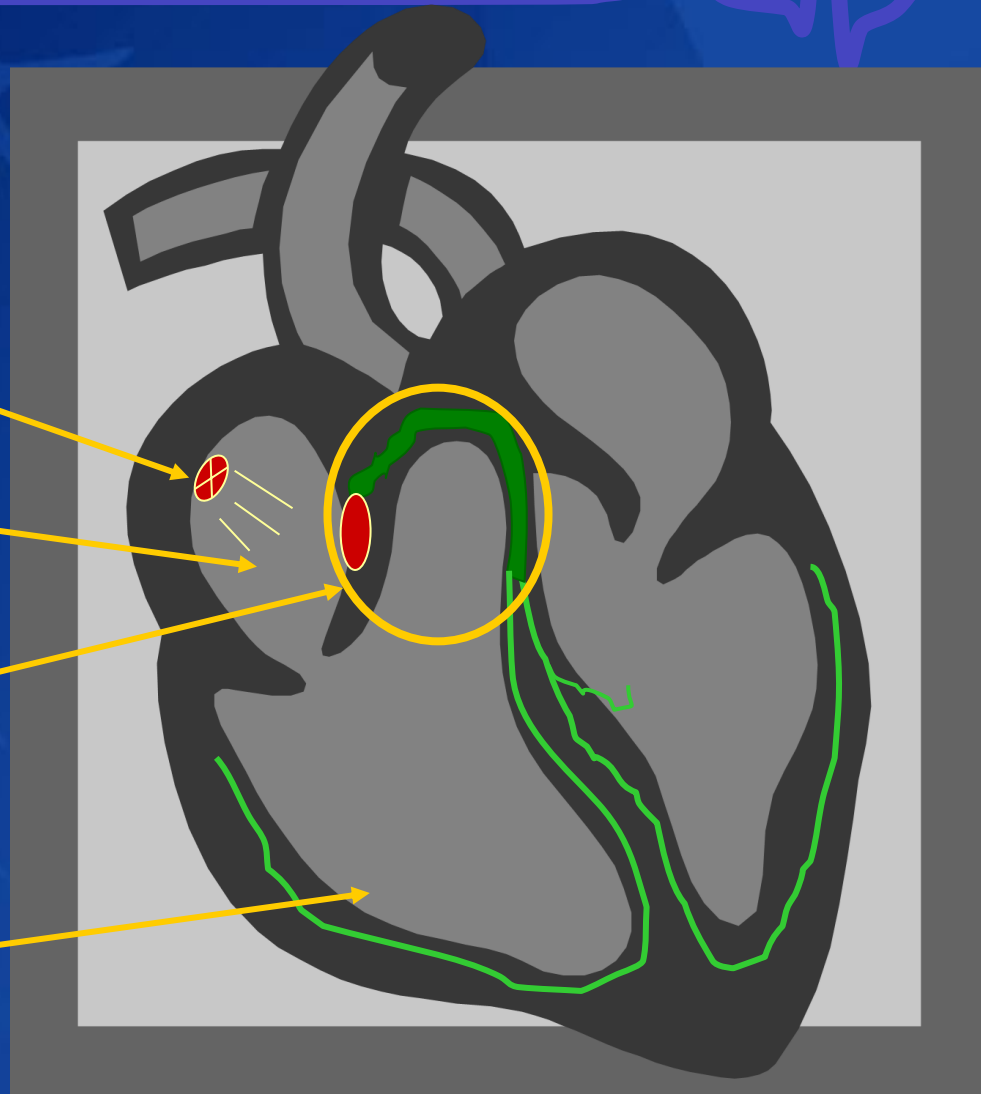


- **Intermittent episodes of slow and fast rates from the SA node or atria**
- **Brady <60 BPM**
- **Tachy >100 BPM**

# Atrial Arrhythmia

- Sinus
- **Atrial**
- Junctional
- Ventricula

r



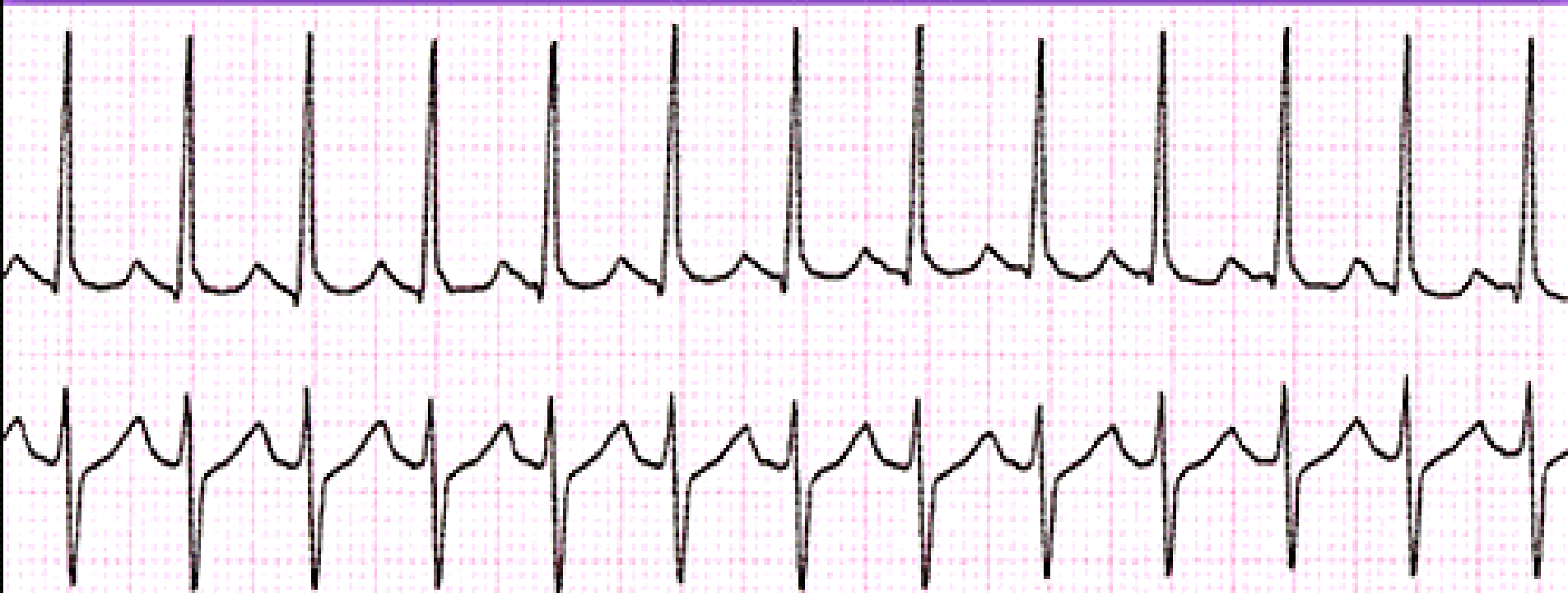


# Types of Atrial Arrhythmia :



- Supraventricular/Atrial Tachycardia(SVT)
- Premature Atrial Contraction(PAC)
- Wandering Atrial Pacemaker(WAP)
- Multifocal Atrial Tachycardia(MAT)
- Atrial Flutter(A Flut.)
- Atrial Fibrillation (AF)

## Atrial Tachycardia



Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
140-250 bpm	Regular	Abnormal P before each QRS (difficult to see)	<.20	<.12

# SVT Definition :



- **Supraventricular tachycardia** refers to tachycardia that originates from his bundle and above.
- **Paroxysmal**
  - Ectopic focus, sudden onset, abrupt cessation

# Premature Atrial Contractions



- Deviation from NSR

- These ectopic beats originate in the atria (but not in the SA node), therefore the contour of the P wave, the PR interval, and the timing are different than a normally generated pulse from the SA node.



# Premature Beats



- Not a rhythm, just a single early beat

- Three Options:

- If it arises from the **Atria**, it will have a normal PR Interval
- This is a **Premature Atrial Contraction** or **PAC**
- If it arises from the **Junctional** area, it will have a PR Interval which is less than normal or no P wave at all
- This is a **Premature Junctional Contraction** or **PJC**
- If it arises from the **Ventricular** area, it will be a QRS which is wide and bizarre shaped
- This is a **Premature Ventricular Contraction** or **PVC**

•SR w/

•PAC

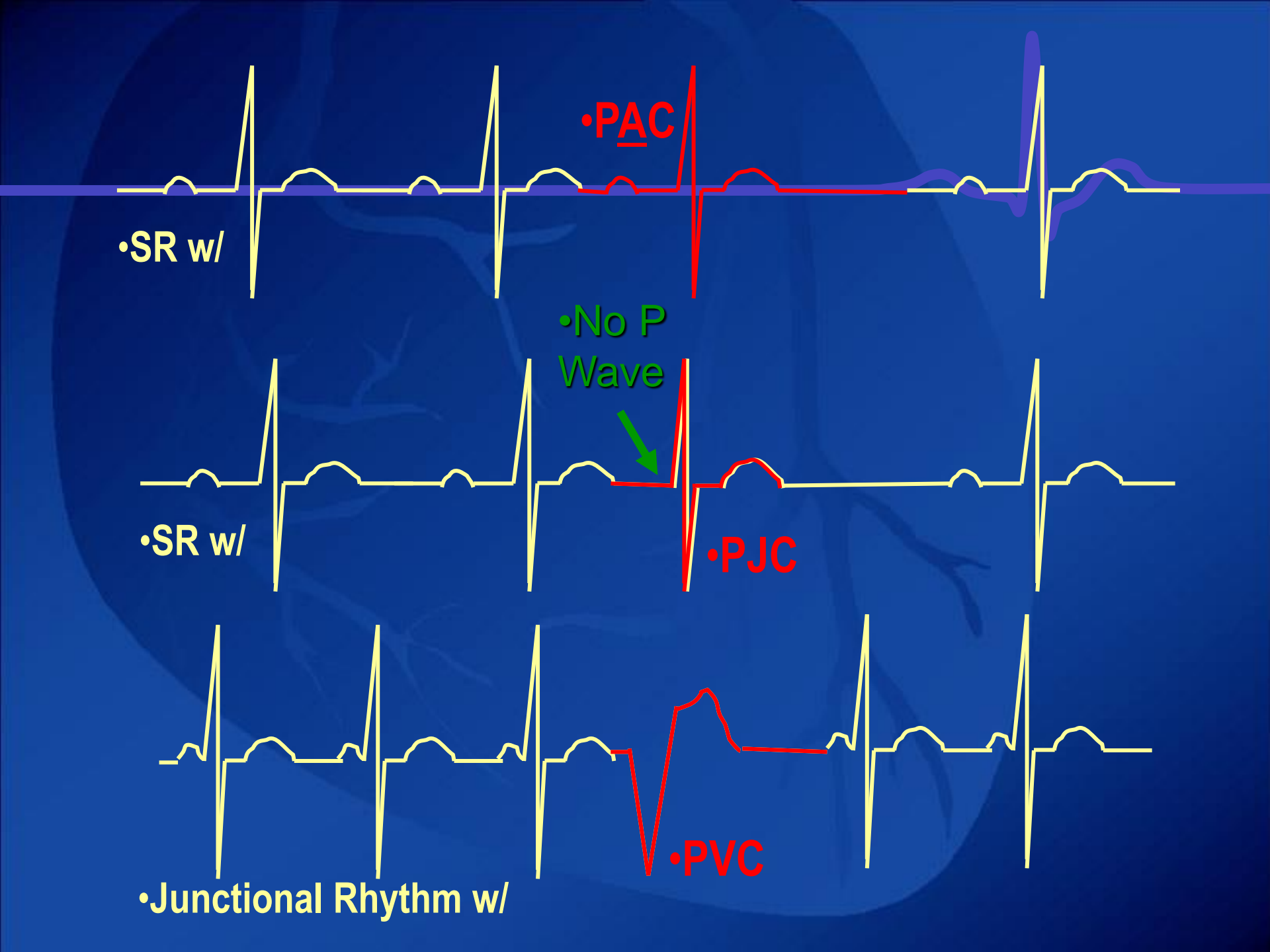
•No P  
Wave

•SR w/

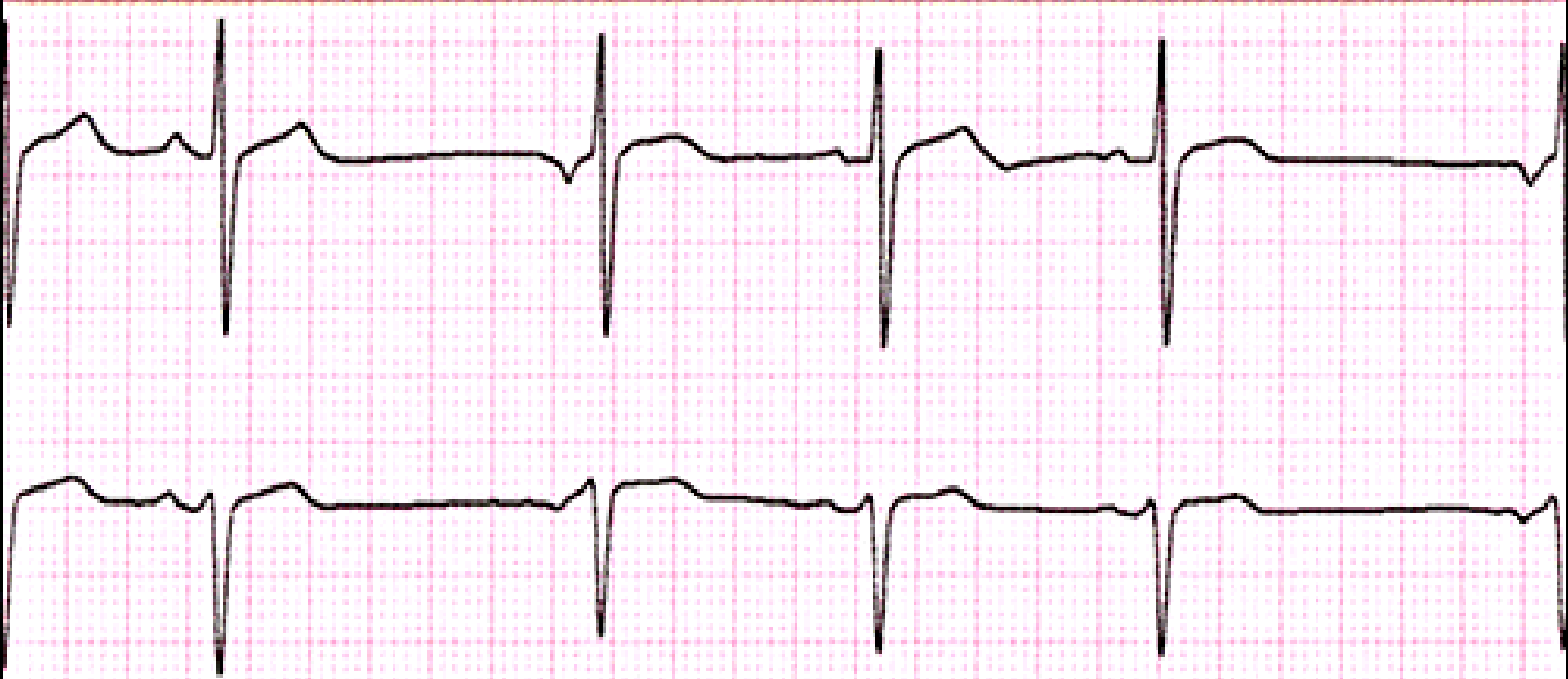
•PJC

•Junctional Rhythm w/

•PVC



# Wandering Pacemaker



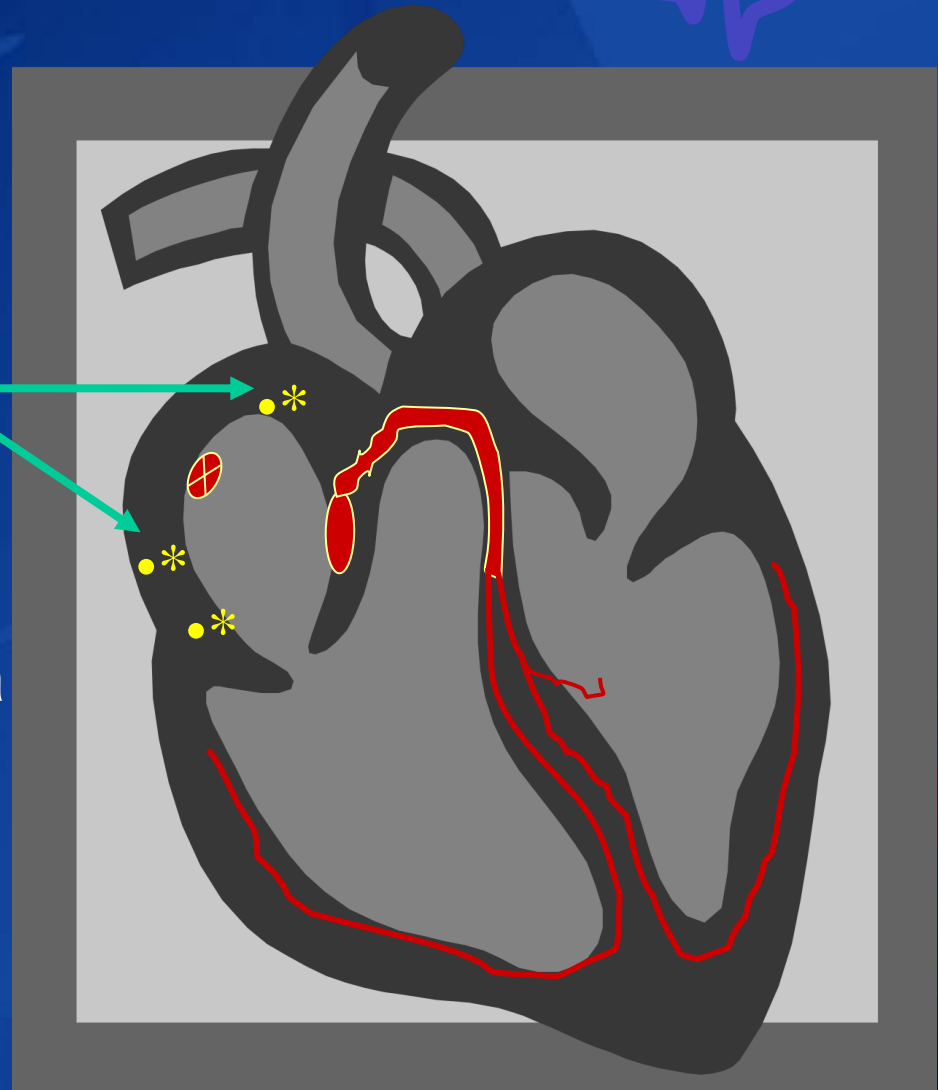
Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
Usually <60 bpm	Irregular	Multiple forms	Variable	<.12

# Wandering Atrial Pacemaker :

- Atrial pacemakers

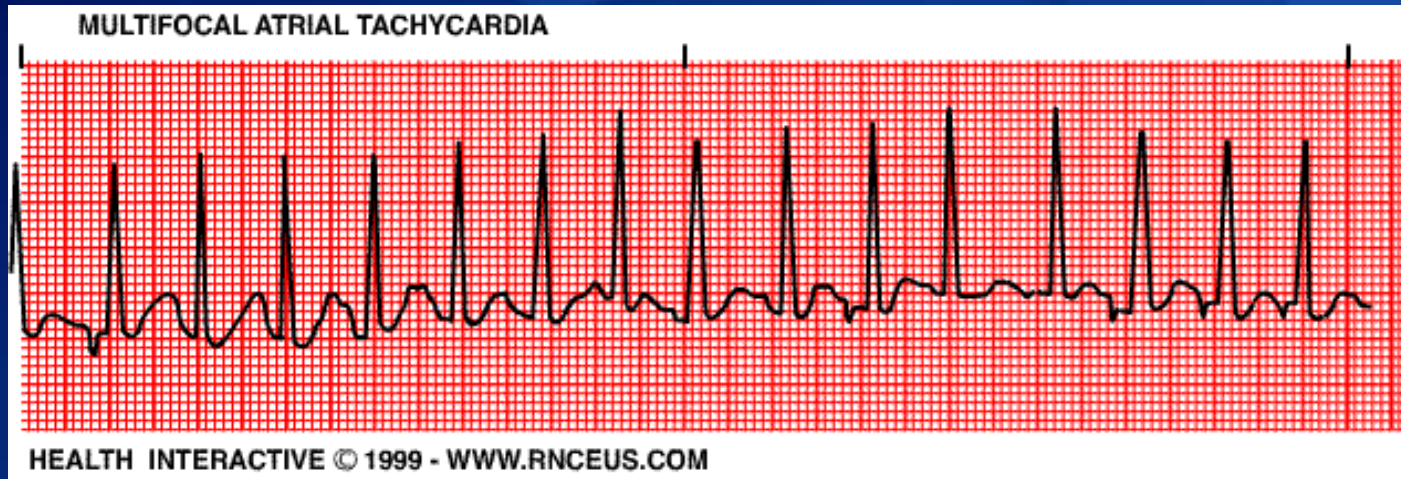
- Different pacemakers fire in a row.

- Since they come from different areas in the atria, they will be shaped differently on the strip



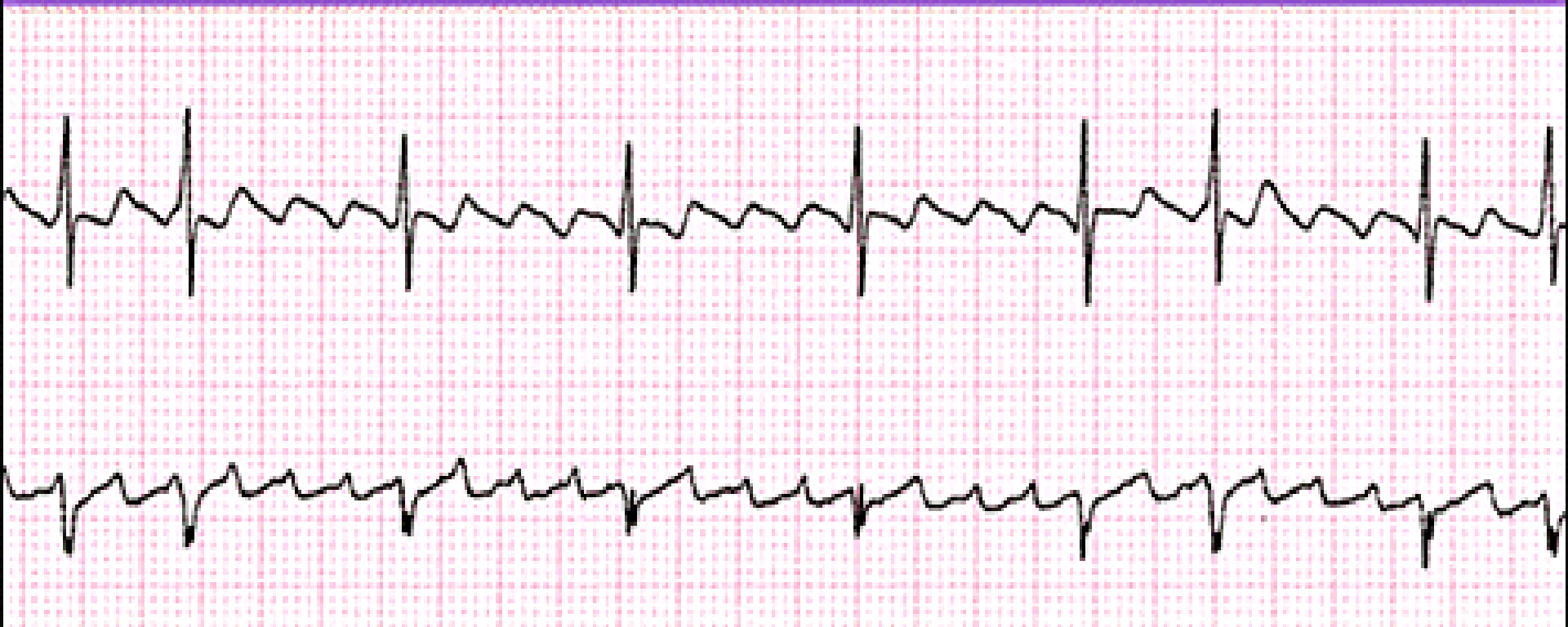


# Multifocal Atrial Tachycardia



- Irregular rhythm.
- P waves change shape as pacemaker location varies.
- Rate greater than 100/minute

## Atrial Flutter



Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
A: 220-430 bpm V: <300 bpm	Regular or variable	Sawtoothed appearance	N/A	<.12

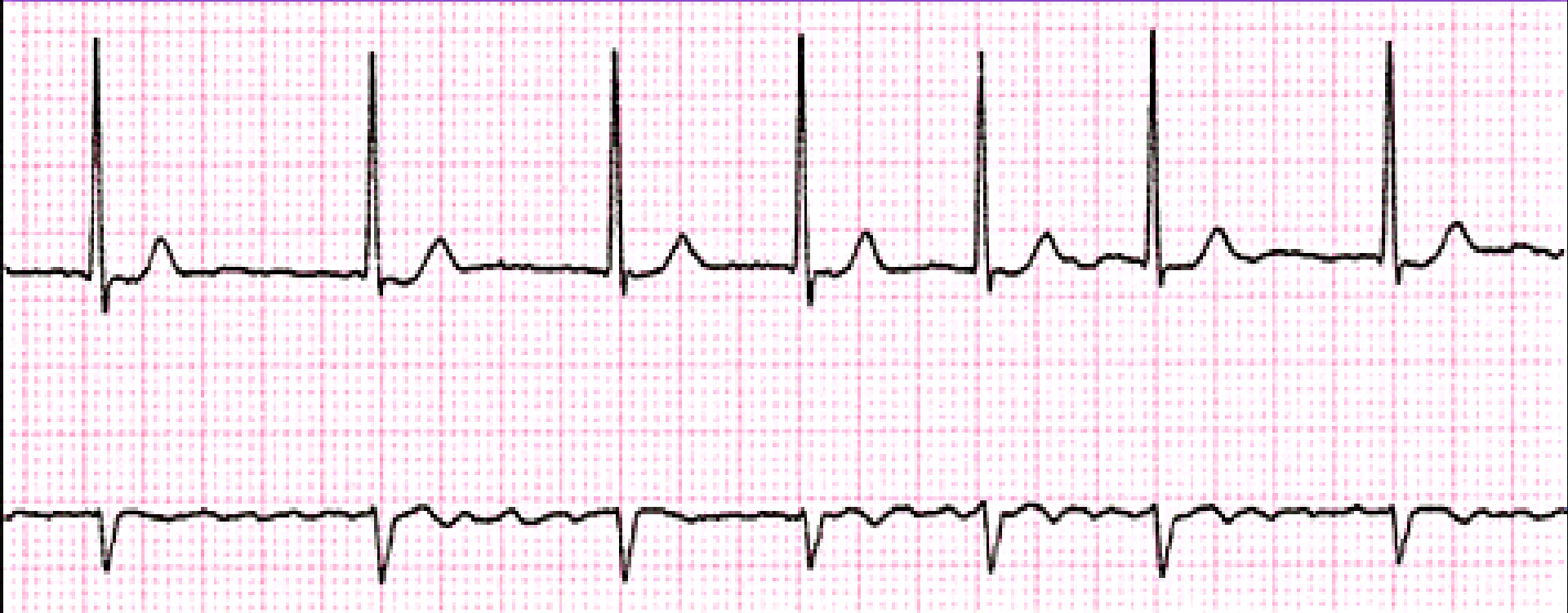
# Atrial Flutter vs. Atrial Fibrillation



## •Summary of Disease Characteristics

	•Atrial Flutter	•Atrial Fibrillation
•Atrial Rate	• 250 to 350 BPM	• $\geq 350$ BPM
•Ventricular Rate	• Varies w/conduction	• Varies w/conduction
•Rhythm	• Usually regular	• Grossly Irregular
•Pattern	• Saw tooth baseline	• Wavy baseline
•Underlying Mechanism	• Reentry via macro reentrant circuit	• Multiple wavelet reentry • Multiple/single focus • fibrillation

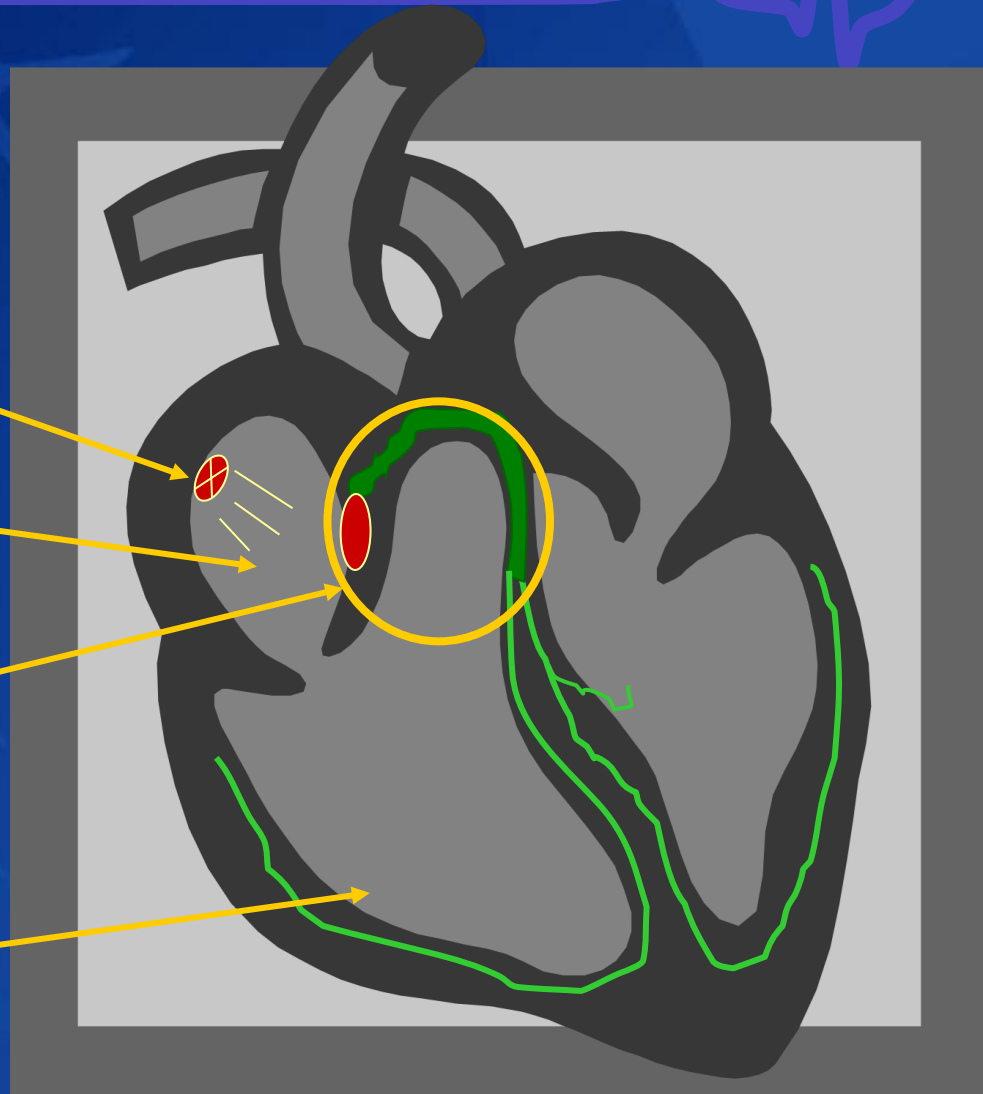
# Atrial Fibrillation



Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
A: 350-650 bpm V: Slow to rapid	Irregular	Fibrillatory (fine to course)	N/A	<.12

# Junctional Arrhythmia & AV Blocks

- Sinus
- Atrial
- Junctional
- Ventricular





## Junctional Rhythm



Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
40-60 bpm	Regular	Inverted, absent or after QRS	<.12	<.12

- Sinus

- PR Interval will be normal



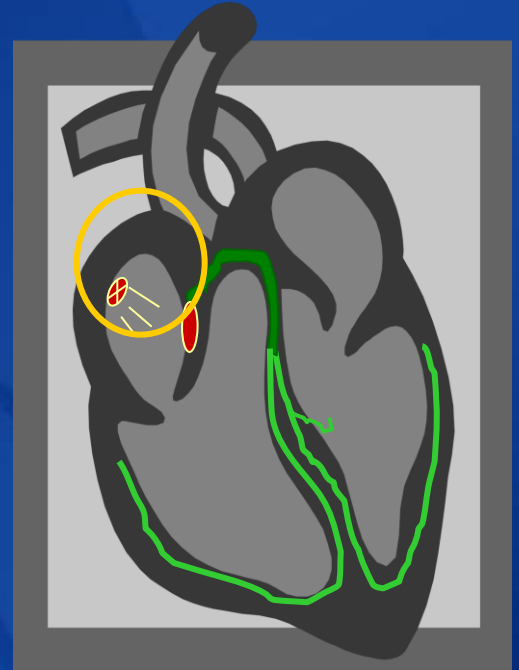
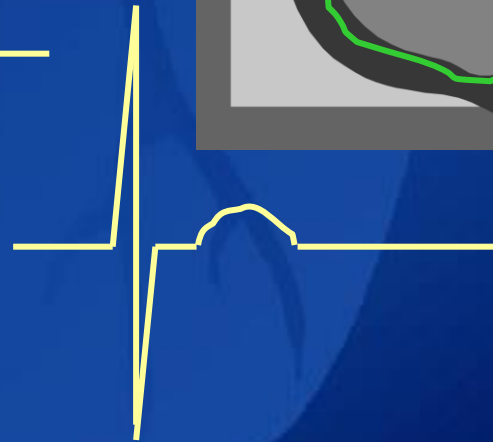
- Junctional

- PR Interval will be

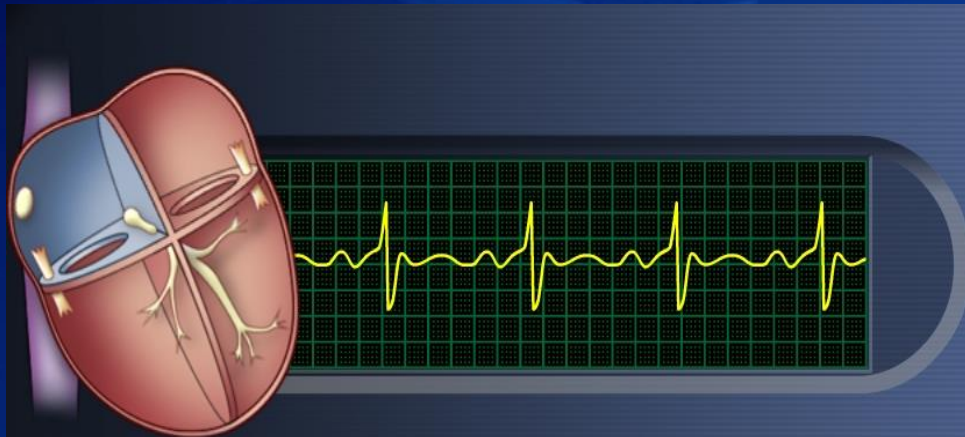
- Less than normal

- Or... • There will

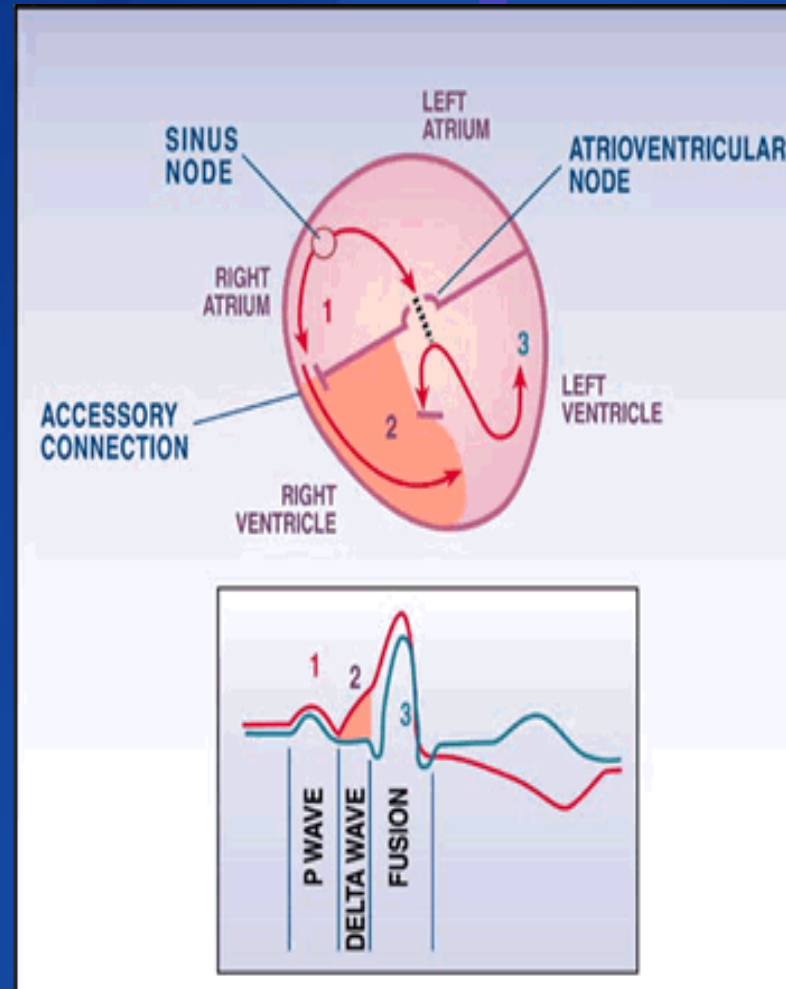
- Be no P Wave

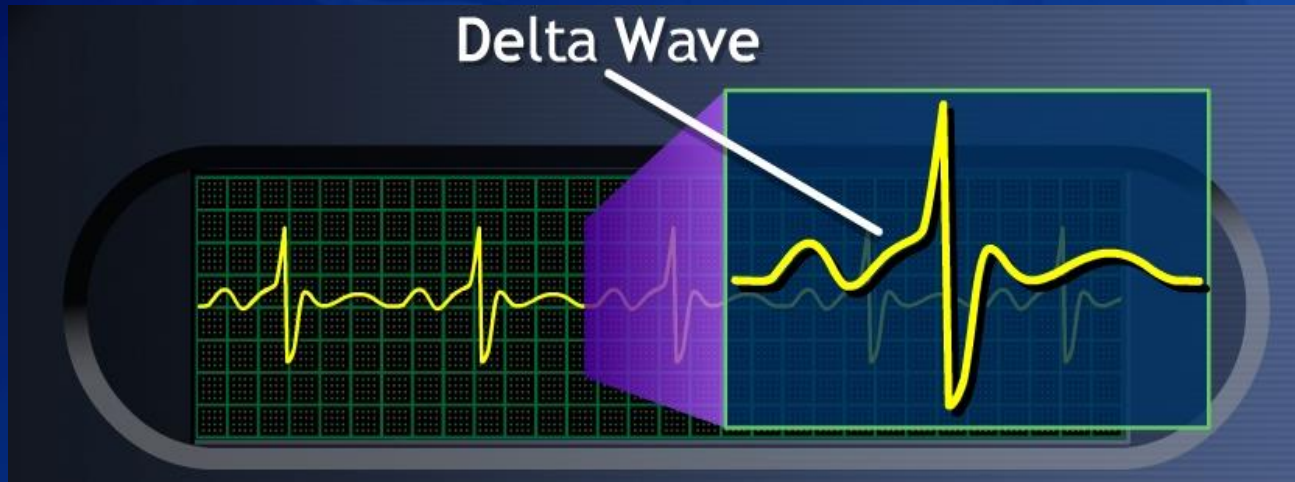


# Wolff-Parkinson-White



- **Accessory Pathway = Bundle of Kent**
- **Orthodromic - 90%**
  - AV node – antegrade conduction;
  - Extra pathway – retrograde conduction
- **Antidromic – 10%**
  - Extra pathway – antegrade conduction



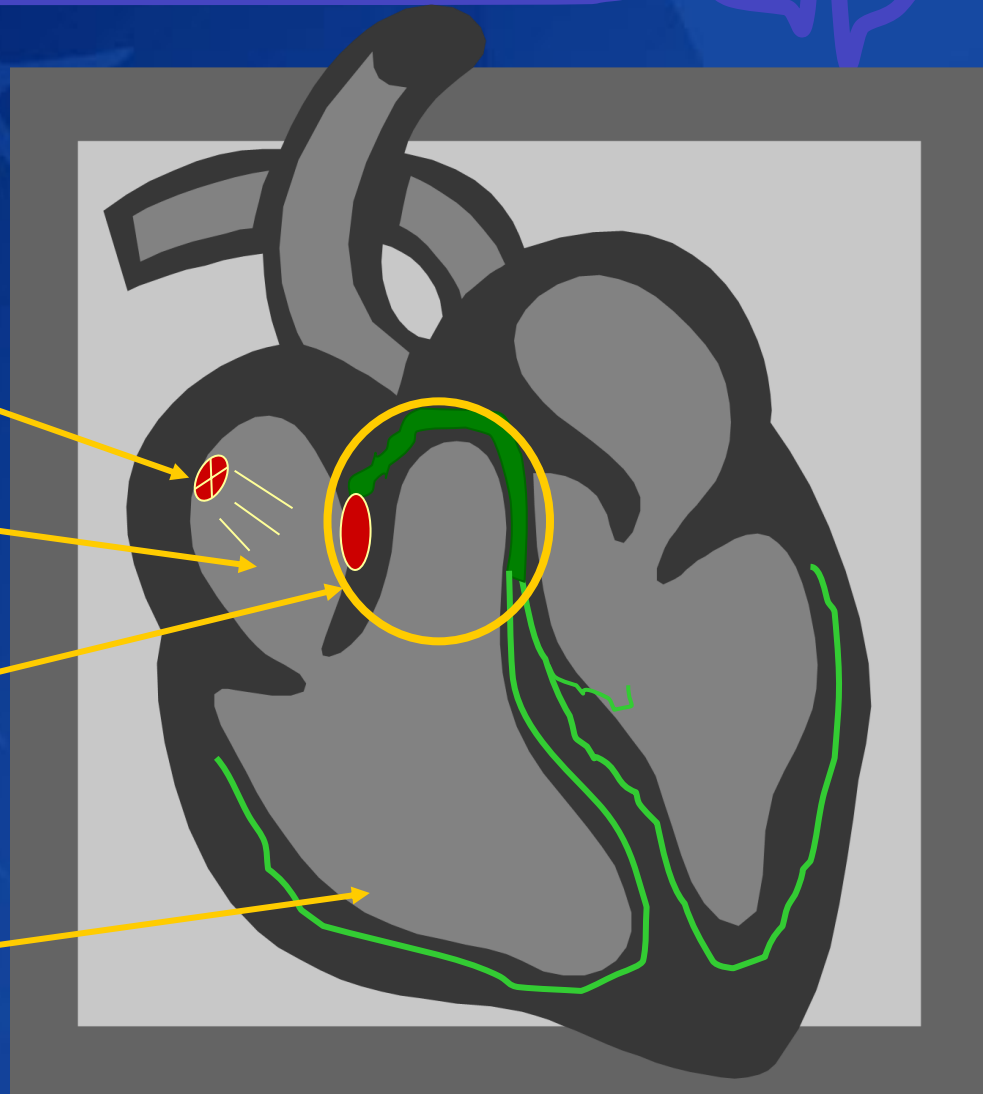


- **Origin:** Outside the AV Node
- **Mechanism:** Reentry
- **Rate:** 180-260 BPM – can be faster
- **Characteristics:** Short PR Interval ( $\leq 120$  ms), wide QRS ( $\geq 110$  ms), obvious delta wave



# Ventricular Arrhythmia

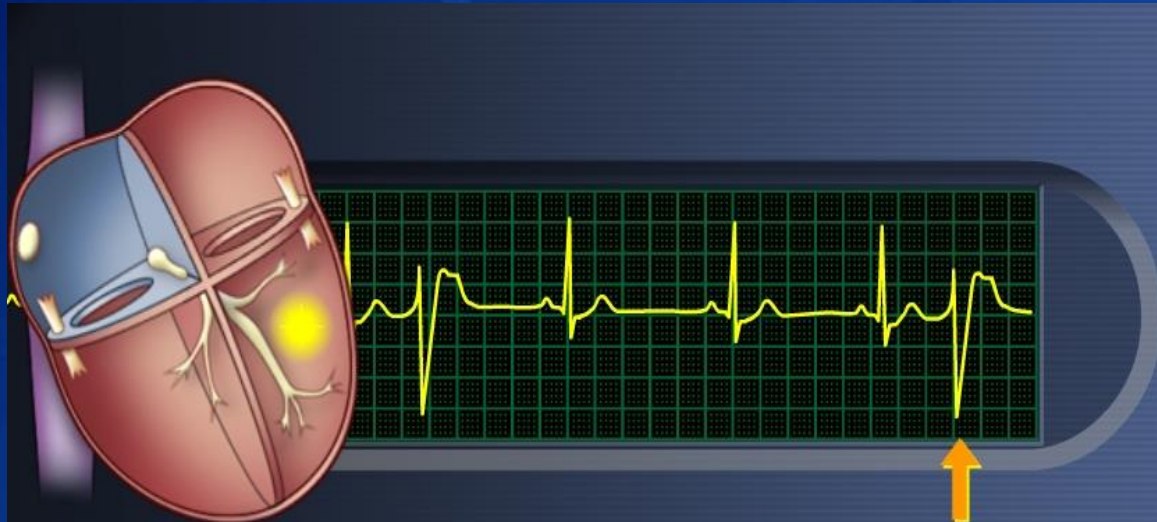
- Sinus
- Atrial
- Junctional
- **Ventricular**





# Premature Beats

- Premature Ventricular



- **Origin:** Ventricles
- **Mechanism:** Abnormal Automaticity
- **Characteristics:** A broad complex occurring earlier than expected, followed by a compensatory pause

# PVC Patterns



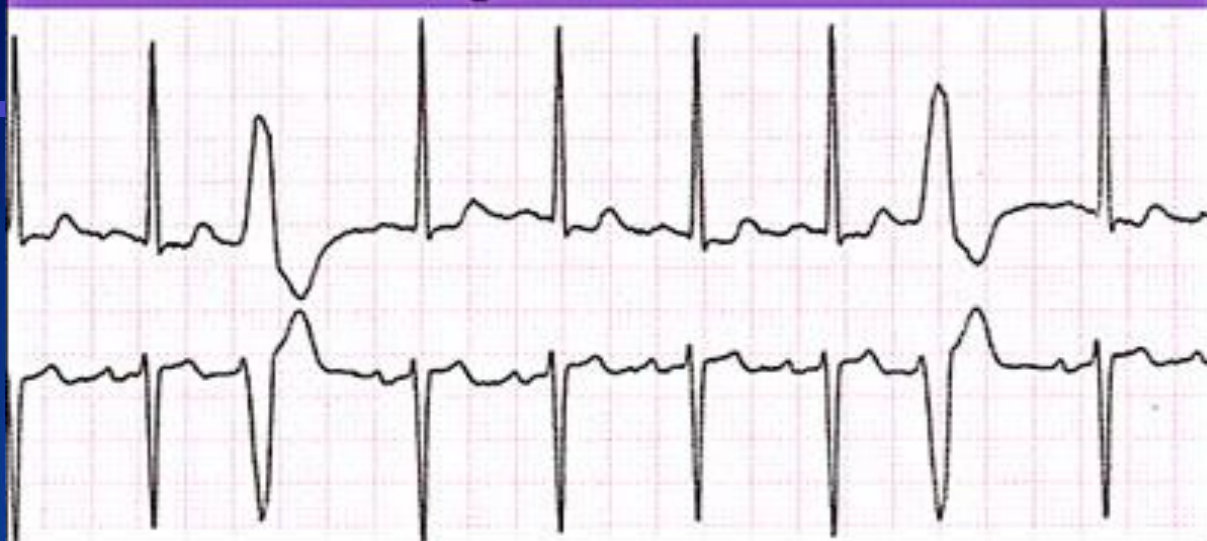
- **Bigeminy**
  - Every other beat
- **Trigeminy**
  - Every third beat
- **Quadrigeminy**
  - Every fourth beat

# Multifocal PVC

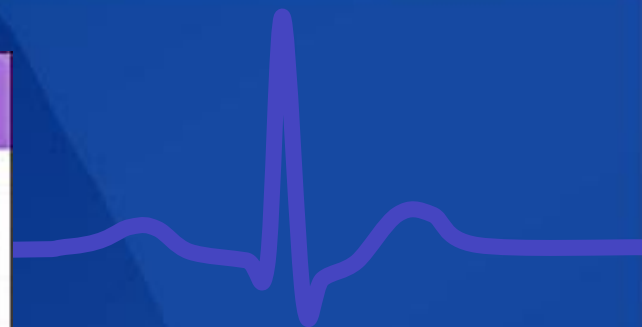


- **Origin:** Varies within the Ventricle
- **Mechanism:** Abnormal Automaticity
- **Characteristics:** Each premature beat changes axis;  
implies a different focus origin for each beat

**Unifocal PVC's: identical shapes**  
**Note: A single PVC is labeled isolated**



**Multifocal PVC's: more than one shape**



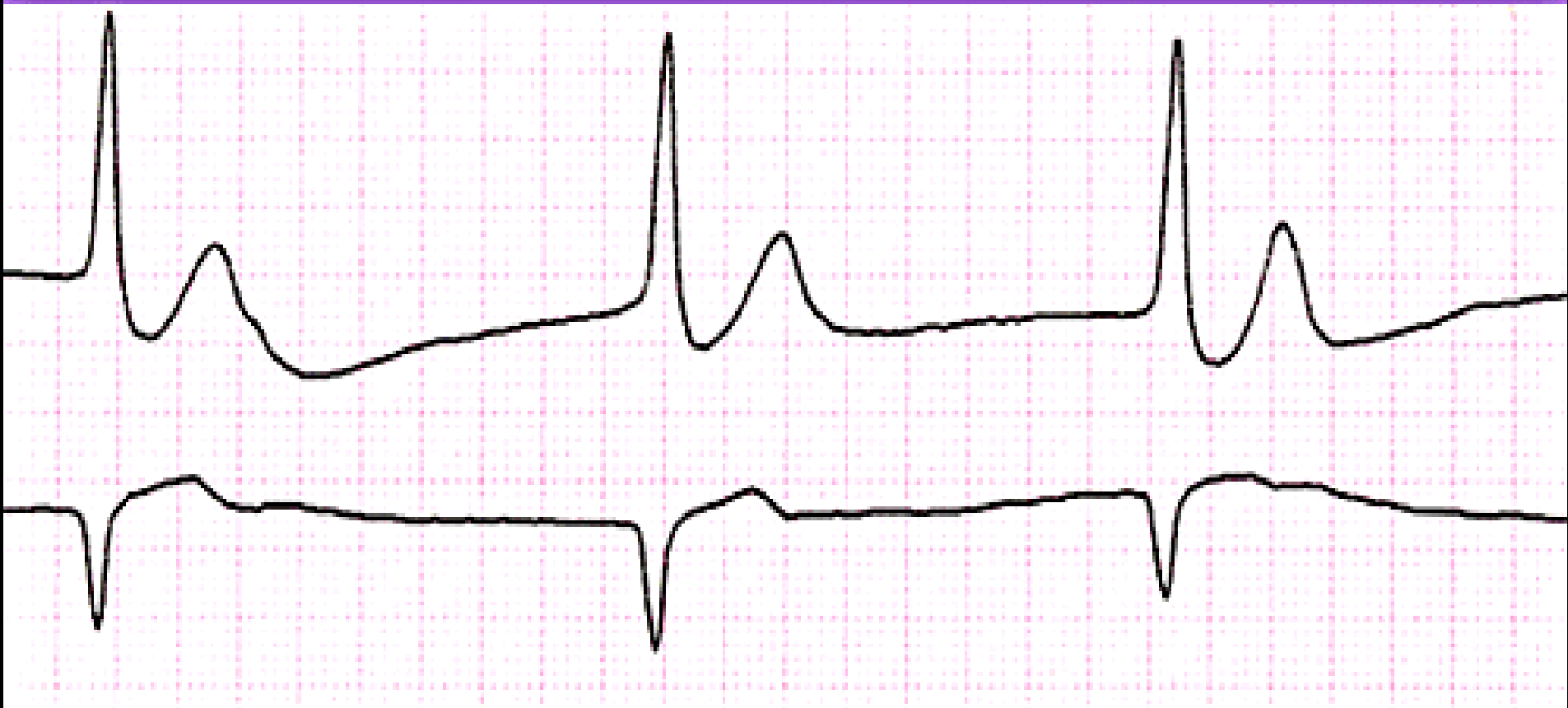


## When are PVCs is Dangerous?

- Increase from the patient's normal
- Multiple PVCs in a row (Couplet or Triplet)
- PVC falls on the T wave of previous beat.
- Multifocal PVCs (they arise from different cells, therefore they are different shapes)
- Troubles PVCs in a row (Bigeminy or



# Idioventricular Rhythms



Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
20-40	Regular	Absent or not related	N/A	$\geq .12$

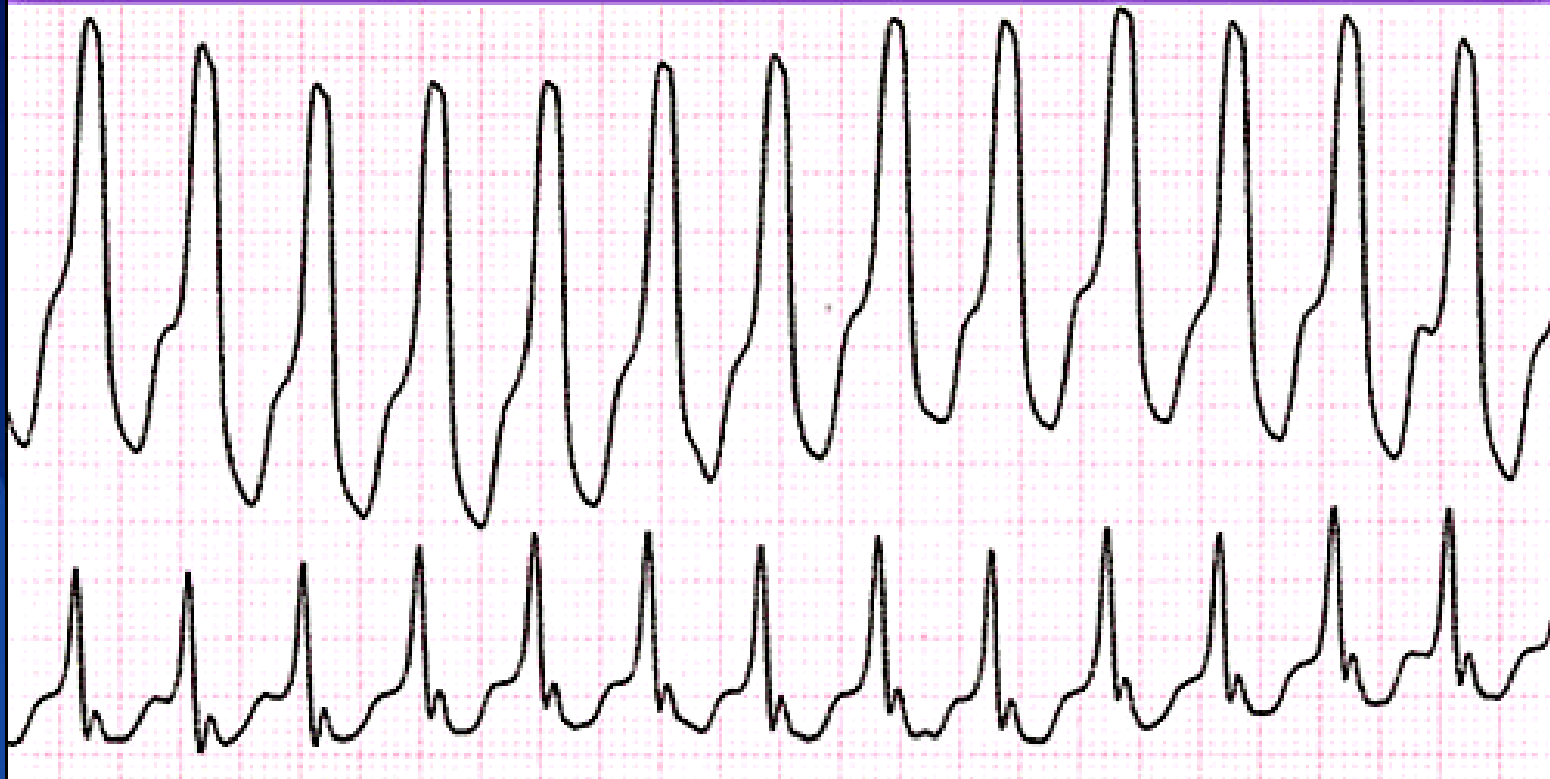
# Accelerated Idioventricular Rhythm



- **Origin:** Ventricle
- **Mechanism:** Abnormal Automaticity
- **Rate:** Ventricular rate  $>$  sinus rate, but  $< VT$
- **Characteristic:** Dominates and takes over the rhythm

# Ventricular Tachycardia

## Ventricular Tachycardia (3 or more consecutive beats)

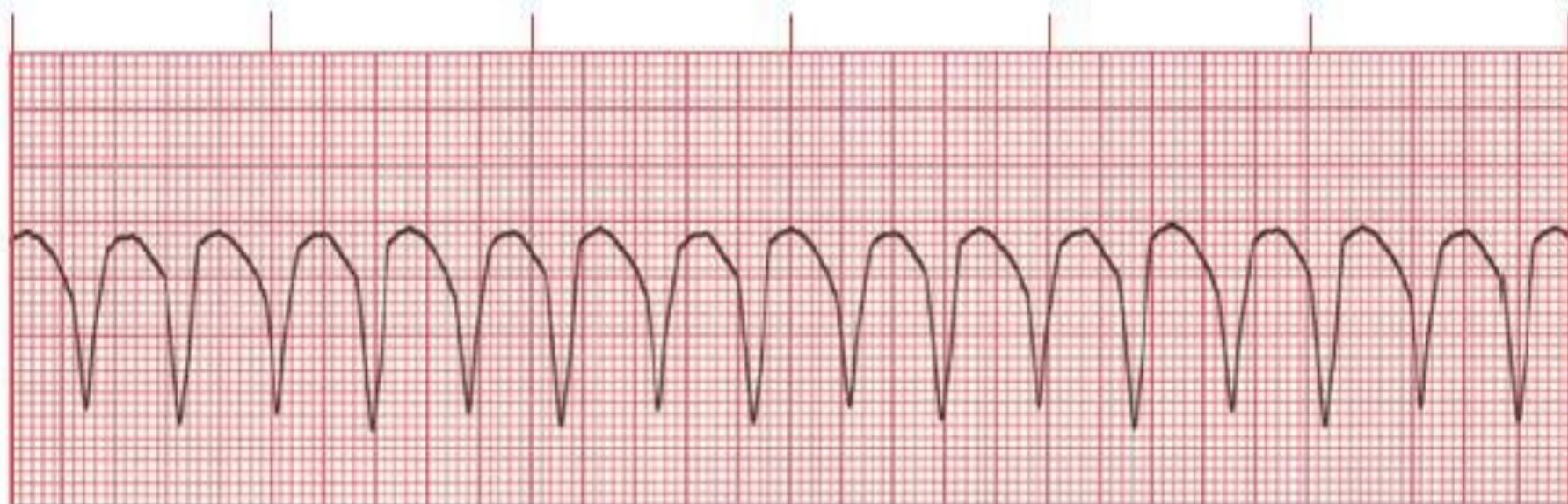


Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
<100	Regular	Absent or not related	N/A	$\geq .12$

درمان vt-vf شوک دفریله می باشد  
چنانچه تاکیکاردی بطنی نبض دار بود شوک سینکرونایزر  
کلاربرد دارد

## Ventricular Tachycardia (VT): Monomorphic

■ In monomorphic VT, QRS complexes have the same shape and amplitude.



**Rate:** 100–250 bpm

**Rhythm:** Regular

**P Waves:** None or not associated with the QRS

**PR Interval:** None

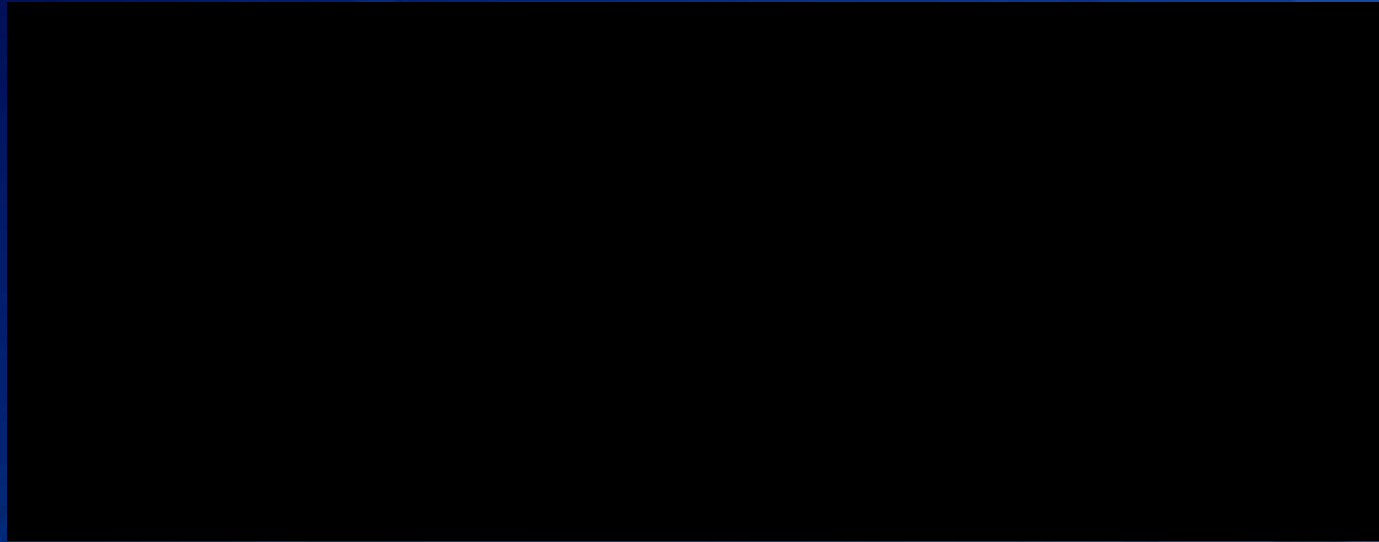
**QRS:** Wide ( $>0.10$  sec), bizarre appearance

♥ **Clinical Tip:** It is important to confirm the presence or absence of pulses because monomorphic VT may be perfusing or nonperfusing.

♥ **Clinical Tip:** Monomorphic VT will probably deteriorate into VF or unstable VT if sustained and not treated.

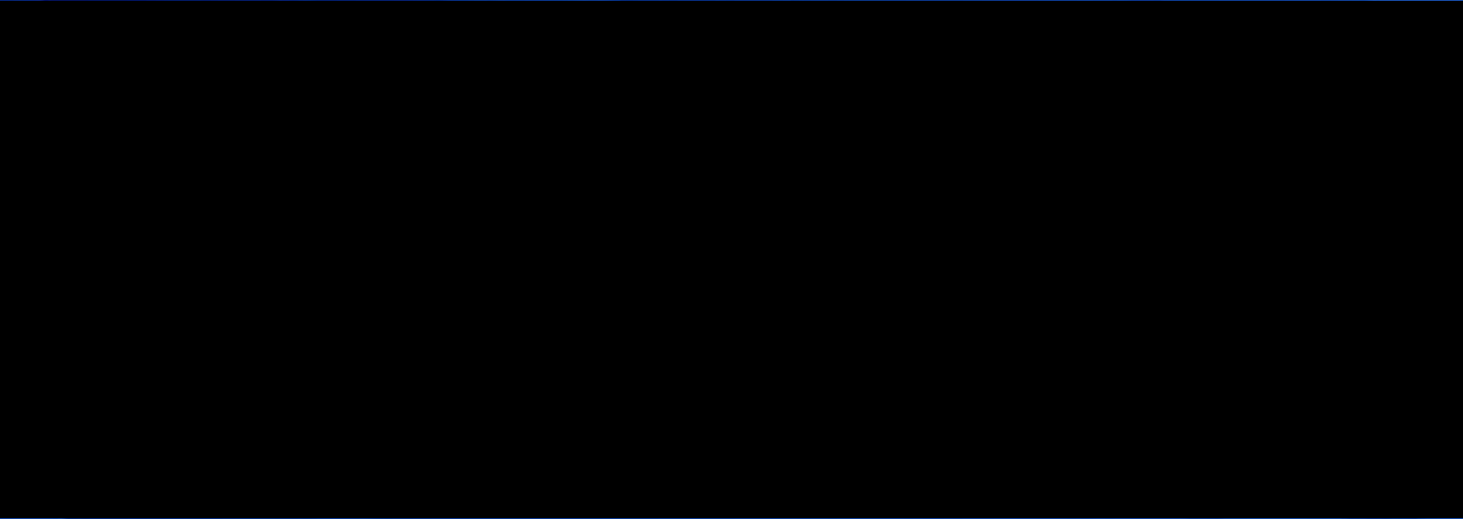
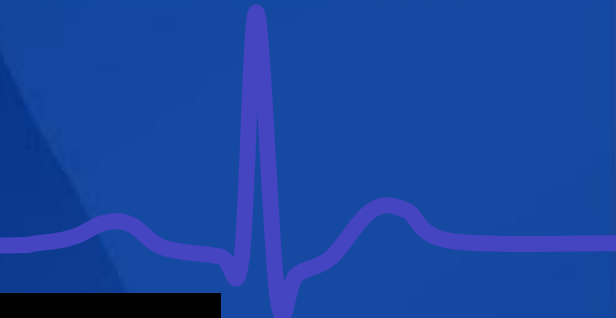


# Monomorphic VT

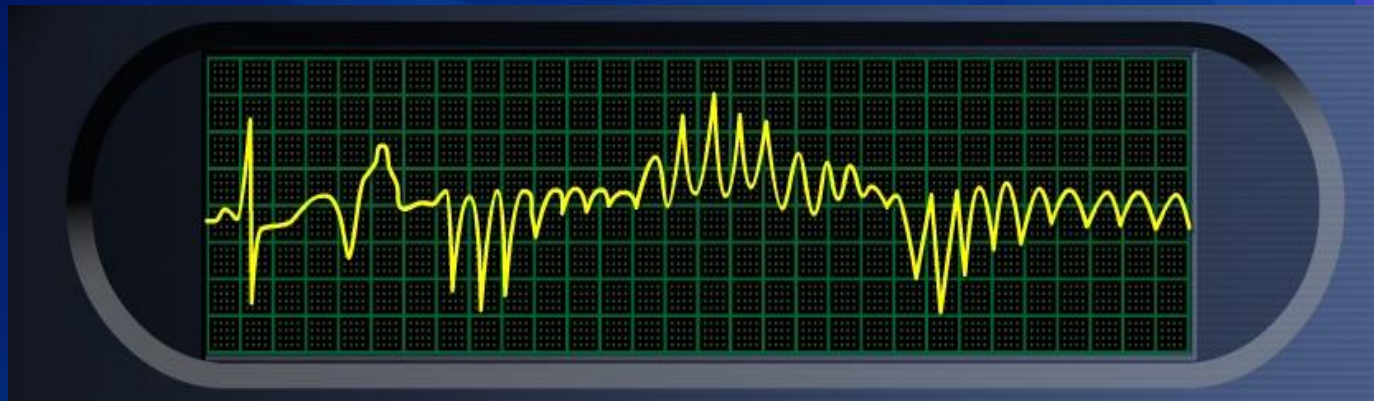


- **Origin:** **Ventricles (Single Focus)**
- **Mechanism:** **Reentry Initiated by abnormal activity**  
**Automaticity or Triggered**
- **Characteristics:** **Rapid, wide, and regular QRS**

# Polymorphic VT

- 
- 
- **Origin:** Ventricles (Wandering Single Focus)
  - **Mechanism:** Reentry with movement in the circuit  
Initiated by Abnormal Automaticity or Triggered activity
  - **Characteristics:** Wide and irregular QRS Complex that changes in axis

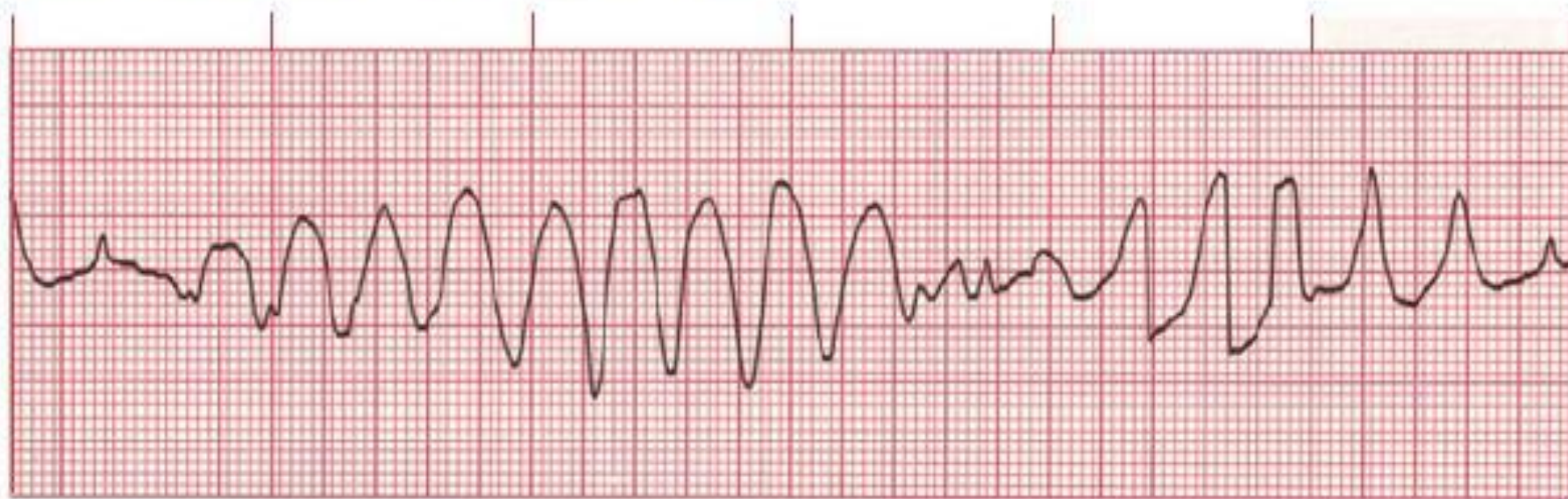
# Torsades de Pointes



- **Origin:** Ventricle
- **Mechanism:** Reentry (movement in focus)
- **Rate:** 200 – 250 BPM
- **Characteristics:** Associated with Long QT interval; QRS changes axis & morphology with alternating positive/negative complexes

## Torsade de Pointes

- The QRS reverses polarity and the strip shows a spindle effect.
- This rhythm is an unusual variant of polymorphic VT with long QT intervals.
- In French the term means "twisting of points."



**Rate:** 200–250 bpm

**Rhythm:** Irregular

**P Waves:** None

**PR Interval:** None

**QRS:** Wide ( $>0.10$  sec), bizarre appearance

♥ **Clinical Tip:** Torsade de pointes may deteriorate to VF or asystole.

♥ **Clinical Tip:** Frequent causes are drugs that prolong the QT interval, and electrolyte abnormalities such as hypomagnesemia.



# Ventricular Fibrillation



Coarse VF

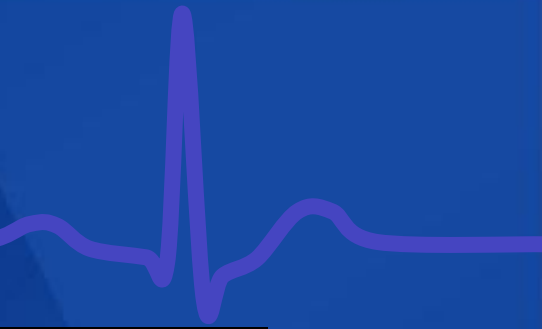


Fine VF

- Etiology: The ventricular cells are excitable and depolarizing randomly.
- Rapid drop in cardiac output and death occurs if not quickly reversed



# Ventricular Fibrillation (VF)



- **Origin:** Ventricle
- **Mechanism:** Multiple Wavelets of reentry
- **Characteristics:** Irregular with no discrete QRS

## Ventricular Fibrillation (VF)

- Chaotic electrical activity occurs with no ventricular depolarization or contraction.
- The amplitude and frequency of the fibrillatory activity can define the type of fibrillation as coarse, medium, or fine. Small baseline undulations are considered fine; large ones are coarse.



**Rate:** Indeterminate

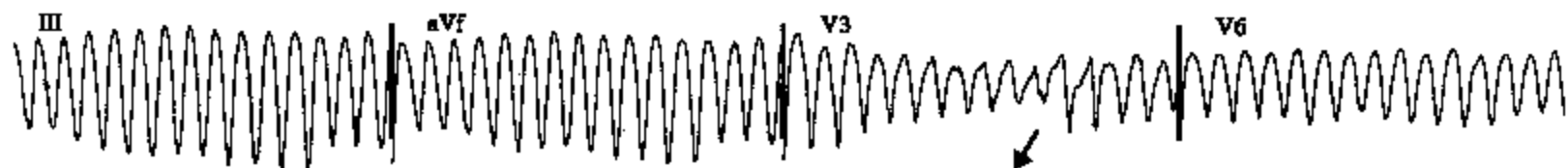
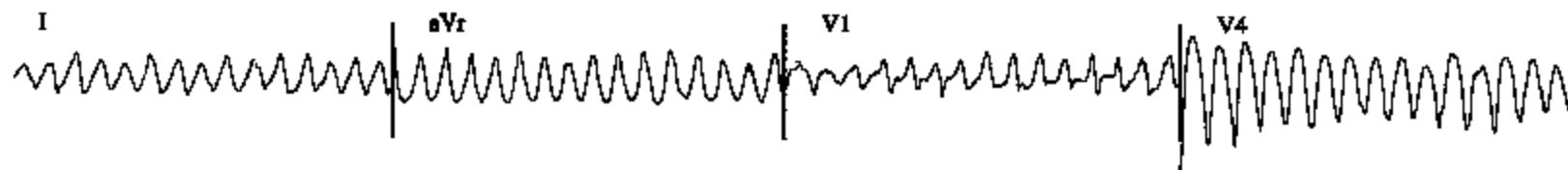
**Rhythm:** Chaotic

**P Waves:** None

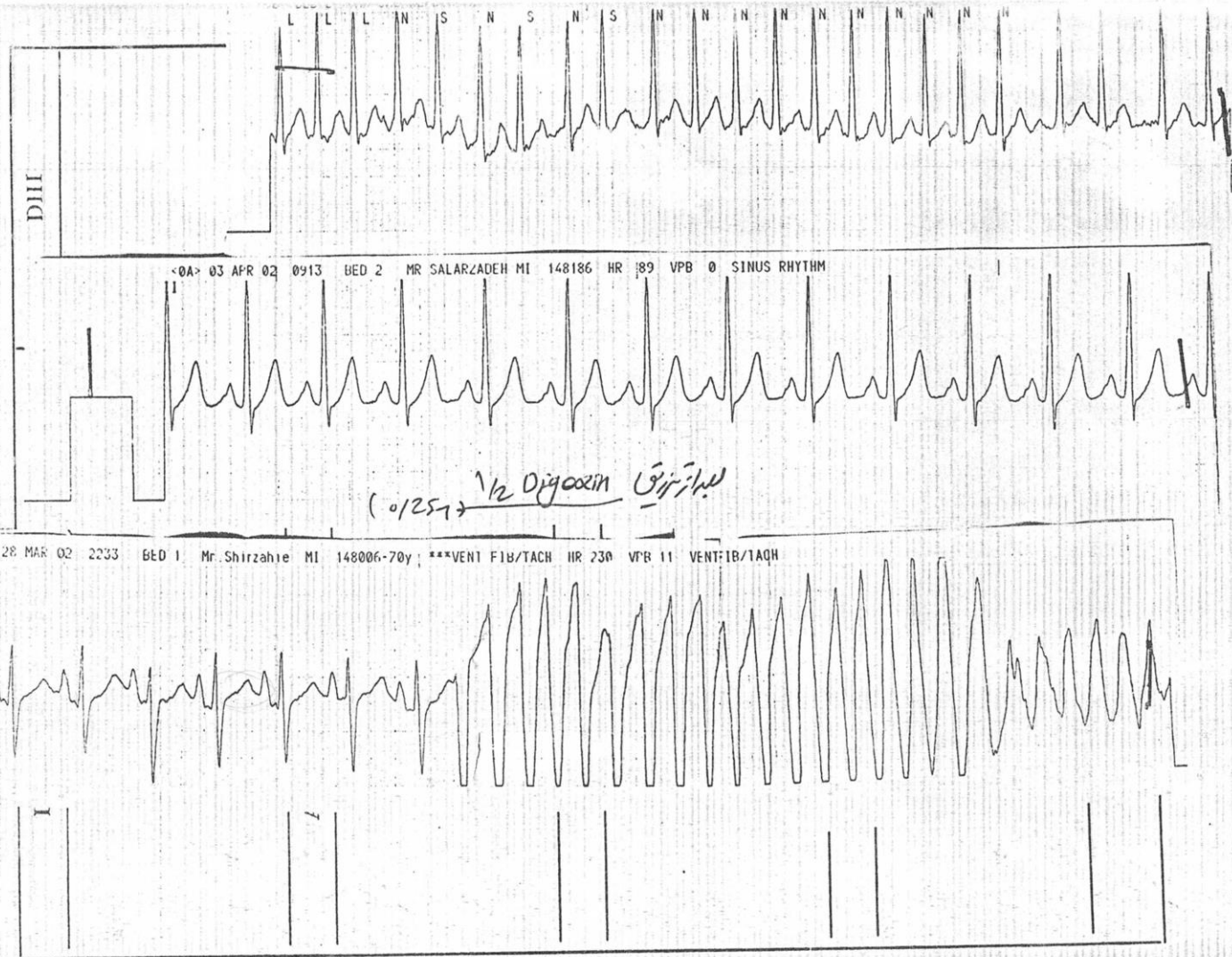
**PR Interval:** None

**QRS:** None

♥ **Clinical Tip:** There is no pulse or cardiac output. Rapid intervention is critical. The longer the delay, the less the chance of conversion.

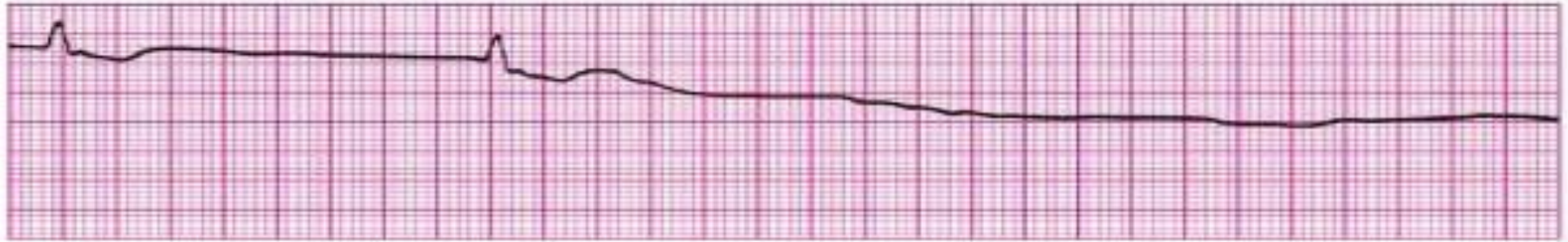


وزارت بهداشت درمان و آموزش پزشکی





# Asystole Rhythm # 14



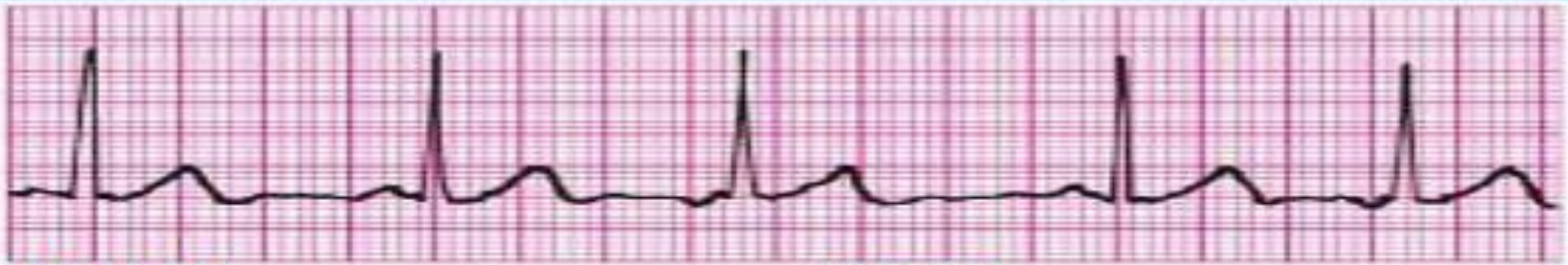
- **Rate:** no ventricular activity seen or  $\leq 6/\text{min}$ ; so-called “P-wave asystole” occurs with only atrial impulses present to form P waves
- **Rhythm:** no ventricular activity seen; or  $\leq 6/\text{min}$
- **PR:** cannot be determined; occasionally P wave seen, but by definition R wave must be absent
- **QRS complex:** no deflections seen that are consistent with a QRS complex

**Asystole:** agonal complexes too slow to make this rhythm



اقدام شما در اسیستول ماساژ قلبی است.  
شوگ الکتریکی اندیکاسیون ندارد

# Pulseless electrical activity Rhythm #13



• Rate?	none
• Regularity?	Regular
• P waves?	present
• PR interval?	Normal
• QRS duration?	0.10
Interpretation?	<i>PEA</i>

*Any organized rhythm without detectable pulse is "PEA"*

Cardiac conduction impulses occur in organized pattern, but this fails to produce myocardial contraction

# Electronic Pacemaker Spikes



Artificially induces electronic stimulus that paces the patient's rhythm causing a blip or spike on the ECG waveform

# Failure to Capture

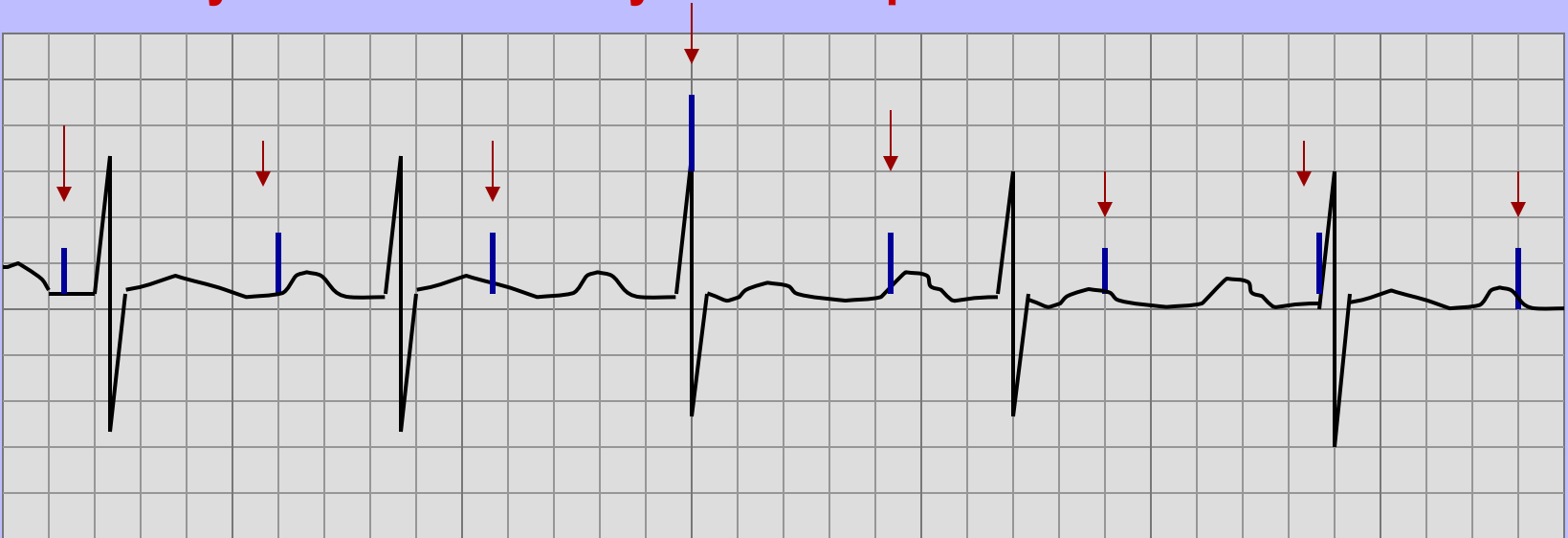
- Pacer spike is fired, but no beat follows



**You can have QRS's without pacer spikes, but you cannot have pacer spikes without a QRS following it!**

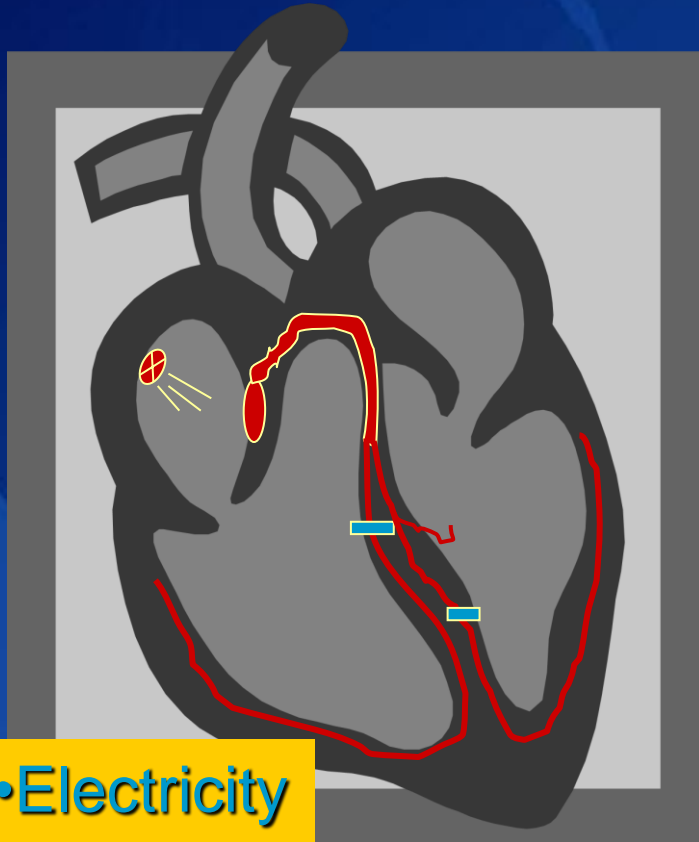
# Failure to Sense

- Heart is beating just fine, but pacemaker fires anyway. The pacemaker should sense what the heart is doing on its own so it doesn't send out an electrical stimulus at a time when the heart is more vulnerable
- Spikes are not in a consistent place before P or QRS  
--they are seen in many different places





# Heart Blocks



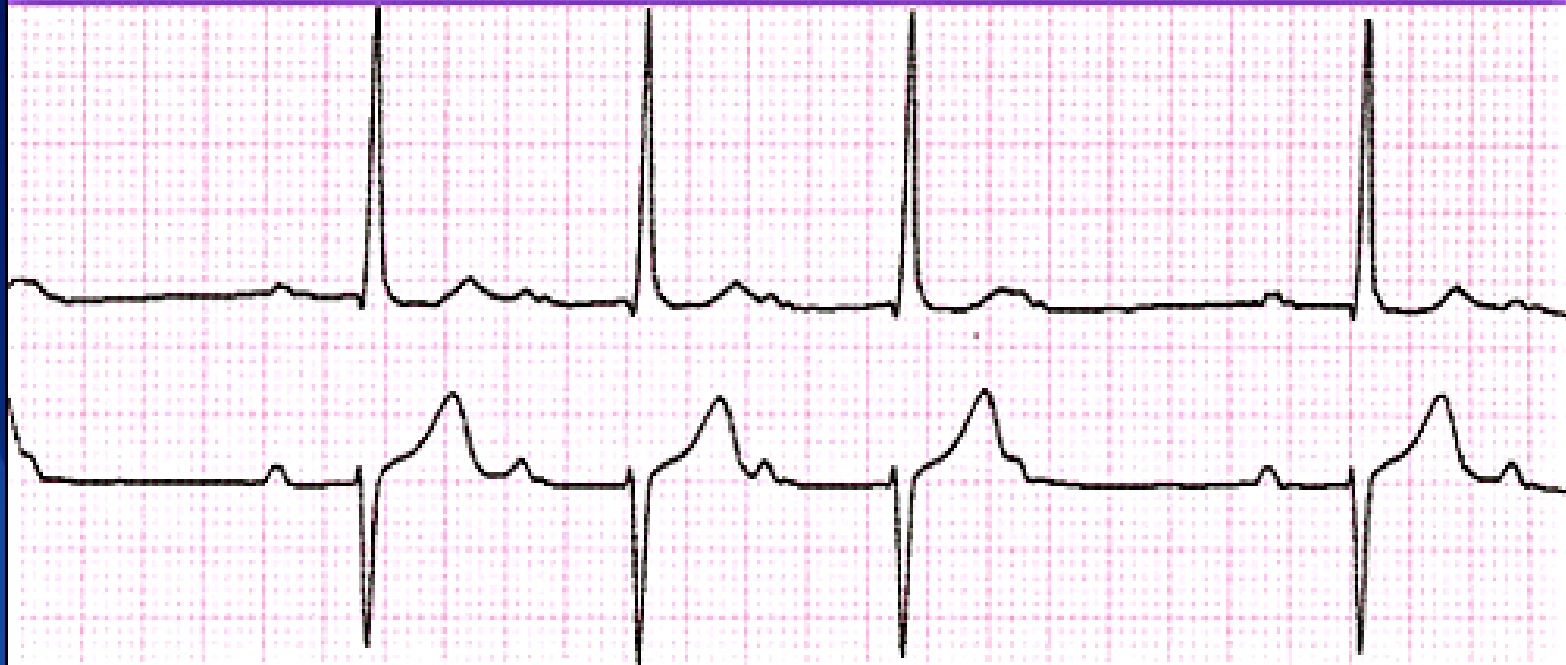
•Electricity  
!



## 2nd degree - Mobitz I (Wenckebach)

PR increases gradually until a QRS is blocked

### Second Degree AV Block • Mobitz 1 (Wenckebach)



P Wave	PR Interval (in seconds)	QRS (in seconds)	Characteristics
Conduction intermittant	Increasingly Prolonged	$< .12$	QRS dropped in a repeating pattern

## 2nd degree - Mobitz II

PR interval consistent except some QRS missing

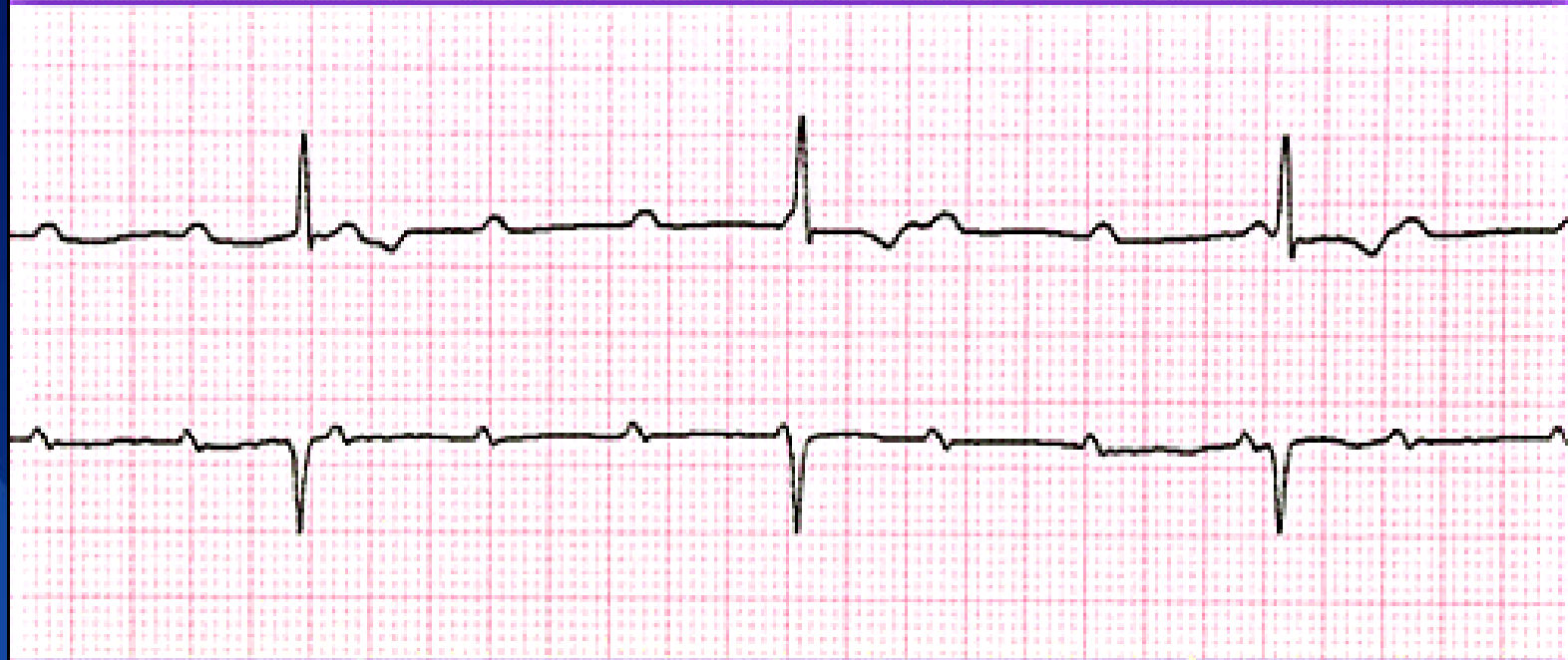


- Note: Ratio can be 3:1, 4:1, etc. The higher the ratio, the “sicker” the heart. (Ratio is P:QRS)

# 3rd degree AV Block

Atria & ventricles act independently

## Third Degree (complete) AV Block



P Wave	PR Interval (in seconds)	QRS (in seconds)	Characteristics
Normal but not related to QRS	None	N/A	No relationship between P&RS

# Heart Block Review

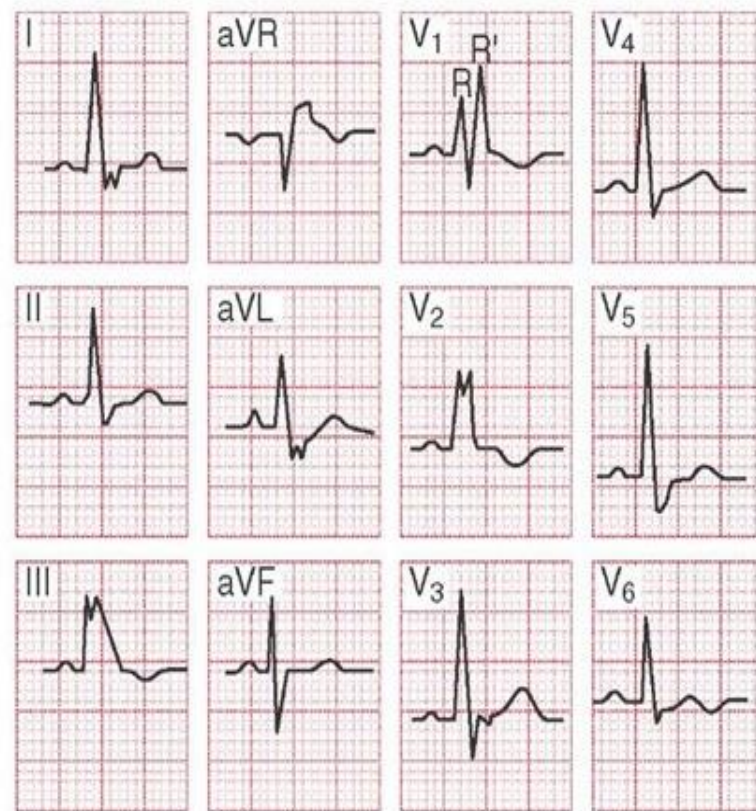
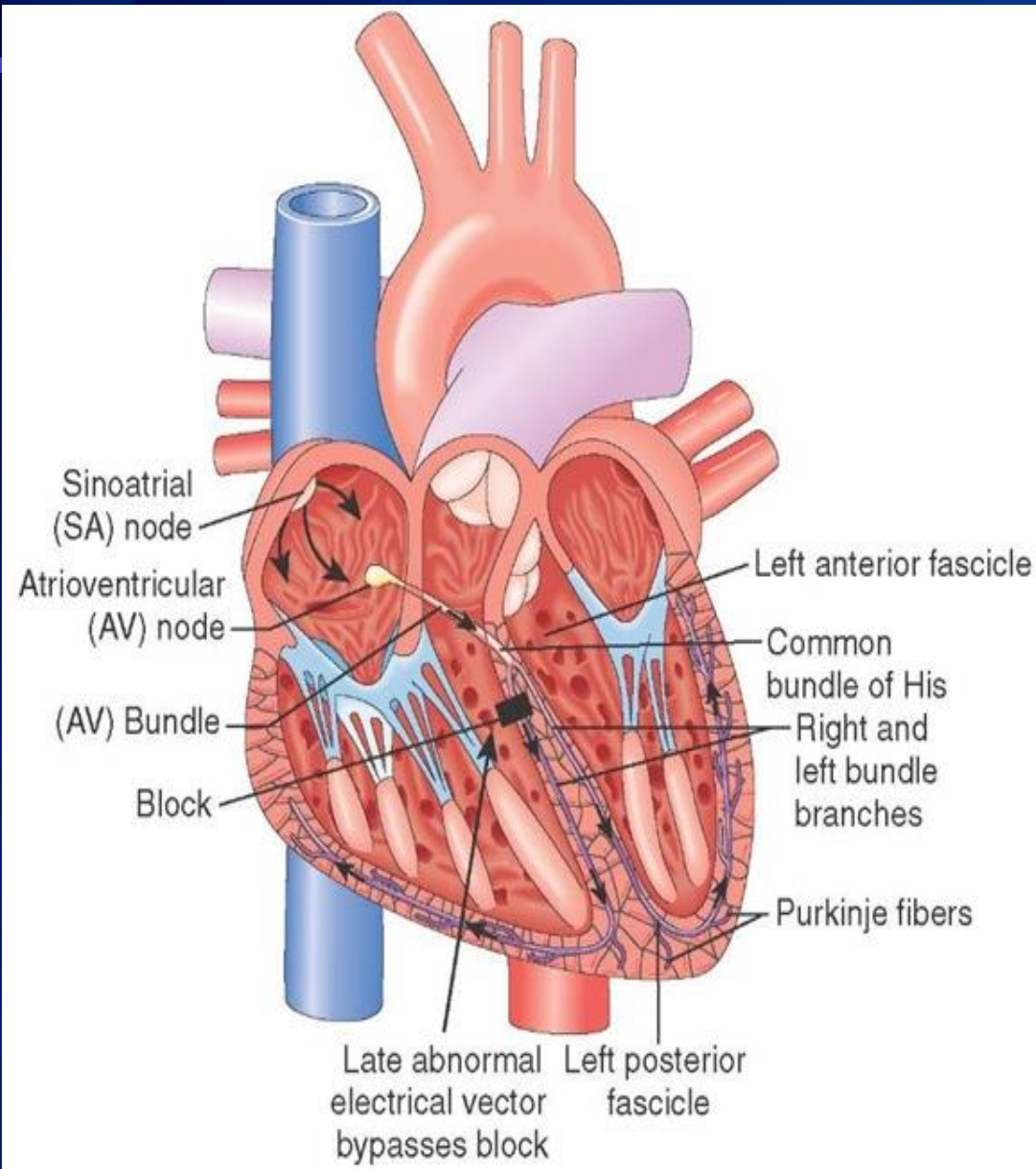


	Other Name	PR Interval	Characteristic
1 <sup>st</sup> ° AV Block		Same	PR Interval > .20
2 <sup>nd</sup> ° AV Block	Wenkebach or Mobitz I	Different	PR Interval gets longer until 1 is dropped
2 <sup>nd</sup> ° AV Block	Mobitz II	Same	PR Interval is the same when you can measure it, some p waves do not have a QRS after it so you can't measure a PR Interval for all
3 <sup>rd</sup> ° AV Block		Different	PR Interval varies but not in any pattern, P waves and QRS waves are not in any relationship to each other

• Bundle Branch Block = QRS is



# Right Bundle Branch Block

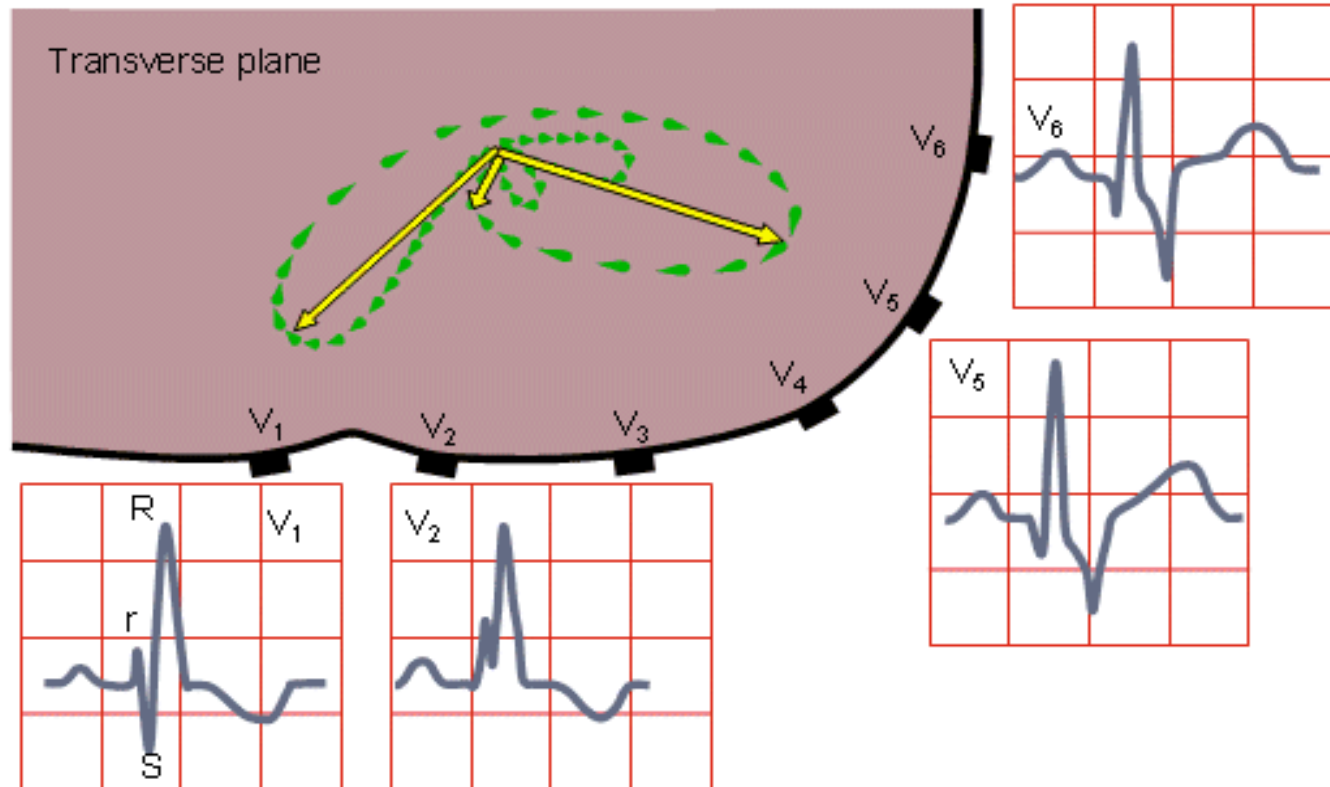
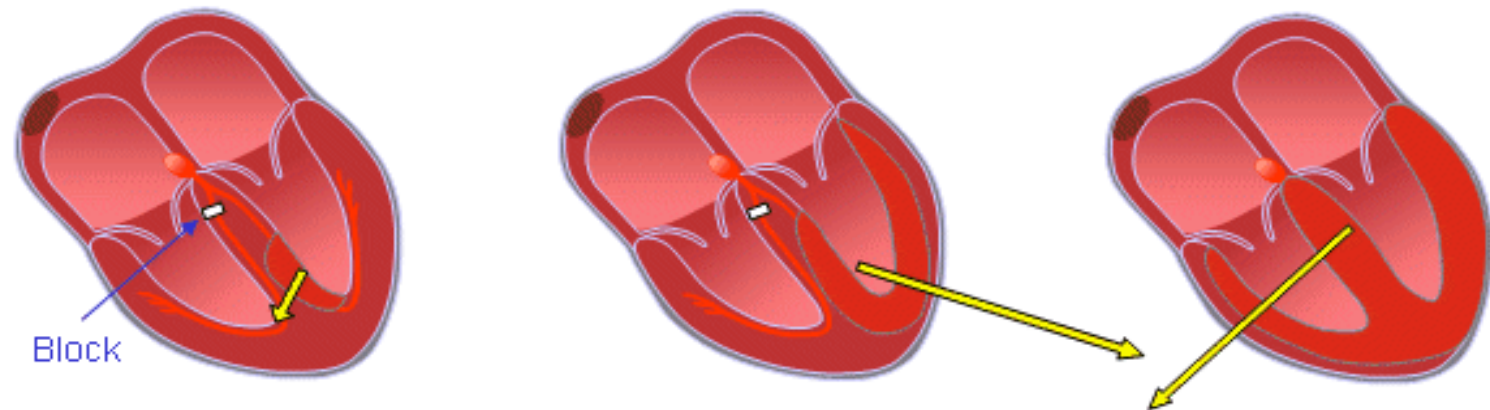


Total QRS complex prolonged ( $\geq 0.12$  second).  
Terminal broad S wave in lead I. RSR' complex in lead V<sub>1</sub>

# RIGHT BUNDLE-BRANCH BLOCK

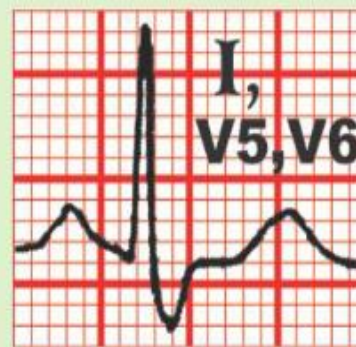
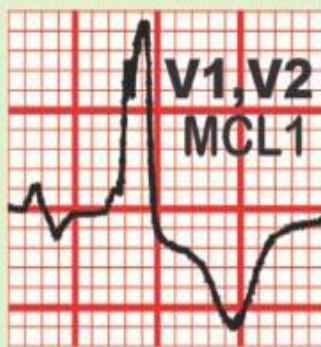
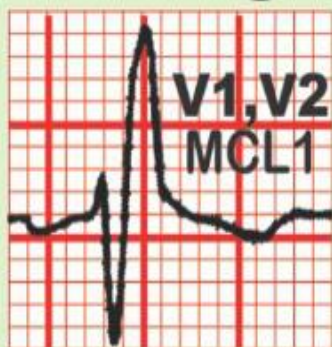
QRS duration greater than 0.12 s

Wide S wave in leads I, V5, and V6



# بلوک شاخه ای راست RBBB

## Right Bundle Branch Block



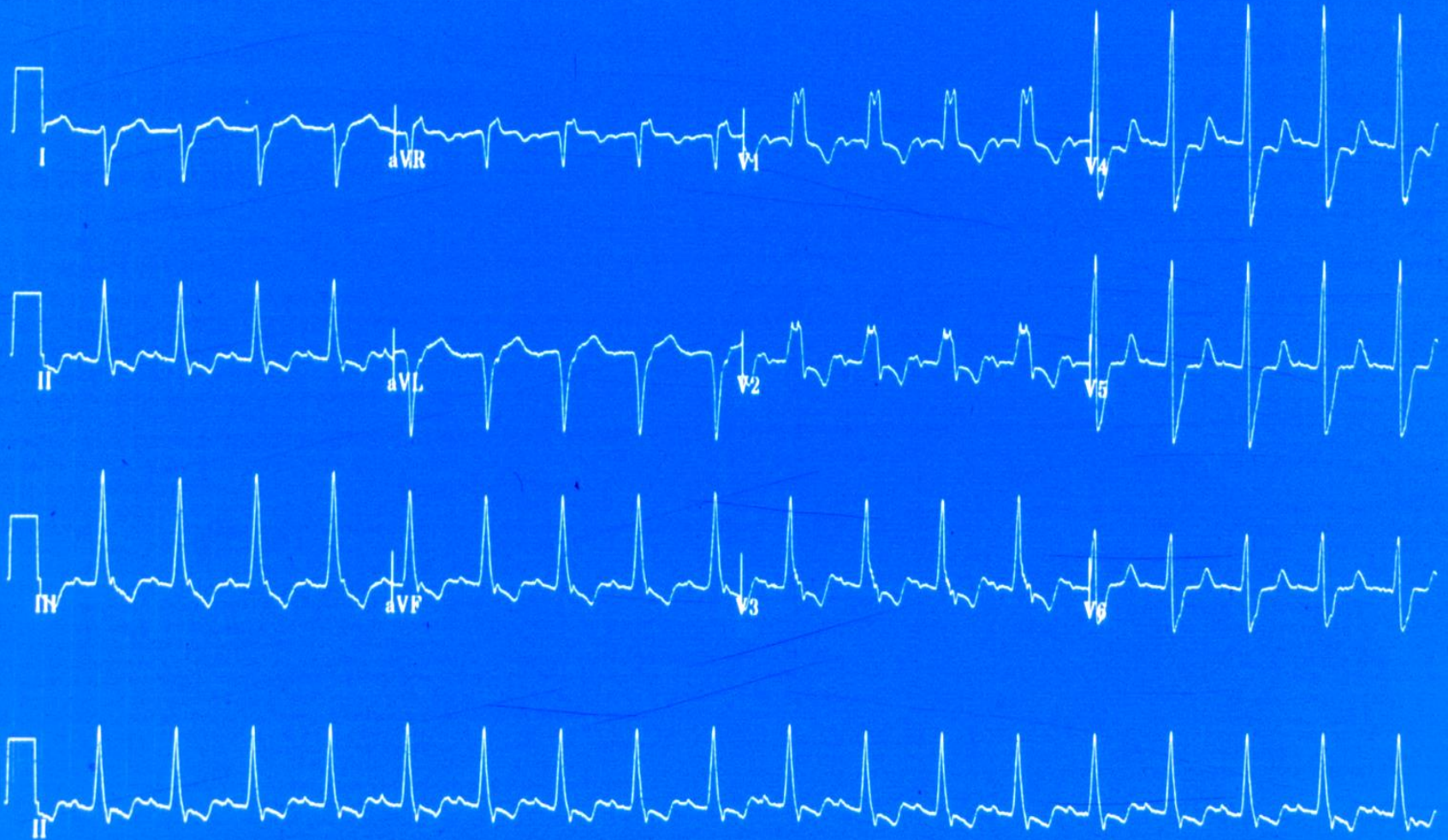
R دندانه دار در لیدهای V1 و V2 و موج S بزرگ در لیدهای V5 و V6  
**نکته مهم:** سندرم بروگادا و دیسپلازی آریتمی زای بطن راست یک نوع خاص  
RBBB هستند که می توانند باعث مرگ ناگهانی قلبی در افراد جوان گردند.



# RBBB with Anteroseptal Ischemia

Referred by:

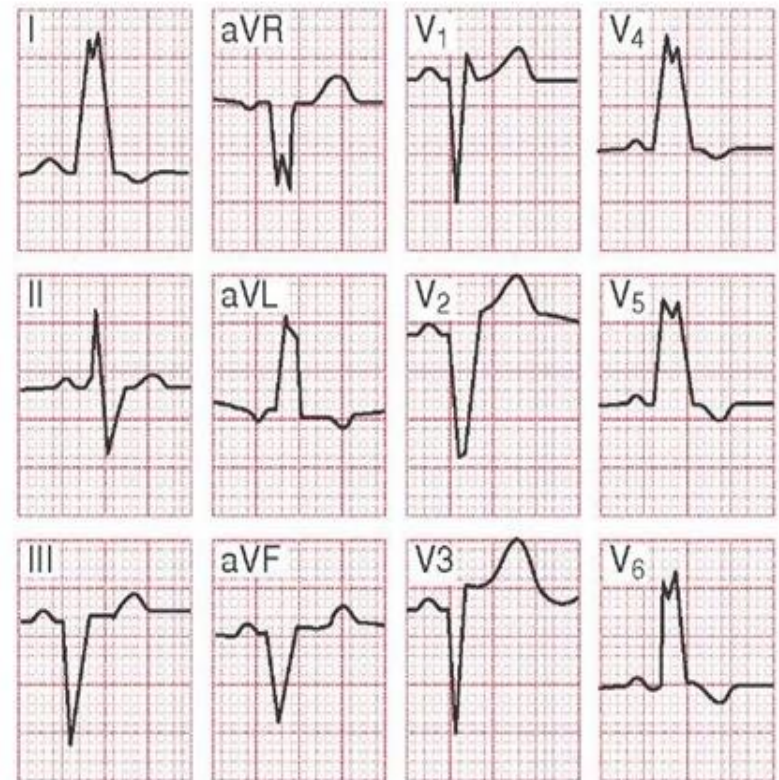
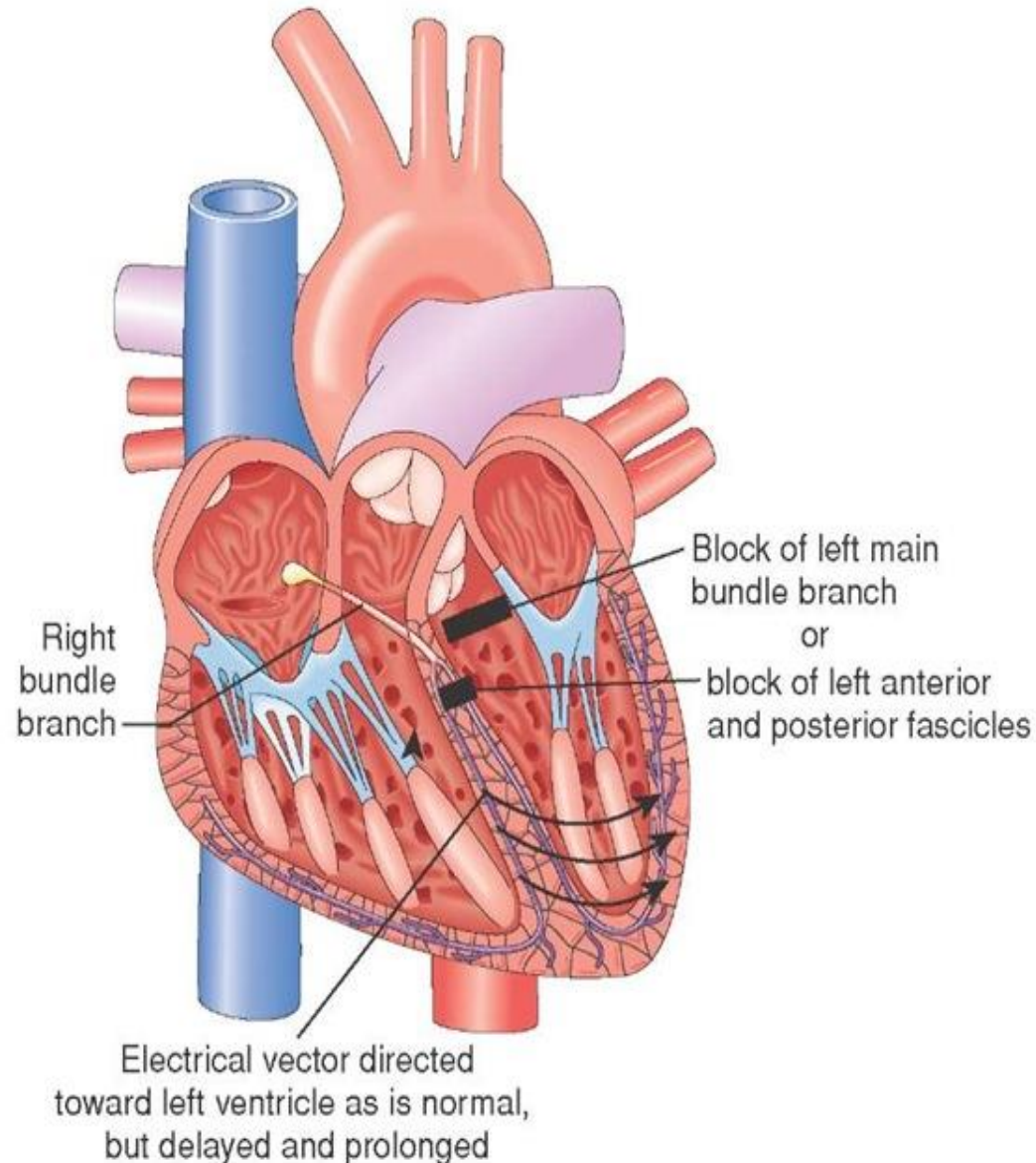
Unconfirmed







# Left Bundle Branch Block

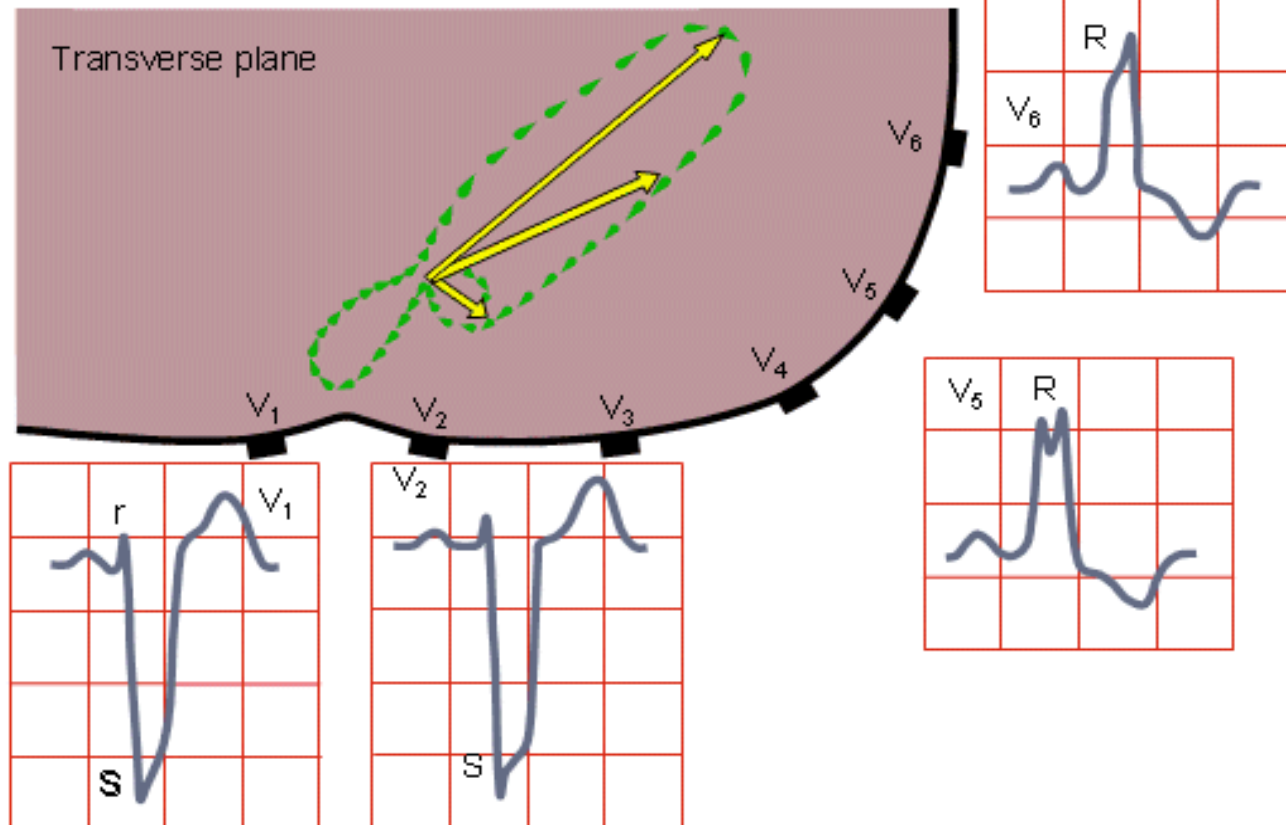
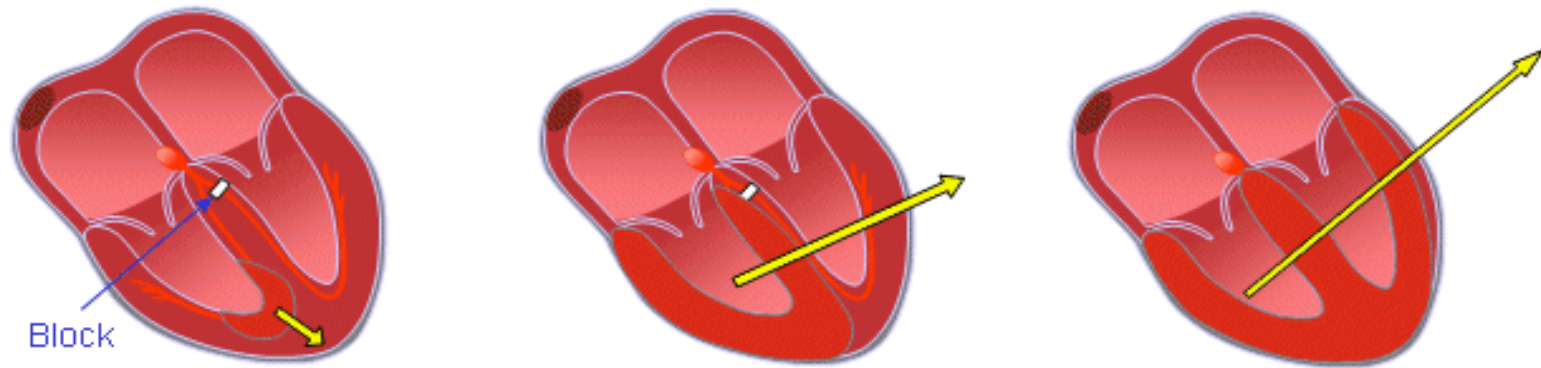


Wide QRS complex prolonged ( $\geq 0.12$  second).  
with ST depressions and inverted T waves,  
particularly in leads I, aVL, V<sub>5</sub> and V<sub>6</sub>

# LEFT BUNDLE-BRANCH BLOCK

QRS duration greater than 0.12 s

Wide S wave in leads V1 and V2, wide R wave in V5 and V6

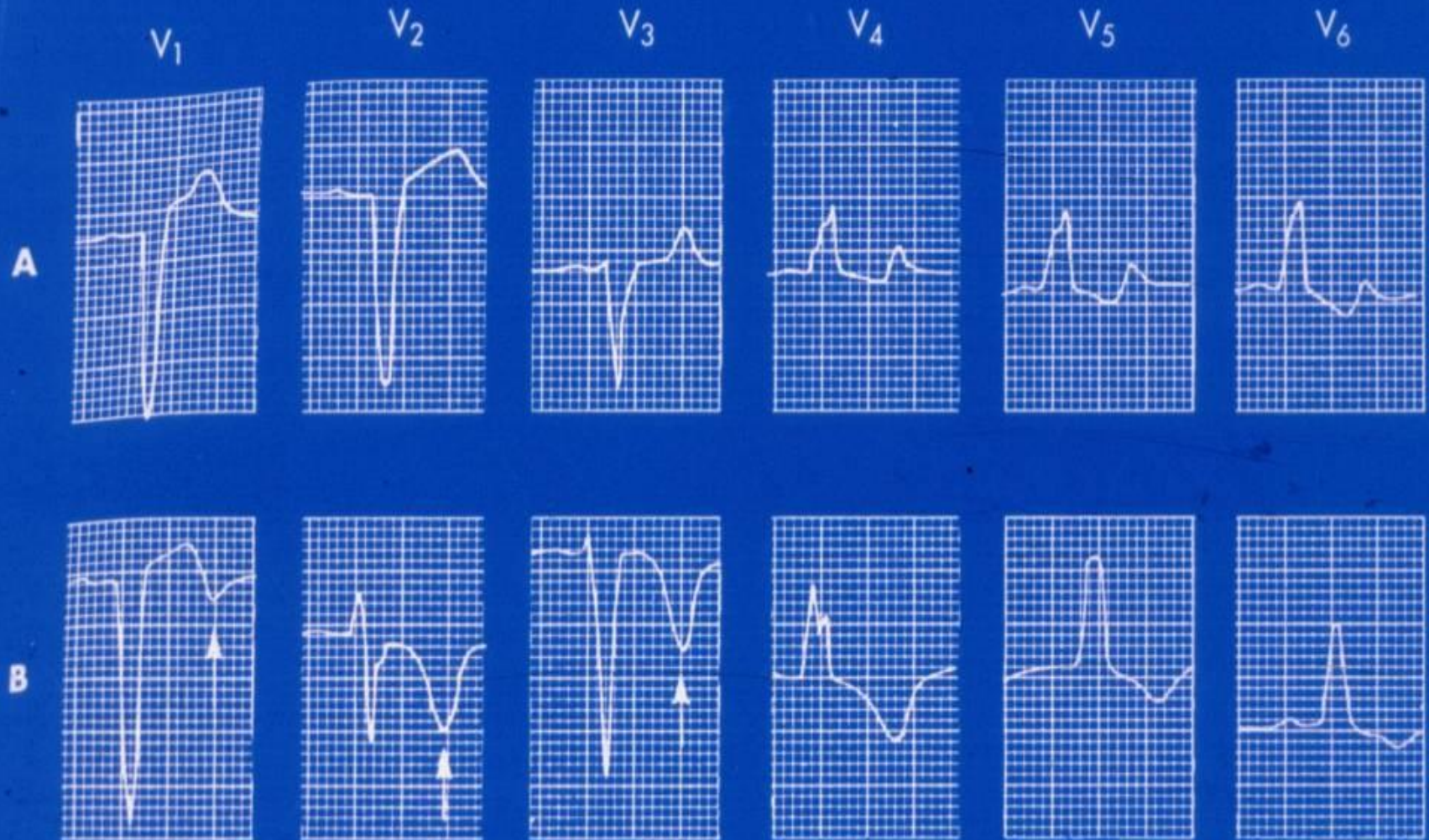


# LBBB with Lateral Infarction



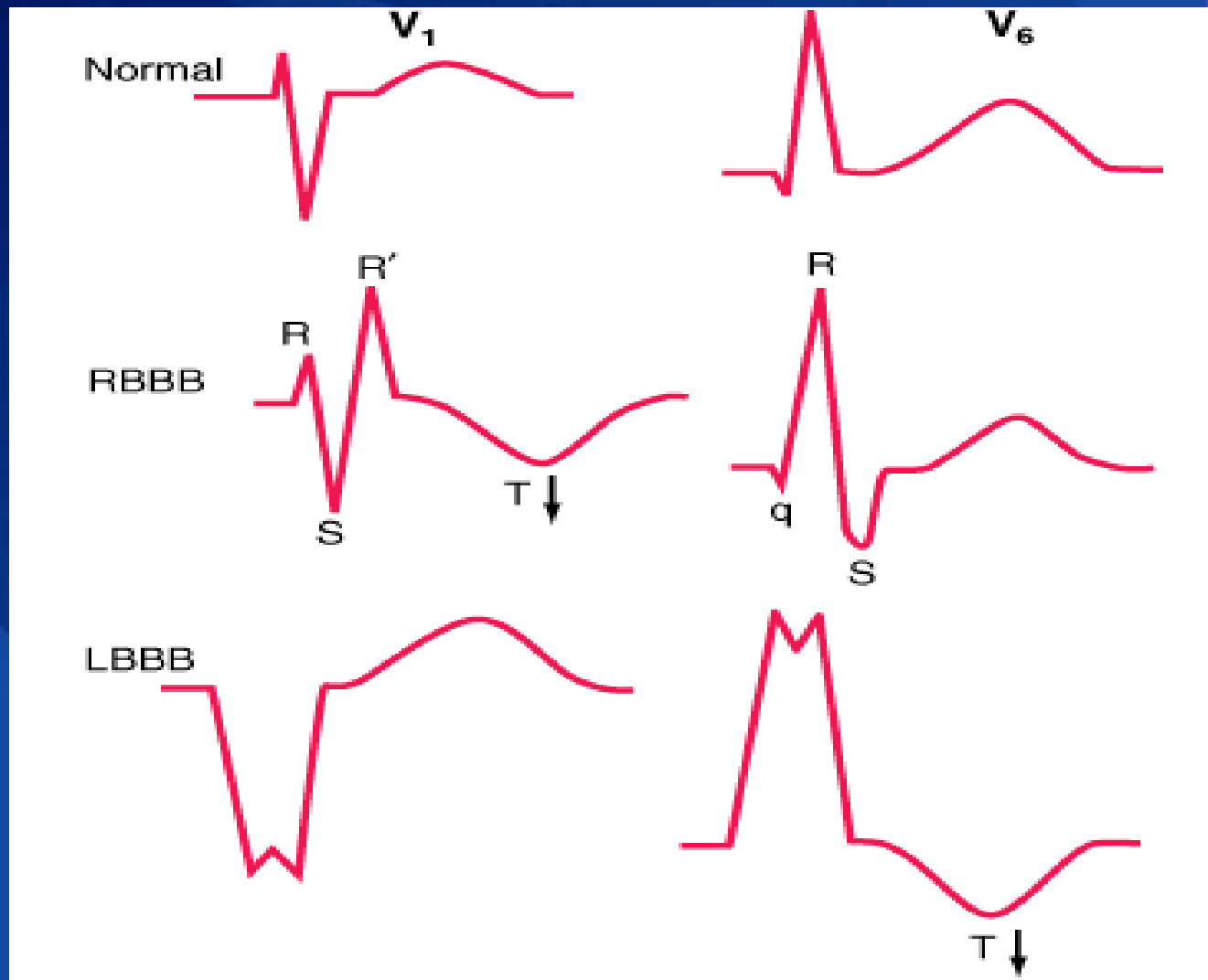


# Left Bundle Branch Block with Anteroseptal Ischemia



**Fig. 8 21 A** Typical left bundle branch block pattern. Notice the poor R wave progression in the right precordial leads

# Typical QRS-T patterns in RBBB vs. LBBB





# ***Hemi-Blocks:***



***LAHB:***

***Left Axis Deviation + S in II & III & AVF***



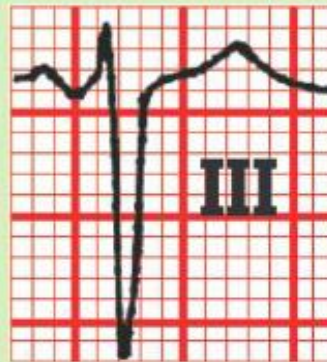
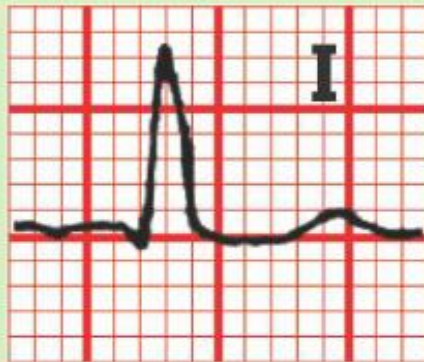
***LPHB***

***Right Axis Deviation + S in I & AVL***

# Left anterior fascicular block

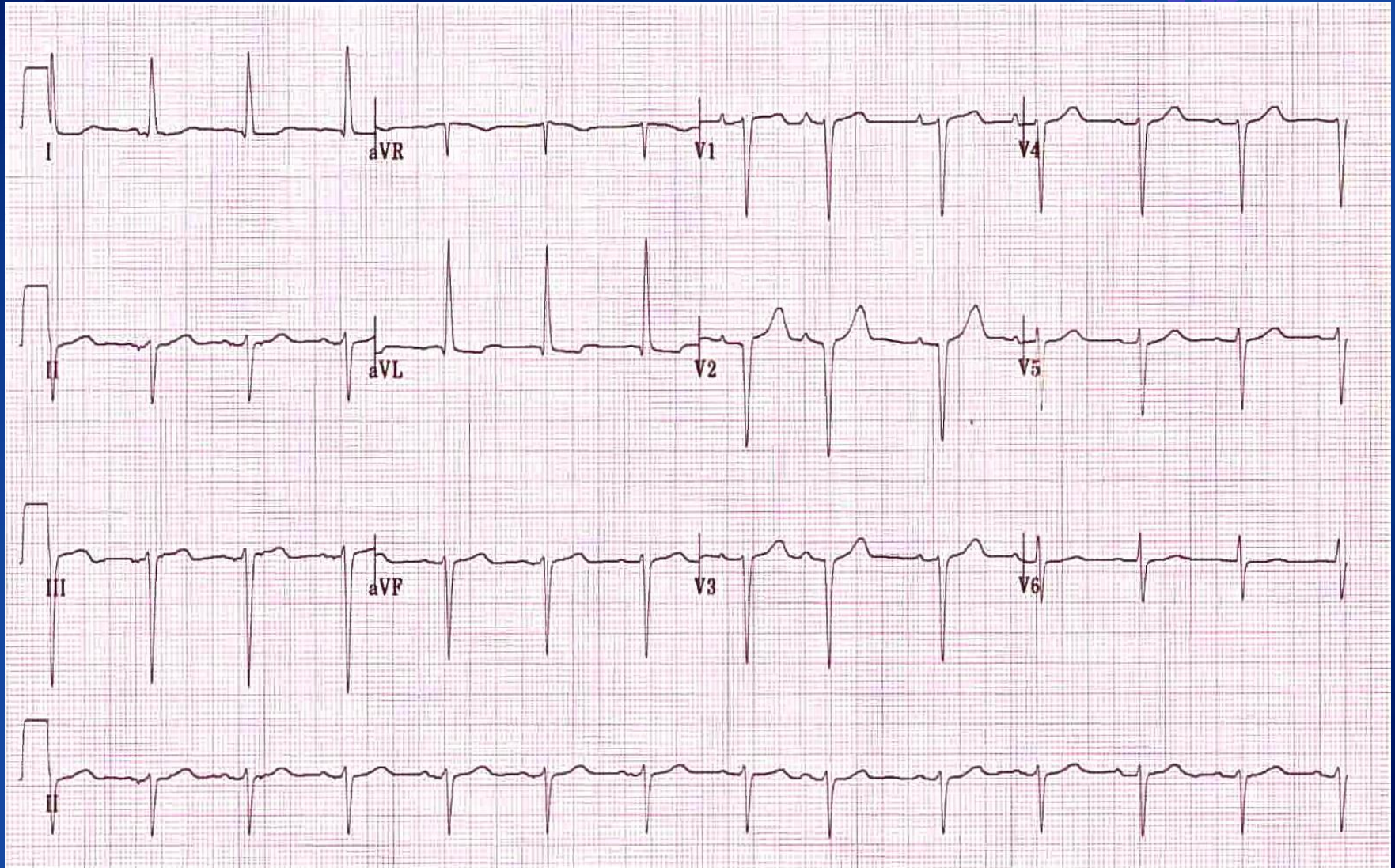
## همی بلوک قدامی چپ LAHB

### Left Anterior Hemi Block



محور قلب به صورت پاتولوژیک بیشتر از  $30^\circ$  - درجه به سمت چپ منحرف می شود. ضمناً بدون وجود انفارکتوس تحتانی Q کوچک در لید I و S بزرگ در لید III مشاهده می شود.

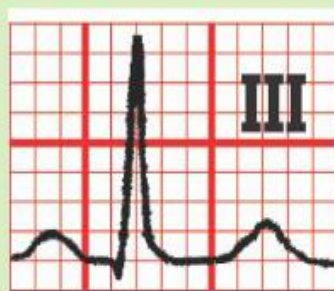




# Left Posterior Fascicular Block

## همی بلوک خلفی چپ LPHB

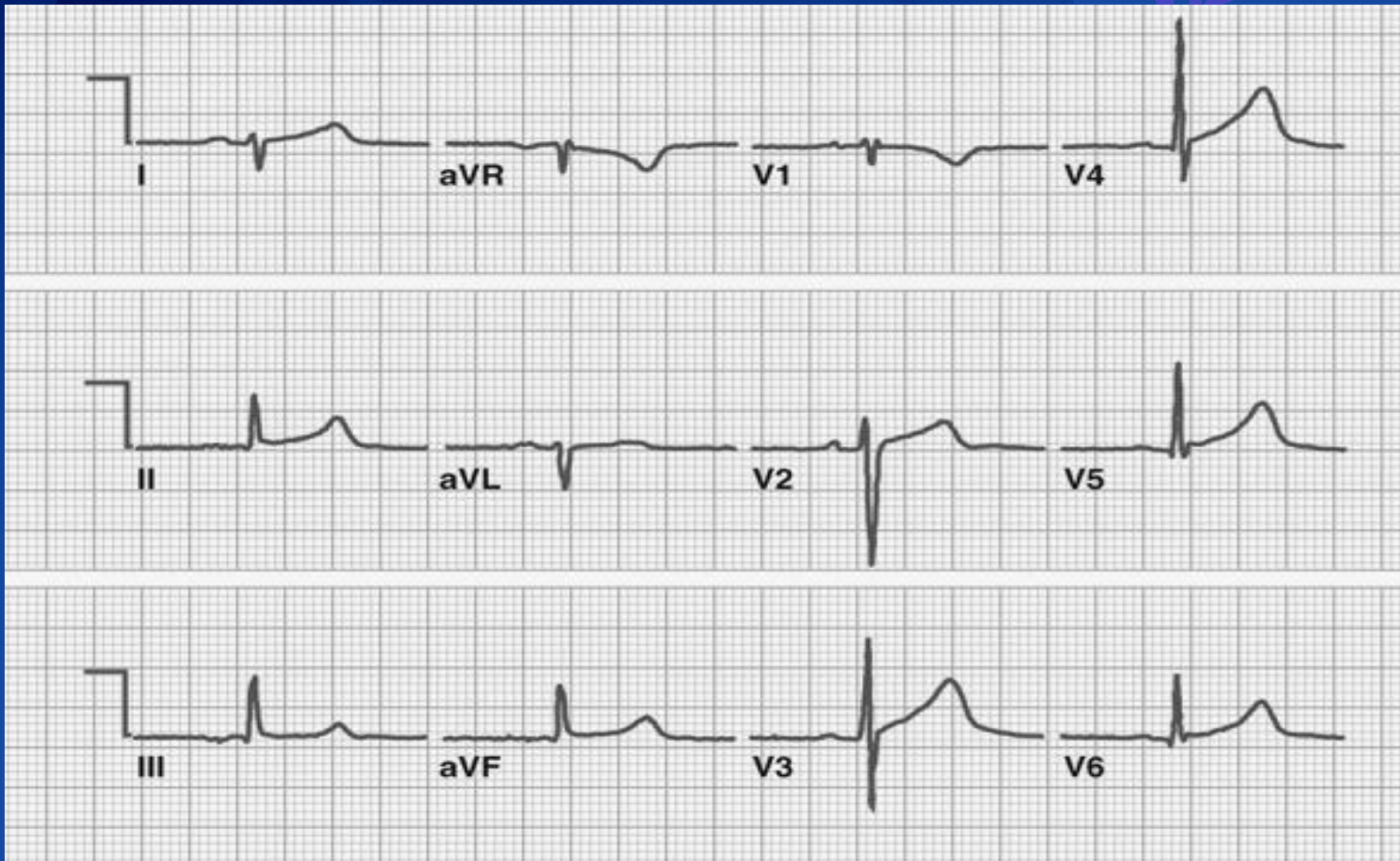
### Left Posterior Hemi Block



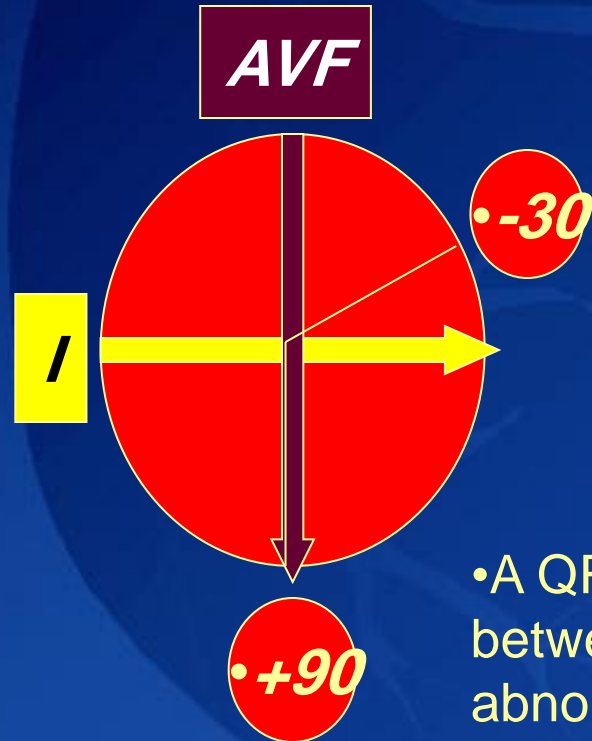
محور قلب به سمت راست منحرف شده و برابر و یا بیش از  $90^{\circ} +$  درجه می باشد.  
ضمناً بدون وجود هایپرتروفی بطن راست S بزرگ در لید I و Q کوچک  
در لید III مشاهده می گردد.



# Left Posterior Fascicular Block



# Axis:



- A QRS axis that falls between  $-30^{\circ}$  and  $-90^{\circ}$  is abnormal and called left axis deviation.

- A QRS axis that falls between  $+90^{\circ}$  and  $+150^{\circ}$  is abnormal and called right axis deviation.



- A QRS axis that falls between  $+150^{\circ}$  and  $-90^{\circ}$  is abnormal and called superior right axis deviation.

# محور الکتریکی قلب AXIS

برای تعیین جهت محور قلب دو بردار به اندازه بلندی کمپلکس لیدهای متقاطع I (افقی) و AVF (عمودی) در نظر گرفته و برابند آنها را بدست می آوریم . زاویه ای که برابند دو بردار با افق می سازد مبنای تعیین محور قلب می باشد.

## دلایل LAD :

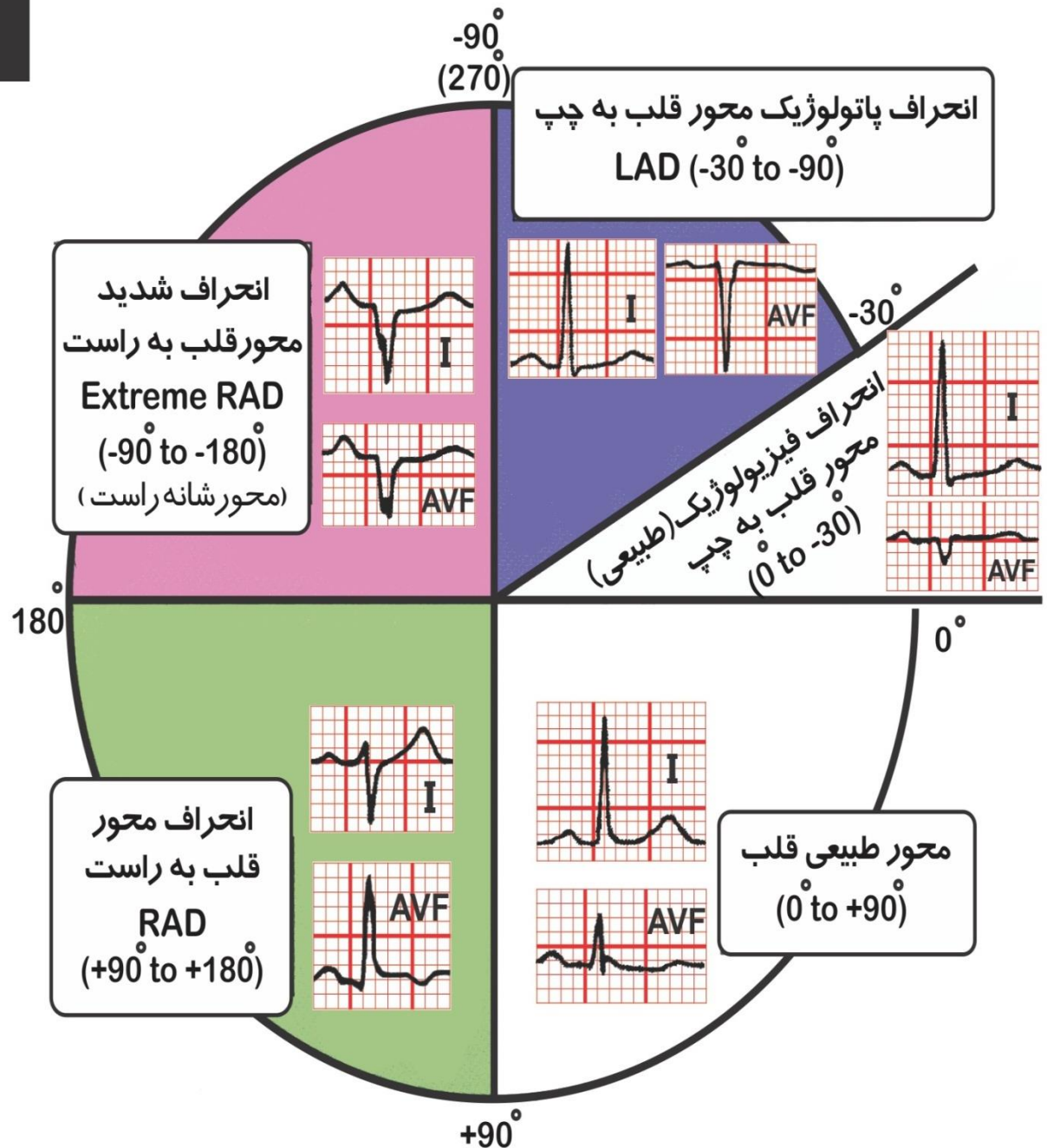
قرار گرفتن قلب در وضعیت افقی ، بیمار چاق ، بارداری ، آسیت ، بلوک شاخه ای چپ ، هایپر تروفی بطن چپ ، همی بلوک قدامی چپ ، انفارکتوس میوکارد تحتانی

## دلایل RAD :

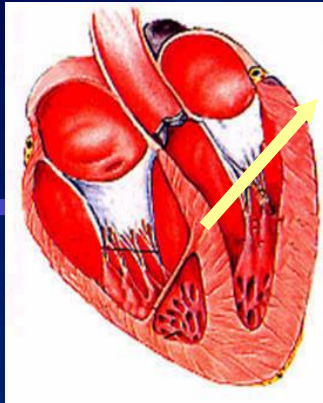
قامت بلند و باریک ، بیماری ریوی ، بلوک شاخه ای راست ، هایپر تروفی بطن راست ، همی بلوک خلفی چپ

## دلایل Extreme RAD :

انفارکتوس میوکارد ، ریتم اکتوپیک نظیر VT

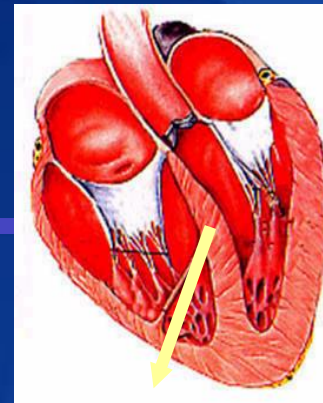






- Causes of left axis deviation include:

- Left ventricular hypertrophy
- Inferior wall MI
- Left bundle branch block
- Left anterior fascicular block
- Horizontal heart

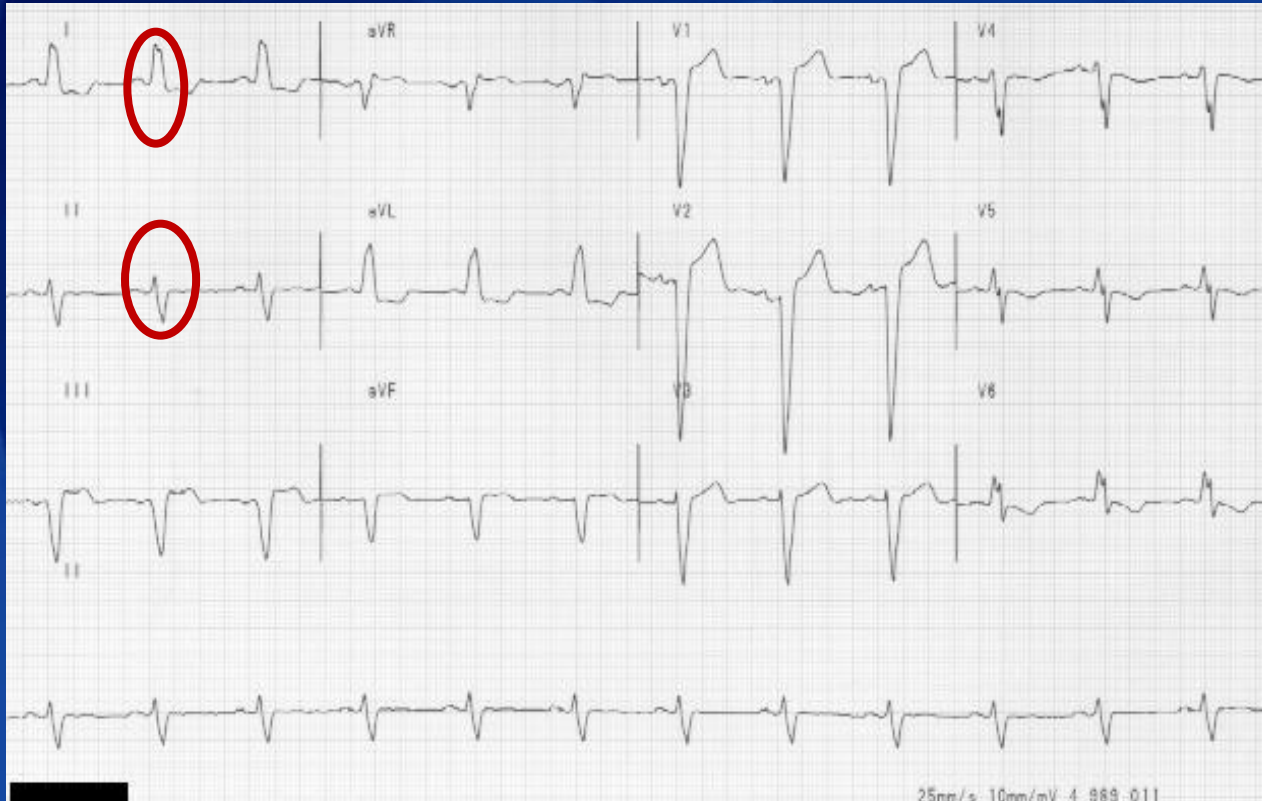


- Causes of right axis deviation include:

- Right ventricular hypertrophy
- Lateral wall MI
- Right bundle branch block
- Pulmonary hypertension
- Vertical heart



# Is the QRS axis normal in this ECG?



*The QRS is positive in I and negative in II.*

***No, there is left axis deviation.***

The background of the slide features a faint, stylized illustration of a human heart in a light blue color, set against a dark blue gradient. A horizontal purple line spans the width of the slide, with a white ECG (heart rate) line superimposed on it, starting from the right side and extending towards the left.

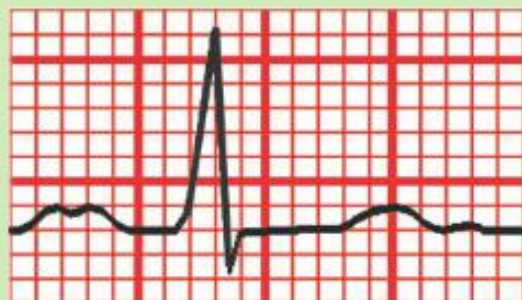
# **Cardiac Enlargement and Hypertrophy**

# بزرگی دهلیزها

بزرگی دهلیز چپ

LAE

Left Atrial Enlargement



موج P بای فازیک همراه

با قسمت دوم بزرگتر در

لید V1

بزرگی دهلیز راست

RAE

Right Atrial Enlargement



موج P نوک تیز

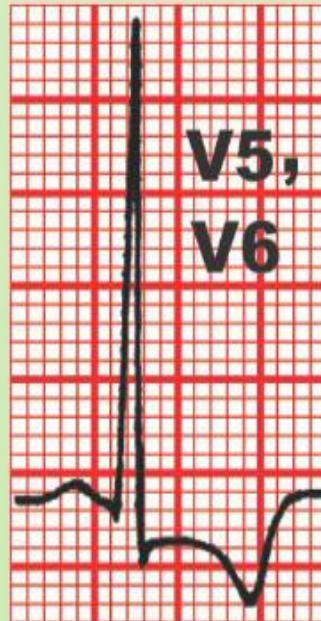
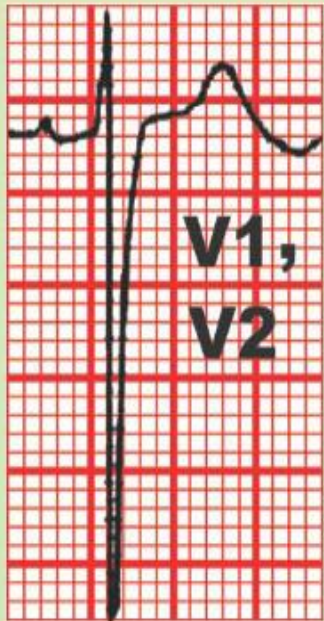
معمولاً در لیدهای

II ، III و AVF

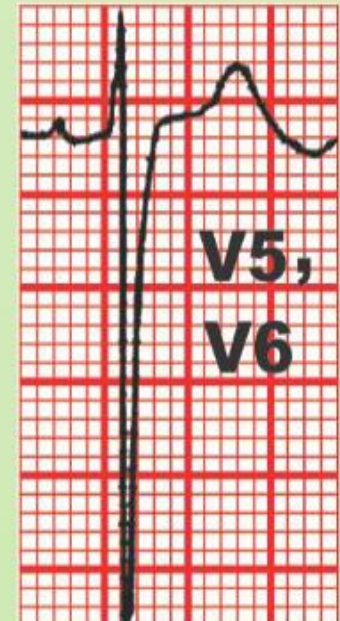
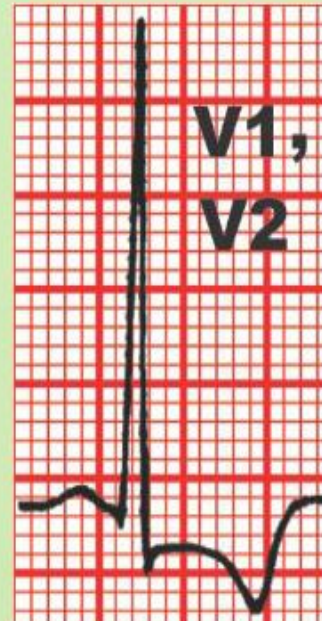


# هایپرتروفی بطن ها

هایپرتروفی بطن چپ LVH  
Left Ventricular Hypertrophy



هایپرتروفی بطن راست RVH  
Right Ventricular Hypertrophy



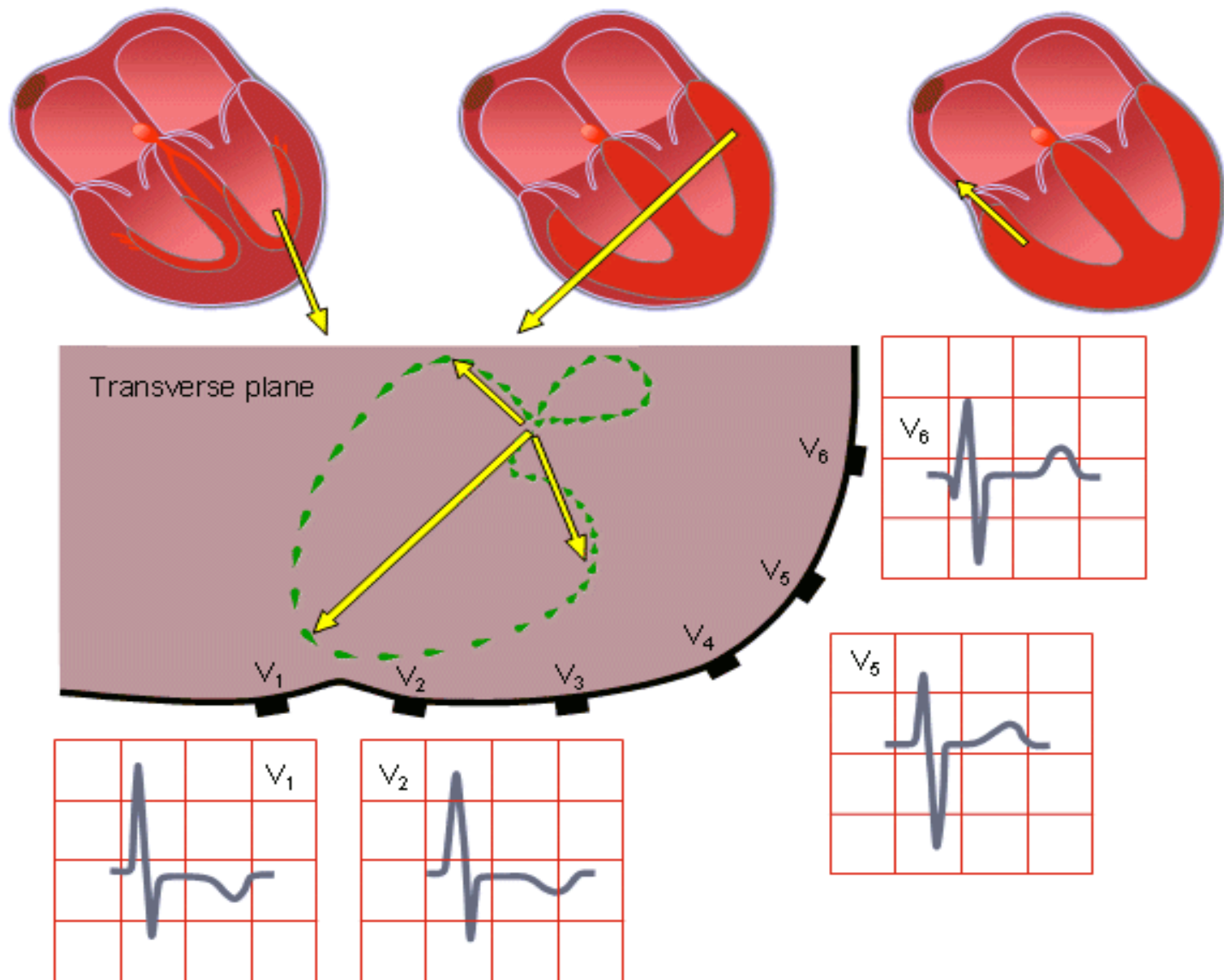
موج های R و S با اندازه برابر یا بیشتر از ۲۵ میلیمتر در لیدهای  
نشان داده شده (طبق شکل) با انحراف محور همسو مشاهده می گردد.



# RIGHT VENTRICULAR HYPERTROPHY

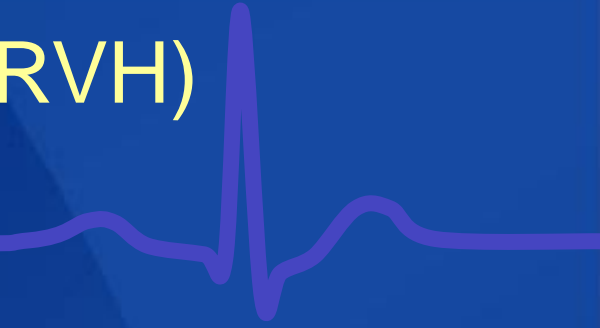
Large R wave in leads V1 and V2,

Wide S wave in leads V1 and V2, wide R wave in V5 and V6



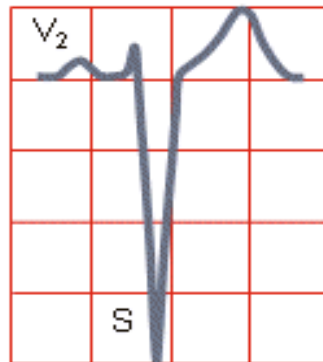
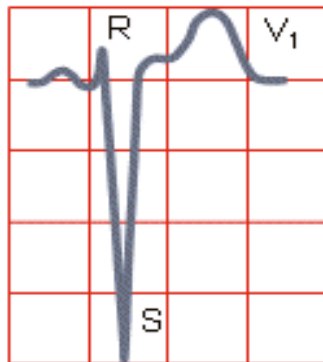
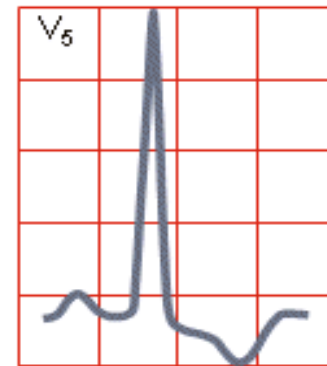
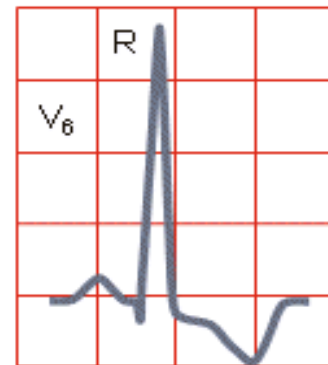
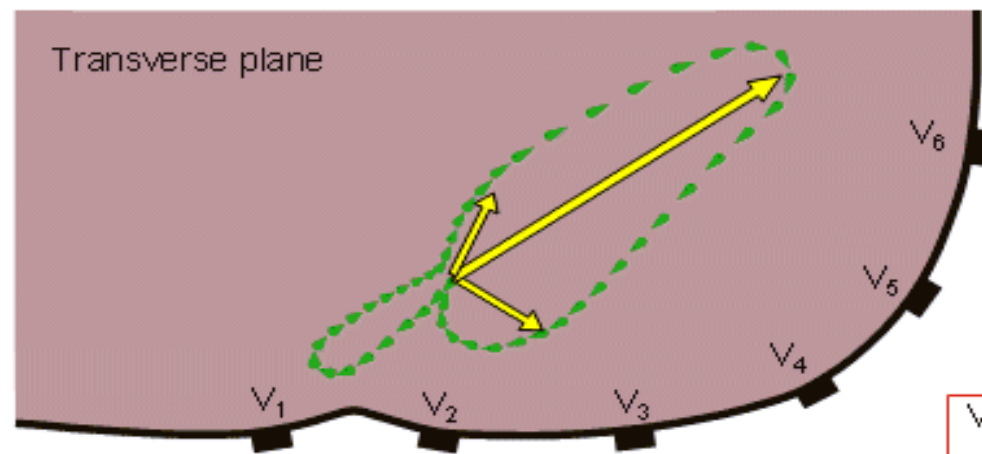
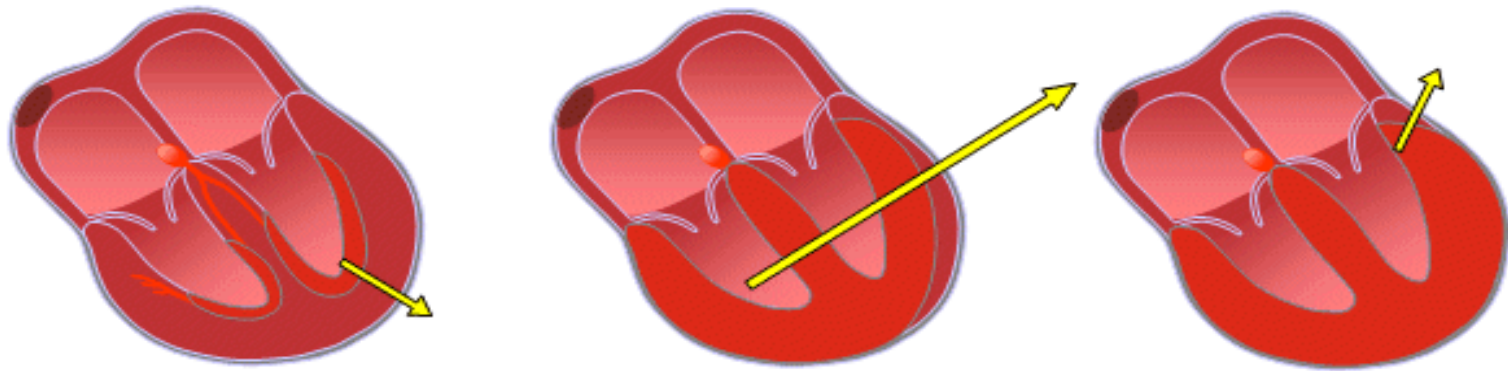
- Right ventricular hypertrophy (RVH) is characterized by:

- A relatively tall R wave in lead V1 ( $R \geq S$  wave), usually with right axis deviation;
- Alternatively, there may be a qR pattern in V1 or V3R.
- ST depression and T-wave inversion in the right to midprecordial leads are also often present (right ventricular strain).
- Prominent S waves may occur in the left lateral precordial leads.



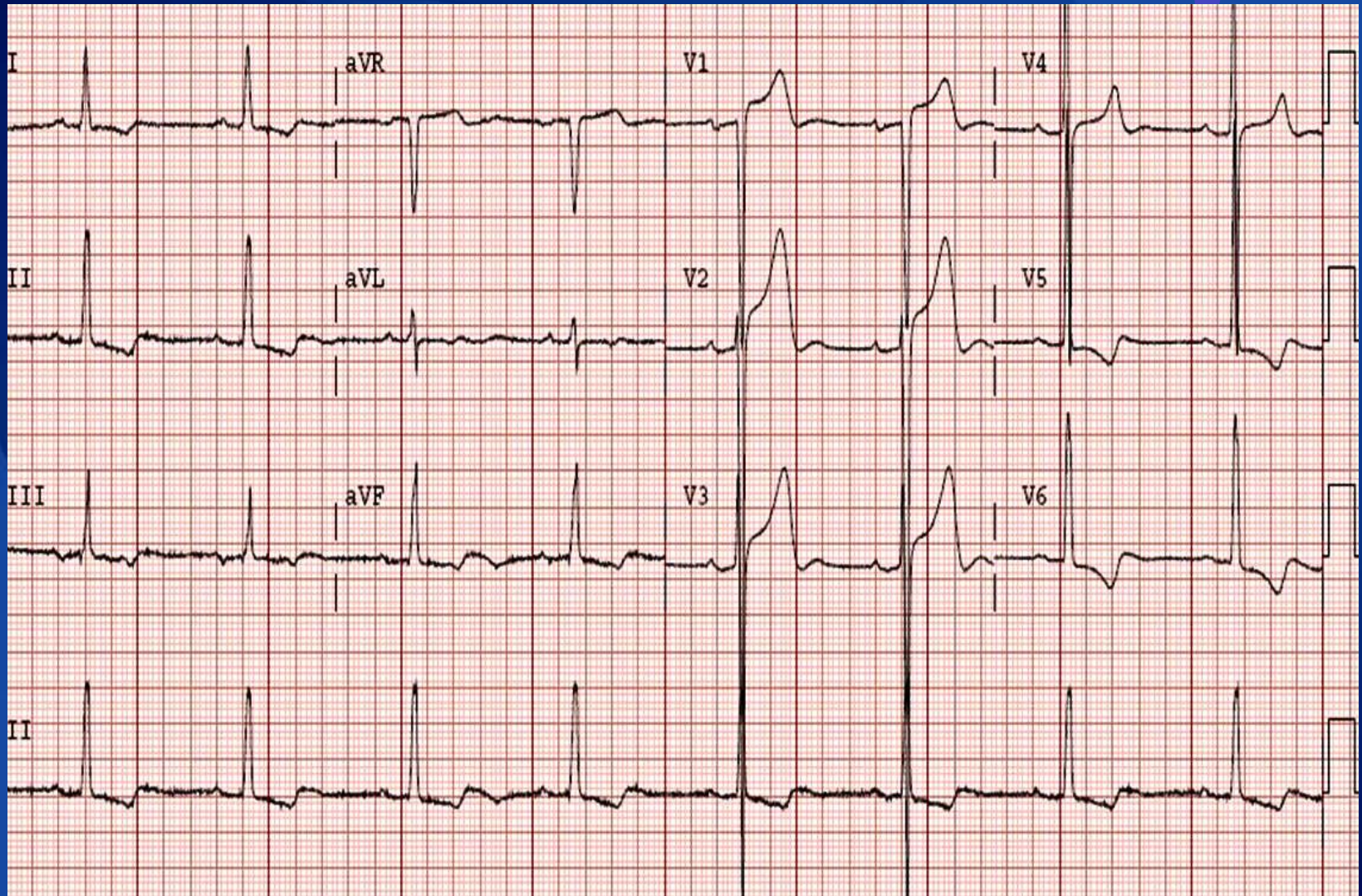
# LEFT VENTRICULAR HYPERTROPHY

Large S wave in leads V1 and V2, large R wave in V5 and V6





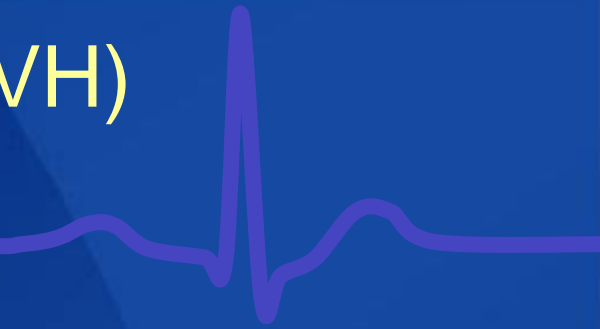
# Left Ventricular Hypertrophy





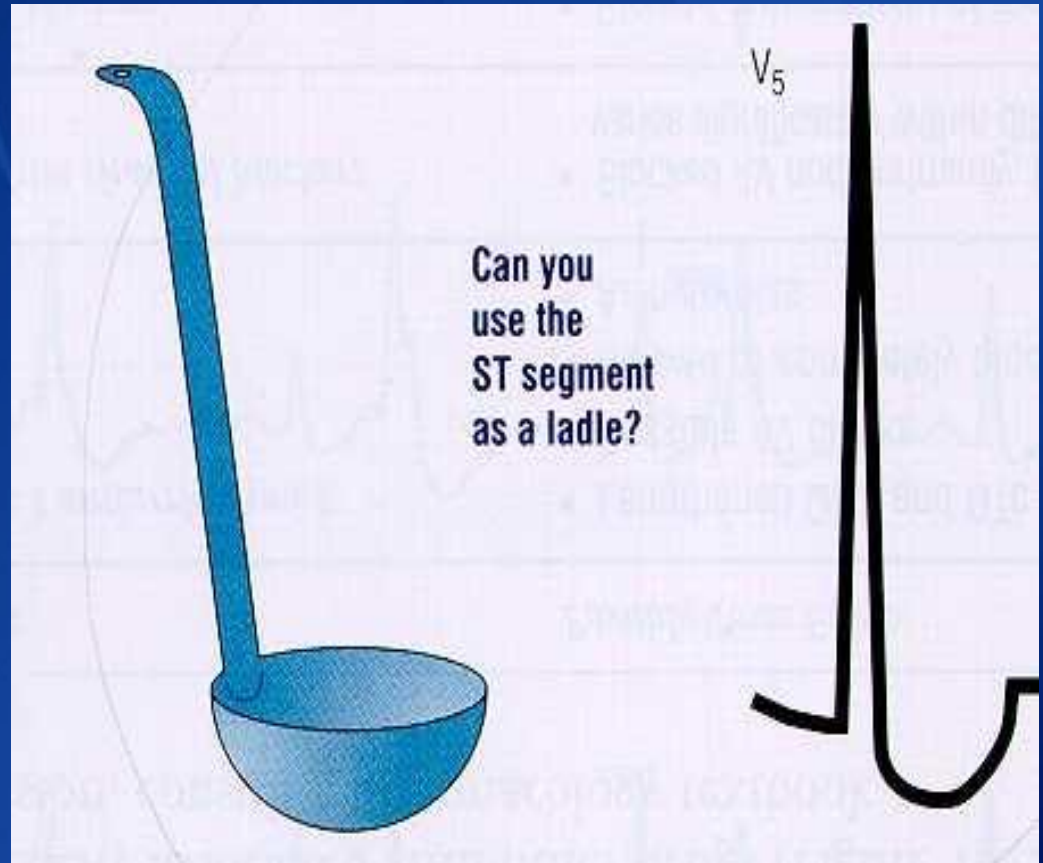
- left ventricular hypertrophy (LVH)  
is characterized by:

- presence of tall left precordial R waves and deep right precordial S waves [e.g.,  $SV1+ (RV5 \text{ or } RV6) > 35 \text{ mm}$ ].
- Repolarization abnormalities (ST depression with T-wave inversions (left ventricular strain) may also appear in leads with prominent R waves.
- LVH may increase limb lead voltage with or without increased precordial voltage (e.g.,  $RaVL+ SV3 > 20 \text{ mm}$  in women and  $> 28 \text{ mm}$  in men).
- The presence of LA abnormality increases the likelihood of underlying LVH in cases with borderline voltage criteria.



# Digitalis Changes:

- EKG appearance with digitalis:
  - Salvador Dali mustache
  - T waves depressed or inverted
  - QT interval shortened



# مسمومیت با دیژیتال Dig.Toxicity

دیپرسیون ST با طرح خاص  
(معروف به سبیل سالوادور)



مشخصات: قطعه ST افت و موج T معکوس می گردد.

# Digitalis Effects :

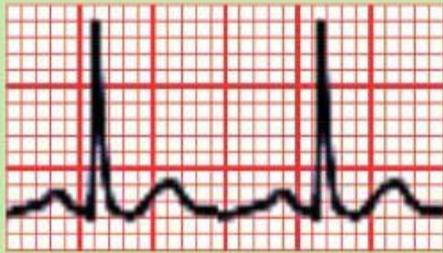


- Digitalis Excess
- (Blocks)
  - SA Block
  - P.A.T. with Block
  - AV Blocks
  - AV Dissociation
- Digitalis Toxicity
- (Irritable foci firing rapidly)
  - Atrial Fibrillation
  - Junctional or Ventricular Tachycardia
  - Multiple PVS's
  - Ventricular Fibrillation



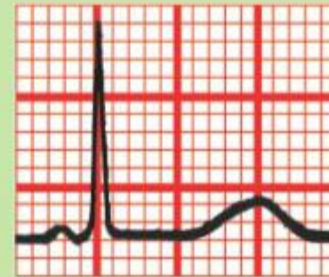
# Calcium

## هایپر کلسمی



فاصله QT کوتاه می شود ( به علت کوتاه شدن قطعه ST و ادغام آن با موج T )

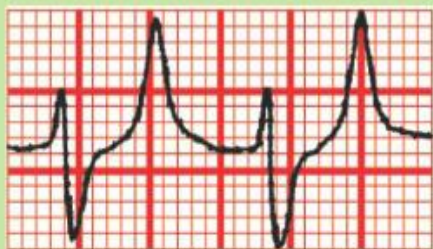
## هیپو کلسمی



فاصله QT افزایش می یابد ( به علت افزایش طول قطعه ST ) و ممکن است موج T به صورت فلت و یا معکوس گردد.

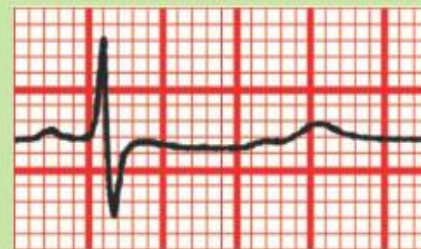
# Potassium

## هایپر کالمی



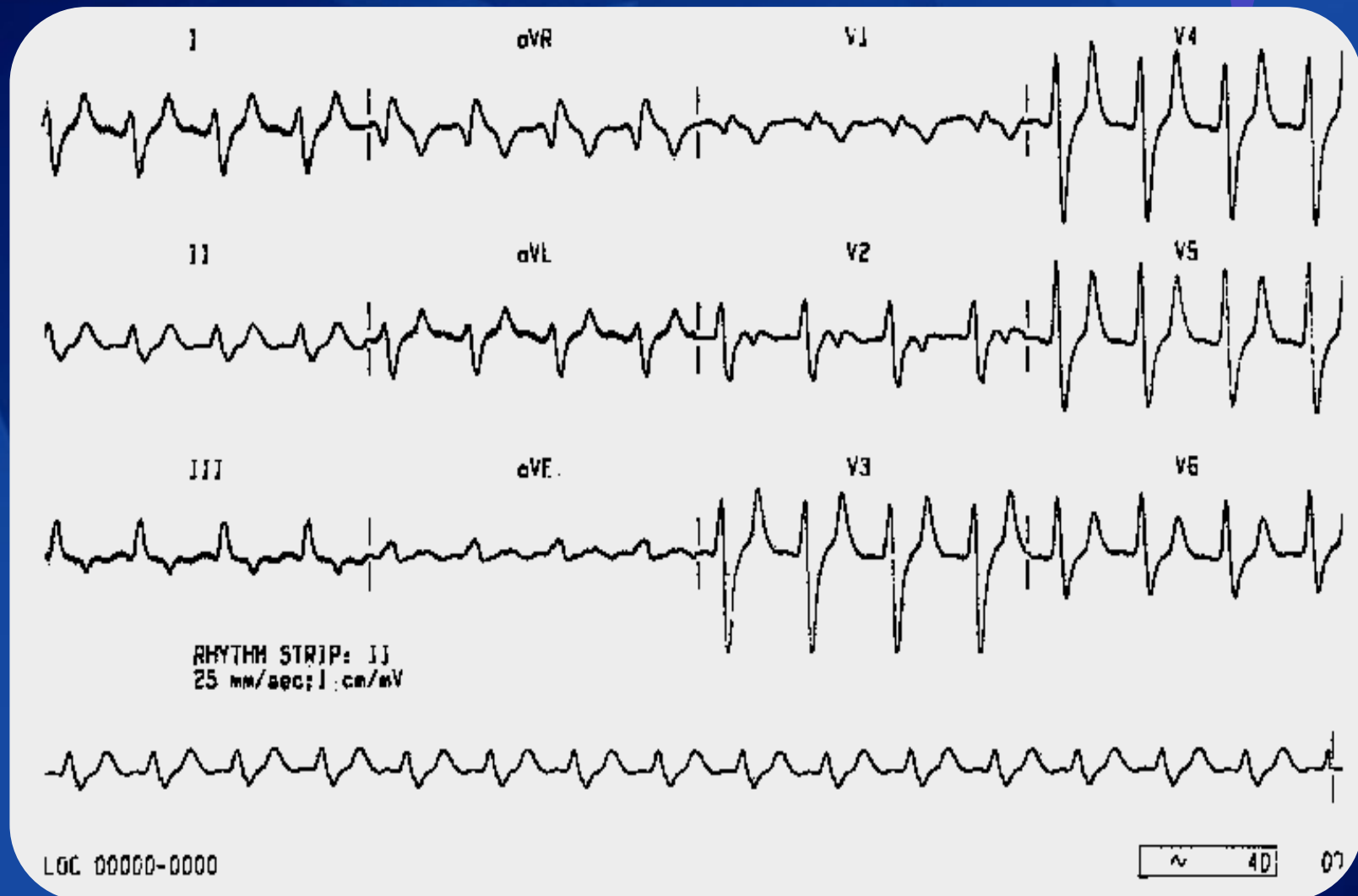
موج T بلند و نوک تیز و QRS پهن  
مشاهده می شود و در بیشتر موارد  
موج P وجود ندارد. خطر ایجاد  
تأیکاردی بطنی (VT) وجود دارد.

## هیپو کالمی



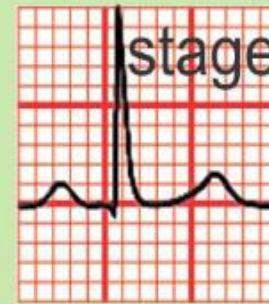
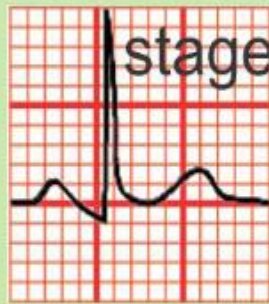
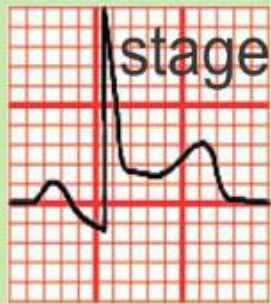
موج T صاف و موج U بزرگ و  
افت قطعه ST مشاهده می شود.  
ضمناً باعث افزایش اثر مسمومیت  
با دیژیتال می گردد.

# Hyperkalemia



# Pericarditis :

## پریکاردیت Pericarditis



مشخصات : قطعه ST به شکل کفه ای بالا رفته و فاصله P تا Q دپرس می شود.  
سپس یکبار طبیعی شدن ، بعد منفی شدن T و نهایتاً طبیعی شدن کلی شکل می گیرد.



# Pulmonary Embolism :



- $S_1Q_3T_3$ 
  - Wide S in I, large Q and inverted T in III
- Acute Right Bundle Branch Block
- R.A.D. and clockwise rotation
- Inverted T waves in V1 – V4
- ST depression in II

