

Zahedan university of medical science

تفسیر نوار قلب

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master of critical care nurse

2022

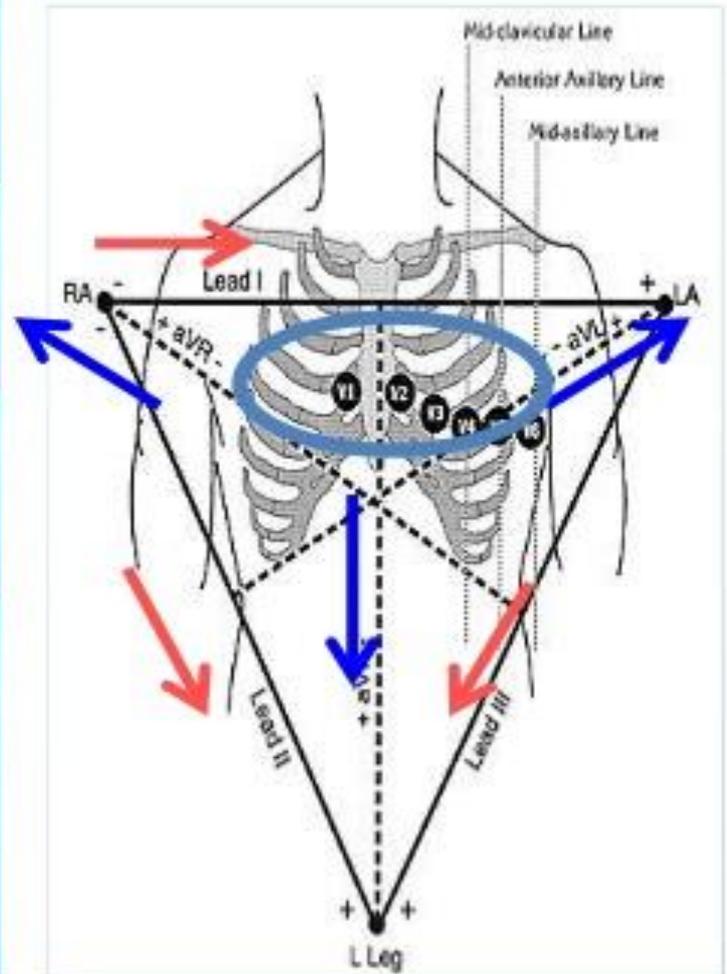
The 12-Leads

The 12-leads include:

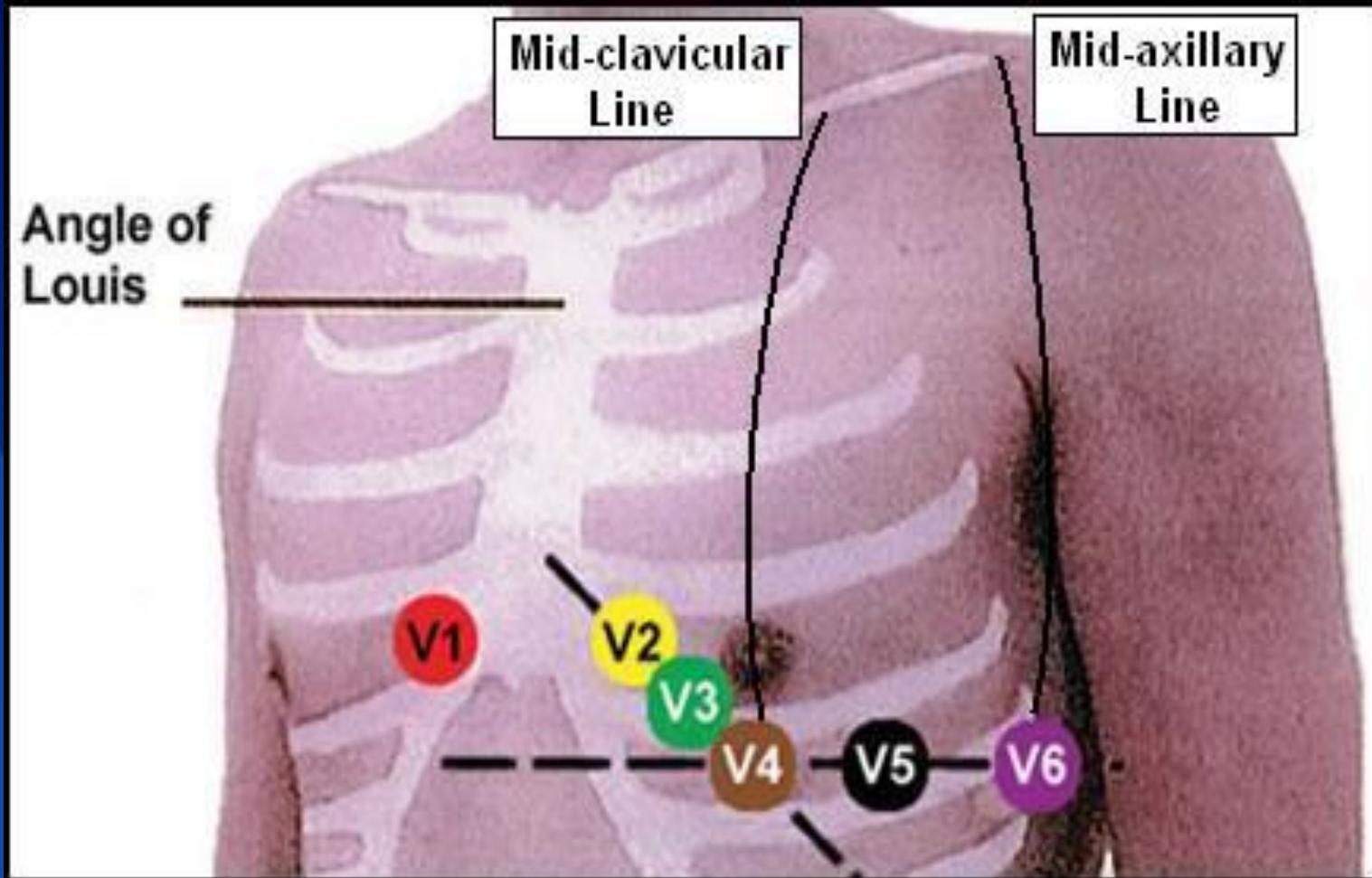
–3 Limb leads
(I, II, III)

–3 Augmented leads
(aVR, aVL, aVF)

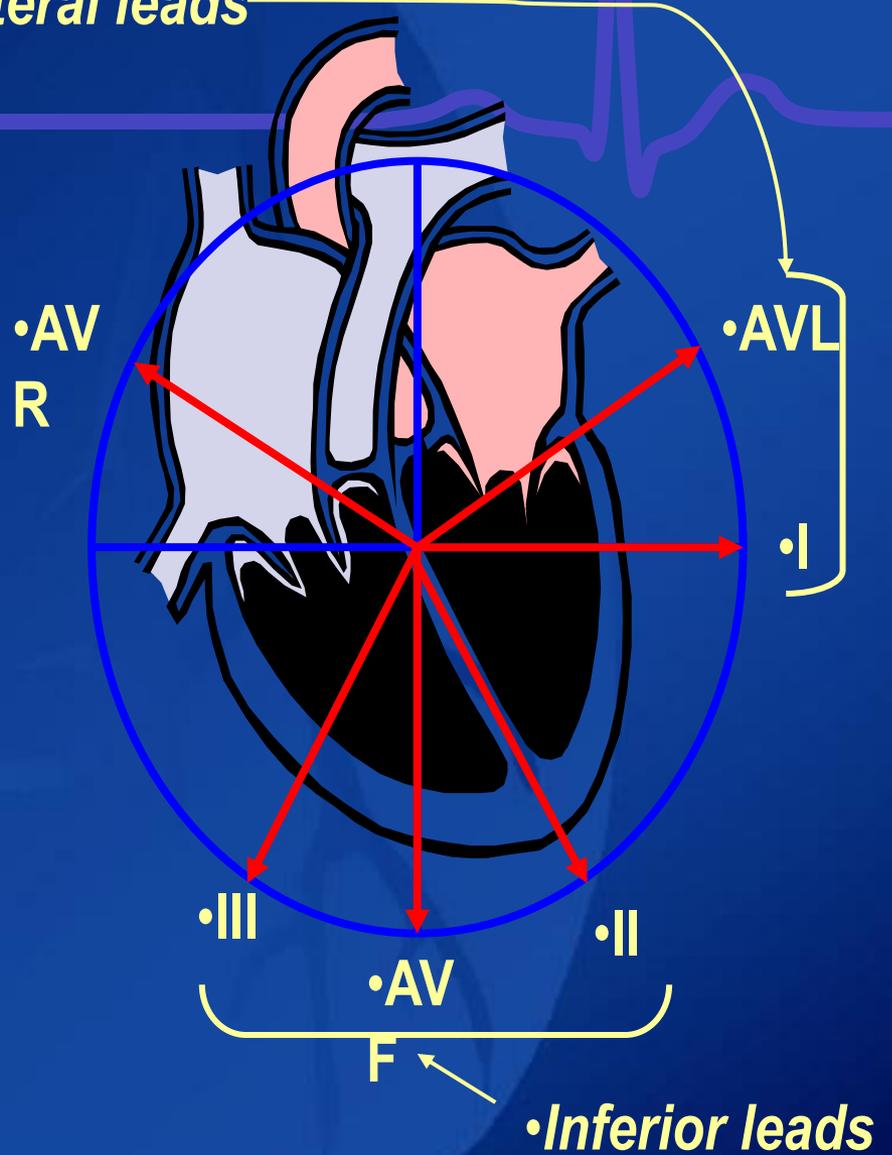
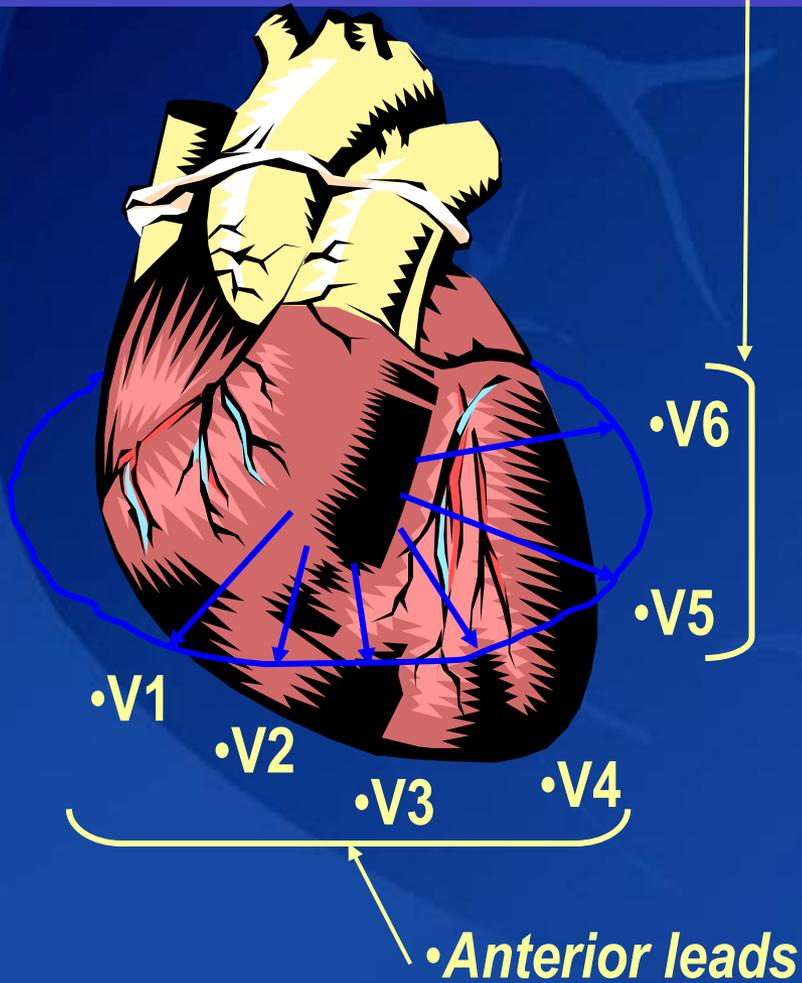
–6 Precordial leads
(V₁- V₆)

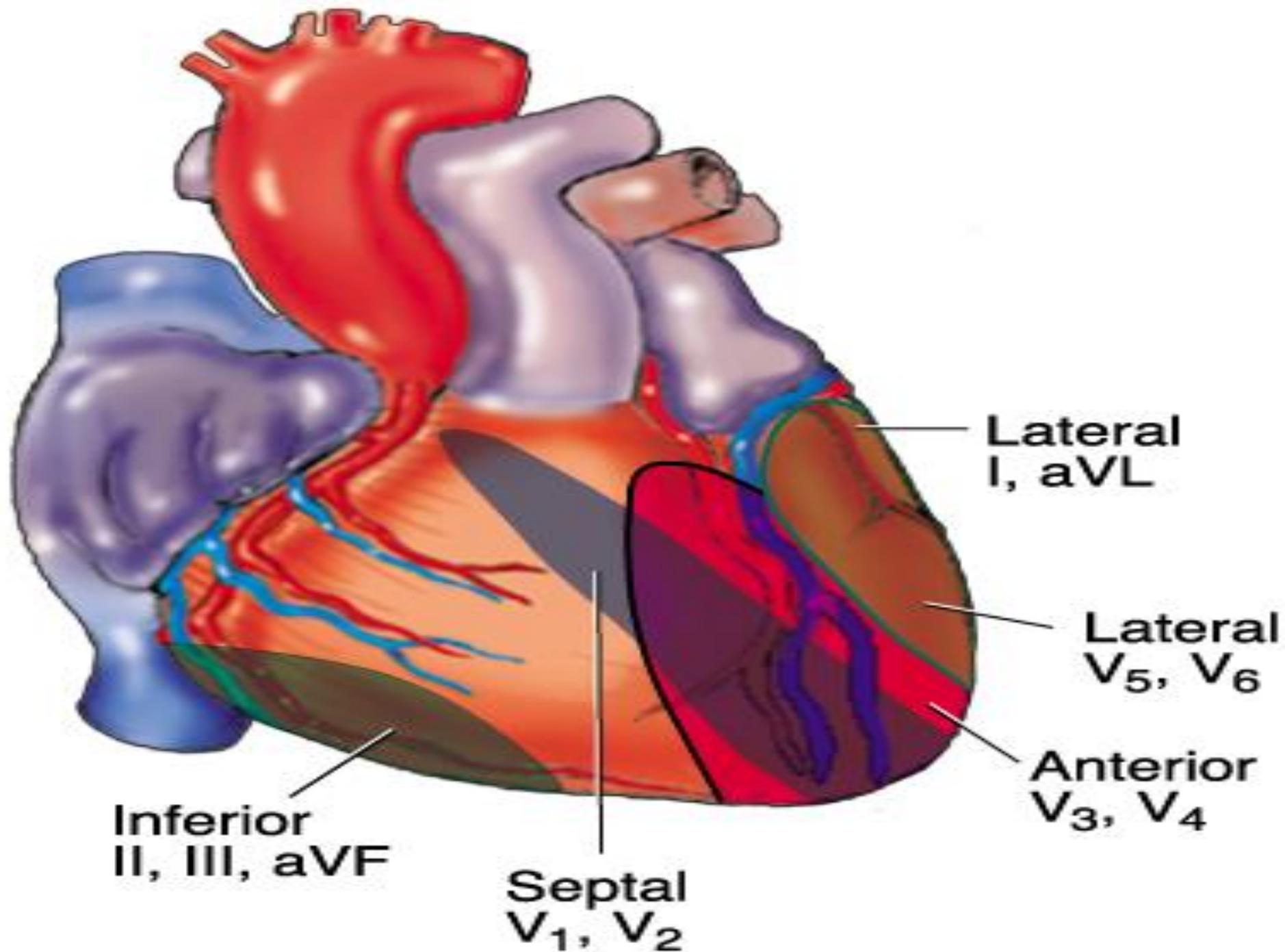


Precordial Leads



Anatomic Groups: *Lateral leads*





Lateral

Anterior / Septal

Inferior

Lateral

aVR

aVL

aVF

V2

V3

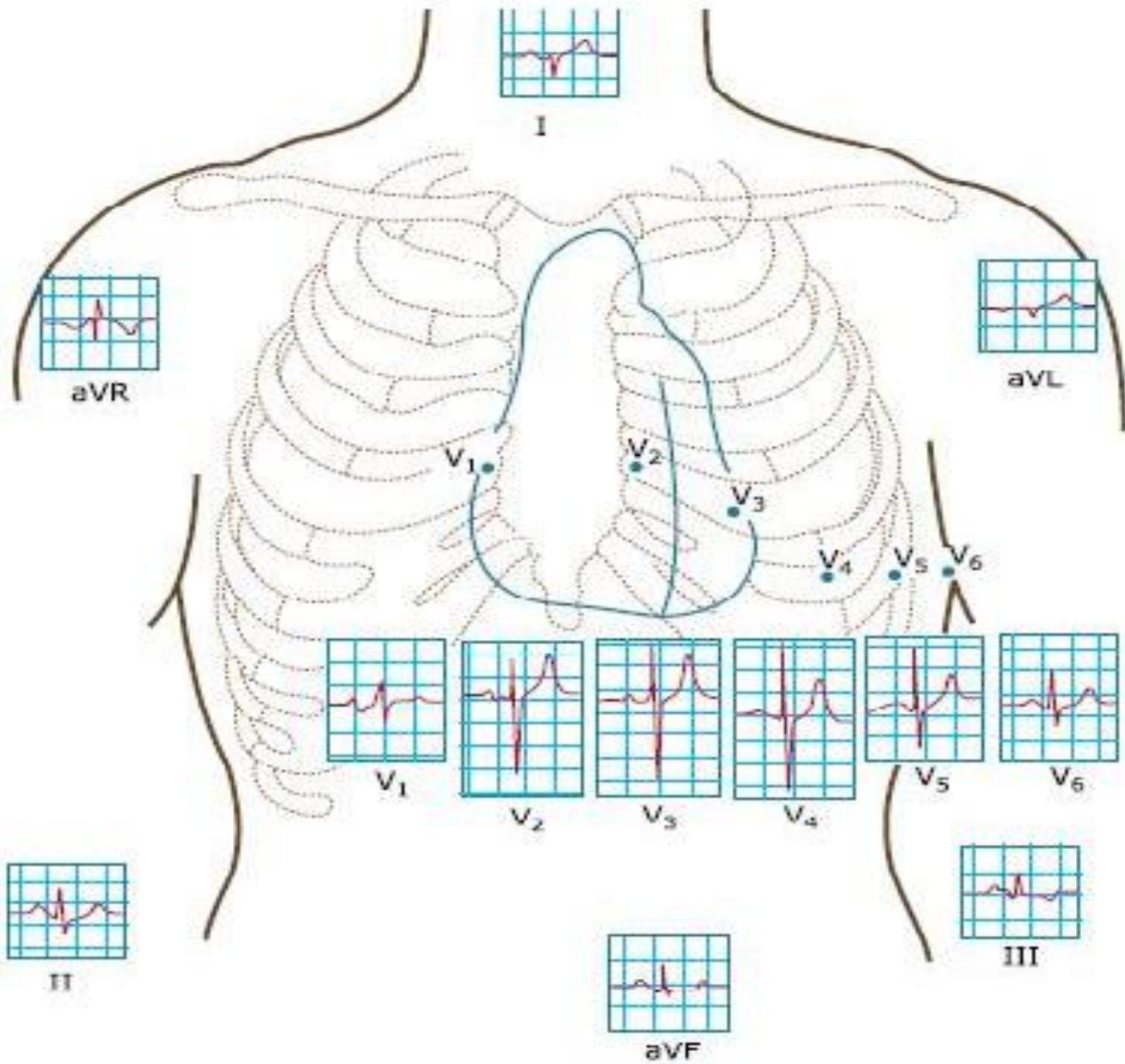
V5

V6

II

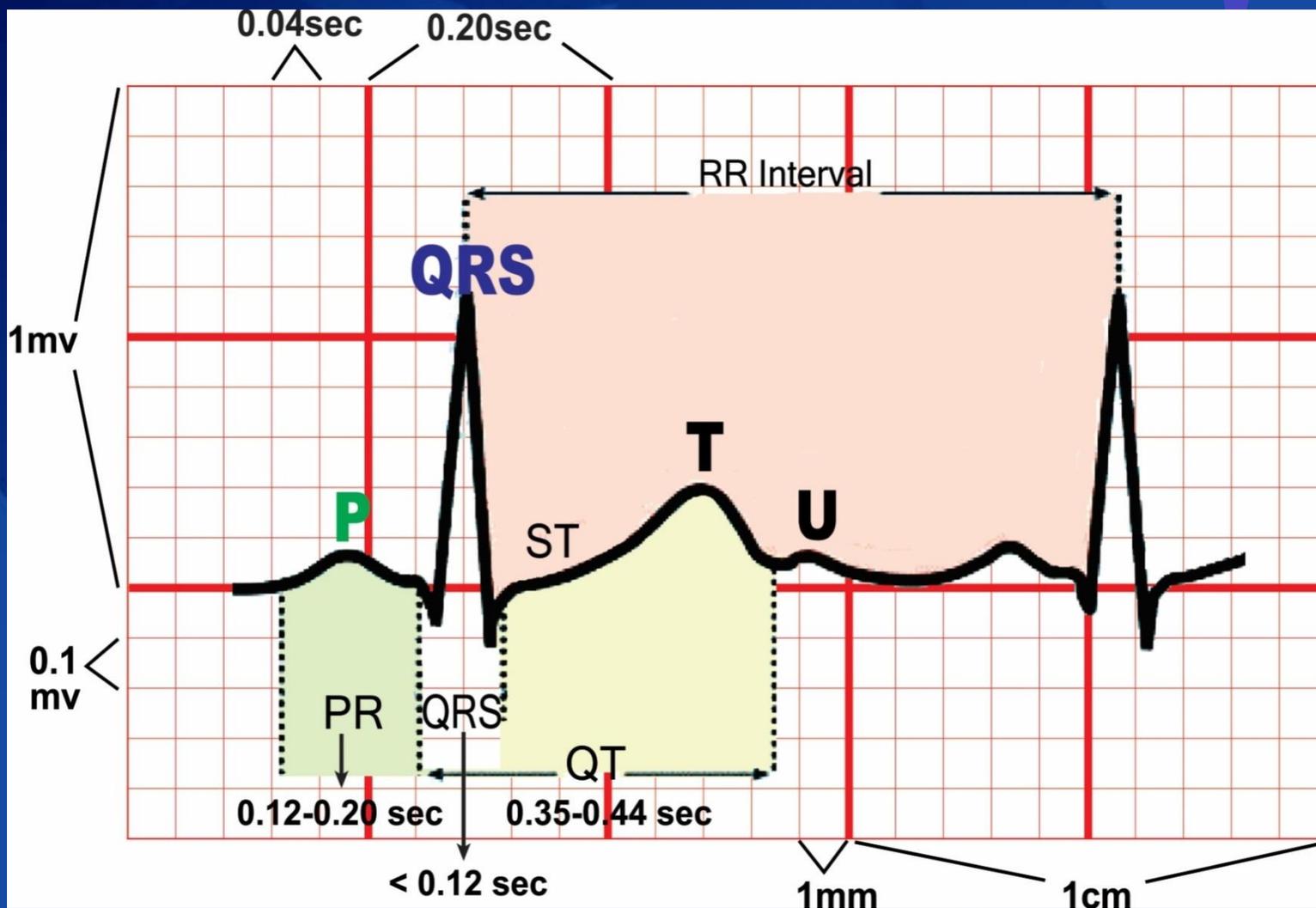
III

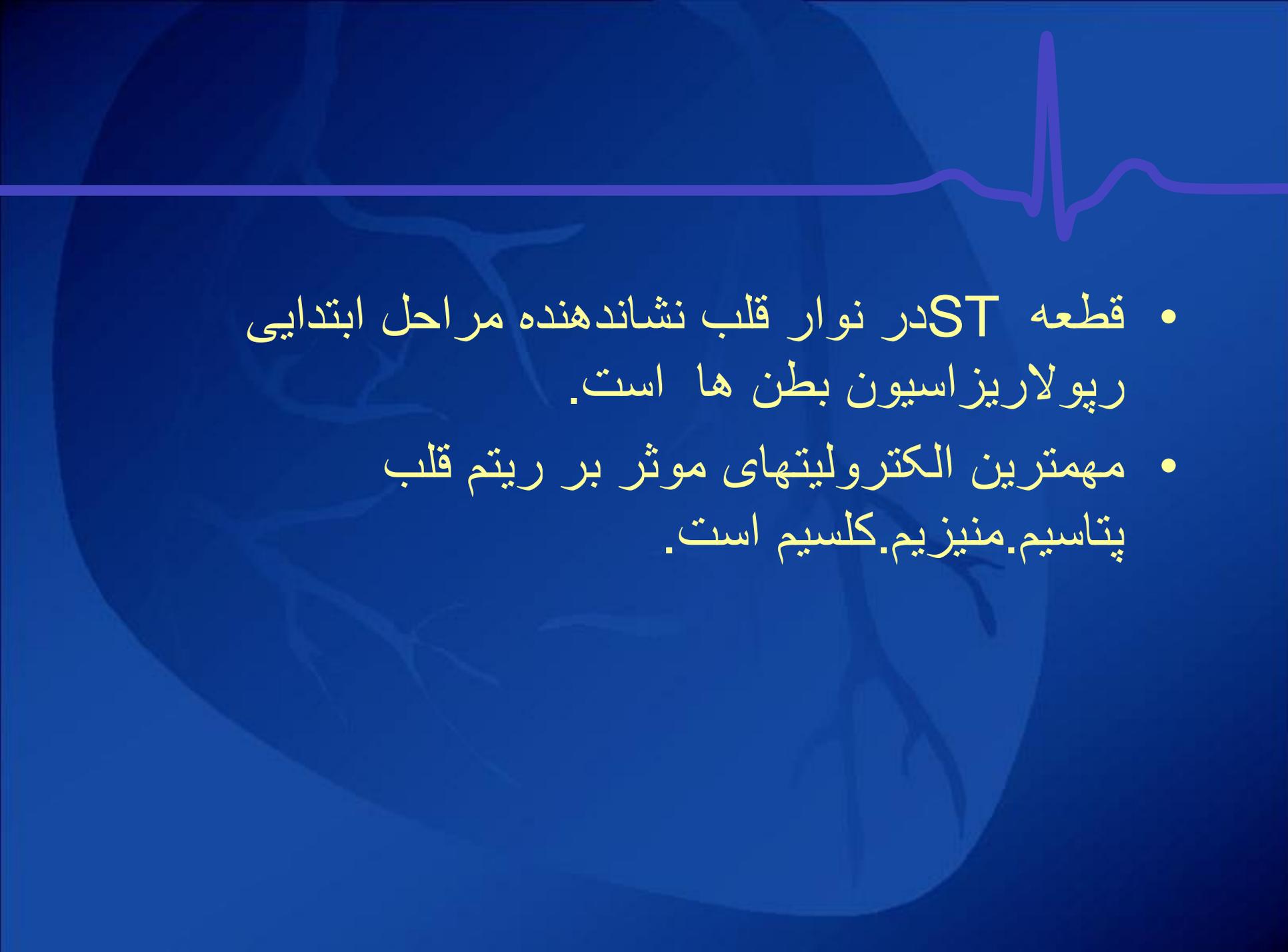
II



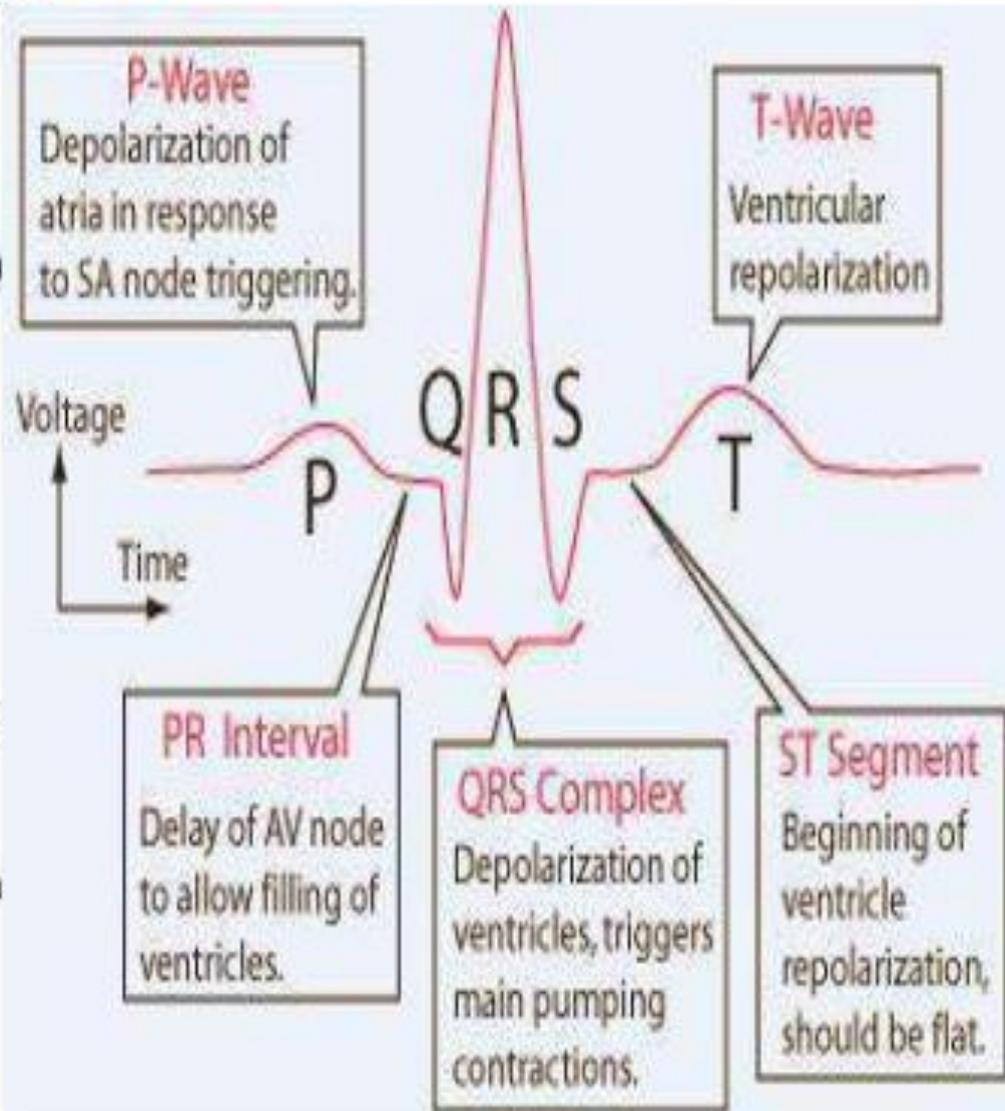
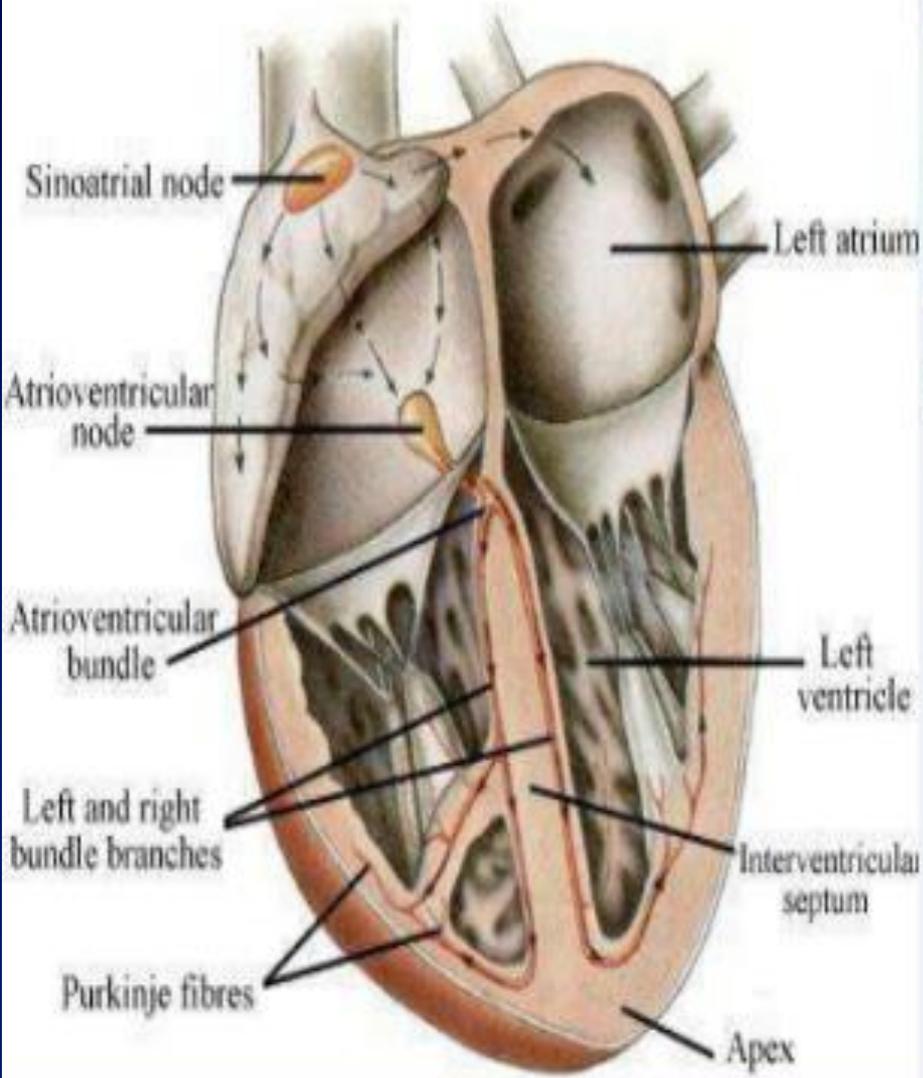
I Lateral	aVR None	V ₁ Septal	V ₄ Anterior
II Inferior	aVL Lateral	V ₂ Septal	V ₅ Lateral
III Inferior	aVF Inferior	V ₃ Anterior	V ₆ Lateral

Normal Intervals:



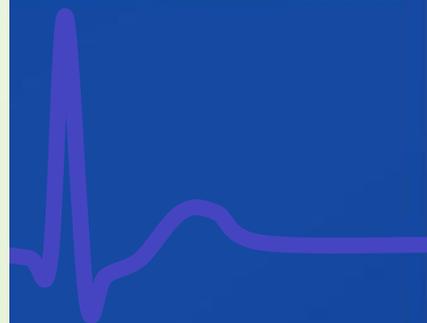
- 
- قطعه ST در نوار قلب نشاندهنده مراحل ابتدایی ریپولاریزاسیون بطن ها است.
 - مهمترین الکترولیت‌های موثر بر ریتم قلب پتاسیم، منیزیم، کلسیم است.

Anatomy of Heart Conduction and ECG signal



مرور سریع ECG به روش ۹ مرحله ای

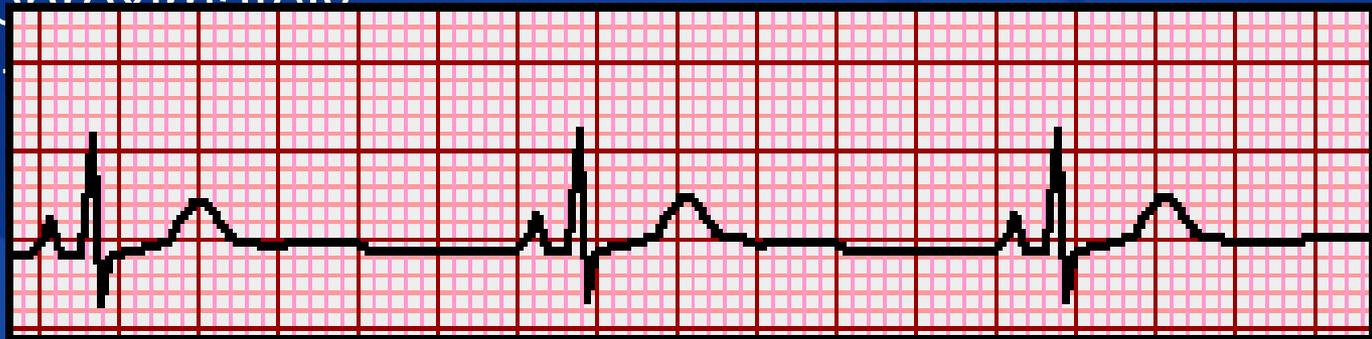
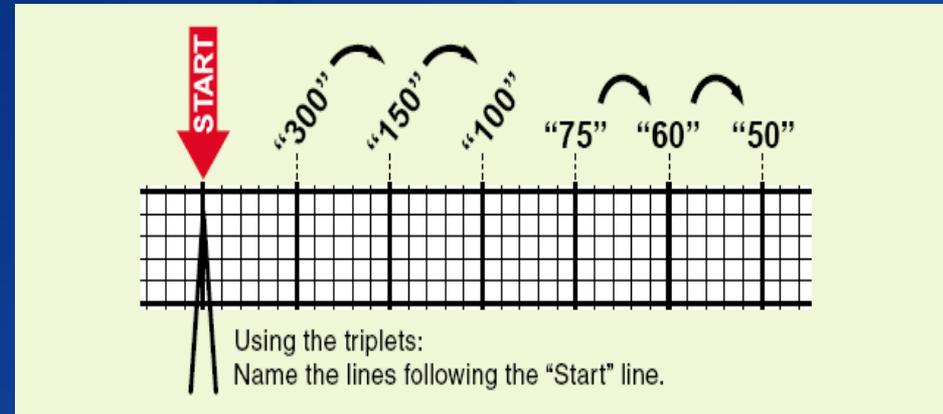
- ۱- بررسی نظم و تعداد ضربان قلب
- ۲- بررسی موج P (تشخیص هایپرتروفی دهلیزی)
- ۳- بررسی فاصله PR (تشخیص تاخیر هدایتی AV)
- ۴- بررسی کمپلکس QRS و محور قلب (تشخیص تاخیر هدایتی و هایپرتروفی بطن ها ، موج Q پاتولوژیک و عدم افزایش ولتاژ موج R در لیدهای پره کوردیال)
- ۵- بررسی قطعه ST (تشخیص ایسکمی یا انفارکتوس)
- 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:

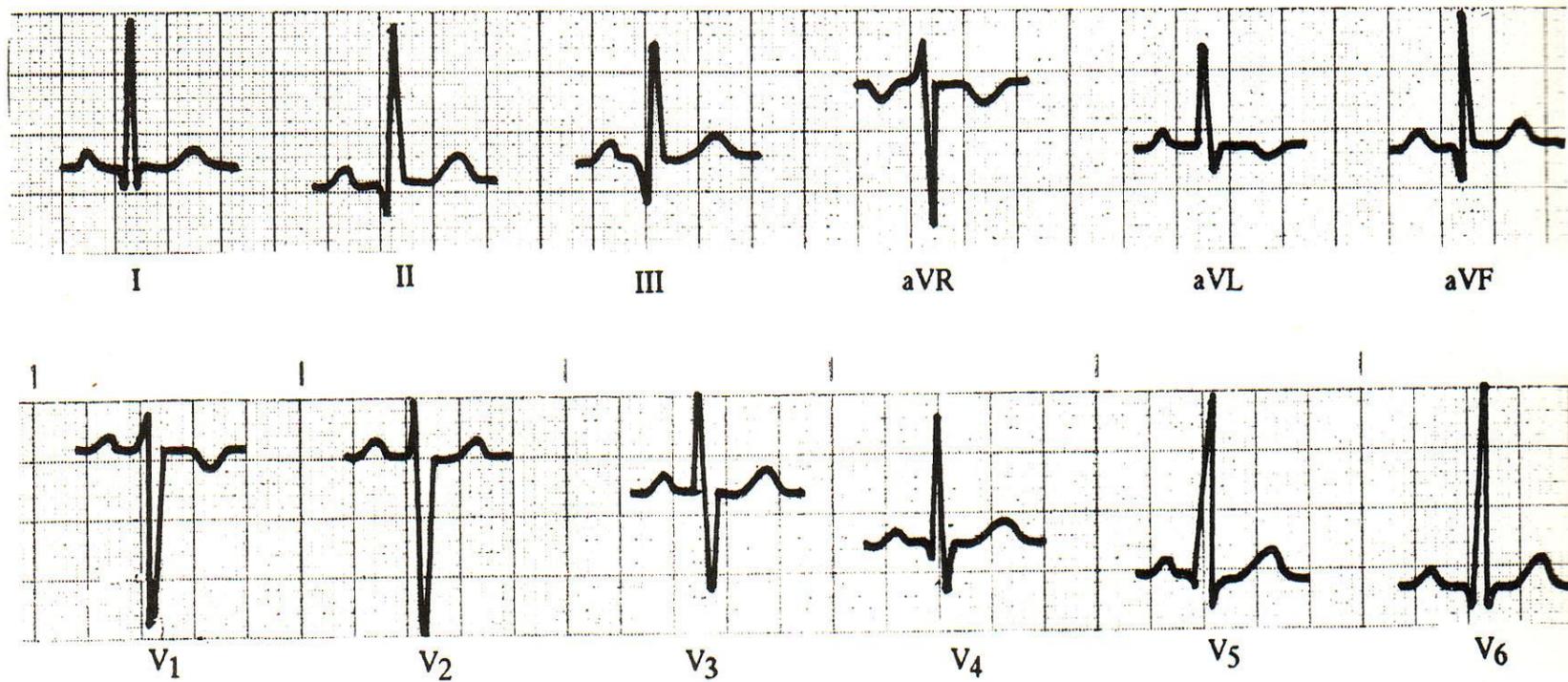
As most EKGs record 10 seconds of rhythm per page, one can simply count the number of beats present on the EKG and multiply by 6 to get the number of beats per 60 seconds.



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

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

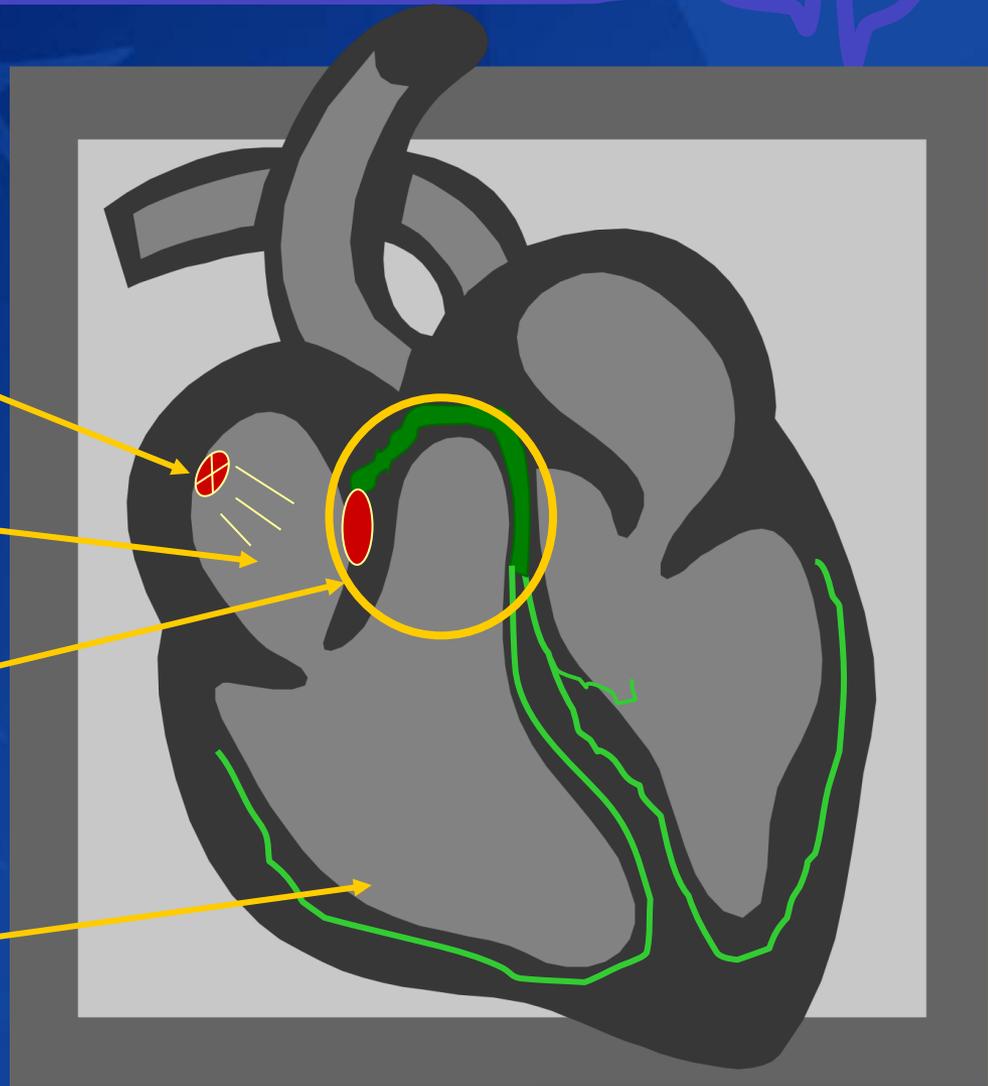


Heart Rate	Rhythm	P Wave	PR Interval (sec.)	QRS (Sec.)
60 - 100	Regular	Before each QRS, Identical	.12 - .20	<.12

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

Sinus Node Dysfunction

- Sinus
- Atrial
- Junctional
- Ventricula



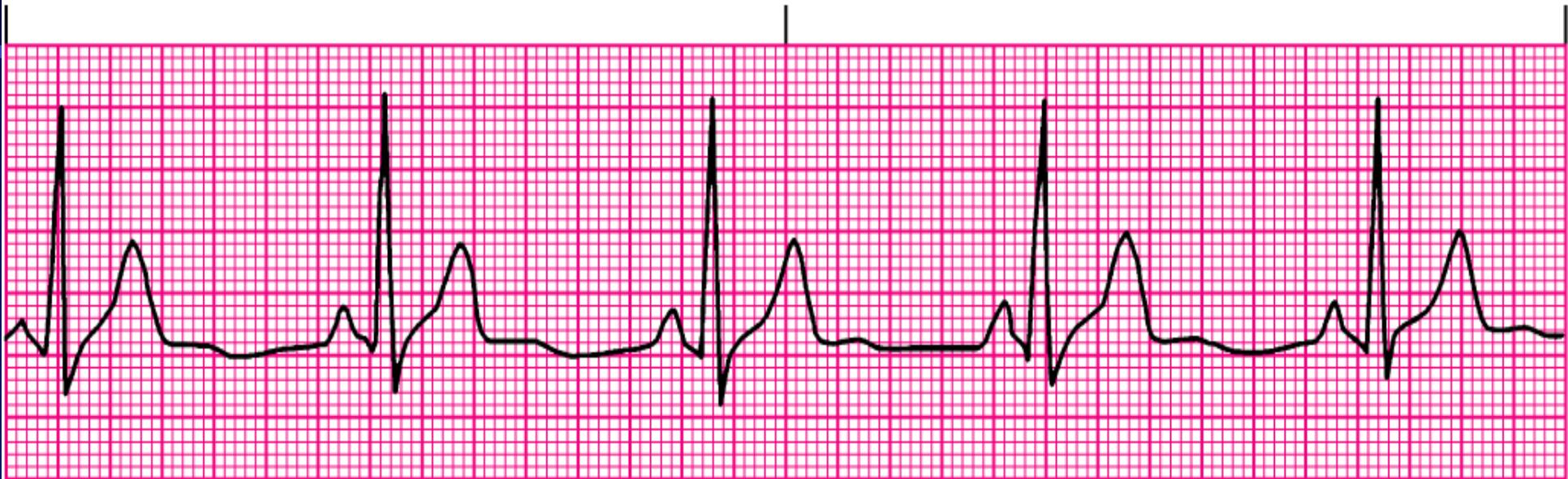
Types of Sinus Node Dysfunction

:

- 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

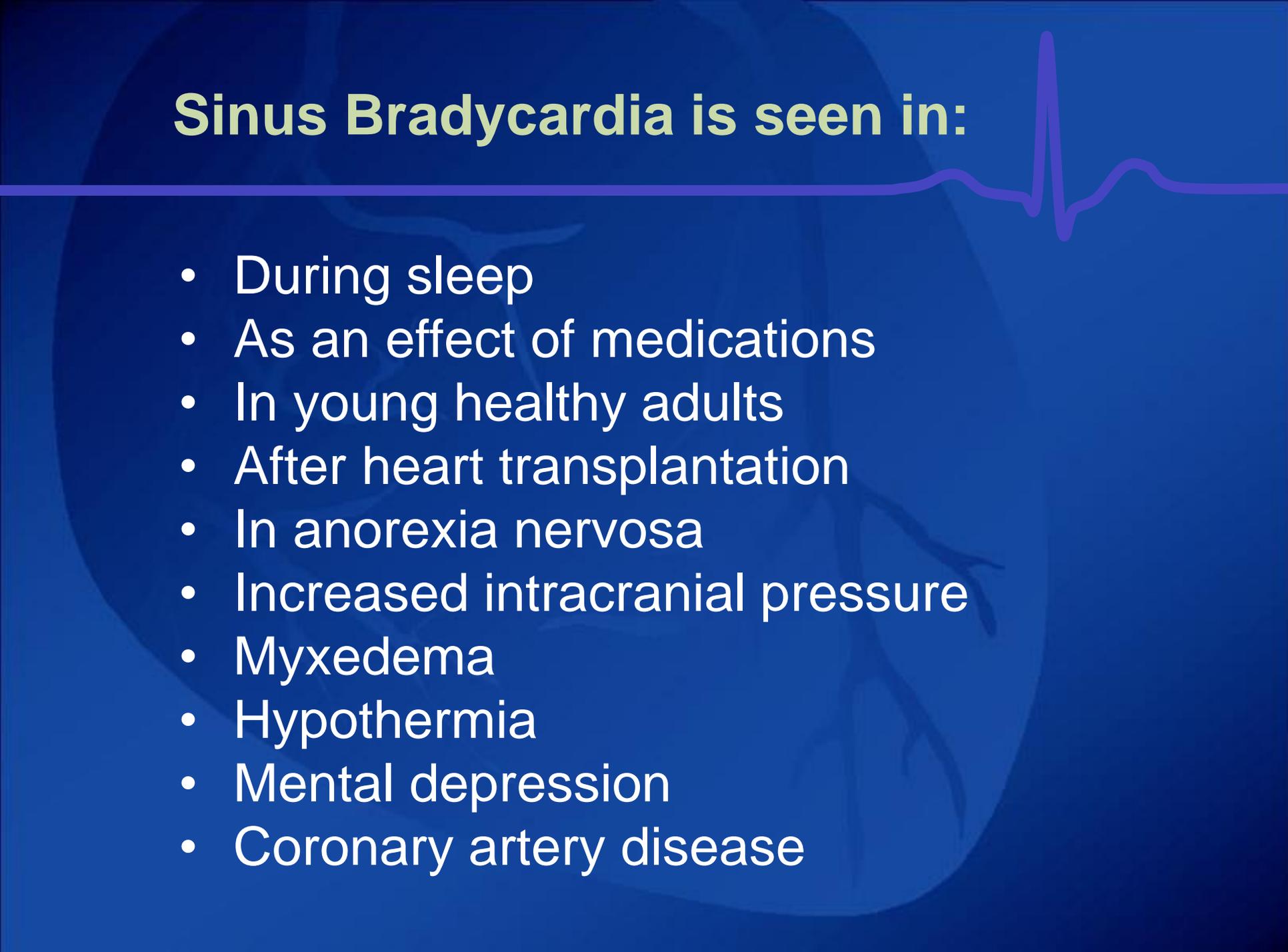
QT interval

- 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

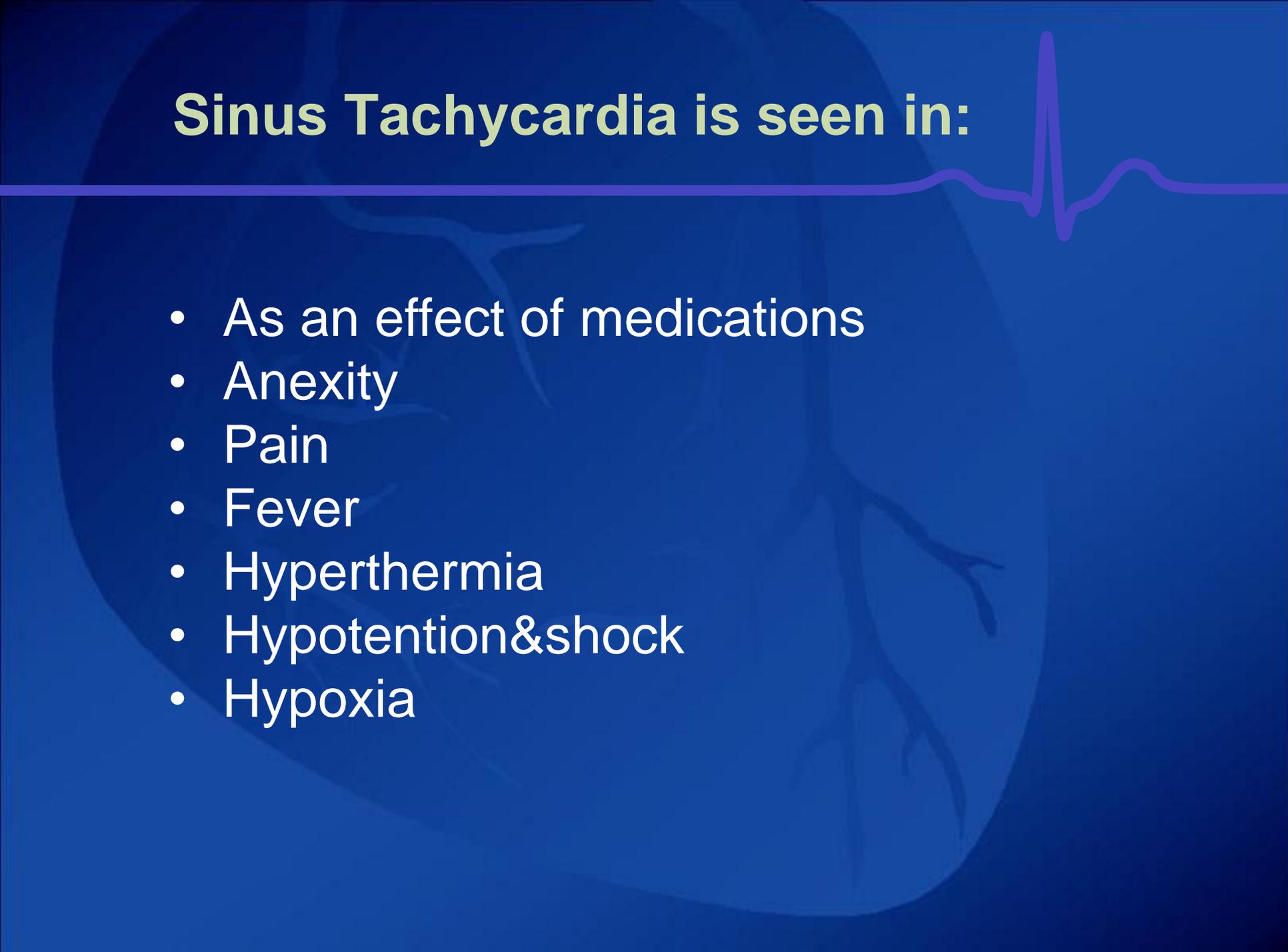
QT interval

- Within normal limits
- Commonly shortened

Other

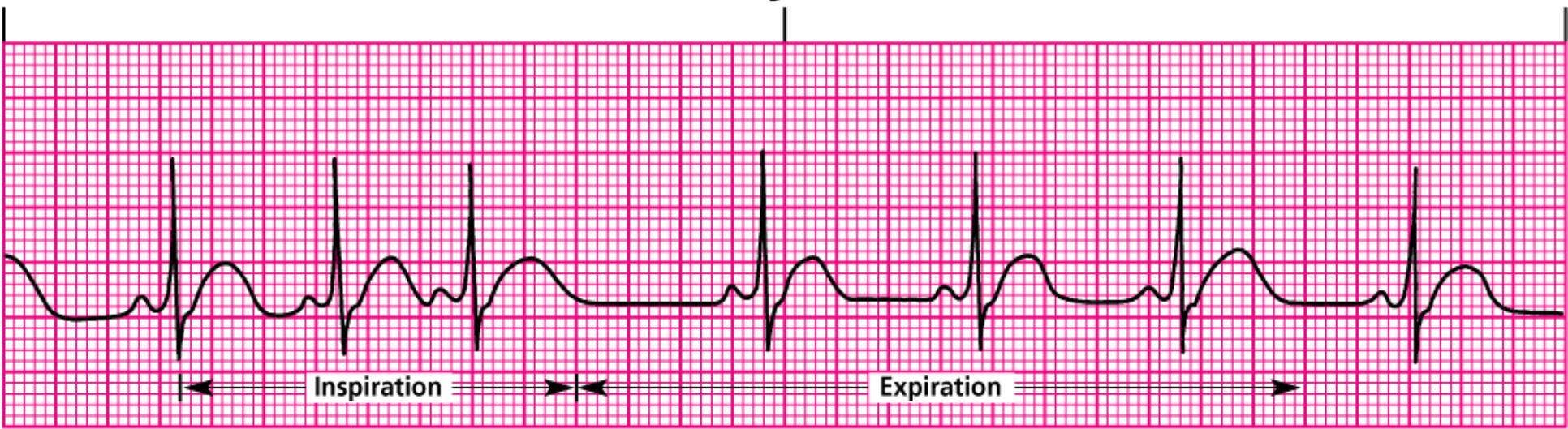
- None

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

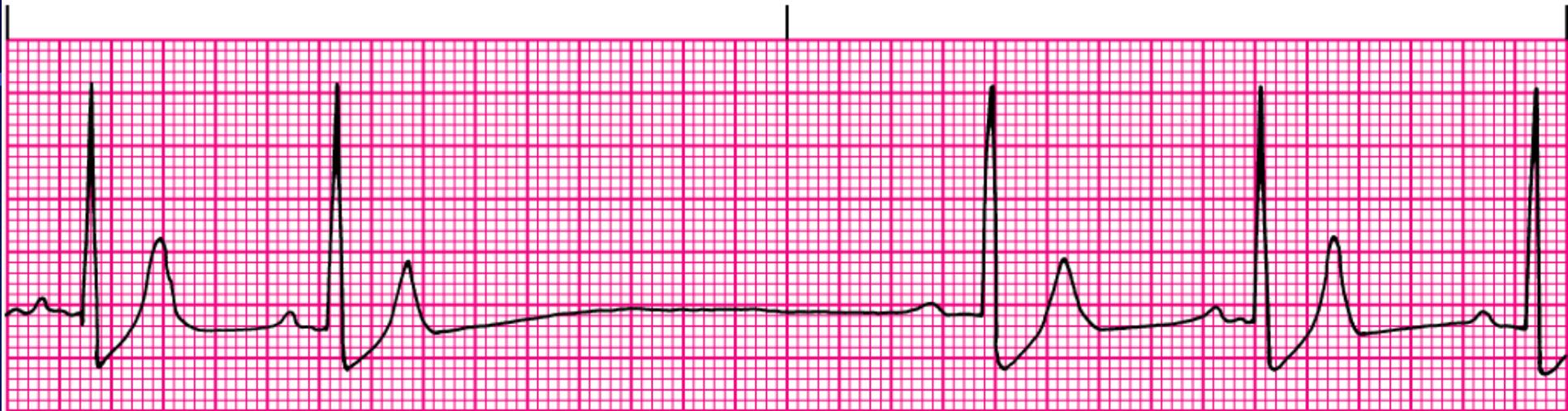
QT interval

- 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

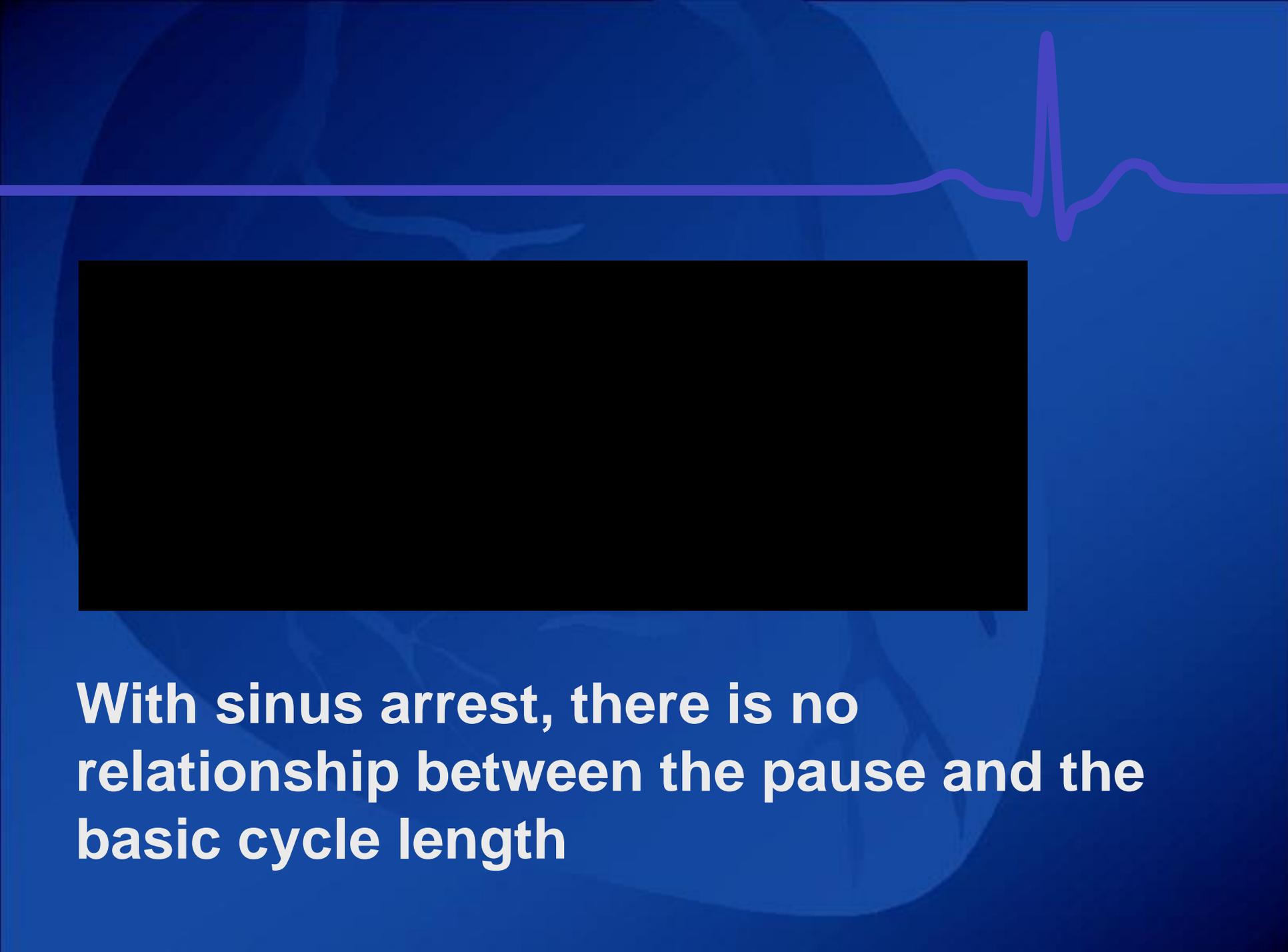
- Normal size
- Normal configuration
- Absent during arrest

QT interval

- Within normal limits
- Absent during arrest

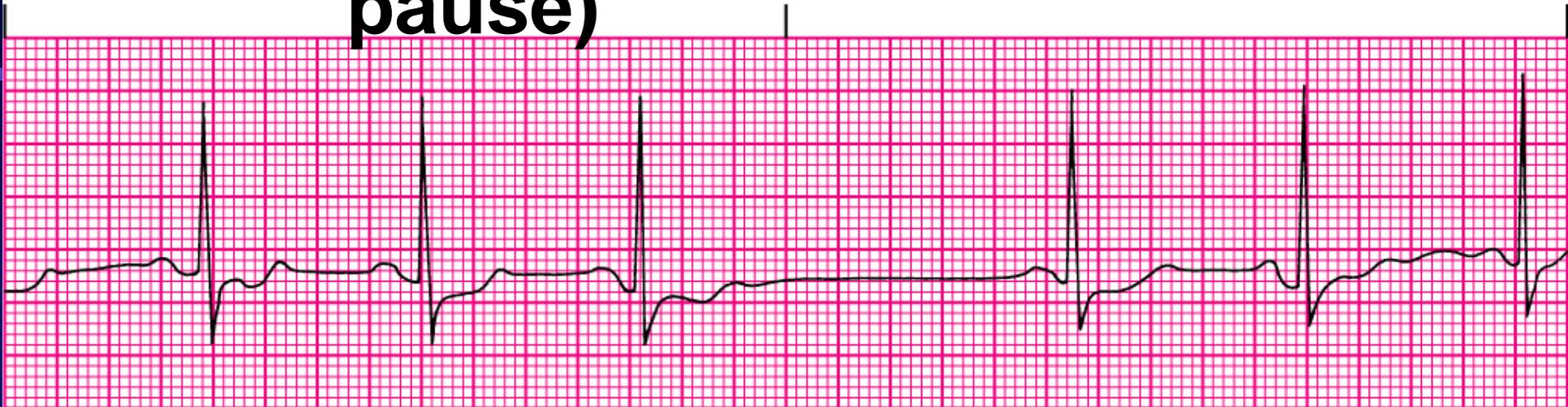
Other

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

The image features a blue background with a faint anatomical illustration of a human torso. A purple ECG tracing is visible at the top, showing a regular rhythm that is interrupted by a significant pause, characteristic of sinus arrest. A large black rectangular box is positioned in the center of the slide, obscuring any text or diagrams that might have been present. Below this box, the text "With sinus arrest, there is no relationship between the pause and the basic cycle length" is written in white, bold font.

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

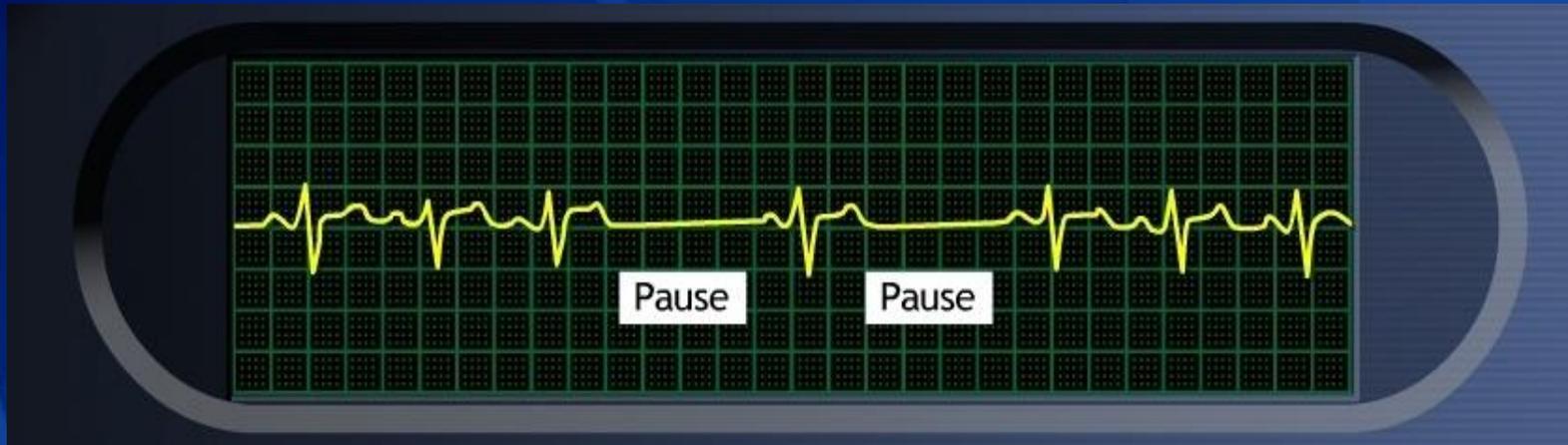
- Normal size
- Normal configuration
- Absent during a pause

QT interval

- Within normal limits
- Absent during a pause

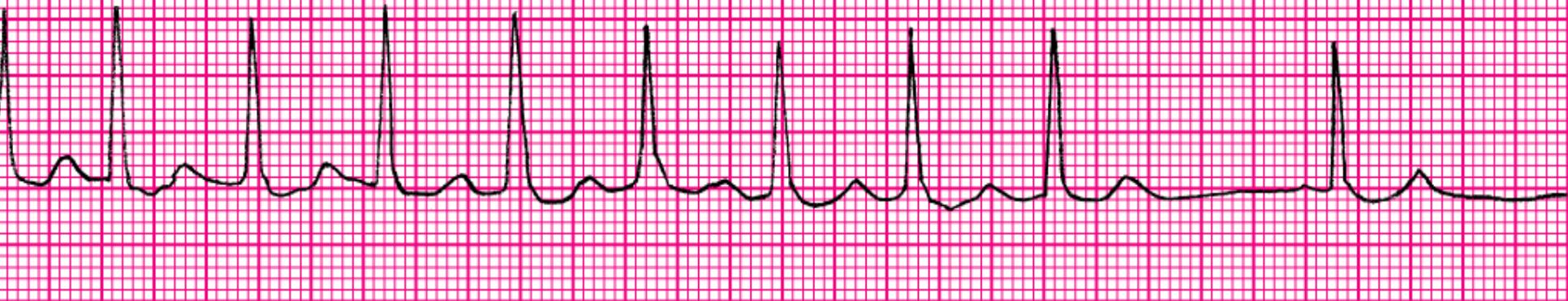
Other

- 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

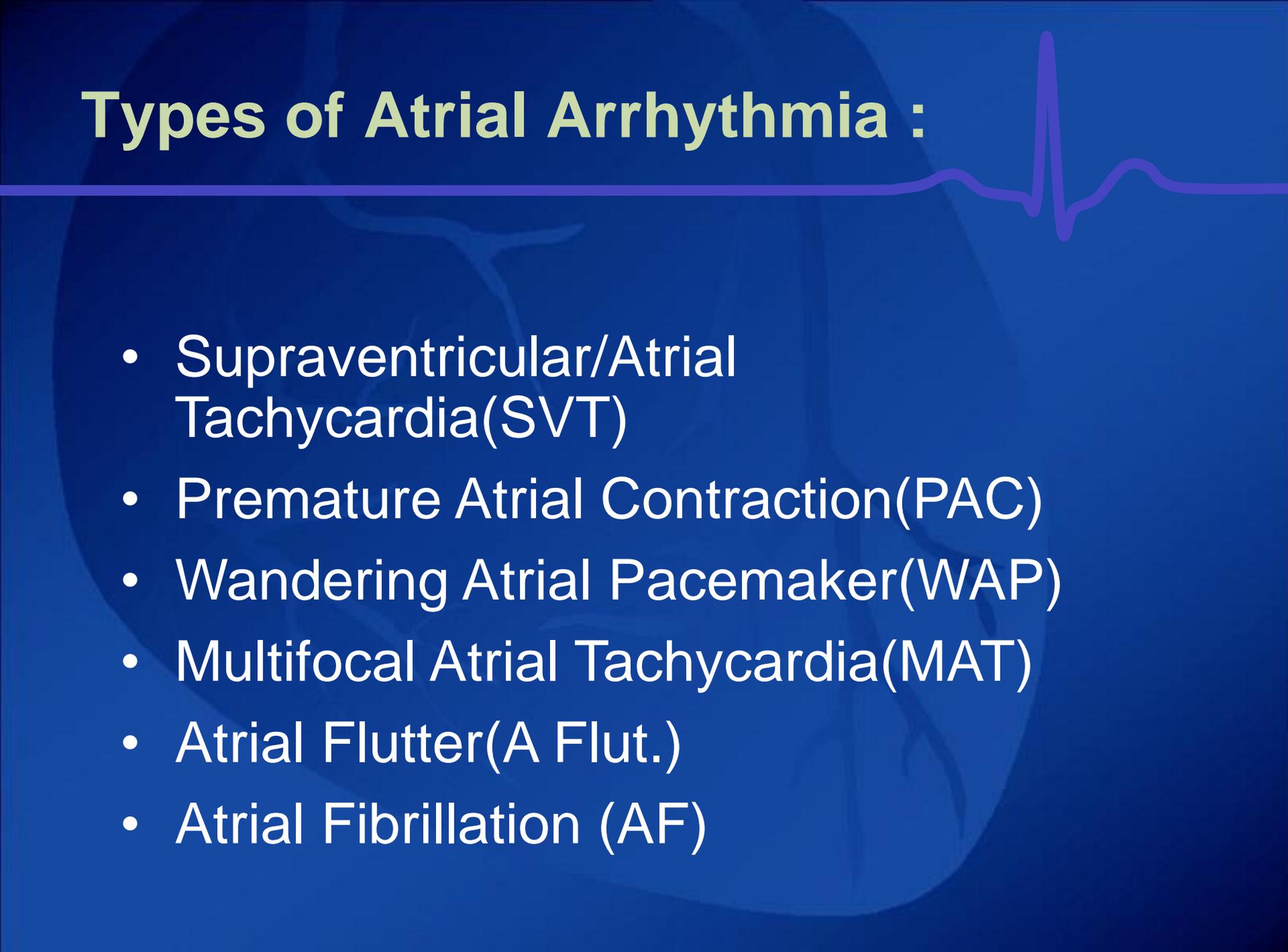
Other

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



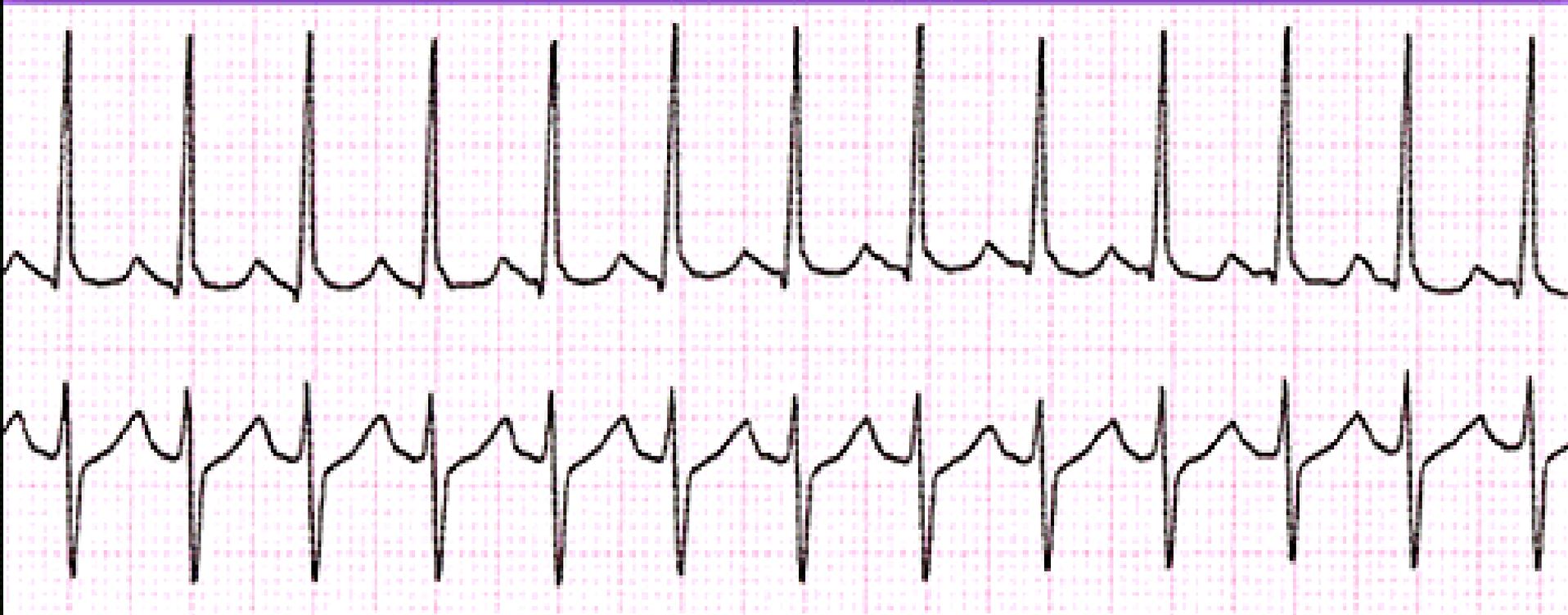
- Intermittent episodes of slow and fast rates from the SA node or atria
- Brady <60 BPM
- Tachy >100 BPM

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)

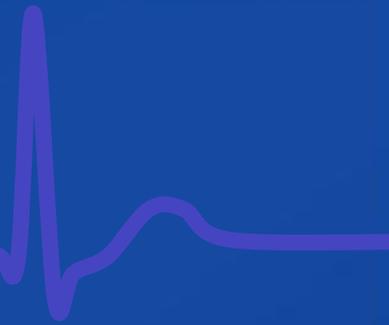
Atrial Tachycardia



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.

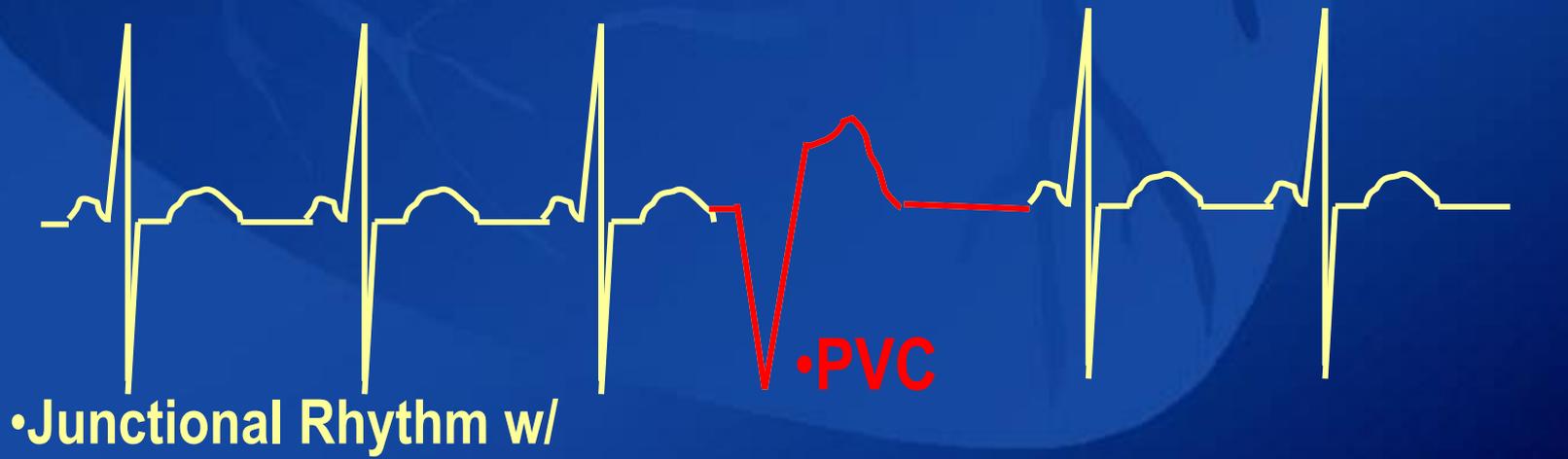
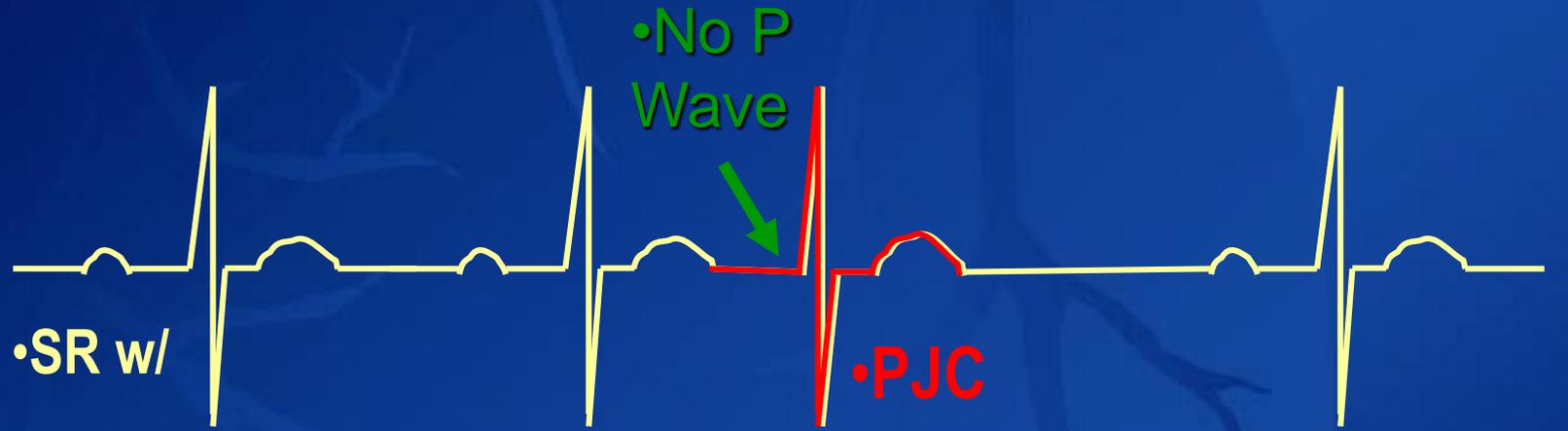
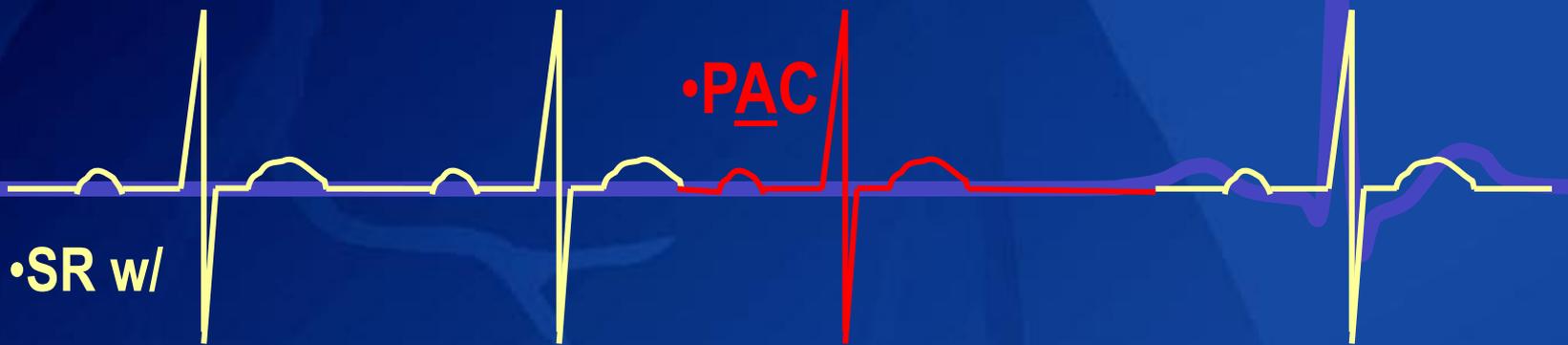
Premature Beats

An ECG trace is shown in the top right corner of the slide. It features a regular rhythm of P waves, QRS complexes, and T waves. One QRS complex is significantly earlier than the others, representing a premature beat. The trace is colored in a light purple/blue hue.

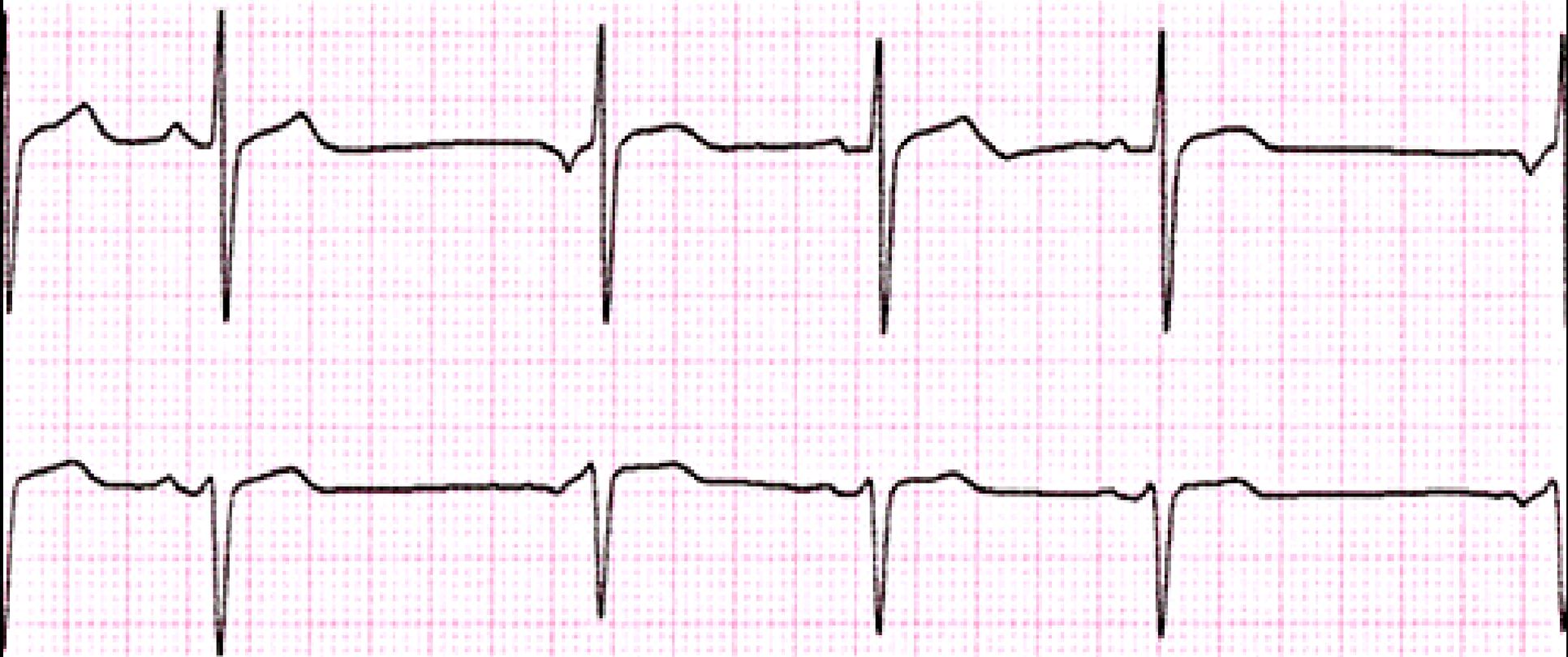
- Not a rhythm, just a single early beat

- 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**



Wandering Pacemaker



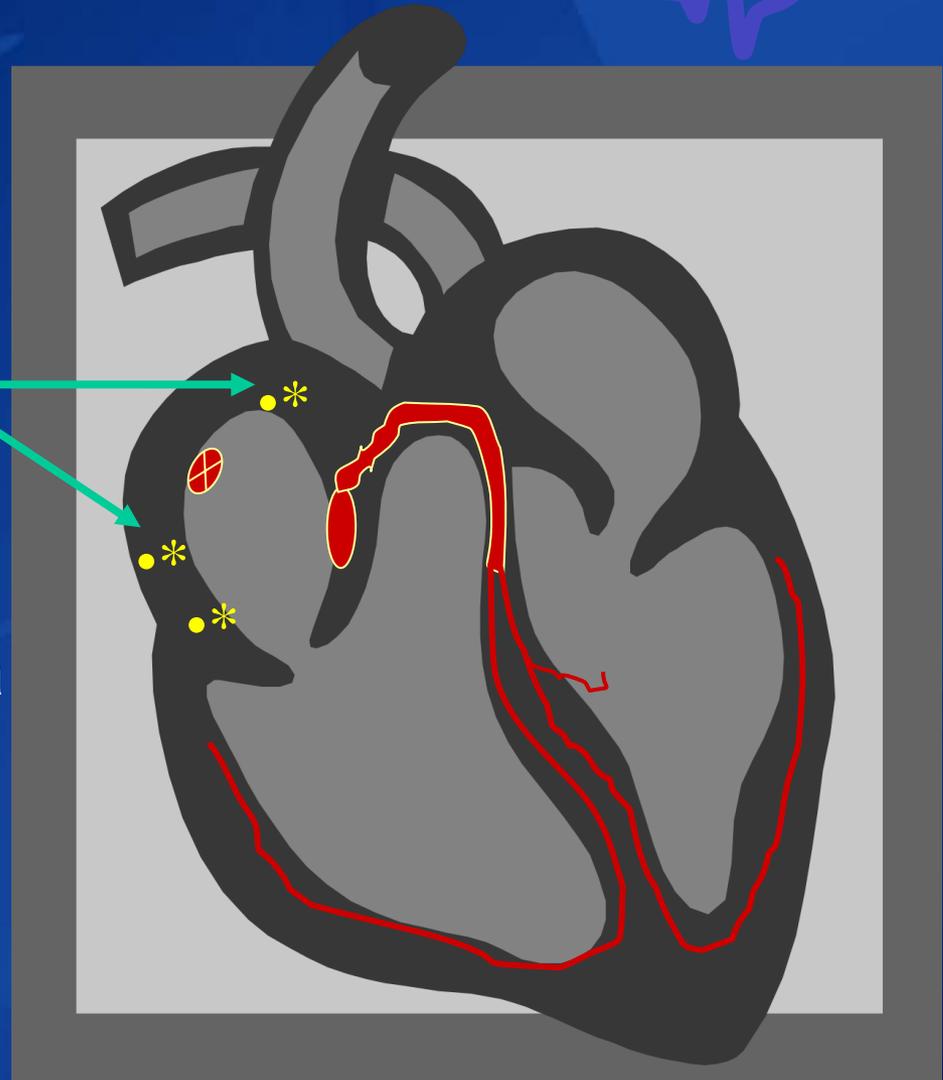
Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
Usually <60 bpm	Irregular	Multiple forms	Variable	<.12

Wandering Atrial Pacemaker :

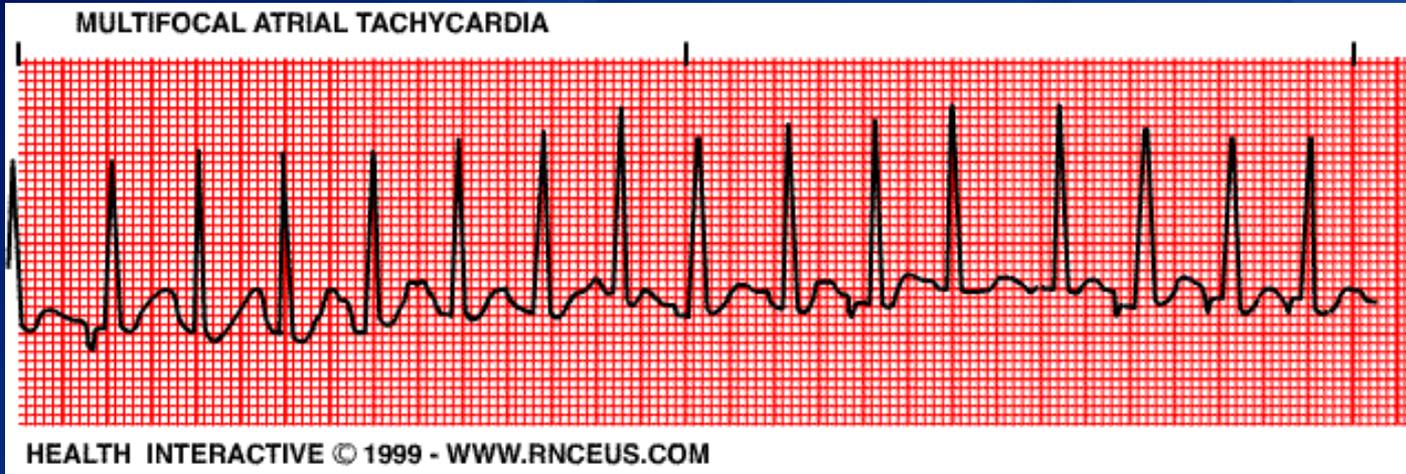
- Atrial pacemakers

- Different pacemakers fire in a row.

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

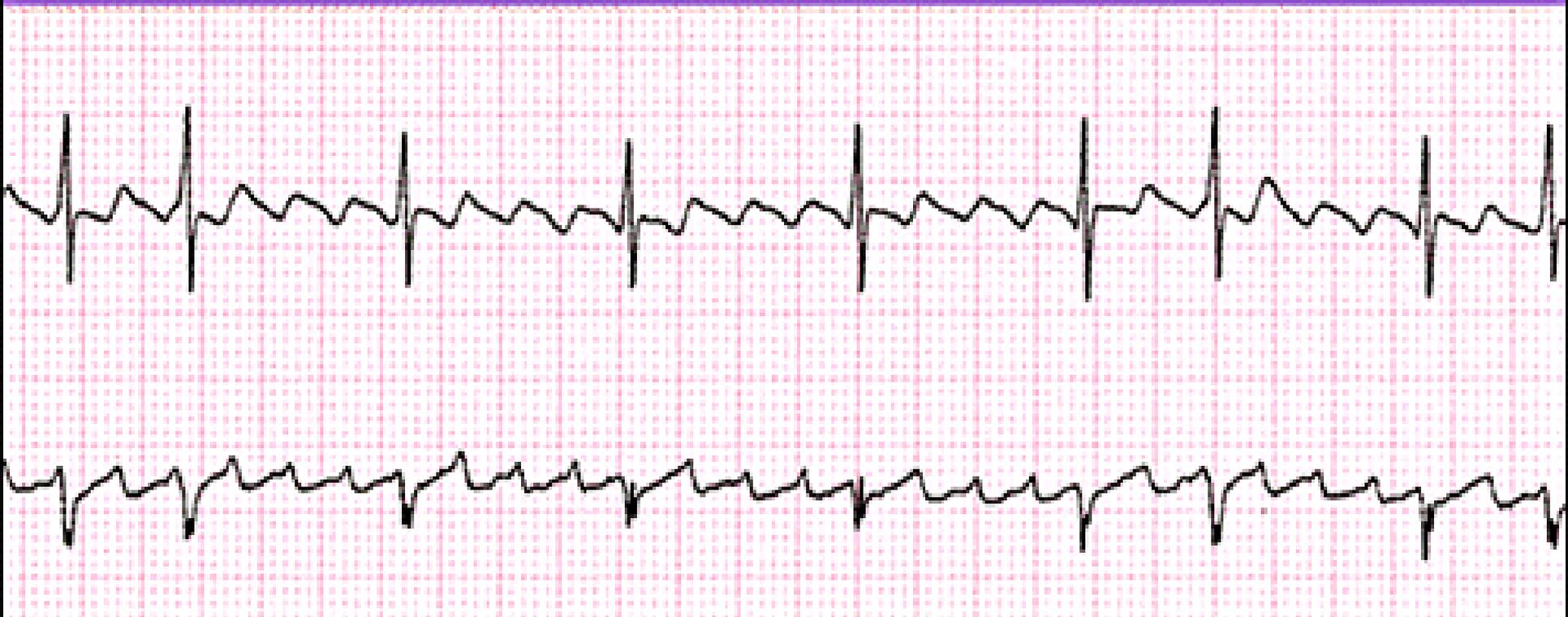


Multifocal Atrial Tachycardia



- 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

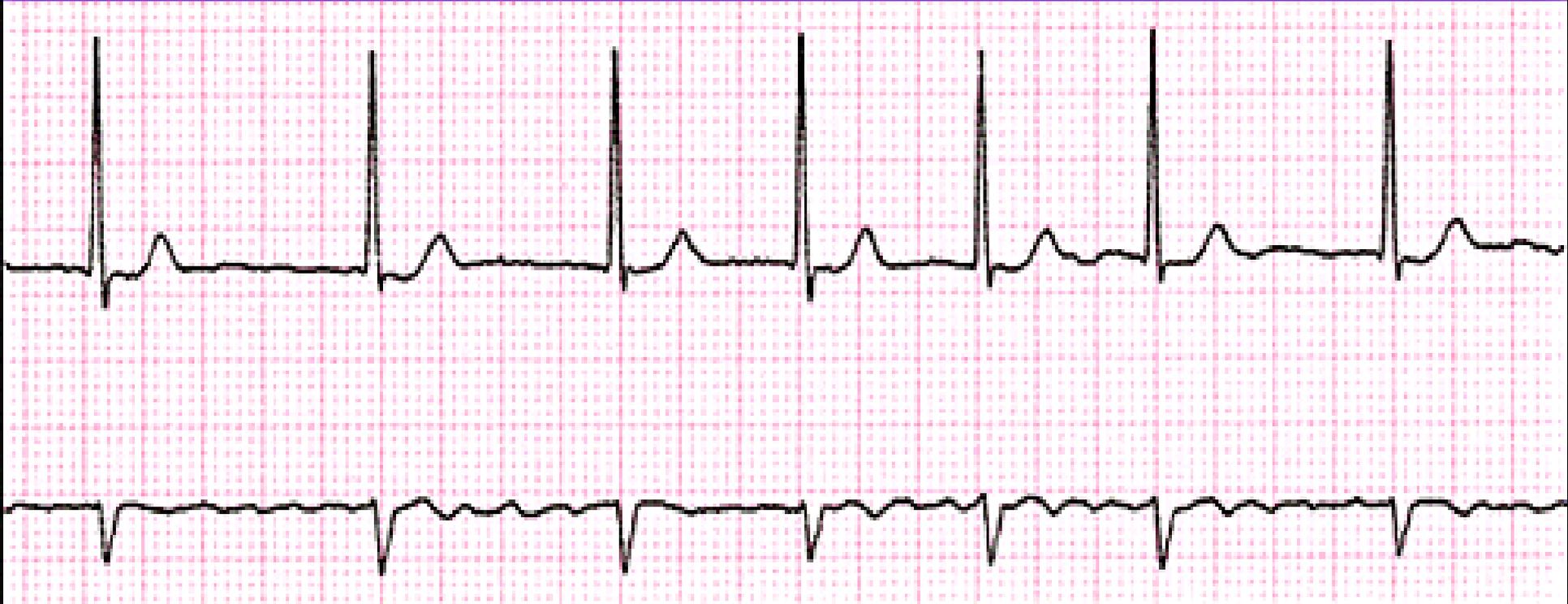
Atrial Flutter vs. Atrial Fibrillation



•Summary of Disease Characteristics

	•Atrial Flutter	•Atrial Fibrillation
•Atrial Rate	• 250 to 350 BPM	• ≥ 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

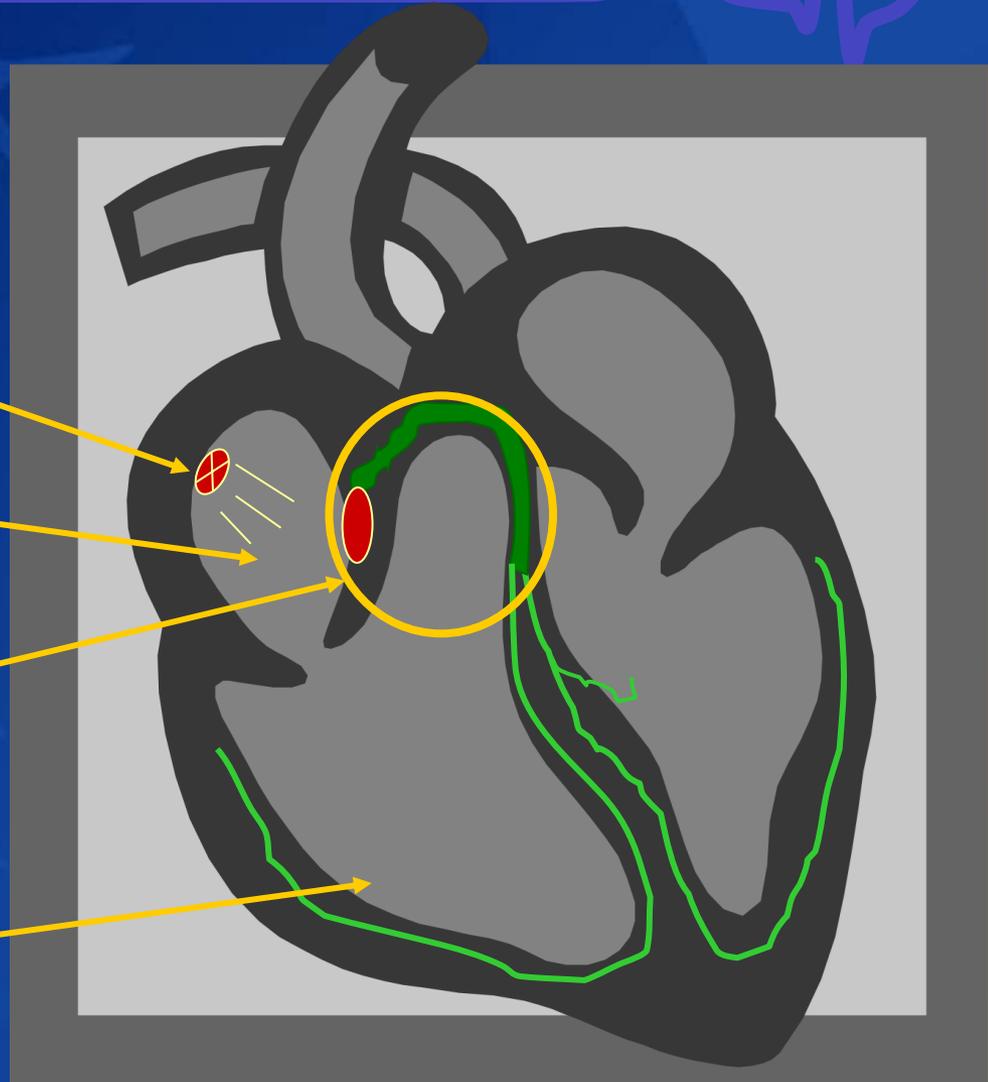
Atrial Fibrillation



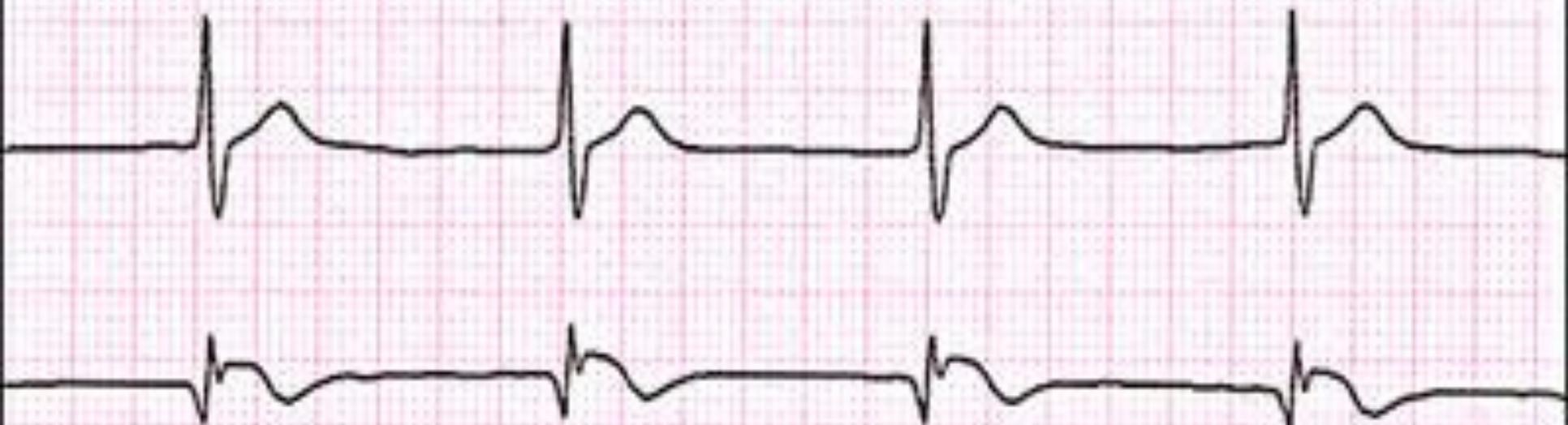
Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
A: 350-650 bpm V: Slow to rapid	Irregular	Fibrillatory (fine to coarse)	N/A	<.12

Junctional Arrhythmia & AV Blocks

- Sinus
- Atrial
- **Junctiona**
|
- Ventricula
r



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

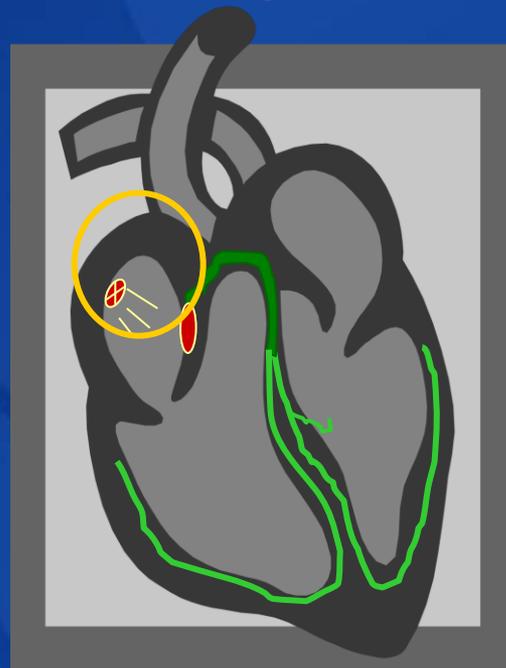


- Junctional

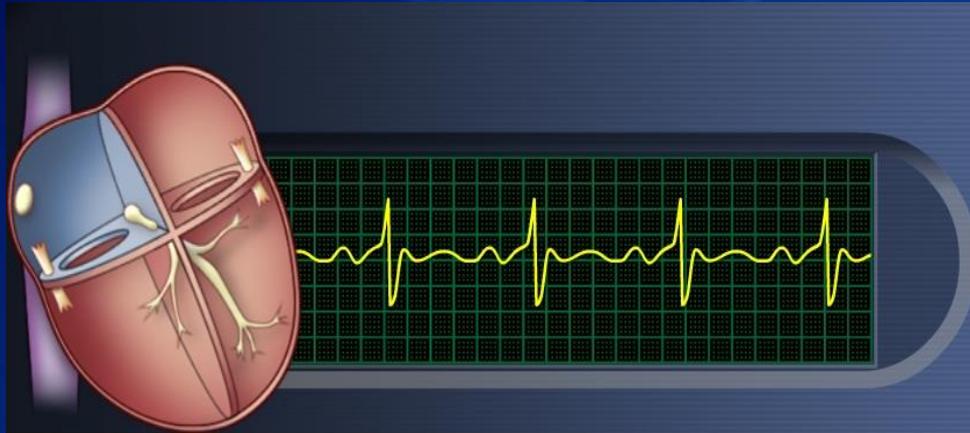
- PR Interval will be less than normal



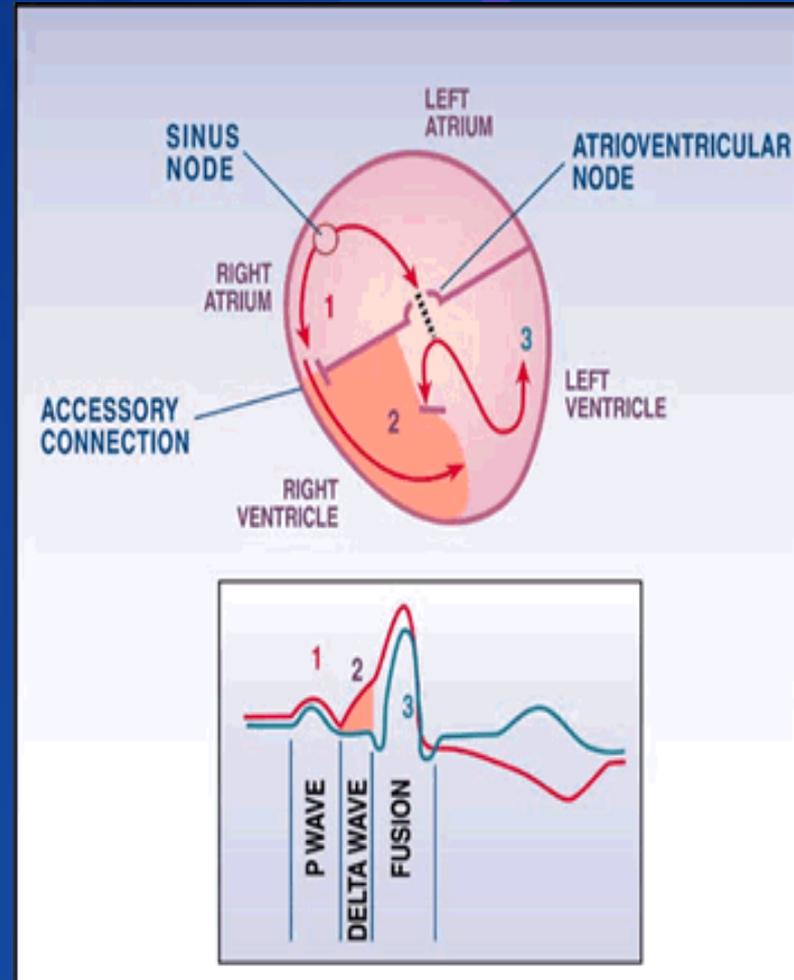
- Or... There will be no P Wave

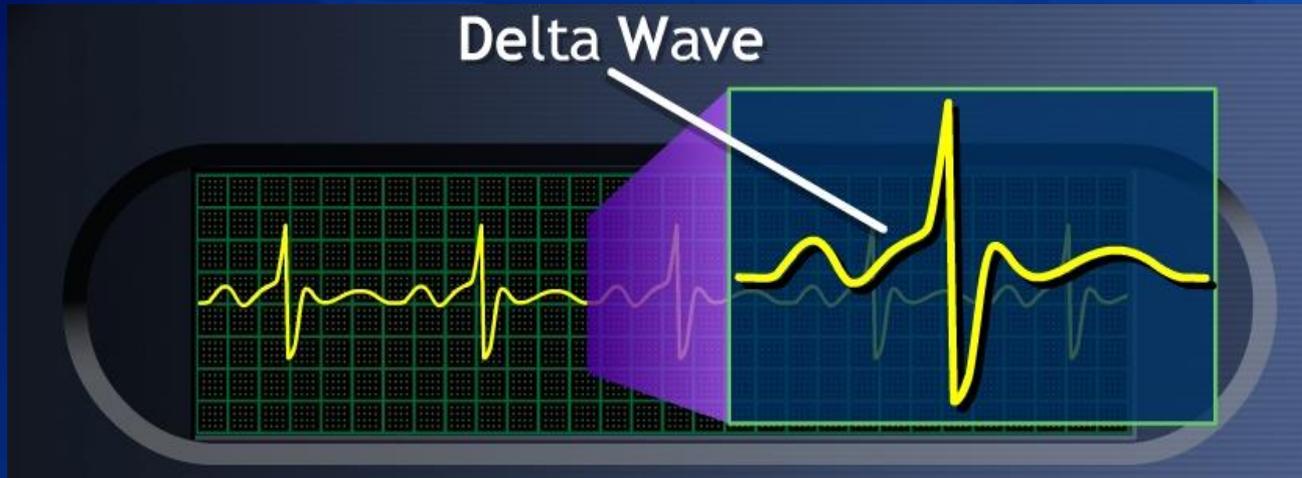


Wolff-Parkinson-White



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

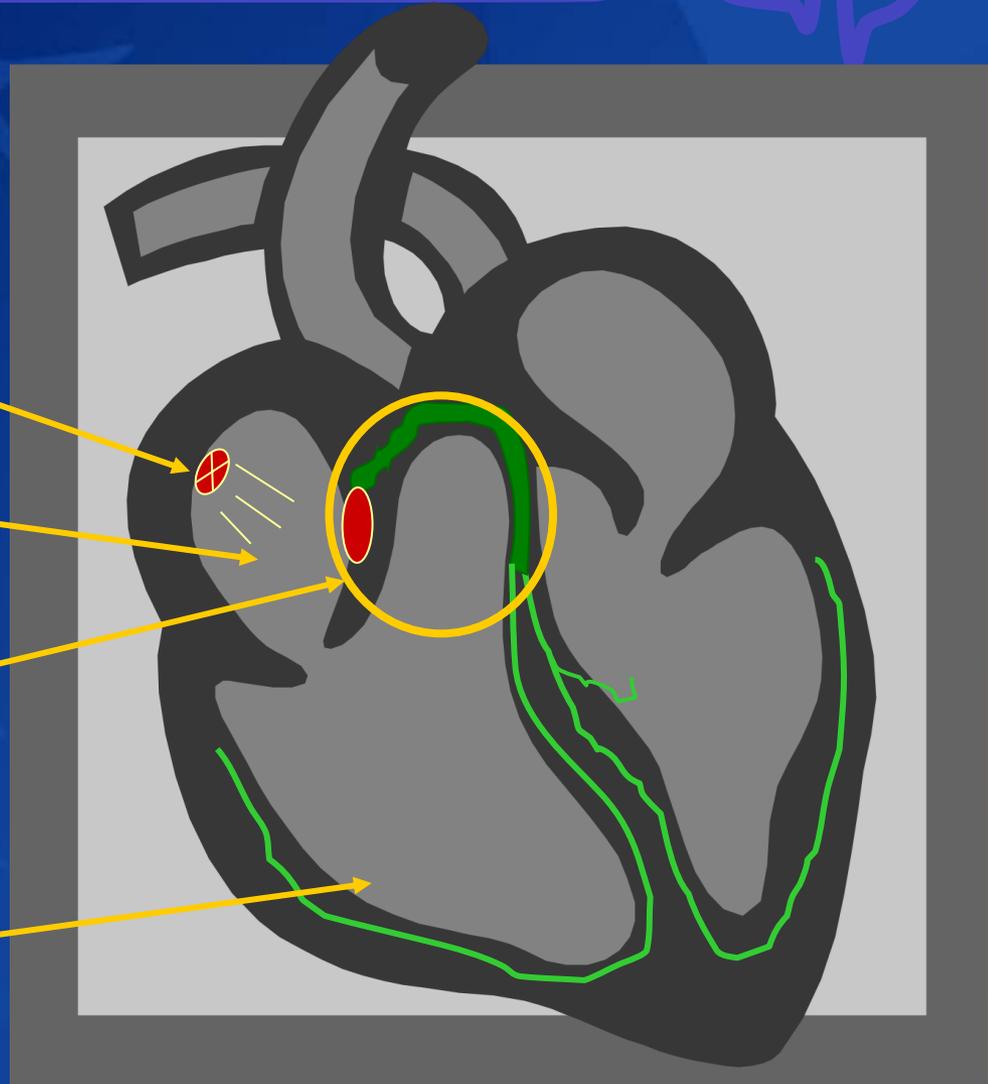




- **Origin:** Outside the AV Node
- **Mechanism:** Reentry
- **Rate:** 180-260 BPM – can be faster
- **Characteristics:** Short PR Interval (≤ 120 ms), wide QRS (≥ 110 ms), obvious delta wave

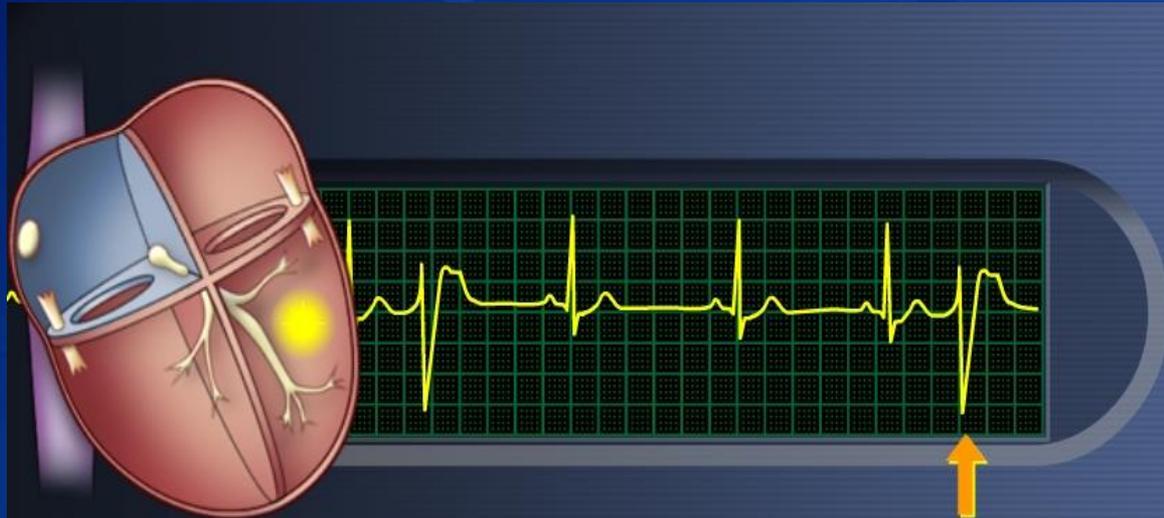
Ventricular Arrhythmia

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



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)

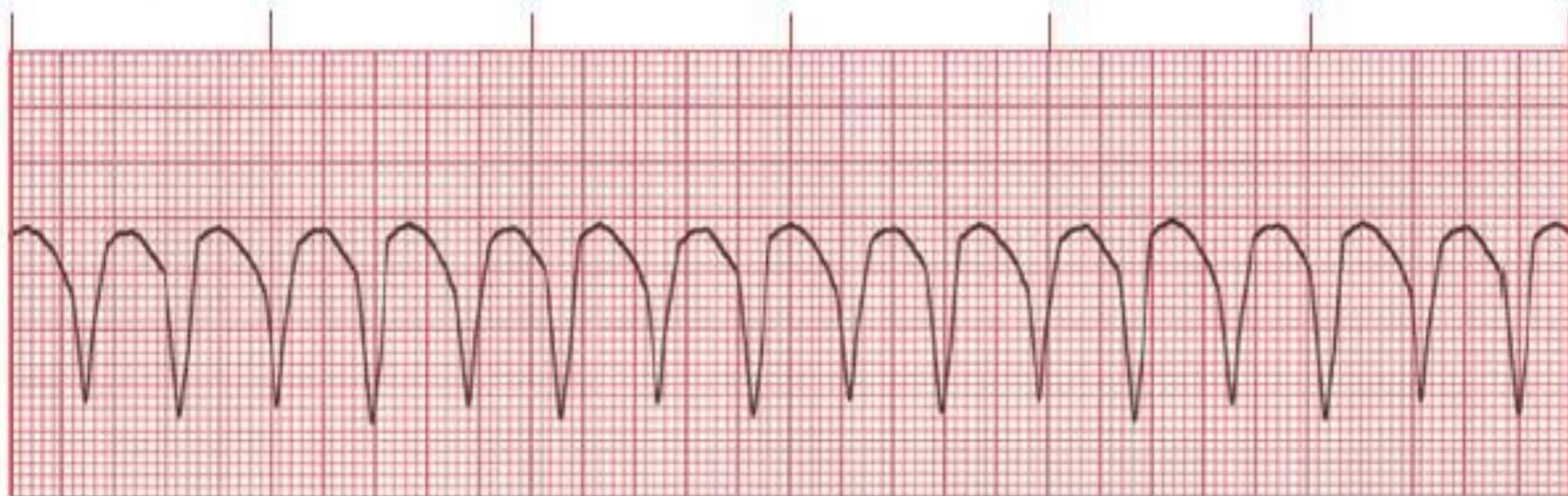


Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
<100	Regular	Absent or not related	N/A	$\geq .12$

درمان vt-vf شوک دفیبریله 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

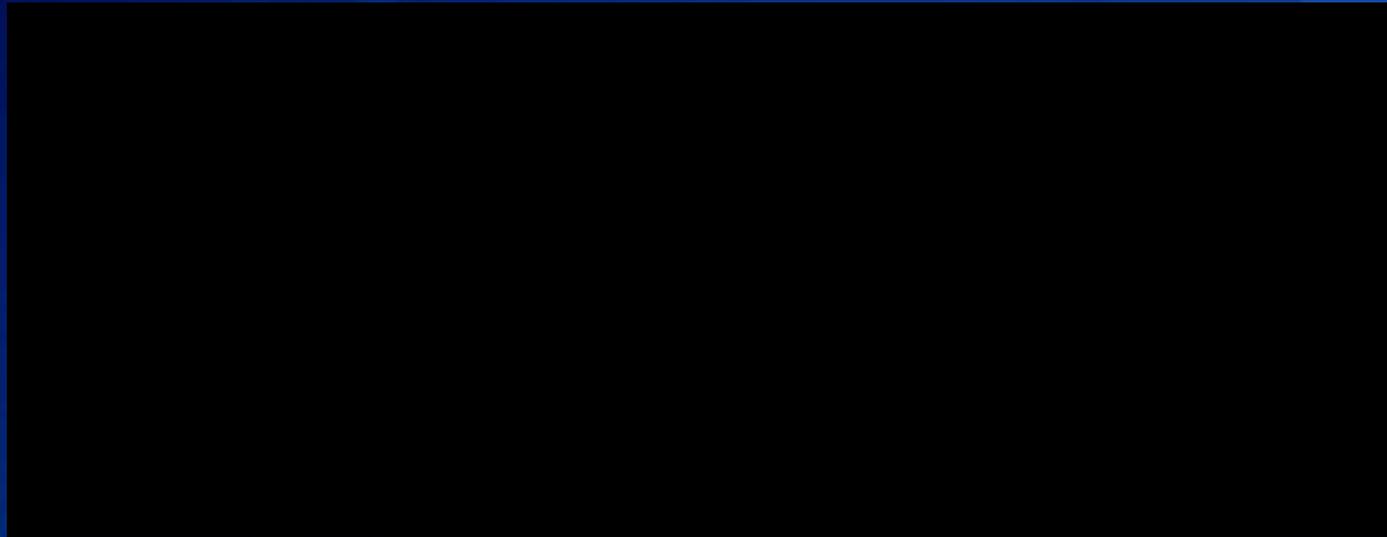
PR Interval: None

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.

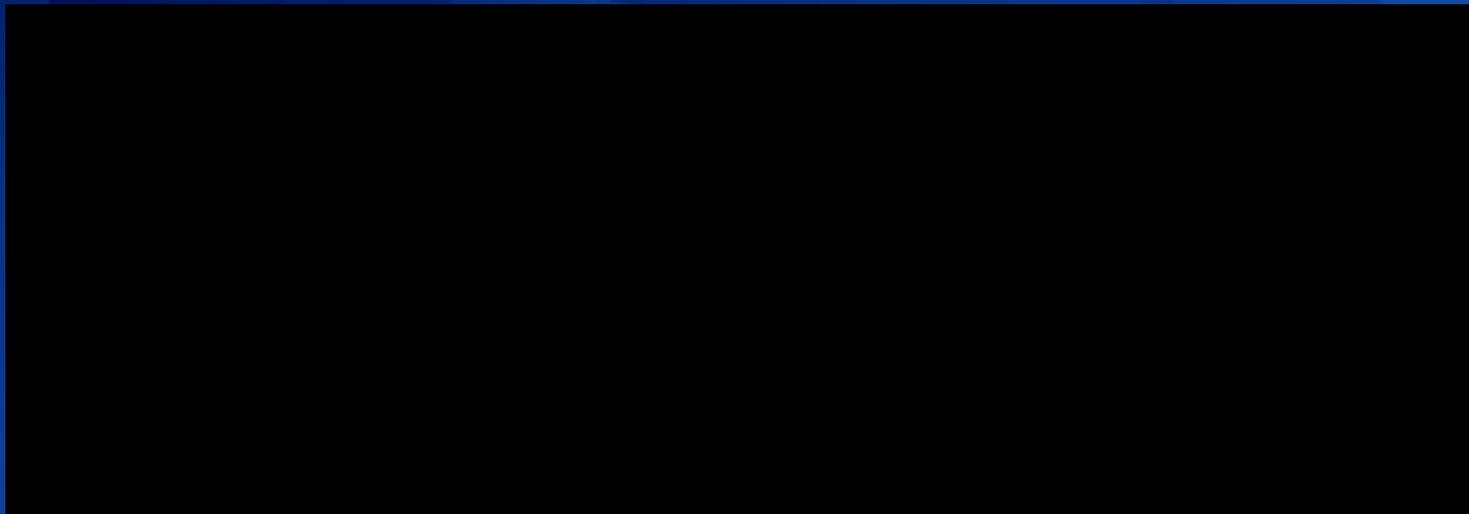
♥ **Clinical Tip:** Monomorphic VT will probably deteriorate into VF or unstable VT if sustained and not treated.

Monomorphic VT

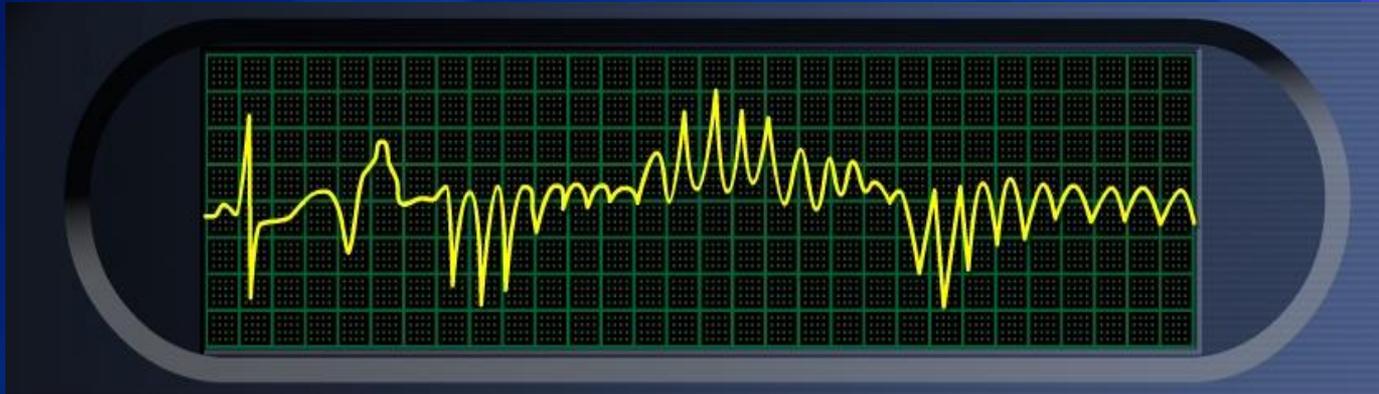


- **Origin:** **Ventricles (Single Focus)**
- **Mechanism:** **Reentry Initiated by abnormal activity**
Automaticity or Triggered
- **Characteristics:** **Rapid, wide, and regular QRS**

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

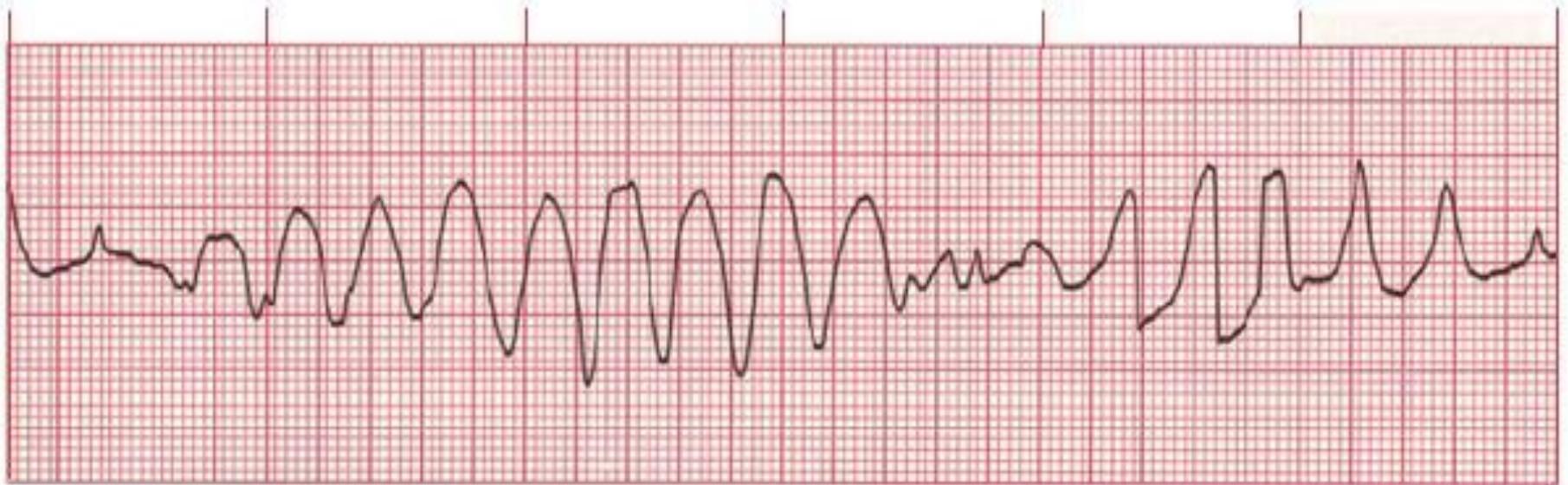
Torsades de Pointes



- **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

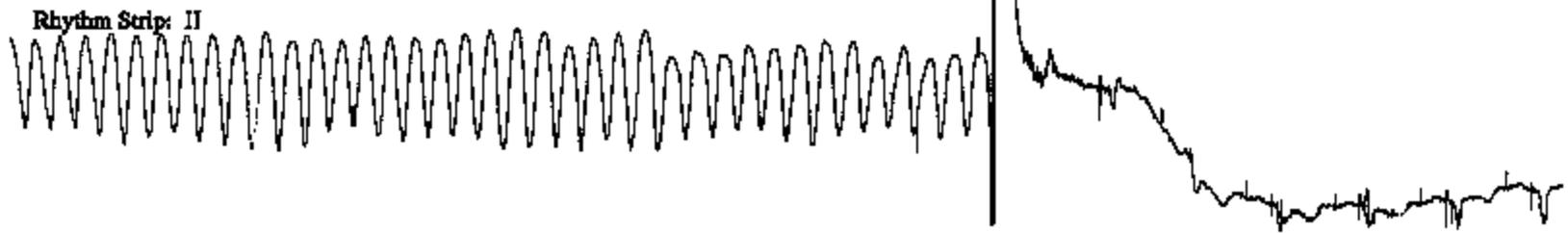
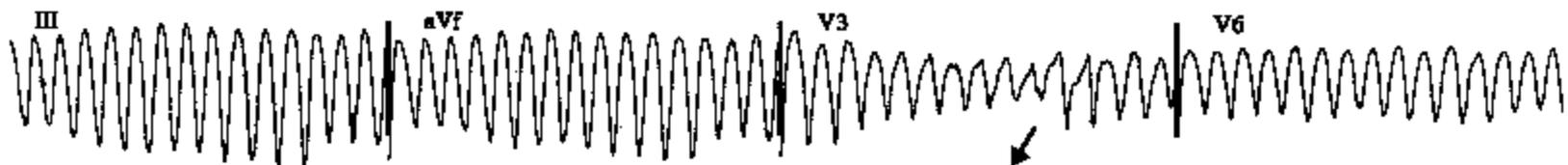
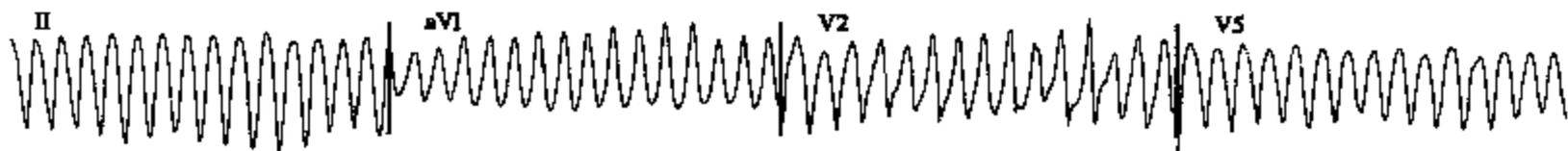
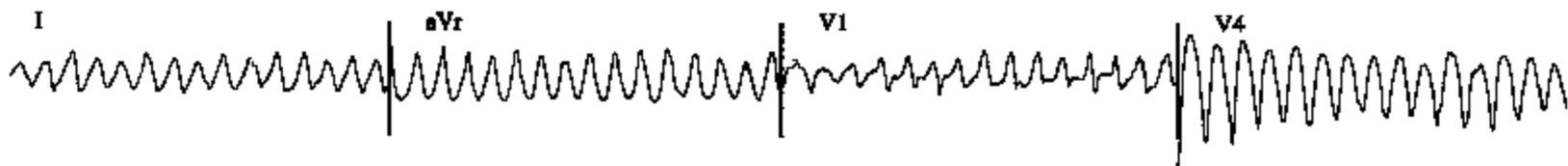
Rhythm: Chaotic

P Waves: None

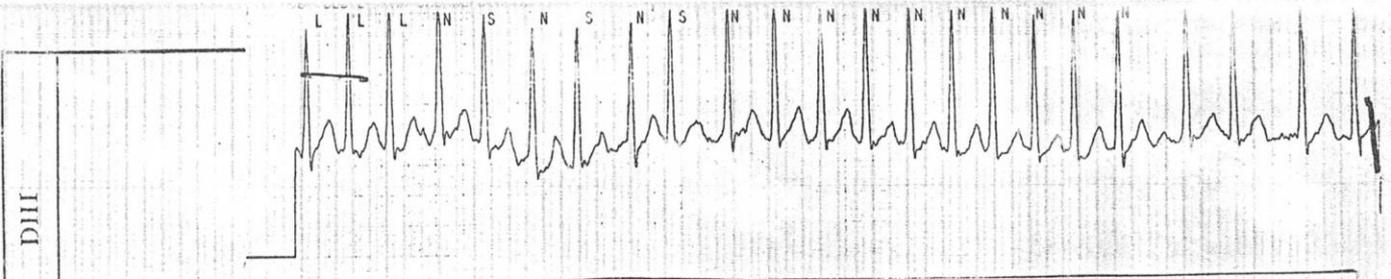
PR Interval: None

QRS: None

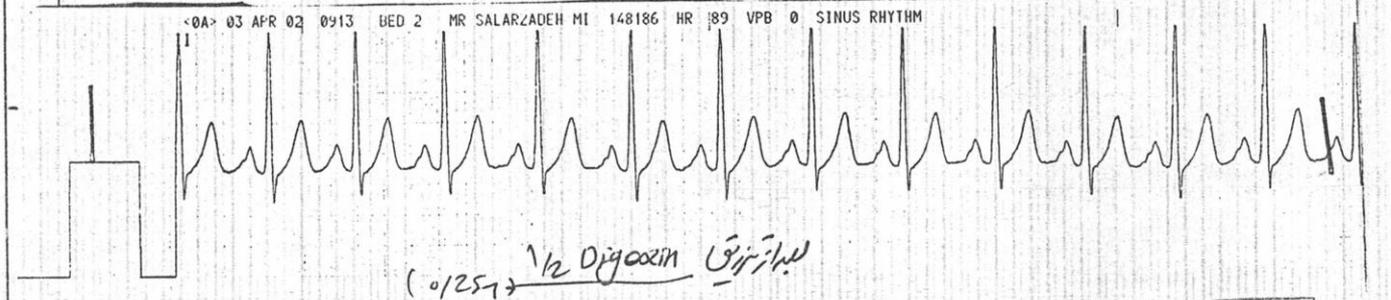
♥ **Clinical Tip:** There is no pulse or cardiac output. Rapid intervention is critical. The longer the delay, the less the chance of conversion.



وزارت بهداشت درمان و آموزش پزشکی
دانشگاه علوم پزشکی و خدمات
بیمارستانی خاتم الانبیا

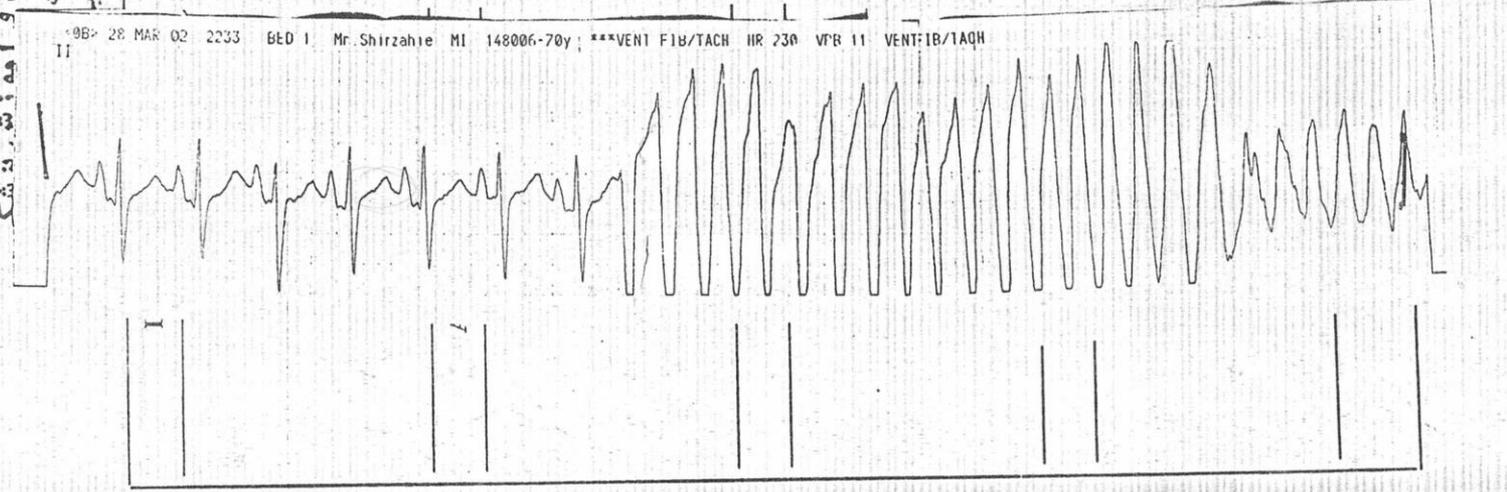


<0A> 03 APR 02 0913 BED 2 MR SALARZADEH MI 148186 HR 89 VPB 0 SINUS RHYTHM

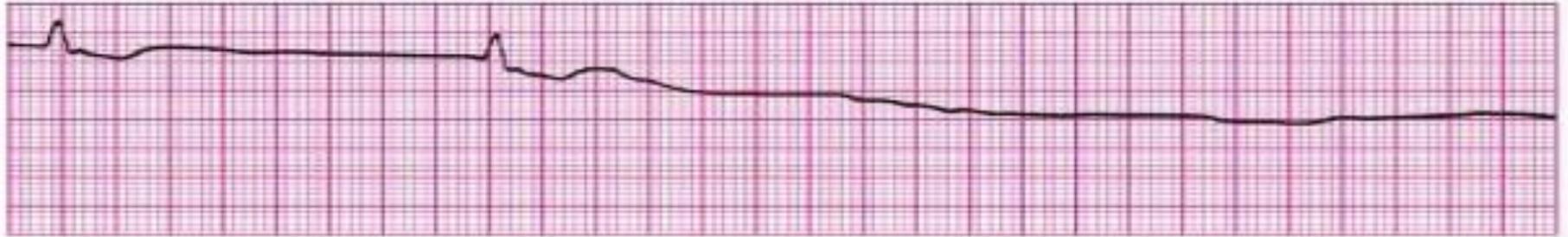


بیمار شریقی ۱/۲ دیگوکسین
(۰/۲۵۶)

09B> 28 MAR 02 2233 BED 1 Mr. Shirzahie MI 148006-70y ; ***VENT FIB/TACH HR 230 VPR 11 VENT:IB/TAQH



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 اسپیتول ماساژ قلبی است.
شوک 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



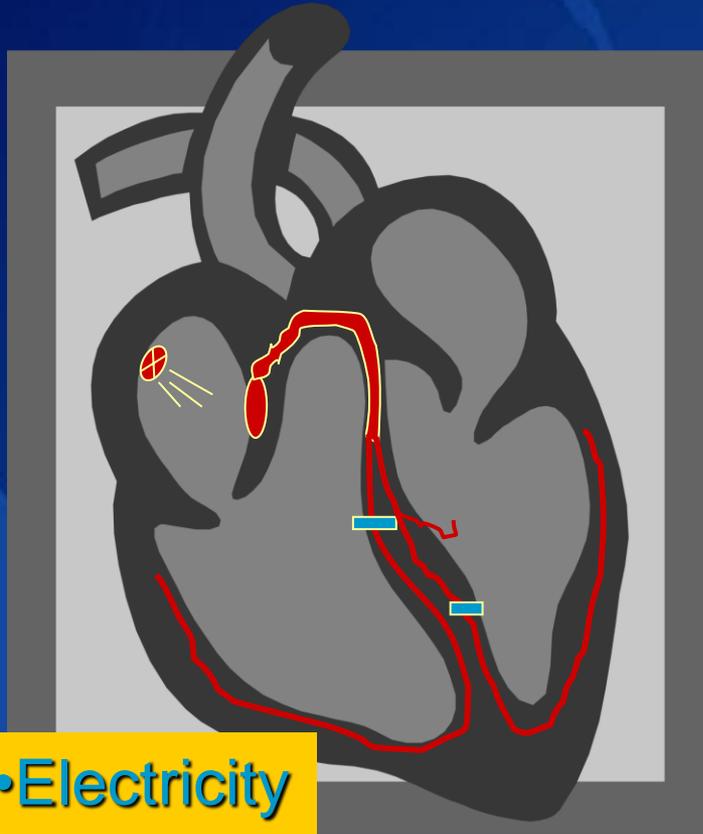
You can have QRS's without pacer spikes, but you cannot have pacer spikes without a QRS following it!

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



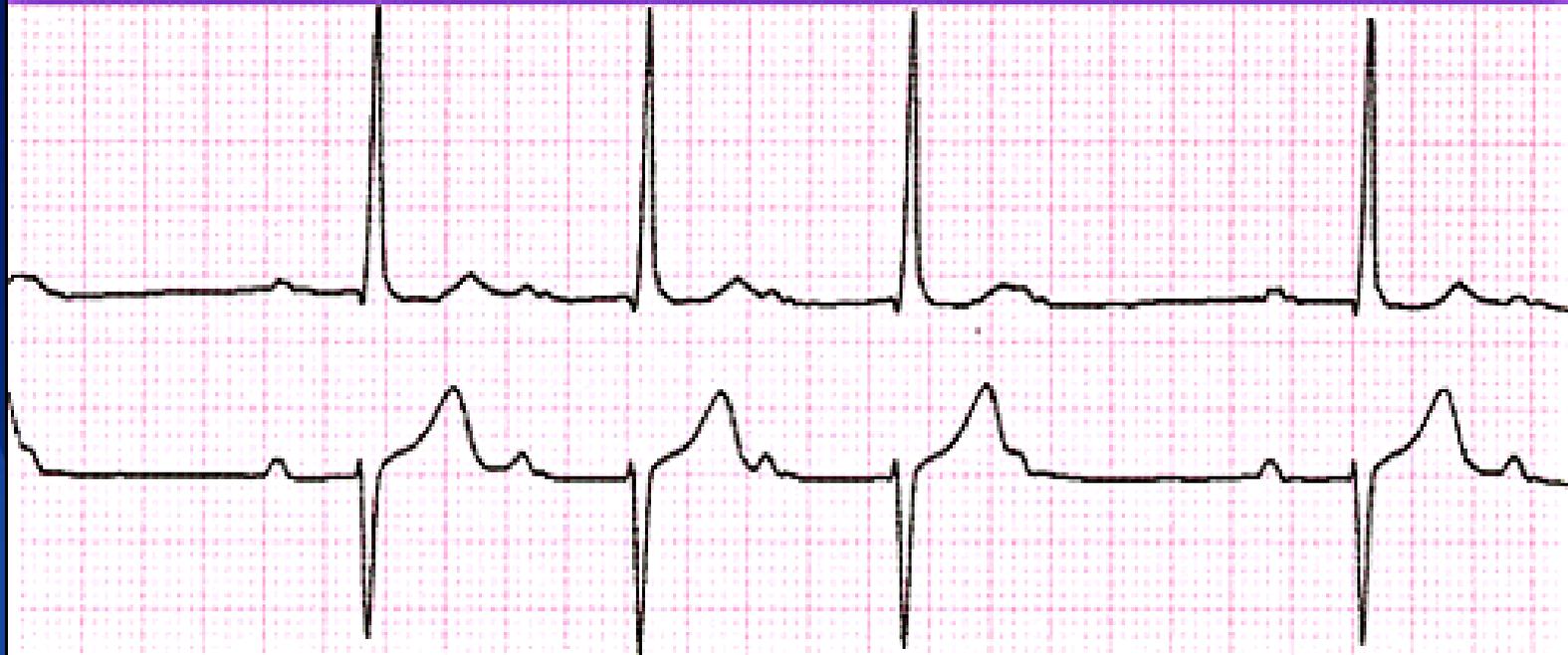
•Electricity
!



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 intermittent	Increasingly Prolonged	<.12	QRS dropped in a repeating pattern

2nd degree - Mobitz II

PR interval consistent except some QRS missing

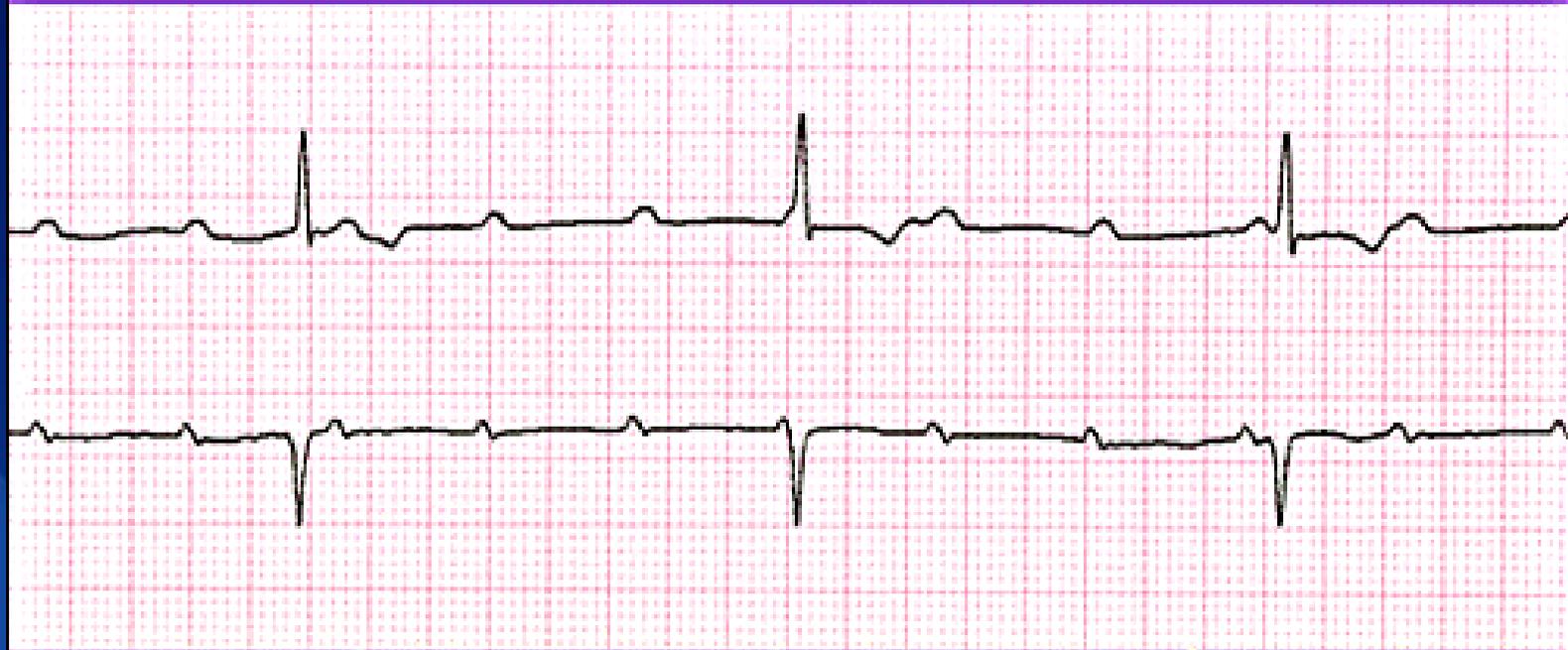


- Note: Ratio can be 3:1, 4:1, etc. The higher the ratio, the “sicker” the heart. (Ratio is P:QRS)

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

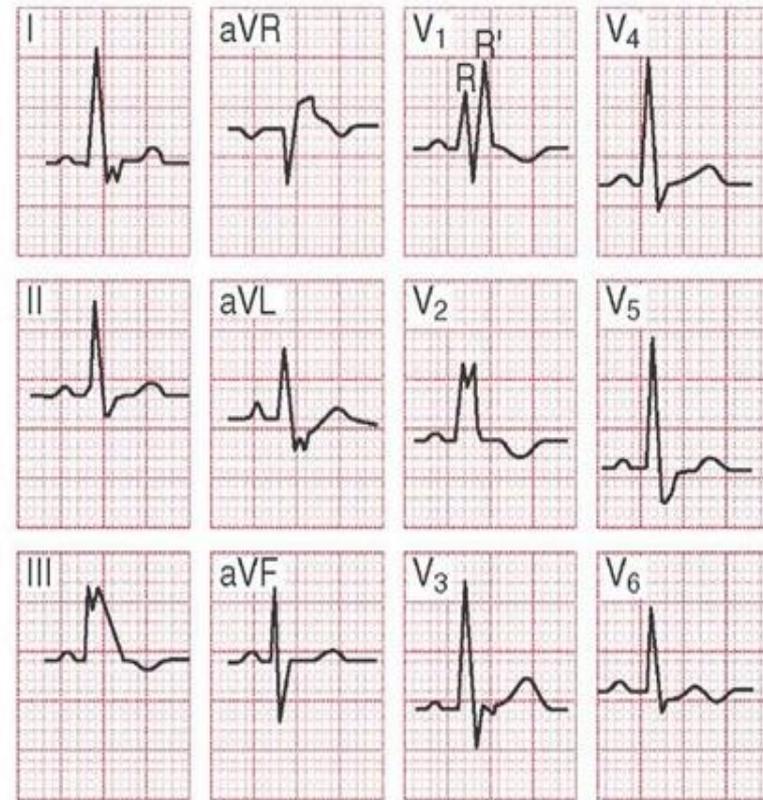
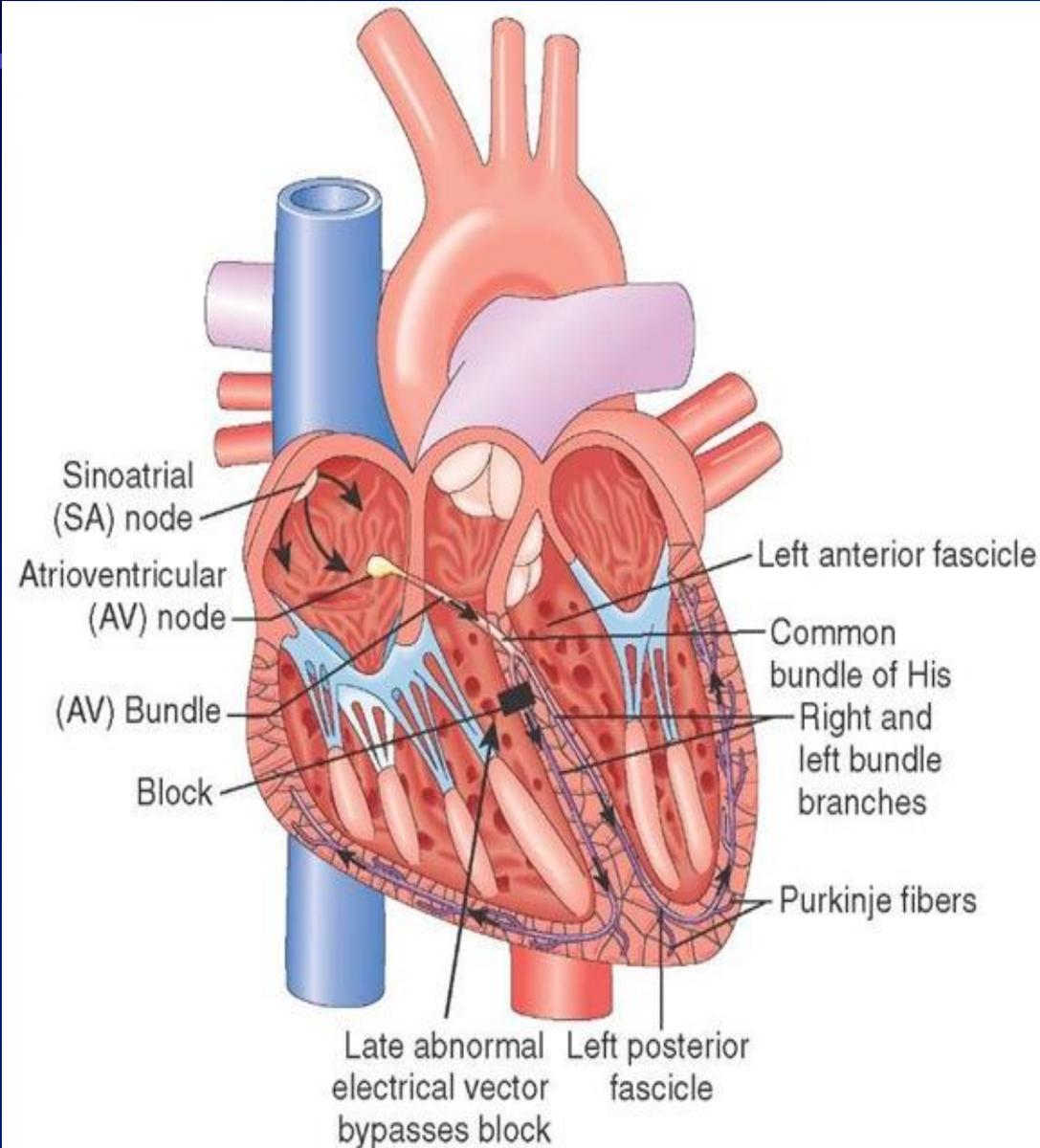
Heart Block Review



	Other Name	PR Interval	Characteristic
1 st ° AV Block		Same	PR Interval > .20
2 nd ° AV Block	Wenkebach or Mobitz I	Different	PR Interval gets longer until 1 is dropped
2 nd ° 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 rd ° 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

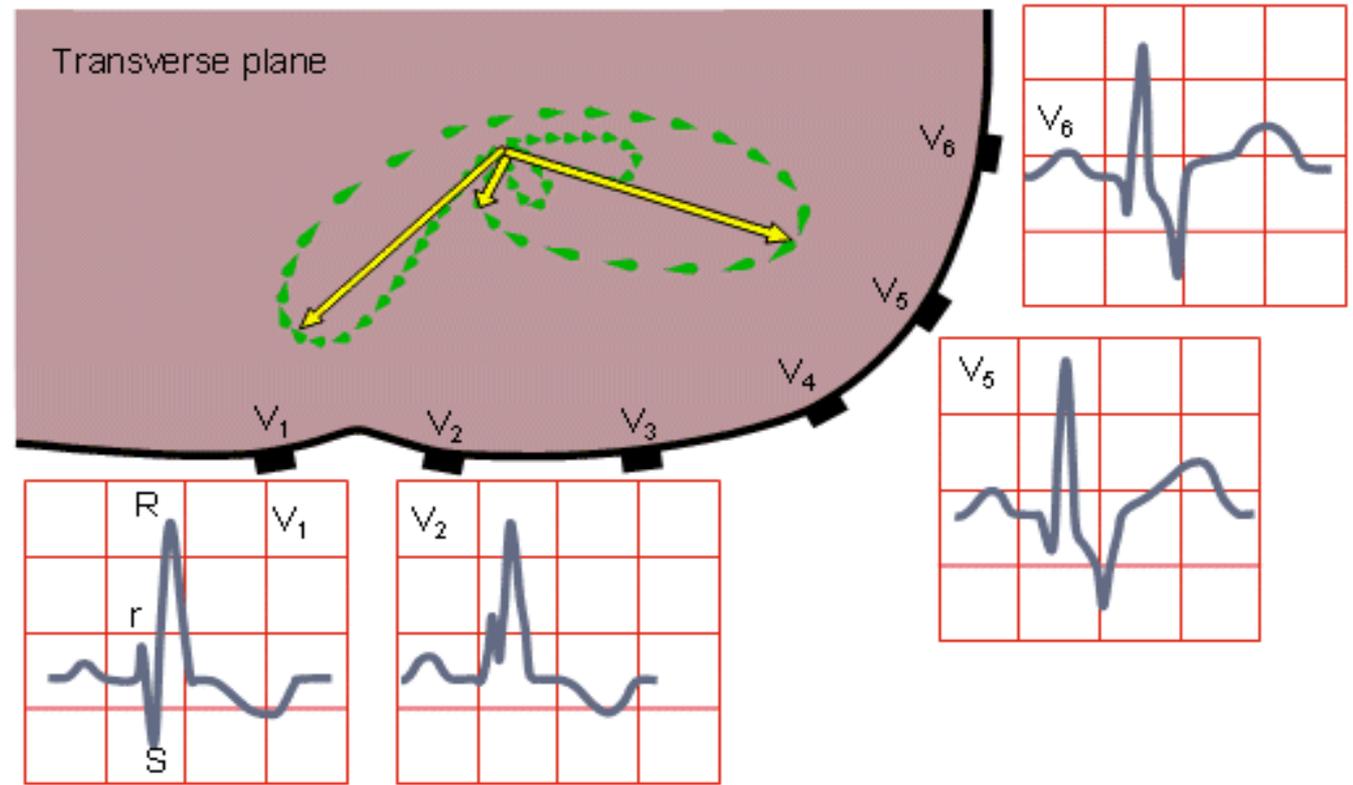
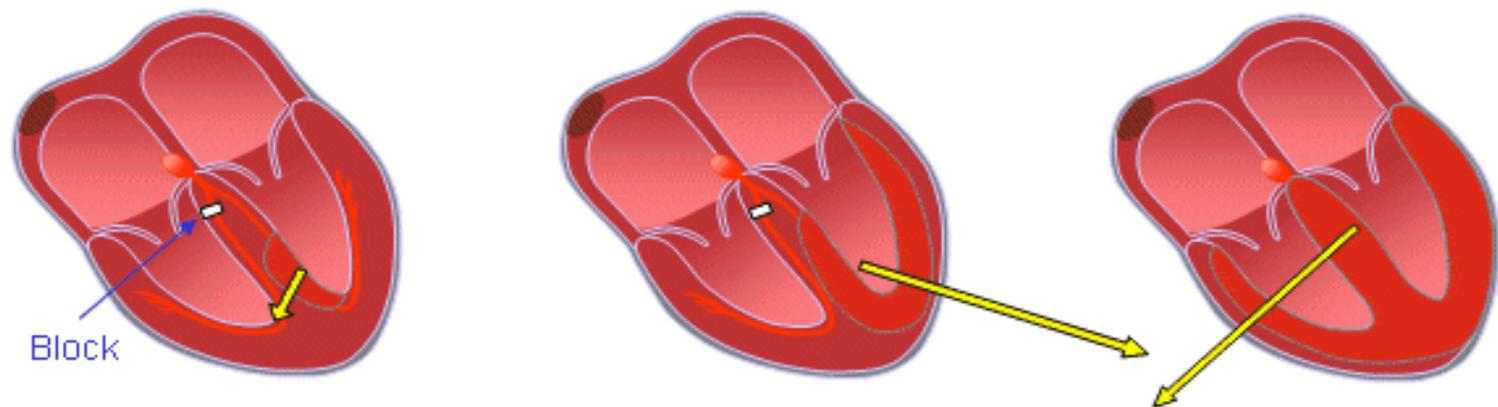
Right Bundle Branch Block



Total QRS complex prolonged (≥ 0.12 second).
Terminal broad S wave in lead I. RSR' complex in lead V₁

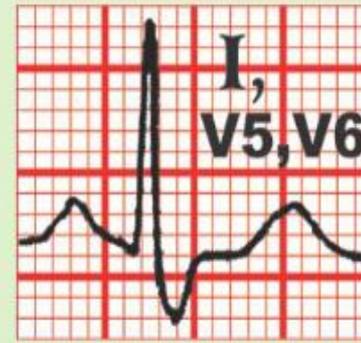
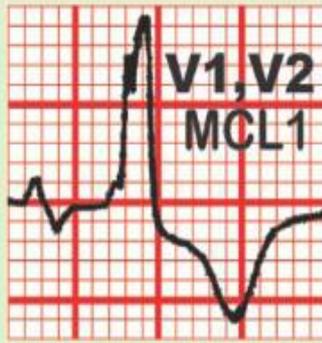
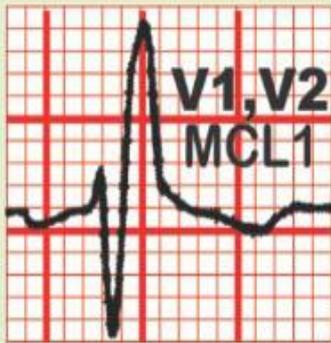
RIGHT BUNDLE-BRANCH BLOCK

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

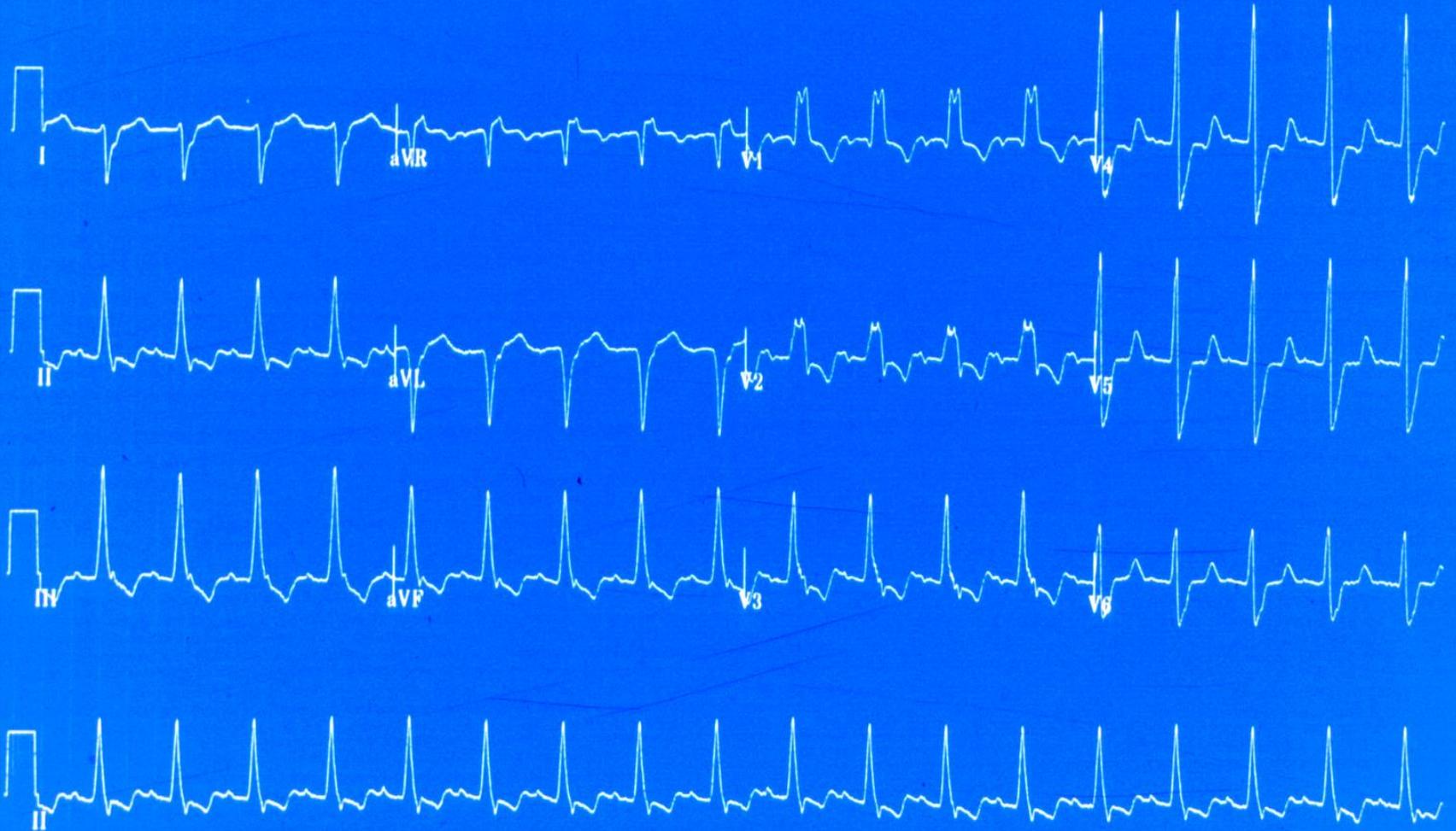


R دنداندار در لیدهای V1 و V2 و موج S بزرگ در لیدهای V5 و V6
نکته مهم: سندرم بروگادا و دیسپلازی آریتمی زای بطن راست یک نوع خاص
RBBB هستند که می توانند باعث مرگ ناگهانی قلبی در افراد جوان گردند.

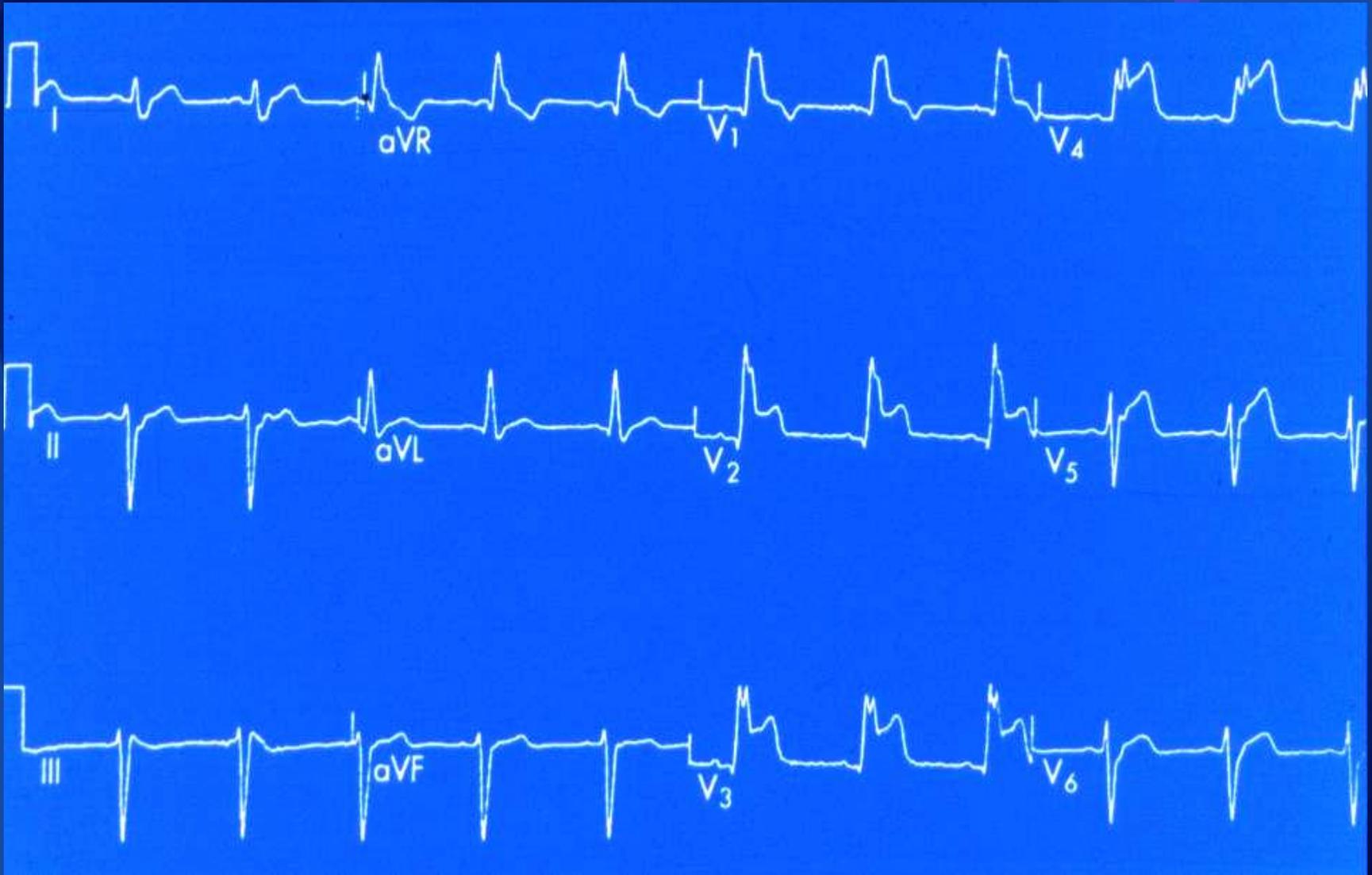
RBBB with Anteroseptal Ischemia

Referred by:

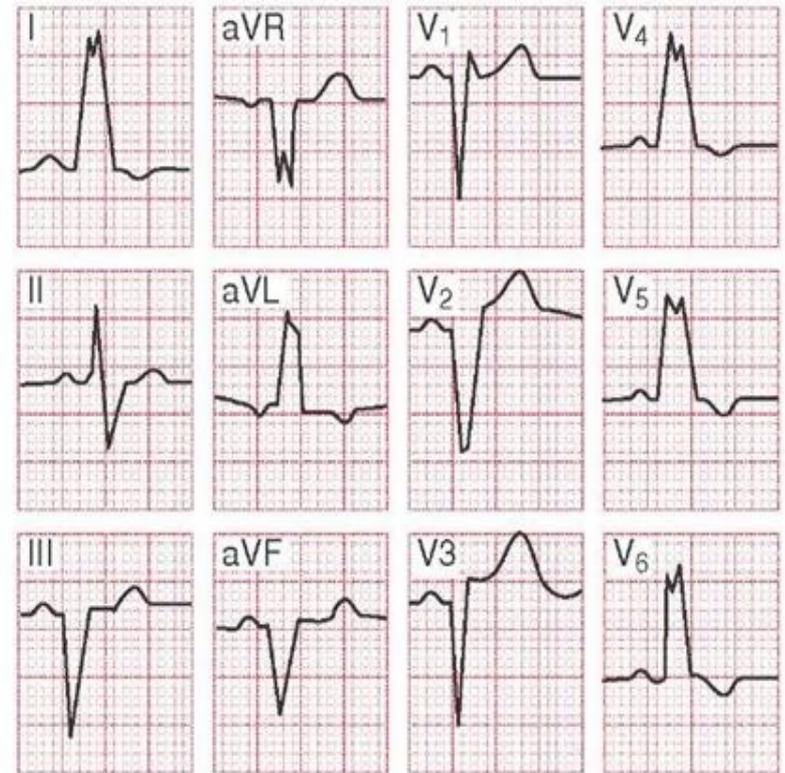
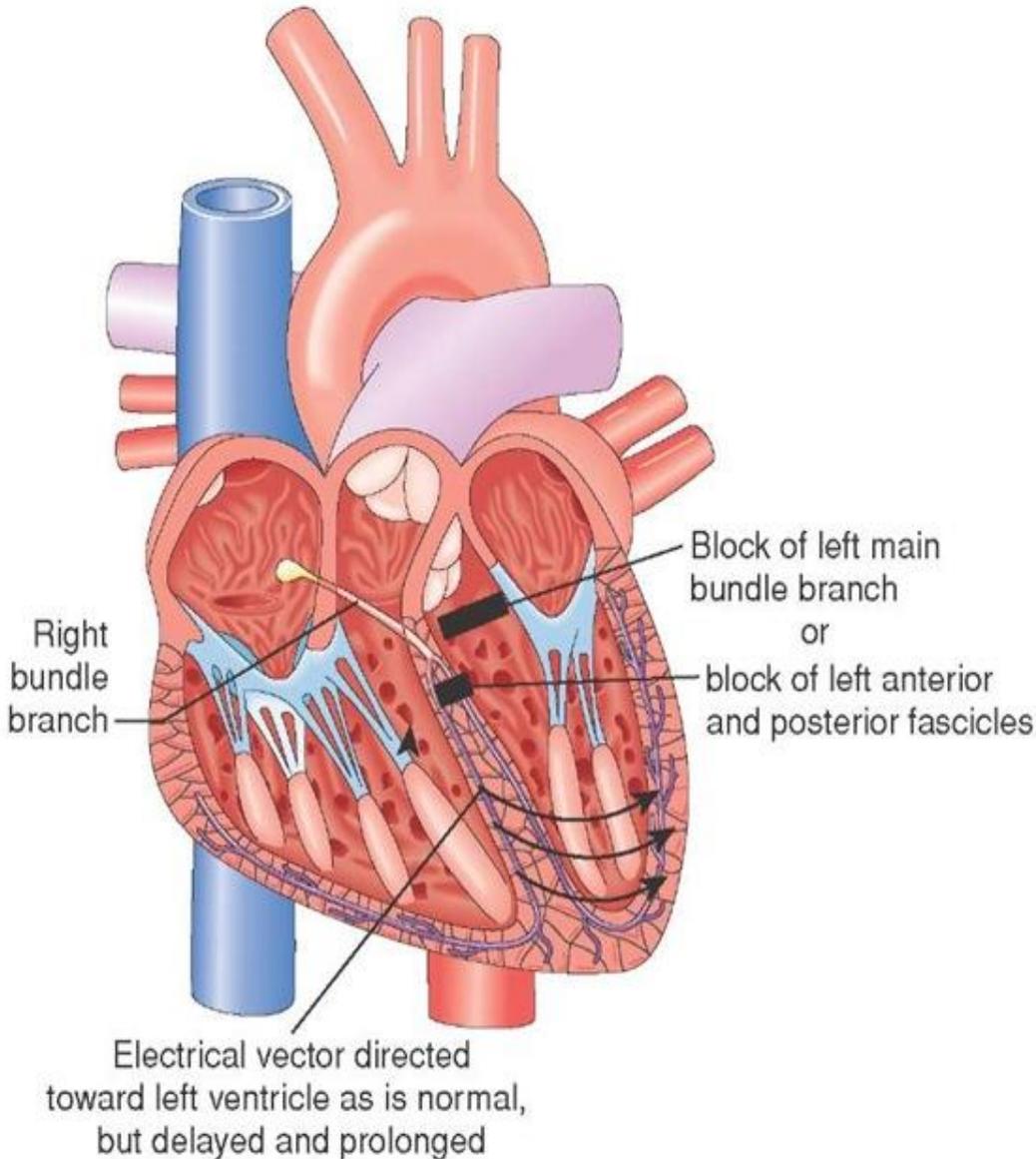
Unconfirmed



RBBB with Anteroseptal Infarction



Left Bundle Branch Block

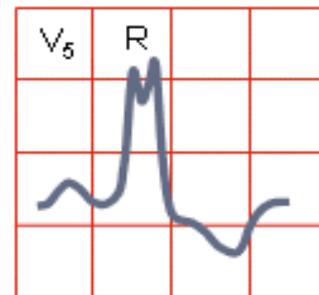
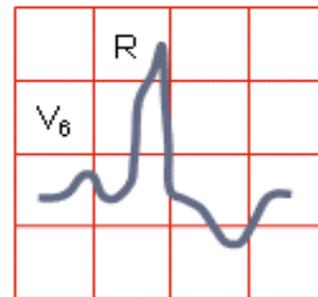
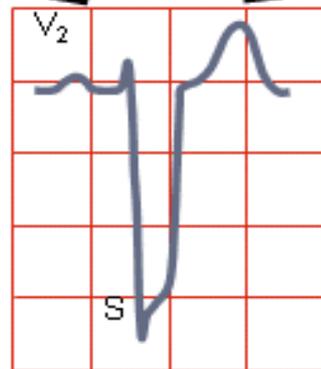
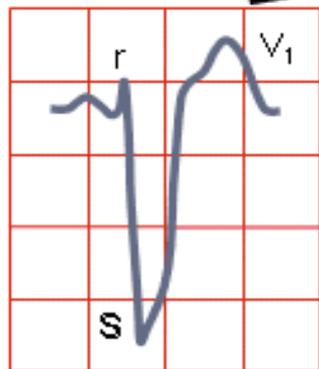
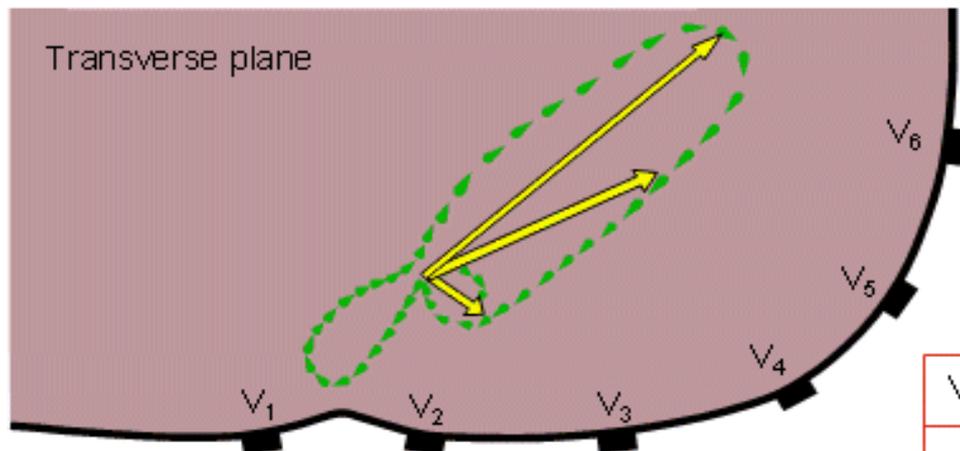
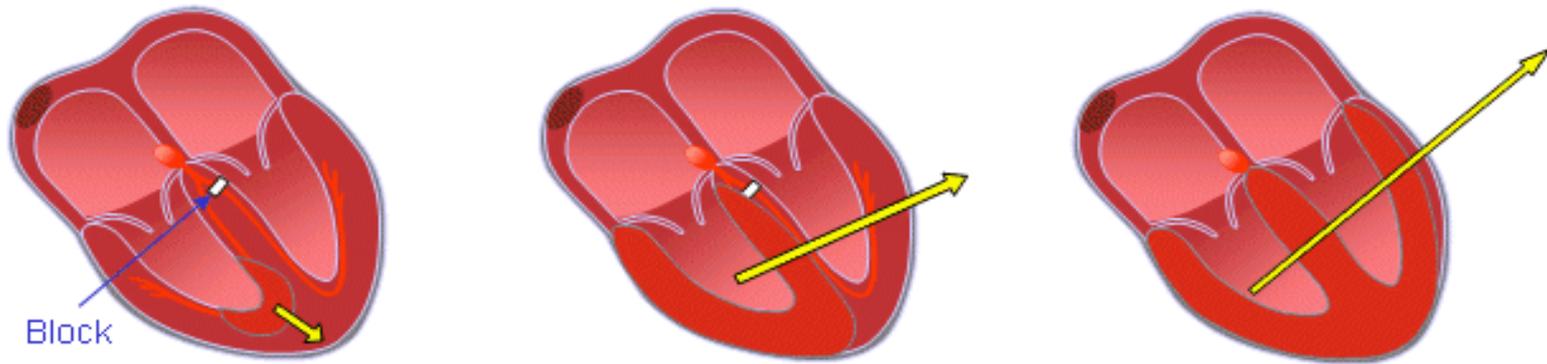


Wide QRS complex prolonged (≥ 0.12 second).
with ST depressions and inverted T waves,
particularly in leads I, aVL, V₅ and V₆

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

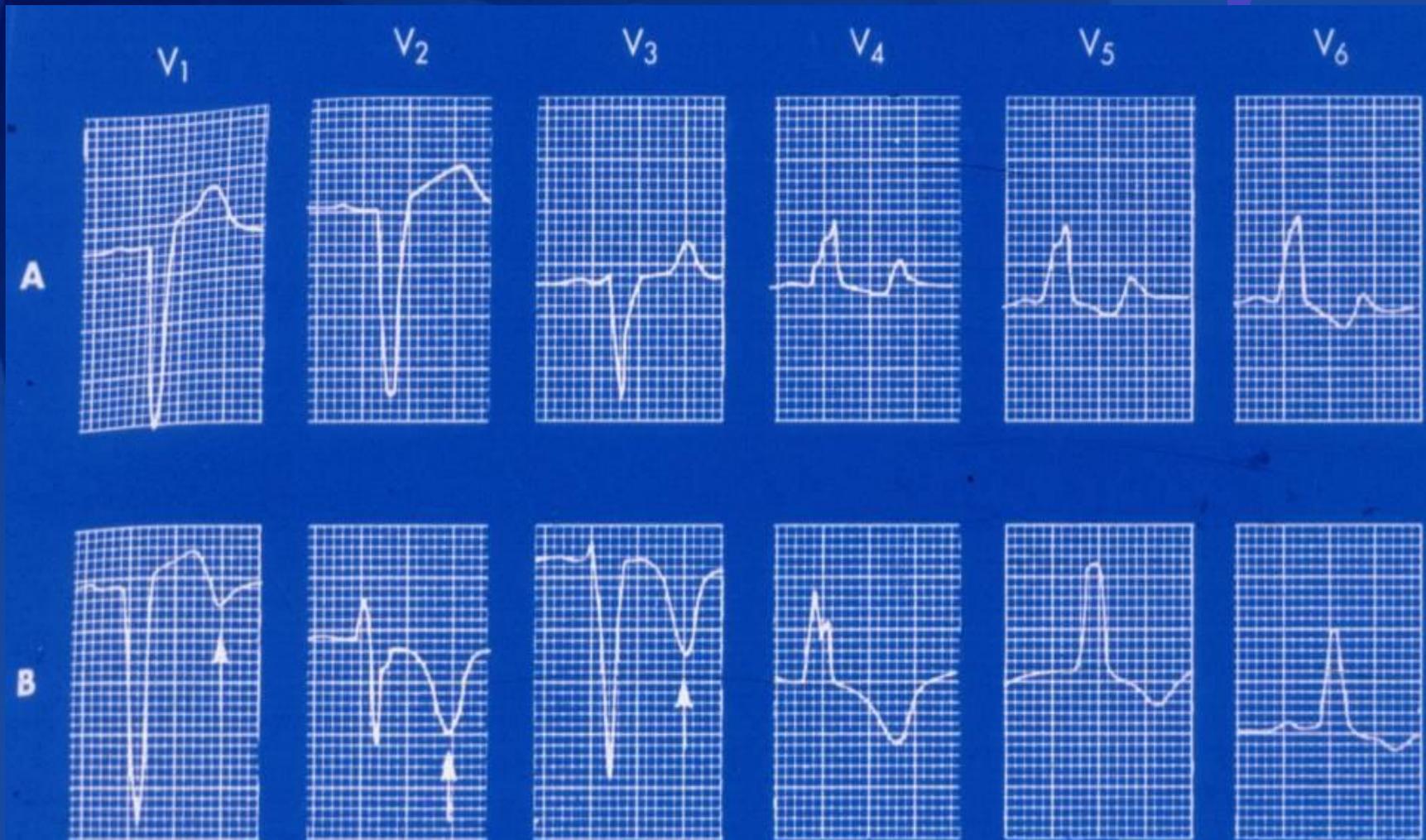
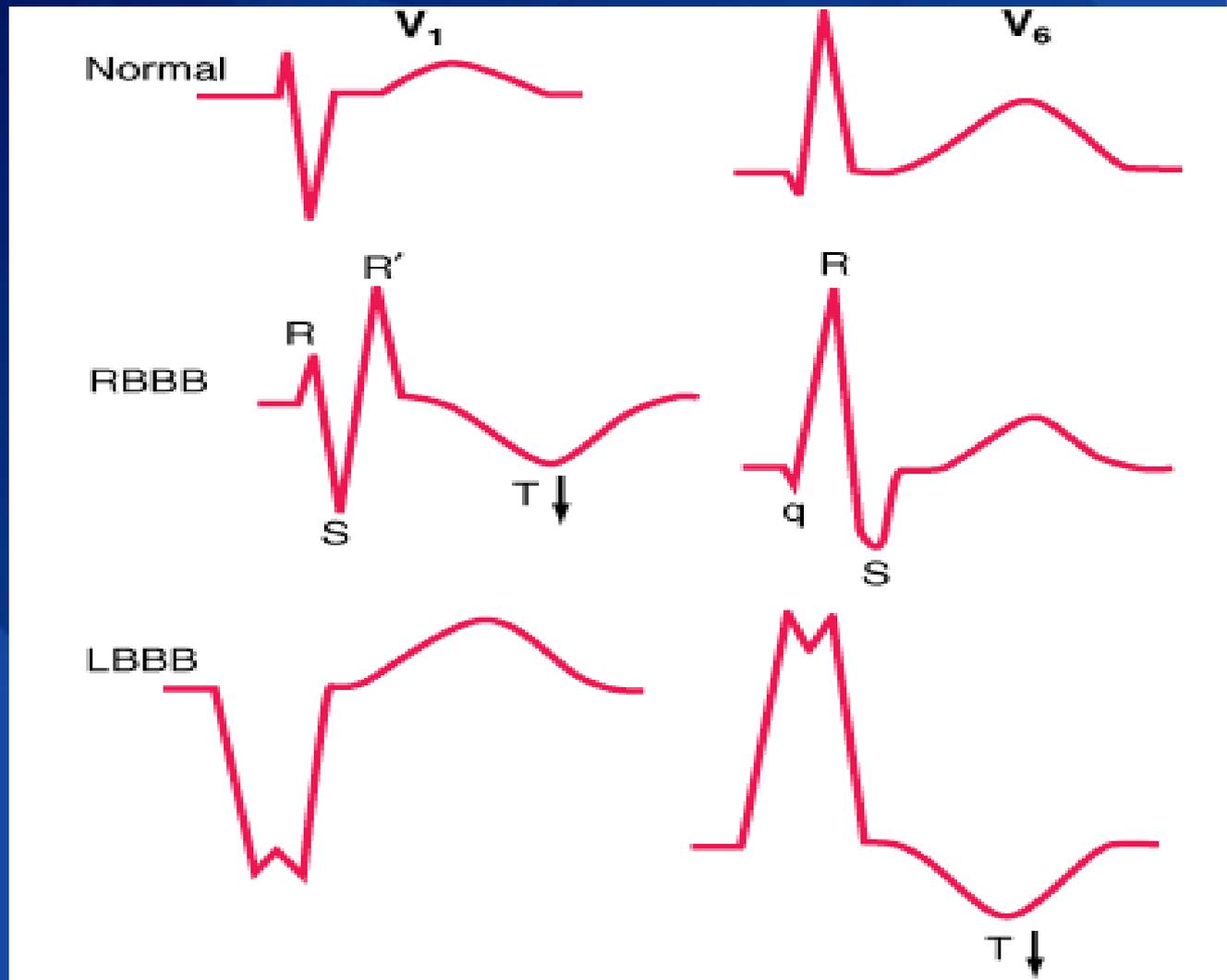


Fig. 8-21 A Typical left bundle branch block pattern. Notice the poor R wave progression in the right precordial leads

Typical QRS-T patterns in RBBB vs. LBBB



Hemi-Blocks:

An ECG trace is shown in the top right corner of the slide, featuring a prominent QRS complex with a sharp R wave and a deep S wave.

 ***LAHB:***

Left Axis Deviation + S in II & III & AVF

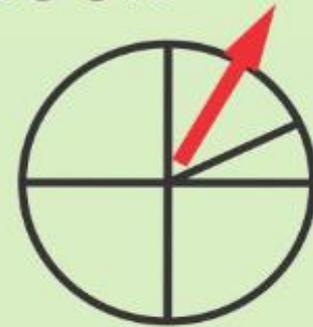
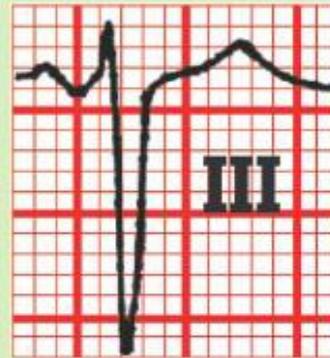
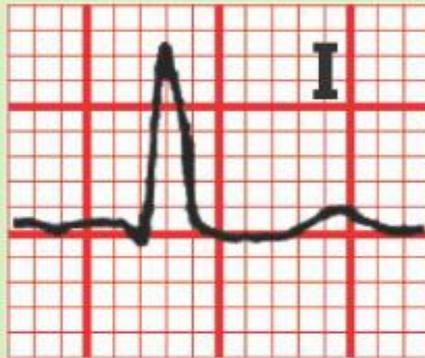
 ***LPHB***

Right Axis Deviation + S in I & AVL

Left anterior fascicular block

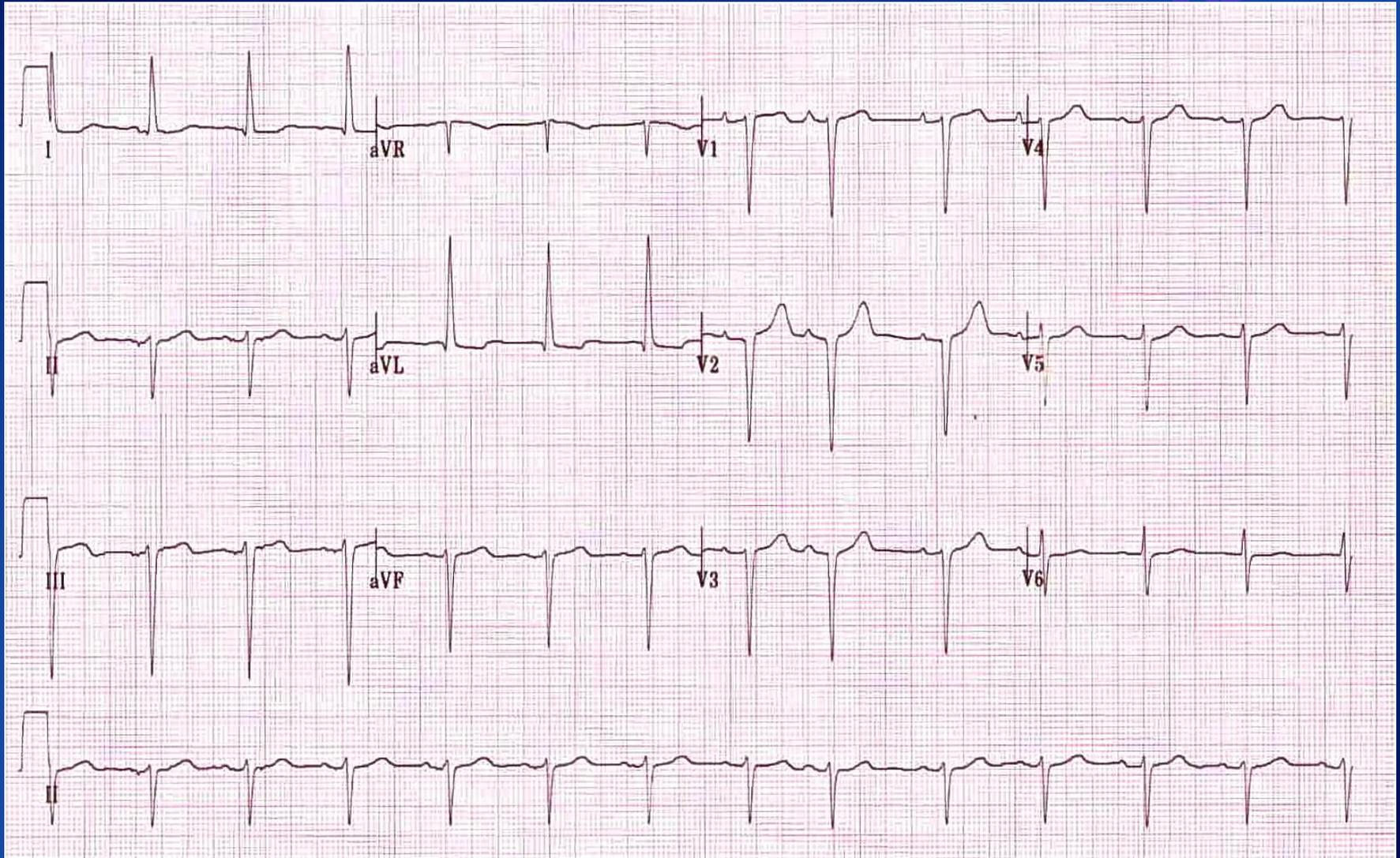
همی بلوک قدامی چپ LAHB

Left Anterior Hemi Block



محور قلب به صورت پاتولوژیک بیشتر از 30° - 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.

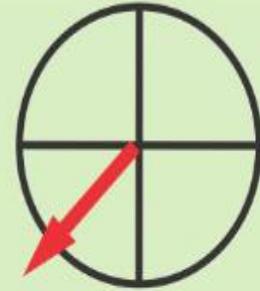
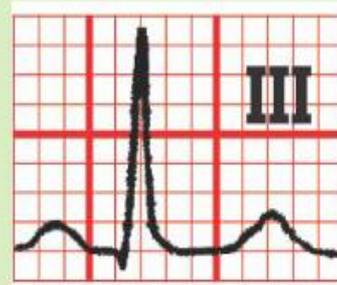
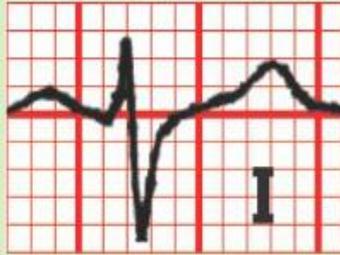
Left anterior fascicular block



Left Posterior Fascicular Block

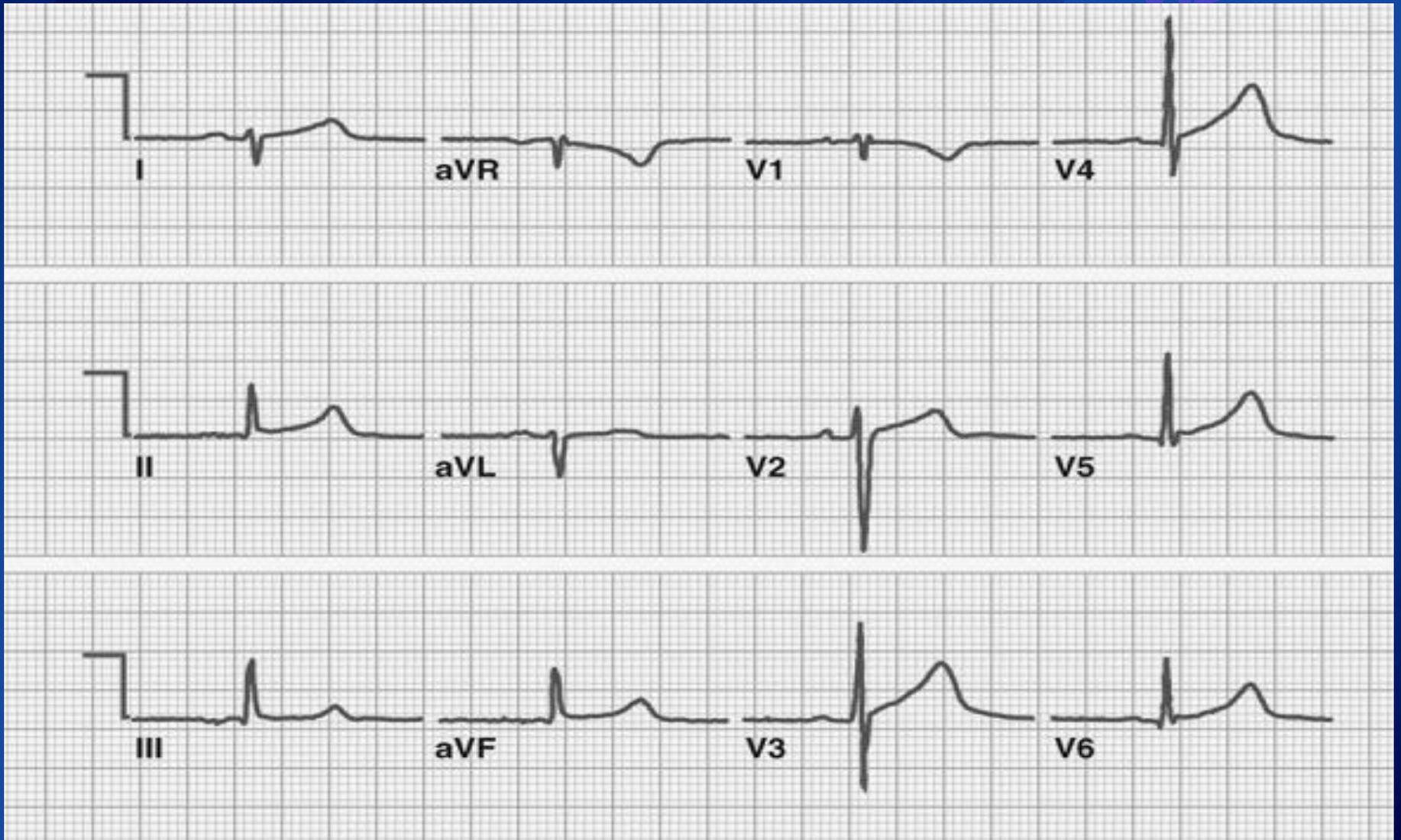
همی بلوک خلفی چپ LPHB

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 هایپر تروفی بطن راست S بزرگ در لید I و Q کوچک
در لید III مشاهده می گردد.

Left Posterior Fascicular Block

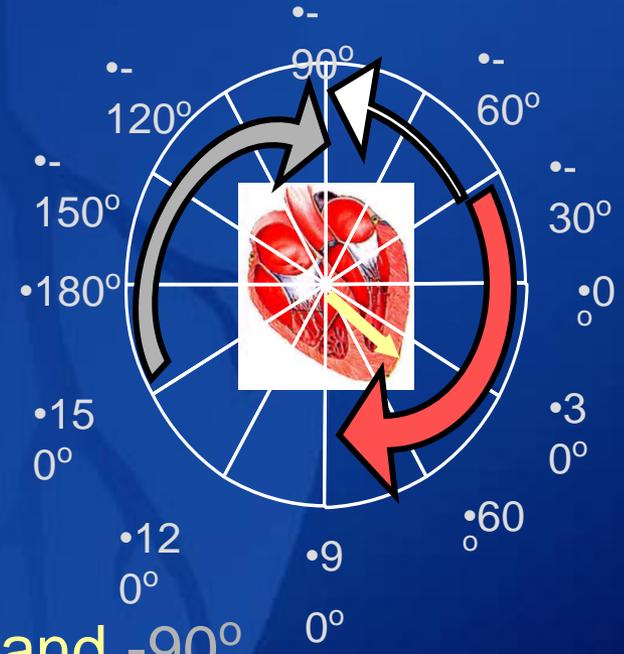


Axis:

•A QRS axis that falls between -30° and -90° 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° 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 برابری آنها را بدست می آوریم. زاویه ای که برابری دو بردار با افق می سازد مبنای تعیین محور قلب می باشد.

دلایل LAD :

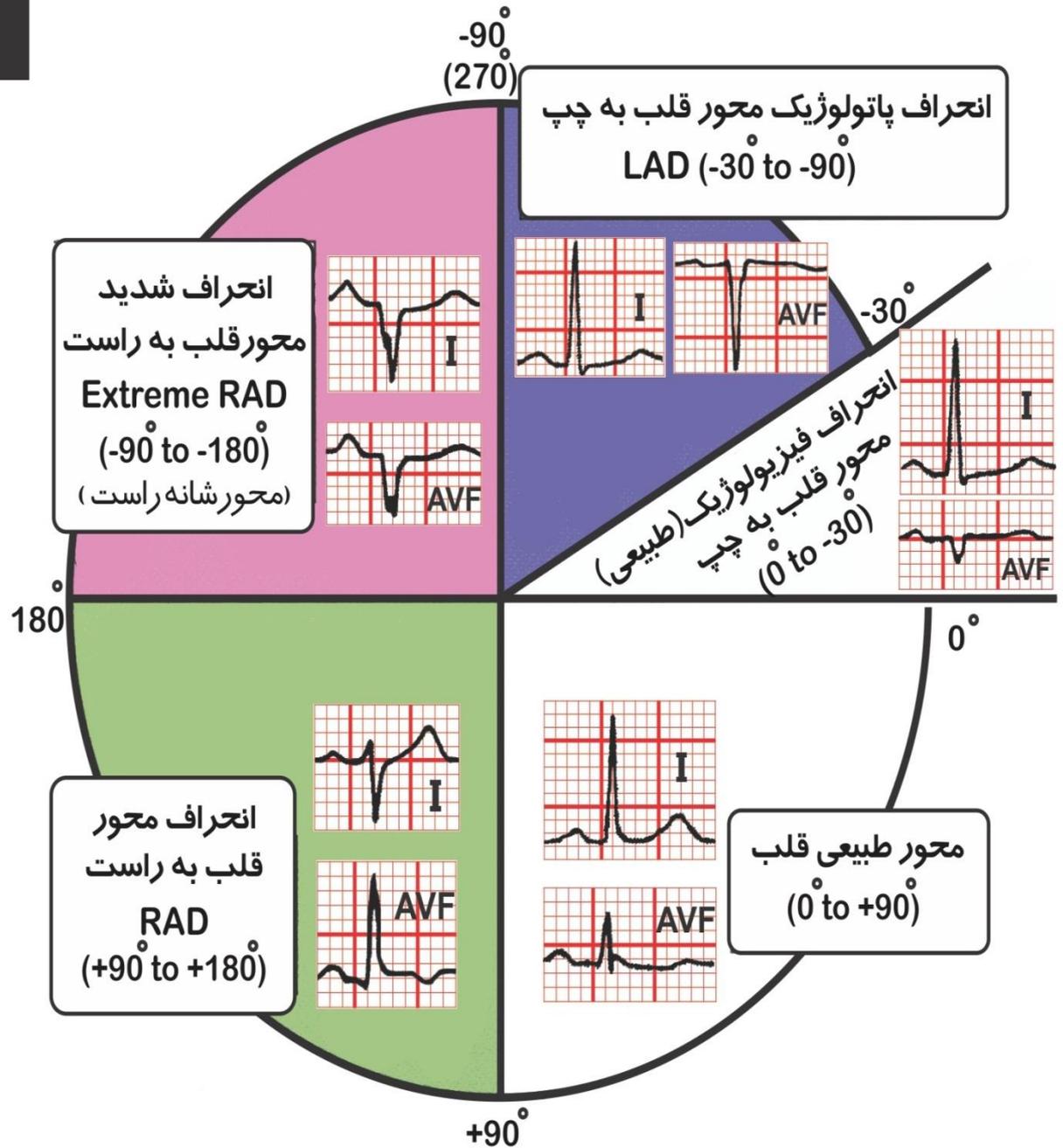
قرار گرفتن قلب در وضعیت افقی، بیمار چاق، بارداری، آسیت، بلوک شاخه ای چپ، هایپر تروفی بطن چپ، همی بلوک قدامی چپ، انفارکتوس میوکارد تحتانی

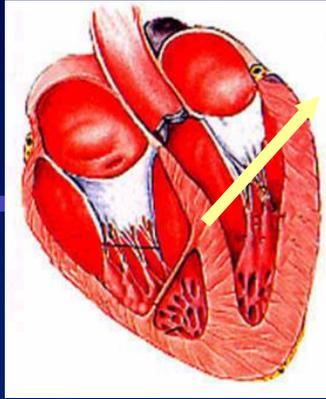
دلایل RAD :

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

دلایل Extreme RAD :

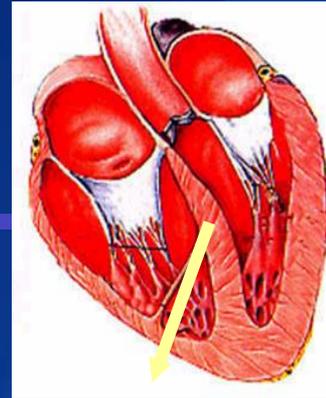
انفارکتوس میوکارد، ریتم اکتویک نظیر VT





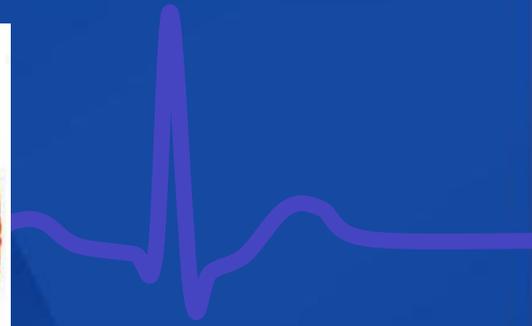
- Causes of left axis deviation include:

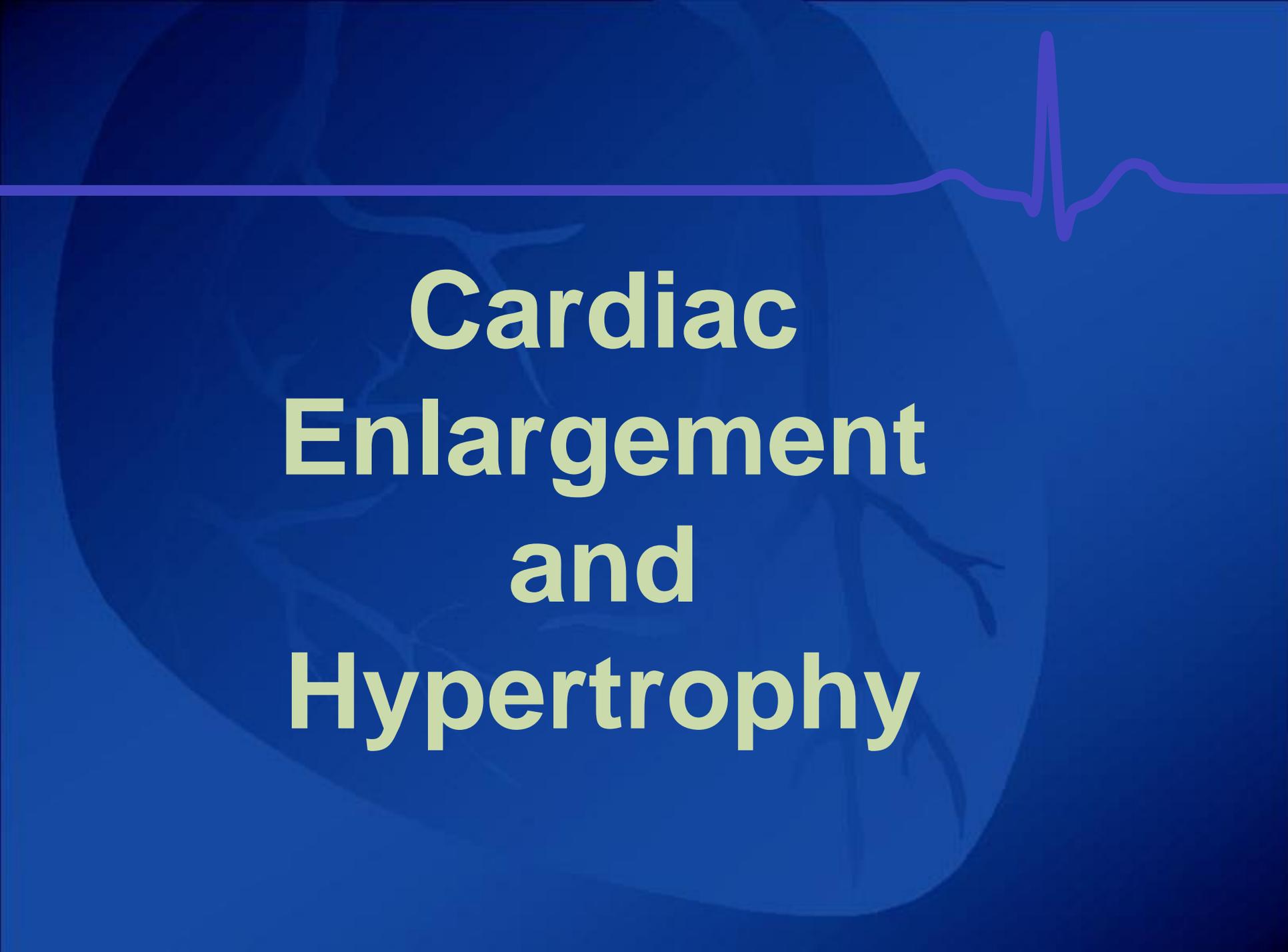
- **Left ventricular hypertrophy**
- **Inferior wall MI**
- **Left bundle branch block**
- **Left anterior fascicular block**
- **Horizontal heart**



- Causes of right axis deviation include:

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



The background features a stylized, semi-transparent illustration of a human heart with its major blood vessels, rendered in a light blue color against a dark blue gradient. A purple ECG (heart rate) line is positioned horizontally across the upper right portion of the image, extending from the right edge towards the center.

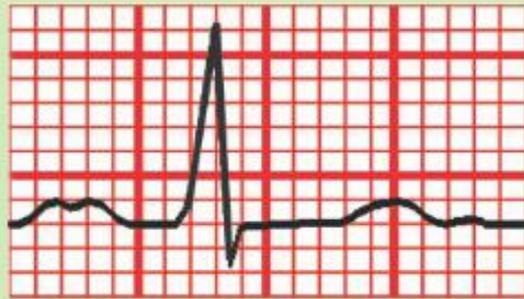
Cardiac Enlargement and Hypertrophy

بزرگی دهلیزها

بزرگی دهلیز چپ

LAE

Left Atrial Enlargement



موج P بای فازیک همراه

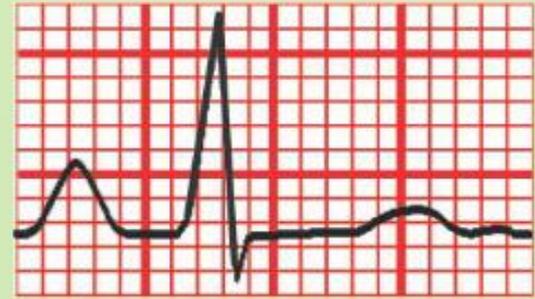
با قسمت دوم بزرگتر در

لید V1

بزرگی دهلیز راست

RAE

Right Atrial Enlargement



موج P نوک تیز

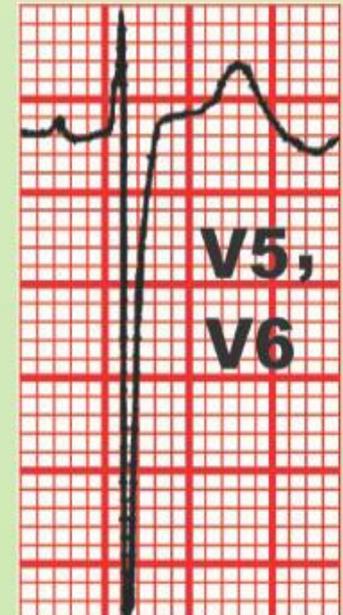
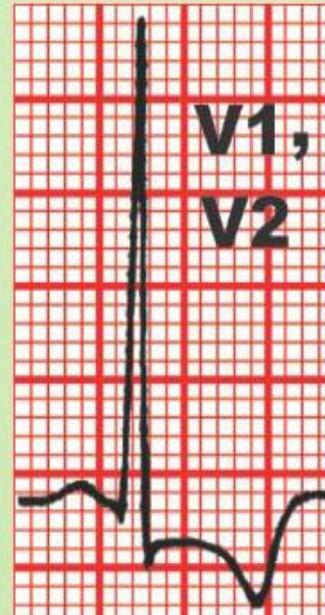
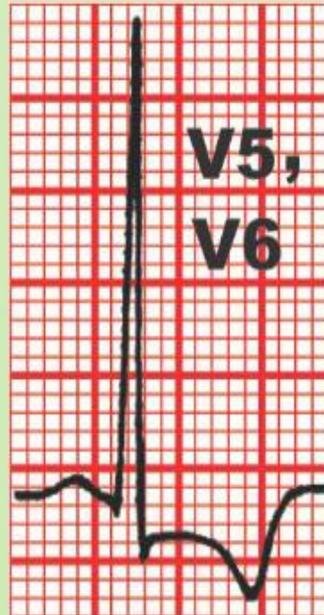
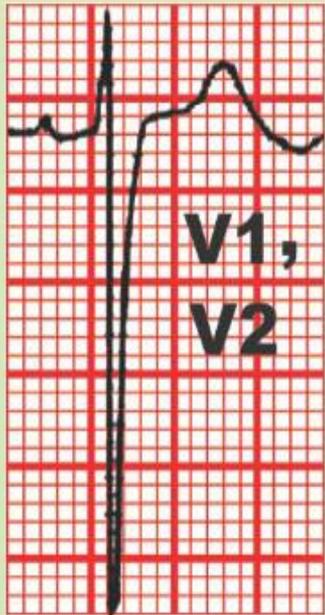
معمولاً در لیدهای

II ، III و AVF

هایپرتروفی بطن ها

هایپرتروفی بطن چپ LVH
Left Ventricular Hypertrophy

هایپرتروفی بطن راست RVH
Right Ventricular Hypertrophy

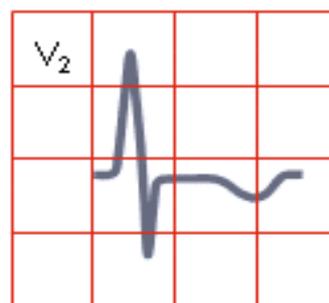
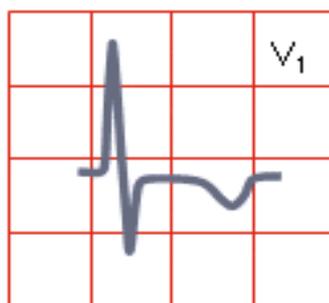
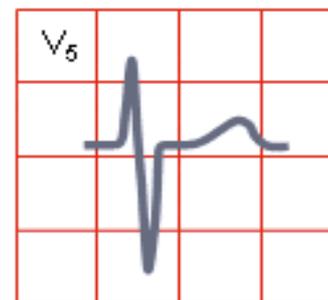
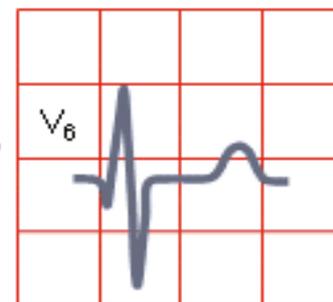
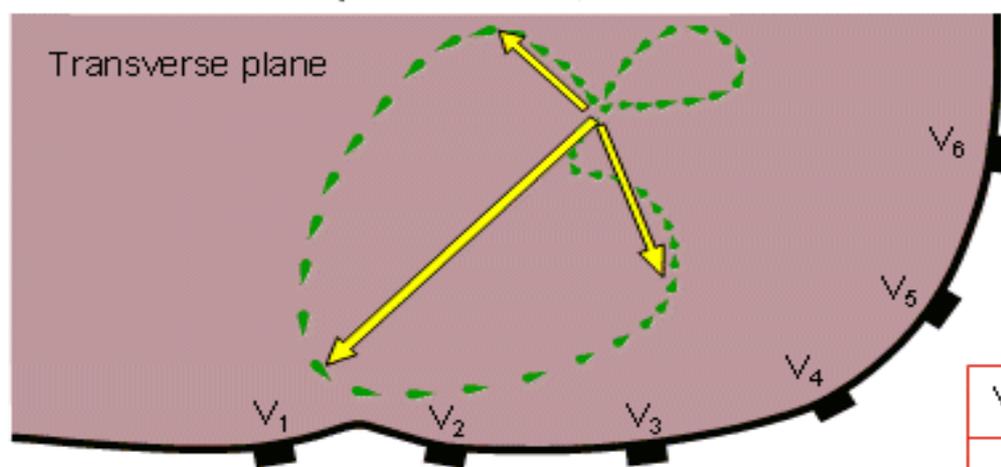
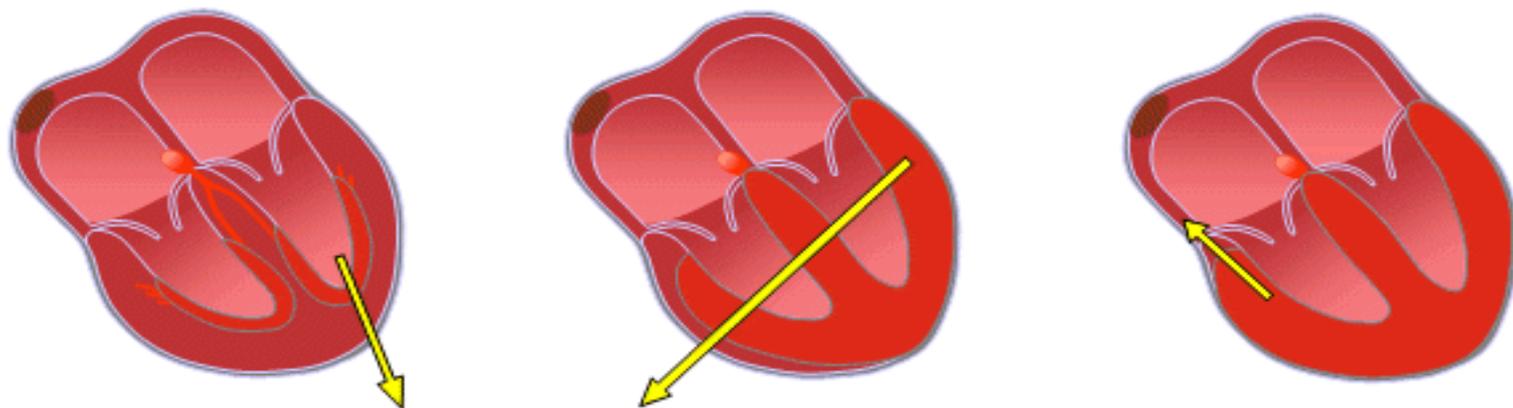


موج های R و S با اندازه برابر یا بیشتر از ۲۵ میلیمتر در لیدهای نشان داده شده (طبق شکل) با انحراف محور همسو مشاهده می گردد.

RIGHT VENTRICULAR HYPERTROPHY

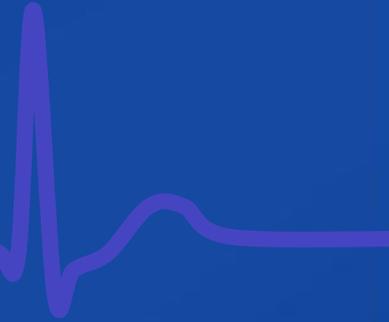
Large R wave in leads V1 and V2,

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



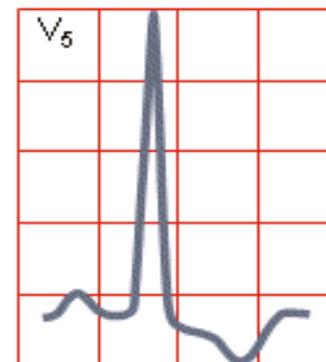
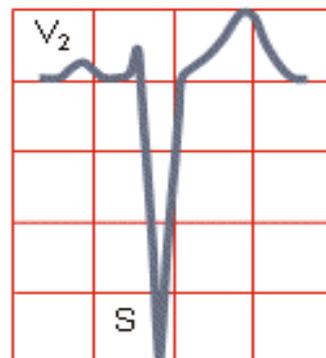
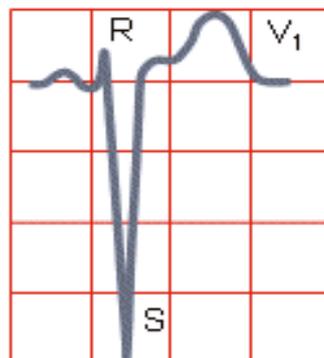
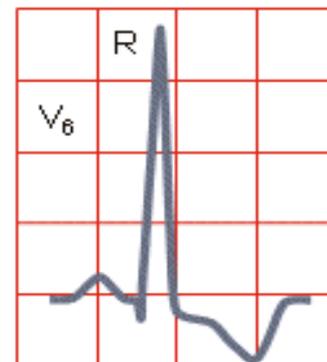
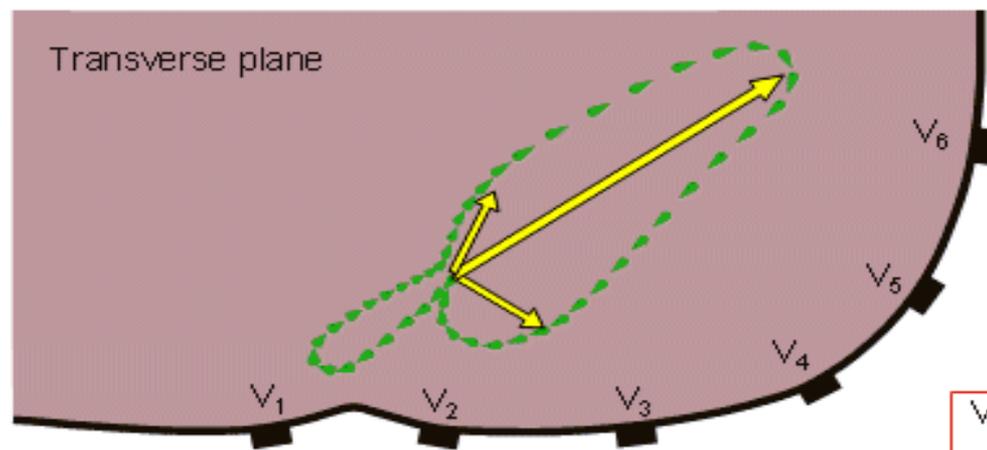
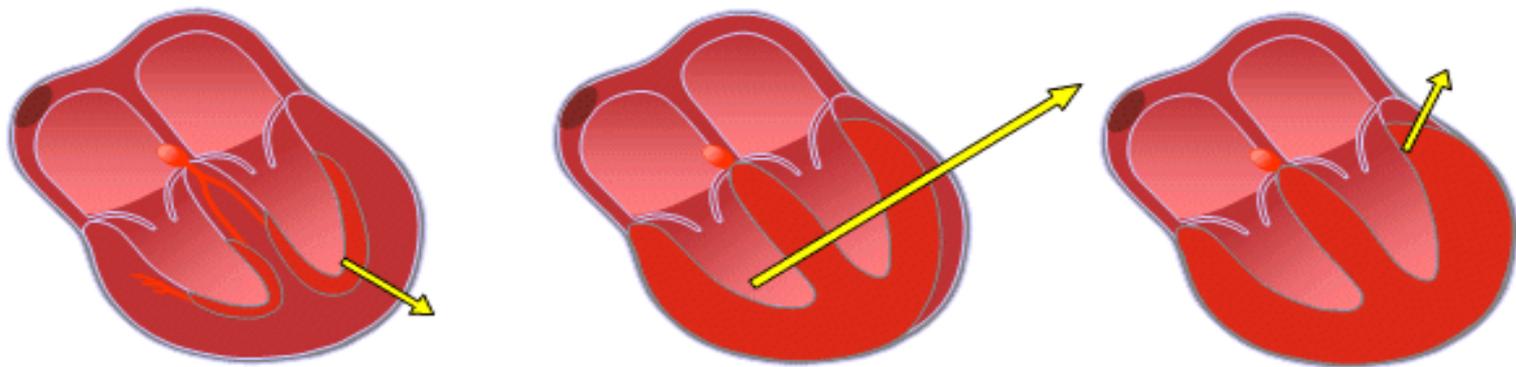
- Right ventricular hypertrophy (RVH) is characterized by:

- 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.

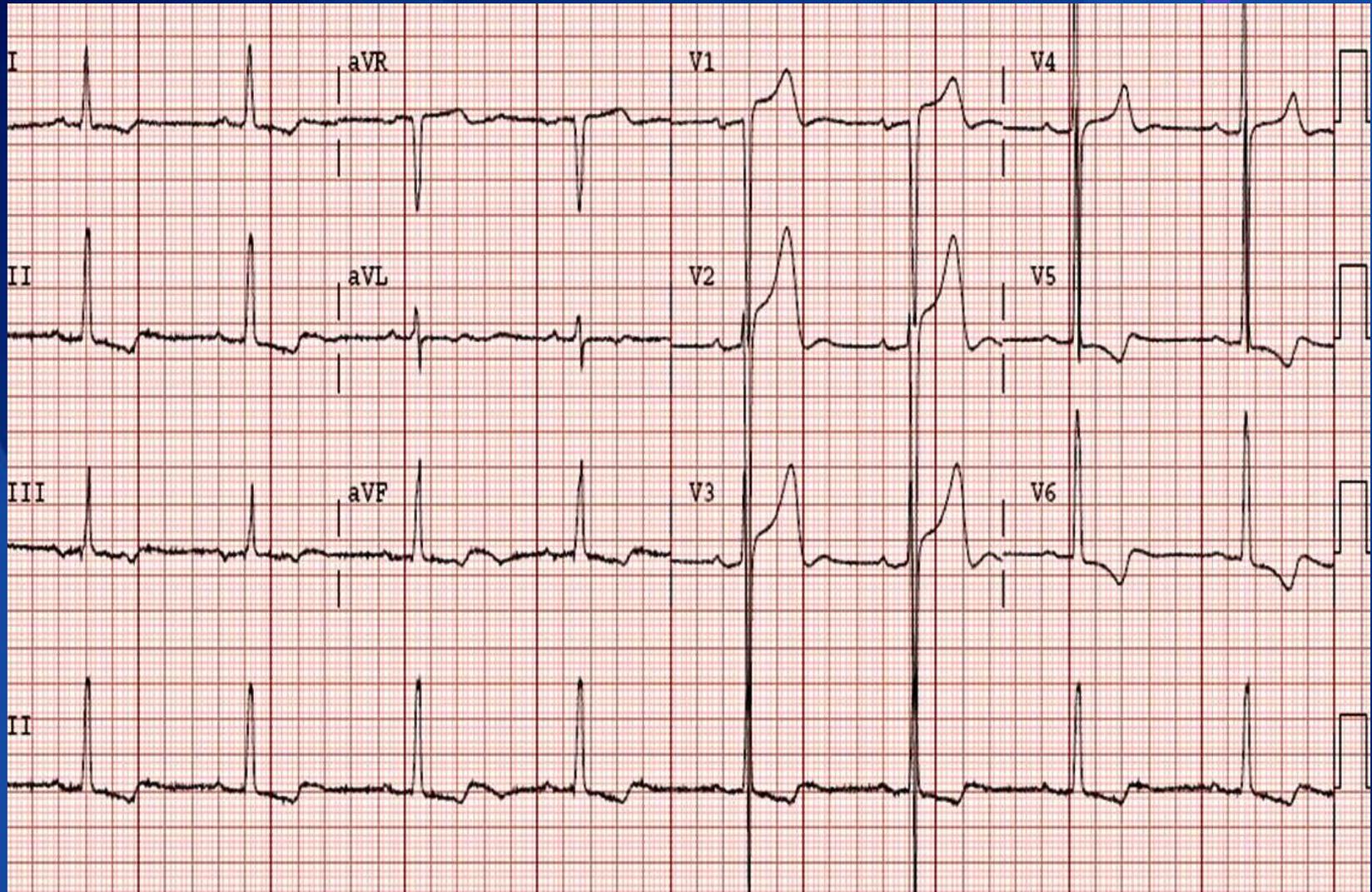


LEFT VENTRICULAR HYPERTROPHY

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



Left Ventricular Hypertrophy



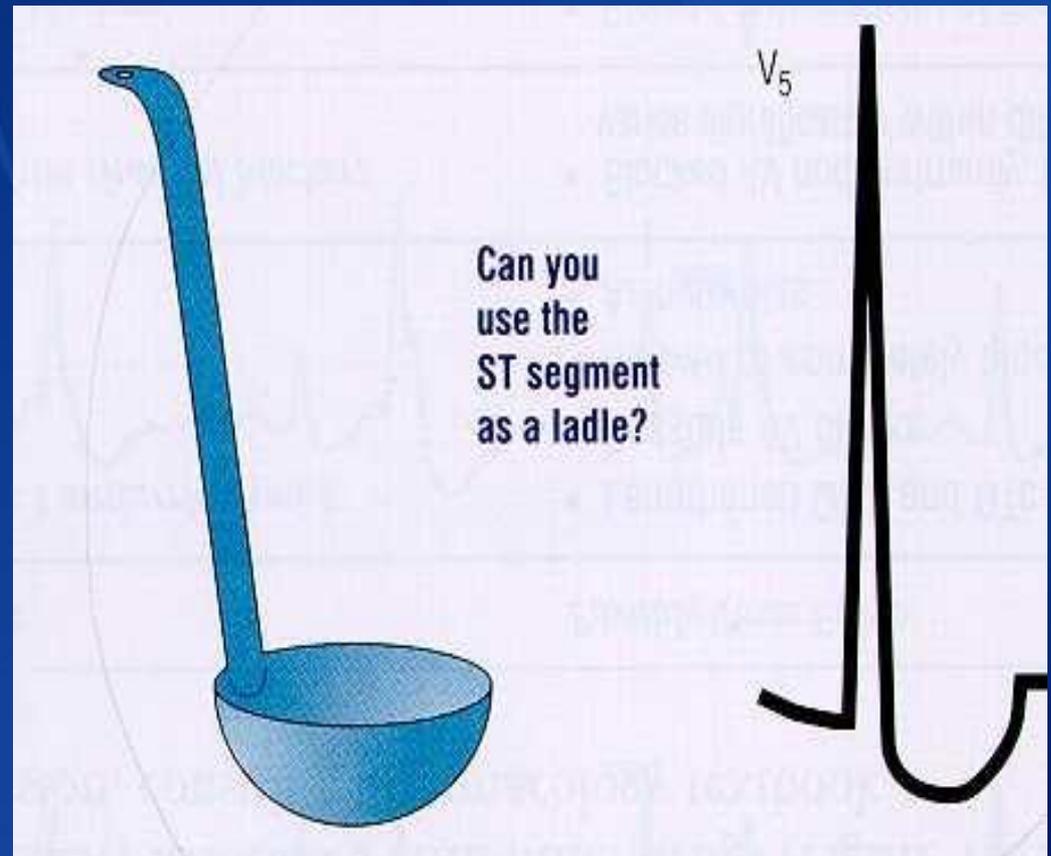
- left ventricular hypertrophy (LVH) is characterized by:

- 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.



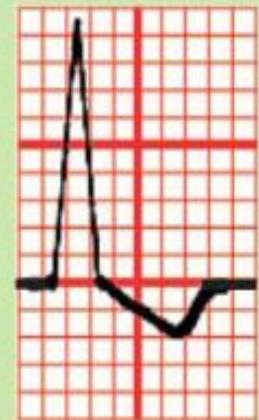
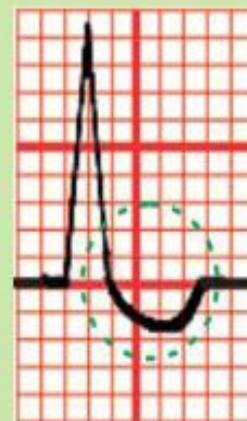
Digitalis Changes:

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



مسمومیت با دیژیتالین Dig. Toxicity

دیپرسیون ST با طرح خاص
(معروف به سبیل سالوادور)



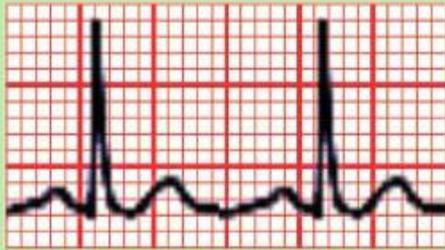
مشخصات: قطعه ST افت و موج T معکوس می گردد.

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

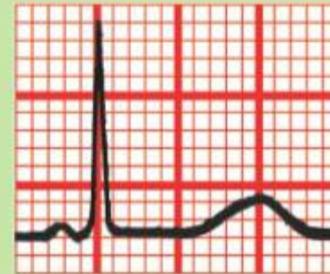
Calcium

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.

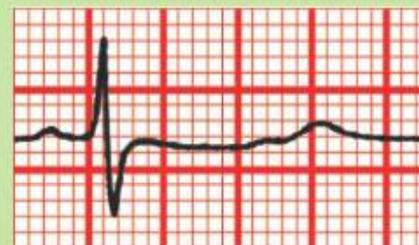
Potassium

هایپر کالمی



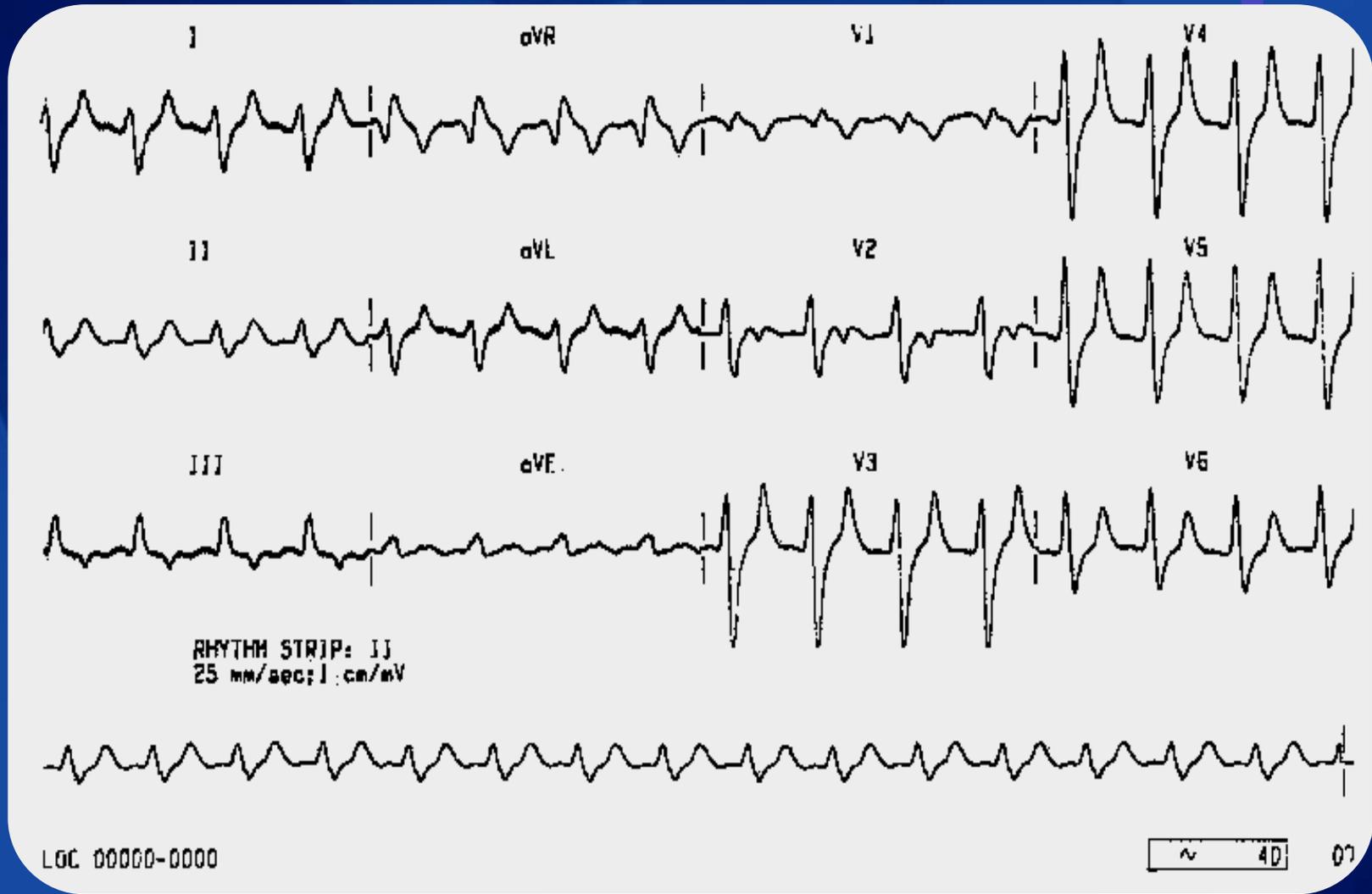
موج T بلند و نوک تیز و QRS پهن
مشاهده می شود و در بیشتر موارد
موج P وجود ندارد. خطر ایجاد
تاکیکاردی بطنی (VT) وجود دارد.

هیپو کالمی



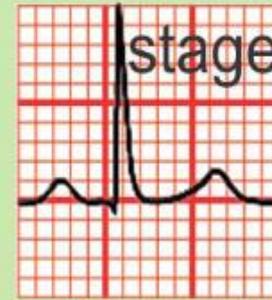
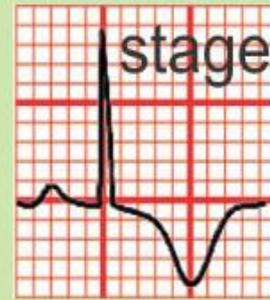
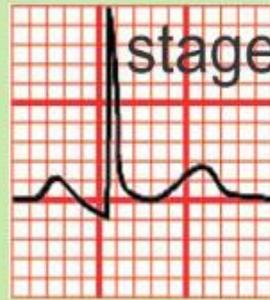
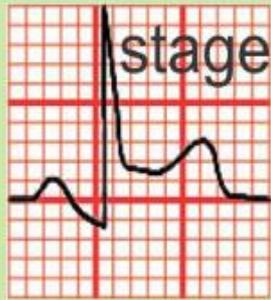
موج T صاف و موج U بزرگ و
افت قطعه ST مشاهده می شود.
ضمناً باعث افزایش اثر مسمومیت
با دیژیتال می گردد.

Hyperkalemia



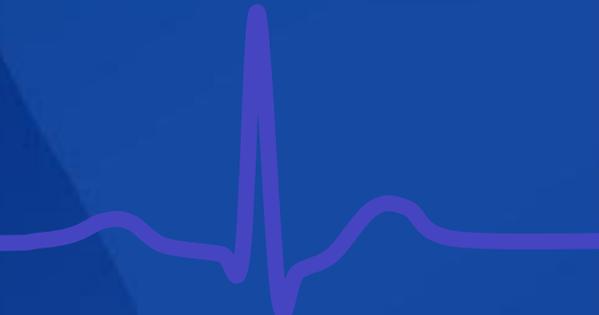
Pericarditis :

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

