

Ventricular Dysrhythmias

Ventricular Dysrhythmias

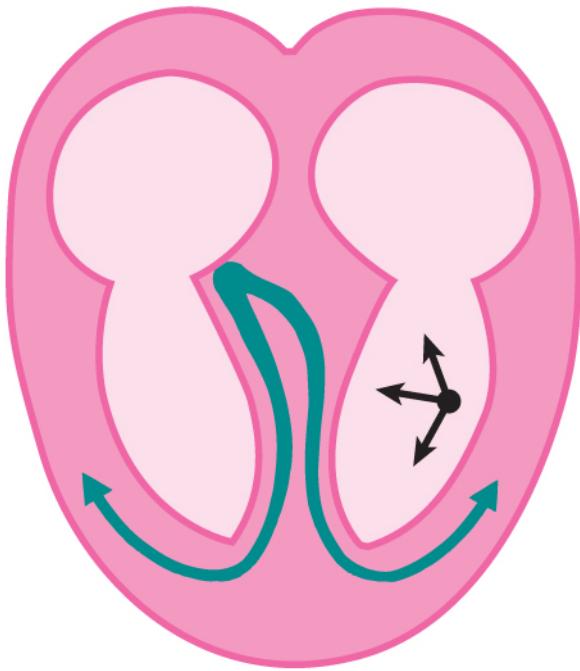
- Ventricles become pacemaker of heart when SA node, atrial pacemaker sites, and AV junction fail to initiate an impulse
- Impulse can be initiated from any pacemaker cell in the ventricles
 - Bundle branches
 - Purkinje's fibers
- Impulse takes alternate conduction pathway
 - Retrograde (to atria) and forward (to ventricles)

Ventricular Dysrhythmia

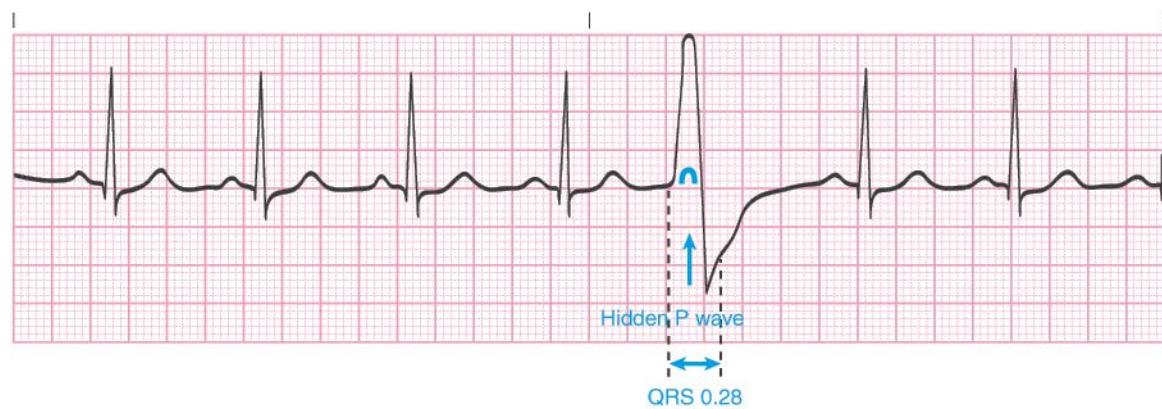
- Because atria depolarize at almost the same time as the ventricles, the P wave is usually hidden in QRS
- Ventricles = least efficient pacemaker of heart
 - Only generates 20 - 40 ipm
- Ventricular dysrhythmias are usually considered life threatening

Ventricular Dysrhythmias

Abnormal conduction



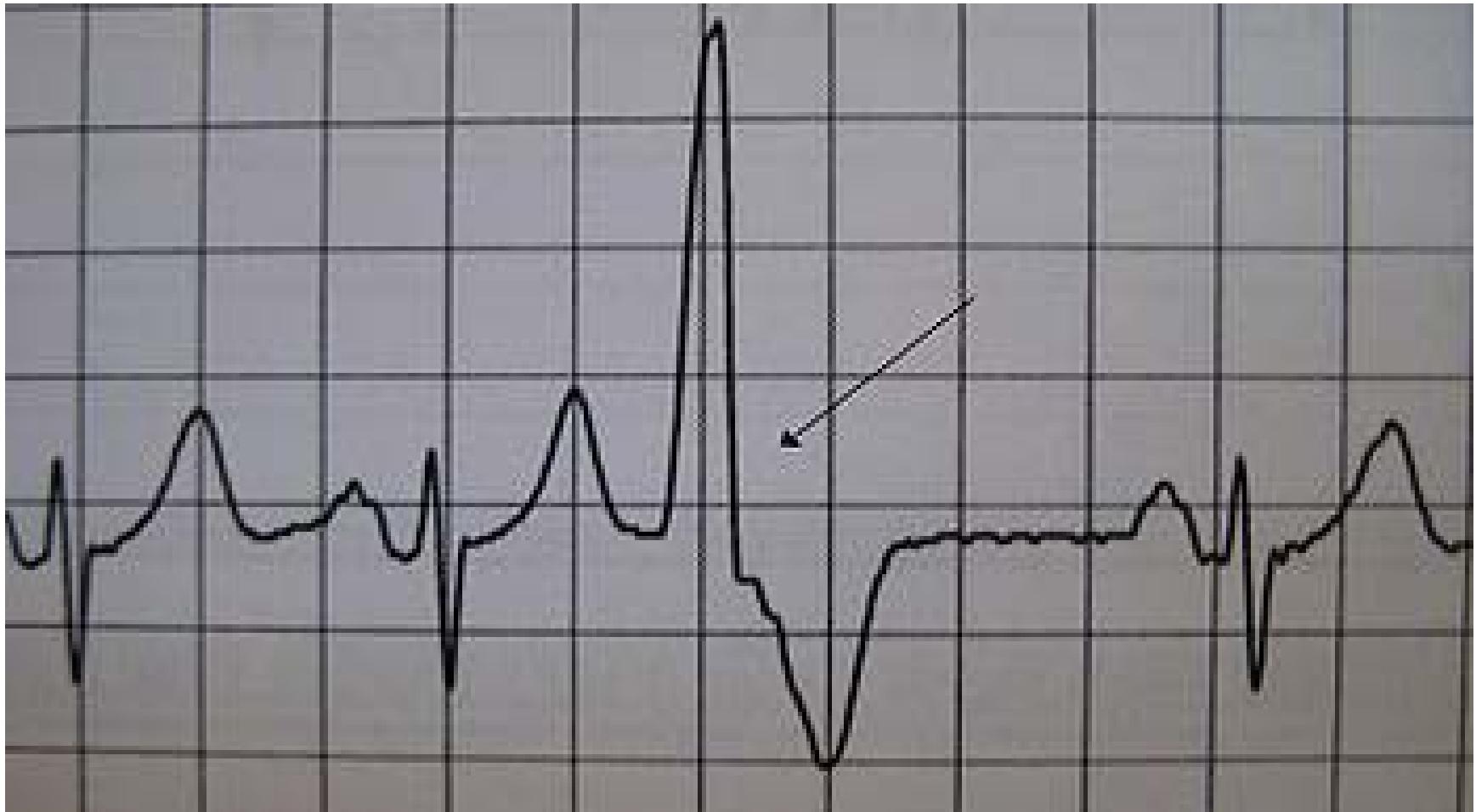
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- Ventricular electrical conduction pathway.
- Ventricular response with hidden P wave within QRS complex.

Premature Ventricular Complex

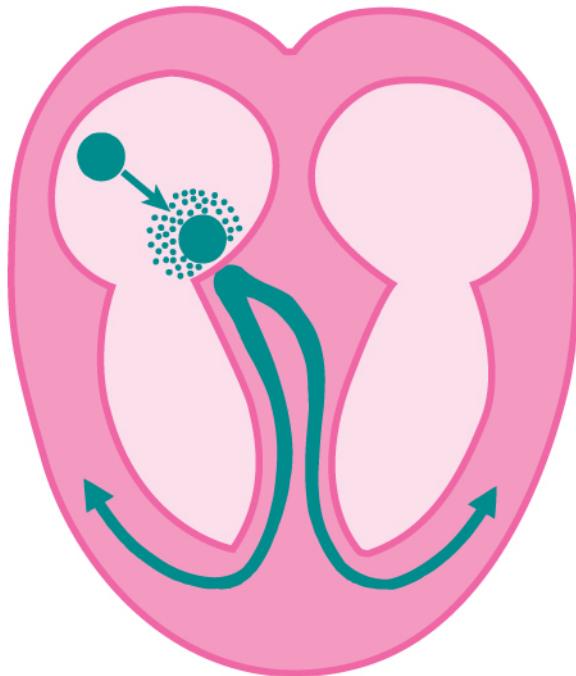


Premature Ventricular Complex

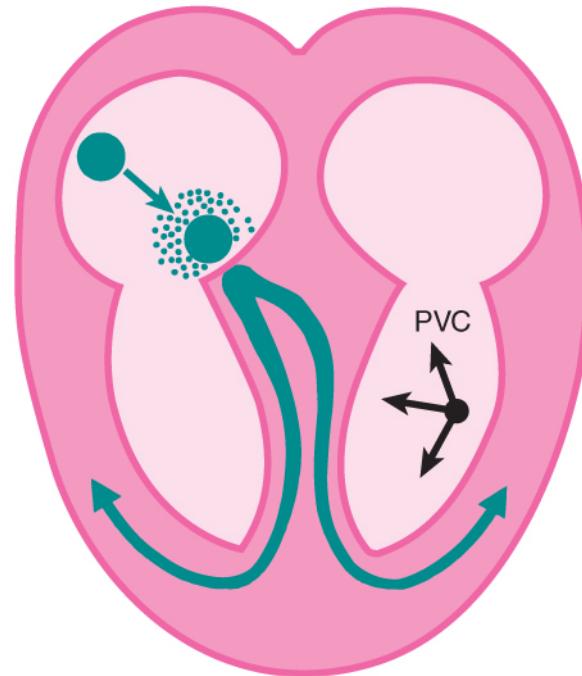
- Also known as a PVC
- Originates from area below bundle of His
- Occurs earlier than next expected complex of underlying rhythm
- Very common
- Atria may or may not depolarize
 - No depolarization = No P wave
 - Depolarization = P wave hidden in QRS

Premature Ventricular Complex

Normal conduction



Abnormal conduction



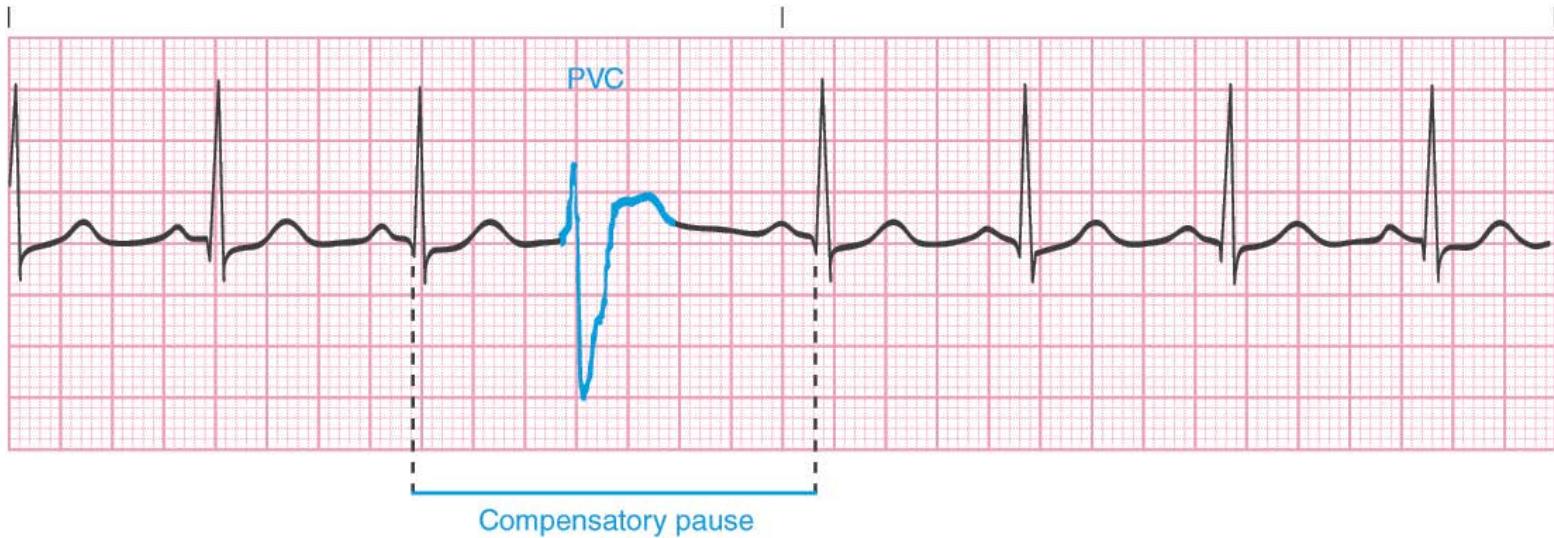
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- Left heart shows normal electrical conduction pathway. Right heart shows conduction pathway of a premature ventricular complex (PVC).

Premature Ventricular Complex

- QRS = Wide and bizarre, > 0.12 second
 - May deflect opposite of other QRS complexes
- T wave following PVC deflects in opposite direction of QRS
 - ST segment appears abnormal
- PVC usually followed by complete compensatory pause
 - This allows the underlying rhythm to continue again at normal rate as if PVC never occurred

Premature Ventricular Complex

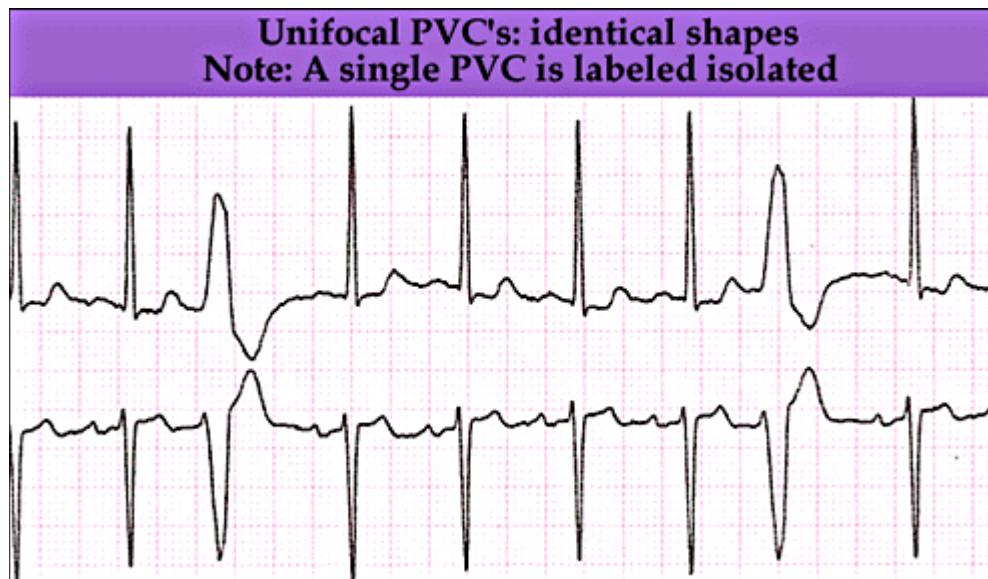


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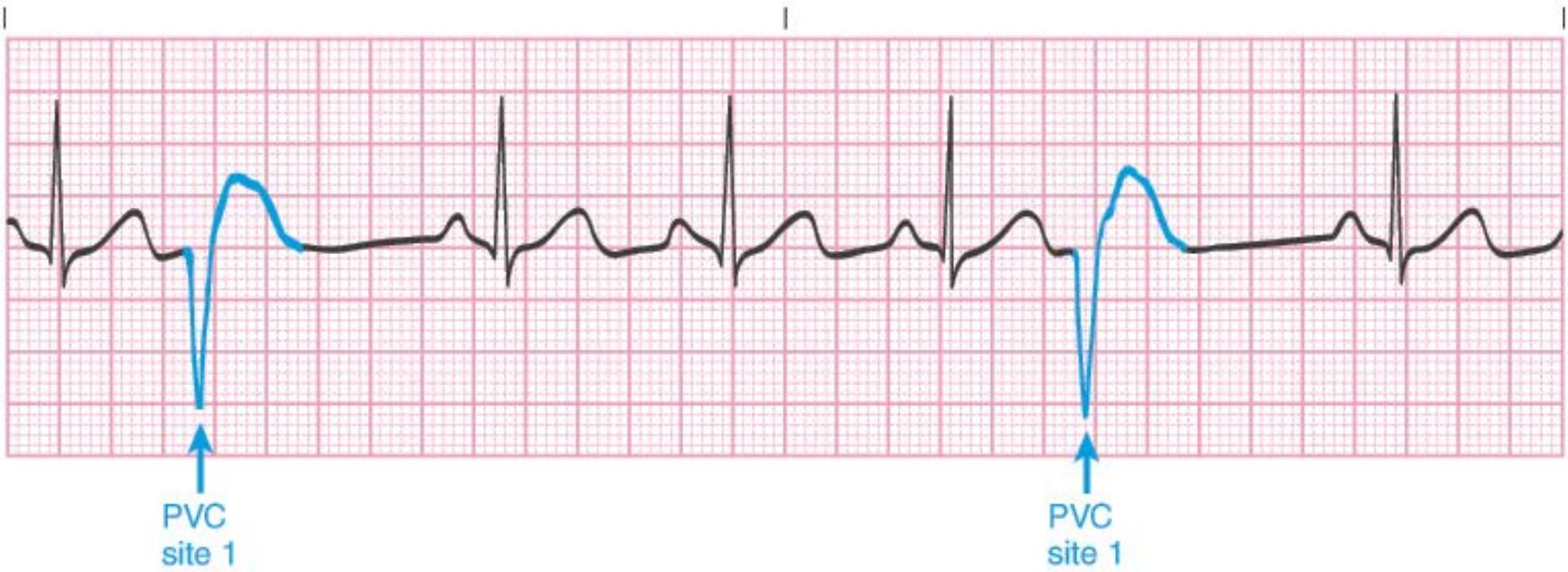
- Premature ventricular complex with a complete compensatory pause.

Premature Ventricular Complex

- Site of origin:
 - Unifocal originate from single site and look alike



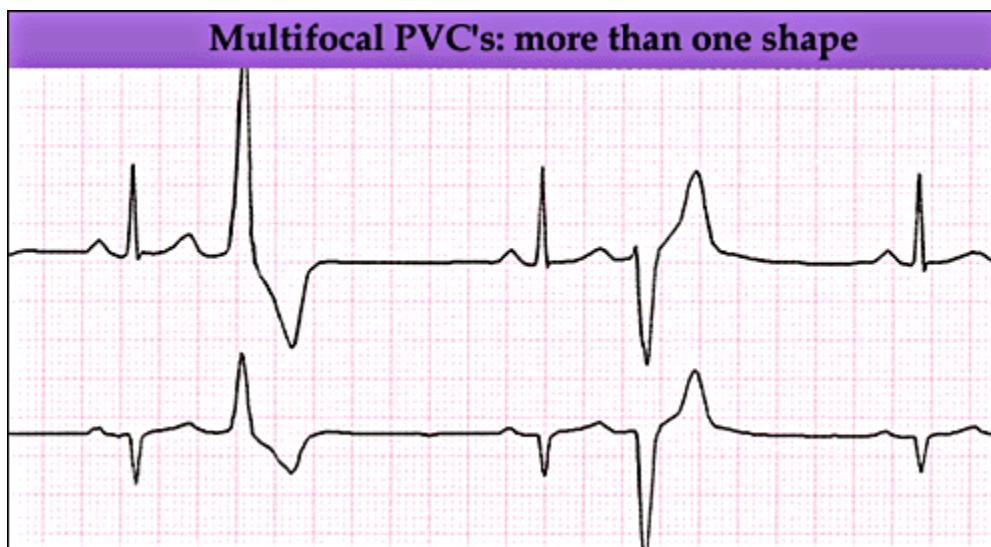
Unifocal PVCs



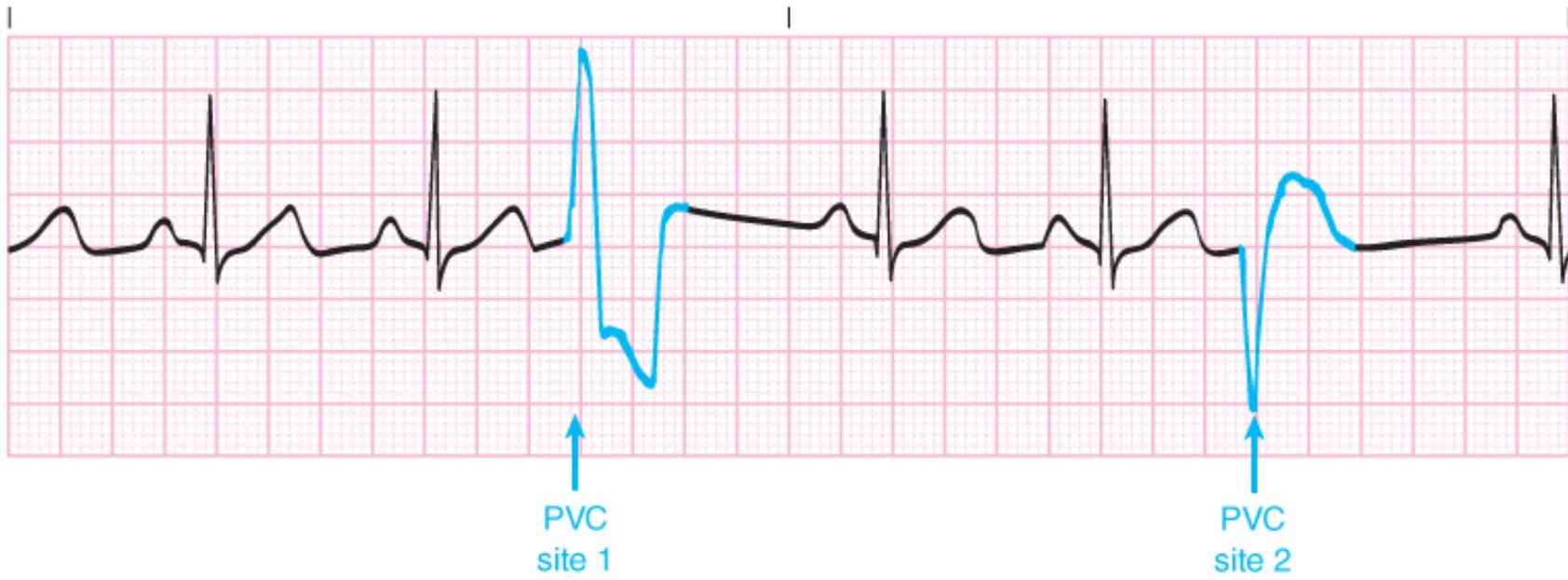
- Sinus rhythm with unifocal premature ventricular complexes; heart rate, 70 beats/min (notice peaked P waves).

Premature Ventricular Complex

- Site of origin:
 - Multifocal originate from different sites and have varying sizes and shapes
 - More dangerous



Multifocal PVCs



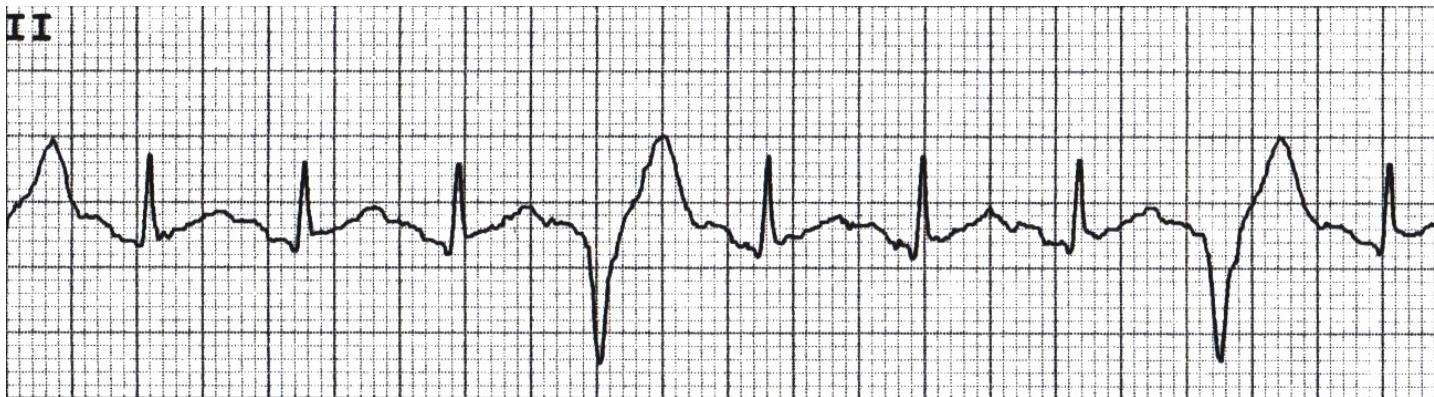
- Sinus rhythm with multifocal premature ventricular complexes; heart rate, 70 beats/min (notice peaked P waves).

Premature Ventricular Complex

- Frequency of occurrence = Indication of how irritable (excitable) cardiac cells are
 - Can lead to a more serious rapid-rate dysrhythmia
- When PVCs occur frequently, ventricles have less time to refill adequately with blood
 - Can cause poor cardiac output

Premature Ventricular Complex

- Types:
 - Quadrigeminy – Occurs every 4th QRS



Quadrigeminy



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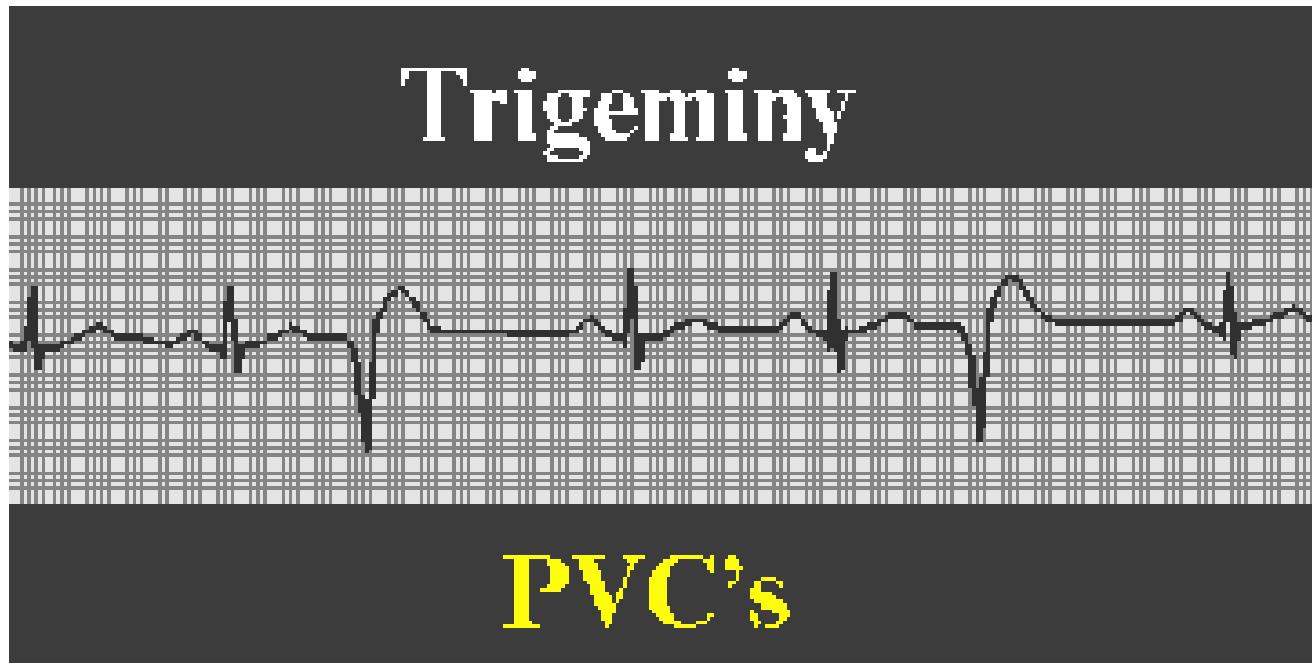


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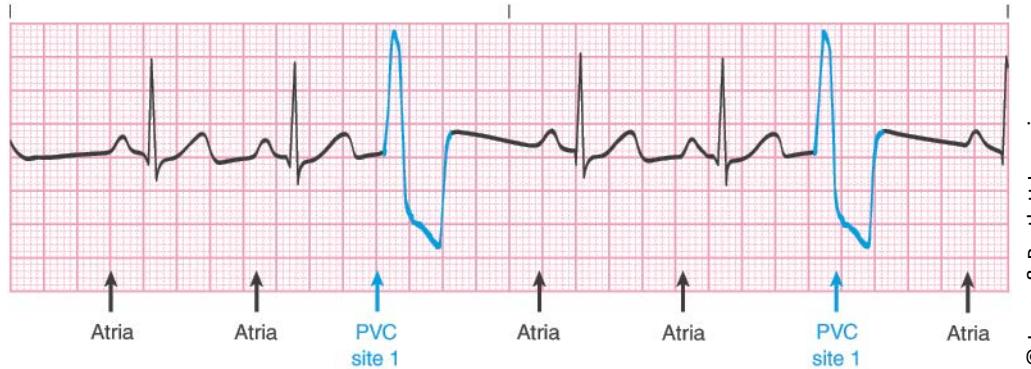
- Quadrigeminy. **A.** Sinus rhythm with unifocal premature ventricular complexes in a pattern of quadrigeminy; heart rate, 70 beats/min. **B.** Sinus rhythm with multifocal premature ventricular complexes in a pattern of quadrigeminy; heart rate, 70 beats/min.

Premature Ventricular Complex

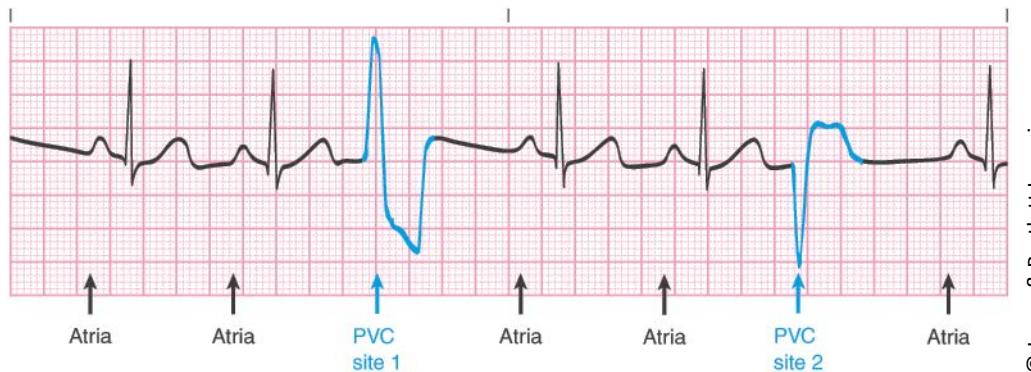
- Types:
 - Trigeminy – Occurs every 3rd QRS



Trigeminy



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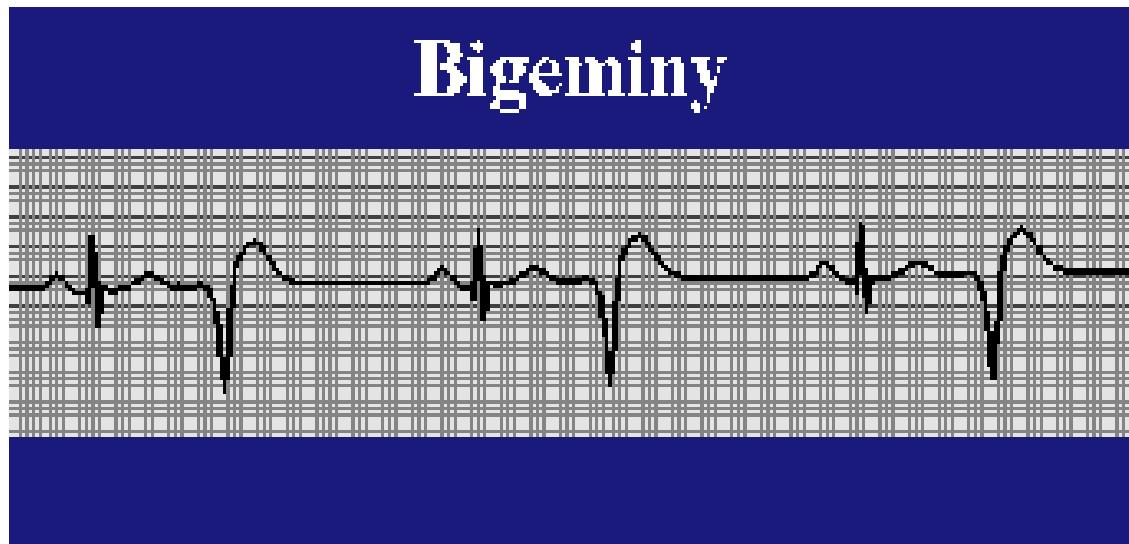


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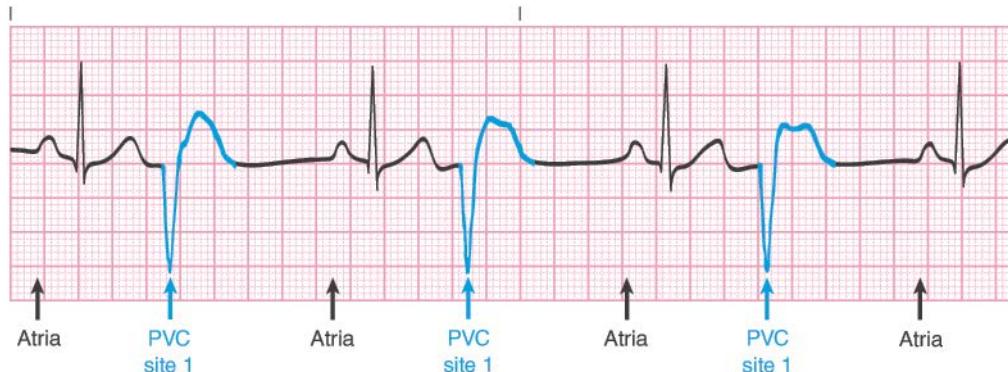
- Trigeminy. **A.** Sinus rhythm with unifocal premature ventricular complexes in a pattern of trigeminy; heart rate, 60 to 70 beats/min. **B.** Sinus rhythm with multifocal premature ventricular complexes in a pattern of trigeminy; heart rate, 70 beats/min.

Premature Ventricular Complex

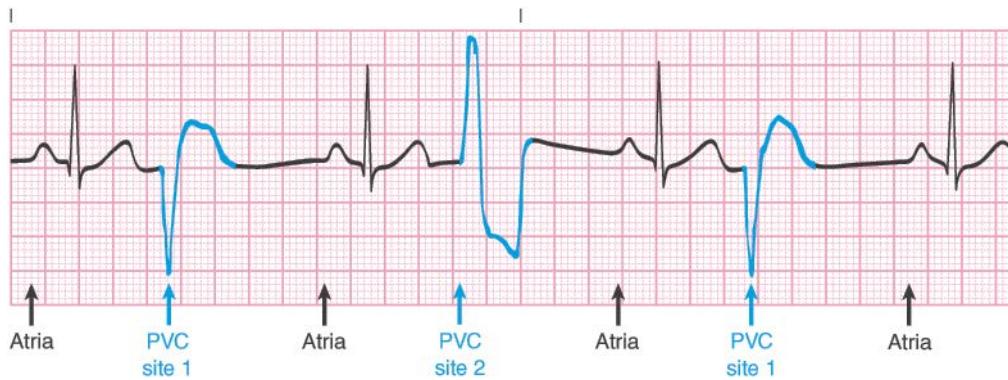
- Types:
 - Bigeminy – Occurs every other QRS
 - More serious than quadrigeminy and trigeminy due to higher degree of irritability in ventricular muscle



Bigeminy



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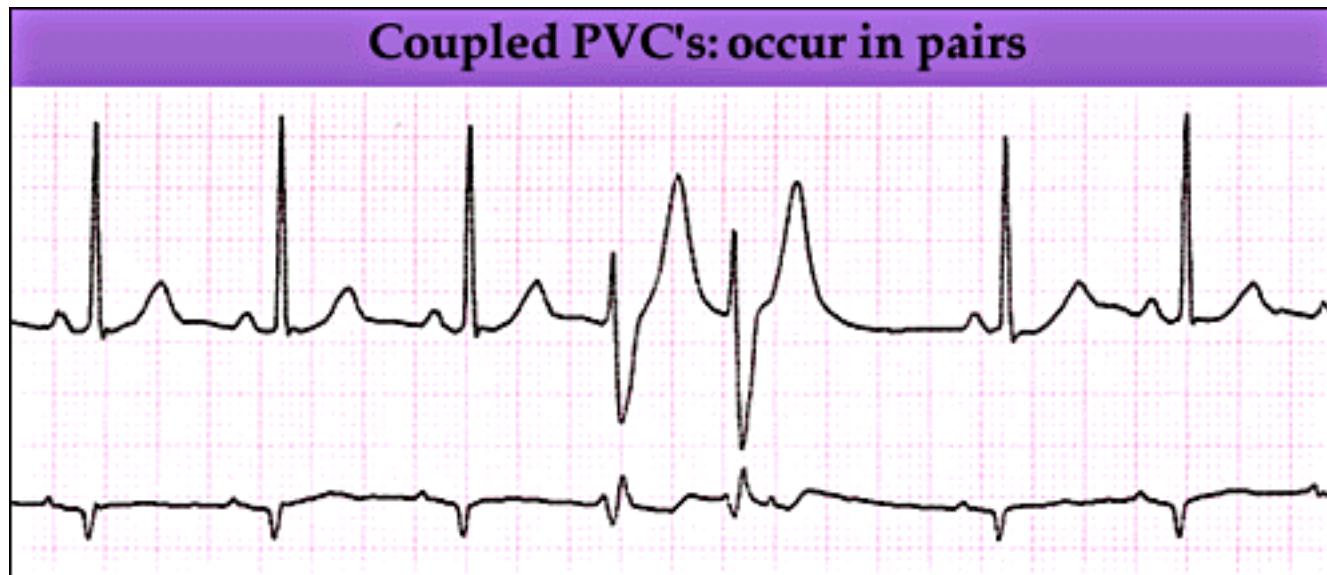


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- Bigeminy. **A.** Sinus rhythm with unifocal premature ventricular complexes in a pattern of bigeminy; heart rate, 70 beats/min. **B.** Sinus rhythm with multifocal premature ventricular complexes in a pattern of bigeminy; heart rate, 70 beats/min.

Premature Ventricular Complex

- Types:
 - Couplet (Paired) = Two PVCs in a row
 - Indicates high degree of irritability in ventricles which may lead to a lethal dysrhythmia



Couplets



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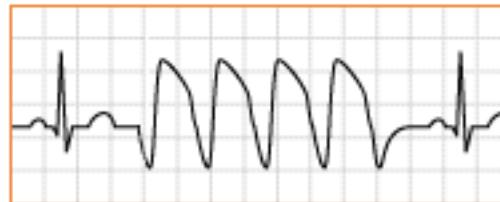
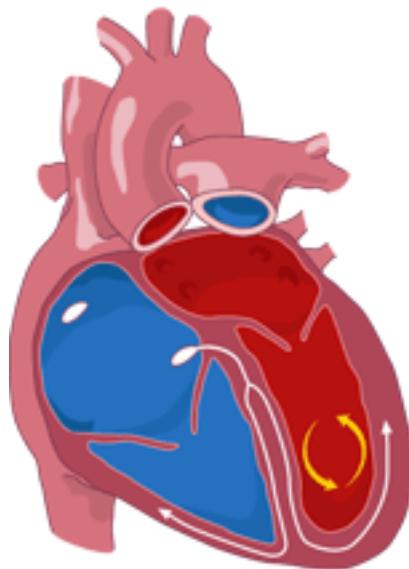
- **Couplets.** **A.** Sinus rhythm with premature junctional complex (PJC) and unifocal couplet of PVCs (notice R on T); heart rate, 90 beats/min. **B.** Sinus rhythm with multifocal couplet of PVCs; heart rate, 80 beats/min (notice peaked P waves in A and B).

Premature Ventricular Complex

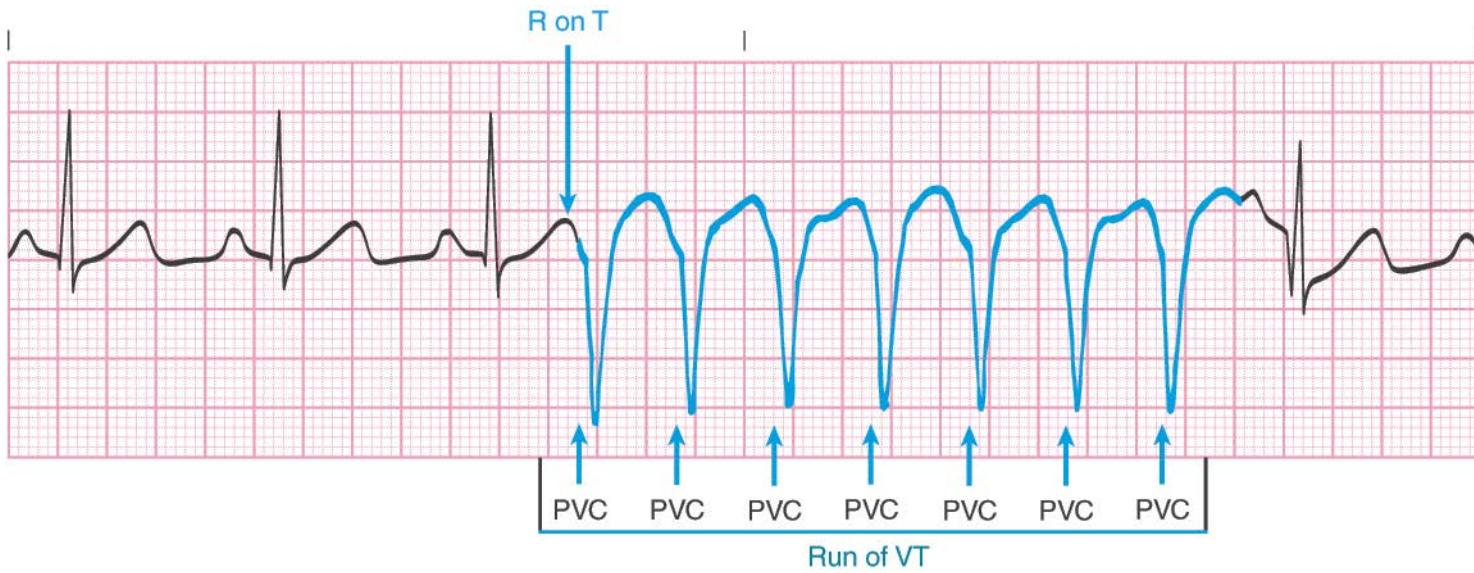
- Types:
 - Run of ventricular tachycardia (run of VT) = 3 or more PVCs in a row
 - Short duration
 - PVCs all unifocal
 - HR > 100 bpm
 - May lead to lethal dysrhythmia
 - May be called salvo or burst of PVCs
 - Indicates high degree of irritability in ventricles and may lead to a lethal dysrhythmia

Premature Ventricular Complex

- Types:
 - Run of ventricular tachycardia (run of VT)



Run of V Tach

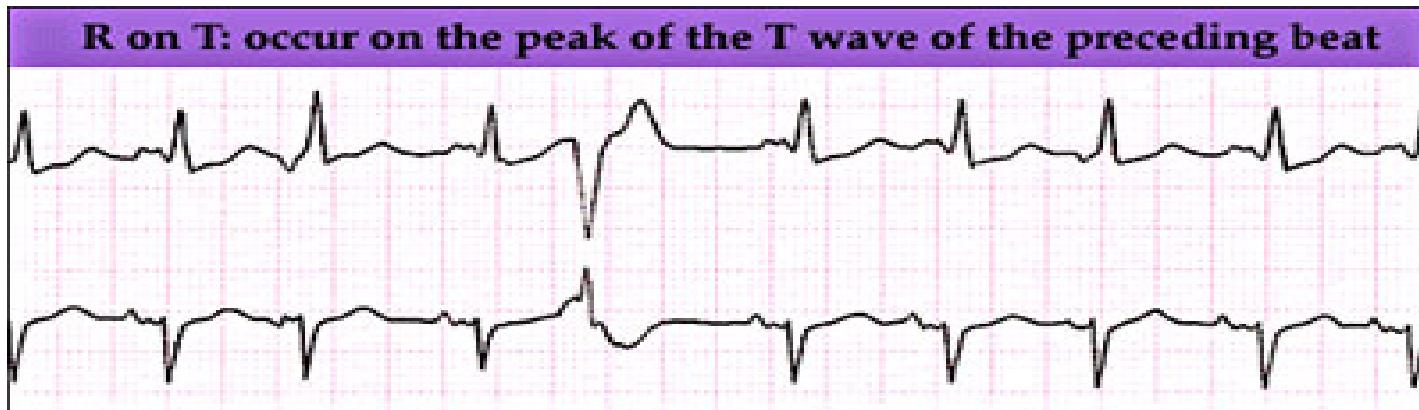


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- Sinus rhythm with a run of ventricular tachycardia; heart rate, 110 beats/min (notice peaked P waves).

Premature Ventricular Complex

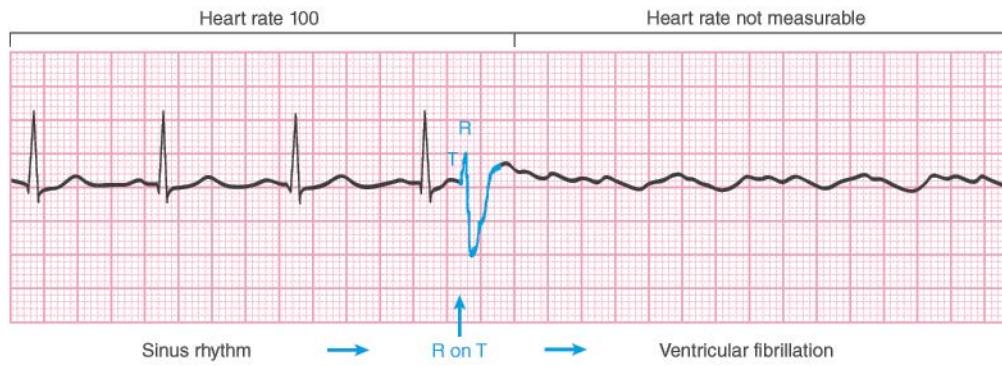
- R on T Phenomenon
 - R wave of PVC falls on T wave of previous complex
 - May lead to lethal dysrhythmia such as V Tach
 - PVC occurs during vulnerable period of ventricular repolarization (relative refractory period)



R on T Phenomenon



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- R on T phenomenon. **A.** Sinus rhythm with two PVC complexes with R on T; heart rate, 80 beats/min. **B.** Sinus rhythm; heart rate, 100 beats/min, followed by R on T premature ventricular complex resulting in ventricular fibrillation (heart rate not measurable).

Premature Ventricular Complex

- Other aspects:
 - Patients with PVCs don't always require treatment
 - PVCs may be heart's attempt to increase cardiac rate to maintain adequate circulation and CO when underlying rhythm is bradycardic
 - But PVCs are usually considered dangerous
 - Patient require immediate treatment if:
 - More than 6 PVCs in 1 minute
 - Multifocal PVCs
 - Couplets
 - Run of VT
 - R on T phenomenon
 - Patient is medically unstable

Premature Ventricular Complex

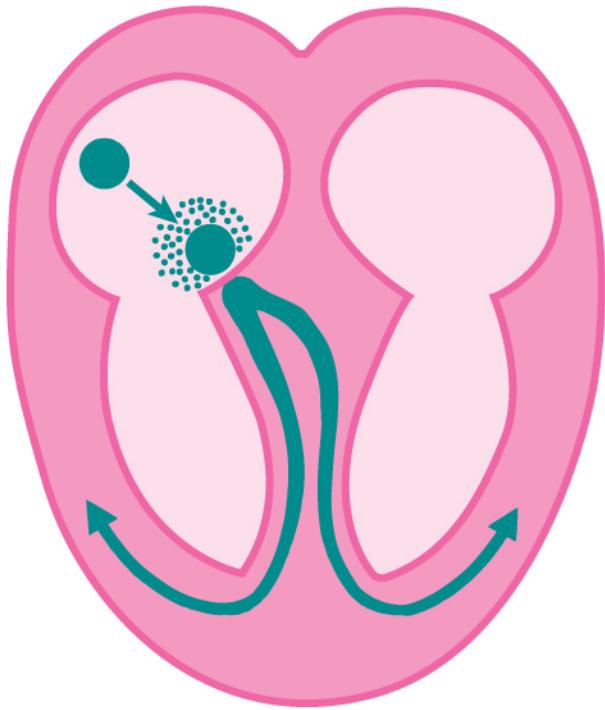
- Other aspects:
 - PVC may not actually produce a pulse
 - Make sure to assess the patient and not rely solely on monitor
 - PVCs may be caused by:
 - Heart disease
 - Myocardial infarction
 - Stimulants
 - Stress
 - Anxiety

Ventricular Tachycardia

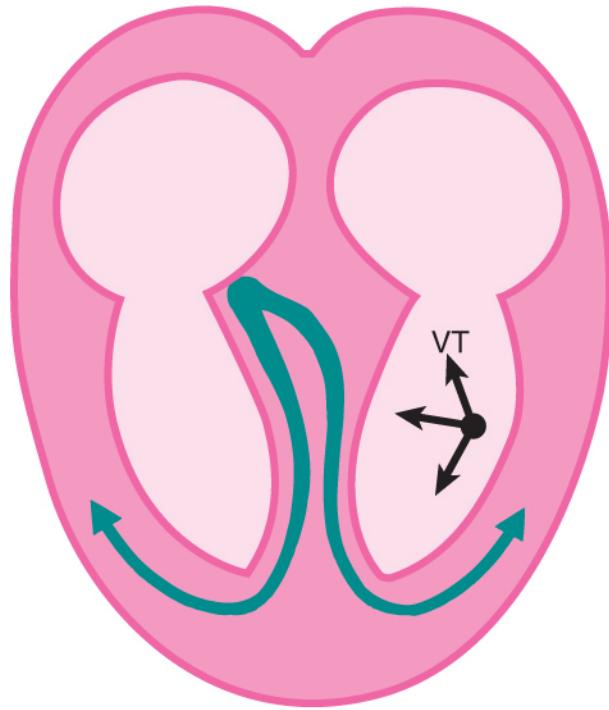


Ventricular Tachycardia

Normal conduction



Abnormal conduction



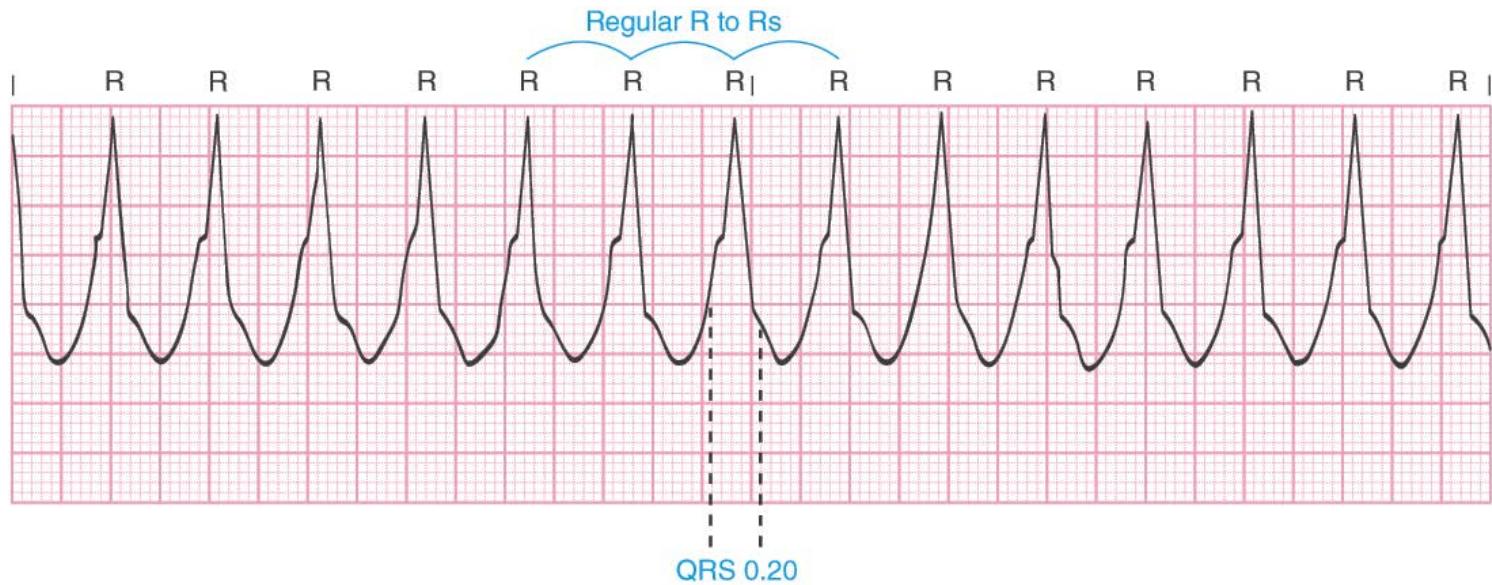
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- Left heart shows normal electrical conduction pathway. Right heart shows conduction pathway of ventricular tachycardia.

Ventricular Tachycardia

- Also known as:
 - VT
 - V Tach
- Originates from a single site in ventricles at a rate of 101 to 250 ipm
- VT with rate of 41 to 100 is considered an accelerated idioventricular dysrhythmia
- PR intervals and P-P intervals not measurable

Ventricular Tachycardia



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- Ventricular tachycardia with regular R to R intervals and QRS greater than 0.12 second; heart rate, 140 to 150 beats/min.

Ventricular Tachycardia

- QRS is wide and bizarre (> 0.12 second)
- R-R interval usually regular
- Starts suddenly and frequently triggered by PVCs
- VT = 3 or more PVCs in a row
- VT that lasts 30 seconds or less = Unsustained VT or run of VT
- VT that lasts > 30 seconds = Sustained (prolonged) VT

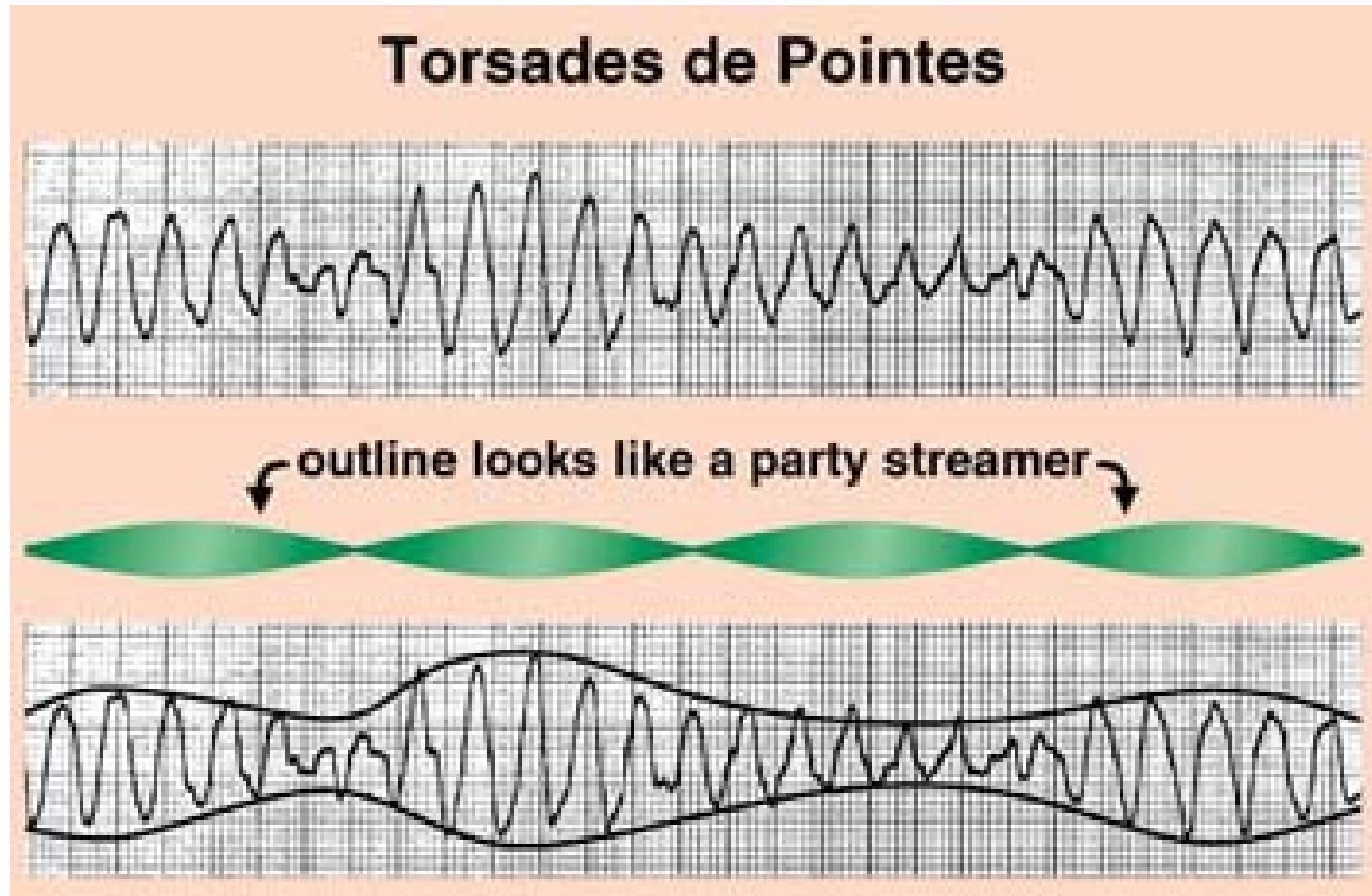
Ventricular Tachycardia

- Life threatening dysrhythmia
 - With increasing HR, ventricles do not have time to completely empty and refill
 - Decreases cardiac output
 - Adequate blood not circulated to vital organs
- Patient symptoms vary depending on duration
 - Examples:
 - Run of VT (stable VT) – Weakness, palpitations, racing heart
 - Sustained VT – Unresponsiveness and loss of pulse

Ventricular Tachycardia

- Assess patient for tolerance and appropriate treatment
- May be result of increased irritability within ventricles, caused by:
 - MI
 - Advanced heart disease
 - Severe ischemia
 - Electrical shock
 - Medications (epinephrine, digitalis)

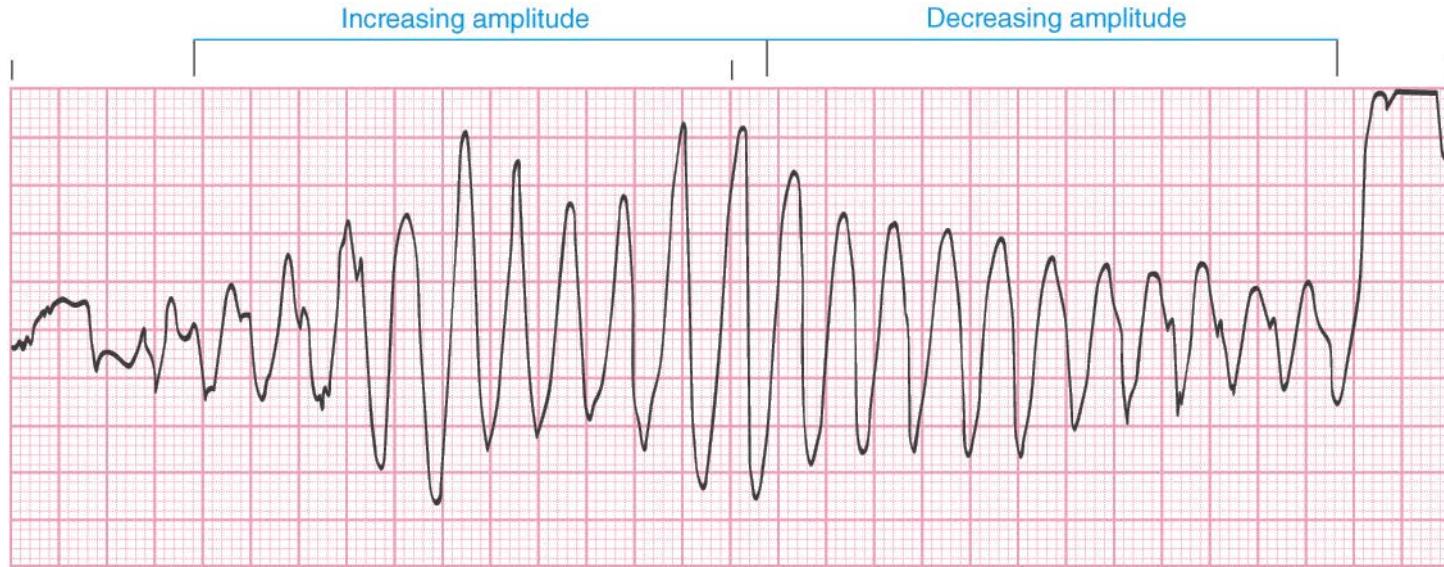
Torsades de Pointes



Torsades de Pointes

- French term meaning “twisting of the points”
- Looks similar to V Tach
 - Must distinguish as treatment is different
- Originates from ventricular muscle but unclear whether from single site or multiple sites
- Wave amplitude begins close to baseline and gradually increases and decreases in repeating pattern
- Resembles twisting and turning motion along baseline

Torsades de Pointes



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- Torsades de Pointes; heart rate, 240 to 250 beats/min.

Torsades de Pointes

- Must determine if VT or Torsades de Pointes as treatment is different
- Starts suddenly and frequently preceded by prolonged QT interval
- PR intervals and P-P intervals immeasurable
- QRS is wide and bizarre (> 0.12 second)
- R-R interval usually regular
- VR often 120-240 ipm
 - Common range = 170-190 ipm
- Duration affects patient's tolerance
 - Few seconds = Slight weakness, occasional palpitations, "racing heart"
 - Longer duration = Unstable condition and may lead to hypotension, unresponsiveness, and loss of pulse

Torsades de Pointes

- Life threatening dysrhythmia
 - Increased HR causes ventricles to not have enough time to completely empty and fill
 - Good cardiac output not maintained
 - Adequate amounts of blood and oxygen not circulated to vital organs
- Treatment centered on rapid recognition and early treatment
- Common causes:
 - MI
 - Severe heart disease
 - Low blood levels of magnesium
 - Long QT interval
 - Medications prolonging QT interval (lidocaine, procainamide, methadone)

Ventricular Fibrillation

Ventricular Fibrillation



Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
300-600	Extremely irregular	Absent	N/A	Fibrillatory baseline

Ventricular Fibrillation

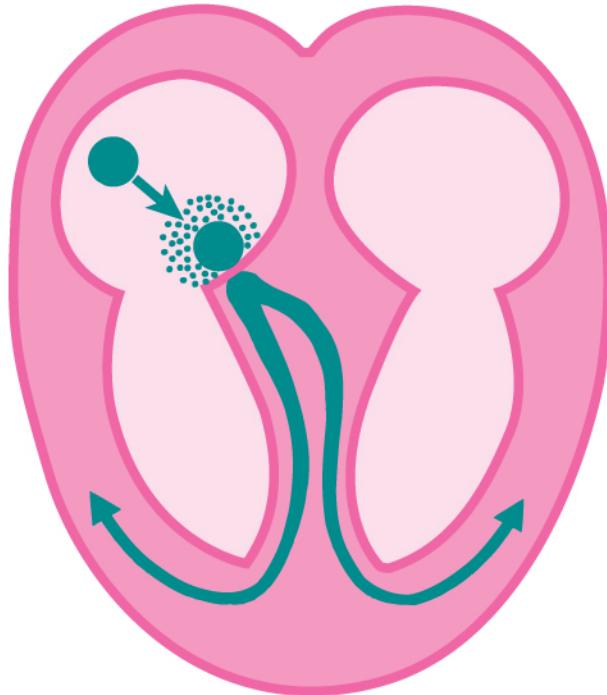
- Also known as:
 - VF
 - V Fib
- Lethal dysrhythmia that originates from many different sites within ventricles
 - With so many sites initiating impulses, cardiac cells don't have time to completely depolarize and repolarize, and impulses don't get transmitted through any conduction pathway

Ventricular Fibrillation

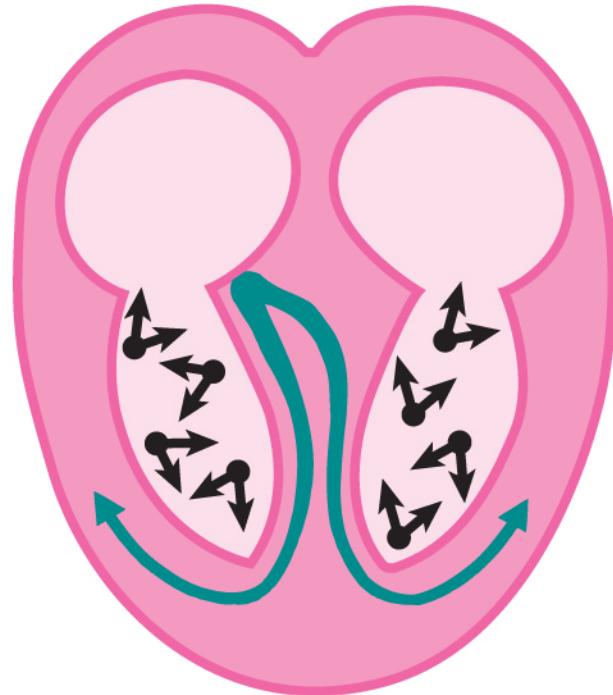
- Neither atria nor ventricles depolarize
 - No P waves, QRS, PR intervals, P-P intervals, and R-R intervals present
 - Only see chaotic wavy line on strip
 - Can't measure HR
- Ventricles make ineffective quivering movements rather than contractions
- Blood not pumped through body
- Patient does not have a pulse, and death will occur without treatment
 - Start CPR immediately and get AED

Ventricular Fibrillation

Normal conduction



Abnormal conduction

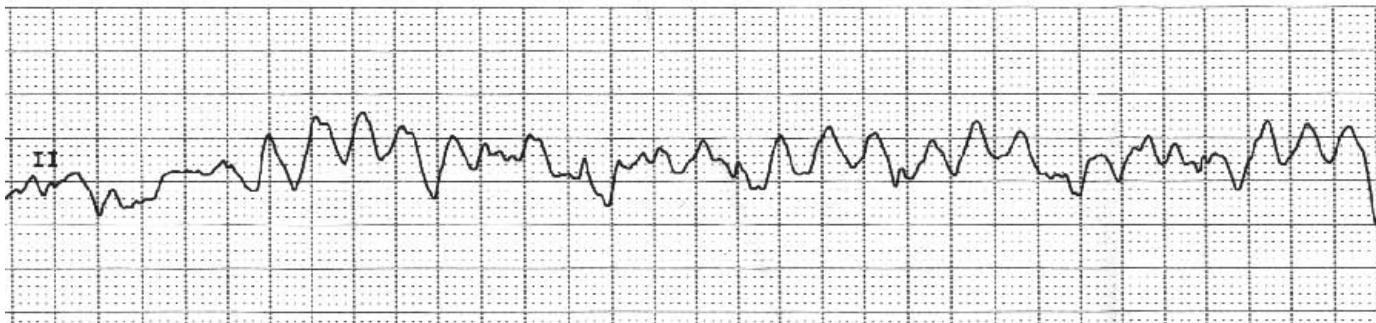


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- Left heart shows normal electrical conduction pathway. Right heart shows conduction pathway of ventricular fibrillation.

Ventricular Fibrillation

- Described as either coarse or fine
 - Coarse V Fib waves have higher amplitude and are more irregular
 - Indicate that a greater number of cardiac cells are able to respond to electrical stimulation
 - Less likely to respond to treatment
 - May progress to fine V fib



Ventricular Fibrillation

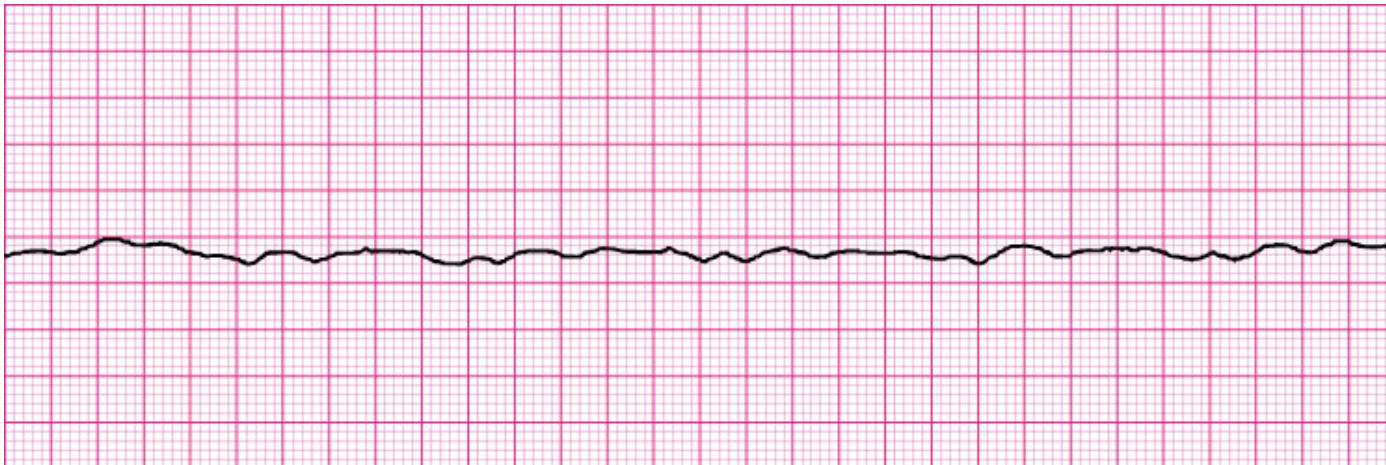


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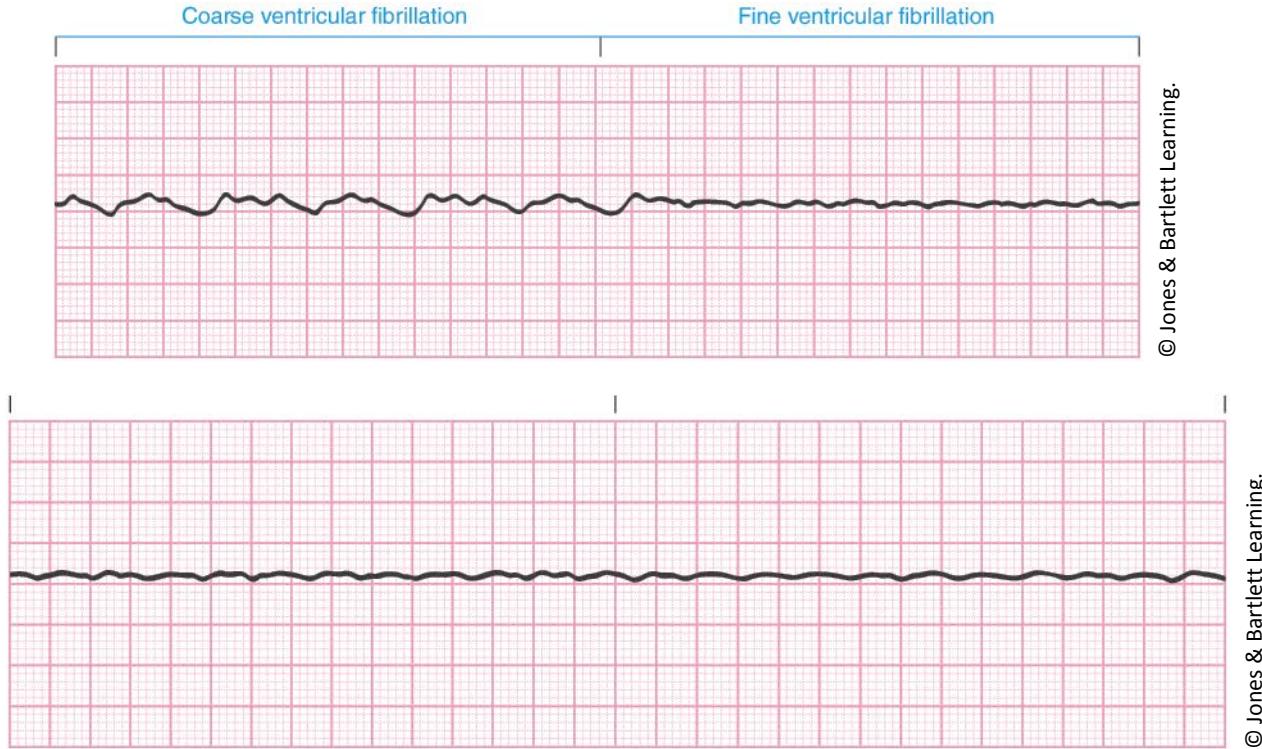
- Coarse ventricular fibrillation; heart rate, not measurable.

Ventricular Fibrillation

- Described as either coarse or fine
 - Fine V Fib have less amplitude
 - Indicates that fewer cardiac cells are able to respond to an electrical impulse
 - Less likely to respond to treatment



Ventricular Fibrillation



- Coarse ventricular fibrillation progressing to fine ventricular fibrillation; heart rate, not measurable.
- Fine ventricular fibrillation; heart rate, not measurable.

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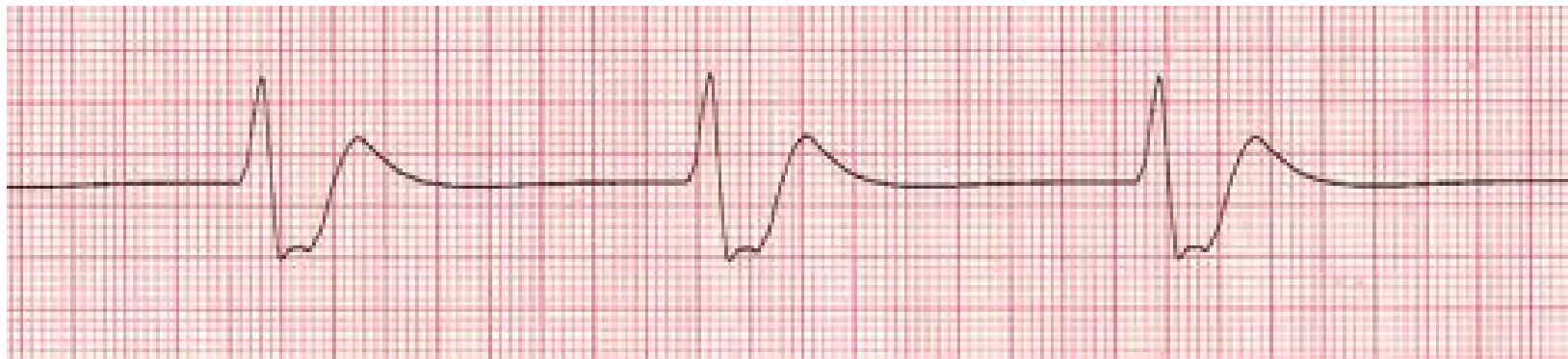
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Ventricular Fibrillation

- Causes:
 - Severe heart disease
 - Electrical shock
 - Drug toxicity
 - Hypoxia
 - Severe electrolyte imbalance
- Remember these patients do not have a pulse and need immediate treatment!

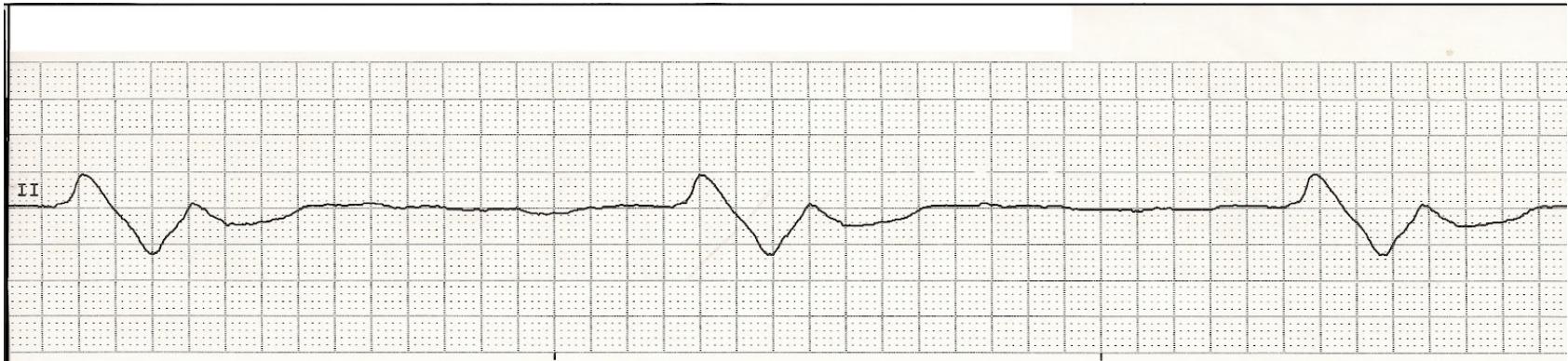
Idioventricular Dysrhythmia / Agonal Dysrhythmia

- Idioventricular Dysrhythmia



Idioventricular Dysrhythmia / Agonal Dysrhythmia

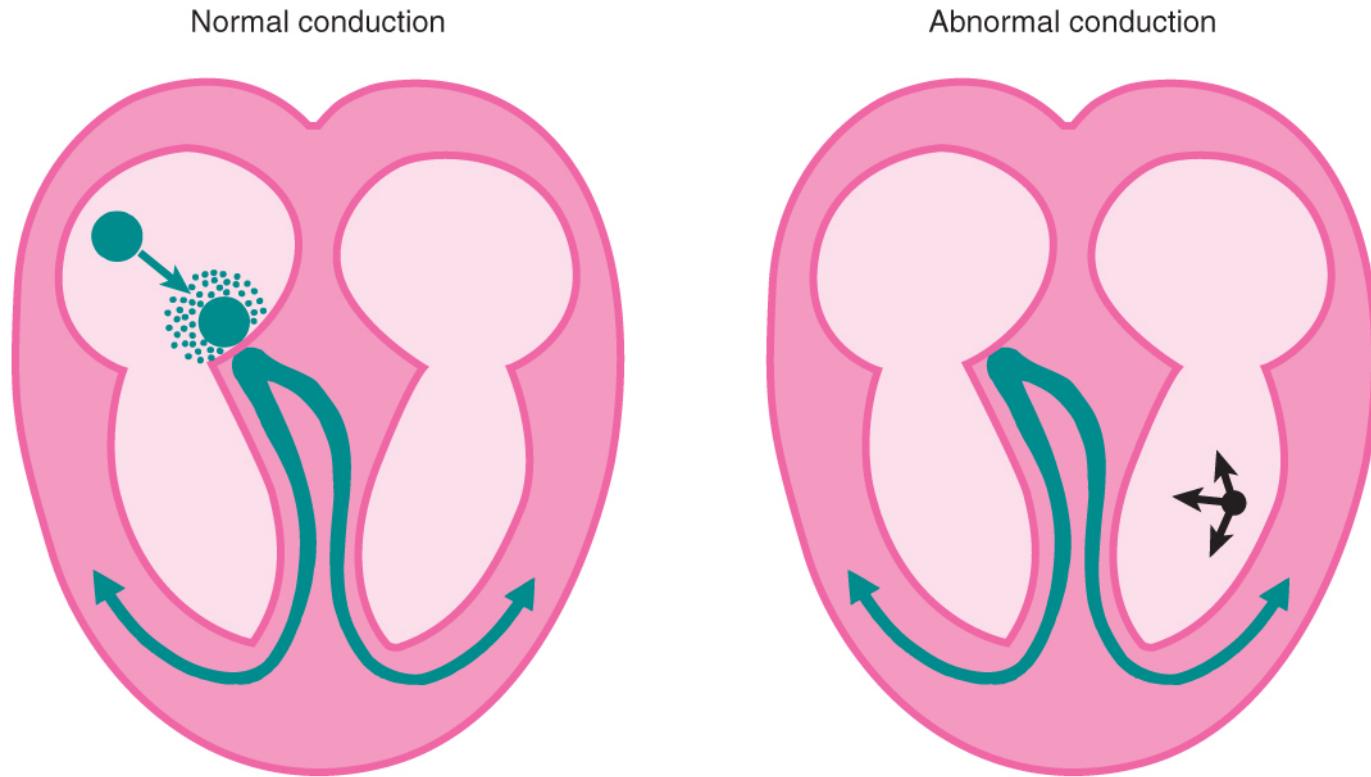
- Agonal Dysrhythmia (dying heart)



Idioventricular Dysrhythmia / Agonal Dysrhythmia

- Lethal dysrhythmias that usually originate from single site in ventricles
- Atria, AV junction, bundle of His, and bundle branches no longer function as pacemakers
 - Final attempt of cardiac conduction system to initiate impulse from ventricular muscle
 - Cardiac muscle so damaged that doesn't respond effectively

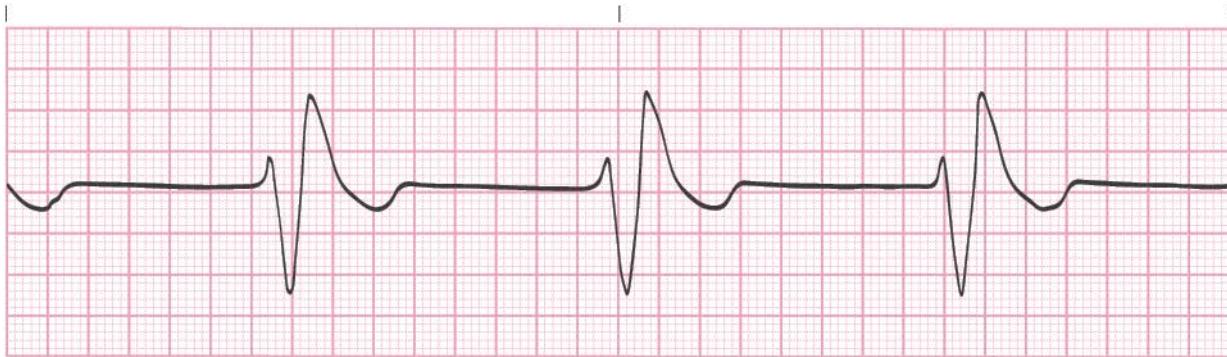
Idioventricular Rhythm/Agonal Rhythm



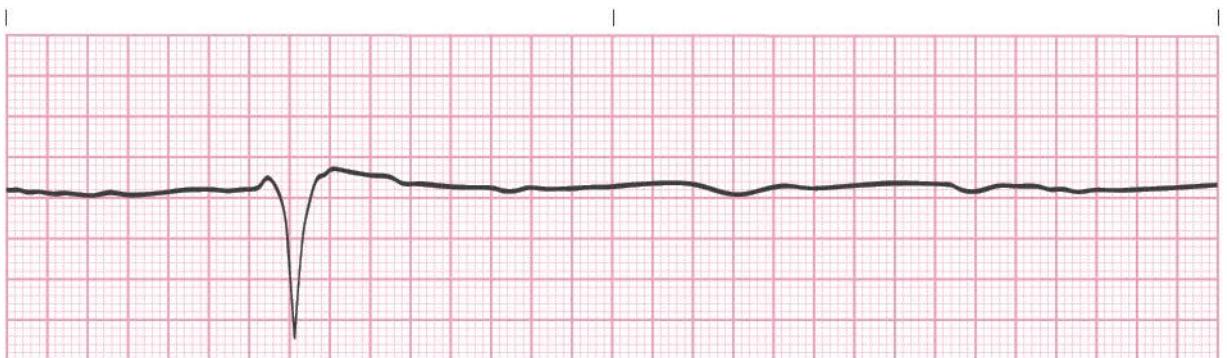
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- Left heart shows normal electrical conduction pathway. Right heart shows conduction pathway of idioventricular/agonal rhythm.

Idioventricular Rhythm/Agonal Rhythm



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- **A.** Idioventricular rhythm; atrial heart rate, 0 beats/min; ventricular heart rate, 30 beats/min. **B.** Agonal rhythm; atrial heart rate, 0 beats/min; ventricular heart rate, 10 beats/min.

Idioventricular Dysrhythmia / Agonal Dysrhythmia

- Atria don't depolarize
 - No P waves, PR intervals, or P-P intervals
- Ventricular depolarization slow and ineffective
 - QRS very wide and bizarre (> 0.12 second)
- R-R intervals irregular
- VR of idioventricular = < 40 ipm
- Accelerated idioventricular rhythm (AIVR) = 41 to 100 ipm

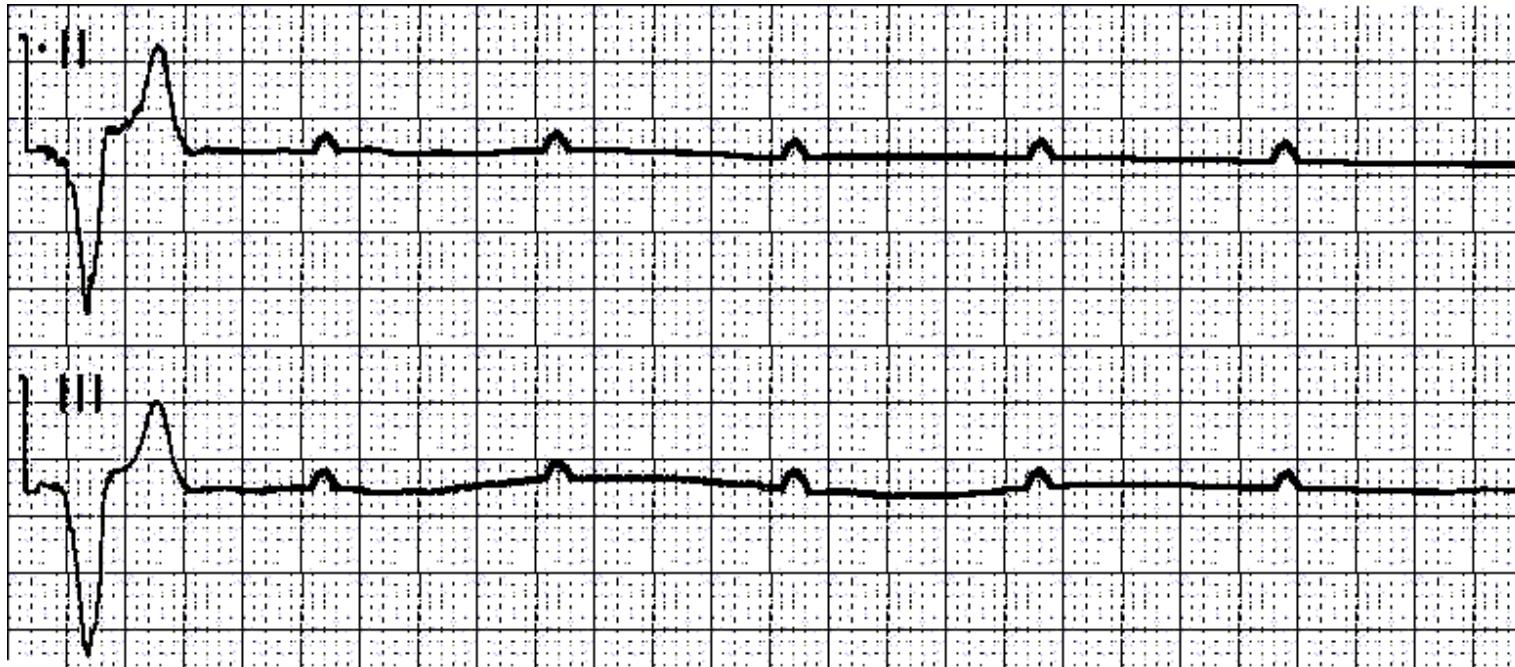
Idioventricular Dysrhythmia / Agonal Dysrhythmia

- VR < 20 ipm = Agonal (dying heart) dysrhythmia
 - Ventricles weaken
 - Impulses become slower
 - QRS show less amplitude and become wider until all cardiac activity stops
- Heart muscle so damaged that cardiac contractions are ineffective
 - CO so poor that O₂ not reaching body cells in sufficient amounts to maintain life

Idioventricular Dysrhythmia / Agonal Dysrhythmia

- Lethal rhythms and require immediate treatment
- Usually seen in an acute cardiopulmonary event or at end stage of advanced heart disease

Ventricular Standstill

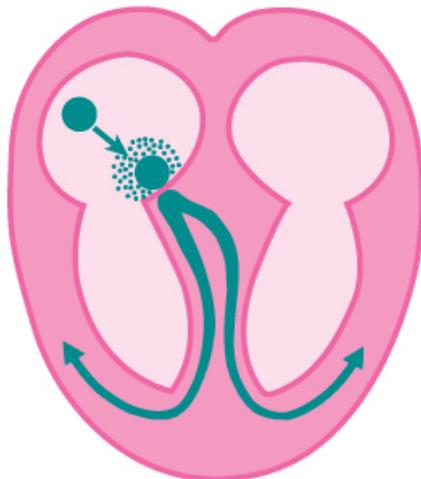


Ventricular Standstill

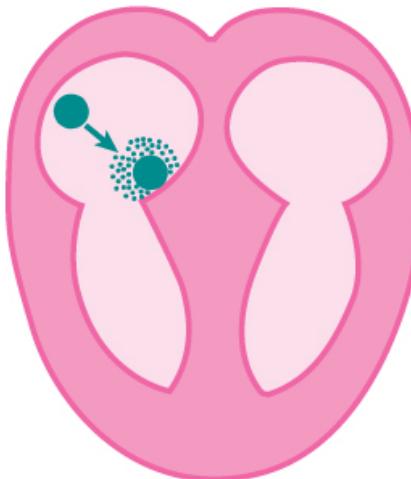
- Occurs only when atrial depolarization exists and no ventricular depolarization
- P waves present
- P-P intervals regular
- No QRS, PR intervals or R-R intervals
- AR = 60 to 100 ipm
- VR = 0
- No ventricular contraction

Ventricular Standstill

Normal conduction

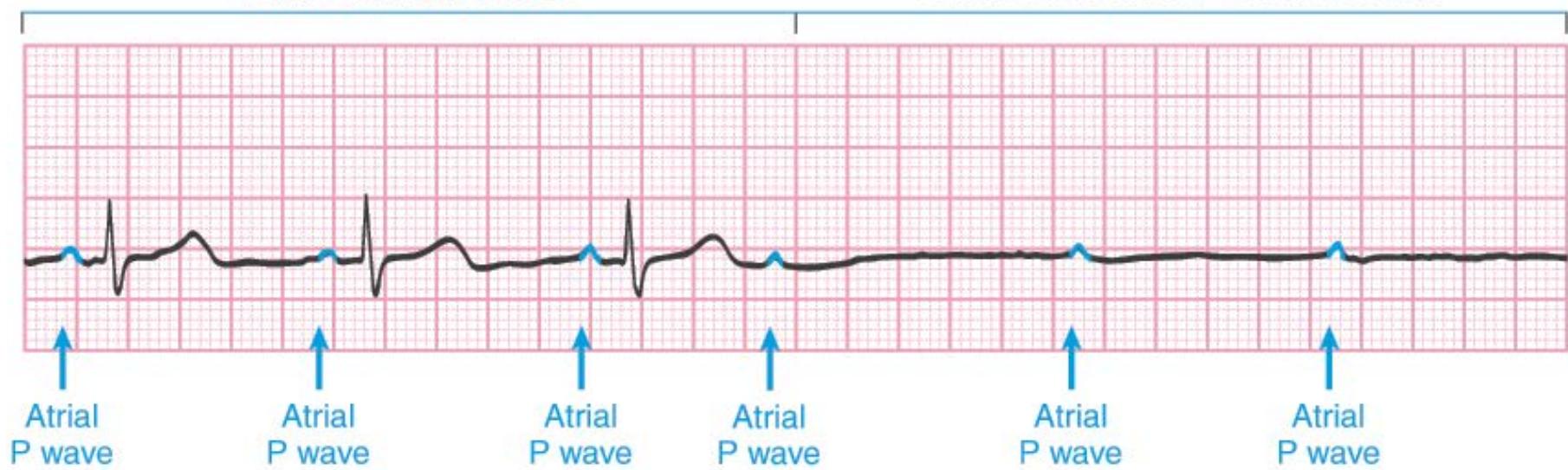


Abnormal conduction



Ventricular heart rate 60

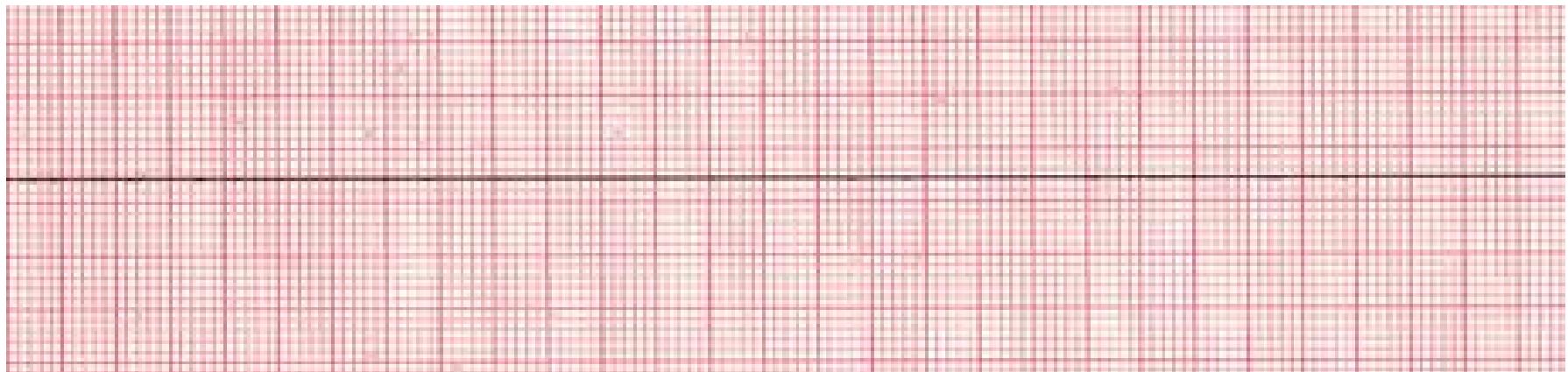
Ventricular heart rate not measurable



Ventricular Standstill

- No blood circulation to body
- Patient does not have a pulse
- Lethal dysrhythmia and requires immediate treatment
- May be result of:
 - Third-degree heart block
 - Massive MI
 - Ventricular rupture

Asystole



Asystole

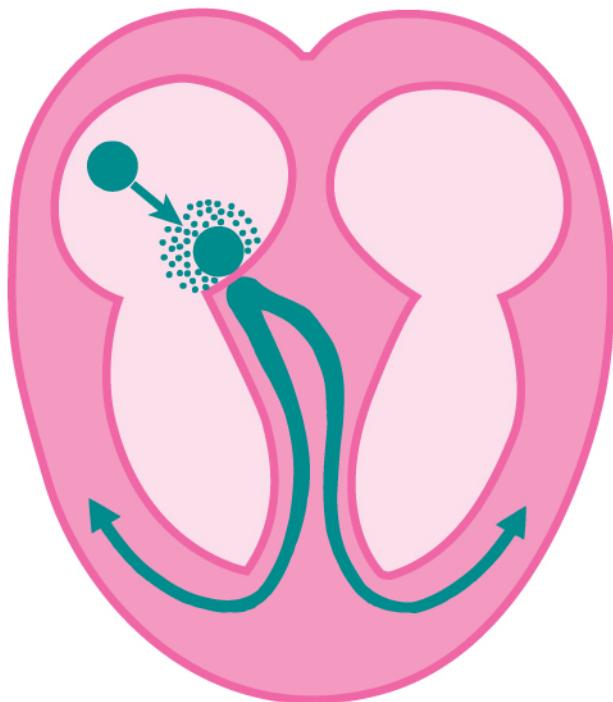
- Occurs when complete lack of electrical activity in both atria and ventricles
 - Neither depolarize
- No P waves, PR intervals, QRS, P-P intervals, or R-R intervals exist
- Slightly wavy or straight line on strip
- May be difficult to distinguish from very fine V Fib so two different leads should be used
(Lead II and MCL₁)

Asystole

- Lethal dysrhythmia
 - No pulse and immediate treatment needed
- Usually follows untreated VT or V Fib
- May be caused by:
 - Massive MI
 - Advanced cardiac disease
 - Electrical shock

Asystole

Normal conduction



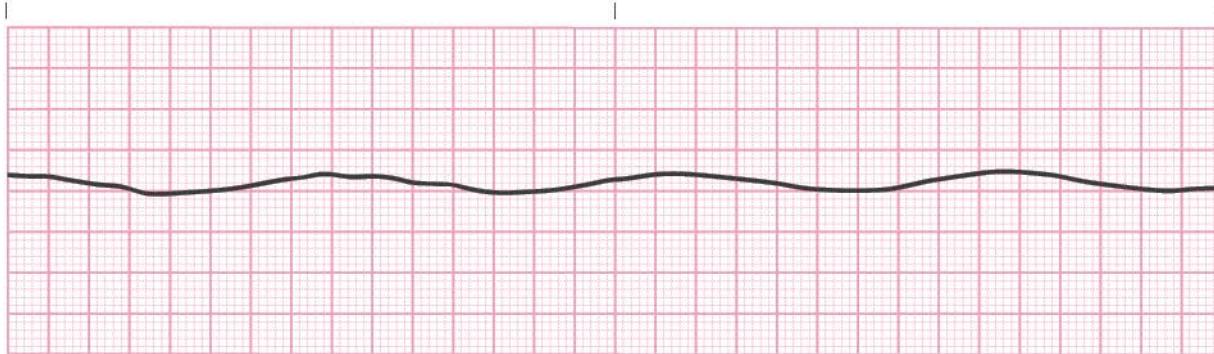
Abnormal conduction



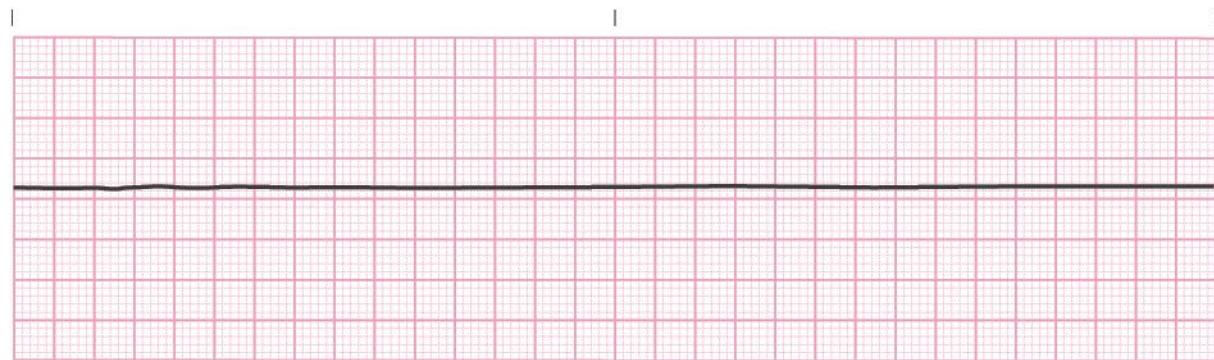
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- Left heart shows normal electrical conduction pathway. Right heart shows conduction pathway of asystole.

Asystole



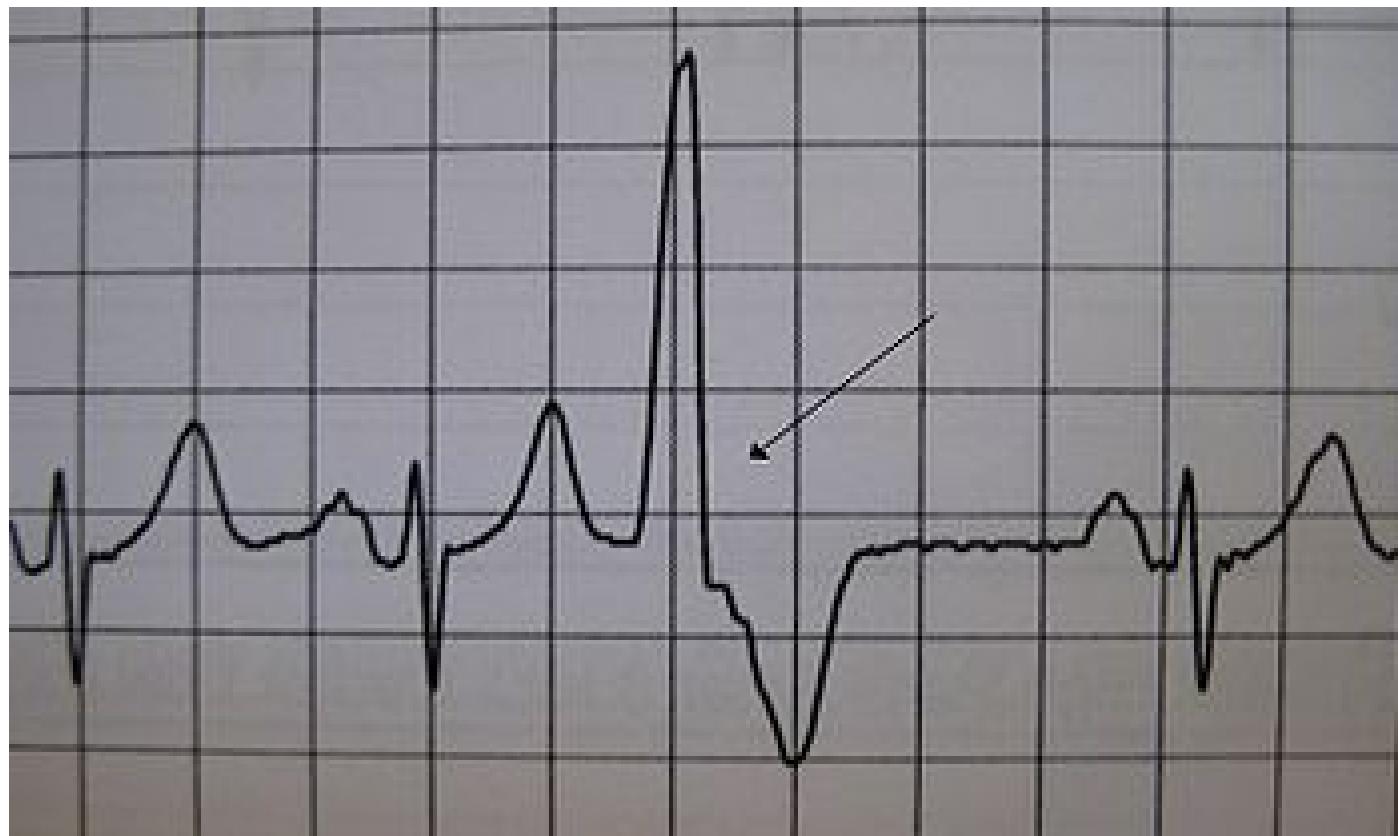
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- Asystole. **A.** Lead II, slightly wavy line, possibly fine ventricular fibrillation. **B.** MCLII, straight line. Rhythm is asystole. Atrial and ventricular heart rates of both strips are 0.

Rhythm Strip Review



Rhythm Strip Review



Rhythm Strip Review



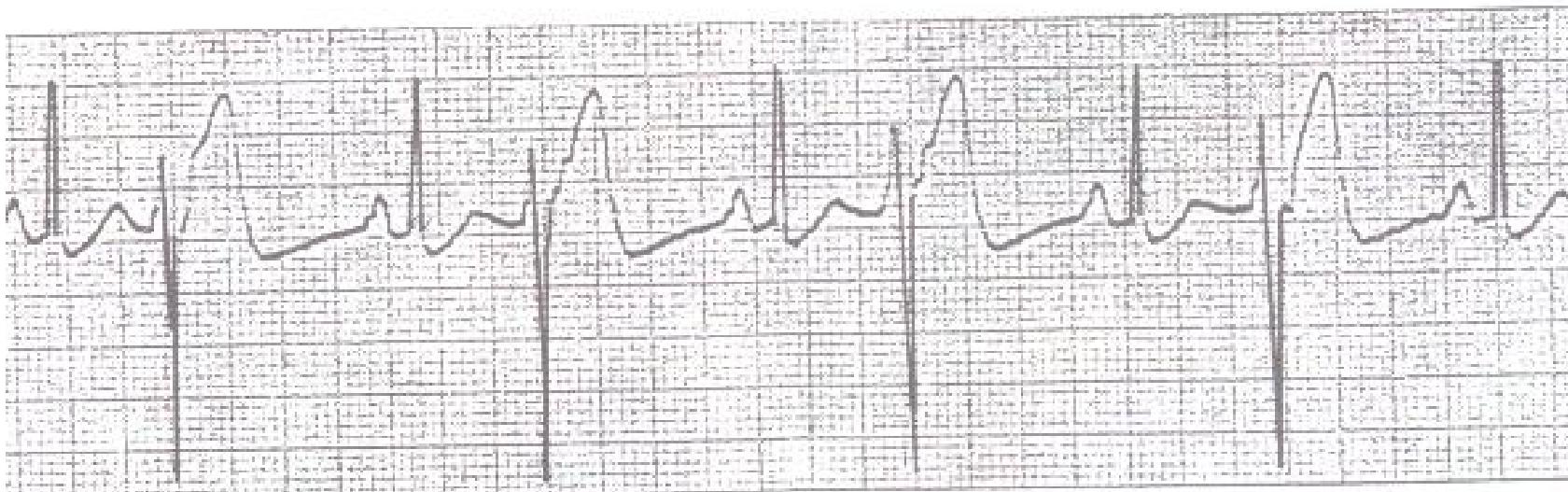
Rhythm Strip Review



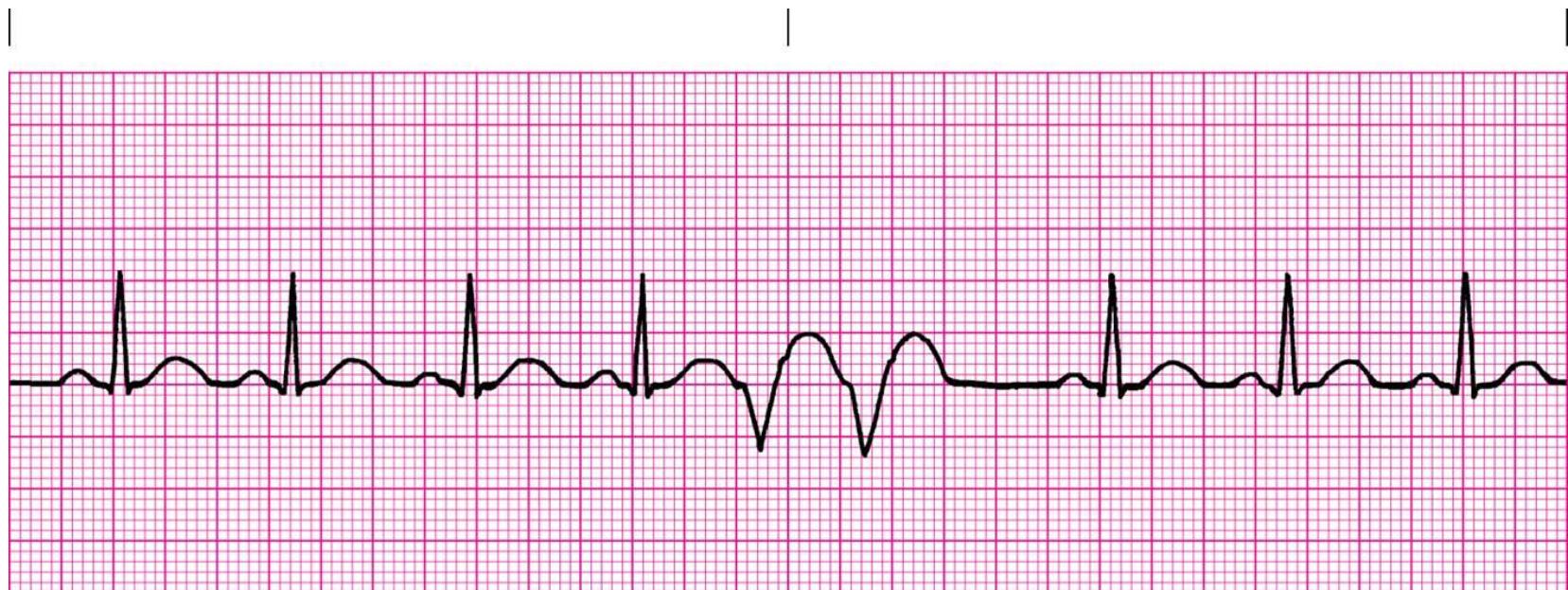
Rhythm Strip Review



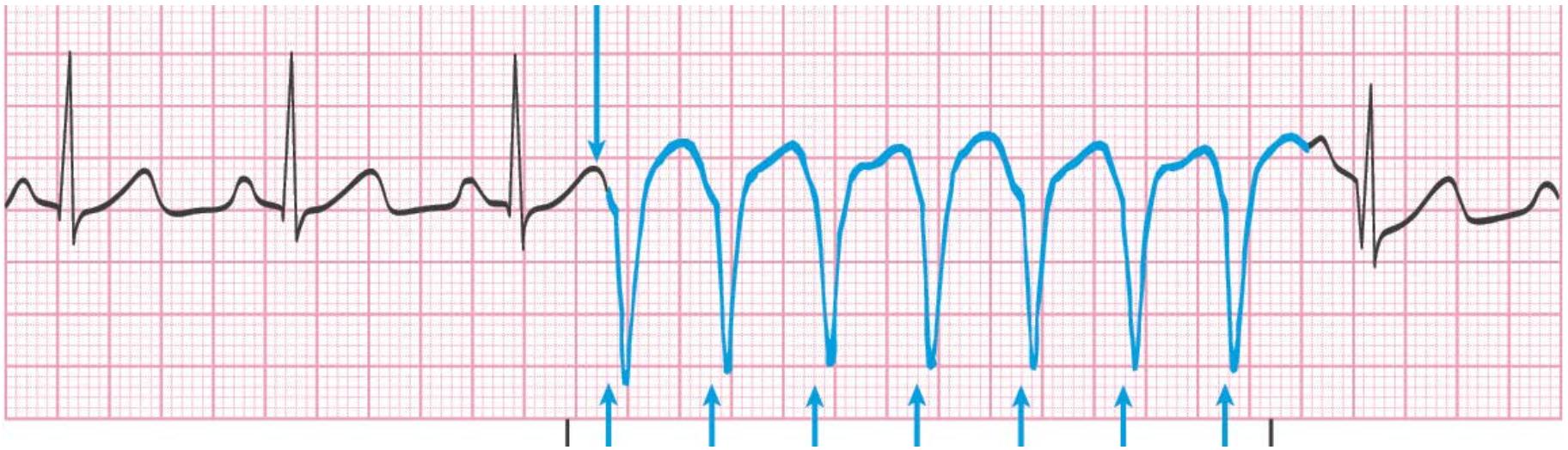
Rhythm Strip Review



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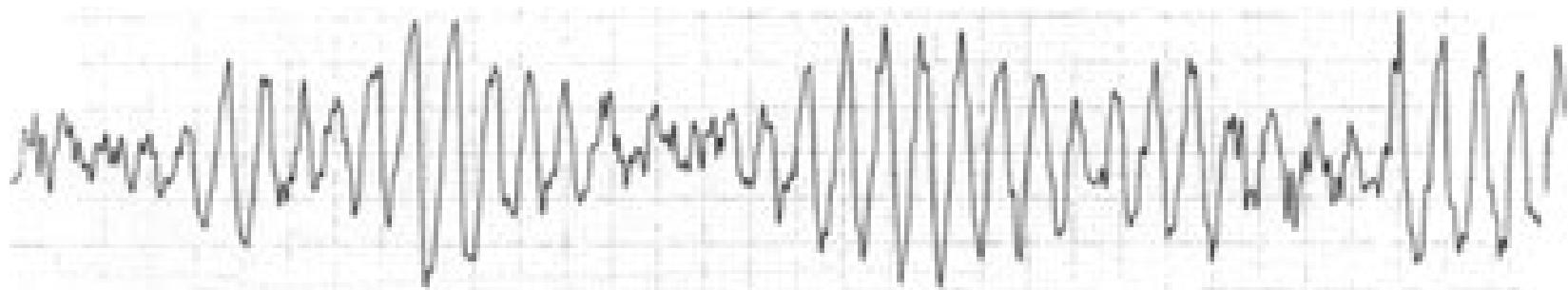
Rhythm Strip Review



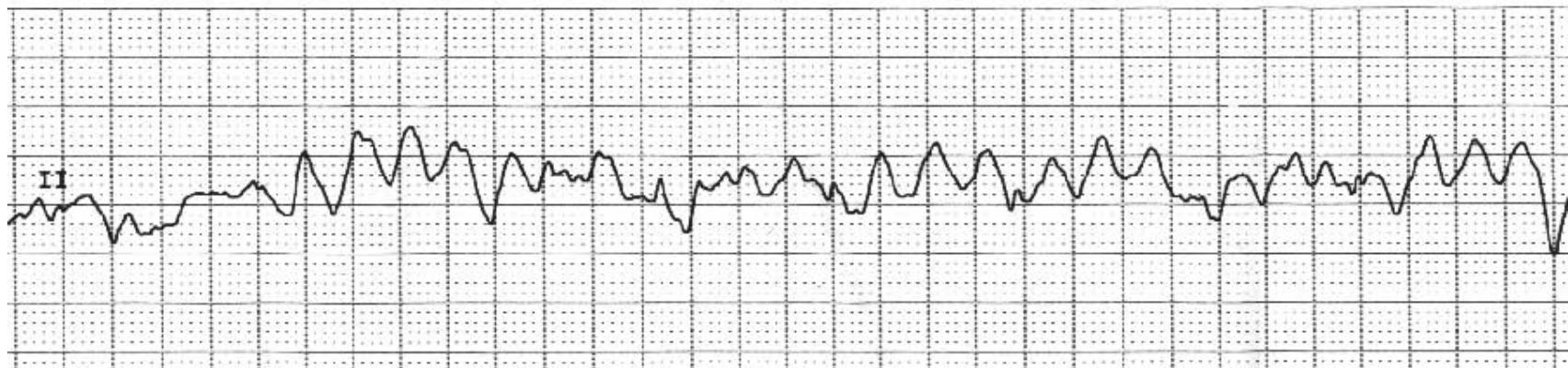
Rhythm Strip Review



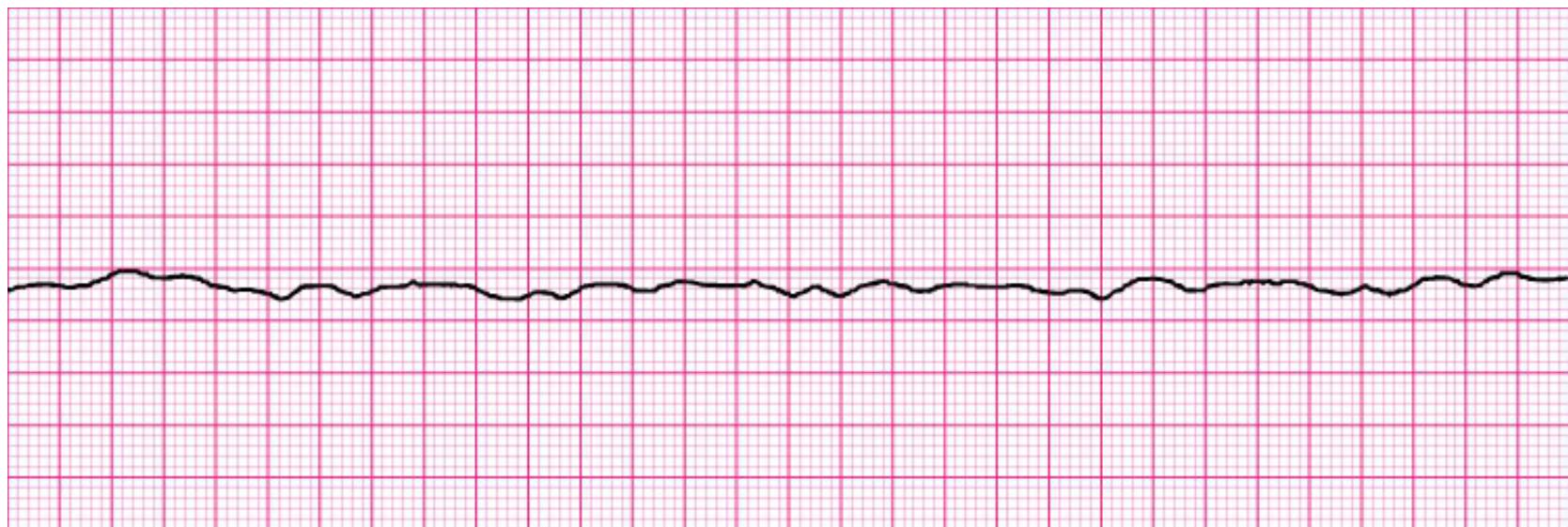
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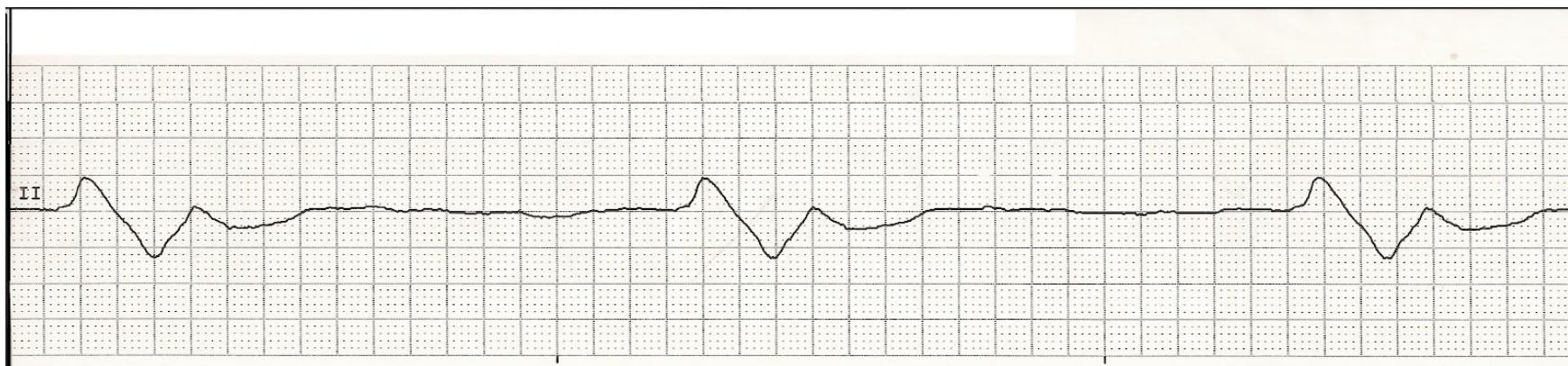
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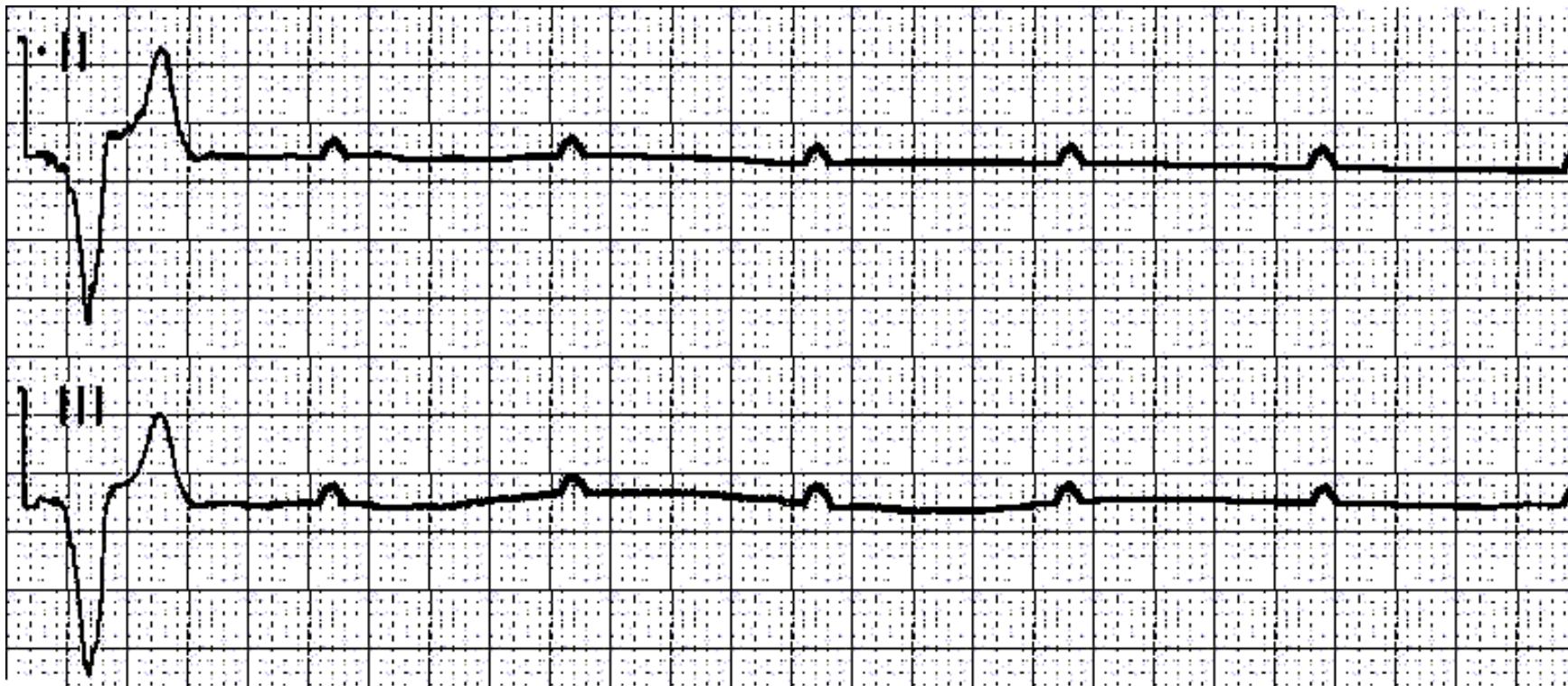
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