Ventricular Dysrhythmias

Fast & Easy ECGs – A Self-Paced Learning Program
Ventricular Dysrhythmias

• Occur when:
  – The atria, AV junction, or both, are unable to initiate an electrical impulse
  – There is enhanced automaticity of the ventricular myocardium
Ventricular Dysrhythmias

- Key features:
  - Wide (> 0.12 seconds in duration), bizarre QRS complexes
  - T waves in the opposite direction of the R wave
  - Absence of P waves
Ventricular Dysrhythmias

- Premature ventricular complex (PVC)
- Ventricular escape complexes or rhythm
- Ventricular tachycardia
- Ventricular fibrillation
- Asystole
Ventricular Dysrhythmias

- Can be benign or they can be potentially life-threatening (because the ventricles are ultimately responsible for cardiac output)
Premature Ventricular Complexes (PVCs)

- Early ectopic beats that interrupt the normal rhythm
- Originate from an irritable focus in the ventricular conduction system or muscle tissue
Premature Ventricular Complexes

- Characteristics

  - Rate: Depends on underlying rhythm
  - Regularity: Irregular
  - P waves: Are not visible as they are hidden in the QRS complexes
  - QRS complexes: Are wide and bizarre in appearance, have T waves in the opposite direction of the R wave
  - PR intervals: Absent
  - QT intervals: Usually prolonged
## Premature Ventricular Complexes

<table>
<thead>
<tr>
<th>Causes of PVCs</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Myocardial ischemia and infarction, enlargement of the ventricular chambers, congestive heart failure, myocarditis</td>
</tr>
<tr>
<td>Use of certain drugs</td>
<td>Drug intoxication, particularly cocaine, amphetamines, tricyclic antidepressants; use of stimulants, such as alcohol, caffeine, tobacco; sympathomimetic drugs, such as phencyclidine (PCP), cocaine, epinephrine, isoproterenol</td>
</tr>
<tr>
<td>Other</td>
<td>Hypoxia, electrolyte imbalance, such as hypokalemia, hyperkalemia, hypomagnesemia, and hypocalcemia; metabolic acidosis, increased sympathetic stimulation</td>
</tr>
</tbody>
</table>
Premature Ventricular Complexes

- PVCs that look the same are called *uniform* (unifocal)
- PVCs that look different from each other are called *multiform* (multifocal)
Premature Ventricular Complexes

- Premature Ventricular Complexes (PVCs) are abnormal heartbeats that originate from the ventricles.

- **Bigeminal PVCs**: Every other beat is a PVC.

- **Trigeminal PVCs**: Every third beat is a PVC.

- **Quadrigeminal PVCs**: Every fourth beat is a PVC.
Premature Ventricular Complexes

- Two PVCs in a row are called a *couplet* and indicate extremely irritable ventricles.
Premature Ventricular Complexes

- PVCs that fall between two regular complexes and do not disrupt the normal cardiac cycle are called *interpolated PVCs*.
Premature Ventricular Complexes

- PVCs occurring on or near the previous T wave (R-on-T PVCs) may precipitate ventricular tachycardia or fibrillation
Idioventricular Rhythm

- Slow dysrhythmia (rate of 20 to 40 BPM) with wide QRS complexes that arise from the ventricles
Idioventricular Rhythm

Characteristics

- Rate: 20 to 40 beats per minute
- Regularity: Regular
- P waves: Are not visible as they are hidden in the QRS complexes
- QRS complexes: Are wide and bizarre in appearance, have T waves in the opposite direction of the R wave
- PR intervals: Absent
- QT intervals: Usually prolonged
Accelerated Idioventricular Rhythm

- Idioventricular rhythm that exceeds the inherent rate of the ventricles (60 to 100 BPM)
Accelerated Idioventricular Rhythm

Characteristics

Rate: 40 to 100 beats per minute
Regularity: Regular
P waves: Are not visible as they are hidden in the QRS complexes
QRS complexes: Are wide and bizarre in appearance, have T waves in the opposite direction of the R wave
PR intervals: Absent
QT intervals: Usually prolonged
Ventricular Tachycardia (VT)

- Fast dysrhythmia (100 to 250 BPM) that arises from the ventricles
Ventricular Tachycardia

- Present when there are 3 or more PVCs in a row
- May come in bursts of 6 to 10 complexes or may persist (sustained VT)
Ventricular Tachycardia

Characteristics

- Rate: 100 to 250 beats per minute
- Regularity: Regular
- P waves: Are not visible as they are hidden in the QRS complexes
- QRS complexes: Are wide and bizarre in appearance, have T waves in the opposite direction of the R wave
- PR intervals: Absent
- QT intervals: Unmeasurable
## Ventricular Tachycardia

### Table 11-2  Ventricular Tachycardia

<table>
<thead>
<tr>
<th>Causes of ventricular tachycardia</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Myocardial ischemia and infarction, coronary artery disease, valvular heart disease, congestive heart failure, cardiomyopathy</td>
</tr>
<tr>
<td>Use of certain drugs</td>
<td>Drug intoxication from digitalis, tricyclic antidepressants, cocaine, amphetamines</td>
</tr>
<tr>
<td>Other</td>
<td>Electrolyte imbalance, such as hypokalemia; acid-base imbalance; trauma; ingestion of stimulants (alcohol, caffeine, tobacco)</td>
</tr>
</tbody>
</table>
Ventricular Tachycardia

- Can occur with or without pulses
- Patient may be stable or unstable
Ventricular Tachycardia

- **Monomorphic** - appearance of each QRS complex is similar
- **Polymorphic** - appearance varies considerably from complex to complex
Ventricular Fibrillation (VF)

- Results from chaotic firing of multiple sites in the ventricles
- Causes heart muscle to quiver rather than contract efficiently, producing no effective muscular contraction and no cardiac output
Ventricular Fibrillation

Characteristics

- Rate: 300 to 500 ventricular impulses per minute
- Regularity: Totally chaotic
- P waves: Absent
- QRS complexes: Wavy, chaotic line without any logic
- PR intervals: Absent
- QT intervals: Absent
# Ventricular Fibrillation

## Table 11-3 Ventricular Fibrillation

<table>
<thead>
<tr>
<th>Causes of ventricular fibrillation</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Myocardial ischemia/infarction, untreated ventricular tachycardia, underlying heart disease</td>
</tr>
<tr>
<td>Other</td>
<td>Acid-base imbalance; electric shock; severe hypothermia; electrolyte imbalances, such as hypokalemia, hyperkalemia, hypercalcemia</td>
</tr>
</tbody>
</table>
Ventricular Fibrillation

- Death occurs if patient not promptly treated (defibrillation)
- Most common cause of prehospital cardiac arrest in adults
Asystole

- Absence of any cardiac activity
- Appears as a flat (or nearly flat) line
- Complete cessation of cardiac output
Asystole

Characteristics

- Rate
  - Total absence of electrical activity
- Regularity
  - Total absence of electrical activity
- P waves
  - Absent (unless ventricular standstill is present)
- QRS complexes
  - Absent
- PR intervals
  - Absent
- QT intervals
  - Absent
# Asystole

<table>
<thead>
<tr>
<th>Causes of asystole</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Myocardial infarction, underlying heart disease</td>
</tr>
<tr>
<td>Other</td>
<td>Severe uncorrected acid-base imbalance; electric shock; electrolyte imbalances, such as hyperkalemia; massive pulmonary embolism; prolonged hypoxemia; drug intoxication (such as cocaine overdose)</td>
</tr>
</tbody>
</table>
Asystole

- Terminal rhythm
- Chances of recovery extremely low
Pulseless Electrical Activity (PEA)

- Condition that has an organized electrical rhythm on the ECG monitor (which should produce a pulse) but patient is pulseless and apneic
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: ____________ (atrial) ____________ (ventricular)  
P waves: ____________  QRS complexes: ____________  
QT intervals: ____________  Dysrhythmia: ____________  
Regularity: ____________  
PR intervals: ____________
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: _______________ (atrial) _______________ (ventricular)
P waves: _______________ QRS complexes: _______________
QT intervals: _______________ Dysrhythmia: _______________
Regularity: _______________
PR intervals: _______________
Practice Makes Perfect

- Determine the type of dysrhythmia

**ECG Tracing**

- Rate: ________ (atrial) ________ (ventricular)
- P waves: ________
- QRS complexes: ________
- QT intervals: ________
- Dyrrhythmia: ________
- Regularity: ________
- PR intervals: ________
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: ___________ (atrial) ___________ (ventricular)  
P waves: ___________  QRS complexes: ___________  
QT intervals: ___________  Dysrhythmia: ___________  
Regularity: ___________  PR intervals: ___________
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: ____________ (atrial) ____________ (ventricular)
P waves: ____________ QRS complexes: ____________
QT intervals: ____________ Dysrhythmia: ____________
Regularity: ____________
PR intervals: ____________

Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: _____________ (atrial) _____________ (ventricular)  
P waves: _______________  QRS complexes: _______________  
QT intervals: _______________  Dysrhythmia: _______________  
Regularity: _______________  
PR intervals: _______________
Practice Makes Perfect

• Determine the type of dysrhythmia

Rate: ________ (atrial) ________ (ventricular)  
P waves: ________ QRS complexes: ________  
QT intervals: ________ Dysrhythmia: ________  
Regularity: ________  
PR intervals: ________
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: ________ (atrial) ________ (ventricular)
P waves: ________ QRS complexes: ________
QT intervals: ________ Dysrhythmia: ________
Regularity: ________
PR intervals: ________
Practice Makes Perfect

• Determine the type of dysrhythmia

Rate: ___________ (atrial) ___________ (ventricular)
P waves: ___________ QRS complexes: ___________
QT intervals: ___________ Dysrhythmia: ___________
Regularity: ___________
PR intervals: ___________
Summary

• Ventricular dysrhythmias occur when the atria, AV junction, or both, are unable to initiate an electrical impulse or when there is enhanced excitability of the ventricular myocardium.

• A key feature of ventricular dysrhythmias are wide (greater than 0.12 seconds in duration), bizarre QRS complexes that have T waves in the opposite direction of the R wave and an absence of P waves.

• Ventricular dysrhythmias include: premature ventricular contraction (PVC), ventricular escape complexes or rhythm, ventricular tachycardia, ventricular fibrillation, and asystole.
Summary

• Premature ventricular complexes are early ectopic beats that interrupt the normal rhythm and originate from an irritable focus in the ventricular conduction system or muscle tissue.

• Idioventricular rhythm is a slow dysrhythmia with wide QRS complexes that arise from the ventricles at a rate of 20 to 40 beats per minute.
Summary

• Ventricular tachycardia is a fast dysrhythmia, between 100 to 250 beats per minute that arises from the ventricles.
  – It is said to be present when there are three or more PVCs in a row.
  – It can occur with or without pulses, and the patient may be stable or unstable with this rhythm.
• VT may be monomorphic, where the appearance of each QRS complex is similar, or polymorphic, where the appearance varies considerably from complex to complex.

• Ventricular fibrillation (VF) results from chaotic firing of multiple sites in the ventricles causing the heart muscle to quiver rather than contracting efficiently, producing an absence of effective muscular contraction and cardiac output.

• Asystole is the absence of any cardiac activity. It appears as a flat (or nearly flat) line on the monitor screen and produces a complete cessation of cardiac output.
Summary

- Pulseless electrical activity (PEA) is a condition in which there is an organized electrical rhythm on the ECG monitor (which should produce a pulse) but the patient is pulseless and apneic.
  - Sinus rhythm, sinus tachycardia, idioventricular rhythm, or other rhythms may be the electrical activity seen with PEA.