Origin and Clinical Aspects of AV Heart Blocks

Fast & Easy ECGs – A Self-Paced Learning Program
Heart Blocks

- Partial delays or complete interruptions in the cardiac conduction pathway between the atria and ventricles
- The degree of block defines the type and classification of heart block
Heart Blocks

- Common causes:
  - Ischemia
  - Myocardial necrosis
  - Degenerative disease of the conduction system
  - Congenital anomalies
  - Drugs (especially digitalis preparations)
AV Heart Blocks

- 1\textsuperscript{st}-degree AV heart block
- 2\textsuperscript{nd}-degree AV heart block, Type I (Wenckebach)
- 2\textsuperscript{nd}-degree AV heart block, Type II
- 3\textsuperscript{rd}-degree AV heart block

1\textsuperscript{st}-degree AV heart block is a consistent delay in conduction through the AV node.

2\textsuperscript{nd}-degree AV heart block, Type I is an intermittent block at the level of the AV node that results in a progressive lengthening of the PR interval.

2\textsuperscript{nd}-degree AV heart block, Type II, is an intermittent block at the level of the bundle of His or bundle branches resulting in some atrial impulses not being conducted to the ventricles.

3\textsuperscript{rd}-degree AV heart block is a complete block of the conduction at or below the AV node, and impulses from the atria cannot reach the ventricles.
1st-Degree AV Heart Block

- Not a true block
- A consistent delay of conduction at the level of the AV node

In 1st-degree AV heart block impulses arise from the SA node but their passage through the AV node is delayed

- Underlying rate may be slow, normal, or fast
- Underlying rhythm is usually regular
- Present and normal and all are followed by a QRS complex
- QRS complexes are normal
- PR interval is longer than 0.20 seconds and is constant
1st-Degree AV Heart Block

- Often of little or no clinical significance because all impulses are conducted to the ventricles
- Can progress to higher degree block, especially in the presence of inferior wall myocardial infarction
1st-Degree AV Heart Block

Characteristics

- **Rate**
  - Underlying rate may be slow, normal, or fast

- **Regularity**
  - Underlying rhythm is usually regular

- **P waves**
  - Present and normal and all are followed by a QRS complex

- **QRS complexes**
  - Normal

- **PR intervals**
  - Longer than 0.20 seconds and constant

- **QT intervals**
  - Usually within normal limits
# 1st-Degree AV Heart Block

## Table 12-1  1st-Degree AV Heart Block

<table>
<thead>
<tr>
<th>Causes of 1st-degree AV heart block</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Myocardial ischemia or infarction (often inferior wall MI), injury or ischemia to the AV node or junction, myocarditis, degenerative changes in the heart</td>
</tr>
<tr>
<td>Use of certain drugs</td>
<td>Digoxin, calcium channel blockers, beta-adrenergic blockers, quinidine, procainamide, amiodarone</td>
</tr>
<tr>
<td>Other</td>
<td>Increased vagal tone, hyperkalemia</td>
</tr>
</tbody>
</table>
2nd-Degree AV Heart Block, Type I

- Intermittent block at the level of the AV node
- Also referred to as Wenckebach
2nd-Degree AV Heart Block, Type I

- More P waves than QRS complexes and the rhythm has patterned irregularity
- PR interval increases until a QRS complex is dropped
- After dropped beat the next PR interval is shorter
- As each subsequent impulse generated there is a progressively longer PR interval until again, a QRS is dropped
- Cycle repeats
2nd-Degree AV Heart Block, Type I

**Characteristics**

- **Rate**: Ventricular rate may be slow, normal, or fast; atrial rate is within normal range
- **Regularity**: Patterned irregularity
- **P waves**: Are present and normal; not all are followed by a QRS complex
- **QRS complexes**: Normal
- **PR intervals**: Is progressively longer until a QRS complex is dropped, then cycle begins again
- **QT intervals**: Usually within normal limits
### Table 12-2  2nd-Degree AV Heart Block

<table>
<thead>
<tr>
<th>Causes of 2nd-degree AV heart block, Type I</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>AV nodal ischemia secondary to right coronary artery occlusion, myocardial ischemia or infarction (inferior wall MI), myocarditis, rheumatic fever</td>
</tr>
<tr>
<td>Use of certain drugs</td>
<td>Digitalis, calcium channel blockers, beta-adrenergic blockers, verapamil</td>
</tr>
<tr>
<td>Other</td>
<td>Increased vagal tone, hyperkalemia</td>
</tr>
</tbody>
</table>
**2nd-Degree AV Heart Block, Type I**

- May occur in otherwise healthy persons
- Usually transient and reversible, mostly resolving when the underlying condition is corrected
- May progress to more serious blocks (particularly if it occurs early in myocardial infarction)
2\textsuperscript{nd}-Degree AV Heart Block, Type I

- If dropped ventricular beats occur frequently, patient may show signs and symptoms of decreased cardiac output
2nd-Degree AV Heart Block, Type II

- Intermittent block at the level of the bundle of His or bundle branches resulting in atrial impulses that are not conducted to the ventricles

In 2nd-degree AV heart block, Type II, impulses arise from the SA node but some are blocked in the AV node.
2nd-Degree AV Heart Block, Type II

- More P waves than QRS complexes
- Duration of PR interval of the conducted beats remains constant
2nd-Degree AV Heart Block, Type II

Characteristics

Rate
- Ventricular rate may be slow, normal, or fast; atrial rate is within normal range

Regularity
- May be regular or irregular (depends on whether conduction ratio remains the same)

P waves
- Present and normal; not all the P waves are followed by a QRS complex

QRS complexes
- Should be normal

PR intervals
- Constant for all conducted beats

QT intervals
- Usually within normal limits
2nd-Degree AV Heart Block, Type II

- A serious dysrhythmia (usually considered malignant in the emergency setting)
- Can result in decreased cardiac output and may produce signs and symptoms of hypoperfusion
- May progress to a more severe heart block and ventricular asystole
3rd-Degree AV Heart Block

- Complete block of conduction at or below the AV node
- Impulses from atria cannot reach ventricles
3rd-Degree AV Heart Block

- Atrial pacemaker site is the SA node
  - Atrial rate 60 to 100 BPM
- Ventricular pacemaker site is an escape rhythm
  - From AV junction rate 40 to 60 BPM
  - From ventricles rate 20 to 40 BPM
3rd-Degree AV Heart Block

• Upright and round P waves seem to “march right through the QRS complexes”
3rd-Degree AV Heart Block

Characteristics

- Rate: Ventricular rate may be slow, normal, or fast; atrial rate is within normal range
- Regularity: Atrial rhythm and ventricular rhythms are regular but not related to one another
- P waves: P waves are present and normal, not related to the QRS complexes; appear to march through the QRS complexes
- QRS complexes: QRS complexes are normal if escape focus is junctional and widened if escape focus is ventricular
- PR intervals: Not measurable
- QT intervals: May or may not be within normal limits
# 3rd-Degree AV Heart Block

## Table 12-3  3rd-Degree AV Heart Block

<table>
<thead>
<tr>
<th>Causes of 3rd-degree AV heart block</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Coronary artery disease, myocardial ischemia or infarction (inferior/posterior and inferior wall), degenerative changes in the heart, septal necrosis, myocarditis</td>
</tr>
<tr>
<td>Use of certain drugs</td>
<td>Digitalis, calcium channel blockers, beta-adrenergic blockers</td>
</tr>
<tr>
<td>Other</td>
<td>Increased vagal tone, surgical injury</td>
</tr>
</tbody>
</table>
3rd-Degree AV Heart Block

- Well tolerated as long as the escape rhythm is fast enough to generate a sufficient cardiac output to maintain adequate perfusion.
- Can result in decreased cardiac output because of the asynchronous action of the atria and ventricles and if the ventricular rate is slow.
Remember!

2\textsuperscript{nd}- and 3\textsuperscript{rd}-degree AV heart block can lead to decreased cardiac output if the ventricular rate slows sufficiently.
<table>
<thead>
<tr>
<th>Type</th>
<th>Rhythm</th>
<th>P Waves</th>
<th>QRS complexes</th>
<th>PR intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st-degree</td>
<td>Underlying rhythm is usually regular</td>
<td>Present and normal; all the P waves are followed by a QRS complex</td>
<td>Normal</td>
<td>Longer than 0.20 seconds and is constant</td>
</tr>
<tr>
<td>2nd-degree, Type I</td>
<td>Patterned irregularity</td>
<td>Present and normal; not all the P waves are followed by a QRS complex</td>
<td>Normal</td>
<td>Progressively longer until a QRS complex is dropped; the cycle then begins again</td>
</tr>
<tr>
<td>2nd-degree, Type II</td>
<td>May be regular or irregular (depends on whether conduction ratio remains the same)</td>
<td>Present and normal; not all the P waves are followed by a QRS complex</td>
<td>Normal</td>
<td>Constant for all conducted beats</td>
</tr>
<tr>
<td>3rd-degree</td>
<td>Atrial rhythm and ventricular rhythms are regular but not related to one another</td>
<td>Present and normal; not related to the QRS complexes; appear to march through the QRS complexes</td>
<td>Normal if escape focus is junctional and widened if escape focus is ventricular</td>
<td>Not measurable</td>
</tr>
</tbody>
</table>
Practice Makes Perfect

- Determine the type of dysrhythmia
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
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
Practice Makes Perfect

- Determine the type of dysrhythmia
Practice Makes Perfect

• Determine the type of dysrhythmia
Practice Makes Perfect

- Determine the type of dysrhythmia
Summary

• Heart blocks are partial delays or complete interruptions in the cardiac conduction pathway between the atria and ventricles.

• 1\textsuperscript{st}-degree AV heart block is not a true block. Instead it is a consistent delay of conduction at the level of the AV node which results in a PR interval that is greater than 0.20 seconds in duration.

• 2\textsuperscript{nd}-degree AV heart block, Type I is an intermittent block at the level of the AV node.
Summary

• With 2nd-degree AV heart block, Type I, the PR interval increases until a QRS complex is dropped. After the dropped beat the next PR interval is shorter. Then as each subsequent impulse is generated and transmitted through the AV junction there is a progressively longer PR interval until again, a QRS is dropped. This cycle can repeat itself.

• With 2nd-degree AV heart block, Type I, there are more P waves than QRS complexes and the rhythm is regularly irregular.
Summary

• 2nd-degree AV heart block, Type II is an intermittent block at the level of the bundle of His or bundle branches resulting in atrial impulses that are not conducted to the ventricles.

• With 2nd-degree AV heart block, Type II, there are more P waves than QRS complexes and the duration of PR interval of the conducted beats remains the same (are constant).

• 3rd-degree AV heart block is a complete block of the conduction at or below the AV node and impulses from the atria cannot reach the ventricles.
Summary

• In 3\textsuperscript{rd}-degree AV heart block the pacemaker for the atria arises from the SA node while the pacemaker for the ventricles arises as an escape rhythm from the AV junction or from the ventricles.

• With 3\textsuperscript{rd}-degree AV heart block the upright and round P waves seem to “march right through the QRS complexes.” This reveals that there is no relationship between the P waves and QRS complexes.

• 2\textsuperscript{nd}- and 3\textsuperscript{rd}-degree AV heart block can lead to decreased cardiac output.