1

2 **Objectives**

- Describe the ECG characteristics, possible causes, signs and symptoms, and emergency management for the following dysrhythmias:
  - First-degree AV block
  - Second-degree AV block type I
  - Second-degree AV block type II
  - Second-degree AV block, 2:1 conduction
  - Complete AV block

3 **The AV Junction**

- The AV junction provides the electrical links between the atrium and ventricle
- If a delay or interruption in impulse conduction occurs within the AV node, bundle of His, or His-Purkinje system, the resulting dysrhythmia is called an "atrioventricular (AV) block"

4 **Classification of AV Blocks**

- AV blocks have been traditionally classified in two ways — according to the degree of the block and/or according to the site of the block

5 **Classification of AV Blocks**

- The PR interval is the key to differentiating the type of AV block
- The key to differentiating the level (location) of the block is the width of the QRS complex
  - And, in second- and third-degree (complete) AV blocks, the rate of the escape rhythm

6 **Location of First-Degree AV Block**

- In first-degree AV block, impulses from the SA node to the ventricles are delayed (not blocked)
- Usually occurs at the AV node

7 **Location of Second-Degree AV Blocks**

- With second-degree AV blocks, there is an intermittent disturbance in the conduction of impulses between the atria and ventricles

8 **Location of Second-Degree AV Blocks**

- Second-degree AV block type I
  - The site of the block is typically at the AV node
- Second-degree AV block type II
  - The site of the block is the bundle of His or, more commonly, the bundle branches

9 **Location of Complete AV Block**

- In complete (third-degree) AV block, the AV junction does not conduct any impulses between the atria and ventricles
- The site of block may be the AV node or, more commonly, the bundle of His or bundle branches

10 **AV Blocks – Clinical Significance**

- Clinical significance of an AV block depends on:
  - Degree (severity) of the block
  - Rate of escape pacemaker (junctional vs. ventricular)
  - Patient's response to that ventricular rate

11 **First-Degree AV Block**

- In first-degree AV block, all components of the cardiac cycle, except the PR interval, are usually within normal limits

12 **First-Degree AV Block**

- Despite its name, the sinus impulse is not blocked

- All sinus beats are conducted

- Impulses are delayed for the same period before they are conducted to the ventricles
  - Results in PR intervals that are more than 0.20 second in duration and constant

13 **First-Degree AV Block**

- First-degree AV block is not a dysrhythmia itself, but a condition describing the consistent prolonged PR interval viewed on the ECG rhythm strip
- Identify:
  - Underlying rhythm
  - Ventricular rate
  - Presence of a first-degree AV block
  - Example: Sinus bradycardia at 40 beats/min with a first-degree AV block

14 **First-Degree AV Block – ECG Characteristics**

15 **First-Degree AV Block**

16 **First-Degree AV Block – Causes**

- May be a normal finding in individuals with no history of cardiac disease, especially in athletes
- May also occur because of:
  - Ischemia or injury to the AV node or junction
  - Medication therapy
  - Rheumatic heart disease
  - Hyperkalemia
  - Acute myocardial infarction (often inferior wall MI)
  - Increased vagal tone

17 **First-Degree AV Block – Clinical Significance**

- The patient usually demonstrates no symptoms related to the first-degree AV block

18 **First Degree AV Block - Intervention**

- In the setting of an acute MI, the patient should be monitored closely for increasing signs of block

19 **Second-Degree AV Block**

20 **Second-Degree AV Block**

- When some, but not all, atrial impulses are blocked from reaching the ventricles, second-degree AV block results
- Because the SA node generates impulses in a normal manner, P waves will occur regularly across the rhythm strip
  - But not every P wave will be followed by a QRS complex

21 **Second-Degree AV Block**

- Second-degree AV block is classified as type I or type II depending on the location of the block
  - Above the bundle of His (type I)
  - Below the bundle of His (type II)

22 **Second-Degree AV Block Type I**

- The conduction delay in second-degree AV block, type I is usually at the level of the AV node

23 **Second-Degree AV Block Type I**

- Impulses generated by the SA node take longer and longer to conduct through the AV node until, finally, a sinus impulse is blocked
  - Appears on the ECG as a P wave with no QRS after it
  - Cycle then begins again
  - Repetition of pattern is called “grouped beating”

24 **Second-Degree AV Block Type I – ECG Characteristics**

25 **Second-Degree AV Block Type I**

26 **Second-Degree AV Block Type I – Causes**

- Increased parasympathetic tone
- Ischemic heart disease
- Effects of drugs
  - Digitalis
  - Beta-blockers
  - Verapamil
- Inferior wall MI
  - Result of increased parasympathetic stimulation rather than injury to conduction system

27 **Second-Degree AV Block Type I – Clinical Significance**

- The patient is usually asymptomatic
- If the patient is symptomatic and the dysrhythmia is the result of medications, these substances should be withheld

28 **Second-Degree AV Block Type I – Intervention**

- If the heart rate is slow and serious signs and symptoms occur because of the slow rate, consider atropine and/or temporary pacing
- When this dysrhythmia occurs in conjunction with acute MI, observe for increasing AV block

29 **Second-Degree AV Block Type II**

- Conduction delay occurs below the level of the AV node, either at the bundle of His or, more commonly, at the level of the bundle branches
  - More serious than second-degree AV block type I
  - Frequently progresses to complete AV block

30 **Second-Degree AV Block Type II**

- Because the SA node is generating impulses in a normal manner:
  - P waves occur at regular intervals
- Impulses generated by the SA node are conducted to ventricles at the same rate until an impulse is suddenly blocked
  - Appears on ECG as a P wave with no QRS after it

31 **Second-Degree AV Block Type II – ECG Characteristics**

32 **Second-Degree AV Block Type II**

33 **Second-Degree AV Block Type II – Causes**

- Left coronary artery disease
- Anterior wall MI
- Acute myocarditis
- Other types of organic heart disease

34 **Second-Degree AV Block Type II – Clinical Significance**

- Significant slowing of the ventricular rate commonly results in serious signs and symptoms
- May progress to complete AV block or asystole with no warning

35 **Second-Degree AV Block Type II – Intervention**

- If the patient is symptomatic, transcutaneous pacing should be instituted until transvenous pacemaker insertion can be accomplished
- Second-degree AV block type II is usually an indication for a permanent pacemaker

36 **Complete AV Block**

Third-degree AV block

37 **Complete AV Block**

- First- and second-degree AV blocks are types of “incomplete” blocks because the AV junction conducts at least some impulses to the ventricles
- In complete AV block, the atria and ventricles beat independently of each other
  - Impulses generated by the SA node are blocked before reaching the ventricles

38 **Complete AV Block**

- The block may occur at the:
  - AV node
  - Bundle of His
  - Bundle branches

39 **Complete AV Block**

- A secondary pacemaker (either junctional or ventricular) stimulates the ventricles
  - The QRS may be narrow or wide depending on the location of the escape pacemaker and the condition of the intraventricular conduction system

40 **Complete AV Block – Inferior MI**

- Complete AV block associated with an inferior MI is thought to be due to a block above the bundle of His
  - Resulting rhythm is usually stable
  - Escape pacemaker usually junctional
    - Narrow QRS complexes
    - Ventricular rate greater than 40 beats/min

41 **Complete AV Block – Narrow QRS**

42 **Complete AV Block – Wide QRS**

43 **Complete AV Block – ECG Characteristics**

44 **Complete AV Block – Causes**

- When associated with an inferior MI, often resolves on its own within 1 week
- Complete AV block associated with an anterior MI may develop suddenly and without warning
  - Usually 12 to 24 hours after onset of acute ischemia

45 **Complete AV Block – Clinical Significance**

- Signs and symptoms depend on:
  - The origin of the escape pacemaker
  - The patient’s response to a slower ventricular rate

46 **Complete AV Block – Intervention**

- If the QRS is narrow and the patient is symptomatic:
  - Atropine and/or transcutaneous pacing
- If the QRS is wide and the patient is symptomatic:
  - Transcutaneous pacing should be instituted while preparations are made for transvenous pacemaker

47 **Differentiation of AV Blocks**

48 **Differentiation of AV Blocks**

49 **Differentiation of AV Blocks**