

Chapter 7

AV Blocks

Objectives

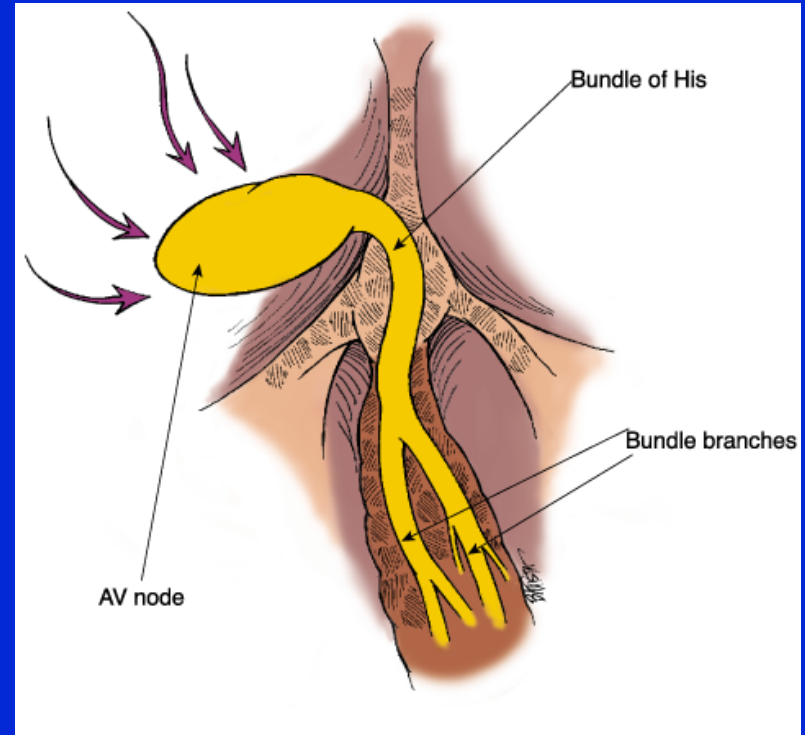
- Describe the ECG characteristics, possible causes, signs and symptoms, and emergency management for first-degree AV block.
- Describe the ECG characteristics, possible causes, signs and symptoms, and emergency management for second-degree AV block, type I.
- Describe the ECG characteristics, possible causes, signs and symptoms, and emergency management for second-degree AV block, type II.

Objectives

- Describe the ECG characteristics, possible causes, signs and symptoms, and emergency management for second-degree AV block, 2:1 conduction.
- Describe the ECG characteristics, possible causes, signs and symptoms, and emergency management for third-degree AV block.

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”



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

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

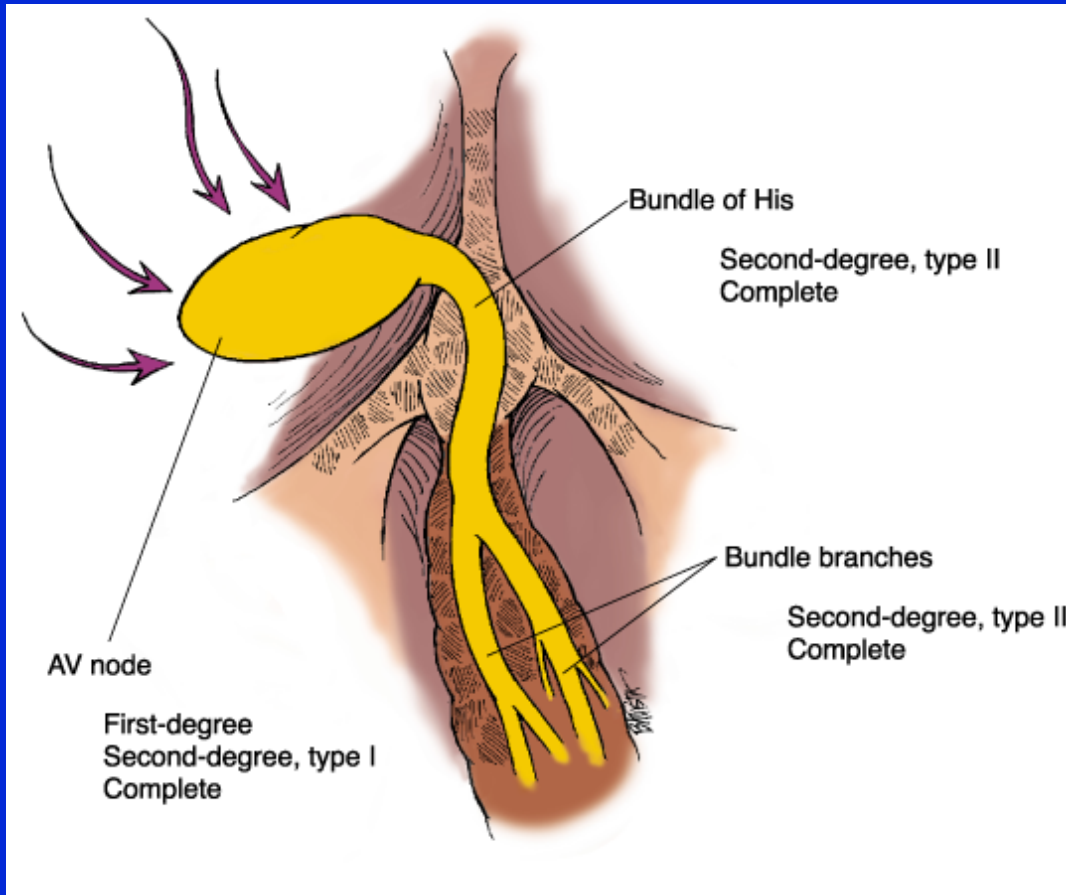
Classification of AV Blocks

Classification by degree	
Name of block	Type of block
First-degree AV block	Incomplete
Second-degree AV block type I	Incomplete
Second-degree AV block type II	Incomplete
Third-degree AV block	Complete

Classification of AV Blocks

Classification by site/location	
Site	Name of block
AV node	First-degree AV block
	Second-degree AV block type I
	Third-degree AV block
Infranodal (subnodal)	
Bundle of His	Second-degree AV block type II (uncommon)
	Third-degree AV block
Bundle branches	Second-degree AV block type II (more common)
	Third-degree AV block

Location of AV Blocks



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

First-Degree AV Block

First-Degree AV Block— How Do I Recognize It?

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

First-Degree AV Block— How Do I Recognize It?

- 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 sec in duration and constant

First-Degree AV Block— How Do I Recognize It?



- Rate** Usually WNL, but depends on underlying rhythm
- Rhythm** Regular
- P waves** Normal in size and shape, one positive (upright) P wave before each QRS in leads II, III, and aVF

First-Degree AV Block— How Do I Recognize It?



PR interval Prolonged (greater than 0.20 sec) but constant

QRS Usually 0.10 sec or less unless an intraventricular conduction delay exists

First-Degree AV Block— How Do I Recognize It?

Rate	Usually WNL, but depends on underlying rhythm
Rhythm	Regular
P waves	Normal in size and shape, one positive (upright) P wave before each QRS in leads II, III, and aVF
PR interval	Prolonged (greater than 0.20 sec) but constant
QRS	Usually 0.10 sec or less unless an intraventricular conduction delay exists

First-Degree AV Block— What Causes It?

- May be a normal finding in individuals with no history of cardiac disease
- 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

First-Degree AV Block— What Do I Do About It?

- Usually no symptoms related to first-degree AV block
- In setting of acute MI, monitor patient closely for increasing signs of block

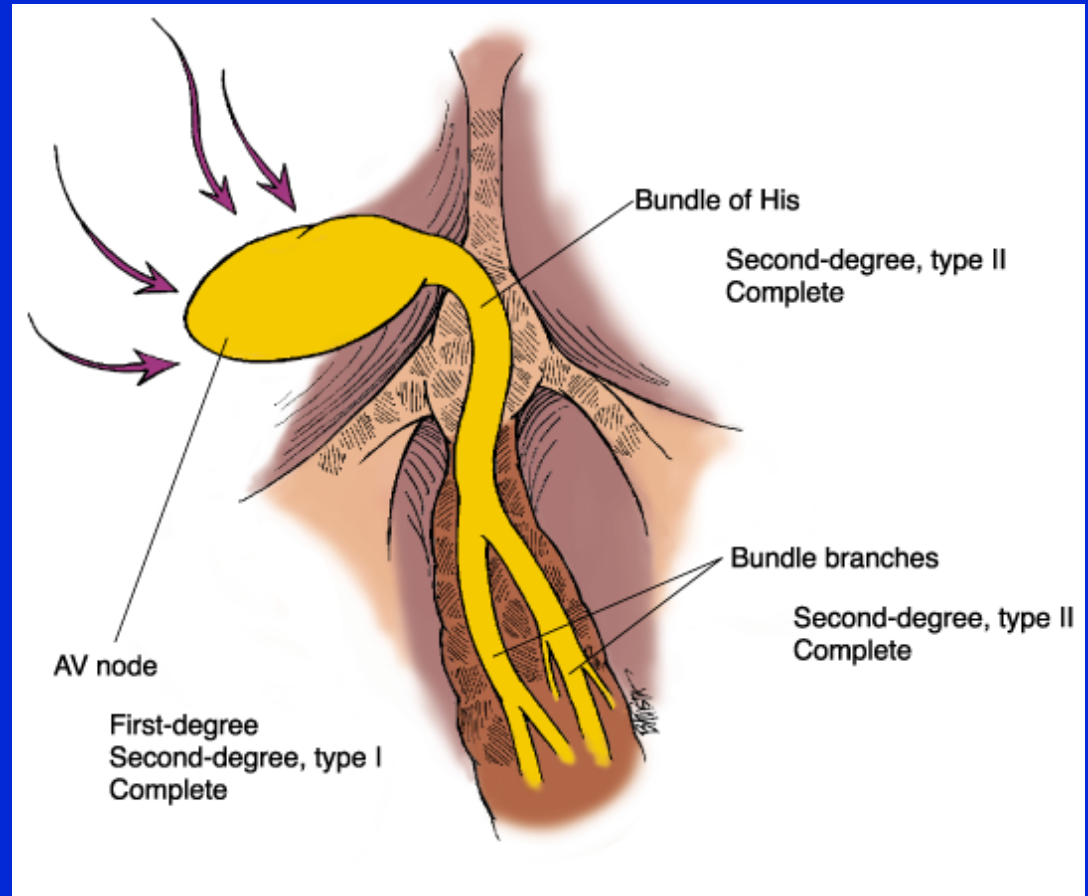
Second-Degree AV Blocks

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 occur regularly across the rhythm strip
 - Not every P wave will be followed by a QRS

Second-Degree AV Block

- Above bundle of His (type I)
- At or below bundle of His (type II)



Second-Degree AV Block Type I

Second-Degree AV Block Type I— How Do I Recognize It?

- 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”

Second-Degree AV Block Type I— How Do I Recognize It?



- Rate** Atrial rate is faster than the ventricular rate
- Rhythm** Atrial regular (P' s plot through on time);
ventricular irregular
- P waves** Normal in size and shape; some P waves are
not followed by a QRS complex (more P' s
than QRSs)

Second-Degree AV Block Type I— How Do I Recognize It?



PR interval Lengthens with each cycle (lengthening may be very slight), until a P wave appears without a QRS; PR interval *after* the nonconducted beat is shorter than the interval preceding the nonconducted beat

QRS Usually 0.10 sec or less but is periodically dropped

Second-Degree AV Block Type I— How Do I Recognize It?

Rate	Atrial rate is faster than the ventricular rate
Rhythm	Atrial regular (P' s plot through on time); ventricular irregular
P waves	Normal in size and shape; some P waves are not followed by a QRS complex (more P' s than QRSs)
PR interval	Lengthens with each cycle (lengthening may be very slight), until a P wave appears without a QRS; PRI <i>after</i> the nonconducted beat is shorter than the interval preceding the nonconducted beat
QRS	Usually 0.10 sec or less but is periodically dropped

Second-Degree AV Block Type I— What Causes It?

- 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

Second-Degree AV Block Type I— What Do I Do About It?

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

Second-Degree AV Block Type I— What Do I Do About It?

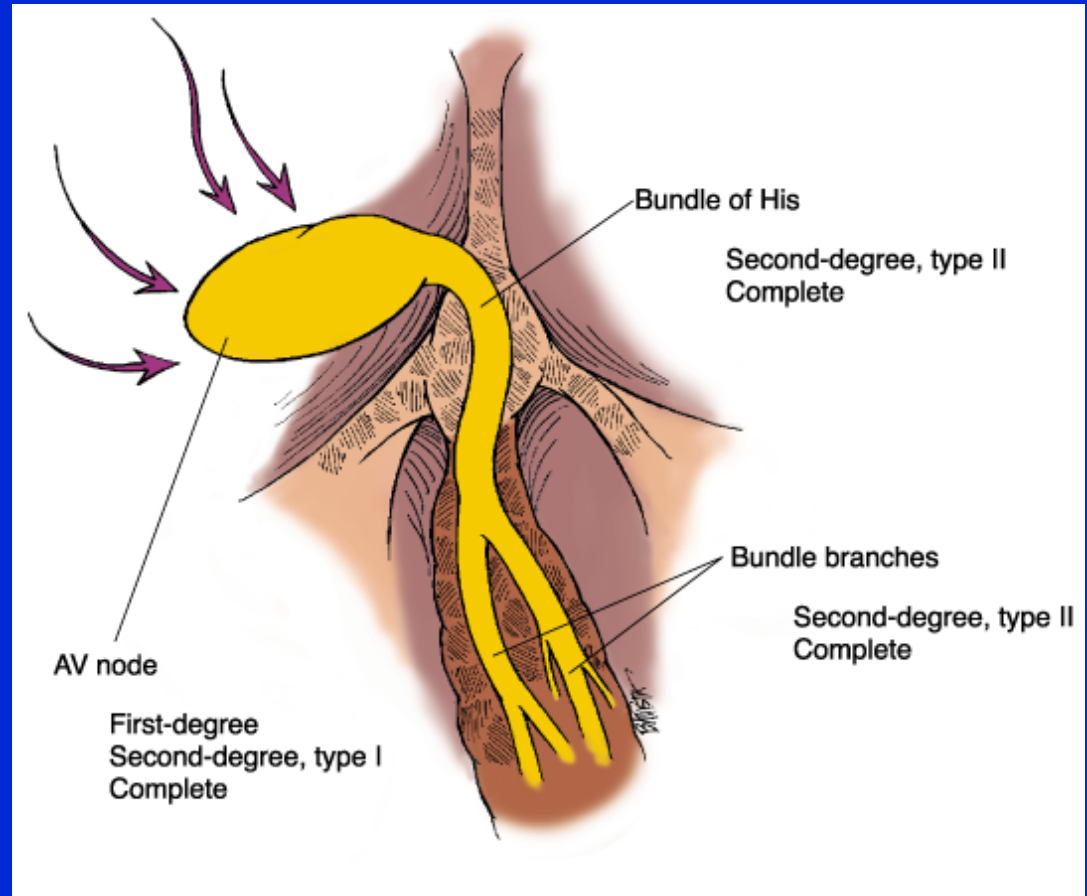
- If the heart rate is slow and serious signs and symptoms occur because of the slow rate, consider atropine and/or temporary pacing
- When this rhythm occurs in conjunction with acute MI, observe for increasing AV block

Second-Degree AV Block Type II

Second-Degree AV Block Type II

Block occurs:

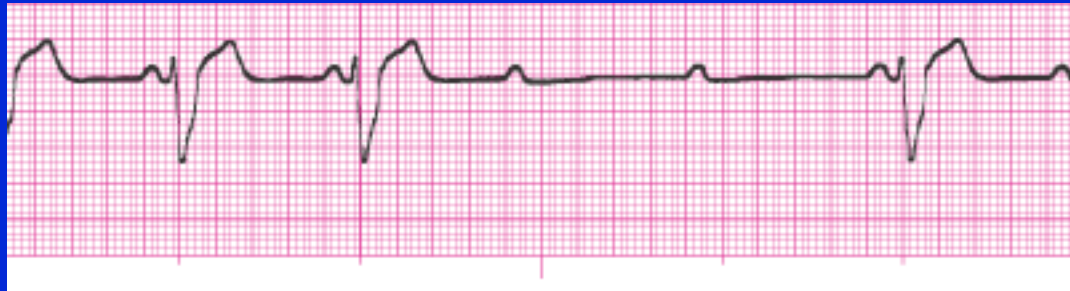
- At or below bundle of His



Second-Degree AV Block Type II— How Do I Recognize It?

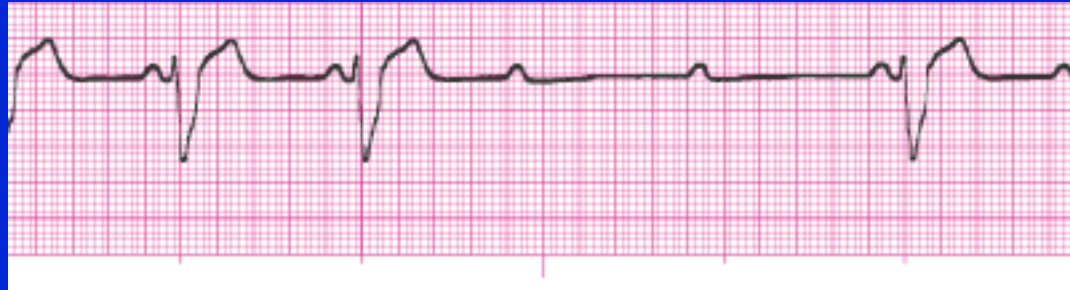
- Because the SA node is generating impulses in a normal manner:
 - P waves occur at regular intervals
- Impulses generated by the SA node are conducted to ventricles at the same rate until an impulse is suddenly blocked
 - Appears on ECG as a P wave with no QRS after it

Second-Degree AV Block Type II— How Do I Recognize It?



- Rate** Atrial rate is faster than the ventricular rate; ventricular rate is often slow
- Rhythm** Atrial regular (P' s plot through on time), ventricular irregular
- P waves** Normal in size and shape; some P waves are not followed by a QRS complex (more P' s than QRSs)

Second-Degree AV Block Type II— How Do I Recognize It?



**PR
interval**

WNL or slightly prolonged but constant for the conducted beats; there may be some shortening of the PR interval that follows a nonconducted P wave

QRS

Usually greater than 0.10 sec, periodically absent after P waves

Second-Degree AV Block Type II— How Do I Recognize It?

Rate	Atrial rate is faster than the ventricular rate; ventricular rate is often slow
Rhythm	Atrial regular (P' s plot through on time), ventricular irregular
P waves	Normal in size and shape; some P waves are not followed by a QRS complex (more P' s than QRSs)
PR interval	WNL or slightly prolonged but constant for the conducted beats; there may be some shortening of the PR interval that follows a nonconducted P wave
QRS	Usually greater than 0.10 sec, periodically absent after P waves

Second-Degree AV Block Type II— What Causes It?

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

Second-Degree AV Block Type II— What Do I Do About It?

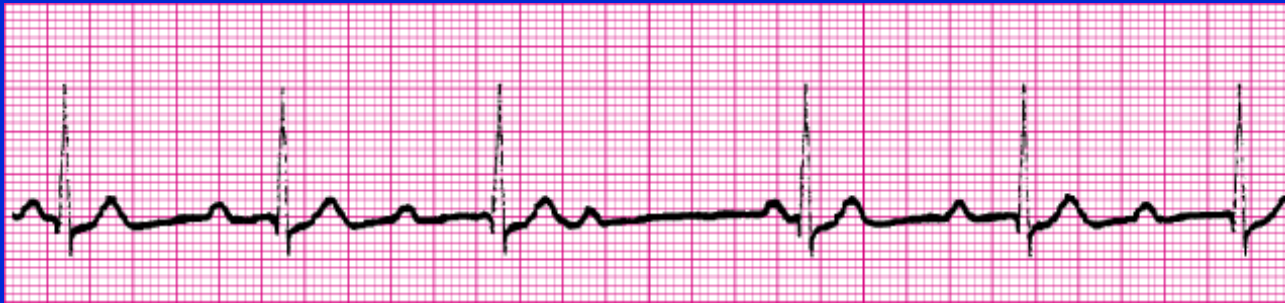
- Significant slowing of the ventricular rate commonly results in serious signs and symptoms
- Second-degree AV block type II is usually an indication for a permanent pacemaker

Second-Degree AV Block 2:1 conduction

- Also called “2:1 AV block”

2:1 AV Block— How Do I Recognize It?

- Two conducted P waves must occur consecutively and the PR intervals of the consecutive beats compared to identify either type I or type II second-degree AV block



2:1 AV Block— How Do I Recognize It?

- When two P waves occur for every one QRS (2:1 conduction), the decision as to what to term the rhythm is based on the *width of the QRS complex*

2:1 AV Block— How Do I Recognize It?

- A 2:1 AV block associated with a narrow QRS complex (0.10 sec or less) usually represents a form of second-degree AV block type I



2:1 AV Block— How Do I Recognize It?

- A 2:1 AV block associated with wide QRS complexes (greater than 0.10 sec) is usually associated with a delay in conduction below the bundle of His—thus it is usually a type II block



2:1 AV Block— How Do I Recognize It?

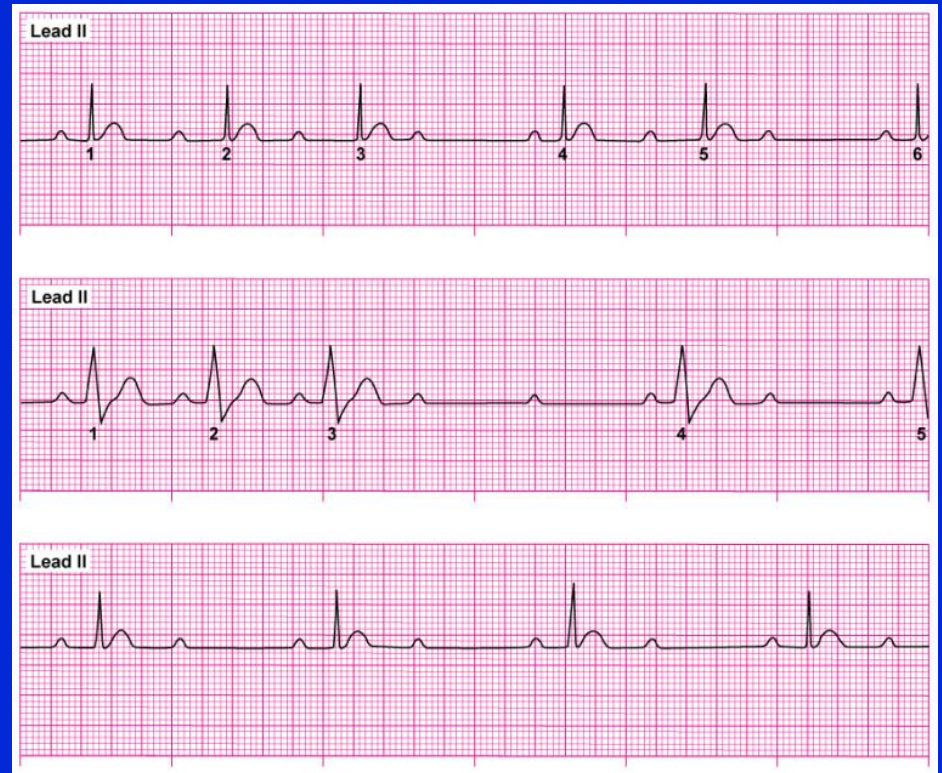
Rate	Atrial rate is twice the ventricular rate
Rhythm	Atrial regular (P' s plot through on time), ventricular regular
P waves	Normal in size and shape; every other P wave is followed by a QRS complex (more P' s than QRSs)
PR interval	Constant
QRS	WNL, if the block occurs above the bundle of His (probably type I); Wide if the block occurs below the bundle of His (probably type II); absent after every other P wave

2:1 AV Block— Causes/Treatment

- The causes and management of 2:1 AV block are those of type I or type II block previously discussed

Types of Second-Degree AV Blocks

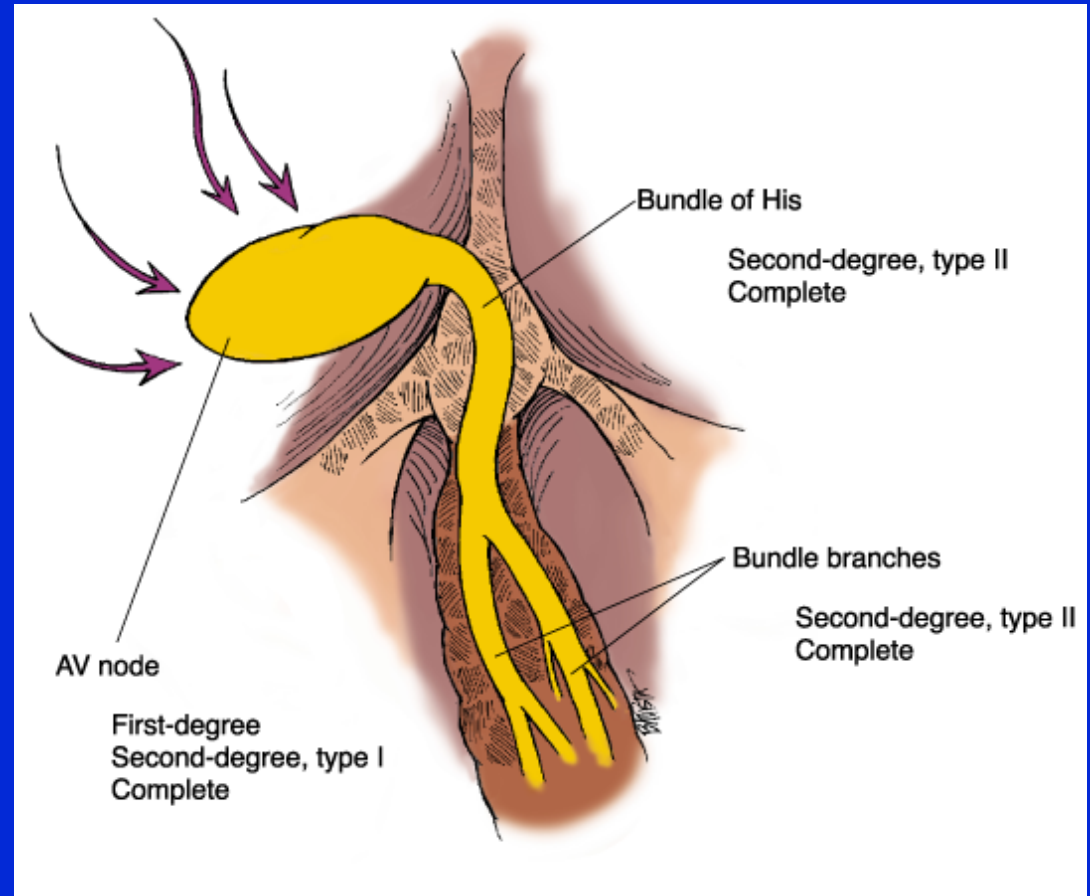
- A) Second-degree AV block type I
- B) Second-degree AV block type II
- C) Second-degree AV block 2:1 conduction



Third-Degree AV Block

Third-Degree (Complete) AV Block

- Block may occur at:
 - AV node
 - Bundle of His
 - Bundle branches



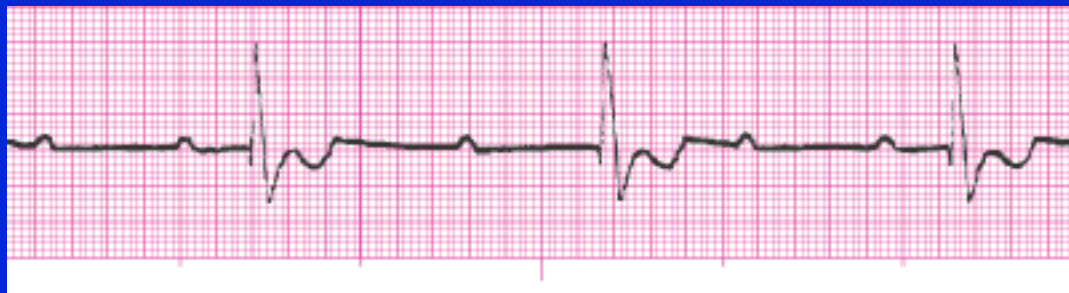
Third-Degree AV Block— How Do I Recognize It?

- Third-degree AV block with an inferior MI
 - Probable block above the bundle of His
 - Resulting rhythm is usually stable
 - Escape pacemaker usually junctional
 - Narrow QRS complexes
 - Ventricular rate is usually more than 40 bpm



Third-Degree AV Block— How Do I Recognize It?

- Third-degree AV block with anterior MI
 - Resulting rhythm is usually unstable
 - Escape pacemaker is usually ventricular
 - Wide QRS complexes
 - Ventricular rate usually less than 40 bpm



Third-Degree AV Block— How Do I Recognize It?

- Rate** Atrial rate faster than (and independent of) the ventricular rate; ventricular rate determined by origin of the escape rhythm
- Rhythm** Atrial regular (P' s plot through on time), ventricular regular; there is no relationship between the atrial and ventricular rhythms
- P waves** Normal in size and shape
- PR interval** None—the atria and ventricles beat independently of each other, thus there is no true PR interval
- QRS** Narrow or wide depending on the location of the escape pacemaker and the condition of the intraventricular conduction system

Third-Degree AV Block— What Causes It?

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

Third-Degree AV Block— What Do I Do About It?

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

Differentiation of AV Blocks

Differentiation of AV Blocks

	Second-Degree AV Block Type I	Second-Degree AV Block Type II
Ventricular Rhythm	Irregular	Irregular
PR Interval	Progressively lengthening	Constant
QRS Width	Usually narrow	Usually wide

Differentiation of AV Blocks

	Second-Degree AV Block 2:1 Conduction	Third-Degree (Complete) AV Block
Ventricular Rhythm	Regular	Regular
PR Interval	Constant	None—no relationship between P waves and QRS complexes
QRS Width	Narrow or wide	Narrow or wide

Questions?