Basic ECG Course

AV Blocks
Lesson 6

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Lessons in this Basic ECG Course

Lesson 1 - Calculating Heart Rate & the Sinus Rhythms
Lesson 2 – Bundle Branch Blocks
Lesson 3 - Atrial Rhythms
Lesson 4 - Junctional Rhythms
Lesson 5 - Ventricular Rhythms
Lesson 6 - AV Blocks
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Lesson 9 – Myocardial Ischemia
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Lesson 12 – Differentiating the Wide QRS Complex Patterns
Lesson 13 – Basic ECG Essentials Manual for Review

AV BLOCKS

Objectives

The objective of this lesson is to introduce the student to the following atrioventricular blocks (AV), and how to monitor patients to rapidly identify them.

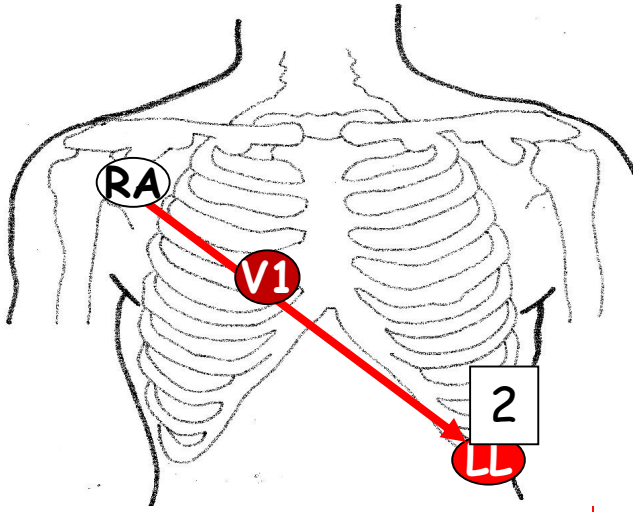
1. Monitoring patients with AV block
2. First degree AV block
3. Second degree AV block type I
4. Second degree AV block type II
5. High grade AV block
6. Complete AV block

1 - Monitoring Patients in Heart Block

- Since the P wave activity is essential to identify all forms of heart block, it is usually best to monitor these patients in lead 2 since it shows P waves very well. However, we generally monitor patients in both V1 and lead 2 and both leads should show the P waves nicely…see diagram below of V1 and lead 2 P waves in this second degree type I AV block pattern.

- And, in complete heart block there will be an escape rhythm take over which will either be from the junction with or without bundle branch block or from the ventricles.

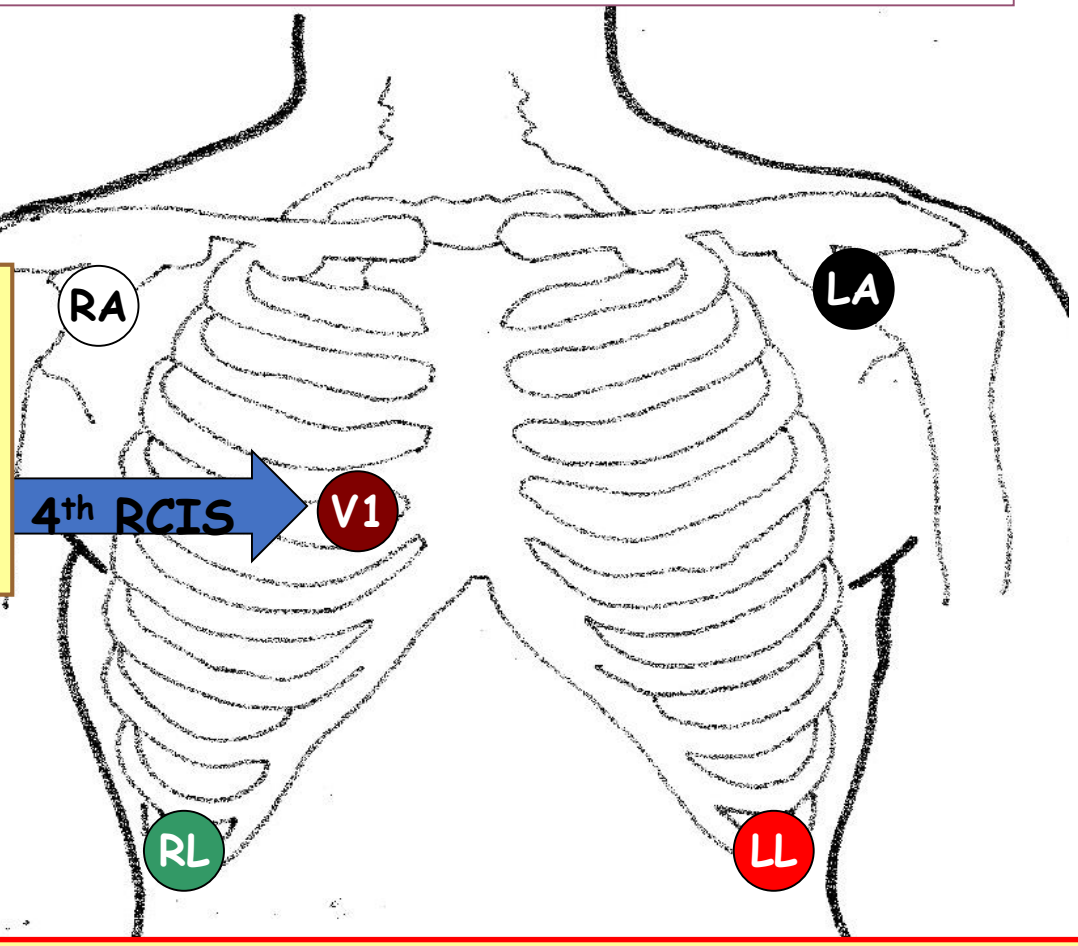
- And since the treatment of choice in complete heart block will most likely be a temporary pacemaker to accelerate the ventricular rate when the blood pressure drops to a dangerous level.



1 - Lets Place the Electrodes on the Patient for Continuous Monitoring of AV Blocks

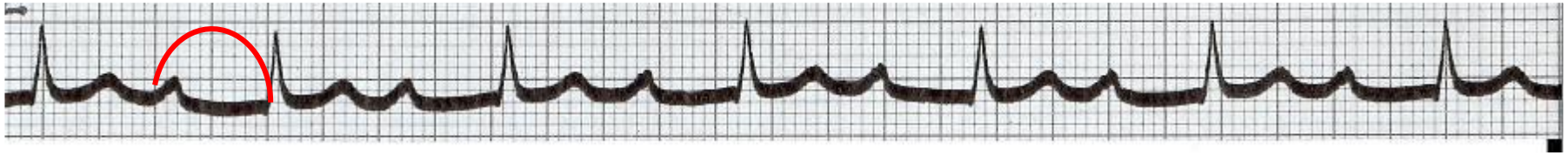
Dress the patient with the following electrodes upon admission

Place the brown positive chest lead in the 4th RCIS to obtain V1…be sure to carefully count the inter-spaces to properly place this lead.

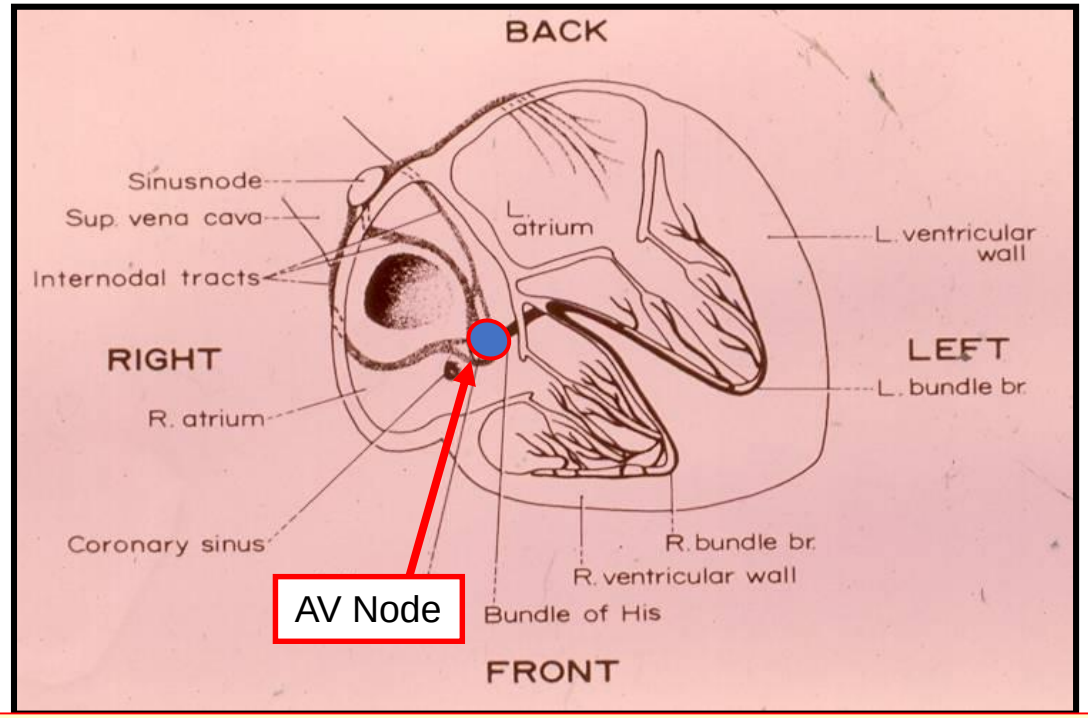


Be sure the arm leads are level with one another and placed out as far toward the shoulder socket as possible without creating artifact when the patient moves their arms. And, place the limb leads level with one another well below the diaphragm (the lower aspect of the rib cage is a safe landmark or on the upper wind of the hip).

2. First Degree AV Block



PR Interval is 0.40 sec.



Criteria for Diagnosing First Degree AV Block: A P-R interval longer than 0.20 sec.
The level of the block is in the AV node and it is caused by delayed conduction of the sinus impulses through the AV node greater than 0.20 sec. Keep in mind that healthy athletic people can have a slightly longer than normal PR and not have any known pathology in the AV node. You should measure each PR interval in the strip and report the longest one in your notes, keeping in mind that they may vary slightly.

2 - Risk Factors & Acquired Heart Block

Risk Factors for First Degree Heart Block:

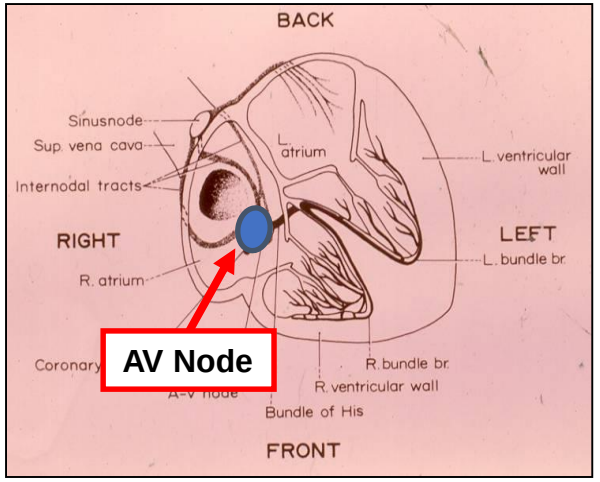
1) Heart block can be congenital and seen at birth
2) Most heart blocks will occur after birth
3) Risk factors for acquired heart block increases with age and heart disease
4) First degree AV block is common in trained athletes, teens, young adults, and in people with a highly active vagus nerve
5) And, of course we know people with the following anomalies are at risk for developing first degree AV block:
   a. CAD
   b. Rheumatic heart disease
   c. Sarcoidosis
   d. Structural heart disorders

Causes of Acquired Heart Block may by from any of the Following:

1) The most common cause is a heart attack
2) Heart disease
3) Cardiomyopathy
4) Heart failure
5) Rheumatic fever
6) May result from injury to the heart during open heart surgery
7) May also be a side effect of some drugs
8) Exposure to certain toxins

3. Second Degree AV Block Type I (Wenckebach)

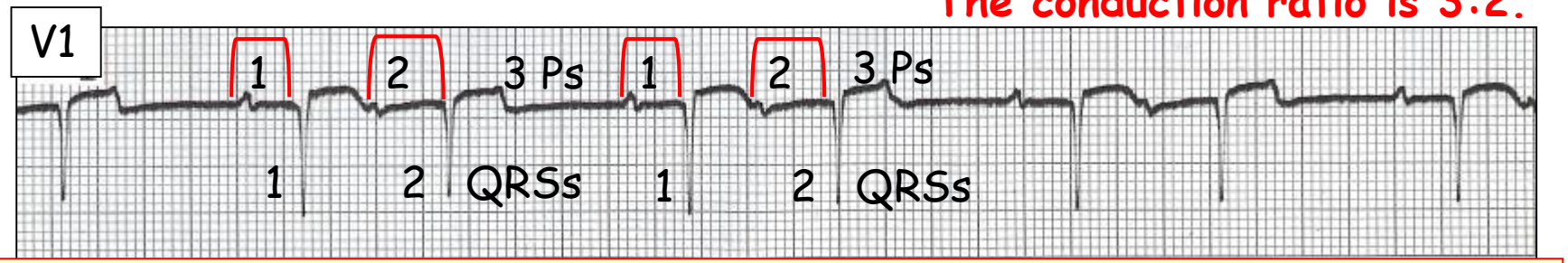
Second degree type I AV block is characterized by
a narrow QRS interval and progressive prolongation of the PR interval until a beat is dropped.



There is usually a group of QRSs separated by a pause, and note that the first PR of the group is usually longer than normal, but may be perfectly normal. However, the second PR interval will be longer than normal. And again, the PR interval gets longer and longer until a sinus P wave finally fails to conduct to the ventricles, resulting in what is called "a dropped beat."

To identify the conduction ratios, count the number of P waves associated with each group including the dropped P, and count the number of QRS complexes in this group and report this as the conduction ratio (for example: 3:2, 4:3, 5:4 and so on. There may also be 2:1 conduction, and in this case there is no progressive prolongation of the PR intervals, but there should be longer than normal PR intervals associated with 2:1 conduction ratios.

The conduction ratio is 3:2.



Second Degree Type I AV Block: Sometimes referred to as Wenckeback in honor of the Doctor who first identified it (the "W" is pronounced as a V as he was from Austria). The level of this block is also at the AV node. If you see group beating of the QRS complexes, automatically think of Second degree type I AV block.

3 – Causes of Second Degree Type I AV Block

There are several possible causes of second degree type I AV block which include:

1) Myocardial infarction (usually from the inferior wall)

2) Myocarditis which causes inflammation to the tissues that may affect the AV node

3) Cardiac surgery, particularly when repairing a mitral valve or Tetralogy of Fallot repair

4) Persons with increased vagal tone such as athletes

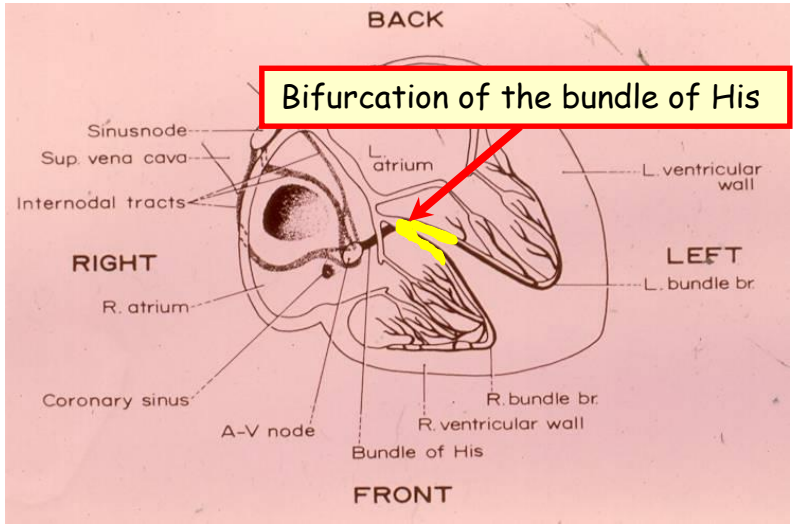
5) Certain drugs such as the beta blockers, calcium channel blockers, digoxin, and amiodarone to name a few

Clinical Implications and Treatment:

1) Second degree type I AV block is usually benign and may cause minimal to no hemodynamic compromise unless the conduction ratio drops to 2:1 causing a very slow ventricular response and therefore a drop in the blood pressure.
2) Asymptomatic patients do not usually require treatment but if the patient becomes symptomatic, atropine would be a prudent choice to improve conduction at the AV nodal level.
3) Temporary pacing may be needed but permanent pacemakers is seldom needed.

4. Second Degree AV Block Type II

The level of the block in second degree type II AV block is at the bifurcation of the bundle of His or below, blocking one of the bundles therefore creating a wide-QRS pattern.



The P-R intervals of the conducted beats are fixed and normal.

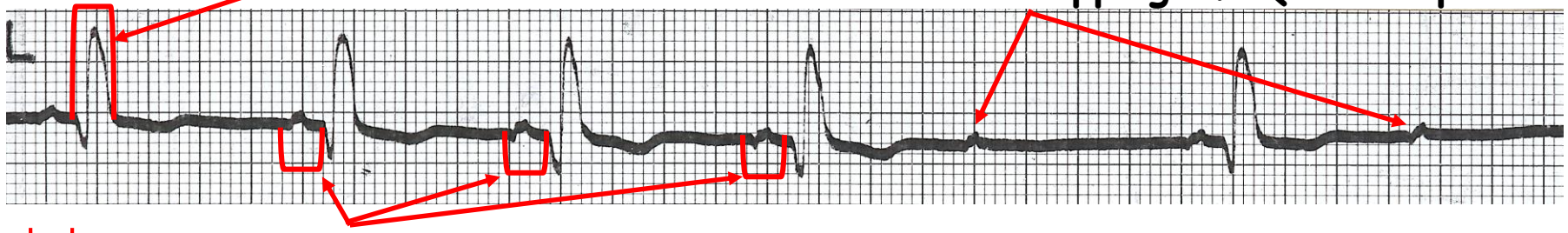
There will be random dropping of one or more QRS complexes as the bundles both block simultaneously.

The sinus impulses conduct with BBB, therefore there will be wide-QRS complexes of the conducted beats.

Type II is ominous in that it can quickly progress into complete heart block.

QRS width is 0.12 sec.

Random dropping of QRS complexes



PR intervals in this example are fixed and normal at 0.16 sec.

4. Second Degree AV Block Type II

There are several possible causes of second degree type II AV block which include:

1) Anterior myocardial infarction which causes necrosis of one of the bundle branches.
2) Lev's or Lenegre's disease which is an Idiopathic fibrosis of the conducting system.
3) Mitral valve repair which damages the septum and one of the bundles.
4) Rheumatic fever causing inflammation to the myocardium.
5) Myocarditis and Lyme's disease also producing inflammation of the myocardium.
6) Infiltrative myocardial disease such as amyloidosis, hemochromatosis, and sarcoidosis.
7) Hyperkalemia
8) Certain drugs such as beta blockers, calcium channel blockers, digoxin, and amiodarone to name a few.

Clinical Significance:

1) Second degree type II can cause sudden & unexpected hemodynamic compromise, leading to syncope (Stokes-Adams attacks) or even sudden cardiac death.
2) Severe bradycardia
3) Progresses to complete heart block easily
4) There is approximately a 35% risk of developing asystole

Response:

Immediate admission for cardiac monitoring, temporary pacing and eventually insertion of a permanent pacemaker if tissue is permanently damaged.