

Bradyarrhythmias



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Definition: Bradyarrhythmias

- is defined as having a ventricular rate of **less than 60 beats** per minute (bpm) and has an arrhythmia (irregular beat).
- are common and can be physiological (ie., athletes), or pathological.
- The most important prognostic factor is the **location** of the block and the underlying cardiomyopathy.

Sinus Bardychardia

Sinus Bardychardia:

Sinus Bradycardia:

Is a rhythm in which the rate of impulses arising from the sinoatrial (SA) node is lower than expected. (Rate less than 60beat/min), and becomes clinically significant when the heart rate is persistently below 45 bpm.

Relative bradycardia:

is used to explain a heart rate that, although not actually below 60 bpm is considered too low for the patient medical condition. For example 70 bpm for septic patient.

Pathological Etiologies:

Pathological: (intrinsic)

1. Degeneration/fibrosis of conduction pathways
2. Post MI- Particularly after an inferior MI.
3. Sinus node dysfunction/ Sick Sinus Syndrome Iatrogenic: Ablation, radiation, surgery
4. Aortic valve disease
5. Myocarditis, cardiomyopathy, SLE.

Pathological: (extrinsic)

1. **Vasovagal**- Very common
2. **Endocrine**: Hypothyroidism, adrenal insufficiency.
3. **Metabolic**: Hyperkalemia, hypoxia.
4. **Other**: Hypothermia, increased ICP.
5. **Infectious causes**
Lyme disease, Chagas disease, typhoid fever, typhus, malaria...etc)
6. **Drug induced**:
Parasympathomimetics (acetylcholine), B-blockers, amiodarone, CCBs (e.g: verapamil, diltiazem), digoxin, cimetidine, chemotherapeutic agents, Opioids and sedatives.
7. **Familial**:
sinoatrial node dysfunction, Brugada syndrome and progressive cardiac conduction disease.

Signs and Symptoms:

Symptoms

1. Chest discomfort
2. SOB
3. Decreased LOC
4. Weakness and fatigue
5. Lightheadedness and dizziness
6. Presyncope and syncope

Signs

1. Hypotension-orthostatic hypotension
2. Pulmonary congestion on xray and auscultation
3. Features of CHF; Cyanosis, Peripheral edema
4. Features of pulmonary edema; Dyspnea, Rales and crackles

Sinus bradycardia: ECG criteria

1. Regular rhythm with ventricular rate slower than 60 beats per minute.
2. Except for the rate, other features, including P-wave morphology, PR interval, and 1:1 AV conduction, are similar to the normal sinus rhythm.

Management principles

Treatment for bradycardia should be based on **controlling the symptoms** and **identifying the cause** using the Hs and Ts

- **Do not delay treatment but look for underlying causes of the bradycardia using the Hs and Ts.**
- If the patient is stable, call for consults.
- Sinus bradycardia usually doesn't need treatment unless you have symptoms.
 - If the patient is symptomatic, **administer atropine 1.0 mg IV or IO bolus**
 - Repeat the atropine every 3 to 5 minutes to a total dose of 3 mg:

Potential Cause	How to Identify	Treatments
Hypovolemia	Rapid heart rate and narrow QRS on ECG; other symptoms of low volume	Infusion of normal saline or Ringer's lactate
Hypoxia	Slow heart rate	Airway management and effective oxygenation
Hydrogen Ion Excess (Acidosis)	Low amplitude QRS on the ECG	Hyperventilation; consider sodium bicarbonate bolus
Hypoglycemia	Bedside glucose testing	IV bolus of dextrose
Hypokalemia	Flat T waves and appearance of a U wave on the ECG	IV Magnesium infusion
Hyperkalemia	Peaked T waves and wide QRS complex on the ECG	Consider calcium chloride, sodium bicarbonate, and an insulin and glucose protocol
Hypothermia	Typically preceded by exposure to a cold environment	Gradual rewarming
Tension Pneumothorax	Slow heart rate and narrow QRS complexes on the ECG; difficulty breathing	Thoracostomy or needle decompression
Tamponade – Cardiac	Rapid heart rate and narrow QRS complexes on the ECG	Pericardiocentesis
Toxins	Typically will be seen as a prolonged QT interval on the ECG; may see neurological symptoms	Based on the specific toxin
Thrombosis (pulmonary embolus)	Rapid heart rate with narrow QRS complexes on the ECG	Surgical embolectomy or administration of fibrinolytics
Thrombosis (myocardial infarction)	ECG will be abnormal based on the location of the infarction	Dependent on extent and age of MI

Management principles

- **Management strategy** (if no improvement with atropine)
- If atropine does not relieve the bradycardia, continue evaluating the patient to determine the underlying cause and **consider transcutaneous pacing**
 - Consider an IV/IO **dopamine infusion** at 2-10 mcg/kg/minute
 - Consider an IV/IO **epinephrine infusion** at 2-10 mcg/minute.
- In the cases of Mobitz type II second-degree heart block, third-degree AV block, or third-degree AV block with new widened QRS complex, atropine is unlikely to be effective. Consider **transcutaneous pacing** immediately or a **beta-adrenergic infusion** to increase heart rate.

Atrioventricular block

Atrioventricular block

- Is defined as a **delay** or **interruption** in the transmission of an impulse from the atria to the ventricles due to an anatomical or functional impairment in the conduction system
- The conduction disturbance can be transient or permanent.

First-Degree AV Block

Delayed conduction from the atrium to the ventricle

Defined as a **prolonged PR interval of >200ms** – 5 small squares).

Every QRS complex is preceded by a single P wave.

It rarely causes symptoms and does not usually require treatment.



Second-Degree AV Block

- **Intermittent** atrial conduction to the ventricle.

Not every atrial impulse is able to pass through the AV node into the ventricles which results in dropped beats occurring.

- **There are 2 subtypes:**

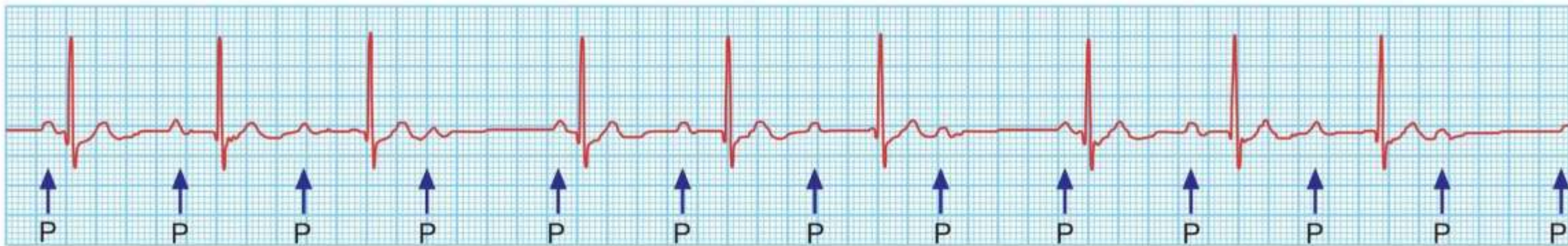
1. Mobitz I (Wenckebach block)
2. Mobitz II (Hay block)

Mobitz type I - Wenckebach phenomenon

- **Progressive lengthening of successive PR intervals, culminating in a dropped beat.**

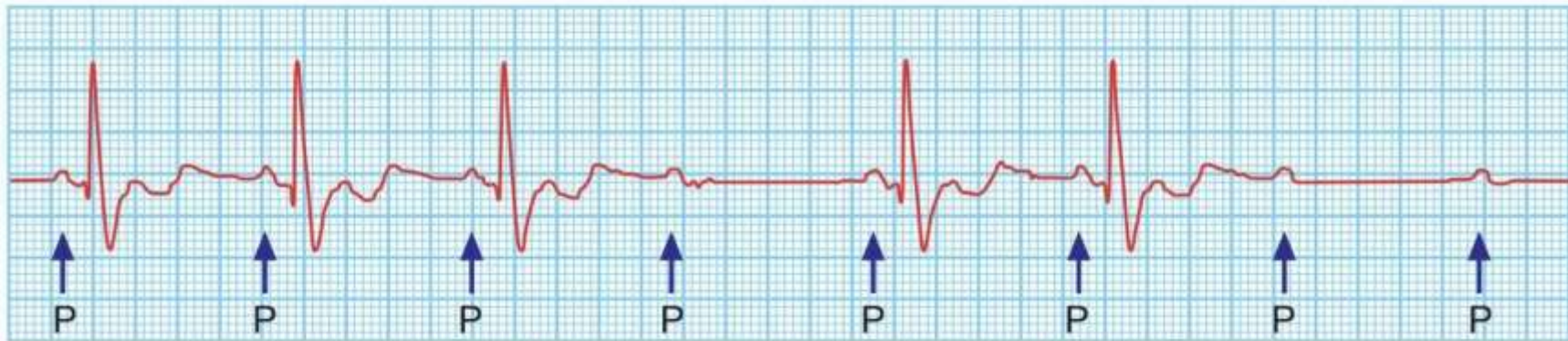
The cycle then repeats itself. This is known as the Wenckebach phenomenon and is usually due to impaired conduction in the AV node itself.

- Rarely progresses to 3rd degree heart block.



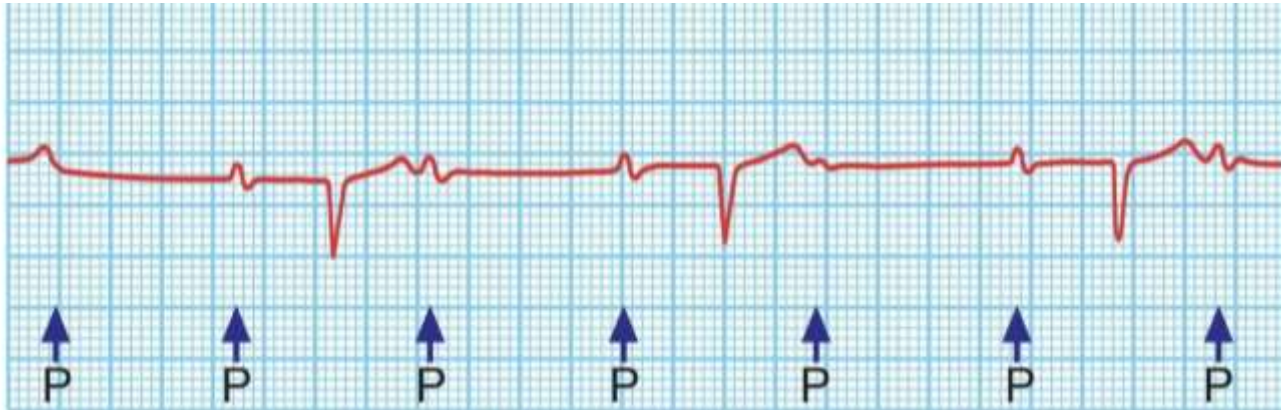
Mobitz type 2

- Occurs when the **dropped QRS beat** is not preceded by progressive PR prolongation.
- The PR interval of the conducted impulses remains constant



Mobitz type 2

- Occurs when the **dropped QRS beat** is not preceded by progressive PR prolongation.
- The PR interval of the conducted impulses remains constant



Third-Degree AV Block

- **AV dissociation:**

Conduction fails completely and the atria and ventricles beat independently.

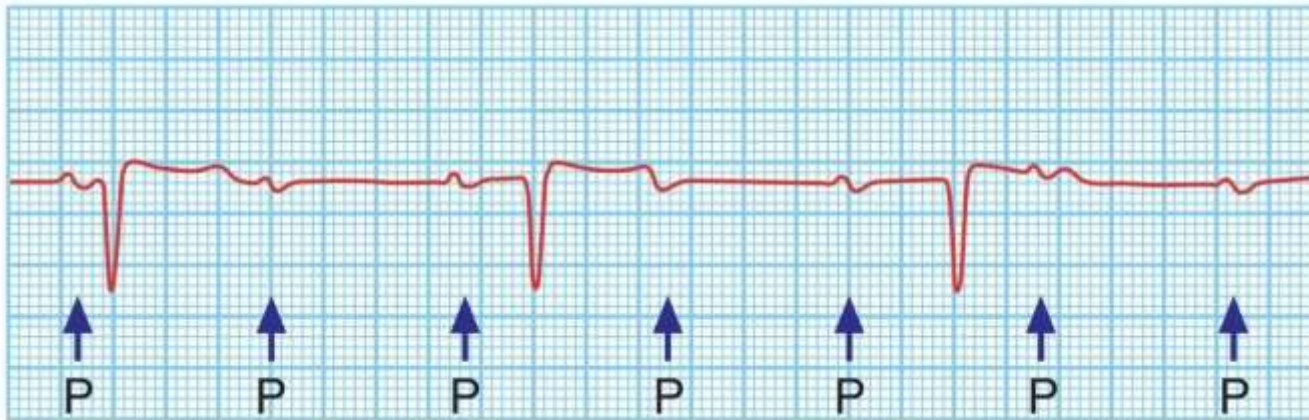
- **Escape rhythm (35 bpm):**

Ventricular activity is maintained by an escape rhythm arising in the AV node or bundle of His (narrow QRS complexes) or the distal Purkinje tissues (broad QRS complexes).

Third-Degree AV Block

Third Degree AV Block is electrocardiographically characterized by:

- Regular P-P interval (60-100)
- Regular R-R interval (30-45)
- Lack of relationship between P waves and QRS complexes



Bundle branch block

Bundle branch block

Impulses, or electrical signals, travel through both the left and right chambers of your heart to make it pump. But if the pathway is blocked, the impulses may move slower than normal or irregularly. This is called a bundle branch block.

There are two types:

Right bundle branch block (RBBB)

Left bundle branch block (LBBB)

Types of bundle branch block :

1. Partial bundle branch block:

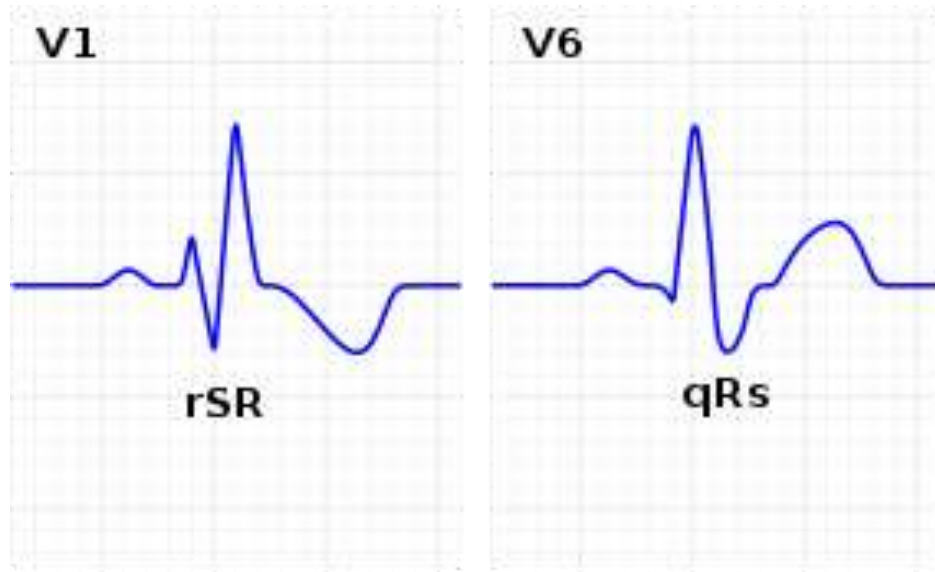
Slight widening of the QRS complex (0.1 -0.12 s) also called incomplete BBB

2. Complete bundle branch block:

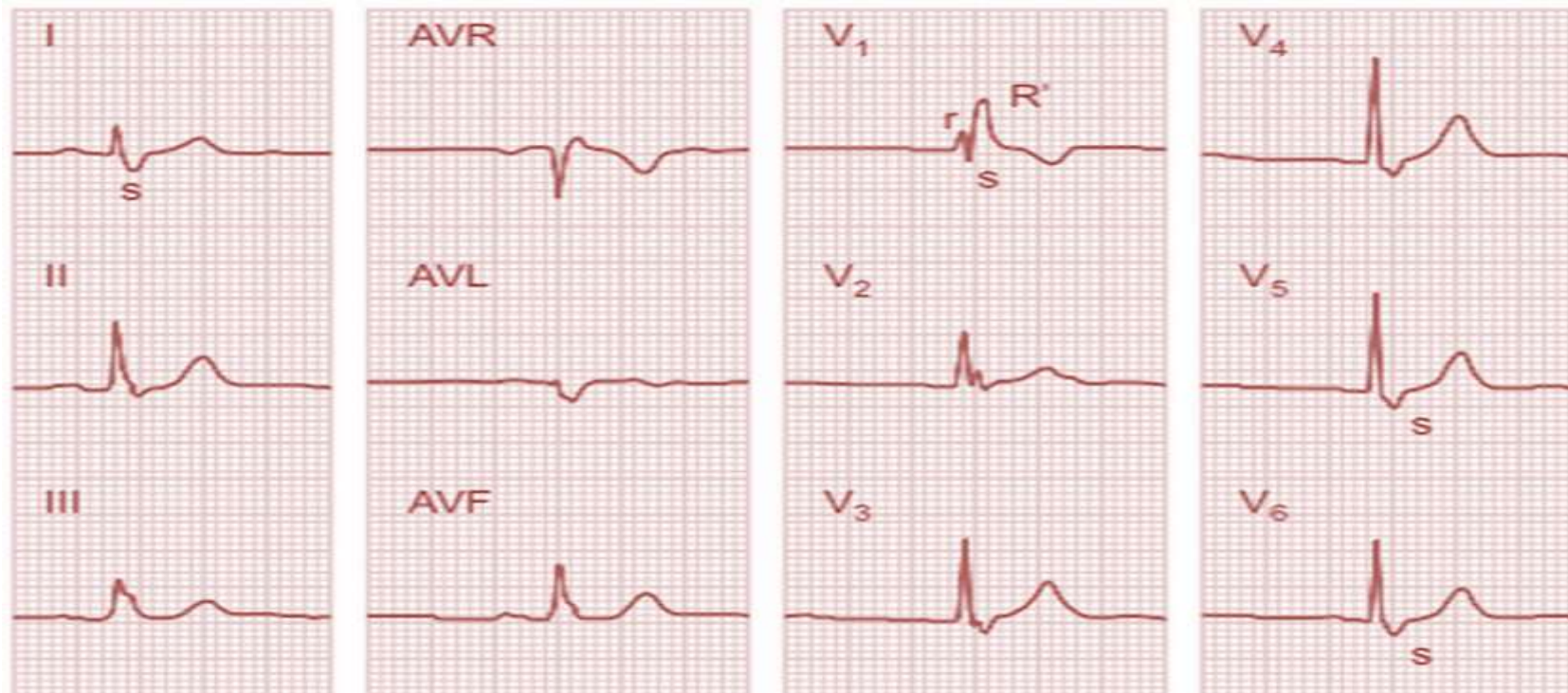
This is associated with a wider QRS complex (more than 0.12 s) this can be on the right or left

Right Bundle Branch Block

There is late activation of the right ventricle, seen in deep S-wave in lead I & V6 and as a tall R wave in V1

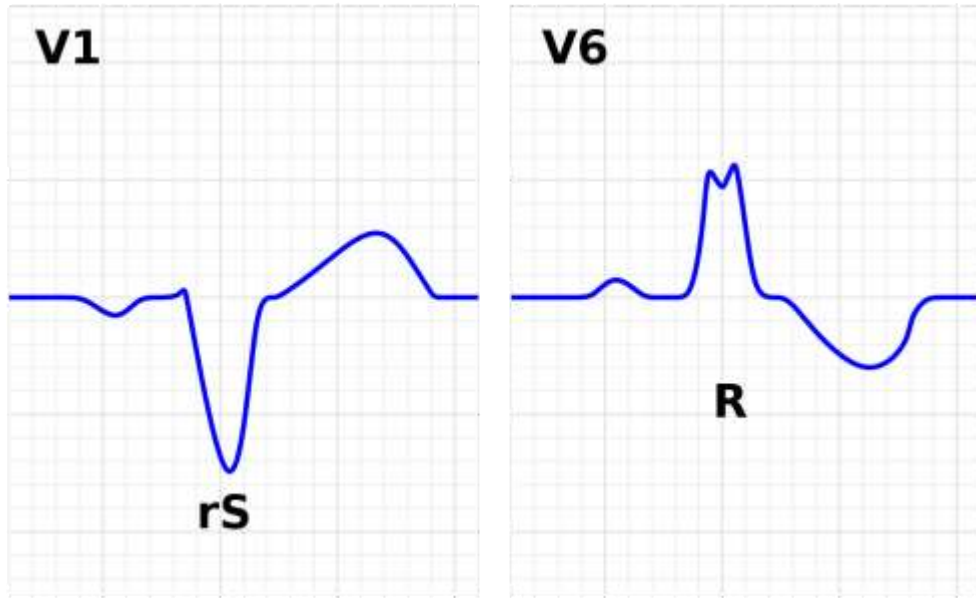


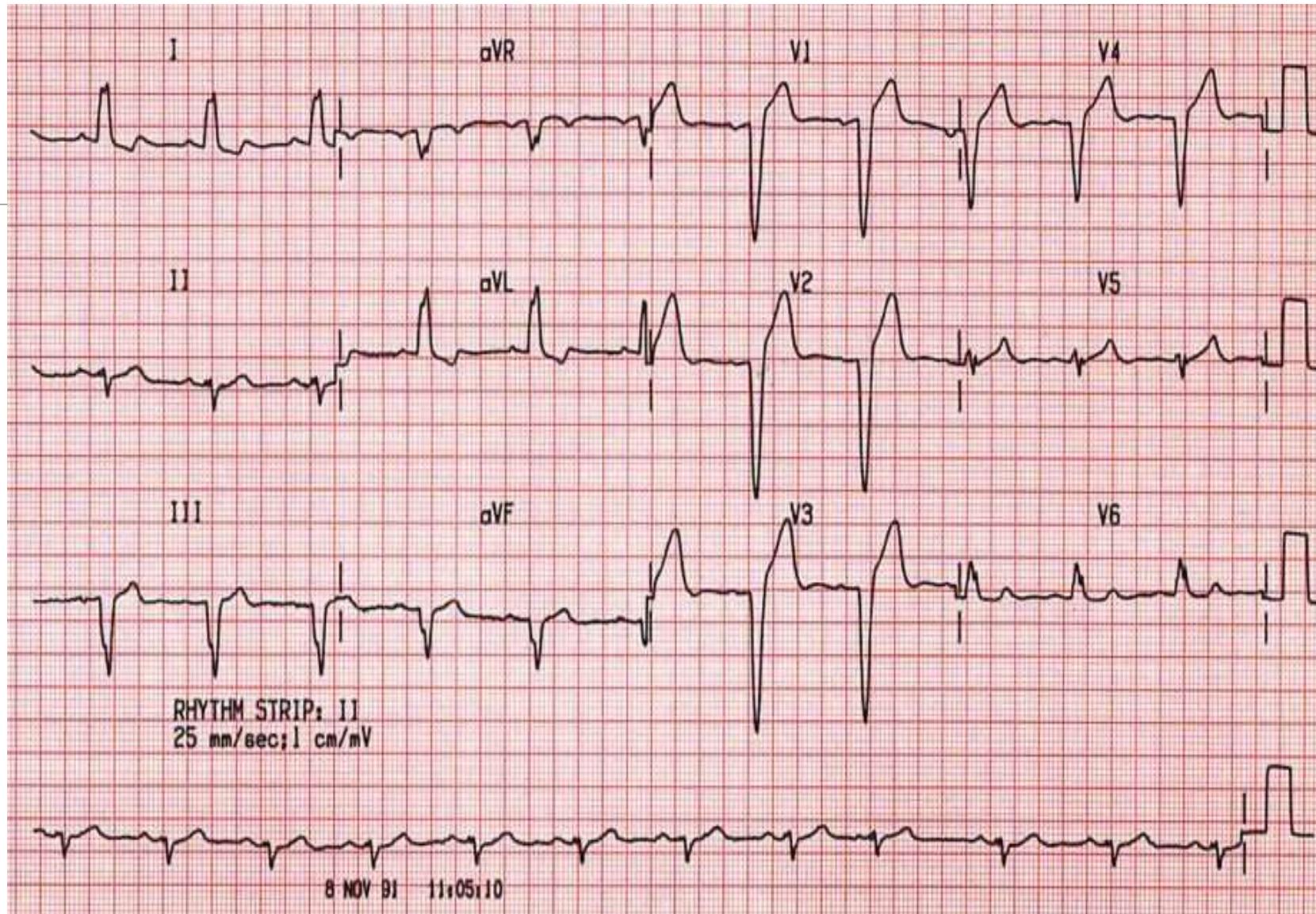
Right Bundle Branch Block

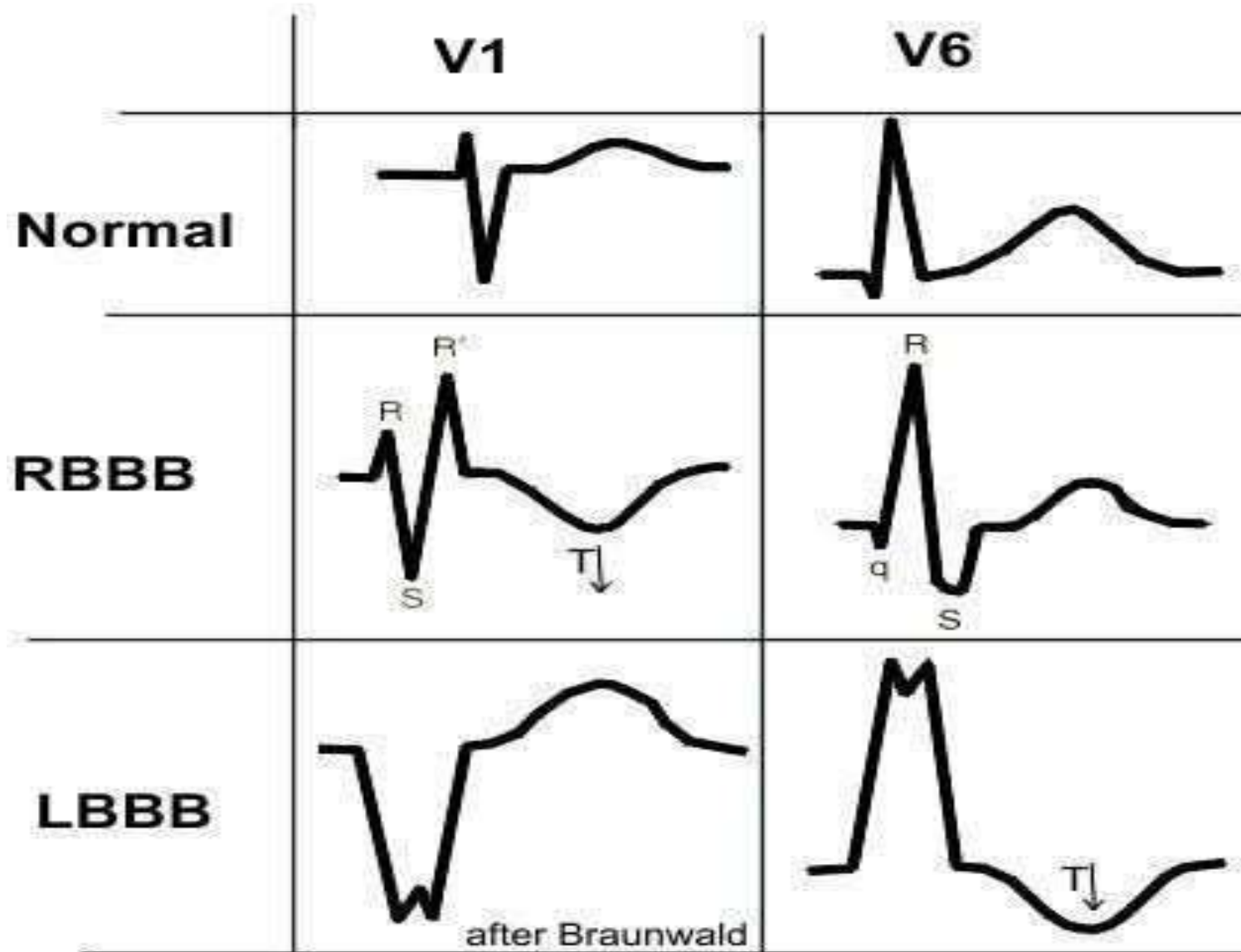


Left bundle branch block

Produce a deep S in V1 and tall late R in lead I and V6







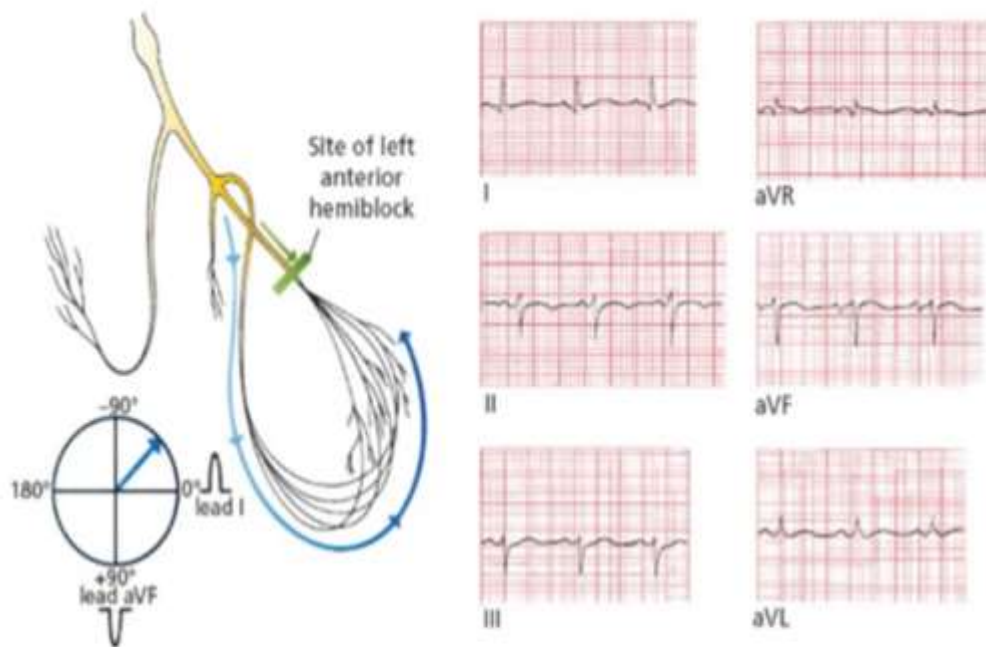
Hemiblock

When there is block in one of the divisions of the left bundle, either anterior division or posterior division, this will produce a swing in the electrical axis of the heart.

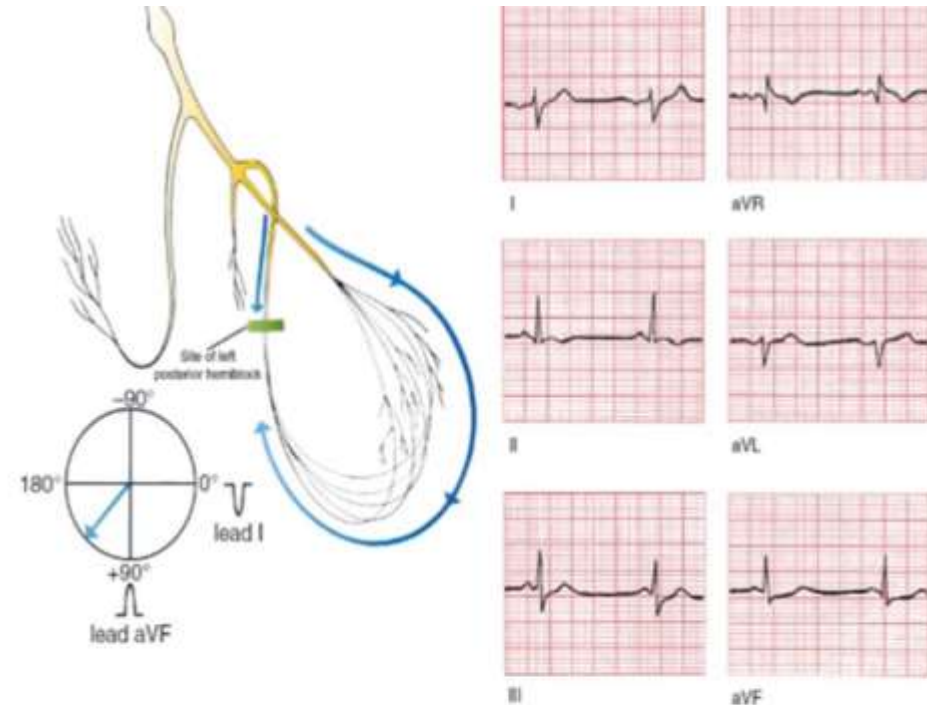
Anterior hemiblock: cause left axis deviation

Posterior hemiblock: cause right axis deviation

Hemiblock



Left anterior hemiblock. Current flow down the left anterior fascicle is blocked; hence, all the current must pass down the posterior fascicle. The resultant axis is redirected upward and leftward (left axis deviation).



Left posterior hemiblock. Current flow down the left posterior fascicle is blocked; hence, all the current must pass down the right anterior fascicle. The resultant axis is redirected downward and rightward (right axis deviation).

Bifascicular/trifascicular block

Bifascicular block

Right Bundle Branch Block + Left Anterior Fascicular Block or Left Posterior Fascicular Block

Trifascicular block

means there are signal problems with the right bundle branch and both of the left fascicles that make up the left bundle branch. This is also known as a complete heart block.

Thank you
