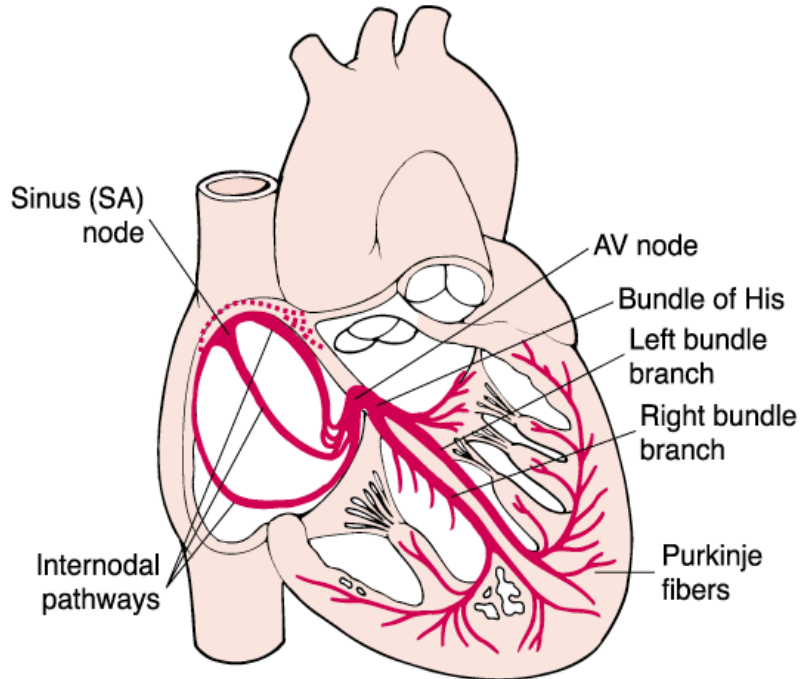


Arrhythmia Study Guide – 2 – Sinus and Atrial Rhythms



Review of Conduction System: SA Node initiates electrical impulses at a rate of 60 – 100 BPM and is the primary pacemaker of the heart. The AV node receives the impulse from the SA Node through the internodal pathways.

The AV Node then delays relay of the impulse to the Bundle of His to allow the atria to empty into the ventricles before the ventricular contraction starts. The Bundle of His relays the impulse to the right and left bundle branches. The bundle branches relay to the Purkinje Fibers and the Purkinje Fibers deliver the impulse to the ventricular myocardium to trigger the ventricular contraction.

If the SA Node fails to fire, or fires at a much slower rate, the AV node may take over as pacemaker at a rate of 40 - 60 BPM. If the AV Node fails or fires at a much slower rate, the Purkinje fibers may act as pacemaker at a rate of 20 – 40 BPM.

The ECG is a graph of the electrical activity of the heart. Knowing how the heart conducts the electrical impulses provides a strong basis for understanding the ECG strip – and figuring out what is or is not working correctly.

SINUS RHYTHMS

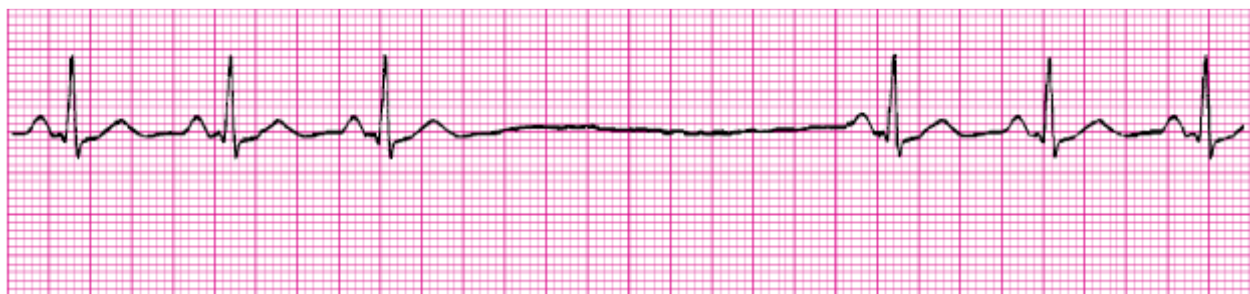
Rhythms that originate from the SA Node are characterized by upright uniform P-waves followed by a QRS complex. The P-R interval is constant, and the atrial (P-waves) and ventricular (QRS Complex) rhythms are regular. A rate less than 60 is bradycardic, 60 to 100 is normal, over 100 is tachycardic.

Sinus Arrhythmia occurs when the SA node fires irregularly. The P-R interval is constant, QRS complex normal, but the atrial and ventricular rhythms are irregular due to the irregular firing of the SA node.

Sinoatrial (SA) Block occurs when the SA node fires but is blocked as it exits the SA node to the surrounding atrium. P-R interval is constant, QRS complex normal, but the rhythm will be irregular due to the pause caused by the blocked impulse. The pause is exact multiples of the distance between two other P – P intervals (twice the normal interval or three times the normal interval, etc.)



Sinus Arrest occurs when the SA Node fails to fire. The AV node/junction or ventricles should initiate an impulse as the escape pacemaker. If they do – there will be an escape beat, followed by sinus rhythm. If they don't – there will be absent P-QRS-T complexes. The pause is of undetermined length (more than one P-QRS-T complex missing) and is not the same distance as other P – P intervals or exact multiples.



ATRIAL RHYTHMS

Atrial Dysrhythmias reflect abnormal electrical impulse formation (also called *automatic*) or abnormal conduction (also called *reentrant*) in the atria.

Premature Atrial Complex (PAC) – occurs when an irritable site or *focus* within the atria fires before the next SA Node is due to fire. The P-wave often has a different shape (flattened, notched, pointed, biphasic or lost in the preceding t-wave), and occur earlier than expected. The QRS complex will look very similar to the other QRS complexes.

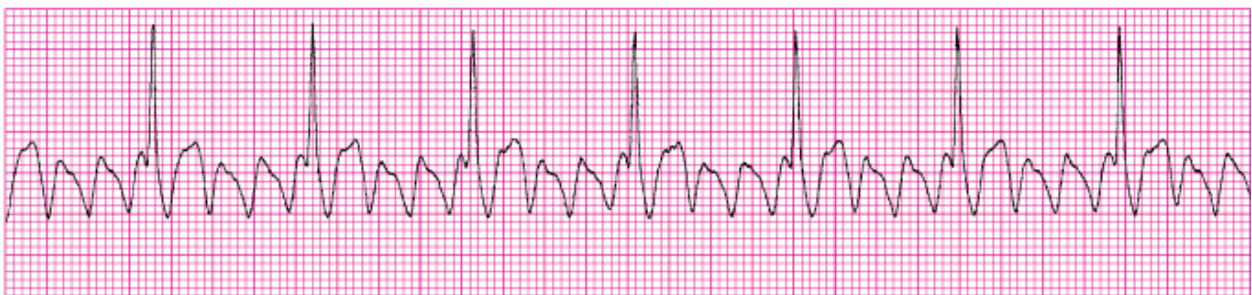
PAC's followed by wide QRS complex are called **aberrantly conducted PAC's** indicating the impulse conduction to the ventricles is abnormal. A PAC that is not followed by a QRS complex is a **Non-conducted PAC**.

Atrial Tachycardia occurs when an irritable area of the atria fires impulses faster than the SA Node and becomes the pacemaker for the heart. Often conduction to the ventricles in 1:1 making Atrial Tachycardia look very similar to Sinus Tachycardia. The difference is the shape of the P waves. With a high rate, it may be impossible to tell where the impulse originated – and is called **Supraventricular Tachycardia**, meaning the impulse is above the ventricles, but unable to determine what part of the atria or AV Node is acting as pacemaker.

Supraventricular tachycardia that starts or ends very suddenly is called **Paroxysmal Supraventricular Tachycardia (PSVT)**. In the strip below – the rhythm starts out as sinus rhythm, and moves to PSVT, and then goes back to sinus rhythm again.



Atrial Flutter occurs when an irritable site in the atria generates impulses at an extremely rapid rate and over-rides the SA Node as pacemaker. If AV Node blocks the impulses at a regular rate, the ventricular rate will be regular. If the AV Node blocks the impulses at an irregular rate, the ventricular rate will be irregular. Atrial Flutter is characterized by no identifiable p-waves, replaced by a “sawtooth” flutter.



Atrial Fibrillation occurs when irritable sites in the atria fire at rates faster than 400 times a minute. The muscle quivers, resulting in ineffectual atrial contraction. The “atrial kick” is lost and cardiac output decreases. As blood pools in the atria, clots may form, and cause serious damage if not death when atrial fibrillation is resolved. For this reason, patients are placed on anticoagulant therapy for new onset Atrial Fib. There are no identifiable p-waves, ventricular rate is irregular.

