Sinus Rhythms

Normal Sinus Rhythm:

This is the normal rhythm of the heart that originates in the SA node.

Diagnostic Characteristics:

Heart Rate:
-60-100

Rhythm:
-Atrial and ventricular rhythms are essentially regular

Pacemaker Site:
-SA node

P waves:
-Sinus P waves are identical, precede each QRS, and are upright in Lead II

PR Interval:
-0.12-0.20 second; generally constant (can vary with heart rate)

R-R and P-P Intervals:
-May be equal or vary slightly.
-The distance between the longest and shortest R-R or P-P interval is less than 0.16 second

QRS Complexes:
-QRS typically follows each P wave.
-0.10 or less

Clinical Significance:
-NSR with a palpable pulse is of no clinical significance and requires no specific treatment per se.

Sinus Arrhythmia:

This is irregularity of the heart beat caused by a cyclic increase and decrease in the rate of a sinus rhythm.

Diagnostic Characteristics:

-Heart Rate:
-60-100

-Rhythm:
-the atrial and ventricular rhythms are regularly irregular as the HR gradually increases and slows
-the changes in rate occur in cycles

-Pacemaker Site:
-SA node

-P Waves:
-the sinus P waves are identical and precede each QRS complex.
-they are positive in Lead II
-sinus arrhythmia is considered to be present when the difference between the longest and shortest P-P or R-R is greater than 0.16 second.

PR Interval:
-normal and constant

R-R Intervals:
-unequal
-the most common type of sinus arrhythmia is related to respiration where the R-R intervals become shorter during inspiration as the HR increases and longer during expiration as the HR decreases.
-difference between longest and shortest is greater than 0.16 second

QRS Complexes:
-normally follow each P wave
-less than 0.10 second

Cause of Arrhythmia:
-most common type is related to respiration
-seen in children, young adults, and elderly
-caused by changes in vagal tone that occur during respiration
-decreases during inspiration, increases during exhalation
-a less common type of sinus arrhythmia is not related to respiration
-it may occur in health individuals, but is more commonly seen in adults with heart disease (after a MI) or in patients on digitalis or morphine.

Clinical Significance:
-usually, it is of no clinical significance and requires no treatment
-marked sinus arrhythmia may cause:
-palpitations
-dizziness
-syncope

Sinus Bradycardia:

This is an arrhythmia that originates in the SA node, but is characterized by a HR of less than 60.

Diagnostic Characteristics:

-Heart Rate:
-less than 60

-Rhythm:
-essentially regular
-may be irregular if sinus arrhythmia is present

-Pacemaker site:
-SA node

-P waves:
- -identical
- -precede each QRS
- -upright

-PR Intervals:
- -normal
- -constant

-R-R intervals:
- -usually equal, but may vary

-QRS Complexes:
- -follow each P wave
- -less than 0.10 second

Cause of Arrhythmia:
- -excessive parasympathetic tone on SA node caused by
  - -carotid sinus stimulation
  - -vomiting
  - -Valsalva maneuvers
  - -vasovagal syncope
- -decrease in sympathetic tone on SA node
  - -beta blockers (atenolol, propranolol)
- -administration of calcium channel blockers (diltiazem, verapamil, nefedipine)
- -digitalis toxicity
- -disease in SA node (sick sinus syndrome)
- -hypothyroidism (myxedema)
- -hypothermia
- -hypoxia
- -during sleep
- -trained athletes

Clinical Significance:
- -mild sinus bradycardia (50-59) usually does not produce symptoms by itself (asymptomatic bradycardia)
- -in the presence of MI, it may actually be beneficial to the patient
  - -decrease in workload
  - -reduced oxygen requirements by myocardium
- -marked sinus bradycardia (30-45) may have hypotension and reduced cardiac output
  - -dizziness, lightheadedness
  - -decreased LOC
  - -syncope
  - -SOB
  - -CP
  - -hypotension
  - -shock
  - -pulmonary edema
  - -CHF
  - -AMI
- -predisposition to more serious arrhythmias (PVC's, V tach, V fib, asystole)
- -symptomatic bradycardia should be treated with atropine and pacing

Sinus Arrest and Sinoatrial Exit Block:

Sinus arrest is an arrhythmia caused by episodes of failure in the automaticity of the SA node, resulting in bradycardia, asystole, or both.

Sinoatrial exit block is an arrhythmia caused by a block in the conduction of the electrical impulse from the SA node to the atria, resulting in bradycardia, asystole, or both.

Diagnostic Characteristics:

Heart Rate:
- -60-100 (may be less)

Rhythm:
- -irregular when sinus arrest or SA exit block is present

Pacemaker Site:
- -SA node

P waves:
- -identical
- -precede each QRS
- -may be absent during the pause

PR Intervals:
- -underlying rhythm may be normal or abnormal

R-R Intervals:
- -unequal when the block or arrest is present
- -sinus block: rhythm resumes on time after pause
- -sinus arrest: rhythm does not resume on time after pause

QRS Complexes:
- -follow each P wave
- -0.10 or less
- -absent during the arrest or block

Cause of the Arrhythmia:
- -sinus arrest results from a depression in the automaticity of the SA node
- -SA exit block results from a block in conduction of the impulse from the SA node to the atria
- -precipitated by:
  - -increase in vagal tone on SA node
  - -hypoxia
  - -hyperkalemia
  - -excessive doses of:
    - -digitalis
    - -beta blockers
  - -damage to the SA node or adjacent atrium from:
    - -MI
    - -myocarditis

Clinical Significance:
- -transient sinus arrest and SA exit block may have no clinical significance per se
- -if a ventricular pacemaker takes over with a slow HR, treatment is the same as sinus bradycardia

Sinus Tachycardia:

An arrhythmia originating in the SA node, characterized by a rate over 100 per minute.

Diagnostic Characteristics:

Heart Rate:
- -greater than 100 (usually between 100-160, but can be 180 or more)

Rhythm:
- -essentially regular

Pacemaker Site:
- -SA node

P waves:
- -usually normal, but can be taller and more peaked than normal
- -positive
- -precede each QRS

PR Intervals:
- -normal
- -constant

R-R Intervals:
- -equal, but can vary slightly

QRS Complexes:
- -less than 0.10
- -follows each P wave

Cause of Arrhythmia:
- -in adults, it is a normal response to exercise and exertion
- -also caused by:
  - -stimulants (coffee, tea)
  - -increase in catecholamines (excitement, anxiety, pain, stress)
  - -excessive doses of anticholinergic drug (atropine) or a sympathomimetic drug (dopamine, epinephrine, isoproterenol, norepinephrine, cocaine)
  - -CHF
  - -PE
  - -MI
  - -fever
  - -anemia
  - -hypovolemia
  - -hypoxia
  - -hypotension/shock

Clinical Significance:
- -ST in healthy individuals usually does not require treatment
- -treatment of ST should be directed at correcting the underlying cause of the arrhythmia