Sinus Node Dysfunction

JI-EUN BAN, MD, PhD

Department of Pediatrics

Ewha Womans University, School of Medicine, Seoul, Republic of Korea

Pacemaker cells in the sinoatrial (SA) node reach the voltage range for the sodium window current during action potential phase 4. In addition to their contribution to cardiac pacemaker activity, sodium channels also play an essential role in the propagation of action potentials from the central area of the sinoatrial node through its peripheral regions to the surrounding atrial muscle. There are 3 different but very related, pathologic processes involving the SA node: sinoatrial exit block, sinus pause and sinus arrest.

A sinoatrial exit block refer to a complete block or failure of the sinus node to capture or depolarize the atrial myocardium, resulting in bradycardia, asystole, or both. The hallmark of a sinoatrial block is that the pause is always an exact multiple of the normal P-P interval.

A sinus pause is cause by a delay in the formation of a sinus impulse in the sinus node itself. The delay is represented as a longer P-P interval on ECG. Sinus pause do not occur as exact multiples of the normal P-P interval because the delay usually occurs in the sinus node itself. When the sinus node returns after the pause, it may be set at the same rate as before the pause or it may be a differentiate.

A sinus arrest is caused by episodes of failure in the automaticity of the SA node, resulting a longer delay in the formation of an atrial impulse. Sinoatrial block can also be found within the pause of a sinus arrest. Sinus arrest can be long, but they are never an exact multiple of the normal P-P interval.

The sick sinus syndrome refers to a series of arrhythmias that are frequently seen in patients with diseased SA nodes. SSS encompasses various forms of arrhythmia that result from SA node dysfunction. The diseased node can cause severe bradycardias, marked sinus arrhythmias, sinus blocks, sinus pauses and arrests to develop. The diseased node can also frequently alternate between very slow bradycardias and very fast tachycardias (tachy-brady syndrome).