Anatomy and Physiology

Cardiovascular System

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CONDUCTION SYSTEM OF HEART

The functions of the Conduction (electrical) system of the heart are for initiation, control the rate of the heartbeat and also its coordinated transmission to the entire heart resulting in maximum mechanical efficiency.

A. Sinoatrial Node (SA Node)

The heartbeat is normally begun in cells of the sinoatrial (SA), or sinus, node which is located in the high lateral right atrium.

Function of the sinus node is influenced profoundly by autonomic nervous system tone – increases in parasympathetic tone decrease automaticity of the sinus node, slowing the heart rate, while increases in sympathetic tone increase automaticity, resulting in increased heart rate.

Impulses spread from the sinus node over the atria, from right to left/top to bottom, completing atrial depolarization in about 80-100 ms.

B. Atrioventricular (AV) node

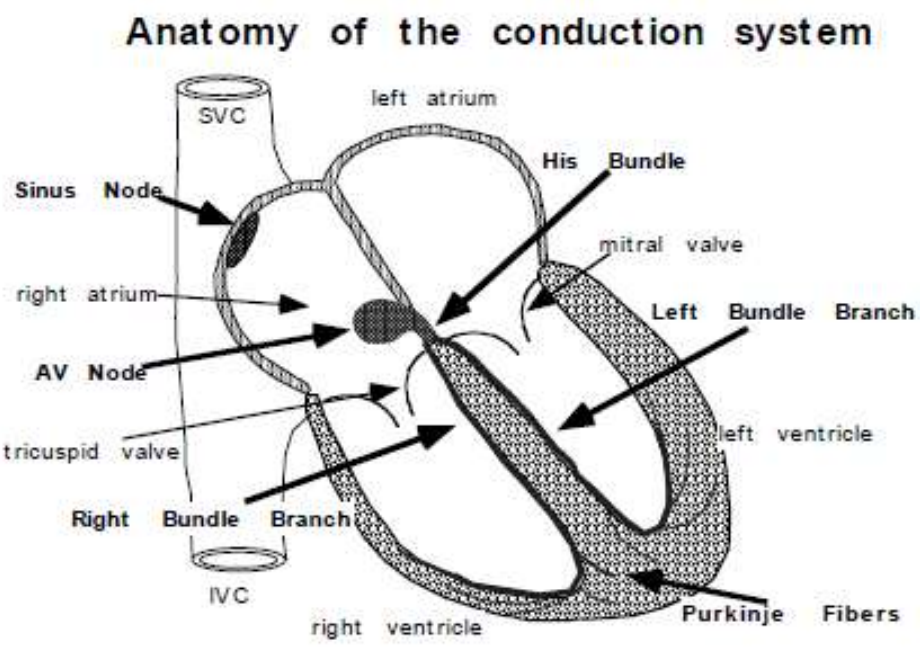
The AV node is situated in the inferomedial right atrium and forms the top of the only normal electrical connection between atria and ventricles.

Special cells transmit impulses very slowly, requiring 60-125 ms to traverse the ~1 cm long node.

C. His-Purkinje System and Ventricles

The rapid spread of impulses through the ventricles is mediated by cells of the His-Purkinje system (HPS). The His bundle is located at the crest of the interventricular septum. The AV node terminates in the top of the His bundle which then branches into a left and right bundle branch. The right bundle branch is a cable-like structure, insulated from surrounding myocardium for most of its length. When it reaches the right ventricular apex it makes its initial electrical contact with myocardial cells of the anterior papillary muscle. In contrast, the left bundle branch is usually a fan-like structure, dividing soon after its origin into anterior and posterior fascicles. These fascicles then further ramify into the rest of the Purkinje network.

Conduction is especially rapid through these cells, activating the left side of the interventricular septum, then the apex, finally the base, from endocardium to epicardium. The entire mass of ventricular myocardium is depolarized in about 80-100 ms, the same as in the atria.



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