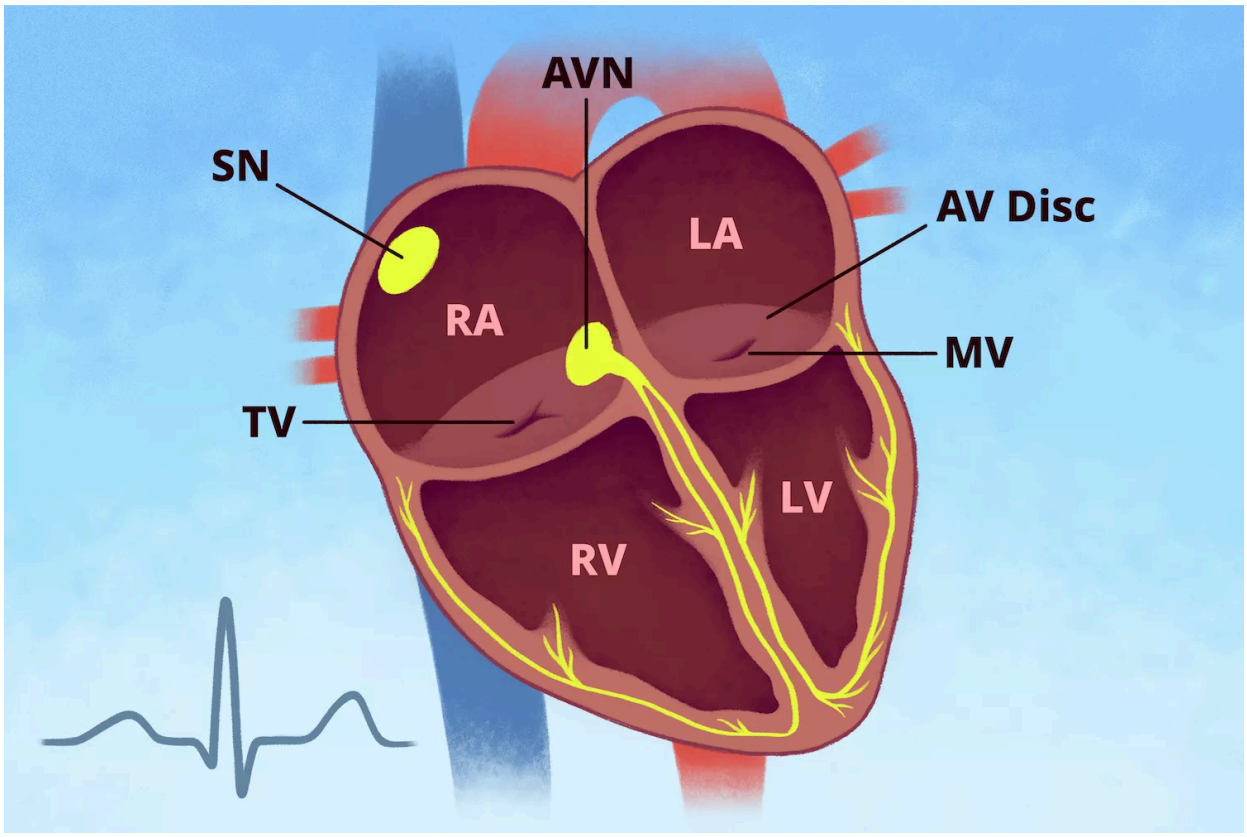
How the heart works
Update: Jan 2024

The Heart's Electrical System: Anatomy and Function

Components of the Cardiac Conduction System



SN = sinus node; AVN = AV node; RA = right atrium; LA = left atrium; RV = right ventricle; LV = left ventricle; TV = tricuspid valve (the valve that separates the right atrium from the right ventricle); MV = mitral valve (the valve that separates the left atrium from the left ventricle)

Heart Block

Heart block is a conduction disorder in which the heart's electrical signals are unable to move from the atria to the ventricles. This interference prevents the atria from telling the ventricles when to contract and pump blood.[9]

Johns Hopkins Medicine. Heart block.

In most cases of heart block, the electrical signals are weakened but do not stop completely. There are three degrees of heart block severity:[9]

- **First degree heart block:** The least severe degree of heart block, in which the electrical signals are slowed but still reach your ventricles. Treatment may not be needed.
- **Second degree heart block:** In second degree AV block, some of the electrical impulses from the atria reach the ventricles, but some are blocked and never reach the ventricles. Depending on the underlying cause of this condition, a pacemaker may need to be considered.
- **Third degree heart block:** The most severe degree of heart block, in which electrical signals completely fail to reach the ventricles. If this happens, a person's pulse may dramatically slow, or there may be no pulse at all. A pacemaker is almost always required.

Another type of conduction disorder, **bundle branch block**, occurs when a blockage in the right or left bundle branch causes one ventricle to contract slightly slower than the other.[10]

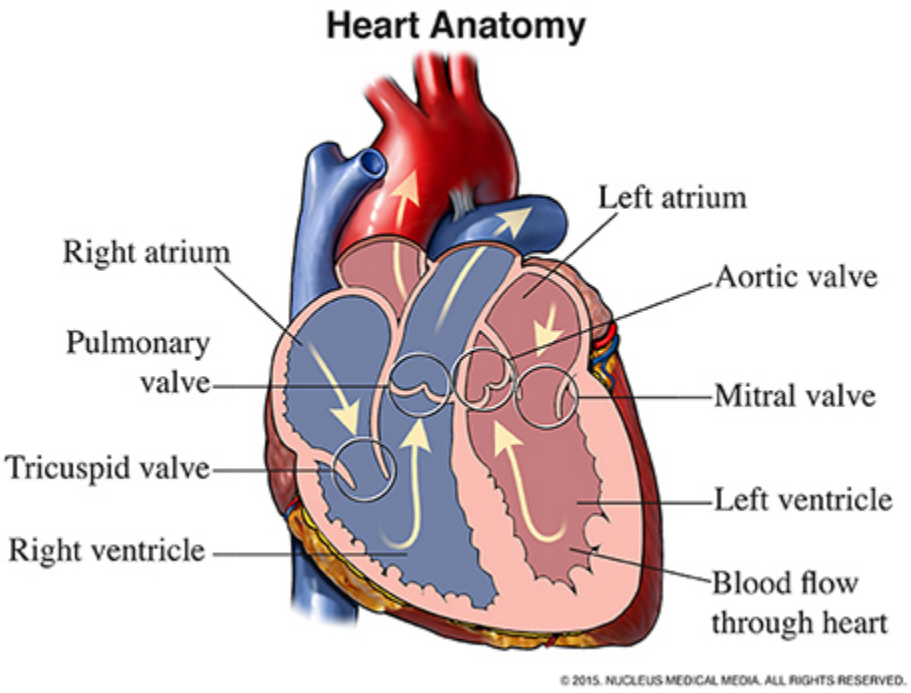
Bundle branch block by itself often does not require treatment. When it does, treatment involves managing the underlying health condition, be it heart disease, high blood pressure, a congenital (present at birth) heart defect, or something else.[10]

Reference: The Heart's Electrical System: Anatomy and Function

Five components of electrical conduction make the heart beat
https://www.verywellhealth.com/cardiac-electrical-system-how-the-heart-beats-1746299

Understanding Heart Valve Disease

https://www.ohsu.edu/knight-cardiovascular-institute/understanding-heart-valve-disease
See a good video with the link above about how the Heart Valve works.

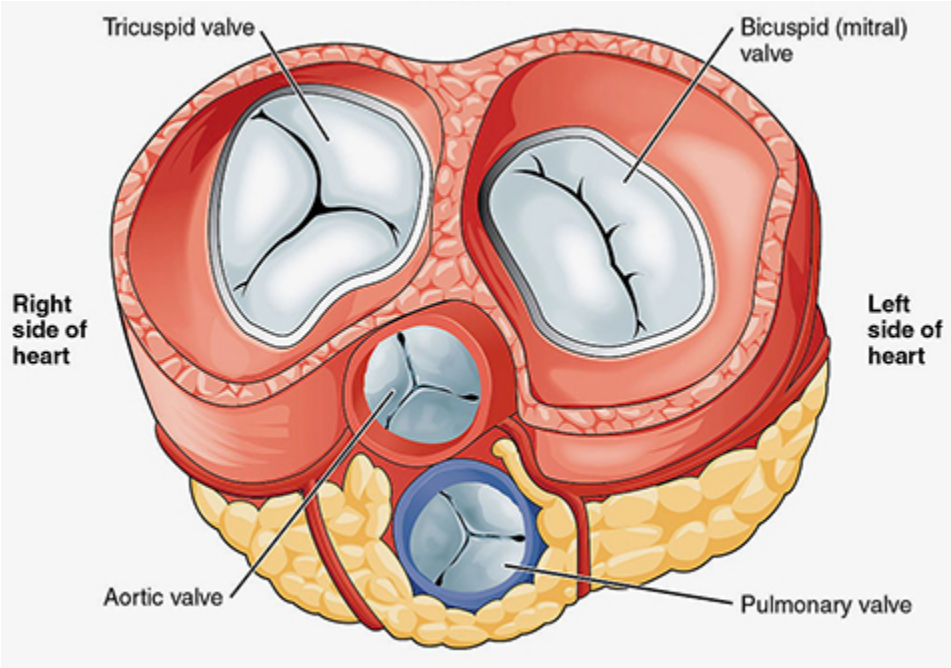


Heart Anatomy and Blood Flow

The heart’s four valves work like gates: opening to allow blood to flow through, then tightly closing to stop blood from leaking backward. This keeps blood flowing in the proper direction.

- **The tricuspid valve** manages blood flow between the heart’s upper and lower right chambers. It has three cusps (flaps).

- **The pulmonary (pulmonic) valve** opens to let blood flow from the heart's lower right chamber into an artery to reach the lungs. It has three flaps or leaflets.
- **The mitral valve** separates the upper and lower chambers on the heart's left side. It controls the flow of oxygen-rich blood from the lungs into the heart. It has two flaps or leaflets.
- **The aortic valve** controls blood flow from the lower left chamber to the aorta — the artery that carries blood from the heart to the rest of the body. It has three cusps or flaps.



Heart Valve Anatomy

Heart valve disease causes and risk factors

- **Age:** As you get older, calcium can build up on your valves. This makes the flaps stiff and unable to open fully. Men older than 65 and women older than 75 are most at risk.
- **Congenital heart defects:** These are conditions you are born with that affect the heart's structure or how it works.
- **Other heart problems:** Some heart conditions can stretch or scar valve tissue, or affect function. These include heart attack, heart failure and arrhythmia.
- **Rheumatic fever:** This infection (caused by untreated strep infections) can permanently damage heart valves.

- **Infective endocarditis:** This is a bacterial infection of the heart's lining or heart valves.
- **High blood pressure:** This can cause your heart to work harder, stretching valves out of shape.

Signs and symptoms of heart valve disease

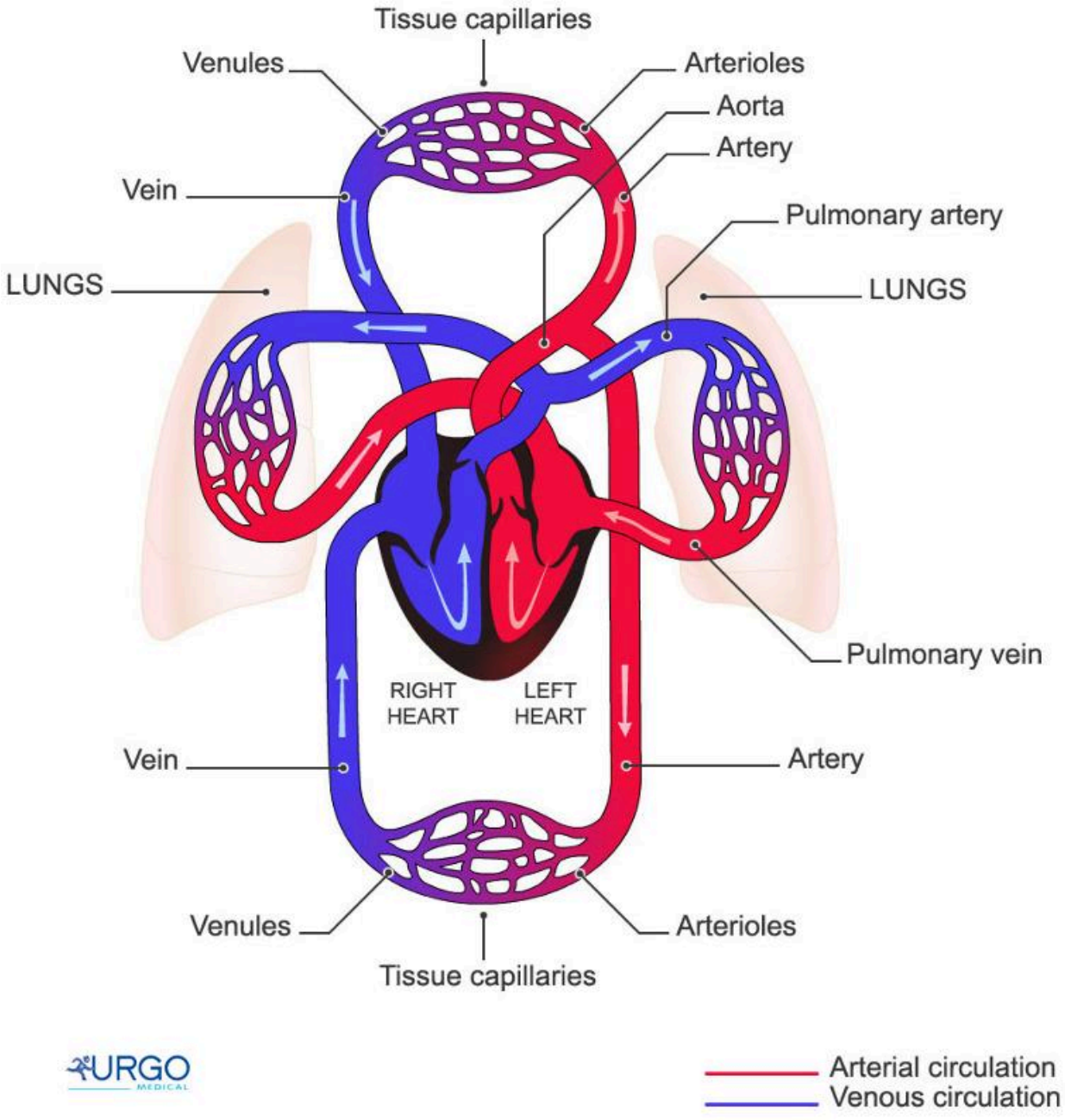
Symptoms can develop over many years or very quickly. Many people never realize they have a mild valve problem. Advanced valve disease, left untreated, can lead to heart failure, blood clots, stroke or death.

You might notice symptoms more when lying down. They can include:

- Shortness of breath
- Heart palpitations (when it feels like your heart is beating too hard, too fast, skipping a beat or fluttering)
- Chest pain or discomfort
- Swelling of the ankles, feet or belly
- Rapid weight gain (3 pounds in one day is possible)
- Tiring more quickly during exercise or daily activities
- Dizziness or fainting

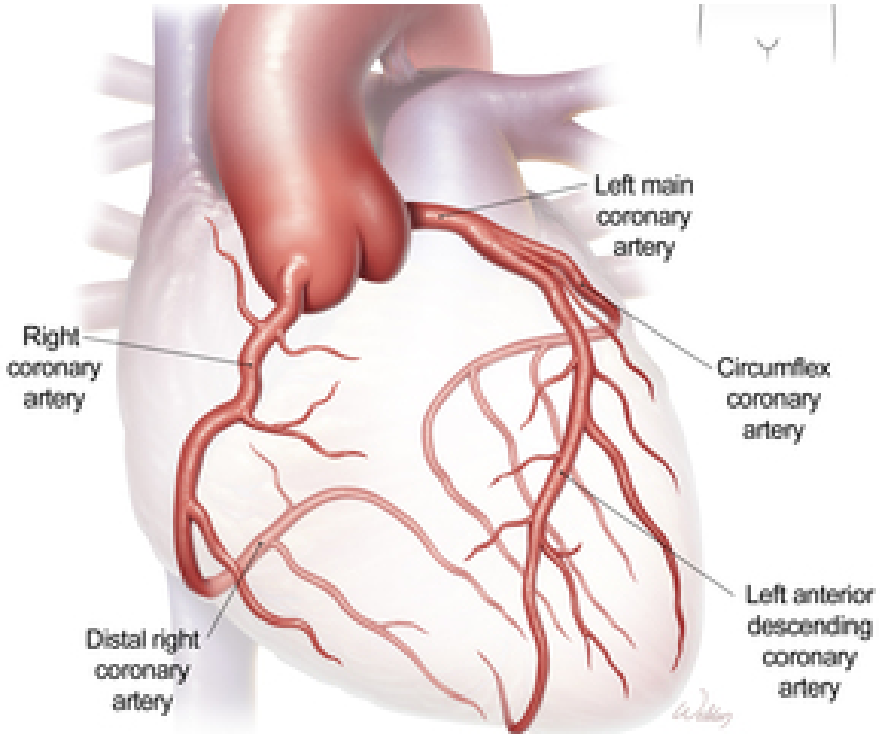
Cardiovascular System

https://sphweb.bumc.bu.edu/otlt/mph-modules/ph/ph709_heart/ph709_heart2.html

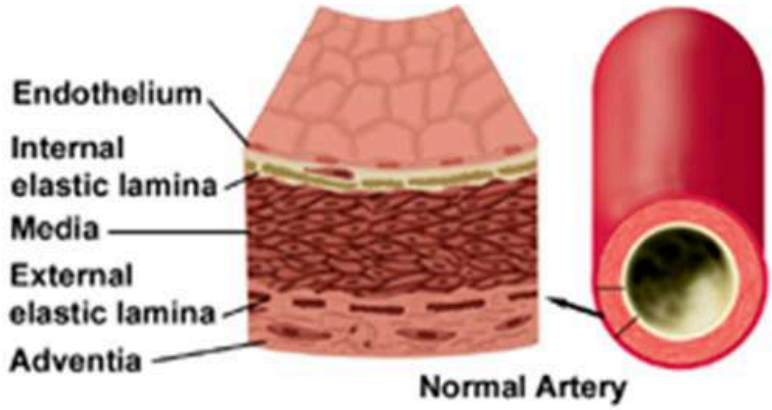


Coronary Artery:

- Right coronary artery
- Left main coronary artery
- Circumflex coronary artery
- Distal right coronary artery
- Left anterior descending coronary artery



Normal Structure of Blood Vessels


Endothelium
Internal elastic lamina
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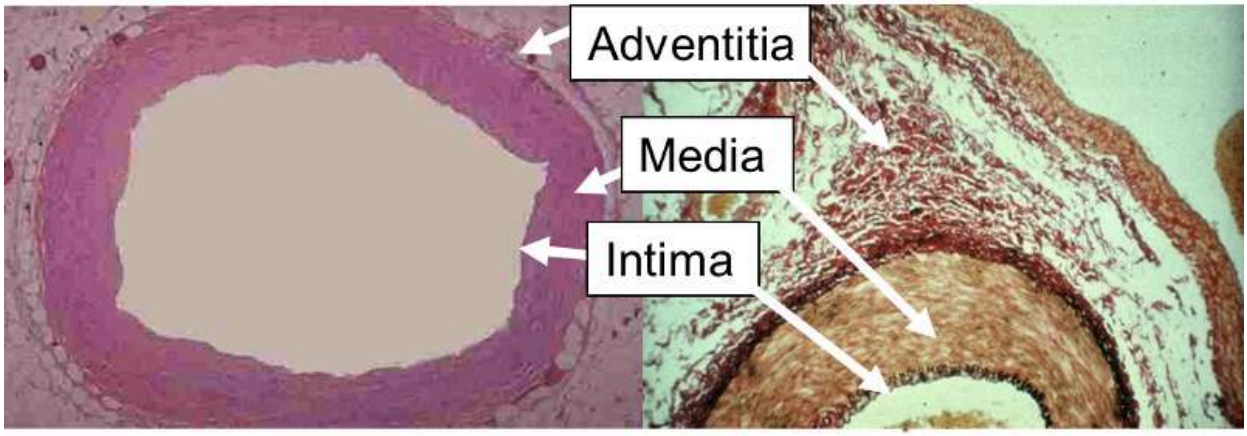
External elastic lamina
Adventia
Normal Artery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