

Patient Information

For : Educational Material

The Human Heart

What is the anatomy of the heart?

The heart has four compartments, or chambers. The upper chambers are called atria, and the lower chambers are called ventricles. Blood returning from the rest of the body enters the right atrium through two big veins called superior and inferior vena cavae. Blood flows through the tricuspid valve, located between the right atrium and right ventricle, and the right ventricle pumps it through the pulmonic valve to the lungs.

As it passes through the lungs, the blood picks up a new supply of oxygen, disposes of carbon dioxide, and flows into the left atrium. From there, it flows through the mitral valve into the left ventricle. The left ventricle has a thick muscle that allows it to pump blood through the aortic valve to the largest blood vessel in the body, the aorta. The aorta distributes the blood to the rest of the body, with a small amount going back to the heart muscle through the coronary arteries.

What is the function of the heart valves?

The four heart valves work in a pattern to keep blood flowing in one direction. They are made of thin tissue and open and close easily. The tricuspid, pulmonic, and aortic valves all have three cusps (leaflets). The mitral valve has only two leaflets.

The mitral and tricuspid valves are larger than the others, and their margins, or free edges, are supported by strands of heart tissue called chordae tendinae. These small cords keep the valves closed during contraction (squeezing) of the heart.

What causes the heart to beat?

Every normal heartbeat starts in a group of specialized cells in the right atrium, called the sinus node. These "pacemaker" cells (P cells) automatically discharge a regular electrical impulse to start the contraction of the heart. The usual rate is between 50 and 100 beats per minute. The rate of beating can be made faster or slower by the body's nervous system, hormones, or drugs. The heart will continue to beat even if all the nerves leading to it are cut.

The sinus node is connected to a "wiring circuit" made up of tissue pathways of special cells that distribute the

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electrical impulse to the rest of the heart. The impulse causes the atria to contract and push blood from the atria into the ventricles. The impulse travels down the tissue pathways to a junction called the atrioventricular (AV) node. Then the impulse proceeds down the special cell pathways to the ventricles. The ventricles contract, pushing blood out to the lungs and the rest of the body.

Are there special features of heart muscle?

The heart is much like other body muscles, although its microscopic structure is slightly different. Like a body builder's muscles, it will enlarge and thicken if it has to do more work. The left ventricular muscle is thicker than the right ventricular muscle because it must pump blood at a higher pressure to supply the body. The lung blood pressure is much lower than that in the rest of the body, so the right ventricle doesn't need to be as thick as the left.

Heart muscle gets its energy from the blood in slightly different ways than other muscles. The heart muscle uses not only glucose and other sugars, but also compounds called fatty acids as sources of energy. It is much more sensitive to oxygen supply than other muscles. Lack of enough oxygen-carrying blood to the heart muscle quickly leads to a decrease in its ability to squeeze.

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