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HEART AND CARDIOVASCULAR SYSTEM

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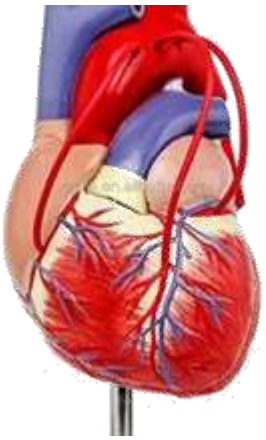
ABSTRACT:

This article provides an in-depth explanation of the human heart's anatomy, functions, and its vital role in the circulatory system. It details the heart's structure, describing its four chambers (two atria and two ventricles), its location, and variations based on age, gender, and body structure. The article also explores how the heart's size and position can change, particularly in infants and children, and how it adapts in individuals engaged in physical labor or sports. Additionally, it explains the heart's cardiac compartments, valves, and their role in blood circulation.

INTRODUCTION. The human heart is 4-chambered: consisting of 2 compartments and 2 ventricles, conical in shape, with the base facing back, up and to the right, the tip (apex) facing down, forward and left. The heart is located in the area of the anterior lower breast range, with two lateral lung and pleural sacs touching the anterior collarbone and rib vault. The heart is strengthened by blood vessels from above and behind, and by a diaphragm from below. The state of the heart is not the same in all people, it also depends on the age, gender, State and structure of the person's body. In particular, in newborns, the heart is round in shape, and the diaphragm dome is higher, transverse and higher, the ayrisimon gland pushes it far behind

the collarbone. Animated image of the heart cycle.Later, at the age of 1-3, the heart changes its transverse situation and settles in an oblique position, as in older people. The average weight of the heart is 300 g in males and slightly less in females (220-250 gr). The length of the heart is 13-15 CM in middle-aged people, the widest part (transverse) is 9-11 CM, the length of the back level with the front level is 6-7 CM. The sharp (right) and impenetrable (left) edges of the external surface of the heart separate it into the posterior, anterior surfaces. The size of each person's heart comes as its own right fist. The heart of a middle-aged person can contract 70-75 times in an average of one minute, 100,000 times in one day. This is equivalent to the power of lifting a 20 t load to a height of 1 m. Drawing by Enrique Simone. "He had a heart" (1890)



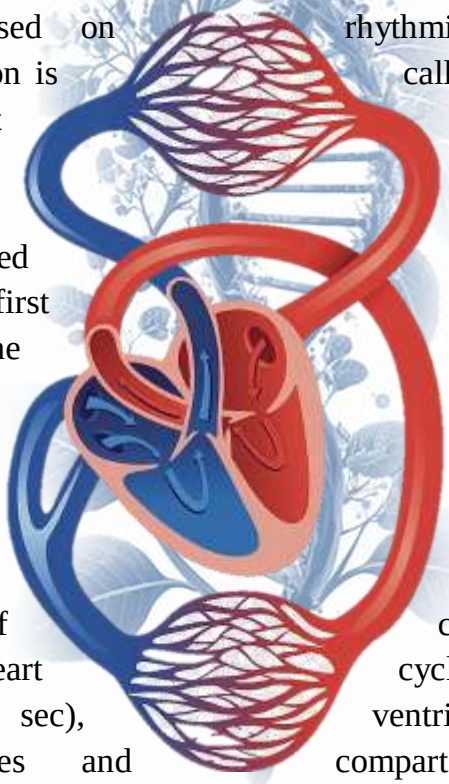
The upper border of the heart corresponds to a horizontal line that is passed from where the rib Mount III is sticking to the collarbone.

The right border of the heart is 2-3 cm in thickness from the right ed ge of the collarbone (opposite the right III and V ribs). In children under one year of age, the right margin of the heart can protrude 1.0-1.5 cm from the right edge of the collarbone. The lower left margin of the heart meets the tip of the heart 1.5 cm inward of the middle O'mrow line of the V rib. The position of the heart border also depends on the shape of the human chest, in people with a wide chest, the heart is located lower. Therefore, in people with such a body structure, the heart stands in a horizontal position. In the chest, which is medium in length, the heart is tilted. Females have a slightly smaller heart and are horizontally positioned. In people who do physical labor and sports, the size of the heart becomes slightly larger.

Cardiac compartments are cavities that receive venous blood. The upper and lower umbilical veins, which bring venous blood from the large circulatory circle to the right compartment; 4 pulmonary veins are poured into the left compartment. The two branches are contiguous with the ventricles-through the ventricular orifices. When the ventricles contract, the holes are sealed with shallow (flaps) valves. On the inner surface of the ventricles, there are muscle fibers that intersect with each other and sucker-like muscles that protrude into the ventricular cavity. It I a strand of fiber that come out of the end of the muscle. At the base of the aorta and pulmonary artery are the semicircular valves. The valves consist of 3 plates that open to the directional side of these vessels. When the heart

contracts, blood is pumped from the right ventricle to the pulmonary artery, and from the left ventricle to the aorta.

A small circulatory circle begins from the right ventricle of the heart, and a large circulatory circle begins from the left ventricle. The heart is enclosed in its own sac — pericardium, the wall consists of 3 floors: the inner endocardium, the middle myocardium and the outer epicardium. The fluid that is in the narrow space between the epicardium and the pericardium reduces the friction of the heart walls when the heart is working. The muscle layer of the heart is the myocardium, 2 in the compartments and 3 in the ventricles, composed of special transverse musculature that contracts involuntarily, a feature that distinguishes it from skeletal muscles. Muscle fibers of the heart compartment and ventricle 2 (the right compartment and the ventricle, the left compartment and the one that wraps the hole between the ventricle) fibrosis fiber ring



Cardiac activity is based on rhythmic contraction of the myocardium. Heart contraction is called systole, relaxation is called diastole. The heart contracts automatically. Impulses that promote myocardial contraction are generated in the conductive system of the heart. These impulses, which are generated 60-80 times per minute in the norm in the Sinus node, first spread to the olfactory myocardium, and from it to the olfactory myocardium through the olfactory node and Gis tutami and Purkine fibers, causing them to contract. During the transition to the ventricles, the speed of impulses decreases. Because of this, the contraction of the compartments in relation to the ventricles is completed faster. The period of contraction and relaxation of the heart constitutes the heart cycle. This cycle consists of a compartment systole (0.1 sec), ventricular systole (0.33-0.35 SEC), diastole (ventricles and compartments joint relaxation phase), as well as pause (0.4 sec).

When the compartments contract, the blood pressure in them (from 1-2 mm to 6-9 mm in the account of the mercury column in the right compartment, up to 8-9 mm in the left compartment) rises. As a result, blood passes through the valves into the ventricle.

When the compartments contract, only 30% of the blood flows out into the ventricles, and 70% flows freely during a general pause. Ventricular systole is also divided into phases. Until when the pressure of the ventricles increases-the ventricular valves close, but the semicircular valves do not open. In this case (isometric contraction phase), all muscle fibers of the ventricles contract, increasing their tension. As a result, after the pressure of the ventricles even exceeds the pressure at the base of the aorta and lungs, the semi-circular valves open; blood flows from the ventricles into the vessels; this is how the phase of pumping blood begins.

Driving blood into the vascular system in a person occurs when the left compartment of the heart reaches 65-75 mm in the account of the mercury column, and 5-12 mm in the absence of the right. Within 0.10-0.12 SEC, the pressure of the ventricles of the heart is sharply [110-130 mm in the account of the column of mercury in the left ventricle, an increase in the right ventricle by 25-35 mm (the phase of rapid blood drive) is observed. Ventricular contraction (0.10-0.15 sec) is completed with a slow blood-pumping phase. Then the ventricles begin to empty, their pressure drops rapidly, the pressure of the large vessels rises, and the semicircular valves close. When the pressure in the ventricles drops to 0 degrees, the hump valves open and blood begins to flow from the ventricles to the ventricles. This phase is divided into a fast (0.08 sec) and a slow (0.07 sec) full phase. The diastole of the ventricles ends with the stage of blood flow to them. The duration of the phases of the cycle of cardiac activity is variable, depends on the frequency of the heart rhythm. Therefore, checking the phases of the cardiac activity cycle will determine the state of cardiac muscle activity

The force and frequency of contraction of the heart varies according to the needs of the body's tissues and organs for oxygen and nutrients. Even if the impulses that allow the heart to contract are generated in the heart itself, its activity is controlled by the nervous system. Stray nerves slow down the heart contraction force, slowing down the rhythm, sympathetic nerves, on the contrary, strengthen. The heart muscles also have self-control: for example, the more blood comes to the heart, the more force it contracts. How much force the heart muscles contract depends on its lengthening, that is, the length of the muscle fibers that are originally (before contraction). The faster the muscle fiber stretches, the stronger IT contracts. This is called the law of the heart.

References:

1. Guyton, A. C., & Hall, J. E. (2021). Textbook of Medical Physiology (14th ed.). Elsevier.
2. Marieb, E. N., & Hoehn, K. (2018). Human Anatomy & Physiology (11th ed.). Pearson Education.
3. Silverthorn, D. U. (2019). Human Physiology: An Integrated Approach (8th ed.). Pearson.
4. Lloyd-Jones, D., et al. (2019). Heart Disease and Stroke Statistics—2019 Update: A Report From the American Heart Association. Circulation, 139(10), e56-e528.
5. Carter, J., & Roderick, P. (2015). Human Heart Physiology. Springer.
6. Hargroder, A., & Ng, G. (2017). Cardiac Anatomy and Physiology: A Review for Medical Students. Journal of Cardiovascular Disease, 6(3), 130-136.
7. Mohrman, D. E., & Heller, L. J. (2014). Cardiovascular Physiology (9th ed.). McGraw-Hill.
8. Zipes, D. P., & Libby, P. (2018). Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine (11th ed.). Elsevier.
9. Lang, R. M., et al. (2015). Recommendations for Cardiac Chamber Quantification by Echocardiography in Adults: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. European Heart Journal, 36(42), 2457-2464.
10. Boron, W. F., & Boulpaep, E. L. (2016). Medical Physiology (3rd ed.). Elsevier.