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FUNCTIONAL ANATOMY OF THE LARGE AND SMALL BLOOD CIRCULATION

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Abstract

Blood circulation is the movement of blood through the circulatory system due to the contraction of the heart. Blood circulation ensures metabolism and homeostasis between body tissues and the external environment. Blood delivers oxygen, water, proteins, carbohydrates, fats, minerals, vitamins, etc. to the tissues and removes carbon dioxide and other metabolic products from the tissues. Carries out thermoregulation and humoral regulation. This is an important factor in immunity. In this paper analyzed issues about it.

Keywords: vascular system, major circulatory system, minor circulatory system, phylogeny.

Introduction

Blood circulation was discovered in 1628 by the English physician W.Harvey. Most invertebrates have an open circulatory system (hemolymph is moved by contraction of body muscles or blood vessels). Humans and some highly developed invertebrates have a closed circulatory system. Aquatic and terrestrial animals, reptiles, mammals and birds have 2 circles of blood circulation. Mammals and birds, including humans, have the same circulatory system.

Materials and methods

The article uses such scientific research methods as analysis of existing scientific literature, comparative analysis, forecasting, mathematical and statistical analysis.

Results and Discussion

Mammals and birds, including humans, have the same circulatory system. The system of vessels leaving the left ventricle of the heart and entering through the tissues into the right chamber is large, and leaving the right ventricle and entering through the lungs into the left chamber is the pulmonary circulation. Blood flows from the left ventricle to the left ventricle and circulation continues. Due to the contraction and relaxation of the heart muscle, blood moves through the vessels. The amount of blood pumped by the heart in one minute is called minute volume. The minute volume at rest is 4-5 liters, and with emotional influence it increases 3-4 times. The heart pumps blood into the arteries under high pressure. The walls of the arteries expand with the flow of blood. The energy collected in diastole maintains blood pressure in the arteries at a certain level and ensures continuous blood flow in the capillaries. Only 5% of the blood in the body is in capillaries, but the main function of blood circulation is the exchange of substances between the blood and tissues in these capillaries.

Due to the hydrostatic pressure of the blood in the capillaries, fluid is filtered from the

capillary into the tissue (the oncotic pressure of the blood plasma prevents this process). The blood experiences resistance in the capillaries, overcoming this, it loses energy and blood pressure decreases. The circle of blood circulation, starting with those who live in water and on land, rotates in two circles, that is, the large and small circles of blood circulation. The pulmonary circulation includes the artery of the right ventricle of the heart and the pulmonary veins of the lungs. A relatively small circulatory system is involved in the exchange of gases in the blood. The systemic circulation (system) includes the aorta, artery, arterial capillary, venous capillary vena cava, starting from the tissues and their pocket valves. The large circulatory system is involved in the delivery of nutrients and oxygen to tissues and organs, as well as in the delivery of harmful substances from metabolism to the excretory organs, as well as in humoral control.[1]

The vascular system plays an important role in the body. Fluid (blood and lymph) flows inside them. This fluid delivers nutrients and oxygen (arteries) necessary for the life of cells and tissues, and removes substances that the body does not need to the excretory organs (veins). Depending on the fluid content inside the veins, they are divided into two parts: blood vessels and lymphatic vessels. Blood vessels are absent in the epithelium of the skin and mucous membranes, hair, cornea of the eyeball, and joints (Fig.1.).

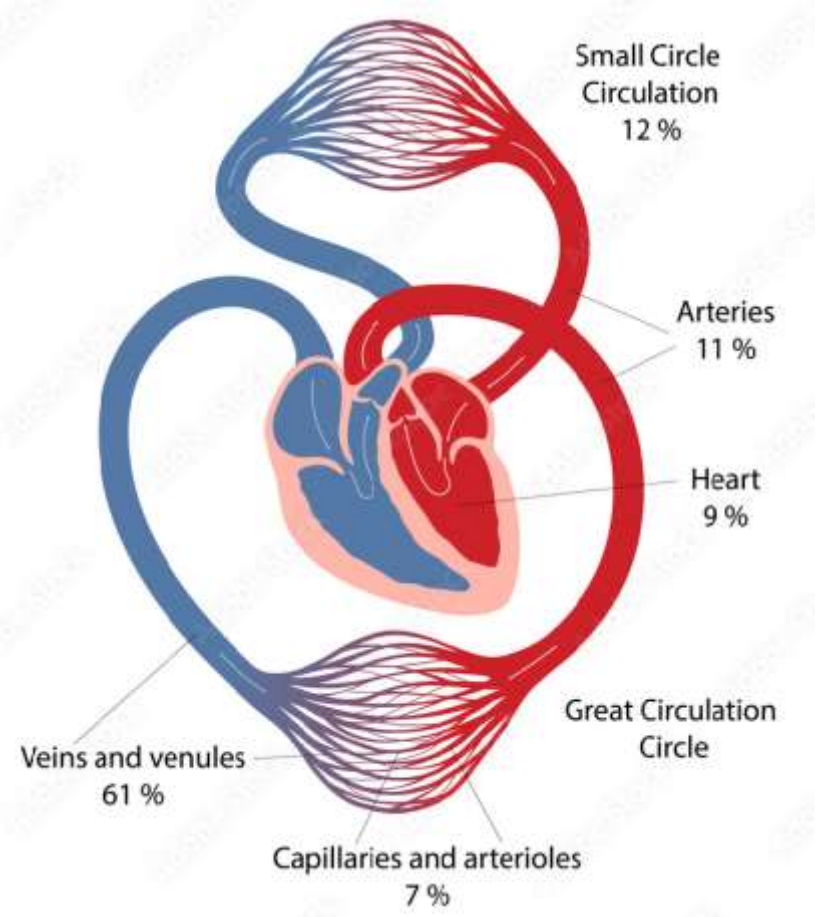

Fig.1. Blood distribution in the circulatory system [9]

Blood flows in the vascular system. This system includes arteries, veins, microcirculatory system and heart. This system ensures metabolism in the body. The heart is the central member of the vascular system. It moves the blood rhythmically. Veins that start from the heart and spread throughout the body are called arteries. The veins that carry blood from cells and tissues to the heart are called veins. In the human body there are two (large

and small) circles of blood circulation. The pulmonary circulation serves to enrich the blood with oxygen in the lungs. It starts from the right ventricle as the pulmonary trunk, reaches the lungs, divides into the right and left pulmonary arteries and surrounds the alveoli, giving carbon dioxide to the alveoli and receiving oxygen. Oxygenated blood flows into the left ventricle through 4 pulmonary veins. The systemic circulation begins from the left ventricle as the aorta. Arteries from the aorta spread to organs and tissues. Veins from tissues and organs join together to form two large veins: the superior and inferior vena cava and drain into the right lobe. In addition, the third (cardiac) circulation supplies the heart itself with blood. It begins with the right and left coronary arteries of the heart, arising from the aorta, and ends with the cardiac veins.

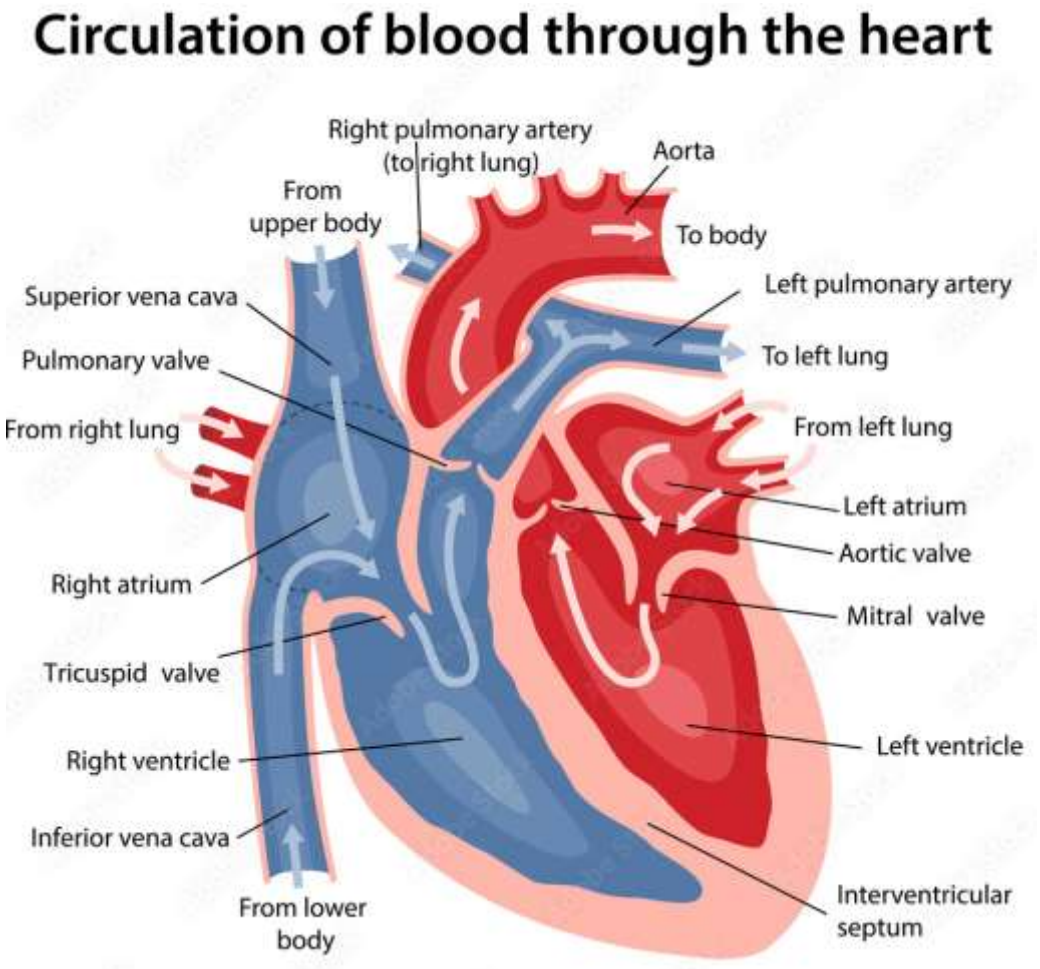

Fig.2. Circulation of blood through the heart [7]

The veins of the heart form the sinus venosus and open into the right ventricle. Between the arteries and veins there is a microcirculation system that provides communication between blood and tissues. This system begins with the arteriole. It includes precapillaries, capillaries and postcapillaries and continues into the venule.[2]

Great blood circulation

The great circulatory circle is part of the cardiovascular system of the heart, which delivers blood rich in oxygen and nutrients to all organs and tissues of the body. The large circulatory circle includes the aorta starting from the left ventricle of the heart, the arteries of the head, neck, body, arms and legs, their branches, microcirculatory vessels of the organs, small and large veins, and the upper and lower cavities flowing into the right ventricle. include veins.[3]

Large circulatory veins

The veins of the great circulatory circle include three systems:

1) cardiac venous system;

2) superior venous system;

3) inferior vena cava system.

The venous system of the heart is very small and collects blood only from the wall of the heart and pumps it into the right auricle. The superior and inferior vena cava systems collect blood from the upper and lower parts of the body and pump it into the right atrium of the heart. The veins of the odd organs located in the abdominal cavity join together to form the jugular portal vein. It branches into the liver and becomes the hepatic vein and flows into the inferior vena cava.[2]

Small blood circulation

The pulmonary circulation, or minor circulation, is the part of the circulatory system that carries deoxygenated blood from the heart to the lungs, and from there oxygenated blood back to the heart. Pulmonary blood circulation is the flow of deoxygenated blood from the right ventricle of the heart to the lungs, followed by the pulmonary artery, and as a result of its purification in the lungs, it flows into the left atrium of the heart (Fig.3.).

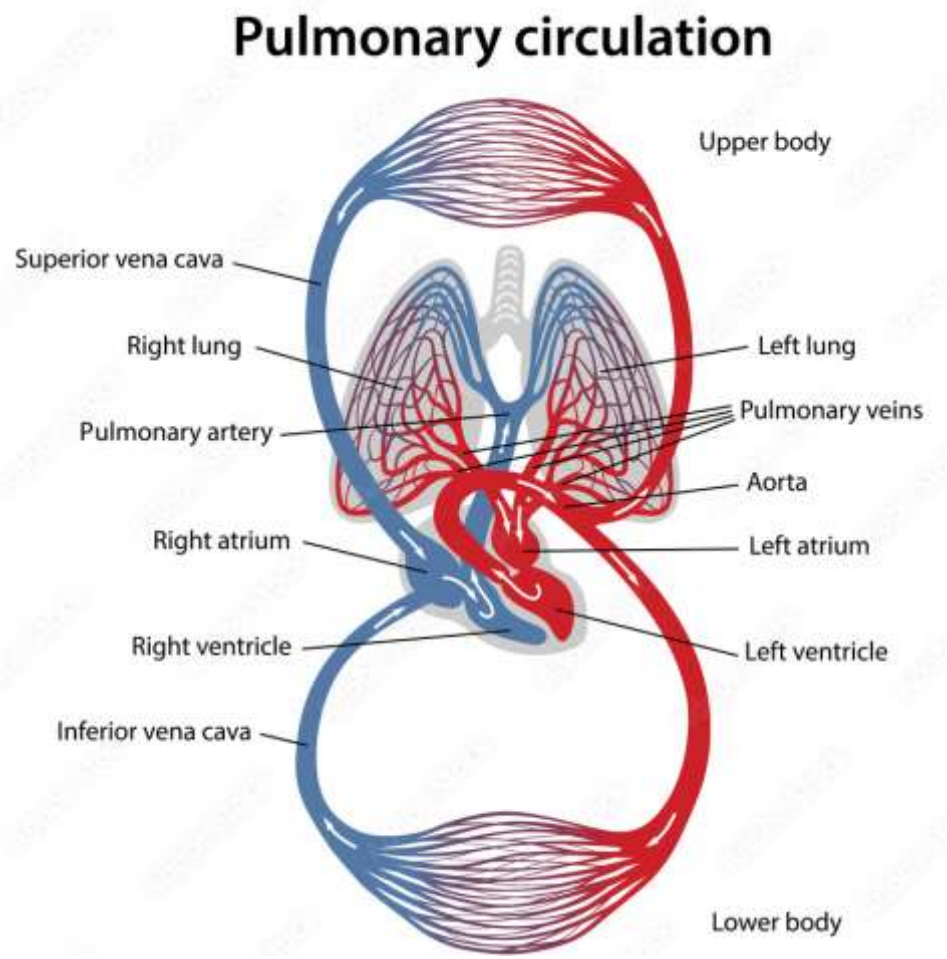

Fig.3. Circulation of blood. Diagram of pulmonary circulation [8]

The small circulation begins in the right ventricle and passes deoxygenated blood from the right ventricle to the pulmonary artery. Then the deoxygenated blood in the pulmonary artery goes to the lungs. It is cleaned in the lungs and then goes to the pulmonary veins. Pure blood flows from the main pulmonary vein into the left atrium.

The opposite is called the systemic circulation, which is the other major part of the circulation, where oxygenated blood is transported from the heart to various parts of the body and returned to the deoxygenated heart.

Blood coming from the body to the right atrium through the superior and inferior vena cava passes into the right ventricle below it. The right ventricle pumps this blood through the pulmonary trunk to the lungs. Oxygen enriched in the lungs returns to the left atrium through the lungs.

In the pulmonary circulation, deoxygenated blood leaves the heart through the pulmonary arteries and is carried to the lungs. Here, oxygenated blood is carried to the heart (ie back) through the pulmonary veins. When blood leaves the right ventricle of the heart, it circulates through the lungs and enters the heart through the left atrium.[4]

The veins of the small circulatory circle or pulmonary veins (venae pulmonales) bring blood from the lungs to the left lobe. They are two in each lung, four in total, 1.2-1.5 cm long, 14-18 mm in cross-section. Since the right lung is larger, its veins are thicker.

Large circulatory circle:

- Arterial blood from the left ventricle first flows through the aorta
- Arteries then divide into arterioles and arterioles into capillaries.
- In the capillaries of the large circle, blood is O2 blood, delivering oxygen and nutrients to tissues and organs, removing carbon dioxide and metabolic products.
- It enters the right compartment through the upper and lower vena cava

This is how tissue gas exchange occurs.

Blood from the capillaries collects in the venules, then in the veins, and enters the right chamber through the superior and inferior vena cava. Blood flows from the right atrium (chamber) to the right ventricle, where the small circulation begins.

Small circle:

- Venous blood from the right ventricle rises along the pulmonary trunk to two pulmonary arteries and goes to the lungs.
- In the lungs, arteries are divided into small arteries and arterioles. Arterioles break up into capillaries that connect the alveoli of the lungs.
- In the pulmonary capillaries, the blood becomes arterial, enriches it with oxygen and removes carbon dioxide.
- This is how gas exchange occurs in the lungs.

From the capillaries, the blood collects in the venules, and then in the veins. Arterial blood enters the left ventricle through four pulmonary veins (two in each lung).[5]

Phylogeny of the vascular system

In lower class animals, without a heart, they act due to the reduction of blood vessels (Fig.4.). In vertebrates, the heart appears as a beating organ and increases in complexity throughout phylogeny. The heart of a fish is two-chambered, consisting of a blood-receiving chamber and a driving ventricle. Venous blood flows from the heart and goes to the wounds of the fish through the arteries of the wounds, where it is saturated with oxygen. When amphibians go on land, they develop lungs along with wounds. Because of this, the heart compartment is divided into two parts by the barrier, and a three-chambered heart appears. Pulmonary artery arises from the last injured artery, carries blood from the heart to the lungs and provides gas exchange.

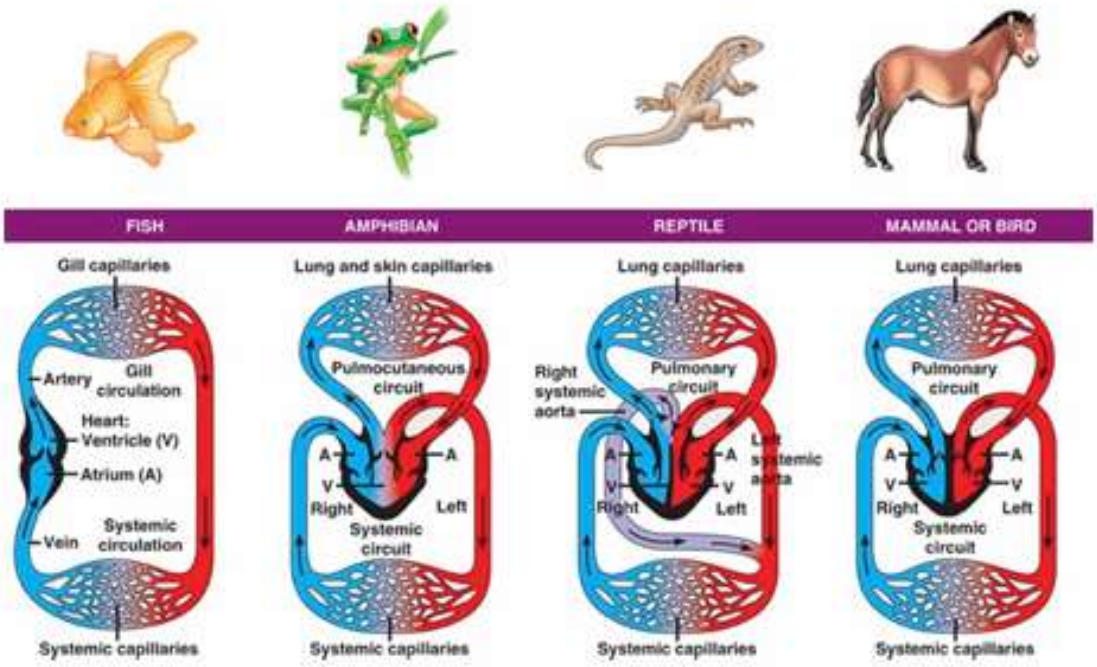

Fig.4. Phylogeny of the vascular system of animals [6]

After the emergence of lung breathing in reptiles, two blood circulation circles are formed. In their heart, the ventricles are divided into two parts by means of an incomplete barrier.[2]

Conclusion

The circulatory system plays an important role in the body, because it delivers oxygen and nutrients to the cells, and also helps to remove metabolic products. This system includes the heart, blood vessels (arteries, capillaries, and veins) and blood.

The heart is the central organ of blood circulation, which ensures the constant movement of blood throughout the body. Blood enriched with oxygen and nutrients is delivered to the cells through arteries, exchange of substances is carried out through capillaries, and blood with accumulated waste products is returned to the heart through veins.

The circulatory system consists of two parts: the large circulation and the small circulation. The large circulation sends blood from the heart to all parts of the body, while the small circulation sends blood from the heart to the lungs for oxygen.

A healthy circulatory system is important for the proper functioning of the body, as disruption of this system can lead to various diseases and health problems. Therefore, it is important to maintain a healthy lifestyle and undergo regular medical examinations to maintain a healthy circulatory system.

References:

1. Formaggia, L., Nobile, F., Quarteroni, A., & Veneziani, A. (1999). Multiscale modelling of the circulatory system: a preliminary analysis. *Computing and visualization in science*, *2*, 75-83.
2. Ahmedov.A. Anotomiya II: darslik- Toshkent: “IJOD- PRINT”, 2018.-316b.
3. Axelsson, M. (2005). The circulatory system and its control. *Fish Physiology*, *22*, 239-280.
4. Pittman, R. N. (2011). The circulatory system and oxygen transport. In *Regulation of Tissue Oxygenation*. Morgan & Claypool Life Sciences.

5. Formaggia, L., Quarteroni, A., & Veneziani, A. (Eds.). (2010). *Cardiovascular Mathematics: Modeling and simulation of the circulatory system* (Vol. 1). Springer Science & Business Media.
6. The Circulatory System, Regents Biology, https://www.nysedregents.org/livingenvironment/
7. Circulation of blood through the heart, https://stock.adobe.com/uz/images/circulation-of-blood-through-the-heart-cross-sectional-diagram-of-the-heart-with-main-parts-labeled-vector-illustration/294695321
8. Circulation of blood. Diagram of pulmonary circulation. https://stock.adobe.com/uz/images/circulation-of-blood-diagram-of-pulmonary-circulation-vector-illustration-of-great-and-small-circles-of-blood-circulation-in-flat-style-isolated-on-white-background/354154627
9. Blood distribution in the circulatory system, https://stock.adobe.com/uz/images/blood-distribution-in-the-circulatory-system-diagram-of-great-and-small-circles-of-blood-circulation-with-main-parts-labeled-vector-illustration-in-flat-style/310149888?
10. Норчаев, Ж. А. (2020). Клинико-неврологические особенности патогенеза диабетической нейроостеоартропатии. *Неврология*, (1), 42.
11. Норчаев, Ж. А. (2022, December). Эффективность биологически активных добавок в лечении диабетической нейропатии. In *Conferences* (pp. 35-45).
12. Нарчаев, Ж., & Нарчаев, Ф. (2021). Иммуноморфологическая характеристика течения синдрома диабетической стопы. *Медицина и инновации*, *1*(2), 98-102.