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Study of Heart Physiology

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Abstract:

This article provides an overview of the circulatory system, major and minor circuits. The history of the blood circulation system es and beats. The characteristics of the heart muscles are written

Key words: *Circulatory system, large and small circulatory system, heart, aorta, artery, vein, capillaries, heart, epicardium, pericardium, myocardium, endocardium, heart chamber, heart ventricle, mitral valve, semilunar valve, ligaments, systole, diastole , pause, cardiac work cycle, heart tones, systolic and diastolic tones, heartbeat, systolic and minute volume of the heart, excitability, conduction, automaticity, refractoriness, bioelectric current, nerve node, blockade, myogenic theory, neurogenic theory.*

Introduction

General understanding of blood circulation. Large and small circulatory circles. Blood performs its various functions in the body only when it is in constant motion. Due to the continuous operation of the heart, the blood is in continuous movement along the vessels.

Blood circulation refers to the continuous movement of blood in special tubes, i.e. blood vessels.

To the circulatory system: Heart. Large blood circulation. Small blood circulation. Blood vessels: include aorta, artery, vein and capillaries.

Artery blood vessels to all blood vessels leaving the heart, Blood vessels that flow to the heart are called venous blood vessels, and blood vessels connecting them are called capillaries.

Mammals and birds have 2 circulatory systems:

Large blood circulation. Small blood circulation.

The large blood circulation begins with the outflow of the aorta from the left ventricle of the heart and ends with the inflow of the anterior and posterior vena cava into the right part of the heart.

The small circulatory circle begins with the exit of the pulmonary artery from the right ventricle of the heart, goes to the lungs, gas exchange occurs in the lungs, and ends with the inflow of the pulmonary vein into the left ventricle of the heart.

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The blood taken from the right ventricle of the heart to the pulmonary artery is venous blood, and the blood that flows into the left ventricle of the heart is arterial blood.

Each circulatory system is made up of specific arteries, veins and capillaries.

So, both circulatory circles start from the heart and end at the heart.

The history of the blood circulation system and Ibn Sina's teaching on it.

The study of the physiology of the cardiovascular system has its own historical development. The first information on the study of the activity of the cardiovascular system was described by Aristotle and Hippocrates. Hippocrates discovered that the body has a heart and a place for the heart.

K. Galen had wrong ideas about blood circulation, saying that there is air without blood in the arteries, blood is moved by the liver, not the heart, and there is an oval opening between the chambers of the heart.

The famous scientist of the East, Abu Ali Ibn Sina (980-1037), expressed his opinion about the dependence of the pulse on the character of the organism and the activity of the nervous system, as well as on the small circle of blood circulation.

1628 V. Garvey determined the circle of large and small blood circulation and blood circulation through the lungs.

1661 MalPygmy discovered the system of capillary blood vessels and fully studied the large and small blood circulation system.

In 1885, the Weber brothers studied the effects of the vagus nerve and the sympathetic nerve on the heart.

The structure and work of the animal heart. The heart is an internal cavity located inside the chest cavity and is an integral organ that makes up 0.6-1% of the body's living weight. The following types of heart are distinguished: - 2-chamber heart - in fish; 3-chamber heart - in amphibians; A 4-chambered heart is found in mammals and birds.

The structure of the animal heart. The heart of highly developed warm-blooded animals and birds consists of 4 chambers: 2 chambers (right and left) and 2 ventricles (right and left).

The left and right parts of the heart are separated from each other by a contiguous barrier, and between the heart chambers and the ventricles there are atrioventricular holes equipped with layered valves. There is a 2-layered valve between the left ventricle and the left ventricle, and a 3-layered valve between the right ventricle and the right ventricle, and they open to the side of the ventricles. The filaments that hold the ventricles in place prevent the valves from opening to the side of the heart chambers. At the beginnings of the aorta and the pulmonary artery, there are crescent-shaped valves that resemble pockets and open into the blood vessels. At the place where the anterior and posterior vena cava flow into the right chamber of the heart, there is a sphincter-like structure consisting of ring-shaped muscles - the sphincter of the heart.

The wall of the heart consists of three layers: Epicardium - the outer layer. Myocardium is the middle muscular layer. Endocardium - inner layer.

Above the heart is a "shirt", that is, a heart bag - the pericardium. Between the pericardium and the epicardium there is a fluid of its own.This fluid protects the heart from friction and heat as it works.

Cardiac muscles are composed of transversely oriented muscles and are connected to each other by protoplasmic bridges.

A work of the heart. The heart is constantly working at the same rate. As a result, blood moves through the body in only one direction: from the chambers of the heart to the ventricles, from the ventricles to the blood vessels, from them to the chambers.

This activity is represented by contraction of heart muscles - systole, expansion and relaxation - diastole, and rest - pause.

The heart alternately works in two phases:Phase 1: ventricular systole and diastole. Phase 2: ventricular systole and diastole.

Then the muscles of the lobes and ventricles rest for a while.

The work of the heart begins with the contraction of both heart chambers - systole. The right ventricle contracts 0.01 seconds before the left ventricle. During the operation of the compartments, the pressure inside them is equal to 30-70 mm Hg.

The ventricles are in dilated diastole, and blood pools in the ventricles as the bicuspid valves between the chambers and the ventricles are open.

When the bicuspid valves close and the ventricular systole begins, the pressure in the ventricles is not enough to open the semilunar valves, the ventricular muscle begins to contract forcefully for 0.03-0.06 seconds, and the contraction phase of the ventricles occurs. As a result, the pressure inside the ventricles increases and becomes equal to 130-150 mm of mercury, and the semilunar valves open and blood is pumped into the vessels. From this moment, the semilunar valves close and the bicuspid valves open.

During general diastole, blood continues to flow, filling the ventricles and ventricles.

One working cycle of the heart is the period from one systole of the heart chambers to the second systole.

If we consider one work cycle of the heart as 100%, 10% of it is for the work of the chambers, 30% for the work of the ventricles, and 60% for the pause, i.e. rest. That is why the heart works in one rhythm without stopping for a lifetime.

Cardiogram: The work of the heart chambers. The work of the ventricles of the heart. Pause - rest. The following factors affect the activity of the heart in different ways: Type of animals. Breed of animals. The gender of animals. Age of animals. Productivity of animals. Animal guts. Body condition. Time of day. Outdoor temperature. Physical work, etc.

In particular, the functioning of the heart depends on the rapid or slow metabolism of substances in the body. Therefore, the work of the heart can change under the influence of various factors. Arrhythmia - a change in the rhythm of the heart. Tachycardia - an acceleration of the heart. - the frequency is different.

Knowing the number of heartbeats per minute, it is possible to determine the minute volume of the heart by multiplying it by the systolic volume of the heart.

The systolic volume of the heart is the amount of blood ejected from the ventricles into the veins during each systole of the heart is called

The systolic volume of the heart depends on the volume of the heart cavities, the amount of blood flowing into the heart, the contraction force of the heart muscles, and the resistance of the vessels to blood flow.

External signs of the heart's work: sounds and beat. Due to the work of the heart, 2 different physiological sounds are heard from it and they are called heart sounds: Systolic tone. Diastolic tone.

The systolic tone is formed by the closing of the mitral valves during the contraction of the muscles of the heart ventricles, and is heard in the form of "boo-hoo", long, muffled, low.

The diastolic tone is formed by the closing of the semilunar valves when the muscles of the heart ventricles expand and relax, and it sounds short, sonorous, high in the form of a "dup".

If the heart sounds other than these sounds, they are pathological sounds and indicate heart diseases.

It is said that the heartbeat changes during the systole of the heart ventricles and hits the chest wall.

There are 2 types of heartbeat:Heart beat with tip. (Observed in dogs and humans). A pulse with the side of the heart. (It is well observed in all farm animals, especially in horses). Features of heart muscles: Heart muscles have the following features: Excitability. Conductivity. Automation. Refractoriness. Formation of biocurrents.

Excitability property. Cardiac muscles, like skeletal muscles, contract in response to impact. But the excitation of the heart muscles is slow and lasts a long time. Because the fibers in the heart muscles are located in a symplast with a mutual protoplasmic bridge and are connected to each other. For this reason, the impact on the heart muscles is equally distributed to all fibers, it creates an excitation only when the impact force is higher than the step force, and the heart is constantly working.

Conductive property. Cardiac muscles have a special conduction system consisting of nerve endings and muscle fibers.

The conduction system of the heart consists of: Kiss-Fleck or sinus node. Ashof - Tovar or atrioventricular node. Hiss tuft and legs. Purkin fibers.

The impulse originates in the Kiss-Fleck node and first spreads to the heart chambers and they contract. Then it is transferred to the Ashof-Tovar node, from it through the bundle of Hiss and Purkin fibers to the heart ventricles, where they contract.

The conduction system of the heart is 10 times faster than that of the skeletal muscles.

Excitation in the heart passes at the following speed: in the muscles of the heart chambers 1000-1200*mm/second;*0.02-0.05 mm/second at the Ashof-Tovar node; 1500-5000 mm/second in the tufts and legs of hiss; 1000-5000 mm/second in Purkin fibers; 300-500 mm/second in the muscles of heart ventricles. It is of great importance that the impulse is a little caught in the Ashof-Tovar node and passes slowly, so that different parts of the heart alternately contract and relax, and work in an orderly manner.

Cardiac automatism refers to the ability of the heart to work independently in certain, special conditions outside the body.

The heart muscle can work independently under the influence of impulses generated directly in itself, even when an impulse does not come to it from the center.

There are 2 theories that explain cardiac automatism: Neurogenic theory.Myogenic theory.

Each theory is based on its own evidence and evidence.

Rather than denying the neurogenic and myogenic theories, it would be appropriate if we study them together as a neuromyogenic theory. Because the nerve and muscle elements of the conduction system in the heart are very interconnected, their activities cannot be separated from each other.

Refractory property. A tetanic contraction is not typical for heart muscles. Because the heart muscles must relax after one contraction. A tetanic contraction is typical for skeletal muscles. For example, when the animal is standing, the leg muscles are in a state of tetanic contraction and remain so for a long time.

If an additional impact is given during the systole of the heart muscle, the heart muscle will not respond to this impact by contracting.

Refractoriness is the property of heart muscles not to respond to a given effect. Refractoriness of heart muscles is manifested in 2 phases: Absolute refractoriness phase. Relative refractoriness phase.

The phase in which the heart muscles do not respond at all to an additional effect is called absolute refractoriness. The phase of heart muscle response to a given strong effect with additional contraction is called relative refractoriness.

Extrasystole is the extrasystole formed during the phase of relative refractoriness. After extrasystole, the pause time is prolonged. This is called a compensatory pause.

The refractoriness of the heart muscles is of great importance for the functioning of the heart.

If the heart were to respond to various stimuli with contractions, its function would be impaired.

Biotok formation feature. Cardiac muscles also have the property of generating biocurrents similar to other excitable tissues.

The main reason for the formation of biocurrent is the formation of negative and positive electropotentials. Because the excited part of the living tissue is negatively charged, and the non-excited part is charged with positive electricity. As a result, there is a difference in bioelectric potentials between the stimulated and non-stimulated parts of the tissue.

The beats formed in the heart are recorded and studied using an electrocardiograph device. This is called electrocardiography, and the recorded waveform is called an electrocardiogram.

Studying the cells formed in the heart allows us to think about the activity of the heart. This is of great importance in veterinary practice.

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