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Heart Physiology, Cardiac Autonomy, Electrocardiogram

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Abstract:

Blood only fulfills its complex functions when constantly in motion. The muscle tissue is considered the functional element of the heart. Composed of interlaced myocardial fibers—myocytes encased in a common sarcoplasmic membrane. In a rhythmic manner, the contracting and relaxing heart emits electrical impulses directed towards the heart's electrical source, pulsating and circling. Since body tissues conduct electricity, it's possible to record the heart's electrical impulses from the body surface using special tools. This method is called electrocardiography, and the graph obtained is referred to as an electrocardiogram. Other components of the conducting system—the atrioventricular node, left and right bundle branches, and their ramifications—the Purkinje fibers, conduct impulses at a high speed of up to 2 m/s. As a result, the left and right ventricles nearly contract simultaneously. Each of the atypical myocardial fibers forming the conducting system has the ability to generate impulses independently or automatically.

Keywords: electrocardiography, atrioventricular, myocytes, sinus node, pacemaker, sinoatrial.

The circulation of blood in the human body, namely the complex process that occurs in the heart, Blood performs its complex functions only when constantly in motion. Blood movement is facilitated by the heart. The heart is a muscular organ composed of ventricles and atria, as well as valves. The rhythmic contractions of the heart are considered the result of impulses that emerge within it. If the heart is removed from the body and maintained under appropriate conditions, it contracts rhythmically. This property of the heart is called automatism. In a rhythmic manner, the contracting and relaxing heart emits electrical impulses directed towards the heart's electrical source. Since body tissues conduct electricity, it's possible to record the heart's electrical impulses from the body surface using special tools. This method is called electrocardiography, and the graph obtained is referred to as an electrocardiogram. Main Part: Blood circulation in the body involves the movement of blood from the right heart to the left heart through the systemic circulation (small circulation). The rest of the organs are supplied with blood and the return of blood from them constitutes the systemic circulation (large circulation). Both of these sections form a single circulation system. At its two points (in the left and right heart), kinetic energy is given to the blood. The activity of blood propulsion in the heart, which alternates between contraction (diastole) and relaxation (systole), depends on it. During diastole, the ventricles and atria fill with blood. During systole, blood is ejected from the ventricles to large arteries (aorta and pulmonary artery). These arteries have semilunar valves at the point where they exit the heart. They do not allow blood to return to the heart. Between the ventricles and atria, there are also two (on the left side) and three (on the right side) membranous flaps. During atrial systole, they prevent blood from returning from the atria to the ventricles. Before blood enters the ventricles, it is directed to the ventricles through large veins (vena cava and pulmonary veins). The contraction of the ventricles leads to the passage of blood into the arteries. The blood vessels that deliver blood to the heart are veins, and those that carry blood away from the heart are arteries. Muscle tissue is considered the functional element of the heart. It consists of interlaced myocardial fibers—myocytes—encased in a common sarcoplasmic membrane. According to morphological and functional characteristics, the muscle tissue of the heart is divided into two types: 1) working muscle of the ventricles and atria. They form the main mass of the heart muscle and perform the function of pumping blood; 2) specialized muscles that perform the function of pacemaker and form the conducting system of the heart. These muscles initiate contraction and conduct it to the working muscles of the myocardium. The myocardium (cardiac muscle) possesses excitability, conductivity, and contractility automatic properties. The cardiac muscle is innervated by nerve fibers and enters into functional contact with skeletal muscles. Therefore, it has excitability potential and responds to stimuli from the nervous system, which triggers action potentials. The difference between the myocardium and skeletal muscle is that it consists of a functional unit (syncytium). Contraction occurs not at a specific point in the myocardium but spreads throughout the myocardium, activating all fibers. This is because the working muscle fibers of the myocardium are interconnected by intermediate disks - nexus. Their electrical resistance is very low. Through them, excitation spreads without hindrance, rapidly spreading.

Cardiac Autonomy: The rhythmic contractions of the heart are considered the result of impulses that emerge within it. If the heart is removed from the body and maintained under appropriate conditions, it contracts rhythmically. This property of the heart is called automatism. In natural conditions, rhythmic impulses are generated by the pacemaker (sinus node). In the human heart, the sinoatrial node fulfills the role of the pacemaker. It consists of atypical cells located in the vicinity of the superior and inferior vena cavae, where they enter the heart. This node generates nearly 70 impulses per minute. The sinoatrial node is considered the primary center of the heart's automaticity. Contraction begins before this node reaches the working myocardium of the atria. As the impulse spreads through the atrioventricular node, it pauses for a short time (0.02-0.04 seconds). The atrioventricular node is also located in the right atrium, just before the atrioventricular septum. From there, the conduction begins. The conduction starts from the atrioventricular septum, dividing into two branches. One branch leads to the right ventricle, the other to the left ventricle, forming the Purkinje fibers, which transmit excitation to the myocardium of the ventricles. Conduction through the atrioventricular node occurs at a high speed (2 m/s) along the conducting system of the heart. The conducting system: In natural conditions, the heart's rhythm is regulated by the pacemaker. In a resting state, this node produces approximately 70 impulses per minute. The conduction of excitation from the sinoatrial node to the working myocardium of the ventricles occurs through the atrioventricular bundle. The bundle ensures that conduction proceeds from the right atrium to the left atrium. The sinoatrial node is also connected to the atrioventricular node by specialized muscles. Impulses reach the ventricles only through one route—the bundle of His—because other parts of the atrioventricular node do not conduct impulses, as they lack contractile elements. As the excitation spreads through the conducting system, it pauses briefly at the atrioventricular node.

Other parts of the conducting system—the atrioventricular bundle, left and right bundle branches, and their ramifications—the Purkinje fibers transmit impulses at a speed of 2 m/s. As a result, the left and right ventricles nearly contract simultaneously. Each of the atypical myocardial fibers forming the conducting system has the ability to generate impulses independently or automatically. However, in natural conditions, the sinoatrial node predominates over the lower automatic centers. The conducting system of the heart ensures the rhythmic production of impulses, the sequential contraction of the atria and ventricles, and the synchronous contraction of the myocardial cells of the ventricles. Electrocardiogram (ECG): The electrical impulses generated by the rhythmic contraction and relaxation of the heart are directed towards the heart's electrical source. Since body tissues conduct electricity, it is possible to record the heart's electrical impulses from the body surface using special tools. This method is called electrocardiography, and the graph obtained is referred to as an electrocardiogram (EKG). An EKG reflects the excitability and conductivity properties of the cardiac muscle. To obtain an EKG, potentials are taken from the limbs and specific points on the chest wall. Most commonly, electrodes are attached according to three standard methods: I - right arm with left arm; II - right arm with left leg; III - left arm with left leg. When necessary, potentials can also be taken from six specific points on the chest wall. In a normal EKG, it is possible to distinguish five peaks, marked with the letters P, Q, R, S, and T. P, R, and T peaks are above the isoelectric line, positive. Q and S peaks are negative, below the isoelectric line. The P peak represents the algebraic sum of potentials that occur when the atria contract rhythmically, lasting less than 0.1 s. The Q, R, S, and T peaks represent the electrical events that occur during ventricular contraction. The QRS complex represents the propagation of excitation through the ventricles, and the T peak indicates their repolarization. Apart from the five peaks, three intervals are distinguished in a normal EKG. The first interval, PQ, is the time from the beginning of atrial contraction to the beginning of ventricular contraction. In normal conditions, the PQ interval lasts less than 0.2 seconds. The second interval, QT, is the time from ventricular contraction to relaxation. When the heart beats 70 times per minute, it lasts 0.32-0.3 seconds. The third interval, TP, is the time when the heart is at rest, lasting 0.4 seconds. The voltage of the peaks in the EKG is as follows: P - 0.25 mV; Q - 0-0.3 mV; R - 0.6-1.6 mV; S - 0.25-0.4 mV; T - 0.25-0.6 mV. Summary: The rhythmic contractions of the heart are governed by impulses that originate within it. When the heart is isolated from the body under appropriate conditions, it continues to contract rhythmically. This property of the heart is called automatism. In natural conditions, rhythmic impulses are generated by the pacemaker (sinus node). An electrocardiogram (ECG) reflects the excitability and conductivity properties of the cardiac muscle. To obtain an ECG, potentials are taken from specific points on the body surface. Electrodes are typically placed according to three standard methods: I - right arm with left arm; II - right arm with left leg; III - left arm with left leg. If necessary, potentials can also be taken from six specific points on the chest wall. In a normal ECG, five peaks are distinguished and labeled as P, Q, R, S, and T. The P, R, and T peaks are above the isoelectric line and are positive, while the Q and S peaks are negative, below the isoelectric line.

The algebraic sum of potentials that occur when the P peak appears during atrial contraction is represented by the P peak.

Literature:

1. A. Qodirov “ Normal fiziologiya “
2. O.T. Alaviya, Sh.Q. Qodirov, A.N. Qodirov, Sh. M. Hamroqulov. E. H. Halilov.
3. E.B. Babskiy “ Odam fiziologiyasi.
4. Ibrokhimovich, A. I., & Kizi, J. M. M. (2023). 1-Type Kandli Diabetes Bilan Kasallangan Bolalarda Caries Kasalligini Organish, Davolash Va Prevention Samaradorligini Oshirish. *AMALIY VA TIBBIYOT FANLARI ILMIY JURNALI* , *2* (4), 165–171. Retrieved from https://sciencebox.uz/index.php/amalibbiyot/article/view/6735

5. Ibrokhimovich, A. I., & Kizi, J. M. M. (2023). Improving the Effectiveness of Research, Treatment and Prevention of Caries in Children with Type 1 Diabetes. Scholastic: Journal of Natural and Medical Education, 2(4), 182-187.
6. FR Kamalova, OO Yarieva, II Akhmedov (2021). Risk factors for oral diseases in children with diabetes mellitus Scholastic: Journal of Natural remedies, 1 (1), 57-63
7. Орзижоновна, Н. У., & Миродил Қизи, Ж. М. (2023). Профилактика Гастродуоденальных Кровотечений При Эрозивной Язве У Больных Ишемической Болезнью Сердца. *AMALIY VA TIBBIYOT FANLARI ILMIY JURNALI*, *2*(4), 16–23. Retrieved from https://sciencebox.uz/index.php/amaltibbiyot/article/view/6517