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The importance of the cardiovascular system in infants

Abstract: *After the birth of the baby, a major change occurs in the vascular system: the placental circulation suddenly switches to the pulmonary circulation. The lungs, pulmonary artery and veins begin to function. After birth, the umbilical vessels that were tied are released: the umbilical vein trunk changes to the hepatic circular bundle, the umbilical arteries to the right and left lateral umbilical bundles, and the arterial fissure is preserved in its initial parts. These umbilical bundles are located on the posterior surface of the anterior abdominal wall. The venous duct is connected to the venous bundle, and the arterial duct, which connects the fetal pulmonary trunk with the curved part of the aortic arch, becomes the arterial bundle. It connects the pulmonary trunk (or left pulmonary artery) with the aortic arch.*

Keywords: *artery, vein, pulse, aorta, ventricles of the heart, chambers of the heart, heart border.*

The child's circulatory system is very flexible and adapts to a rapidly growing organism; the cardiovascular system changes during development between simple circulation (blood from the heart to the lungs, from the lungs to the heart) and complex circulation (blood from the heart to all body organs, then to the heart); at birth, the pulmonary circulation does not function, but is taken over by the placenta; after birth, the pulmonary circulation opens and later a centralized circulation is formed, which is important for the growth, development and energy supply of the child.

Factors affecting the state of the cardiovascular system in infants are mainly genetic, exogenous (external environment) and related to the mother's health during pregnancy.

Cardiovascular defects and risk factors in infants are divided into the following:

1. Factors related to the mother during pregnancy

* Infectious diseases: Maternal infection with rubella, influenza, or other viral infections during the first trimester of pregnancy increases the risk of congenital heart defects in the child.

* Chronic diseases: Maternal diabetes, rheumatism, or thyroid disease can negatively affect the development of the fetal heart.

* Harmful habits: Drinking alcohol, smoking, or taking certain strong medications (such as anticonvulsants) during pregnancy without medical supervision.

2. Genetic and hereditary factors



* Heredity: If family members or close relatives have congenital heart defects, the baby is more likely to have this condition.

* Chromosomal abnormalities: More than half of children with genetic diseases such as Down syndrome have heart defects.


If infants experience symptoms such as rapid heartbeat, shortness of breath, or rapid fatigue while breastfeeding, it is recommended that they be examined by a cardiologist immediately.

In infants, the heart is relatively large and makes up 0.8% of the body weight (about 22 g), in adults - 0.4%. The right and left ventricles are equal, the thickness of their walls is 5 mm. With increasing age, the weight of the heart increases: at 8 months, the heart weight doubles, at 3 years old it triples, at 6 years old it increases 11 times. The left heart contracts intensively under great stress, at 14 years old the wall of the left ventricle reaches 10 mm (the average is 6 mm). Both chambers are large in size, their wall thickness is 2 mm. At the same time, tissue differentiation occurs. The myocardium of the infant consists of very thin muscle tissue, the connective tissue is weakly developed, consists of transverse fibrils and transverse striations. The nucleus is numerous, but small, poorly differentiated, small arteries are well developed and provide good blood supply to the heart muscle. The main vessels are relatively large. Up to 10-12 years of age, the pulmonary artery in children is wider than the aorta, then its width becomes the same. After puberty, their relationship is restored. In children of early age, the sum of the widths of the arteries and veins of the great circulation is close to each other (1:1), in older children this ratio is 1:3, and in adults it is 1:5. The capillary system in children, both in adults and in absolute terms, makes it difficult to maintain temperature homeostasis.

In healthy children, there should be no difference between the heart rate and the pulse rate. In children at the age of 2.5-3 years, like in adults, the II tone is better heard between the II ribs, up to 8-12 years, the P tone is better heard over the pulmonary artery than over the aorta. In healthy children, sometimes at the beginning of diastole, as a result of the rapid contraction of the ventricular wall, the III tone is heard. It is heard at the apex of the heart or slightly inside it after the II tone. and at the V-point. In healthy children, sometimes the II tone is heard twice as a result of the flapping of the aortic and pulmonary artery valves at different times, in addition to additional tones, functional murmurs are heard in healthy children at all stages of childhood. Functional murmurs occupy a limited area, are better heard in the supine position at the V-point, at the base of the apex, in the jugular veins, their intensity decreases in the vertical position or after physical exertion. Functional murmurs are not constant, do not extend to extracardiac areas.

The pulse in children changes sharply when moving from a vertical to a horizontal position, after physical exertion, after crying, after eating, when the environment and body





temperature increase. Therefore, the optimal time for determining the pulse rate in children is considered to be during sleep, when the pulse rate decreases to 20, its rhythm is observed. Blood pressure in children is lower than in adults, the reason for this is the width of blood vessels in children, higher vascular elasticity, lower peripheral resistance in the vessels. Blood pressure in a newborn is 70-64 mm Hg., at 1 year old it is 80-85 mm Hg. The minimum blood pressure in children is $\frac{2}{3}$ or $\frac{1}{2}$ of the maximum blood pressure, in infants it is 35-50 mm Hg., at 1 year old it is 40-55 mm Hg. The increase in blood pressure is observed up to 2 years of age, then slows down. It increases again during puberty.

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localization of the cardiac apex impulse is not constant and depends on the age of the child, the degree of completeness of the abdominal organs.

Rules for percussion determination of the boundaries of the heart in children.

- Percussion is performed in a calm state.
- The plessimeter-finger is placed parallel to the searched boundary.
- The plessimeter-finger step should not be large, not exceeding the width of the finger.
- The direction of percussion should be front to back.
- 5. The percussion limit being sought starts from the outer edge of the plessimeter

