

Etiology and Pathogenesis of Congenital Cardiac Diseases in Children

Ergashev Daler Batirovic

Department of Pathological Anatomy with a Sectional Biopsy Course, Samarkand State Medical
University

Malika Rustamovna Kadyrova

Student of the Faculty of Medicine, Group 319, Samarkand State Medical University

Abstract: This article describes the concepts of congenital heart defects, their etiology and pathogenesis, the processes occurring in the cardiovascular system during a number of pathologies, and treatment options. Conclusions and findings are provided on the topic and the material studied.

Keywords: heart, ASD (atrial septal defect), VSD (ventricular septal defect), arteriovenous shunts, hypertrophy, hypertension, anomaly, defects, hypertension.

a leading cause of infant mortality in recent years , and unfortunately, this anomaly has not been overlooked in the Republic of Uzbekistan. In the Khorezm region of the Republic of Uzbekistan, the most common anomaly is ventricular septal defect (1.6%). The highest incidence of congenital heart defects is also observed in the Khozarsp (21.9%) and Yangiarik (18.8%) districts.¹

Congenital heart defects (CHD) are anomalies characterized by anatomical defects of the heart, valves and blood vessels, circulatory disorders, and disturbances of intracardiac and systemic hemodynamics.

Marder's classification , congenital heart defects are divided into 4 large groups:

I. Congenital heart defects with hypertension of the pulmonary circulation, left-to-right, arteriovenous shunts, without cyanosis:

1. Atrial septal defect (ASD).
2. Ventricular septal defect (VSD).
3. Open ductus arteriosus.
4. Eisenmenger complex (VSD complication)

II. Congenital heart defects with hypotension of the pulmonary circulation, right-to-left, venous-arterial shunts, blue defects (general cyanosis):

¹ Sh.A. Agzamova , F.R. Babadzhanova. Frequency of occurrence and risk factors for the development of congenital heart defects in children of the Khorezm region of the Republic of Uzbekistan. "Bulletin of the National Children's Medical Center", No. 2, 2022

1. Triad of Fallot :

- a. stenosis of the pulmonary artery orifice.
- b. right ventricular hypertrophy.
- in. ASD.

2 . Tetralogy of Fallot :

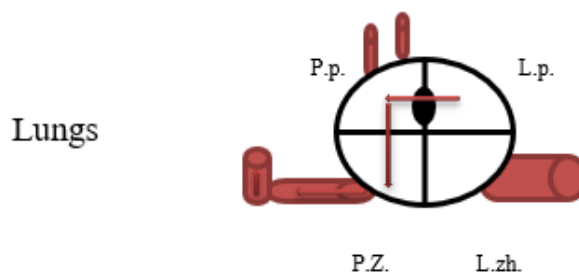
- a. Stenosis of the pulmonary artery orifice.
- b. Right ventricular hypertrophy.
- v. VSD
- g. Dextroposition of the aorta.

3 . Pentade of Fallot :

- a. Stenosis of the pulmonary artery orifice.
- b. Right ventricular hypertrophy.
- in. ASD.
- city of DMZhP.
- d. Dextroposition of the aorta.

Atrial septal defect (ASD) – normally, the atrial septum completely separates the right and left atria, ensuring adequate blood flow. However, with this condition, the opposite occurs. An ASD is a congenital anomaly characterized by a communication (hole) between the right and left atria, which significantly interferes with normal functioning and the baby's development.

Normally, pressure in the left atrium is higher than that in the right atrium, and because of this characteristic, a left-to-right shunt is observed in this anomaly. This means that oxygenated blood, when the left atrium contracts , immediately enters the right atrium through the defect (left-to-right shunt), where the blood mixes. The right atrium already held a certain volume of blood, but due to the defect, additional blood from the left atrium enters the right atrium. Blood from the right atrium then flows into the right ventricle, and from there into the pulmonary artery. In all of these processes, it is important to understand that the right chambers of the heart are under volume overload due to the additional blood flow from the left chambers (due to the presence of the defect). Over time, the right atrium attempts to adapt to these changes, and the walls of the right atrium and right ventricle stretch and thicken, resulting in right atrial and right ventricular **hypertrophy** . The right chambers of the heart then begin to work harder, pumping a large volume of blood, all of which is directed into the pulmonary artery. Due to the large volume of blood, the pressure in the pulmonary artery increases, filling the pulmonary capillaries and subsequently causing hypervolemia of the pulmonary circulation (see Figure 1).



Atrial septal defect (ASD).

We've covered the concept of an atrial septal defect, and now we need to understand the etiology of the anomaly , i.e., the causes of this pathology. The causes of the onset and development of ASD are as follows:

1. Diseases of the chromosomal apparatus.
2. Adverse effects of environmental factors.
3. Intrauterine infections.
4. adverse effects during pregnancy (smoking, alcohol, drugs, medications, maternal illnesses).
5. It is known that syndromic causes of congenital heart disease are detected in 6-40% of children, and the monogenic nature of congenital heart disease is detected in 8%.²

Ventricular septal defect --- Normally, the interventricular septum completely separates the right and left ventricles, ensuring adequate blood flow. However, with this pathology, the opposite occurs. With a ventricular septal defect, a communication (hole) exists between the right and left ventricles, which disrupts intracardiac and systemic hemodynamics and blood flow, leading to adverse developmental outcomes for the child, interfering with their vital functions.

Normally, the pressure in the left ventricle is higher than the pressure in the right ventricle. As a result, when the left ventricle contracts, oxygenated blood enters the right ventricle (left-to-right shunt), and the blood becomes mixed (containing CO₂ and O₂). Large volumes of blood then enter the pulmonary artery, leading to hypervolemia in the pulmonary circulation. The load on the left chambers of the heart also increases, as blood from the pulmonary veins flows into the left atrium. The heart attempts to cope with these changes, and the muscular layer of both ventricles stretches and thickens, leading to hypertrophy of both the right and left ventricles. Over time, the left-to-right shunt gives way to a right-to-left shunt.

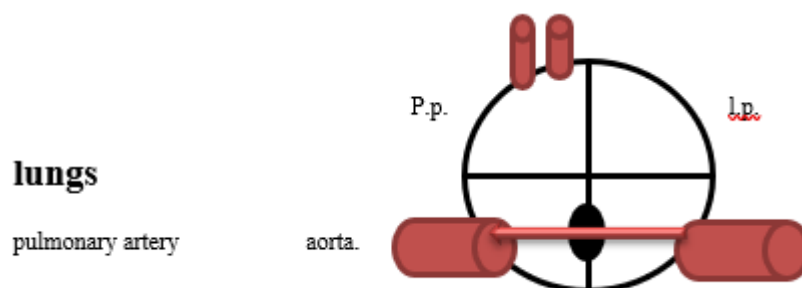


Fig. 2. Ventricular septal defect

Most often, a ventricular septal defect is a consequence of impaired embryonic development and develops in the fetus due to abnormal organ formation. Therefore, ventricular septal defects are often accompanied by other heart defects: patent ductus arteriosus (20%), atrial septal defect (https://www.krasotaimedicina.ru/diseases/zabolevanija_cardiology/atrial-septal-defectseptal-defect) (https://www.krasotaimedicina.ru/diseases/zabolevanija_cardiology/atrial-septal-defect20%), coarctation of the aorta (12%), aortic stenosis (5%), aortic insufficiency (2.5-4.5%), mitral valve insufficiency (2%), and, less commonly, anomalous pulmonary venous drainage, pulmonary artery stenosis, etc.

In 25-50% of cases, ventricular septal defect is combined with extracardiac malformations - Down's syndrome, renal malformations, cleft palate and cleft lip.

Direct factors causing embryogenesis disruption include harmful effects on the fetus in the first trimester of gestation: maternal illnesses (viral infections, endocrine disorders), alcohol and drug intoxication, ionizing radiation, and abnormal pregnancy progression (severe toxycosis, risk of

²Department Assistant E.V. Mironova, Department Assistant S.V. Dolbnya. "Congenital Heart Defects: Etiology, Pathogenesis, Classification. Congenital Heart Defects with Pulmonary Circulation Enrichment." METHODOLOGICAL DEVELOPMENT for fourth-year students of the Faculty of Pediatrics for conducting a practical lesson on the section "Pathology of Young Children." Stavropol, 2016. Congenital Heart Defects.pdf

spontaneous abortion , etc.). There is evidence of a hereditary etiology of ventricular septal defects. Acquired ventricular septal defects can be a complication of myocardial infarction .³

Based on the above research data, the following findings and conclusions can be drawn:

First, we can understand that with ASD and VSD, hypertrophy of certain parts of the heart is observed, including both the ventricles and atria. Hypertrophy is a kind of compensatory mechanism in the body, which involves dilation and thickening of the walls of the atria and ventricles.

Secondly, congenital heart disease cannot occur with corresponding hypertension, that is, an increase in blood pressure.

Thirdly, it is important to understand that any disease is difficult to treat, so increased attention must be paid to prevention to prevent or reduce the occurrence of such abnormalities.

List of references

1. Sh.A. Agzamova, F.R. Babadzhanova. Frequency of occurrence and risk factors for the development of congenital heart defects in children of the Khorezm region of the Republic of Uzbekistan. "Bulletin of the National Children's Medical Center", No. 2, 2022;
2. Department Assistant E.V. Mironova, Department Assistant S.V. Dolbnya. "Congenital Heart Defects: Etiology, Pathogenesis, Classification. Congenital Heart Defects with Pulmonary Circulation Enrichment." METHODOLOGICAL DEVELOPMENT for fourth-year students of the Faculty of Pediatrics for conducting a practical lesson on the section "Pathology of Young Children." Stavropol, 2016. Congenital Heart Defects.pdf

³https://www.krasotaimedicina.ru/diseases/zabolevaniya_cardiology/atrial-septal-defect