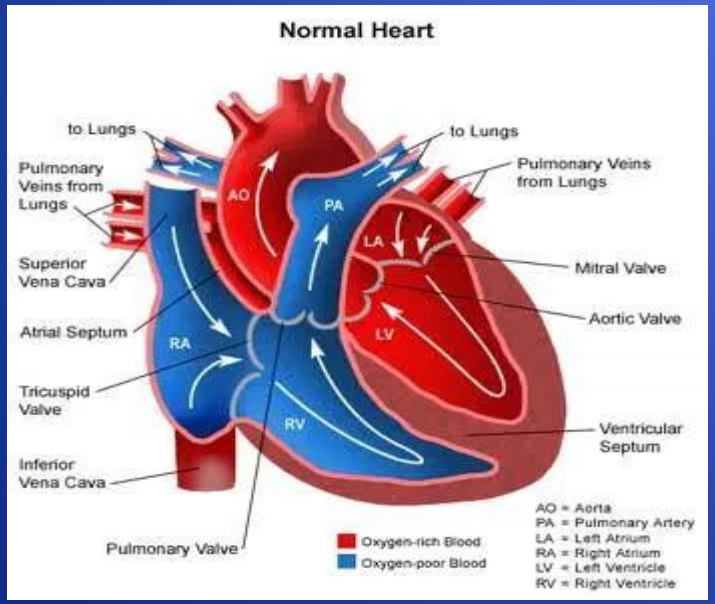
Radiation methods for studying the organs of the cardiovascular system in childhood.



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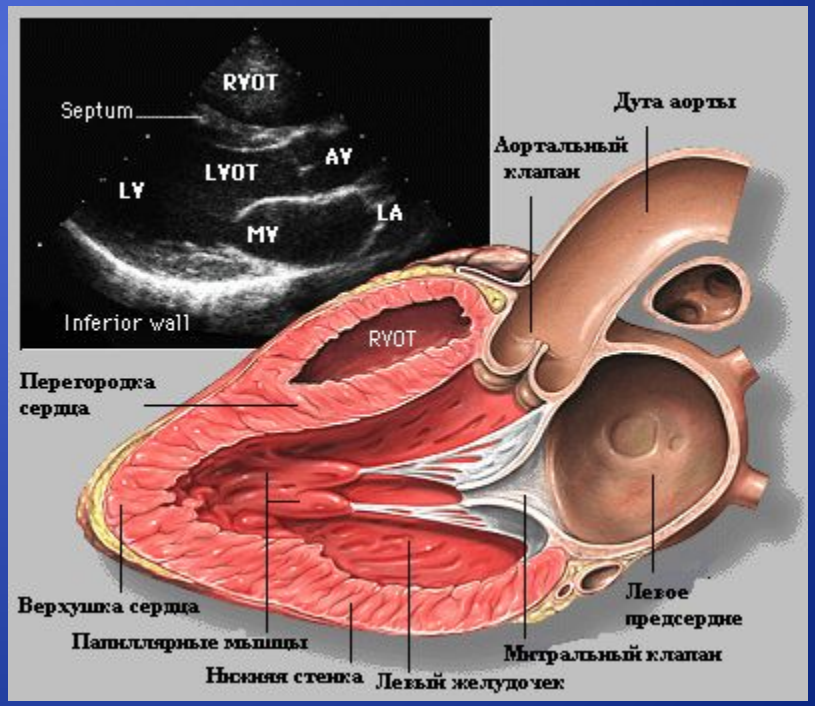
USM

- The method of choice in the diagnosis of pathological changes in the cardiovascular system in children is ultrasound.

Ultrasound examination of the heart includes two methods:

- echocardiography
- Doppler study.

- The level of the capabilities of modern ultrasonic devices allows to assess the anatomical and functional state of the tissues of the heart and hemodiamy.



- It is possible to perform a non-invasive assessment of the size of the valvular apparatus and heart cavities and to detect the presence of cardiac blood shunts inside the heart, which allows to diagnose the majority of developmental abnormalities and heart diseases in children.

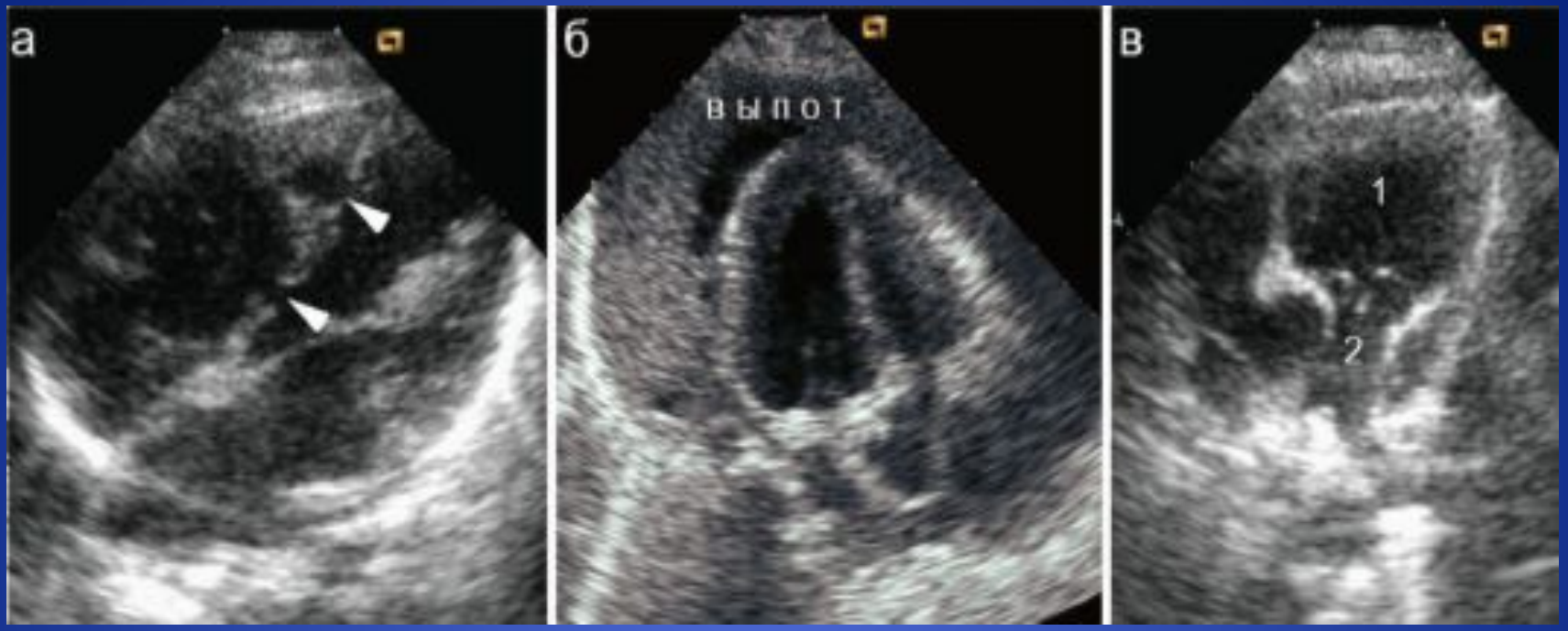
The main indications for Echocardiography are:

- - auscultative picture (noise);
- - complaints of the child for fatigue, dyspnea, pain in the chest;
- - Cyanosis, pallor;
- - bad weight gain;
- - arterial hypertension;
- - frequent colds;
- - cough without signs of respiratory infection;
- - changes on the roentgenogram: atypical configuration of the heart, atypical pulmonary pattern, etc.

The main scanning modes for echocardiography are:

- B-mode: visualization of the heart in real time from various accesses. Used to visually assess the anatomy of the heart, its location, contractions, the presence of defects, pathological inclusions

- - M-mode is usually in modern devices is switched in parallel to the B-mode. This is a one-dimensional scan in real time. As accurately as possible, it allows measurements of various anatomical structures.

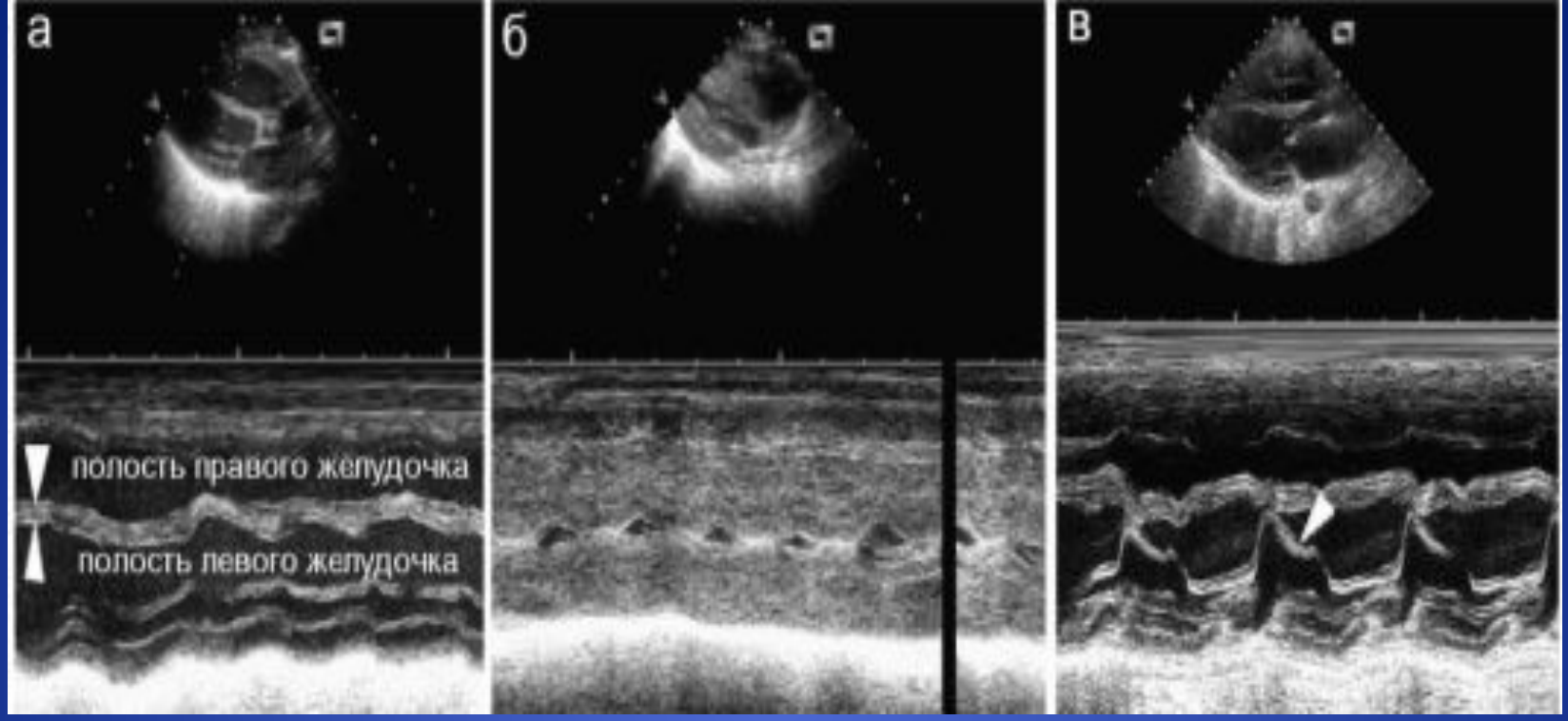


EchoCG in B-mode: 1 - cavity of the right ventricle; 2 - pulmonary artery trunk:

a - two defects of the interventricular septum (arrows);

b - a significant amount of purulent effusion in the pericardium;

в - a hypoplasia of a trunk of a pulmonary artery (the right ventricle is expanded)



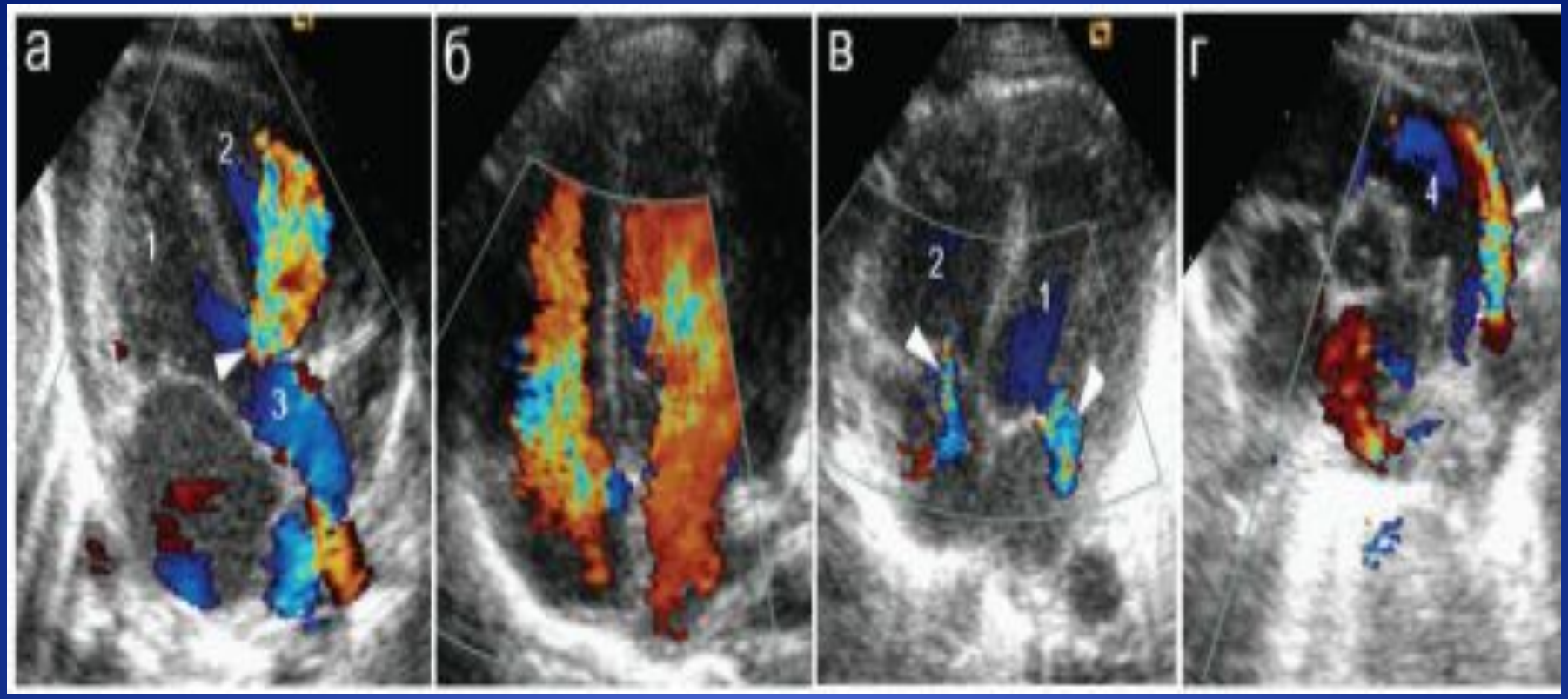
EchoCG in M-mode:

a - decreased contractility of the left ventricle (between the arrows - interventricular septum);

b - early carditis, severe myocardial hypertrophy, ventricular cavity

sharply reduced (compare with the image of "a");

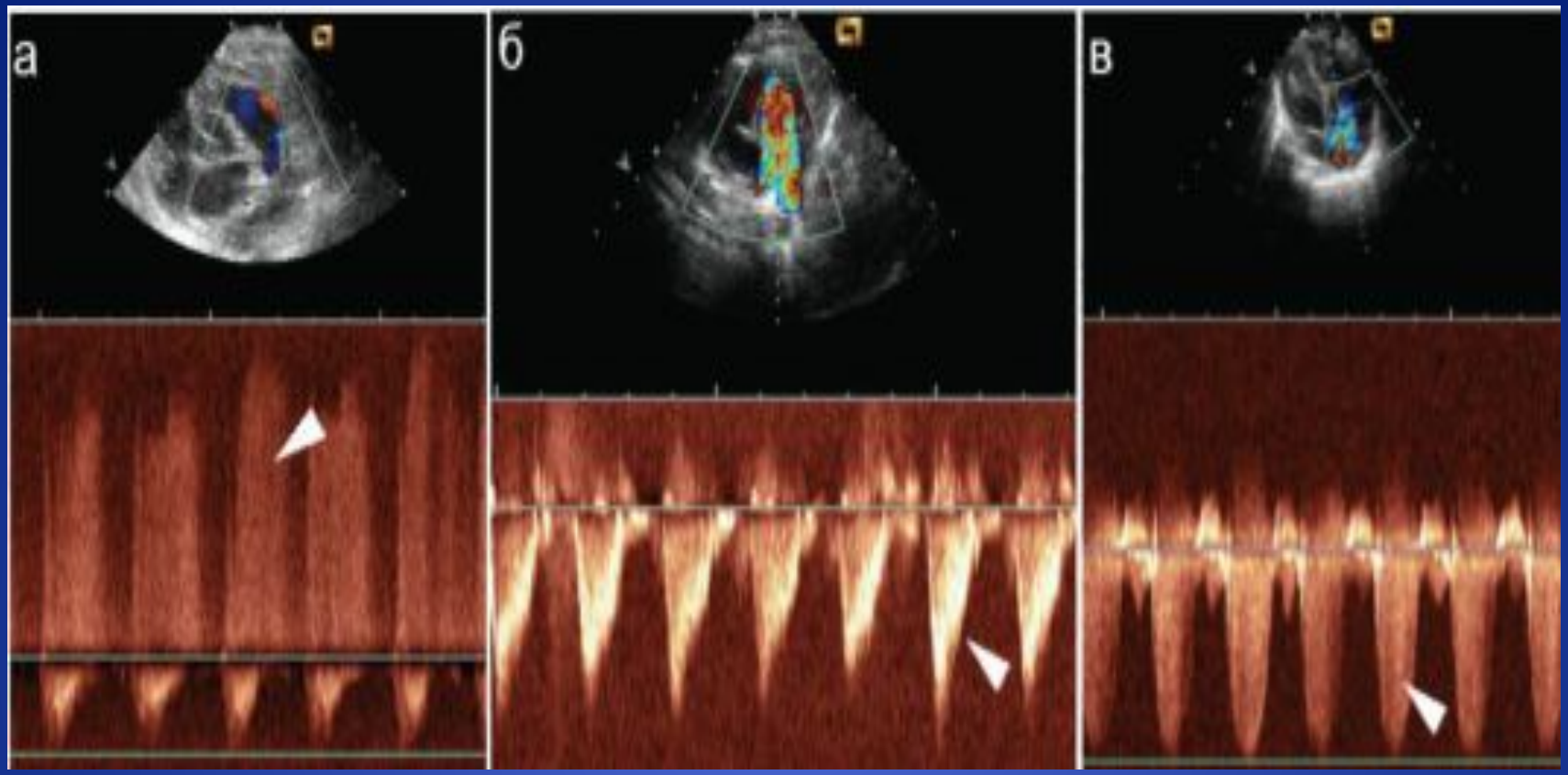
в - movements of the mitral valve leaf (arrow)



Echocardiography in the color doppler mode: 1 - the cavity of the left ventricle; 2 - cavity of the right ventricle; 3 - aorta; 4 - pulmonary artery; a - a large defect of the interventricular septum with massive discharge of blood from left to right (arrow);

b - normal transmittal and tranciscus tidal streams are colored red;

c - regurgitation flows on the mitral and tricuspid valves (arrows). Color regurgitation flows - in the blue spectrum; g - open arterial (botallus) duct: high-velocity retrofractional flow (arrow) in the pulmonary artery trunk

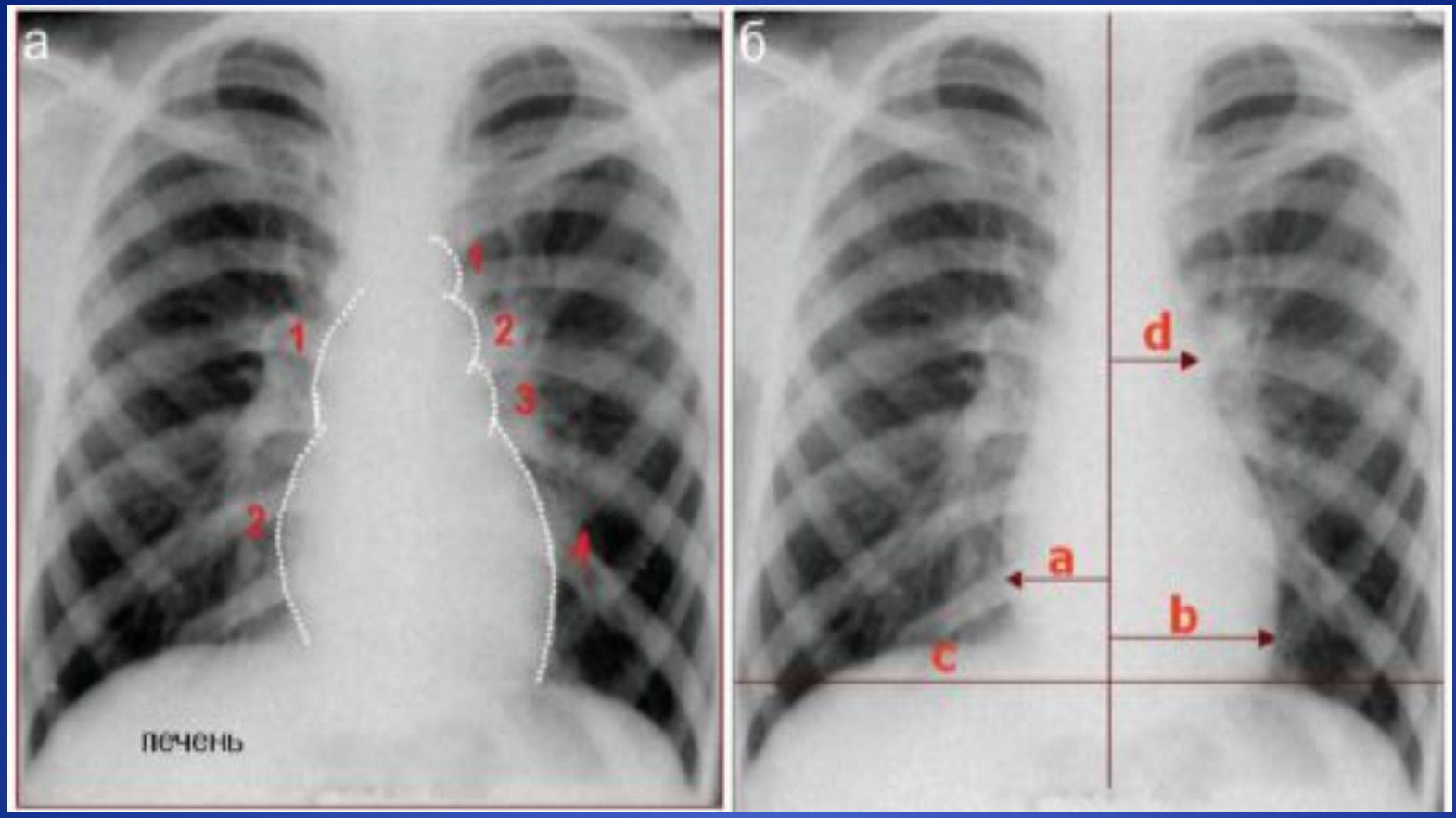


Echocardiography in the regime of constant wave doppler (arrows show the components of Doppler curves characterizing the defect): a - open arterial (botalla) duct; b - stenosis of the pulmonary artery; c - regurgitation on the tricuspid valve

x-ray method

- Historically, the x-ray method belongs to the precedence in the diagnosis of congenital heart defects on the basis of both an analysis of the actual position and configuration of the heart and a pulmonary picture that allows one to judge the presence or absence of pathological changes from the pulmonary blood flow.

- With the review of radiography can be identified only such views that lead to a change in the structure of the heart and / or pathology of the small circle of blood circulation. The main advantages of the method are the possibility of its implementation in almost any medical institution and the simultaneous receipt of information on both the structure of the heart and the state of the lungs and the small circulation

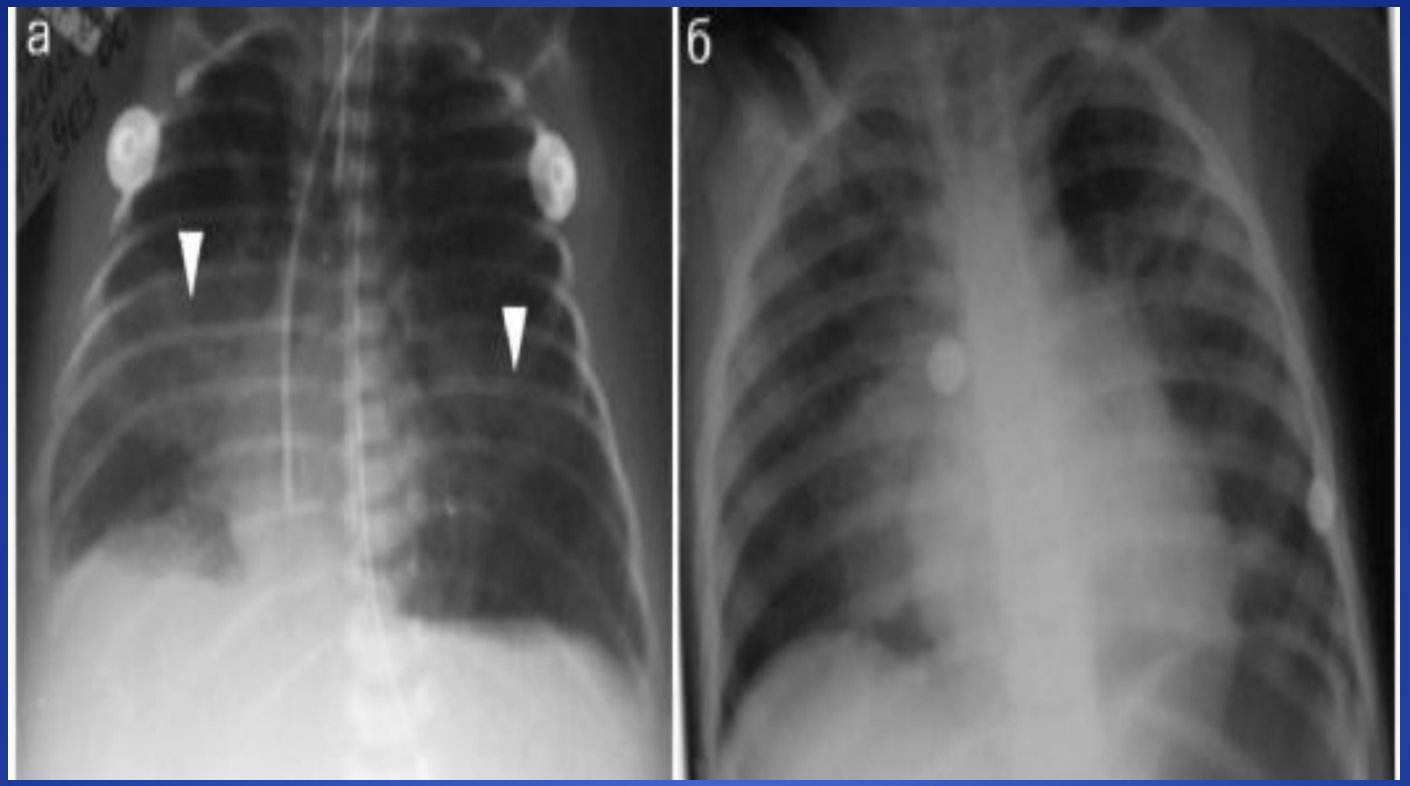


Normal radiographic anatomy of the heart in a direct projection:
a - arches of the heart along the right and left contours;

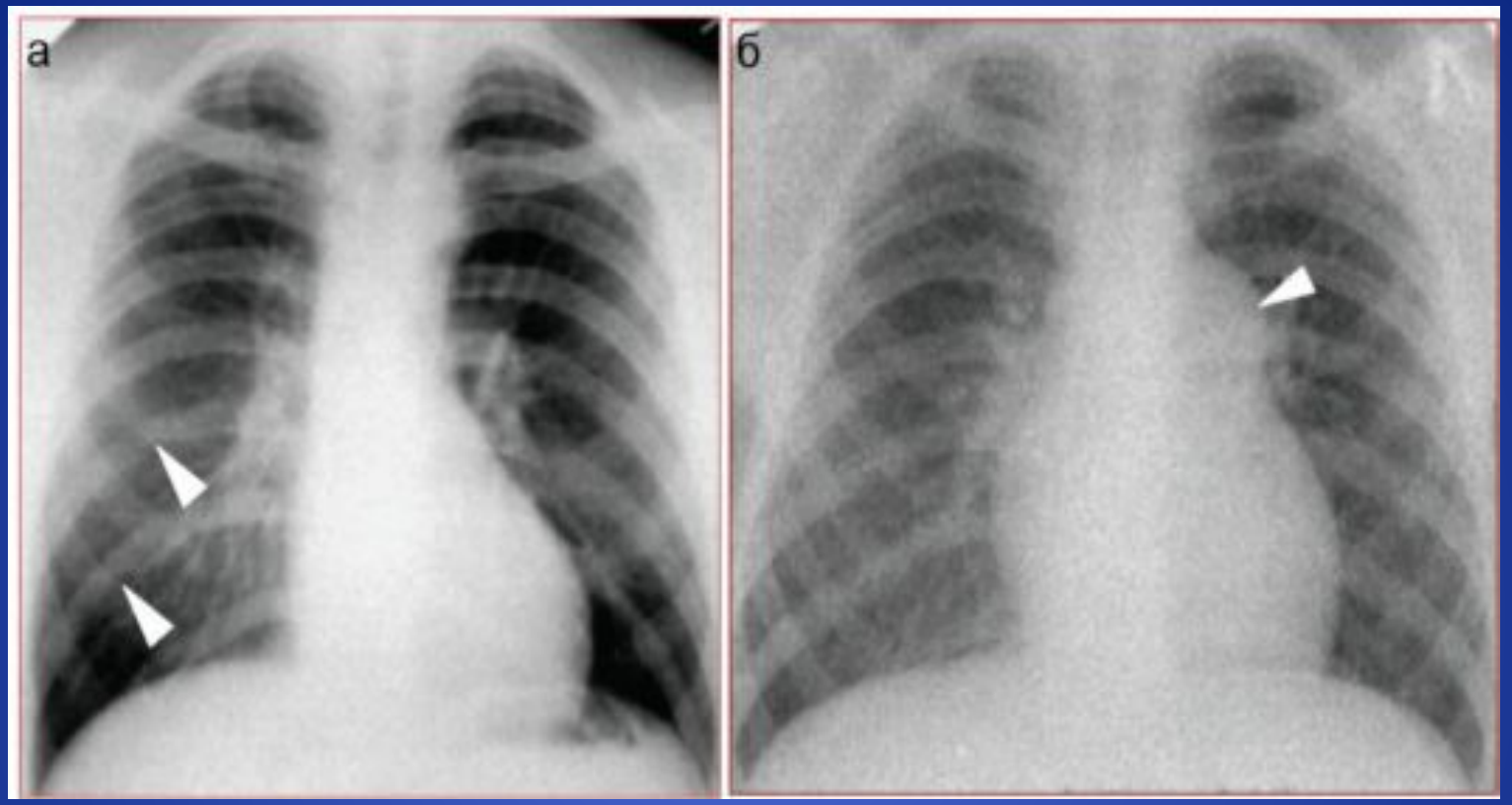
b - measurements for calculation of cardiothoracic index and Moore's index

- **On the right contour,** 2 arcs are distinguished: the upper one is formed by the ascending aorta or the superior hollow vein (1), the lower one by the lateral wall of the right atrium (2). Between them, in the middle of the height of the heart shadow, is the atriovasal angle. Shifting it upwards indicates an increase in the right atrium, downward - about the expansion and lengthening of the ascending aorta.
- **On the left contour** of the heart, 4 arcs are visualized: the first (1) - the arch of the aorta; the second (2) - the arc of the pulmonary artery; the third arc (3) - the eye of the left atrium; the fourth arch (4) is the lateral wall of the left ventricle, which should not protrude into the left pulmonary field behind the median-clavicular line (Figure 7.2.2).

- To determine the size of the heart cardiothoracic index is used - the ratio of the diameter of the heart to the internal diameter of the chest (at the level of the right dome of the diaphragm):
- cardiothoracic index = (a + b): with x 100% and is normally no more than 50%.
- The degree of expansion of the pulmonary artery is determined by the Moore index:
- d: 1 / 2c
- and is normally no more than 0.25.



X-ray signs of pulmonary edema in children: a - newborn, arrows show "butterfly wings"; b - child 2 years old

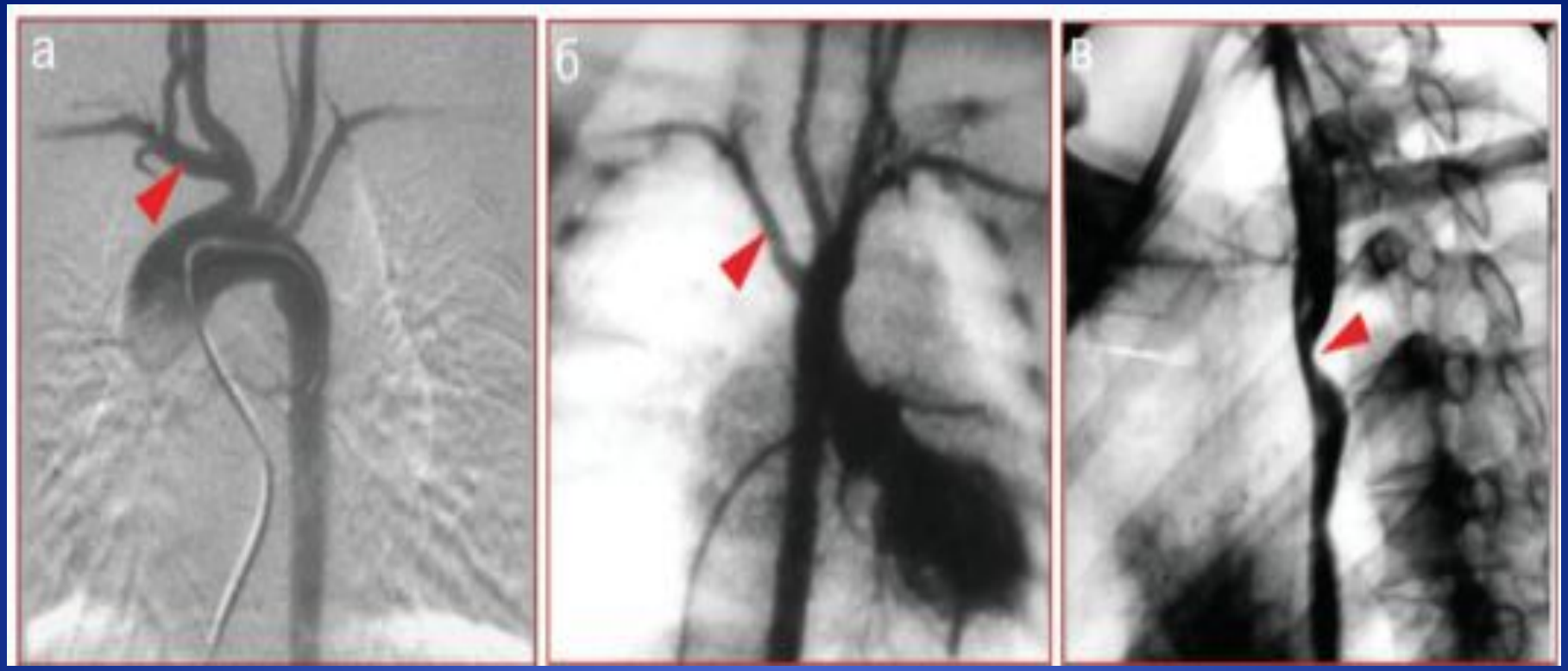


X-ray signs of heart defects with normovolemia of the small circle of blood circulation:

a - normovolemia of the small circle, we determine the usuras along the lower edge of the VII and VIII ribs on the right (arrows) in a child with coarctation of the aorta; b - valve stenosis of the pulmonary artery (swelling of the pulmonary arterial contour is indicated by an arrow)

Angiocardiography

- Congenital abnormalities of the aortic arch and pulmonary bifurcation may occur in isolation or in combination with other AMS, and also be accompanied by symptoms of dysphagia and tracheal obstruction. Diagnosis of these anomalies is based on the detection of deformation of the contrasted esophagus, which is an indirect sign of the presence of an aberrant or abnormal vessel passing through the mediastinum. For this purpose, a special examination (angiocardiography with cardiac catheterization) is carried out, designed to accurately diagnose these conditions.



Левая дуга аорты с аберрантной правой подключичной артерией: а - субтракционная аортограмма с нормальным отхождением правой под- ключичной артерии от брахеоцефального ствола (стрелка); б - антеградная аортограмма: аберрантное отхождение правой подключичной артерии от нисходящей аорты (стрелка);

в - фрагмент рентгенограммы во II косой проекции с контрастированием пищевода: определяется его деформация на уровне пересечения с аберрантной правой подключичной артерией (стрелка)

CT and MRI

- Computer tomography is performed after surgery for heart defects, for visualizing the noncompact myocardium and coronary arteries.
- Magnetic resonance imaging in children is used to diagnose cardiomyopathies and myocarditis and associated fibrotic changes in the myocardium and to assess the presence of effusion in pericarditis.
- Computer tomography and magnetic resonance imaging of the heart are used to diagnose and assess the size of tumors. The final answer is biopsy.