

# SIW

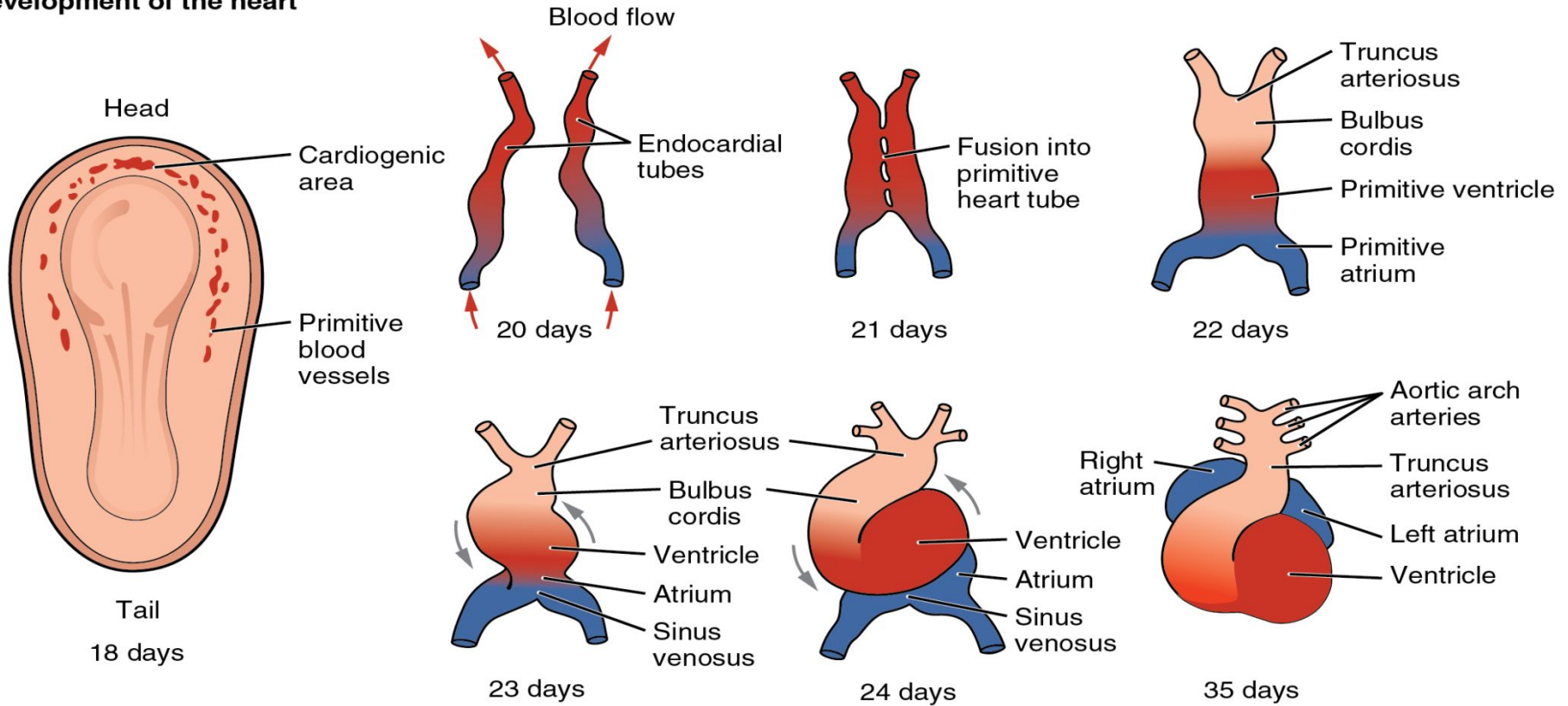
Topic: Properties of heart and vessels in children

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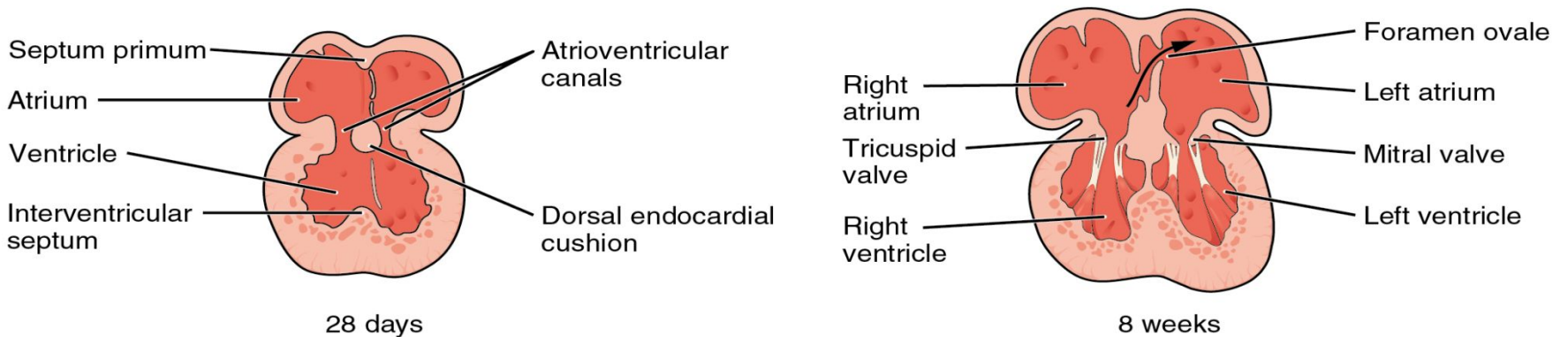
# Plan

1. Features of embryonic cardiovascular system.
2. Morphological and histological features of the heart.
3. Characteristics of the functions of the circulatory system.
4. The morphology and function of the cardiovascular system in children.

## Development of the heart



## Partitioning of the heart into four chambers



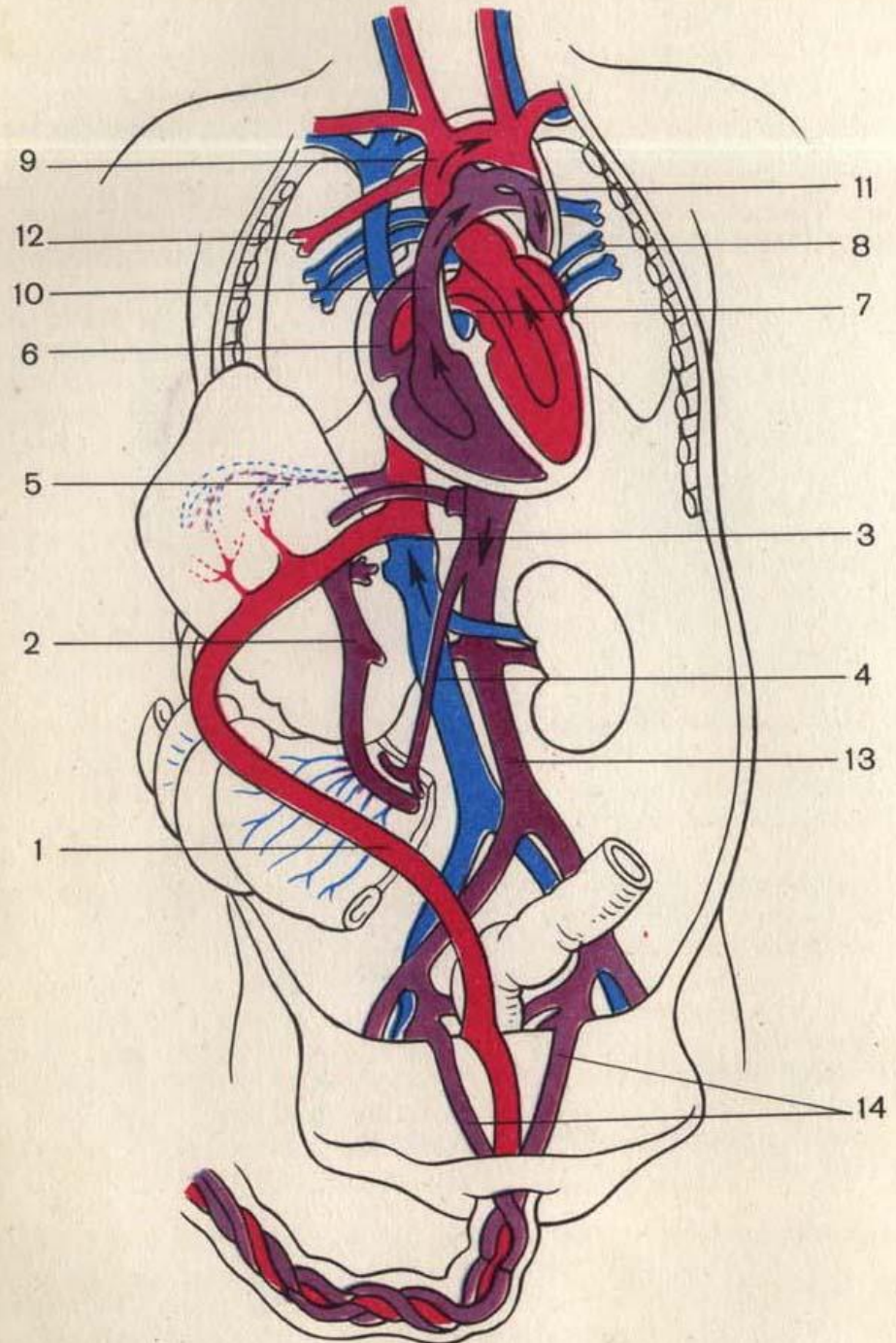
- Stawage the heart (the end of the 2nd week of fetal development)
- The separation of the heart into left and right half (the end of the third week of embryonic development), education and the formation of atrial foramen ovale
- The formation of the interventricular septum (the fifth week of fetal development)
- Education septum that separates the bulb on the mouth of the pulmonary artery and the aorta (the fourth week of intrauterinedevelopment)

- Forming a third septum that combines atrium and venous sinus (4-5 week)
- Internal formation(trabecular) (3 Week 4) and the outer layer of the myocardium (4-5 week)
- The formation of the fibrous ring at the atrioventricular openings
- (2nd month of intrauterine development)

# Stages of development of the fetal circulation:

- a) glistiotrofny type of food (first two weeks)  
- the circulatory system is absent;  
Nutrients come from the yolk sac;
- b) yolk circulation period (from 3 weeks to 2 months of fetal development);
- c) placental circulation period (end of 2 nd - beginning of the 3 months of fetal development) - fetal blood is separated from the mother's blood placental membrane.



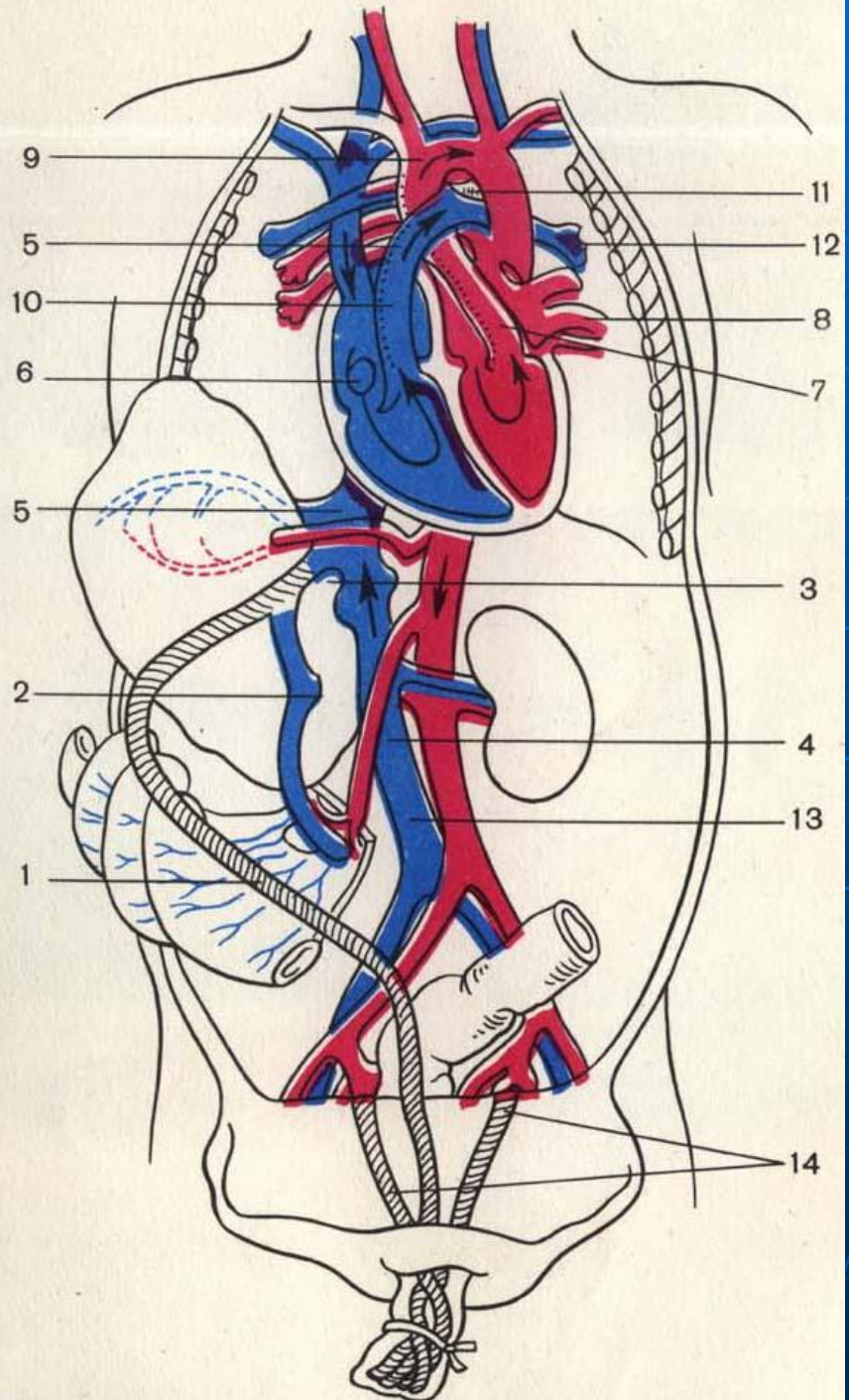


# Features newborn circulation



- oxygen saturation occurs in the placenta, where it flows through the umbilical vein to the liver of the fetus and through the venous (Arantsiev) duct empties into the vena cava;
- pulmonary circulation is not functioning, the principal amount of blood through the patent ductus arteriosus enters the aorta;



- ✉ all organs (except liver) get mixed blood;
- ✉ the blood returns to the placenta through the umbilical artery,
- ✉ functioning shunts: Arantsiev duct, an oval hole, Botalov flow;
- ✉ a synchronous contraction of the ventricles, rather than sequentially.



# Features newborn circulation:

-  cease to function 6 main structures:  
4 (umbilical vein, ductus venosus and the two umbilical arteries) that provide blood flow and placental 2 (foramen ovale and ductus arteriosus), which shunted blood from the pulmonary circulation into the aorta;
-  starts functioning pulmonary circulation

# The morphological features of the heart

1. The relatively large mass of the heart (the newborn corresponds to 0.8% of the adult body weight - 0.4%).
2. Features of the form heart of a conditioned aspect ratio of the cavity.
3. The ratio of heart weight to body weight increases unevenly.

- ✉ closes Arantsiev duct committed spasm and subsequent obliteration of blood (Botallova) flow;
- ✉ a relatively wide lumen of the arteries and veins of the same caliber.
- ✉ 4. The most intensive growth of the heart in the 1st year of life in pre - and pubertal periods (10 - 14 years).

5. The walls of the heart macroscopically not have a clear differentiation flap valves are formed enough, capillary (papillary), the muscles are underdeveloped; capillary muscle tendon thread 2 times shorter than that of adults.
6. subepicardial department little adipose tissue, its amount increases markedly after 7 years



# Динамика массы сердца

- До года масса сердца удваивается;
- До 2 – 3 лет утраивается;
- До 15 –16 лет увеличивается в 15 – 16 раз.

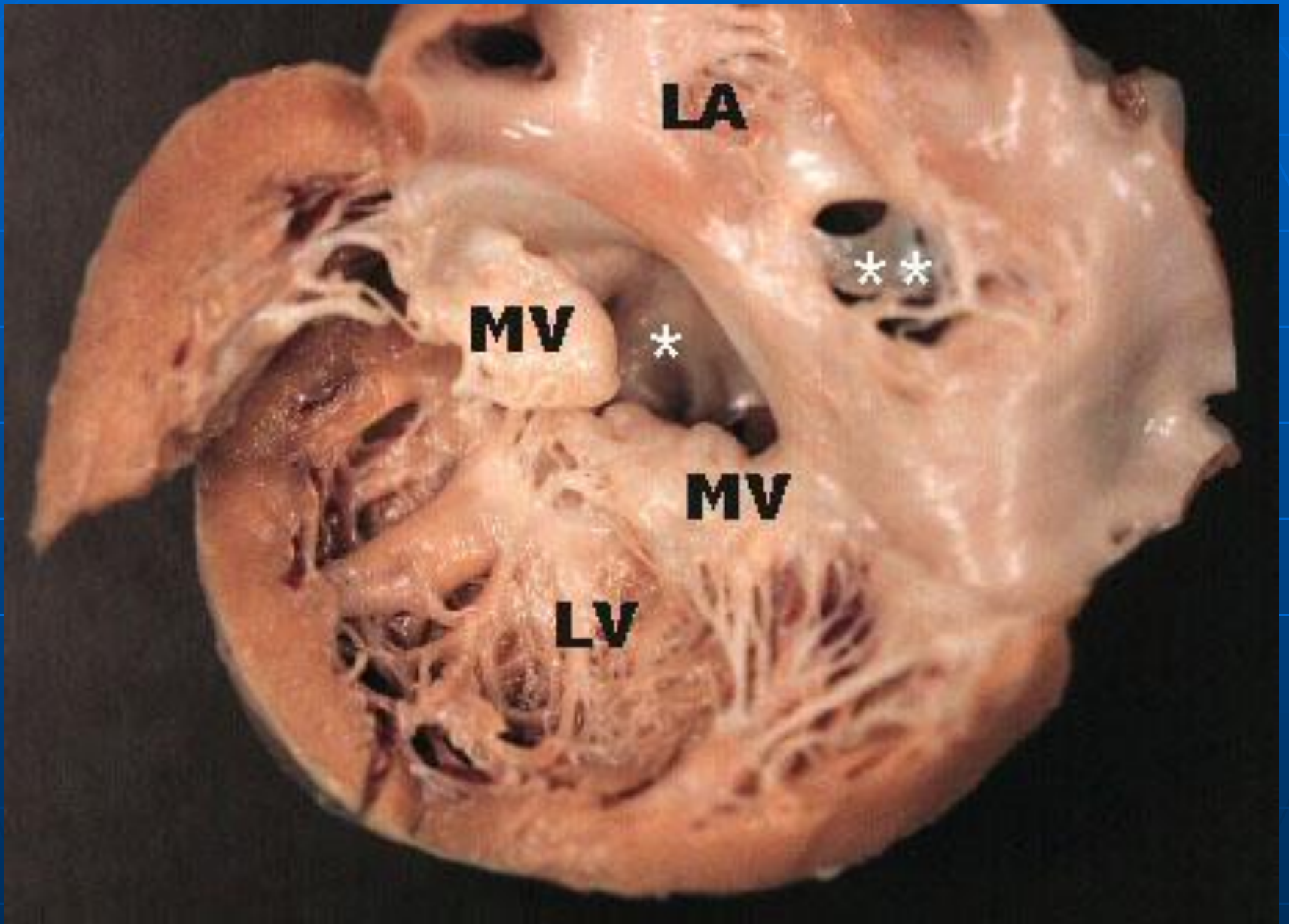
# Соотношение правого и левого желудочков.

- К 1-му году составляет  $1 : 1,5$  ;
- К 5-ти годам –  $1 : 2$ ;
- К 14-ти годам –  $1 : 2,76$ .

Толщина стенки левого желудочка возрастает в 3 раза за период роста ребенка, правого – на  $1/3$ .

# Heart weight (relative to body weight)

- 5 - 6 months. - 0.38%
- At 8 years old boys - 0.44%
- In 12 years in girls - 0.48%



# Properties neonatal cardiac muscle:

- a) muscle fibers are thin, are located close to one another;
- b) have a large number of large nuclei;
- c) poorly developed interstitial, and elastic connective tissue, a well-developed net of blood vessels;
- g) Soft flap valves and epicardium.

# The duration of the cardiac cycle in children of all ages:

- Newborn - to 0,40-0,50
- 10 years - 0.70
- adults - to 0,77-0,80
- The duration of ventricular diastole:
  - infants - 0.23
  - adults - 0.48 to
- The physiological importance of:  
increasing blood filling of the ventricles



# Differences vessels Child and adult:

- Arteries are relatively wider
- Artery wider than veins
- Veins grow rather than artery
- In 16 years in the lumen of the vein 2 times wider than the lumen of the arteries
- Thin-walled blood vessels of newborn, they are not sufficiently developed muscle and elastic fibers

- With age comes the differentiation of the vascular wall, increasing the number of elastic and muscle fibers
- The development of blood vessels ends up to 12-13 years
- Children have a well-developed capillary network
- Capillaries intestine, kidney, skin, lung, relatively and absolutely larger than in adults

# Referenc

Internet resources **es**

**THANKS FOR  
YOUR  
ATTENTION**