

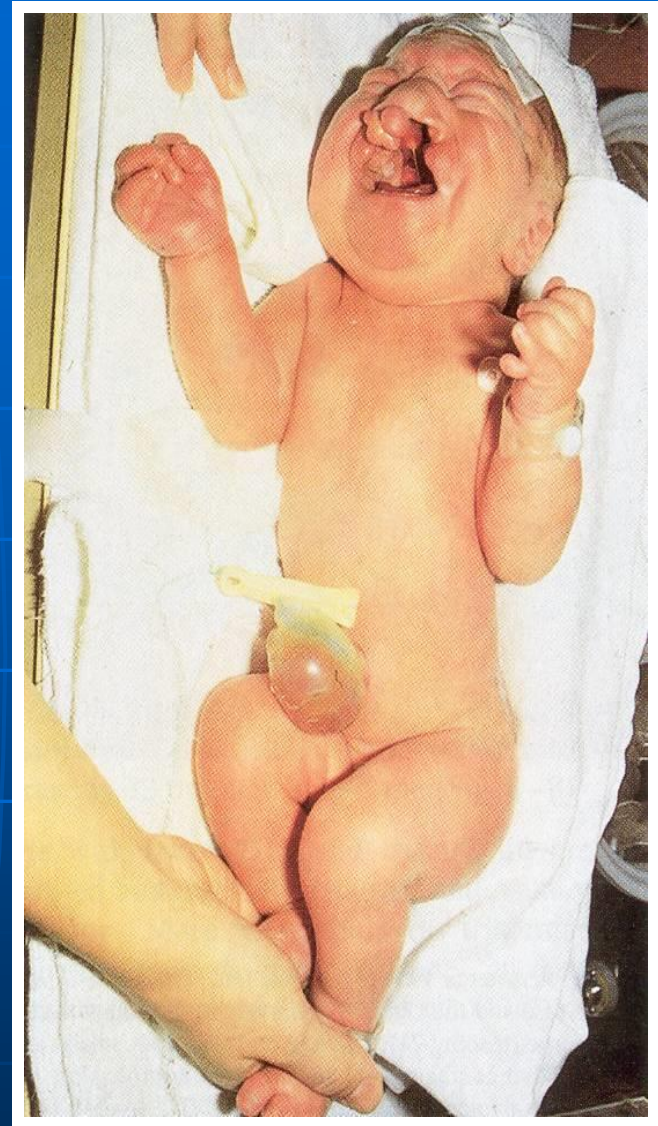
Fetal Circulation & Postnatal Changes

Prof. Saeed Abuel Makarem



- Fetal Cardiovascular system is designed To:
 - 1- Serve prenatal needs.
 - 2- Permit modifications at birth, which establish the neonatal circulation.

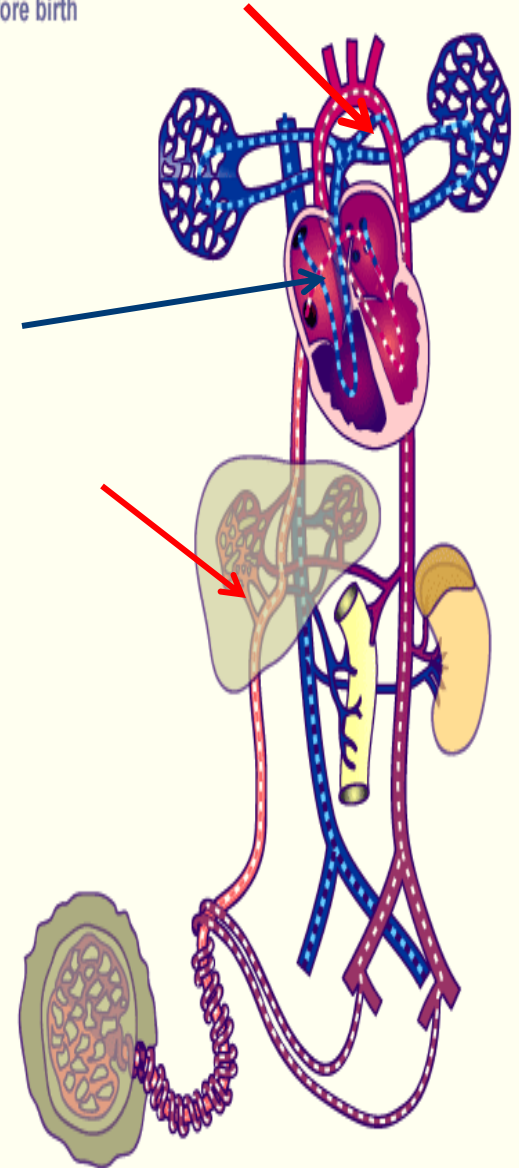
Good respiration in the newborn infant is dependent completely upon normal circulatory changes at birth.



- Three structures are very important in the transitional circulation:

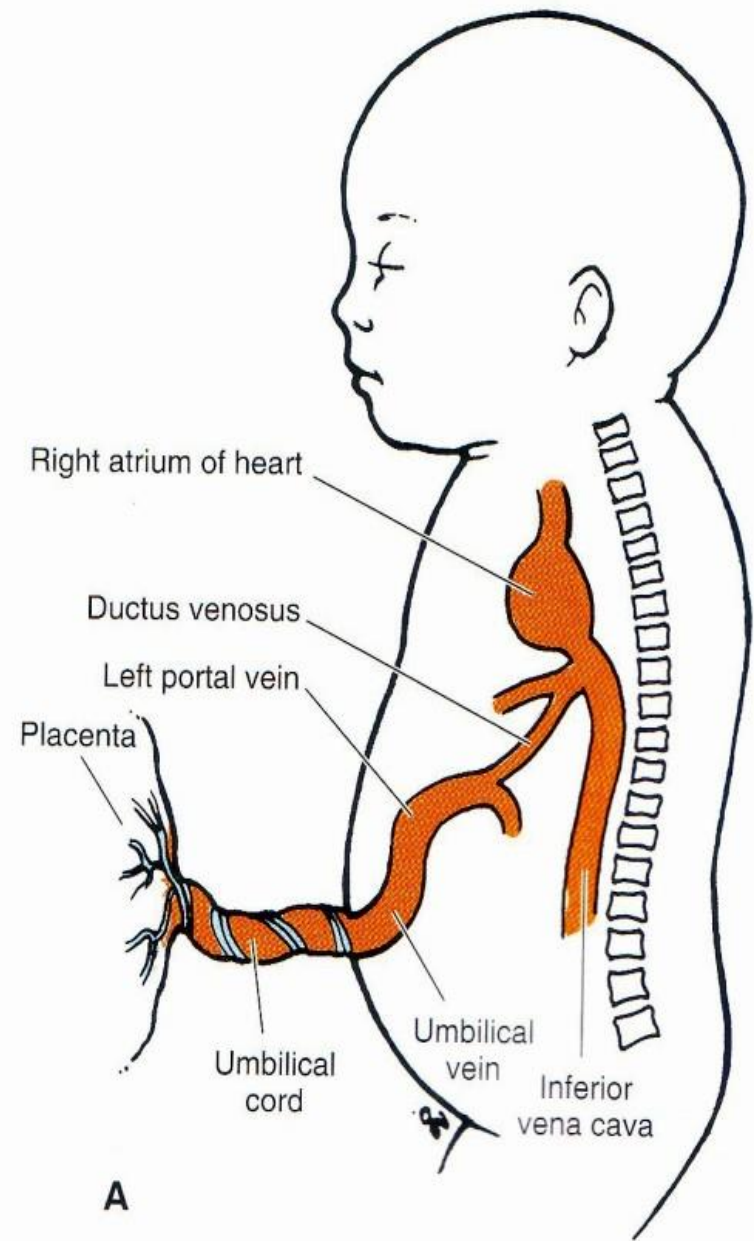
- *1-Ductus venosus.*
- *2-Ductus arteriosus.*
- *3- Foramen ovale.*

before birth



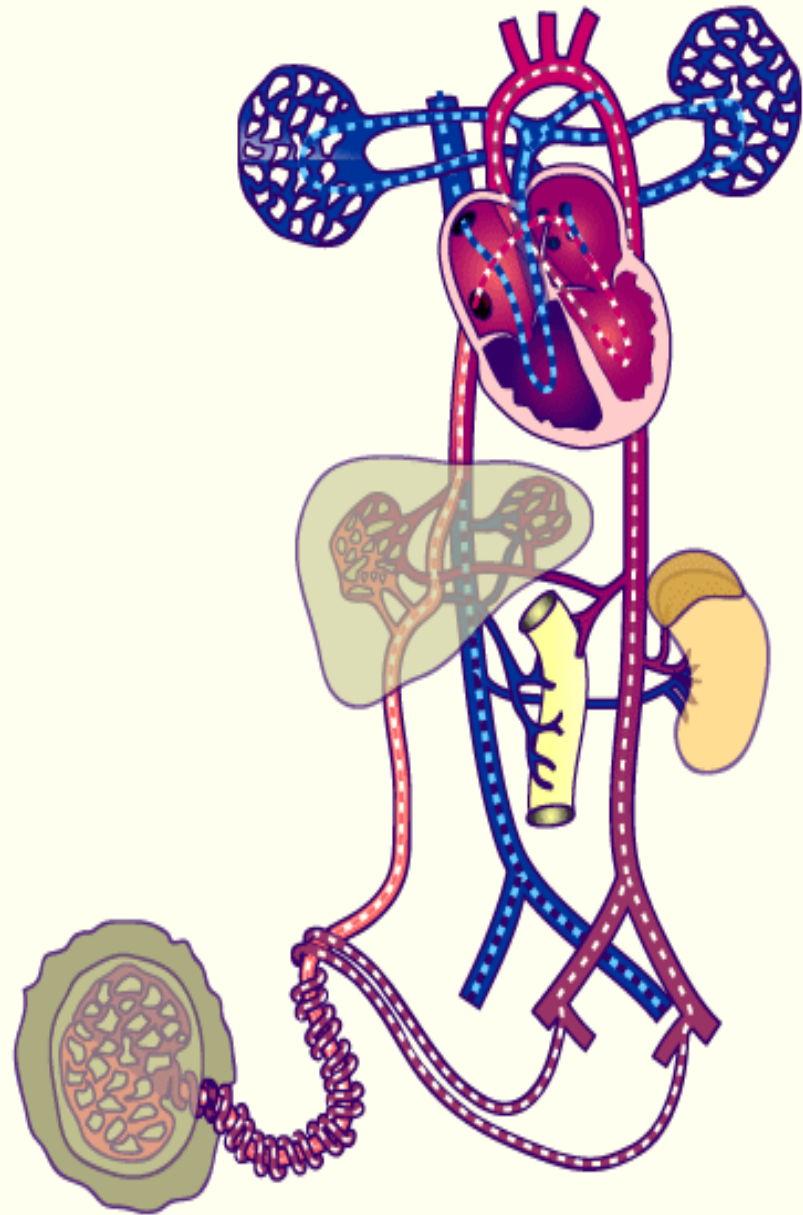
- **Blood** reaches & leaves the fetus through the **umbilical cord.**

The umbilical cord
Contains two
arteries and **one**
vein.

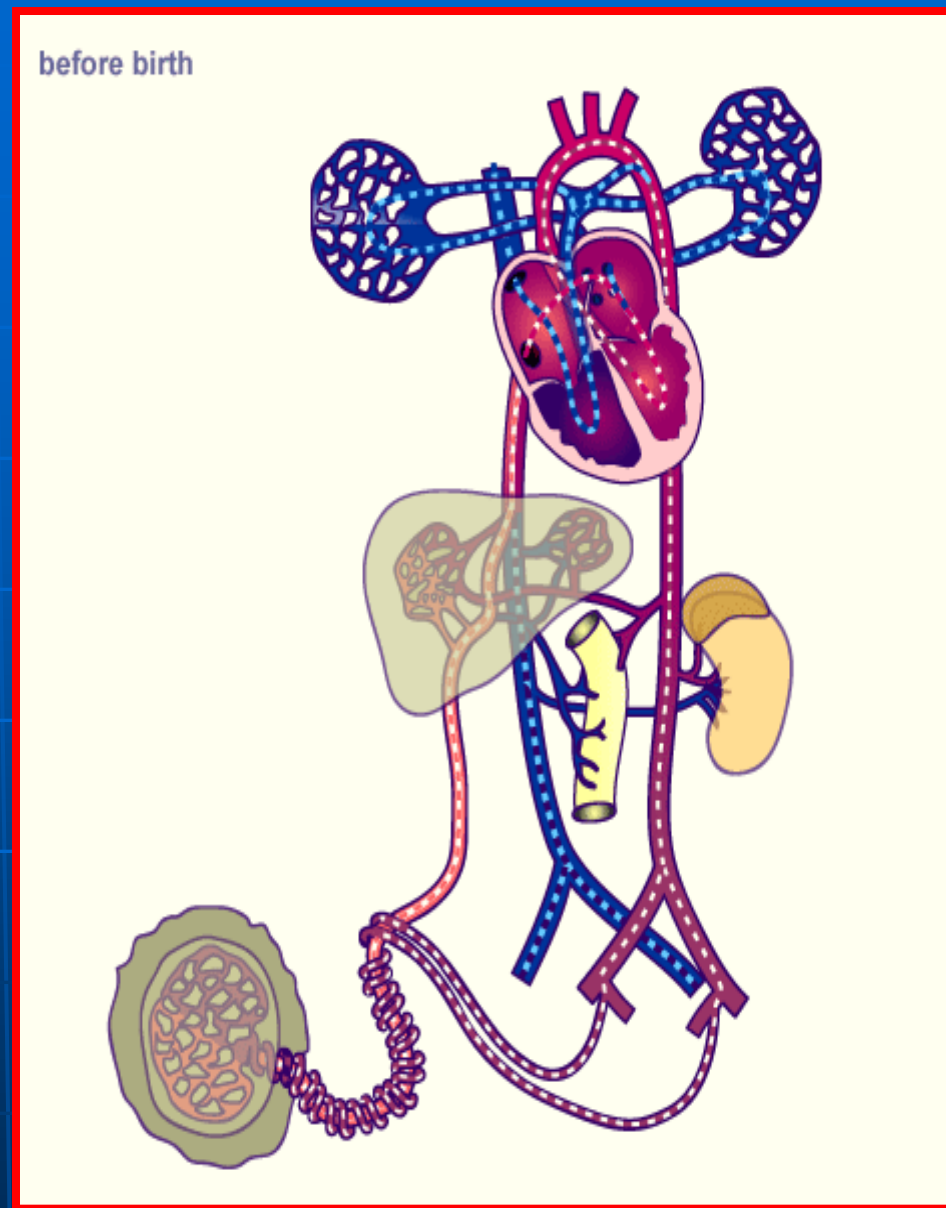


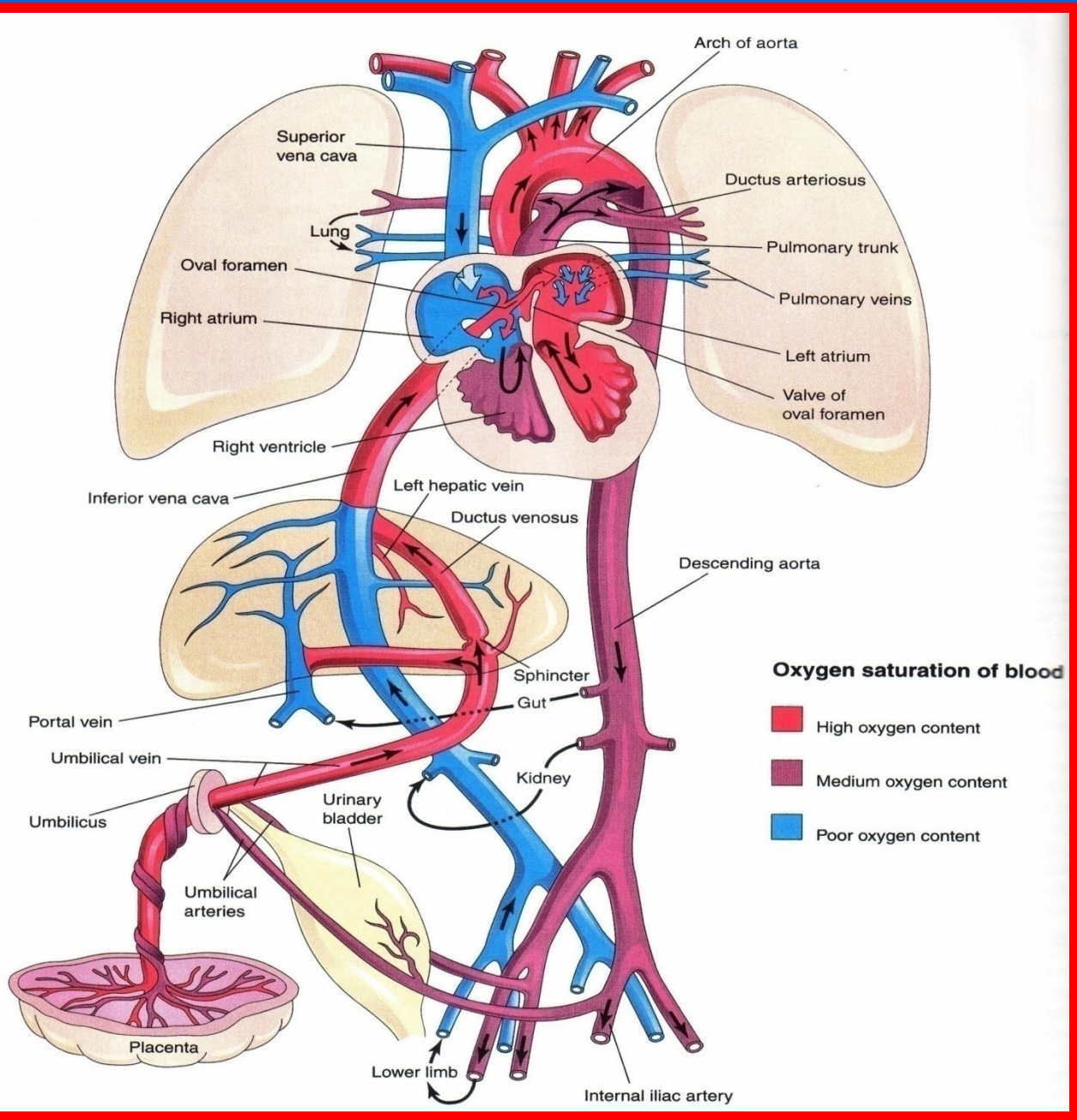
- Highly **oxygenated** blood passes from placenta through the left **umbilical vein**.
- Half of this blood reaches the **IVC** through the ductus **venosus**.
- The other half passes to **liver** sinusoids then to the IVC.

before birth



- Blood of the IVC reaches the right atrium, then to **left** atrium through the Foramen Ovale.
- Then to the left ventricle through the mitral valve.
- Then to ascending aorta, to supply head & neck brain, coronary and upper limbs with **highly oxygenated blood**.

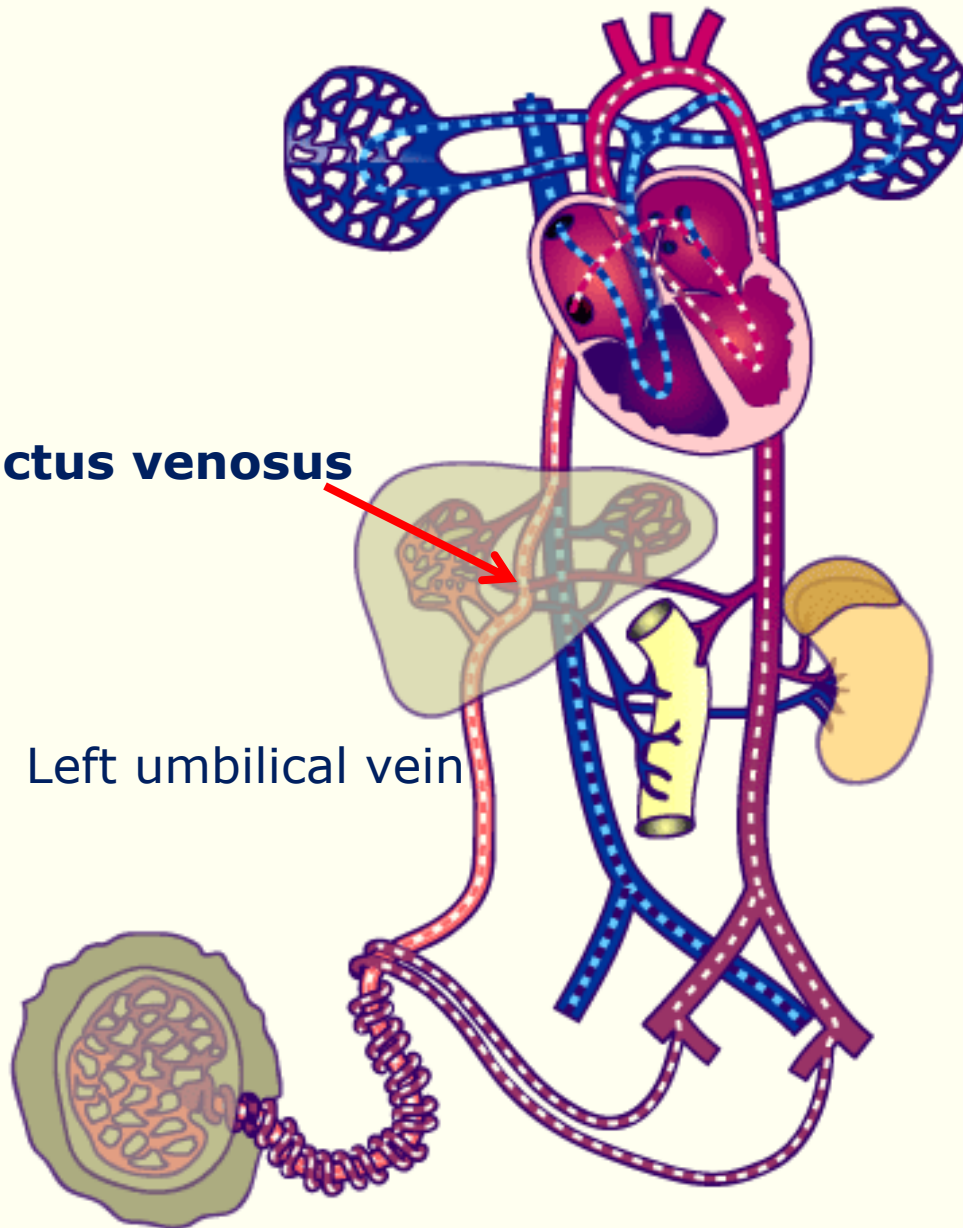


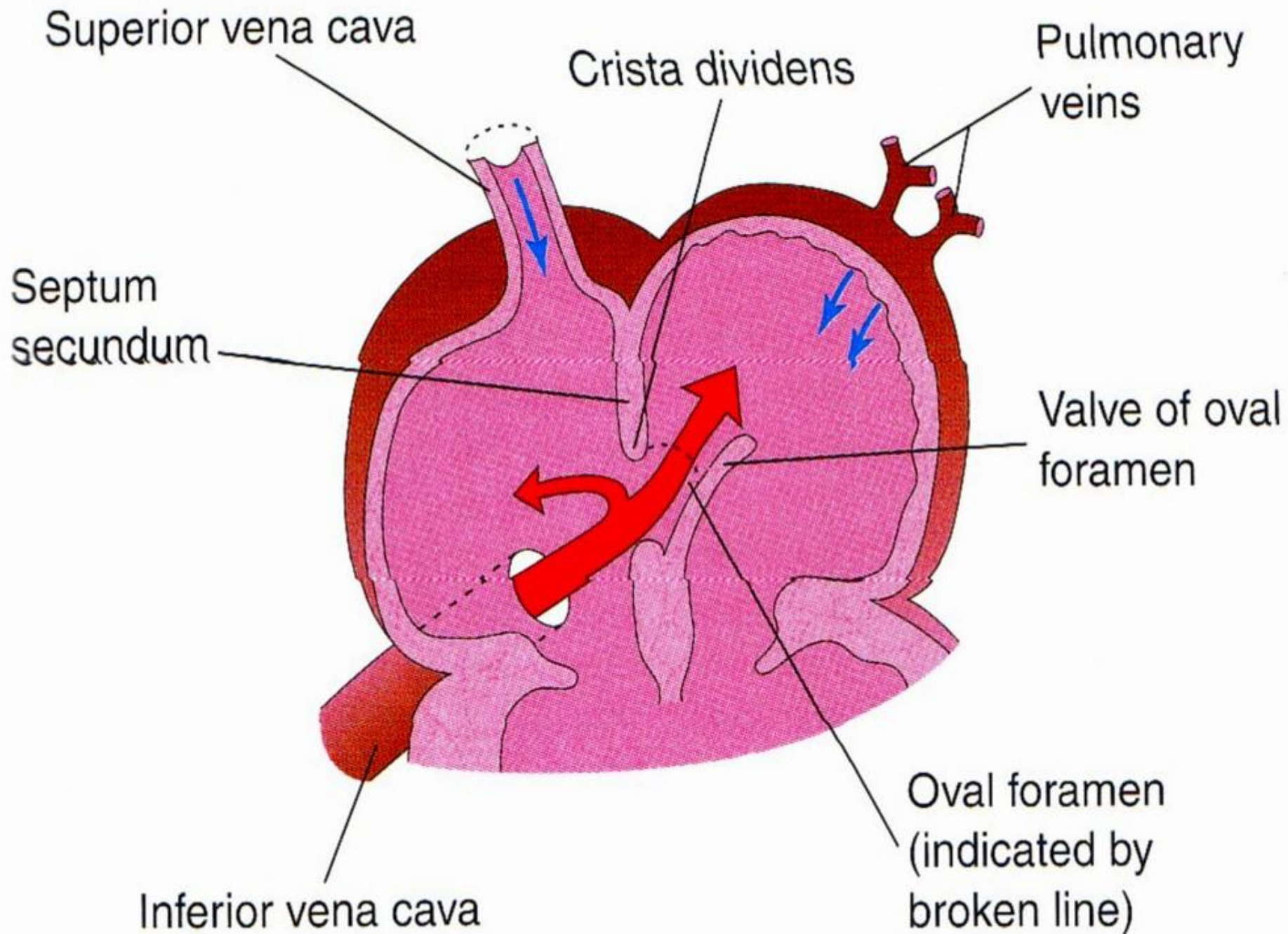


before birth

Ductus venosus

Left umbilical vein

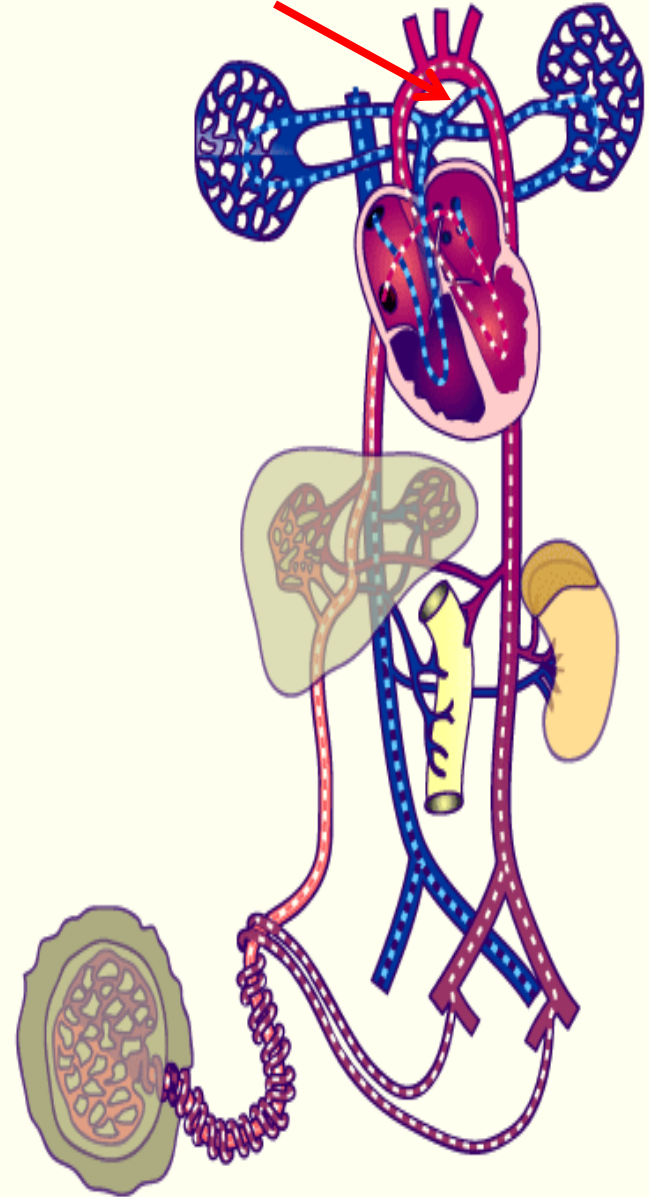




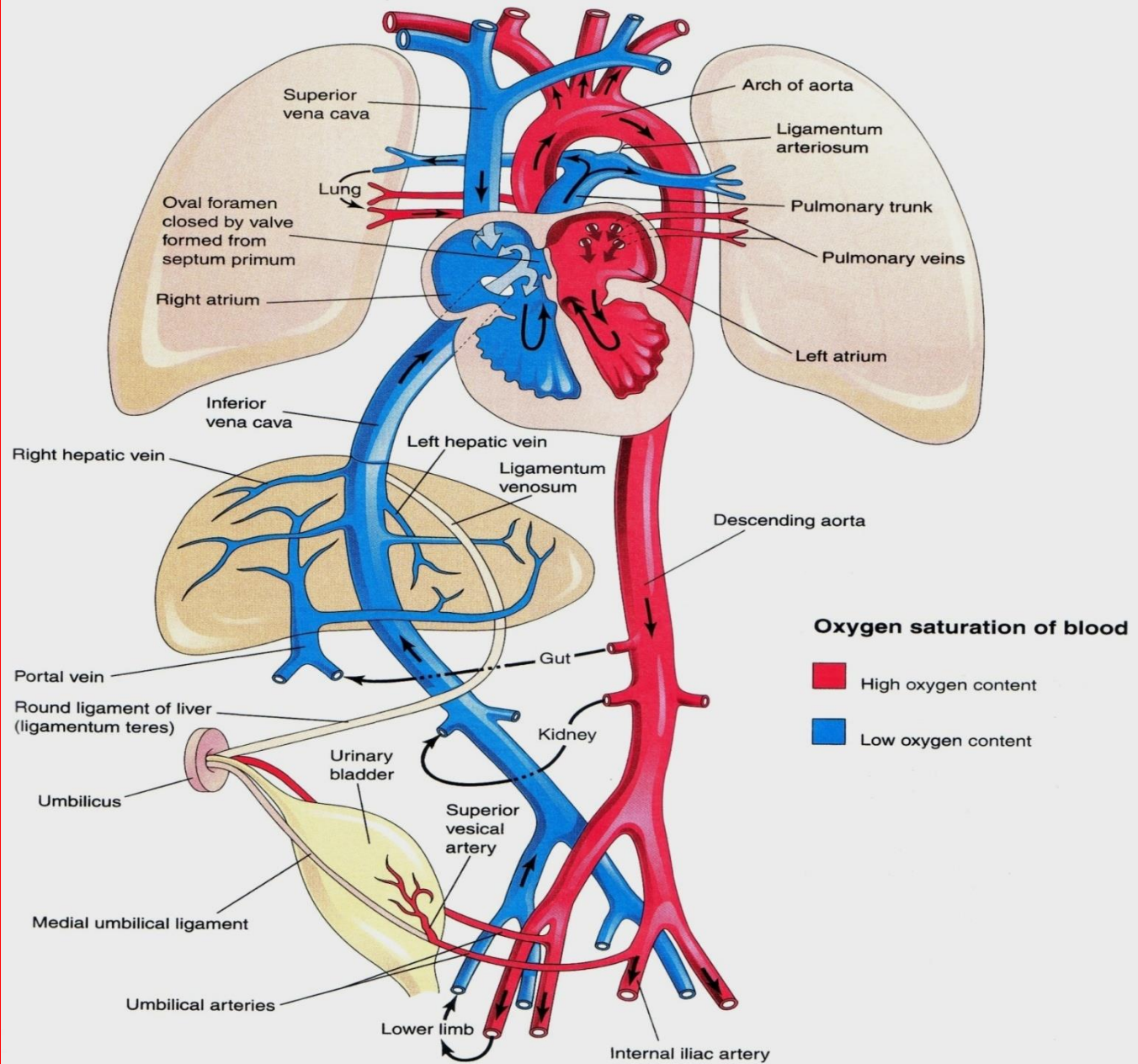
- Small amount of highly oxygenated blood in right atrium mixes with venous blood of the **SVC** passes to **right ventricle** .
- Then to the pulmonary artery then to ductus arteriosus to the descending aorta, to the fetal body.
- Then back to placenta via the **umbilical arteries**.

before birth

Ductus arteriosus



CHANGES AFTER BIRTH



After Ligation of the umbilical cord

- Sudden fall of blood pressure in the IVC & the Right Atrium.
- Also the valve of the ductus venosus constricts.

After Aeration of the lungs at birth:

- 1- Marked increase in the pulmonary blood flow.
- 2- Dramatic fall in pulmonary vascular resistance.
- 3- Thinning in the wall of the pulmonary arteries.

Changes after birth

- 1- Closure of foramen ovale:
 - a. Physiological closure
 - b. Anatomical closure.
- 2- Constriction of **ductus arteriosus**.
- By the end of the first 24 hours 20% of the lumen of the duct is closed.
- By the end of 48 hours 82% is closed.
- By 96 hours 100% of the duct is closed.

WHAT CLOSES THE DUCT ?

Bradykinin:

It is a substance released from fetal lungs during their initial inflation.

This substance has a contractile effect on smooth muscles of the ductus arteriosus.

The action of this substance appears to be dependant on the high **Oxygen** saturation of the aortic blood.

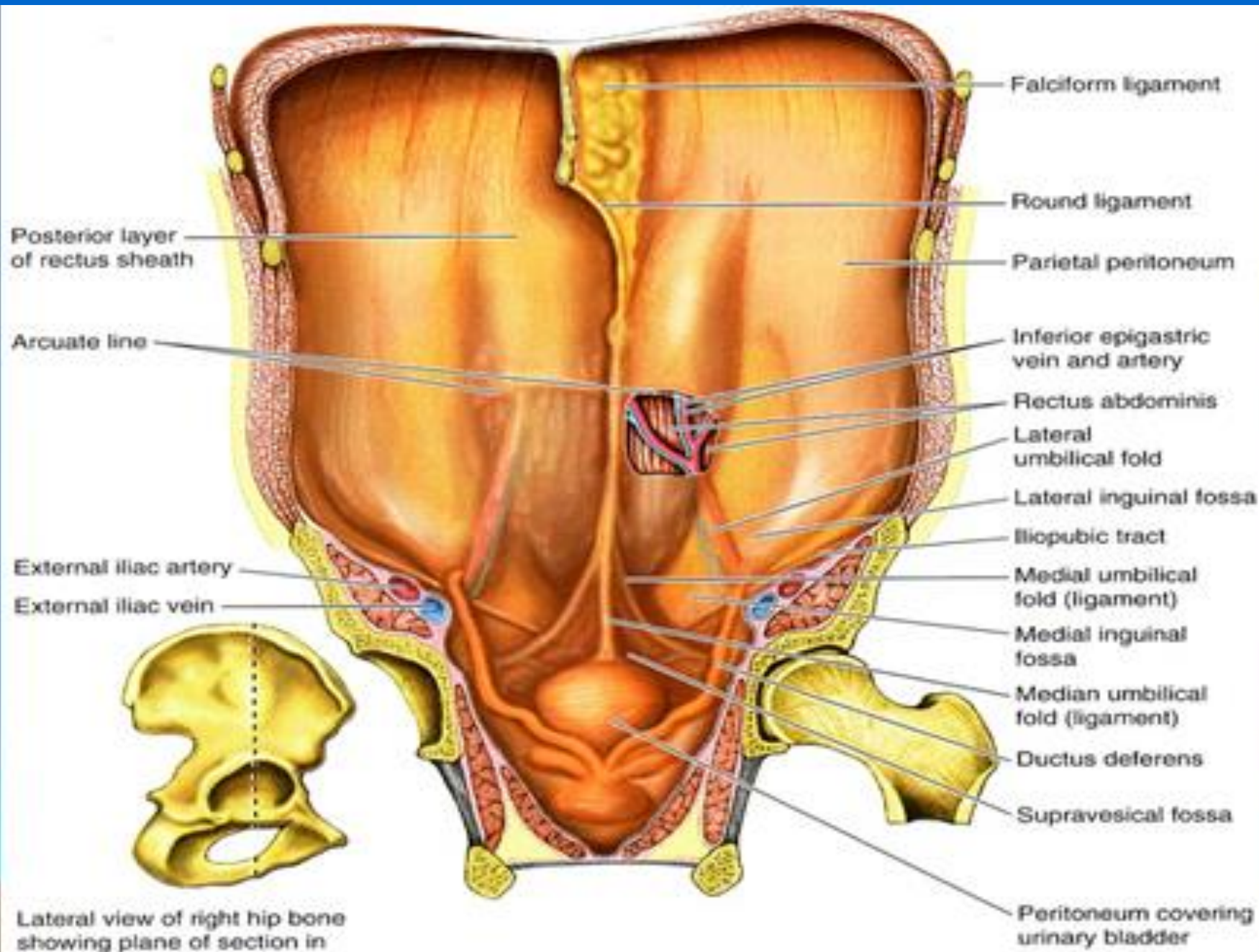
When oxygen saturation reaches 50 mmHg in the ductus arteriosus it causes constriction of its smooth muscles.

During fetal life the patency of ductus arteriosus before birth is controlled by the low contents of oxygen in the blood passing through it.

So hypoxia and other ill-defined factors keep the ductus arteriosus patent.

Adult derivatives of fetal vascular structures

- 1-Umbilical vein-----Ligamentum teres.
- 2-Umbilical arteries—medial umbilical ligaments.
- 3-Ductus venosus-----Ligamentum venosum.
- 4-Ductus arteriosus---Ligamentum arteriosum
- 5-Foramen ovale----fossa ovalis.



Thank You

&

Good Luck