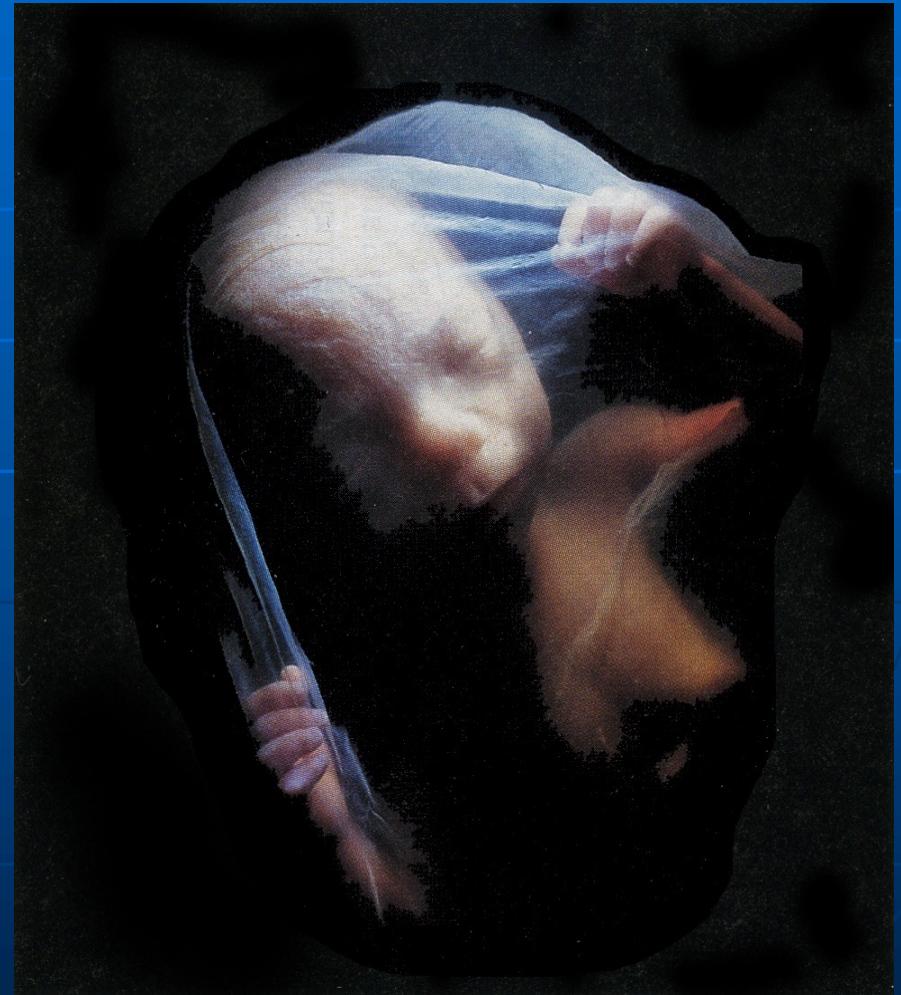


Fetal Circulation & Postnatal Changes

By
Prof. Saeed Abuel Makarem
Dr. Jamila EL Medany



- **Fetal Cardiovascular system is designed:**

- 1-To serve prenatal needs.
- 2-To permit modifications at birth, which establish the neonatal circulation.



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

■ **Three** structures are very important in the transitional circulation:

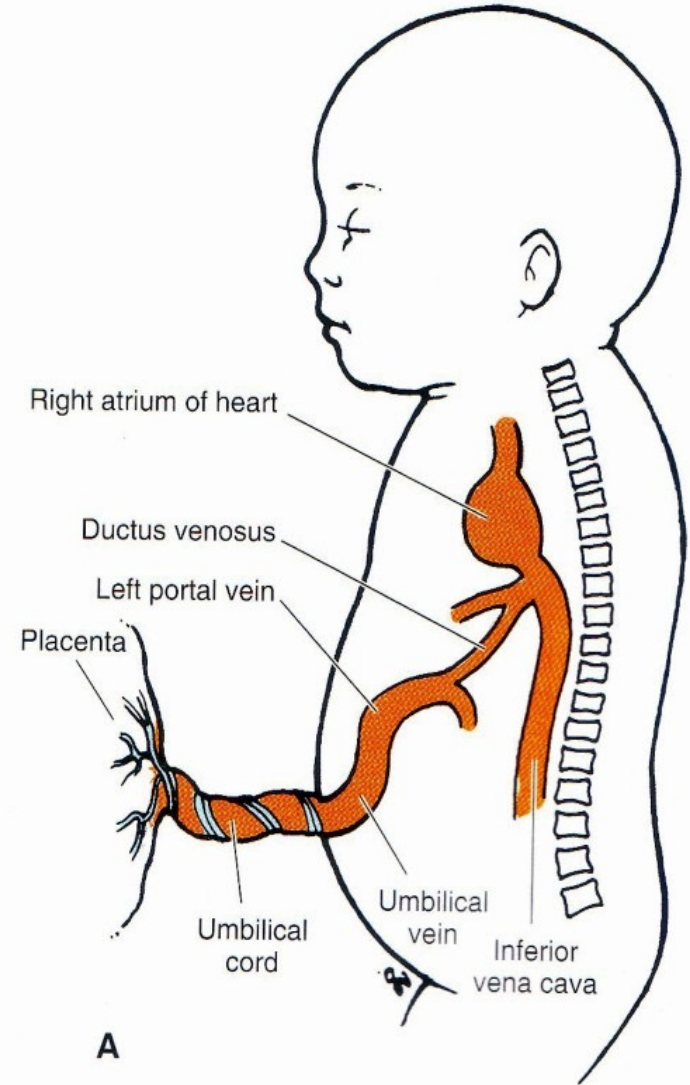
1- Ductus venosus.

2- Ductus arteriosus.

3- Foramen ovale.

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

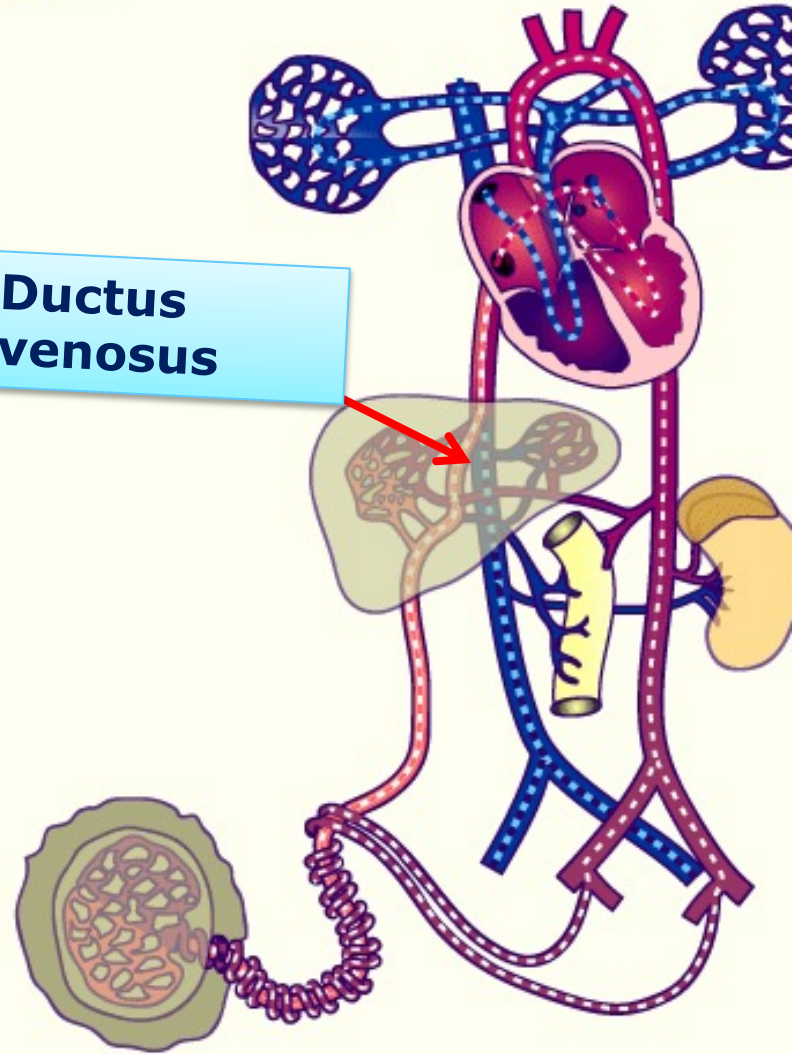
The umbilical cord
Contains two
arteries and one
vein.



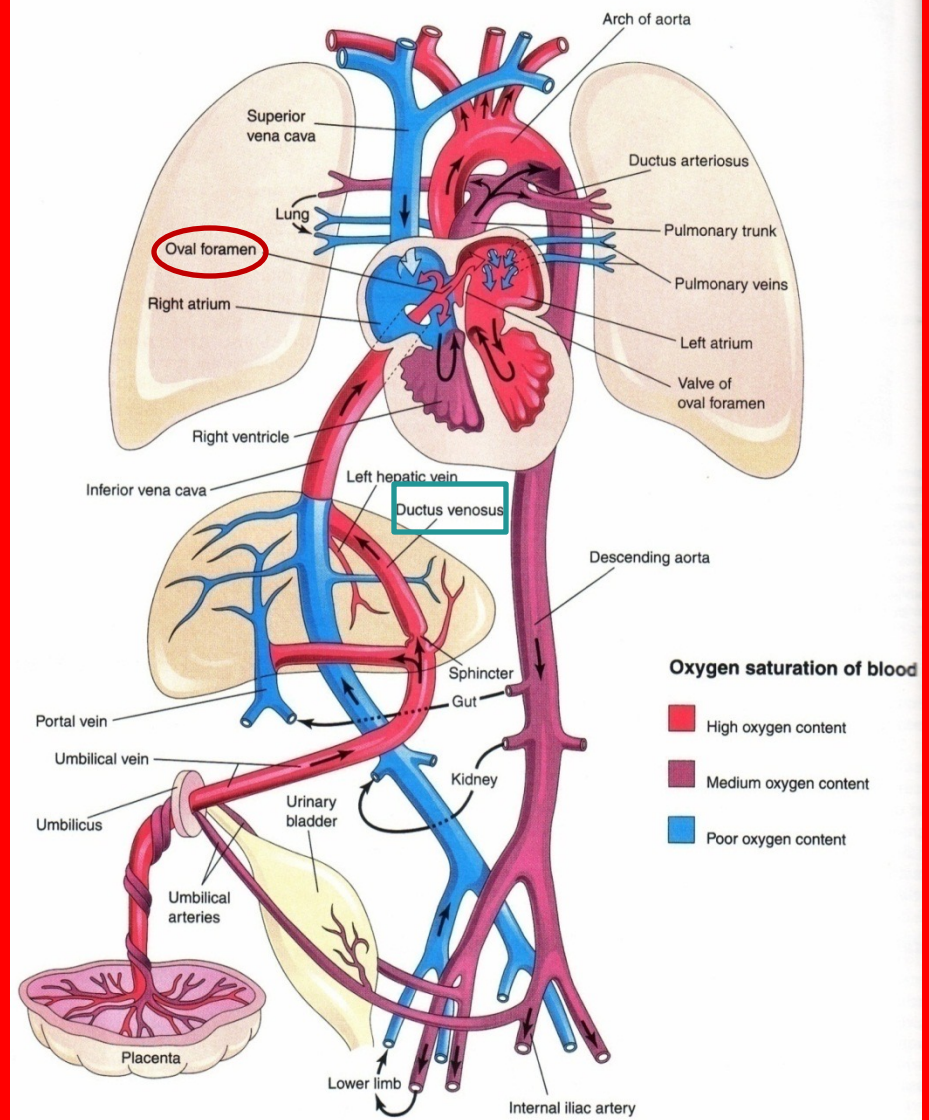
- **Highly oxygenated** blood passes from the placenta through the **umbilical vein**.
- **Half** of this blood reaches the IVC through the **ductus venosus**.

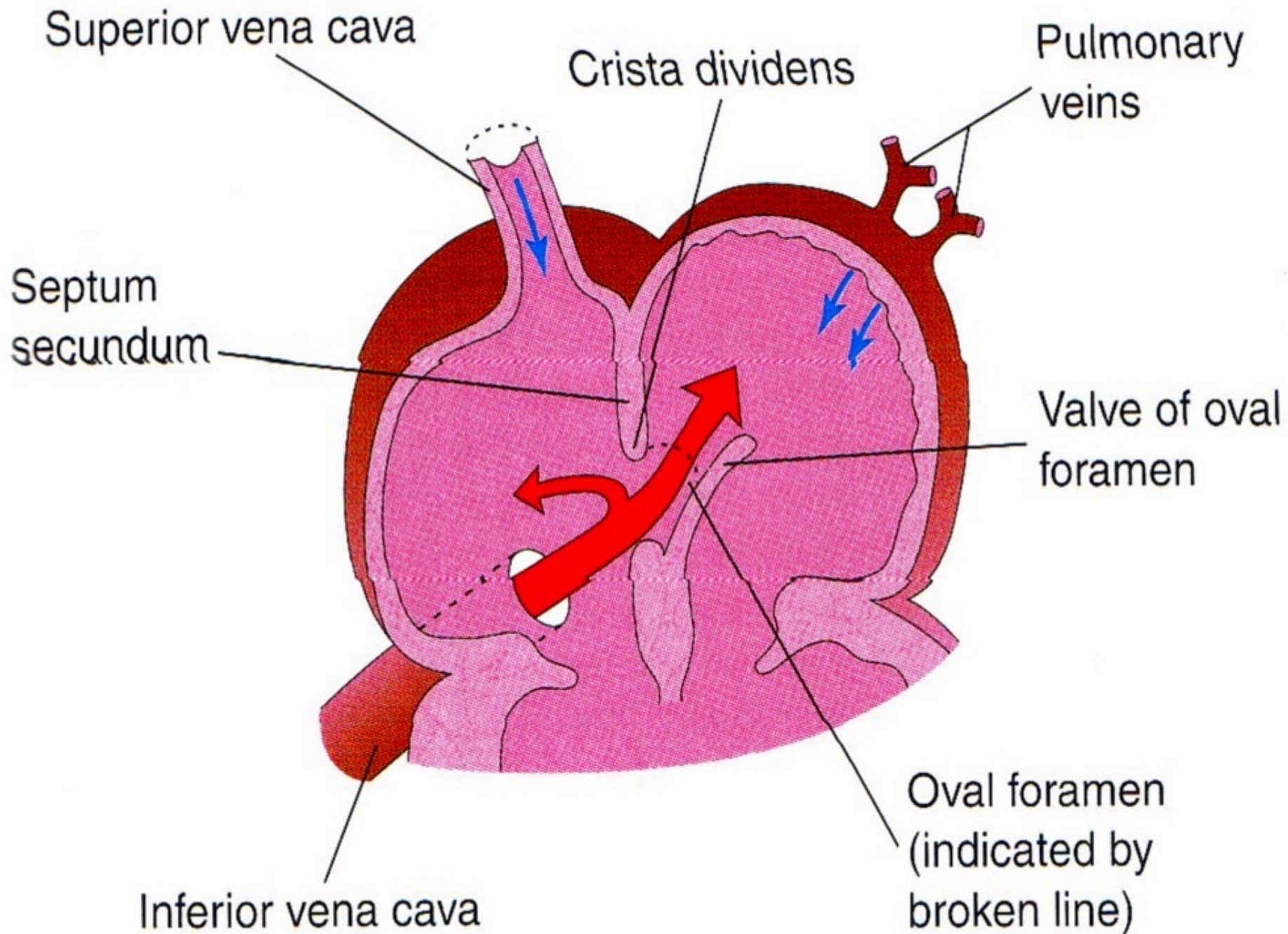
before birth

Ductus venosus



- The other **Half** passes to liver sinusoids then to the IVC.
- Blood of the IVC reaches the right atrium, then left atrium through the **Foramen Ovale**.
- Then to the left ventricle to the ascending aorta, and the aortic arch to supply head & neck brain, cardiac muscle and upper limbs.

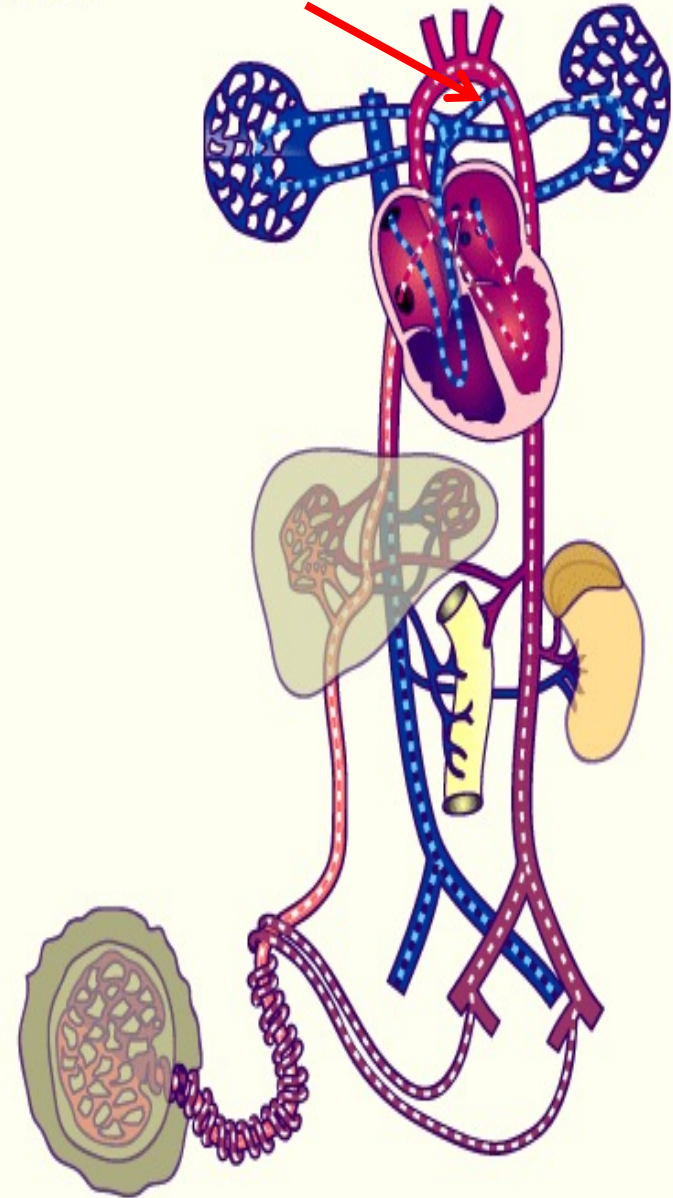




- Small amount of highly oxygenated blood in right atrium mixes with venous blood of the SVC passes to **right ventricle** .
- Then to the pulmonary artery then to **Ductus Arteriosus** (between the left Pulmonary artery & arch of the aorta), to the fetal body.
- Then back to placenta via the **umbilical arteries**.

before birth

Ductus arteriosus

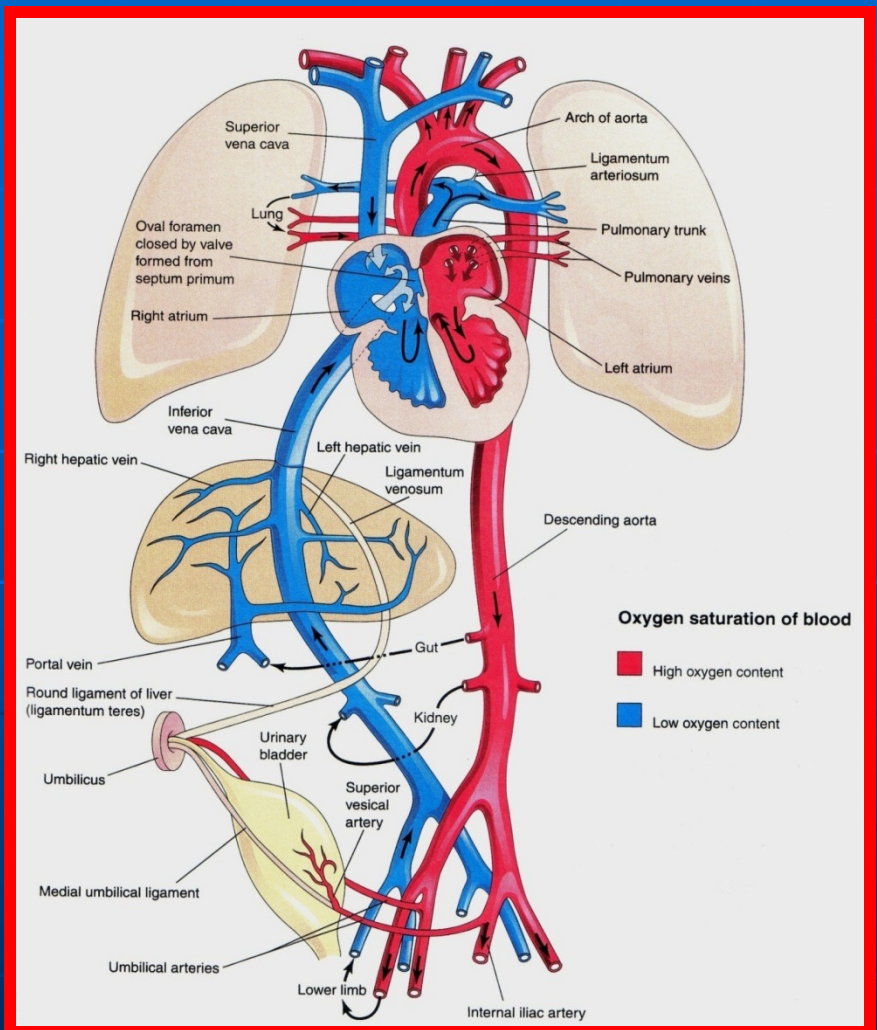


After Ligation of the umbilical cord

- Sudden fall of blood pressure in the IVC and the **right Atrium**.
- 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 ductus is closed.
 - By the end of 48 hours **82%** is closed.
 - By **96 hours** **100%** of the duct is closed

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.

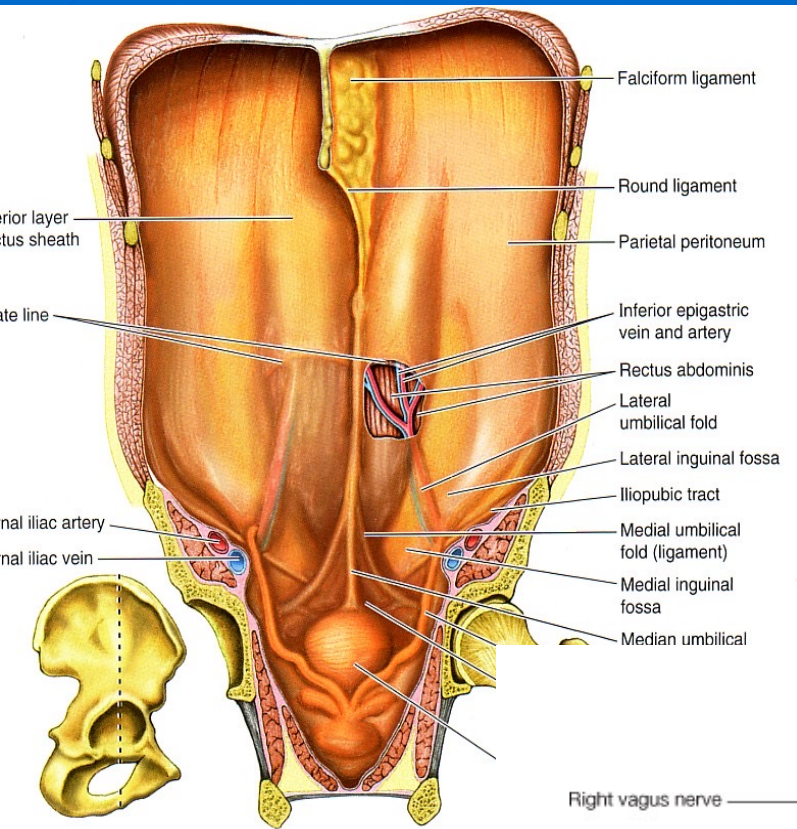
When oxygen tension reaches **50** mmHg in the ductus arteriosus it causes constriction of its smooth muscles.

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

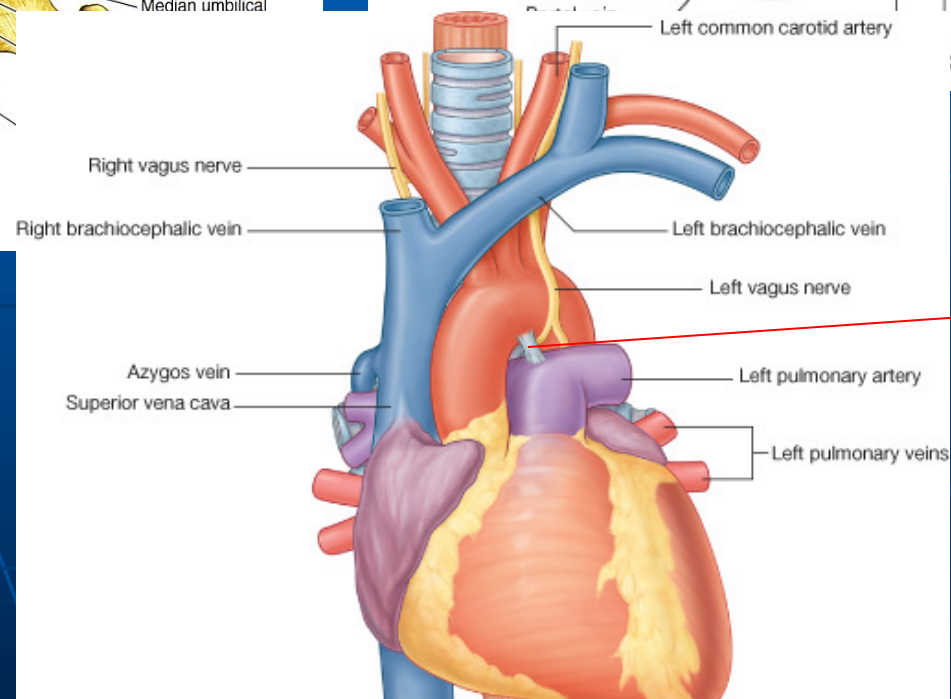
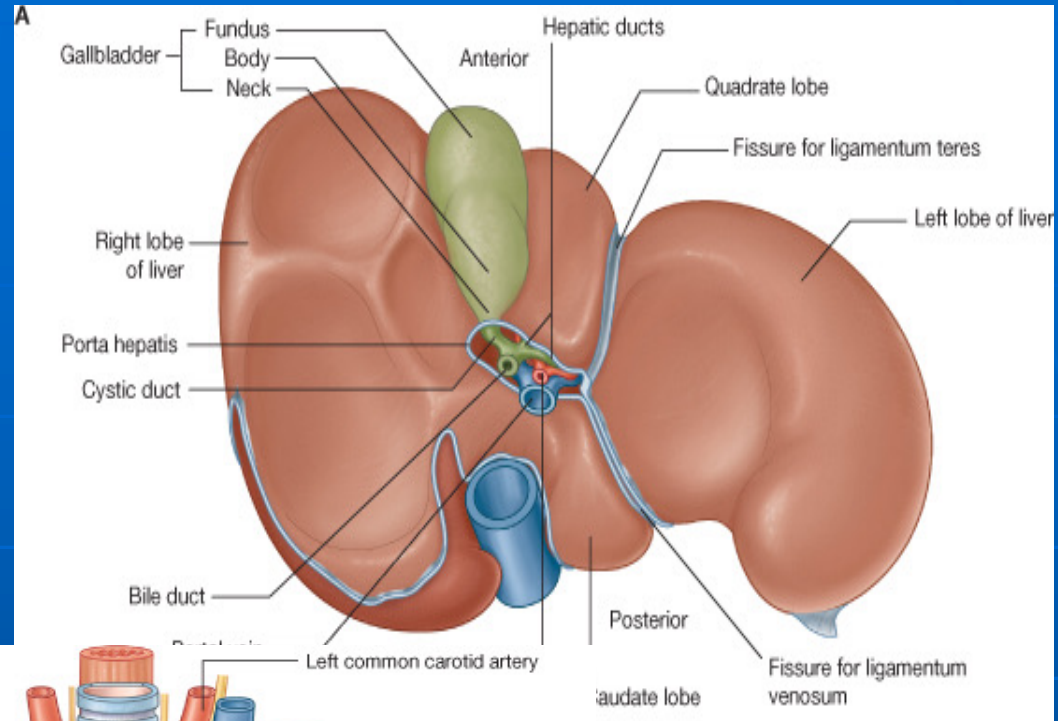
So hypoxia and other ill-defined factors keep the ductus arteriosus patent.

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.



Lateral view of right hip bone showing plane of section in



Ligamentum arteriosum

Thank You