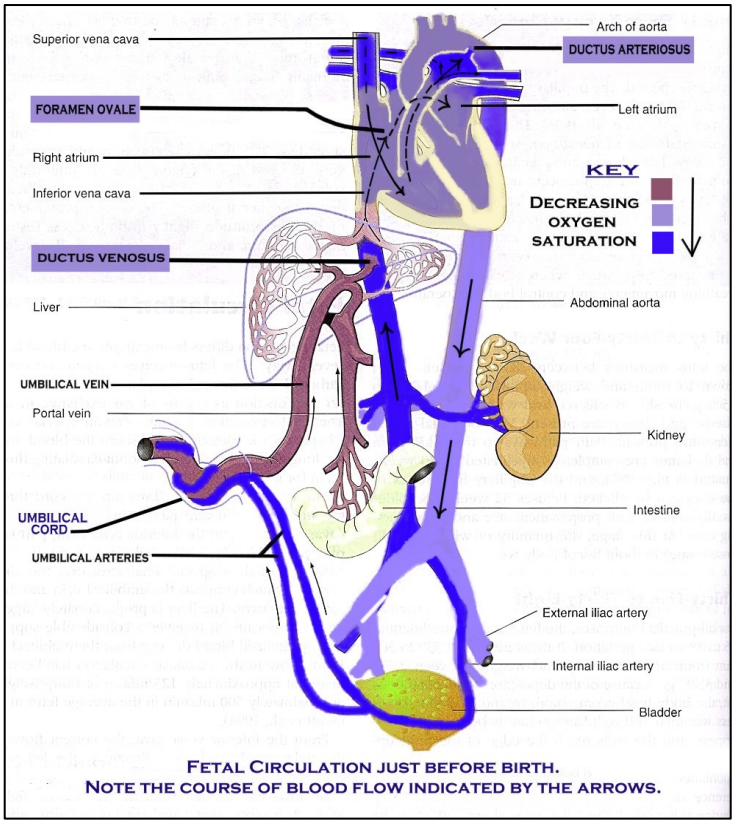
Persistent Fetal Circulation

Anesthetic Pearls: Anesthetic Implications of Persistent Fetal Circulation

Fetal Circulation

- Well-oxygenated blood from placenta and venous blood returning from lower body (IVC to Right Atrium)
- Up to one-half of well-oxygenated blood in umbilical vein goes to **Ductus Venosus** then to IVC (therefore bypassing liver)
- In the Right Atrium, blood from IVC is directed through the **Foramen Ovale** to the Left Atrium
- Left Atrial blood goes to the Left Ventricle and then to the upper body, brain, and heart.
- Poorly oxygenated blood from upper body goes to the SVC then the Right Atrium then to the Right Ventricle
- RV blood goes to the pulmonary artery (high PVR) then to the **Ductus Arteriosus** to the descending aorta to the placenta and lower body
- Parallel circulation: unequal ventricular flows - RV ejects 2/3 ventricular output; LV ejects 1/3 output.



At Birth

1. Lung expansion leads to and increase in alveolar and arterial 0_2 tension which decreases PVR.
2. Increase in pulmonary blood flow + augmented flow to left heart lead to an increase in left atrial pressure which causes a **functional closure of foramen ovale**.
3. An increase in arterial oxygen tension leads to the **functional closure of ductus arteriosus.**
4. Overall result: elimination of right -> left shunt which starts the process of adult circulation.
   - Anatomic closure of ductus arteriosus: ~ 2 wks
   - Anatomic closure of foramen ovale: months to years

Persistent Fetal Circulation

- **Hypoxia, acidosis, hypercarbia, and hypothermia** - prevent or reverse physiologic changes, resulting in return to fetal circulation
- Other causes: congenital heart disease (VSD, PDA), diaphragmatic hernia, prematurity
- Vicious cycle develops with a R-to-L shunt which promotes hypoxemia, de-saturation, and acidosis
- Results in fetal demise if not corrected.