**Fetal Circulation**

The cardiovascular system starts early in the embryonic stage of development and commences at the closure of the third week in the first trimester or at the start of the time of fetal development (Vrachnis et al., 2013). Once established, blood circulation starts where the embryo can obtain nutrients from its blood. Fetal circulation establishes within the womb during the early phases of development, hence enabling the growing fetus to have the needed oxygen, nutrients and removal of wastes. This type of circulation differs from post-natal circulation since in fetal circulation the umbilical cord plus the placental blood vessels carry fetal blood from the fetus through the placenta (Nguyen et al., 2013). It is established in the fetal stage of development and is made to provide prenatal nutritional needs and allow the switch through a neonatal circulatory pattern during birth. A neonate’s respiration depends on the circulatory changes during birth that lead to oxygenation of blood in the lungs when the fetal blood flow via the placenta ceases.

The rationale for this discourse is to explain the process of fetal circulation, and in particular, identify the processes that take place in the umbilical cord and the final circulatory circuit and the changes after birth.

**The Fetal Circulatory System**

The fetal circulatory system uses two shunts, the left plus right shunt that are tiny openings which direct blood for deoxygenation. The shunts help bypass some organs in the body such as the liver and the lungs that are not completely developed when the fetus in the womb (Ahmed et al., 2018). Foramen ovale are shunts that bypass the lungs, and they help transport blood to the left atrium through the heart’s right atrium to the ductus arteriosus that transports blood to the aorta via the pulmonary artery.

Nutrients, as well as oxygen from the mother’s blood, are carried to the developing fetus through the placenta. Here, blood moves to the liver via the umbilical cord and then divides into tri branches. Next, the blood enters the inferior vena cava, a primary vein joined to the heart. A large portion of the blood is then pumped via the ductus venosus, a shunt which carries blood rich in oxygen to the inferior vena cava through the liver and also to the right atrium. However, a small portion of such blood is taken to the liver to supply oxygen as well as the nutrients it may need. Wastes from the fetus are moved to the mother’s blood via the placenta (Vrachnis et al., 2013).

Blood enters inside the fetal heart to the right atrium, found on the upper region of the heart. After the blood reaches this chamber, a great portion of it runs via the foramen ovale into the next chamber, the left atrium. What follows is that blood goes into the left ventricle and to the aorta. Blood is then sent from the aorta to the heart muscle and to the fetus brain. Following circulation in these regions, blood goes back to the right atrium via the superior vena cava. About two-thirds of the blood passes via the foramen ovale and the remaining one-third passes into the right ventricle to the fetal lungs.

While in the fetus, the placenta helps in breathing instead of the lungs hence the reason a small portion of blood is continuous flowing into the lungs (Ahmed et al., 2018). A large portion of this blood is moved from the lungs via the ductus arteriosus to the aorta. However, it should be noted that most of the circulatory to the lower body is enabled by the blood flowing via the ductus arteriosus. Next, the blood enters the umbilical cord where it then flows into the placenta where carbon IV oxide, as well as wastes, are expelled into the mother’s circulatory system (Vrachnis et al., 2013). At the same time, nutrients and oxygen in the mother’s blood are transported into the fetus.

After birth, clamping of the umbilical cord is done and the baby does not receive nutrients as well as oxygen from the mother. At her first breath, the lungs start to enlarge and the alveoli found in the lungs get cleared of fluid. When the blood pressure of the baby increases and the pulmonary pressure lowers, there is reduced need for the arteries to shunt blood (Nguyen et al., 2013). Such changes after birth lead to the closure of the shunt. Also, the changes raise the pressure in the baby’s left atrium with a decline in pressure in the right atrium. A change in pressure causes the foramen ovale to close.  According to Ahmed et al., (2018), the closure of the foramen ovale plus the ductus arteriosus completes the transition from fetal circulation to a newborn circulation.

Conclusion

It has been noted that in fetal circulation, the lungs do not help in gaseous exchange plus the pulmonary vessels are vasoconstricted. As a substitute, the placenta helps in gaseous exchange to provide the fetus with blood rich in oxygen. The common vascular systems that are used in the fetal transitional circulation include the foramen ovale and the ductus venosus/arteriosus.

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