***Development of placenta, membranes, amniotic fluid, Umbilical cord and Fetal Circulation***

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**Development Of Placenta, Membranes Amniotic Fluid And Umbilical Cord**

***Placenta:***

Three weeks after fertilization, projections from the trophobiastic layer proliferate and branch, forming the chorionic villi.

The villi become most profuse in the *basal decidus* where the blood supply is richest.

This part is known as *chorion frondosum* and will develop into the placenta *.The placenta is completely formed and functioning from 10-12 weeks after fertilization.*

**Functions of the Mature Placenta**

***1.Respiration:*** The fetus obtains oxygen and excretes carbon dioxide through the placenta.

Oxygen from the mother's hemoglobin passes into the blood and carbon dioxide from fetal blood passes into the maternal blood by simple diffusion.

**2. *Nutrition:***

Food for the fetus comes from the mother's diet, which has been broken down into simple form.

***3.Storage:***The placenta metabolizes glucose, stores it in the form of glycogen and reconverts it to glucose as required. It also stores iron, fat and soluble vitamins.

***4- Excretion***

Carbon dioxide is the main substance excreted from the fetus.Bilirubin & very small amounts of urea and uric acid are also excreted.

***5- Protection*** :The placenta provides a limited barrier to infection. Few bacteria for example Treponema Pallidum of syphilis and the Tubercle bacilli can cross the placenta.Parasite (*Toxoplasma-gondii* )

* Rubella ,cytomegalo virus, can cross the placental membrane and enter the fetal system and cause fetal death or defects and some drugs cross to the fetus except heparin.

Small antibodies are transferred to the fetus and give immunity to the baby for the first 3 months after birth.

***6. Endocrine:***

Human chorionic gonadotrophin (HCG) forms the basis or pregnancy tests it is excreted in the mothers urine.

Its function is to stimulate the growth and activity of the corpus luteum.

Oestrogens are produced by the placenta.

The amount of oestrogen produced is an index of fetoplacental wellbeing.

• Progesterone is secreted by the placenta in large amounts until it falls before the onset of labour.

• Human placental lactogen (HPL) has a role in glucose metabolism in pregnancy and the activity of human growth hormone.

***The Placenta at Term***

The placenta is a round, flats mass, about 20 cm in diameter and 2.5 cm thick at its center.

It weights ***one-sixth*** of the baby's weight at term and has two surfaces.

1. ***The Maternal Surface***

The maternal surface: this surface is dark red in colour. The chorionic villi are arranged in about 20 lobules known as cotyledons, which are separated by sulci each cotyledon contains a single villus with its branches.

1. ***The Fetal surface***

The amnion covering the fetal surface gives it a white, shiny appearance. Branches of the umbilical vein and arteries are visible, spreading out from the insertion of umbilical cord (normally the center).

Membranes form the fetal sac, which protects the fetus against ascending bacteria! infection.

It consists of a double membrane chorion and amnion.

**• *Chorion.*** Which lies under the capsular decidua and adheres to the uterine wall.

**• *Amnion.*** The inner membrane, which contains the amniotic fluid. It is a smooth, tough, translucent

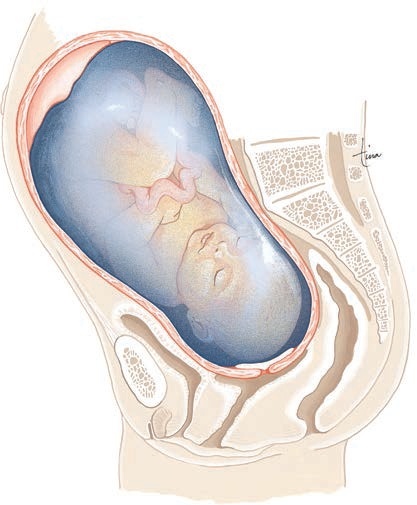
membrane derived from the inner cell mass.

**Amniotic Fluid**

Origin Amniotic fluid is the fluid contained within the amniotic sac is clear and is mainly composed of water.It also contains proteins, carbohydrates, lipids, electrolytes, fetal cells, lanugo, and vernix caseosa.

■ Amniotic fluid during the first trimester is produced from the amniotic membrane. During the second trimesters, the fluid is produced by the fetal kidneys.

Fetal urine also contributes to the volume from the 10th week of pregnancy.



**Function of Amniotic Fluid**

* Acts as a cushion for the fetus when there are sudden maternal movements
* Prevents adherence of the developing human to the amniotic membranes
* Allows freedom of fetal movement, which aids in symmetrical musculoskeletal development
* Provides a consistent thermal environment

**Polyhydramnios or hydramnios**

amniotic fluid (1,500–2,000 mL). Newborns of mothers have an increased incidence of chromosomal disorders and gastrointestinal, cardiac,and/or neural tube disorders.

**Oligo hydramnios**

Amniotic fluid (<500 mL at term or 50% reduction of normal amount), which is generally related to a decrease in placental function. Newborns of mothers have an increased incidence of congenital renal problems.

**Umbilical Cord**

* Connects the fetus to the placenta Consist of two umbilical arteries and one umbilical vein
* *Arteries carry deoxygenated blood.*
* *The vein carries oxygenated blood.*
* ■ The vessels are surrounded by **Wharton’s jelly, a collagenous** substance, which

protects the vessels from compression. Usually inserted in the center of the placenta. Average length of the cord is 55 cm.



The Fetal Circulation

1. The fetus receives oxygen through the placenta because its lungs do not function as organs of respiration in the uterus.

2. The fetal circulation contains certain special vessels that shunt the blood around the lungs, with only a small amount circulating through them for nutrition.

3. The oxygenated blood flows up the cord through the umbilical vein and passes in to the inferior vena cava, part of the oxygenated blood goes through the liver, but most of it passes through a special fetal structure.

4. The ductus venosus, which connects the umbilical vein and inferior vena cava.

5. The blood flows in the umblical circulation has been estimated at approximately 125 ml/kg of body weight.

6. From the inferior vena cava, the current flows into the right auricle and goes directly on to the left auricle through a special fetal structure, the foramen ovale.

7. It flows into the left ventricle and out through the aorta.

8. The blood that circulates up the arms and head returns through the superior vena cava to the right auricle again, but instead of passing through foramen ovale as before, the current is deflected downward into the right ventricle and through the pulmonary arteries.

Part of it goes to the lungs (for purpose of nutrition only), but most of it goes into the aorta through the ductus arteriosus.

9. The blood in the arota, with the exception of that which goes to the head and upper extremities ( blood has been accounted for) passes downward to supply the trunk and the lower extremities .

Most of this blood finds its way through the internal iliac, or hypogastric arteries and back to the cord to the placenta, where it is again oxygenated, but a small amount passes back into the ascending vena cava to mingle with fresh. blood from the umbilical vein and again makes the circuit of the entire body.

**CHANGES IN FETAL CIRCULATION PATH  
AFTER BIRTH**

Umbilical vein and umbilical arteries

**Before Birth**

Brings arterial blood to liver and heart brings arterio

venous blood to placenta

**After Birth**

Obliterated; becomes round ligaments on anterior abdominal wall.

Ductus venous

**Before Birth**  
Shunts arterial blood into inferior vena cava

**After Birth**  
Obliterated: becomes ligamentum venosum

Ductus arterious

**Before Birth**

Shunts arterial and some venous blood from pulmonary artery to aorta.

**After Birth**

Obliterated; becomes Ligamentum arteriosum

Foramen ovale

**Before Birth**

Connects right& left auricles arterial

**After Birth**

Obliterated usually; At times open

Lungs

**Before Birth**   
Contain no air and Very little blood

**After Birth**

Filled with air and well Supplied with blood

Pulmonary arteries

**Before Birth**

Bring little blood to Lungs.

**After Birth**   
Bring much blood to Lungs

Aorta

**Before Birth**

Receives blood from Both ventricles

**After Birth** Receives blood only From left ventricles

inferior vena cava

**Before Birth**

Brings various blood from body & arterial blood from placenta

**After Birth**

Brings venous blood Only to right auricle

**Thank you**