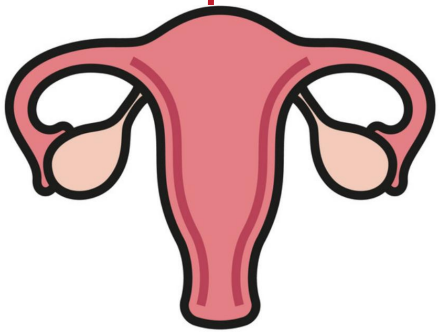
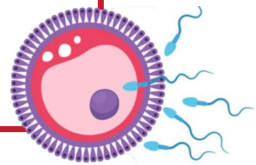


Placenta

Reproductive block-Embryology-Lecture 4

Editing file
Summary file



Color index:

- Girls' slides
- Main content
- Important
- Boys' slides
- Extra
- Drs' notes

Objectives

At the end of the lecture, students should be able to:

- Identify nothing because there is no objectives in the Dr's lectures
- There is also nothing here but we want to fill the space
- It is worth noting that, this lecture was done while coronavirus pandemic 
- I would like to thank the batch and academic leaders for their hard working in these two years
- Free space for adding any things

Useful Links:

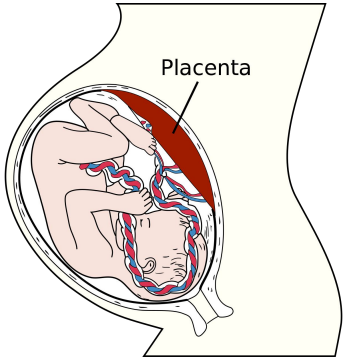
- Amboss

Placenta

Introduction

- It is a fetomaternal structure.
- Formed by the beginning of the 4th month. and by the end of the 4th month a complete vascular network in placenta is established (after degenerate of corpus luteum which provides nutrition in the first 4 months)
- It is the primary site for exchange of gases and nutrients between mother and fetus
- Full term placenta shows: Discoid in shape, **Weighs** (500 – 600)g, **Diameter** 15-25 cm, **Thickness** 2-3 cm.
- Umbilical cord is attached to the center.
- It has two surfaces: Fetal & Maternal.

Fate of placenta : Within 15 minutes after birth of the infant, the strong uterine contractions that continue after birth compress uterine blood vessels to limit bleeding & cause the placenta to detach from the uterine wall. Surgeon must make sure all the placental pieces have been removed to avoid postpartum hemorrhage



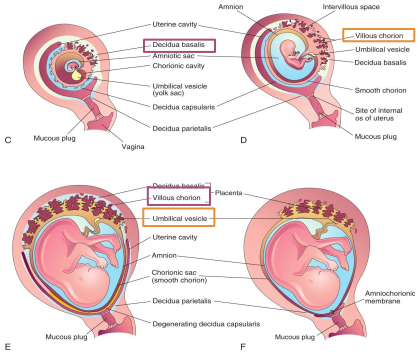
Formation

Fetal Part

- Villous Chorion. which attach to endometrium (3rd stage villi)
- It is the bushy area at the embryonic pole (area where implantation starts).
- Its villi are more in number, enlarged and branch profusely.

Maternal Part

- Decidua Basali (part of the decidua deep to the conceptus.) No implantation happens here
- By the end of 4th month, the decidua basalis is replaced by the fetal component of the placenta.
- Decidua (Gravid Endometrium): It is the functional layer of the endometrium during pregnancy which is shed after parturition (Decidua is latin for "falling down").
- Villi are less in number, smaller, and less branched



Placenta

Placental externally

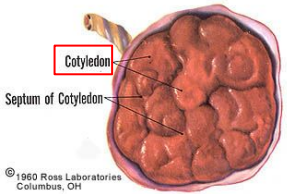
Surfaces

Fetal Surface

- Smooth because it is covered with the amnion.
- Developed from chorionic sac.
- The umbilical cord is attached to its center.
- The chorionic vessels are radiating from the umbilical cord.

FETAL SURFACE OF PLACENTA

MATERNAL SURFACE OF PLACENTA



Maternal Surface

- Rough.
- Derived from endometrium.
- Formed of (15 –20) irregular convex areas (Cotyledons) which are separated by grooves (placental septa).
- Each cotyledon is covered by a thin layer of decidua basalis at the endometrial side.

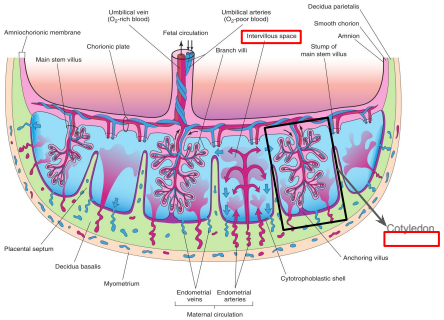
Placental internally

Structure of a Cotyledon

- It consists of two or more stem villi with their many branch villi.
- It receives (80-100) maternal spiral arteries that enter the intervillous spaces (between cotyledons) at regular intervals.

Intervillous Space

- Large blood filled spaces which are freely communicating.
- They receive spiral arteries from the lacunae in the **syncytiotrophoblast**.
- The spaces are drained through endometrial veins.
- Both arteries and veins pass through pores in the **cytotrophoblastic shell.**
- the blood comes from the mother enters the this space for the exchange



Placental circulation

Umbilical cord is made up of Two Umbilical arteries & One Umbilical vein

Fetal placental circulation

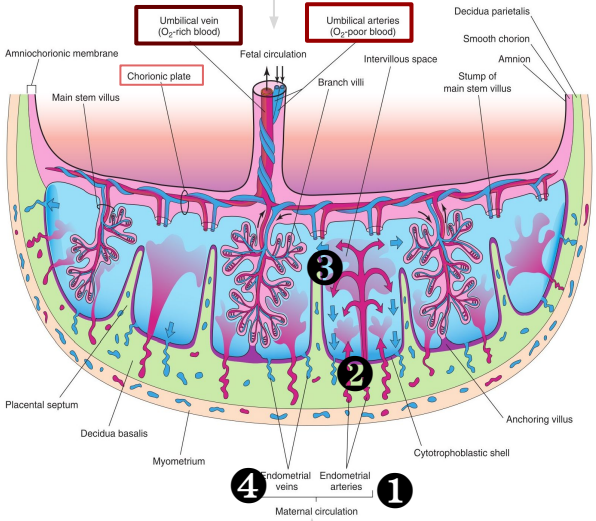
Two Umbilical Arteries:

1. Carry poorly oxygenated (an exception for arteries) blood from the fetus to the placenta.
2. Within the branch chorionic villi, they form:

Arterio-capillary venous network:

- It brings the fetal blood extremely close to the maternal blood.
- The well oxygenated fetal blood in the capillaries passes into veins accompanying the chorionic arteries.

At the umbilical cord, they form the **One Umbilical Vein.** Which leave the placenta back to the fetus



1. 80 –100 spiral endometrial arteries discharge into the intervillous space.
2. The blood is propelled in jet like (not continuous, like a fountain) fountains by the maternal blood pressure.
   - Now the pressure of this entering blood is higher than that in the intervillous space.
   - It forms a roof of the space.
3. As the pressure dissipates, the blood flows slowly around the branch villi.
   - Exchange of metabolites and gases with the fetal blood.
4. As the pressure decreases, the blood flows back from the chorionic plate and enter the endometrial veins to the maternal circulation.

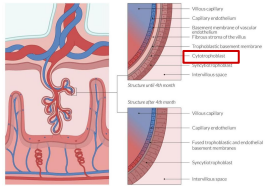
Maternal placental circulation

Placental Membrane

- It is a composite thin membrane of extra fetal tissues which separates the fetal and maternal bloods.
  It makes up the wall of the villi, everything needs to pass through it.

Upto (20) weeks
it is composed of four layers
which lead to relatively slow diffusion:

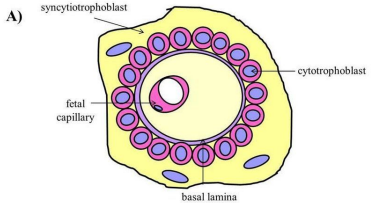
1. Syncytiotrophoblast outer layer, attached to endometrium with unclear cell borders
2. Cytotrophoblast. separated cells with clear borders
3. Connective tissue of the villus
4. Endothelium of fetal capillaries

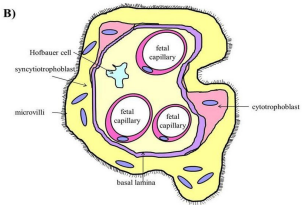


At full term
it becomes thinner and composed of three layers only
due to loss of cytotrophoblasts for faster diffusion:

1. Syncytiotrophoblast
2. Connective tissue of the villus
3. Endothelium of fetal capillaries

At some sites, the syncytio comes in direct contact with the endothelium of the capillaries without CT in between and forms Vasculo syncytial placental membrane.





Functions of placenta

Has there main function

1. Metabolic

Synthesis of:

- Glycogen
- Cholesterol
- Fatty Acids

which supply the fetus with nutrients and energy. without need of a maternal source

2. Transportation of:

A) Gases:

- Exchange of O2, CO2 and CO is through simple diffusion due to ↑ maternal pressure, except in cases of anemia or circulatory disorder.
- The fetus extracts (20 –30) ml of O2/minute from the maternal blood

B) Drugs and Drug metabolites:

- They cross placenta by simple diffusion.
- They can affect the fetus directly or indirectly by interfering with placental metabolism. e.g. sedatives, anti epileptic, antidepressants.

C) Maternal Antibodies:

Maternal immunoglobulin G gives the fetus passive immunity to some infectious diseases (measles, small box) and not to others (chicken box). The measles vaccine is taken 9 months after birth when the maternal antibodies can no longer provide protection for the baby.

D) Hormones:

Protein hormones do not reach the embryo in sufficient amounts. some of these hormones (Thyroxine & Testosterone which may cause masculinization of a female fetus) can cross the placental membrane.

E) Waste products:

Urea and uric acid pass through the placental membrane by simple diffusion. from the baby

F) Nutrients and Electrolytes:

Water, Amino acids, Carbohydrates, Vitamins and Free Fatty Acids are rapidly transferred to the fetus. from the mother

3. Endocrine Synthesis:

(1) Progesterone: Maintains pregnancy if the corpus luteum is not functioning well Abortion in the first 4 months is usually due to corpus luteum abnormality, after that the placenta is responsible for keeping the pregnancy

(2) Estrogen: Stimulates uterine growth and development of the mammary glands. Feminization of Ext. genitalia

(3) Human chorionic somatotropin (HCS) or Hpl: A growth hormone that gives the fetus the priority on maternal blood glucose. It promotes breast development for milk production

(4)Human chorionic gonadotropin (HCG): Maintains the corpus luteum and used as indicator of pregnancy.

Anomalies Of Placenta

Placenta Accreta

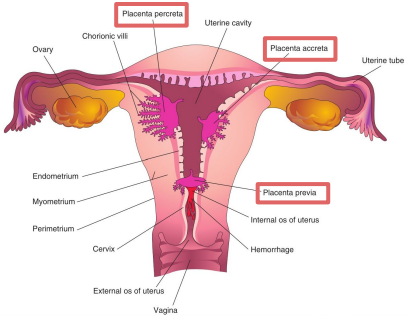
- Abnormal absence of chorionic villi with partial or complete absence of the decidua basalis. No placenta, due to loss of fetal or maternal part
  Show: **early** bleeding & abortion

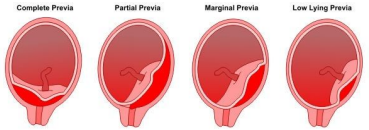
Placenta Percreta

- Chorionic villi penetrate the myometrium to the perimetrium therefore no nutrients would be available for developing embryo from the endometrium.
- The most common presenting sign of these two anomalies is trimester bleeding (**early** bleeding & abortion).

Placenta Previa

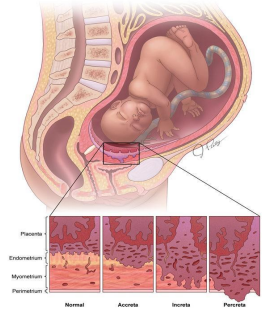
- Most common anomaly, normal placenta in an abnormal location (lower uterine segment)
- The blastocyst is implanted close to or overlying the internal uterine os.
- It is associated with **late** pregnancy bleeding.
- Delivery is through Cesarean section to remove the fetus before the placenta, or else hypoxia would occur to the fetus if the placenta is removed first.





Effect Of Maternal Drugs On Fetus

- Fetal drug addiction can be due to some drugs as Heroin.
- All sedatives and analgesics can affect the fetus to some degree. so it's avoided in C-section
- Drugs used for management of labor can cause respiratory distress to the newborn (hypoxia), mental retardation



Answers: [Q1:C] [Q2:C] [Q3:B] [Q4:A] [Q5:B] [Q6:D] [Q7:B] [Q8:B]

QUIZ

Q1: Which of the following layers mostly disappears in full term placenta

A. syncytiotrophoblast

B. Endothelium of fetal capillaries

C. Cytotrophoblasts

D. Connective tissue of the villi

Q2: Which of the following Anomalies is associated with late pregnancy bleeding

A. Placenta Accreta

B. Placenta Percreta

C. Placenta Previa

D. Placenta increta

Q3: fetal surface of placenta Derived from.....

A. endometrium

B. chorionic sac

C. Yolk sac

D. Connective tissue of the villus

Q4: placenta can synthesis .....

A. Glycogen

B. Collagen

C. amino acid

D. protein

Q5: which of these hormone Maintains the corpus luteum

A. hCS

B. hCG

C.Progesterone

D. Estrogen

Q6: The most common presenting sign of Placenta Percreta

A. anal bleeding

B. pain in the abdomen

C. blood in urine

D. trimester bleeding

Q7: the Umbilical Arteries carry

A. deoxygenated blood

B. poorly oxygenated blood

C. highly oxygenated blood

D. mixed blood

Q8: Each Cotyledon contains

A. one or more stem vill

B. two or more stem vill

C. only two stem vill

D. at least three stem vill

Members board

This amazing lecture was originally done by 438's team

Team leaders

- Abdulrahman Shadid
- Ateen Almutairi

Member

Salman Alagla
Sameh nuser

Edited by 439's team

Team leaders

- Mohammed Alshunaif

Sarah AlQuwayz

Note Taker

Bushra Abdulaziz

Ghada Alothman

Member

Saad Aldohaim

Reviser

Mayasem Alhazmi