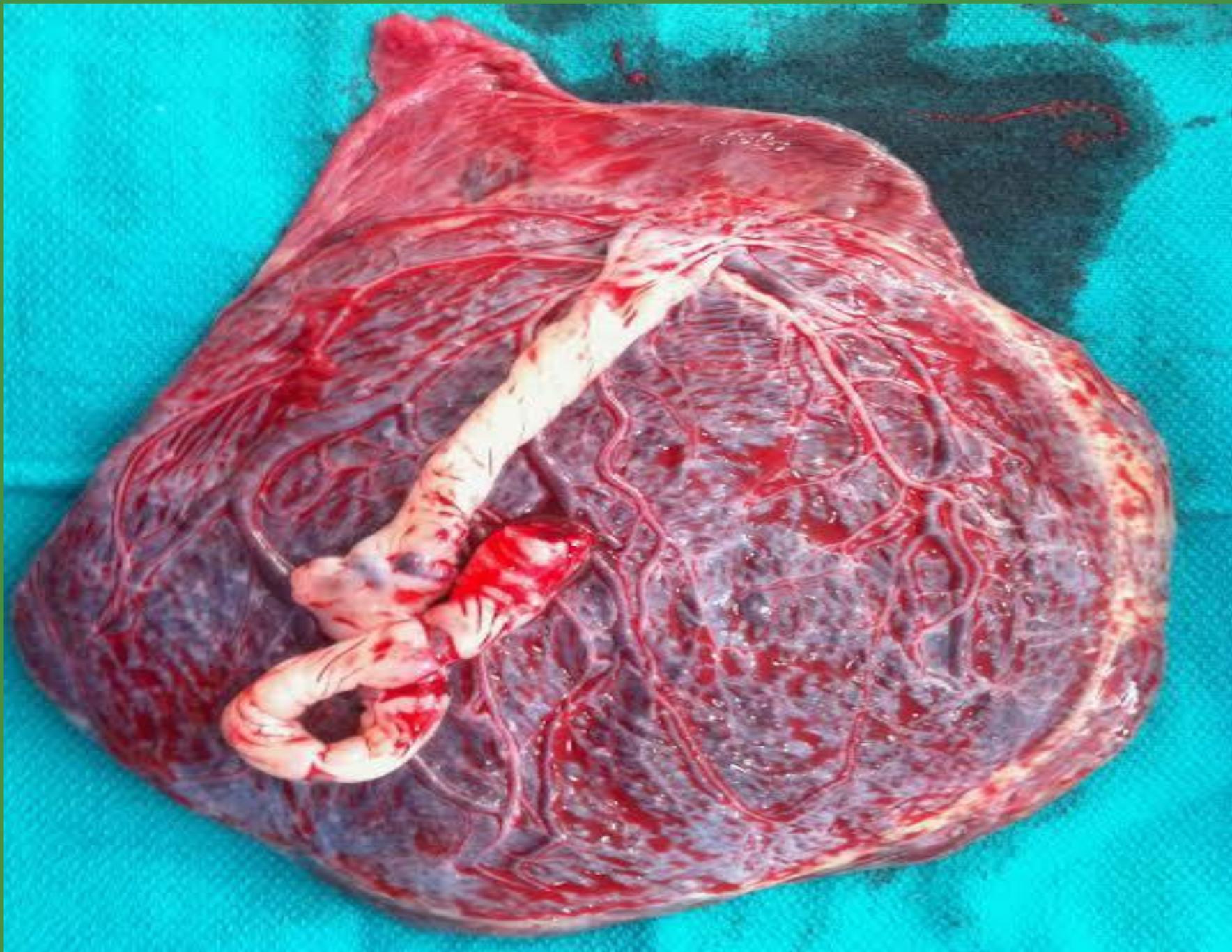


PLACENTA



**PRESENTED BY:-
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- The Placenta Origin
- The placenta develops from the chorion frondosum (foetal origin) and decidua basalis (maternal origin). Anatomy at term:
 - * Shape: discoid. Diameter: 15-20 cm. Weight: 500 gm.
 - * Thickness: 2.5 cm at its center and gradually tapers towards the periphery.
 - * Position: in the upper uterine segment (99.5%), either in the posterior surface (2/3) or the anterior surface (1/3).

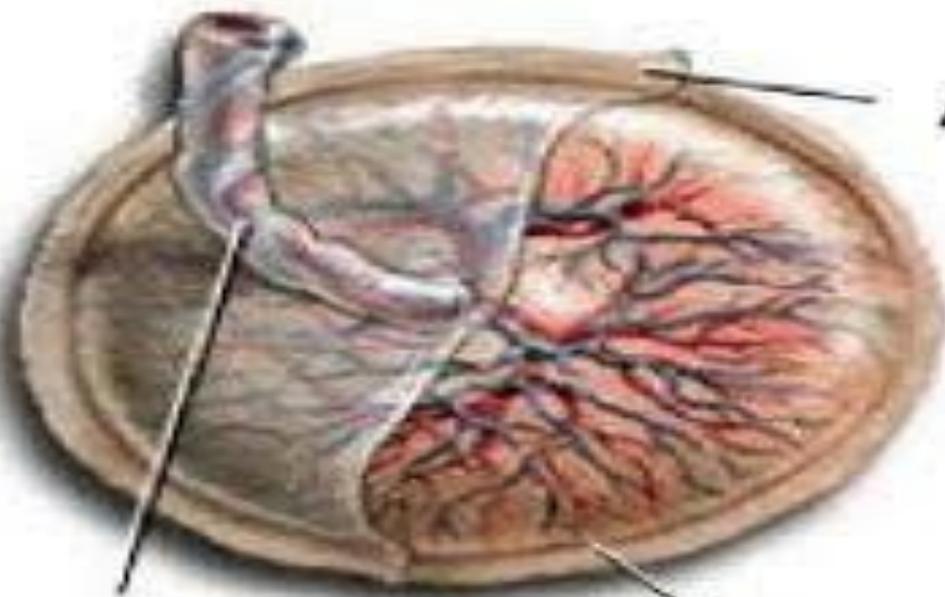


- Surfaces:

- * Foetal surface: smooth, glistening and is covered by the amnion which is reflected on the cord. The umbilical cord is inserted near or at the center of this surface and its radiating branches can be seen beneath the amnion.

- * Maternal surface: dull greyish red in colour and is divided into 15-20 cotyledons. Each cotyledon is formed of the branches of one main villus stem covered by decidua basalis.

Fetal surface



Amnion

**Umbilical
cord**

Chorion

Maternal surface



Functions of the Placenta

- Respiratory function
- O₂ and CO₂ pass across the placenta by simple diffusion. The foetal haemoglobin has more affinity and carrying capacity than adult haemoglobin. 2,3 diphosphoglycerate (2,3-DPG) which competes for oxygen binding sites in the haemoglobin molecule, is less bounded to the foetal haemoglobin (HbF) and thereby allows a greater uptake of O₂ (O₂ affinity). The rate of diffusion depends upon:
 - * maternal/foetal gases gradient.
 - * maternal and foetal placental blood flow.
 - * placental permeability.
 - * placental surface area.

- Nutritive function
- The transfer of nutrients from the mother to the foetus is achieved by:
 - * Simple diffusion: e.g. water and electrolytes.
 - * Facilitated diffusion: e.g. glucose.
 - * Active diffusion: e.g. aminoacids.
 - * Pinocytosis: e.g. large protein molecules and cells.

- **Excretory function**

- Waste products of the foetus as urea are passed to maternal blood by simple diffusion through the placenta.
- Production of enzymes E.g. oxytocinase, monoamino oxidase, insulinase, histaminase and heat stable alkaline phosphatase.
- Production of pregnancy associated plasma proteins (PAPP)
E.g. PAPP-A, PAPP-B, PAPP-C, PAPP-D and PP5. The exact function of these proteins is not defined.

- **Barrier function**

- The foetal blood in the chorionic villi is separated from the maternal blood, in the intervillous spaces, by the placental barrier which is composed of:
 - * endothelium of the foetal blood vessels,
 - * the villous stroma,
 - * the cytotrophoblast, and
 - * the syncytiotrophoblast.
- However, it is an incomplete barrier. It allows the passage of antibodies (IgG only), hormones, antibiotics, sedatives, some viruses as rubella and smallpox and some organisms as *treponema pallida*. Substances of large molecular size as heparin and insulin cannot pass the placental barrier.

• Endocrine function

* Protein hormones:

Human chorionic gonadotrophin (hCG):

It is a glycoprotein produced by the syncytiotrophoblast.

It supports the corpus luteum in the first 10 weeks of pregnancy to produce oestrogen and progesterone until the syncytiotrophoblast can produce progesterone.

HCG molecule is composed of 2 subunits:

alpha subunit which is similar to that of FSH, LH and TSH.

beta subunit which is specific to hCG.

HCG rises sharply after implantation, reaches a peak of 100000 mIU/ml about the 60th day of pregnancy then falls sharply by the day 100 to 30000 mIU/ml and is maintained at this level until term.

Estimation of beta-hCG is used for:

diagnosis of early pregnancy.

diagnosis of ectopic pregnancy.

diagnosis and flow-up of trophoblastic disease.

Human placental lactogen (hPL):

It is a polypeptide hormone produced by the syncytiotrophoblast.

The supposed actions of hPL include:

lipolysis: increasing free fatty acids which provide a source of energy for mother and foetal nutrition.

inhibition of gluconeogenesis: thus spare both glucose and protein explaining the anti-insulin effect of hPL.

somatotrophic: i.e. growth promotion of the foetus due to increased supply of fatty acids, glucose and amino acids.

mammatropic and lactogenic effect.

HPL can be detected by the 5-6th week of pregnancy, rises steadily until the 36th week to be 6m g/ml.

Its level is proportional to the placental mass.

Human chorionic thyrotrophin (hCT):

No significant role has been established for it, but it is probably responsible for increased maternal thyroid activity and promotion of foetal thyroid development.

Hypothalamic and pituitary like hormones:

e.g. gonadotropin releasing hormone (GnRH), corticotropin releasing factor (CRF), ACTH and melanocyte stimulating hormone.

Others as inhibin, relaxin and beta endorphins.

Steroid Hormones:

Oestrogens:

They are synthesized by syncytiotrophoblast from their precursors dehydroepiandrosterone sulphate (DHES) or its 16 α -hydroxy (16 α -OH-DHES).

- Near term, 50% of DHES is derived from the foetal adrenal gland and 50% from maternal adrenal. It is transformed in the placenta into oestradiol-17 β (E2).
- On the other hand, 90% of 16 α -OH-DHES is derived from foetal origin after hydroxylation of DHES in the foetal liver, while only 10% is derived from the mother by the same way.
- Oestrogens are excreted in the maternal urine as oestriol (E3), oestradiol (E2) and oestrone (E1). Oestriol (E3) is the largest portion of them.
- Maternal urinary and serum oestriol level is an important index for foetal wellbeing as its synthesis depends mainly on the integrity of the foetal adrenal and liver as well as the placenta (foeto-placental unit).
- Urinary oestriol increases as pregnancy advances to reach 35-40 mg per 24 hours at full term. Progressive fall in urinary oestriol indicates that the foetus is jeopardous.
- Oestrogens are responsible with progesterone for the most of the maternal changes due to pregnancy especially that in genital tract and breasts.

- Progesterone:
- It is synthesized by syncytiotrophoblast from the maternal cholesterol.
- Excreted in maternal urine as pregnandiol.
- Increasing gradually during pregnancy to reach a daily production of 250 mg per day in late normal single pregnancy.
- It provides a precursor for the foetal adrenal to produce glucocorticoids and mineralocorticoids.

Abnormalities of the Placenta

Abnormal Shape

1.Placenta Bilobata: The placenta consists of two equal lobes connected by placental tissue.

2.Placenta Bipartita: The placenta consists of two equal parts connected by membranes. The umbilical cord is inserted in one lobe and branches from its vessels cross the membranes to the other lobe. Rarely, the umbilical cord divides into two branches, each supplies a lobe.

3. Placenta Succenturiata: The placenta consists of a large lobe and a smaller one connecting together by membranes. The umbilical cord is inserted into the large lobe and branches of its vessels cross the membranes to the small succenturiate (accessory) lobe. The accessory lobe may be retained in the uterus after delivery leading to postpartum haemorrhage. This is suspected if a circular gap is detected in the membranes from which blood vessels pass towards the edge of the main placenta.

4. Placenta Circumvallata: A whitish ring composed of decidua, is seen around the placenta from its foetal surface. This may result when the chorion frondosum is too small for the nutrition of the foetus, so the peripheral villi grow in such a way splitting the decidua basalis into a superficial layer (the whitish ring) and a deep layer. It can be a cause of abortion, antepartum haemorrhage, premature labour and intrauterine foetal death.

5. Placenta Fenestrata: A gap is seen in the placenta covered by membranes giving the appearance of a window.

Abnormal Diameter

- Placenta membranacea: A great part of the chorion develops into placental tissue. The placenta is large, thin and may measure 30-40 cm in diameter. It may encroach on the lower uterine segment i.e. placenta praevia.

Abnormal Weight

- The placenta increases in size and weight as in congenital syphilis, hydrops foetalis and diabetes mellitus.

Abnormal Position

- Placenta Praevia: The placenta is partly or completely attached to the lower uterine segment.

Abnormal Adhesion

- Placenta Accreta: The chorionic villi penetrate deeply into the uterine wall to reach the myometrium, due to deficient decidua basalis. When the villi penetrate deeply into the myometrium, it is called "placenta increta" and when they reach the peritoneal coat it is called "placenta percreta".

Placental Lesions

Placental Infarcts:

Seen in placenta at term, mainly in hypertensive states with pregnancy.

- + White infarcts: due to excessive fibrin deposition. Normal placenta may contain white infarcts in which calcium deposition may occur.

- + Red infarcts: due to haemorrhage from the maternal vessels of the decidua. Old red infarcts finally become white due to fibrin deposition.

Placental Tumour:

- Chorioangioma is a rare benign tumour of the placental blood vessels which may be associated with hydramnios.

Assignment:-

1. Draw structure of placenta.

THANK

YOU !!!