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**MATRIC NO: 18/MHS01/165**

**COURSE: EMBRYOLOGY**

**SECOND WEEK OF THE HUMAN DEVELOPMENT**

By the time of the second week, the blastocyst is superficially implanted in the endometrium. As implantation of the blastocyst progresses, a small space appears in the embryoblast, which is the **amniotic cavity**. Soon, **amnioblasts** separate from the **epiblast** and form the **amnion**, which encloses the amniotic cavity. Morphologic changes occur in the embryoblast that result in the formation of the **bilaminar embryonic disc**, consisting of 2 layers;

* **Epiblast,** the thick layer consisting of high columnar cells related to the amniotic cavity (forms the floor of the amniotic cavity)
* **Hypoblast**, consisting of small cuboidal cells forming the roof of the exocoelomic cavity.

Exocoelomic membrane together with the hypoblast lines the **primary umbilical vesicle. It is important to note that the embryonic disc now lies between the amniotic cavity and the primary umbilical vesicle**. Cells from the vesicle endoderm form a layer of connective tissue, called the **extraembryonic mesoderm** which surrounds the amnion and umbilical vesicle. As the amnion, embryonic disc and umbilical vesicle, **lacunae (small spaces)** appear in the **syncytiotrophoblast**. The lacunae become filled with a mixture of maternal blood from ruptured **endometrial capillaries** and cellular debris from the eroded **uterine gland**. The communication of the eroded endometrial capillaries with the lacunae in the syncytiotrophoblast establishes the **primordial uteroplacental circulation**. When maternal blood flows in the lacunar network, oxygen and nutritive substances are passed to the embryo. Oxygenated blood passes into the lacunae from spiral endometrial arteries. Deoxygenated blood is removed from the lacunae through the endometrial veins.

By day 10-11, the **conceptus (embryo & membranes)** is completely embedded in the uterine endometrium. There is completely embedded in the uterine endometrium. There is a surface defect in the endometrial epithelium that is soon closed by a **closing plug (of a fibrin coagulation of blood)**. By day 12, uterine epithelium is regenerated and covers the closing plug. As the conceptus implants, the endometrial connective tissue cells continue to undergo a transformation, the **decidual reaction** where the cells swell because of accumulation of glycogen and lipid in their cytoplasm. The first decidual reaction is to provide nutrition for the early embryo and an immunologically privileged site for the conceptus. The syncytiotrophoblastic lacunae (small spaces) have fused to form the lacunar networks giving the syncytiotrophoblast a sponge-like appearance.

The endometrial capillaries around the implanted embryo become congested and dilated to form **maternal sinusoids**; thin-walled terminal vessels that are larger than normal capillaries. The syncytiotrophoblast erodes the sinusoids, and maternal blood flows freely into the lacunar networks and it absorbs nutritive fluid from the lacunar networks (embryotroph) which is transferred to the embryo. As changes occur in the trophoblast and endometrium, the extraembryonic mesoderm, increases and isolated **extraembryonic coelomic spaces** appear within it. These spaces rapidly fuse to form a large isolated cavity, the **extraembryonic coelom**. The fluid-filled cavity surrounds the amnion and umbilical vesicle, except where they are attached to chorion (outermost fetal membrane) by the connecting stalk.

As the extraembryonic coelom forms, the primary umbilical vesicle decreases in size and forms a smaller secondary umbilical vesicle. The extraembryonic coelom splits the extraembryonic mesoderm into 2 layers;

* **Extraembryonic somatic mesoderm,** lining the trophoblast and covering the amnion
* **Extraembryonic splanchnic mesoderm**, surrounding the umbilical vesicle

The extraembryonic somatic mesoderm and the 2 layers of trophoblast ( cytotrophoblast & syncyntiotrophoblast) form the chorion (outermost fetal membrane) which forms the wall of the chorionic sac. The embryo, amniotic sac and umbilical vesicle are suspended in the chorionic sac by the connecting stalk. The appearance of the primary chorionic villi, which are vascular processes of the chorion occurs. The cellular extensions grow into the syncytiotrophoblast. The primary chorionic villi is the first stage in the development of the chronic villi of the placenta (the fetomaternal organ for metabolic exchange between the embryo and the mother)

In day 14, the embryo still has the bilaminar embryonic disc but the hypoblastic cells in a localised area are now columnar and form a thickened circular area, the **prechordal plate**. The plate indicates the site of the mouth and is an important organizer of the head region. **By the end of the second week, the blastocyst is fully implanted in the endometrium and prechordal plate develops**.