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DEPARTMENT: Medicine and surgery

Discuss the second week of development.

***2nd week of development***

The following events take place during the 2nd week of development:

1. Completion of implantation of the blastocyst
2. Formation of bilaminar embryonic disc(epiblast and hypoblast)
3. Formation of extraembryonic structures(amniotic cavity, amnion, umbilical vesicle [yolk sac], connecting stalk, and chorionic sac)

**Day 8**

* At the eighth day of development, the blastocyst is partially (slowly) embedded in the endometrium
* the syncytiotrophoblast continues its invasion of the endometrium, thereby eroding endometrial blood vessels and endometrial glands
* More cells in the cytotrophoblast divide and migrate into the syncytiotrophoblast, where they fuse and lose their individual cell membranes
* Cells of the inner cell mass or embryoblast also differentiate into 2 layers:

1. the **hypoblast** layer, which is made up of small cuboidal cells, and it is adjacent(nearer) to the blastocyst cavity
2. the **epiblast** layer which is made up of high columnar cells, and it adjacent to the amniotic cavity

* The hypoblast and epiblast layers **together** form a flat ovoid shaped disc called the **bilaminar embryonic disc**
* At the same time, a small cavity appears within the epiblast which enlarges to form the amniotic cavity
* Epiblast cells adjacent to the cytotrophoblast are called **amnioblasts**
* **Amnioblasts** together with the rest of the epiblast, line the amniotic cavity
* The endometrium adjacent to the implantation site is edematous and highly vascular

**Day 9**

* The blastocyst is more deeply embedded in the endometrium, and the penetration defect in the surface epithelium is closed by a coagulum called **fibrin**
* Vacuoles appear at the region of the trophoblast and they fuse to form lager lacunae
* this phase of trophoblast development is known as the **lacunar stage**
* the cells of the hypoblast adjacent to the cytotrophoblast form a thin membrane called the **exocoelomic (Heuser’s) membrane**
* this membrane lines the inner surface of the cytotrophoblast
* the **exocoelomic (Heuser’s) membrane** together with the hypoblast forms the lining of the **exocoelomic cavity,** or **primitive yolk sac** or **primary umbilical vesicle**

**11th** - **12th day of development**

* The blastocyst is completely embedded in the endometrium,
* and the surface epithelium almost entirely covers the original defect in the uterine wall
* The blastocyst now produces a slight protrusion into the lumen of the uterus
* cells of the syncytiotrophoblast penetrate deeper into the stroma(tissue) and erode the endothelial lining of the endometrial capillaries
* These ruptured endometrial capillaries are called **sinusoids**
* The lacunae then begin to communicate with the sinusoids, and maternal blood enters the lacunar system
* The communication of the eroded endometrial capillaries with the lacunae establishes the **primordial uteroplacental circulation**
* When maternal blood flows into the lacunae, oxygen and nutritive substances are available to the embryo
* a new population of cells appears between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity
* These cells which are derived from yolk sac cells form a fine, loose connective tissue called the **extraembryonic mesoderm**
* Soon, large cavities develop in the extraembryonic mesoderm, and when these become confluent, they form a new space known as the **extraembryonic cavity,** or **chorionic cavity** or **extraembryonic coelom**
* This space surrounds the primitive yolk sac and amniotic cavity, except where the germ disc is connected to the trophoblast by the connecting stalk (which develops into the umbilical cord)
* The extraembryonic mesoderm lining the cytotrophoblast and amnion is called the **extraembryonic somatic mesoderm**
* **extraembryonic somatic mesoderm also forms the connecting stalk**
* the lining covering the yolk sac is known as the **extraembryonic splanchnic mesoderm**
* As the conceptus implants, the endometrial connective tissue cells undergo a transformation, called **decidual reaction**
* During this transformation, the cells of the endometrium swell because of the accumulation of glycogen and lipid in their cytoplasm, and they are known as **decidual cells**
* The primary function of the decidual reaction is to provide nutrition for the early embryo and an immunologically privileged site for the conceptus

***13th day of development***

* The surface defect in the endometrium has been completely covered by the surface epithelium
* Occasionally bleeding occurs at the implantation site as a result of increased blood flow into the lacunar spaces
* Cells of the cytotrophoblast proliferate locally and penetrate into the syncytiotrophoblast, forming cellular columns surrounded by syncytium
* Cellular columns with the syncytial covering are known as **primary villi**
* The primary yolk sac becomes reduced in size and is known as the **secondary yolk sac**
* This new cavity is known as the **secondary yolk sac** or **definitive yolk sac** or the **secondary umbilical vesicle**
* In humans the yolk sac **contains no yolk** but is important for the transfer of nutrients between the fetus and mother
* This yolk sac is much smaller than the original exocoelomic cavity or primitive yolk sac
* During its formation, large portions of the exocoelomic cavity are pinched off to form **exocoelomic cysts**
* **Exocoelomic cysts** are often found in the extraembryonic cavity or chorionic cavity or extraembryonic coelom
* Meanwhile, the extraembryonic coelom expands and forms a large cavity called the **chorionic cavity**
* The extraembryonic mesoderm lining the inside of the cytotrophoblast is then known as the chorionic plate
* The only place where extraembryonic mesoderm traverses the chorionic cavity is in the **connecting stalk**
* With development of blood vessels, the connecting stalk becomes the **umbilical cord**