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Course Title: Embryology

Assignment

- ❖ Discuss the second week of embryonic development

Second Week of Embryonic Development (Days 8-14)

Three major events take place in the second week of embryonic development, these events are:

- Completion of implantation of the blastocyst.
- Formation of a bilaminar germ/embryonic disc (epiblast & hypoblast).
- Development of extra embryonic structures (amniotic cavity, amnion, umbilical vesicle (yolk sac), connecting stalk and chorionic sac)

➤ Day 8

Blastocyst is partially embedded in the endometrium, the syncytiotrophoblast will continue to erode the endometrium (capillaries/vessels and glands in the endometrium). The cytotrophoblast will continue divide and migrate into the region of the syncytiotrophoblast. Inner cell mass (embryoblast) differentiates into two cells, high columnar cells called epiblast near the amniotic cavity and small cuboidal cells called hypoblast near the blastocyst cavity. The columnar cells of epiblast lining/adjacent/nearer to the cytotrophoblasts are referred to as amnioblasts. The amnioblast together with the rest of the epiblast surrounds a cavity called amniotic cavity. The epiblast and hypoblast give rise to a flat ovoid bilaminar germ disc.

➤ Day 9

Blastocyst is deeply embedded in the endometrium. The penetration defect in the surface epithelium is closed by fibrin, a coagulum. As development continues, a thin membrane develops from the cells of the hypoblast lying adjacent to the region of the cytotrophoblast called the exocoelomic membrane/Heuser's membrane which surrounds a cavity called exocoelomic cavity/primary yolk sac. Exocoelomic cavity/Primitive yolk sac/Primary umbilical vesicle is lined by the exocoelomic membrane and hypoblast. Syncytiotrophoblast will continue to erode the endometrium (blood vessels and capillaries in the endometrium). The cytotrophoblast will continue to divide and migrate into the region of the syncytiotrophoblast. Vacuoles develop in the region of trophoblast, and fuse to form trophoblastic lacunae. The stage of trophoblast development is the lacunar stage.

➤ Day 11-12

Blastocyst is completely embedded in the endometrium, and the surface epithelium almost completely covers the original in the uterine wall. The blastocyst produces a slight protrusion into the lumen of the uterus. The syncytiotrophoblast will continue to erode the endometrium. The cytotrophoblast will continue to divide and migrate into the region of the syncytiotrophoblast. This leads to rupture of some blood capillaries called sinusoids, they communicate with the trophoblastic lacunae which leads to blood moving from the mother to the developing embryo providing the embryo with oxygen and nutrients. At this stage, a primordial uteroplacenta circulation is established.

A space of mesoderm develops as a new population of cells between the region of the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity appears and is called the extra embryonic mesoderm. Inside the extra embryonic mesoderm, some cavities develop, they form a space called the extra embryonic cavity or extra embryonic coelom or chorionic cavity. 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 extra embryonic cavity divides the mesoderm into two parts. The part that lines the region of the cytotrophoblast and amnioblast is called the extra embryonic somatic mesoderm. The part that lines the region of the extra embryonic coelom is called the extra embryonic splanchnic membrane. As development continues a reaction called decidual reaction takes place. During the reaction, 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 immunologically privileged site for the conceptus.

➤ Day 13

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. Syncytiotrophoblast acquire syncytium on their cells giving primary villi, extending in the region of the syncytiotrophoblast. Connecting stalk gives rise to the umbilical cord with development of blood vessels. The extra embryonic coelom becomes enlarged and gives rise to the chorionic cavity. The extra embryonic mesoderm lining the inside of the cytotrophoblast is then known as the chorionic plate. A portion of the primary yolk sac is removed and is then known as secondary yolk sac, this portion is called exocoelomic cyst.

➤ Clinical Correlates

- i. The syncytiotrophoblast produces a hormone called human chorionic gonadotropin (hCG) which enters the maternal blood through lacunae and keeps the corpus luteum secreting estrogen and progesterone. The hormone maintains the hormonal activity of the corpus luteum in the ovary during pregnancy. hCG can be detected in maternal blood/urine as early as day 10 of pregnancy; it gives the basis for pregnancy test. An adequate amount of hCG is produced by the syncytiotrophoblast at the end of the second week to give a positive pregnancy test.
- ii. Possibility of extra uterine Implantation, the blastocyst may implant outside the uterus. These implantations result in ectopic pregnancies; a pregnancy where the fertilized egg implants outside the uterus and cannot survive. If left, It may cause damage to nearby organs and severe blood loss.