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LEVEL: 200

MAT. NO.: 18/MHS01/360

COURSE: EMBRYOLOGY

ASSIGNMENT:

Discuss the second week of development

THREE EVENTS TAKE PLACE HERE:

1. Completion of implantation of the blastocyst
2. Formation of bi-laminar embryonic disc (epiblast and hypoblast)
3. Formation of extra-embryonic structures (amniotic cavity, amnion, umbilical vesicle (yolk sac), connecting stalk and chorionic sac.

COMPLETION OF IMPLANTATION OF THE BLASTOCYST (DAY 8)

The blastocyst is partially (slowly) embedded in the endometrium. The syncytiotrophoblast continues to invade the endometrium thereby eroding endometrial blood vessels and endometrial glands. The size of the cytotrophoblast will continue to divide and migrate into the syncytiotrophoblast. They fuse here and lose their individual cell membranes. Cells of the inner cell mass or embryoblast also differentiates into two layers. The hypoblast which is made up of cuboidal cells and adjacent (nearer) to the blastocyst cavity and the epibast which made up of columnar cells and adjacent to the amniotic cavity.

The cell of the epiblast that are adjacent to the cytotrophoblast are called amnioblast or amnion while the hypoblast and epiblast layers together form a flat ovoid shaped disc called the bilaminar embryonic disc/bilaminar germ disc. At the same time a small cavity appears within the epiblast which enlarges to form the amniotic cavity. 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 deeply embedded in the endometrium and the penetration defect in the surface epithelium is closed by a coagulum called fibrin (clotting of blood). Vacuoles appear at the region of the trophoblast and they fuse to form lacunae. This phase of trophoblast development is known as 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 surfaces of the cytotrophoblast. The exocoelomic membrane and the hypoblast form of the exocoelomic cavity or primitive yolk sac or primary umbilical vesicle.

(DAY 10-12)

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. The cells of the syncytiotrophoblast penetrate deeper into the tissue and erode the endothelial lining of the endometrial capillaries. These ruptured endometrial capillaries are called sinusoids. The lacuna then begins to communicate with the sinusoids and maternal blood enter the lacunar system. The communication of the eroded endometrial capillaries with the lacunae establishes the PROMORDIAL UTEROPLACENTAL CIRCULATION. When maternal blood flows into the lacunae, oxygen and nutritive substances are available to the embryo. A new population of calls appear between the inner surface of cytotrophoblast and the outer surface of the exocoelomic cavity. These cells which are derived from yolk sac from a fine, loose connective tissue called EXTRAEMRYONIC MESODERM.

Soon, they develop large cavities which becomes the extra embryonic cavity or extra embryonic coelom. The extra embryonic cavity surrounds the primitive yolk sac and amniotic cavity except where the trophoblast by the connecting stalk (which develops into the umbilical cord). The extra embryonic somatic mesoderm is the extra embryonic mesoderm lining the cytotrophoblast and amnion. Extra embryonic splanchnic mesoderm is the lining covering the yolk sac. 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 function of decidual reaction is to provide nutrition for the early embryo and immunologically privileged sites 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 increase blood flow into 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 known as primary villi becomes reduced in size and is known as the secondary yolk sac or definitive yolk sac or secondary umbilical vesicle. In humans the yolk sac doesn’t contain a yolk but it 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 this formation, large portions of the exocoelomic cavity are pinched off to form exocoelomic cysts. Exocoelomic cysts are often in the extra embryonic cavity or chorionic cavity or extra embryonic coelem. The extra embryonic mesoderm lining the inside of the cytotrophoblast is then known as the chorionic plate. The only place the extra embryonic mesoderm traverses the chorionic cavity is in the connecting stalk. With development of blood vessels, the connecting stalk becomes umbilical cord.

CLINICAL CORRELATE

The syncytiotrophoblast produces a hormone Human Chorionic Gonadotrophin (HCG) which enters the maternal blood via lacunae which keeps the corpus luteum secreting estrogen and progesterone. HCG can be detected in maternal blood or urine as early as day 10 of pregnancy and is the basis of pregnancy test.