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COURSE CODE: ANA201 (EMBRYOLOGY)

Question: Discuss the 2nd week of development

Answer

The following events take place during the second week of development

1. Completion of implantation of the blastocyst
2. Formation of bilaminar disc
3. Formation of extra-embryonic structures

DAY 8

- Blastocyst is partially embedded in the endometrium
- Syncytiotrophoblast will continue its invasion of the endometrium, thereby eroding endometrial blood vessels and glands
- Cells of cytotrophoblast will continue to divide and migrate into the syncytiotrophoblast
- The embryoblast will differentiate into two layers: cuboidal hypoblast and columnar epiblast
- Hypoblast and epiblast layers together form a flat ovoid shaped disc called 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.

DAY 9

- Blastocyst is more deeply embedded in the endometrium and the penetration defect in the surface epithelium is closed by a coagulum called fibrin
- Syncytiotrophoblast will continue to erode the endometrium

- Cells of cytotrophoblast will continue to divide and migrate to the region of syncytiotrophoblast
- The cells of the hypoblast adjacent to the cytotrophoblast form a thin membrane called exocoelomic(Heuser's) membrane
- Exocoelomic membrane together with the hypoblast form the lining of exocoelomic cavity/primitive yolk sac/primary umbilical vesicle
- Vacuums appear at the region of the syncytiotrophoblast and fuse together to form larger lacunae

DAY 11 &12

- Blastocyst is completely embedded in the endometrium
- Syncytiotrophoblast will continue to erode the endometrium
- Cells of cytotrophoblast will continue to divide and migrate to the region of syncytiotrophoblast
- As syncytiotrophoblast continues to erode the endometrium, it damages some capillaries and structures forming blood ruptured capillaries referred to as sinusoids
- The lacunae begins to communicate with the sinusoids and maternal blood enters the lacunar system, establishing the primordial utero-placental circulation
- A mesodermal space develops between the region of cytotrophoblast and exocoelomic membrane called extra-embryonic cavity
- Inside the extraembryonic mesoderm, there's a development of some cavities known as extra-embryonic cavity

This cavity divides the mesoderm into 2 parts

- Extra-embryonic somatic mesoderm (lines the region of the cytotrophoblast)
 - Extra-embryonic splanchnic mesoderm (lines the amnioblast and extracoelomic membrane)
- As development continues, a reaction takes place known as decidual reaction- this is the swelling of the cells of the endometrium due to accumulation of glycogen and lipid in their cytoplasm and they are known as decidual cells

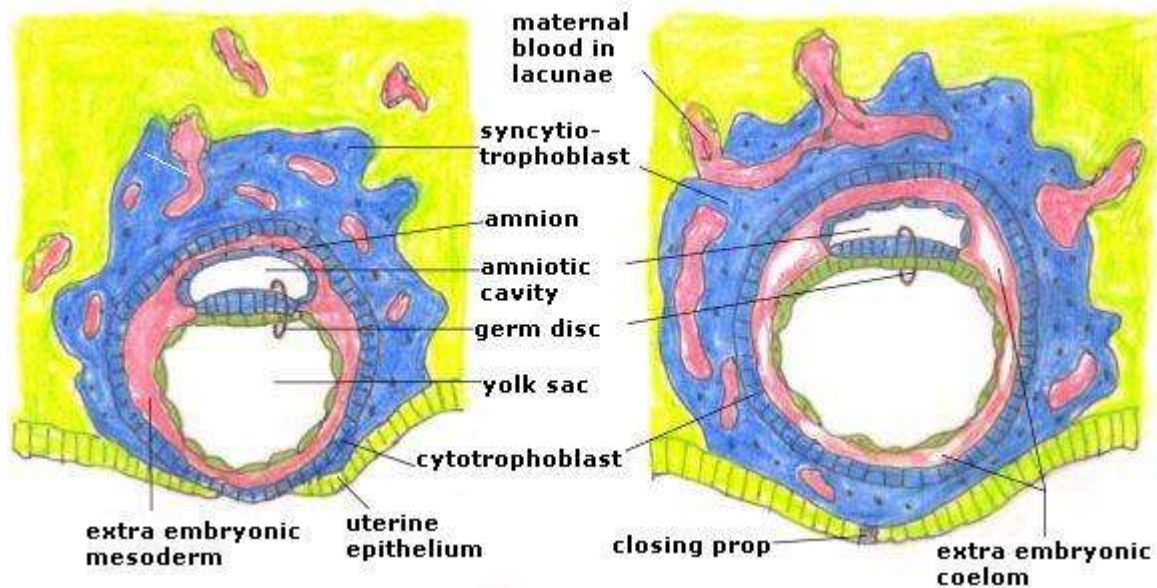
(Decidual reaction provides nutrition for the early embryo and an immunologically privileged site for the conceptus)

DAY 13

- Surface defect in the endometrium has been completely covered by surface epithelium
- Cells of cytotrophoblast acquire syncytium giving off a shape that looks like a villi. (When they're covered by syncytium, it is called primary villi)
- The primary yolk sac becomes reduced in size and is known as secondary yolk sac/definitive yolk sac/secondary umbilical vesicle.

(The yolk sac is important for transfer of nutrients between the foetus and mother)

- During the formation of secondary yolk sac, a large portion of exocoelomic cavity is pinched off to form exocoelomic cysts
- Extraembryonic coelom forms a large cavity called chorionic cavity
- The extraembryonic mesoderm lining the inside of the cytotrophoblast is known as chorionic plate.
- With the development of blood vessels, connecting stalk becomes the umbilical cord



CLINICAL CORRELATION

1. Syncytiotrophoblast produces a hormone called human chorionic gonadotropin (hCG) which enters the maternal blood via lacunae and keeps the corpus luteum secreting estrogen and progesterone

(hCG maintains hormonal activity of the corpus luteum during pregnancy)

- It is the basis for pregnancy tests. It can be detected in maternal blood or urine as early as day 10 of pregnancy
2. Extrauterine Implantation:
 - Blastocysts may implant outside the uterus and these implantations may result in ectopic pregnancy.
 - 95% -98% of these implantations occur in the uterine tubes, most often in the ampulla and isthmus.

