The second week of development

During the second week of development there are three main things that happen. They are:

1. Completion of implantation
2. Formation of bilaminar embryonic disc
3. Formation/ development of extraembryonic structures such as amnion

Day 8

The blastocyst formed during the first week of development is partially embedded in the endometrium. The syntriotrophoblast then continues to invade the endometrium eroding endometrial blood vessels and glands. The size of the cytotropoblast will reduce because of cell division and cell migration to the region of syncytiotrophoblast. Here the cells fuse and lose their individual cell membranes. Cells of the embryoblast also differentiate into two layers-the hypoblast and the epiblast. The hypoblast is the layer made up of small cuboidal cells closer to the blastocyst cavity, while the epiblast is made up of columnar cells which is closer to the amniotic cavity. These two layers together then give rise to the bilaminar embryonic disc. Then a small cavity forms within the epiblast that enlarges to make the amniotic cavity. The epiblast cells adjacent to the cytotrophoblast called amnioblasts (amnion) and the remaining epiblas cells line the amniotic cavity.

Day 9

The blastocyst is now deeply embedded in the endometrium and the surface epithelium is covered by fibrin a coagulum because of the defect caused by penetration. Vacuoles develop in the region of syntiotrophoblast becoming lacuna and fuse to become larger. Another membrane is formed which is adjacent to the cytotrophoblast called the exocoelomic/Heuser's membrane. It is formed by the hypoblast cells adjacent to the cytotrophoblast. Then a cavity forms between the

exocoelomic membrane and the hypoblast forming the exocoelomic cavity. The exocoelomic cavity is also known as primitive yolk sac or primary umbilical vesicle.

Day 11-12

Blastocyst is now completely embedded in endometrium, as the syntiotrophoblast erodes deeper into the endometrium the endometrial capillaries are ruptured and become sinusoids. The lacunae then communicate sinusoids to transfer nutrients and oxygen to the embryo through flow of the maternal blood into the lacunar system. This communication establishes the primordial uteroplacental circulation. A space called extraembryonic mesoderm a fine, loose connective tissue develops between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity. Then large cavities develop in the extraembryonic mesoderm and form a space known as extraembryonic cavity. This cavity is also known as chorionic cavity or extraembryonic coelom and surrounds the exocoelomic cavity and amniotic cavity except for where the connecting stalk is. The cavity divides the mesoderm into two. One is the extraembryonic mesoderm lining the cytotrophoblast and amnion called the extraembryonic somatic mesoderm. The other is the lining covering the exocoelomic cavity and it is called extraembryonic splanchnic mesoderm. Decidual reaction then occurs as it implants. This reaction makes the cells of the endometrium to swell because of the accumulation of glycogen and lipid in their cytoplasm. These cells become decidual cells. The main function of this reaction is to provide nutrient for the early embryo and an immunologically privileged site.

Day 13

The surface epithelium has now completely covered up the surface defect. There will be occasional bleeding at the implantation site as a result of increased blood flow into the lacunar spaces. Cells of the cytotrophoblast penetrate the syncytiotrophoblast forming syncytium which moves towards the syncytiotrophoblast. When covered with syncytium it is known as the primary villi. The primary yolk sac becomes smaller in size forming the secondary yolk sac or secondary umbilical vesicle or definitive yolk sac. This yolk sac is important because it transfers nutrients between the fetus and mother, although it does not

contain yolk in humans and it is smaller than the original primary yolk sac. Then large portions of the exocoelomic cavity are pinched off to form exocoelomic cysts that are found in the extraembryonic cavity. While this happens the extraembryonic cavity expands to form a large cavity called the chorionic cavity. The extraembryonic mesoderm lining the inside of the cytotrophoblast then becomes the chorionic plate and the extraembryonic mesoderm only traverses the chorionic cavity in the connecting stalk. Eventually when the blood vessels develop the connecting stalk becomes the umbilical cord.

Clinical Correlate

- The syncytiotrophoblast produces a hormone called the Human Chorionic Gonadotrophin (hCG), which helps maintain corpus luteum of pregnancy and can be detected in the maternal blood and urine
- In Extrauterine Implantation where the blastocysts may be planted outside the uterus which results in ectopic pregnancies often in the ampulla and isthmus.