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DISCUSS THE SECOND WEEK OF DEVELOPMENT

Week 2 of development is also known as the week of two's. This is because most things are formed in two's. There are 2 layers of the embryoblast (epiblast and hypoblast), 2 sacs (amniotic sac and chorionic sac), 2 membranes (Heuser's membrane and extraembryonic mesoderm) and 2 layers of extraembryonic mesoderm (somatic and visceral mesoderm).

The events that take place during this period include;

- i. Completion of implantation of blastocyst
- ii. Formation of bilaminar embryonic disc
- iii. Formation of extraembryonic structures

Day 8

As at the 8th day of development, the blastocyst is partially embedded in the endometrium. The outer layer of trophoblast, the syncytiotrophoblast, invades the endometrium thus eroding the endometrial blood vessels and glands. More cells in the inner trophoblast layer, the cytotrophoblast, divide and migrate into the syncytiotrophoblast where they fuse.

Cells of the embryoblast also differentiates into two layers which are:

- i) Hypoblast layer: This is adjacent to the blastocyst cavity. It is made up of small cuboidal cells.

ii) Epiblast layer: This is adjacent to the amniotic cavity. It is made up of high columnar cells.

The two layers together form an 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 line the amniotic cavity and are called amnioblasts. 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 together to form larger lacunae. This stage is known as the lacunar stage.

The cells of the hypoblast adjacent to the cytotrophoblast form a thin membrane called the exocoelomic membrane (Heuser's membrane). This membrane together with the hypoblast form the lining of the primitive yolk sac or exocoelomic cavity.

Day 11-12

The blastocyst is completely embedded in the endometrium and the surface epithelium almost entirely covers the original defect in the uterine

wall. The blastocyst produces a slight protrusion into the lumen of the uterus.

Cells of the syncytiotrophoblast penetrate deeper and erode the endothelial lining of the endometrial capillaries. These ruptured endometrial capillaries are called sinusoids. The lacunae then begins to communicate with the sinusoids and maternal blood enters the lacunar system. This communication establishes the primordial uteroplacental circulation, and oxygen and other nutritive substances are made available to the embryo.

A new population of cells emerge between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity. These cells form a fine loose connective tissue called extraembryonic mesoderm which differentiates into 2 layers- visceral and somatic mesoderm. Large cavities begin to develop in this mesoderm and when they become confluent they form a new space known as the extraembryonic cavity or chorionic cavity. This cavity surrounds the amniotic cavity and primitive yolk sac except at the connecting stalk.

As the conceptus implants, the endometrial connective tissue undergoes a transformation known as decidual reaction. The primary aim of this reaction is to provide nutrition for the embryo and also provide an immunologically privileged site for the conceptus.

Day 13

The surface defect in the endometrium is completely covered by the surface epithelium. Occasionally, bleeding may occur at the implantation site because of increased blood flow into the lacunae.

The cells of the cytotrophoblast proliferate rapidly and penetrate into the syncytiotrophoblast, forming cellular columns surrounded by syncytium known as primary villi.

The primary yolk sac becomes reduced in size and becomes the secondary yolk sac. The secondary yolk sac is much smaller than the primitive yolk sac and during its formation, large portions of the primitive yolk sac are pinched off to form exocoelomic cysts. These exocoelomic cysts are usually found in the chorionic cavity.

Positive pregnancy test can be given as early as week 2 due to the detection of human chorionic gonadotropin (hCG) in the mother's urine. The hormone is produced by the syncytiotrophoblast, and it inhibits the hormonal activity of the corpus luteum during pregnancy. hCG enters the maternal blood via lacunae.