APONBIEDE TOMILOLA LATEEFAT

18/MHS01/083

Discuss the second week of development.

During the second week of development, three major events take place which include;

1. Completion of implantation.
2. Formation of a bilaminar germ disc.
3. Development of extra embryonic structures.

Completion of implantation.

Implantation of the blastocyst is completed during the second week of embryonic development. The erosive syncytiotrophoblast invades the endometrial connective tissue, and the blastocyst slowly embeds itself in the endometrium. Syncytiotrophoblastic cells displace endometrial cells at the implantation site. The endometrial cells undergo apoptosis (programmed cell death), which facilitates the invasion. Implantation of blastocysts usually occurs in the endometrium of the uterus, superior in the body of the uterus, slightly more often on the posterior than on the anterior wall

Formation of a bilaminar germ disc.

At this stage, the developing human (blastocyst) is deeply embedded in the endometrium and the surface epithelium is closed by a fibrin coagulum. As implantation of the blastocyst progresses, a small space appears in the embryoblast. This space is the primordium of the amniotic cavity. Soon amnioblasts separate from the epiblast and form the amnion, which encloses the amniotic cavity. Concurrently, morphologic changes occur in the embryoblast that result in the formation of a flat, almost circular bilaminar plate of cells, the embryonic disc, consisting of two layers:

- Epiblast, the thicker layer, consisting of high columnar cells related to the amniotic cavity.
- Hypoblast, consisting of small cuboidal cells adjacent to the exocoelomic cavity.

The epiblast forms the floor of the amniotic cavity and is continuous peripherally with the amnion. The hypoblast forms the roof of a cavity named exocoelomic cavity/primary yolk sac/ primary umbilical vesicle and is continuous with a thin membrane called exocoelomic membrane/Heuser's membrane. This membrane, together with the hypoblast, lines the primary umbilical vesicle. The embryonic disc now lies between the amniotic cavity and the umbilical vesicle. The umbilical vesicle and amniotic cavities make morphogenetic movements of the cells of the embryonic disc possible. As the amnion, embryonic disc, and primary umbilical vesicle form, isolated cavities- lacunae-appear in the syncytiotrophoblast. The lacunae soon become filled with a mixture of maternal blood from ruptured endometrial capillaries and cellular debris from eroded uterine glands. The fluid in the lacunar spaces passes to the embryonic disc by diffusion and provides nutritive material to the embryo. The communication of the eroded endometrial capillaries with the lacunae establishes the primordial uteroplacental circulation. When maternal blood flows into the lacunae, oxygen and nutritive substances are available to the embryo. Oxygenated blood passes into the lacunae from the spiral

endometrial arteries, and poorly oxygenated blood is removed from them through the endometrial veins.

The 10-day blastocyst is completely embedded in the endometrium. For approximately 2 days, there is a defect in the endometrial epithelium that is filled by a closing plug, a fibrinous coagulum of blood. By day 12, an almost completely regenerated uterine epithelium covers the closing plug. As the conceptus implants, the endometrial connective tissue cells undergo a transformation, the decidual reaction. After the cells swell because of the accumulation of glycogen and lipid in their cytoplasm, they are known as decidual cells. The primary function of the decidual reaction is to provide nutrition for the early embryo and an immunologically privileged site for the conceptus. In a 12-day embryo, adjacent syncytiotrophoblastic lacunae have fused to form lacunar networks, giving the syncytiotrophoblast a sponge like appearance. The endometrial capillaries around the implanted embryo become congested and dilated to form sinusoids, thin walled terminal vessels that are larger than ordinary capillaries. The syncytiotrophoblast erodes the sinusoids, and maternal blood flows freely into the lacunar networks. The trophoblast absorbs nutritive fluid from the lacunar networks, which is transferred to the embryo. Growth of the bilaminar embryonic disc is slow compared with growth of the trophoblast.

The implanted 12-day embryo produces a minute elevation on the endometrial surface that protrudes into the uterine lumen. As changes occur in the trophoblast and endometrium, the extraembryonic mesoderm increases and isolated extraembryonic coelomic spaces appear within it. These spaces rapidly fuse to form a large isolated cavity, the extraembryonic coelom. This fluid-filled cavity surrounds the amnion and umbilical vesicle, except where they are attached to the chorion by the connecting stalk. As the extraembryonic coelom forms, the primary umbilical vesicle decreases in size and a smaller secondary umbilical vesicle forms. This smaller vesicle is formed by extraembryonic endodermal cells that migrate from the hypoblast inside the primary umbilical vesicle. During formation of the secondary umbilical vesicle, a large part of the primary umbilical vesicle is pinched off. The umbilical vesicle contains no yolk; however, it has important functions (e.g., it is the site of origin of primordial germ cells. It may have a role in the selective transfer of nutrients to the embryo.

Development of extra embryonic structures.

The end of the second week is characterized by the appearance of primary chorionic villi. Proliferation of cytotrophoblastic cells produces cellular extensions that grow into the syncytiotrophoblast. The growth of these extensions is thought to be induced by the underlying extraembryonic somatic mesoderm. The cellular projections form primary chorionic villi, the first stage in the development of the chorionic villi of the placenta. The extraembryonic coelom splits the extraembryonic mesoderm into two layers:

- Extraembryonic somatic mesoderm, lining the trophoblast and covering the amnion
- Extraembryonic splanchnic mesoderm, surrounding the umbilical vesicle

The extraembryonic somatic mesoderm and the two layers of trophoblast form the chorion. The chorion forms the wall of the chorionic sac, within which the embryo and its amniotic sac and umbilical vesicle are suspended by the connecting stalk. The extraembryonic coelom is now called the chorionic cavity. The amniotic sac and the umbilical vesicle can be thought of as two balloons pressed together (at the site of embryonic disc) and suspended by a cord (connecting stalk) from the inside of a larger balloon (chorionic sac). The 14-day embryo still has the form of a flat bilaminar embryonic disc, but the

hypoblastic cells in a localized area are now columnar and form a thickened circular area-the prechordal plate, which indicates the future site of the mouth and an important organizer of the head region.

Clinical correlates

1. Extrauterine Implantation: Blastocysts may implant outside the uterus, these implantations result in ectopic pregnancies. 95% to 98% of ectopic implantations occur in the uterine tubes, most often in the ampulla and isthmus
2. The syncytiotrophoblast produces a hormone called the human chorionic gonadotropin (hCG), which enters the maternal blood via lacunae keeps the corpus luteum secreting estrogens and progesterone, hCG maintains the hormonal activity of the corpus luteum in the ovary during pregnancy. The syncytiotrophoblast produces a hormone called the human chorionic gonadotropin (hCG), which enters the maternal blood via lacunae keeps the corpus luteum secreting estrogens and progesterone. hCG maintains the hormonal activity of the corpus luteum in the ovary during pregnancy