Lecture title: Embryology introduction / Early embryonic period-complete

Lecturer Affiliation: ***Naziha Sultan Ahmed, BVMS, MSc***

Scientific degree(*Assistant Prof.*), *Department of Anatomy*, *College of Veterinary Medicine, University of Mosul, Mosul, Iraq*

https://orcid.org/0000-0002-2856-8277

https://www.researchgate.net/profile/Naziha_Ahmed

Early embryonic period –complete-

•The site of penetration of blastula within the endometrium is initially sealed by fibrin and coagulation plug and is later healed by the lining of endometrial epithelium, which completely heals the defect caused due to implantation.

•Lacunar spaces enlarge and form communication with each other. This change is more prominent along the embryonic pole.
•Cords of syncytiotrophoblast form the trabeculae.
•Syncytiotrophoblast erodes maternal capillaries and other vessels; hence, lacunar spaces get filled with maternal blood.

*Chorionic villi:

very small finger like processes or villi of syncytiotrophoblast, invade the endometrial connective tissue. They represent the essential functional elements of the placenta. These villi surrounded by maternal blood .

In the substance of the villi, there are capillaries through which fetal blood circulates**.**

Exchanges between maternal and fetal circulations take place through the tissues forming the walls of the villi. As the trophoblast along with the underlying extra-embryonic mesoderm constitutes chorion, the villi are known as chorionic villi.

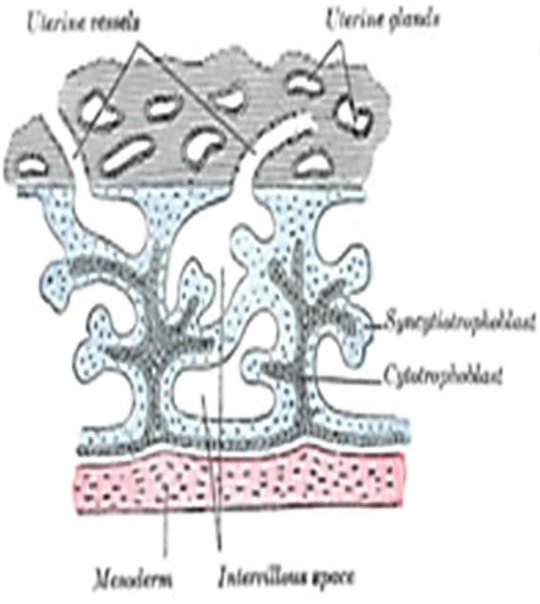
Chorionic villi are first formed all over the trophoblast and grow into the surrounding endometrium**.**

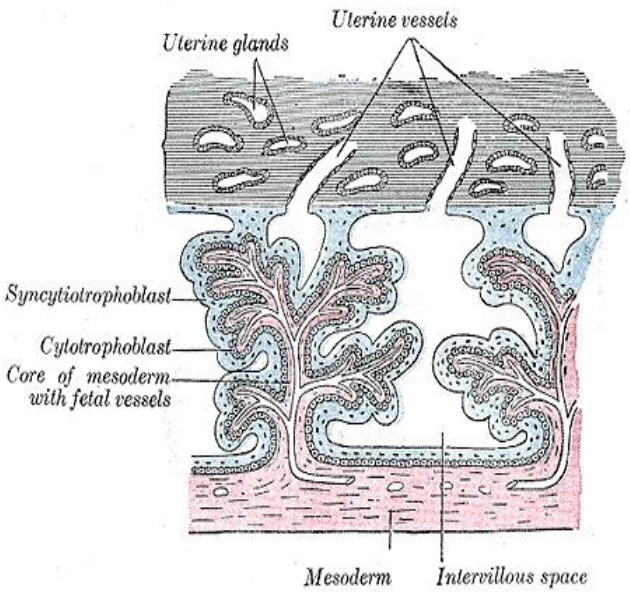
Classification of chorionic villi:

1-Primary chorionic villi : consist of a layer of cytotrophoblast covered by a layer of syncytiotrophoblast.

2-Secondary chorionic villi : consist of a layer of mesoderm covered by cytotrophoblast and syncytiotrophoblast, these develop into tertiary villi.

3-Tertiary chorionic villi : secondary villi contain primitive blood vessels within their mesoderm.

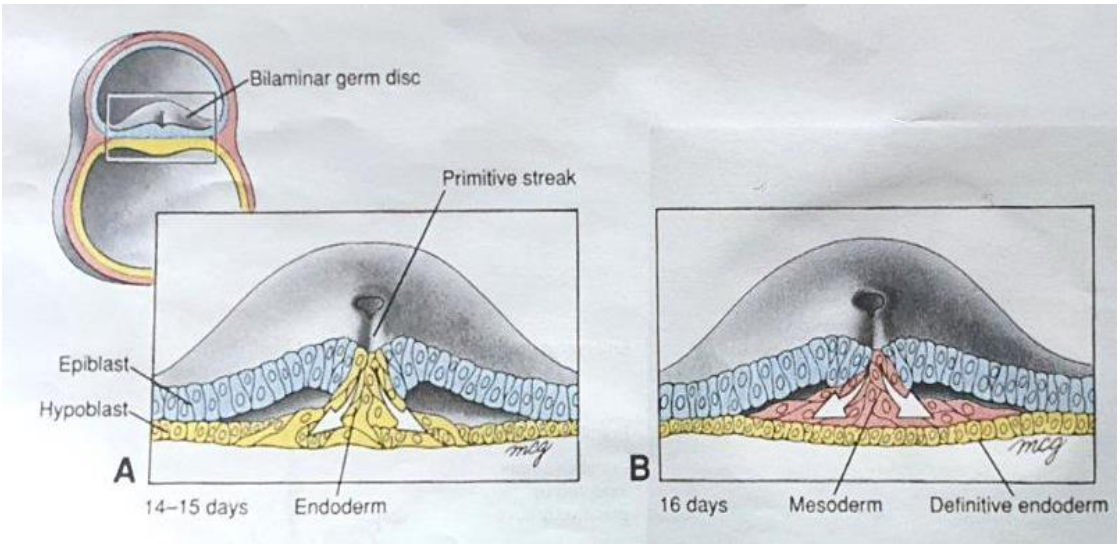




4-Phase of gastrulation:

Major changes occur to convert the bilaminar embryonic disc into trilaminar embryonic disc at the third week of intrauterine life .

A thickness of central band occur in epiblast extend from the caudal part of bilaminar embryonic disc to the center forming primitive streak that end by the primitive knot . The primitive streak form the mesoderm which occupy the space between epiblast (ectoderm) and hypoblast (endoderm) .



Germ layers : ectoderm , mesoderm and endoderm are designated primary germ layers because origin of all organs can be traced back to these three layers.

Derivatives of germ layers :

Germ layers	Derivatives	
Ectoderm	**1-Central nervous system** **2-Sense organs** **3-Mammary glands**	**4-Sweat glands** **5-Skin and hair** **6-Hooves**
Mesoderm	**1-Circulatory system** **2-Skeletal system** **3-Muscles**	**4-Reproductive system** **5-kidneys** **6-Urinary tracts**
Endoderm	**1-Digestive system** **2-Liver** **3-Lungs**	**4-Pancreas** **5-Thyroid glands** **6-Most other glands**

The mesodermal cells in the primitive streak extends to all directions (cranially , laterally , caudally) . Some of these cells migrate cranially under the ectoderm to form a central cellular band called the prochordal plate extend till oropharyngeal membrane (represent the future mouth) , here the ectoderm & the endoderm attached immediately.

Caudally to primitive streak, there is a circular region called cloacal membrane (represent the future anus) , here ectoderm connect directly with the endoderm .
The prochordal plate arched as the cord forming the notochord (through process called the notochordal process) , which represent the

longitudinal axis of the embryo around which the vertebral column formed.

Formation of the Notochord:

***The notochord :**

is a cellular cord developed from notochordal process , extend from the oropharyngeal membrane cranially till the cloacal membrane caudally, it represent the longitudinal primitive axis of the embryo.

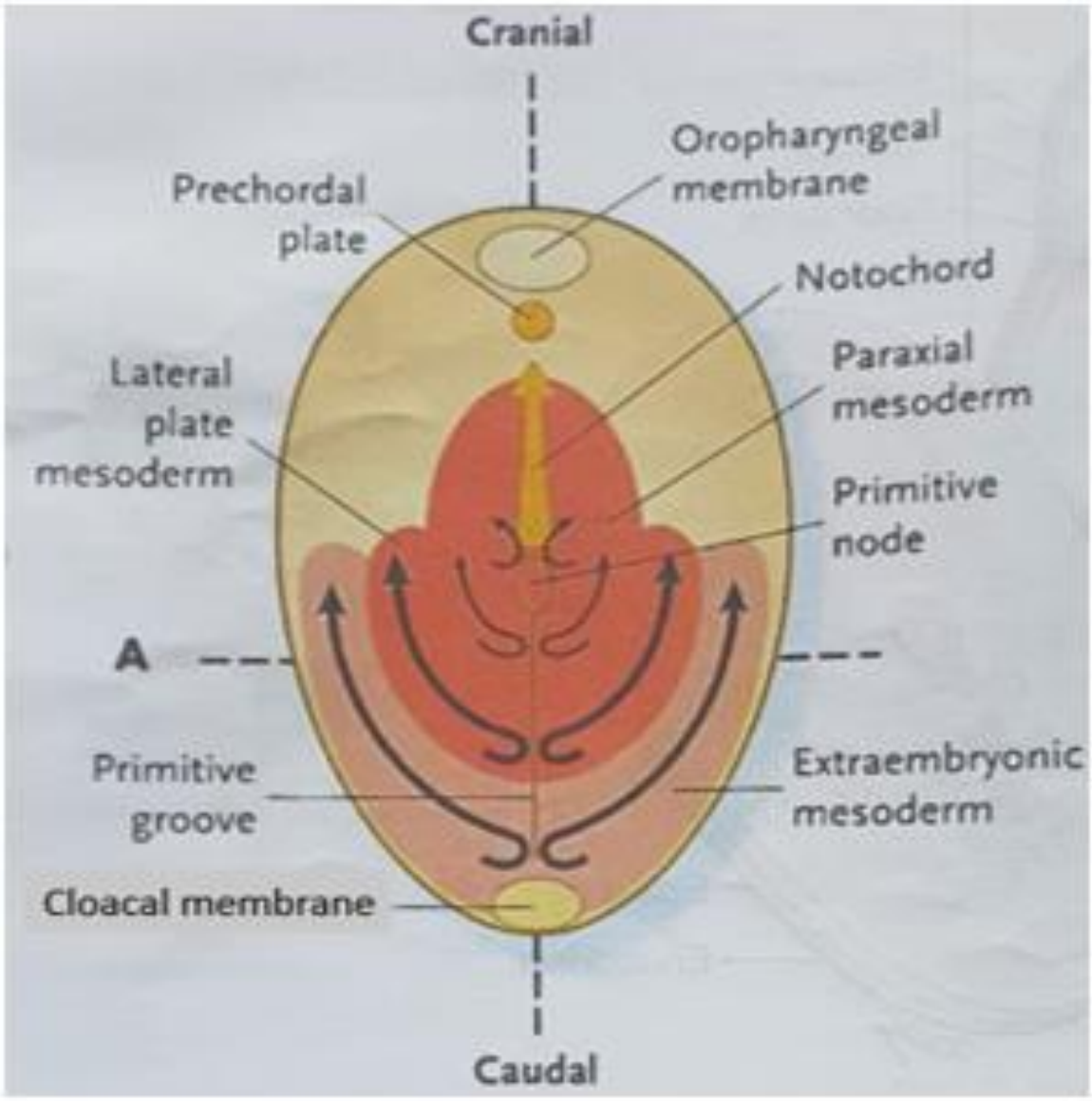
Notochord formation is important because it induces :

1-Formation of the head process.

2-Nervous system development**.**

3-Formatiom of somites**.**

The notochord marks the future location of the vertebral column and the base of the cranium. The ultimate fate of the notochord is to become the nucleus pulposus of the inter vertebral discs.



The mesoderm differentiation :

Mesoderm divided into three divisions within the process of differentiation:

1-Paraxial mesoderm: long columns of cells near the notochord, form cubic bodies called the somites which begin cranially and continue to grow caudally**.**

Somites give rise to: skull, vertebral column, ribs, sternum and intercostal muscles.

2-Median mesoderm: present laterally to paraxial mesoderm. It give rise to urogenital cord which represent the primordium of the urinary and genital systems.

3-Lateral mesoderm: present lateral to the median mesoderm, within this mesoderm some spaces appear, these spaces enlarge gradually and coalesce finally to form large crescent space or horse-shoe shape called intraembryonic coelom that give rise to: peritoneum, pericardium and pleura.

The neurulation :

refers to notochord –induced transformation of ectoderm to nervous tissue, where, the ectodermal cells over the notochord initiate and proliferate and differentiate to form the neural plate, which differentiate to neural groove surrounded by the neural folds, then the groove pinched with the approaching of the two neural folds forming the neural tube and the neural crest within a process called the neurulation. **Neurulation** occur during the third week accompanied with the mesoderm differentiation .

The neural tube give rise to the brain and the spinal cord.

The neural crest give rise to the spinal ganglia, autonomic ganglia, meninges, some cranial nerves, sheaths of peripheral nerves and adrenal medulla.