



# **Third Week of Development and Gastrulation**

**Dr. Ahmed Salman**  
**Associate professor of anatomy**

**The following changes occur during 3<sup>rd</sup> week of pregnancy :**

**A) Changes in the embryonic disc :**

**I. Changes in shape :** the embryonic disc becomes **pear shape** because the cranial part grows at a higher rate than the caudal part .

**II. Gastrulation :** ( 15-20 day ) It includes the followings :

1. Formation of the ***primitive streak*** ( 15 days )

2. ***Invagination***

3. Formation and beginning of differentiation of the ***intra-embryonic mesoderm*** .

**III. Formation of notochord .**

**IV. Neurulation (formation of neural tube ) .**

**V. Beginning of folding** of the embryonic disc ( end of 3<sup>rd</sup>. week ).

**B) Changes in the trophoblast ( chorion ) :**

3 types of chorionic villi ( primary , secondary & tertiary ) develop and cover the whole surface of chorionic vesicle

## ***Development of the trophoblast during 3<sup>rd</sup> week***

### **Formation of the chorion**

#### **The chorion**

- It is the outer wall of the chorionic vesicle (chorionic sac) and is formed of three layers (From external to internal ) :

- Syncytiotrophoblast.
- Cytotrophoblast.
- Extraembryonic somatic mesoderm.

#### **B. The chorionic villi**

- The chorion gives rise to finger like processes called chorionic villi
- The spaces between the chorionic villi are filled with maternal blood derived from the eroded uterine vessels.
- These are called the lacunae, which are the future intervillous spaces.

## **Types of Chorionic Villi**


### **A. Primary chorionic villi**

- Consists of a cytotrophoblastic core covered by a syncytiotrophoblast layer.
- They are separated by lacunae filled with maternal blood.

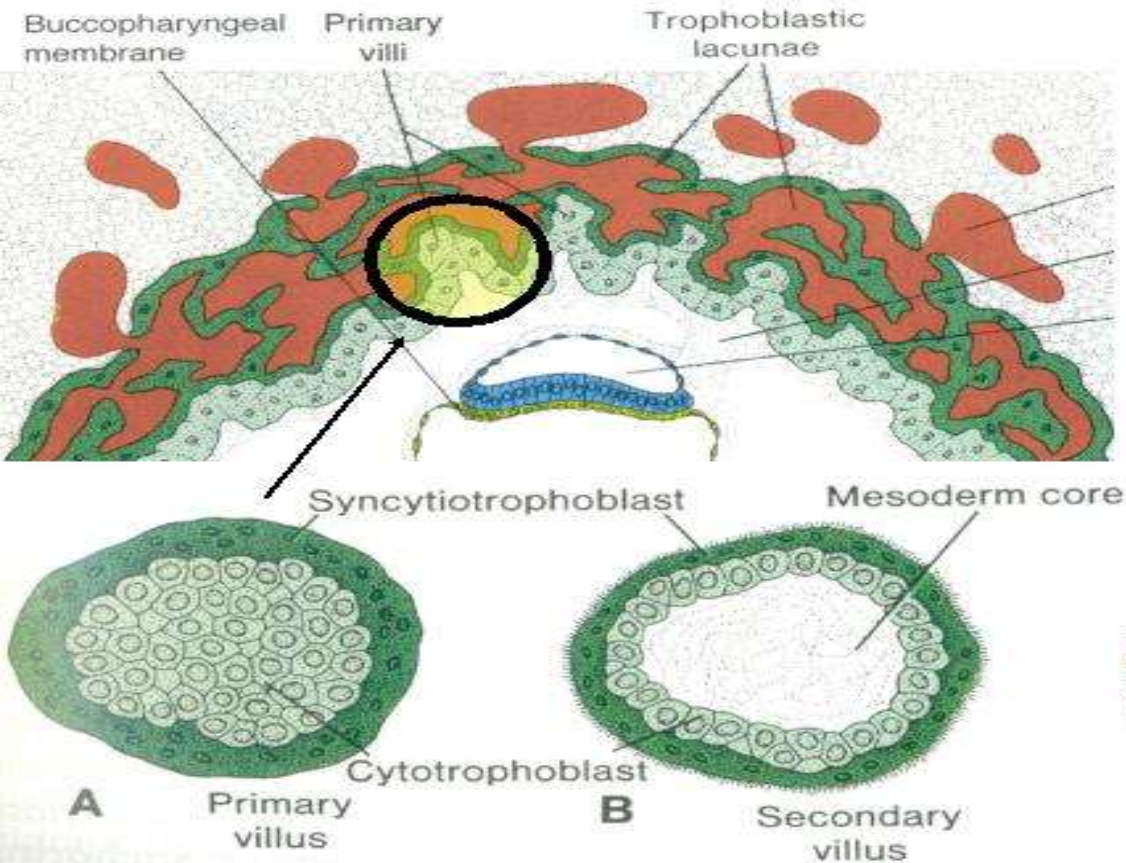
### **B. Secondary chorionic villi:**

- During middle of the 3rd week, extraembryonic mesoderm invades the cores of the primary villi
- 2ry villus is formed of a core of mesoderm covered by cytotrophoblast then syncytiotrophoblast.

### **C. Tertiary chorionic villi:**

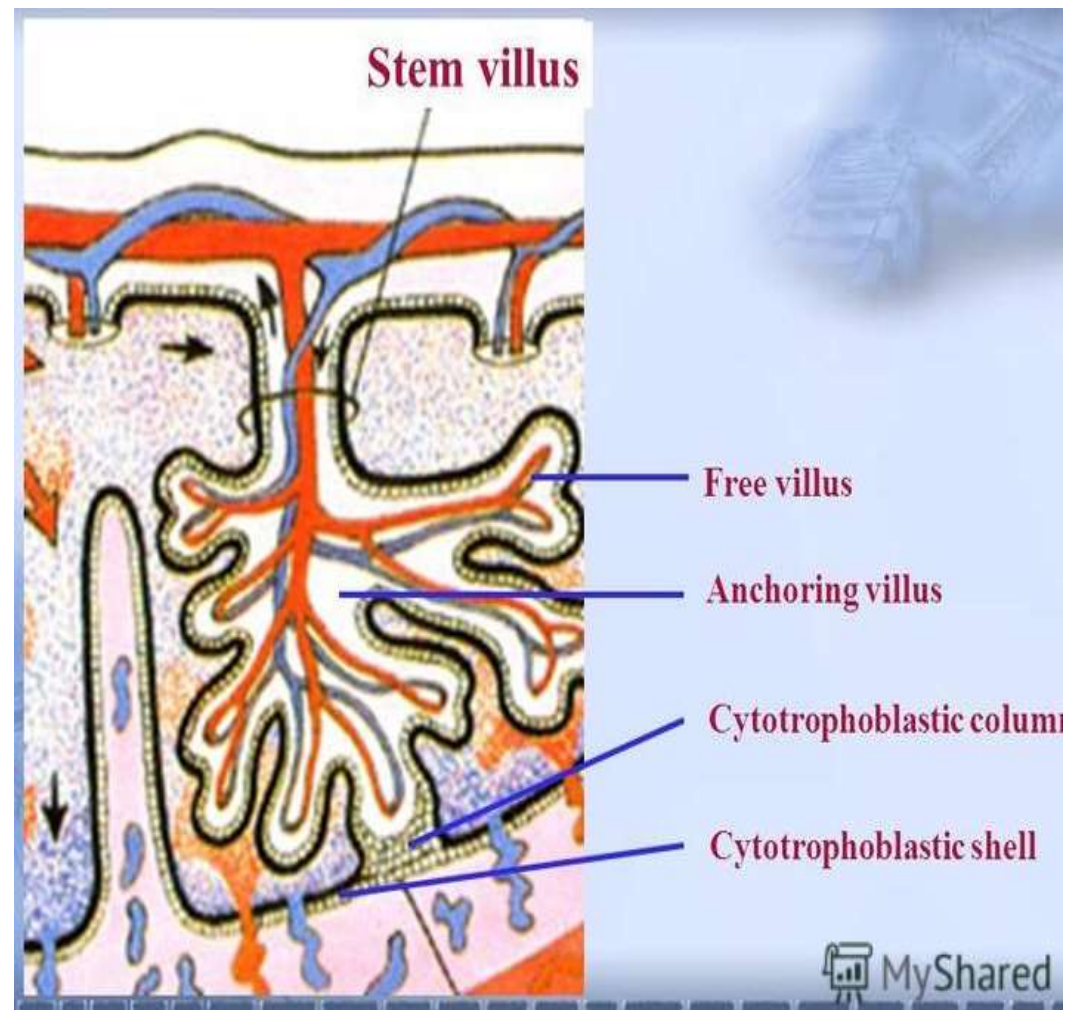
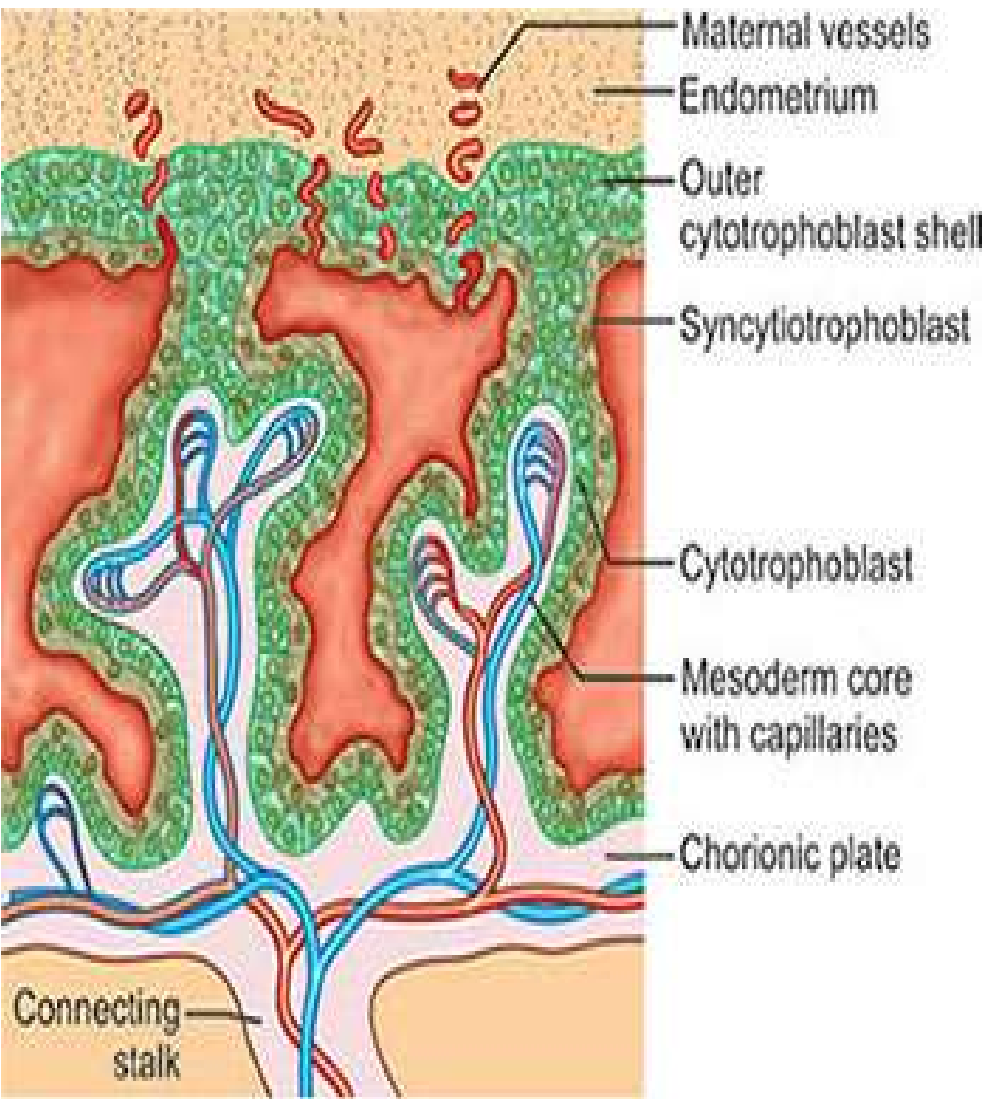
- By end of the 3rd week of development, the mesodermal cells in the cores of the 2nd villi begin to differentiate into blood vessels.
  - They are separated by intervillous spaces filled with maternal blood.
- 

# Trophoblast Development in the 3<sup>rd</sup> Week



At the end of the 3<sup>rd</sup> week mesoderm invades the primary villus and those cells differentiate into small blood vessels.

Blood vessels in the villus will make contact with blood vessels that develop in the chorionic plate (the outer shell of the chorionic cavity).



REED ONLY

***Outer cytotrophoblastic shell*** is formed by penetration of the cytotrophoblast into the overlying syncytium until it reaches the maternal endometrium .

The cytotrophoblastic cells of one villous establish contact with similar extensions of the neighboring villi forming the cytotrophoblastic shell.

## Parts of tertiary villi

- **Stem villi** are those attached to the chorionic plate .
- **Anchoring villi** are those which extend to the **decidua basalis** (endometrium forming the maternal part of the placenta ) to fix the chorionic vesicle to the uterine wall .
- **Free, floating or absorbing villi :**

Those are the side branches from the stem villi and float freely within maternal blood in the intervillous spaces .

***At these villi exchange of nutrients and other factors will occur.***



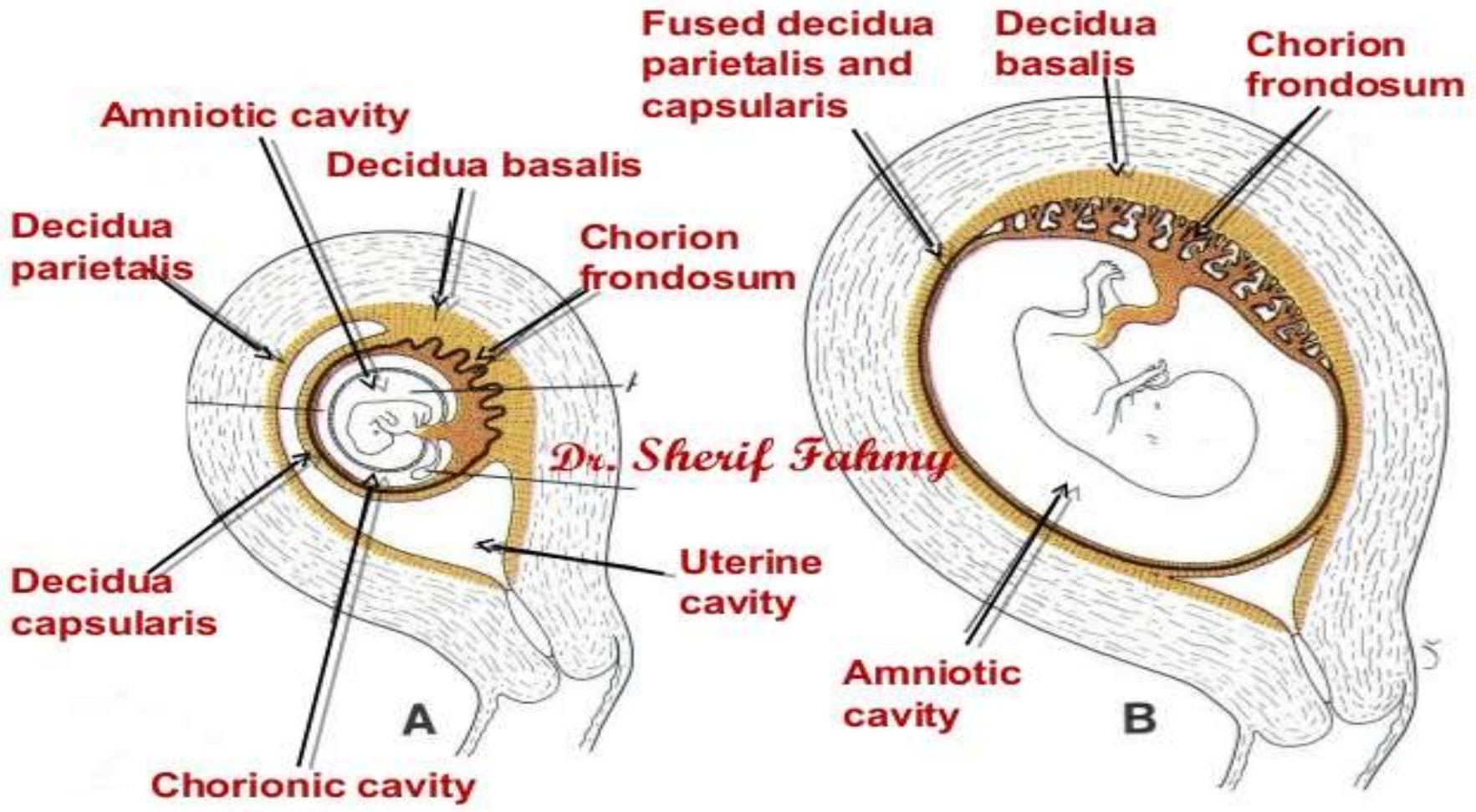
## Parts of chorion

### ➤ **Chorion frondosum**

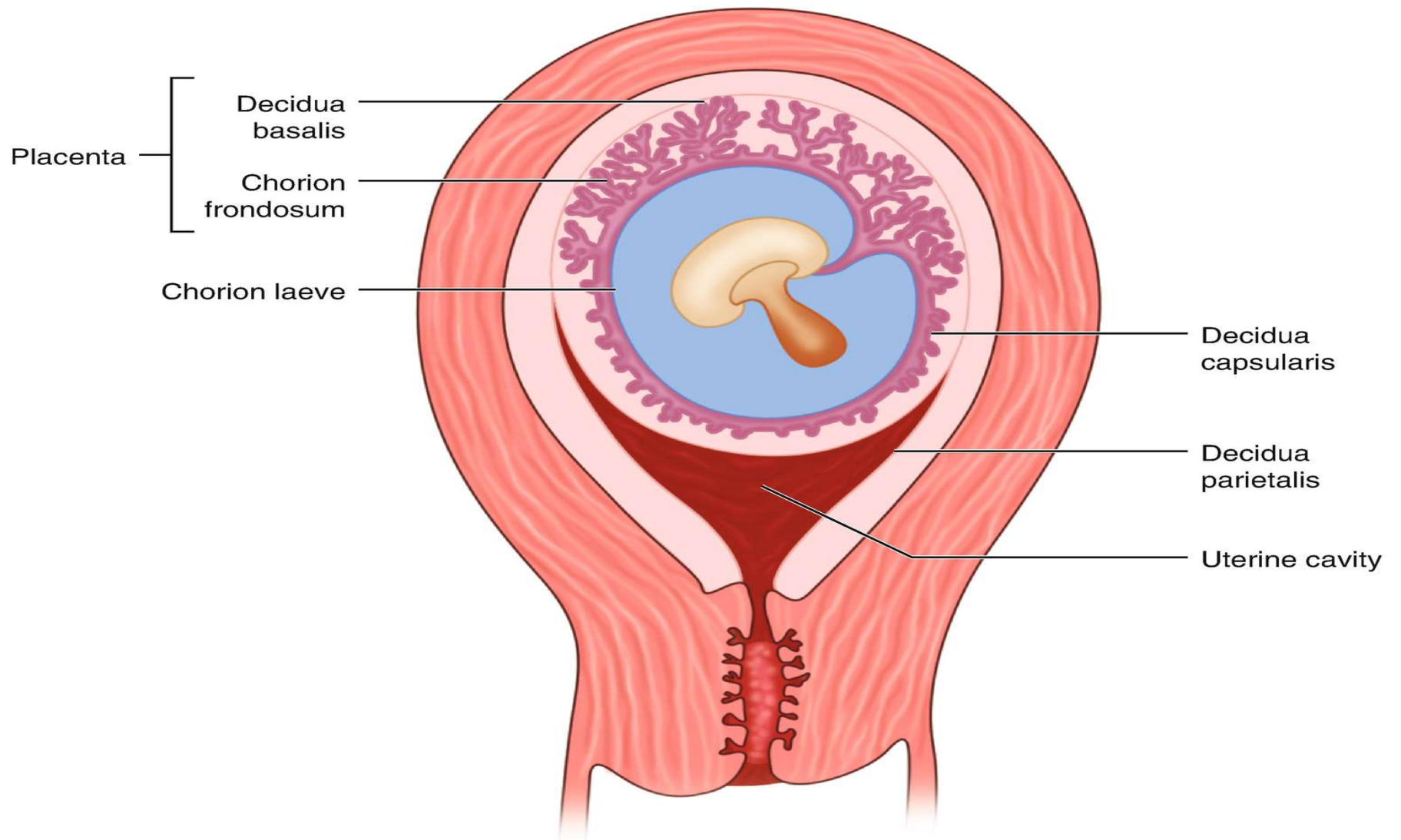
The villi adjacent to decidua basalis (of endometrium) enlarge and form chorion frondosum, which will form the fetal part of the placenta.

### ➤ **Chorion leave**

The villi adjacent to decidua capsularis (of endometrium) will form the chorion leave ,which will atrophy .



*Dr. Sherif Fahmy*



# Gastrulation

---

It is the process of transformation of the **bilaminar embryonic disc** to form a **trilaminar germ disc**

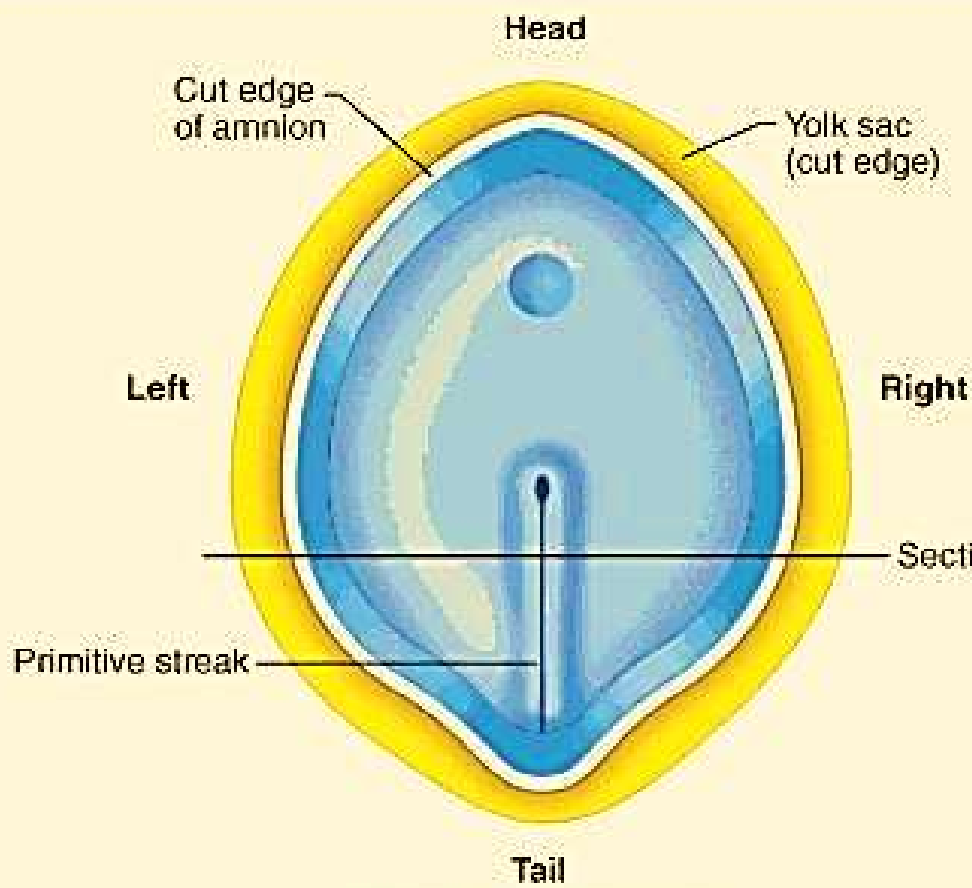
## 1. Formation of the primitive streak: ( 15 days )

- The **primitive streak** is formed in the median region of the embryonic disc near its caudal end due to migration of the cells of epiblast in the caudal part of embryonic disc to the middle line .
- It appears as a narrow groove called **primitive groove** with slightly bulging regions on either side.
- Its cephalic end forms a bulge called **primitive node** which has a central depression called **primitive pit** .

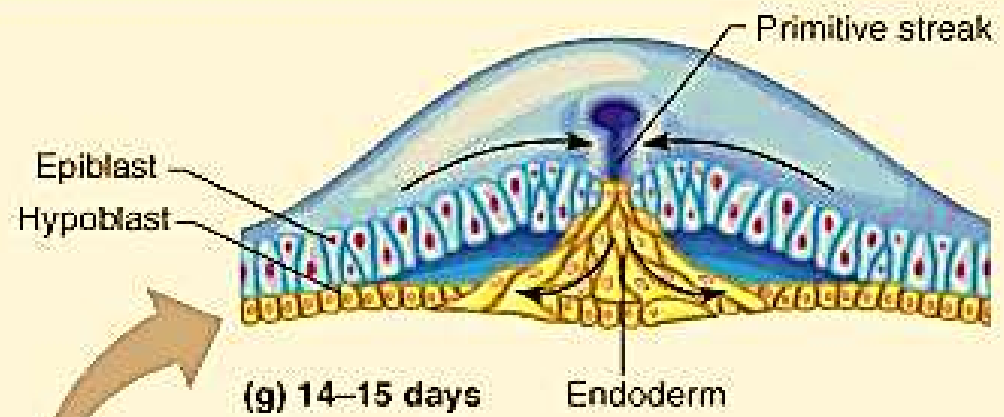
## 2. Invagination :

The cells of epiblast migrates towards the primitive streak ,slip beneath it into the interior of the embryonic disc to :

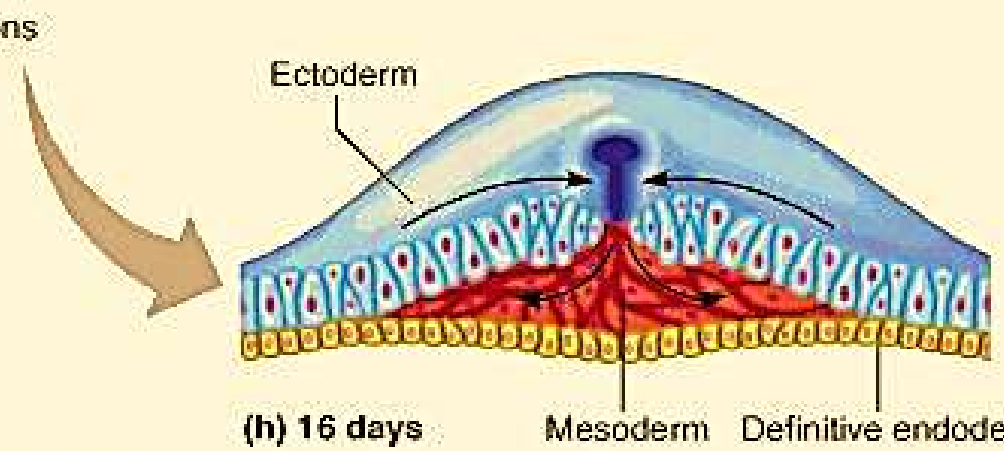
- a) Invade and replaces the hypoblast to form the **endoderm**.
- b) The remaining part of the epiblast forms the **ectoderm**
- c) Some of the invaginated epiblast cells remain and migrate in all directions in between the ectoderm and the endoderm to form **intra-embryonic mesoderm** .



(f) Bilayered embryonic disc, superior view

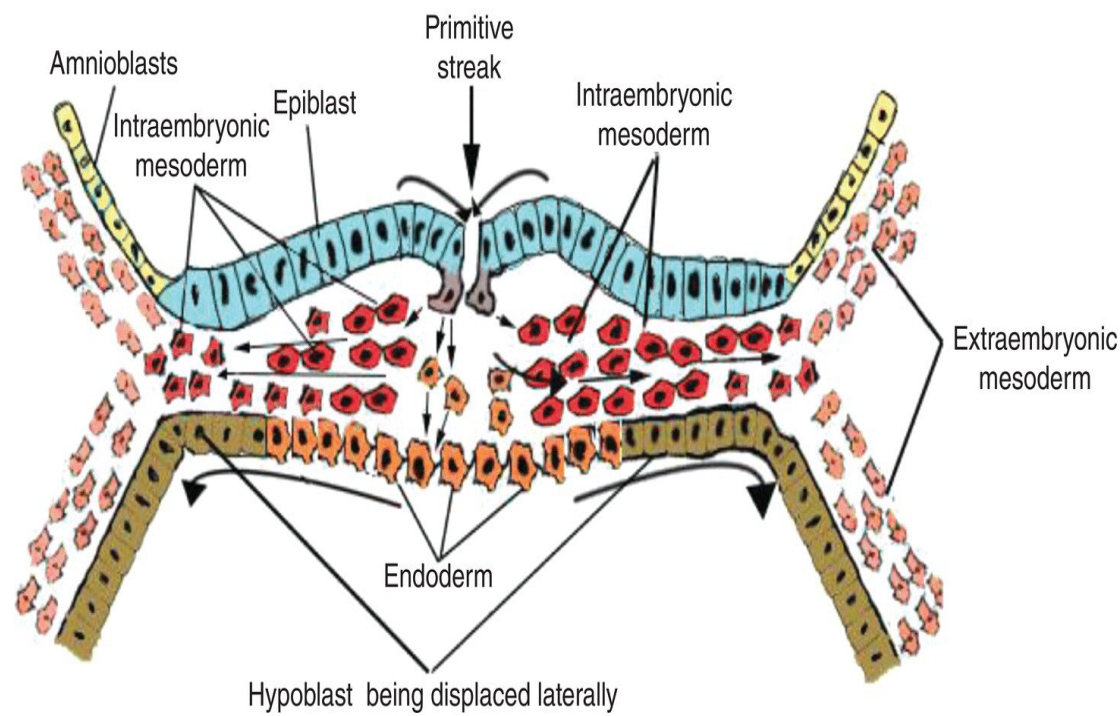
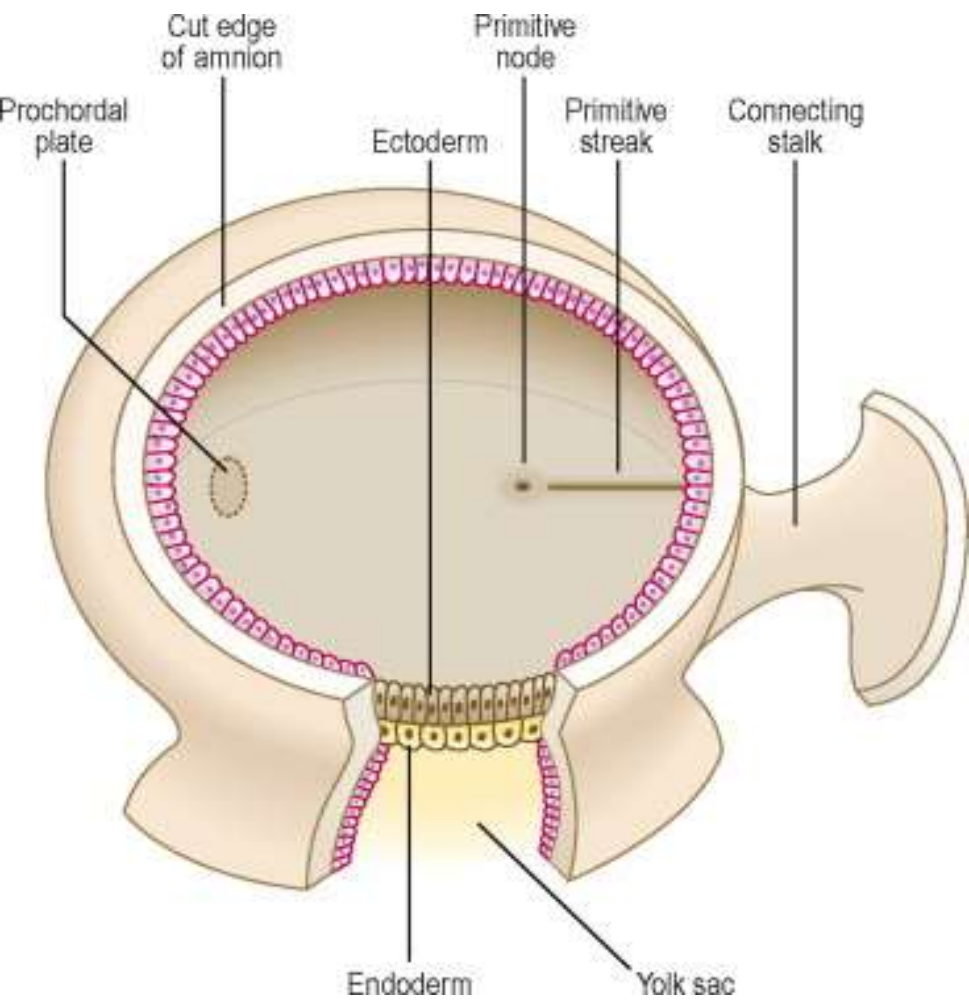


(g) 14-15 days



(h) 16 days

Copyright © 2001 Benjamin Cummings, an imprint of Addison Wesley Longman, Inc.





**Watch this video**

<https://www.youtube.com/watch?v=3AOoikTEfeo>

The embryonic disc remain bilaminar i.e ectoderm and endoderm with no intervening mesoderm in 2 sites :

**1) Prochordal plate** : near the cephalic end of the embryonic disc .

The prochordal plate later on will share in formation of the oro-pharyngeal membrane

**2) Cloacal membrane** : immediately behind the caudal end of the primitive streak .

REED ONLY

## Formation of the notochord :

- ❖ Formation of the **pre-notochordal process** by invagination of cells in the **primitive node** .
- ❖ These cells grow cranially in the median plane between endoderm & ectoderm until they reach the buccopharyngeal membrane.
- ❖ A fine canal develops , starts from the **primitive pit** then extends cranially into the pre notochordal process , transforming it to **pre notochordal canal** .
- ❖ **Notochordal-endodermal fusion**: The **floor** of pre notochordal canal is adherent to the underlying endoderm .
- The floor of the pre notochordal tube **degenerates** together with the underlying endoderm , forming a **Neurenteric canal** that temporarily **connects** the yolk sac with the amniotic cavity.
- **Notochordal plate** is formed by fusion of the **roof** of the pre notochordal canal with the surrounding endoderm.

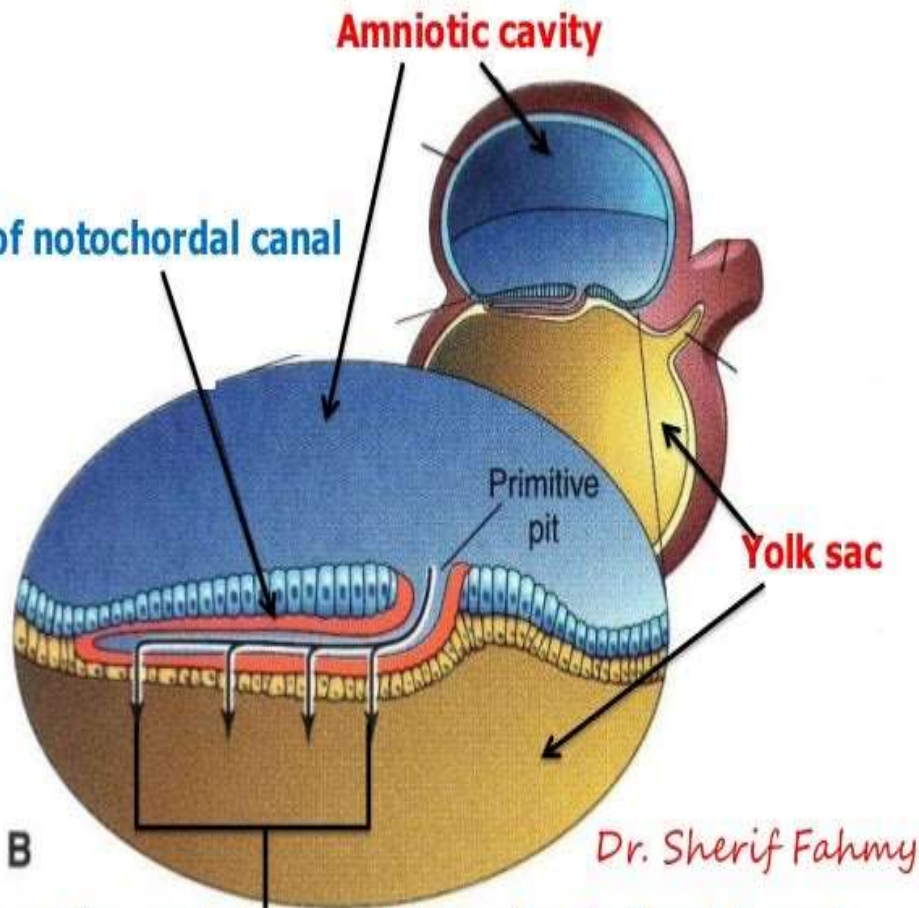
➤ **Definitive notochord** is a solid cord of cells **extending** from the primitive pit to the **Prochordal plate** and buccopharyngeal membrane.

➤ **Significance of notochord :**

It acts as **temporary axial skeleton** for the embryo being **replaced later** on by the vertebral column which is the permanent axial skeleton .

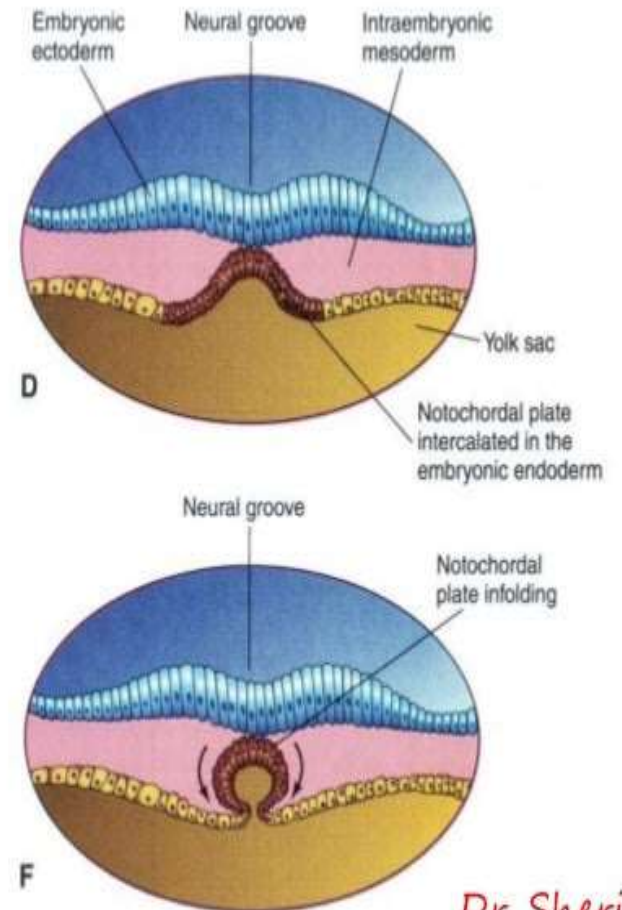
**LS**

**Roof of notochordal canal**



**Degenerating endoderm and floor of notochordal canal**

**TS**





**THANK YOU**

DR.AHMED SALMAN