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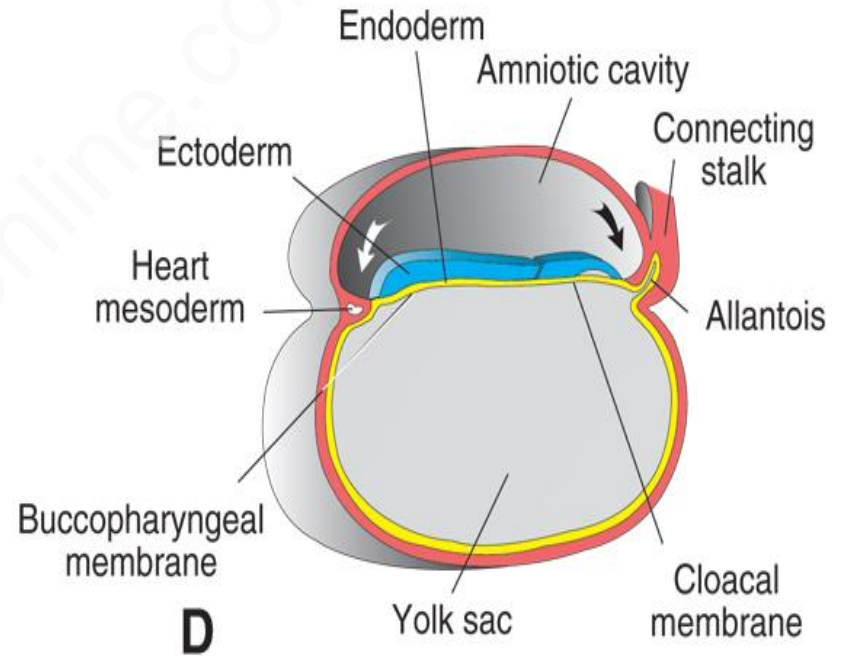
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Foldings of the embryo



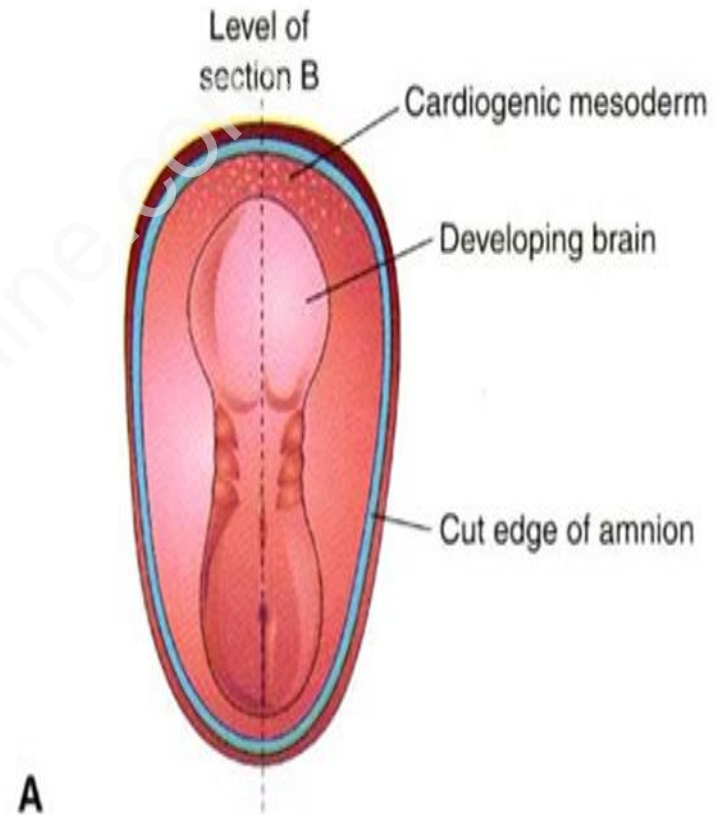
Introduction

- Following gastrulation, The embryo is a flat trilaminar disc
- During the 4th week differential growth occurs in certain regions of the embryo.
- The embryonic disc and amnion shows rapid growth but not the yolk sac.
- Between day 22-28 two important events occurs



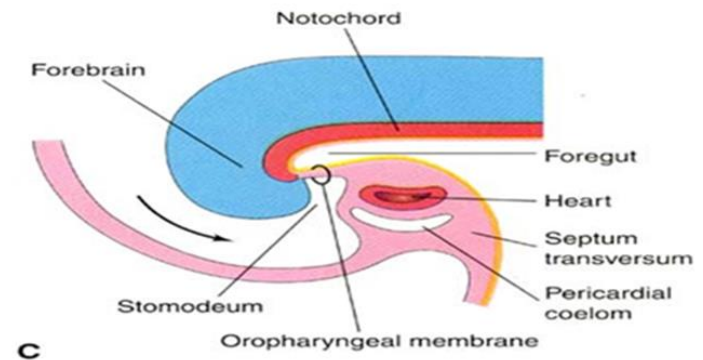
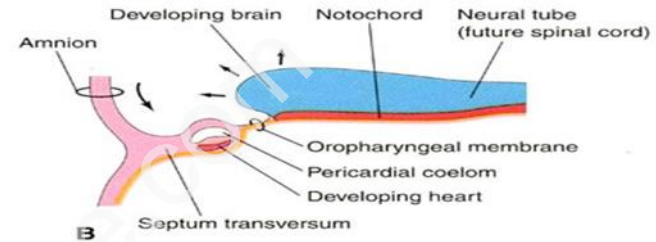
3-5D Body folding

- The cephalocaudal folding and lateral folding of the embryo.
- As a result the flat embryo is converted into cylindrical one
- Folding along the median plane is cephalocaudal folding
- Folding along the tranverse plane is lateral folding

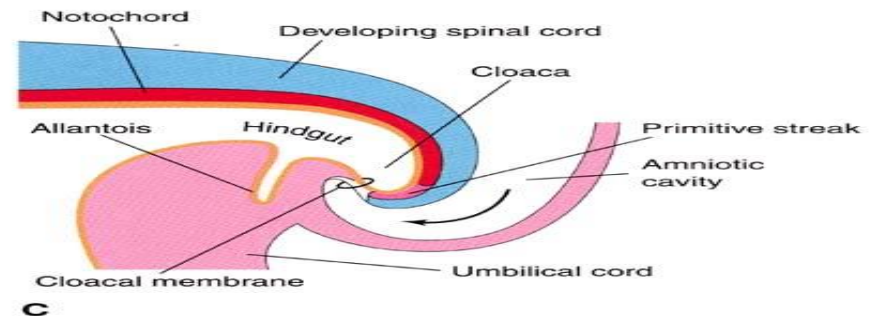
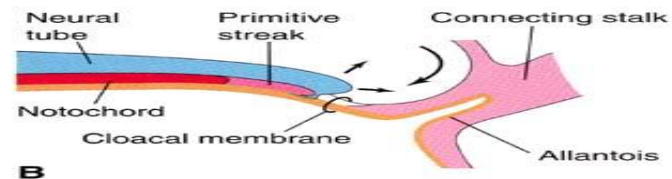
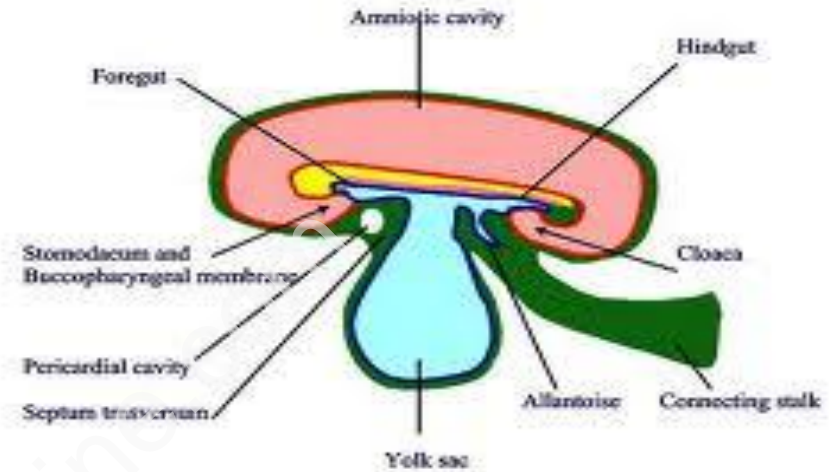


Cephalocaudal (Head and tail) folding

- The cranial end of the embryo consists of Buccopharyngeal membrane and cranial to this is the cardiogenic area
- Due to rapid growth of forebrain vesicle the above structures are brought to ventral aspect forming the future mouth and heart.(head fold)



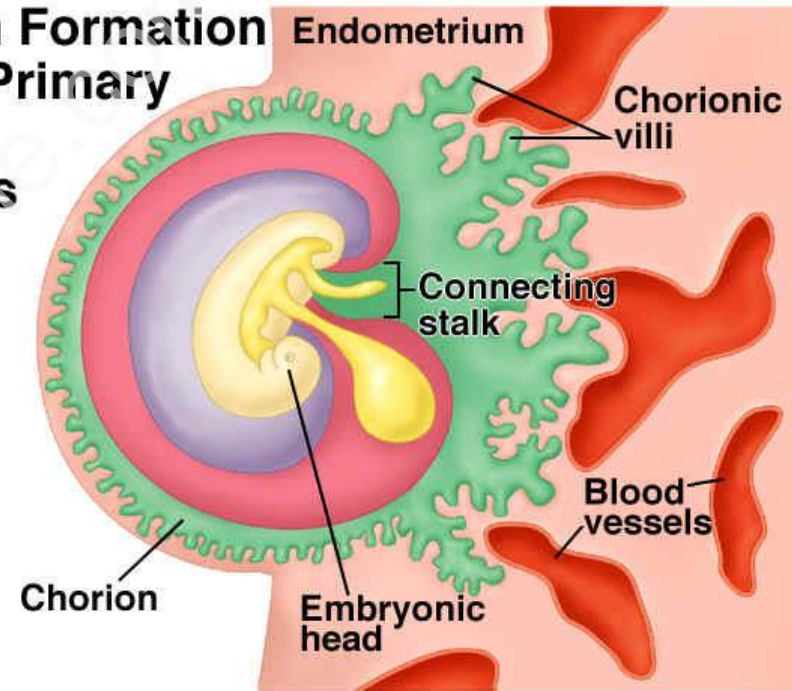
- Repositioning of septum transversum also takes place from cranial end to its final position below the heart.
- Septum transversum is the future diaphragm
- A similar process occurs at the caudal end of the embryo (tail fold)
- The caudal flexion shifts the cloacal membrane to the anterior surface.



- The connecting stalk is brought close to the neck of yolk sac
- During head and tail fold a part of yolk sac is incorporated in the embryo forming the foregut and hindgut respectively
- The foregut lies between heart and brain

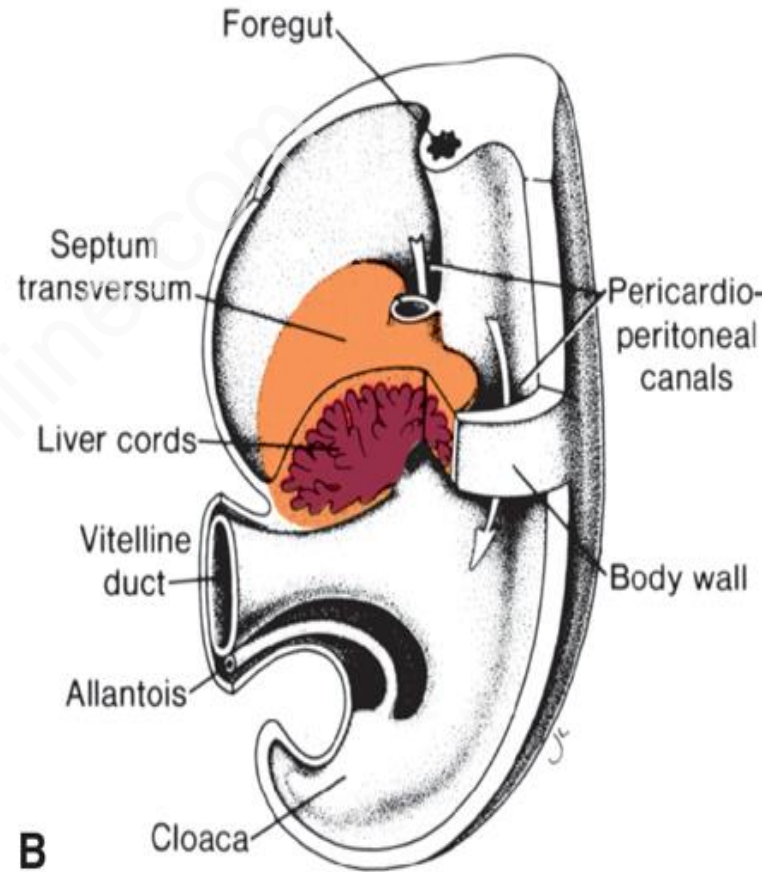
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Organ Formation from Primary Germ Layers



- The terminal part of hind gut dilates to form cloaca.
- The allantois is partly incorporated and communicates with the gut to form urinary bladder

http://www.ehd.org/movies.php?mov_id=11



3-6B Body cavities: Pleuropericardial and diaphragm formation

To summarize...

Folding of the head region of the embryo moves...

1. The septum transversum

2. The heart and

3. The buccopharyngeal membrane

...to the **ventral** aspect.

Part of the endoderm / yolk sac gets incorporated into the embryo as **foregut**.

Folding of the tail region of the embryo moves...

1. The connecting stalk

2. The allantois and

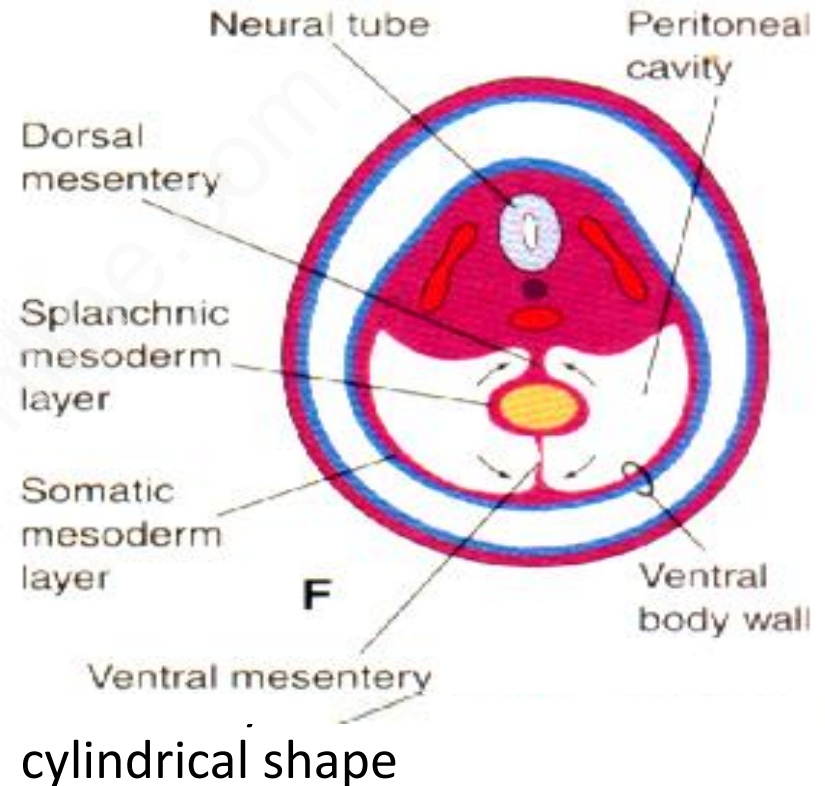
3. The cloacal membrane

...to the ventral aspect.

Part of the yolk sac is incorporated into the embryo as **hindgut** and **cloaca** (terminal part of hindgut).

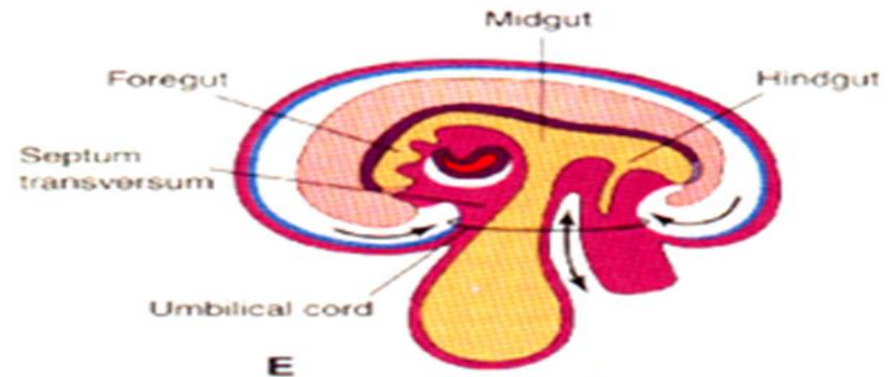
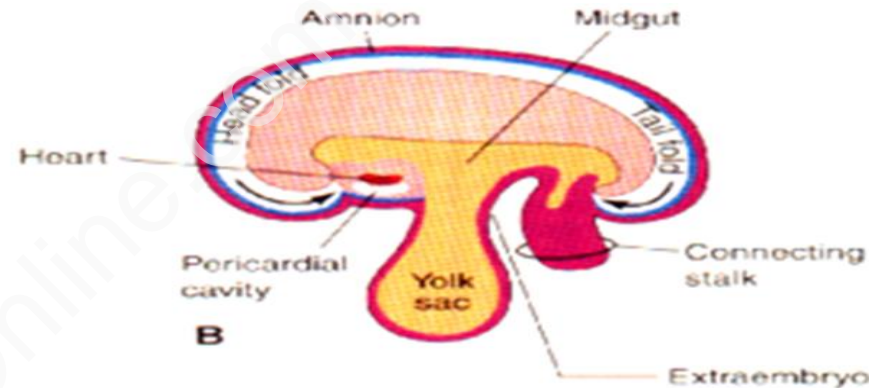
Lateral/Transverse folding

- The lateral plate mesoderm splits into somatopleuric and splanchnopleuric intra embryonic mesoderm
- These flaps of mesoderm fold and merge in the anterior midline except at the region of umbilical cord
- The space between the two mesoderm exist as coelomic cavity.
- ape

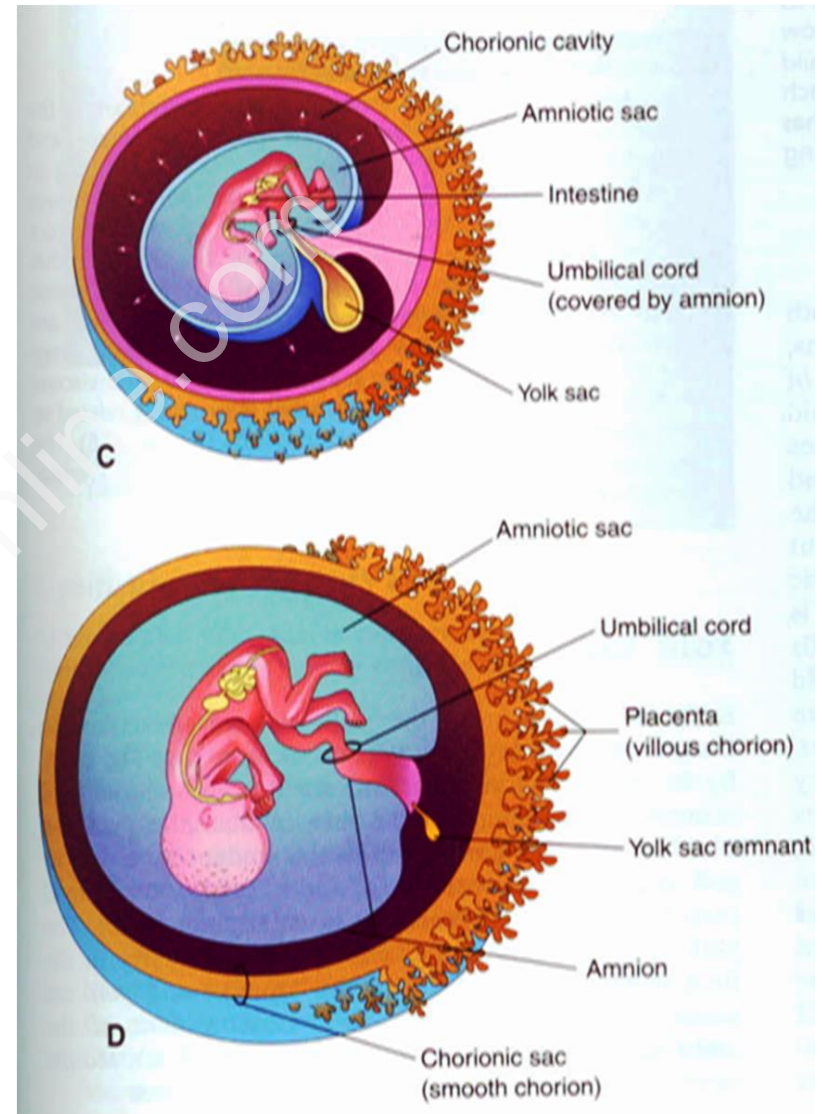


<http://www.indiana.edu/~anat550/genanim/latfold/latfold.swf>

- The endoderm between foregut and hindgut is midgut.
- Initially the midgut is in wide communication with the yolk sac through a broad vitellointestinal duct
- This is reduced to a narrow yolk stalk
- The ectoderm and amnion undergoes rapid growth.

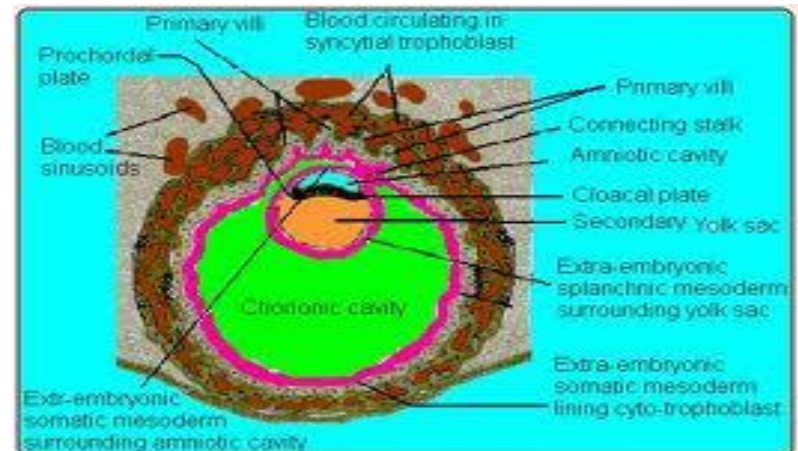
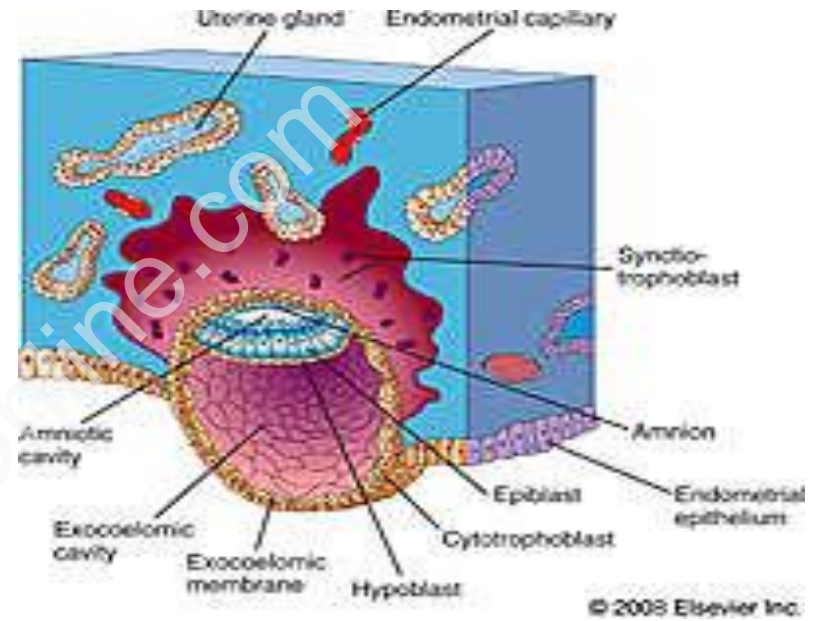


- The ectoderm also fuses in the midline except at the umbilicus and covers the embryo externally.
- The amnion now expands and covers the entire embryo
- Communication between intraembryonic and extraembryonic mesoderm (chorionic) is reduced.
- With the expansion of amnion the chorionic cavity is further obliterated.

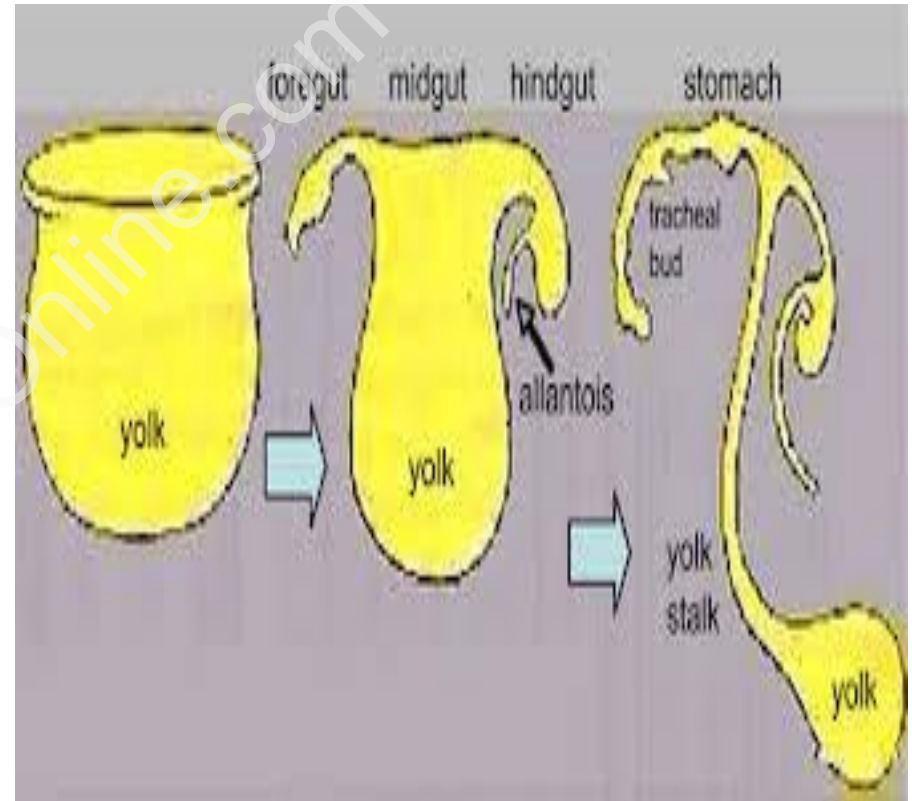


Yolk Sac

- Initially the yolk sac is large and called as Primitive yolk sac
- With the formation of extra embryonic coelom the yolk sac is reduced to secondary yolk sac



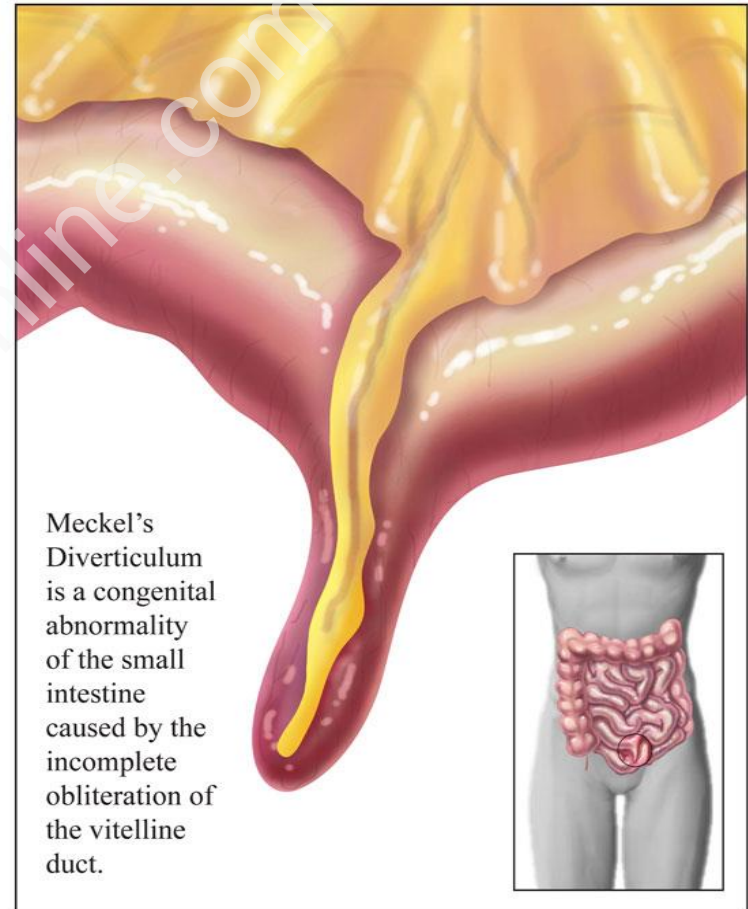
- With the foldings of the embryo along the transverse plane the yolk sac communicates thru a vitellointestinal duct
- Finally the yolk sac atrophies



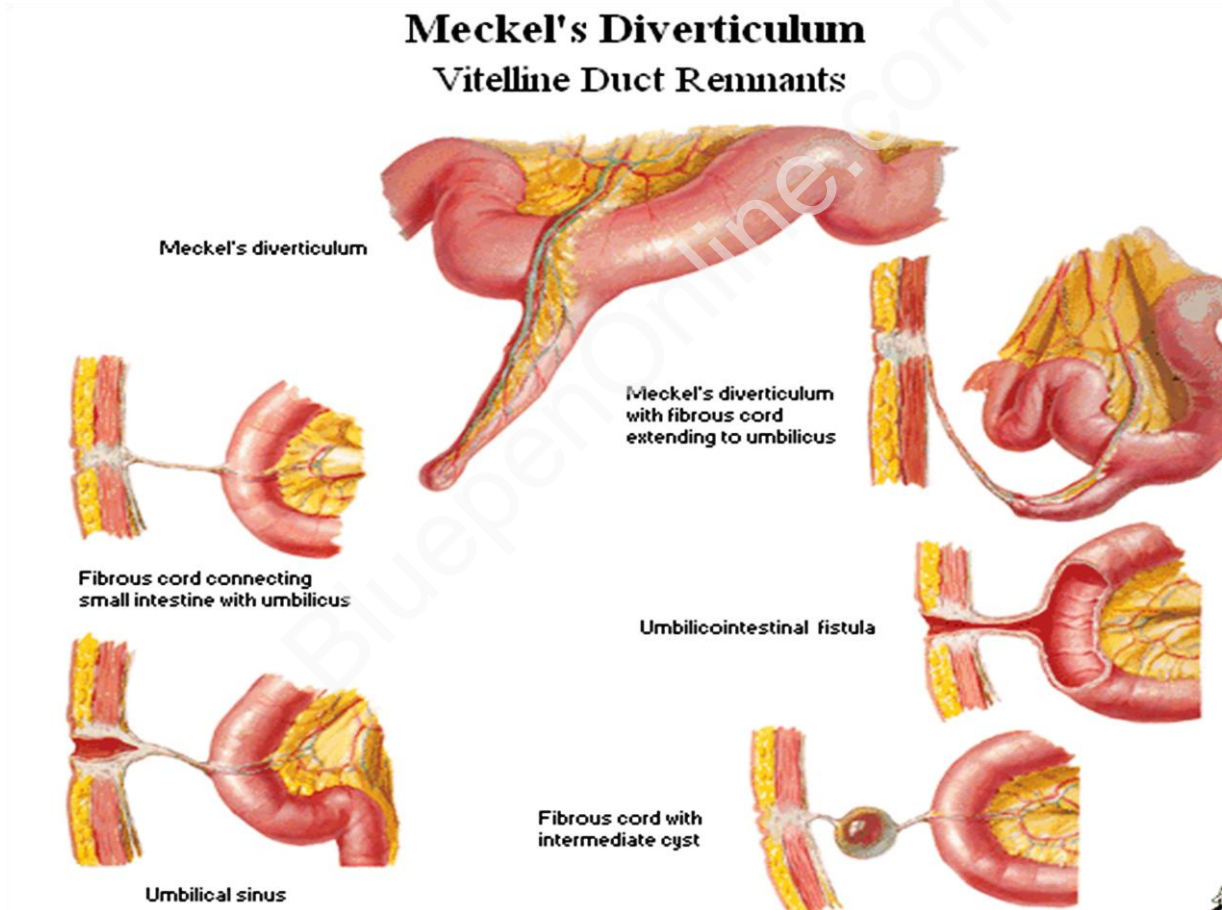
Meckel's Diverticulum

- Persistent vitellointestinal duct
- From antimesenteric border of ileum to umbilicus
- 2% of people
- 2 inches is length
- 2 feet way from ileocecal junction

Meckel's Diverticulum



Meckel's diverticulum - types



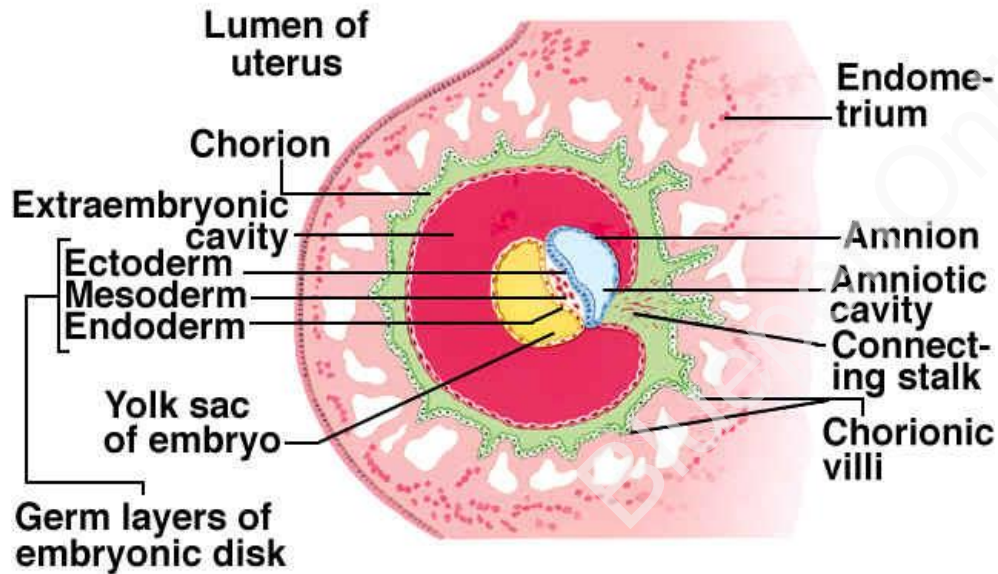
Significance of yolk sac

- Transfer of nutrients to the embryo during 2nd & 3rd weeks of gestation till utero placental circulation is established.
- Hemopoiesis begins first in the splanchnopleuric mesoderm lining the yolk sac & continues to do so till liver takes over.
- Primordial germ cells are derived from the yolk sac from where they migrate towards the developing gonads around 3rd week.
- Endoderm lined wall of the yolk sac incorporated into the embryo during folding forms the foregut, midgut & hind gut.

CONNECTING STALK

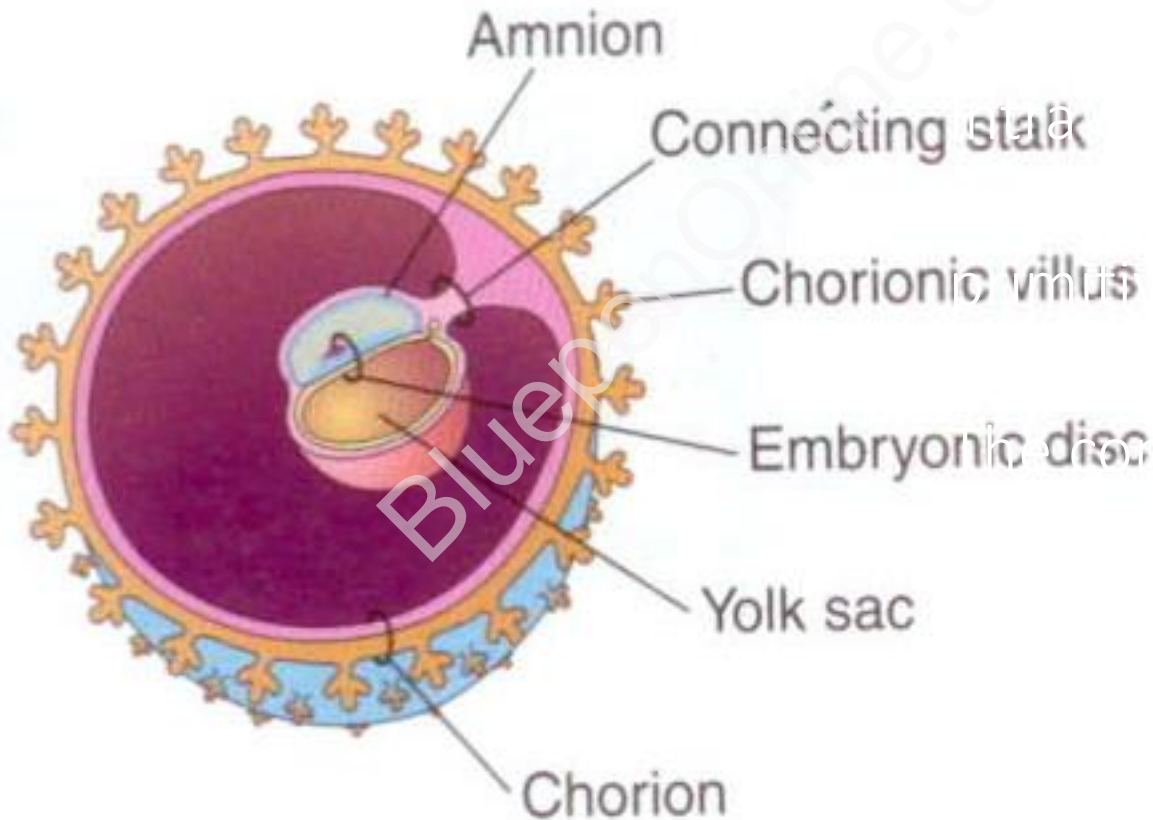
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Embryonic Primary Germ Layers



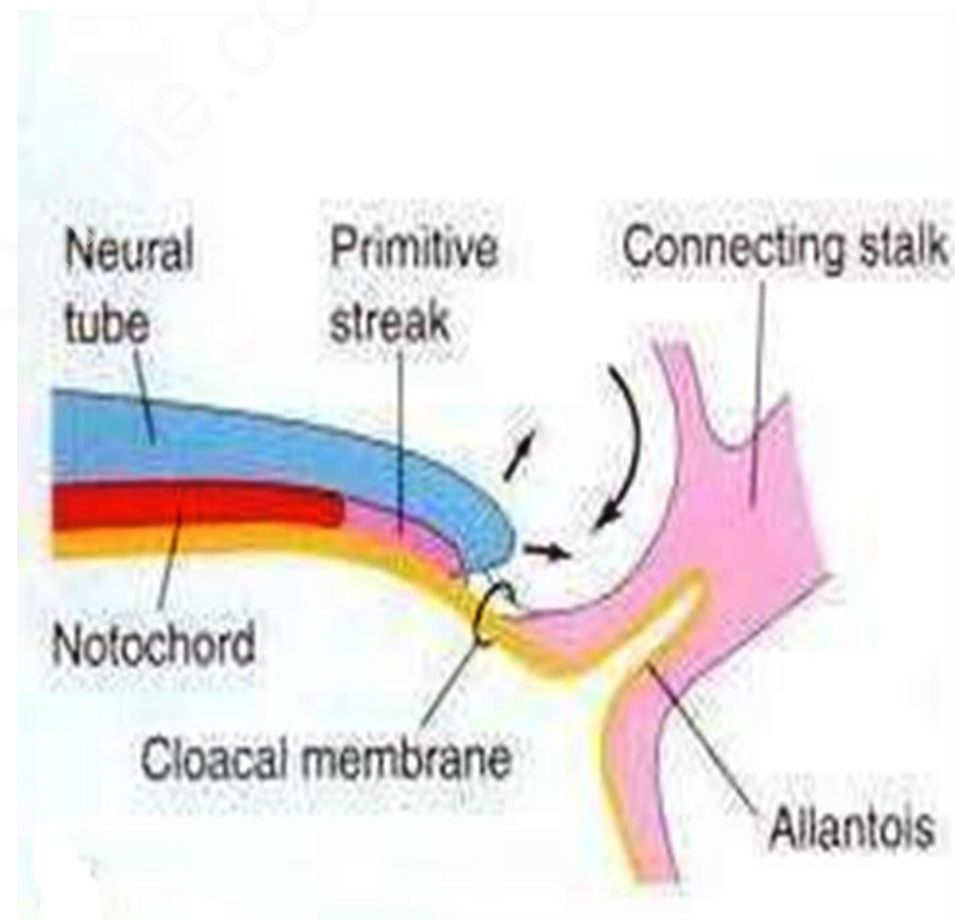
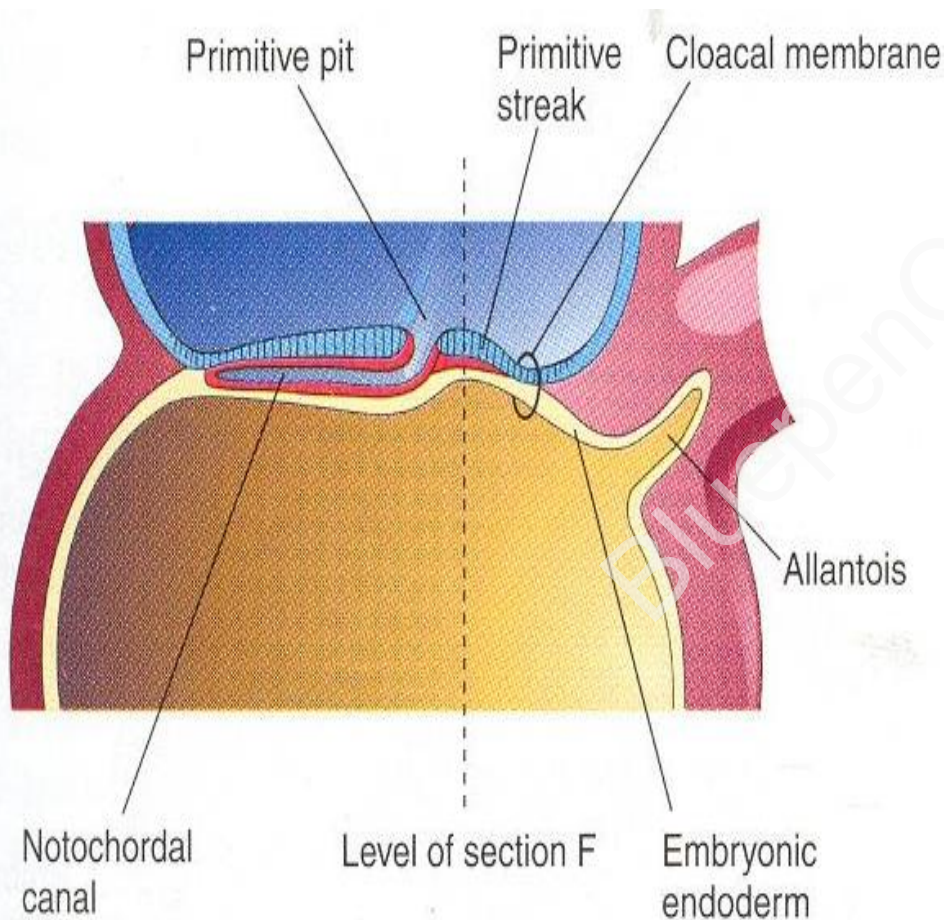
- It is the site where the two layers of extra embryonic mesoderm are continuous with each other. To begin with, the connecting stalk is broad & attached to the roof of amniotic cavity.

- With the enlargement of the extraembryonic coelomic cavity, amniotic cavity & embryonic disc, the connecting stalk becomes relatively small.
- Its attachment is shifted to the caudal end of the embryo.

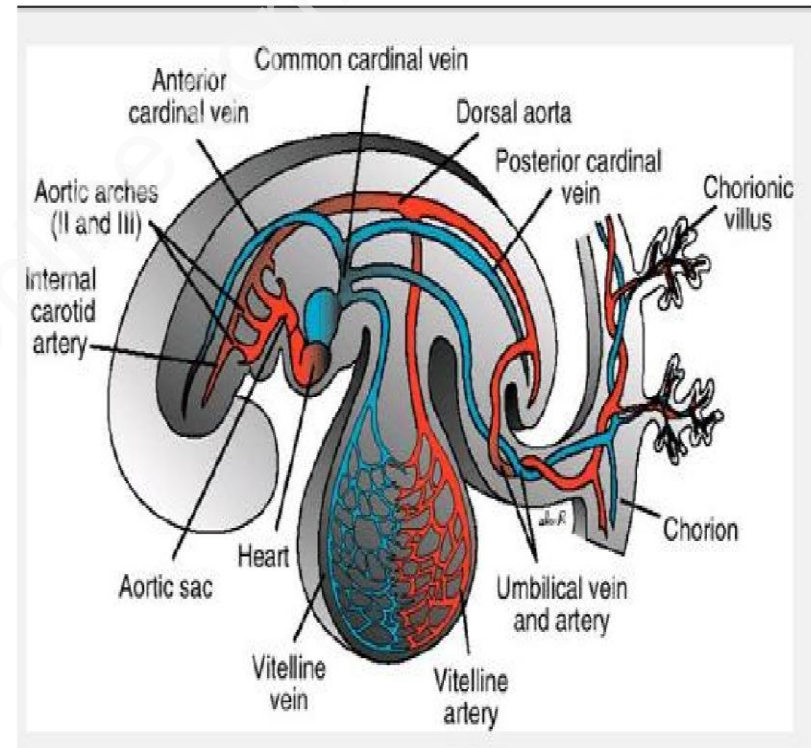


ALLANTOIS

- At around 16th day a small sausage shaped diverticulum extends into the connecting stalk from the endoderm at the caudal end – Allantoic diverticulum.



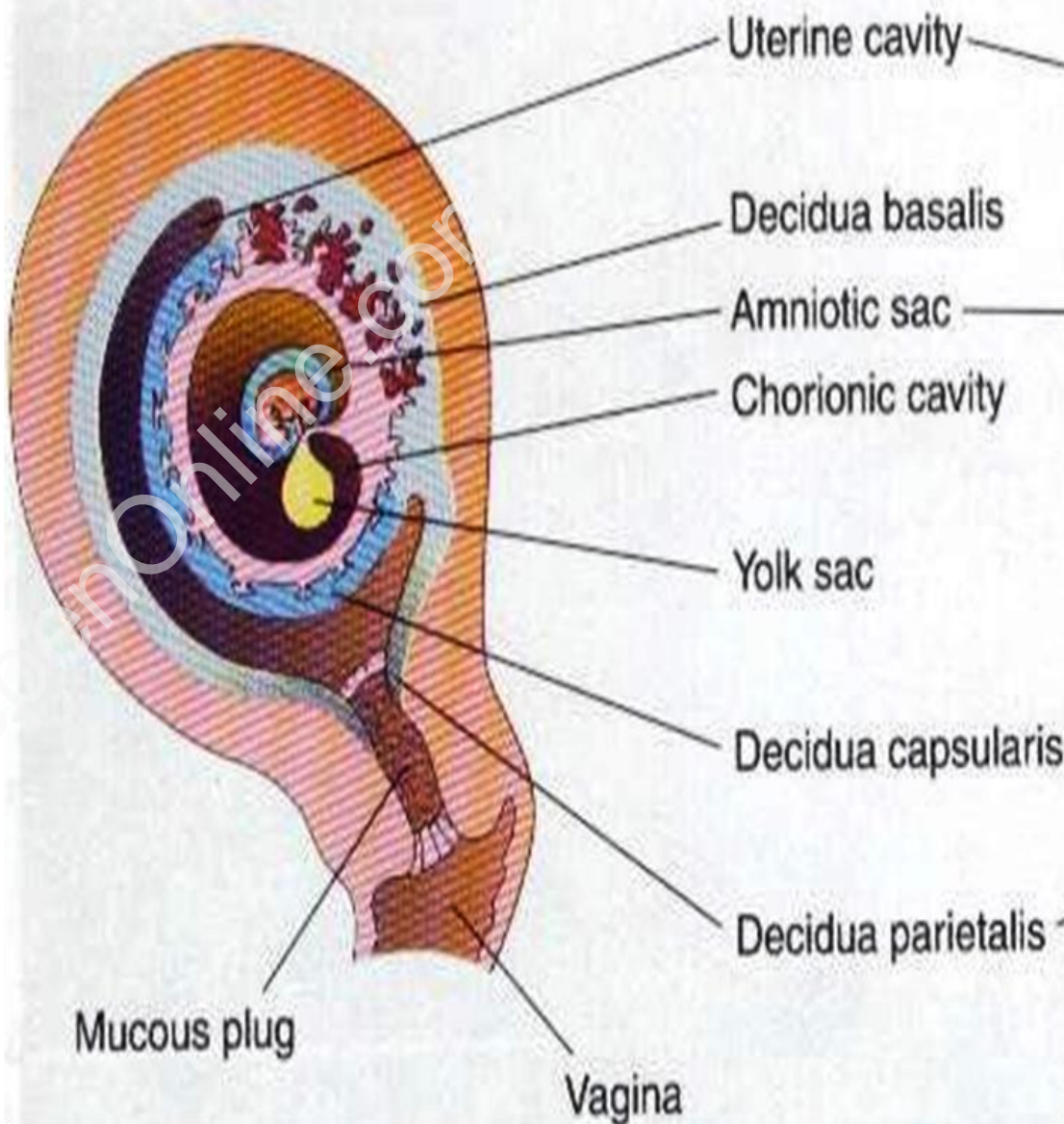
- It is involved with early blood formation of the embryo.
- It contributes to the formation of urinary bladder.
- The blood vessels of allantois forms the umbilical arteries & veins.

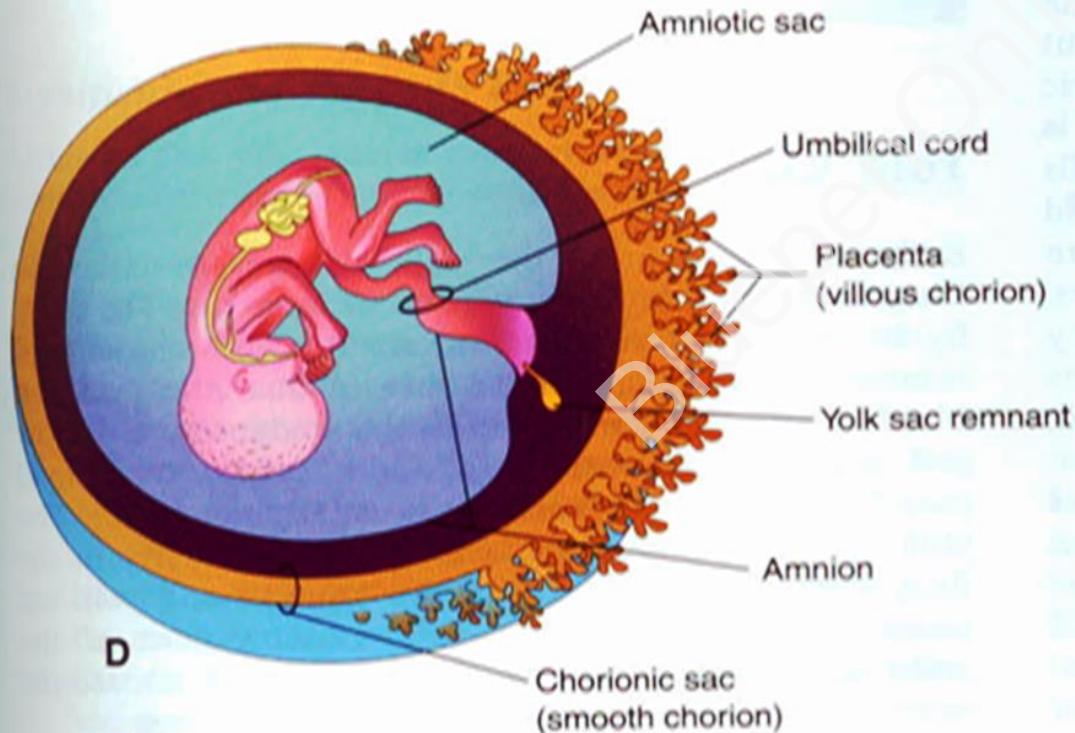
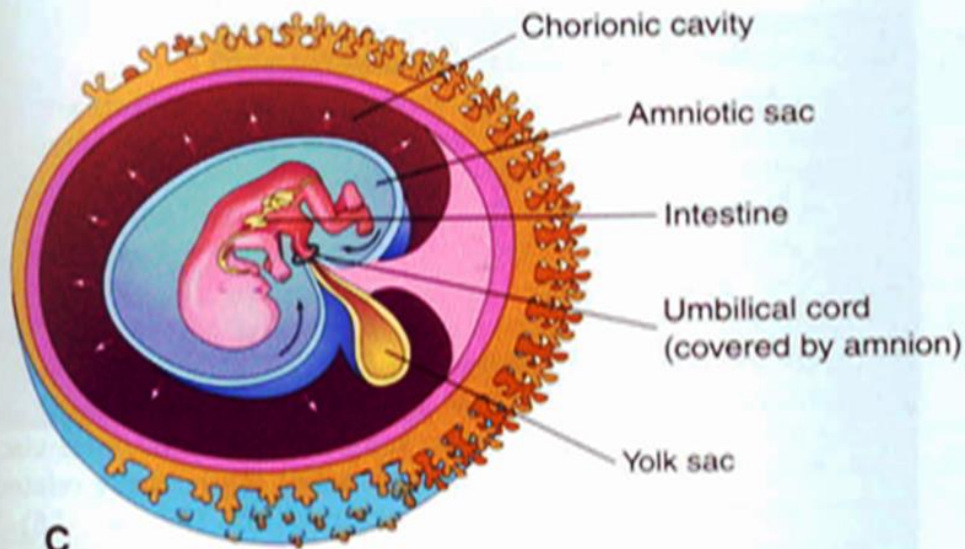


FORMATION OF FETAL MEMBRANES

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- With the folding of the embryonic disc the baby become completely covered by amniotic cavity & outside to it by extra embryonic coelomic cavity or chorionic cavity.

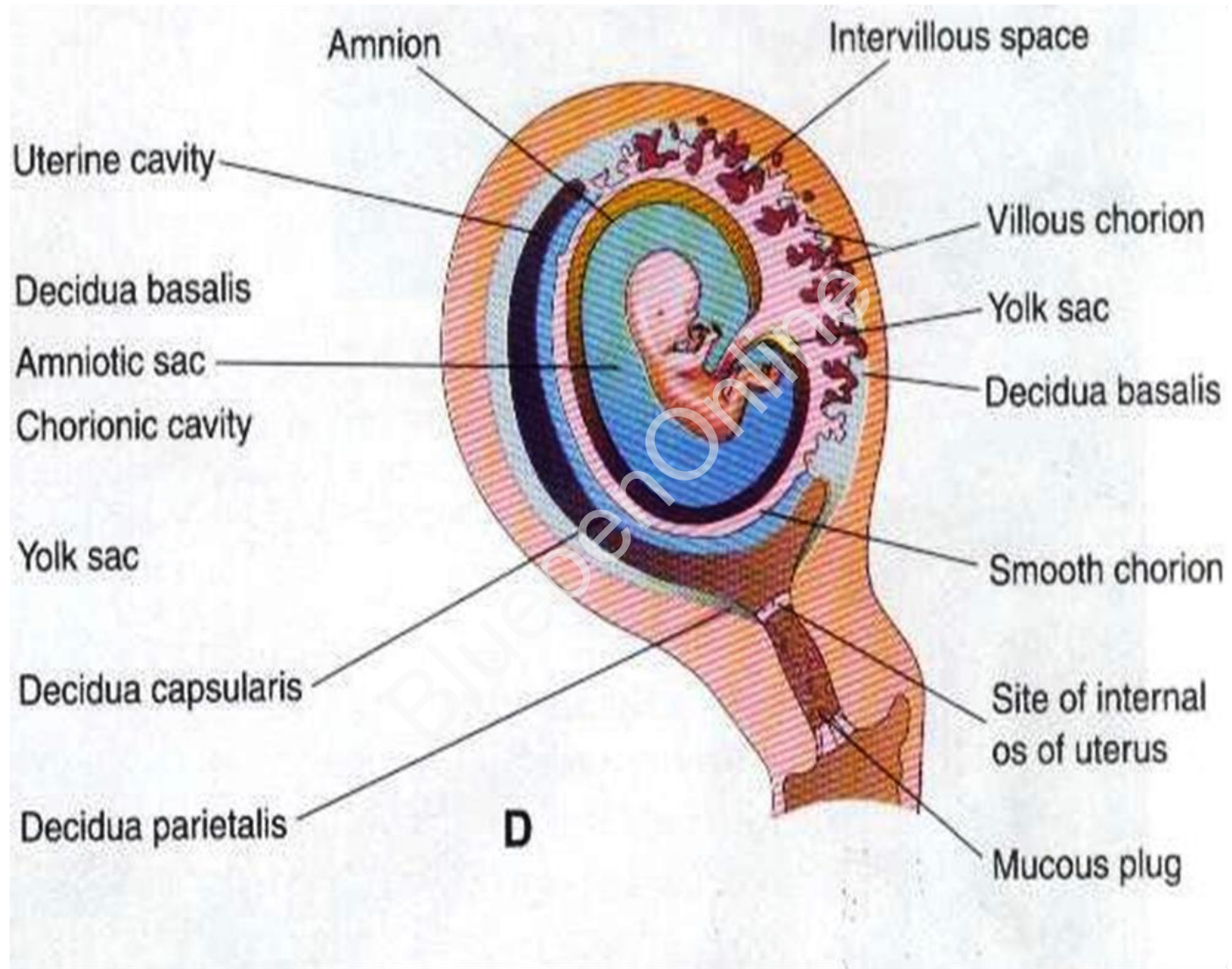


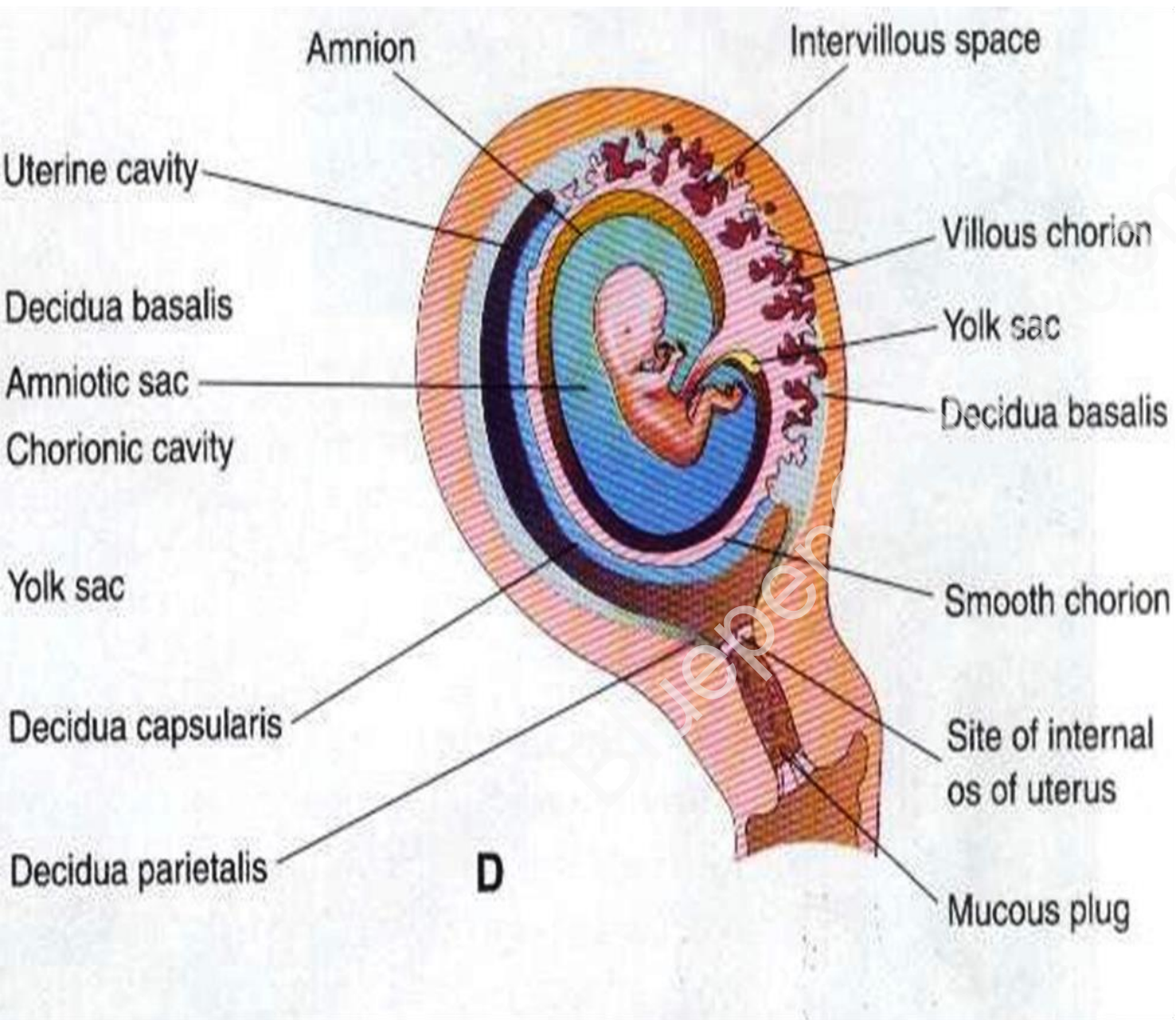


With the enlargement of amniotic cavity the chorionic cavity is completely obliterated & amnion fuses with chorion –

AMNIOCHORIONIC MEMBRANE.

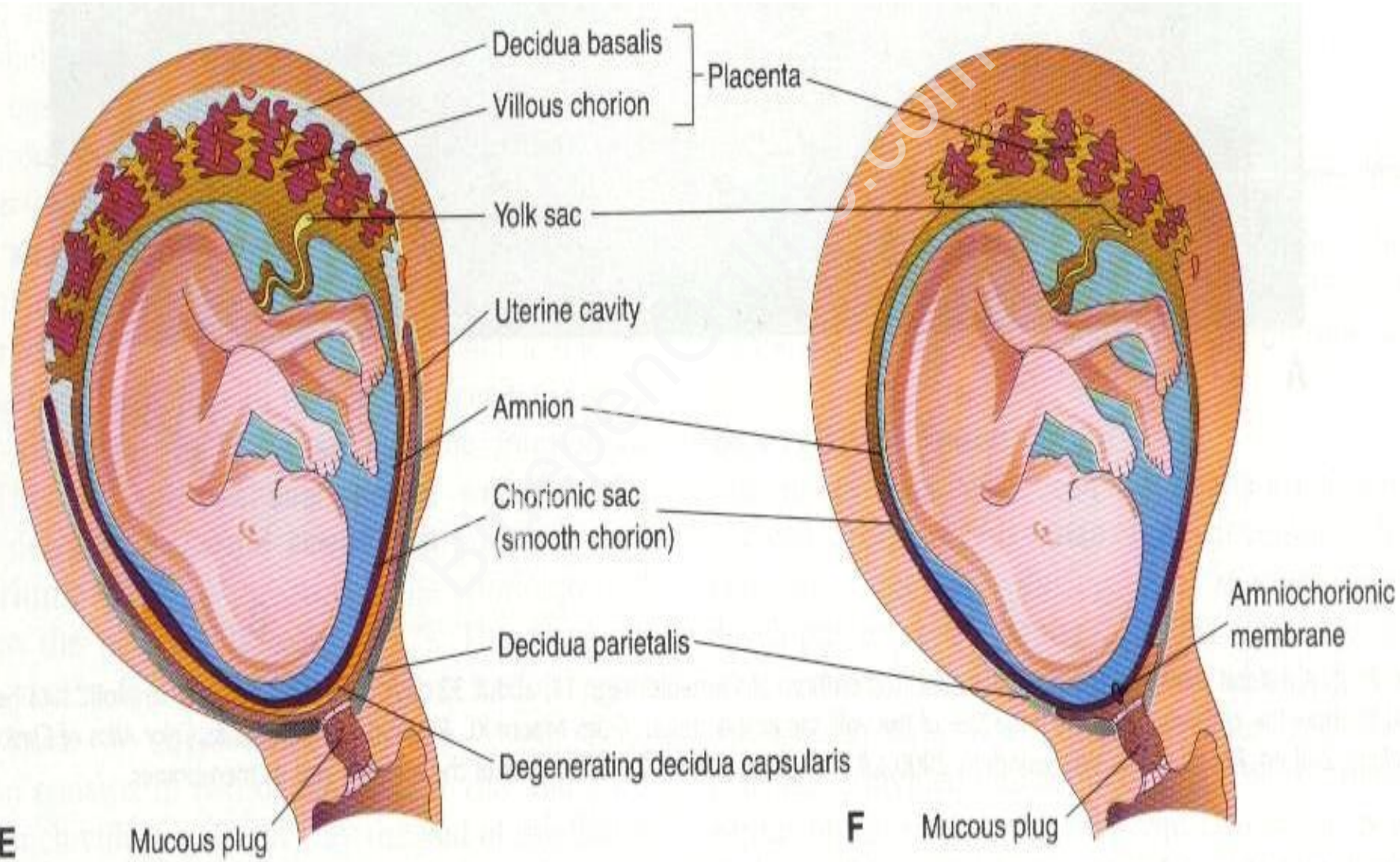
With further growth of the baby the amniotic cavity enlarges obliterating the uterine cavity





With complete obliteration of the uterine cavity the decidua capsularis on the outer surface of the amnio chorionic membrane fuses with the decidua parietalis of the uterine wall.

The fused decidua parietalis, decidua capsularis & amniochorionic membranes are together called as – **FETAL MEMBRANES**.




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