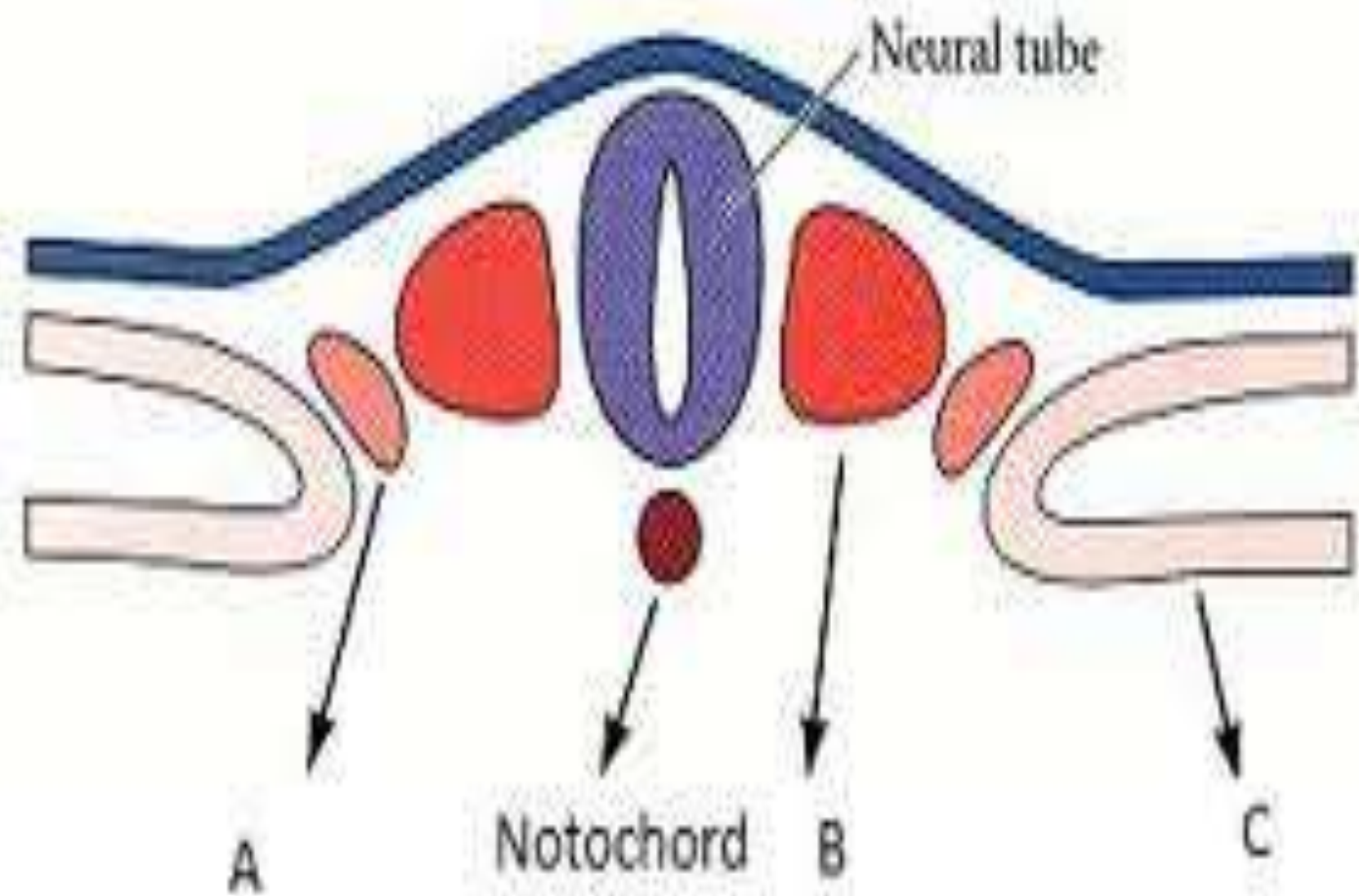


Intra embryonic mesoderm

Intraembryonic mesoderm

- intra embryonic mesoderm is formed by proliferation of cells in primitive streak & it separates ectoderm & endoderm except in –
 - prochordal plate
 - cloacal membrane
 - in midline the place which will be occupied by notochord.

- at edges of embryonic disc , the intraembryonic mesoderm is continuous with extraembryonic mesoderm.
- intraembryonic mesoderm now subdivided into three parts—
- A) **paraxial** mesoderm—mesoderm on either side of notochord
- b) **lateral plate** mesoderm—most laterally
- c) **intermediate mesoderm**— longitudinal strip b/w two.



Paraxial mesoderm

- cells are homogeneously arranged, later mesoderm gets segmented
- the segments are of two categories—
- **somites**—cubical, distinctly segmented. finally 44 pair of somites are formed(4 occipital, 8 cervical, 12 thoracic , 5 lumbar, 5 sacral & 8-10 coccygeal)
- **somitomeres**—lie in region of head , they are rounded structures. they are seven of them, form bones & muscles of head & jaw.
- occipital somites form muscles of tongue
- somites form axial skeleton, skeletal muscle & part of skin.

Intraembryonic coelom

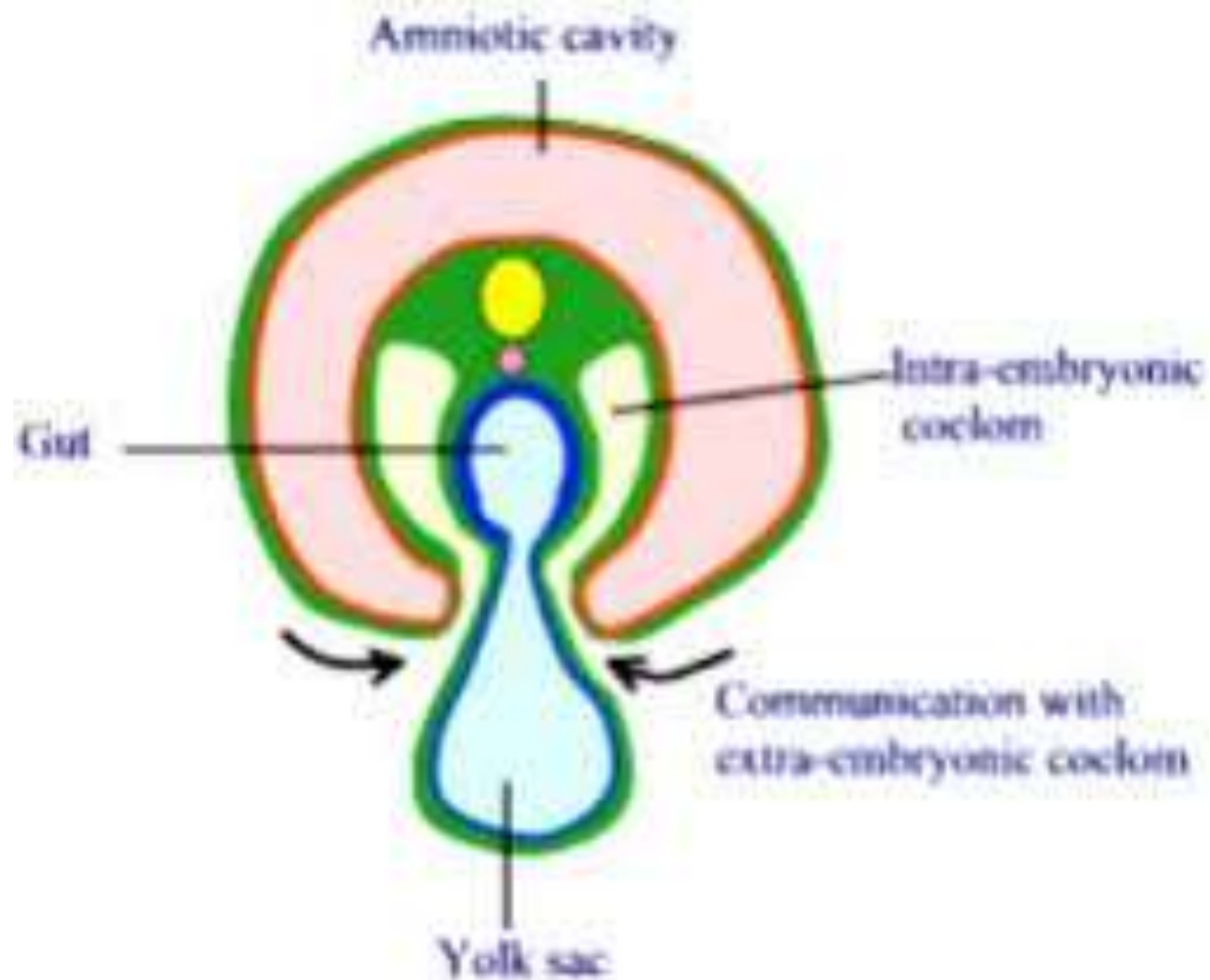
- while paraxial mesoderm is undergoing segmentation ,to form somites,changes are also occurring in lateral plate mesoderm .
- Small cavities appear in it ,which coalesce to form one large cavity---intraembryonic coelom.
- it is horse shoe shaped cavity with two halves joined together cranial to prochordal plate.
- initially it is closed cavity , but soon communicates with extra-embryonic coelom.

- with formation of intraembryonic coelom , the lateral plate mesoderm splits into –
- **Somatopleuric** / parietal i/e mesoderm --- that is in contact with ectoderm,
- **splanchnopleuric** / visceral,intraembryonic mesoderm that is in contact with endoderm.
- intraembryonic coelom give rise to pericardial ,pleural & peritoneal cavities.

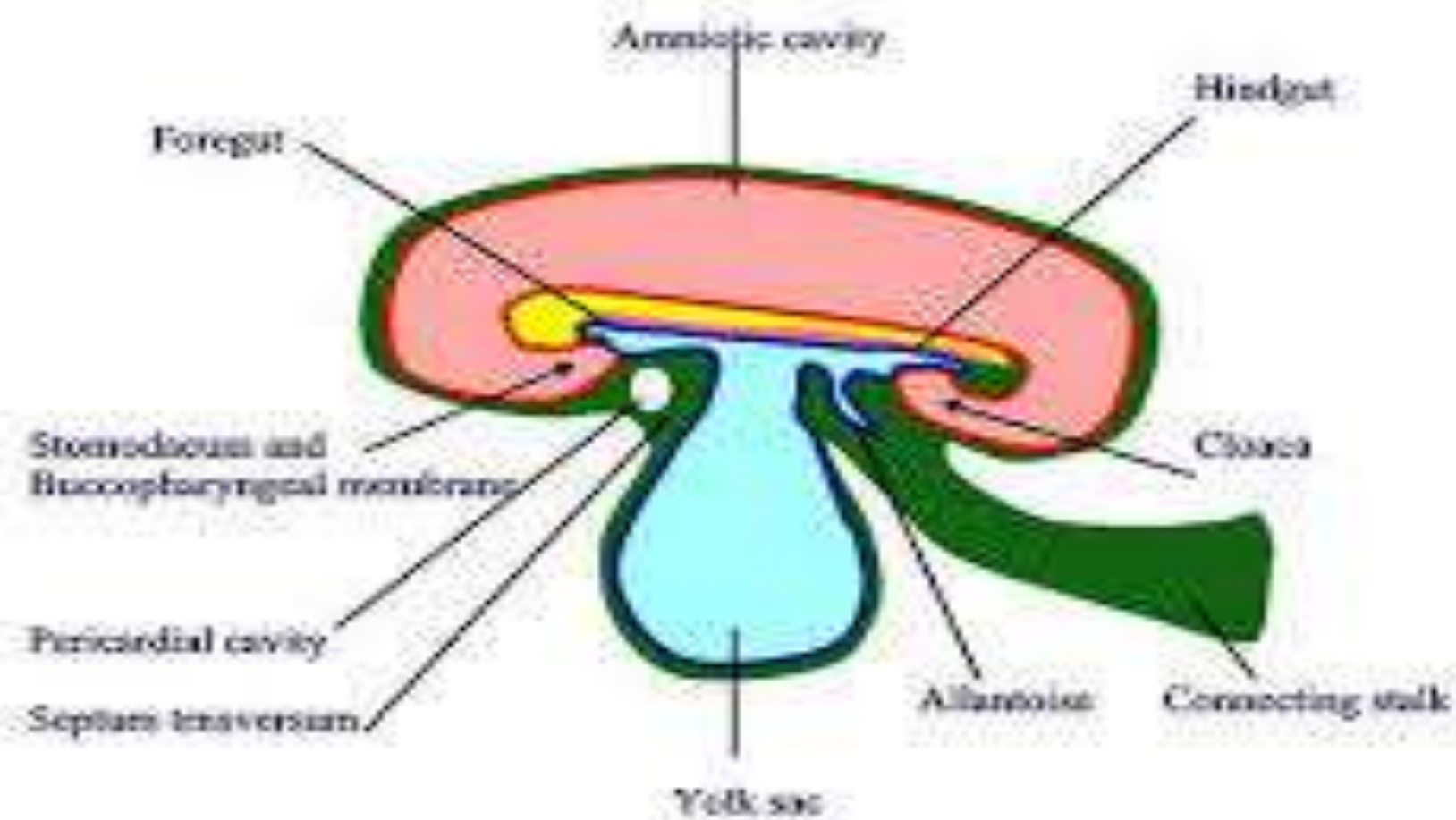
- The pericardium is formed from part of intra-embryonic coelom that lies ,in the midline ,cranial to prochordal plate . The heart is formed in splanchnopleuric mesoderm forming the floor of this part of coelom.—called **cardiogenic** area (**cardiogenic** plate ,heart -forming plate)
- cranial to cardiogenic area the somato & splanchnopleuric mesoderm are continuous with each other .mesoderm here does not split here and form a structure --**septum transversum**.

Yolk sac & folding of embryo

- **as primary yolk sac** is bounded above by cubical endoderm of embryonic disc & elsewhere by flattened cells lining inside of blastocystic cavity.
- with formation of extraembryonic mesoderm & later extraembryonic coelom , the yolk sac becomes much smaller , lined by cuboidal cells now called as **secondary yolk sac**.



- Following changes are seen—
- progressive increase in size of embryonic disc.
- Head & tail ends are very close to each other, so with increase in length of disc there is bulging upwards in amniotic cavity.
- with further increase in length there is folding on ends called **as head & tail folds**.
- With this now yolk sac becomes more narrowed out ,enclosed in embryo (thus a tube line by endoderm is formed –**primitive gut** is formed which further distinguish **into foregut, midgut & hindgut**)



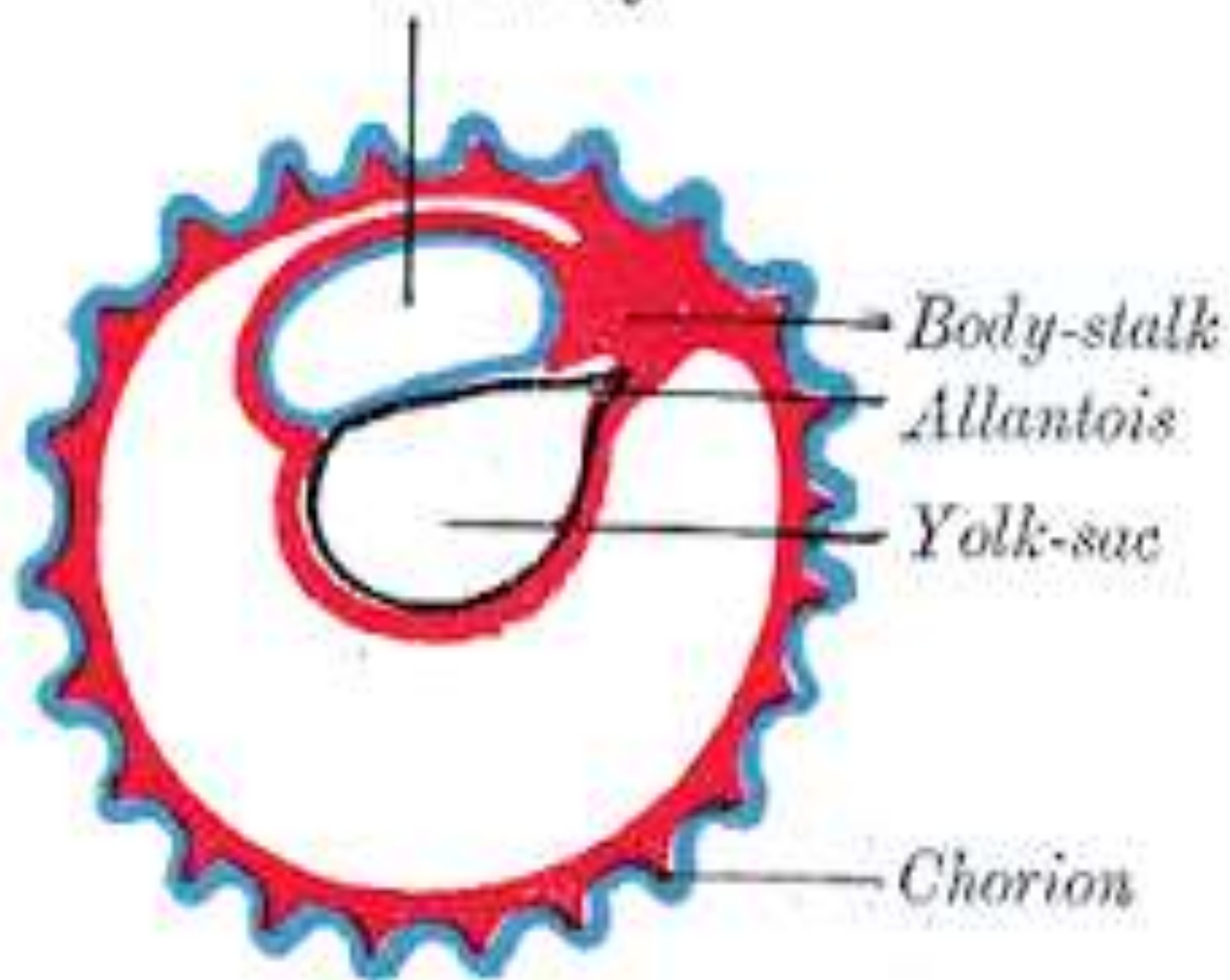
- now yolk sac becomes further narrower – **definitive yolk sac**(the umbilical vesicle)
- narrow channel connecting it to gut is **called— vitellointestinal duct / vitelline duct/ yolk stalk / omphalomesentric duct.**
- this duct gradually elongate & disappears.
- as the head & tail folds are being formed , similarly there is side growth so lateral folds are being formed .
- now there is circular opening called umbilical opening.

- As embryonic disc expands so now amniotic cavity expands greatly & comes to surround the embryo on all sides, thus embryo now floats in amniotic fluid that fills the cavity.

Connecting stalk

- the extraembryonic mesoderm forms connecting stalk.
- **trophoblast** and tissues of **uterus** thus forms – **placenta.**, which provides growing embryo food , nutrition & oxygen.
- as embryo grows area of attachment of connecting stalk becomes narrower & smaller.
- This attachment of connecting stalk is then only seen near caudal end of embryonic disc , that gradually moves toward ventral end of embryo.

Amniotic cavity



Body-stalk

Allantois

Yolk-sac

Chorion

- Thus at **umbilical opening** ---
- vitello-intestinal duct & remnants of yolk sac
- mesoderm of connecting stalk (mesoderm is then converted into gelatinous substance Wharton's jelly ,which protects blood vessels in umbilical cord.
- blood vessels that pass from embryo to placenta.
- a small part of extra embryonic coelom.

- this tube of amnion & structures with in constitute the umbilical cord.

Allantoic diverticulum

- before the formation of tail fold , a small endodermal diverticulum called allantoic diverticulum, arises from the yolk sac near the caudal end of embryonic disc.
- This diverticulum goes into mesoderm of connecting stalk,
- after the formation of tail fold ,part of this diverticulum is absorbed into hindgut,(development of urinary bladder)

Position of structures in relation to head & tail fold

- from cranial to caudal side structures in midline—
- septum transversum
- developing pericardial cavity & heart
- prochordal plate
- neural tube
- primitive streak
- cloacal membrane

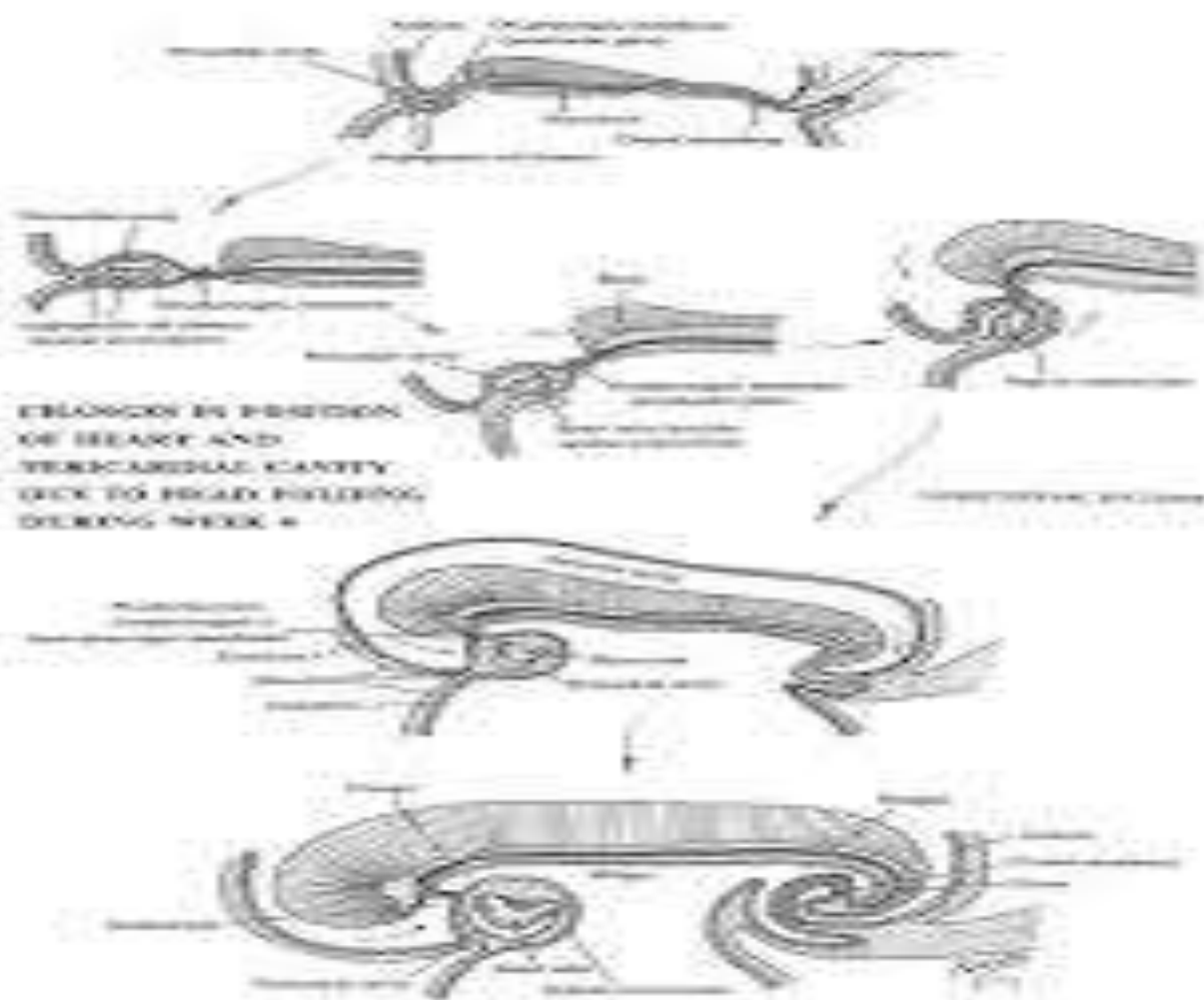
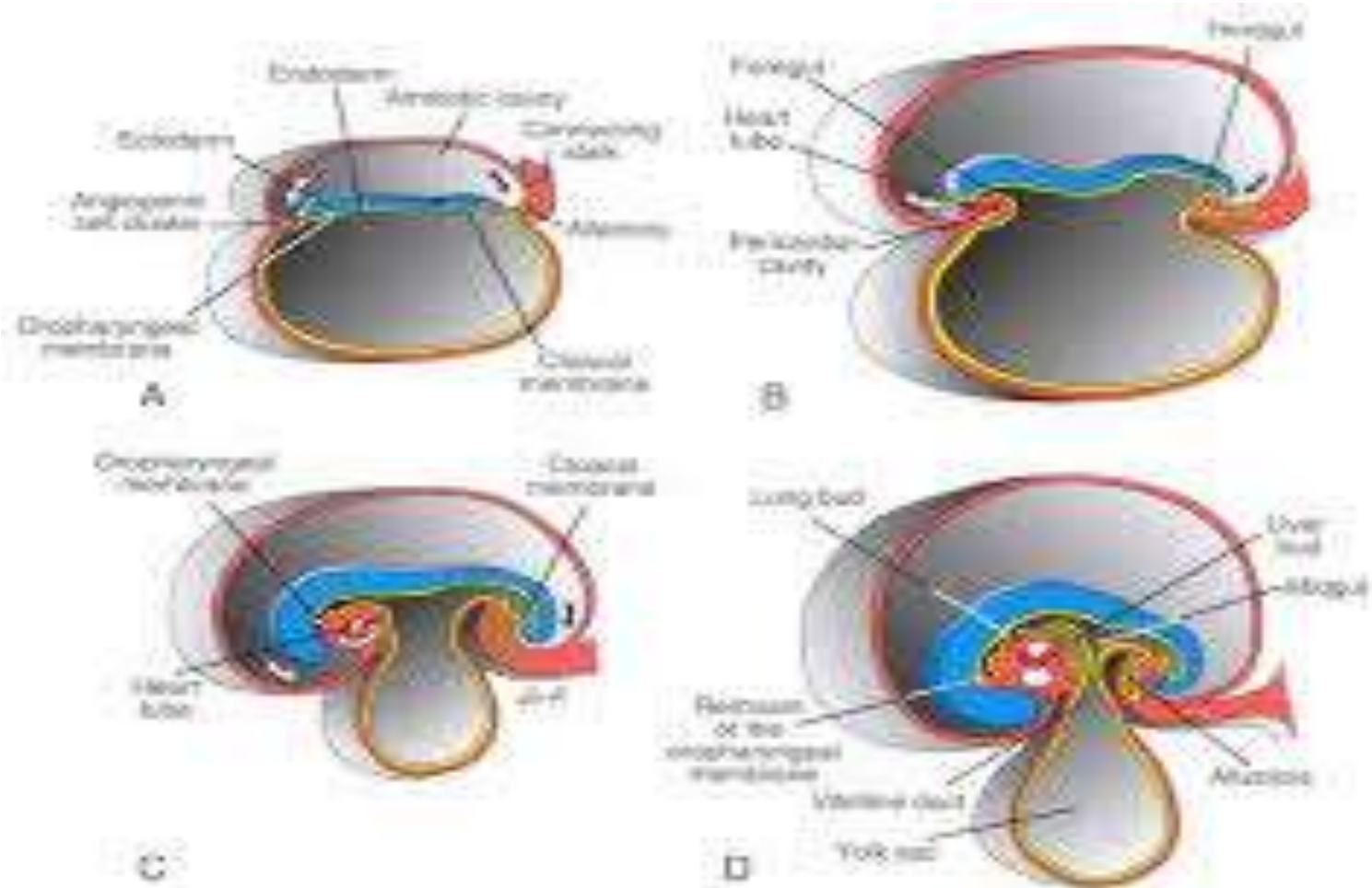
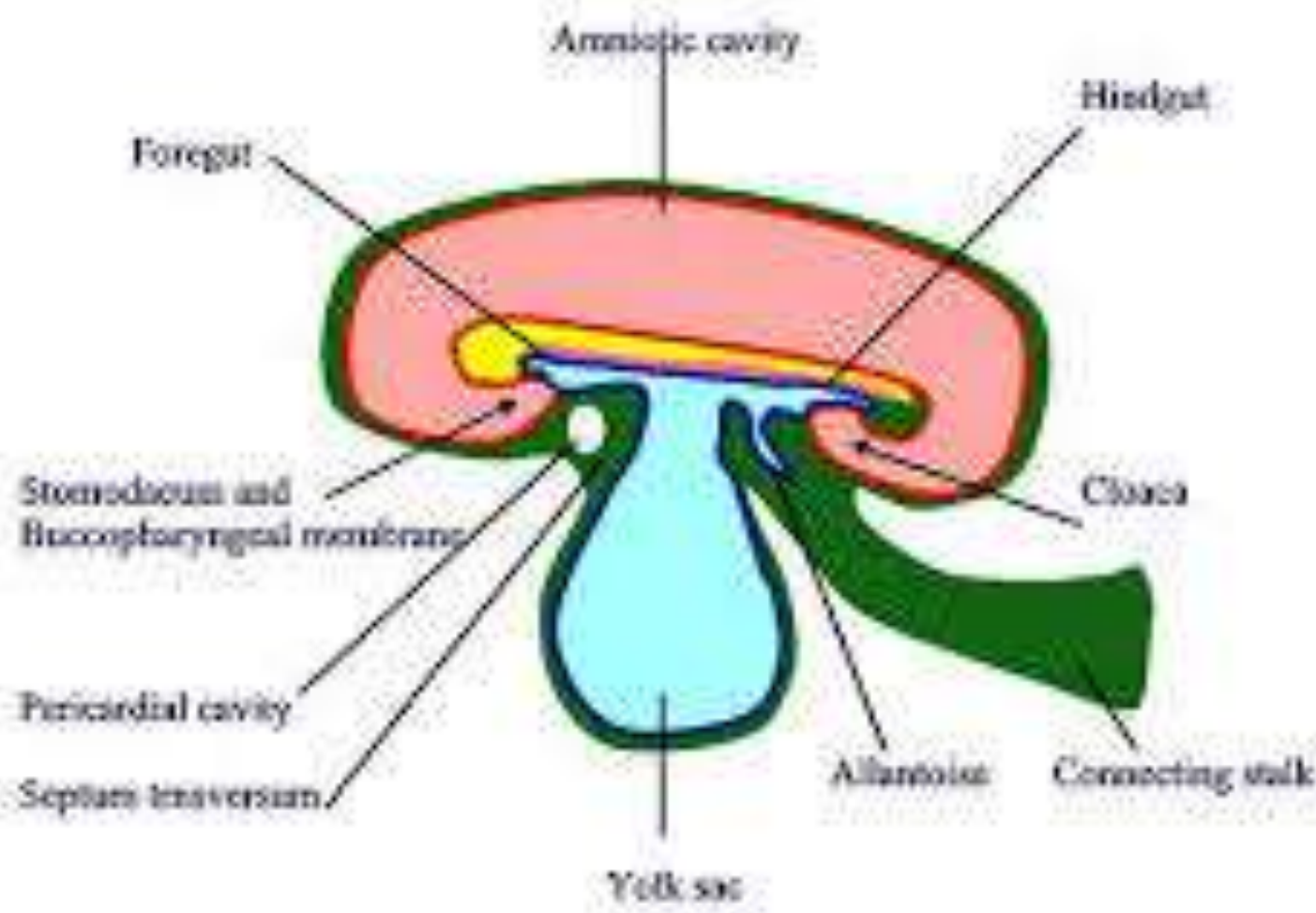


FIGURE 11-12 Longitudinal section: changes in position of the heart and pericardial cavity due to head folding.



- with formation of head fold ,the developing pericardial cavity comes to lie on the ventral side of embryo , ventral to foregut . The heart which was developing in splanchnopleuric mesoderm , in floor of pericardial cavity now lies on roof of cavity.
- septum transversum , which was most cranial most structure in embryonic disc , now lies caudal to heart , later diaphragm & liver develops in relation to septum transversum.



- **prochordal plate** region forms buccopharyngeal membrane / oral membrane which closes foregut cranially.
- most cranial structure of embryo is now enlarged cranial part of neural tube, which later forms brain. thus two big bulgings on ventral aspect of embryo, cranially is developing brain & a little below it there is bulging pericardium. in b/w the depression is called – **stomatodeum**, floor of which is formed by **buccopharyngeal membrane**.

- distal end of hindgut is closed by cloacal membrane,(initially caudally then lie ventrally)
- thus embryo development is occurring with rudiments of nervous system, gut and heart .