Lec.5
Embryology

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Growth of the Embryonic Disc

The embryonic disc, initially flat and almost round, gradually becomes elongated, with a broad cephalic and a narrow caudal end. Expansion of the embryonic disc occurs mainly in the cephalic region; the region of the primitive streak remains more or less the same size.

Invagination of surface cells in the primitive streak and their subsequent migration forward and laterally continues until the end of the fourth week. At that stage, the primitive streak shows regressive changes, rapidly shrinks, and soon disappears.

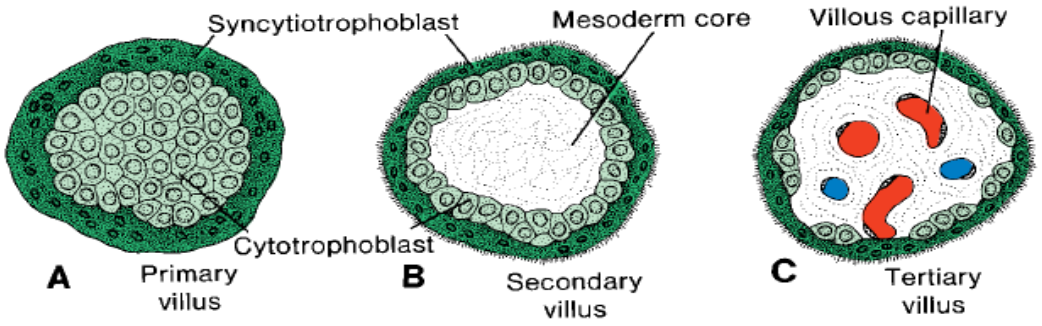
Further Development of the Trophoblast

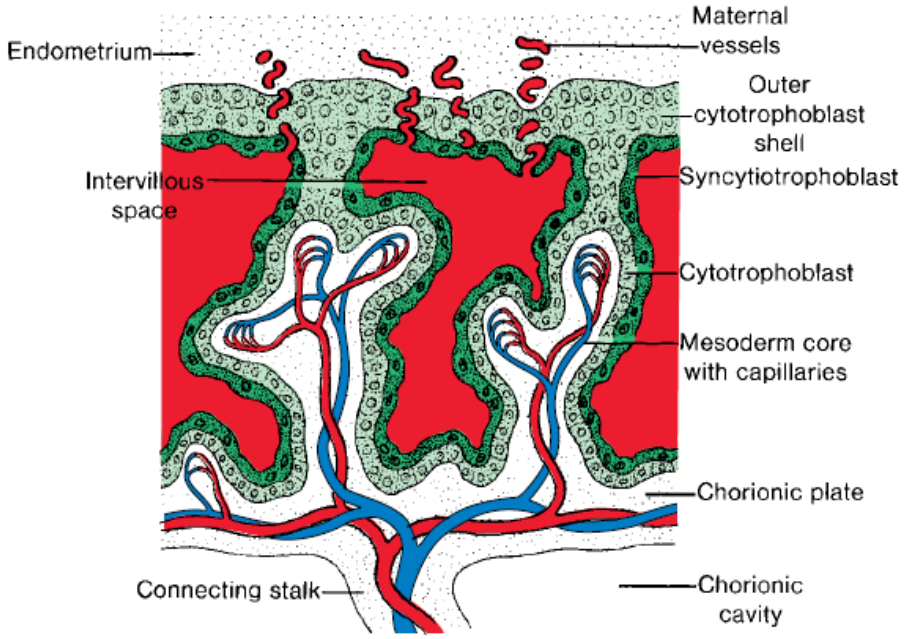
By the beginning of the third week, the trophoblast is characterized by **primary villi** that consist of a cytotrophoblastic core covered by a syncytial layer.

During further development, mesodermal cells penetrate the core of primary villi forming (a **secondary villus).**

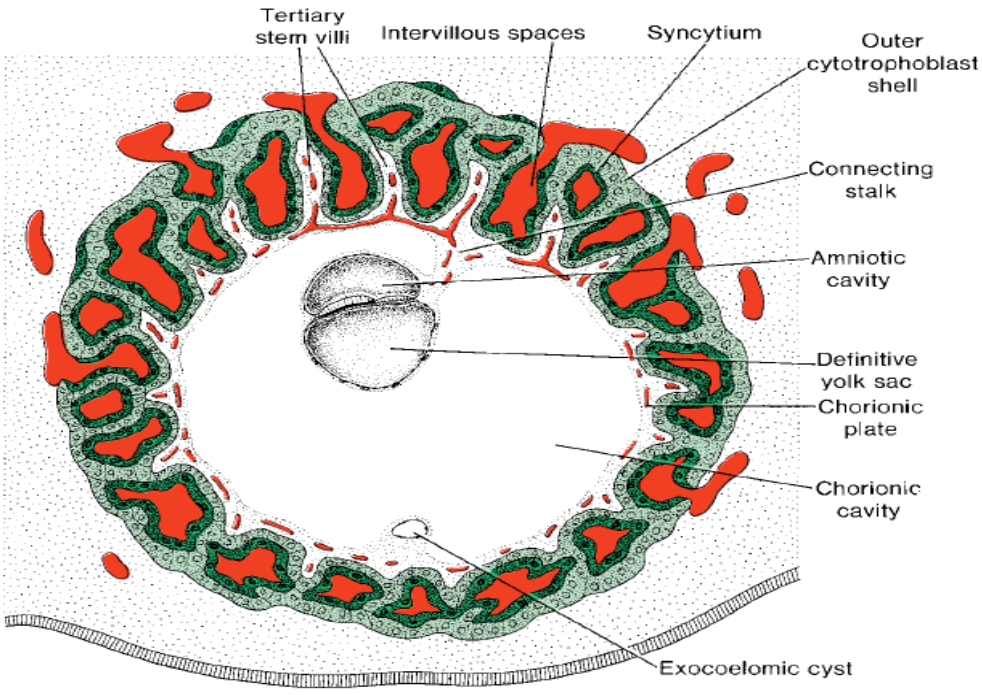
By the end of the third week, mesodermal cells in the core of the villus begin to differentiate into blood cells and small blood vessels, forming the villous capillary system (a **tertiary villus** or **definitive placental villus).**

Capillaries in tertiary villi make contact with capillaries developing in mesoderm of the chorionic plate and in the connecting stalk. These vessels, in turn, establish contact with the intraembryonic circulatory system, connecting the placenta and the embryo.





The chorionic cavity, meanwhile, becomes larger, and by the 19th or 20th day, the embryo is attached to its trophoblastic shell by a narrow **connecting stalk**. The connecting stalk later develops into the **umbilical cord** which forms the connection between placenta and embryo.



Clinical considerations

Chordoma (CD) is a benign or malignant tumor that arises from remnants of the notochord. CD may be found either intracranially or in the sacral region.

Sacrococcygeal teratoma ; is a tumor that arises from remnants of the primitive streak, which normally degenerates and disappears. ST is the most common germ cell tumor of childhood.

Caudal dysplasia (sirenomelia) refers to a constellation of syndromes ranging from minor lesions of lower vertebrae to complete fusion of the lower limbs. Caudal dysplasia is caused by abnormal gastrulation.

VATER, which includes **v**ertebral defects, **a**nal atresia, **t**racheo**e**sophageal fistula, and **r**enal defects.

VACTERL, which is similar to VATER but also includes **cardiovascular** defects and upper **l**imb defects.

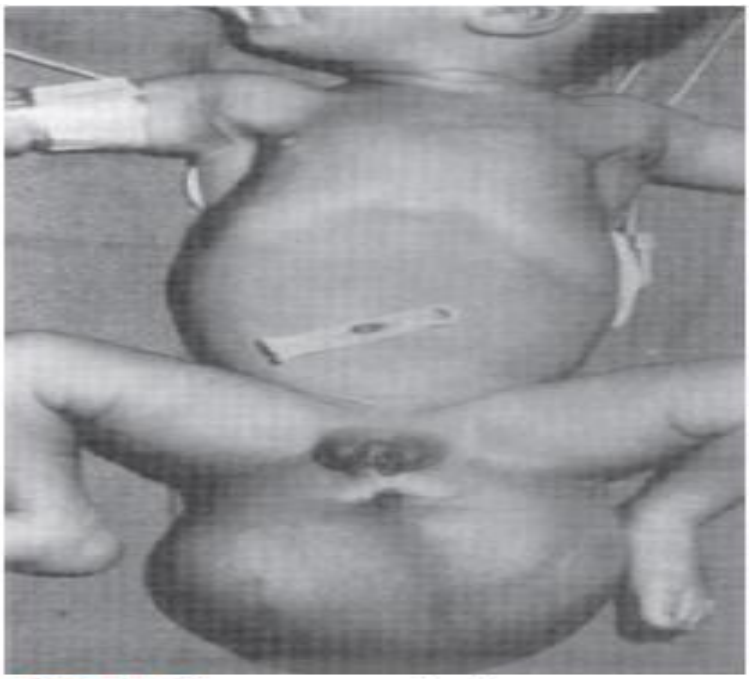


FIGURE 4.4. Sacrococcygeal teratoma.

FIGURE 4.5. Caudal dysplasia (sirenomelia).

Third to Eighth Week: (The Embryonic Period)

The period of **organogenesis (third to the eighth weeks)** it is the time when each of the three germ layers, **ectoderm, mesoderm,** and **endoderm,** gives rise to a number of specific tissues and organs.

It is also known as the period of morphogenesis; it's the most critical period of development as congenital malformation occur during this period.

Derivatives of the Ectodermal Germ Layer

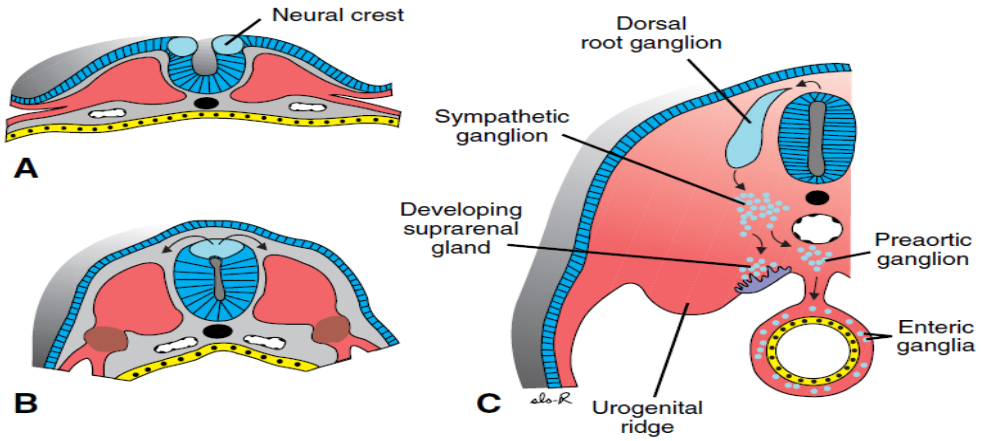
Appearance of the notochord and prechordal mesoderm induces the overlying ectoderm to thicken and form the **neural plate**. Cells of the plate make up the **neuroectoderm** and their induction represents the initial event in the process of **neurulation.**

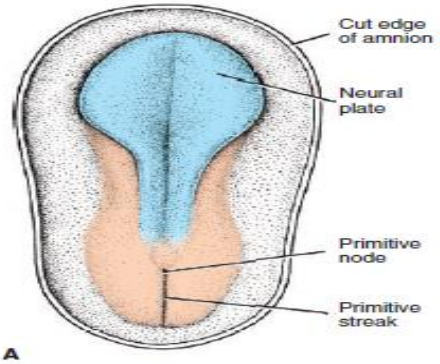
NEURULATION

By the end of the third week, the lateral edges of the neural plate become more elevated to form **neural folds,** and the depressed mid region forms the **neural groove**. Gradually, the neural folds approach each other in the midline, where they fuse.

Fusion begins in the cervical region (fifth somite) and proceeds cranially and caudally. As a result, the **neural tube** is formed. Until fusion is complete, the cephalic and caudal ends of the neural tube communicate with the amniotic cavity by way of the **anterior (cranial)** and **posterior (caudal) neuropores**, respectively. Closure of the anterior cranial neuropore occurs at approximately day 25, whereas the posterior neuropore closes at day 28

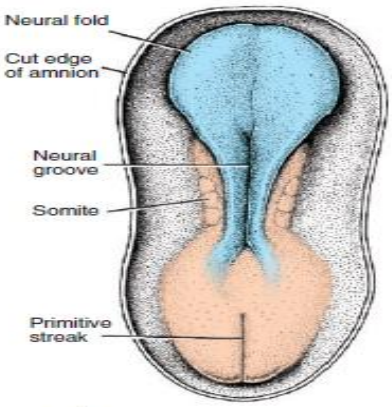
As neurulation is complete, the central nervous system is represented by a closed tubular structure with a narrow caudal portion, the **spinal cord,** and a much broader cephalic portion, the **brain vesicles**.





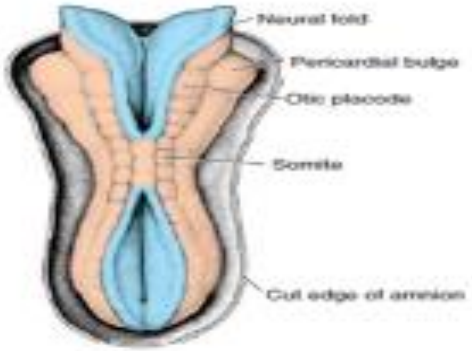
A

19 days



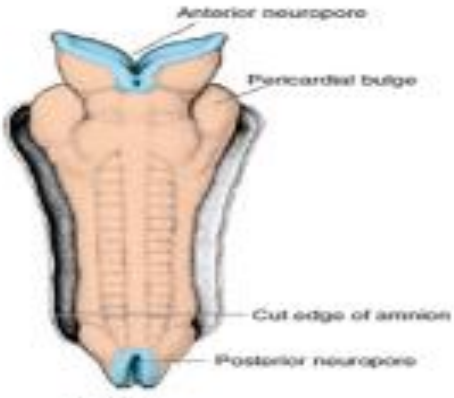
C

20 days



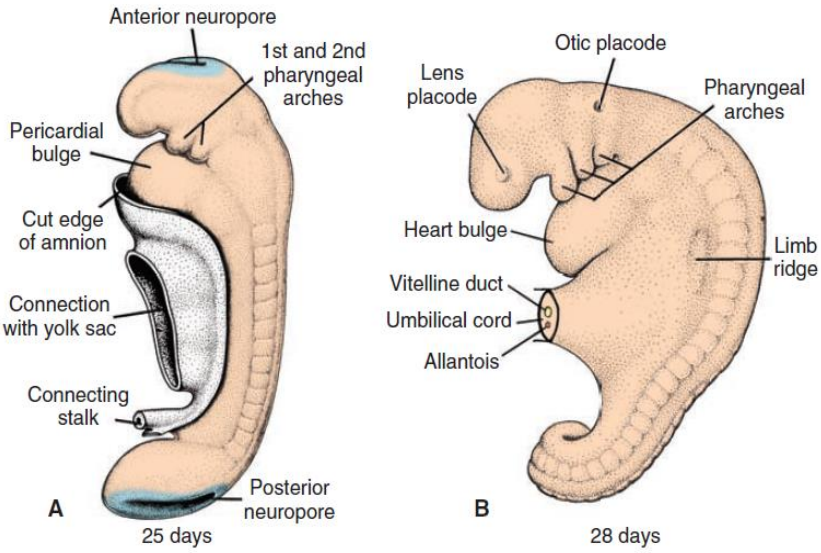
A

22 days



C

23 days


Anterior neuropore
1st and 2nd pharyngeal arches
Pericardial bulge
Cut edge of amnion
Connection with yolk sac
Connecting stalk
Posterior neuropore
A
25 days
Otic placode
Lens placode
Pharyngeal arches
Heart bulge
Limb ridge
Vitelline duct
Umbilical cord
Allantois
B
28 days