

Lecture 9/Neural tube - Assistant prof. Eman Ali Hashim

Objective: Development of neural tube , Neural crest, Derivatives of ectoderm

Neural tube development:

Appearance of notochord & prechordal mesoderm induce the overlaying ectoderm to thicken & form neural plate, neuroectoderm .

Elevation of the two edges (folds) & fusion to form neural tube with two openings, anterior and posterior neuropores. They are connected to amniotic cavity temporarily. All parts of CNS are developed from neural plate.

Neural Crest

During the formation of neural tube, strip of ectodermal cells appear along the edges of neural plate on either side. This cell population, neural crest will undergo an epithelio-to- mesenchymal transition.

Neural crest derivatives

(some examples)

Connective tissue & bones of the face and skull.

Cranial nerve ganglia.

Cells of thyroid gland.

Odontoblasts.

Spinal & sympathetic ganglia.

Glial cells.

Melanocytes.

By the time neural tube is closed, two bilateral ectodermal thickening, the otic and lens placodes become visible in the cephalic region of the embryo. With further development they will be the otic vesicles and lens vesicles.

Closure of neural tube occurs at the cervical region & proceeds cranially and caudally.

Closure of anterior neuropore occurs at approximately day 25, whereas the posterior neuropore at day 28.

Neural tube closure

When neural tube fails to close will result in abnormal condition clinically named anencephaly .

If closure fails anywhere from the cervical region caudally the defect is called spina bifida .

Derivatives of ectoderm

- Central nervous system.

- Peripheral nervous system.

Sensory epithelium of the ear , nose & eye.

- The epidermis, including the hair and nails.

- Subcutaneous glands.

-Mammary glands.

-Pituitary gland.

- Enamel of teeth.

Growth of embryonic disc

The embryonic disc, initially flat & almost round, gradually becomes elongated with wide cephalic & narrow caudal end . Growth and elongation of cephalic part of the disc is caused by a continuous migration of cells from primitive streak region in cephalic direction.

Invagination of surface cells in the primitive streak and their subsequent migration forward and laterally continues until the end of 4th week. At that stage, the primitive streak shows regressive changes, rapidly shrinks, and soon disappears. Sometimes, its remnants persist in the sacrococcygeal region and proliferate to develop tumors (sacrococcygeal teratomas) , is the most common tumor in newborns.

