Fourth to eighth week of embryo development

The fourth to eighth week of *intrauterine development* follows three weeks full of very important and necessary events such as fertilization, furrowing of the zygote, blastogenesis and [[Development of the cardiovascular system|development of the cardiovascular system]]. During these weeks, all essential external and internal structures are established. Although all organ systems are being established at this time, with the exception of the cardiovascular system, they are functionally negligible for the time being. At the end of the eighth week, the embryo takes on the shape of a human character. During this period, there is a very intensive growth of the embryo, which is why the embryo is very susceptible to damage by various teratogens resulting in severe disability, even death of the embryo.

Creating folds

🔎 *For more information see Development of Embryo Folds.*

The formation of folds is an important process in the development of body shape. It takes place in the longitudinal as well as in the horizontal plane.

Folds in the longitudinal axis

Folds are formed at both ends of the embryo, head and caudal eyelashes are formed. Thus, the anterior and posterior regions of the embryo move ventrally simultaneously with elongation.

Head crease

At the beginning of the fourth week, the neural crests in the head area gain volume and thus form the basis of the brain. The brain gradually outgrows the oropharyngeal membrane and forms an overhang over the developing heartm. As a result, the transverse septum in the mesoderm, the pericardial coelom, and the oropharyngeal membrane move to the ventral side of the embryo. Part of the yolk sac endoderm is taken into the embryo as the foregut, eventually forming the basis of the pharynx and oesophagus. It is located between the brain and the heart, separated by the oropharyngeal membrane from the stomodeum (the future oral cavity). At this stage, the septum transversum already lies caudal to the heart and gradually develops into the centrum tendineum diaphragmatis.

Caudal fold

It arises from the growth of the distal sections of the neural tube. The caudal landscape projects above the cloacal membrane. Part of the endoderm is taken into the embryo as the hindgut, the final part of which soon expands slightly and forms the cloaca - the base of the bladder and anus. After this process is completed, the primitive streak emerging in the third week is deposited caudally. The germinal shaft is now attached to the ventral side of the embryo and the allantois.

Folds in the horizontal axis

A lateral fold is formed on both sides of the embryo, the spinal cord and somites grow rapidly. The ventrolateral bases of the body wall bend towards the midline, wrapping the edges of the germinal plate ventrally, thus the embryo takes on a roughly cylindrical shape. Part of the endoderm is taken into the embryo and forms the foregut. After the formation of the lateral folds, a mere peduncle is formed from the original wide connection between the midgut and the yolk sac. The area connecting the amnion to the ventral surface of the embryo is also reduced to a narrowed umbilical landscape. The germinal shaft transforms into the umbilical cord, and the ventral fusion of the lateral folds at the median line reduces the originally wide connection of the intraembryonic and extraembryonic coelom to a very narrow slit.

Development by weeks

Fourth week

Scoring in week 4 (overview) Embryo furrowing in week 4

At the beginning of this week, the 2-5 mm embryo is practically straight, with 4-12 somites rising to the surface. At both the rostral and caudal ends we find a wide open neural tube. On the 24th day, the pharyngeal arches appear. A cephalic and a caudal fold are formed. Heart forming a prominent bump in front. On the 26th day, three pairs of pharyngeal (gill) arches are visible, the anterior neuroporus is just closing. The embryo has the characteristic shape of the letter C, the forebrain is formed. Easily visible is the long, curved tail. 26-27 day upper limb buds appear - on the ventrolateral sides of the body wall. Also visible are auditory pits on both sides of the head together with endodermal thickenings of lens placodes - the precursors of eye lenses. On the 28th day, we find the emergence of the fourth pair of pharyngeal arches and lower limb buds. Characteristically, the tail narrows, the posterior neuropore closes.

Fifth week

There is a rapid development of the brain and thus an increase in the head and facial prominences. The face thus comes into contact with the cardiac hump. The hyoid (second) pharyngeal arch outgrows the third and fourth and forms an endodermal depression on both sides - sinus cervicalis. The upper limb buds take on the shape of a paddle, the bases of the lower limbs are fin-like. Apart from the head and face, the external shape of the embryo does not change much during this week.

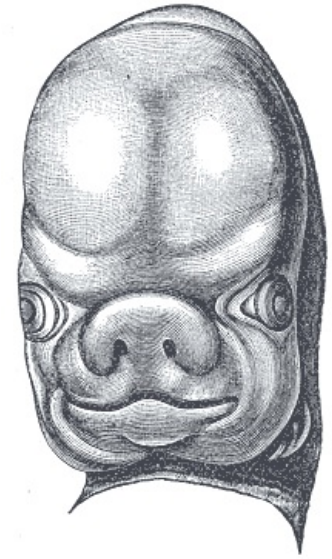
Sixth week

There are indications of a regional arrangement in the form of the elbow and large finger plates with the bases of the fingers - the so-called digital rays on the upper limbs. The development of the lower limbs is slightly delayed compared to the development of the upper limbs. Ear tubercles appear around the pharyngeal slit between the first two gill arches, and the slit turns into the meatus acusticus externus, the tubercles merge to form the bases of the auricles of the external ear. The head is significantly larger than in previous weeks, pigmentation appears in the outer layer of the retina (and the eye is therefore visible). The hull is starting to straighten. Spontaneous movements of the embryos as well as reflex reactions to touch have been described in some studies.

Seventh week

The main event of this week is a significant transformation of the limbs. Notches appear between the digital rays of the finger plates, which clearly indicate the next position of the interdigital slits. A yolk stalk is formed, the intestinal loops extend into the proximal part of the umbilical cord - a physiological umbilical herniation caused by the disproportion between the small extent of the abdominal cavity and the rapid growth of the intestine. Ossification of the skeleton of the upper limbs begins.

Eighth week



The eighth week is the last period of the embryonic period. The upper limbs are clearly separated, but proximally they are still connected by a membrane. We can see grooves between the digital rays of the foot plate. The embryo still has a tail. The vascular plexus of the scalp forms around the head and forms a band around the top of the head. By the end of the eighth week, all parts of the limbs are clearly defined, the fingers are elongated and completely separate from each other. Ossification begins on the lower limbs, the hint of a tail disappears. The arms and legs approach each other ventrally. By the end of this week, the embryo has a distinctly human form, but the head is disproportionately large. The neck and lids are distinct, which gradually close and at the end of this period the epithelia of the upper and lower lids merge (end of the embryonic period). The earlobes take on their definitive shape, but are set low on the head. The differences in the arrangement of the external genitalia are not very distinguishable, so it is practically impossible to determine the sex of the fetus.[1]

Links

Related Articles

- Prenatal Development: Embryo • Fetus
- Gametogenesis • Fertilization • Types of eggs and their furrowing
- First week of embryo development • Second week of embryo development • Third week of embryo development

References

1. KEITH L, MOORE – T.V.N, PERSAUD. *Birth of Life : Embryology with a clinical focus.* Czech 1 edition. Prague : ISV publishing house, 2002. Chapter 5. ISBN 80-85866-94-3.

Resources

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