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FORMATION OF ANTERIOR CEREBRAL VESICLE CAVITIES AT THE 5TH WEEK OF THE EMBRYONIC PERIOD

Abstract. *The 5th week of the embryonic period is critical in the development of the embryo due to a significant restructuring of brain structures at this stage, which can cause various shortcomings. The period of distribution of the anterior cerebral vesicle to the terminal and intermediate brains, the formation of the interventricular foramen, the formation of the pituitary gland and the complication of its structure, and the beginning of the formation of the cerebral aqueduct are those changes that most often cause developmental disorders.*
Key words*: anterior cerebral vesicle, embryo, brain cavity, human.*

Introduction. Embryological research is of great importance for practical medicine [1,2]. The study of general and special patterns of embryo development is important for the working-out new methods for early monitoring of the correct development of the fetus and prevention of congenital malformations [3,4,5]. On the significant prospects of using these embryological studies, Academician V.V.Kupriyanov said in the eighties of the last century. To date, the relevance of all embryological research is in the antenatal prevention of fetal diseases, the methods of pre- and postnatal correction, as noted in many world symposia and congresses devoted to morphological sciences [6, 7].

Morphologists are interested in the implementation of new scientific ideas, the unconventionality of thinking, the breadth of practical plans, which is the source of scientific progress in the creation of priority scientific directions [8,9].

Objective of the study: to clarify the features of the formation of the cavities of the anterior cerebral vesicle.

Materials and methods: the study was carried out on 15 corpses of human embryos by methods of histological examination, preparation and morphometry.

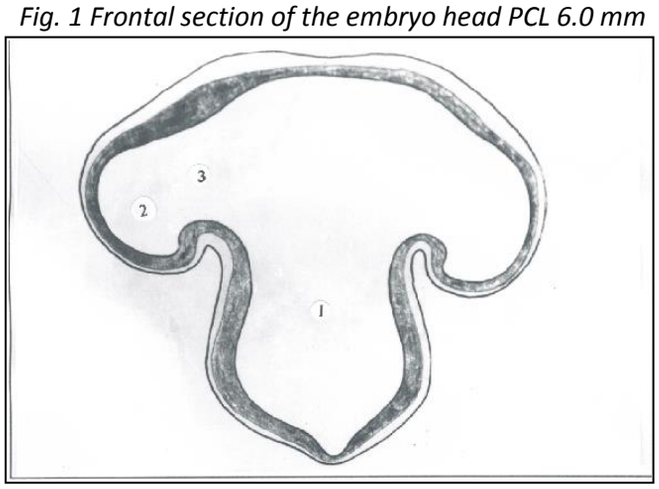
Results of the study and their discussion: At the beginning of the 5th week, the anterior and posterior primary cerebral vesicles begin to divide into two parts. The posterior cerebral vesicle is divided into an aniage of Pons Varoli and the cerebellum and medulla oblongata. The posterior cerebral vesicle is separated from the middle by a narrow membrane. The telencephalon and the midbrain are developing from the anterior vesicle. It appreciably increases in size in comparison with the 4-week embryo, and on the lateral surfaces appear protrusions forward, upward and backward, forming the relief of the aniage of the endbrain, namely the hemispheres. Above the protrusions, a fissure is defined that separates the caudal part of the prosencephalon from the telencephalic vesicles. In the same period of development, an orbit begins to form on the outer lateral wall of the anterior vesicle, which is separated from the rest of the vesicle by a fissure. This is the beginning of differentiation of the anterior cerebral vesicle. In the embryo of 6.0 mm parietal-coccygeal length (PCL) brain consists of five cerebral vesicles: the end, intermediate, middle, oblong and posterior. Each of these vesicles in the process of further development gives rise to a certain part of the brain.

It is at this stage that one can already speak of complications of the ventricular system as a system of the cavities of the brain. The lateral ventricles are the cavities of the end and, in part, intermediate brain, the third ventricle is the cavity of the intermediate brain and the fourth ventricle is the cavity of the medulla oblongata.

Parallel with the external redistribution of the brain, amplifications occur in the system of its cavities.

Expansion in the lateral side of the cranial part of the brain cavity formed in the above-mentioned protrusions, forming the hemisphere, is the beginning of the formation of the lateral ventricles. The caudal part of the cavity behind the orbit becomes the cavity of the medulla oblongata. As a result of dividing the anterior cerebral vesicle into the end and intermediate brains, one can talk about creating an interventricular opening between the third and lateral ventricles (Fig. 1). At this stage of development, these holes are still very large, but the boundary between the ventricles becomes more pronounced than the previous week.

Fig. 1 Frontal section of the embryo head PCL 6.0 mm



(figure from the preparation)
1 - cavity of the third ventricle; 2 - cavity of the lateral ventricle; 3 - an interventricular aperture.

In the place of neuropore closure, the end plate is visualized, which is the front wall of the third ventricle. In the frontal sections, the cavity of the rudiments of the lateral ventricles has the shape of a hemisphere, where the upper, lateral and lower walls differ, not having clear boundaries. The cavity of the third ventricle on horizontal sections has a cup shape due to the thickening of the lateral walls of the intermediate brain. These thickenings are the beginning of the formation of the pulvinaria.

The largest transverse dimension of the third ventricle at this stage of development reaches 0.2 ± 0.05 mm, and the longitudinal one - 1.4 ± 0.15 mm. The dimensions of the lateral ventricles are: transverse - 0,15 ± 0,07 mm, and longitudinal - 0,8 ± 0,1 mm [10].

In its anterior part, the ventral cerebral fold considerably increases in transverse dimension. Due to the fact that it expands and contracts into the brain tissue, the space of the cerebral vesicles narrows. During this period, the forebrain reaches the greatest width and falls even lower. It forms the lower wall of the ventral cerebral fold, at the end of which the forebrain is almost adjacent to the rhomboid. The latter, in turn, is the top wall of this fold.

In embryos of 5 weeks of development in the structure of the walls of the cerebral vesicles, three layers of cells are distinguished: 1) inner core, multichannel, matrix or rudimentary; 2) light, in which there is almost no cellular elements, interstitial; 3) cell-free, or marginal layer, is clearly separated from the surrounding mesenchymal layer. The matrix rudimentary layer of cells is most pronounced in the ventral wall of the vesicles. It is partially present in the lateral ones. The thickness of the matrix on the side walls of the vesicles decreases dorsally towards the midline (Fig. 2).

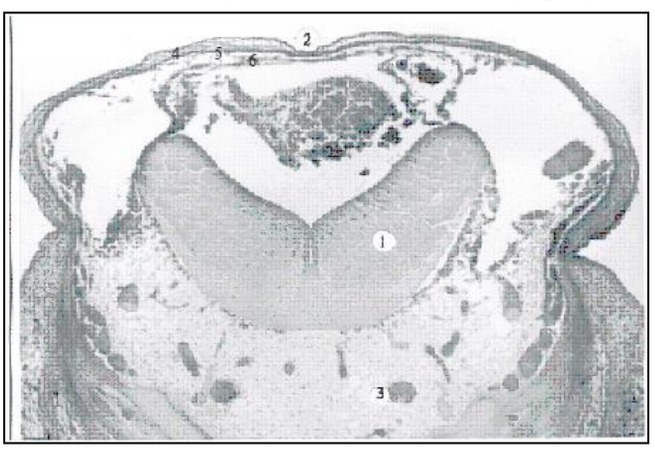


Fig. 2. The frontal section of the brain of the embryo is 6.5 mm PCL. Hematoxylin-eosin. Microphoto. O. 8, ca. 7th. 1 - thalamus; 2 - closing or final plate; 3 - vessels of the brain; 4 - matrix layer; 5 - the ultimate layer; 6 - edge layer.

During this period, the forebrain is maximally bent downwards. The oral cavity is located close to the ventral wall of the forebrain.

This week can be considered critical in the development of the embryo due to the fact that disorders that can occur during a significant restructuring of the brain structure at this stage are capable of causing birth defects [11]. The changes during which disturbances most often occur, we consider the distribution of the anterior cerebral vesicles to the end and intermediate brains, the formation of interventricular foramen, the formation of the pituitary gland and the

complication of its structure, and the beginning of the formation of the cerebral aqueduct cerebral aqueduct cerebral aqueduct cerebral aqueduct.

Prospects for further research: In further studies, attention should be paid to the development of the brain cavities in the following terms, to identify new critical periods, possible developmental defects and the working-out the new research methods.

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