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SCIENTIFIC RESEARCH IN THE MODERN WORLD

PROCEEDINGS OF VII INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE MAY 4-6, 2023

TORONTO 2023

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Proceedings of VII International Scientific and Practical Conference

Toronto, Canada

4-6 May 2023

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2023

UDC 001.1

The 7th International scientific and practical conference "Scientific research in the modern world" (May 4-6, 2023) Perfect Publishing, Toronto, Canada. 2023. 601 p.

ISBN 978-1-4879-3795-9

The recommended citation for this publication is:
Ivanov I. Analysis of the phaunistic composition of Ukraine // Scientific research in the modern world. Proceedings of the 7th International scientific and practical conference. Perfect Publishing. Toronto, Canada. 2023. Pp. 21-27. URL: https://sci-conf.com.ua/vii-mizhnarodna-naukovo-praktichna-konferentsiya-scientific-research-in-the-modern-world-4-6-05-2023-toronto-kanada-arhiv/.

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MEDICAL SCIENCES

FEATURES OF THE DEVELOPMENT OF BONE TISSUE OF THE CRANIAL VAULT

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The object of the study is the stages of the formation of the cranial vault. The study's subject is cranial vault preparations at different stages of bone tissue formation.

The aim is the consideration the features of the development of bone tissue in the cranial vault and theoretical evidence of the influence of knowledge of the main stages of the formation of the skull on the effectiveness of further diagnostics and treatment of congenital anomalies of the skull.

Tasks of scientific work:

- determine the features of the formation of bone tissue and the cranial vault at different stages of embryonic development;
- consider the structure of the skull bones on preparations and with the

help of innovative technologies;

- form a detailed description of the structure and general signs of the development of bone tissue in the cranial vault;
- substantiate theoretically the influence of knowledge of the main stages of the formation of the cranial vault on the effectiveness of further diagnostics and treatment of congenital anomalies of the skull;
- draw conclusions.

The process of development of the tissues of the cranial vault in embryos aged 2-3 months leads to differentiation of osteoid processes into a bone tissue. Morphologically, this is expressed in the thickening of fibrous structures and the beginning of their mineralization, that is, in the formation of bone trabeculae. Such beams are differently oriented collagen fibers, among which large cells of bone tissue lie unevenly. A single-layer system of trabeculae forms the frontal and parietal bones of this period of intrauterine development.

During the fourth month of intrauterine development, the integumentary bones take the form of thin, curved plates, ending in sharp marginal trabeculae in wide connective tissue gaps. In areas of bone formation, there are thin-walled vessels.

As the embryo develops, the bundles of collagen fibers of the radial direction become thicker. The marginal sections of the fiber become mineralized to a greater extent. So the fiber acquires a three-layer appearance. From the moment when significant amount of radial fibers enters the bone, its main substance acquires a pronounced spongy-fibrous structure.

The process of bone tissue development in the frontal, parietal, and occipital bones occurs typically: osteoblasts, contacting with the surface of the beams, form a light pink border of osteoid, which includes bone-forming cells and radially directed fibers of the bone membranes, which separate them. After that, by approaching the bone surface, bones become denser, losing clear boundaries or acquiring a three-layer appearance with clearly defined boundaries.

As the embryo develops, there is a rapid growth of the integumentary bones of the skull along the plane and less intense growth in thickness. This process is carried

out over the entire surface of the bone from the periosteum and dura mater, interrupted by resorption zones. As a result, the system forms of beams diverging along the radius from the center to the periphery. Anastomoses are formed between adjacent beams, which combine them into a network of bone membranes.

Further, the development of bone tissue is accompanied by the destruction of coarse-fiber bone tissue and its replacement by more differentiated structures: parallel fibrous and lamellar bone tissue. This process is accompanied by the displacement of the radial fibers of the periosteum and the dura mater to the bone edges, starting from the central sections and, first of all, the central sections of the frontal bone.

From the 7th month of intrauterine development to the 5th month of life, the development of chondroid tissue is observed in the marginal parts of the bones. It is observed on the edges of the covering bones from the side of the frontal, sagittal, parietal-temporal seams, and most consistently and with a significant extent from the side of the lambdoid seam.

Chondroid tissue is a temporary structure and it will be completely replaced by bone tissue in the future. The reconstruction of this tissue begins from the 8th month of fetal development and is not the same for the peripheral and central departments. In the peripheral part, it is carried out by resorption, starting from the end of the field, opposite to the seam, at the same time as changes are observed in the central parts, which indicate the transformation of chondroidal tissue into bone tissue: vesicular cartilage cells are densified, gradually being replaced by bone ones. In this way, bone-cartilaginous beams are formed. Later they are completely replaced by bone ones.

Mature bone structures, with a clearly defined orientation of cellular elements and fibrous structures, appear in the fetus in the central parts of the frontal bone at the end of the 4th month of intrauterine development, in the parietal and occipital bones - at 5 and 6 months, respectively.

In the process of bone tissue differentiation, changes in the fibrous cambial layers of the periosteum and dura mater are observed, which is represented by thinning of both layers, reduction of radial fibers, reduction and flattening of cellular

elements in the cambial layer. By the age of 3, the multilayered cambium is replaced by one thin layer of cells. The sinusoidal cavities that surround the fetal bones are replaced by vessels of various sizes, which are mostly directed parallel to the bone surface.

The bone tissue formation is followed by the development of bone marrow. The first bone marrow cells are found in the central and lateral parts of the frontal bone at the 6th month of fetal development, and in the central parts of the parietal and occipital bones - at the 7th month. The centers of bone marrow functioning are the intergirdle areas.

Let's move on to the conclusions. Thus, despite the differences in origin and common signs of development, the nature of morphological and functional disorders allow us to consider not only the clinical issues, but also the diagnosis and treatment of the vast majority of congenital deformities in the same context. That is why it is necessary to know the main stages of the skull formation to study the pathogenesis of deformities.