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GROWTH OF THE PHARYNX AT THE END OF THE FETAL STAGE OF HUMAN ONTOGENESIS

Abstract. *On the basis of the morphological methods of research, the topographic and anatomical relationship between the pharynx and adjacent formations in human embryos has been studied and consistently analyzed. Skeletopia of the pharynx is closely related to the nasal and oral cavity, the palate, throat, and esophagus. It has been established that in the dynamics of the overall pharyngeal formation a craniocaudal gradient of development is observed, where the caudal limit is gradually shifting along the vertical axis throughout the embryonic period.*
Key words: *pharynx, embryo, human, ontogenesis.*

Introduction. The formation of syntopical relationships and the development of organs in different ages attracts special attention of modern embryologists, anatomists, and clinicians [1]. Scientists always have questions about the insufficient number of scientific developments in the study of the development of organs in the normal and pathology [2]. An in-depth study of the development of thoracic topography for specialists in many branches of medicine is an urgent task [3]. Syntopical correlation and mechanisms of ontogenetic processes are an aspect of understanding the foundations of the formation of an organ, the formation of its topography, variants of the structure and development of various defects [4]. It is indisputable that the onset of various anomalies, that occur in clinical practice, can only be explained by a clear understanding of the embryonic process of the origin and the interaction of certain organs and structures [5], which requires a thorough study of normal and pathological development of the fetus for the further development of algorithms and antenatal aspects of health protection [6].

Objective. To study the topographic-anatomical relationship of the pharynx and adjacent structures at the end of the embryonic stage of human ontogenesis.

Material and methods. The research was conducted on specimens of 16 corpses of human embryos using histological, macro-, microscopic methods, plastic and graphic reconstructions and morphometry.

Results and discussion. In the embryos with 9.0-10.5 mm of the crown-rump length (CRL) (beginning of the sixth week of fetal development), the longitudinal size of the pharynx rudiment is 363-372 microns, the width of the lumen on the sagittal cut is 122 μm on average.

The entire primary cavity of the mouth is occupied by a bulky tongue in which it is easy to distinguish the side rolls and the unpaired middle tubercle.

Pharyngeal openings of the auditory tubes are funnel-shaped and their diameter reaches 4.7 - 5.2 μm.

In the caudal part of the anterior wall of the pharynx, at the point of branching of the tracheo-pulmonary rudiment, there is a thickening of the mesenchyma in the form of arytenoid and transverse rolls that separate the entrance to the respiratory tube. In this way the process of forming the larynx begins and the differentiation of the pharyngeal part of the thrombosis, which is associated with it, and therefore, one can speak of the emergence of a quite clear limit between the oral and the laryngeal parts of the organ.

The lumen of the pharyngeal rudiment is lined with a two-layer cylindrical epithelium. In the embryo with 10.5 mm of CRL, the cell height increases and reaches 11 - 14 microns. Epithelial

cell nuclei are still located at different levels.

In the areas adjacent to the epithelial layer of the pharynx, cells of the mesenchyma are located more compactly than in its peripheral parts, where they merge with the mesenchyma of adjacent organs without a sharp bound. The thickness of this more compact mesenchymal layer reaches an average of 19 - 22 microns. The nuclei of mesenchymal cells are oval and located at different levels.

More dorsally to the pharynx the spine is located which is separated from the pharynx with a thin layer of mesenchyma 17-20 microns thick, more ventrally there is a larynx rudiment, behind the pharynx the basilar artery passes, and ventrolaterally, between the pharynx and the rudiment of the respiratory system, lies the neurovascular bundle of the neck. The vagus nerve is massive, its diameter is almost equal to the diameter of the intestinal tube. After the rudiments of various organs are formed the pharyngeal mesenchyma forms a loose connective tissue, which surrounds the blood vessels and nerves. In the embryonic period of development the vessels and nerves are gradually shifting more medially, thus approaching the lateral wall of the pharynx.

While studying the series of histological sections of embryos with 12,0 - 14,0 mm of CRL (the end of the sixth week of intrauterine development) and plastic wax reconstructive model of the primary oral and nasal cavities of an embryo with 14,0 mm of CRL, it was established that the length of the pharynx rudiment is 443-475 microns. The width of the lumen is on average 62 microns. Moreover, the shape of the lumen throughout the embryo growth is not the same because of the further development of the anlage of the tongue and the rudiment of the larynx.

The epithelium, which lines the lumen of the pharynx rudiment, at the end of the embryonic development period, is three-layer and cylindrical, with a thickness of 13-16 microns. Cell nuclei sized 5-7 microns are circular or elongated and occupy a predominantly apical position, although in general they are placed on three levels. Around the epithelium of the pharyngeal gland there is a much higher concentration of mesenchymal cells. The thickness of the pharynx rudiment walls is on average identical throughout and reaches 113-122 microns. The mucous layer is 21-25 μm. Outside of the mucous membrane rudiment there is a thick layer of mesenchymal tissue, which does not differ in structure from that of organs adjacent to the pharynx. The same layer of mesenchyma, which separates the posterior wall of the pharynx from the spine, becomes somewhat thinner compared to the similar layer of mesenchyma in the rudiments of 9.0 - 10.5 mm CRL. The vault of the pharynx borders with the rudiment of the base of the skull.

At the end of the embryonic period (embryos with 12,5 - 14,0 mm of CRL) there is a breakthrough of the nasal chambers into the primary oral cavity, resulting in the connection between the primary cavities of the nose and mouth.

The massive tongue is located quite high and thus closes the opening that leads to the airways. In the thick of the tongue there are muscular fibers, going in different directions.

Studying the plastic reconstructive model of the primary oral and nasal cavities of the embryo with 13.5 mm of CRL showed that the two halves of the primary nasal cavity are curve-shaped, that is, they are initially directed dorsally, and then somewhat caudally - in the direction of the primary oral cavity and open at its lateral walls. The anterior-posterior size of the primary nasal cavity is 676 - 688 μm.

The rudiment of the larynx, represented by thickening of the mesenchyma and located directly at the entrance to the respiratory tube, indicates the caudal border of the pharynx and corresponds to the level of the third cervical vertebra.

A distinctive feature is a funnel-shaped depression on the dorsal wall in the extreme caudal section of the pharynx rudiment , which is lined with a three-layer epithelium. Its depth reaches 11 - 13 microns, the distance between the edges on the sagittal cut is 25-26 microns.

Conclusion. In the embryonic developmental period, all parts of the pharynx are not completely formed due to the absence of a secondary palate that separates the secondary nasal cavity from the oral cavity, as well as because of the insufficiently clear separation of the larynx rudiment from that of the pharynx and the latter from adjacent structures, since they are surrounded by the

commonl layer of mesenchyme.

Prospects of further research. It is rational to study the topography and anatomical relationships of the pharynx with adjacent structures in different age periods of ontogenesis for the possibility of studying the occurrence of individual morphological changes and pathological variations in clinical practice.

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