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## TOPOGRAPHIC – ANATOMICAL PECULIARITIES OF THE PHARYNX IN 4-5TH MONTH FETUSES OF HUMAN ONTOGENESIS

**Abstract.** *On the basis of the conducted morphological methods of the study topographic-anatomical peculiarities of the human fetal pharynx were investigated and analyzed consistently. Skeletotopia of the pharynx is closely associated with the cavity of the nose, oral cavity, palate, larynx, and esophagus. Craniocaudal gradient of development was found to occur in the dynamics of general formation of the pharynx, where caudal border during the whole fetal period gradually dislocates along the vertical axis.*

**Key words:** *pharynx, fetuses, human, ontogenesis.*

**Introduction.** Establishment of syntopogenous interrelations and development of organs at different age periods attract attention of modern embryologists, anatomists and clinicians [3]. Scientists always are interested in the issues concerning insufficient amount of scientific works on the development of organs in the norm and pathology [1]. The task of a comprehensive learning of the pharynx topographic development is a topical issue for the professionals in many branches of medicine [7]. The data concerning morphogenesis of the respiratory tract are rather sufficient. Meanwhile the questions concerning the pharyngeal lymphoid tissue formation associated with the mucous membranes in the postnatal period remain incompletely studied [4]. Syntopogenous correlation and mechanisms of ontogenetic processes are the aspects for understanding the bases of organ formation, its topography, structural variants and occurrence of developmental defects [2]. Occurrence of various defects found in clinical practical work can be undoubtedly explained only at the expense of clear realization of the embryonic process of origin and interrelations of certain organs and structures [5], requiring substantial investigation of both normal and pathological fetal development and further elaboration of algorithms and antenatal aspects of health care [6].

Objective: to investigate topographic-anatomical peculiarities of the pharynx in 4-5th-month fetuses of human ontogenesis.

**Materials and methods.** The study was conducted on 23 specimens of dead human fetuses by means of histological, macro- and microscopic methods, plastic and graphic reconstruction, and morphometric examination.

**Results.** At the beginning of the fetal period the pharynx has three clearly determined parts peculiar for the definite state. The borders between the parts of the organ can be considered: the level of the soft palate – caudal border of the nasal pharynx; the level of entrance into the larynx (the upper border of the epiglottis) – caudal border of the oral cavity; the level of the lower border of the cricoid cartilage of the pharynx – caudal border of the laryngeal part and pharyngeal-esophageal passage.

Macroscopic examination of fetuses (83,0 – 94,0 mm of the parietococcygeal length (PCL)) determines that the longitudinal size of the pharynx is from 5,07 to 5,40 mm, and craniocaudal size of the parts are the following: nasal – from 0,58 to 0,59 mm, oral – from 0,84 to 0,85 mm, laryngeal - from 3,46 to 3,62 mm.

In fetuses with 83,0 mm of PCL the length of the pharynx is: nasal part – from 0,59 to 0,60 mm, oral part – from 0,83 to 0,84 mm, laryngeal part – from 3,44 to 3,48 mm; in fetuses with 94,0 mm of PCL the size is the following: nasal – from 0,63 to 0,64 mm, oral – from 0,88 to 0,89 mm, laryngeal – from 3,58 to 3,61 mm.

The pharyngeal cavity is funnel-shaped because the oral part is wide, and the laryngeal one narrows quickly. The transverse size of the nasal pharynx is from 0,51 to 0,54 mm, oral pharynx – from 0,27 to 0,28 mm, laryngeal pharynx – from 0,19 to 0,20 mm.

Its upper wall is not found due to the oblique location of the dorsal wall of the pharynx in the fetuses at this period of development, and its posterior and lateral walls approximate each other in the extreme cranial portion of the nasal part. Macroscopic examination of this part in fetuses of 94,0-98,0 mm of PCL finds the rudiment of the pharyngeal tonsil in the form of longitudinal folds 123-358  $\mu$ m long, and fine superficial sulci between them. At the end of the fourth month of the intrauterine development the length of the pharyngeal tonsil is from 7,43 to 7,58 mm, its width - from 5,73 to 5,81 mm, and pharyngeal openings of the auditory tubes look like slits mostly, sometimes – oval in shape. In fetuses from 120,0 to 133,0 mm of PCL the anterior and posterior labia of the pharyngeal openings of the auditory tubes become more visible. The rudiments and development of tubular tonsils are found further posteriorly from the labia and along the tubular rolls. Due to transition of the auditory tube pharyngeal openings the distance from choanae to the anterior labia of the openings is from 2,71 to 2,92 mm, and the distance from the surface of the pharyngeal tonsil to the middle of the tubular pharyngeal openings – from 1,14 to 1,48 mm. The distance from the posterior pharyngeal wall to the middle of the tubular pharyngeal openings is from 4,11 to 4,39 mm, and from the posterior end of the hard palate to the middle of the tubular

pharyngeal openings – from 3,07 to 3,24 mm. The level of location of the pharyngeal openings over the hard palate is from 0,43 to 0,71 mm.

Glossopalatine and palatopharyngeal arches in the fetuses at the end of the fourth month of the intrauterine development are clearly seen. Depressions of the mucous membrane of the lateral pharyngeal walls are found between them in the form of tonsillar fossa from 2,81 to 2,92 mm long.

At the beginning of the fifth month of the intrauterine development the lower portion of the pharynx is of an expressed funnel-shaped form and smooth walls. The anterior-posterior size of the laryngeal part of the pharynx on the level of the epiglottis is 3,62 - 3,67 mm, on the level of the arytenoid cartilage – 2,35 - 2,41 mm long.

At the end of the fifth month of the intrauterine development in fetuses of 173 - 184 mm of PCL the craniocaudal size of the pharynx is 5,83 - 5,96 mm, including its nasal part – from 0,69 to 0,71 mm, oral – from 1,09 to 1,13 mm, laryngeal – from 4,01 to 4,10 mm. The length of the pharyngeal tonsil is 8,43 - 8,65 mm. The pharyngeal openings of the auditory tubes look like slits. The distance from the choana to the anterior labia of the openings is from 4,09 to 4,18 mm, from the surface of the pharyngeal tonsil to the middle of the pharyngeal openings of the auditory tubes – from 3,42 to 3,52 mm, from the posterior pharyngeal wall to the middle of the pharyngeal openings – from 5,27 to 5,41 mm, from the middle of the pharyngeal openings of the tubes to the posterior end of the hard palate – from 3,40 to 3,51 mm, and above - from 1,24 to 1,52 mm. The length of the glossopalatine arches ranges from 4,59 to 4,90 mm, and palatopharyngeal ones – from 5,47 to 6,13 mm. They are located at the distance from 3,00 to 3,31 mm one from another.

In the place of the lingual tonsil, behind the extreme folds of the mucous membrane in the place of the root of the tongue in particular, in fetuses of 170,0 - 177,0 mm of PCL several tubercula from 0,68 to 0,72 mm high are found.

The level of the upper border of the epiglottis concerning the anterior-posterior size of the lower pharyngeal part is from 4,42 to 4,57 mm, and on the level of the arytenoid cartilages – from 2,71 to 2,83 mm.

**Discussion.** Our study of the beginning of the fetal period of human ontogenesis determined that pharyngeal cavity is funnel-shaped: its oral part is wide, and the laryngeal one – narrows abruptly. Since due to oblique location of the posterior pharyngeal wall its upper wall is not seen in fetuses, the vault of the pharynx is determined as the extreme cranial portion of the nasal part where its posterior and lateral walls approach each other.

Glossopalatine and palatopharyngeal arches in the fetuses of this period of intrauterine development are clearly seen. Depressions of the mucous membrane in the form of tonsillar fossa are found between the arches. On the bottom of these depressions macroscopic

examination simultaneously detects the rudiments of the right and left palatine tonsils in the form of weakly marked sulci passing in the longitudinal direction.

In fetuses of 114-132 mm the anterior and posterior labia of the pharyngeal openings of the auditory tubes become vivid.

**Conclusions.** During 13 – 16th week of the intrauterine development of human fetuses the definite form of the pharynx appears. In the dynamics of the general pharyngeal development craniocaudal gradient of development is determined. The rudiments of the pharyngeal and palatine tonsils are found practically at the same time at the end of the 13th week, tubular tonsils – during 15-16th weeks, lingual tonsils – at the end of the 19th week.

During the intrauterine development skeletotopia of the pharynx is closely associated with the cavity of the nose, oral cavity, palate, larynx, and esophagus.

At the end of the fifth month of the intrauterine development the lower part of the pharynx is funnel-shaped with smooth lateral and posterior walls.

**Prospects of further studies.** Investigation of topographic-anatomical peculiarities of the pharynx at different age periods of human ontogenesis in order to study possible individual morphological changes and pathological variants in clinical practical work appears to be quiter reasonable.

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