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## ASSESSMENT OF THE ETHMOID BONE SIZE IN THE PERINATAL PERIOD OF HUMAN ONTOGENESIS AND INFANTS

**Abstract:** *The anterior-posterior, transverse sizes of the perforated lamina, the number of cells, shape of the ethmoid bone and sizes of the adjacent structures by means of comprehensive morphometry were determined which will promote the efficacy of diagnostics of congenital developmental defects.*

**Key words:** *ethmoid bone, perinatal period, infancy, ontogenesis, man.*

**Introduction.** To specify the time of occurrence of different intrauterine transformations ensuring the whole systemic genesis of the fetus is very important for practical health care [1,2]. Despite the fact that the period of the intrauterine development is relatively short, the body transformations in this period of time are much more substantial than during the whole following life. Therefore, the structure of the organs and systems should be studied in association with the principal forms of morphogenesis [3]. Annually the WHO estimates 140 million children in the world born, many of them have congenital disabilities. Therefore, one of the most serious tasks of modern perinatology is substantiation of effective methods of prevention and early diagnostics of congenital pathology [4]. Investigation of the peculiarities of the structure and variant anatomy of the ethmoidal labyrinth at different ages is an important issue of practical ENT specialists (otorhinolaryngologists). The greatest individual variability is peculiar for the cells of the ethmoidal labyrinth of the ethmoid bone and frontal sinuses [5]. Topographic development and formation of lateral nasal walls in the intrauterine period of human ontogenesis have been studied (6-7-month, 9-10-month old). The main form-building processes of the nasal cavity walls are found to occur during the fetal development. Syntopy is changed and morphometric parameters of the nasal walls become larger in 9-10-month fetuses which is

indicative of incompleteness of their morphogenesis in the prenatal period of human development [6]. Literary review is indicative of the fact that the data concerning regulations of development and formation of topography of the human ethmoidal labyrinth derivatives during intrauterine period and infancy of human ontogenesis are fragmentary and do not reveal the succession of their transformations.

**Objective:** to determine anterior-posterior, transverse sizes of the perforated lamina, the number of cells, shape of the ethmoid bone and sizes of the adjacent structures by means of comprehensive morphometry.

**Materials and methods.** At first the fetuses were fixed in 5% formalin solution during 7 days, followed by fixation in 10% formalin solution during 30 days. Before putting into formalin solution the thorax and abdomen of fetuses were dissected. All the fetuses were examined by means of macro- and microdissection methods, and histological sections of the fetal nasal areas were made. During dissection certain structures were drawn, and specimens with anatomical peculiarities after completion of dissection photos were made. Specimens of dead fetuses, newborns, heads or separate complexes of organs of different age groups fixed in formalin solution after external examination were washed during 1-2 days under running water. Afterwards sagittal section of the head or complex of organs was made in that way the section passed close to the

wall of the nasal septum. On the anatomical specimens obtained in this way the structures of the ethmoid bone and opening of the paranasal sinuses were described. Then the ethmoidal labyrinth was opened and its sizes were measured (anterior-posterior, transverse and vertical), ethmoidal cells were examined, and structural peculiarities of the ethmoid bone were described.

**Results and discussion.** In fetuses of the fourth month of development (81,0-134,0 mm of PCL) the perforated lamina of the ethmoid bone is presented by the cartilaginous tissue. Its anterior-posterior size increases from 4,9 to 7,8 mm, and the transverse one – from 1,5 to 2,2 mm. The ethmoidal labyrinth is also presented by the cartilaginous tissue. Its anterior-posterior size increases from 4,7 to 6,2 mm, and the vertical one – from 2,5 to 3,2 mm.

In fetuses of the fifth month of development (135,0-185,0 mm of PCL) the perforated lamina of the ethmoid bone is of cartilaginous structure as well. Its anterior-posterior size is 11,5 mm, the transverse one – 2,7 mm. The length of the ethmoidal bulla is 3,4 mm, the width – 1,7 mm. The uncinat process of ethmoid bone is 4,4-5,1 mm long and 1,4 mm wide. Anteriorly it bounds the semilunar opening 4,3 mm long.

In fetuses of the sixth month of development (186,0-230,0 mm of PCL) the border in the cartilaginous part between the septum cartilage and perpendicular lamina of the ethmoid bone is not found. The anterior-posterior size of the ethmoid bone perpendicular lamina is 13,2 mm, and the transverse one – 3,3 mm. The labyrinth of the ethmoid bone is of an osseous basis. Its anterior-posterior size is 6,9-8,4 mm, and vertical one – 4,4-5,2 mm. The length of the semilunar opening is 4,3-4,9 mm. The ethmoidal bulla looks like a roller (3,7×1,4 mm), the length of the uncinat process of ethmoid bone is 5,1 mm and its width – 1,9 mm. Anterior and middle ethmoidal cells are opened higher of the ethmoidal bulla. The labyrinth of the ethmoid bone is of an osseous basis.

In fetuses of the seventh-eighth months of development (231,0-310,0 mm of PCL) the structure of the nasal septum does not differ from the fetuses of the preliminary stage. The anterior-posterior size of the labyrinth of the ethmoid bone is 11,2-12,4 mm, its height – 5,4-6,2 mm. The

length of the semilunar opening is 7,7 mm. The ethmoidal bulla looks like a roller as in previous case (5,1×2,2mm). The length of the uncinat process of ethmoid bone is no more than 7,2 mm, the width – 2,4 mm. In the fetuses of the described age the ethmoidal labyrinth cells are well expressed, but their number is not big – from 3 to 6. The cells are covered with the mucous membrane 0,24-0,35 mm thick, they are oval in shape and different in size. The largest of them is 1,4×1,12 mm, and the smallest one – 0,83×0,55 mm.

In fetuses of the ninth-tenth months of development (311,0-378,0 mm of PCL) the islets of the osseous tissue appear in the perforated lamina of the ethmoid bone. Its anterior-posterior size increases to 17,2-18,5 mm, the transverse – to 7,5 mm. The anterior-posterior size of the ethmoidal labyrinth is 13,5 mm, the vertical one – 6,7 mm. Posterior ethmoidal cells open in the posterior third of the upper nasal passage. The length of the semilunar opening is no longer than 8,6 mm. The ethmoidal bulla is 6,2 mm long and 2,3 mm wide. The length of the uncinat process of ethmoid bone is 8,1-8,7 mm, the width – 2,2 mm. The ethmoidal cells are well seen, their number ranges from 4 to 6. They are oval in shape and of different sizes. The largest of them is 1,7×1,5 mm, and the smallest - 1,0×0,7 mm.

In newborns the length of the semilunar opening is no longer than 8,2±0,7 mm. The ethmoidal bulla is 4,0±0,13 mm long and 2,4±0,05 mm high. The length of the uncinat process of ethmoid bone is 5,8±0,1 mm, and the width – 2,0±0,05 mm. Protrusion of the frontal inlet on the specimens examined is 1,8±0,07 mm. The ethmoidal cells are well marked. There are 4-8 of them. They are oval in shape and different in size. The largest of them is 2,2 x1,6 mm, and the smallest – 1,6x1,0 mm. All the cells are covered with the mucous membrane, the blood vessels and mucous glands are found in them.

In newborns the ethmoidal cells are variable in shape: oval (52%), spherical (32%), spherical-oval (16%). On computed tomograms their number ranges from 4 to 8. Anterior and middle ethmoidal cells open in the area of the osteomeatal complex, and the posterior ones – in the upper nasal passage. All the ethmoidal cells are divided by septa. There are no connections between the

anterior, middle and posterior cells found. In 15% of cases anatomical variability of shape, number and size of the ethmoidal cells are found.

Investigations of development and topographic-anatomical interrelations of the nasal walls with the adjacent structures during the period of infancy (10 days – one year) have found the following: well marked ethmoidal cells in the amount of 4-6. They are oval in shape and different in size. The largest of them is 2,5x1,8 mm, and the smallest – 1,2x0,8 mm. Posteriorly from the ethmoidal labyrinth the hyoid perpendicular lamina is located, 7,6±0,14 mm high and 4,8±0,05 mm wide. The posterior portion of the lateral wall is supplied by the middle lamina of the pterygoid process 7,6±0,05 mm high and 5,6±0,1 mm wide.

**Conclusions:** the anterior-posterior, transverse sizes of the perforated lamina, the number of cells, shape of the ethmoid bone and sizes of the adjacent structures by means of comprehensive morphometry were determined which will promote the efficacy of diagnostics of congenital developmental defects.

**Perspective of further studies.** Investigations of the ethmoid bone at other age periods are

planned to be performed.

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