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EVOLUTION OF THE LOWER WALL OF TYMPANIC CAVITY IN THE EARLY PERIOD OF ONTOGENESIS

Abstract. *The structure and syntopy of the inferior wall of the tympanic cavity have been studied in 58 fetuses and 11 newborns. It is established that it begins to be formed at the eighth month of intrauterine development. In newborns, the thickness of the inferior wall of the tympanum is 1.06 ± 0.03 mm, the length of the jugular fossa is 12.5 ± 0.29 mm, the width of the jugular fossa is 8.51 ± 0.27 mm.*
Key words: *anatomy, fetus, jugular fossa, ontogenesis, tympanic cavity.*

Introduction. At this time, the problem of the pathology of the middle ear in newborns and infants is very topical due to the high frequency of their detection of otitis media [1]. It connected with certain anatomical characteristics of the structure of the nasal cavity and the middle ear, and the presence of amniotic fluid in the middle ear [5]. Most authors are engaged in the study of the pathology of the middle ear of term infants and children of the first year of life [3]. Some researchers consider the disease of the middle ear in premature infants [5, 6]. In the analysis of the pathology of the middle ear, they pay more attention to exudative otitis media [2, 8].

There are few works on the pathology of the middle ear in premature infants, although in the first months of life many of them receive continuous therapy (Continuous Positive Airway Pressure) and are on enteral feeding, which can lead to inflammation changes in the cavity of the nose, nasopharynx, auditory tube and provoke the development of exudative otitis media [4].

Therefore, the nursery of children with low and extremely low body weight and an increase of the number of cases of such children surviving to 7% [1], the study of the problem of the pathology of the middle ear is very actual today.

These traumatic lesions of soft tissues of the nose and nasopharynx in premature infants may lead to pathological processes in the middle ear what can reach 42% [4]. At the same time in 10% of premature infants the otitis media goes quite difficult and in the future it is necessary to conduct surgical intervention - miringoplasty or shunting of the tympanic cavity [6]. That's why the study of embryological aspects of the development of the middle ear, its anatomy and topographic anatomy in the fetuses, remains very important. Modern scientific achievements have considerably expanded the practical possibilities of endoscopic operations with diseases of the ear. The introduction of them contributed to the development of the priority direction - endoscopic operations, which have several advantages over traditional otomicrosurgical operations [7].

The aim of the study. To study the peculiarities of the development of the inferior wall of the tympanic cavity in the early period of ontogenesis.

Materials and methods. The study was carried out on corpses of 58 fetuses of 271,0-375,0 mm of parietal-coccygeal length (PCL) and 11 newborns by methods of ordinary and fine preparation under the control of binocular enlarging lens, macromyscope and morphometry, photomacrography of the "OLIMPUS μ 1000 All-weather 10.0 Mpix" digital camera.

Result. We have found out that the inferior wall of the tympanic cavity limits the jugular fossa and begins to form on the 8th month of intrauterine development in the fetuses of 271.0 -

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310.0 mm PCL as an processus of the petrosal part of the temporal bone. The development of internal jugular vein contributes to the formation of this wall. Within process of increasing of its diameter the lower edge of the annulus tympanicus begins to depart from the promontory and the tilt angle of the upper edge increases. As a result the annulus tympanicus moves from a horizontal position in a more inclined. The thickness of the inferior wall of the tympanic cavity during this period is 0,63 ± 0,03 mm. The width of the jugular fossa is 6,25 ± 0,27 mm, and its length reaches 8,50 ± 0,32 mm (Fig. 1, 2).

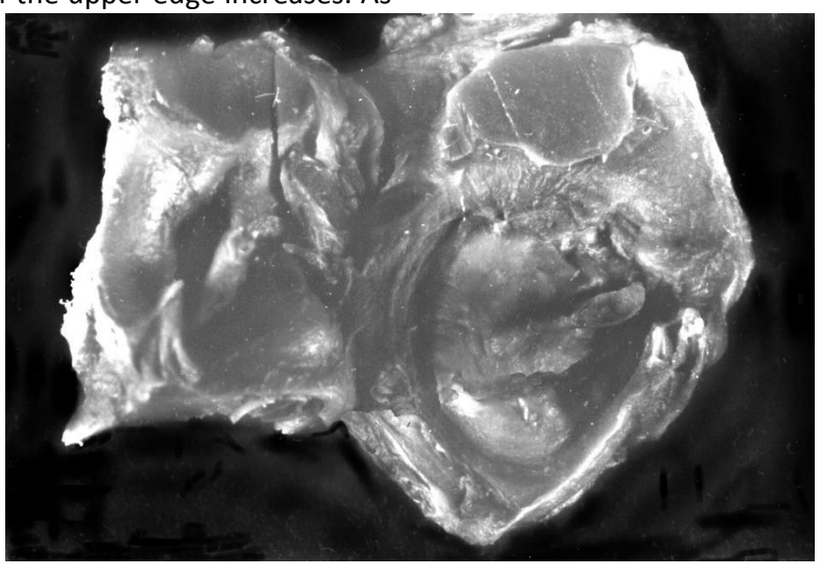

Fig. 1. Surgical incision the tympanic cavity of the fetus 275,0 mm PCL. Increase 1: 3,8. 1 – medial wall of the tympanic cavity, 2 – eardrum.

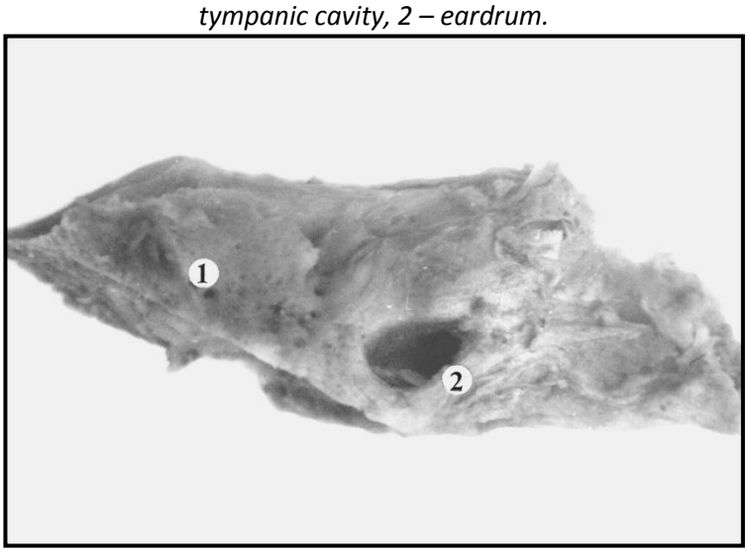

Fig. 2. The temporal bone of the fetus 290,0 mm PCL (bottom view). Increase. 1:3,2. 1 – the jugular fossa, 2 – canal of the internal carotid artery.

During the ninth month of intrauterine development that is in the fetuses 311.0 - 345.0 mm PCL the tympanic cavity becomes more irregular in shape, numerous cells appear on its walls. The inferior wall of the tympanic cavity increases its size and the lower edge of the annulus tympanicus departs from the promontory even more, and the angle of inclination of the upper edge increases. As a result the tympanic cavity from the almost horizontal position moves in the inclined. The thickness of the inferior wall of it is 0,72 ± 0,02 mm. The width of the jugular fossa is 7,25 ± 0,18 мм, its length is 9,50 ± 0,24 mm (Fig. 3).

During the tenth month of intrauterine development that is from the fetuses of 346.0 - 375.0 mm PCL the formation of the inferior wall of the tympanic cavity continues as a result of the increase of the diameter of the internal jugular vein. Its thickness is 0,87 ± 0,04 mm. The width of the jugular fossa is 7,75 ± 0,26 mm, its length is 10,15 ± 0,27 mm (Fig. 4).

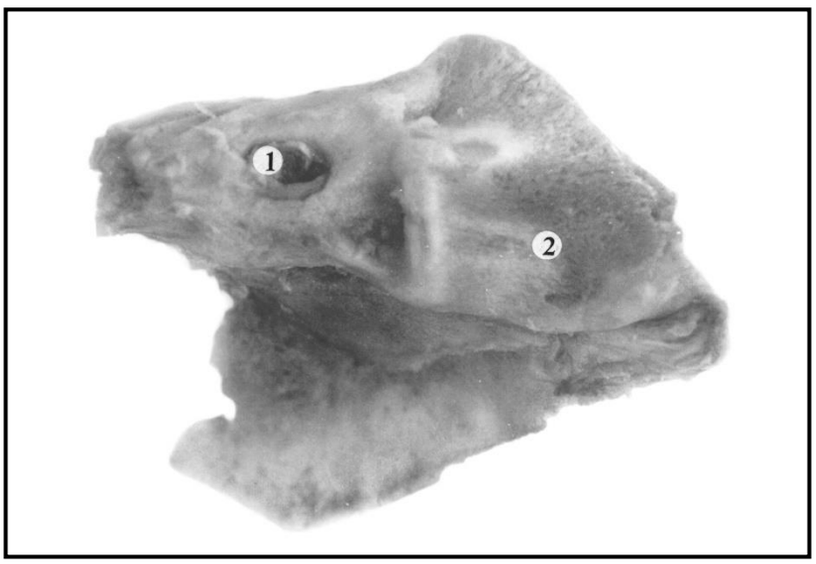

Fig. 3. The temporal bone of the fetus 336,0 mm PCL (bottom view). Increase 1: 3,2. 1 – canal of the internal carotid artery, 2 – the jugular fossa.

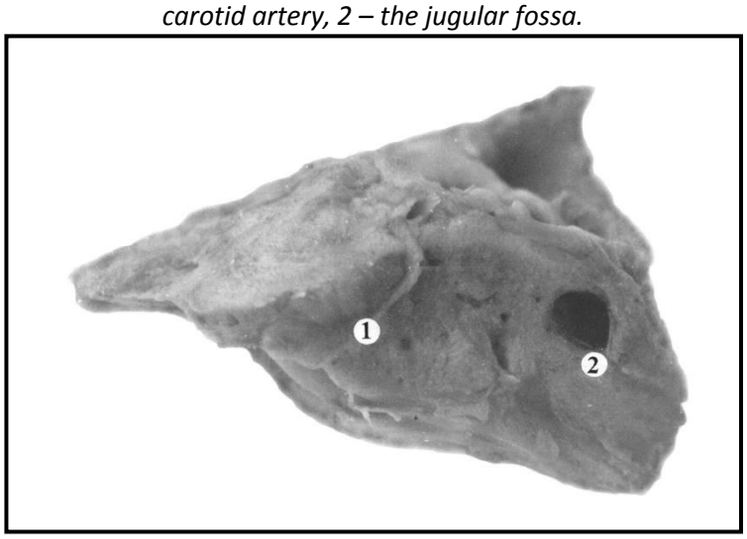

Fig. 4. The temporal bone of the fetus 350,0 mm PCL (bottom view). Increase 1: 3,2. 1 – canal of the internal carotid artery, 2 – – the jugular fossa.

The tympanic cavity of the newborns has the form an irregular cube with rounded edges that is filled with embryonic tissue. The inferior wall of the tympanic cavity is a bone plate under which the bulb of the jugular vein is located. Its thickness is small and is 1,06 ± 0,03 mm. The width of the jugular fossa is 8,51 ± 0,27 mm, its length is 12.50 ± 0,29 mm (Fig. 5).

Discussion. From the eighth month of prenatal life to the period of newborn's birth, the thickness of the inferior wall of the tympanic cavity

is increased by 1.68 times. The dimensions of the jugular fossa which is limited by this wall increase the length for 1,47 times and the width for 1,36 times.

Begining from the 8th month of the fetal period of development and till the period of newbornnes, the movement of the annulus tympanicus with the tympanic membrane is in a more vertical position as a result of the increase

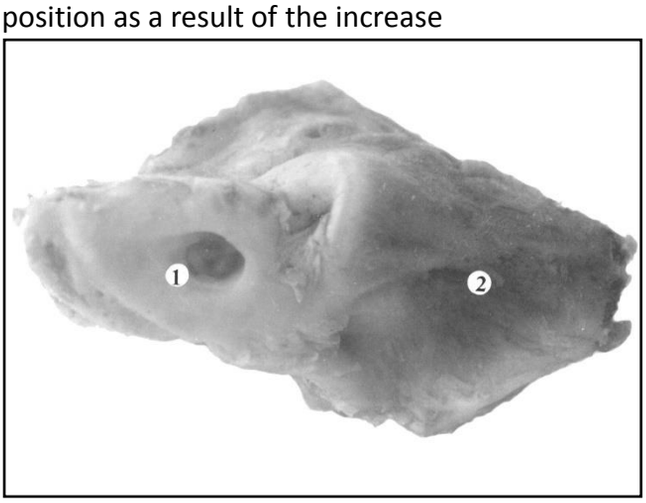

Fig. 5. The temporal bone of the newborn (bottom view). Increase 1: 3,2. 1 – canal of the internal carotid artery, 2 – the jugular fossa.

of the width of the jugular fossa.

The results of this study will contribute to the rational choice of methods for surgical interventions in the middle ear of newborns and babies in the first months of life.

Conclusions. 1. The thickness of the inferior wall of the tympanic cavity is 1.06 ± 0.03 mm of newborns, which should be taken into account when performing manipulations and surgical interventions on the middle ear.

2. The thickness of this wall of newborns does not differ from the thickness of it of children of 1-3 years.

3. The thickness of this wall of the fetuses of the 8th - 10th months is thinner than of newborns.

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