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### **NEW RESEARCH – NEW RESULTS** **НОВІ ДОСЛІДЖЕННЯ – НОВІ РЕЗУЛЬТАТИ**

Abstract. We conducted the study by means of modern and adequate morphological methods on 46 specimens of dead fetuses (aged 4-10 months) and 11 new born infants; we clarified some topographical and anatomical features of the common carotid arteries in human fetuses and new born infants. It was established, that in the perinatal life of the human ontogenesis, the common carotid artery in 48% of early fetuses (aged 4-5 months), in 76% of late fetuses and new born infants divides into the external and internal carotid arteries at the level of the hyoid bone. During the perinatal life the bifurcation of the common carotid artery shifts skeleton topically caudad by one cervical vertebra. The division of the common carotid artery to the internal and external carotid arteries is determined in two forms: parallel and bulb-like ones. The front joining of the superior laryngeal nerve to the site of bifurcation of the common carotid artery must be considered when performing surgery in the neck in infants and young children.

Key words: common carotid artery, topography, perinatal life.

Резюме. За допомогою сучасних та адекватних морфологічних методів проведені дослідження на 46 препаратах трупів плодів (від 4 до 10 місяців) та 11 новонароджених з'ясовані топографоанатомічні особливості загальних сонних артерій в плодів та новонароджених людини. Встановлено, що в перинатальному періоді онтогенезу людини загальна сонна артерія, у 48% випадків у ранніх плодів (4-5 місяць) та у 76% – у пізніх плодів (8-10 місяць) та в новонароджених, поділяється на зовнішню і внутрішню сонні артерії на рівні під'язикової кістки. Упродовж перинатального періоду біфуркація загальної сонної артерії скелетотопічно зміщується каудально на один шийний хребець. Поділ загальної сонної артерії на внутрішню і зовнішню сонні артерії визначається за двома формами: паралельною та цибулиноподібною. Переднє примикання верхнього гортанного нерва до місця біфуркації загальної сонної артерії потрібно враховувати під час виконання оперативних втручань у ділянці шиї у новонароджених та дітей раннього віку.

Ключові слова: загальна сонна артерія, топографія, перинатальний період.

Under the conditions of intensive pace of life, of extremely rich information environment, of high levels of daily stress performance and environmental distress, people are in a state of balance between health and disease. In this sense, the problem of preserving life and health of each child is of a great medical and social importance and, therefore, it determines the prosperity and national security. Thus, the health of pregnant women and fetal physiological maturity are an important determinant in promotion of children's health [1]. Therefore, no one doubts the urgent need to develop new medical aspects of modern embryology,

without which it is impossible to solve important issues of practical public health problems such as infertility treatment and prevention of congenital and hereditary diseases [2, 6, 7, 10].

There are congenital and acquired anatomical deviations among the components of the main neurovascular fascicle of the neck including the carotid artery and the internal jugular vein. A. Lo et al. [9] give some facts of the carotid artery stenosis in the bifurcation area (over 75%), abnormal tortuosity and formation of loops in the extracranial part of the internal carotid artery, the internal carotid artery stenosis etc. Today, some new surgical techniques, such as open endarterectomy of the carotid artery bifurcation with surgery of an arteriotomy defect, redressment of the internal carotid artery into the common carotid artery, a resection of the common carotid artery, are introduced into modern cardiovascular surgery and it requires deep topographical and anatomical studies and explanation [5, 8].

The analysis of the literature shows the interest of domestic and foreign scholars in anatomy and topography of the components of the main neurovascular fascicle of the neck at the stages of ontogeny, as to the surgical correction of deviations from their normal development in infants and young children [3, 12]. However, the literature data on the anatomy of the common carotid arteries (CCA) in the early stages of ontogeny are contradictory and fragmentary, they are usually devoted to studying the topography of these structures in adults [4, 11]. The fact that the studies about the topographical and anatomical features of the CCA are not classified requires some further anatomical research in the perinatal period of ontogenesis.

Objective of the paper was to determine topographical and anatomical features of the common carotid arteries in fetuses and new born infants.

**Materials and methods.** The study was conducted on 46 specimens of fetuses (aged 4-10 months) and 11 new born infants (including 6 isolated organo-complexes) without any visible signs of anatomical deviations or abnormalities as well as without apparent macroscopic deviations from the normal structure of the blood-vascular system. We used modern and adequate morphological methods that will clarify complex and diverse processes of the carotid arteries topography and create a complete and holistic view of their morphogenesis in the perinatal period of human ontogenesis, namely, macro and microscopy, arterial injection with a mixture based on minium, followed by a dissection and radiography, making topographical and anatomical sections in three mutually perpendicular planes. The research was performed in compliance with key provisions of the Helsinki Declaration of the World Medical Association on ethical principles of scientific and medical research involving human subjects (1964-2000) and the order of MOH of Ukraine of 13.02.2006.

**Results and discussion.** The process of formation of the carotid artery topography in fetuses and newborn infants is influenced by a close relationship both with the components of the main neurovascular fascicle of the neck (internal jugular veins, vagus nerves), and with adjacent structures and organs.

The CCA in the neck area extend cranially and are a part of the main neurovascular fascicle of the neck, which is covered with the parietal layer of the intracervical fascia. Above the lower border of the neck, the right CCA is located in a groove, formed by the trachea and the anterior scalene muscle, the left one is adjacent to the middle part of the trachea, the anterior wall of the artery joins the left internal jugular vein, the posterior wall does the same with the left subclavian artery, and the posterior wall joins the long muscle of neck and that of head. On the border between a 1/3 and a 1/2 of the CCA length, its anterior wall is adjacent to the back surface of the thyroid gland lobes. The internal jugular veins and CCA are adjacent to the inner surface of the omohyoid muscle and then flow within the carotid triangle. In the lower part of the triangle CCA are hidden with sternocleidomastoid muscle; in the upper part it is adjacent to the front edge of the muscle (in 4-6 month old fetuses) or CCA is located at a distance of 0,5 1.0 cm from the front edge of this muscle (in 8-10-month-old fetuses).

Within the carotid triangle the topographic and anatomical relationship between the components of the main neurovascular fascicle of the neck are the following: mid-placed CCA, the internal jugular vein is adjacent to its anterior wall adjacent internal jugular vein, behind it in the groove the vagus lies between these vessels. Vagus nerve at the top of carotid triangle is adjacent to the side wall of the CCA; at the bottom it goes to the anterior wall of the artery. Projection of the CCA within the carotid triangle is determined by the longitudinal line that passes through the point at the intersection of the lateral edge of

omohyoid muscle with the front edge of the sternocleidomastoid muscle, forming an acute angle (15-30 °) with the latter. The older a fetus the less acute this angle is.

Within the carotid triangle in the prenatal period the CCA bifurcation occurs. The CCA division into the external and internal ones in the early fetuses (4-5 month old) in 48%, in the late fetuses (8-10 month old) and infants in 76% of cases takes place at the level of the hyoid bone. In 28% (for early fetuses) and 16% (for late fetuses and newborn infants) of observations the CCA divides at the upper edge of the thyroid gland. It is noteworthy that the percentage of the CCA bifurcation at the level of the thyroid cartilage is more on the left. This division is called a descending one. In 24% of cases for early fetuses and 8% for late fetuses and newborn infants the division of CCA was found above the hyoid bone; this division is called an ascending one.

During the perinatal period of ontogenesis the division of the CCA into the external and internal carotid arteries shifts skeleton topically caudad by one cervical vertebra. The bifurcation of the CCA in 8-10-month-old fetuses and newborn infants is determined skeleton topically at C3.

The division of the CCA into the internal and external carotid arteries in the prenatal period of ontogenesis is determined in two forms: parallel and bulb-like ones. The parallel division of the CCA is a form of bifurcation when the external and internal carotid arteries extend parallel to each other, meeting with their walls, with an approximate division angle of 10-20 ° (Fig. 1). The bulb-like form of the CCA division is considered to be its division at an obtuse angle with the following approach of the internal and external carotid arteries to each other, forming a shape that resembles a bulb (Fig. 2). The parallel form of the CCA division is typical and it occurs in 84% of fetuses and newborn infants while the bulb-like form is a variant one (16%). The bulb-like shape occurs the most frequently in the descending division of the CCA, which, in our opinion, is an anatomical prerequisite of congenital defects of the carotid arteries.

Anteriorly to the site of the CCA bifurcation in the perinatal period of ontogenesis there usually (78% of cases), extends the superior laryngeal nerve (Fig. 3), in other cases (22%), it passes more cranially to the site of the CCA division 0.3-0.5cm anteriorly to the external and internal carotid arteries. This topographical and anatomical mutual placement should be considered in surgeries in the neck area of newborn infants and young children.

Conclusions. 1. In the perinatal period of human ontogenesis the common carotid artery is divided into the external and internal carotid arteries at the level of the hyoid bone in 48% of cases of early fetuses (4-5 months) and 76% - late fetuses (8-10 months) and newborn infants. 2. Bifurcation of the common carotid artery during the perinatal period shifted skeleton topically caudad by one cervical vertebra. 3. The division of the common carotid artery into the internal and external carotid arteries in the perinatal period of ontogenesis is determined in two forms: parallel and bulb-like ones. 4. The front abutment of the superior laryngeal nerve to the site of bifurcation of the common carotid artery must be considered when performing surgery in the neck in infants and young children.

Prospects for further research. To clarify the topographical and anatomical relationship between the components of the main neurovascular fascicle of the neck during the perinatal period of ontogenesis.

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**РАЗРАБОТКА КОМПЬЮТЕРНОГО СКРИНИНГ ТЕСТА ДЛЯ РАННЕГО ВЫЯВЛЕНИЯ  
РАКА МОЛОЧНОЙ ЖЕЛЕЗЫ**  
*DEVELOPMENT OF COMPUTER-BASED SCREENING TEST FOR EARLY DETECTION OF BREAST  
CANCER*

*Аннотация. Проведен ретроспективный анализ анамнеза жизни двух групп по методу «случай-контроль»: «случай» -144 больных РМЖ и «контроль» -287 здоровых женщины по специально разработанной анкете, учитывающей основные онкоэпидемиологические факторы.*

*На основании значимых факторов разработана прогностическая таблица, которая служила основой компьютерного скрининг теста, «Onkohushyorlik-1» выдающий заключение об отнесении тестированной женщины при положительной сумме диагностических коэффициентов более «+27» к группе риска развития рака молочной железы, при меньшем значении к здоровым.*

*Прогностическая модель проверена на экзаменационной выборке, чувствительность составила 85,1%, специфичность - 77,3%, площадь под ROC- кривой - 0,85.*

*Ключевые слова: рак молочной железы, ранняя диагностика, компьютерный скрининг тест.*

*Abstract. Retrospective analysis of history of life of two groups according to the method "case-control": "case" -144 breast cancer patients and "control" -287 healthy women using a specially designed questionnaire based on key factors oncoepidemiological.*

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