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DEVELOPMENT OF THE CAVERNOUS SINUS IN THE FETAL PERIOD: A MORPHOLOGICAL STUDY

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Багатоспрямованість шляхів венозного відтоку з порожнини черепа виникає на ранніх стадіях внутрішньоутробного розвитку людини. Важливе місце на всіх етапах розвитку венозної системи головного мозку займають пазухи твердої мозкової оболонки основи черепа та їхні зв'язки, що після народження людини являють собою важливу складову морфологічної основи компенсаторних механізмів судинної системи при порушеннях мозкового кровообігу.

Ключові слова: печериста пазуха основи черепа, антенатальний розвиток.

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Разнонаправленные пути венозного оттока из полости черепа формируются на ранних стадиях антенатального развития человека. Важную роль на всех этапах развития венозной системы головного мозга играют синусы основания черепа и их связи. После рождения человека они являются важным звеном морфологической основы компенсаторных механизмов при нарушениях мозгового кровообращения.

Ключевые слова: пещеристый синус основания черепа, антенатальное развитие.

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The multi-directional path of the venous outflow from the cranial cavity is formed at the early stages of antenatal human development. The sinuses of skull base and their outer anatomies are greatly important during all stages of development of fetus brain. After the birth they become as the main morphological links of compensatory mechanisms in disorders of brain circulation.

Key words: cavernous sinus of the skull base, antenatal development.

One of the actual problems of modern medicine is the violation of brain blood circulation because it occupies one of the leading places in structure of disease and death rate of the population [3,8].

The important role in cerebral hemodynamics belongs to the venous system of brain, and the dural cavernous sinus is considered one of the central parts of regulation of cerebral circulation [1,5]. The sinus has complex internal structure, diverse intramural nervous apparatus, numerous connections with sinuses of calvaria, vertebral venous basin and extracranial veins, that defines the participation of sinus in regulation, redistribution and drainage of venous blood from the cavity of skull [2-5].

The studying of features of the vascular brain system structure on different stages of antenatal development gets practical value, because these knowledge's are necessary for interpretation the results of investigation as prenatal, with using of ultrasonic research, and the data of diagnostic (a nuclear magnetic resonance, angiography, etc.) of premature children [6,7].

The aim of research is complex studying of features of structure and development of the cavernous sinus of human fetus.

112 corpses of human fetuses of age from 16 till 36 weeks were used for research. The age periodization of human ontogenesis was used for age distribution of material.

Such methods as injection of cerebral vessels,

preparation, corrosion, stereotopo- and morphometric, macro- and microphotographing, statistical analysis of material were used in this research.

It is established, that cavernous sinus at the fetuses of 16 weeks of gestation is presented by the vascular venous circle, which is formed by the basic trunks of cavernous sinuses, anterior, posterior and inferior intercavernous sinuses. The basic trunks of cavernous sinus are located along lateral surface of sphenoid bone. They have lumen of triangular form, with length $3,9 \pm 0,54$ and general width of lumen $1,8 \pm 0,04$ mm.

The intrasinus structures are well developed and presented by trabeculas, membranes, chords and threads, which divide the lumen of sinus on numerous canals. The part of vessels of venous plexus, which accompany internal carotids, is opened in cavernous sinus. Some vessels with diameter of lumen $0,2-0,4$ mm begin from the inferiolateral surface of cavernous sinus. These vessels take part in the formation of venous plexuses of oval and lacer foramens of the base skull.

During 22-24 weeks of the fetus development, the lumen of trunks of cavernous sinus has microplethysmous character, their general diameter makes $2,2 \pm 0,5$ mm. The intrasinus canals are connected to the dense venous plexus of anterior and inferiolateral walls of sinus, these vessels connect the lumen of sinus to the venous system of oval foramens of the base skull (Fig.1.1). The separate fascicles of vessels of this system, with diameter of ves-

sels up to 1,2 to 1,6 mm, leave the cavity of skull and follow to the vessels of retropharyngeal and pterygoid plexuses.

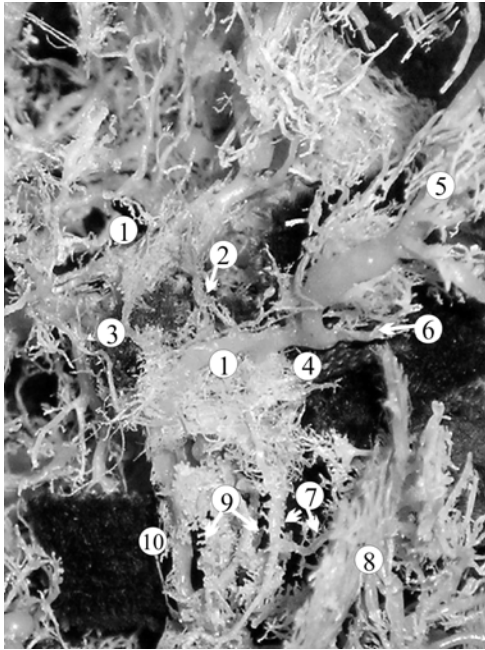


Figure 1.1. The cavernous venous complex of fetus by 20 week. 1 - cavernous sinus; 2 - anterior and 3 - posterior intercavernous sinuses; 4 - common ophthalmic trunk; 5 - superior ophthalmic vein; 6 - inferior ophthalmic vein; 7 - venous plexus of oval foramen; 8 - pterygoid venous plexus; 9 - venous plexus of jagged hole; 10 - inferior petrosal sinus. Preparation. № 39 (sex - female, brachicran). Injection by AKR-15. Total corrosion. Macrograph x 7.

At fetuses of 28 weeks of gestation it is mainly kept a plexiform structure of cavernous sinus, with the general diameter of trunks is $2,1 \pm 0,61$ mm, and length is - $5,9 \pm 1,08$ mm. On separate preparations of this period the lumen of sinus is presented by 2-3 canals in diameter to 0,6 mm, which is closely connected by anastomoses.

At the loose type of structure of venous system of fetuses of the late fetal period (29-36 weeks), intrasinus canals with diameter of separate foramina up to 0,3 mm, form a macroplethysmous system. These vessels together with canals of anterior and posterior intercavernous sinuses, forms a continuous venous circle. The diameter of trunks of cavernous sinus increases a little and reaches $2,48 \pm 0,8$ mm; the length of sinuses makes $6,28 \pm 1,49$ mm. At the magisterial type of structure of the head's venous system, the one - two canals with the general diameter $1,45 \pm 0,63$ mm and length of trunks $7,55 \pm 0,92$ mm, in which 1-2 superficial veins of brain were opened, formed the lumen of cavernous sinus.

The anterior and posterior intercavernous sinuses connect among themselves the trunks of cavernous sinus. During the fetal period, their length gradually increases from $3,3 \pm 0,08$ in 16 weeks of development till $8,1 \pm 0,64$ mm in 36 weeks. During the early fetal period, the anterior intercavernous

sinus has mainly two-canals form with diameter of trunks up to 0,5 to 0,6 mm. In the late fetal period, there is a reduction of one of the canals of sinus, and the diameter of lumen of other sinuses increases to $0,8 \pm 0,27$ mm. During all fetal period, the posterior intercavernous sinus is presented by one trunk, the diameter of which gradually increases and reaches to $0,6 \pm 0,29$ mm in 32 weeks.

Thus, formation of the cavernous sinus is difficult process which includes the reduction and magistralization of a primary venous net of the basis of a skull.

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