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Clinical consequences of perinatal hypoxic-ischemic lesions of the central nervous system in infants born prematurely

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Abstract

In the course of work, in order to study the leading risk factors for the unfavorable prognosis of development of impaired motor function in children born prematurely who underwent perinatal hypoxic-ischemic brain injury, a comprehensive examination of 79 children at an average age of 3.2 ± 1.3 years, who suffered from perinatal hypoxic-ischemic lesions of the central nervous system, and who were born prematurely, was conducted. As shown by the results of the survey, in 20.3% of the surveyed, it was found spastic cerebral palsy with severe motor disorders of the 4-5th levels according to the Gross Motor Function Classification System (GMFCS); 37.9% had spastic diplegia, 22.6% of which had motor disorders of the 3rd level by GMFCS, 15.3% had motor disorders of the 2nd level; 27.8% were diagnosed with hemiplegic form of cerebral palsy with the 1st level of motor disorders. 14.0% were diagnosed with acquired post-hemorrhagic hydrocephalus, 63.6% were operated on up to 6 months of age, they were implanted with liquor-bypass system and had motor disorders of the 1-2nd level; 27.3% of children were operated on after 6 months of life and had motor disorders of the 3rd level, and 9.1% were not operated on and had the 5th level of motor disorders. It has been established that the most important factors that form the difficult motor prognosis are gestational age of 27 - 30 weeks, peri-intraventricular hemorrhages of 2-4 degrees, periventricular leukomalacia of the 3rd degree, presence of signs of periventricular ischemia. Predictors of the formation of severe disorders of motor functions (inability to

absorb walking, mastered only walking with auxiliary devices) in premature infants are pronounced ischemic brain injury, spastic form of cerebral palsy, operated on after 6 months of life, or generally non-operative acquired post-hemorrhagic hydrocephalus, gestational age 27 - 30 weeks, peri-intraventricular hemorrhage of 2-4 degrees, periventricular leukomalacia of the 3rd degree.

Key words: perinatal hypoxic-ischemic lesion; central nervous system; infants born prematurely; motor function.

The health of children is a reflection of the processes of their development during the prenatal period, which makes it difficult to overestimate the importance of early ontogeny in the formation of health. One of the most important problems of practical neonatology is pregnancy miscarriage. Preterm birth is the most common cause of impaired adaptation to post-natal living conditions, high perinatal morbidity and neonatal mortality, which are a consequence of low weight of the newborn, his immaturity and concomitant infection. [1, 2].

Perinatal brain damage in children accounts for a significant proportion of the incidence, neonatal and early infant mortality rates, and disablement. The need for modern approaches to treatment, prevention of this pathology in children and the problem of social and psychological adaptation go far beyond medical assistance. It requires the integration and efforts of health professionals, educators, psychologists, and educational work of parents. [3, 4].

Perinatal brain lesions play an important role in diseases of young children, significantly affect the further development of the child and cause high rates of perinatal morbidity, mortality and disablement. According to the World Health Organization Expert Committee, about 10% of the child population have neuropsychiatric disorders, 80% of which begin in the perinatal period. The neonatal period is crucial in terms of adaptation, survival and subsequent quality of life. Brain lesions in the early stages of ontogeny slow down the maturation of parameters of functional systems of the central nervous system, which increases the risk of long-term consequences [5, 6, 7].

The severity of possible neurological consequences and the high percentage of persistent disablement in preterm infants determine the need to identify risk factors for severe neurological pathology in perinatal hypoxic-ischemic lesions of the central nervous system. Despite the considerable success of diagnostic and therapeutic interventions in nursing premature babies, many aspects of this problem remain unclear. Namely, such questions as the lack of early reliable diagnostic criteria for brain lesion, the scheme of organizational,

diagnostic and therapeutic measures for children with perinatal hypoxic-ischemic lesions of the central nervous system remain open [9, 10, 11].

The above mentioned determines the relevance of our work, **the purpose** of which is to study the leading risk factors for the unfavorable prognosis of motor function disorders in premature infants who have suffered from perinatal hypoxic-ischemic brain damage.

Material and research methods. In order to achieve this goal, we conducted a comprehensive examination of 79 children of the average age of 3.2 ± 1.3 years born prematurely with an earlier perinatal hypoxic-ischemic lesion of the central nervous system, in compliance with the principles of bioethics and deontology at the Kharkiv City Children's Neurosurgical Center.

The following examination methods were used in the work: clinical-neurological, neurosonographic and magnetic resonance with assessment of the degree of periventricular leukomalacia and peri-ventricular hemorrhage, for the evaluation of motor status, classification GMFCP (Gross Motor Function Classification System) was used, and statistical method.

Research results and their discussion. The following forms of infantile cerebral paralysis are observed in 86% of those surveyed:

Spastic cerebral paralysis (20.3% of the children), which showed rigidity of the muscles of the upper and lower extremities, at the position of the baby on the abdomen and on the back were pronounced specific bending or extending postures and extending posture with the hanging of the head in support of the child in vertical position. Severe movement disorders of the 4-5 levels by GMFCS were observed; the patients needed support for sitting and standing, were not able to consciously control their own movements.

Spastic diplegia (37.9%) - children mastered walking with restrictions and with auxiliary supporting tools, motor status in 22.6% of the surveyed corresponds to the 3rd level of GMFCS - children could independently sit on the floor with externally rotated and bent hips and knees, move with the help of crawling, they were able to walk a short distance using aids. In 15.3%, the 2nd level of movement disorders was noted - children, with the support of hands, could stay on the floor in order to maintain balance; they moved by crawling on their bellies, could pull themselves up to stand on their own and take several steps using aids.

In 27.8%, hemiplegic form of infantile cerebral paralysis G 80.2 with unilateral lesion of extremities, mainly upper, development of spastic hemiparesis, gait type Wernicke-Mann, but without circulation of lower extremity was observed. Children learned to walk without

restriction, could sit independently on the floor and with two hands to manipulate objects, which corresponds to the 1st level according to the GMFCS classification.

In 14.0% of the surveyed children, acquired hemorrhagic hydrocephalus was diagnosed. In 7.5%, hydrocephalus was diagnosed in the first month of life, developed acutely, due to intraventricular hemorrhages with tamponade and occlusion of the cerebrospinal fluid pathways. In 6.5%, hydrocephalus occurred in the first 2-3 months of life, due to impaired resorption and stenosis of the cerebrospinal fluid pathways. Thus, all children required neurosurgical intervention in the first months of life.

Among patients with children with hydrocephalus, 63.6% were operated on for up to 6 months of life, and were implanted with liquor-bypass system. In the follow-up study, the following clinical data were observed in these patients: 54.5% of children had no motor deficits, acquired physiological walking without restrictions, which corresponded to the 1st level of GMFCS. 9% develop with spastic lower extremity paresis, symptomatic epilepsy in the stage of medication remission, have not mastered independent walking, move with an external aid, according to the 2nd level according to GMFCS; 27.3% of children were operated on after 6 months of life and had motor disorders of the 3rd level. 9.1% were not operated on, developed with spastic tetraparesis, symptomatic refractory epilepsy, severe cognitive disorders, did not move, has complete dependence on others – the 5th level of motor disorders according to the GMFCS classification.

According to the data of neurosonography, periventricular ischemia was observed in 16.9% of the children, intraventricular hemorrhage of the 1st degree - in 30.1% of the examined children, intraventricular hemorrhage of the 2nd degree, periventricular leukomalacia - in 32.1% of the children, intraventricular leukemia was observed in 20.9% of newborns.

As shown by the results of the study, in the structure of severe motor disorders in children with perinatal hypoxic-ischemic lesions of the central nervous system, a significant place is occupied by violations of the arbitrary regulation of movements and postural control.

The obtained data were processed by the methods of variational statistics with the calculation of the probability of difference (P), the probability of difference between the two means was determined according to the Student's table, and correlation dependencies were determined. Between the gestation period of the baby and the formation of neurological deficit, the correlation dependence is weak, from 0.181 to 0.271, can not be reliable. In children with intraventricular hemorrhage of the 3rd degree and periventricular leukomalacia,

motor and speech deficits were formed, and a positive correlation was established between the two factors with a coefficient of 0.9, which confirms the linear relationship between them.

It has been established that the most important factors that form the difficult motor prognosis are: gestational age of 27 - 30 weeks, peri-intraventricular hemorrhages of the 2-4 degrees, periventricular leukomalacia of the 3rd degree, presence of signs of periventricular ischemia.

Thus, as evidenced by the obtained data, predictors of the formation of severe disorders of motor function (inability to learn walking, mastered only walking with auxiliary devices) in premature infants are pronounced ischemic brain damage, spastic form of cerebral paralysis, operated after 6 months of life, or non-operated posthemorrhagic hydrocephalus, gestational age of 27 - 30 weeks, peri-intraventricular hemorrhage of the 2-4 stages, periventricular leukomalacia of the 3rd degree.

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