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Neurospecific enolase marker of hypoxic - ischemic brain damage in newborns

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Summary: Authors presents results of neuron-specific enolase (NSE) determination in neonates with hypoxic-ischemic brain disorders. Examination showed correlation of NSE serum level and severity of brain disorders and the gestational age in neonates. As well as high probability of infectious-inflammatory diseases in newborns with a high level of NSE.

Key words: neonates, hypoxic-ischemic brain disorders, neuron-specific enolase (NSE)

Introduction: according to the special medical research at the present time the prevalence of neurological diseases in newborn children in Russia amounts to 50-60 per 1000 live births, and the share of perinatal lesions of the central nervous system (CNS) accounts for up to 70% of cases, in the 60-65% of childhood disability due to a lesion of the brain in the perinatal period [1]. In the economically developed countries hypoxic - ischemic lesions of the central nervous system occupy one of the first places in the structure of perinatal mortality, yielding only intrauterine developmental defects [4]. The degree of severity of hypoxic - ischemic lesions of the central nervous system of the newborn is not possible to identify by the methods of clinical and instrumental examination, prognosis of its course and outcome also difficult.

The pathogenesis of chronic neurodegenerative process, which is determining the course and outcome of perinatal hypoxic-ischemic lesions of the central nervous system, remains mostly unknown. Some of researchers believe that after the primary lesion of the nervous tissue of an inclusion in the pathological process of autoimmune mechanisms [2,3], which is accompanied by a violation of the resistance of the blood-brain barrier (BBB). Prospective markers of pathological processes and brain injuries for in vivo assessment of the state of the central nervous system are biochemical, immunochemical methods to analyse the changes in the metabolism in the brain tissue, accompanied by the appearance in blood serum specific for brain chemicals [6]. Neurospecific proteins (NSP) do not detected in biological fluids in normally and fall in blood system only when the violation of the permeability of BBB. The determination of the NSP in the blood serum and cerebrospinal fluid today is recognized as one of the most promising methods of studying of the permeability of BBB[3].

Neurospecific proteins (NSP) are structural components of cells of the nervous tissue, performing specific functions of the central nervous system (the enzyme, receptor, regulatory, transport, etc.). Due to the fact that the NSP are synthesized by cells of nervous tissue, do not come into contact with by immunocompetent cells, they immunotolerant and in the norm there are no blood in immunogenic concentrations. Aetiological various injuries of the nervous tissues (hypoxia-ischemia, injury, infection) cause the same type of complex violations in the form of changes in permeability of the blood-brain barrier with a goal in the blood of the NSPs, with high antigenicity [7]. Contact NSP with by immunocompetent cells of the blood can lead to result the power of immune response, particular in relation to the corresponding protein, leading to the emergence in the blood of antibodies. Antibodies to the NSP, in turn, can pass through the damaged blood-brain barrier and contact with antigens in brain tissue, where with the mediation of the factors of the complement will be started not specific acute phase reactions, leading to autoimmune inflammation and cytotoxic edema [7].

Neurospecific enolase (NSE) - protein differentiated neurons, catalyzing the transformation of 2-phosphoglycerate in phosphoenolpyruvate. *енолпируват*. NSE - this is a key enzyme of glycolysis in neurons. At the present time the NSE is considered as one of the most specific markers damage neurons and serves as an indicator to identify their degree of differentiation [3,11,12].

Materials and method: the method of random sampling carried out a randomized study of the level of the NSE in 25 newborns, of which 13 children were born in the period of gestation 38-40 weeks (I group) and 12 premature infants born at term 35-37 weeks of gestation (II group). All newborns, included in our study, received treatment in the Department of neonatal resuscitation in the form of respiratory support by artificial pulmonary ventilation, the beginning of the artificial lung ventilation for all the children had not later than 12 hours after birth. The basis for the transfer of the child on the respiratory support by artificial pulmonary ventilation served as a clinical-laboratory complex of cerebral ischemia severe degree, the growth of respiratory failure and severe. The degree of severity of hypoxic-ischemic brain lesions were evaluated in accordance with the classification of RASPM.

All newborn carried out determination of the level of neurospecific enolase (NSE) on 3-5 day life by immunoenzyme analysis according to the standard Protocol with the use of a set of reagents for immunoenzyme analysis for determining the concentration of the NSE in the blood serum "NSE - IFA - BEST" by company VEKTOR-BEST, on the basis of immunological laboratory of Perinatal centre, Khabarovsk. Material for the immunoenzyme analysis was the venous blood in the amount of 0.5 ml, taken from a survey of children. To a reference value

neurospecific enolase in the serum of the blood of the newborn accepted value of 3.65 ± 2.0 ng/ml, some have full term newborns without hypoxic - ischemic brain lesions [6].

Statistical processing of the material carried out generally accepted methods of descriptive statistics. Reliable indicators were considered to be at $p < 0,05$.

Results and discussion: as a result of the conducted research it was established that the increase of the level of the NSE was observed in 100% of newborns. In group I (доношенные newborns) the level of NSE, the majority (62%) amounted to 8.6 ± 2.7 nm/ml, and in 38% of cases - $42,5 \pm 13.6$ nm/ml. The increased number of the NSE was observed in children exposed asphyxia during birth, with the development of the hereinafter in this group of infectious-inflammatory complications - to pneumonia. In the group of premature births increased levels of the enzyme dominated (70%, a 42.4 ± 9.5 nm/ml). In this group in the dynamics of the neonatal period, all newborns have marked the realization of infectious-inflammatory diseases, such as pneumonia, meningitis. In children with perinatal lesions of the nervous system changes of immunological indices connected with violation of the regulation of immunogenesis and the influence of hypoxia on the state of the immune system [10], possible increase of the level of NSE may be a criterion for evaluating the implementation of the infectious-inflammatory diseases of the newborn, post-hypoxic-ischemic brain that requires further study.

Conclusion: the obtained data shows that among premature newborns with hypoxic - ischemic brain damage the average content of NSE significantly exceeds the indicators of full term newborns. In this case, the heavier defeat of the brain in newborn infants, the higher the level of the NSE in the blood serum. In the focus groups noted the stable correlation between clinical indicators that characterize the severity of the disease, and disorders of the higher nervous activity. In newborns with hypoxic - ischemic lesion of the central nervous system of the NSE in the blood system can serve as a criterion of severity of perinatal injuries and, together with other indicators, determining the tactics of the therapy, assess the timing of the withdrawal of respiratory support artificial pulmonary ventilation, to identify violation of the permeability of BBB, determine the outcome in children with perinatal hypoxic - ischemic lesion of the central nervous system.

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