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CLINICAL AND INSTRUMENTAL ASPECTS OF ASSESSMENT OF HYPOXIC-ISCHEMIC BRAIN DAMAGE IN NEWBORNS

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Abstract: among all neurological disorders in the pediatric category of patients, it is the hypoxic-ischemic changes in the brain that remain a complex and unresolved problem, since they account for more than 50%, in addition, in most of them, a severe delay in psychomotor development develops later. The aim of the study was to study the clinical and diagnostic features and prognostic criteria of hypoxic-ischemic disorders in infants. The study was conducted at the Multidisciplinary Clinic of Samarkand State Medical University in the period 2023-2024. The study included full-term newborns (n=67) who were followed from birth to the age of one year. The observation was carried out sequentially in the Department of obstetrics, the Department of Pediatric Neurology, followed by outpatient monitoring in the polyclinic department of the Moscow State Medical University. During the study, a detailed analysis of the obstetric history of mothers was carried out, including the features of the course of this and previous pregnancies. All patients were divided into two groups: The first group (n=31) consisted of children with clinically verified signs of neurological insufficiency. The second group (n=36) consisted of children without obvious signs of neurological dysfunction, but with perinatal risk factors in their mother's obstetric history (threat of termination of pregnancy, chronic somatic diseases, acute viral infections during pregnancy, and other pathological conditions). Results of the study in accordance with the objective, a comprehensive analysis of the maternal history of the children included in the study was carried out. When assessing the age characteristics of mothers, statistically significant differences between the groups were revealed. In children of the second group (without obvious signs of neurological dysfunction), the average age of mothers was 23.0±2.5 years, whereas in the first group (with clinical manifestations of neurological insufficiency), older mothers prevailed - over 30 years (average age 32.4±3.1 years). Conclusions: A significant correlation has been established between the age of the mother and the risk of developing neurological pathology in newborns. In mothers over 30 years of age, children with signs of neurological insufficiency were significantly more often ($p<0.05$) registered.

Key words: hypoxic-ischemic brain damage, newborns, perinatal encephalopathy, neuroimaging, neurological status, diagnostic criteria, cerebral ischemia, instrumental diagnosis, perinatal pathology, neuromonitoring.

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Relevance. Hypoxic-ischemic brain damage in newborns remains one of the most pressing problems of modern neonatology and pediatric neurology. According to the World Health Organization, the incidence of perinatal lesions of the central nervous system is 15-20% among full-term newborns and reaches 60-70% in premature infants. In the structure of childhood disability, neurological pathology caused by perinatal brain damage occupies one of the leading places and accounts for 35-40%.

Timely diagnosis of hypoxic-ischemic brain lesions in newborns is of particular relevance, since early detection of pathology and the initiation of adequate therapy significantly improve the prognosis of the disease and the quality of life of patients. Despite significant achievements in the field of perinatal medicine, the problem of early diagnosis and prediction of the course of hypoxic-ischemic brain lesions remains unresolved.

Modern methods of neuroimaging and functional diagnostics have significantly expanded the possibilities of an objective assessment of the state of the central nervous system in newborns. However, the interpretation of the data obtained often causes difficulties due to the lack of clear diagnostic criteria and examination algorithms for newborns with perinatal damage to the central nervous system.

The issue of predicting the outcomes of hypoxic-ischemic brain lesions in newborns deserves special attention. Existing prognostic criteria do not always allow us to reliably assess the risk of neurological complications and disability in the long term. In this regard, it is important to search for new markers and predictors of the unfavorable course of the disease.

In recent years, new data have emerged on the pathogenetic mechanisms of the development of hypoxic-ischemic brain lesions, which opens up prospects for the development of new diagnostic and therapeutic methods. However, many aspects of this problem require further study and clarification.

A comprehensive study of the clinical and instrumental aspects of assessing hypoxic-ischemic brain damage in newborns will optimize the diagnostic process, improve disease prognosis, and develop effective methods for preventing neurological complications. Literary sources indicate that if 15%, the problem of hypoxic-ischemic disorders depends on asphyxia during childbirth, then the highest percentage of the pathomechanism of pathology development is associated with the state of health of the mother, which directly damage or affect the supply of nutrients to the fetus (V.P.Katuntsev, M.V.Baranov, S.Yu.Zakharov, 2023, J.Kang, 2023). Accordingly, factors that disrupt the maturation of the placenta affect the general circulatory system in a small body, including blood flow to the central nervous system. In addition, impaired blood circulation in the fetus leads to damage to the placenta, thereby exacerbating the dysfunction of fetal organs, such is the cycle (Amirkhanova D.Yu., 2022). It is very important to understand that during pregnancy, it is early pathological processes that cause profound changes in the central nervous system, since the cytotrophoblast penetrates into the decidualized endometrium and completes the embryo implantation process before the onset of maternal arterial blood flow, therefore, hypoxic syndrome, during this period, puts pressure on trophoblast differentiation, migration and invasion, from which determines the usefulness of the formation of the placenta. Thus, fetal hypoxia during pregnancy can progress and, consequently, worsen the function of the placenta itself, due to a decrease in the necessary oxygen and nutrients, which leads initially to decompensation and then to acidosis (M.M.Grebenyuk, 2020, A.McDouall, G.Wassink, L.Bennet, 2023). Many authors note that in conditions of chronic hypoxia, the genetic program for the development of all functional systems of the fetal body may be disrupted in parallel, thereby complicating postnatal adaptation and increasing the risk of adverse effects from the central nervous system (N.G.Istomina et al., 2021, Palchik A.B., 2023, L.Chalak, R.W.Redline, 2021). To date, the diagnosis of hypoxic-ischemic brain disorders in children in the first months from birth is based on clinical and neurological manifestations, methods of functional diagnosis, and neuroimaging. At the same time, these standard research methods in practice have limitations, for example, for predicting the long-term results of the development of the nervous system. Thus, the issues of diagnosis and prediction of cerebral disorders in children who have suffered from hypoxia-ischemia

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during prenatal maturation remain open, the above determines the interest in the presented study and its main purpose.

The purpose of the study. To study the clinical and diagnostic features of hypoxic-ischemic disorders in infants with prognosis determination.

Research materials and methods. On the basis of the Multidisciplinary Clinic of Samarkand State Medical University, for the period 2023-2024, a study was conducted on children from the newborn period to one year, that is, from the moment of birth in the department of obstetrics in the subsequent Department of pediatric Neurology (in compliance with outpatient monitoring in the polyclinic of the Moscow State Medical University). During the examination of patients, mothers collected a thorough obstetric history of this pregnancy and previous ones. All 67 children (full-term) were divided into two groups, in group 1 children with obvious signs of neurological insufficiency (31), group 2 children without signs of neurological dysfunction, but having a maternal obstetric history: the threat of termination of pregnancy, chronic diseases, acute viral infection, etc. (36). In addition to the basic standard diagnostic methods, examination by a neurologist, neonatologist, pediatrician (in some cases, a neurosurgeon); medical history collection; All children underwent dynamic neurosonography examination; electroencephalography; if necessary, MRI neuroimaging of the brain. The physical development of newborns was assessed taking into account body length and weight, head and chest circumference, followed by the calculation of the median (Me) and the first and third quartiles (Q1; Q3), which were compared with the tables of the centile type. The statistical analysis was carried out using MSExcel 2019 application software packages (developed by Microsoft, USA). The nonparametric Kruskal-Wallis criterion for independent samples and the median criterion were used to compare the intergroup differences. A nonparametric correlation analysis was performed using Spearman's criterion (r). The differences were considered statistically significant at $p<0.05$.

The result of the study, in accordance with the goal set, a detailed analysis of the mothers whose children were included in the study was carried out, while it turned out that the average age of children in group 2 varied between 23 years, and in group 1, women were over 30 years old. In group 2, the children were more often from the first pregnancy, and in group 1, the children were from the second/third pregnancy. In addition, in group 1, mothers had genital and extragenital pathology, and their somatic status was characterized by predominantly combined chronic pathology of the cardiac, respiratory, and urinary tracts, with significant differences in groups 1 and 2 ($p<0.05$). The result of the analysis of the nature of the previous pregnancy was noted: in the ratio of groups 1 and 2, medical abortion 18.9% / 12.3%, undeveloped pregnancy 6.8% / 2%, late miscarriage 10.1% / 2%, stillbirth 3% / 1.4%, ectopic pregnancy 7%/ 1.3%. The next stage of the study is reflected in the above-mentioned indicators, in the objective division of the studied groups of children according to the severity of hypoxic damage from birth.

It is noteworthy that in group 2, some children had a moderate condition (mild asphyxia) at birth, while the majority of newborns (65%) were rated satisfactory at birth. In group 1, in contrast to group 2, the majority of children's condition was assessed as severe (66%), and 13% of children were in extremely serious condition at birth: impaired adaptation of cardiovascular activity; cardiopulmonary insufficiency on the background of hypoxic-ischemic insufficiency of the central nervous system; respiratory disorders of central origin; immaturity of the fetus at the time of birth. During the examination, it was found that the children in group 1 had a statistically significantly lower birth weight, head and chest circumference compared to group 2.

The clinical and neurological manifestations of cerebral pathology in the examined children had differences, and depended on the severity of the condition and the level of hypoxic-ischemic brain damage. The general condition of the children in group 2 was assessed as satisfactory, however, 37.6% of the children revealed minor neurological signs in the form of transient strabismus (in several cases, floating movements of the eyeballs were noted), chin tremor, increased muscle tone, Moreau reflex, step reflex; All these symptoms subsided by the end of the first week, which is why they were regarded as a transient neurological dysfunction. At the same time, in group 1, depression syndrome and

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convulsive arousal syndrome prevailed more than 3 times in frequency than in group 2 (44.9% and 8.2%), tremor of the chin and extremities (as a result of the reaction of the "immature" brain to damaging effects). It should be noted that in the same group, vegeto-visceral dysfunction syndrome was found in 60% of cases: red or white dermographism, marbled skin, perioral cyanosis (acrocyanosis, hyperhidrosis of the palms and feet); gastrointestinal motility dysfunction (which led to regurgitation and unstable stools); episodes of rapid breathing (tachycardia or bradycardia); thermoregulation disorders.

The assessment of the children's condition according to neurosonography data showed a difference in the examined groups: in group 1, only 4 children showed an increase in echogenicity of the parenchyma, while in group 2, there was a greater increase in echogenicity of the brain parenchyma and vascular plexuses, in 47.3% of cases. In addition, in 32% of cases, signs of cerebral edema were detected, the differentiation of the brain structure was reduced, in the form of smoothness of the furrows and gyri, signs of hyperperfusion were found, which subsequently forms multiple cysts. With the help of NSG, severe abnormalities were recorded as an indicator of chronic severe intrauterine hypoxia (14.2%), which was subsequently caused by the formation of hydrocephalus syndrome already in the perinatal period. Only 2 children of group 1 showed signs of periventricular leukomalacia, the type of small foci of necrosis in the symmetrical parts of the major hemispheres closer to the lateral ventricles, which subsequently forms severe forms of CNS damage (cerebral palsy).

Conclusions: Thus, based on the signs that undergo changes during the dynamic diagnosis of neurosonography, it makes it possible to understand the level of severity and structural components of the brain in children at the initial stage and subsequent transformations, and in combination with the obstetric anamnesis of the mother, clinical, neurological and somatic signs of patients, a complete picture of CNS damage is formed.

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