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Determining the Adaptation of Newborns Born to Women with Pe in the Early Neonatal Period

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Abstract: The article presents an analysis of the literature devoted to the study of the health status of newborns who have suffered perinatal hypoxia due to severe preeclampsia in mothers. The relationship of preeclampsia with fetal growth retardation, premature delivery , pathology of the neonatal period and the delayed effect of preeclampsia on intellectual development, metabolism and the cardiovascular system are discussed. Given the role of vascular endothelial growth factor in the formation of preeclampsia and endothelial reparation, interest in its level in newborns and its role in the formation of adaptive reactions of the circulatory system in newborns is justified. There is no consensus on this issue in the literature, and the problem of reducing the degree of hypoxic damage to organs and tissues in children in the early neonatal period remains relevant in practical neonatology.

Keywords: newborns, consequences of preeclampsia, children, pregnant women, preeclampsia, perinatal lesions, risk of disease development.

Introduction: Preeclampsia (PE) is a clinical syndrome that complicates the course of pregnancy in 7-23% of women and determines up to 12.1-23.2% of obstetric mortality worldwide annually. A severe form of the disease associated with adverse pregnancy outcomes and perinatal pathology develops in 10% of women with preeclampsia. The disease is characterized by severe impairment of feto-uterine blood flow due to insufficient depth of cytotrophoblast invasion and inadequate placentation against the background of a conflict between pressor and depressor factors of decreased vascular tone, as well as increased platelet aggregation. That is, the basis for the formation of pathological placental circulation, according to various authors, is a violation of the angiogenic, athrombogenic and other functions of endotheliocytes. In this case, proinflammatory and prothrombogenic changes lead to the appearance of areas of placental ischemia/ reperfusion and, under the influence of hypoxia, form a whole complex of aggressive factors affecting the fetus. The perinatal outcome and the condition of the newborn child depend on the gestational age, the severity of arterial hypertension, and the mother's need for antihypertensive therapy. In the structure of causes of perinatal mortality, the consequences of severe preeclampsia occupy the first place, which determines the importance of studying this problem.

Main part: Pediatric practice deals with the clinical consequences of preeclampsia in different periods of childhood. These conditions include delayed physical, emotional and intellectual development, various types of convulsive syndrome, earlier onset of arterial hypertension due to oligonephropathy, carbohydrate and lipid metabolism disorders, including obesity, and non-insulin-dependent diabetes mellitus. However, the mechanisms of development and patterns of the course of the consequences of PE in the early neonatal period are most actively studied, since patient management at this stage is the most responsible, and treatment tactics determine the

prognosis for the life and health of the child. The most well-known consequences of severe preeclampsia in newborns are intrauterine growth retardation due to nutrient deficiency, prematurity, usually associated with premature delivery for obstetric indications, as well as a significantly more frequent development of certain conditions of the early neonatal period. Thus, in this group of children, the development of hemorrhagic syndrome is 2 times more likely, asphyxia is 3.5 times more common, intrauterine infections are 8 times more common, and respiratory distress syndrome and hypoxic-ischemic brain damage are 10 times more common. These conditions, as a rule, have a severe course, pose a threat to life and are the leading causes of adverse outcomes in the early neonatal period, therefore, newborns with these diseases are observed for a long time in intensive care units or intensive care units with the use of mechanical ventilation. Among the factors of aggression that affect the development of the fetus and the condition of the newborn is high blood pressure in the mother, chronically limiting the volume of fetoplacental blood flow and causing fluctuations in metabolic parameters of the fetus under conditions of nutrient deficiency, as well as the influence of angiogenic factors due to impaired functional state of endotheliocytes . However, a comparative analysis of the adaptation period of children from mothers with PE and women with chronic arterial hypertension revealed a significantly more pronounced negative effect of preeclampsia on the development of the fetus and newborn compared to the effect of systemic arterial hypertension. Thus, the Apgar score in newborns from mothers with PE was significantly lower, 86.4% of children were born prematurely, 63.6% were transferred to the intensive care unit after birth and 29.5% received oxygen therapy with artificial ventilation. Of these, 74.4% of children had a clinical picture of respiratory distress syndrome, 65.9% - intrauterine growth retardation, 43.2% - grade II hypoxic -ischemic CNS injury, and 9% had documented intraventricular hemorrhages. In this study, the authors drew attention to the association of preeclampsia with aminoaciduria and the development of neonatal encephalopathy. Since a number of authors have established a connection between placental angiogenesis abnormalities and functional endothelial disorders in newborns born to mothers with PE, the study of the features of central and regional hemodynamics in newborns is of considerable interest. Ensuring the preservation of cerebral blood flow in newborns with intrauterine hypoxia is an important aspect of nursing children, and it has been established that children from mothers with PE often have a decrease in volumetric indicators of blood flow in the brain, which, in combination with intravascular activation of platelets, is one of the leading mechanisms of its damage. The diversity of pathologies of the neonatal period associated with impaired fetoplacental hemodynamics draws attention to the state of the circulatory system in newborns immediately after birth and the nature of its adaptation during the first week of life. An integral clinical indicator for assessing systemic hemodynamics is blood pressure (BP). It is known that blood pressure values in newborns can fluctuate significantly, reflecting the reaction to pain and birth stress, characterizing the disruption of the electrical functions of the heart, the development of a systemic infectious process and decompensation of heart failure up to shock. Both arterial hypertension and a decrease in blood pressure are formed under the modulating influence of endotheliocytes and can cause serious disturbances in adaptation to extrauterine conditions of existence. There are various approaches to assessing blood pressure (BP) in newborns: by gestational and postconceptual age, body weight, days of life after birth. According to various authors, in premature babies, compared with full-term newborns, blood pressure is significantly lower on the first day of life, and there is a direct relationship between mean blood pressure and gestational age in newborns with different gestation periods . This difference persists during the first week of life, and subsequently the blood pressure level gradually increases in accordance with the gestational age and determines the main perfusion indicators.

The influence of gestosis (preeclampsia) on the functional state of other systems Currently, special attention is paid to the problem of development of the reproductive system in the antenatal period, since it is often at this time that the foundations of future pathology are formed. Hormonal indices and neuroendocrine interactions of the reproductive system in newborns from

mothers with physiological pregnancy and with gestosis were studied . The latter were found to have hormonal disorders - an imbalance of the thyrotropic- thyroid and pituitary-gonadal systems, which can negatively affect the formation of the reproductive system in the future. In the pineal gland of the brain, the intermediate and posterior lobes of the pituitary gland of the fetus, polyploidization of cells increases and the processes of mass cell death intensify under gestosis conditions. A direct correlation is observed between the severity of these processes and the severity of maternal gestosis. An increase in the incidence of respiratory diseases, such as respiratory distress syndrome and bronchopulmonary dysplasia, has been shown in children whose mothers had preeclampsia. Preeclampsia has been found to be an important risk factor for bronchopulmonary dysplasia in premature infants. Moderate and severe forms of the disease developed significantly more often in premature infants born to mothers with preeclampsia (38.5%) than in premature infants born to mothers with normal pregnancy(19.5%). This may be due to impaired angiogenesis that occurs with pregnancy complications.

Cerebrovascular disorders in women in the postpartum period caused by gestosis (preeclampsia) In preeclampsia, the cerebral vessels are affected, the autoregulatory mechanisms that maintain the constancy of cerebral blood flow with significant fluctuations in cerebral perfusion pressure are disrupted. Such changes are especially pronounced in pregnant women with severe eclampsia and can lead to the development of hypertensive encephalopathy and hyperperfusion syndrome. In women with preeclampsia, a progressive increase in the resistance index of the cerebral vessels is observed in the 6th and 12th weeks of the postpartum period - the ophthalmic artery, the central retinal artery, but not in the middle cerebral artery, which indicates vasoconstriction of small vessels and the possibility of cerebral ischemia. A case-control study using the Duke databases University Medical Center Perinatal and Health Services Outcomes Database, which included 42,263 women who gave birth between 1979 and 2005, showed that 164 of them, at approximately 40 years of age, were diagnosed with acute cerebrovascular accidents (subarachnoid hemorrhage, spontaneous intracerebral hemorrhage, and ischemic stroke) an average of 13.5 years after delivery. In addition, ischemic and hemorrhagic strokes after preeclampsia were found to be frequently associated with reversible posterior encephalopathy syndrome. Hemorrhagic stroke is the most common type of stroke associated with complicated pregnancy and the postpartum period. Nationwide survey data Inpatient Sample of women aged 15 to 44 years indicate that most cases of pregnancy-associated hemorrhagic stroke occur in the postpartum period. Factors independently associated with the risk of hemorrhagic stroke include early hypertension (OR 2.6, 95% CI 1.34–5.07), gestational hypertension (OR 2.41, 95% CI 1.62–3.59) and the most unfavorable prognosis in preeclampsia /eclampsia (OR 10.4, 95% CI 8.3–13.0). Another study also found that of 27 women with preeclampsia and subsequent stroke, 25 (93%) had hemorrhagic and 2 (7%) had ischemic stroke. The mortality rate was 54%. Magnetic resonance imaging performed in Neuroimaging Center at the School for Behavioural and Cognitive Neurosciences (Netherlands) in women with a history of preeclampsia showed that they had white matter lesions in the brain in 37% of cases, while in patients who had previous uncomplicated pregnancies, the figure was 21% .

Conclusion: In women with preeclampsia, most studies consistently show low levels of expression of key growth factors, including placental growth factor and vascular endothelial growth factor, compared to healthy controls. This may explain the development of ineffective uteroplacental circulation in women with preeclampsia and the inhibition of fetal growth and development.

Thus, among the most pressing issues of modern neonatology is the assessment of the state of the circulatory system taking into account the characteristics of the blood pressure profile and the state of the myocardium, determining the contribution of hemodynamic disturbances to the development of clinical consequences of severe preeclampsia in newborns born to mothers with severe preeclampsia, as well as the role of vascular endothelial growth factor in the formation of circulatory characteristics in this group of children.

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