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FUNCTIONAL STATE OF THE KIDNEYS IN NEWBORN BORN FROM MOTHERS WITH PRE-ECLAMPSIA

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Abstract:

38 newborns were examined, the functional state of the kidneys was assessed depending on the presence of maternal preeclampsia. It was revealed that in all newborns, there is a decrease in diuresis, a decrease in the osmotic concentration of urine, which increases by the end of the first week of life, but does not reach the indicators of healthy children, while the most pronounced changes are observed in the group of children born from mothers with preeclampsia, and are accompanied by azotemia , which is associated with catabolic processes in the body and reduced renal excretion of nitrogenous products.

Keywords: Newborns, Kidneys, Pregnancy Preeclampsia.

THE URGENCY OF THE PROBLEM. Preeclampsia occupies the 2nd-3rd place in the structure of the causes of perinatal morbidity in mortality [2,4], which is due to chronic hypoxia, intrauterine growth retardation of the fetus [3]. This is a complication of pregnancy, which is manifested by fetoplacental insufficiency, metabolic disorders, vasoconstriction, activation of the coagulation cascade, endothelial dysfunction and hemostasiological disorders [5,7].

Pre-eclampsia, the symptom complex of high blood pressure and proteinuria, affects 4–8% of pregnancies [1].

Despite significant advances in perinatology in recent years, the incidence of preeclampsia is between 16 and 22% of all pregnancies and does not tend to decrease. In developed countries, preeclampsia is the second direct cause of ante- and postnatal mortality, affecting perinatal mortality [9,10]. The leading role in the structure of perinatal mortality in preeclampsia belongs to fetal asphyxia. Along with disorders in the respiratory system, the kidneys are the first to suffer from asphyxia, which after birth will replace the placenta as the main organ of homeostasis [11,13].

Fetal renal blood flow accounts for only 2-3% of cardiac output compared to 15-185 in adults. Glomeruli are fully formed only by 34 weeks of childbirth and its level, as in an adult, is reached only by the age of one year of life [17,18,19]. Thus, the study of kidney function in newborns against the background of maternal preeclampsia is an urgent problem. In this regard, we evaluated the functionality of the kidneys of newborns born to mothers with preeclampsia.

MATERIAL AND RESEARCH METHODS. A comprehensive clinical, laboratory and instrumental examination of 38 newborns was carried out. All examined newborns were divided into the following groups: group 1 - 18 newborns born from mothers with preeclampsia, group 2 - 20 real pregnancy and whose births proceeded physiologically. At the same time, the body weight of children in the 1st group at birth was 2070.20±144.70g, and in the second group it was slightly higher (2237.30±150.56g).

The exclusion criteria were: gestational age less than 32 weeks, congenital malformations, including those of the urinary system, manifest forms of intrauterine infections, and purulent-septic diseases. The severity of preeclampsia in pregnant women was assessed using the Goecke scale modified by G.M. Savelyeva. Of the 20 women, 17 had moderate preeclampsia and 3 had severe preeclampsia. For biochemical studies, venous blood was taken from the umbilical vein immediately after birth and from the saphenous veins of the head. Urine was collected at the same time. Given the difficulty of collecting daily urine from newborns, urine was collected within 6-8 hours according to the Apcria method. Nitrogen homeostasis was assessed by the level of creatinine urea in blood and urine on a Mindray MR-96A biochemical analyzer. Osmotic activity is determined using an osmometer, the principle of which is based on determining the cryoscopic constant of a given solution and comparing it with the cryoscopic constant of water. It is important to note that the volume of the test fluid is only 50-100 µl.

RESULTS OF THE STUDY: In a comparative analysis, it was found that without asphyxia, i.e. with an Apgar score of 8 or more points, only 5% (1) of the children of the main group were born, and 15% (3) - in the 2nd group, thus, in a state of asphyxia, significantly more

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premature babies were born from women with preeclampsia (p<0, 01), severe asphyxia at birth was observed significantly more often in children in the main group (40% compared with group 2 255. p<0.01).
Thus, the results obtained indicate a direct dependence of the functional state of premature newborns in the first minute of life not only on the morpho-functional state of newborns in the first minute of life, not only on morpho-functional immaturity. But also from the presence of preeclampsia in the mother. According to the data obtained, pathology of the respiratory and central nervous system (CNS) prevailed in premature newborns of both groups. The incidence of respiratory distress syndrome (RDS) decreased with increasing gestational age. Thus, the degree of respiratory disorders was assessed using the Silverman scale. Respiratory failure (RD) of the 1st degree was detected in 30% of newborns of the main group and 55% in the 2nd group, respectively. The second degree of respiratory failure was noted in the main group in 60% of newborns of the 1st group, in the 2nd group - in 45%. The third degree of respiratory failure was determined in 2910%) of premature babies in the main group, while in children of the second group these cases were not registered. Thus, severe respiratory disorders were more often observed in premature babies from women with preeclampsia (p<0.01).
When studying the general reaction of the body of newborns to identify signs of kidney damage, it was found that edematous syndrome significantly prevailed in children born to children born to mothers with preeclampsia. So, edematous syndrome was observed in 60% of children of the 1st group, when signs of edematous syndrome were detected in the group of children born from mothers with a physiologically occurring pregnancy, only isolated cases were detected, while edematous syndrome was represented by 1 (mild severity). So, the edematous syndrome in newborns was conditionally divided, while swelling of the skin, subcutaneous fat, eyelids, pubis, lethargy, hypotension, hyporeflexia, unstable thermoregulation, and respiratory failure were noted.
At the 2nd degree of edematous syndrome, widespread edema was observed on the face, chest, abdomen, limbs, this contingent of children amounted to 25% of children in the 2nd group. At grade 3, massive edema was noted, especially on the dorsal surface of the hands and feet, premature babies with these symptoms occurred in 255 cases. In the study of the water excretory function of the kidneys, it was found that the first urination in premature newborns born from a physiologically proceeding pregnancy was on average 17.3 hours later and the amount of urine excreted was 1.06 ± 0.04 ml/kg/hour during the first day, while , despite the fact that the rate of increase in diuresis during the first seven days was higher compared to full-term children, daily diuresis in this group of children remained reduced on days 6-7 and amounted to 1.48 ± 0.07 ml / kg / hour . In 55% of children born to mothers with preeclampsia, especially those who had severe asphyxia, the first urination occurred in the delivery room, and the subsequent one, on average, after 19 hours. Daily diuresis throughout the week was reduced by 0.98±0.08 ml/kg/h. By 3-4 days, 25% of newborns in group 1 showed a decrease in diuresis to 0.36 ml/kg/h. Thus, it was found that in all premature babies born to mothers with preeclampsia, there was a violation of glomerular filtration, especially this fact was expressed in children who had severe asphyxia, due to renal vasoconstriction and hypoperfusion, oliguria developed by 3-4 days. The osmolar plasma concentration in preterm newborns of the 2nd group was on average from 273.93 ± 0.81 mosm / l, while in premature newborns born from mothers with preeclampsia it was determined in the range from 210.33 ± 1.7 mosm / l to 273 ± 1, 8 mosm/l and averaged 264.75±0.66 mosm/l. Thus, in premature babies. a decrease in the ability of the kidneys to form osmotically concentrated urine was found, the violation of which is especially pronounced in premature babies born to mothers with preeclampsia.
When determining the osmolarity of urine, it was found that the urine remained hypotonic throughout the first week of life in children of the main group (average 284.56±10.5 mosm/l). In premature newborns born from healthy mothers, the formation of the water excretory function of the kidneys was more intense, the urine was hypotonic only on the first day (296.31 ± 9.7 mosm / l), and by the end of the early neonatal period, the osmolar concentration of urine was equal to 398.52 ±10.1 mosm/l. A direct correlation was found between diuresis and urine osmolarity (r=0.78). In the first week of life in newborns of all studied groups, a wide range of values of nitrogen-containing products from 0.034 to 1.23 mmol/l was revealed. In group 2, there was an increase in their nitrogen excretion in premature newborns who were born from a physiological pregnancy on the first day was small (creatinine 0.048 ± 0.002 mmol / l, urea 4.13 ± 0.20 mmol / l), which, apparently, is adaptive adaptation mechanism, because, in the first days of life, the child is in conditions of reduced protein intake, as well as the breakdown and assimilation of food. Therefore, the excretion of nitrogen-containing products was consistent with the level of tissue catabolism (urine creatinine 0.21±0.01 mmol/l; urine urea 13.45±0.49 mmol/l). With an

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increase in diuresis in full-term newborns, the level of nitrogen excretion also increased. We have established a direct correlation between diuresis and the concentration of urea in the urine (r=0.512) of group 1 newborns.

In the group of newborns born prematurely, the concentration of creatinine and urea was significantly higher than in the group of children born from women with physiological pregnancy during the entire early neonatal period (cretinine 0.077±0.022 mmol/l, $p<0.001$; urea 5.31 ±0.15 mmol/l, $p<0.05$). Accordingly, the concentration of nitrogen-containing products in the urine of premature newborns born to mothers with preeclampsia was slightly lower than in group 1 (urine creatinine 0.14±0.02 mmol/l, $p<0.01$; urine urea 8.44±0, 58 mmol/l, $p<0.01$). Azotemia in newborns of these groups can be explained by a high level of tissue catabolism. Despite the fact that nitrogen excretion increased with an increase in diuresis, the rate of recovery of the nitrogen excretion function of the kidneys in newborns lagged significantly behind the rate of recovery of the water excretory function. Decreased primarily was the excretion of urea. It averaged 63% of total nitrogen, while in adults - 90%, these facts explained the low osmolarity of urine in preterm infants in the first 7 days of life. In our studies, one of the features for preterm infants born from mayers with preeclampsia, and transferred to intrauterine fetoplacental insufficiency (FPI), was azotemia immediately after birth (0.089±0.02 mmol/l, $p<0.001$; urea 7.86±0.13 mmol /l, $p<0.01$), this fact was associated with a reduced excretory function of the placenta with FPI. Considering that the children of these groups had high processes of tissue catabolism, and the amount of breast milk received in the first 3-4 days was less due to the serious condition of the children, it can be noted that the renal factor plays a large role in maintaining nitrogen homeostasis.

By 3-4 days in this category of premature newborns (25%), edema of the head, shins, and back remained. In these same children, a decrease in diuresis to 0.35 ml/hour/kg of body weight was found, and a low osmolarity of urine was also observed compared to group 1. At the same time, CBS disorders had the character of a mixed, respiratory-metabolic acidosis, which did not tend to normalize by the end of the early neonatal period. Electrolyte disorders in premature infants born to mothers with preeclampsia were characterized by hyponatremia and hyperkalemia. It should be noted that biochemical parameters were correlated with the clinical manifestations of electrolyte imbalance, so some newborns had arousal syndrome, repeated regurgitation, skin paresthesia, hyporeflexia, and sometimes convulsions were observed.

CONCLUSIONS. In premature newborns, there is a decrease in the osmotic concentration of urine, which increases by the end of the first week of life, but does not reach the levels of healthy children, while the most pronounced changes are observed in the group of premature babies born to mothers with preeclampsia. Premature newborns, especially those born against the background of placental insufficiency with maternal preeclampsia, give azotemia by 4 days, which is associated with catabolic processes in the body and reduced renal excretion of nitrogenous products.

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