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Correlation features cardio hemodynamic and renal blood flow in pregnant women with severe preeclampsia.

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Objective: to study the characteristics cardiohemodynamics and renal blood flow in pregnant women with severe preeclampsia.

Subjects and methods. The basis of this work the results of the survey 90 women in the III trimester of pregnancy. Integrated ultrasound and Doppler blood flow study was carried out strictly fasting ultrasound scanner Sono-scape SSI 5000 (China model) sektoral sensor frequency 3.5 MHz.

Results. With increasing severity of PE worsens cardiac contractility with reduced ejection fraction, an increase in average end - systolic volume. With the progression of the severity of PE there were changes of morphometric parameters of the heart. LVM and its index, there was the tendency of these parameters increase with the progression of the severity of preeclampsia. In the study of renal blood flow revealed by us direct correlation between blood flow and cardiohemodynamics renal. In the renal arteries traced characteristic tendency to increase IR in the development of PE and growth of its severity

Conclusion. Inadequate marker of cardiovascular adjustment in PE is the development of a disproportionately high LVM, the formation of isolated diastolic dysfunction of the left ventricle. The development of LV diastolic dysfunction develop systemic circulatory disorders in all organs, tissues, particularly in the renal

Keywords: Doppler, renal blood flow, pre-eclampsia, cardiohemodynamics.

Maternal and child health is a major public health problem in the Republic of Uzbekistan [1,2,5,6]. The most common condition of pregnancy is preeclampsia (PE). According to official statistics, the Ministry of Health of the Republic of Uzbekistan PE occurs in 7-15% of healthy pregnant women with a history of extragenital pathology. Maternal mortality in this case reaches 25%, perinatal 20-30%. Despite significant advances in the study of pathogenesis of PE and the development of new methods of prevention and treatment, declining trends in the above data is not observed. [2,5,6]. Even with a favorable course of pregnancy, childbirth in women with PE is often observed residual lesions of organs and systems of the mother. According to V.N Serov (2002), preeclampsia in itself is a syndrome of multiple organ function failure, developing as a result of pregnancy. As the progression of hemodynamic changes of pregnancy, causing endothelial damage, become generalized and lead to tissue hypo perfusion, ischemic changes in them with the worsening of multiple organ failure. In this clinical signs of liver disease usually absent. Careful attention should be especially severe form of liver damage (HELLP - syndrome, acute fatty steatosis), are urgently needed delivery. [3,4,8,12]. While the number of publications devoted to the evaluation of cardiac hemodynamics, blood flow in the liver and kidneys, are still poorly understood. This is especially true of the changes taking place against the background of PE and dynamically changing depending on its severity.

Objective: to study the features of cardiac hemodynamics and renal blood flow in pregnant women, depending on the severity of preeclampsia.

Materials and methods.

The basis of this work is the results of the survey of 90 women in the III trimester of pregnancy. In the gestational age of 30-34 weeks. Group I consisted of 29 pregnant women with physiological pregnancy, 27 pregnant women with mild PE (II group) and 34 patients with severe pre-eclampsia (III group).

The social status and age groups were identical. The most frequent and serious complications of this pregnancy in the main groups have been associated with chronic placental insufficiency and intrauterine growth retardation. In the comparison group, these complications are absent. Kidney function was studied with the determination of bilirubin, alkaline phosphates, uric acid, urea, creatinine, total protein and its fractions. Hemostasiogram included the determination of fibrinogen, trombotest, ant thrombin III, the fibrinolytic activity of the blood by conventional methods. Integrated ultrasound and Doppler blood flow study was performed strictly on an empty stomach ultrasound scanner Sono-scape SSI 5000 (China model) sectoral sensor frequency of 3.5 MHz. It included ultrasound in real time in the M-mode, pulsed - wave Doppler and color Doppler mapping of the heart cavities.

To this end, we studied the following factors:

Statistical processing of the results was performed using the criterion Student's t using the software package Statgraf and Microsoft Excel version for Windows.

The severity of PE was caused by a diastolic blood pressure greater than 110 mm Hg, proteinuria more than 1 g / l in a single urine, edema of the lower extremities and abdomen, intra-uterine growth retardation (IUGR), the growth of subjective complaints, headache, nausea, vomiting .

Research findings and discussion.

Considering that one of the most important features of PE is hypertension in violation of organ blood flow, we found it extremely important in the groups studied pregnant women to follow the dynamics of changes in the circulatory system as a whole, highlighting the performance of cardiovascular hemodynamic (CG), renal blood flow beginning with gestational age 30 - 34 weeks.

When studies of cardiac function, we obtained the following data: end-diastolic (EDD), end-systolic (ESD) of the ventricular dimensions, dimensions of the walls of the left atrium and right ventricle (LA, RV), posterior wall diastolic thickness (PWd), interventricular septum (IVS d), diameter of the aorta (DA), and also studied the performance in left ventricular mass (LVM), The index of left ventricular mass (LVMI), relative wall thickness (RWT), and disproportional coefficient (CD) for judging the relationship of indices and the degree of proportionality.

Table№1**Dopplerechocardiographic indicators of cardiac function in pregnant women studied groups.**

(n=90)

indicators	I group n = 29	II group n =27	III group n=34
EDV, ml.	139,1 ± 5,0 (134-145)	135,6 ± 4,3 (131-142)	128,1 ± 3,7× (119 – 146)
ESV, ml.	45,5 ± 3,1 (41-49)	49,1 ± 2,4 (45-52)	55,6 ± 2,1× [^] (40-62)
EF, %	67,2 ± 4,2 (63-71)	63,7 ± 2,1 (60-65)	56,6±1,9× [^] (50-61)
TPVR, dyne · s ⁻¹ · cm ⁻⁵	948,8 ± 14,5	1127,8 ± 11,4	1340,9 ± 12,6× [^]

Note: In parentheses are spread data groups

X- validity indicators III group relative to the control values (p <0,05).

[^] - The accuracy of the relative performance of Group III Group II (p <0,05).

From the data presented in the table is easy to see that with the increasing severity of PE indicators worsen cardiac contractility with reduced ejection fraction. With an increase in systemic blood pressure in this group of patients there is a further reduction EDV 5.6% relative to the group of pregnant women with mild PE and 8.4% (p <0.05) relative to control values.

At the same time increases the rate of ESV, demonstrating the amount of blood remaining in the left ventricle of the heart immediately after the completion of systole, diastole to the top. ESV in the surveyed group of pregnant women exceeded that in group II by 13.2% (p <0.05) and 22.2% of control values.

This resulted in low levels of EF, which was 11.2% lower than that in pregnant group II and 15.8% (p <0.05) of the data control.

With a view to better understanding of the changes we have studied the indicators of the heart geometry studied pregnant women. These data are shown in the table below, where comparisons give the same indicators parameters of the two previous groups.

Table№2

Doppleroehokardiografi data (geometry of the heart) in pregnant women studied groups in terms of gestational age 30-34 weeks. (N = 90)

indicators	I group n = 29	II group n =27	III group n=34
EDD,mm	48,3 ± 2,0	45,2 ± 1,6	44,2 ± 1,9 (39-48)
ESD,mm	33,4 ± 1,6	33,0 ± 1,9	33,9 ± 1,4 (26-38)
LA, mm	31,5 ± 1,0	31,7 ± 1,6	34,2 ± 1,3 [^] (27-38)
RV, mm	24,7 ± 1,1	25,9 ± 2,0	24,0 ± 1,5 (18-31)
PW d, mm	8,1 ± 0,3	11,0 ± 0,9	12,1 ± 0,4 [^] (9- 14)
IVS d, mm	8,4 ± 0,4	10,4 ± 0,7	11,8 ± 0,5 [^] (10-14)
DA, mm	28,5 ± 0,7	29,3 ± 0,4	30,6 ± 1,1 (27-34)
LVM,g	159,9 ± 8,7	204,7 ± 9,0	210,8 ± 7,6 [^] (189- 264)
LVMi,g/m ²	97,9 ± 4,0	111,9 ± 5,3	119,0 ± 3,9 [^] (90-138)
RWT	0,38 ± 0,04	0,49 ± 0,04	0,54 ± 0,03 [^] (0,42 – 0,57)
DC,%	129,0 ± 4,7	141,0 ± 3,8	142,1 ± 2,9 [^] (120-163)

Note: In parentheses are the variation is in the patients of group III

[^] - The accuracy of the data relative to the control group III values.

Presented in the table with a clear evidence that with the progression of the severity of PE is changing the morphometric parameters of the heart, although all the parameters studied data between groups II and III were not statistically significant. But the tendency to deterioration of these parameters in pregnant women with severe PE is quite obvious.

As for the difference of these indicators pregnant III in the control group, the majority of it is reliable. With the progression of the severity of PE has been a clear downward trend in the EDD with respect to minor changes in the indices of ESD.

With the worsening of the severity of PE increases the size of the left atrium relative to groups I and II by 7.8% and 8.6%, respectively, but are likely to be associated with an increase in EDV. The wall thickness of the left ventricle according to our data did not undergo, any significant change, which is an indirect

indication of the absence of pulmonary hypertension in pregnant women with severe PE in these stages of gestation. With the progression of the severity of PE tendency to increase the diameter of the aorta, although of this indicator is the difference in groups was not significant. We explained the increase in the DA in connection with the increase in systemic vascular resistance. The most significant changes in pregnant women with severe PE were exposed indicators PW and IVS d. Their difference between groups II and III were on average 10% and 13.4%, was not statistically significant, whereas the increase in these parameters relative to the control and amounted 49.4% and 40.5%, were statistically significant. As for MMLV and its index, with the progression of severity of PE is a further improvement of these indicators, which in comparison with those of the control group were statistically significant.

So LVM and LVMI were increased relative to the same parameters in the II group of pregnant women by 3% ($p > 0.05$) and 6.3% ($p > 0.05$), respectively, and their increase relative to the control group was 31.8% ($p < 0.05$) and 21.5% ($p < 0.05$), respectively. In the dynamics of increased left ventricular rate RWT it was higher than the previous group by 1.0% ($p > 0.05$), as compared to controls by 42.1%.

As mentioned above the most significant changes in terms of characterizing, morphological and functional features of the myocardium, but strangely are PWd, IVS d, LVM, LVM i and RWT. We must assume that with the increase in systemic arterial pressure and systemic vascular resistance is developing very fast functional hypertrophy of the left ventricle.

Further increase in left ventricular mass, index it, RWT, PW d, IVS d, occurred with less intensity, in spite of the progression of the severity of PE, which is probably due to the increasing shortage of blood volume in women with severe PE. Thus, these indicators are, to our knowledge, there may be a predictor and indicator of progression layers PE and its severity.

DC pregnant Group III reaching an average $142,1 \pm 2,9\%$, was increased relative to the previous group of 0.8% ($p > 0.05$), whereas it was relatively controls above 10.1% ($p < 0.05$). This degree of increase in the indicator DC testified disproportionately high LVM in pregnant women with severe PE. Given the large variety of parameters obtained by Doppler renal vessels, as well as the prevalence of PE in the pathogenesis of generalized spasm of resistance vessels with increased systemic vascular resistance and the fact that a greater extent these occur in the kidneys, we decided to stay only on the Doppler index RI, which characterizes the resistance of the vascular system of the kidneys.

To assess the changes in an advantageous position renal vascular resistance, we determined the rate RI in the distal segment of the renal artery, at the level of the segmental and interlobar arteries. The following table reflects the state of renal vascular resistance in the surveyed pregnant women with physiological pregnancy, preeclampsia mild to severe.

Table №3

Indicators of renal vascular resistance of the groups of pregnant women at term gestation 30-34 weeks.

(n=90)

indicators	I group n = 29	II group n =27	III group n=34
RI			
1. distal renal artery	0,66±0,02× [^] (0,63-0,68)	0,65±0,01× [^] (0,63-0,67)	0,65±0,02× [^] (0,62-0,69)
2. segmental artery	0,61±0,03× (0,58-0,63)	0,67±0,02× (0,65- 0,70)	0,69±0,01 (0,64-0,73)
3. interlobar artery	0,56±0,01 (0,52-0,58)	0,61±0,02 (0,60-0,67)	0,63±0,01 (0,61-0,65)

Note: In parentheses are the spread of the studied parameters in groups
x accuracy between the II and III group p <0,05

[^]- Reliability of data between Group III and control p <0,05.

By analyzing these data on renal vascular resistance index, it should be noted that patients with physiological pregnancy tone of the distal renal artery authentically higher than the intrarenal vascular resistance (segmental and interlobar arteries). That is, the resistance of the intrarenal arteries in normal pregnancy is relatively low and does not prevent intrarenal blood flow.

With layering PE mild generally increased renal vascular resistance index: interlobar by 8.9% (p <0.05) increase in the tone of the segmental renal arteries was 9.8% (p <0.05), while resistance index of the distal segment of the renal artery remained virtually unchanged.

With increasing severity of PE continued to increase resistance of the intrarenal segmental and interlobar arteries.

RI segmental and interlobar intrarenal arteries in women with severe PE flow was increased relative to those of group II 3.3%, respectively (P in both cases <0.05).

RI distal renal artery remained and was not changed by 5,8% (P <0,05) below that of the intrarenal segmental arteries and 3.2% lower than the resistance of the intrarenal interlobar arteries. (P <0,05). All of the above evidence of a significant increase in the resistance of the intrarenal arteries, and this led to a decrease in renal blood flow, reduced renal threshold in albumin excretion and renal function

impairment, in particular filtration and concentration. This was evidenced by decreased urine output, urine specific gravity and increased values proteinuria.

Thus, assessment of cardiac hemodynamics, renal blood flow can identify systemic hemodynamic disturbances in pregnant women with PE.

Inadequate marker of cardio - vascular reconstruction in PE is the development of a disproportionately high LVM, with the formation of isolated diastolic dysfunction of the left ventricle.

The development of left ventricular diastolic dysfunction develop systemic circulatory disorders in all the organs, tissues, particularly in the kidney, which is manifested by increased of IR indicators, SDR in the kidney, arteries and veins in the lower. What determines prognosis of preeclampsia is a predictor of severe preeclampsia before its clinical manifestation and possible indications for revision of tactics of pregnancy.

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