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Features of Cardiovascular and Cardio Hemodynamics in Women With Physiological Pregnancy

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Objective : to study the characteristics of the physiological changes in the circulation of mother and cardio hemodynamics during normal pregnancy. Subjects and methods. We studied 50 women with physiological pregnancy at 30-34 weeks of gestation. Integrated ultrasound and Doppler blood flow study was performed, ultrasound scanner Sono-scape SSI 5000 (China model). To this end, we have studied the following parameters: EDD, IVS, PW, DA, LVM, LVMI, RWT and KD for judging the relationship of indices and the degree of proportionality, MMLV. Results. After studying the geometry parameters of the heart, on the basis of left ventricular mass indices and RWT, we determined the type of geometry of the left ventricle in pregnant control group in terms of 30-34 weeks' gestation. The criterion for left ventricular hypertrophy, assume values LVMI> 110 g / m ². Above-average values of left ventricular mass in the control group were 97,9 ± 4,0 g / m ², which is within the physiological norm for pregnant women. The mean values of RWT, reaching 0,38 ± 0,04 units remain within the normal range. The outcome of this in general, pregnant women, we have normal left ventricular geometry and satisfactory values contractility it. Conclusion. In contrast to physiological pregnancies complicated by pre-eclampsia is characterized by reduced volumetric hemodynamic parameters disproportionate MMLV, eccentric geometry, diastolic left ventricular dysfunction and a progressive increase in vascular resistance index.

Keywords: Doppler, the criteria for the geometry of the heart, (MMLV, RWT), pre-eclampsia.

Pregnancy is a physiological process, but the needs of the developing fetus impose increased loads on all the physiological systems of a woman. One of the most promising areas of influence on the current situation is the maximum possible reduction in the influence of risk factors and the achievement of optimal conditions for the formation of a healthy fetus during pregnancy [1.6.8.9].

Interest in the study of the vascular system is explained by its importance in the pathogenesis of such complications of pregnancy as preeclampsia, pathology of the placenta, impaired functional state of the fetus [2.5.7.12]. A comprehensive study of the state of hemodynamics can provide valuable information about the state of the central and peripheral hemodynamics of pregnant women, individualize prevention methods, timely and purposefully correct detected changes, which will significantly improve the outcome of pregnancy and childbirth for mother and child [4.10.14.16].

As a result of these studies, data were obtained on the parameters characterizing regional hemodynamics at various gestational ages, and the possibility of using hemodynamic parameters as prognostic criteria for a complicated course of pregnancy was substantiated [3.11]. However, the data presented in the work of prove that the level of physical performance is a significant factor influencing the likelihood of developing a complicated course of pregnancy, which necessitates the formation of an individual approach to the prevention of a complicated course of pregnancy, depending on the level of physical performance of a pregnant woman [13.15.18].

The aim of the study was to study the characteristics of physiological changes in the mother's circulatory system and cardiodynamics during a normal **pregnancy.**

Materials and research methods.

We have studied 50 women with a physiological course of pregnancy at a gestational age of 30-34 weeks.

Were used clinical - laboratory and functional methods for assessing the condition of pregnant women. The average age of the examined pregnant women was 22.1±2.5 years.

In the somatic history, a high incidence of anemia (60%), kidney disease (21.0%), vegetative-vascular dystonia (12.0%) was established.

The course of this pregnancy in 10.2% of women was complicated by toxicosis of the first half of pregnancy, in 20% the threat of abortion in the first trimester.

Laboratory diagnostics included biochemical studies of liver and kidney function and determination of coagulation system factors.

A comprehensive ultrasound and Doppler study of blood flow was performed strictly on an empty stomach on an ultrasound scanner Sono-scape SSI 5000 (model China) with a 3.5 MHz sectar transducer. It included real-time ultrasound in M-mode, pulsed wave Doppler and color Doppler mapping of the heart cavities.

To this end, we have studied the following indicators: end-diastolic (EDD), end-systolic (ESD) dimensions of the ventricle and also the dimensions of the walls of the left atrium and right ventricle, thickness of the posterior wall of the left ventricle, thickness of the interventricular septum, diameter of the aorta (DA), and also studied the parameters of the mass of the left ventricular myocardium (MMLV), the mass index of the myocardium of the left ventricle (LVMI), the relative thickness of the walls of the myocardium of the left ventricle ((RTS) and coefficient of disproportionality (KD) for judging the relationships of the studied parameters and the degree of proportionality, MMLV.

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

Results of own researches and their discussion.

Considering that during a normal pregnancy there is an increase in BCC from 30 to 50% exactly by the gestational age of 30-34 weeks, which leads to physiological changes in the mother's circulatory system and cardiodynamics, this was the reason for studying the parameters of the central peripheral and cardiodynamics in 50 pregnant women. with the physiological course of pregnancy.

The indicators of the peripheral circulatory system of the pregnant women examined by us are presented in the following table.

Table No. 1.Indicators of the peripheral circulatory system in pregnant women with a physiological course. (n = 50)

Indicators	Averages	Oscillation limits
SBP, mmHg	107,1 ± 2,7	100 - 110
DBP, mmHg	66,3 ± 1,4	60 - 70
Heart rate, v / min.	80,6 ± 3,0	78 - 84
medium. BP, mmHg	79,6 ± 2,7	73 - 83

From the data presented in the table, it is not difficult to see that all indicators of peripheral hemodynamics (both their average values and their spread) did not go beyond normal physiological data. Below are the indicators of central hemodynamics in this group of pregnant women

Table number 2 Indicators of CG of pregnant women in terms of gestation of 30-34 weeks (n = 50)

Indicators	Mean values	Oscillation limits
Minute volume of the heart, l/min.	7,5 ± 0,4	6,1 – 8,6
Impact index, ml/m²	57,6 ± 2,7	48 - 66
Cardiac index l/min/m²	4,6 ± 0,7	3,7 – 5,4
Total peripheral vascular resistance, dyn.sec.cm¯5	948,8 ± 14,5	988 - 1027

From the data presented in the table, it can be seen that in healthy pregnant women, all the studied CG indicators also did not go beyond the physiological values.

In Doppler echocardiographic studies of cardiac function in this group of patients, we obtained the following data.

Table number 3 Doppler Echocardiographic indicators of cardiac function in pregnant women (n=50).

Indicators	Norm	Mean values	Oscillation limits
End diastolic volume, ml.	110-145	139,1 ± 5,0	114 - 151
End systolic volume, ml.	45	45,5 ± 3,1	38 - 54
Ejection fraction, %	55-65	67,2 ± 4,2	62 - 71

The data given in the table regarding the ejection fraction (EF) of the end systolic and diastolic volumes of the left ventricle (LV) in the examined category of pregnant women in the control group did not go beyond normal physiological values.

For a deeper understanding of cardiohemodynamics in pregnant women at the above gestational periods, we analyzed additional Doppler echocardiography tests that characterize the geometry of the heart and its type.

Table No. 4D oppler echocardiography data in pregnant women during gestation 30-34 weeks (n = 50).

Indicators	Norm	Mean values	Oscillation limits
end-diastolic size.mm	38 - 56	48,3 ± 2,0	43 - 55
end-systolic size, mm	22 - 38	33,4 ± 1,6	29 - 37
Thickness of the posterior wall of the left ventricle, mm	8 - 11	8,1 ± 0,3	8 - 10
Thickness of the interventricular septum, mm	7 - 10	8,4 ± 0,4	7 - 10
Aorta diameter, mm	27	28,5 ± 0,7	21 - 34
MMLV, g	67-162	159,9 ± 8,7	106 - 198
LVMI, g/m²	95-	97,9 ± 4,0	66 -139

	110		
Relative wall thickness	0,45	0,38 ± 0,04	0,27 – 0,40
KD,%	128	129,0 ± 4,7	86 - 142

Analyzing the data given in the table, taking into account the values of M ± m, it can be stated that for almost all the studied parameters characterizing the geometry of the heart, they were within the physiological range. However, the limits of fluctuations of some parameters went beyond the limits of the norm. Having studied all the above parameters of the geometry of the heart, based on the indicators of LVMI and Relative wall thickness, we tried to determine the type of geometry of the left ventricle in pregnant women in the control group at 30-34 weeks of gestation. When determining the type of geometry of the left ventricle, recommendations were used.

The criterion for left ventricular hypertrophy was taken as LVMI>110 g/m². As it was, the indicated above-average LVMI values in the control group were 97.9 ± 4.0 g/m², which fit into the physiological norm for pregnant women. As for the average values of the Relative wall thickness, they amounted to 0.38 ± 0.04 units and also fit within the normal range. Based on this, in general, in pregnant women, we noted the normal geometry of the left ventricle with satisfactory values of its contractility. One pregnant woman from this group had some thickening of the walls of the left atrium (36 mm), right ventricle (28 mm), aortic diameter (34 mm), left ventricular myocardial mass (198 g), left ventricular myocardial mass index (139 g / m²), KD (142%) with slightly underestimated Relative wall thickness indicators (0.40). A detailed examination of this patient with an analysis of the obtained data from Doppler echocardiography revealed that the pregnant woman had chronic arterial hypertension of 140/90 mm Hg. Art. before pregnancy, which led to the indicated results indicating a violation of the geometry of the heart by the type of eccentric hypertrophy.

Taking this into account, we organized individual clear observation for this pregnant woman, establishing a diagnosis: mild preeclampsia, with monitoring of the studied parameters and simultaneous medical corrective therapy.

Thus, in contrast to the physiological, pregnancy complicated by preeclampsia is characterized by a decrease in volumetric hemodynamic parameters, a disproportionately high LVML, eccentric geometry, left ventricular diastolic dysfunction, and a progressive increase in vascular resistance indices.

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