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FEATURES OF THE STATE OF THE CIRCULATORY SYSTEM MOTHER AND FETUS IN THE SECOND TRIMESTER OF PREGNANCY IN WOMEN WITH MITRAL STENOSIS OF RHEUMATIC ETIOLOGY

Tuksanova D. I.[1*], Negmatullaeva M. N.[2], Nosirova M. Sh.[3] and Akhmedov F. K.[4]

Bukhara State Medical Institute, Bukhara, Uzbekistan.

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***Corresponding Author**
Tuksanova D. I.
Bukhara State Medical Institute, Bukhara, Uzbekistan.

ABSTRACT

Introduction: The spectrum and prevalence of cardiovascular disease during pregnancy varies widely between countries. According to the latest information, 1-4% of all pregnancies in industrialized countries are complicated by cardiovascular diseases (CVD). The link between heart disease and pregnancy is becoming more common. **Purpose:** Studying the state of central hemodynamic of the mother, regional fetal blood flow for early diagnosis of activation of the rheumatic process and decompensation of blood circulation. **Materials and Methods:** We observed 113 pregnant women, of which 58 were observed from the first trimester and 55 were newly admitted. The diagnosis of heart disease was made jointly with a cardiologist on the basis of complaints, medical history, clinical and additional methods of examination, all patients observed were aged 20 to 42 years. **Results and Discussion:** Indicators of CH, uterine and fetoplacental blood flow changed more noticeably. Thus, in patients with a single heart rate lower than that, heart rate was increased by 19.5%, which kept the cardiac output for a minute at satisfactory values. **Conclusion**: Thus, in total, in the second trimester of pregnancy, 31 patients with mitral stenosis were presented with indications for termination of pregnancy, when the leading criteria, in addition to clinical, laboratory biochemical, were indicators of volemia, CH, which indicated a decrease in single and minute cardiac performance, an increase in heart rate, and a gradual progressive decrease in Total peripheral resistance and coefficient of integral tonicity.

KEYWORDS: preeclampsia, dopplerometry, mitral stenosis, circulation of the mother and fetus, heart defects.

INTRODUCTION

Heart defects are one of the most serious and dangerous complications of the gestational process, as they threaten the development of acute circulatory disorders, reactivation of the rheumatic process, the occurrence of episodes of thromboembolism and thrombosis, various complications of the gestational process, accompanied by disseminated intravascular coagulation syndrome, preeclampsia, purulent - septic diseases.[1,5,9]

In each of the listed risk factors, there are elements of a critical condition that threaten the death of the patient. The importance of the problem is confirmed by the fact that among pregnant patients with heart defects make up from 7 to 10% and over the past 20 years this indicator has no tendency to decrease.[3,7]

Heart diseases in the structure of obstetric diseases in the United States, take fourth place after bleeding, eclampsia, in the UK - first place.[2,10]

Heart diseases in the structure of extra genital diseases most often (22%) cause maternal mortality. Of great interest are statistics on the effect of maternal heart disease on the fetus. Thus, infant mortality in the presence of heart disease in mothers is 3–9%, and in especially unfavorable cases it reaches even 10–30%; when a pregnant woman has arrhythmias fibrillation, it can reach -50%. Many authors noted that in pregnant women with severe cardiovascular diseases, children subsequently lag behind in physical and mental development, even if they were born at normal times with normal weight. In recent decades, among the acquired heart diseases, the first place belongs to combined heart defects and mitral stenos is. Of all rheumatic heart diseases in pregnant women, mitral stenos is predominates (50-75%). Mitral stenos are characterized by the following hemodynamic changes due to pregnancy: an increase in circulating blood volume and heart rate, which leads to an increase in the transmitral gradient and an increase in pressure in the left atrium. An increase in blood pressure in the pulmonary circulation with a tendency to a decrease in pulmonary vascular resistance, water and sodium retention and related “dilution anemia”, as well as overload of both ventricles, pose a life threat to patients with mitral stenosis.[11]

Among the known three trimesters of pregnancy, the second trimester of pregnancy is considered the most dangerous, since it corresponds to the period of the highest load on the mother’s circulatory system, due to the final formation of the third circulatory circle, the

utero-placental circulatory system, and the final formation of fetal organs and systems with an independent system of autonomic regulation.[1,4]

The above findings represent serious burdens for the mother's cardiac activity and is considered a critical period in connection with the possible development of circulatory disorders. In addition, the second trimester of pregnancy is dangerous in the sense of activating the rheumatic process, which some authors attribute to a 20-fold decrease in the production of active estrogen fractions (estradiol).[6,8]

Purpose of the study. The study of the state of mother's CG, regional fetal blood flow for early diagnosis of activation of the rheumatic process and decompensation of blood circulation to adequately address the issue of obstetric tactics.

MATERIALS AND METHODS

We observed 113 pregnant women, of which 58 were observed from the first trimester and 55 were newly admitted. The diagnosis of heart disease was made jointly with a cardiologist on the basis of complaints, medical history, clinical and additional methods of examination, all patients observed were aged 20 to 42 years. The duration of the disease with rheumatism in the study of the anamnesis revealed that in 13 -12 years old, (11,5%), from 3-9 years old in 54 (47,7%), over 9-16 years old in 46 (40,7%).

For clinical and statistical analysis and examination of pregnant women of the main group, anamnesis data, concomitant extra genital and gynecological diseases, the onset and nature of the course of menstrual, sexual and reproductive functions were taken into account. Particular attention was paid to the limitation of the underlying disease, the number and clinical features of rheumatic attacks, the time of the last exacerbation of the rheumatic process. The stage of development of the defect, the degree of circulatory failure, were determined, the presence of a history of circulatory disorders, the features of their treatment, the nature and effectiveness of the treatment carried out before pregnancy were revealed.

All pregnant women underwent an examination: clinical blood and urine tests, biochemical blood tests to determine the activity of the rheumatic process. We studied the content of total serum protein, protein fractions, sialic acids, C-reactive protein, and coagulogram. When determining the degree of narrowing of the atrioventricular opening of the presence of NK, the activity of the rheumatic process, clinical studies were supplemented by an instrumental

method of study (electrocardiography, dopplerochocardiography, and echocardiography). The study of uteroplacental blood flow (UBF) and fetoplacental blood flow (FBF) was carried out by ultrasonic dopplerometry..

RESULTS AND DISCUSSION

In the second trimester of pregnancy, we observed 113 pregnant women, of which 58 were observed from the first trimester and 55 were newly admitted. It should be noted the positive effect of corrective therapy and dynamic monitoring among pregnant women, for whom monitoring began in the first trimester of pregnancy.

Table № 1: The frequency of exacerbation of the rheumatic process, circulatory disorders and preeclampsia, depending on management tactics.

Pregnant women monitored from the first trimester of pregnancy (n = 58)							The newly arrived are pregnant (n = 55)						
Exacerbation of the rheumatic process	Circulatory disorders=8			Preeclamp-sia = 5			Exacerbation of the rheumatic process	Circulatory disordersК=8			Preeclamp-sia = 5		
	I	IIA	IIB	I	II st	III st		I	II A	II B	I	II st	III st
6	6	2	-	5	-	-	12	10	6	2	3	2	1

As can be seen from table No. 1, depending on the management of patients, the rheumatic process was exacerbated more than 2 times less (10% and 21.8%, respectively), we observed a total circulatory disturbance in the second trimester of pregnancy in 26 (22%) women. In those who were monitored and received corrective therapy, the complication rate was 13.3%, and in newborns, 32.7%. As for the stratification of preeclampsia, we noted it in 11 (9.2%) pregnant women, although out of 55 newly admitted patients, 2 revealed moderate to severe PE and 1 to severe.

Table № 2:Clinical and biochemical data from laboratory studies of pregnant women with mitral stenosis in the II trimester (16-27 weeks) n=113.

Parameters	Control group	Study groups	
	n=30	n=95	n=18
Hb, g / l	104,3±0,7	82,4±1,2*	78,2±1,8**
Erythrocytes, 10^{12}/ l	3,1±0,4	2,8±0,8	2,4±0,6
Ht,%	36,2±2,1	26,9±2,3*	26,2±0,8*
leukocytes,10^{9}	6,2±0,7	7,6±1,2	9,2±1,3*
erythrocyte sedimentation rate, mm / h	11,3±1,2	16,4±2,1	25,3±3,1*

Sialic acid, units	180,1±0,084	210,0±0,096*	260,0±0,076
C-reactive protein (+)	-	+	++
Fibrinogen, g / l	3,64±0,28	3,84±0,28	4,16±0,018
Total protein, g / l	76,4±2,9	60,1±1,8*	50,1±2,3**

Note: the reliability is given relative to the control. * - P <0.05, ** - P <0.01.

Based on the clinical and laboratory characteristics of the exacerbation of the rheumatic process, taking into account the signs of circulatory disturbance and layering of PE, in 18 patients we decided to terminate the pregnancy. To confirm the diagnosis and a more reasoned solution to the issue of abortion, we studied the parameters of central hemodynamic, regional and fetal blood flow.

Table №3: **Indicators of volemia, systemic, central, regional hemodynamics and fetal blood flow in women with mitral stenosis in the second trimester of pregnancy (n = 113)**

Parameters	**Control group**	**Study groups**	P
Volemia			
circulating blood volume, ml / kg	65,6±5,2	60,8±4,6	>0,05
The volume of circulating red blood cells, ml / kg	30,5±2,2	27,2±1,7	>0,05
circulating plasma volume, ml / kg	35,1±3,0	33,6±2,9	>0,05
Hemodynamics			
Percussive index, ml / m².	41,5±2,7	34,6±3,0	<0,05
Heart rate in minutes	76,4±3,2	91,3±5,3	<0,05
Heart index, l / min / m².	3,07±0,30	3,15±0,29	>0,05
Coefficient of integral tonicity	77,9±0,9	81,7±0,8	>0,05
Total peripheral resistance, din.s.cm¯5.	1250,0±97,0	1472,0±67,0	<0,05
Uterine Artery: SDR	1,91±0,02	2,30±0,04	<0,05
IR	0,57±0,005	0,49±0,007	<0,05
umbilical artery: SDR	3,51±0,10	4,16±0,20	<0,05
IR	0,80±0,008	0,71±0,04	
A: SDR	6,76±0,12	7,17±0,29	>0,05
IR	0,84±0,002	0,79±0,008	<0,05
Placental blood flow	0,149±0,003	0,105±0,001	<0,05

Upon admission, all women in this group underwent a study of volemia, systemic, central hemodynamic, regional and fetal blood flow. For comparison, the values of the control group. In table No. 3, the tendency of the indicators of willemia to decrease relative to control values is traced. Indicators of central hemodynamic, uterine and fetoplacental blood flow changed more noticeably. Thus, in patients with a single heart rate lower than that, heart rate was increased by 19.5%, which kept the cardiac output for a minute at satisfactory values. The Total peripheral resistance increased by 17.7% ($p < 0.05$), entirely at the level of the capillary-venous bed, or the tone of resistive vessels only tended to increase. An increase in peripheral resistance with reduced values of a single productivity of the heart and tachycardia could not but affect the uterine, fetoplacental and fetal blood flow. Statistically significant blood circulation in uterine spiral vessels worsened by 20,4%. Blood flow in the umbilical artery worsened by 18.5% and, finally, aortic circulation of the fetus worsened by 6%.

A decrease in uteroplacental, fetoplacental and fetal blood flow was confirmed by ultrasound examination of the fetus. Photometric data of the fetus indicated a decrease in all indicators compared with those in the control by 9-10%, which indicated the development of the syndrome of delayed development of the fetus.

In a more detailed analysis of the studied circulatory parameters and their comparison with clinical manifestations, the severity of the disturbed blood circulation, the activity of the rheumatic process, and the associated PE, we identified prospectively 18 women. In which marked disturbed blood circulation was noted, with its clinical manifestations requiring an urgent solution to the issue of abortion due to the ineffectiveness of the corrective therapy that we started.

Our monitoring of indicators of central, regional and fetal hemodynamics indicated the exceptional severity of the changes and their deterioration in dynamics, which was reflected in table No. 4, which characterizes the dynamics in 18 pregnant women with mitral stenosis after short-term corrective therapy (ant rheumatic, cardio tonic, desensitizing antioxidant).

Table № 4: Indicators of CG, regional and fetal blood flow during therapy in pregnant women with mitral stenosis and impaired blood flow. (n = 18)

Parameters	Data on admission	Data during corrective therapy	P
Volemia			
circulating blood volume, ml / kg	59,6±2,3	61,2±1,9	>0,05
The volume of circulating red blood cells, ml / kg	35,3±1,4	35,2±1,1	>0,05
circulating plasma volume, ml / kg	24,3±0,9	26,0±0,8	>0,05
Hemodynamics			
Percussive index, ml / m².	26,3±1,7	21,0±1,2	>0,05
Heart rate in minutes	97,6±2,4	104,5±3,4	<0,05
Heart index, l / min / m².	2,56±0,19	2,50±0,21	>0,05
Coefficient of integral tonicity	78,3±1,1	76,2±0,8	>0,05
Total peripheral resistance, din.s.cm¯5.	1114,0±44,0	1079,0±53,0	>0,05
Uterine Artery: SDR	1,83±0,03	1,93±0,04	<0,05
IR	0,52±0,06	0,50±0,04	>0,05
umbilical artery: SDR	3,60±0,22	3,81±0,18	>0,05
IR	0,78±0,03	0,72±0,02	>0,05
A: SDR	6,53±0,34	6,62±0,34	>0,05
IR	0,80±0,002	0,78±0,003	>0,05
Placental blood flow	0,153±0,003	0,136±0,002	<0,05

From the data obtained, it can be seen that, at relatively favorable values of volemia, overload reactions of the mother's blood circulation increased with the worsening of indicators of single and minute cardiac performance, increased tachycardia, a gradual progressive decrease in heart rate, including the tone of resistive vessels. As for the regional and fruit blood flow, a tendency to deterioration was also observed here. In all likelihood, the relatively satisfactory values of regional and fetal blood flow still persisted due to the decentralization of the blood circulation of the mother, and a decrease in total peripheral resistance.

However, such a progressive and rapid decrease in peripheral vascular tone became dangerous in the sense of the development of collaptoid states, pulmonary edema. clinical manifestations also testified to this. the indicated dynamics on the part of the studied indicators, especially the mother, the absence of positive changes in the process of therapy urgently required an active abortion.

In the course of the corrective therapy in the remaining 95 patients of this group, monitoring of the studied indicators of blood circulation of the mother and fetus after 5-8 days showed that in 13 of them the dynamics of the indicators of blood circulation of the mother closely

resembled that in the 18 patients described above, but without pronounced clinical manifestations of circulatory disturbance.

Thus, monitoring of them showed a decrease in a single cardiac performance by 8.9%, an increase in heart rate by 6.3%, a decrease in cardiac output per minute by 2.3% and a slow but progressive decrease in coefficient of integral tonicity and total peripheral resistance, respectively, by 5.4 % and 8.7%

Considering the indicated dynamics, first of all, changes on the part of the mother, without surviving the clinical manifestations of circulatory disturbance, we began to question the termination of pregnancy.

CONCLUSION

Thus, in total, in the second trimester of pregnancy, 31 patients with mitral stenosis were presented with indications for termination of pregnancy, when the leading criteria, in addition to clinical, laboratory biochemical, were indicators of volemia, circulatory disturbance, which indicated a decrease in single and minute cardiac performance, an increase in heart rate and a gradual progressive decrease total peripheral resistance and coefficient of integral tonicity. When choosing a method of delivery, first of all, the compensatory abilities of the mother were taken into account, the least load on cardiac activity, depending on the type of abortion. The possibility of exposure to uterotonic agents and the volume of necessary infusion therapy were seriously considered. Very important was the time necessary for preparing the birth canal.

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