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CHANGES IN THE INTENSITY
OF UTERINE CIRCULATION IN PREGNANT
WOMEN WITH A HISTORY
OF CHRONIC ENDOMETRITIS

Summary

Introduction. An essential prerequisite for the normal course of pregnancy is a complete gestational remodeling of the blood circulation, when the spiral arteries are transformed into uteroplacental vessels with reduced resistance and constant blood flow. Chronic endometritis is characterized by morphofunctional changes in the mucous membrane and microcirculatory disorders in the pool of spiral arteries. If pregnancy develops with the above disease, it may lead to disruption of gestational remodeling of the spiral arteries and contribute to increased resistance to fetoplacental blood flow.

Aim. To study the peculiarities of blood flow in the uterine spiral arteries and uterine arteries during pregnancy in women with a history of chronic endometritis and to evaluate the role of preconception care in the prevention of pregnancy complications.

Material and Methods.

303 women with chronic endometritis were followed during pregnancy. Of these, 135 received antepartum treatment (Group I), which included broad-spectrum antibiotics, hormone replacement therapy for 3 months, and L-arginine during the antepartum period and the first 17-18 weeks of pregnancy. The other 168 women received no treatment during the preconception period (Group II). A control group of 20 healthy patients without chronic pre-pregnancy endometritis was also included.

Doppler ultrasound of the spiral and uterine arteries was performed at 5-6 weeks of gestation and 17-18 weeks of gestation. The systolic-to-diastolic ratio (SDR) was calculated as the ratio of the maximum systolic blood flow velocity to the end-diastolic velocity, the pulsatility index (PI) was calculated as the ratio of the difference between the maximum systolic and minimum diastolic velocities to the mean blood flow velocity, and the resistance index (RI) was calculated as the ratio of the difference between the maximum systolic and minimum diastolic velocities to the maximum systolic blood flow velocity.

The obtained data were processed using the methods of mathematical statistics, calculating the mean sample values (M), variance (σ), standard error of the mean (m), applying the Student's t -test and calculating the odds ratio using the statistical software "STATISTICA" (StatSoft Inc., USA).

During the research, the principles of patient-centered care were followed in accordance with the requirements of the Tokyo Declaration of the World Medical Association, the International Recommendations of the Helsinki Declaration on Human Rights, the Convention on Human Rights and Biomedicine of the Council of Europe, the Laws of Ukraine, the Orders of the Ministry of Health of Ukraine, and the requirements of the Ethical Code of the Ukrainian physician.

The paper is an excerpt from the initiative scientific research project of the Department of Obstetrics and Gynecology No. 2 at Poltava State Medical University, entitled "Optimization of approaches to the management of pregnancy in women at high risk of obstetric and perinatal pathology" (State registration number 0122U201228, duration: 10.2022-09.2027).

Results. In healthy women at 5-6 weeks of gestation, low resistance blood flow with low pulsatility and high diastolic component was observed in the uterine spiral arteries, as indicated by relatively low resistance indices. In Group II patients who became pregnant with chronic endometritis, an increase in SDR by 11.3% ($p < 0.01$), PI by 36% ($p < 0.01$) and RI by 36.2% ($p < 0.05$) was observed in the spiral arteries at 5-6 weeks of pregnancy, as well as at 17-18 weeks, when SDR increased by 23% ($p < 0.001$), PI by 63% ($p < 0.001$) and RI by 47.5% ($p < 0.01$) compared to healthy women. No significant changes in resistance indices were found in the uterine arteries. The calculated blood flow indices in the uterine spiral arteries at 5-6 weeks of gestation were significantly higher in those Group II women who developed pre-eclampsia later in pregnancy. In these patients, SDR, PI, and RI were 12.4% ($p < 0.05$), 21.7% ($p < 0.05$), and 17.7% ($p < 0.05$) higher, respectively, than in group II women who did not develop pre-eclampsia during pregnancy. Furthermore, the more significant the increase in vascular resistance at the beginning of pregnancy, the more severe the pre-eclampsia. At 17-18 weeks' gestation, the increase in Doppler blood flow indices in the uterine spiral arteries was more pronounced and was accompanied by an increase in SDR, PI, and RI in the uterine arteries.

In women of Group I who received pre-pregnancy treatment for chronic endometritis, both at 5-6 weeks and at 17-18 weeks of pregnancy, the values of resistance indices in the uterine spiral arteries were significantly lower than in the group of patients who did not receive such treatment. A more favorable course of pregnancy was also observed: the incidence of spontaneous abortion decreased by a factor of 2.3 (OR 5.20; 95% CI [1.75-15.42]; $p < 0.05$), and the incidence of pre-eclampsia decreased by a factor of 1.8 (OR 2.3; 95% CI [1.25-4.31]; $p < 0.05$). At the same time, the proportion of moderate forms of pre-eclampsia increased (85% of cases of moderate pre-eclampsia in Group I versus 73% in Group II) and the proportion of severe forms decreased (15% versus 27%). The mean duration of disease manifestation also decreased (34.3 ± 0.4 weeks in Group I versus 29.4 ± 0.6 weeks in Group II).

Conclusions: In patients with chronic endometritis, pregnancy is associated with a high incidence of spontaneous abortion, especially in early pregnancy, and pre-eclampsia. This is accompanied by vasoconstriction and spasm of the uterine spiral arteries, as evidenced by a significant increase in the resistance indices of these vessels, which appears as early as 5-6 weeks of pregnancy and progresses to 17-18 weeks. It is more pronounced in women whose pregnancy is complicated by the development of pre-eclampsia. Preconception treatment of chronic endometritis can reduce vascular resistance in the pre-placental circulation at the stage of cytotrophoblastic transformation of the walls of the spiral arteries, which leads to a decrease in the incidence of spontaneous abortion and preeclampsia, especially its severe forms.

Keywords: Pre-eclampsia; Chronic Endometritis; Doppler Ultrasound; Spiral Arteries.

Introduction

A necessary prerequisite for a normal pregnancy is a complete gestational remodeling of the blood circulation, which is achieved by the invasion of cytotrophoblast cells into the walls of the spiral arteries [1-4]. As a result, the spiral arteries are transformed into uteroplacental vessels in which the endothelial and smooth muscle layers are completely replaced by endovascular trophoblasts [5-8]. This ensures a reduction in preplacental resistance to blood flow, stability of the uteroplacental circulation, and adequate supply of oxygen and nutrients to the embryo [8, 9].

The onset of pregnancy in women with chronic endometritis (CE) is associated with the development of numerous complications during pregnancy [10-13]. This is mainly due to the morphofunctional characteristics of the uterine mucosa resulting from prolonged persistent inflammatory processes: destruction of endometrial cells, sclerosis of the spiral arteries, luminal narrowing with restricted blood flow [14-18]. This is associated with disturbed secretory transformation of the endometrium during the menstrual cycle, decreased synthesis of endometrial proteins, and disturbances in the activity of the receptor apparatus of the uterine mucosa [1,19-21].

Disturbed cytotrophoblastic transformation of the spiral arteries, together with the development of gestational endothelial dysfunction, serves as the main triggering mechanism for the development of numerous complications, including miscarriage, intrauterine growth restriction, and pre-eclampsia [22]. Currently, obstetric practice lacks accessible methods to assess the adequacy of invasive procedures in the spiral arteries. The only available approach to indirectly evaluate the effectiveness of their gestational transformation is Doppler ultrasound visualization of the above vessels and measurement of vascular resistance [23, 24].

The aim is to study blood flow in the uterine spiral arteries and uterine arteries during pregnancy in women with a history of chronic endometritis and to evaluate the role of preconception care in the prevention of pregnancy complications.

Material and Methods

The paper is an excerpt from the initiative scientific research project of the Department of Obstetrics and Gynecology No. 2 at Poltava State Medical University, entitled "Optimization of approaches to the management of pregnancy in women at high risk of obstetric and perinatal pathology" (State registration number 0122U201228, duration:10.2022-09.2027).

303 pregnant women with a history of chronic endometritis (CE) were followed during pregnancy. Of these, 135 were treated for CE in the preconception period (Group I). This treatment included broad-spectrum antibacterial agents, hormone replacement therapy for 3 months, and L-arginine. The latter was prescribed to restore impaired endometrial blood flow to improve microcirculation [25] in the form of an oral solution at a dose of 6 g during the preconception period and throughout the first 17-18 weeks of pregnancy. The remaining 168 women

(Group II) received no preconception treatment for CE. The control group (CG) consisted of 20 healthy patients who had no history of CE prior to pregnancy.

Doppler ultrasound of the spiral and uterine arteries was performed at 5-6 weeks of gestation and 17-18 weeks of gestation. The systolic-to-diastolic ratio (SDR) was calculated as the ratio of the maximum systolic blood flow velocity to the end-diastolic velocity, the pulsatility index (PI) was calculated as the ratio of the difference between the maximum systolic and minimum diastolic velocities to the mean blood flow velocity, and the resistance index (RI) was calculated as the ratio of the difference between the maximum systolic and minimum diastolic velocities to the maximum systolic blood flow velocity [23, 24].

The obtained data were processed using the methods of mathematical statistics, calculating the mean sample values (M), variance (σ), standard error of the mean (m), applying the Student's t-test and calculating the odds ratio using the statistical software "STATISTICA" (StatSoft Inc., USA).

During the research the principles of patient-centered care were followed in accordance with the requirements of the Tokyo Declaration of the World Medical Association, the international recommendations of the Helsinki Declaration of Human Rights, the Convention on Human Rights and Biomedicine of the Council of Europe, the laws of Ukraine, the regulations of the Ministry of Health of Ukraine, and the requirements of the Ethical Code of the Ukrainian Physician.

Results

In healthy women of the control group at 5-6 weeks of gestation, the SDR in the uterine spiral arteries was 2.03 ± 0.04 , the PI was 0.66 ± 0.06 , and the RI was 0.47 ± 0.06 . These values indicated a low resistance blood flow with low pulsatility and a high diastolic component, which is expected in the early stages of physiological pregnancy. At 17-18 weeks of gestation, the SDR in these vessels decreased by 21% compared to baseline ($p < 0.001$) and was 1.60 ± 0.04 . The PI was 33% lower than at the beginning of pregnancy (0.44 ± 0.04 ; $p < 0.01$). RI was 0.40 ± 0.04 , which was not significantly different from the initial values at the beginning of pregnancy, but indicated a tendency to decrease this parameter ($p > 0.5$). In the uterine arteries of healthy women, the SDR was 2.23 ± 0.06 at 5-6 weeks of gestation and decreased to 1.9 ± 0.04 at 17-18 weeks of gestation, representing a 15% decrease compared to the baseline values at the beginning of pregnancy ($p < 0.001$). The PI changed from 0.84 ± 0.06 at 5-6 weeks of gestation to 0.68 ± 0.05 at 17-18 weeks of gestation (a 19% decrease, $p < 0.05$), while the RI was 0.6 ± 0.07 and 0.44 ± 0.04 , respectively, with no significant difference ($p > 0.05$).

In pregnant patients with CE of Group II, we observed an increase in vascular resistance indices in the spiral arteries. At 5-6 weeks of gestation, the SDR in the spiral arteries of these women exceeded the control values by 11.3% and was 2.26 ± 0.07 compared to 2.03 ± 0.04 in the control group ($p < 0.01$). Similarly, the PI was 0.9 ± 0.07 , 36% higher than the control group ($p < 0.01$). The RI was also 36.2% higher than the control values (0.64 ± 0.05 vs.

0.47 ± 0.06 in the control group; $p < 0.05$). At 17-18 weeks of gestation, vascular resistance indices in the uterine spiral arteries of women with a history of CE decreased compared to the values at the beginning of pregnancy, as expected for physiological changes during pregnancy. However, the Doppler indices were high compared to those of healthy women at this stage of pregnancy. Specifically, the SDR in the spiral vessels of women in Group II was 23% higher than in healthy patients (1.98 ± 0.05 vs. 1.6 ± 0.04 in the control group; $p < 0.001$); the PI was 63% higher (0.72 ± 0.07 ; $p < 0.001$ vs. the control group); and the RI was 47.5% higher (0.59 ± 0.05 ; $p < 0.01$).

Thus, we observed high values of vascular resistance indices in the spiral arteries of the uterus both in early pregnancy and in the second trimester. In our opinion, these values are associated with histologic changes in the uterine spiral arteries that are characteristic of CE. Authors who have studied histological changes in the endometrium in this pathology have reported the presence of sclerosis and thickening of the walls of the spiral arteries, narrowing of their lumen, and significant restriction of blood flow in these vessels in 75.9% of women with CE [14, 15]. We hypothesize that the above conditions may significantly restrict blood flow in the spiral arteries after the onset of pregnancy, especially if the pathologic histologic changes associated with CE were not corrected at the preconception stage.

This may be evidenced by the high rate of complicated pregnancies in women with CE. At this point, out of 168 women in Group II who conceived with CE, 41 (24%) had miscarriages, 23 of which (56%) occurred before 8 weeks of gestation. The high incidence of pre-eclampsia (PE) is also noteworthy. PE complicated the course of pregnancy in 37 (32.1%) women in Group II who carried their pregnancy to the third trimester, with 27% of cases being severe, and the mean duration of clinical manifestation was 29.4 ± 0.6 weeks.

The study of uterine arteries in women of Group II showed no significant deviations from control values of Doppler indices at both 5-6 and 17-18 weeks of gestation. In early pregnancy, the PI in these vessels was 2.09 ± 0.07 ($p > 0.1$ compared to the control group), the RI was 0.8 ± 0.04 ($p > 0.5$ compared to the control group), and the SDR was 0.6 ± 0.05 ($p > 0.5$ in the same comparison). At 17-18 weeks of gestation, the SDR in the uterine arteries of women in Group II was 1.94 ± 0.05 ($p > 0.5$ compared to the control group), the PI was 0.7 ± 0.06 ($p > 0.5$ in the same comparison), and the RI was 0.5 ± 0.05 ($p > 0.2$ in the same comparison). This may indicate that the blood flow in the spiral arteries is more sensitive and disturbed earlier than in the uterine arteries.

It is noteworthy that the Doppler indices measured in the spiral arteries of the uterus in the early stages of pregnancy were significantly higher in women of group II who subsequently developed PE. The SDR in the spiral arteries of these patients was 2.45 ± 0.06 at 5-6 weeks of gestation. This was 21% higher than in healthy women (2.03 ± 0.04 ; $p < 0.001$) and 12.4% higher than in women in Group II who did not develop PE later in pregnancy (2.18 ± 0.06 ; $p < 0.05$). The PI in Group II women who developed PE during pregnancy (1.01 ± 0.050) was 53% higher than in the

control group and 21.7% higher than in Group II women whose pregnancies progressed without PE (0.82 ± 0.06 ; $p < 0.05$). The RI in these women was 0.73 ± 0.03 , which was 55.3% higher than that in the control group (0.47 ± 0.06 ; $p < 0.05$) and 17.7% higher than that in women in Group II who did not have preeclampsia (0.62 ± 0.04 ; $p < 0.05$).

Furthermore, the greater the increase in vascular resistance in early pregnancy, the more severe the PE. In Group II patients who subsequently developed moderate PE, the SDR at 5-6 weeks of gestation was 2.41 ± 0.07 . This was 18.7% higher than in the control group ($p < 0.001$). In patients who experienced severe PE, the SDR in the early terms was 2.58 ± 0.06 , which was 27% higher than the control values ($p < 0.001$). The SDR in patients who did not develop PE during pregnancy (2.18 ± 0.06) was significantly lower compared to the SDR in women who subsequently developed moderate PE (by 10.5%; $p < 0.02$) and even lower compared to those who subsequently developed severe PE (by 18.3%; $p < 0.001$).

Similarly, the PI in the spiral arteries in early pregnancy was 45.4% higher in Group II patients who subsequently developed moderate pre-eclampsia compared to the control group (0.96 ± 0.06 versus 0.66 ± 0.06 ; $p < 0.001$). However, no significant difference was observed compared to the values of women in Group II without pre-eclampsia ($p > 0.1$). Notably, in patients who subsequently developed severe PE, the PI was 72% higher than in the control group (1.14 ± 0.07 ; $p < 0.001$) and 39% higher than in women without PE ($p < 0.001$). The difference in PI values between the subgroups of women with subsequent development of moderate and severe pre-eclampsia at this time point was not significant ($p > 0.05$).

The RI in the aforementioned vessels in the early stages of pregnancy was also higher in women who subsequently developed moderate and severe pre-eclampsia. In patients who developed moderate PE, RI at 5-6 weeks' gestation was 0.66 ± 0.06 , which was 40% higher than the control values ($p < 0.05$), but not significantly different from the values in women of this group whose pregnancy was uncomplicated by PE (0.62 ± 0.04 ; $p > 0.5$). In women with severe PE, this parameter was 0.7 ± 0.05 at the beginning of pregnancy, which was 48.9% higher than in healthy pregnant women ($p < 0.01$). Comparison of this parameter in the subgroup of women with moderate PE ($p > 0.5$) and patients without PE ($p > 0.1$) showed no significant difference.

In the second trimester (17-18 weeks) of pregnancy, spiral artery SDR was higher in women who subsequently developed moderate pre-eclampsia. It was 32% higher than in the control group (2.12 ± 0.03 vs. 1.60 ± 0.04 ; $p < 0.001$) and 12.7% higher than in women without pre-eclampsia (2.12 ± 0.03 ; $p < 0.001$). In women with severe pre-eclampsia, the SDR was 2.37 ± 0.05 , which was significantly higher than in controls (48% higher; $p < 0.001$), women without pre-eclampsia (126% higher; $p < 0.001$), and women with moderate pre-eclampsia (11.7% higher; $p < 0.001$). The PI in patients with subsequent moderate pre-eclampsia (0.80 ± 0.05) was 82% higher than in controls (0.44 ± 0.04 ; $p < 0.001$) and 31% higher than in women without pre-eclampsia (0.61 ± 0.06 ; $p < 0.02$). In women with severe pre-eclampsia, the

PI was 1.1 ± 0.06 , which was 2.5 times higher than in the control group (0.44 ± 0.04 ; $p < 0.001$), 1.8 times higher than in women without pre-eclampsia (0.61 ± 0.06 ; $p < 0.001$), and 1.3 times higher than in women with moderate pre-eclampsia (0.80 ± 0.05 ; $p < 0.001$). Similarly, RI in the spiral arteries was higher in women with subsequent moderate pre-eclampsia. It exceeded control values by 64% (0.72 ± 0.05 versus 0.40 ± 0.04 in the control group; $p < 0.001$) and was 44% higher than in women without pre-eclampsia (0.50 ± 0.05 ; $p < 0.01$). In women with severe pre-eclampsia, RI was 0.88 ± 0.06 , which was 2.2 times higher than in healthy women (0.40 ± 0.04 ; $p < 0.001$), 1.8 times higher than in women without pre-eclampsia (0.50 ± 0.05 ; $p < 0.001$), and 1.2 times higher than in the subgroup of women with moderate pre-eclampsia (0.72 ± 0.05 ; $p < 0.05$).

We also observed an increase in Doppler indices in the uterine arteries at 17-18 weeks' gestation; however, no significant difference in SDR, PI, and RI values was observed in these vessels in early pregnancy. Notably, in women who subsequently developed severe PE, the SDR at 17-18 weeks' gestation increased significantly to 2.27 ± 0.01 , exceeding both the control level (by 19%; $p < 0.002$) and the level in women without PE (by 21%; $p < 0.002$), as well as in women with moderate PE (by 13%; $p < 0.02$). The PI in the uterine arteries of women with subsequent severe PE (1.1 ± 0.04) also significantly exceeded the values in healthy patients (0.68 ± 0.05 ; by 62%; $p < 0.001$), in women in Group II without PE (0.71 ± 0.06 ; by 55%; $p < 0.001$), and in women with subsequent moderate PE (0.91 ± 0.08 ; by 21%; $p < 0.05$). The RI of the uterine arteries also changed. At the mentioned gestational age, it was 0.62 ± 0.03 in women in Group II who subsequently developed moderate PE, which was 41% higher than in controls (0.44 ± 0.04 ; $p < 0.001$) and 26% higher than in women without PE (0.49 ± 0.05 ; $p < 0.05$). In patients with subsequent severe PE, RI values reached 0.72 ± 0.03 , which was also higher than in healthy patients (by 64%; $p < 0.001$), higher than in women without PE (by 47%; $p < 0.001$), and higher than in women with moderate PE (by 16%; $p < 0.05$).

Thus, Doppler ultrasound performed in pregnant patients with a history of CE showed signs of vasoconstriction and spasm in the spiral arteries of the uterus, manifested by a significant increase in SDR, PI and RI in these vessels as early as 5-6 weeks of pregnancy, progressing to 17-18 weeks of pregnancy. It is important to note that at the beginning of pregnancy, increased vascular resistance is observed only in the spiral arteries, but as pregnancy progresses, this phenomenon also occurs in the uterine vessels. Obviously, the anomalies observed in pregnant women with a history of CE could have been prevented by a preconception treatment capable of improving the state of the endometrium, its blood supply and the functional characteristics of the mucosal glands. To confirm this assumption, we analyzed the above-mentioned vascular resistance indices in women whose pregnancies occurred after preconception treatment for CE (Group I). It was found that at 5-6 weeks of pregnancy the values of all Doppler indices in the uterine spiral arteries were significantly lower than the values in the group of

patients who did not receive such treatment and did not differ significantly from the values observed in healthy pregnant women.

Finally, in women who received preconception treatment for CE, the SDR at 5-6 weeks of pregnancy was 2.04 ± 0.06 , which was 10.7% lower than in women in Group II who did not receive preconception treatment ($p < 0.05$). The PI in Group I women was 0.67 ± 0.07 , showing a 34.3% decrease compared to the corresponding group ($p < 0.05$). The RI also decreased by 29.4% ($p < 0.05$) to 0.49 ± 0.04 . At 17-18 weeks' gestation, women who received pre-pregnancy treatment for PE also showed significantly improved spiral artery blood flow conditions. The SDR was in the range of 1.68 ± 0.05 , which was 17.8% lower than in the women of Group II ($p < 0.001$). The PI was 0.49 ± 0.07 , showing a 46.9% decrease compared to the corresponding group ($p < 0.05$). The RI decreased by 40.4% ($p < 0.05$) to a value of 0.42 ± 0.06 . Consequently, the blood flow in the uterine arteries also improved.

As a result of the improved blood supply, women who received preconception treatment had a more favorable pregnancy outcome. The miscarriage rate was 10.3% compared to 24% in Group II (OR 2.79; 95% CI [1.45-5.38]; $p < 0.05$). Miscarriage before the 8th week of pregnancy occurred in 4 patients in Group I (2.96% compared to 13.7% in Group II; OR 5.20; 95% CI [1.75-15.42]; $p < 0.05$). PE complicated pregnancy in 20 women in Group I (17% vs. 32.1% in Group II; OR 2.3; 95% CI [1.25-4.31]; $p < 0.05$). Among these cases, moderate manifestations of this complication were present in 17 women (85% of PE cases) in Group I and 27 women (73%) of 37 patients with PE in Group II (OR 2.51; 95% CI [1.25-5.04]; $p < 0.05$). Severe PE further complicated pregnancy in 3 women (15% of women with PE) in Group I and 10 women (27% of women with PE) in Group II (OR 4.64; 95% CI [1.23-17.48]; $p < 0.05$). The mean gestational age at onset of PE was 34.3 ± 0.4 weeks in Group I and 29.4 ± 0.6 weeks in Group II.

Conclusions

Women who conceived with untreated CE experience a significant increase in SDR, PI and RI values both in early (5-6 weeks) and late (17-18 weeks) gestation. This indicates vasoconstriction in the pre-placental circulation, which is associated with a high incidence of complications such as miscarriage, especially in the early stages, and pre-eclampsia. In women who develop pre-eclampsia during pregnancy, an increase in vascular resistance in the spiral arteries of the uterus (SDR by 21%, PI by 53%, RI by 55% compared to the values in healthy pregnant women) is observed even in early pregnancy. Preconception care, including treatment of CE, offers a real opportunity to reduce vascular resistance in the pre-placental circulation during cytotrophoblastic transformations in the walls of the spiral arteries. This, in turn, has positive trends in reducing spontaneous losses (by 4.6 times) and pregnancy complications. In women who have undergone preconception treatment, the incidence of pre-eclampsia is reduced by 1.8 times and the duration of its manifestation is increased.

Future research prospects: The identified features of pregnancy complications in the presence of pre-existing chronic endometritis highlight the need for further research aimed at improving methods of

preconception care and prevention of obstetric pathology.

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ЗМІНИ ІНТЕНСИВНОСТІ МАТКОВОГО КРОВОТОКУ У ВАГІТНИХ З ХРОНІЧНИМ ЕНДОМЕТРИТОМ В АНАМНЕЗІ

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Резюме

Вступ. Для хронічного ендометриду характерні морфо-функціональні зміни в слизовій оболонці та розлади мікроциркуляції в басейні спіральних артерій. Розвиток вагітності на такому фоні супроводжується порушенням гестаційної перебудови спіральних артерій і сприяє підвищенню резистентності матково-плодового кровотоку.

Мета дослідження – вивчення кровотоку в спіральних артеріях матки та маткових артеріях в процесі вагітності у жінок з хронічним ендометритом в анамнезі та оцінка ролі прекоцепційної підготовки у профілактиці гестаційних ускладнень.

Матеріал та методи дослідження.

Спостерігали за гестацією у 303 жінок, які до настання вагітності мали хронічний ендометрит. 135 з них прекоцепційно отримували лікування (І група), яке включало антибактеріальні засоби широкого спектру дії, замісну гормональну терапію впродовж 3 місяців та L-аргінін протягом прекоцепційного періоду та впродовж перших 17-18 тижнів гестації. Інші 168 жінок лікування не отримували (ІІ група). 20 здорових пацієнток, які до настання вагітності хронічного ендометриду не мали, склали контрольну групу.

Дослідження виконані із дотриманням «Правил етичних принципів проведення наукових медичних досліджень за участю людини», затверджених Гельсінською декларацією (1964-2013 рр.).

Проводилося визначення систоло-діастолічного відношення (СДВ); пульсового індексу (ПІ) та індексу резистентності (ІР) у спіральних та маткових артеріях на 5-6 та 17-18 тижнях вагітності. Показники обробляли методами математичної статистики з розрахунком середніх вибіркового значень (М), дисперсії (σ) та помилок середніх значень (m), оцінкою критерію Ст'юдента та розрахунку вірогідності шансів за допомогою програми «STATISTICA» («StatSoft Inc.», США).

Стаття є фрагментом ініціативної НДР кафедри акушерства і гінекології №2 Полтавського державного медичного університету «Оптимізація підходів до ведення вагітності у жінок груп високого ризику по виникненню акушерської та перинатальної патології» (№держреєстрації 0122U201228, термін виконання 10.2022-09.2027).

Результати дослідження. У здорових жінок в терміні 5-6 тижнів вагітності в спіральних артеріях матки має місце низькорезистентний кровоток з низькою пульсацією і високим діастолічним компонентом, про що свідчать відносно низькі значення індексів судинного опору. У пацієнток ІІ групи, гестація яких настала на фоні хронічного ендометриду, у спіральних артеріях виявлене зростання СДВ на 11,3% ($p < 0,01$), ПІ на 36% ($p < 0,01$), ІР на 36,2% ($p < 0,05$) на 5-6 тижнів вагітності, а також в 17-18 тижнів: СДВ на 23% ($p < 0,001$), ПІ - на 63% ($p < 0,001$), ІР на 47,5% ($p < 0,01$) в порівнянні з показниками у здорових жінок. Достовірних змін індексів опору в маткових артеріях не виявлено. Вимірювані в 5-6 тижнів вагітності у спіральних артеріях матки індекси кровотоку виявилися достовірно вищими у тих жінок ІІ групи, вагітність яких у подальшому ускладнилася розвитком прееклампсії. У таких пацієнток СДВ на 12,4% ($p < 0,05$), ПІ – на 21,7% ($p < 0,05$), а ІР на 17,7% ($p < 0,05$) були вищими за показники у тих жінок ІІ групи, які прееклампсії в ході подальшого перебігу вагітності не мали. При цьому, чим більшим було зростання судинного опору на початку вагітності, тим більш тяжкою виявилася прееклампсія. У 17-18 тижнів вагітності зростання доплерометричних індексів кровотоку в спіральних артеріях матки було більш виразним і поєднувалося зі збільшенням СДВ, ПІ та ІР в маткових артеріях.

У жінок І групи, які отримували прекоцепційне лікування хронічного ендометриду, як в 5-6 тижнів, так і в 17-18 тижнів вагітності значення індексів судинного опору в спіральних артеріях матки були достовірно меншими в порівнянні зі значеннями в групі пацієнток, що такого лікування не отримували. Відмічений також більш сприятливий перебіг вагітності: в 2,3 рази зменшувалася частота самовільного викидня (ВШ 5,20; ДІ 95% [1,75-15,42]; $p < 0,05$); в 1,8 рази – частота прееклампсії (ВШ 2,3; ДІ 95% [1,25-4,31]; $p < 0,05$). При цьому зросла частка помірних її форм (85% випадків помірної прееклампсії у осіб І групи проти 73% у ІІ групі) і зменшилася частка тяжкої (15% проти 27% відповідно). Середній термін маніфестації хвороби зменшився ($34,3 \pm 0,4$ тижнів в І групі проти $29,4 \pm 0,6$ тижнів в ІІ групі).

Висновки: У пацієнток, вагітність яких настала на фоні хронічного ендометриду, мають місце висока частота самовільного переривання вагітності, особливо на ранніх термінах, та прееклампсії. Це поєднується з вазоконстрикцією і спазмом у спіральних артеріях матки, про що свідчить достовірне зростання індексів опору в цих судин, яке з'являється ще на початку вагітності, у 5-6 тижнів, і прогресує до 17-18 тижнів. Воно є більш вираженим у жінок, вагітність яких ускладнилася розвитком прееклампсії. Проведення прекоцепційного лікування хронічного ендометриду дає можливість зменшити судинну резистентність преплацентарного кровотоку на етапі цитотрофобластичних перетворень в стінках спіральних артерій і призводить до зменшення частоти самовільних викиднів та прееклампсії, особливо тяжких її форм.

Ключові слова: прееклампсія; хронічний ендометрит; доплерометрія; спіральні артерії.

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