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THE IMPACT OF ORGAN-PRESERVING OPERATIONS ON THE OVARIAN RESERVE IN PATIENTS AFTER PATHOLOGICAL BLOOD LOSS

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ABSTRACT

Purpose of the study: to study the state of the ovarian reserve in women after organ-conserving operations and obstetric hemorrhage. The objectives of the study were to study the state of the hypothalamic-pituitary-ovarian system in women with pathological blood loss and organ-preserving operations. The main group consisted of 33 women who had stopped obstetric hemorrhage during cesarean section and who underwent compression sutures after ineffective ligation of 3 pairs of uterine vessels. The control group consisted of 25 patients after cesarean section without pathological blood loss and organ-saving operations. Ovarian reserve was assessed by the level of follicle-stimulating and anti-Mullerian hormones. The ultrasound was performed on modern ultrasound equipment using transvaginal sensors to determine the volume and number of antral follicles with a diameter of 2-10 mm in each ovary. All analyzes and measurements were carried out on days 3-5 of the menstrual cycle. The results showed that follicle-stimulating hormone levels were elevated (9.7±1.06 mIU/ml) in 39.4%, which was significantly higher than the control group ($p<0.05$). The level of anti-Müllerian hormone was below 1.0 ng/ml in 33.3% (0.95±0.16 ng/ml), which is 2.6 times lower than in the control group ($p<0.05$). The number of antral follicles in 33.3% of the main group was 4.5±1.2 and 4.6±0.9 follicles in the right and left ovaries. Analysis of the results showed that organ-preserving operations against the background of pathological blood loss lead to a decrease in ovarian reserve in every third patient, and, as a consequence, the risk of developing hypergonadotropic ovarian insufficiency.

Key words: ovarian reserve, ligation of 3 pairs of uterine vessels, compression sutures, obstetric hemorrhage.

INTRODUCTION

Obstetric hemorrhages are among the top three causes of maternal morbidity and mortality in the world, along with eclampsia and septic complications. The

incidence of obstetric hemorrhages in our country averages 29% according to a confidential report and, unfortunately, there is a tendency to increase [5]. In recent years, organ-preserving surgical interventions have been widely used when pharmacological conservative stopping of obstetric bleeding is ineffective. In recent years, organ-preserving surgical interventions have been widely used when pharmacological conservative stopping of obstetric bleeding is ineffective. For this purpose, the following are used: ligation of 3 pairs of uterine vessels, application of various modifications of compression sutures, ligation of the internal iliac arteries and their various combinations [2, 4, 6, 9]. The effectiveness of organ-preserving surgical methods in stopping bleeding is beyond doubt and amounts to approximately 75-92% [6, 11].

All conservative methods of organ-preserving operations are based on stopping obstetric bleeding by sharply reducing blood flow in the uterus, which leads to disruption of organ perfusion, which, together with severe blood loss, can affect the woman's ovarian reserve [10]. This problem is especially relevant for women who have not yet completed their reproductive plans.

There are not enough studies in the literature devoted to the study of hormonal levels after surgical interventions, or they exist, but are isolated, for example, with bilateral ligation of the uterine arteries, compression sutures, or are mainly found in embolization of the uterine arteries [3, 8, 10].

The aim of this study was to analyze the state of the ovarian reserve in women after the application of compression sutures and ligation of 3 pairs of uterine vessels. The objectives of the study were to study the state of the hypothalamic-pituitary-ovarian system and echographic indicators in women who underwent pathological blood loss and organ-preserving operations during childbirth.

MATERIAL AND METHODS OF RESEARCH

The main group consisted of 33 women who underwent compression sutures to stop obstetric bleeding after ineffective ligation of 3 pairs of uterine vessels (uterine, ovarian and round ligaments) after cesarean section. The control group for us consisted of 25 patients after cesarean section without pathological blood loss and organ-preserving operations.

To assess the hormonal background, an analysis was performed of the level of gonadotropins - follicle-stimulating hormone (FSH) and luteinizing hormone (LH), steroid hormones - estradiol and progesterone, as well as anti-Müllerian hormone (AMH). The volume and number of antral follicles (AFC) with a diameter of 2-10 mm were determined in each ovary using an echographic examination. All analyses and measurements were performed on days 3-5 of the menstrual cycle. If the FSH level was above 8 mIU/ml, the AMH level was below 1 ng/ml and there

were less than 5 CAFs in each ovary, the ovarian reserve was considered reduced. The study was conducted on modern ultrasound equipment using transvaginal sensors according to the generally accepted method of examining the pelvic organs in women [1, 7]. The results obtained were processed using standard statistical methods.

RESULTS AND DISCUSSION

The average age of patients in the main group was 27.3±5.47 years, ranging from 18 to 35 years. The control group consisted of patients of the same age with an average of 26.0±4.86 years, ranging from 20 to 36 years. There were 12 primiparous women in the main group (36.4%), and 14 (56%) in the control group. Parity in the main group was 2.12±1.04 births, in the control group – 1.6±1.78 births. The volume of pathological blood loss in the main group was significantly higher and averaged 1387.88 ±256.09 ml, which is 3.4 times higher than in the control group 406.8 ±80.45 ml ($p<0.001$). Of the 33 patients, blood loss of up to 1000 ml was diagnosed in 4 (12.1%), severe blood loss (from 1000 to 1499 ml) - in 14 (42.4%) and massive blood loss (from 1500 ml to 2100 ml) - in 15 (45.5%).

Analysis of the course of pregnancy in the main group showed that in the early stages it was accompanied by toxicosis in 9.1%, complicated by an infection of viral or bacterial etiology (ARI or COVID-19) in 27.3%. The threat of premature birth was observed in 9.1%, prelabor rupture of membranes in 24.2%, which was significantly more often recorded in the control group (8%). Chronic arterial and mild gestational hypertension were observed in 6.1%, moderate and severe preeclampsia developed in 12.1% and 15.2%, respectively. The presence of an overstretched uterus due to multiple pregnancy, fetal macrosomia and polyhydramnios were noted in 12.1%, 4% and 9.1%, respectively. Fetal growth retardation and antenatal fetal death were diagnosed in 6.1% and 24.2%. The following indications were the reason for surgical intervention in the main group: premature detachment of a normally located placenta in 16.4%, cephalopelvic disproportion in 9.1%, unsatisfactory progress of labor and an inconclusive condition of the fetus in 9.1%, and placenta previa in 3.0%. The gestational age at admission was 60.6% full-term, 36.4% premature, and 6.1% post-term.

To study the parameters of the ovarian reserve, we analyzed the basal level of FSH and LH, estradiol and progesterone, as one of the biomarkers of the hypothalamic-pituitary-ovarian system, and AMH, which, like the volume of the ovary and CAF, is used to predict the reproductive potential of a woman. A study of the FSH level showed a significant increase in the average FSH level to 10.04±0.65 mIU/ml compared to the control group 4.57±0.09 mIU/ml; compared to the control, an almost two-fold increase in average values was noted ($p<0.001$).

In a personalized assessment, the FSH level in 13 patients of the main group (39.4%) was 9.7±1.06 mIU/ml. In the control group, the FSH level was 4.57±0.37 mIU/ml, which is significantly lower than in the main group ($p<0.05$). The average LH level was slightly increased to 5.35±0.42 mIU/ml, while the control level was 3.49±0.10 mIU/ml ($p<0.05$). The increase in gonadotropin levels was apparently associated with a pronounced deficiency of steroid hormones, and according to the feedback principle, a reliable decrease in estradiol to 51.22±1.93 pg/ml and progesterone to 0.52±0.03 ng/ml ($p<0.001$) was noted against the control values of 124.04±1.59 pg/ml and 1.22±0.02 ng/ml, respectively. The AMH level in the main group was reduced in 11 patients (33.3%) and was 0.95±0.16 ng/ml compared to the control, where the AMH level was 2.49±1.03 ng/ml, which is 2.6 times higher than in the main group ($p<0.05$).

During the ultrasound examination of the uterus and ovaries, we measured the volume of each ovary and CAF. Considering that these parameters are independent markers of ovarian reserve that can be measured in each ovary, we studied these parameters. Thus, ligation of 3 pairs of uterine arteries, including ovarian arteries, could affect the disruption of ovarian perfusion and lead to disruption of vascularization, especially in combination with pathological blood loss. In this regard, we measured the volume of each ovary, and noted an insignificant decrease in the volume of the right ovary to 6.51±0.09 cm^3 in the main group versus 8.42±0.13 cm^3 in the control group ($p<0.05$). When measuring the left ovary, similar changes were noted - 5.96 ± 0.09 cm^3 versus 8.01 ± 0.11 cm^3 in the control ($p < 0.05$), while the left ovary was 0.55 cm^3 (5.96 ± 0.09 cm^3) smaller than the right. In a personalized assessment, the volume of the right ovary up to 6 cm3 was diagnosed in 9 patients (27.3%) and the left ovary - in 13 patients (39.4%), while in the control group, patients with a volume of less than 6 cm3 were not registered. In the group with obstetric blood loss and a combination of organ-preserving methods of stopping bleeding, such an indicator as AFC in each ovary was significantly reduced when compared with the control group ($p<0.001$). AFC in the right ovary was 5.85±0.15 pieces, which is reliably less than the control - 11.44±0.30 follicles; in the left ovary, on average, AFC was 5.12±0.18 with the control - 10.16±0.28 follicles. The number of antral follicles in 33.3% of the main group was 4.5±1.2 and 4.6±0.9 follicles in the right and left ovaries.

The next indicator for assessing the functional state of the ovaries is the thickness of the endometrium, which in the main group was thinner than in patients in the control group by 1.21 mm and amounted to 4.23±0.07 mm, while in the control group it was 5.44±0.09 mm ($p<0.05$).

CONCLUSION

The state of the vascular network of the uterus and ovaries is important for their supply of hormonal and nutrient substances. Also, the hundreds of growing follicles in the ovary at any given time are actively influenced by the state of the vascular bed, which is necessary to support their changing needs for growth and further transformations. Accordingly, adequate blood supply to the uterus and ovaries is important for the functioning of the reproductive system, and in the context of interventions associated with devascularization of the uterus against the background of pathological blood loss, a violation of ovarian perfusion is noted. In the future, this may lead to the development of disorders in the form of a decrease in the follicular pool and a decrease in the production of steroid hormones and, as a consequence, an increase in the feedback synthesis of gonadotropic hormones, which may lead to the development of hypergonadotropic ovarian insufficiency. In turn, the development of this condition leads, on the one hand, to a decrease in reproductive capabilities and, as a consequence, to infertility or miscarriage; on the other hand, ovarian insufficiency leads to the development of neurovegetative, metabolic, mental and trophic manifestations. In this regard, this category of patients requires rehabilitation measures for the purpose of timely diagnosis and treatment.

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