

MEDICINE

ANATOMIC-FUNCTIONAL STATE OF PELVIC ORGANS IN WOMEN WITH INFERTILITY AND OVARICOVARICOCELE

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ABSTRACT

Introduction. High informativeness and accessibility of ultrasound examination in infertile patients provides for the exclusion or confirmation of morphological changes in genitals, the degree of damage to the organ and the involvement structures, in particular, varicose veins of the gonadal veins, which can be explained by the emergence of ovarian dysfunction. In addition, the polymorphism of semiotics of echographic signs of pathological changes in pelvic organs in the examined patients confirms the complexity of determining the main and concomitant etiological factors of the emergence of functional infertility in women, the development of disorders of reproductive function and causes the need to involve other methods. The aim of the work was to study the anatomical and functional characteristics of the pelvic organs by ultrasound, medical diagnostic laparoscopy and hysteroscopy to determine the degree of morphological changes of the genitals in women with infertility and ovaricovaricocele.

Materials and methods. To solve the goals and objectives, 117 pregnant women of reproductive age (21-44 years old) with functional infertility were prospectively examined and divided into 2 groups for the comparative analysis: the main group was 62 women with infertility and varicose veins in the ovaries; a comparison group was 55 women with infertility without varicose veins. The study of the anatomical and functional state of the uterus, ovaries and fallopian tubes in women of the studied groups was performed by standard ultrasound examination on the PHILIPS ATL-HDI 4000, PHILIPS HD 11-XE with the analysis of folliculogenesis. Laparoscopic intervention was performed by the patients of the main group on the apparatus "Karl Storz" (Germany) in the first phase of the menstrual cycle. Diagnostic hysteroscopy in order to clarify the state of the uterus and endometrium was performed simultaneously with laparoscopy in the 1st or 2nd phase of the menstrual cycle using the equipment "Karl Storz" (Germany).

Results. In women of the main group with a combination of functional infertility and ovaricovaricocele, there is a statistically significant increase in the percentage of incorrect position of the uterus - 36 (58.1%) in normal form and size of the uterus, both in the main group of women and in the comparison group - 53 (85.5%) and 48 (87.3%) cases respectively. Analyzing the indicators of ovarian size and the number of antral follicles, a statistically significant difference was found in the direction of its reduction in women with functional infertility and ovaricovaricocele women without varicose dilatation of ovarian veins - 4.1 ± 0.1 cm³ vs. $5.8 \pm 1, 4$ cm³ and 3.9 ± 1.1 versus 5.6 ± 1.4 , respectively, in two groups. In addition, there is a tendency to reduce the size of the ovary of the progradial age in women of all the studied groups with statistically significant rates in the patients of the main group. Also, there is a difference in the right ovary volume relative to the left in women with infertility and ovaricovaricocele in the direction of decreasing the size of the latter, which may be due to the predominant localization of the enlarged gonadal vein, and this difference is statistically significant. In determining the

functional state of the ovaries in the overwhelming number of women in all of the studied groups ovulation was noted, however, when studying the characteristics of the functional state of the yellow body according to echographic signs, decrease in the thickness of the endometrium in the middle of the luteal phase of the menstrual cycle in patients of the main group, as well as the absence in the overwhelming majority cases of its adequate secretory changes, which is statistically significant against the women of the comparison group. In patients, both the main group and the comparison groups, there is a decrease in the ratio of the volume of the yellow body and ovarian volume and the decrease in the thickness of the wall of the yellow body, respectively, against the control group women, which is an ultrasound sign of inferiority of the yellow body and lack of luteal phase of the menstrual cycle. In addition, women in the main group have a statistically significant reduction in the rates against the women in the comparison group. In women of the main group, a large percentage of varicose veins of the small pelvis are found in the absence of organic changes in the uterus and adnexes (73.3%) in the presence of infertility of obscure genesis.

Conclusions. Ultrasound study in combination with color Doppler of patients with ovarico-varicocele is a highly informative method of research, because it allows to perform topical diagnosis, to determine the morphological character of the lesion, to differentiate the type of pathological process and to identify the concomitant pathology of the pelvic organs. The conducted study suggests that ovarico-varicocele should be considered not only as an accompanying symptomatic changes in diseases of the female genitals, but also as one of the causes of ovarian dysfunction with delay or termination of growth of the follicles, change in their size, degenerative-dystrophic changes in the ovaries, which leads to a violation hormonal homeostasis and manifested by reproductive disorders. In the perspective of further research it is necessary to consider a complex analysis of the morphological and functional characteristics of the internal genital organs, which will establish the presence of a certain functional and organic gynecological pathology and will enable to diagnose the initial and minimal course of the pathological process of the pelvic organs, finally verify the final diagnosis and appoint pathogenetic treatment.

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Introduction. Ultrasound examination by improving the research methods, allowing non-invasively visual and quantitative analysis of functional state of reproductive organs, presents significant opportunities for the diagnosis of structural changes in the internal genital organs and the assessment of ovarian reserve in women with functional infertility [1, 2, 4].

In addition, high informative and accessible ultrasound examination in infertile patients provides for the exclusion or confirmation of morphological changes in genitals, the degree of organ damage and the involvement of adjacent structures, in particular, varicose dilatation of gonadic veins, which can be explained by the onset of ovarian dysfunction [3, 6]. In addition, the polymorphism of semiotics of echographic signs of pathological changes in pelvic organs of examined patients confirms the complexity of determining the main and concomitant etiological factors of the occurrence of functional women's infertility, the development of disorders of reproductive function and causes the need to involve other methods for examination [5, 7].

Therefore, the purpose of our work was to study the anatomical and functional characteristics of pelvic organs by ultrasound, diagnostic laparoscopy, and for the determination the degree of morphological changes of genitals in women with infertility and ovarico-varicocele.

Materials and methods. To solve the goals and objectives, 117 women of reproductive age (21-42 years old) with functional infertility were prospectively examined and divided into 2 groups for the comparative analysis: the main group was 62 women with infertility and ovarian varicose veins; A comparison group - 55 women with infertility without varicose veins.

The criteria for including women in the main group was no pregnancy without any contraceptive use for 12 months and the presence of ovarian veins confirmed with or without varicose dilatation of any of the major venous reservoirs of the small pelvis of more than 5 mm in the ultrasound examination diameter, positive Valsalva test (widening of the diameter of the veins with respiratory depression and simultaneous stress).

In the comparison group, women with infertility were included in accordance with the criteria of the main group without varicose veins dilatation. The study did not include women with tuboperitoneal infertility factors in the context of endometriosis, inflammatory diseases of the pelvic organs, organic changes in the genital organs (large-sized uterine fibroids, ovarian cysts), uterine defects, thyroid gland diseases, hyperandrogenism and hyperprolactinemia, male factor infertility.

The control group was selected by random sampling and consisted of 33 women of reproductive age without gynecological pathology who had a history of pregnancy and childbirth.

The study of the anatomical and functional state of uterus, ovaries and fallopian tubes in women of the studied groups was performed by standard ultrasound examination on the PHILIPS ATL-HDI 4000, PHILIPS HD 11-XE with the analysis of folliculogenesis. In conducting the echographic study, the size of uterus and ovaries, the thickness of endometrium, the presence of dominant follicles and signs of ovulation, the formation, development and regression of the yellow body, the presence of structural changes in the pelvic organs were studied. The topographies, dimensions, contours, echo structure of the uterus and its applications were echographed. Conducting ultrasound in a complex with laboratory methods of investigation allowed to provide a preliminary assessment of the ovarian reserve. Determine the ovarian volume by means of longitudinal, anterior-posterior, and transverse sizes, the number of antral follicles with a diameter of 2-10 mm, the mean diameter of the largest follicle as the half-value of its perpendicular size.

Laparoscopic intervention was performed for the patients of the main group on the apparatus "Karl Storz" (Germany) in the first phase of the menstrual cycle. During the laparoscopy performed a general review of the pelvic organs. During the examination of the pelvic organs, uterus was evaluated externally, its mobility, size, color, consistency, examined the peritoneum of the anterolateral and Douglas space, uterine tubes and ovaries, wide and cardinal ligaments, and determined the patency of the fallopian tubes.

Diagnostic hysteroscopy with the aim of clarifying the state of uterus and endometrium was performed simultaneously with laparoscopy in the 1st or 2nd phase of the menstrual cycle using the equipment "Karl Storz" (Germany). During hysteroscopy, the size and shape of the uterine cavity, the presence of deformations were evaluated. Attention was drawn to the color, the foldiness of endometrium, the presence of polypoid formations, intrauterine sinechias, endometrioid passages. If necessary, an endometrial biopsy was performed using an actinoid electrode in the form of a loop fed to it active current with a frequency of 300 kHz, power in coagulation mode 80 W, in the tissue dissipation mode - 100-120 W.

Results Discussion. The average age of the examined women in the main group was 27.8 ± 3.6 years, which was approximately the same with the women of the comparison and control group, with an average age of 28.1 ± 2.4 and 27.9 ± 3.4 years, respectively. The age group of women in the main group was as follows: 21 - 27 years old - 8 (12.9%) patients, 28 - 35 years old - 39 (62.9%), more than 36 years old - 15 (24.2%) women. In the comparison group, the number of patients from 21 to 27 years was 7 (12.7%), 28-35 years old - 35 (63.6%) women and 36-42 years old - 13 (23.7%). The distribution of women by age group in the control group was approximately identical, namely: 21-27 years old - 4 (12.1%) of women, 28-35 years old - 22 (65.7%), 36-42 years - 7 (22, 2%).

Thus, the position of uterus in retroflexio occurred in 36 (58.1%) patients in the main group, only 12 (21.8%) women in the comparison group and 5 (15.2%) women in the control group. In the latter, the position of the uterus in anteflexio prevailed - 43 (78.2%) and 28 (84.8%) respectively. The usual form of uterine body is found in 53 (85.5%) cases of infertility patients and ovarioacavirulus, in 48 (87.3%) cases of infertility women without structural ovarian changes and in 100% of women in the control group. In women of the main group, the percentage of fibromatically altered uterus was 14.5% - 9 patients, and in women of the comparison group 12.7% - 7 cases. The state of myometrium in women of the studied groups in most cases was unchanged (clear borders, linear form, normal structure): 50 (80.6%) in the main group, 45 (81.8%) in the comparison group and 100% in the control group.

Given the rather wide age range of examined women and the importance of age as a predictor of the functional state of the reproductive system, in particular the ovarian reserve, we considered it necessary to analyze the anatomical characteristics of the ovaries in women of the age groups under study.

Consequently, when investigating the volume of ovaries in women with infertility and ovaricovariocele, a gradual decrease in this index with age was established, namely at the age of 21-27, the average ovary volume was $5.3 \pm 1.1 \text{ cm}^3$, at the age of 28-35 years - 4.8 ± 1.53 and in 36-42 years - $3.9 \pm 1.3 \text{ cm}^3$, while in comparison with patients with infertility without varicose dilatation of ovarian veins there is a statistically significant difference in the direction of increase of these indices in the latter with a similar tendency according to age - $6.8 \pm 1.6 \text{ cm}^3$, $5.9 \pm 1.3 \text{ cm}^3$ and 3 according to age distribution. The indicators of the control group were not statistically significantly different from those of the control group patients, but were slightly higher - in the 21-26 years - $6.9 \pm 1.8 \text{ cm}^3$, 28-35 years - $6.9 \pm 1.8 \text{ cm}^3$ and in the 36-42 years - $5.3 \pm 1.7 \text{ cm}^3$.

Regarding the number of antral follicles, women with functional infertility and ovaricovariocele also showed a tendency to decrease with age, which statistically significantly differed from those of infertile patients without structural changes in ovarian veins. Thus, in women of the main group, the number of antral follicles at the age of 21-27 years was 5.4 ± 1.2 versus 6.4 ± 1.5 in the comparison group, at the age of 28-35 years - 4.5 ± 1.7 versus 5.6 ± 1.2 and 36-42 years old - 3.7 ± 1.4 versus 4.9 ± 1.2 , respectively, in groups. In the control group of women, the number of antral follicles was not statistically significantly different from those in the comparison group with a similar age-related trend, but a slight increase was observed - 6.5 ± 1.3 , 5.9 ± 1.1 and 5.1 ± 1.6 according to age distribution.

In addition, the statistically significant difference in the volume of the ovaries and the number of antral follicles in the women of the studied groups, depending on the location relative to the pelvic floor, is drawn to the attention. Thus, in patients with functional infertility and ovaricovariocele, there is a significant difference in the direction of reduction of the indicator of the left ovary compared with the right ovary - $4.1 \pm 0.1 \text{ cm}^3$ vs. $4.7 \pm 1.6 \text{ cm}^3$. In the infertility group without varicose veins, ovarian veins were not diagnosed with a statistically significant difference between the left and right ovary parameters as in the control group of women - $5.8 \pm 1.4 \text{ cm}^3$ versus $5.9 \pm 1.6 \text{ cm}^3$ and $6.3 \pm 1.4 \text{ cm}^3$ versus $6.3 \pm 1.7 \text{ cm}^3$, respectively, in groups. A similar trend is observed with respect to the number of antral follicles, which in women of the main group was lower in the left ovary than in the right and this difference was statistically significant - 3.9 ± 1.1 versus 4.5 ± 1.1 . In the comparison group and the control group, a statistically significant difference between the numbers of antral follicles in the left and right ovaries was not found to be statistically significant - 5.6 ± 1.4 versus 5.6 ± 1.1 and 5.7 ± 1.5 versus 5.8 ± 1.2 in groups respectively.

Ovulatory function of the ovaries was studied using an ultrasound study based on morphological characteristics. The echographic signs of ovulation were the following: disappearance of a dominant follicle or a decrease in its size with deformation of the structure with shading and formation in the middle of the structure of middle echogenicity (yellow body), the presence of free fluid in the Douglas space. For example, in women with functional infertility and ovaricovariocele in 27 (43.5%) cases ovulation was observed with the formation of a yellow body, in 11 (17.7%) patients - persistence of the follicle, in 19 (30.6%) - absence of dominant follicles and in 5 (8.2%) women - premature luteinization of the follicle. In patients with infertility without varicose dilatation of ovarian veins, ovulation occurred in 25 (45.5%) cases, in 7 (12.7%) - persistence of the follicle, in 20 (36.4%) - absence of a dominant follicle and 3 (5.4%) is premature for his luteinists. As for women in the control group, the majority of them stated ovulation with the formation of a yellow body - 30 (90.9%).

Since in a significant percentage of cases in women with functional infertility, both with ovaricovariocele and without varicose veins, ovulation was confirmed, the main characteristics of the yellow body were studied by echographic study, namely, the ratio of its volume to the volume of the ovary, as well as the thickness the walls of the yellow body. Consequently, in women with a combination of varicose veins and functional infertility, and the average ratio of the volume of the yellow body to the ovarian volume was 0.22 ± 0.01 , which is statistically significantly lower than in patients with infertility without structural ovarian changes veins - 0.23 ± 0.02 and healthy women - 0.25 ± 0.01 . The thickness of the wall of the yellow body was $1.2 \pm 0.05 \text{ mm}$ in the main group and there was also a statistically significant difference in the indicators towards a significant decrease, while in the comparison group, this indicator was $2.3 \pm 0.03 \text{ mm}$ and in the control group $2.5 \pm 0.05 \text{ mm}$.

In addition to establishing the fact of ovulation, the echography of the pelvic organs allows indirect evaluation of the full function of the function of the yellow body by studying the morphological changes occurring in endometrium in luteal phase of the menstrual cycle during 3 cycles.

Thus, in studying the thickness of the endometrium in the middle of the secretory phase of the menstrual cycle, it was found that the average thickness of it in women with functional infertility without varicose widening of ovarian veins was 10 ± 2.1 mm, in the group of patients with infertility and varicose dilatation of ovarian veins - $8 \pm 1, 4$ mm, which is statistically significantly lower than in the women of the previous group and in healthy women - 13 ± 2.1 mm.

In addition to the thickness of endometrium, special attention was paid to its echostructure. Thus, the absence of complete secretory changes that echo-graphically showed an increase in echogenicity only in the peripheral regions of the M-echo with the hypoechogenic zone in center, the presence of its three-layer structure with hypoechoic functional layers occurred in 52 (83.8%) women in the main group, 39 (70.1%) of the patients in the comparison group and in 1 (3.0%) of the women from the control group, inconsistency in the structure of the endometrial phase of the cycle was observed in 10 (16.2%) women in the primary group and in 16 (29.9%) patients comparison groups.

In recent years, laparoscopic examination is considered as a compulsory component in a comprehensive examination of patients with infertility and suspicion of venous plethora of the pelvis. Therefore, diagnostic-therapeutic laparoscopy and hysteroscopy were performed to verify the diagnosis for all 62 women in the main group.

In all 62 (100%) women with laparoscopy, the expansion of the ovarian veins was established: in 28 (45.2%) cases varicose enlarged were only the ovarian ligaments on the left, in 21 (33.8%) - varicose veins were distributed on the vessels of a wide uterine ligament to the left. In 10 (16.1%) cases there was a varicose vein enlargement of the broad uterine ligament; in 3 (4.9%) patients there was venous dilation only in wide uterine ligaments from both sides. At the same time, in 27 (43.5%) patients, including women with the expansion of only extensive uterine ligament, the expansion of the veins of the small pelvis was more precisely diagnosed when trying to change the position of women on the operating table (the transition from the position of Trendelenburg to the position Fowler)

In parallel with the study of the venous pelvic system, an intraoperative evaluation of the morphofunctional state of the uterus and its adnexes was performed. Thus, in 45 (72.3%) cases, there was an isolated expansion of the ovarian veins; in 11 (17.7%) patients there was a multifollicular structure of the ovaries and in 6 (10.6%) cases, a functional ovarian cyst.

When performing diagnostic hysteroscopy, 9 (14.5%) patients had endometrial hyperplasia requiring biopsy of the material and confirmed in 4 (6.5%) women in the main group. Regarding other parameters, all women of the main group had normal size and shape of the uterus, absence of deformation, intrauterine sinenchy, endometrioid passages.

Conclusions and perspectives of further developments.

1. In women of the main group with a combination of functional infertility and ovaricoaricocele, there is a statistically significant increase in the percentage of incorrect position of the uterus - 36 (58.1%) in normal form and size. The last cases, both in the main group of women, and in the comparison group - 53 (85.5%) and 48 (87.3%) cases, respectively.

2. Analyzing the indicators of ovarian size and the number of antral follicles, a statistically significant difference was found in the direction of its reduction in women with functional infertility and ovaricoaricocele in spite of infertility women without varicose dilatation of ovarian veins - 4.1 ± 0.1 cm³ vs. 5.8 ± 1.4 cm³ and 3.9 ± 1.1 versus 5.6 ± 1.4 , respectively, in groups. In addition, there is a tendency to reduce the ovipositive obesity of the progradiental age in women of all the studied groups with statistically significant rates in the patients of the main group. Also, there is a difference in right ventricular left ventricle in women with infertility and ovarikovaricocele in the direction of decreasing the size of the latter, which may be due to the predominant localization of the enlarged gonadal vein, and this difference is statistically significant.

3. In determining the functional status of the ovaries in the vast majority of women in all the groups studied, ovulation was noted, however, when studying the characteristics of the functional state of the yellow body on the basis of echographic signs, a reduction in the thickness of the endometrium in the middle of the luteal phase of the menstrual cycle in patients in the main group, as well as the absence of the vast majority of cases of its adequate secretory changes, which is statistically significant against the women of the comparison group.

4. In patients, both the main group and the comparison group, there is a decrease in the ratio of volume of the yellow body and ovarian volume and reduction of the thickness of the wall of the yellow body, respectively, against the women of the control group, which is an ultrasound sign of inferiority of the yellow body and lack of luteal phase menstrual cycle. In addition, women in the main group have a statistically significant reduction in the rates against the women in the comparison group.

5. In women of the main group, a large percentage of varicose veins of the small pelvis have been established in the absence of organic changes in the uterus and appendages (73.3%) in the presence of infertility of obscure genesis.

Thus, ultrasound examination in combination with color Doppler mapping of patients with ovarikovarikocele is a highly informative method of research, because it allows to perform topical diagnosis, to determine the morphological character of the lesion, to differentiate the type of pathological process and to identify the concomitant pathology of the pelvic organs. The study suggests that ovarikovarikocele should be considered not only as an accompanying symptomatic changes in diseases of the female genital area, but also as one of the causes of ovarian dysfunction with delay or termination of growth of follicles, change in their size, degenerative-dystrophic changes in the ovaries, which leads to a violation hormonal homeostasis and manifested by reproductive disorders.

In the perspective of further research it is necessary to consider complex analysis of the morphological and functional characteristics of internal genital organs, which will allow to establish the presence of a certain functional and organic gynecological pathology and will enable to diagnose the initial and minimum course of the pathological process of pelvic organs, finally verify the final diagnosis and appoint pathogenetic treatment.

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