DOI 10.26724/2079-8334-2025-2-92-125-130
UDC 618.1-037-084:616-055.23-053.7-071.2

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PREDICTION OF GENITAL ENDOMETRIOSIS IN UKRAINIAN GIRLS DEPENDING ON THE FEATURES OF SONOGRAPHIC INDICATORS OF THE UTERUS AND OVARY

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In Ukrainian girls without and with somatotype, based on the features of the sonographic dimensions of the uterus and ovaries, reliable discriminant models were constructed that allow predicting the possibility of genital endometriosis with high probability (without taking into account somatotype – the correctness of the classification matrix is 98.8% of cases, Wilks' Lambda statistics=0.142, p<0.001; in mesomorphs – the classification matrix covers 95.9 % of cases, Wilks' Lambda statistics=0.231, p<0.001; in ectomorphs – the classification matrix covers 100 % of cases, Wilks' Lambda statistics=0.049, p<0.001; in ecto-mesomorphs – the classification matrix covers 100 % of cases, Wilks' Lambda statistics=0.061, p<0.001).

Key words: obstetrics and gynecology, genital endometriosis, Ukrainian girls, sonography, uterus, ovaries, menstrual cycle, somatotype, discriminant analysis.

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ПРОГНОЗУВАННЯ ГЕНІТАЛЬНОГО ЕНДОМЕТРІОЗУ В УКРАЇНСЬКИХ ДІВЧАТ У ЗАЛЕЖНОСТІ ВІД ОСОБЛИВОСТЕЙ СОНОГРАФІЧНИХ ПОКАЗНИКІВ МАТКИ ТА ЯЄЧНИКІВ

В українських дівчат без та з урахуванням соматотипу, на основі особливостей сонографічних розмірів матки та яєчників, побудовані достовірні дискримінантні моделі, які дозволяють з високою ймовірністю прогнозувати можливість виникнення генітального ендометріозу (без урахування соматотипу – коректність класифікаційної матриці 98,8 % випадків, статистика Wilks' Lambda=0,142, p<0,001; у мезоморфів – класифікаційна матриця охоплює 95,9 % випадків, статистика Wilks' Lambda=0,231, p<0,001; у ектоморфів – класифікаційна матриця охоплює 100 % випадків, статистика Wilks' Lambda=0,049, p<0,001; у екто-мезоморфів – класифікаційна матриця охоплює 100 % випадків, статистика Wilks' Lambda=0,061, p<0,001).

Ключові слова: акушерство та гінекологія, генітальний ендометріоз, українські дівчата, сонографія, матка, яєчники, менструальний цикл, соматотип, дискримінантний аналіз.

The study is a fragment of the research project "Prediction, diagnosis and prevention of reproductive disorders in women and girls in modern conditions", state registration No. 0122U002435.

Endometriosis is one of the most common and under-recognized gynecological diseases, often accompanied by chronic pain, infertility, and a significant decrease in the quality of life of women of reproductive age. According to a national epidemiological study that included more than 59,000 women in the United States, the incidence of endometriosis is approximately 6.1 % among those with a confirmed diagnosis, with a significant proportion of patients remaining undiagnosed for a long time [5].

This imbalance between the real and registered prevalence is partly explained by the complexity of diagnosis, the variability of the clinical picture, and the invasiveness of traditional verification methods. The uncertainty of the etiology and pathogenesis of endometriosis remains a serious obstacle for both clinical practice and scientific research. Koninckx P. R. et al. emphasize that the available epidemiological data are fragmentary and the true prevalence may be significantly higher than the current estimates, especially in populations with limited access to laparoscopic diagnostics [10].

There are also regional differences in the pattern of incidence. Thus, according to international reviews, the incidence of endometriosis ranges from 2 to 10 % in the general female population, but increases to 30–50 % in patients with chronic pelvic pain or infertility [6]. Endometriosis is often diagnosed in adolescence, when clinical symptoms are caused by dysmenorrhea, dyspareunia and other menstrual disorders. According to recent reviews, the most typical onset of symptoms is the age of 16–20 years [7].

A separate clinical problem is extragenital forms, in particular lesions of the urinary system, which can be asymptomatic until the development of complications. According to Barra F. et al., ureteral endometriosis occurs in 0.08-1 % of all cases, but the frequency of its detection increases significantly when performing specialized surgical interventions [1].

Infertility is another important clinical aspect associated with endometriosis. The work of Maggiore U. L. and colleagues indicates that the frequency of infertility among patients with this pathology exceeds

30 %, and in some samples reaches 50 % [11]. At the same time, the probability of pregnancy is significantly reduced in case of late diagnosis or in the presence of combined forms of damage to the reproductive system. Such data determine the need to develop prognostic models that would allow early detection of patients with an increased risk of pathology.

In general, endometriosis remains a polyetiological and multifactorial disease that requires an interdisciplinary approach to diagnosis and prevention. At the same time, the use of modern imaging methods allows us to investigate not only morphological, but also prognostic features of anatomical structures that may be involved in the pathological process.

The purpose of the study was to construct and analyze discriminant models of the possibility of genital endometriosis in Ukrainian girls without and with regard to somatotype, depending on the features of the sonographic dimensions of the uterus and ovaries in different phases of the menstrual cycle.

Materials and methods. On the basis of the Department of Obstetrics and Gynecology of the National Pirogov Memorial Medical University, Vinnytsya and the medical and diagnostic center "Vita Med Life" (Vinnytsya), a sonographic and somatotypological examination of 89 Ukrainian girls (aged 16 to 18 years) with genital endometriosis was performed. The diagnosis of genital endometriosis was made according to the updated guidelines of the European Society of Human Reproduction and Embryology (ESHRE) [2]. Committee on Bioethics of National Pirogov Memorial Medical University, Vinnytsya (protocol No. 11 from 3.12.2020) found that the studies do not contradict the basic bioethical standards of the Declaration of Helsinki, the Council of Europe Convention on Human Rights and Biomedicine (1977), the relevant WHO regulations and laws of Ukraine.

Using the ultrasound diagnostic medical device Aplio XG SSA-790 (Japan), the following sonographic dimensions of the uterus and ovaries were determined in the follicular and luteal phases of the menstrual cycle (MC): length of the uterine body, anterior-posterior size of the uterus, width of the uterus, thickness of the endometrium, length of the right ovary, width of the right ovary, thickness of the right ovary, length of the left ovary, width of the left ovary, thickness of the left ovary, volume of the right ovary and volume of the left ovary. Somatotypological examination according to the Heath-Carter method [4] revealed the following distribution by somatotype of sick girls: endomorphs – 1; mesomorphs – 45; ectomorphs – 23; ecto-mesomorphs – 12; endo-mesomorphs – 2; average intermediate somatotype – 6. Therefore, further modeling of the possibility of genital endometriosis was carried out in groups without taking into account somatotype, in mesomorphs, ectomorphs and ecto-mesomorphs.

As a control group, the primary sonographic indicators in the corresponding phases of MC of 78 practically healthy Ukrainian girls of a similar age group were taken from the data bank of the National Pirogov Memorial Medical University, Vinnytsya.

Discriminant models of the possibility of genital endometriosis depending on the features of the sonographic dimensions of the uterus and ovaries were built in the "Statistica 6.0" license package.

Results of the study and their discussion. When taking into account the sonographic dimensions of the uterus and ovaries in different phases of MC in practically healthy and genital endometriosis girls without taking into account somatotype, the discriminant function covers 100 % of practically healthy and 97.8 % of genital endometriosis girls. In general, the model that takes into account the sonographic dimensions of the uterus and ovaries in the follicular and luteal phases of MC in practically healthy and genital endometriosis girls without taking into account somatotype is correct in 98.8 % of cases. The discriminating variables between practically healthy and patients with genital endometriosis in Ukrainian girls, regardless of somatotype, are: uterine body length in the luteal phase of the menstrual cycle (LLM), anterior-posterior uterine size in the luteal phase of the menstrual cycle (LMPZ), right ovary length in the luteal phase of the menstrual cycle (LYLR), left ovary width in the luteal phase of the menstrual cycle (LYSHL), right ovary width in the follicular phase of the menstrual cycle (FYSHR), right ovary volume in the follicular phase of the menstrual cycle (VFYP), and anterior-posterior uterine size in the follicular phase of the menstrual cycle (FMPZ). The greatest contribution to discrimination is made by the width of the right ovary in the follicular phase of the menstrual cycle. The set of all sonographic variables has a pronounced (Wilks' Lambda statistic=0.142, χ^2=315.3, $p<0.001$) discrimination between practically healthy and girls with genital endometriosis without taking into account somatotype. To determine the classification indicators (Df), which allow to attribute the obtained sonographic indicators of the uterus and ovaries in different phases of MC to "typical" for practically healthy or girls with genital endometriosis without taking into account somatotype, we established the coefficients of the classification discriminant functions for each feature. Below are the equations, where the assignment to practically healthy girls without taking into account somatotype is possible at a Df value close to 142.7; and to girls with genital endometriosis without taking into account somatotype – at a Df value close to 130.1:

– Df (for practically healthy girls without taking into account somatotype)= LLM×1.698 + LMPZ×0.680 + LYLR×2.980 + LYSHL×1.641 + FYSHR×3.348 - VFYP×4.334 - FMPZ×0.116 - 142.7;

– Df (for girls with genital endometriosis, regardless of somatotype)= LLM×1.174 + LMPZ×1.061 + LYLR×3.865 + LYSHL×0.768 + FYSHR×1.929 - VFYP×2.672 + FMPZ×0.148 - 130.1;

where (here and in the following), the linear dimensions of the uterus and ovaries are in mm; the volume of the ovaries is in cm^3.

When taking into account the sonographic dimensions of the uterus and ovaries in different phases of MC in practically healthy and patients with genital endometriosis girls with a mesomorphic somatotype, the discriminant function covers 92.9 % of practically healthy and 97.8 % of patients with genital endometriosis girls. In general, the model that takes into account the sonographic dimensions of the uterus and ovaries in the follicular and luteal phases of MC in practically healthy and patients with genital endometriosis girls with a mesomorphic somatotype is correct in 95.9 % of cases. The discriminating variables between practically healthy and genital endometriosis patients in Ukrainian girls with a mesomorphic somatotype are: length of the right ovary in the luteal phase of the MC (LYLR), width of the left ovary in the luteal phase of the MC (LYSHL), thickness of the endometrium in the luteal phase of the MC (LMTE), volume of the right ovary in the luteal phase of the MC (VLYP), width of the right ovary in the follicular phase of the MC (FYSHR) and anterior-posterior size of the uterus in the follicular phase of the MC (FMPZ). The greatest contribution to discrimination is made by the length of the right ovary and the width of the left ovary in the luteal phase of the MC. The set of all sonographic variables has an average (Wilks' Lambda statistic=0.231, χ^2=99.74, p<0.001) discrimination between practically healthy and girls with genital endometriosis with a mesomorphic somatotype. Below, in the form of equations, the definition of the Df indicator is given, where the assignment to practically healthy girls with a mesomorphic somatotype is possible with a Df value close to 127.8; and to girls with genital endometriosis with a mesomorphic somatotype – with a Df value close to 120.2:

– Df (for practically healthy girls with a mesomorphic somatotype)=LYLR×3.210 + LYSHL×1.403 + LMTE×9.836 - VLYP×3.974 + FYSHR×1.960 + FMPZ×0.502 - 127.8;

– Df (for patients with genital endometriosis, girls with a mesomorphic somatotype)= LYLR×4.119 + LYSHL×0.381 + LMTE×8.476 - VLYP×3.131 + FYSHR×1.437 + FMPZ×0.670 - 120.2.

When taking into account the sonographic dimensions of the uterus and ovaries in different phases of the MC in practically healthy and genital endometriosis patients with ectomorphic somatotype girls, the discriminant function covers 100 % of practically healthy and 100 % of genital endometriosis patients. The discriminant variables between practically healthy and genital endometriosis patients Ukrainian girls with mesomorphic somatotype are: anterior-posterior dimension of the uterus in the luteal phase of the MC (LMPZ), endometrial thickness in the follicular phase of the MC (FMTE), left ovary thickness in the follicular phase of the MC (FYTL), right ovary volume in the follicular phase of the MC (VFYP) and right ovary width in the follicular phase of the MC (FYSHR). The greatest contribution to the discrimination is made by the anterior-posterior dimension of the uterus in the luteal phase of the MC. The set of all sonographic variables has a very pronounced (Wilks' Lambda statistic=0.049, χ^2=117.1, p<0.001) discrimination between practically healthy and girls with genital endometriosis with an ectomorphic somatotype. Below, in the form of equations, the definition of the Df indicator is given, where the assignment to practically healthy girls with an ectomorphic somatotype is possible with a Df value close to 108.1; and to girls with genital endometriosis with an ectomorphic somatotype – with a Df value close to 131.7:

– Df (for practically healthy girls with an ectomorphic somatotype)=LMPZ×2.613 - FMTE×3.507 + FYTL×1.022 - VFYP×7.812 + FYSHR×7.125 - 108.1;

– Df (for patients with genital endometriosis, girls with an ectomorphic somatotype)=LMPZ×6.231 - FMTE×7.986 - FYTL×2.016 - VFYP×0.692 + FYSHR×2.770 - 131.7.

Taking into account the sonographic dimensions of the uterus and ovaries in different phases of the MC in practically healthy and genital endometriosis patients with ecto-mesomorphic somatotype girls, the discriminant function covers 100 % of practically healthy and 100 % of genital endometriosis patients. The discriminant variables between practically healthy and genital endometriosis patients Ukrainian girls with mesomorphic somatotype are: width of the left ovary in the luteal phase of the MC (LYSHL), length of the right ovary in the follicular phase of the MC (FYLR), width of the right ovary in the follicular phase of the MC (FYSHR), length of the right ovary in the luteal phase of the MC (LYLR), length of the left ovary in the follicular phase of the MC (FYLL). The greatest contribution to the discrimination is made by the width of the right ovary in the follicular phase of the MC. The set of all sonographic variables has a very pronounced (Wilks' Lambda statistic=0.061, χ^2=60.06, p<0.001) discrimination between practically healthy and girls with genital endometriosis with an ecto-mesomorphic somatotype. Below, in the form of equations, the definition of the Df indicator is given, where the assignment to practically healthy girls with

an ecto-mesomorphic somatotype is possible with a Df value close to 262.3; and to girls with genital endometriosis with an ecto-mesomorphic somatotype – with a Df value close to 331.3:

– Df (for practically healthy girls with an ecto-mesomorphic somatotype)=LYSHL×7.007 + FYLR×2.861 - FYSHR×6.433 + LYLR×6.082 + FYLL×8.671 - 262.3;

– Df (for patients with genital endometriosis, girls with an ecto-mesomorphic somatotype) =LYSHL×5.802 + FYLR×5.394 - FYSHR×11.67 + LYLR×8.723 + FYLL×10.53 - 331.3.

Thus, when dividing Ukrainian girls into practically healthy and patients with genital endometriosis without taking into account somatotype, a reliable pronounced discrimination (Wilks' Lambda statistic=0.142, χ^2=315.3, p<0.001) of the obtained classification indicators was established (the correctness of entering the models of sonographic sizes of the uterus and ovaries in different phases of the MC is 98.8 % of cases). The models include the linear dimensions of the uterus (42.86 %, of which 28.57 % in the luteal phase of the MC and 14.29 % in the follicular phase of the MC), the linear dimensions of the ovaries (42.86 %, of which 28.57 % in the luteal phase of the MC and 14.29 % in the follicular phase of the MC) and the volume of the right ovary in the follicular phase of the MC (14.29 %). The greatest contribution to the discrimination between practically healthy and genital endometriosis girls without taking into account the somatotype has the width of the right ovary in the follicular phase of the MC. When dividing Ukrainian girls into practically healthy and genital endometriosis patients of the mesomorphic somatotype, a reliable average discrimination (Wilks' Lambda statistic=0.231, χ^2=99.74, p<0.001) of the obtained classification indicators was established (the correctness of the entry into the models of sonographic sizes of the uterus and ovaries in different phases of the MC is 95.9 % of cases). The models include the linear dimensions of the ovaries (50.00 %, of which 33.33 % in the luteal phase of the MC and 16.67 % in the follicular phase of the MC), the volume of the right ovary in the luteal phase of the MC (16.67 %), the anterior-posterior size of the uterus in the follicular phase of the MC (16.67 %) and the thickness of the endometrium in the luteal phase of the MC (16.67 %). The greatest contribution to the discrimination between practically healthy and genital endometriosis-stricken girls of the mesomorphic somatotype is the length of the right ovary and the width of the left ovary in the luteal phase of the MC.

When dividing Ukrainian girls into practically healthy and patients with genital endometriosis of the ectomorphic somatotype, a reliable and very pronounced discrimination (Wilks' Lambda statistic=0.049, χ^2=117.1, p<0.001) of the obtained classification indicators was established (the correctness of entering the models of sonographic sizes of the uterus and ovaries in different phases of the MC is 100 % of cases). The models include linear dimensions of the ovaries (40.00 %, all in the follicular phase of the MC), the volume of the right ovary in the follicular phase of the MC (20.00 %), the anterior-posterior size of the uterus in the luteal phase of the MC (20.00 %) and the thickness of the endometrium in the follicular phase of the MC (20.00 %). The greatest contribution to the discrimination between practically healthy and genital endometriosis-suffering girls of the ectomorphic somatotype is made by the anterior-posterior size of the uterus in the luteal phase of the menstrual cycle.

When dividing Ukrainian girls into practically healthy and genital endometriosis-suffering girls of the ecto-mesomorphic somatotype, a reliable and very pronounced discrimination (Wilks' Lambda statistic=0.061, χ^2=60.06, p<0.00) of the obtained classification indicators was established (the correctness of the entry into the models of sonographic sizes of the uterus and ovaries in different phases of the menstrual cycle is 100 % of cases). The models include only linear sizes of the ovaries (of which 60.00 % in the follicular phase of the menstrual cycle and 40.00 % in the luteal phase of the menstrual cycle). The greatest contribution to the discrimination between practically healthy and genital endometriosis-affected girls of the ecto-mesomorphic somatotype is the width of the right ovary in the follicular phase of the MC.

The results of our study on the relationship between ultrasound parameters of the reproductive system and the risk of developing gynecological pathology are consistent with the literature, which confirms the influence of anthropometric indicators and morphological features of the pelvic organs on the frequency of disease detection. In particular, Jenabi E. et al. in a meta-analysis involving more than 14 thousand women found an inverse relationship between body mass index (BMI) and the risk of developing endometriosis (OR=0.89; 95 % CI: 0.83-0.96), which suggests a specific role of adipose tissue in the pathogenesis of this disease [8].

Similar conclusions are supported by the data of Sánchez-Ferrer M. L. et al., who studied body structure in patients with polycystic ovary syndrome and found that skin-fat fold thickness in different areas of the body differed depending on the clinical phenotype. The most pronounced disorders are characteristic of patients with hyperandrogenism, which indicates a complex interaction between metabolic, hormonal and anatomical factors [12]. This is consistent with the hypothesis that an imbalance in tissue fat metabolism can indirectly affect the functional state of the reproductive organs, including their ultrasound structure.

Also interesting are the data of the study by Khamdamova M. T. and Tukhtasinovna K. M., who studied the ultrasound features of the uterus and ovaries in women using different types of contraceptives.

They found statistically significant variability in the size and shape of both the uterus and ovaries, which, according to their conclusions, may be associated with the effect of estrogen-gestagen drugs on the endometrium and ovarian tissue [9]. This approach demonstrates the value of sonography not only as a diagnostic tool, but also as a source of prognostic information in assessing the risk of developing diseases associated with hormonal background.

In addition, a growing body of research has focused on ethnic and regional differences in the incidence of endometriosis. Bougie O. and colleagues demonstrated in a systematic review that Asian women had a 50 % higher risk of developing endometriosis compared with Caucasian women, while African-American women had a lower risk (OR=0.49; 95 % CI: 0.29-0.83) [3]. Although the mechanisms of these differences are not fully understood, it is possible that anthropometric characteristics, including fat distribution and somatotype, may play a role in these intergroup variations.

The study by Yen C. F., Kim M. R. and Lee C. L. emphasized the role of epidemiological factors, among which urbanization, physical activity level, and body weight are particularly important. The authors note that in East Asia, the prevalence of endometriosis ranges from 6-12 %, but shows a tendency to increase in megacities, where the body mass index of women is mainly lower than the average [15].

Thus, the results of the above studies confirm the relevance of studying the relationships between somatic and morphometric indicators and the risk of developing endometriosis. Taking into account anthropometric and echographic parameters can not only improve diagnostics, but also play a prognostic role in risk stratification and the selection of individualized prevention for young patients.

Conclusions

1. Based on the features of the sonographic dimensions of the uterus and ovaries, reliable highly informative discriminant models have been developed that allow predicting the possibility of genital endometriosis in Ukrainian girls regardless of somatotype (the classification matrix covers 98.8 % of cases, Wilks' Lambda statistics=0.142), as well as in representatives of mesomorphic (the classification matrix covers 95.9 % of cases, Wilks' Lambda statistics=0.231), ectomorphic (the classification matrix covers 100 % of cases, Wilks' Lambda statistics=0.049) and ecto-mesomorphic somatotypes (the classification matrix covers 100 % of cases, Wilks' Lambda statistics=0.061).

2. The greatest contribution to the discrimination between practically healthy and patients with genital endometriosis in Ukrainian girls is made by: in the group without taking into account the somatotype – the width of the right ovary in the follicular phase of the MC; in mesomorphs – the length of the right ovary and the width of the left ovary in the luteal phase of the MC; in ectomorphs – the anterior-posterior size of the uterus in the luteal phase of the MC; in ecto-mesomorphs – the width of the right ovary in the follicular phase of the MC.

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Стаття надійшла 19.06.2024 р.

DOI 10.26724/2079-8334-2025-2-92-130-135
UDC 616.61-78-073.432.1

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STUDY OF VASCULAR ACCESS IN HAEMODIALYSIS PATIENTS USING ULTRASONOGRAPHY

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The purpose of this study was to evaluate the efficacy of arteriovenous fistula using ultrasound technique in patients undergoing haemodialysis, taking into account their anamnesis analysis and their psychological state assessment. The study involved 76 patients with chronic kidney disease aged 25 to 70 years. During the ultrasound assessment of arteriovenous fistula in patients, the diameter, lumen, compressibility of the vein and its location relative to the skin were analyzed, as well as the feeding artery was examined. Bloodflow assessment in vascular access was performed using colour Doppler mapping and pulse dopplerometry. In patients without complications in vascular access, the average diameter of the feeding artery was 4.3±1.4 mm. The diameter of the anastomosis ranged from 1.4 mm to 10 mm. The volumetric bloodflow rate in the vascular access was from 500 ml/min to 1600 ml/min which corresponds to the standard values for a functioning arteriovenous fistula. Anatomical and individual tissue characteristics of each patient and concomitant diseases reduce the efficacy of fistula and increase the risk of complications. Ultrasonography allows for the timely detection of anatomical and functional changes affecting the effectiveness of hemodialysis, which makes this method a valuable tool for diagnostics and monitoring. Authors conclude that ultrasound Doppler study is the main method for vascular access monitoring in the complex management of patients receiving renal replacement therapy. Evaluation of the psychological state of patients on hemodialysis showed a decrease in interest in life, a feeling of dissatisfaction, despair, hopelessness and fear for the future, which worsened during the outbreak of military actions in Ukraine.

Key words: chronic kidney disease, hemodialysis, arteriovenous fistula, ultrasonography, efficacy, quality of life.

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ДОСЛІДЖЕННЯ СУДИННОГО ДОСТУПУ У ПАЦІЄНТІВ НА ГЕМОДІАЛІЗІ ІЗ ЗАСТОСУВАННЯМ УЛЬТРАСОНОГРАФІЇ

Метою дослідження було визначення ефективності артеріовенозної фістули за допомогою ультразвукового методу у пацієнтів, які перебувають на гемодіалізі, враховуючи аналіз анамнезу та оцінку їхнього психологічного стану. У дослідженні взяли участь 76 пацієнтів із хронічною хворобою нирок віком від 25 до 70 років. При ультразвуковій оцінці артеріовенозної фістули у пацієнтів проводився аналіз діаметра, просвіту, компресивності вени та її розташування щодо шкіри, а також дослідження артерії живлення. Оцінка кровотоку в судинному доступі здійснювалася з використанням кольорового доплерівського картування та імпульсної доплерометрії. У пацієнтів без ускладнень у судинному доступі середній діаметр живильної артерії становив 4.3±1.4 мм. Діаметр анастомозу складав від 1.4 мм до 10 мм. Об'ємна швидкість кровотоку в судинному доступі дорівнювала від 500 мл/хв до 1600 мл/хв, що відповідає нормативним показникам для артеріовенозної фістули що функціонує. Анатомічні та індивідуальні особливості тканин кожного пацієнта, супутні захворювання знижують ефективність фістули та збільшують ризик ускладнень. Ультрасонографія дозволяє своєчасно виявляти анатомічні та функціональні зміни, що впливають на ефективність гемодіалізу, що робить цей метод цінним інструментом діагностики та моніторингу. Автори висловлюють, що ультразвукове доплерівське дослідження є основним методом моніторингу судинного доступу в комплексному лікуванні пацієнтів, які отримують замісну ниркову терапію. Оцінка психологічного стану пацієнтів, які перебувають на гемодіалізі, показала зниження інтересу до життя, почуття незадоволеності, відчаю, безвихідь та страху за майбутнє, що посилилося в період початку військових дій в Україні.

Ключові слова: хронічна хвороба нирок, гемодіаліз, артеріовенозна фістула, ультрасонографія, ефективність, якість життя.

The study is a fragment of the research project "The latest treatment, diagnostic and preventive approaches for diseases of the female reproductive system and high-risk pregnancy", state registration No. 0122U201370.

Kidney diseases are among the most common diseases worldwide and the number of patients suffering from chronic kidney disease increases annually. Chronic renal failure affects more than 10 % of the world's population. This pathology is one of the leading causes of death worldwide in the 21st century [7, 8]. According to WHO estimates, kidney diseases are the tenth leading cause of death. The mortality rate from these diseases increased from 813 thousand cases in 2000 to 1.3 million in 2019 [7].