FEATURES OF UTERINE CAVITY IN WOMEN WITH EXTRAGENITAL DISORDERS AND ABNORMAL UTERINE BLEEDINGS

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INTRODUCTION

The lifestyle of a modern woman under the influence of unfavorable environmental conditions, psychological stress, dietary habits leads to an increase frequency of menstrual dysfunction, causes an increase in the prevalence of abnormal uterine bleeding (AUB) and a deterioration of reproductive function. AUB is common in women of all age groups and is characterized by heavy menstrual bleeding, irregular or intermenstrual bleeding [1–2]. According to international studies, 70% of patients seek gynecologist's advice due to AUB in a group of reproductive aged women [3]. An important pathological trigger for menstrual and reproductive disorders is the state of general somatic health of the patients. The most common extragenital pathological conditions in this case reveal various disorders of the central and autonomic nervous system, in particular, autonomic dysfunction, complicating the course of the main gynecological disease of the female body at different ages, from puberty to menopause [4–6].

Standard diagnosis for AUB includes ultrasound, endometrial biopsy, and hysteroscopy [7]. Contrast sonography with saline or gel infusion, 3D ultrasound and magnetic resonance imaging can be performed additionally [8].

Transvaginal ultrasound is considered a relatively safe, non-invasive and simple procedure and is recommended as a first-line screening diagnostic tool, which gives a clear idea of most pathological conditions of the uterus, as well as its appendages [9, 10].

To clarify the nature of small intrauterine pathology (small polyps of the endometrium, submucous myomatous nodes), ultrasound is used with the infusion of saline into the uterine cavity. Usually this image is only two-dimensional, but now there is a technical possibility of a three-dimensional image for a more accurate determination of the type of abnormality [11–15]. This method is also used to determine the need for such invasive diagnostic method as hysteroscopy [16].

Compared to transvaginal ultrasound, magnetic resonance imaging (MRI) is a more accurate but expensive technique that is rarely used. MRI is recommended in cases of poor visualization of the uterine cavity to assess the endometrium [17–19].

Nowadays, hysteroscopy has become the gold standard in the assessment of AUB. This method makes it possible to directly visualize the uterine cavity, endometrium and the orifice of the fallopian tubes, in addition, to assess the vaginal pathology, which may be the cause of AUB. In doubtful cases, a targeted biopsy can be performed using hysteroscopy to exclude false negative results from a blind biopsy [20]. Today, hysteroscopy has become a simpler, safer outpatient procedure that is well tolerated by most patients [15, 21–23].

Given the high prevalence of AUB, timely identification of the causes of this pathology can prevent the development of complications and such long-term consequences as infertility and malignant neoplasms [8, 24, 25]. An accurate diagnosis is of paramount importance for the effective treatment of AUB.

Objective of the study: to determine the characteristics of the uterine cavity in women with extragenital pathology with AUB using modern diagnostic methods.

MATERIALS AND METHODS

The study was carried out at the Department of Obstetrics, Gynecology and Pediatric Gynecology of Kharkiv National Medical University (the clinical base of the department is municipal non-profit enterprise "City Maternity Hospital No. 1" of Kharkiv City Council).

The study involved 100 women with concomitant extragenital disorders, who were admitted due to AUB. These patients constituted the main group. The control group consisted of 50 somatically healthy women who visited a gynecologist for medical examination. Patients of the main and control groups were of reproductive age from 18 to 44 years.

To assess the pelvic organs, all women underwent ultrasound examination with color Doppler mapping according to the standard technique using the Mindray-8 ultrasound scanner with abdominal and vaginal convex transducers and a frequency of 3.5–7.5 MHz, respectively. To clarify the diagnosis, some patients underwent MRI. Due to the presence of AUB, patients of the main group underwent hysteroscopy and/or separate diagnostic curettage with further morphological assessment of the obtained material. All patients

were consulted by related specialists (general practitioner, neuropathologist, surgeon) to identify extragenital disorders.

Statistical data processing was carried out using the general-purpose data processing software package "Statistica for Windows" version 6.1. Interval scale data are presented either as M ± m, where M is the sample mean; m is the error of the mean or a set of descriptive statistics (sample mean and median as characteristics of the central tendency, minimum and maximum values, lower and upper quartiles as indicators of dispersion). A numerical value with a percentage of the total was used to represent the data on the nominal scale. Given the small sample size, quantitative comparisons were made using the Kruskal–Wallis test (KWT) and the Mann–Whitney test (MWT).

The study was approved by the ethics committee of Kharkiv National Medical University (protocol No. 2, September 17, 2019). All women were informed and agreed to participate in the study.

RESULTS AND DISCUSSION

A comprehensive study found that AUB in 100 women developed secondary to extragenital disorders. Assessment of the state of somatic health of women often revealed the following extragenital disorders: nervous (often autonomic dysfunction), respiratory, hepatobiliary and urinary, gastrointestinal diseases. Due to the presence of abdominal pain in a significant number of patients, they were examined by a surgeon together with a gynecologist to rule out acute abdominal symptoms.

The results of ultrasound showed that the uterus size corresponded to physiological norms in the control group (Table 1). The uterine cavity was without additional inclusions. Assessment of median M-echo was performed in the first phase of the menstrual cycle. It was found that its thickness was 6 ± 3 mm and was characterized by smooth, clear contours, high echo density.

Table 1. Ultrasound characteristics of the uterus size of the control group

Length, mm	Thickness, mm	Width, mm	Volume, cm^3
60.1 ± 7.1	41.4 ± 5.9	58.7 ± 4.3	66.5 ± 13.0

The women of the main group were further divided into subgroups depending on the detected pathological changes in the uterine cavity: endometrial polyp (EP) (glandular polyp (GP), adenofibromatous polyp (AFP)), submucosal leiomatous node (SL), endometrial polyp and submucosal leiomatous node (EPSL), endometrial hyperplasia (EH), endometrial hyperplasia in combination with submucosal leiomatous node (EHSL) (Table 2).

Table 2. Frequency of ultrasound changes in the uterine cavity in the main group

Ultrasound evaluation	Number of women, n (%)
EP: • GP • AFP	25 (25%) 18 (18%) 7 (7%)
SL	9 (9%)
EPSL	15 (15%)
EH	28 (28%)
EHSL	23 (23%)

The size of the uterus in the main group varied depending on the detected changes in its cavity (Table 3).

Table 3. Ultrasound characteristics of uterine size in the main group, depending on the detected changes in its cavity

Uterine cavity	Length, mm	Thickness, mm	Width, mm	Volume, cm^3
EP	62.4 ± 5.7*	43.1 ± 7.8*	60.4 ± 6.6*	67.3 ± 17.9*
SL	68.6 ± 6.2*	45.3 ± 6.3*	62.5 ± 5.9*	74.1 ± 15.6*
EPSL	72.5 ± 5.8*	47.2 ± 6.1*	66.0 ± 4.3*	73.5 ± 14.4*
EH	65.7 ± 7.6*	46.4 ± 4.7*	63.6 ± 4.6*	71.0 ± 18.9*
EHSL	77.4 ± 6.9*	50.2 ± 5.1*	68.4 ± 5.0*	76.3 ± 19.7*

* $p < 0.05$, statistically significant differences compared with the control group (KWT, MWT)

Evaluation of the obtained data showed that in the main group the average length of the uterus was the smallest in patients with EP (KWT, MWT, $p < 0.05$). The increase in uterine thickness and width was also less pronounced in this category of subjects (KWT, MWT, $p < 0.05$), while the largest uterine size (1.2-fold increase) was recorded in women with submucosal uterine leiomyoma and hyperplastic endometrial process.

The thickness of the endometrium in the main group was 12 ± 4 mm. Thus, in patients with hyperplastic process of the endometrium there was increased echogenicity of the endometrium of heterogeneous structure, sometimes there were anechoic inclusions of different sizes (Fig. 1).

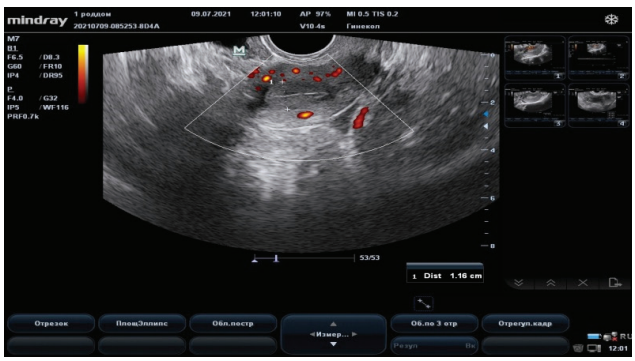

Figure 1. Hyperplastic process of the endometrium

Ultrasound examination suggested that there were polyps of medium size (8 ± 3 mm). Histological examination confirmed the diagnosis. Thus, 15 (15%) women were shown to have single or multiple formations of round or oval shape, reduced or inhomogeneous structure (GP) (Fig. 2). In 8 (8%) subjects such formations were of increased echogenicity with clear contours (AFP) (Fig. 3). All formations were separated from the surrounding tissues by hypoechoic rim. Polyps of the uterine cavity of large size (12 ± 2 mm) were found in 3 (3%) women (Fig. 4).

When submucosal uterine fibroids were suspected, ultrasound was performed to clarify the diagnosis in women of the main group. A formations of 16 ± 4 mm round or oval shape with clear, smooth contours of low echogenicity was visualized in in the uterine cavity of 46 (46%) patients of the

main group. These formations were regarded as submucosal leiomatous nodes (Fig. 5). A combination of endometrial polyp and submucosal leiomatous node was found in 15 (15%) individuals (Fig. 6).

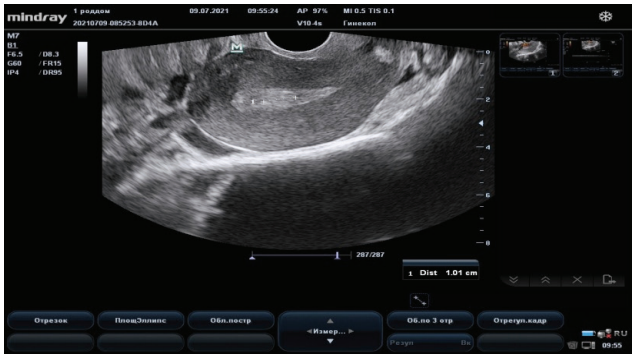

Figure 2. Glandular polyp of the uterine cavity

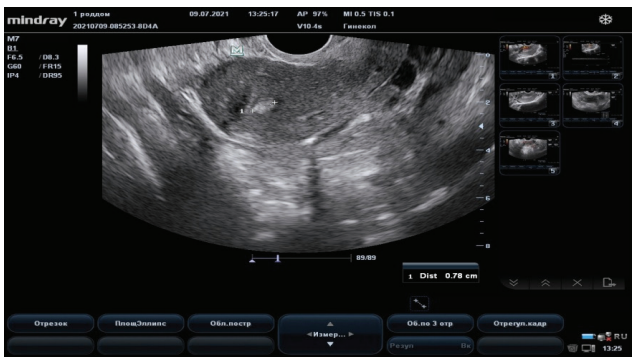

Figure 3. Adenofibromatous polyp of the uterine cavity

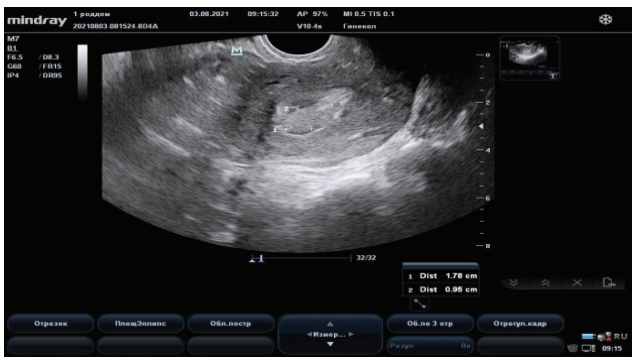

Figure 4. Large polyp of the uterine cavity

When submucosal uterine fibroids were suspected, ultrasound was performed to clarify the diagnosis in women of the main group. A formations of 16 ± 4 mm round or oval shape with clear, smooth contours of low echogenicity was visualized in in the uterine cavity of 46 (46%) patients of the main group. These formations were regarded as submucosal leiomatous nodes (Fig. 5). A combination of endometrial polyp and submucosal leiomatous node was found in 15 (15%) individuals (Fig. 6).

A Doppler study showed that endometrial blood flow was characterized by a few vessels that were evenly located in the peripheral parts of the endometrium.

In hyperplastic processes of the endometrium, the characteristic feature of endometrial blood flow was increased speed and resistance (Fig. 7).

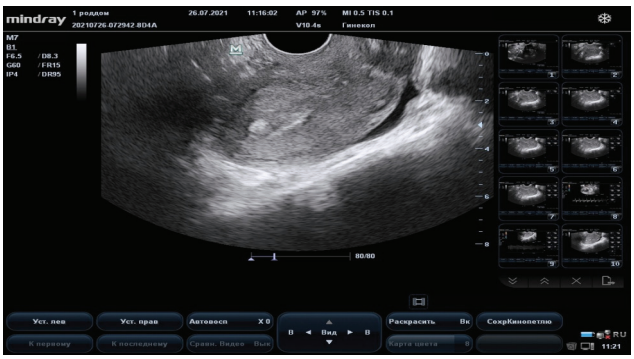

Figure 5. Submucosal leiomatous node

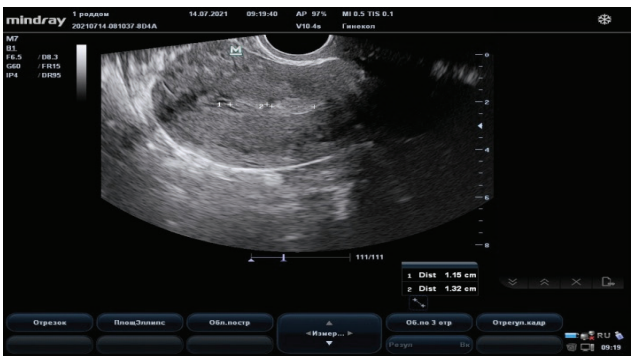

Figure 6. Endometrial polyp and submucosal uterine leiomyoma

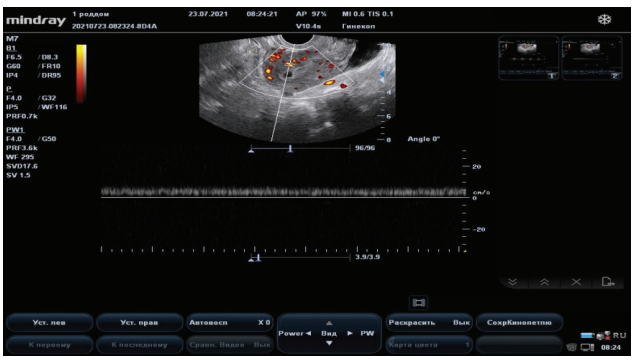

Figure 7. Intra-endometrial peripheral blood flow. The spectrum of the venous type curve

At a Doppler study of the uterine cavity with an endometrial polyp the characteristic feature was the "vascular leg" (Fig. 8).

Figure 8. Doppler study. "Vascular leg" of an endometrial polyp

Color Doppler mapping was used to make a differential diagnosis between EP and submucosal leiomatous node. The absence of "vascular leg" and the presence of blood flow on the periphery of the formation testified in favor of submucosal leiomatous node. MRI was performed to confirm the diagnosis (Fig. 9).

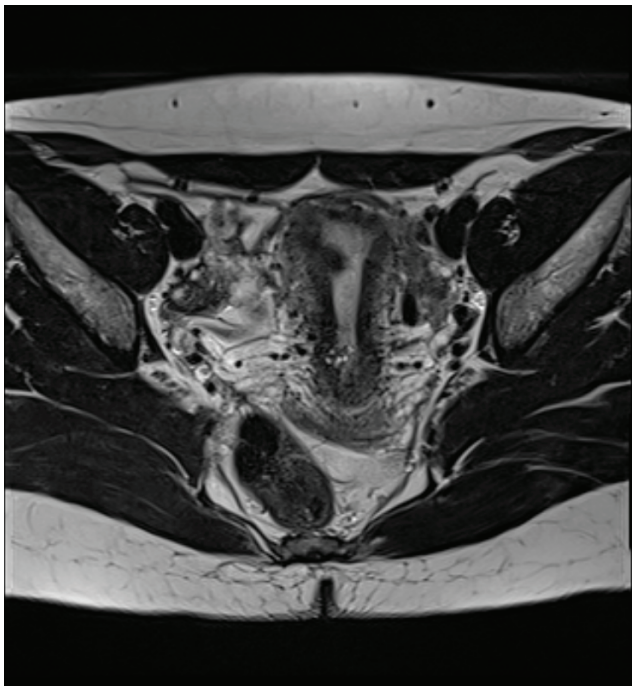

Figure 9. Magnetic resonance imaging. Submucosal leiomatous node

During the Doppler study, blood flow in the uterine, basal and spiral arteries was analyzed depending on the ultrasound assessment of the uterine cavity in patients of the control (Table 4) and the main groups (Fig. 10–12).

The study of pulsation index (PI) in the right and left uterine arteries (UA) showed that these indicators did not have significant differences in measurement in the same woman, so the average PI UA was taken into account for further study.

Thus, in women of the control group, the median value of PI in UA was 1.67, and the minimum and maximum 1.5 and 2.67 respectively. In BA the magnitude of variation was 0.58–0.79, and the median value was 0.67. In the SA the range of variation was 0.49–0.69, and the median value was 0.59.

At the time of diagnosis the examined patients were found to have a significant increase in the PI level in all studied vessels compared with the corresponding values in the control group (KWT, MWT, $p < 0.001$).

The study of PI in UA determined a statistically significant excess of the index in the main group compared with the control group by 1.3 times (Fig. 10). In the main group PI was studied depending on the identified ultrasound changes in the uterine cavity. In women with GP the interquartile range was 1.73 ÷ 2.39, and the median value of this indicator was 2.07. The following data were obtained in patients with AFP: interquartile range 1.89 ÷ 2.76, median value 2.15. In patients of the main group with SL the interquartile range was at the level of 1.58 ÷ 2.14, the median value was 1.9, and in the patients with EPSL the interquartile range was 1.7 ÷ 2.43, the median value was 2.17. In women with EH the interquartile range 1.67 ÷ 2.40, the median value was 2.04, in women with EHSL 1.72 ÷ 2.46 and 1.99 respectively.

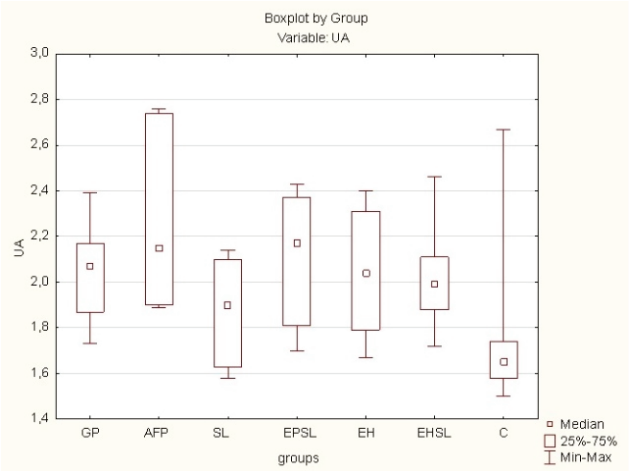

Figure 10. PI in UA in the control and main groups depending on echographic changes in the uterine cavity

Evaluation of PI in the basal arteries in the control group revealed median 0.67; interquartile range 0.58 ÷ 0.79. At the same time, the median value of this indicator in patients with GP and AFP 1.05 and 1.00 respectively (with an interquartile range of 0.90 ÷ 1.14 in women with GP and 0.86 ÷ 1.10 with AFP) (Fig. 11). In patients with SL and EPSL the median PI was 0.97 and 1.07 respectively (with an interquartile range of 0.87 ÷ 1.07 and 0.95 ÷ 1.20). In women of the main group with EH and EHSL the median PI value was 0.89 and 0.96 respectively (with an interquartile range of 0.80 ÷ 0.96 and 0.82 ÷ 1.06). The highest level of PI was in women with EPSL and exceeded this index by 1.6 times compared with the control group.

In the study of PI in the spiral arteries found a statistically significant increase in its level in the main group compared with

Table 4. Indicators of pulsation index in the studied vessels in the control group

Vessels under study	Statistical indicators							
	n	Average	Median	Minimum	Maximum	Lower quartile	Top quartile	SD
Uterine arteries (UA)	50	1.67	1.65	1.5	2.67	1.58	1.74	1.74
Basal arteries (BA)	50	0.67	0.67	0.58	0.79	0.6	0.72	0.72
Spiral arteries (SA)	50	0.58	0.59	0.49	0.69	0.53	0.64	0.64

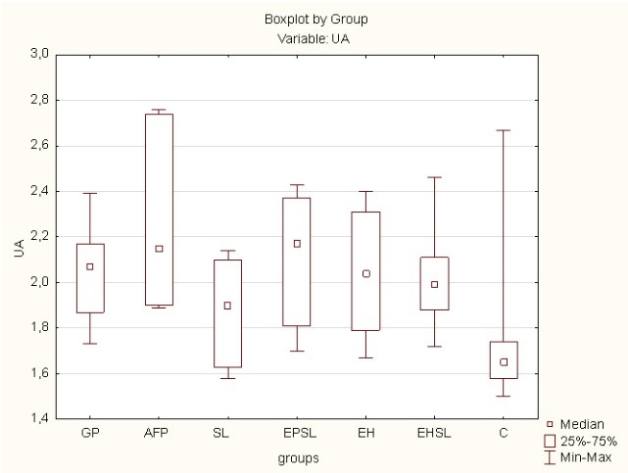

Figure 11. PI in BA in the control and main groups depending on echographic changes in the uterine cavity

the control group by 1.89 times (Fig. 12). In patients with GP the interquartile range was 0.77 ÷ 0.99, and the median value of this indicator was 0.89. The following data were obtained in the AFP group: interquartile range 1.00 ÷ 1.20, median value 1.12. In the group with SL the interquartile range was 0.82 ÷ 1.05, the median value was 0.97, and in the group with EPSL the interquartile range was 0.97 ÷ 1.22, the median value was 1.09. In the groups with EH and EHSL the interquartile range was 0.78 ÷ 0.89 and 0.84 ÷ 1.12 respectively, the median value was 0.82 and 0.985. The highest level of PI was registered in women with AFP and EPSL.

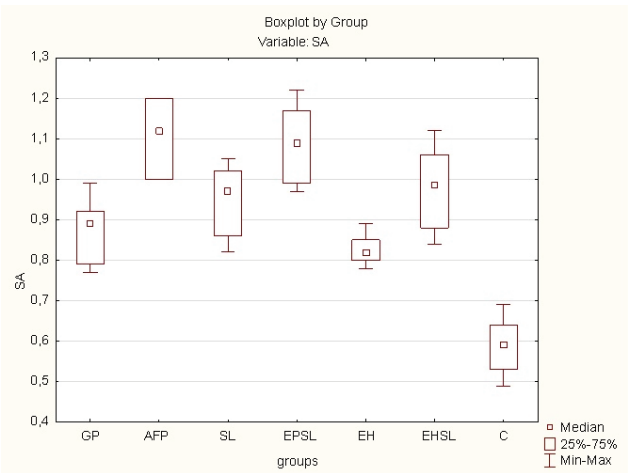

Figure 12. PI and SA in the control and main groups depending on echographic changes in the uterine cavity

CONCLUSIONS

The most common disorder of the uterine cavity in women with extragenital diseases and AUB detected by ultrasound scan were uterine polyps and endometrial hyperplasia. A feature of blood flow in pathological processes in the uterine cavity was an increase in the PI in the UA, BA and SA in the main group compared with the control group.

Conflict of interest

There is no conflict of interest.

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FEATURES OF UTERINE CAVITY IN WOMEN WITH EXTRAGENITAL DISORDERS AND ABNORMAL UTERINE BLEEDINGS

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Objectives: to determine the features of the uterine cavity in women with extragenital disorders and abnormal uterine bleedings (AUB) using modern diagnostic methods.

Materials and methods. The study involved 100 women with AUB and concomitant extragenital disorders, who constituted the main group. The control group consisted of 50 somatically healthy women. Women underwent ultrasound with Doppler mapping, and MRI if indicated to assess the condition of the pelvic organs. Due to the presence of AUB the patients of the main group underwent hysteroscopy and/or separate diagnostic curettage with further morphological assessment of the material obtained.

Results. Ultrasound showed that the uterine size in women of the control group corresponded to physiological norms, and the thickness and structure corresponded to the M-echo phase of the menstrual cycle. The main group was additionally divided into subgroups depending on the detected pathological changes in the uterine cavity: endometrial polyp (glandular polyp, adenofibromatous polyp), submucous leiomatous node, endometrial polyp and submucous leiomatous node, endometrial hyperplasia, endometrial hyperplasia in combination with submucous leiomatous node. During the Doppler study the blood flow in the uterine, basal and spiral arteries was analyzed depending on the echographic assessment of the state of the uterine cavity in the main group in comparison with the data of the control group. The patients of the main group were found to have a significant increase in the level of the pulsation index in all the studied vessels in comparison with the corresponding values in the control group (Kruskal–Wallis test, Mann–Whitney test, $p < 0.001$).

Conclusions. The most common disorder of the uterine cavity in women with extragenital diseases and AUB, detected by ultrasound scanning, were polyps of the uterine cavity and endometrial hyperplasia. A feature of blood flow in pathological processes in the uterine cavity was an increase in the pulsation index in the uterine, basal and spiral arteries in women of the main group compared to the control group.

Keywords: abnormal uterine bleedings, ultrasound characteristics, disorder of the uterine cavity, extragenital disorders.

ОСОБЛИВОСТІ СТАНУ ПОРОЖНИНИ МАТКИ В ЖІНОК З ЕКСТРАГЕНІТАЛЬНОЮ ПАТОЛОГІЄЮ ПРИ АНОМАЛЬНИХ МАТКОВИХ КРОВОТЕЧАХ

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Мета дослідження: визначити особливості стану порожнини матки в жінок з екстрагенітальною патологією при аномальних маткових кровотечах (АМК) за допомогою сучасних діагностичних методів.

Матеріали та методи. На обстеженні й лікуванні перебували 100 жінок з АМК та супутньою екстрагенітальною патологією, які становили основну групу. Контрольна група – 50 соматично здорових жінок. Для оцінювання стану органів малого таза жінкам проведено УЗД з доплерометричним картуванням, МРТ за показаннями. Через наявність АМК пацієнткам основної групи було виконано гістероскопію та/або роздільне діагностичне вишкрібання з подальшим морфологічним оцінюванням отриманого матеріалу.

Результати. За даними УЗД виявлено, що в жінок групи контролю розміри матки відповідали фізіологічним нормам, а товщина та структура – фазі менструального циклу М-ехо. Учасниць основної групи було додатково розподілено на підгрупи залежно від виявлених патологічних змін у порожнині матки: поліп ендометрію (залозистий поліп, аденофіброматозний поліп), субмукозний лейоматозний вузол, поліп ендометрію та субмукозний лейоматозний вузол, гіперплазія ендометрію, гіперплазія ендометрію в поєднанні із субмукозним лейоматозним вузлом. Під час доплерометричного дослідження проаналізовано кровоток у маткових, базальних і спіральних артеріях залежно від ехографічного оцінювання стану порожнини матки в пацієнток основної групи порівняно з даними групи контролю. У пацієнток основної групи виявлено достовірне зростання рівня пульсаційного індексу в усіх досліджуваних судинах порівняно з відповідними значеннями в контрольній групі (тест Краскела – Волліса, тест Манна – Вітні, $p < 0,001$).

Висновки. Найпоширенішою патологією порожнини матки в жінок з екстрагенітальними захворюваннями при АМК, виявленою при УЗД, є поліпи порожнини матки та гіперплазія ендометрію. Особливістю кровотоку при патологічних процесах у порожнині матки є підвищення пульсаційного індексу в маткових, базальних і спіральних артеріях у жінок основної групи порівняно з групою контролю.

Ключові слова: аномальні маткові кровотечі, ультразвукові характеристики, патологія порожнини матки, екстрагенітальна патологія.