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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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FEATURES OF BLOOD PRESSURE DAILY MONITORING INDICATORS, STRUCTURAL AND FUNCTIONAL CHANGES OF THE LEFT VENTRICLE AND VESSELS IN WOMEN WITH HYPERTENSION II STAGE OF DIFFERENT REPRODUCTIVE AGE AND THEIR RELATIONSHIP WITH SEX HORMONES LEVEL

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Abstract.

Arterial hypertension (AH) ranks first among diseases of the cardiovascular system. The severity of clinical manifestations and prognosis in patients with AH is determined not only by the level of increased blood pressure (BP) but also by the degree of target organ damage.

The aim: to evaluate indicators of daily BP monitoring, and structural and functional changes of the left ventricle and blood vessels in women with stage II hypertension of different reproductive age and to determine their relationship with the level of sex hormones.

Material and Methods: The study included 114 women with essential arterial hypertension II stage, I-II-degree, chronic heart failure 0-I degree of different reproductive age. Ambulatory blood pressure monitoring (24-h ABPM), the echocardiological examination, determination of the vascular function, and the level of sex hormones were performed in patients.

Results: It was noted that the process of reproductive aging is associated with the deterioration of BP parameters in women with AH. It was established that the process of reproductive aging of women suffering from AH and progressive hypoestrogenemia are associated with the deepening of a whole series of unfavorable changes in the structural and functional state of the heart and blood vessels. In the process of reproductive aging in women with AH, not only a decrease in the level of estradiol was determined, but also higher numbers of both systolic and diastolic BP, which led to a greater load of pressure on the heart as a target organ and more pronounced structural and functional changes.

Conclusions: The process of reproductive aging is associated with the deterioration of BP parameters in women with AH. Extinction of reproductive function and progressive hypoestrogenemia in women with AH were associated with higher BP, increased mass of the myocardium of the left ventricular, progression of its diastolic filling disorder and deterioration of the vasoregulatory function of blood vessels.

Key words. Hypertension, ambulatory blood pressure monitoring, diastolic disfunction, endothelial disfunction, menopause, estradiol, follicle-stimulating hormone.

Introduction.

Arterial hypertension (AH) ranks first among diseases of the cardiovascular system (CVS). The severity of clinical manifestations and prognosis in patients with hypertension is determined not only by the level of increased blood pressure (BP) but also by the degree of target organ damage [1,2].

Among the leading factors determining the development of AH are age and gender [3,4]. The frequency of AH increases significantly with age in both women and men. The most vulnerable to cardiovascular diseases (CVD) are older and elderly women, while AH is found in a significant part of postmenopausal women and is the leading factor determining cardiovascular morbidity and mortality [5]. Therefore, the problems of gender cardiology acquire such importance, because the differences in risk factors, clinical manifestations, and diagnostic and treatment approaches for men and women are the most significant in cardiovascular pathology [6,7].

A climacteric period is a physiological transition period during which, against the background of age-related changes, involutional processes in the reproductive system dominate, which are characterized by the termination of a woman's generative and menstrual function due to the genetically programmed extinction and termination of ovarian function [8,9]. A decrease in the number of functioning follicles leads to a decrease in the intensity of estrogen synthesis.

Age-related changes in a woman's body are manifested not only by the involution of her reproductive system but also affect almost all physiological and metabolic processes. [10,11]. As is well known, the influence of sex hormones on the body in general and CVS in particular is realized through genomic and non-genomic effects [12]. Nongenomic effects include the direct effect of sex hormones on blood vessels and the production of vasoregulatory molecules. It is believed that it is the deficit of estrogens is the leading pathogenetic factor that creates prerequisites for the occurrence of AH, as it leads to many pathological processes - decrease in the elasticity of blood vessels, increase in the activity of the renin-angiotensin system and sensitivity of receptors to angiotensin II, increase in the level of endothelin-1, leukotrienes, catecholamines, decrease in the ability of the endothelium to relax due to a decrease in the production of nitric oxide, prostacyclins, increase in sensitivity to salt. AH often develops already in the initial stages of the climacteric period but is especially common in menopause and post menopause.

The prognosis of the course of AH depends on the severity and speed of development of lesions of the target organs [13].

Significant gender differences were recorded in both the structural and functional parameters of the CVS functioning in women and men (myocardial mass of the left ventricle (LV), peripheral resistance, blood volume, cardiac output, pulse BP, vascular elasticity, etc.), as well as in the regulation of its function. In postmenopausal women, the frequency of AH and hypertrophy of the LV is higher, compared to that in the premenopausal period [14].

The LV is one of the main target organs in AH. Long-term and stable hypertension is a key determinant of LV hypertrophy (LVH), which, in turn, is an important prerequisite for its function disorders, the development of diastolic dysfunction (DD), and heart failure. DD is recognized as a predictor of deterioration independent of BP level of prognosis in patients with AH [15,16].

BP increase is a consequence of the interaction of complex mechanisms, among which the leading role belongs to endothelial dysfunction. The results of clinical studies support the concept of a causal relationship between ED and the development and progression of AH [17].

Research in the field of gender and age medicine belongs to the priority problems of modern medical science, because the bulk of diseases and the social and material costs caused by them, borne by society, fall on the final stage of a person's life.

The aim of the research: to evaluate indicators of daily BP monitoring, and structural and functional changes of the left ventricle and blood vessels in women with stage II hypertension of different reproductive ages and to determine their relationship with the level of sex hormones.

Materials and Methods.

The study included 114 women with essential arterial hypertension II stage, I-II-degree, chronic heart failure 0-I degree, I-II functional class according to NYHA, who did not receive regular antihypertensive therapy. The age of the examined patients ranged from 32 to 70 years (the average age was 55.4±0.68 years). The duration of the disease was from 2 to 21 years (the average duration was 7.1±0.31 years).

Exclusion criteria were: male gender, symptomatic arterial hypertension, hypertension I and III stages, III degree of hypertension, concomitant ischemic disease, chronic heart failure IIA-III stage and III-IV functional classes according to NYHA, permanent form of atrial fibrillation, frequent ventricular and supraventricular extrasystole, conduction disorders, diabetes, chronic obstructive lung disease, chronic diseases of the gastrointestinal tract, kidneys, induced (artificial) menopause, presence of contraindications or intolerance to angiotensin-converting enzyme inhibitors.

Ambulatory blood pressure monitoring (ABPM), the echocardiological examination (EchoCG), determination of the vascular function, and the level of sex hormones were performed in patients.

In the analysis of the results of ABPM 24-hour mean, daytime (awake) mean, night-time (asleep) mean systolic and diastolic BP (24-h SBPm, 24-h DBPm, dSBPm, dDBPm, nSBPm, nDBPm), the level of night-time SBP, DBP dipping (ndSBP, ndDBP), the time index of 24- hour mean, daytime mean, night-time mean of systolic and diastolic BP (TI 24-h SBPm, TI 24-h DBPm, TI dSBPm, TI dDBPm, TI nSBPm, TI nDBPm) were assessed.

In the Echo-CG examination the LV end-diastolic and end-systolic volume index (EDVI, ESVI), the LV end-diastolic and end-systolic size index (EDSI, ESSI), the LV ejection fraction (LVEF), LV mass index (LVMI), interventricular septal thickness (IVS) and the LV posterior wall thickness (PWT), relative wall thickness (RWT), the maximum speed of early (E) and late (A) diastolic filling of the LV, a diastolic index (E/A) were evaluated for determining of the structural and functional changes of the left ventricle.

The endothelial function of the vessels was determined by the method of Doppler examination of the right brachial artery according to the Celermajer-Sorensen technique (endothelium-dependent vasodilatation − EDVD). The initial diameter of this artery and diameter after temporary occlusion in 90 seconds were measured. An increase in the diameter of this artery by more than 10% was considered normal. The thickness of the intima-media complex of the brachial artery (IMT BA) and the common carotid artery (IMT CCA) also were measured.

The content of sex hormones in blood serum - estradiol, follicle-stimulating hormone (FSH), and luteinizing hormone (LH) were determined by the immunoenzymatic method using commercial test systems DRG, DAI (USA).

Statistical processing of the research results was carried out in «MS Excel XP» and SPSS-10.0.5 for Windows.

The parametric Student's t-test was used to assess the intergroup difference, Spearman's correlation analysis for determining relationships between indicators, and Fisher's test for comparison of the frequency of changes. The difference was considered significant at $p<0.05$. Results are given as M±m.

Results and Discussion.

All examined patients were divided into 4 groups according to reproductive age according to the STRAW classification (Stages of Reproductive Aging Workshop) [18,19]. 1-st group (16 patients) consisted women of late reproductive age (preserved ovariomenstrual cycle, a level of FSH >10 mU/ml); 2-nd group (27 patients) - women of premenopausal age (menopausal transition, variable cycles, the level of FSH >10 mU/ml); 3-nd group (30 patients) - women of early postmenopausal age (up to 4 years since the last menstruation, the level of FSH >40 mU/ml, the level of estradiol <50 pg/ml) and 4-th group (41 patients) - women of late postmenopausal age (more than 4 years since the last menstruation, FSH level >40 mU/ml, estradiol level <20 pg/ml). Additional criteria for the postmenopausal period were increased the level of LH more than 20 mU/ml. Thus, the patients of 1-st and 2-nd groups were carried to the premenopausal period (43 women; the average age was 49,0±0,74 years; duration of hypertension 4,22±0,23 years), patients of groups 3 and 4 - to the postmenopausal period (71 women; the average age was 59,1±0.57 years; duration of hypertension 8,78±0,42 years).

As can be seen from Table 1, the patients examined by us of different reproductive ages differed significantly in terms of the level of sex hormones. The content of estradiol in the blood serum of women of late reproductive and premenopausal age was comparable and amounted to 58,4±2,97 and 55,1±2,51 pg/ml. At the same time, the level of estradiol in women in the early and late postmenopausal period was, respectively, 3.5 and 4.6 times lower than that in women in the late reproductive period. The level of FSH progressively increased as the reproductive aging of the patients progressed. Thus, in premenopausal, early, and late postmenopausal women, this hormone's content was 2, 2.8, and 4 times higher than in women in the late reproductive period. Another indication of the development of involutional processes in the hypothalamus-pituitary-ovary system is a decrease in the ratio of LH/FSH as reproductive aging progresses.

When analyzing ABPM indicators, it was noted that the process of reproductive aging is associated with the deterioration of BP parameters in women with AH (Table 2). In particular, 24-h SBPm, dSBPm, and nSBPm in postmenopausal women were significantly higher than those in premenopausal women.

Table 1. *The content of sex hormones in blood serum of women with hypertension depending on the period of their reproductive function (M±m).*

Periods of reproductive function of women		The content of hormones in blood serum			
		Estradiol, pg/ml	**FSH, mU/ml**	**LH, mU/ml**	**LH/FSH**
1	Late reproductive period, n=16	58,4±2,97	14,4±1,75	7,71±0,87	1,21±0,51
2	Premenopause (menopausal transition), n=27	55,1±2,51	25,8±1,92	9,95±1,14	0,41±0,05
		$p_{1,2}$>0,05	$p_{1,2}$<0,001	$p_{1,2}$<0,02	$p_{1,2}$<0,03
3	Early postmenopause, n=30	17,5±1,53	37,2±2,13	9,9±0,96	0,30±0,04
		$p_{1,3}$<0,001 $p_{2,3}$<0,001	$p_{1,3}$<0,001 $p_{2,3}$<0,001	$p_{1,3}$<0,01 $p_{2,3}$>0,05	$p_{1,3}$<0,02 $p_{2,3}$>0,05
4	Late postmenopause, n=41	11,6±1,47	39,4±2,83	12,2±1,33	0,43±0,08
		$p_{1,4}$<0,001 $p_{2,4}$<0,001 $p_{3,4}$>0,01	$p_{1,4}$<0,001 $p_{2,4}$<0,001 $p_{3,4}$>0,02	$p_{1,4}$<0,001 $p_{2,4}$<0,05 $p_{3,4}$>0,05	$p_{1,4}$<0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05

Table 2. *Blood pressure level (mm Hg) in women with hypertension depending on the period of their reproductive function (M±m).*

Groups of patients		24-hour mean		Daytime mean		Night-time mean	
		SBP	**DBP**	**SBP**	**DBP**	**SBP**	**DBP**
Premenopausal period, n=43		145±1,74	87,6±1,08	149±2,03	89,8±1,40	138±2,37	82,0±1,36
Postmenopausal period, n=71		154±1,80	90,5±0,82	157±1,71	92,5±0,84	145±2,68	83,8±1,48
		p<0,01	p<0,04	p<0,01	p>0,05	p<0,04	p>0,05
Including women with hypertension:							
1	Late reproductive period, n=16	143±2,38	86,7±1,51	147±3,15	89,3±2,09	137±4,28	81,8±2,28
2	Premenopause (menopausal transition), n=27	147±2,38 $p_{1,2}$>0,05	88,1±1,49 $p_{1,2}$>0,05	150±2,66 $p_{1,2}$>0,05	90,0±1,89 $p_{1,2}$>0,05	137±2,86 $p_{1,2}$>0,05	82,1±1,72$p_{1,2}$>0,05
3	Early postmenopause, n=30	157±2,50	90,7±1,15	157±2,42	93,3±1,12	145±3,90	83,5±2,18
		$p_{1,3}$<0,01 $p_{2,3}$<0,05	$p_{1,3}$<0,04 $p_{2,3}$>0,05	$p_{1,3}$<0,02 $p_{2,3}$<0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05
4	Late postmenopause, n=41	155±2,54	90,7±1,16	157±2,40	91,9±1,21	147±3,68	84,0±2,02
		$p_{1,4}$<0,01 $p_{2,4}$<0,04 $p_{3,4}$>0,05	$p_{1,4}$<0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$<0,02 $p_{2,4}$<0,05 $p_{3,4}$>0,05	$p_{1,4}$>0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$>0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$>0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05

Table 3. *Time indexes (%) of 24-h mean, daytime mean, night-time mean of systolic and diastolic BP in women with hypertension depending on the period of their reproductive function (M±m).*

Groups of patients		Time index of 24-hour mean		Time index of daytime mean		Time index of night-time mean	
		SBP	**DBP**	**SBP**	**DBP**	**SBP**	**DBP**
Premenopausal period, n=43		60,7±2,87	49,0±2,49	58,1±3,08	49,8±3,17	67,5±3,88	47,6±3,9
Postmenopausal period, n=71		68,4±1,88	51,5±1,79	67,5±2,22	49,2±2,04	72,6±2,73	52,7±2,98
		p<0,04	p>0,05	p<0,02	p>0,05	p>0,05	p>0,05
Including women with hypertension:							
1	Late reproductive period, n=16	57,3±4,60	48,3±4,05	56,3±4,68	53,1±6,09	61,9±6,94	44,1±6,90
2	Premenopause (menopausal transition), n=27	62,6±3,68 $p_{1,2}$>0,05	49,4±3,20 $p_{1,2}$>0,05	59,1±4,10 $p_{1,2}$>0,05	47,9±3,57 $p_{1,2}$>0,05	70,8±4,59 $p_{1,2}$>0,05	49,6±4,75 $p_{1,2}$>0,05
3	Early postmenopause, n=30	68,8±3,00	52,5±2,33	68,8±3,56	49,4±2,98	73,4±4,24	53,2±4,67
		$p_{1,3}$<0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$<0,04 $p_{2,3}$<0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05
4	Late postmenopause, n=41	68,2±2,43	50,7±2,60	66,7±2,87	49,0±2,81	72,0±3,61	52,3±3,92
		$p_{1,4}$<0,04 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$>0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$<0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$>0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$>0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$>0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05

If in late reproductive and premenopausal age, only a trend towards an increase in SBP levels was observed, then in early and late postmenopause 24-h SBPm was significantly (by 9 and 8%) higher than that in persons of late reproductive age. At the same time, the relationship between the reproductive age of the patients and levels of DBP were significantly lower. Thus, 24-h DATm, dDBPm, and nDBPm in patients of pre- and postmenopausal age probably did not differ. A significant increase in 24-hDBPm was registered only in patients in early and late postmenopause compared to that in patients in the late reproductive period.

When analyzing the relevant time indices that characterize the duration of the load by pressure on the target organs, it was noted that in the process of reproductive aging, higher BP numbers are accompanied by an increase in the level of these indicators (Table 3). At the same time, probable changes were recorded only concerning TI SBP. In particular, in postmenopausal women, TI 24-h SBPm, and TI nSBPm were 11 and 7% higher than in premenopausal women. In patients in early postmenopause, TI 24-h SBPm was also probably higher than in women in the late reproductive period. It should be noted that TI 24-h DBPm, TI dDBPm, and TI nDBPm practically did not differ in pre- and postmenopausal women.

Despite the dependence of SBP parameters on reproductive age, we found no significant differences between the groups of the examined women regarding the daily profile of SBP. The main share of pre- and postmenopausal patients was made up of patients with the physiological daily profile "dipper" (51,1 and 47,9%, respectively). Pathological daily profiles associated with more pronounced target organ damage and higher risk of cardiovascular complications were also comparable in both groups. Thus, the share of persons with the "non-dipper" profile among premenopausal and postmenopausal women was 32,6 and 33,8%, respectively. The profile of BP "night-peaker" was registered in 16,3 and 18,3% of pre- and postmenopausal women, respectively.

The influence of estrogens on blood pressure has been demonstrated in other works. Thus, an increase in peripheral resistance and blood pressure was recorded in women with surgical menopause. These indicators decreased after the prescribing of replacement therapy [7]. According to other data, the low level of estrogens in postmenopausal women is closely associated with the value of the increase in BP and rapid progression of AH. Increase of the vasoconstrictor molecules production, such as endothelin, angiotensin II, pressor catecholamines is the trigger mechanism for the development of hypertension in postmenopause [20].

Analyzing the data of the Echo-CG study, it was established that the majority of patients had concentric LV hypertrophy (CLVH). In the premenopause period, 11,5% of patients had normal LV geometry. The process of reproductive aging, a longer hypertensive history, and higher BP levels were associated with an increase in the frequency of development of CLVH in this category of patients. Thus, CLVH was found in 46,2% of premenopausal women and 68,3% of postmenopausal women.

According to the results Mishchenko and co-authors, in most of the patients with AH examined by them, a physiological daily BP profile was recorded, a smaller share was made up of non-dipper patients, and up to 14% of patients had a "night-peaker" profile. There were signs of LV remodeling found in all patients, and, moreover, having a concentric nature. CLVH was observed in 56 to 95,14% of patients, and concentric remodeling was determined in others, which can be due to a long course of AH with a significant increase in BP. Indicators characterizing LVH were higher and statistically more significant in the group of patients with higher numbers of BP. In the same group of patients, a more pronounced violation of LV diastolic filling was observed in the form of slow relaxation, which indicates increased stiffness of the myocardium and a greater contribution of LA to LV filling. It was also noted that in some patients with AH and normal LV geometry increased parameters of stiffness of the myocardium and violation of its diastolic filling occurred even before the development of echocardiographic signs of LVH [21].

A higher frequency of CLVH in postmenopausal women was also demonstrated in other studies [22]. It is believed that

Table 4. *Indicators of the left ventricular end- systolic, end-diastolic sizes, volumes, and systolic function in women with hypertension depending on the period of their reproductive function (M±m).*

Groups of patients		**ESSI, sm**	**EDSI, sm**	**ESVI, ml/m²**	**EDVI, ml/m²**	**LVEF, %**
Premenopausal period, n=43		1,67±0,06	2,57±0,05	22,55±1,96	61,73±2,92	63,2±0,91
Postmenopausal period, n=71		1,62±0,04	2,48±0,04	20,97±1,35	57,14±2,36	62,7±0,57
		p<0,04	p>0,05	p>0,05	p<0,04	p>0,05
Including women with hypertension:						
1	Late reproductive period, n=16	1,71±0,07	2,60±0,09	24,03±2,41	63,72±2,75	62,2±1,31
2	Premenopause (menopausal transition), n=27	1,65±0,08	2,54±0,06	21,94±0,91	60,26±1,62	63,6±1,24
		$p_{1,2}$>0,05	$p_{1,2}$>0,05	$p_{1,2}$>0,05	$p_{1,2}$>0,05	$p_{1,2}$>0,05
3	Early postmenopause, n=30	1,58±0,06	2,46±0,06	19,9±1,76	56,57±1,51	65,0±1,13
		$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05	$p_{1,3}$>0,05 $p_{2,3}$>0,05
4	Late postmenopause, n=41	1,64±0,06	2,47±0,06	21,24±2,0	55,77±1,42	63,0±0,96
		$p_{1,4}$<0,01 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$<0,02 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$<0,02 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$<0,02 $p_{2,4}$>0,05 $p_{3,4}$>0,05	$p_{1,4}$>0,05 $p_{2,4}$>0,05 $p_{3,4}$>0,05

different types of LV geometry are accompanied by certain hemodynamic disturbances (increased peripheral resistance in concentric and increased cardiac output in eccentric LVH) and have excellent prognostic significance. In many works, it was shown that the greatest number of cardiovascular complications is observed in CLVH [23].

When analyzing the structural and functional indicators of LV in our patients, their relationship with both the BP level and the reproductive age of the patients was established. Thus, in women of postmenopausal age, the indicators of EDSI and EDVI were probably lower than in persons of premenopausal age, and ESSI and ESVI showed a tendency to decrease (Table 4). It should be noted that the linear and volumetric indicators of LV estimated by us in women of premenopausal and early postmenopausal age showed only a tendency to decrease, compared to those in persons of the reproductive period, and only in late menopause they probably decreased. Indicators of LV systolic function (EF) in women of pre- and postmenopausal age practically did not differ.

A stronger connection was established concerning indicators of the thickness and mass of the LV myocardium (Table 5). Thus, LVPWTd and IVSd in postmenopausal women were, respectively, 7,1 and 7,2% higher than in premenopausal women. LVMMI in postmenopausal women was significantly (6.8%) higher than in premenopausal women. It should be noted that there was a trend towards an increase in the thickness and mass of the myocardium even in premenopause, and their significant increase, compared to those in women of the reproductive period, was recorded both in late and early postmenopause. RWT of the LV significantly increased as the reproductive age of the patients increased.

When assessing the functional state of the LV, it was noted that more pronounced structural changes of the LV were associated with a significant deterioration of the processes of its relaxation and diastolic filling. Thus, in postmenopausal women, the ratio of the amplitudes of the speed of early and late transmitral E/A flows was 12% lower than in women in the pre-menopause period. It was also found that the tendency to the deterioration of diastolic LV filling is determined even among women of premenopausal age as they move from the late reproductive to the premenopausal period. This trend increased in the postmenopausal period, as evidenced by the likely worsening of LV diastolic filling in women of late reproductive age compared to patients of early postmenopausal age.

Thus, the data obtained by us proved that the leading factor in the formation of LVH is the hemodynamic load with increased BP. Thus, in the process of reproductive aging in women with AH, not only a decrease in the level of estradiol was determined, but also higher numbers of both systolic and diastolic BP, which led to a greater load of pressure on the heart as a target organ and more pronounced structural and functional changes.

Numerous studies have proven that LVH is a significant factor that determines the prognosis of CVD and mortality, including sudden death. An increase in LVMMI of more than 116 g/m2 increases the risk of cardiovascular complications by 3-4 times compared to individuals with LVMMI of less than 75 g/m^2 regardless of the presence of AH. An increase in the thickness of the LV wall in patients with AH by 1 mm can be associated with an almost 7-fold increase in the risk of death.

It has been studied that with age and changes in the reproductive system of women with AH, structural changes appear in the vessel wall, which is characterized by a significant increase in their thickness (Table 6). Thus, in patients of postmenopausal age, the thickness of IMC BA and IMC CCA was 19 and 15%, respectively, in comparison with those in patients of premenopausal age. It should be noted that a significant increase in IMC BA was registered even among women of premenopausal age during the transition from the late reproductive to the premenopausal period. In women in late postmenopause, the value of IMC BA was 44, 29 and 24% higher than that in women of late reproductive, premenopausal, and early postmenopausal age, respectively. A probable increase in IMC CCA was recorded in patients of early postmenopausal age. In women of late postmenopausal age, the value of the IMC CCA was 27, 18, and 12% higher, than in women of late reproductive, premenopausal, and early postmenopausal age, respectively.

When assessing the functional state of blood vessels, it was noted that the process of reproductive aging of women suffering

Table 5. *Indicators of the thickness and mass of the myocardium of the LV in women with hypertension depending on the period of their reproductive function (M±m).*

Groups of patients		**PWT, mm**	**IVS, mm**	**LVMI, g/m^2**	**RWT**	**E/A**
Premenopausal period, n=43		1,16±0,02	1,17±0,01	137±3,01	0,47±0,01	0,99±0,03
Postmenopausal period, n=71		1,27±0,01	1,23±0,01	143±2,60	0,50±0,01	0,86±0,03
		p<0,001	p<0,001	p<0,01	p<0,001	p<0,001
Including women with hypertension:						
1	Late reproductive period, n=16	1,13±0,02	1,15±0,02	134±4,54	0,45±0,01	1,05±0,04
2	Premenopause (menopausal transition), n=27	1,18±0,02 $p_{1,2}$>0,05	1,18±0,02 $p_{1,2}$>0,05	139±4,0 $p_{1,2}$>0,05	0,48±0,01 $p_{1,2}$<0,05	0,96±0,04 $p_{1,2}$>0,05
3	Early postmenopause, n=30	1,24±0,03	1,23±0,02	145±3,42	0,51±0,01	0,87±0,04
		$p_{1,3}$<0,01 $p_{2,3}$>0,05	$p_{1,3}$<0,01 $p_{2,3}$>0,05	$p_{1,3}$<0,05 $p_{2,3}$>0,05	$p_{1,3}$<0,01 $p_{2,3}$>0,05	$p_{1,3}$<0,01 $p_{2,3}$>0,05
4	Late postmenopause, n=41	1,22±0,01	1,24±0,01	142±3,14	0,52±0,01	0,82±0,04
		$p_{1,4}$<0,001 $p_{2,4}$<0,001 $p_{3,4}$<0,02	$p_{1,4}$<0,001 $p_{2,4}$<0,001 $p_{3,4}$>0,05	$p_{1,4}$<0,01 $p_{2,4}$<0,04 $p_{3,4}$>0,05	$p_{1,4}$<0,001 $p_{2,4}$<0,001 $p_{3,4}$<0,01	$p_{1,4}$<0,001 $p_{2,4}$<0,05 $p_{3,4}$>0,05

Table 6. *The intima-media thickness of the brachial artery, of the common carotid artery and the indicator of the endothelial function in women with hypertension depending on the period of their reproductive function (M±m).*

Groups of patients		**IMT BA, mm**	**EDVD, %**	**IMT CCA, mm**
Premenopausal period, n=43		0,326±0,01	10,5±0,63	0,748±0,02
Postmenopausal period, n=71		0,399±0,017	7,81±0,57	0,888±0,022
		p<0,005	p<0,02	p<0,005
Including women with hypertension:				
1	Late reproductive period, n=16	0,298±0,013	11,7±0,69	0,709±0,029
2	Premenopause (menopausal transition) n=27	0,341±0,013	9,84±0,89	0,770±0,026
		$p_{1,2}$<0,04	$p_{1,2}$>0,05	$p_{1,2}$>0,05
3	Early postmenopause, n=30	0,352±0,013	8,59±0,76	0,828±0,032
		$p_{1,3}$<0,01 $p_{2,3}$>0,05	$p_{1,3}$<0,01 $p_{2,3}$>0,05	$p_{1,3}$<0,02 $p_{2,3}$>0,05
4	Late postmenopause, n=41	0,452±0,031	7,28±0,75	0,930±0,032
		$p_{1,4}$<0,01 $p_{2,4}$<0,01 $p_{3,4}$<0,01	$p_{1,4}$<0,01 $p_{2,4}$<0,04 $p_{3,4}$>0,05	$p_{1,4}$<0,01 $p_{2,4}$<0,01 $p_{3,4}$<0,04

Table 7. *Correlation coefficients between BP indicators and the level of sex hormones in pre- and postmenopausal women with AH.*

Indicators of BP, mm Hg	**Premenopausal period, n=43**			**Postmenopausal period, n=71**		
	Estradiol,	**FSH**	**LH**	**Estradiol**	**FSH**	**LH**
24-h SBPm	-0,27*	0,04	0,15	-0,38**	0,29*	0,15
24-h dBPm	-0,13	-0,02	0,13	-0,19	0,07	0,11
dSBPm	-0,26*	0,09	0,10	-0,31*	0,25*	0,16
dDBPm	-0,10	0,02	0,08	-0,28*	0,15	0,10
nSBPm	-0,19	-0,03	0,01	-0,36**	0,25	0,09
nDBPm	-0,06	-0,10	0,02	-0,18	0,16	0,08

*Note: * - p<0,05; ** - p<0,001*

from AH is associated with the deterioration of vascular functions of the brachial artery. Thus, in postmenopausal patients, the indicator of EDVD BA after 90 seconds after hyperemia was reliably 24% lower than that in postmenopausal women. It should be noted that the tendency to deterioration of EF was found even in women of premenopausal age. In patients of early and late postmenopausal age, the index of EDVD BA after 90 seconds was, respectively, 27 and 36% lower than that in patients of late reproductive age.

The data we obtained proved that progressive hypoestrogenemia in women with AH is associated with increased arterial remodeling phenomena, as evidenced by an increase in the thickness of the IMC BA and CCA in postmenopausal patients compared to that in premenopausal patients.

Thus, it was established that the process of reproductive aging of women suffering from AH is associated with the deepening of a whole series of unfavorable changes in the structural and functional state of the heart and blood vessels. It is possible that to a certain extent, the deterioration of the condition of the heart and blood vessels is due not only to the increase in the reproductive age of the patients examined by us but also to an increase in the duration of AH.

When conducting a correlation analysis, it was found that in premenopausal women, the levels of 24-h SBPm and dSBPm were weakly inversely correlated with the level of estradiol (r=-0.27, -0.26), but they did not correlate with the levels of FSH and LH in blood serum. In women of postmenopausal age, the level of estradiol showed a higher probability inverse than the modulus correlations with the levels of 24-h SBPm, dSBPm, and nSBPm (r=-0.38, -0.31, -0.36, respectively) and dDBPm (r=-0.28). Also, in this group, there were weak probable connections between the level of SBP and the level of FSH in blood serum (Table 7).

We obtained additional confirmation of the connection between the level of sex hormones and indicators of the structural and functional state of the heart when conducting a correlation analysis. An inverse probable correlation was established between the level of estradiol in blood serum and IVSd, LVMMI (r=-0.29, -0.41, respectively) in premenopausal women. The level of estradiol revealed a direct probable correlation with the E/A ratio (r=0.34). However, no reliable correlations were registered between indicators of the structural and functional state of the heart in postmenopausal women and the levels of FSH and LH.

In postmenopausal women, we noted an increased correlation between the level of estradiol in blood serum and IVSd, LVMMI, E/A ratio (r=-0.33, -0.48, 0.44, respectively). In addition, there were weak, but probable correlations between LVMMI, E/A ratio, and serum FSH level (r=0.28, -0.20, respectively).

In premenopausal women, weak probable correlations were determined between the level of estradiol and IMC BA, IMC CCA, EDVD BA for 90 seconds. (r=-0.30, -0.32, and 0.34, respectively). In postmenopausal women, there was an increase in correlations between the level of estradiol and IMC BA, IMC CCA, EDVD BA for 90 seconds. (r=-0.38, -0.38, and 0.40, respectively). In postmenopausal women, there were also weak probable relationships between the level of SBP, the value of IMC BA, IMC CCA, EDVD DA, and the level of FSH in blood serum.

According to the literature, ED was observed in 40% of patients with isolated AH and in all patients with CHF with preserved LVEF. A parallelism was established between the increase in stiffness of the aorta and the deterioration of EDVD ($r=-0.2$; $p<0.05$) and the thickening of the IMC, which is the basis of the deterioration of the elastic characteristics of the aorta. A correlation was also found between the duration of AH and impaired vascular endothelial function ($r=-0.26$; $p<0.05$). The increase of LVMMI and IVSd occurred in parallel with the deterioration of EF, as evidenced by established correlations between EDVD and LVMMI ($r=-0.25$; $p<0.05$) and IVSd ($r=-0.35$; $p<0.01$) [24].

Data from the literature also indicate the existence of a close relationship between the level of sex hormones and the state of blood vessels in postmenopausal women. It was recently demonstrated that a low level of estrogens in blood plasma is associated with thickening of the intima-media of carotid arteries and vascular remodeling reaches its maximum expression in late postmenopause. The level of endothelin-1 in the blood plasma of postmenopausal women increases significantly compared to the state before menopause, which is a consequence of estrogen deficiency, because the natural effect of this hormone is to inhibit the formation of endothelin. Production of nitric oxide by vessels decreases and endothelium-dependent vasodilation of vessels is suppressed in the postmenopausal period, while the use of estrogens improves endothelial function in hypertensive postmenopausal women [25,26].

The data presented by us are also consistent with the results of several experimental studies that demonstrated the possible involvement of sex hormones in the regulation of vascular and myocardial remodeling processes. Fredette NC et al. and Somani YB et al. established that estrogens have a vasodilating effect, which is due to an increase in the bioactivity of nitric oxide and the induction of synthase expression of nitric oxide, by increasing the synthesis of prostacyclin, by modulating the activity of the endothelium-dependent hyperpolarizing factor. Sex hormones take part in the regulation of vascular and myocardial remodeling processes, inhibiting the mitogenic effects of many growth cytokines, in particular transforming and epidermal growth factors, fibroblast growth factor [27,28].

Thus, the data obtained by us indicate that progressive hypoestrogenemia, which occurs in the process of reproductive aging of a woman, is associated with many prognostically undesirable structural and functional changes in the heart and blood vessels. Revealing the pathogenetic mechanisms of the adverse effect of hypoestrogenemia on the cardiovascular condition will allow us to optimize the existing approaches to the pharmacotherapy of AH in women.

Conclusion.

1. It was noted that the process of reproductive aging is associated with the deterioration of BP parameters in women with AH. In particular, 24-h SBPm, dSBPm, and nSBPm in postmenopausal women were significantly higher than those in premenopausal women. The relationship between the reproductive age of the patients and levels of DBP was significantly lower. A significant increase in 24-hDBPm was registered only in patients in early and late postmenopause compared to that in patients in the late reproductive period.

2. It was established that the process of reproductive aging of women suffering from AH was associated with the deepening of a whole series of unfavorable changes in the structural and functional state of the heart and blood vessels.

3. Extinction of reproductive function and progressive hypoestrogenemia in women with AH were associated with higher BP, increased mass of the myocardium of the left ventricular, progression of its diastolic filling disorder and deterioration of the vasoregulatory function of blood vessels. More significant relationship between these indicators and the low level of estradiol in blood serum was determined in postmenopausal women in comparison with the premenopausal patients.

4. Determination of the level of estradiol in blood serum in women with AH may be recommended to optimize a choice of diagnostic and therapeutic tactics.

Conflict of interest.

The authors declare no conflict of interest.

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