DOI: 10.26693/jmbs07.03.143
UDC 618.11-002.2+618.12-022.2.2:577.171.6+616.12-073.97-71+543.42
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Comparative Assessment of Hormonal, Echographic and Spectral Parameters in Chronic Endometritis and Chronic Salpingo-Oophoritis

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The purpose of the study was to assess the effectiveness and clinical significance of the use of spectral analysis of molecular markers for an objective assessment of the clinical course of chronic endometritis and salpingo-oophoritis.

Materials and methods. The paper presents survey data of 100 women aged 18-47 years with a diagnosis of chronic endometritis and chronic salpingo-oophoritis. Laboratory methods of blood tests were carried out according to the generally accepted methods when patients were admitted for examination. The assessment of the hormonal status was carried out using standard kits from the company "Immunotec" (Czech Republic) on a radioisotope analyzer "Gamma-800" (Narcotest). All subjects underwent ultrasound of the pelvic organs using the Voluson E8 apparatus, using transabdominal transducers of 11 Hz and 18 Hz and a transvaginal transducer with a frequency of 20 Hz and 31 Hz. To study molecular markers, we used the method of molecular Raman spectroscopy. We used a standard two-beam infrared spectrometer "SPECORD-75 IR" in the frequency range of 4000-400 cm-1. Statistical data processing was carried out using Microsoft Excel 2000 and SPSS 10.0.5 software.

Results and discussion. The results of our research showed that the use of hormonal and echographic studies, although they are informative methods in the diagnosis of chronic endometritis and salpingo-oophoritis, are not specific enough. One of the important points of pathogenesis, both for acute and chronic inflammatory diseases of the genitals, is the development of endogenous intoxication. A manifestation of acute inflammation against the background of intoxication is a change in the biosynthesis of "acute phase proteins". Spectral analysis of molecular markers allows detecting chronic endometritis / salpingo-oophoritis with higher accuracy (98%), sensitivity (99%) and specificity (97%).

Stretching and bending vibrations of -CO and its derivatives are most intensely manifested. At the same time, depending on the pathological process, a shift in the position of the maxima in the absorption spectra was noted. The magnitude of the shift between the wave numbers obtained in patients with endometritis and salpingo-oophoritis was 1000/1500 cm-1, which is important for the identification and differentiation of components in the mixture.

Conclusion. For samples of the spectrum of blood plasma in patients with chronic endometritis, characteristic bands with maxima are located in the region of 1510 cm-1, 1520 cm-1, 1535 cm-1. The absorption spectrum corresponds to 0.13-0.18.

In patients with chronic salpingo-oophoritis, 1720cm-1 is characteristic for the 1600/1750cm-1 band, but 3420cm-1 for the 3300/3680cm-1 band. In this case, the absorption of waves during this process has significant differences – 0.16-0.25 for the first band and 0.06-0.20 for the second, on average 0.11.

Keywords: endometritis, salpingo-oophoritis, hormonal and echographic researches, infrared spectroscopy of molecular markers.

Introduction. In the structure of gynecological morbidity, the number of patients with infectious and inflammatory diseases of the genitals ranks first, accounting for 60.4–65.0%. The incidence rate of inflammatory diseases of the female genital organs (IDFGO) for the first decade of the 21st century increased in patients of 18-24 years by 1.4 times, and in 25-29-year-olds – by 1.8 times. At the same time, the costs of diagnostics and treatment have increased, reaching 50-60% of all costs for the provision of gynecological care to the population [1, 2, 3]. Every 4th patient who has had IDFGO subsequently has such complications as infertility, miscarriage, ectopic pregnancy, placental insufficiency and chronic pelvic pain syndrome [4, 5, 6].

Despite presence in the literature of information about the possibility of using the data of immunological, microbiological, hormonal and ultrasound research methods for differential diagnosis of inflammatory and non-inflammatory diseases of the pelvic organs, at the moment there is no "harmonious" algorithm for the diagnosis of IDFGO [7, 8].

The purpose of the study was to assess the effectiveness and clinical significance of the use of spectral analysis of molecular markers for an objective assessment of the clinical course of chronic endometritis and salpingo-oophoritis.

Materials and methods. The paper presents survey data of 100 women aged 18-47 years with a diagnosis of chronic endometritis (ChE) and chronic salpingo-oophoritis (CSO), who were divided into two groups with the inclusion criteria: patients with chronic nonspecific salpingo-oophoritis and chronic endometritis in remission, at least 6 months after exacerbation, the duration of the disease from 6 months up to 10 years, with a frequency of exacerbation up to 3-4 times a year.

Exclusion criteria from the study were acute inflammatory diseases of the female genital organs and urinary system, hormone-dependent diseases of the female genital area, use of hormonal or intrauterine contraception, a positive test for HIV, syphilis, gonorrhea, tuberculosis, organic pathology of the pelvic organs.

The control group consisted of 30 women without gynecological diseases, comparable in age, gynecological and somatic status with the patients of the study group.

Laboratory methods of blood tests were carried out according to the generally accepted methods when patients were admitted for examination.

The assessment of the hormonal status was carried out using standard kits from the company “Immunotec” (Czech Republic) on a radioisotope analyzer “Gamma-800” (Narcotest). All subjects underwent ultrasound examination of the pelvic organs using the Voluson E8 apparatus, using transabdominal transducers of 11 Hz and 18 Hz and a transvaginal transducer with a frequency of 20 Hz and 31 Hz.

To study molecular markers, we used the method of molecular Raman spectroscopy. We used a standard two-beam infrared spectrometer “SPECORD-75 IR” in the frequency range of 4000-400 cm-1. To record Raman spectra of plasma, the method of obtaining a thin film on the surface of an optical plate KRS-5 was used.

Ethical considerations. The study conforms to the Helsinki Declaration (1997), the Convention on Europe on Human Rights and Biomedicine (1997), the International Code of Medical Ethics (1983), ICHGSP (2002). Informed consent was obtained from the patient.

Statistical data processing was carried out using Microsoft Excel 2000 and SPSS 10.0.5 software. The determination of the significance of differences was carried out using two-sample t-tests. Differences between groups were considered significant at $p < 0.05$.

Results and discussion. The patients were comparable in age (the average age of the observed was 32.5 ± 1.3 years), the duration of the disease, and the clinical manifestations of the inflammatory process. In the study of the hormonal analysis of the blood of the women under study, a decrease in the content of estradiol in the main groups I and II was 13.78-14.90 ($p < 0.05$). The progesterone level in both groups was 3.55-3.04 nmol / L, which is significantly lower than the norm. The testosterone level among the patients was above the norm and amounted to 2.29-2.37 nmol / L ($p < 0.05$). The prolactin content in the main groups was significantly higher than the norm and amounted to 39.23-37.78 ng / ml. The level of FSH and LH in the main groups was significantly higher than normal and corresponded to 27.32 ± 0.28 mMe / ml 38.39 ± 0.64 mMe / ml ($p < 0.05$). The results obtained revealed insignificant hormonal fluctuations between indicators in the main group. At the same time, they sharply differ from the control group ($p < 0.05$), which is quite expected. These changes are detected with pronounced clinical symptoms of the disease itself, but they can also be detected with other gynecological disorders.

In ultrasound diagnostics of inflammatory changes in the uterus and appendages, the acoustic picture is characterized by significant polymorphism. Echographic signs in ChE of CHO are as follows: thickening of the endometrium (46.6-42.5%); increased echogenicity of the endometrium in the proliferative phases (53.3-35%); endometrial atrophy with a long-term current process (10-22.5%); uneven endometrial contour (23.3-42.5%); heterogeneous echo structure of the endometrium (31.6-20%); uneven expansion of the uterine cavity in the proliferative phase due to impaired vascular permeability (26.6-12.5%). In 57.5% of cases, the intimate connection of tubo-ovarian inflammatory formations with the uterus is determined, which often becomes almost invisible. The frequency of detection of inflammatory diseases of the uterine appendages is influenced by the severity of the inflammatory process. Analysis of Doppler data showed an increase in blood flow velocity, as well as an increase in vascular resistance indices in the vessels of the uterus and ovaries. Every of two patients has several of the listed signs.

One of the important points of pathogenesis, both for acute and chronic inflammatory diseases of the genitals, is the development of endogenous intoxication. The organs of natural detoxification and excretion, the immune defense system and the natural resistance of the body are involved in the development of endogenous intoxication. As a result, vascular disorders occur, leading to persistent metabolic and hypoxic disorders [9]. A manifestation of acute inflammation against the background of intoxication is a change in the biosynthesis of “acute phase proteins”. This concept unites more than 25 blood plasma proteins involved in the reactions of the body’s inflammatory response to damage. From the point of view of the body’s defense reactions, acute phase proteins are precursors of immunoglobulins [10].

When studying the molecular markers of blood serum in patients with chronic endometritis and sal-

pingo-oophoritis, a wide range of stretching fluctuations in C-0 groups was revealed, due to the presence of fats, triglycerides, lipids, amino acids. However, the main changes were in the range of 1500/1720cm-1, which corresponds to a change in various forms of proteins. In addition, in some samples, there were no changes in the 1100/1300 cm-1 range. The wavenumber corresponding to 2900/3200cm-1 characterized the changes at the -CH, -CH3 level, which corresponds to phospholipids and cholesterol esters.

According to our data, for patients with a diagnosis of endometritis, the most indicative is the wave number at the level of 1950/2000 cm-1. At the same time, the absorption band is also quite variable 0.04-0.25. But even here there is an average numerical value equal to 0.12-0.16. It should be noted that for patients with a refined diagnosis of endometritis in all plasma samples, there are no wave numbers characteristic of -NH.

When studying blood plasma in patients with chronic salpingo-oophoritis, the spectrum peaks were located within 1600/1750 cm-1 (longitudinal vibration mode C = 0) and 2500/3680 cm-1 (longitudinal vibration mode - NH). The wavenumber for the first peak was within 1600/1750 cm-1, for almost all subjects it was in the 0.20-0.22 absorption band. We examined wavenumbers in the ratios 1600/1720cm-1 and 1732/1750cm-1, the spirals of which correspond to proteins, lipids, triglycerides, and cholesterol. The peak of the second wavenumber is located in wider spectra (2500/3680 cm-1). On average, the amplitude corresponded to 3250/5500 cm-1. The absorption band is also very variable from 0.12-0.25, on average 0.16-0.20. The obtained wave numbers of the second amplitude correspond to different ratios –NH.

Stretching and bending vibrations of -CO and its derivatives are most intensely manifested. At the same time, depending on the pathological process, a shift in the position of the maxima in the absorption spectra was noted. The magnitude of the shift between the wave numbers obtained in patients with endometritis and salpingo-oophoritis was 1000/1500 cm-1, which is important for the identification and differentiation of components in the mixture.

Conclusions

1. The results of our research showed that the use of hormonal and echographic studies, although they are informative methods in the diagnosis of chronic endometritis and salpingo-oophoritis, are not specific enough.
2. Spectral analysis of molecular markers allows detecting chronic endometritis / salpingo-oophoritis with higher accuracy (98%), sensitivity (99%) and specificity (97%).
3. For samples of the spectrum of blood plasma in patients with chronic endometritis, characteristic bands with maxima are located in the region of 1510 cm-1, 1520 cm-1, 1535 cm-1. The absorption spectrum corresponds to 0.13-0.18. In patients with chronic salpingo-oophoritis, 1720cm-1 is characteristic for the 1600/1750cm-1 band, but 3420cm-1 – for the 3300/3680cm-1 band. In this case, the absorption of waves during this process has significant differences 0.16-0.25 for the first band and 0.06-0.20 for the second, on average 0.11.

Perspectives of further research. In the future, it is planned to study the molecular pathways of chronic endometritis and chronic salpingo-oophoritis development.

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УДК 618.11-002.2+618.12-022.2.2:577.171.6+616.12-073.97-71+543.42

ПОРІВНЯЛЬНА ОЦІНКА ГОРМОНАЛЬНИХ, ЕХОГРАФІЧНИХ ТА СПЕКТРАЛЬНИХ ПАРАМЕТРІВ ПРИ ХРОНІЧНОМУ ЕНДОМЕТРИТІ ТА ХРОНІЧНОМУ САЛЬПІНГООФОРИТІ

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Резюме. *Мета.* У структурі гінекологічної захворюваності перше місце займає кількість хворих на інфекційно-запальні захворювання статевих органів, які становлять 60,4–65,0 %.

Матеріали та методи. У роботі наведено дані опитування 100 жінок віком 18-47 років з діагнозом ХЕ та ЦСО. Лабораторні методи дослідження крові проводились за загальноприйнятими методиками при надходженні пацієнтів на обстеження. Оцінку гормонального статусу проводили за допомогою стандартних наборів фірми «Immunotec» (Чехія) на радіоізотопному аналізаторі «Гамма-800» (Наркотест). Усім обстежуваним було проведено УЗД органів малого тазу на апараті Voluson E8 з використанням трансабдомінальних датчиків 11 Гц і 18 Гц та трансвагінального датчика з частотою 20 Гц і 31 Гц. Для дослідження молекулярних маркерів використовували метод молекулярної раманівської спектроскопії. Використовували стандартний двопроменевий інфрачервоний спектрометр «СПЕКОРД-75 ІК» в діапазоні частот 4000-400 см-1.

Результати. Результати досліджень показали, що використання гормональних та ехографічних досліджень хоча і є інформативними методами в діагностиці хронічного ендометриту та сальпінгоофориту, ал є недостатньо специфічними. Одним із важливих моментів патогенезу, як гострих, так і хронічних запальних захворювань статевих органів, є розвиток ендогенної інтоксикації. Проявом гострого запалення на тлі інтоксикації є зміна біосинтезу «білків гострої фази». Спектральний аналіз молекулярних маркерів дозволяє виявити хронічний ендометрит/сальпінгоофорит з більшою точністю (98%), чутливістю (99%) і специфічністю (97%).

Висновки. Для зразків спектру плазми крові у хворих на хронічний ендометрит характерні смуги з максимумами розташовані в області 1510 см-1, 1520 см-1, 1535 см-1. Спектр поглинання відповідає 0,13-0,18. У хворих на хронічний сальпінгоофорит 1720 см-1 характерний для діапазону 1600/1750 см-1, але 3420 см-1 для діапазону 3300/3680 см-1. При цьому поглинання хвиль під час цього процесу має суттєві відмінності 0,16-0,25 для першої смуги і 0,06-0,20 для другої, в середньому 0,11.

Ключові слова: ендометрит, сальпінгоофорит, гормональні та ехографічні дослідження, інфрачервона спектроскопія молекулярних маркерів.

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The authors of this study confirm that the research and publication of the results were not associated with any conflicts regarding commercial or financial relations, relations with organizations and/or individuals who may have been related to the study, and interrelations of coauthors of the article.

Стаття надійшла 08.04.2022 р.
Рекомендована до друку на засіданні редакційної колегії після рецензування