

COMPARISON OF LOW-FREQUENCY PIEZOELECTRIC THROMBOELASTOGRAPHY DATA IN PATIENTS WITH GENITAL ENDOMETRIOSIS USING THE NPO STRATEGY FOR PREOPERATIVE PREPARATION WITH THE BASELINE STATE OF THE HEMOSTASIS SYSTEM

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According to WHO, endometriosis affects about 190 million women of reproductive age worldwide. Despite the prevalence of the pathology, its proven effect on the hemostasis system, data on this effect are heterogeneous. The paper investigates the problem of the influence of preoperative management of patients with genital endometriosis, according to the nil per os (NPO) strategy and changes in the hemostasis system against the background of such tactics; the initial state of the hemostasis system of such patients and its response to the test with local double hypoxia of the upper limb are compared. In the study group of 32 patients aged 20–35 years who were diagnosed with genital endometriosis, using low-frequency piezoelectric thromboelastography (LPTEG), the hemostasis response to pathology was assessed: baseline data, after a test with double local hypoxia without the NPO strategy and with its use. The obtained data indicate the presence of moderate statistically significant disorders in the direction of hypocoagulation during a stress test without using the NPO strategy, and moderate statistically significant disorders in the direction of hypercoagulation during a stress test in the case of using the NPO strategy. The presented data confirm the hypothesis of the possibility of predicting disorders in the hemostasis system of the studied patients in relation to the management strategy and the influence of factors that can be modified in the preoperative period; however, the overall impact of these changes on the course of the perioperative period, the spectrum of external factors with the possibility of a similar effect, the need to use therapeutic strategies for the prevention of thrombosis and bleeding – as well as the monitoring regimen for these changes – remain open to research and discussion.

Key words: NPTEG, hemostasis, endometriosis, gynecology, stress test, NPO.

ПОРІВНЯННЯ ПОКАЗНИКІВ НИЗЬКОЧАСТОТНОЇ П'ЄЗОЕЛЕКТРИЧНОЇ ТРОМБОЕЛАСТОГРАФІЇ У ПАЦІЄНТОК ІЗ ГЕНІТАЛЬНИМ ЕНДОМЕТРІОЗОМ ПІД ЧАС ЗАСТОСУВАННЯ СТРАТЕГІЇ NPO ДЛЯ ПЕРЕДОПЕРАЦІЙНОЇ ПІДГОТОВКИ З ВИХІДНИМ СТАНОМ СИСТЕМИ ГЕМОСТАЗУ**Сулов О.С.**

За даними ВООЗ, ендометріоз уражає близько 190 млн жінок репродуктивного віку в усьому світі. Незважаючи на поширеність патології, доведено її вплив на систему гемостазу, дані щодо цього впливу різномірні. У роботі досліджується проблема впливу передопераційного ведення пацієнток, хворих на генітальний ендометріоз, за стратегією nil per os (NPO) та змін у системі гемостазу на тлі такої тактики; порівнюється вихідний стан системи гемостазу таких пацієнток та відповідь його на пробу з локальною подвійною гіпоксією верхньої кінцівки. У досліджуваній групі з 32 пацієнток віком 20–35 років, у котрих виявлено генітальний ендометріоз, за допомогою низькочастотної п'єзоелектричної тромбоеластографії (НПТЕГ) оцінювалася реакція гемостазу на патологію: дані вихідного стану, після проби з двократною локальною гіпоксією без стратегії NPO та за її використання. Отримані дані свідчать про наявність помірних статистично значущих порушень у бік гіпокоагуляції під час проведення стрес-тесту без використання стратегії NPO та помірних статистично значущих порушень у бік гіперкоагуляції під час проведення стрес-тесту у разі використання стратегії NPO. Наведені дані підтверджують гіпотезу про можливість прогнозування порушень у системі гемостазу досліджуваних пацієнток відносно стратегії ведення та впливу чинників, що можуть бути модифіковані у передопераційному періоді; проте загальний вплив цих змін на перебіг періопераційного періоду, спектр зовнішніх чинників із можливістю схожого впливу, необхідність використання терапевтичних стратегій профілактики тромбозів та кровотечі, так само як і режим моніторингу цих змін, лишаються відкритими для дослідження та дискусії.

Ключові слова: НПТЕГ, гемостаз, ендометріоз, гінекологія, стрес-тест, NPO.

Introduction. According to WHO data for 2023, a pathology such as endometriosis affects approximately 10% of women of reproductive age worldwide, a total of about 190 million people [1]. Among the seven main causes of infertility, genital and extragenital prevail endometriosis, and modern methods of diagnosing infertility involve monitoring the pathology even in the absence of clinical manifestations – such as pelvic pain, discomfort during intercourse, problems with urination or defecation, menstrual cycle disorders.

The question of the violation of the blood coagulation system in these patients remains unresolved, since the data of the available studies are contradictory and sometimes diametrically opposed [2, 3]. In addition, the methods of assessing hemostatic potential are diverse, ranging from simple coagulograms to advanced and expensive methods. One of the particularly promising and cost-effective methods is the use of low-frequency piezoelectric thromboelastography (LPTEG), which has demonstrated its effectiveness in many studies [4, 5].

It has been established that the strategy of preparing the patient for surgical intervention NPO (nil per os, “nothing to intake”) can significantly affect the response

of the blood coagulation system (BCS) to external stimuli [6, 7]. Moreover, in Ukraine, the practice of prolonged preoperative fasting with complete exclusion of fluid intake in any form for 8–12 hours before surgery continues - despite the recommendations of the world's leading agencies on anesthesiology and surgery, as well as the numerous described advantages of a liberal approach to, at least, the water regime at the preoperative stage.

Goals and objectives of the work

The following tasks were outlined during the work:

- To assess the presence (or absence) of the influence of the classical NPO approach in the preoperative period on the BCS system in patients with genital endometriosis using the method of low-frequency piezoelectric thromboelastography using a test with local double hypoxia of the upper limb;
- Compare the obtained LPTEG data for the group of patients who followed the recommendations of the NPO strategy with those in the same group without using the above strategy and in the group of healthy volunteers;
- Formulate a conclusion regarding the obtained results of changes in the BCS system, if similar changes are detected among the studied groups.

Materials and methods. Among the study group (n = 32), which consisted of patients aged 20-35 years with diagnosis of the genital endometriosis, according to laboratory and instrumental tests, using low-frequency piezoelectric thromboelastography (LPTEG) the response of the BCS to the pathology was assessed. At the initial stage of the study, the response of the hemostasis system to the test with local double hypoxia of the upper limb was assessed as an option for safe modeling of the state of tissue ischemia and assessment of the compensatory mechanisms of the body in response [8]. According to the classification of the BCS system response to the test patients can be classified as type 2 (subcompensated) – a state of moderate hypocoagulation with the possibility of developing a disorder in the form of DIC-syndrome. The results obtained with the results characteristic of healthy volunteers are given in Box 1. The results of LPTEG in the study group after passing the test will be further highlighted in the work as the “Baseline Test”.

The same study group (n = 32) was asked to undergo an identical test with local double hypoxia of the upper limb after fulfilling the conditions of preoperative preparation within the framework of the NPO concept, namely: exclusion of solid food and any liquid 8-10 hours before the planned surgical intervention. It is worth noting that the time interval of 8-10 hours was chosen in order to optimize the study in this group using LPTEG and to exclude delays in receiving patients for the purpose of the study; the standard NPO technique is usually oriented towards abstinence from food and drinks for 8 hours before the surgical intervention without taking into account the type of surgical intervention, age, constitutional features of the patients and variants of the clinical course of the main and comorbid pathologies. Box 2 shows the results obtained, which are marked as “NPO Test”; The data were compared with baseline hemostasis values before the stress test in this group and with data characterizing the results of the stress test outside the NPO strategy.

Box 1

Baseline NPTEG indicators of the RASK system in healthy volunteers and patients with genital endometriosis when performing a test with local double hypoxia of the upper limb

Indicator	Healthy volunteers		Study group, baseline test (n = 32)	
	Before the test	After the test	Before the test	After the test
Blood aggregation state (A0)	231.67±12.22	204.02±14.07	232.24±15.33	212.13±17.53
Coagulation contact phase time (Rt 1)	2.35±0.23	2.24±0.11	2.33±0.14	3.13±0.18
Contact coagulation intensity (CCI)	82.82±1.04	76.01±1.14	84.32±1.01	79.34±1.07
Thrombin activity constant (TAC)	14.37±0.41	13.21±0.31	15.23±0.32	17.24±0.33
Blood clotting time (t3)	8.17±0.21	8.89±0.19	8.45±0.18	8.63±0.21
Coagulation drive intensity (CDI)	21.11±0.39	20.09±0.54	21.11±0.60	20.24±0.50
Clot polymerization intensity (CPI)	13.98±0.48	13.21±0.39	14.44±0.42	13.62±0.43
Maximum clot density (MA)	522.22 ± 26.98	508.52±30.79	525.42±30.50	492.23±30.64
retraction and lysis intensity (CRLI)	16.81±0.37	19.64±0.55	16.43±0.40	18.26±0.42

Box 2

LPTEG indicators in patients with genital endometriosis : data on baseline and use of NPO strategy (explanation in text)

Indicator	Baseline test (n = 32)		NPO test (n = 32)	
	Before the test	After the test	Before the test	After the test
Blood aggregation state (A0)	232.24±15.33	212.13±17.53	232.24±15.33	268.03 ± 1 2 . 33
Coagulation contact phase time (Rt1)	2.33±0.14	3.13±0.18	2.33±0.14	2.04 ± 0.11
Contact coagulation intensity (CCI)	84.32±1.01	79.34±1.07	84.32±1.01	99.22 ± 0.15
Thrombin activity constant (TAC)	15.23±0.32	17.24±0.33	15.23±0.32	17.24±0.33
Blood clotting time (t3)	8.45±0.18	8.63±0.21	8.45±0.18	7.47 ± 0.43
Coagulation drive intensity (CDI)	21.11±0.60	20.24±0.50	21.11±0.60	31 , 11 ± 0, 31
Clot polymerization intensity (CPI)	14.44±0.42	13.62±0.43	14.44±0.42	1 5 , 14 ± 0, 51
Maximum clot density (MA)	525.42±30.50	492.23±30.64	525.42±30.50	601.19 ± 28.91
retraction and lysis intensity (CRLI)	16.43±0.40	18.26±0.42	16.43±0.40	1 4 . 91± 0.39

Conclusion. The presented data confirm: the hypothesis of the possibility of predicting disorders in the hemostasis system of the studied patients in relation to the management strategy and the influence of factors that can be modified in the preoperative period, using a stress test; belonging to the subcompensated variant of the course with moderate hypocoagulation of hemostasis disorders in patients with endometriosis without using the NPO strategy in the classical form and belonging to the subcompensated variant of the course with moderate hypercoagulation of hemostasis disorders in patients with

endometriosis , as well as the possibility of a sharp transformation from one state to another depending on the influence of modified factors.

However, the overall impact of these changes on the course of the perioperative period, the range of external factors with the possibility of a similar effect, the need for therapeutic strategies to prevent thrombosis and bleeding – as well as the monitoring regimen for these changes – remain open to research and discussion.

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