



Optimization of treatment of antiphospholipid syndrome in pregnant women: Clinical research

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ABSTRACT

Relevance: Antiphospholipid syndrome (APS) is a very complex and urgent problem during pregnancy. APS is characterized by venous and arterial thromboses caused by the circulation of antiphospholipid antibodies in the blood. These thromboses lead to various complications and negative consequences of pregnancy, requiring improved therapy.

The study aimed to optimize the management of antiphospholipid syndrome in pregnant women.

Materials and Methods: The study was conducted among 76 pregnant women with APS, divided into 2 groups. The groups were representative regarding age, parity, obstetric, and somatic pathology but differed in treatment methods. The comparison group (traditional therapy) included 28 pregnant women with APS. In this group, all pregnant women received traditional APS therapy, including anticoagulants, antiplatelet agents, and glucocorticoids. The main group included 48 pregnant women with APS. In this group, all pregnant women, in addition to traditional therapy, were given systemic enzyme therapy (SET) and plasmapheresis. The control group included pregnant women with uncomplicated pregnancy, n=30.

Results: After 30 days of treatment, the changes in the traditional therapy group compared to the controls included the increases in Willebrand factor – by 17.7%, platelet aggregation index – by 24.1%, total platelet aggregation index – by 26.2%, soluble fibrin-monomer complexes (SFMC) – by 55.3%, and early fibrin degradation products (EFDP) – by 45.6% ($p<0.05$). The platelet disaggregation index decreased by 18.5% and antithrombin III activity – by 14.3% ($p>0.05$). Multidirectional trends in hemostasis system parameters recorded during traditional therapy generally aggravated the degree of disturbances registered in the initial period of the study.

The treatment provided more significant dynamics toward normalizing the studied parameters in the main group. Reliable differences were revealed with the indicators obtained with traditional therapy: SFMC – by 29.7%, EFDP – by 23.3%, and blood prothrombin time – by 14.0% ($p<0.05$).

Conclusion: Using SET in combination with plasmapheresis and low molecular weight heparin ensures the normalization of hemostasis system parameters in pregnant women with APS.

Keywords: antiphospholipid syndrome, pregnancy, systemic enzyme therapy (SET), plasmapheresis.

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Оптимизация лечения антифосфолипидного синдрома у беременных: клиническое исследование

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АННОТАЦИЯ

Актуальность: Антифосфолипидный синдром (АФС) при беременности является очень сложной и актуальной проблемой. Характерные для синдрома венозные и артериальные тромбозы, обусловленные циркуляцией антифосфолипидных антител в крови, приводят к различным осложнениям и негативным последствиям беременности, которые требуют улучшения терапии.

Цель исследования – оптимизация лечения антифосфолипидного синдрома у беременных.

Материалы и методы: Исследование проводилось среди 76 беременных с АФС, которые были разделены на 2 группы. Группы были репрезентативны по возрасту, паритету, акушерской и соматической патологии, но отличались по методам лечения. В группу сравнения (традиционного ведения) вошли 28 беременных с АФС. В данной группе все беременные получали традиционную терапию АФС, включающую антикоагулянты, антиагреганты, глюокортикоиды. В основную группу вошли 48 беременных с АФС. В данной группе всем беременным на фоне традиционной терапии дополнительно применялись системная энзимотерапия и плазмаферез. Отдельно выделена контрольная группа беременных с неосложненным течением беременности, n=30.



Результаты: В группе традиционной терапии по сравнению с контролем через 30 суток были выявлены превышения по показателям фактора Виллебранда – на 17,7%, индекса агрегации тромбоцитов – на 24,1%, суммарного индекса агрегации тромбоцитов – на 26,2%, растворимых фибрин-мономерных комплексов (РФМК) – на 55,3% и ранних продуктов деградации фибрина (РПДФ) – на 45,6% ($p<0,05$). Отмечается снижение индекса дезагрегации тромбоцитов на 18,5% и активности антитромбина III – на 14,3% ($p>0,05$). При традиционной терапии были зарегистрированы разнонаправленные тенденции показателей системы гемостаза на фоне лечения, которые, однако, в целом приводили к усугублению степени нарушений, имевшейся в исходном периоде исследования.

В основной группе лечение обеспечило более значительную динамику к нормализации исследованных показателей. Были выявлены достоверные различия с показателями, полученными при традиционной терапии: по уровню РФМК – на 29,7%, РПДФ – на 23,3% и по показателю протромбинового времени – на 14,0% ($p<0,05$).

Заключение: Применение системной энзимотерапии в сочетании с плазмаферезом и низкомолекулярным гепарином у беременных с АФС обеспечивает практически полную нормализацию показателей системы гемостаза.

Ключевые слова: антифосфолипидный синдром (АФС), беременность, системная энзимотерапия (СЭТ), плазмаферез.

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Жұкті әйелдерде антифосфолипидті синдромды емдеуді онтайландыру: клиникалық сынақ

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АНДАТПА

Озектілігі: Жұктілік кезіндегі антифосфолипидті синдром (АФС) – ете құрделі және өзекті мәселе. АФС веноздық және артеријалық тромбоздармен сипатталады, олар қандағы антифосфолипидті антиденелердің айналымынан туындауды және әртүрлі аскынұлар мен жүктіліктің жағымсыз салдарына әкеледі, терапияны жақсартуды қажет етеді.

Зерттеу мақсаты – жұкті әйелдерде АФС емдеуді онтайландыру.

Материалдар мен әдістері: Зерттеу АФС бар 76 жұкті әйелдер арасында жүргізілді, олар 2 топқа бөлінген. Топтар жас, паритет, акушерлік және соматикалық патология бойынша репрезентативті болды, бірақ емдеу әдістерінде ерекшеленді.

Салыстыру тобына (дәстүрлі емдеу) АПС бар 28 жұкті әйел кірді. Бұл топтағы барлық жұкті әйелдер дәстүрлі терапияны алды (соның ішінде антикоагуланттар, антиагреганттар және глюкокортикоидтар). Негізгі топқа АПС бар 48 жұкті әйел кірді. Бұл топта барлық жұкті әйелдер дәстүрлі терапия фонында жүйелі ферменттік терапия және плазмаферезбен қосынша емделді. Аскынбаған жүктілігі бар жұкті әйелдердің жеке бақылау тобы бөлінди, $n=30$.

Нәтижелері: Дәстүрлі терапия тобында бақылаумен салыстырылғанда 30 күннен кейін келесілер көрсеткіштердің жогарылауы анықталды: Виллебранд факторының мөлшерінің 17,7%-ға, тромбоциттер агрегациясының индексінің 24,1%-ға және жалпы IAT 26,2%-ға, еритін фибрин-мономер кешендерінің (ЕФМК) және фибриннің өртे ыдырау өнімдерінің (ФЕЫӨ) деңгейі 55,3%-ға және 45,6%-ға сыйкесінше ($p<0,05$). Көрсеткіштердің темендеуі байкалады: тромбоциттер дезагрегациясының индексі 18,5%-ға, анти-тромбин III белсенделілігі 14,3%-ға ($p>0,05$). Дәстүрлі терапиямен емдеу кезінде гемостаздық жүйе параметрлерінің көп бағытты тенденциялары тіркелді, алайда бұл жалпы зерттеудің баставапқы кезеңінде болған бұзылулар дәрежесінің нашарлауына әкелді.

Негізгі топта емдеу зерттелетін параметрлерді қалыпқа келтіру бағытында айтарлықтай динамика берді. 30 күннен кейін дәстүрлі терапия тобынан айырмашылығы, бақылау тобынан көрсеткіштерімен айтарлықтай айырмашылықтар тіркелмеді. Сонымен қатар, дәстүрлі терапиямен алынған көрсеткіштермен айтарлықтай айырмашылықтар анықталды: ЕФМК деңгейінде – 29,7%-ға, ФЕЫӨ – 23,3%-ға және қандағы протромбин уақытының көрсеткіші бойынша – 14,0%-ға ($p<0,05$).

Қорытынды: Жүйелі ферменттік терапия, плазмаферез және төмен молекулалы гепаринмен бірге қолдану АФС бар жұкті әйелдерде гемостаз жүйесінің көрсеткіштерін қалыпқа келтіруді қамтамасыз етеді.

Түйінді сөздер: антифосфолипидті синдром, жұктілік, жүйелі ферменттік терапия, плазмаферез.



Introduction: Antiphospholipid syndrome (APS) is a clinical and laboratory diagnosis characterized by both persistent laboratory signs of antiphospholipid antibodies (aPL) and associated complications, which may include venous thrombosis, arterial thrombosis, and adverse pregnancy outcomes [1-3]. APS is based on a specific vasculopathy associated with thrombotic occlusive vascular disease in the absence of inflammatory or degenerative changes in the vascular wall [4-6].

The appearance of auto-antiphospholipid antibodies disrupts thrombus formation. As their action increases, the activation of the endogenous physiological inhibitor of protein C, which limits the action of plasma factors V and VIII, is disrupted, leading to venous and arterial thrombosis [7, 8].

Pregnancy complications in APS include preeclampsia, intrauterine growth retardation syndrome, premature birth, and spontaneous miscarriages. Critical conditions include complications such as premature detachment of a normally located placenta, hemolytic uremic syndrome, and HELLP syndrome [9-12].

The pathological conditions described above during pregnancy require timely diagnosis of APS and improved treatment.

The study aimed to optimize the management of antiphospholipid syndrome in pregnant women.

Materials and methods: Assuming the potentiation of the effects of systemic enzyme therapy (SET), plasmapheresis, and low molecular weight heparins (LMWH), a complex therapy of APS was developed with the simultaneous use of the above-mentioned treatment methods in combination.

For achieving the objectives, pregnant women with APS (n=76) were divided into 2 groups. The main group (n=48) included pregnant women with APS who, in addition to traditional therapy, received SET and plasmapheresis [13]. The comparison group (traditional therapy) (n=28) included pregnant women with APS who received traditional APS therapy, including anticoagulants, antiplatelet agents, and glucocorticoids [14-18]. The groups were representative regarding age, parity, obstetric, and somatic pathology but differed in treatment methods.

A separate control group (n=30) of pregnant women with uncomplicated pregnancy was identified.

Results: SET is a therapeutic method based on combined enzyme preparations. The basis of these preparations is highly purified proteinases [19].

Indications for plasmapheresis were pronounced activity of the autoimmune process, manifestations of chronic DIC syndrome, allergic reactions to antiplatelet agents and anticoagulants, activation of bacterial and viral infections, exacerbation of gastric ulcer and duodenal ulcer, in which the use of prednisolone is impossible [20].

Plasmapheresis has detoxifying, rheo-, coagulo-, and immunocorrective effects. Its inclusion in the complex therapy of patients with APS is pathogenetically justified and potentiates the positive effect of drugs [20, 21]. The use of heparins in women with thrombosis and thrombotic readiness is determined by the need to prevent thrombosis of placental vessels [22]. When obstetric pathology was detected in pregnant women in both groups (miscarriage, preeclampsia, placental

insufficiency, etc.), experimental obstetric pathology was treated against the background of APS treatment. In traditional care of pregnant women with APS, antiplatelet agents, anticoagulants, and glucocorticoids were used against the obstetric pathology treatment without SET plasmapheresis. The main group received traditional APS treatment plus additional SET with plasmapheresis in several intermittent modes every two weeks under hemostasis control.

During the treatment, pregnant women with APS were monitored for indicators of various links of the hemostasis system.

In the blood of pregnant women in the traditional therapy group, the content of von Willebrand factor in the initial period was increased relative to the control group by 17.2%. In the dynamics of traditional treatment, this indicator decreased, and after 10 days, its value exceeded the control indicator by 11.4%. However, after 30 days, an opposite trend towards its growth was observed, and the degree of excess was 17.7%.

The dynamics of the platelet aggregation index (PAI) was initially aimed at decreasing relative to the initial level, but after 30 days, its increase was observed again, and the excess over the control group level was 24.1% ($p<0.05$).

At the same time, platelet aggregation rate (PAR) was significantly higher than the control group indicator at the initial examination, and after 10 days ($p<0.05$), and after 30 days, it decreased.

The total PAI level changed similarly to PAI. Initially, there was a decrease in this indicator from a 17.5% excess over the control group to the equality with its level. However, after 30 days, this indicator reliably increased compared with the control (by 26.2%, $p<0.05$).

During the observation period, a decrease in the platelet disaggregation index was revealed in the traditional therapy group. The differences with the control group reached the level of reliability only after 30 days from the initial examination (18.5%, $p<0.05$), indicating a deterioration of the hemostasis system parameters in pregnancy complications [23].

The level of soluble fibrin-monomer complexes (SFMC) and early fibrin degradation products (EFDP) had a reliable excess in the initial period and a tendency to increase when analyzing the differences between the initial indicator and the state after 30 days. In the latter case, the excess over the controls amounted to 55.3% and 45.6%, respectively, $p<0.05$.

The prothrombin time in the blood increased. It had no significant differences with the control after 10 days and practically normalized after 1 month from the start of correction in the main group.

Similar dynamics characterized the international normalized ratio, which in the comparison group tended to decrease (hypercoagulation), and in the main group, it was completely normalized upon completion of the course of treatment.

Antithrombin III activity decreased compared with the control group at the outcome (by 12.6%, $p>0.05$) and after 30 days (by 14.3%, $p>0.05$).

Table 1 shows the dynamics of hemostasis parameters in pregnant women with antiphospholipid syndrome using complex treatment (SET, plasmapheresis, and anticoagulants).



Table 1 – The effect of complex treatment using SET, plasmapheresis, and low molecular weight heparins on hemostasis system parameters in pregnant women with antiphospholipid syndrome

Indicators	Pregnant women with uncomplicated pregnancy (n = 30)	Traditional therapy (n=28)			SET with plasmapheresis (n = 48)		
		Before treatment	After 10 days of treatment	After 30 days of treatment	Before treatment	After 10 days of treatment	After 30 days of treatment
Ejection fraction, %	88.5±6.2	103.7±7.7	98.6±4.9	104.2±5.1	108.2±6.0*	95.7±5.5	96.1±5.7
ADP-dependent aggregation							
PAI, %	37.8±2.3	45.2±3.5	41.8±2.9	46.9±3.3*	47.3±2.9*	42.2±3.0	40.5±2.5
TPA, extra units/min	0.025±0.002	0.033±0.002*	0.031±0.002*	0.030±0.002	0.034±0.002*	0.032±0.002*	0.029±0.001
TPAI, %	49.2±3.0	57.8±4.4	50.5±3.7	62.1±4.5*	58.5±3.7	51.3±3.3	52.0±4.1
PDT, %	20.5±1.3	18.4±1.1	17.9±1.2	16.7±1.0*	17.4±0.9	19.2±1.2	19.6±1.1
Plasma coagulation component							
Fibrinogen, g/L	3.61±0.25	3.95±0.18	3.88±0.14	4.15±0.21	4.12±0.17	3.72±0.12	3.84±0.15
SFMC, mg/mL	6.60±0.45	8.69±0.63*	8.34±0.58*	10.25±0.60**	10.24±0.49**	7.65±0.31	7.21±0.30#
EFDP, mg/mL	11.83±0.90	14.70±1.05*	12.95±0.76	17.22±1.09*	16.08±1.05*	11.45±0.87	13.20±0.72#
Prothrombin time, s	24.2±1.1	19.1±1.5*	18.5±1.4*	17.9±1.4*	18.5±1.1*	20.7±1.3	23.1±1.3
INR	1.24±0.08	0.97±0.06*	0.94±0.07*	0.89±0.05*	0.99±0.08*	1.15±0.07	1.22±0.10
Antithrombin III, %	87.2±5.4	76.2±3.9	79.7±4.1	74.7±4.2	71.5±3.9*	77.2±4.1	75.8±3.7
XIIa-dependent fibrinolysis, min	5.3±0.4	6.4±0.4	5.0±0.3	5.9±0.4	7.0±0.3*	5.1±0.2	5.3±0.2

Note: * – differences with the baseline are significant, p <0.05, ** – p <0.01 # – differences with the traditional therapy group are significant, p <0.05 ADP – adenosine diphosphate, PAI – platelet aggregation index, PDI – platelet disaggregation index, SFMC – soluble fibrin-monomer complexes, EFDP – early fibrin degradation products, TPA - total platelet aggregation, TPAI – total platelet aggregation index

Discussion: Previously, studies were conducted among women of fertile age with APS to develop a method of pregravid preparation for a planned pregnancy and assess its clinical results. This study provides a comparative analysis of the effectiveness of complex therapy for APS during pregnancy. With traditional therapy, multidirectional trends in hemostasis system parameters were recorded during treatment, which generally led to an aggravation of the disorders present in the initial period of the study. At the same time, with complex therapy (SET, plasmapheresis, anticoagulants), reliable differences with the control group were recorded in the initial examination period [23].

The course of treatment provided more significant dynamics toward the normalization of the studied parameters. If reliable differences with the group of pregnant women without complications in the initial period were revealed in the parameters of von Willebrand factor, PAI, PAR, PV, SFMC, RPDF, antithrombin III and XIIa-dependent fibrinolysis, then after 10 days – only by PAR and protrombine time – by 28.0% and 15.7%, respectively (p<0.05).

After 30 days, there were no significant differences between the parameters of the main group and the traditional therapy group. At the same time, significant differences with the parameters obtained with traditional therapy were revealed: in the level of RFMC - by 29.7%, RPDF - by 23.3%, and PV - by 14.0% (p<0.05).

Conclusion: According to the hemostasis system parameter analysis, SET in combination with plasmapheresis and

LMWH ensures almost complete normalization of condition in pregnant women with APS. This complex treatment is of great practical significance for pregnant women; it improves the course and outcomes of pregnancy.



REFERENCES:

1. Tripodi A, Cohen H, Devreese KMJ. Lupus anticoagulant detection in anticoagulated patients. Guidance from the Scientific and Standardization Committee for lupus anticoagulant/antiphospholipid antibodies of the International Society on Thrombosis and Haemostasias. *J Thromb Haemost.* 2020;18(7):1569-1575.
<https://doi.org/10.1111/jth.14846>
2. Devreese KMJ, Zuijly S, Meroni PL. Role of antiphospholipid antibodies in the diagnosis of antiphospholipid syndrome. *J Transl Autoimmun* [Internet]. 2021;4:100134.
<https://doi.org/10.1016/j.jtauto.2021.100134>
3. Yun Z, Duan L, Liu X, Cai Q, Li C. An update on the biologics for the treatment of antiphospholipid syndrome. *Front Immunol* [Internet]. 2023;14:1145145.
<https://doi.org/10.3389/fimmu.2023.1145145>
4. Yin D. *Evaluation and optimization of laboratory criteria for Antiphospholipid Syndrome Diagnosis* [Internet] [Doctoral Thesis]. [Maastricht University]; 2021. Available from:
<https://doi.org/10.26481/dis.20211027dy>
5. Cohen H, Cuadrado MJ, Erkan D, Duarte-Garcia A, Isenberg DA, Knight JS, Ortel TL, Rahman A, Salmon JE, Tektonidou MG, Williams DJ, Willis R, Woller SC, Andrade D. 16th International Congress on Antiphospholipid Antibodies Task Force Report on Antiphospholipid Syndrome Treatment Trends. *Lupus*. 2020;29(12):1571-1593.
<https://doi.org/10.1177/0961203320950461>
6. Moore GW. Analytical dilemmas in lupus anticoagulant detection. *Explor Immunol* [Internet]. 2023 Aug 31 [cited 2024 Mar 25];3(4):300-324.
<https://doi.org/10.37349/ei.2023.00104>
7. Balbi GGM, Pacheco MS, Monticielo OA, Funke A, Danowski A, Santiago MB, Staub HL, Rêgo J, de Andrade DCO. Antiphospholipid Syndrome Committee of the Brazilian Society of Rheumatology position statement on the use of direct oral anticoagulants (DOACs) in antiphospholipid syndrome (APS). *Adv Rheumatol*. 2020;60(1):29.
<https://doi.org/10.1186/s42358-020-00125-9>
8. Cohen H, Efthymiou M, Devreese KMJ. Monitoring of anticoagulation in thrombotic antiphospholipid syndrome. *J Thromb Haemost.* 2021;19(4):892-908.
<https://doi.org/10.1111/jth.15217>
9. Khamashta M, Taraborelli M, Sciascia S, Tincani A. Antiphospholipid syndrome. *Best Pract Res Clin Rheumatol*. 2016;30(1):133-148.
<https://doi.org/10.1016/j.bepr.2016.04.002>
10. Sciascia S, Khamashta MA, D'Cruz DP. Targeted therapy in antiphospholipid syndrome. *Curr Opin Rheumatol*. 2014;26(3):269-275.
<https://doi.org/10.1097/BOR.0000000000000051>
11. Космуратова Ш.Б., Битемирова Ш.К., Жакиева Ш.С., Жылкайдар Г.М., Кайсажанова Г.А. Клинико-анамнестические факторы риска развития преэклампсии. *Репродуктивная медицина (Центральная Азия)*. 2024;2:80-87.
Kosmuratova ShB, Bitemirova ShK, Zhakieva ShS, Zhylkajdar GM, Kajsazhanova GA. Clinical and anamnestic risk factors for developing preeclampsia. *Reproductive medicine (Central Asia)*. 2024;2:80-87. Russian.
<https://doi.org/10.37800/RM.2.2024.80-87>
12. Тайжанова Д.Ж., Зубков Д.В., Комличенко Э.В., Магалов И.Ш., Сорокина М.А., Амирбекова Ж.Т., Турдунова Г.С., Беспалова Н.В., Майданова З.О. Оценка параметров коагулограммы для прогнозирования потери беременности на ранних сроках. *Репродуктивная медицина (Центральная Азия)*. 2024;3:82-91.
Tajzhanova DZh, Zubkov DV, Komlichenko JeV, Magalov ISh, Sorokina MA, Amirbekova ZhT, Turdunova GS, Bespalova NV, Majdanova ZO. Evaluation of coagulogram parameters for predicting early pregnancy loss. *Reproductive medicine (Central Asia)*. 2024;3:82-91. Russian.
<https://doi.org/10.37800/RM.3.2024.82-91>
13. Legault K, Schunemann H, Hillis C, Yeung C, Akl EA, Carrier M, Cervera R, Crowther M, Dentali F, Erkan D, Espinosa G, Khamashta M, Meerpolh JJ, Moffat K, O'Brien S, Pengo V, Rand JH, Rodriguez Pinto I, Thom L, Iorio A. McMaster RARE-Best practices clinical practice guidelines on diagnosing and managing the catastrophic antiphospholipid syndrome. *J Thromb Haemost*. 2018;16:1656-1664.
14. Devreese KMJ, Ortel TL, Pengo V, De Laat B. for the Subcommittee on Lupus Anticoagulant/Antiphospholipid Antibodies. Laboratory criteria for antiphospholipid syndrome: communication from the SSC of the ISTH. *J Thromb Haemost*. 2018;16(4):809-813.
<https://doi.org/10.1111/jth.13976>
15. Garcia D, Erkan D. Diagnosis and management of the antiphospholipid syndrome. *N Engl J Med*. 2018;378(21):2010-2021.
<https://doi.org/10.1056/NEJMra1705454>
16. Cohen H, Mackie IJ, Devreese KMJ, International Society for Thrombosis and Haemostasias Scientific and Standardization Committee for Lupus Anticoagulant/Antiphospholipid Antibodies. Clinical and laboratory practice for lupus anticoagulant testing: An International Society of Thrombosis and Haemostasias Scientific and Standardization Committee survey. *J Thromb Haemost*. 2019;17(10):1715-1732.
<https://doi.org/10.1111/jth.14560>
17. Tripodi A, Cohen H, Devreese KMJ. Lupus anticoagulant detection in anticoagulated patients. Guidance from the Scientific and Standardization Committee for lupus anticoagulant/antiphospholipid antibodies of the International Society on Thrombosis and Haemostasias. *J Thromb Haemost*. 2020;18(7):1569-1575.
<https://doi.org/10.1111/jth.14846>
18. Arachchilage DRJ, Gomez K, Alikhan R, Anderson JAM, Lester W, Laffan M, British Society for Haematology, Haemostasis and Thrombosis Taskforce. Addendum to British Society for Haematology Guidelines on Investigation and Management of



- Antiphospholipid syndrome, 2012 (Br J Haematol. 2012;157:47-58.): use of direct-acting oral anticoagulants. *Br J Haematol.* 2020;189:212-215.
<https://doi.org/10.1111/bjh.16308>
19. Опыт применения препаратов системной энзимотерапии (Вобэнзим) в акушерстве и гинекологии. *Медицинские новости.* 2019;4 (295):56-59.
Experience of using systemic enzyme therapy drugs (Wobenzym) in obstetrics and gynecology. *Meditinskie novosti.* 2019;4 (295):56-59. Russian.
<https://cyberleninka.ru/article/n/opyt-primeneniya-preparatov-sistemnoy-enzimoterapii-vobenzim-v-akusherstve-i-ginekologii>
20. Petri M. Improvements in diagnosis and risk assessment of primary and secondary antiphospholipid syndrome. *Hematol Am Soc Hematol Educat Progr.* 2019;2019(1):415-420.
<https://doi.org/10.1182/hematology.2019000046>
21. Федорова А.Т., Серов В.Н., Сидельникова В.М. *Применение плазмафереза в лечении патологических состояний в акушерстве* [Интернет]. Дата доступа: 17.01.2025. Доступно по адресу:
Fedorova AT, Serov VN, Sidelnikova VM. *Use of plasmapheresis in the treatment of pathological conditions in obstetrics* [Internet]. Access date: 17.01.2025. Russian. Available at:
https://www.critical.ru/ann/pages/it_page30.html
22. Pengo V, Denas G. Diagnostics and treatment of thrombotic anti-phospholipid syndrome (APS): A personal perspective. *Thromb Res.* 2018;169:35-40.
<https://doi.org/10.1016/j.thromres.2018.07.011>
23. Танышева Г.А., Желпакова М.С., Маусымбаева Н.Б., Курмангалиева Д.А., Сидорова О.Г. Способ прегравидарной подготовки женщин с антифосфолипидным синдромом и его клинические результаты. *Наука и здравоохранение.* 2015;6:124-132.
Tanyshova GA, Zhelapkova MS, Mausimbaeva NB, Kurmangaliyeva DA, Sidorova OG. Method of pregravid preparation of women with antiphospholipid syndrome and its clinical results. *Nauka i zdravookhranenie.* 2015;6:124-132. Russian.
<https://cyberleninka.ru/article/n/sposob-predgravidarnoy-podgotovki-zhenschin-s-antifosfolipidnym-sindromom-i-ego-klinicheskie-rezulaty>

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