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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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ANTIPHOSPHOLIPID SYNDROME AS A MODIFIER OF CLINICAL PHENOTYPES IN ATHEROSCLEROTIC CARDIOVASCULAR DISEASE: A CASE–CONTROL STUDY

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Abstract.

Background: Antiphospholipid syndrome (APS) is an autoimmune prothrombotic disorder characterized by persistent antiphospholipid antibodies and vascular thrombosis. Its contribution to clinical phenotypes of atherosclerotic cardiovascular disease (ASCVD) remains incompletely defined.

Objective: To evaluate the association between APS and clinical, thrombotic, and laboratory characteristics in patients with ASCVD.

Methods: A single-center case–control study (2019–2023) included 355 patients with confirmed ASCVD. Ninety-two patients (25.9%) fulfilled revised Sydney APS criteria and were included as cases. Ninety-two age- and sex-matched APS-negative ASCVD patients served as controls. Clinical characteristics, vascular involvement, cardiovascular risk factors, coagulation parameters, lipid profile, and antiphospholipid antibodies (anticardiolipin, anti-β2-glycoprotein I, and lupus anticoagulant) were analyzed. Correlation and multivariable regression analyses were performed.

Results: APS prevalence among ASCVD patients was 25.9%. APS-positive patients demonstrated significantly higher rates of venous thrombosis (OR 4.02; p=0.037) and central nervous system arterial thrombosis (OR 2.40; p=0.044). Cerebral arterial involvement was more frequent in APS patients (OR 3.12; p=0.036). Lupus anticoagulant was the most prevalent antibody (57.6%). IgG isotype antibodies showed strong correlations with activated partial thromboplastin time, particularly anti-β2GPI IgG (r=0.709; p < 0.001). APS patients exhibited prolonged prothrombin time, reduced prothrombin index, and significantly elevated D-dimer levels. Multivariable regression models (adjusted R^2 0.35–0.44) identified thrombotic localization, coagulation parameters, and lipid indices as independent predictors of antiphospholipid antibody levels.

Conclusion: APS is associated with a distinct thrombotic phenotype in ASCVD characterized by increased venous and cerebrovascular thrombosis and coagulation dysregulation. These findings support the concept that APS acts as an immunothrombotic modifier of ASCVD rather than a primary cause of atherosclerosis.

Key words. Antiphospholipid syndrome, atherosclerotic cardiovascular disease, immunothrombosis, antiphospholipid antibodies, risk stratification.

Introduction.

Antiphospholipid syndrome (APS) is a systemic autoimmune disorder characterized by persistent antiphospholipid antibodies (aPL) and a clinical predisposition to arterial and venous thrombosis. The syndrome represents one of the most important acquired thrombophilias and is associated with a wide spectrum of vascular and obstetric manifestations [1-4]. According to international consensus criteria, APS is defined by the occurrence of vascular thrombosis or pregnancy morbidity in the presence of persistent aPLs, including lupus anticoagulant, anticardiolipin antibodies, and anti-β2-glycoprotein I antibodies [5].

Although APS has traditionally been considered primarily a thrombotic disorder, increasing evidence indicates that immune-mediated mechanisms play a broader role in vascular pathology. aPLs may induce endothelial activation, platelet aggregation, complement activation, and tissue factor expression, thereby promoting a proinflammatory and prothrombotic vascular environment [6-9]. These mechanisms contribute to the concept of immunothrombosis, linking immune dysregulation with coagulation activation.

ASCVD remains the leading cause of morbidity and mortality worldwide. Classical cardiovascular risk factors such as hypertension, diabetes mellitus, dyslipidemia, smoking, and aging explain a large proportion of cardiovascular events; however, they do not fully account for the occurrence and heterogeneity of atherosclerotic disease [10]. Consequently, increasing attention has been directed toward non-traditional cardiovascular risk factors, including chronic inflammation and autoimmune disorders.

Several studies suggest that APS may be associated with accelerated atherosclerosis and increased cardiovascular morbidity. Increased carotid intima-media thickness, endothelial dysfunction, and plaque progression have been described in APS patients independently of traditional cardiovascular risk factors [11-14]. In addition, aPLs have been detected in patients with myocardial infarction and ischemic stroke, supporting the hypothesis that immune-mediated mechanisms contribute to cardiovascular pathology [15,16].

Despite these observations, the precise role of APS in the clinical expression of ASCVD remains incompletely understood. It is still unclear whether APS directly contributes to atherosclerotic plaque formation or whether it primarily modifies the thrombotic phenotype of patients with established atherosclerotic disease. Clarifying this relationship is clinically important because it may influence risk stratification and therapeutic strategies.

The present study was therefore designed to investigate the association between antiphospholipid syndrome and clinical phenotypes of atherosclerotic cardiovascular disease. Specifically, the aim of the study was to evaluate whether APS is associated with distinct thrombotic patterns, vascular involvement, and laboratory characteristics in patients with ASCVD.

Materials and Methods.

A case–control study was conducted from November 2019 through December 2023 in a tertiary care clinical center and included patients presenting with confirmed ASCVD. Given the nature of a tertiary referral setting, the study population may have been enriched with patients presenting more severe, complex, or refractory cardiovascular disease.

Consecutive adult patients (≥18 years) were enrolled during the screening process. Inclusion criteria comprised: (1) male and female patients aged ≥18 years; (2) outpatients with a history of atherosclerotic cardiovascular disease, including coronary, peripheral, and cerebrovascular disease, as well as venous thrombosis; and (3) hospitalized patients presenting with acute atherothrombotic cardiovascular events. ASCVD was defined according to ESC/ACC/AHA guidelines as acute coronary syndrome (ACS), ischemic stroke/transient ischemic attack (TIA), chronic coronary syndrome, or acute peripheral arterial thrombosis/embolism. All patients underwent standardized antiphospholipid antibody (aPL) screening.

Cases comprised ASCVD patients satisfying the revised Sydney APS classification criteria: clinical (vascular thrombosis) and laboratory (≥1 aPL positivity confirmed on two occasions at least 12 weeks apart). Patients not fulfilling APS criteria were assigned to the control group. Controls were selected via 1:1 matching for age (±5 years) and sex from the APS-negative ASCVD population. Exclusion criteria mitigated confounders: active infection/sepsis, active malignancy, alternative systemic autoimmune diseases, inherited/acquired thrombophilias, or pregnancy. All participants provided written informed consent.

The study was conducted in accordance with the ethical principles of Helsinki Declaration, securing local Institutional Review Board approval (November 2019).

Demographic characteristics and detailed medical history were collected using a structured medical questionnaire, focusing on prior arterial/venous thromboses (deep vein thrombosis [DVT], pulmonary embolism [PE], cerebral/systemic arterial sites), ASCVD event chronology, familial cardiovascular disease, and established ASCVD traditional risk factors. A comprehensive physical examination was performed in all cases.

Laboratory profiling spanned complete blood count (CBC), coagulation panel biochemistry, high-sensitivity C-reactive protein (hsCRP, mg/L), cardiac troponins (ng/L), and full lipid panel (total cholesterol, LDL-C, HDL-C, triglycerides [all mmol/L]; atherogenic index = log[triglycerides/HDL-C]). aPL assays were performed using commercial ELISA (Human Diagnostics/Demeditec Diagnostics GmbH, Germany) for aCL IgG/IgM (AU/mL; positive >10, >99th percentile) and anti-β2GPI IgG/IgM (U/mL; positive >8, >99th percentile), per EULAR/ISTH recommendations. LA detection followed ISTH standardized 3-phase protocol (screen/mix/confirm) using dilute Russell's viper venom time (dRVVT) and silica-based APTT (HemosIL, Werfen Spain; normalized ratio >1.20 positive).

Diagnostic imaging confirmed ASCVD topography: 12-lead ECG, transthoracic echocardiography (valvular regurgitation/stenosis graded I-IV, ejection fraction [%], regional wall motion abnormality), coronary angiography (Gensini score for lesion severity), computed tomography (CT), computed tomography angiography (CTA), Doppler ultrasonography, or peripheral arteriography as clinically indicated. Acute events verified per guideline algorithms.

Statistical analyses were conducted using IBM SPSS software (version 29.0). Continuous variables were presented as means with standard deviations or medians with interquartile ranges, depending on data distribution. Normality was assessed using the Shapiro–Wilk test. For normally distributed variables, Student's t-test was used, while for non-normally distributed variables, the Mann–Whitney U test was applied. Categorical variables were expressed as frequencies and percentages and compared using the χ^2-test. The strength of associations was evaluated using odds ratios (OR) with 95% confidence intervals (CI). Correlation analyses were conducted using Spearman or Pearson coefficients as appropriate. A p-value <0.05 was considered statistically significant.

Multiple linear regression analyses were performed using a stepwise backward elimination approach. From an initial pool of 59 candidate variables, independent predictors of five APS-related laboratory outcomes (aCL IgM, aCL IgG, anti-β2GPI IgM/IgG, and LA; n=92 APS-positive patients) were identified. Variables with $p>0.10$ were iteratively removed, retaining predictors with $p<0.05$ in the final models. Model fit was assessed using ANOVA F-tests, R^2, and adjusted R^2 statistics. Given the exploratory nature of the analysis, significance level was set at $\alpha=0.05$.

Coronary artery involvement variables (VD_CA, VD_CX, VD_RCA) were included as binary indicators (presence vs absence of lesions in the corresponding vascular territories).

Results.

Of 355 screened ASCVD patients, 92 (25.9%; 95% CI 21.4-30.7%) met Sydney APS criteria, forming cases. Age and sex distribution was balanced between case and control groups, reflecting the predefined matching criteria.

Descriptive analysis.

Age and Sex Distribution:

The mean age of participants in the APS-positive group was 65.63 ± 10.30 years, compared to 65.54 ± 10.60 years in the control group. No statistically significant difference in mean age was observed between groups ($p > 0.05$), confirming appropriate matching. Age stratification further demonstrated a comparable distribution between groups (see Table 1).

Sex distribution was balanced between groups, reflecting the predefined matching criteria, Male participants comprised 80% in each group (see Table 2). The absence of statistically significant differences in age and sex confirms that subsequent comparisons of clinical and laboratory parameters were not influenced by demographic imbalance.

Clinical characteristics:

Analysis of prior medical history revealed a significantly higher burden of thrombotic events among APS-positive ASCVD patients compared with matched controls (see Table 3). APS-positive patients manifested a profoundly prothrombotic profile. Prior venous thrombosis predominated (OR 4.02, 95% CI 1.09-14.96, p=0.037), alongside CNS arterial events (OR 2.40, 95% CI 1.02-5.64, p=0.044).

Vascular Territory Involvement:

The anatomical distribution of ASCVD showed significant divergence between the groups. Cerebral arteries predominance characterized APS-positive cases (OR 3.12, 95% CI 1.08-9.07, p=0.036), as shown in Table 4. No statistically significant differences were observed for LAD, CX, or RCA territories.

Cardiac Functional Parameters:

Heart rate did not differ between groups (81.4 ± 19.6 vs 79.3 ± 15.6; p=0.422). QTc interval was significantly lower in APS-positive patients (396.5 ± 49.6 vs 420.6 ± 22.0 ms; t=4.26; p < 0.001). Left ventricular ejection fraction (EF) did not differ (45.8 ± 10.0 vs 45.4 ± 8.4; p=0.769) (Table 5). Regarding NYHA functional class, class IV was more frequent in case group (14.1% vs 4.3%; OR 3.62, 95% CI 1.13–11.56; p=0.030). No significant differences were observed in other NYHA classes (Table 6).

Valvular pathology:

Echocardiography unveiled subtle valvulopathy: mild tricuspid regurgitation (mild to moderate) prevailed in APS-positive group (OR 2.79, 95% CI 1.03-7.56, p=0.043). No significant differences were observed in the distribution of other valvular pathologies.

aPL values and distribution:

The distribution of aPLs is presented in Table 7. The median level of aCL IgM was 3.07 [IQR: 0.96–9.89], with positive results observed in 25.0% of patients. The median level of aCL IgG was 4.23 [IQR: 1.01–29.81], and 38.0% of patients tested positive.

For anti-β2 glycoprotein I IgM, the median value was 1.33 [IQR: 0.48–4.40]; most pa-tients were negative (77.2%), while 13.0% showed positive results. The median level of anti-β2 glycoprotein I IgG was 1.59 [IQR: 0.96–2.95], with negative results predominat-ing (88.0%) and 8.7% testing positive.

Lupus anticoagulant (LA) values were normally distributed and are presented as mean ± standard deviation (1.2 ± 0.2). Positive LA results were detected in 57.6% of patients, while 42.4% had values within the normal range.

Coagulation parameters:

Prothrombin time (PT) was significantly higher in APS-positive patients, while the prothrombin index (PI) was lower (16.8 ± 2.2 vs 15.5 ± 2.5; p < 0.001 and 72.5 ± 9.5 vs 80.3 ± 11.5; p < 0.001, respectively). Activated partial thromboplastin time (APTT) was also lower in APS-positive patients (p = 0.010). No significant differences were observed for INR or thrombin time (TT). Fibrinogen levels were lower, whereas D-dimer levels were significantly higher in APS-positive patients (p = 0.004 and p < 0.001, respectively). (See Table 8).

Lipid profile and inflammatory markers:

Total cholesterol was significantly lower in APS-positive patients (120.9 ± 38.9 vs 176.7 ± 35.2; p < 0.001). HDL cholesterol was higher in APS-positive patients (44.5 ± 14.8 vs 35.2 ± 5.9; p < 0.001). LDL cholesterol was slightly higher in APS-positive patients (125.4 ± 47.4 vs 112.7 ± 39.5; p=0.049). VLDL cholesterol and triglycerides were lower in APS-positive patients (p < 0.001 and p=0.002, respectively). The atherogenic index was significantly lower in APS-positive patients (2.0 ± 1.2 vs 4.5 ± 1.5; p < 0.001) (See Table 9.).

Other Laboratory Parameters:

No significant differences were observed for CRP (p=0.176), troponin (p=0.579), platelet count (p=0.091), creatinine (p=0.532), systolic blood pressure (p=0.693), or diastolic blood pressure (p=0.889).

Cardiovascular risk factors:

Cardiovascular risk factors showed a heterogeneous distribution between groups. Nota-bly, BMI-derived categories revealed a divergent pattern: overweight was significantly more prevalent in the Case group (42.4% vs. 6.5%; p<0.001), whereas obesity was mark-edly higher in the Control group (76.1% vs. 38.0%; p<0.001). Consistently, mean BMI was also higher in controls (33.2 vs. 29.4; p<0.001).

These findings indicate that excess body weight was distributed differently across groups, with overweight predominating in cases and obesity in controls.

Additionally, grade II hypertension (21.7% vs. 7.6%; p=0.009), alcohol consumption (35.9% vs. 12.0%; p<0.001), higher physical activity (27.2% vs. lower; p=0.001), and family history (17.4% vs. 6.5%; p=0.028) were more frequent in the Case group, whereas sedentary behavior was higher in controls (91.3% vs. 72.8%; p=0.001). Diabetes and smoking did not differ significantly (Table 10).

Correlations Between aPLs and Clinical, Coagulation, and Lipid Parameters:

Within the APS-positive cohort, aPLs demonstrated significant correlations with thrombotic events, vascular damage, valvular pathology, coagulation parameters, and lipid profile indices. The strongest correlations were observed between aPLs and activated partial thromboplastin time (APTT), particularly for anti-β2GPI IgG. Detailed correlation coefficients between aPLs and clinical, coagulation, and lipid parameters are presented in Table 11.

Multivariate linear regression analysis:

Multivariable linear regression with backward elimination was performed in APS-positive patients (n = 92) to identify independent predictors of antiphospholipid antibody titers.

Coronary artery involvement variables (VD_CA, VD_CX, VD_RCA) were included as binary indicators (presence vs absence of lesions in the respective vascular territories).

For aCL IgM, the final model ($R = 0.69$; $R^2 = 0.48$) identified CNS arterial thrombosis, pulmonary artery thrombosis, QTc interval, aortic valve regurgitation, and the atherogenic index as significant predictors (all $p < 0.05$).

For aCL IgG, the final model ($R = 0.69$; $R^2 = 0.47$) demonstrated significant association with APTT ($\beta = 0.64$, $p < 0.001$).

The anti-β2GPI IgM model ($R = 0.62$; $R^2 = 0.38$) identified mostly venous thrombosis and CNS arterial thrombosis as independent predictors.

For LA, significant predictors included APTT, coronary artery involvement (VD_CX and VD_RCA), lipid parameters (LDL and VLDL), systolic blood pressure, and smoking (all $p < 0.05$).

Table 1. *Age Distribution by Study Group.*

Age groups	**Cases (n=92)**	**Control N(n=92)**	**chi2-test**	**P value**
<40	1(1.1%)	1(1.1%)	0.34	0.987
40-49	3 (3.3%)	4 (4.3%)		
50-59	23(25.0%)	23(25.0%)		
60-69	30(32.6%)	32(34.8%)		
>70	35 (38.0%)	32(34.8%)		

Table 2. *Sex Distribution by Study Group.*

Sex	Cases(n=92)	Controls (n=92)	chi2-test	P value
Male	74 (80.4%)	74 (80.4%)	0.00	1.000
Female	18 (19.6%)	18 (19.6%)		

Table 3. *Medical History Distribution by Study Group.*

Medical History	Cases (n=92)	Controls (n=92)	OR	95% CI	p
Venous Thrombosis	11(12.0%)	3 (3.3%)	4.02	1.09-14.96	0.037
CNS Thrombosis	19(20.7%)	9(9.8%)	2.40	1.02-5.64	0.044
PAD	27(29.3%)	18(19.6%)	1.71	0.86-3.38	0.125
CAD	79(85.9%)	83(90.2%)	0.66	0.26-1.63	0.366

Abbreviations: *CNS, central nervous system; PAD, peripheral arterial disease; CAD, coronary artery disease; OR, odds ratio; CI, confidence interval.*

Table 4. *Vascular Involvement by Study group.*

Variable	Case Group n (%)	Control Group n (%)	OR	95% CI	p
Vein	7 (7.6%)	3 (3.3%)	3.14	0.61–15.98	0.168
CA	19 (20.7%)	10 (10.9%)	3.12	1.08–9.07	0.036
PA	21 (22.8%)	13 (14.1%)	1.99	0.87–4.59	0.105
LAD	73 (79.3%)	77 (83.7%)	0.71	0.32–1.60	0.413
CX	54 (58.7%)	58 (63.0%)	0.78	0.39–1.56	0.483
RCA	55 (59.8%)	63 (68.5%)	0.58	0.28–1.21	0.148

Abbreviations: *CA, cerebral arteries; PA, pulmonary artery; LAD, left anterior descending artery; CX, circumflex artery; RCA, right coronary artery; OR, odds ratio; CI, confidence interval.*

Table 5. *Cardiac Functional Parameters Distribution Between Study Groups.*

Variable	Case group	Control Group	p
Heart rate	81.4 ± 19.6	79.3 ± 15.6	0.422
QTc (ms)	396.5 ± 49.6	420.6 ± 22.0	<0.001
EF (%)	45.8 ± 10.0	45.4 ± 8.4	0.769

Abbreviations: *QTc, corrected QT interval; EF, ejection fraction.*

Table 6. *Distribution of NYHA Functional Class Between Study Groups.*

Variable	Case Group n (%)	Control Group n (%)	OR	95% CI	p
NYHA I	1 (1.1%)	1 (1.1%)	1.00	0.06–16.23	1.000
NYHA II	18 (19.6%)	29 (31.5%)	0.53	0.27–1.04	0.065
NYHA III	17 (18.5%)	16 (17.4%)	1.08	0.51–2.29	0.848
NYHA IV	13 (14.1%)	4 (4.3%)	3.62	1.13–11.56	0.030

Abbreviations: *NYHA, New York Heart Association; OR, odds ratio; CI, confidence interval.*

Table 7. *Distribution and Levels of aPLs.*

Antibody	Values	Negative n (%)	Borderline n (%)	Positive n (%)
aCL IgM	3.07[0.96–9.89]	63 (68.5%)	6 (6.5%)	23 (25.0%)
aCL IgG	4.23[1.01-29.81]	54 (58.7%)	3 (3.3%)	35 (38.0%)
anti-β2 GPI IgM	1.33 [0.48–4.40]	71 (77.2%)	9 (9.8%)	12 (13.0%)
anti-β2 GPI IgG	1.59 [0.96–2.95]	81 (88.0%)	3 (3.3%)	8 (8.7%)
LA	1.2 ± 0.2	39 (42.4%)	-	53 (57.6%)

Abbreviations: *aCL, anticardiolipin antibody; anti-β2 GPI, anti-β2 glycoprotein I antibody; IgM, immunoglobulin M; IgG, immunoglobulin G; LA, lupus anticoagulant.*

Table 8. *Comparison of Coagulation Parameters Between Study Groups.*

Variable	Case group (Mean ± SD)	Control group (Mean ± SD)	p
PT	16.8 ± 2.2	15.5 ± 2.5	<0.001
PI	72.5 ± 9.5	80.3 ± 11.5	<0.001
INR	1.4 ± 0.2	1.5 ± 1.2	0.432
APTT	39.7 ± 7.9	47.9 ± 29.2	0.010
TT	16.8 ± 2.8	19.7 ± 33.2	0.405
Fibrinogen	334.6 ± 130.5	408.1 ± 205.6	0.004
D-dimer	1321.9 ± 854.8	796.2 ± 250.6	<0.001

Abbreviations: *PT, prothrombin time; PI, prothrombin index; INR, international normalized ratio; APTT, activated partial thromboplastin time; TT, thrombin time; Fibr, fibrinogen; APS, antiphospholipid syndrome.*

Table 9. *Lipid Profile by Study Groups.*

Parameter	**Case group (Mean ± SD)**	**Control group (Mean ± SD)**	**p**
Total cholesterol	120.9 ± 38.9	176.7 ± 35.2	<0.001
HDL	44.5 ± 14.8	35.2 ± 5.9	<0.001
LDL	125.4 ± 47.4	112.7 ± 39.5	0.049
VLDL	26.6 ± 8.8	33.2 ± 10.5	<0.001
Triglycerides	134.0 ± 61.2	162.2 ± 57.5	0.002
Atherogenic index	2.0 ± 1.2	4.5 ± 1.5	<0.001

Abbreviations: *HDL, high-density lipoprotein; LDL, low-density lipoprotein; VLDL, very-low-density lipoprotein.*

Table 10. *Cardiovascular risk factors Distribution between study groups.*

Variable	Case Group	Control Group	OR (95% CI)	p
Grade 2 HTN	21.7%	7.6%	3.37 (1.35–8.43)	0.009
BMI (mean)	29.4 ± 6.1	33.2 ± 6.8	—	<0.001
Overweight	42.4%	6.5%	10.55 (4.18–26.60)	<0.001
Obesity	38.0%	76.1%	0.19 (0.10–0.37)	<0.001
Diabetes	29.3%	38.0%	0.68 (0.37–1.25)	0.213
Smoking	59.8%	66.3%	0.76 (0.41–1.38)	0.360
Alcohol	35.9%	12.0%	4.12 (1.92–8.81)	<0.001
Sedentariness	72.8%	91.3%	0.26 (0.11–0.60)	0.001
Family history	17.4%	6.5%	3.02 (1.12–8.10)	0.028

Abbreviations: *APS, antiphospholipid syndrome; HTN, hypertension; BMI, body mass index; OR, odds ratio; CI, confidence interval.*

Table 11. *Correlations Between aPLs and Clinical, Coagulation, and Lipid Parameters.*

Antibody	Parameter	r	p
Anti-β2GPI IgM	Venous vascular damage	0.206	0.049
Anti-β2GPI IgM	Deep vein thrombosis	0.314	0.002
Anti-β2GPI IgM	CNS arterial thrombosis	0.217	0.037
aCL IgM	Cerebral artery damage	0.207	0.036
aCL IgM	CNS arterial thrombosis	0.460	<0.001
aCL IgM	Pulmonary artery thrombosis	0.233	0.026
Anti-β2GPI IgG	Cerebral artery damage	0.314	0.002
aCL IgM	Aortic valve regurgitation	0.310	0.003
aCL IgG	Aortic valve regurgitation	0.311	0.003
Anti-β2GPI IgG	Aortic valve regurgitation	0.288	0.005
aCL IgG	APTT	0.594	<0.001
Anti-β2GPI IgG	APTT	0.709	<0.001
LA	APTT	0.442	0.007
Anti-β2GPI IgG	Total cholesterol	0.270	0.009
aCL IgM	HDL cholesterol	-0.210	0.045
aCL IgM	Atherogenic index	0.255	0.010

Abbreviations: *ACA, anticardiolipin antibody; anti-β2GPI, anti-β2 glycoprotein I antibody; LA, lupus anticoagulant; APTT, activated partial thromboplastin time; CNS, central nervous system; HDL, high-density lipoprotein.*

Discussion.

The present study demonstrates that antiphospholipid syndrome is associated with a distinct thrombotic and clinical phenotype among patients with ASCVD. APS was identified in approximately one quarter of ASCVD patients and was associated with a higher prevalence of venous thrombosis, increased cerebrovascular involvement, and measurable alterations in coagulation parameters.

The relatively high prevalence of APS observed in our cohort (25.9%) should be inter-preted in light of the study design and setting. As the study was conducted in a tertiary care center, the population was likely enriched with patients presenting more severe, complex, or refractory cardiovascular disease, introducing a potential selection bias. This is further supported by the consecutive inclusion of both hospitalized patients with acute atherothrombotic events and outpatients with established ASCVD, reflecting a high-risk clinical spectrum.

Additionally, chronic atherosclerotic cardiovascular disease was more prevalent in the APS-positive group compared to controls (31.6% vs. 13%, respectively), suggesting a greater burden of persistent or advanced disease. This imbalance may have contributed to the increased detection of APS in our cohort.

A major finding of the present analysis is the increased thrombotic burden observed in APS-positive patients. Venous thrombosis occurred approximately four times more frequently in the APS group, while central nervous system arterial thrombosis was more than twice as common compared with controls. These observations are consistent with the systemic prothrombotic nature of APS and align with previous studies demonstrating that aPLs significantly increase the risk of both arterial and venous thrombotic events [3,6,17-19].

The predominance of cerebrovascular involvement observed in our cohort is particularly notable. Previous investigations have shown that aPLs represent an important risk factor for ischemic stroke and other cerebrovascular events, especially in patients without pronounced atherosclerotic risk factors [15,20]. The underlying mechanisms include endothelial dysfunction, complement activation, and platelet activation induced by aPLs, which collectively promote thrombosis in susceptible vascular territories [6,8].

In the present study, LA was the most prevalent antiphospholipid antibody detected among APS-positive patients. This observation is consistent with prior research indicating that LA is the strongest laboratory predictor of thrombotic complications in APS [21,22]. Moreover, strong correlations were observed between IgG aPLs and activated partial thromboplastin time, particularly for anti-β2-glycoprotein I IgG. These findings reflect the known interaction of aPLs with phospholipid-dependent coagulation assays and confirm their functional involvement in disturbances of the intrinsic coagulation pathway.

Significant differences were also observed in several coagulation parameters. APS-positive patients demonstrated prolonged prothrombin time, reduced prothrombin index, and markedly elevated D-dimer levels, suggesting increased thrombin generation and fibrin turnover. These findings are consistent with the concept of persistent subclinical coagulation activation in APS and have been described in previous studies investigating thrombotic mechanisms in the syndrome [23].

Another notable observation was the higher prevalence of mild valvular abnormalities among APS-positive patients. Cardiac valve involvement is a recognized manifestation of APS and has been reported in both primary and secondary forms of the disease. Valvular lesions are thought to result from immune-mediated endothelial injury and microthrombotic processes affecting the valvular surface [24].

Interestingly, APS-positive patients in this cohort demonstrated lower total cholesterol and triglyceride levels compared with controls, suggesting that the increased thrombotic burden observed in APS cannot be explained solely by classical lipid-mediated atherosclerotic mechanisms. Instead, immune-mediated vascular injury and coagulation activation may play a dominant role in vascular complications in this population. Previous studies have suggested that aPLs may interact with oxidized lipoproteins and promote inflammatory pathways contributing to vascular damage [25].

Traditional cardiovascular risk factors remained prevalent in both groups; however, grade II hypertension, overweight status, and several lifestyle-related factors were more frequent among APS-positive patients. These findings support the concept that APS interacts synergistically with conventional cardiovascular risk factors rather than replacing them. The coexistence of autoimmune thrombophilia and metabolic risk factors may therefore contribute to the heterogeneity of clinical manifestations observed in ASCVD.

Multivariable regression analysis identified several independent predictors of antiphospholipid antibody expression, linking thrombotic localization, coagulation parameters, and cardiovascular risk factors with aPL profiles. Although causality cannot be established due to the case–control design, these findings highlight clinically relevant associations that may help identify ASCVD patients who could benefit from targeted APS screening. In particular, LA was significantly associated with coronary vascular involvement, specifically circumflex (CX) and right coronary artery (RCA) stenosis, together with coagulation and metabolic parameters including activated partial thromboplastin time, LDL and VLDL levels, systolic blood pressure, and smoking (all $p < 0.05$). Notably, CX and RCA involvement were not statistically significant in univariate analysis when assessed as binary anatomical variables (presence vs absence of lesions). However, in the multivariate model, these variables (VD_CX and VD_RCA) emerged as independent predictors of LA. This discrepancy may be explained by adjustment for confounding factors and inter-variable interactions. Multivariate regression accounts for the combined influence of clinical and biochemical parameters, allowing detection of independent effects that may remain hidden in unadjusted analyses. These findings suggest that lupus anticoagulant may play a central role in the immunothrombotic phenotype of APS-positive ASCVD patients, linking antibody-mediated coagulation disturbances with coronary vascular involvement [3,8,16].

Taken together, our findings support the emerging concept that APS functions as an immunothrombotic modifier of cardiovascular disease, influencing thrombotic expression

and vascular involvement patterns in patients with underlying atherosclerosis [9,26-30].

While the study's strengths include its age- and sex-matched case–control design and

independent funding, several limitations should be acknowledged. The single-center nature and relatively small sample size limit generalizability. Furthermore, incomplete evaluation of potential seronegative APS cases and the absence of long-term follow-up data represent additional constraints.

Future multicenter prospective studies with larger sample sizes and longitudinal follow-up are needed to validate these findings and to better define the role of APS in the pathogenesis and clinical stratification of ASCVD.

Conclusion.

Antiphospholipid syndrome is associated with a distinct thrombotic phenotype in patients with atherosclerotic cardiovascular disease. APS-positive patients demonstrated significantly higher rates of venous thrombosis and cerebrovascular events together with measurable abnormalities in coagulation parameters and a higher prevalence of valvular involvement.

Lupus anticoagulant was the most prevalent antiphospholipid antibody, and IgG isotype antibodies showed strong associations with coagulation markers, supporting their pathogenic relevance. Importantly, the increased thrombotic burden observed in APS-positive patients occurred despite relatively favorable lipid profiles, suggesting that immune-mediated mechanisms contribute substantially to vascular complications in this population.

Overall, these findings support the concept that antiphospholipid syndrome acts as an immunothrombotic modifier of atherosclerotic cardiovascular disease rather than a primary cause of atherosclerosis [8,28]. Recognition of APS in selected ASCVD patients may therefore improve cardiovascular risk stratification and support targeted diagnostic evaluation.

REFERENCES

1. Ames P.R.J. Atherogenesis and atherosclerosis in primary antiphospholipid syndrome. Autoimmunity Reviews. 2013.
2. Andreoli L, Chighizola C.B, Banzato A, et al. Estimated frequency of antiphospholipid antibodies in patients with pregnancy morbidity, stroke, myocardial infarction, and deep vein thrombosis: a critical review of the literature. Arthritis Care and Research. 2013;65:1869-1873.
3. Garcia D, Erkan D. Diagnosis and management of the antiphospholipid syndrome. New England Journal of Medicine. 2018;378:2010-2021.
4. Sammaritano L.R. Antiphospholipid syndrome. Best Practice and Research Clinical Rheumatology. 2020;34:101463.
5. Miyakis S, Lockshin M.D, Atsumi T, et al. International consensus statement on an update of the classification criteria for definite antiphospholipid syndrome. Journal of Thrombosis and Haemostasis. 2006;4:295-306.
6. Chaturvedi S, Brodsky R.A, McCrae K.R. Complement in the pathophysiology of the antiphospholipid syndrome. Frontiers in Immunology. 2019;10:449.
7. Chighizola C.B, Andreoli L, Gerosa M, et al. The treatment of antiphospholipid syndrome: a comprehensive clinical approach. Journal of Autoimmunity. 2018;90:1-27.
8. Corban M.T, Duarte-Garcia A, McBane R.D, et al. Antiphospholipid syndrome: role of vascular endothelial cells and implications for risk stratification. Journal of the American College of Cardiology. 2017;69:2317-2330.
9. Tektonidou M.G. Cardiovascular disease risk in antiphospholipid syndrome: thrombo-inflammation and atherothrombosis. Journal of Autoimmunity. 2022;128:102813.
10. Roman M.J, Shanker B.A, Davis A, et al. Prevalence and correlates of accelerated atherosclerosis in systemic lupus erythematosus. New England Journal of Medicine. 2003;349:2399-2406.
11. Di Minno M.N.D, Scalera A, Tufano A, et al. The association of adjusted Global AntiphosPholipid Syndrome Score with cardiovascular disease. Atherosclerosis. 2018;278:60-65.
12. Duarte-García A, Pham M.M, Crowson C.S, et al. The epidemiology of antiphospholipid syndrome: a population-based study. Arthritis and Rheumatology. 2019;71:1545-1552.
13. Evangelatos G, Tentolouris N, Sfikakis P.P, et al. Atherosclerosis progression in antiphospholipid syndrome. Rheumatology. 2022;61:3408-3413.
14. Evangelatos G, Tentolouris N, Sfikakis P.P, et al. Seven-year follow-up of atherosclerotic plaque progression in antiphospholipid syndrome. Rheumatology. 2025;64:836-841.
15. Grosso G, Sippl N, Kjellström B, et al. Antiphospholipid antibodies in patients with myocardial infarction. Annals of Internal Medicine. 2019;170:277-280.
16. Lóczi L, Kappelmayer J, Tarr T, et al. Antiphospholipid syndrome and the risk of myocardial infarction. Kardiologia Polska. 2020;78:6-14.
17. Arachchillage D.R.J, Laffan M. Pathogenesis and management of antiphospholipid syndrome. British Journal of Haematology. 2017;178:181-195.
18. Barbhaiya M, Zuily S, Ahmadzadeh Y, et al. Development of new international antiphospholipid syndrome classification criteria. Arthritis Care and Research. 2021;73:1490-1501.
19. Bilora F, Boccioletti V, Girolami B, et al. Are antiphospholipid antibodies an independent risk factor for atherosclerosis? Journal of Thrombosis and Thrombolysis. 2016;8:103-113.
20. Svenungsson E, Antovic A. The antiphospholipid syndrome – an often overlooked cause of vascular occlusions. Journal of Internal Medicine. 2020;287:349-372.
21. Devreese K.M.J, de Groot P.G, de Laat B, et al. Guidance from the Scientific and Standardization Committee for lupus anticoagulant detection and interpretation. Journal of Thrombosis and Haemostasis. 2020;18:2828-2839.
22. Pengo V, Banzato A, Bison E, et al. Laboratory testing for antiphospholipid syndrome. International Journal of Laboratory Hematology. 2016;38:27-31.
23. Limper M, de Leeuw K, Lely A.T, et al. Diagnosing and treating antiphospholipid syndrome: a consensus paper. Netherlands Journal of Medicine. 2019;77:98-108.
24. Kolitz T, Shiber S, Sharabi I, et al. Cardiac manifestations of antiphospholipid syndrome. Frontiers in Immunology. 2019;10:941.

25. Iseme R.A, McEvoy M, Kelly B, et al. A role for autoantibodies in atherogenesis. Cardiovascular Research. 2017;113:1102-1112.
26. Pignatelli P, Ettorre E, Menichelli D, et al. Seronegative antiphospholipid syndrome. Haematologica. 2020;105:562-572.
27. Sciascia S, Baldovino S, Schreiber K, et al. Thrombotic risk assessment in antiphospholipid syndrome. Clinical and Molecular Allergy. 2016;14:1.
28. Tektonidou M.G, Andreoli L, Limper M, et al. EULAR recommendations for the management of antiphospholipid syndrome in adults. Annals of the Rheumatic Diseases. 2019;78:1296-1304.
29. Undas A, Musiał J, Ząbczyk M. Antiphospholipid antibodies and atherosclerotic vascular disease: recent advances. Rheumatology International. 2025.
30. Zhu Q.N, Qi X.B, Ren S.W, et al. Novel advances in pathophysiological mechanisms and treatment of antiphospholipid syndrome. Frontiers in Immunology. 2025.