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Peculiarities of diagnostics and treatment of chronic generalized periodontitis in patients with heart rhythm disorders taking anticoagulants

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Abstract
INTRODUCTION. A clinical examination and treatment were conducted on 104 patients with cardiac arrhythmias who were receiving anticoagulant therapy. The patients were aged between 45 and 59 years (classified as middle age according to the WHO classification) and were diagnosed with moderate chronic generalized periodontitis (53% male, 47% female).
AIM. To evaluate the effectiveness of standard therapeutic measures in the treatment of chronic generalized periodontitis in patients receiving anticoagulant therapy and to identify the specific characteristics of the disease course in this patient group.
MATERIALS AND METHODS. The study included 104 patients with cardiac arrhythmias who were receiving anticoagulant therapy and were diagnosed with moderate chronic generalized periodontitis. Standard treatment for periodontitis was administered with consideration of anticoagulant use. Clinical parameters, including gingival bleeding, periodontal status, and the effectiveness of therapeutic measures, were assessed.
CONCLUSIONS. Standard therapeutic measures for the treatment of chronic generalized periodontitis were equally effective in patients receiving and not receiving anticoagulant therapy. However, a distinguishing feature of periodontitis treatment in patients receiving anticoagulants was the persistence of high levels of gingival bleeding after the resolution of the inflammatory process in the periodontium, which was attributed to anticoagulant use. This situation often misleads clinicians, who may interpret gingival bleeding as a sign of inflammation, resulting in overdiagnosis and inflated values of corresponding indices. Standard therapeutic methods were found to be effective and sufficient for preventing the progression of pathological processes in the periodontium in this patient group.

Keywords: chronic periodontitis, heart rhythm disorders, anticoagulants

Особенности диагностики и лечения хронического генерализованного пародонтита у пациентов с нарушением сердечного ритма, принимающих антикоагулянты

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Резюме
ВВЕДЕНИЕ. Проведено обследование и лечение 104 больных с нарушением сердечного ритма, принимающих антикоагулянты, в возрасте от 45 до 59 лет (средняя возрастная группа по классификации ВОЗ) с диагнозом хронический генерализованный пародонтит средней степени тяжести (мужчин 53%, женщин – 47%).
ЦЕЛЬ ИССЛЕДОВАНИЯ. Оценка эффективности стандартных лечебных мероприятий в лечении хронического генерализованного пародонтита у больных, принимающих антикоагулянты, и выявить особенности течения заболевания в данной группе пациентов.

МАТЕРИАЛЫ И МЕТОДЫ. В исследование были включены 104 пациента с нарушением сердечного ритма, принимающих антикоагулянты, и имеющих хронический генерализованный пародонтит средней степени тяжести. Проводилось стандартное лечение пародонтита с учетом приема антикоагулянтов. Оценивались клинические показатели, включая кровоточивость десен, состояние пародонта и эффективность лечебных мероприятий.

ВЫВОДЫ. Стандартные лечебные мероприятия в лечении хронического генерализованного пародонтита одинаково эффективны у больных как принимающих, так и не принимающих антикоагулянты. Однако особенностью лечения пародонтита у больных, принимающих антикоагулянты, является сохранение высокой степени кровоточивости десен после ликвидации воспалительного процесса в пародонте, что связано с приемом антикоагулянтов. Данное обстоятельство часто вводит в заблуждение врачей, которые воспринимают кровоточивость десен как признак воспаления, что проявляется в гипердиагностике и завышении значений соответствующих индексов. Стандартные лечебные методы эффективны и достаточны для профилактики прогрессирования патологического процесса в пародонте у данной категории больных.

INTRODUCTION

Studies on the dental status of patients receiving anticoagulant therapy during the post-myocardial infarction period are available in the existing literature [1; 2]. Research on the condition of periodontal tissues in cardiology patients has also been conducted [3–5], particularly among individuals with cardiac arrhythmias [6–9]. However, the findings of these studies do not provide a complete understanding of how anticoagulants specifically affect the dental status and blood circulation in periodontal tissues [10–12]. This limitation arises from the fact that the patient population in these studies consists of individuals who have suffered a myocardial infarction. This factor inevitably affects the state of peripheral circulation, including microcirculation in periodontal tissues, which in turn influences the clinical manifestations of gingivitis and periodontitis.

To eliminate this confounding factor, it is advisable that future research on the effects of anticoagulants on microcirculation and the inflammatory response in periodontal tissues include patients receiving anticoagulant therapy who do not exhibit signs of heart failure [13–15].

Among oral anticoagulants, rivaroxaban-based drugs are currently the most widely used [16; 17]. These drugs are preferred over previously used warfarin due to a lower risk of severe bleeding [18]. Rivaroxaban is a direct inhibitor of factor Xa and is indicated for patients with cardiac arrhythmias, specifically atrial fibrillation without mitral valve pathology [19; 20].

In light of the above, to study the effect of anticoagulant therapy on gingival microcirculation and the clinical course of inflammatory periodontal diseases, we formed a study group consisting of patients with moderate chronic generalized periodontitis who were receiving anticoagulant therapy (rivaroxaban) for cardiac arrhythmias, specifically atrial fibrillation without mitral valve pathology or heart failure.

AIM

The aim of this study was to improve the effectiveness of dental treatment and prevention of periodontal diseases in patients with cardiac arrhythmias receiving anticoagulant therapy.

MATERIALS AND METHODS

A clinical examination and treatment were conducted on 104 patients aged between 45 and 59 years (classified as middle age according to the WHO classification) diagnosed with moderate chronic generalized periodontitis (53% male, 47% female).

Based on the research objectives, the patients were divided into two groups according to their underlying pathology. The first group (main group) consisted of 52 patients with cardiac arrhythmias (atrial fibrillation without mitral valve pathology or heart failure) who were receiving oral anticoagulants of the rivaroxaban type (a direct factor Xa inhibitor). The average age of the patients in this group was 49.6 ± 4.51 years. The second group (control group) consisted of 52 patients without cardiac arrhythmias and not receiving anticoagulant therapy, with an average age of 50.9 ± 5.32 years. The groups were comparable in terms of sex and age.

All patients in both groups underwent oral hygiene correction, including supervised tooth brushing and removal of dental deposits using low-frequency ultrasound. They were prescribed mouth rinses with a 0.05% chlorhexidine bigluconate solution for 10 days and the toothpaste "LACALUT aktiv" for 30 days. Follow-up examinations were conducted at 1 and 6 months after treatment.

To objectively assess the periodontal condition, an additional evaluation of periodontal tissues was performed using digital technologies at the specified time points. Laboratory and functional diagnostic methods were also used to evaluate blood coagulation, blood

circulation in major vessels, microcirculation, and oxygen content in periodontal tissues.

The study was based on an index-based evaluation, including the Green-Vermillion hygiene index, the Mühlemann bleeding index modified by Cowell, and the periodontal index (PI) according to Russell.

To assess oral hygiene and inflammatory changes in the gums, optical fluorescence technologies (OFT) (or alternatively, laser conversion diagnostics – LCD) were used. The registration and digital processing of the results were conducted according to the criteria of fluorescence spectral intensity using the hardware-software complex "InSpektr M" (InSpektr LLC, Russia).

RESULTS

To evaluate the effectiveness of therapeutic measures for moderate chronic generalized periodontitis in patients with cardiac arrhythmias receiving anticoagulant therapy, treatment was conducted in both study groups.

Analysis of the obtained results demonstrated that in patients with moderate chronic generalized periodontitis in both the first and second groups (i.e., patients receiving and not receiving anticoagulant therapy), improvements were noted in all indicators reflecting oral hygiene, inflammation severity, microcirculation, and tissue oxygenation one month after treatment. However, six months after treatment, a deterioration in all the aforementioned parameters was observed; nonetheless, most values did not return to the levels recorded before the start of treatment. However, the dynamics of changes in the indicators assessed by clinicians and obtained using digital hardware-based methods varied between the two groups.

One month after treatment, in the first group (patients with cardiac arrhythmias receiving anticoagulants), 78% of patients still reported gingival bleeding during tooth brushing. After six months, gingival bleeding during tooth brushing and consumption of solid food was reported by 88% of patients in the first group.

In the second group (patients without cardiac arrhythmias and not receiving anticoagulants), only 16% of patients reported gingival bleeding during mechanical stimulation one month after treatment. After six months, 48% of patients in the second group reported gingival bleeding and discomfort in the gums.
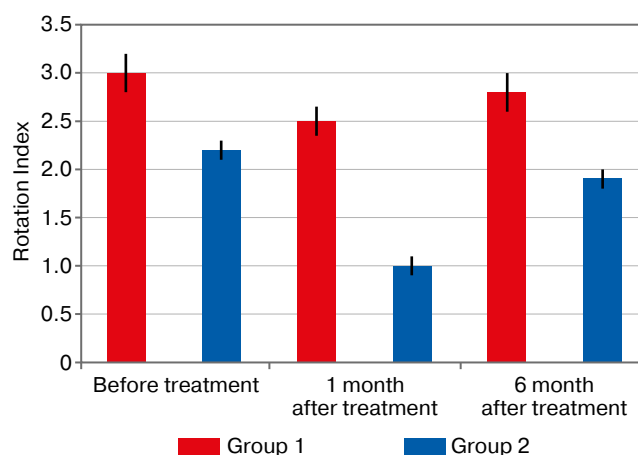
The gingival bleeding index in the first group decreased significantly by 25% ($p < 0.05$) one month after treatment compared to baseline values; however, it remained 61% higher than in the second group one month after treatment ($p < 0.05$) (Fig. 1).

Six months after treatment, the gingival bleeding index in the first group increased by 18% ($p < 0.05$) compared to the values recorded one month after treatment, but remained significantly 11% lower than the baseline values ($p < 0.05$). Nevertheless, the gingival bleeding index six months after treatment was 30% higher in the first group compared to the second group at the same time point.

Significantly higher gingival bleeding index values in the first group compared to the second group at all observation time points were associated with the use of anticoagulant therapy in these patients. Particular attention

should be given to the bleeding index values recorded one month after treatment, when inflammatory changes in the gums were minimal. This indicates that the high gingival bleeding levels in the first group could not be attributed to inflammation in the periodontium but were directly linked to the effects of anticoagulant therapy.

One month after treatment, an improvement in oral hygiene status was observed in patients of the first group. The hygiene index, calculated by clinicians based on a visual assessment of the dental hygiene status, significantly decreased by 50% compared to the baseline values ($p < 0.05$). However, this value remained 42% higher than the corresponding index in the second group of patients one month after treatment ($p < 0.05$) (Fig. 2).

Fig. 1. Dynamics of Changes in the Gingival Bleeding Index (Mühleman-Kowell) in the Study Groups of Patients

Рис. 1. Динамика изменения индекса кровоточивости десен Muhleman-Kowell в исследуемых группах больных
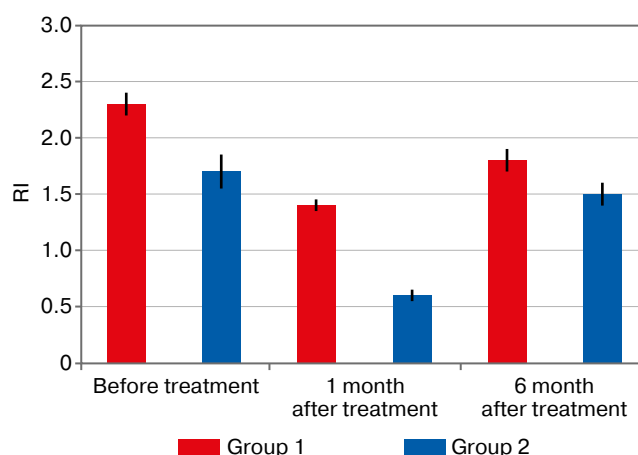
Fig. 2. Dynamics of Changes in the Hygiene Index Based on Visual Assessment of Dental Hygiene Status in the Study Groups of Patients

Рис. 2. Динамика изменения индекса гигиены, рассчитанного врачами на основании визуальной оценки гигиенического состояния зубов, в исследуемых группах больных

Six months after treatment, a deterioration in oral hygiene status was observed in patients of the first group compared to the values recorded one month after treatment. The hygiene index, calculated by clinicians based on a visual assessment of dental hygiene status, increased by 20% ($p < 0.05$) and was 14% higher than the corresponding index in the second group of patients six months after treatment ($p < 0.05$).

One month after treatment, the hygiene status determined using digital laser fluorescence technology in the first group of patients was 2.4 times lower than the baseline values recorded before treatment ($p < 0.05$) and showed no statistically significant differences from the hygiene status of patients in the second group one month after treatment ($p > 0.05$) (Fig. 3).

Six months after treatment, the hygiene status in the first group, as assessed using digital laser fluorescence technology, increased by 1.8 times compared to the values recorded one month after treatment ($p < 0.05$).

Six months after treatment (as well as at other observation time points), the hygiene status of patients in the first group did not show statistically significant differences compared to the hygiene status of patients in the second group ($p > 0.05$). This finding indicates that subjective errors in the assessment of dental hygiene status were present when clinicians calculated the hygiene index in the first group at all observation time points. These errors were likely related to increased gingival bleeding due to anticoagulant therapy. Thus, based on objective control methods, the oral hygiene status in the study groups not only showed a similar trend but also did not differ statistically in the obtained values.

The results suggest that to ensure an objective assessment of oral hygiene status and eliminate subjective interpretation in patients receiving anticoagulants, it is essential to use laser fluorescence technology for hygiene status evaluation.
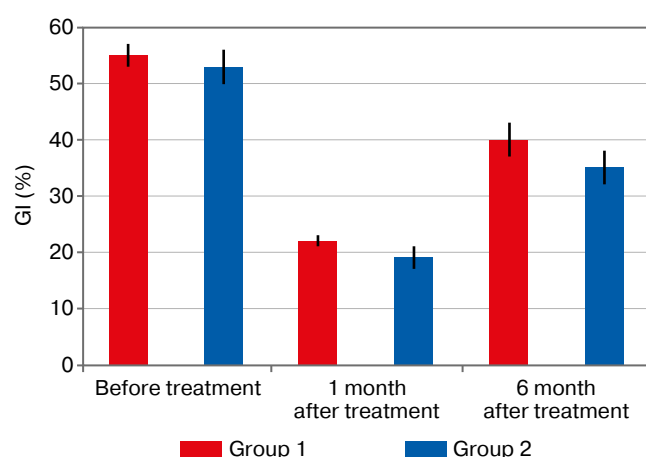
The PMA (Papillary-Marginal-Attached) indices, calculated by clinicians based on visual assessment of the gums stained with Lugol's solution, decreased more than twofold in the first group one month after treatment compared to baseline values. However, the PMA index was 1.6 times higher in the first group compared to the second group ($p < 0.05$) (Fig. 4).
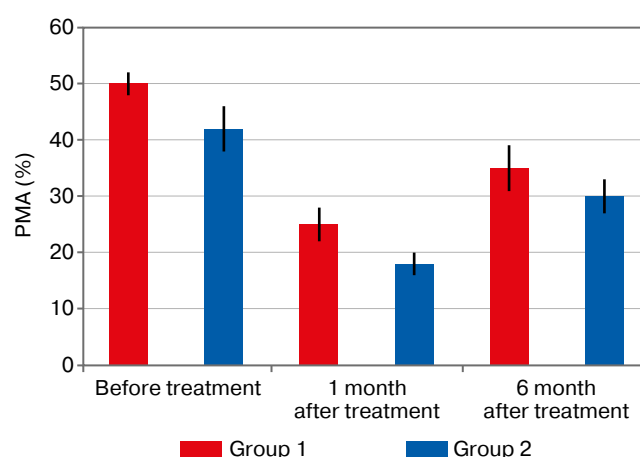
Six months after treatment, the PMA index in the first group, calculated by clinicians, increased 1.4 times compared to the values recorded one month after treatment and was 1.4 times higher than the index calculated in the second group six months after treatment.

Thus, the PMA index calculated by clinicians in the first group, where patients were receiving anticoagulants, showed a similar trend in dynamics but remained significantly higher at all observation time points compared to the PMA index calculated by clinicians in the second group, where patients were not receiving anticoagulant therapy.

The PMA index obtained using digital laser technologies in the first group of patients decreased 2.35 times one month after treatment compared to the baseline values and showed no statistically significant differences from the PMA index obtained using the same method in the second group one month after treatment ($p > 0.05$) (Fig. 5).

Six months after treatment, the PMA index obtained using laser computer technology in the first group increased 1.6 times compared to the values recorded one month after treatment. However, this index showed no significant differences from the PMA index obtained using laser computer technology in the second group six months after treatment ($p > 0.05$).

Analysis of the dynamics of changes in the PMA index obtained using laser computer technology indicates that the changes in the study groups were not only unidirectional but also showed no statistically significant

Fig. 3. Dynamics of Changes in Hygiene Status Based on Laser Fluorescence Technology in the Study Groups of Patients

Рис. 3. Динамика изменения гигиенического статуса, полученная с помощью лазерных флуоресцентных технологий, в исследуемых группах больных

Fig. 4. Dynamics of Changes in the PMA Index Based on Visual Assessment with Lugol's Solution in the Study Groups of Patients

Рис. 4. Динамика изменения индекса ПМА, рассчитанного врачами на основании визуальной оценки окраски десны раствором Люголя, в исследуемых группах больных

differences at any observation time points. This suggests that inflammatory processes in the gums of patients receiving and not receiving anticoagulants did not differ significantly and were comparable. Furthermore, it can be concluded that during the visual assessment of gum conditions in patients receiving anticoagulants, the increased gingival bleeding was mistakenly interpreted by clinicians as a sign of inflammation, leading to overestimated PMA index values that did not reflect the true clinical situation.

Therefore, for an objective assessment of inflammatory changes in the gums, reliance on absolute PMA index values calculated by clinicians is insufficient. Instead, objective digital methods–specifically laser computer technology – should be used.

During the visual assessment, clinicians noted that one month after treatment, slight mobility of individual teeth persisted in 8% of patients in the first group. However, periotestometry showed no pathological tooth mobility in these cases.

In the second group, one month after treatment, no pathological tooth mobility was observed during either visual inspection or periotestometry.

Six months after treatment, during visual assessment, slight mobility of individual teeth was noted in 12% of patients in the first group. However, periotestometry confirmed pathological tooth mobility in only 6% of these cases.

Six months after treatment, slight mobility of individual teeth was noted during visual assessment in 8% of patients in the second group, which was confirmed by periotestometry data.

Analysis of tooth mobility assessment indicates that in the presence of increased gingival bleeding, clinicians tend to overdiagnose tooth mobility during visual inspection. Therefore, for patients receiving anticoagulant therapy, tooth mobility assessment should be conducted using objective digital methods, particularly periotestometry.

The periodontal index values, calculated by clinicians based on a visual assessment of periodontal status, decreased by 41% one month after treatment in patients of the first group compared to the baseline values. However, the index values in this group were 39% higher than the periodontal index values recorded one month after treatment in the second group ($p < 0.05$) (Fig. 6).

Six months after treatment, an increase of 39% in the periodontal index was observed in the first group compared to the values recorded one month after treatment. At the same time, the periodontal index in the first group remained 13% higher than the periodontal index values recorded one month after treatment in the second group ($p < 0.05$).

Analysis of the dynamics of changes in the periodontal index in the study groups indicates that the changes followed a similar pattern in both groups. However, at all observation time points, the periodontal index in the first group (patients receiving anticoagulants) remained higher than the periodontal index in the second group (patients not receiving anticoagulants).

However, the absolute numerical values of the periodontal index calculated by clinicians in patients receiving anticoagulant therapy should not be taken into consideration, as the calculations are unreliable. This is because the periodontal index is calculated based solely on the clinician's visual assessment of periodontal status, which requires consideration of both inflammatory changes in the gums and tooth mobility.

As demonstrated by the results of our previous studies on the PMA index and tooth mobility, clinicians tend to overdiagnose these parameters due to increased gingival bleeding, which inevitably leads to overestimated periodontal index values in patients receiving anticoagulant therapy.
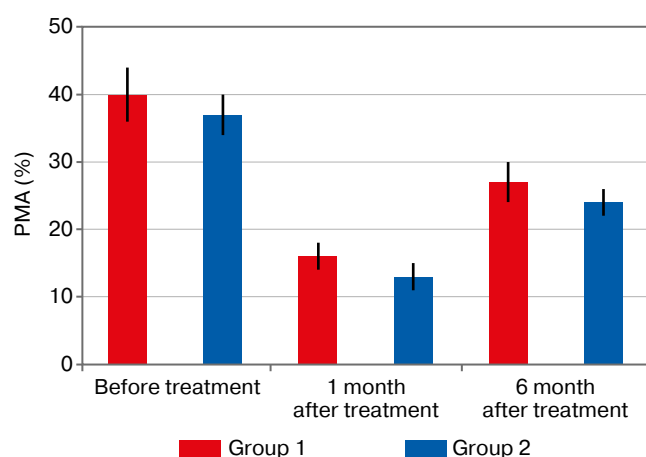
Fig. 5. Dynamics of Changes in the PMA Index Based on Laser Computer Technology in the Study Groups of Patients

Рис. 5. Динамика изменения индекса ПМА, полученная с помощью лазерных компьютерных технологий, в исследуемых группах больных
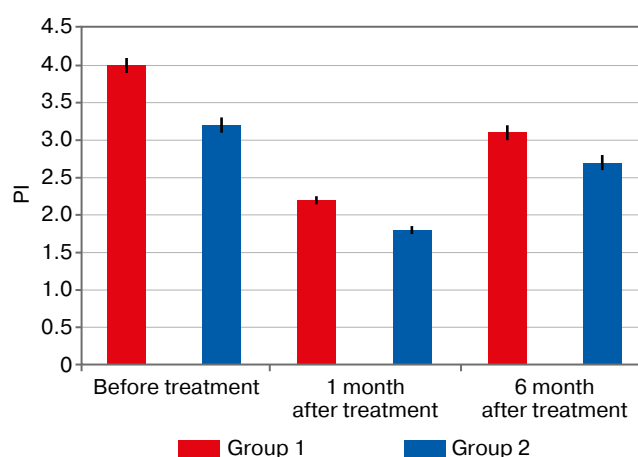
Fig. 6. Dynamics of Changes in the Periodontal Index Based on Visual Assessment of Periodontal Status in the Study Groups of Patients

Рис. 6. Динамика изменения пародонтального индекса, рассчитанного врачами на основании визуальной оценки состояния пародонта, в исследуемых группах больных

DISCUSSION OF RESULTS

Thus, the results of the study demonstrated that standard therapeutic measures used in the treatment of moderate chronic generalized periodontitis – including oral hygiene correction, removal of dental deposits, mouth rinsing with chlorhexidine solution, and the use of toothpaste containing chlorhexidine – are equally effective in patients receiving and not receiving anticoagulant therapy. However, in patients with atrial fibrillation without mitral valve pathology or heart failure who are receiving anticoagulant drugs such as rivaroxaban, certain clinical features in the course of periodontitis after treatment were identified.

The main feature is the persistence of high levels of gingival bleeding after the resolution of the inflammatory process in the periodontium, which is associated with the use of anticoagulants. This situation often misleads clinicians, who tend to interpret gingival bleeding as a sign of inflammation. As a result, during the visual assessment of oral hygiene status, inflammatory changes in the periodontium, and tooth mobility, clinicians tend to overdiagnose, which leads to overestimated values of the corresponding indices calculated by clinicians.

Objective digital hardware-based methods not only failed to identify significant differences in the clinical course of moderate chronic generalized periodontitis after treatment in patients receiving and not receiving anticoagulants but also revealed more favorable dynamics of changes in microcirculation and tissue oxygenation in the periodontium of patients receiving anticoagulant therapy. This suggests that standard therapeutic methods are effective and sufficient for preventing the progression of pathological processes in the periodontium in patients with atrial fibrillation, without mitral valve pathology or heart failure, who are receiving rivaroxaban therapy.

REFERENCES / СПИСОК ЛИТЕРАТУРЫ

1. Erema N.A., *Dental care for patients receiving anticoagulant therapy in the post-myocardial infarction period* [Dissertation for the degree of Candidate of Medical Sciences]. Moscow; 2013. 127 p.
Ерёма Н.А. *Стоматологическая помощь больным, принимающим антикоагулянты в постинфарктном периоде*: дис. … канд. мед. наук. М.; 2013. 127 с.

2. Vieira R.W. Cardiovascular and periodontal diseases. *Rev Bras Cir Cardiovasc*. 2014;29(1):VII–IX. https://doi.org/10.5935/1678-9741.20140003

3. Anisimova E.N., Ryazancev N.A., Raskurajev A.A., Tanashyan M.M., Philippova M.P., Sadulaev A.H., Labzenkova M.A. The relationship of inflammatory diseases in the oral cavity and cardiovascular system. Literature review and determining the level of dental education. *Parodontologiya*. 2019;24(4):301–307. (In Russ.) https://doi.org/10.33925/1683-3759-2019-24-4-301-307
Анисимова Е.Н., Рязанцев Н.А., Раскуражев А.А., Танашян М.М., Филиппова М.П., Садулаев А.Х., Лабзенкова М.А. Взаимосвязь воспалительных заболеваний полости рта с патологией сердечно-сосудистой системы. Обзор литературы и определение уровня стоматологического просвещения. *Пародонтология*. 2019;24(4):301–307. https://doi.org/10.33925/1683-3759-2019-24-4-301-307

4. Glushhenko V.A., Irklienko E.K. Cardiovascular morbidity – one of the most vital problems of modern health care. *Medicine and Health Care Organization*. 2019;4(1):56–63. (In Russ.) Available at: https://ojs3.gpmu.org/index.php/medorg/article/download/559/561/ (accessed: 17.01.2025).
Глущенко В.А., Ирклиенко Е.К. Сердечно-сосудистая заболеваемость – одна из важнейших проблем здравоохранения. *Медицина и организация здравоохранения*. 2019;4(1):56–63. Режим доступа: https://ojs3.gpmu.org/index.php/medorg/article/download/559/561/ (дата обращения: 17.01.2025).

5. Karakov K.G., Mordasov N.A., Kasimova G.V., Ivanyuta I.V. Comparative study of complex therapy of chronic catarrhal gingivitis against the background of cardiovascular system pathology. *Scientific Medical Bulletin*. 2017;(1):43–50. (In Russ.).
Караков К.Г., Мордасов Н.А., Касимова Г.В., Иванюта И.В. Сравнительное исследование комплексной терапии хронического катарального гингивита на фоне патологии сердечно-сосудистой системы. *Научный медицинский вестник*. 2017;(1):43–50.

6. Skirdenko Y.P., Nikolaev N.A., Livzan M.A., Ershov A.V. Anticoagulant therapy for atrial fibrillation in real practice: Problems and prospects. *Annals of the Russian Academy of Medical Sciences*. 2019;74(2):98–107. (In Russ.) https://doi.org/10.15690/vramn1116
Скирденко Ю.П., Николаев Н.А., Ливзан М.А., Ершов А.В. Антикоагулянтная терапия при фибрилляции предсердий в реальной практике: проблемы и перспективы. *Вестник Российской академии медицинских наук*. 2019;74(2):98–107. https://doi.org/10.15690/vramn1116

7. Aoyama N., Suzuki J.-I., Kobayashi N., Hanatani T., Ashigaki N., Yoshida A. et al. Detrimental effects of specific Periodontopathic bacterial infection on tachyarrhythmia compared to Bradyarrhythmia. *BMC Cardiovasc Disord*. 2017;17:267. https://doi.org/10.1186/s12872-017-0703-2

8. Holm-Pedersen P., Avlund K., Morse D.E., Stoltze K., Katz R.V., Viitanen M., Winblad B. Dental caries, periodontal disease, and cardiac arrhythmias in community-dwelling older persons aged 80 and older: is there a link? *J Am Geriatr Soc*. 2005;53(3):430–437. https://doi.org/10.1111/j.1532-5415.2005.53160.x

9. Yu G., Yu Y., Li Y.N., Shu R. Effect of periodontitis on susceptibility to atrial fibrillation in an animal model. *J Electrocardiol*. 2010;43(4):359–366. https://doi.org/10.1016/j.jelectrocard.2009.12.002

10. Grudianov A.I., Tkacheva O.N., Avraamova T.V., Khvatova N.T. Interrelations of inflammatory periodontal disease and cardiovascular pathology. *Stomatologiya*. 2015;94(3):50–55. (In Russ.) https://doi.org/10.17116/stomat201594350-55
Грудянов А.И., Ткачева О.Н., Авраамова Т.В., Хватова Н.Т. Вопросы взаимосвязи воспалительных заболеваний пародонта и сердечно-сосудистой патологии. *Стоматология*. 2015;94(3):50–55. https://doi.org/10.17116/stomat201594350-55

11. Kaigorodov V.A. Management of dental patients receiving anticoagulation therapy. *Perm Medical Journal*. 2016;33(3):115–119. Available at: https://permmedjournal.ru/PMJ/article/view/5679 (accessed: 17.01.2025).
Кайгородов В.А. Ведение стоматологических пациентов, получающих антикоагулянтную терапию.

Пермский медицинский журнал. 2016;33(3):115–119. Режим доступа: https://permmedjournal.ru/PMJ/article/view/5679 (дата обращения: 17.01.2025).

12. Alwithanani N. Periodontal diseases and heart diseases: A systemic review. *J Pharm Bioallied Sci.* 2023;15(Suppl 1):S72–S78. https://doi.org/10.4103/jpbs.jpbs_517_22

13. Zolotovskaya I.A., Davydkin I.L., Duplyakov D.V., Limareva L.V., Sustretov A.S. The influence of anticoagulant therapy on oxygenation of erythrocyte membranes in correlation with the parameters of microcirculation in patients with atrial fibrillation. *Cardiology: News, Opinions, Training.* 2018;(1):82–90. (In Russ.) https://doi.org/10.24411/2309-1908-2018-00004
Золотовская И.А., Давыдкин И.Л., Дупляков Д.В., Лимарева Л.В., Сустретов А.С. Влияние антикоагулянтной терапии на оксигенацию мембран эритроцитов во взаимосвязи с показателями микроциркуляции у пациентов с фибрилляцией предсердий. *Кардиология: новости, мнения, обучение.* 2018;(1):82–90. https://doi.org/10.24411/2309-1908-2018-00004

14. Ionin V.A., Bliznuk O.I., Baranova E.I., Shlyakhto E.V. Anticoagulant therapy in patients with non-valvular atrial fibrillation in real clinical practice: in appropriate dose reductions. *Rational Pharmacotherapy in Cardiology.* 2021;17(2):206–211. (In Russ.) https://doi.org/10.20996/1819-6446-2021-03-04
Ионин В.А., Близнюк О.И., Баранова Е.И., Шляхто Е.В. Антикоагулянтная терапия у больных с неклапанной фибрилляцией предсердий в реальной клинической практике: необоснованное применение сниженных доз. *Рациональная фармакотерапия в кардиологии.* 2021;17(2):206–211. https://doi.org/10.20996/1819-6446-2021-03-04

15. Linchak R.M., Ovchinnikov Yu.V., Kuzovlev A.N. Prevalence and analysis of antithrombotic therapy during atrial fibrillation in Russia. *Vestnik SurGU. Meditsina.* 2021;17(2):206–211. https://doi.org/10.34822/2304-9448-2019-4-14-20
Линчак Р.М., Овчинников Ю.В., Кузовлев А.Н. Распространенность и анализ антитромботической терапии при фибрилляции предсердий в России. *Вестник СурГУ. Медицина.* 2019;(4):14–20. https://doi.org/10.34822/2304-9448-2019-4-14-20

16. Kropacheva E.S., Krivosheeva E.N., Panchenko E.P. Rivaroxaban in patients with atrial fibrillation: from research to real practice (based on REGistry of Long-term AnTithrombotic TherApy-2 (REGATA)). *Atherothrombosis.* 2021;(1):68-88. (In Russ.) https://doi.org/10.21518/2307-1109-2021-1-68-88
Кропачева Е.С., Кривошеева Е.Н., Панченко Е.П. Эффективность и безопасность ривароксабана у больных неклапанной фибрилляцией предсердий в реальной клинической практике (по данным регистра РЕГАТА-2). *Атеротромбоз.* 2021;(1):68-88. https://doi.org/10.21518/2307-1109-2021-1-68-88

17. Moiseev S.V. Clinical trials of rivaroxaban in patients with atrial fibrillation in context of evidence-based medicine. *Klinicheskaya Farmakologiya i Terapiya.* 2016;25(4):4–10. (In Russ.)
Моисеев С.В. Обзор клинических исследований ривароксабана у пациентов с фибрилляцией предсердий в свете медицины, основанной на доказательствах. *Клиническая фармакология и терапия.* 2016;25(4):4–10.

18. Napalkov D.A., Sokolova A.A., Gabitova M.A., Uddin L.N. Anticoagulant therapy in difficult patients with atrial fibrillation: when the risks of embolism and bleeding are comparable. *Rational Pharmacotherapy in Cardiology.* 2018;14(5):785–789. (In Russ.) https://doi.org/10.20996/1819-6446-2018-14-5-785-789
Напалков Д.А., Соколова А.А., Габитова М.А., Уддин Л.Н. Антикоагулянтная терапия у сложных пациентов с фибрилляцией предсердий: когда риски эмболий и кровотечений сопоставимы. *Рациональная фармакотерапия в кардиологии.* 2018;14(5):785–789. https://doi.org/10.20996/1819-6446-2018-14-5-785-789

19. de Andrade N.K., Motta R.H.L., Bergamaschi C.C., Oliveira L.B., Guimarães C.C., Araújo J.O., Lopes L.C. Bleeding risk in patients using oral anticoagulants undergoing surgical procedures in dentistry: a systematic review and meta-analysis. *Front Pharmacol.* 2019;10:866. https://doi.org/10.3389/fphar.2019.00866

20. Kaplovitch E., Dounaevskaia V. Treatment in the dental practice of the patient receiving anticoagulation therapy. *J Am Dent Assoc.* 2019;150(7):602–608. https://doi.org/10.1016/j.adaj.2019.02.011

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