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Research Article

Medication correction of the main clinical symptoms of generalized periodontitis in patients with different blood groups

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Abstract

The article presents the results of treatment of 106 patients with generalized periodontitis (GP) depending on blood type. We determined the effectiveness of treatment by the frequency of detection of the main clinical symptoms (dental plaque, tartar, bleeding, tenderness, gingival hyperemia, serous-purulent discharge, periodontal pockets, pathological tooth mobility, radiological changes in the alveolar membranes) of GP. As a result of applying our proposed therapy, it was found that on day 3–5 after treatment only in patients with blood group 0 (I) of the main group the number of patients with clinical symptoms of GP was significantly less than in the control group (13.58±3.39% of patients vs. 25.69±6.42% of patients, $p<0.01$, respectively). At 1 month after treatment, there was a significant difference in the presence of clinical symptoms of GP in patients with blood group 0 (I) of the main and control groups (6.17±1.53% vs. 21.58±5.40%, $p<0.05$, respectively) and with blood group B (III) (8.33±2.08% vs. 22.22±5.56%, $p<0.05$, respectively). In patients with A (II) and AB (IV) blood groups, the number of patients with symptoms of GP in the study groups did not differ from each other during this follow-up period, $p>0.05$. After 6–12 months of study, in patients with GP, regardless of blood group, the number of patients in the main group with clinical symptoms of GP was significantly lower than in the control group, $p<0.01$. The improvement of clinical symptoms in patients with generalized periodontitis indicates a positive effect on the periodontal tissue the medicines we have prescribed.

Keywords

generalized periodontitis, blood type, мedication correction

Introduction

Periodontitis is a chronic inflammatory disease that affects the periodontium and can result in the loss of teeth if left untreated (Avdeev et al. 2022). Generalized periodontitis (GP) is a more advanced form of the disease that affects multiple teeth and can lead to a greater degree of tooth loss (Zabolotny et al. 2016). Understanding the prevalence of generalized periodontitis is crucial for effective management and prevention of this disease.

According to recent studies, the prevalence of generalized periodontitis is significant, affecting a substantial

portion of the adult population worldwide (Bandrivskaia et al. 2014). For example, a study conducted in the United States found that approximately 47% of adults over the age of 30 have some form of periodontitis, with generalized periodontitis accounting for a significant portion of these cases (Plessas et al. 2014). In Europe, the prevalence of generalized periodontitis ranges from 10–15% among adults, with higher rates reported among older age groups (Hasiuk et al. 2022). In Asia, the prevalence of generalized periodontitis is also high, with some studies reporting rates as high as 50% among adults (Wu et al. 2014). In developing countries, the prevalence of generalized periodontitis is expected to increase due to factors such as poor oral hygiene, limited access to dental care, and the aging population (Bandrivsky et al. 2020). These statistics highlight the importance of effective periodontal disease management and prevention strategies. Early diagnosis and treatment can help prevent the progression of generalized periodontitis and reduce the risk of tooth loss (Demkovych et al. 2022).

According to the American Academy of Periodontology, the main clinical symptoms of generalized periodontitis include bleeding gums, gum recession, deepening of periodontal pockets, tooth mobility, and eventual tooth loss. In addition to these symptoms, halitosis, sensitivity to hot and cold temperatures, and changes in the position of teeth may also occur. The severity of generalized periodontitis can vary among individuals and can be influenced by various factors such as age, smoking, and genetic predisposition (Bandrivsky et al. 2019). As stated (Kassebaum et al. 2014; Dankevych-Kharchyshyn et al. 2019; Demkovych et al. 2021a), generalized periodontitis can also lead to systemic inflammation, increasing the risk of cardiovascular disease, diabetes, and other chronic health conditions. Therefore, early detection and treatment of generalized periodontitis are essential to prevent disease progression and maintain overall oral and systemic health.

Generalized periodontitis is a prevalent condition worldwide and is considered one of the leading causes of tooth loss in adults (Tonetti et al. 2018). The treatment of generalized periodontitis aims to eliminate the microbial biofilm and restore the periodontal tissues' health. Traditionally, non-surgical therapy, such as scaling and root planing (SRP), has been the primary treatment for periodontitis (Chen et al. 2017). However, in severe cases, surgical intervention may be necessary (Caton et al. 2018). Over the years, several advancements have been made in the treatment of periodontitis, including the use of antimicrobial agents, lasers, and regenerative therapies (Muniz et al. 2018; Demkovych et al. 2021b). Additionally, the concept of personalized medicine has gained traction in periodontal therapy, where treatment is tailored to an individual's specific needs (Sanchez et al. 2019).

Some dental scientist, it is important to consideron the relationship between generalized periodontitis and blood types (Al-Askar et al. 2021). Several studies have investigated this relationship and have suggested that individuals with certain blood types may be more susceptible to periodontitis (Albandar et al. 2021; Hasiuk et al. 2021). A group of researchers (Demir et al. 2007) found that individuals with blood type O were more likely to develop severe periodontitis compared to those with blood types A, B, or AB. The authors proposed that this relationship may be due to differences in the immune response among individuals with different blood types, which may affect their susceptibility to periodontitis.

Another study (Albandar et al. 2021) found that individuals with blood type A had a higher prevalence of severe periodontitis compared to those with blood type O. The authors suggested that this relationship may be due to differences in the distribution of subgingival bacteria among individuals with different blood types. More recently, a systematic review and meta-analysis by. (Bandrivsky et al. 2022a) evaluated the effects of polypeptide drugs in the treatment of generalized periodontitis, taking into account the patient's blood type. The authors found that while polypeptide drugs were effective in improving clinical outcomes in patients with generalized periodontitis regardless of their blood type, patients with blood type O and A may require higher doses of antibiotics to achieve similar treatment outcomes as patients with blood types F or AB.

Overall, while the relationship between blood type and generalized periodontitis is still not fully understood, the literature suggests that individuals with blood type O or A may be more susceptible to the disease. This highlights the importance of personalized treatment plans for patients with generalized periodontitis, taking into account individual factors such as blood type, to ensure optimal outcomes. Further research is needed to fully understand the underlying mechanisms of this relationship and to develop more effective treatments for periodontitis.

In this review we will discuss the future directions of periodontal therapy, including the potential use of novel therapeutic agents taking into account the blood type of patients in treatment planning and monitoring.

Objective. To evaluate the effectiveness of the treatment of patients with generalized periodontitis with different blood group with our proposed drugs.

Materials and methods

In the course of our study, 106 patients with generalized periodontitis were examined and treated. The patients of the study groups were divided into two groups - the main and control groups, where, within each group, patients were divided on subgroups according to blood type and severity of generalized periodontitis. Thus, the main group included 56 patients with generalized periodontitis who were divided into 4 subgroups: 1A – 18 patients with 0 (I) blood type (32.14%); 2A – 16 patients with A (II) blood type (28.57%); 3A – 12 patients with B (III) blood type (21.43%) and 4A –10 patients with AB (IV) blood type (17.86%). The control group consisted of 50 patients, who were also divided into 4 subgroups: 1B – 16 patients

with 0 (I) blood type (32.0%); 2B – 14 patients with A (II) blood type (28.0%); 3B – 10 patients with B (III) blood type (20.0%) and 4B – 10 patients with AB (IV) blood type (20.0%).

The diagnosis of generalized periodontitis was performed in accordance with generally accepted clinical criteria and data from paraclinical examination methods (Tonetti et al. 2018). The condition of periodontal tissues was assessed by determining the severity of bleeding during probing, the presence of periodontal pockets, which was determined by a graduated probe, as well as their depth and the nature of discharge from them. The type of dental plaque, the degree of exposure of the roots of the teeth and their sensitivity, and the degree of tooth mobility were taken into account. Periodontal pocket depth (PPD) and epithelial attachment loss (EAL) were measured with a graduated probe and expressed in millimeters: the state of furcation of multi root teeth was assessed in the horizontal direction by the Hamp method, in the vertical direction - by the Tarnow-Fletcher method (Cardoso et al. 2018). To assess the degree and nature of destruction of the alveolar ridge, radiological studies were used. Orthopantomography of the jaws was performed using an orthopantomograph (Planmeca PM 2002 EC Proline Panoramic X-ray unit). When assessing the radiographic picture, the height and shape of the interalveolar septa, the severity of the cortical plate, the nature of the pattern of the spongy substance of the alveolar bone and the state of the periodontal gap, the presence of resorption were taken into account. If the radiograph revealed osteoporosis in the area of the apices of the interalveolar membranes with disruption of the integrity of the compact plate and widening of the periodontal gap only at the apices of the interalveolar membranes, "generalized periodontitis of the initial stage" was diagnosed. In case of violation of the integrity of the cortical plate, resorption of alveolar bone within the upper third of the interalveolar membranes on the background of osteoporosis and widening of the periodontal gap, "generalized periodontitis of the first degree" was diagnosed. In "grade II GP", radiological examination revealed destruction of the cortical lamina and resorption of the alveolar membranes in the range of 1/3 to 2/3 of their height, widening of the periodontal gap and diffuse osteoporosis. "Grade III GP" is characterized by diffuse osteoporosis of the alveolar bone tissue, widening of the periodontal gap, absence of the cortical plate, resorption of alveolar bone by 2/3 or more of the height of the interalveolar septa, and the presence of bone pockets.

The appointment of drugs was carried out depending on the blood type of patients and the degree of generalized periodontitis. Considering the data obtained in our previous studies (Bandrivsky et al. 2022a, b), namely changes in metabolic parameters of oral fluid and structural and functional composition of blood cells were of the same type for representatives of 0 (I) and A (II) blood type and B (III) and AB (IV) with varying severity of generalized periodontitis. Therefore, the treatment was the same, but differed in the dose and frequency of preparations for representatives of 0 (I) and A (II) blood types and B (III) and AB (IV). After completion of treatment, all patients were recommended to undergo a course of maintenance therapy twice a year, which included the use of topical and general medications.

Thus, patients with 0 (I) and A (II) blood type and generalized periodontitis of initial-I degree were prescribing hydrogel "Gengigel" (RicerFarma, Italy) oral bathes (10 ml undiluted) – for 7 days; gel "Gengigel" (RicerFarma, Italy) – gingival applications for 7 days; "Imunal" (Lec, Slovenia) – 1 tablet 3 times per a day for 14 days. Whereas, patients with B (III) and AB (IV) blood type and generalized periodontitis of I degree were prescribed hydrogel "Gengigel" (RicerFarma, Italy) oral bathes (10 ml undiluted) – for 5 days; gel "Gengigel" (RicerFarma, Italy) – gingival applications for 5 days; "Imunal" (Lec, Slovenia) – 1 tablet 3 times per a day for 10 days.

Patients with generalized periodontitis of II degree with 0 (I) and A (II) blood type were prescribed "Lactoferrin Defense" rinse aid (SesDerma, Spain) – instillation into periodontal pockets for 10 days; gel "NBF Gingival Gel" (Nano Cure Tech, South Korea) – gingival applications for 10 days; "Nucleinate" (Kyivmedpreparat, Ukraine) – 1 capsule 2 times per a day with meals for 14 days. Patients with B (III) and AB (IV) blood type and generalized periodontitis of II degree were prescribed "Lactoferrin Defense" rinse aid (SesDerma, Spain) – instillation in periodontal pockets for 7 days; gel "NBF Gingival Gel" (Nano Cure Tech, South Korea) – gingival applications for 7 days; "Nucleinate" (Kyivmedpreparat, Ukraine) – 1 capsule 2 times per a day with meals for 10 days.

Patients with 0 (I) and A (II) blood type with grade III generalized periodontitis were prescribed "Biorepair Mouthwash Gum Protection" rinse aid (Biorepair, Italy) – mouth baths, instillation in periodontal pockets for 10 days; gel "Perio - AID Protect" (Dentaid, Spain) – gingival applications for 10 days; "Nucleinate" (Kyivmedpreparat, Ukraine) – 1 capsule 2 times per a day with meals for 14 days; "Glutamic acid" (JSC "Kyiv Vitamin Plant", Ukraine) – 2 tablet 2 times per a day with meals for 14 days. Patients with B (III) and AB (IV) blood type and generalized periodontitis III degree were prescribed "Biorepair Mouthwash Gum Protection" rinse aid (Biorepair, Italy) – mouth baths, instillation into periodontal pockets for 10 days; gel "Perio - AID Protect" (Dentaid, Spain) – gingival applications for 10 days; "Nucleinate" (Kyivmedpreparat, Ukraine) – 1 capsule 2 times a day with meals for 10 days; "Glutamic acid" (JSC "Kyiv Vitamin Plant", Ukraine) – 1 tablet 2 times per a day with meals – for 10 days.

Patients in the control group were treated for generalized periodontitis according to generally accepted methods (Plessas 2014).

Statistical calculation of the obtained results was performed using the application programs "Statistica 8.0" (StatSoft, USA) and the package of statistical functions of the program "Microsoft Excel 2021" (Orlov 2015).

Results

The analysis of the frequency of clinical symptoms in patients with GP, representatives of blood group 0 (I) (Table 1) 3–5 days after treatment showed the absence of dental plaque in patients of groups 1A and 1B. At the same time, in patients of the main group (1A), 22.2% of the examined objectified bleeding and soreness of the gums, the presence of periodontal pockets, accompanied by tooth mobility. Gingival hyperemia and serous-purulent discharge from periodontal pockets were observed in 16.7% of patients.

In the control group (1B), 31.25% of the subjects had bleeding gums with complaints of gingival pain. Gingival hyperemia was detected in 37.5% of the subjects and serous-purulent discharge from periodontal pockets was objectified in 43.75% of the patients treated during this treatment period. Pathological tooth mobility was diagnosed in 57.1% of patients in group 1B. It was noteworthy that Rtg changes in alveolar septa were determined in 100% of patients in the main (1A) and control (1B) groups.

At 30 days after treatment, patients with GP of the main group (1A) did not have soft and hard dental plaque, gingival soreness and hyperemia, serous-purulent discharge from periodontal pockets. However, 11.1% of the treated patients had bleeding gums, periodontal pockets, and tooth mobility. Radiographic changes in the periodontal bone component were present in 22.2% of patients in group 1A.

In patients of control group 1B, the absence of tartar was determined during this treatment period in the presence of all other analyzed symptoms. Thus, in group 1B, 12.5% of patients had plaque, 18.75% complained of gingival soreness, hyperemia, and serous-purulent discharge from periodontal pockets. Bleeding gums and periodontal pockets with abnormal tooth mobility were detected in 4 patients (25.0%). Bone resorption of the alveolar cellular division was diagnosed in 50.0% of the examined patients.

Six months after treatment in patients of group 1A, as a result of the application of our proposed treatment method, 1 patient (5.6%) had gingival bleeding, 2 treated patients (11.1%) and 4 subjects (22.2%) had periodontal pockets and pathological tooth mobility, respectively. At the same time, radiological changes in the periodontal bone component were examined in 22.2% of patients in the main group 1A.

During this study period, in patients of group 1B (control group), 9 patients (56.25%) had soreness of the gums, bleeding gums, and gingival hyperemia; in 10 subjects (62.50%), pathological tooth mobility, periodontal pockets with serous purulent discharge, and Rtg - changes in the bone component of the periodontium were objectified. At the same time, plaque and tartar were visualized in 43.75% and 56.25% of the examined patients, respectively.

After 12 months of research, as a result of the use of our proposed pharmacotherapy, in patients of the main group 1A, bleeding and hyperemia of the gums, periodontal pockets with serous-purulent discharge, pathological tooth mobility were observed in 1 patient (5.6%), accompanied by Rtg changes in 2 treated patients (11.1%) of the main group 1A.

In patients of control group 1B, as a result of conventional treatment, a significant deterioration in the clinical course of GP was detected after 1 year: 50.0% of patients had gingival hyperemia, 62.5% of treated patients had bleeding and sore gums, and the presence of tartar. Plaque was objectified in 87.5% of people in group 1B. In 16 patients (100%) of the control group, periodontal pockets, pathological tooth mobility and significant changes in the cortical plate of the alveolar bone were diagnosed in the Rtg study.

The frequency of detection of clinical symptoms in patients with GP with A (II) blood group depending on the treatment methods at different follow-up periods is presented in Table 2.

Table 1. Frequency of detection of clinical symptoms in patients with GP with 0 (I) blood group in different treatment periods.

Treatment timeframe	Groups research	Symptoms of clinical course of generalized periodontitis								
		Dental plaque, abs. (%)	Tartar, abs. (%)	Bleeding gums, abs. (%)	Soreness of the gums, abs. (%)	Gingival hyperemia, abs. (%)	Serous-purulent discharge, abs. (%)	Periodontal pockets, abs. (%)	Pathological tooth mobility, abs. (%)	Rtg changes in alveolar membrane abs. (%)
Prior to treatment	Main group 1A (n=18)	18 (100)	16 (88.9)	8 (44.4)	9 (50.0)	16 (88.9)	17 (94.4)	18 (100)	15 (83.3)	18 (100)
	Control group 1B (n=16)	16 (100)	15 (93.8)	9 (56.3)	8 (50.0)	16 (100)	15 (93.8)	16 (100)	13 (81.3)	16 (100)
3–5 days after treatment	Main group 1A (n=18)	0	0	4 (22.2)	4 (22.2)	3 (16.7)	3 (16.7)	4 (22.2)	4 (22.2)	18 (100)
	Control group 1B (n=16)	0	0	5 (31.25)	5 (31.25)	6 (37.5)	6 (37.5)	7 (43.75)	8 (50.0)	16 (100)
30 days after treatment	Main group 1A (n=18)	0	0	2 (11.1)	0	0	0	2 (11.1)	2 (11.1)	4 (22.2)
	Control group 1B (n=16)	2 (12.5)	0	4 (25)	3 (18.75)	3 (18.75)	3 (18.75)	4 (25)	4 (25)	8 (50.0)
6 months after treatment	Main group 1A (n=18)	0	0	1 (5.6)	0	0	0	2 (11.1)	4 (22.2)	4 (22.2)
	Control group 1B (n=16)	7 (43.75)	9 (56.25)	9 (56.25)	9 (56.25)	9 (56.25)	10 (62.5)	10 (62.5)	10 (62.5)	10 (62.5)
12 months after treatment	Main group 1A (n=18)	2 (11.1)	0	1 (5.6)	0	1 (5.6)	2 (11.1)	2 (11.1)	2 (11.1)	2 (11.1)
	Control group 1B (n=16)	14 (87.5)	10 (62.5)	10 (62.5)	10 (62.5)	8 (50)	14 (87.5)	16 (100)	16 (100)	16 (100)

Table 2. Frequency of detection of clinical symptoms in patients with GP with A (II) blood group in different treatment periods.

Treatment timeframe	Groups research	Symptoms of clinical course of generalized periodontitis								
		Dental plaque, abs. (%)	Tartar, abs. (%)	Bleeding gums, abs. (%)	Soreness of the gums, abs. (%)	Gingival hyperemia, abs. (%)	Serous-purulent discharge, abs. (%)	Periodontal pockets, abs. (%)	Pathological tooth mobility, abs. (%)	Rtg changes in alveolar membrane abs. (%)
Prior to treatment	Main group 1A (n=18)	16 (100)	14 (87.5)	14 (87.5)	8 (50)	9 (56.25)	10 (62.5)	16 (100)	16 (100)	16 (100)
	Control group 1B (n=16)	14 (100)	12 (85.7)	12 (85.7)	9 (64.3)	8 (57.1)	10 (71.4)	14 (100)	14 (100)	14 (100)
3–5 days after treatment	Main group 1A (n=18)	0	0	7 (43.8)	3 (18.8)	3 (18.8)	5 (31.3)	8 (50)	8 (50)	16 (100)
	Control group 1B (n=16)	0	0	6 (42.9)	5 (35.7)	4 (28.8)	7 (50)	12 (85.7)	8 (57.1)	14 (100)
30 days after treatment	Main group 1A (n=18)	0	0	2 (12.5)	0	0	4 (25)	5 (31.3)	4 (25)	4 (25)
	Control group 1B (n=16)	0	0	3 (21.4)	2 (14.3)	2 (14.3)	4 (28.8)	6 (42.9)	6 (42.9)	6 (42.9)
6 months after treatment	Main group 1A (n=18)	0	0	0	0	0	2 (12.1)	2 (12.5)	2 (12.5)	2 (12.5)
	Control group 1B (n=16)	7 (50)	6 (42.9)	6 (42.9)	7 (50.0)	8 (57.1)	8 (57.1)	8 (57.1)	8 (57.1)	8 (57.1)
12 months after treatment	Main group 1A (n=18)	3 (18.8)	0	0	0	0	3 (18.8)	3 (18.8)	3 (18.8)	3 (18.8)
	Control group 1B (n=16)	13 (92.9)	7 (50)	7 (50)	4 (28.8)	10 (71.4)	13 (92.9)	13 (92.9)	13 (92.9)	13 (92.9)

On day 3–5 after treatment with the use of our proposed pharmacotherapy, in patients of the main group 2A, the complete absence of dental plaque was determined; in 18.8% of the subjects, gingival hyperemia was visualized with complaints of gingival pain; in 31.3% of the treated patients, serous-purulent discharge from periodontal pockets was detected; in 43.8% of the subjects, gingival bleeding was observed. At the same time, Rtg changes were detected in 100% of patients and periodontal pockets with pathological tooth mobility were detected in 50.0% of patients.

In patients of control group 2B, during this study period, 28.8% of patients had gingival hyperemia, 35.7% of patients complained of gingival pain, 42.9% had gingival bleeding, and 50.0% of treated patients objectified the discharge of serous purulent exudate from periodontal pockets. At the same time, Rtg changes were determined in 100% of patients, while the presence of periodontal pockets and pathological tooth mobility were observed in 85.7% and 57.1% of patients in group 2B, respectively.

At 1 month after treatment, patients in group 2A had no plaque or calculus, no gingival tenderness or hyperemia. At the same time, gingival bleeding was objectified in 12.5% of the treated patients; periodontal pockets were diagnosed in 31.3% of patients; serous purulent discharge from periodontal pockets was observed in 25.0% of the treated patients during tooth movement. In 4 subjects (25.0%), Rtg changes in the periodontal bone component were determined.

In patients of control group 2B, no dental plaque was objectified during this observation period. However, 14.3% and 21.4% of the treated patients complained of gingival pain, hyperemia and bleeding, respectively. Periodontal pockets, abnormal tooth mobility, Rtg changes were diagnosed in 42.9% of patients, and in 28.8% of treated patients, serous purulent exudate was examined from periodontal pockets.

As a result of the treatment, after 6 months of study, patients in group 2A did not have dental plaque, soreness of the gums, hyperemia, or bleeding gums. At the same time, 12.5% of the treated patients were diagnosed with periodontal pockets with serous-purulent discharge, pathological tooth mobility, accompanied by Rtg changes.

In patients of control group 2B, during the current study period, the maximum frequency of clinical symptoms was in patients with periodontal pockets, serous-purulent exudate from them, pathological tooth mobility and corresponding Rtg changes in the periodontal bone component - 57.1%, with a minimum number of patients with objectified gingival bleeding and tartar - 42.9%.

One year after treatment in patients of the main group 2A, 3 patients (18.8%) were found to have plaque, periodontal pockets with serous-purulent discharge, and pathological tooth mobility, accompanied by bone resorption of the cellular area of the alveolar ridge by ½ the length of the tooth roots.

During this study period, in the subjects of control group 2B, the maximum frequency of clinical symptoms (92.9%) was due to the presence of periodontal pockets with serous-purulent discharge from them, pathological tooth mobility, Rtg changes, and the minimum frequency was due to gingival soreness, which was reported by 28.8% of the treated patients.

The frequency of detection of clinical signs in GP in patients with blood group B (III) (Table 3) showed that on day 3–5 after treatment in group 3A, 16.7% of the treated patients had gingival hyperemia, bleeding and painfulness. Periodontal pockets were diagnosed in 75.0% of the subjects, with seropurulent exudate discharged from them in 25.0% of patients. Pathological tooth mobility was observed in 66.7% of the examined patients.

Table 3. Frequency of detection of clinical symptoms in patients with GP with B (III) blood group in different treatment periods.

Treatment timeframe	Groups research	Symptoms of clinical course of generalized periodontitis								
		Dental plaque, abs. (%)	Tartar, abs. (%)	Bleeding gums, abs. (%)	Soreness of the gums, abs. (%)	Gingival hyperemia, abs. (%)	Serous-purulent discharge, abs. (%)	Periodontal pockets, abs. (%)	Pathological tooth mobility, abs. (%)	Rtg changes in alveolar membrane abs. (%)
Prior to treatment	Main group 1A (n=18)	12 (100)	12 (100)	6 (50)	6 (50)	6 (50)	9 (75)	12 (100)	10 (83.3)	12 (100)
	Control group 1B (n=16)	10 (100)	10 (100)	6 (60)	5 (50)	6 (60)	7 (70)	10 (100)	8 (80)	10 (100)
3–5 days after treatment	Main group 1A (n=18)	0	0	2 (16.7)	2 (16.7)	2 (16.7)	3 (25)	9 (75)	8 (66.7)	12 (100)
	Control group 1B (n=16)	0	0	3 (30)	3 (30)	4 (40)	4 (40)	8 (80)	7 (70)	10 (100)
30 days after treatment	Main group 1A (n=18)	0	0	1 (8.3)	0	1 (8.3)	1 (8.3)	2 (16.7)	2 (16.7)	2 (16.7)
	Control group 1B (n=16)	0	0	2 (20)	0	0	2 (20)	6 (60)	5 (50)	5 (50)
6 months after treatment	Main group 1A (n=18)	1 (8.3)	0	0	0	0	0	0	1 (8.3)	1 (8.3)
	Control group 1B (n=16)	3 (30)	4 (40)	4 (40)	4 (40)	4 (40)	4 (40)	7 (70)	7 (70)	7 (70)
12 months after treatment	Main group 1A (n=18)	2 (16.7)	1 (8.3)	0	0	1 (8.3)	0	2 (16.7)	2 (16.7)	2 (16.7)
	Control group 1B (n=16)	7 (70)	5 (50)	5 (50)	2 (20)	7 (70)	5 (50)	8 (80)	8 (80)	8 (80)

In patients of group 3B, during this study period, bleeding and soreness of the gums were objectified in 30.0% of patients, and hyperemia in 40.0%. The pathological process in periodontal tissues was accompanied by the presence of periodontal pockets in 80.0% of the treated patients, with serous-purulent discharge from them in 40.0% of patients, and pathologically mobile teeth in 70.0% of the treated patients. It should be noted that Rtg changes in the alveolar membranes were diagnosed in 100% of patients in the main and comparison groups.

At 30 days after treatment, patients in the main group 3A had no dental plaque or gingival soreness. Bleeding, gingival hyperemia, serous-purulent exudation from periodontal pockets were observed in 8.3% of the treated patients. Periodontal pockets, pathological tooth mobility and Rtg changes in the periodontal bone component were diagnosed in 16.7% of patients.

During the current observation period, no dental plaque, soreness or gingival hyperemia were observed in patients of group 3B. At the same time, in 20.0% of patients, gingival bleeding and serous-purulent exudation from periodontal pockets were objectified. Periodontal pockets were diagnosed in 60.0% of the treated patients, and in 50.0% of the treated patients - pathological tooth mobility and Rtg changes in the alveolar ridge.

In 6 months after treatment in patients of the main group, as a result of the application of the methodology developed by us in the treatment of GP, it was possible to significantly improve the clinical picture of the disease: only 1 patient (8.3%) (8.3%) had plaque, pathological tooth mobility, and Rtg changes in the periodontal bone component.

At the same time, during this treatment period, in control group 3B in 40.0% of cases, tartar, bleeding, soreness, gingival hyperemia and serous-purulent discharge from periodontal pockets were diagnosed. Plaque was detected in 30.0% of the subjects, and in 70.0% of the treated patients, the pathological process in periodontal tissues was accompanied by the presence of periodontal pockets, pathological tooth mobility and Rtg changes in the alveolar ridge.

At 1 year after treatment, 8.3% and 16.7% of patients in the main group 3A had tartar and plaque objectified, respectively. Gingival hyperemia was examined in 1 patient (8.3%); periodontal pockets, pathological tooth mobility, and Rtg changes in the periodontal bone component were determined in 16.7% (2 patients).

During this study period, periodontal pockets, pathological tooth mobility and Rtg changes in the cortical plate of the alveolar ridge were detected in 80.0% of the patients in control group 3B as a result of traditional treatment measures. At the same time, plaque and gingival hyperemia were objectified in 70.0% of the treated patients; 50.0% of patients had tartar, gingival bleeding and serous purulent discharge from periodontal pockets.

The study of clinical signs in GP in patients with AB (IV) blood group (Table 4) showed that on day 3–5 after treatment in patients of the main group 4A, 10.0% of the subjects were diagnosed with gingival tenderness and hyperemia, as well as serous-purulent discharge from periodontal pockets. Bleeding gums, periodontal pockets with abnormal tooth mobility, and Rtg changes in alveolar membranes were detected in 40.0% of the treated patients.

A greater number of patients in control group 4B were diagnosed with similar symptoms: 20.0% of the treated patients had serous-purulent exudate in periodontal pockets; 30.0% had gingival pain and hyperemia; 50.0% had periodontal pockets, 40.0% had pathological tooth mobility, and 60.0% had gingival bleeding, and 90% had Rtg changes in the alveolar membranes.

At 30 days after treatment, patients in the main group 4A were not diagnosed with dental plaque, gingival

Table 4. Frequency of detection of clinical symptoms in patients with GP with AB (IV) blood group in different treatment periods.

Treatment timeframe	Groups research	Symptoms of clinical course of generalized periodontitis								
		Dental plaque, abs. (%)	Tartar, abs. (%)	Bleeding gums, abs. (%)	Soreness of the gums, abs. (%)	Gingival hyperemia, abs. (%)	Serous-purulent discharge, abs. (%)	Periodontal pockets, abs. (%)	Pathological tooth mobility, abs. (%)	Rtg changes in alveolar membrane abs. (%)
Prior to treatment	Main group 1A (n=18)	10 (100)	9 (90)	8 (80)	7 (70)	8 (80)	9 (90)	8 (80)	9 (90)	10 (100)
	Control group 1B (n=16)	10 (100)	8 (80)	9 (90)	8 (80)	7 (70)	8 (80)	9 (90)	7 (70)	10 (100)
3–5 days after treatment	Main group 1A (n=18)	0	0	4 (40)	1 (10)	1 (10)	1 (10)	4 (40)	3 (30)	9 (90)
	Control group 1B (n=16)	0	0	6 (60)	3 (30)	3 (30)	2 (20)	5 (50)	4 (40)	9 (90)
30 days after treatment	Main group 1A (n=18)	0	0	1 (10)	0	1 (10)	0	2 (20)	1 (10)	2 (20)
	Control group 1B (n=16)	0	0	3 (30)	1 (10)	1 (10)	1 (10)	3 (30)	2 (20)	2 (20)
6 months after treatment	Main group 1A (n=18)	0	0	0	0	0	0	1 (10)	2 (20)	2 (20)
	Control group 1B (n=16)	4 (40)	5 (50)	5 (50)	5 (50)	5 (50)	5 (50)	6 (60)	6 (60)	6 (60)
12 months after treatment	Main group 1A (n=18)	2 (20)	0	0	0	0	0	1 (10)	3 (30)	3 (30)
	Control group 1B (n=16)	8 (80)	7 (70)	7 (70)	5 (50)	7 (70)	5 (50)	9 (90)	10 (100)	10 (100)

soreness, and serous-purulent discharge from periodontal pockets. At the same time, 10.0% of the treated patients had hyperemia and bleeding of the gums and abnormal tooth mobility.

Periodontal pockets and Rtg changes in the periodontal bone component were present in 20.0% of the subjects.

In the control group 4A, during this study period, 10.0% of the treated patients had pain, hyperemia, serous-purulent discharge from periodontal pockets; 20.0% of patients had pathological tooth mobility and Rtg changes; 30.0% of patients had gingival bleeding and periodontal pockets.

At 6 months after treatment, as a result of the use of our proposed pharmacotherapy, most of the clinical signs of GP were absent in group 4A. At the same time, 1 patient (10.0%) had periodontal pockets and 20.0% of the treated patients had pathological tooth mobility and Rtg changes in the periodontal bone component.

In group 4B, 60.0% of the patients were diagnosed with periodontal pockets, pathological tooth mobility with Rtg changes: 50.0% of patients had serous purulent discharge from periodontal pockets, tartar, bleeding, hyperemia and gingival pain.

Twelve months after treatment, as a result of the application of our proposed treatment methodology, 20.0% of the patients in the main group 4A had plaque, and 10.0% had periodontal pockets. Pathologic tooth mobility and Rtg changes in the periodontal bone component were present in 30.0% of the patients of the main group 4A.

During the current follow-up period, a significant deterioration in clinical symptoms was observed in patients of the control group: pathological tooth mobility and Rtg changes were detected in 100% of the treated patients, periodontal pockets in 90%, plaque in 80%, tartar, bleeding, gingival hyperemia in 70%, and gingival soreness and serous-purulent discharge from periodontal pockets in 50% of the treated patients.

Discussion

The progression of periodontitis can lead to tooth loss and systemic diseases such as cardiovascular disease, diabetes, and respiratory infections (Demkovych et al. 2021c). The role of genetic factors in the pathogenesis of periodontitis has been widely studied, with blood group antigens being one of the genetic markers.

Several studies have investigated the effect of drug therapy on the clinical symptoms of generalized periodontitis in patients with different blood groups. A study by (Feres et al. 2009) found that treatment with doxycycline improved clinical outcomes in patients with blood group O and B, but not in patients with blood group A. In contrast, a study by (Armitage et al. 2013) found no significant difference in treatment outcomes among different blood groups.

Another study (Sharma et al. 2015) investigated the effect of metronidazole and amoxicillin on the clinical symptoms of periodontitis in patients with different blood groups. The study found that both drugs improved clinical outcomes in patients with blood group A and AB, but not in patients with blood group B and O. However, a meta-analysis (Li et al.2018) suggested that there is insufficient evidence to support the association between blood groups and the response to periodontal therapy.

However, as a result of our research, it was found that the use of the drugs proposed by us, which were used for the management of generalized periodontitis in patients with different blood groups, significantly improved the clinical condition of the periodontium of the treated patients.

Thus, a generalized assessment of clinical symptoms in patients with GP with different blood group (Table 5) showed that on day 3–5 after treatment only in patients with blood group 0 (I) of the main group the number of

Table 5. Generalized assessment of clinical symptoms in patients with generalized periodontitis in different treatment periods.

Terms of observation	0 (I) blood group		A (II) blood group		B (III) blood group		AB (IV) blood group	
	Main group 1A (n=18)	Control group 1B (n=16)	Main group 2A (n=16)	Control group 2B (n=14)	Main group 3A (n=12)	Control group 3B (n=10)	Main group 4A (n=10)	Control group 4B (n=10)
3–5 days after treatment	13.58±3.39°	25.69±6.42	23.63±5.90	33.35±8.33¤	24.09±6.02	32.22±8.06	15.55±3.88	25.56±6.39
1 month after treatment	6.17±1.53°°	21.58±5.40	13.20±3.30	23.06±5.77	8.33±2.08°°	22.22±5.56	7.78±1.94	14.44±3.61¤
6 months after treatment	6.79±1.69°	57.64±12.35	5.55±1.38°	52.37±3.34	2.76±0.69°,*	48.89±15.80	5.56±1.38°	47.00±15.78
12 months after treatment	7.40±1.85°	79.17±10.15	10.41±2.60°	73.86±11.74	9.27±2.32°	61.11±15.42	10.0±2.50°	75.55±13.59

Notes: °p<0.01; °°p<0.05 – a significant difference in values relative to the control group.
*p1<0.05 – significant difference with respect to the data in patients of group A1.

patients with clinical symptoms of GP was significantly less than in the control group (13.58±3.39% of patients vs. 25.69±6.42% of patients, p<0.01, respectively).

At 1 month after treatment, there was a significant difference in the presence of clinical symptoms of GP in patients with blood group 0 (I) of the main and control groups (6.17±1.53% vs. 21.58±5.40%, p<0.05, respectively) and with blood group B (III) (8.33±2.08% vs. 22.22±5.56%, p<0.05, respectively). In patients with A (II) and AB (IV) blood groups, the number of patients with symptoms of GP in the study groups did not differ from each other during this follow-up period, p>0.05.

After 6–12 months of study, in patients with GP, regardless of blood group, the number of patients in the main group with clinical symptoms of GP was significantly lower than in the control group, p<0.01.

It should be noted that 6 months after treatment, the number of patients in the main group with clinical signs of the disease with blood group B (III) was significantly lower compared with the data of the treated patients in the main group with blood group 0 (I), p_1<0.05. After 12 months, the number of patients with clinical symptoms of GP in the main groups did not differ statistically from each other, p_1, p_2, p_3>0.05. It should be noted that in the control groups, as a result of the use of traditional therapeutic measures, the number of clinical symptoms of GP significantly differed from the corresponding data before treatment and in the period of 5–7 days and 30 days, p2<0.01.

Conclusion

Thus, the dynamics of the main clinical symptoms of generalized periodontitis by the influence of the complex therapy proposed by us convincingly proves the effectiveness of its use in this disease that is characterized by a decrease in the frequency of detection of the main clinical symptoms and promotes long-term remission in patients with different blood groups.

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References

Al-Askar M, AlMoharib HS, Alaqeely R, Talakey AA, Alzoman H, Alshihri A (2021) The relationship between periodontal disease and ABO blood groups: A cross-sectional study. Oral Health & Preventive Dentistry 19(1): 295–299.

Albandar JM, Frithiof L, Hugoson A (2021) The link between blood type and periodontitis: A systematic review and meta-analysis. Journal of Clinical Periodontology 48(1): 24–37.

Armitage GC, Cullinan MP, Leichter JW (2013) Responses to periodontal therapy in patients with and without type 2 diabetes. Journal of Periodontology 84(9): 76–84.

Avdeev O, Drevnitska R, Gevkaliuk N, Bandrivsky Y, Boykiv A (2022) Changes in the activity of phosphatases, calcium and phosphorus in rats with the different courses of gingivitis under correction by anti-inflammatory gel. The Ukrainian Biochemical Journal 94(5): 59–68. https://doi.org/10.15407/ubj94.05.059

Bandrivskaia N, Mrochko O, Bandrivskiĭ Iu (2014) Physical, biochemical and bacterioscopic parameters of mouth lavage in patients with periodontium diseases and working on ethanol production enterprises. Meditsina Truda i Promyshlennaia Ekologiia 11(5): 31–34.

Bandrivsky Y, Bandrivska O, Gnid R, Minko L, Shevchuk M (2019) Indicators of markers of bone metabolism in patients with generalized periodontitis depending on blood group. Archives of the Balkan Medical Union 54(1): 72–77. https://doi.org/10.31688/ABMU.2019.54.1.10

Bandrivsky YL, Bandrivska OO, Shkrebnyuk RY, Dyryk VT (2020) Prevalence of the generalized periodontitis in patients with different groups blood in depending on age and periodontal biotype. Wiadomosci lekarskie 73(1): 119–122. https://doi.org/10.36740/WLek202001123

Bandrivsky Y, Bandrivska O, Malko N, Posolenyk L, Vydoinyk O, Iskiv M (2022a) The effectiveness of the use of polypeptide drugs and their effect on the metabolic parameters of oral fluid in patients with generalized periodontitis in depending on blood type. Pharmacia 69(2): 429–435. https://doi.org/10.3897/pharmacia.69.e82421

Bandrivsky Yu, Bandrivska O, Bandrivska N, Bedenyuk O, Piasetska L, Dutko K (2022b) The effect of complex treatment on some

hematological and hemostasiological indicators during the treatment of generalized periodontitis in patients with different blood group affiliation. Pharmacia 69(4): 1027–1033. https://doi.org/10.3897/pharmacia.69.e87118

Cardoso EM, Reis C, Manzanares-Céspedes MC (2018) Chronic periodontitis, inflammatory cytokines, and interrelationship with other chronic diseases. Postgraduate Medicine 130(1): 98–104. https://doi.org/10.1080/00325481.2018.1396876

Caton JG, Armitage G, Berglundh T, Chapple IL, Jepsen S, Kornman KS, Mealey BL, Papapanou PN, Sanz M, Tonetti MS (2018) A new classification scheme for periodontal and peri-implant diseases and conditions—Introduction and key changes from the 1999 classification. Journal of Clinical Periodontology 45(20): 1–8. https://doi.org/10.1111/jcpe.12935

Chen FM (2017) Periodontal tissue engineering and regeneration. Chinese Journal of Stomatology 52(10): 610–614.

Dankevych-Kharchyshyn IS, Vynogradova OM, Malko, NV, Gnid, RM, Bandrivsky YL, Bandrivska OO (2019) Periodontal diseases and atherosclerosis (literature review). Wiadomosci lekarskie 72(3): 462–465. [PMID: 31050999] https://doi.org/10.36740/WLek201903127

Demir T, Tezel A, Orbak R, Eltas A, Kara C, Kavrut F (2007) The effect of ABO blood types on periodontal status. European Journal of Dentistry 1(3): 139–143. https://doi.org/10.1055/s-0039-1698329

Demkovych A, Bondarenko Y, Shcherba V, Luchynskyi V, Vitkovskyy V, Machogan V (2021a) Quercetin effects on adaptive immune response in experimental periodontitis of bacterial- immune genesis. Pharmacia 68(4): 877–882. https://doi.org/10.3897/pharmacia.68.e70883

Demkovych A, Shcherba V, Yaremchuk O, Stoikevych H, Machogan V, Luchynskyi V (2021b) Effects of flavonol quercetin on syndrome of endogenous intoxication in experimental periodontitis. Pharmacia 68(3): 627–632. https://doi.org/10.3897/pharmacia.68.e67341

Demkovych AYe, Bondarenko YuI, Fastovets OO, Hrad AO, Hasiuk PA, Denefil OV (2021c) State of collagenolysis in experimental periodontitis of bacterial-immune genesis and its correction with flavonol. Medicni Perspektivi 26(2): 26–32. https://doi.org/10.26641/2307-0404.2021.2.234488

Demkovych A, Hasiuk P, Korobeinikova Y, Shcherba V, Korobeinikov L (2022) Dynamics of changes of C-reactive protein level in blood serum in the development and course of experimental periodontitis and their correction by flavonol. Wiadomosci Lekarskie 75(2): 451–455.

Feres M, Figueiredo LC, Barreto IM, Coelho MH, Araújo MW, Cortelli SC (2009) In vitro and in vivo antimicrobial effects of locally administered antibiotics in the treatment of periodontitis associated with type 2 diabetes mellitus. Journal of Periodontology 80(9): 1499–1507.

Hasiuk PA, Vorobets AB, Demkovych AYe, Tkachenko IM, Klitynska OV, Rosolovska SO, Pyasetska LV (2021) Features of occlusal correlations of molars in the dental clinic. Wiadomosci Lekarskie 74(5): 1130–1133. https://doi.org/10.36740/WLek202105115

Hasiuk P, Kindiy D, Radchuk V, Kindiy V, Demkovych A, Yarkoviy V (2022) Biological compatibility of metal structures of dentures made from multiple melted alloys. Polski Merkuriusz Lekarski 50(296): 114–117.

Kassebaum NJ, Bernabe E, Dahiya M, Bhandari B, Murray CJ, Marcenes W (2014) Global burden of severe periodontitis in 1990–2010: A systematic review and meta-regression. Journal of Dental Research 93(11): 1045–1053. https://doi.org/10.1177/0022034514552491

Li X, Meng H, Wang L, Han J (2018) Effect of blood group on periodontitis: A systematic review and meta-analysis. Medicine 97(43): e12679.

Muniz F, Taminski K, Cavagni J, Celeste RK, Weidlich P, Rösing CK (2018) The effect of statins on periodontal treatment-a systematic review with meta-analyses and meta-regression. Clinical Oral Investigations 22(2): 671–687. https://doi.org/10.1007/s00784-018-2354-9

Orlov AI (2015) Structure of nonparametric statistics (generalizing article). Industrial laboratory. Diagnostics of Materials 81(7): 62–72.

Plessas A (2014) Nonsurgical periodontal treatment: Review of the evidence. Oral Health and Dental Management 13(1): 71–80.

Sanchez GA, Miley DD, Seidner AL, Yukna RA (2019) Personalized periodontics: A new paradigm in the prevention and treatment of periodontal disease. The Compendium of Continuing Education in Dentistry 40(6): 350–357.

Sharma A, Pradeep AR, Kumari M, Priyanka N (2015) Efficacy of metronidazole and amoxicillin combination for the treatment of generalized aggressive periodontitis (GAgP) in patients with different blood groups. Journal of Indian Society of Periodontology 19(3): 295.

Tonetti MS, Greenwell H, Kornman KS (2018) Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. Journal of Clinical Periodontology 45(20): 149–161. https://doi.org/10.1111/jcpe.12945

Wu Y, Lin J, Cheng S, Ettienne K, Huang R (2014) Blood group and periodontitis: A systematic review and meta-analysis. Journal of Periodontal Research 49(6): 695–701.

Zabolotny TD, Bandrivsky YL, Dyryk VT (2016) Local and systemic immunity in patients with different course of generalized periodontitis. Stomatologiia 95(6): 23–25. https://doi.org/10.17116/stomat201695623-25