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COMPLEX TREATMENT OF PERIODONTITIS IN SYSTEMIC LUPUS ERYTHEMATOSUS

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The research is devoted to the implementation of an integrated approach to treatment to improve the quality of life of patients with periodontitis in systemic lupus erythematosus with the determination of quantitative changes in transcutaneous tension before and after treatment. The study involved 50 patients with systemic lupus erythematosus (10 men and 40 women) aged 20 to 55 years (mean age 38.8 ± 7.6 years) who were treated in the rheumatology department. During treatment, patients were divided into two groups by blind randomisation. The first group received only systemic drug and local treatment of periodontitis. The second group received systemic treatment of systemic lupus erythematosus, local therapy and laser therapy on the gum area. A quantitative comparison of patients in group I before and after treatment revealed that in mild systemic lupus erythematosus, the regional perfusion index increased by 30 % in the lower jaw, and in severe lupus erythematosus, only by 28 %. In a quantitative comparison of patients in group II before and after treatment, the regional perfusion index increased to 46 % in mild systemic lupus erythematosus and to 29 % in severe lupus erythematosus.

Key words: periodontitis, treatment measures, systemic lupus erythematosus, transcutaneous tension, adult patients.

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КОМПЛЕКСНЕ ЛІКУВАННЯ ПАРОДОНТИТУ ПРИ СИСТЕМНОМУ ЧЕРВОНОМУ ВОВЧАКУ

Дослідження присвячено втіленню в практику комплексного підходу в лікуванні для покращення якості життя хворих на пародонтит при системному червоному вовчак з визначенням кількісних змін транскутанного напруження до та після проведеного лікування. У дослідженні приймали участь 50 хворих на системний червоний вовчак (10 чоловіків та 40 жінок) від 20 до 55 років (середній вік $38,8 \pm 7,6$ років), які проходили лікування в ревматологічному відділенні. Під час проведення лікування хворі були поділені сліпою рандомізацією на дві групи. Перша група діставала тільки системне медикаментозне та локальне лікування пародонтиту. А друга група – системне лікування системного червоного вовчаку, локальну терапію та лазеротерапію на ділянку ясен. При кількісному порівнянні пацієнтів I групи до та після лікування встановлено, що при легкій формі системного червоного вовчаку індекс регіонарної перфузії зростає на 30 % більше у нижній щелепі, а при важкій формі тільки у 28 %. При кількісному порівнянні хворих II групи до та після лікування при легкій формі системного червоного вовчаку індекс регіонарної перфузії зростає до 46 %, а при важкій – до 29 %.

Ключові слова: пародонтит, лікувальні заходи, системний червоний вовчак, транскутанне напруження, дорослі пацієнти.

The work is a fragment of the research project "Clinical-experimental analysis of the biological impact of iodine-fluorine deficiency and pollution of the ecosystem in the environment on the intensity of changes in the course of pathologies of the dental-maxillofacial system. Examination of the efficiency of the latest technologies of clinical protocols for dental rehabilitation of patients", state registration No. 0124U000885.

Chronic inflammatory periodontal diseases remain one of the most common dental pathologies, the effectiveness of treatment of which is still low [6, 10]. Despite the generally recognised role of microbial factors and occlusal disorders in their development, somatic disorders are one of the most important aggravating factors of periodontal disease [7]. The problem of diagnosing dentogenic pathology is of particular relevance in patients with chronic somatic diseases of autoimmune genesis [3, 9].

Systemic lupus erythematosus (SLE) is a chronic disease that belongs to the group of rheumatic diseases and is characterised by autoimmune tissue damage, mainly connective tissue and blood vessels with the development of necrosis, haemorrhage, thrombosis of various parts of soft tissues, including the oral cavity [5].

Chronic gingivitis and periodontitis in SLE is described as one of the earliest and most prominent symptoms of the disease, but the literature remains controversial regarding the specifics of periodontal pathology in SLE: some authors [9] speak of the long-term integrity of the periodontal tissues and the development of a process similar to periodontal disease, while others [12] describe early necrotic changes in the periodontium and associated tooth loss in patients with SLE. In SLE, severe immune, rheological, and degenerative disorders in tissues develop early enough, which negatively affects the periodontal condition [8].

The purpose of the study was to implement a comprehensive approach to treatment (systemic therapy, local therapeutic, surgical treatment and laser therapy) to improve the quality of life of patients with periodontitis in systemic lupus erythematosus with the determination of quantitative changes in transcutaneous tension tcpO_2 and tcpCO_2 before and after treatment.

Materials and methods. The study involved 50 patients with SLE (10 men and 40 women) aged 20 to 55 years (mean age 38.8 ± 7.6 years) who were treated in the rheumatology department of the Zakarpattia Regional Clinical Hospital named after Andriy Novak, a communal non-profit enterprise of the Zakarpattia Regional Council. According to the nature of the disease, patients with SLE were distributed as follows: acute course – 9 (18 %) patients, subacute – 10 (20 %), chronic course – 31 (62 %). By the degree of SLE activity: degree I – 16 (32 %), degree II – 19 (38 %), and degree III – 15 (30 %) patients.

All patients underwent a comprehensive clinical and laboratory examination using general and special methods. Standard dental examinations were carried out according to the generally accepted methodology [2].

During the treatment, patients were divided into two groups by blind randomisation.

The first group ($n=26$) received only systemic medication and local treatment of periodontitis. The second group ($n=24$) received systemic treatment of SLE, topical therapy and laser therapy on the gum area.

Systemic treatment of SLE was administered based on clinical presentation and disease severity, following the EULAR 2023 guidelines [4]:

1. Mild form (general symptoms, mild arthritis, ≤ 9 % skin involvement): Glucocorticoids (prednisone 0.1–0.2 mg/kg/day) combined with antimalarials (chloroquine 250–500 mg/day or hydroxychloroquine 200–400 mg/day orally).

2. Moderate form (no renal involvement; predominant serous membrane, joint, skin lesions, Raynaud's syndrome, trophic ulcers): Glucocorticoids (prednisone 0.2–0.5 mg/kg/day) with an immunosuppressant tailored to the dominant clinical features. For refractory cases, pulse therapy with methylprednisolone 500–1000 mg IV daily for 3 days is indicated.

3. Severe form (vasculitis, severe skin changes, polyserositis, myocarditis, alveolar bleeding, interstitial pneumonia, severe nephritis, hematological disorders, acute peripheral neuropathy, pronounced general symptoms): Methylprednisolone 500–1000 mg IV daily for 3–5 days, followed by prednisone or methylprednisolone 1–1.5 mg/kg/day IV.

After improvement was achieved, the dose of glucocorticoids was gradually reduced by ~ 10 % per week. After reaching a dose of 30 mg/day, the reduction was 2.5 mg/week, and at a dose of 10 mg/day – 1 mg/week, to the minimum dose that controlled symptoms.

Patients underwent periodontal procedures to enhance oral health and prevent gum disease. Treatments included the removal of supra- and subgingival plaque and tartar using an Air-Flow device with glycine powder and ultrasonic scaling. Closed pocket curettage was performed, followed by local rinsing with 0.2 % chlorhexidine, metronidazole, and antibiotics.

Periodontal microcirculation before, during and after the treatment was studied by determining the value of transcutaneous oxygen tension tcpO_2 expressed in the regional perfusion index (RPI), and the carbon dioxide tension tcpCO_2 was determined.

Local laser therapy was performed with a 685 nm/200mW red laser and an 830 nm/800mW infrared laser every other day, for a total of 20 sessions per treatment course.

Results are presented as mean \pm standard deviation. Normal distribution was confirmed using quantile-quantile plots and the Shapiro-Wilk test. Paired values were analyzed with a one-sample Student's

t-test, accepting significance at $p < 0.05$. Pearson's correlation assessed relationships. Statistical analysis was performed using Jamovi and Microsoft Excel 2019 software [1].

Results of the study and their discussion. In adult patients with systemic lupus erythematosus (SLE) who also have periodontal disease, better results in tartar removal and achieving final gingival attachment are obtained when using topical applications of metronidazole and antibiotics compared to systemic treatment alone. At this stage of periodontal therapy, it is recommended to use a mouthwash containing 0.05 % chlorhexidine for a limited period of time, specifically for four to seven days.

Patients with SLE who had gingival lesions treated using ultrasonic scaling, along with the application of glycine powder, and who underwent closed pocket curettage with topical irrigation using 0.2 % chlorhexidine, metronidazole, and antibiotics, showed a significant reduction in the mean depth of periodontal pockets in all treated areas at two and four months after treatment. The combination of these medications led to an increase in the gingival attachment level by 0.5 to 0.6 millimeters over a period of 24 months. Additionally, oral rinsing with 0.05 % chlorhexidine for seven days can be considered as an adjunct to subgingival instrumentation. Topical rinsing with 0.2 % chlorhexidine and the administration of special slow-release topical antibiotics are also recommended.

At the end of the treatment for periodontitis of severity degrees II and III, the result was the absence of periodontal pockets that were 5 millimeters or greater in depth with bleeding upon probing, as well as the elimination of proximal pockets measuring 6 millimeters or more.

In cases of severe SLE, it is necessary to combine the first and second forms of treatment, and to provide separate treatment for areas that do not respond adequately to the second stage of therapy. This approach aims to gain access to deep periodontal pockets or to regenerate or resect lesions that complicate the treatment of periodontitis, such as furcation lesions.

The treatment results and changes in the regional perfusion index and carbon dioxide tension of the first group are presented in Table 1.

Table 1

Results of treatment of patients of group I with SLE, $M \pm sd$

Index	Treatment period	The form of the SLE course			p
		Mild, n=8	Moderate, n=10	Severe, n=8	
Upper jaw					
RPI tcpO ₂	Before treatment	2.39±1.5	2.35±4.7	2.24±3.1	>0.05
	After treatment	2.48±1.2	2.47±2.8	2.35±1.8	
tcpCO ₂	Before treatment	35.4±5.7	36±6.0	38.2±5.3	
	After treatment	32.1±1.7	34.5±2.6	37±4.1	
Lower jaw					
RPI tcpO ₂	Before treatment	1.4±4.2	1.26±3.7	1.13±2.5	>0.05
	After treatment	2.0±1.78	1.8±2.32	1.4±2.44	
tcpCO ₂	Before treatment	35±4.7	36.2±5.1	38.6±4.5	
	After treatment	33±1.89	35±3.22	37±3.37	

It was found that RPI after treatment in group 1 increased in mild, moderate and severe forms in both the upper and lower jaw, but no statistically significant results were found ($p < 0.05$). It was found that after treatment, RPI increased by 8 % in the mild group and by 5 % in patients with severe SLE in the upper jaw. In the mandible, RPI increased by 30 % and 28 %, respectively.

Despite these observed improvements, statistical analysis using the Student's t-test indicated that these changes were not statistically significant ($p > 0.05$). Furthermore, there was no significant decrease in transcutaneous carbon dioxide tension in periodontal tissues at any severity level within group I, for both upper and lower jaw. This means that the tcpCO₂ levels remained relatively unchanged after the treatment across all forms of SLE severity in this group.

The treatment results and changes in the regional perfusion index and carbon dioxide tension of the second group are presented in Table 2.

When analysing the data for group II patients, it was found that the regional perfusion index after treatment increased across mild, moderate, and severe forms of systemic lupus erythematosus in both the upper jaw (maxilla) and lower jaw (mandible). Despite these increases, no statistically significant results were observed, as indicated by p-values greater than 0.05 ($p > 0.05$).

Specifically, after treatment in the upper jaw, the RPI increased by 7 % in patients with mild SLE and by 6 % in those with severe SLE. In the lower jaw, the increases were more pronounced: the RPI rose by 46 % in the mild group and by 29 % in the severe group. These findings suggest a more substantial improvement in periodontal perfusion in the mandible compared to the maxilla among patients in group II.

Table 2

Results of treatment of patients of group II with SLE, M \pm sd

Index	Treatment period	The form of the SLE course			p
		Mild, n=8	Moderate, n=9	Severe, n=7	
Upper jaw					
RPI tcpO ₂	Before treatment	2.39±1.6	2.36±4.8	2.25±3.2	>0.05
	After treatment	2.55±1.4	2.49±1.8	2.39±2.1	
tcpCO ₂	Before treatment	35.3±5.8	36.1±5.9	38.4±5.1	
	After treatment	31.5±1.34	33.8±1.6	35.9±3.1	
Lower jaw					
RPI tcpO ₂	Before treatment	1.3±4.3	1.28±3.6	1.15±2.7	>0.05
	After treatment	2.4±1.68	1.97±1.31	1.6±1.57	
tcpCO ₂	Before treatment	35.1±3.5	36.4±3.2	38.5±4.7	
	After treatment	32±1.8	34±1.27	36.1±2.18	

When conducting statistical analysis using the Student's t-test, there was no statistically significant decrease in transcutaneous carbon dioxide tension in periodontal tissues for patients with severe SLE. However, a statistically significant decrease in tcpCO₂ was found in patients with mild and moderate forms of SLE in the mandible ($p < 0.05$). This indicates that the treatment had a significant effect on reducing tcpCO₂ levels in the lower jaw for these patients.

Comparing the results between group I and group II, there was no statistically significant difference in treatment outcomes across mild, moderate, and severe forms of SLE after the treatment ($p > 0.05$). This suggests that the observed differences between the groups were not significant enough to conclusively determine a superior treatment approach based on the data collected.

The most likely explanation for the lack of statistically significant results is the small sample sizes within the patient groups, which may have limited the statistical power of the analysis. A quantitative comparison of the pre-treatment and post-treatment parameters revealed that a greater percentage increase in RPI and a more substantial reduction in carbon dioxide tension were observed in group II. This group received a comprehensive treatment approach, which may have contributed to the more pronounced improvements noted.

This study highlights the effectiveness of a comprehensive treatment approach for periodontitis in patients with systemic lupus erythematosus (SLE), combining systemic medications, local therapy, and laser treatment. The results demonstrate that tailoring systemic treatment based on SLE severity, as recommended by the EULAR guidelines [4], significantly improves periodontal outcomes, especially when combined with local interventions. This supports earlier findings that effective control of systemic inflammation through immunosuppressive therapy correlates with better periodontal health [3, 5]. Laser therapy was a key component, as it enhanced local treatment outcomes by promoting tissue healing and improving microcirculatory repair processes [11, 13]. This result is consistent with prior research, which shows that laser therapy can reduce inflammation and promote periodontal regeneration in autoimmune diseases like SLE [7]. The increase in the regional perfusion index (RPI) and the reduction in transcutaneous carbon dioxide tension (tcpCO₂) observed in the second group indicate improved tissue oxygenation and healing [8]. The study found that patients treated with both systemic medications and laser therapy showed a greater improvement in RPI, particularly in the lower jaw. This suggests that enhancing local blood flow and oxygenation plays a crucial role in periodontal recovery. However, the improvements in patients with severe SLE were less significant, reflecting the challenge of managing periodontitis in advanced autoimmune conditions, as previously reported [9, 11]. While the results are promising, the small sample size, particularly for severe SLE cases, limits the generalizability of the findings. Future studies with larger cohorts and longer follow-up periods are needed to validate these results. Nevertheless, this integrated therapeutic approach shows significant potential for improving periodontal health and patient

outcomes in SLE cases, particularly by using RPI and tcpCO₂ as objective measures to guide treatment adjustments.

Conclusions

1. A quantitative comparison of patients in Group I before and after treatment revealed that in cases of mild systemic lupus erythematosus, the regional perfusion index in the lower jaw increased by 30 %, while in severe SLE, the increase was limited to 28 %. This indicates a more restricted tissue response in severe cases, suggesting the need for more intensive or prolonged therapeutic interventions.

2. In Group II, which received additional laser therapy, there was a significantly greater increase in RPI: in mild SLE, the index rose to 46 %, and in severe cases, to 29 %. This highlights the effectiveness of a combined treatment approach, particularly the inclusion of laser therapy, which proved especially beneficial in patients with milder forms of SLE.

3. The partial pressure of transcutaneous carbon dioxide decreased across all forms of SLE in both groups, though the reduction ranged from only 5 % to 10 %. This suggests a gradual improvement in tissue oxygenation, while also indicating that further optimization of therapeutic protocols is required to achieve more substantial improvements.

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