GEORGIAN BIOMEDICAL NEWS

ISSN (Online): 2720-8796 ISSN (Print): 2720-7994 VOLUME 1. ISSUE 3. JUL-SEP 2023

Diagnosis and Treatment Options of Endo-Perio Lesions

Nazim A. Panahov,[1,ID] Vusalya M. Bayramova,[1] Fuad Y. Mamedov,[1,ID] Ilgar T. Gajar[1]

DOI: 10.52340/GBMN.2023.01.01.40

ABSTRACT

Background: Endo-perio lesions (EPLs) are a significant challenge for modern scientific and practical dentistry, and the complexity of their etiology reduces the effectiveness of treatment and rehabilitation measures.
Objectives: This study aimed to assess diode lasers' clinical efficacy in endo-perio lesions.
Methods: The study was conducted from 2019 to 2022 and included several clinical and laboratory examinations of 100 patients with EPLs and 50 patients of the same age with periodontitis. Forty-one patients were distributed among the two groups: Group I consisted of 20 patients with EPLs treated with a dental diode laser (Picasso Lite, Italy, wavelength 810±10 nm, the pulsed mode was chosen, the average power was 0.1 - 2.5 W) along the standard treatment; Group 2 (the control group) consisted of 21 patients with EPLs and traditional methods of treatment.
Results: Six months following the initiation of the therapy, we observed a strong positive correlation dependency in Group I (r=0.38, p=0.0975). The correlation analysis's findings for the control group of patients over that period were quite positive (r=0.32, p=0.1627). After a year, the results indicated that the level of TNF-a was considerably lower in the leading group than in the control group (p=0.0001).
Conclusions: Laser therapy may be fully used in practical dentistry to treat mixed endodontic-periodontal lesions.
Keywords: Cytokines; diode laser; endoperiodontal lesions (EPLs); immunoglobulin; periapical index (PAI); periodontal index (PI).

BACKGROUND

The combined endodontic-periodontal lesions, also known as Endo-perio lesions (EPLs), represent a significant challenge for contemporary scientific and practical dentistry because of the unpredictable course of development and spread of foci of chronic infection in the periapical region and the tissues of the periodontium.[1]

The correctness of the diagnosis impacts the prognosis of the disease and the efficacy of therapy. Consequently, an in-depth comprehension of the etiopathogenetic mechanisms beneath both the development and progression of the simultaneous defeat of soft and hard periodontium tissues is necessary.

The primary goal of research in this field is to provide the best results by developing and using realistic, evidence-based clinical and diagnostic guidelines for accurate diagnosis and effective therapeutic approaches.[2-4]

The involvement of the immune system, whose functional condition depends on the protective reaction of the organs and tissues of the mouth cavity in response to the development of the inflammatory process, is associated with the high risk of infection spreading in the buccal-facial area.[5]

The complexity of the etiology and pathogenesis of endoperiodontal complications reduces the effectiveness of treatment and rehabilitation measures, making this question one of the priority tasks of modern dentistry. Thus, the urgency of developing and implementing new promising methods of diagnosis and treatment increases.[6,7]

Many experts also point out the possibility of using extra, non-medical physical elements since they considerably speed up the healing processes and finally restore the compromised functioning of the dental-jaw system.[8,9]

Understanding how laser technologies might improve the anti-inflammatory and immunomodulating effects of drugs is fascinating.[10]

This study aimed to assess the clinical efficacy of diode lasers in the case of endo-perio lesions.

METHODS

The present study was conducted from 2019 to 2022 at the Department of Therapeutic Dentistry of Azerbaijan Medical University (AMU). The study population consisted of 100 patients with endo-perio lesions (EPLs) and 50 with periodontal disease without signs of damage to the periapical region (Tab.1). The study protocol with inclusion (confirmed EPLs, no pregnancy and comorbidities, and written consent of participation in the study) and exclusion (refusal to participate in the study, comorbidities, previous endodontic treatment, pronounced resorption of the alveolar bone, and >5 mm depth of periodontal pocket) criteria was approved by the local ethics committee of AMU.

Mechanical expansion using endodontic instruments, antiseptic therapy using 3% sodium hypochlorite solution, and 17% EDTA solution constituted endodontic treatment.

Treatment for periodontitis includes scaling, curettage with Gracie curettes, and use of the Piezon Master 600™

EMS ultrasound equipment, as well as removing dental plaque in the control group. The teeth's surface was cleaned and polished using an abrasive paste.

The effectiveness of traditional and proposed treatment methods for endoperiodontal lesions was evaluated using the periodontal index or PI (Russel A., 1956). The study of the quantitative parameters of IgA immunoglobulin utilizing the method of G. Mancini et al., 1965 and the proinflammatory cytokine TNF-α using standard kits reagents intended for the quantitative determination of human I.L. in biological fluids ("Vector-Best").

Statistical research was conducted using Social Science Statistics (https://www.socscistatistics.com/tests/) and Statistica 8.0 Microsoft Excel. The Wilcoxon W-test was used to test for differences between the two compared paired samples. When comparing independent quantitative data, the Mann-Whitney U-test was used. Pearson's χ2 test was used to assess the difference in the distribution of a categorical variable between two independent groups. The presence of a relationship between the values was evaluated based on the results of a correlation analysis using the Spearman rank correlation index (r). P-value is used to determine the significance of observational data. $p<0.05$ was considered statistically significant.[11]

RESULTS

Table 1 represents the distribution of the study population by age.

TABLE 1. The distribution of the study patients by age

Age (years)	With EPLs		Without EPLs		P (χ2)
	N	%	N	%	
Up to 20	3	3.0	2	4.0	
20-29	12	12.0	3	6.0	
30-39	14	14.0	9	18.0	0,617(2.65)
40-49	52	52.0	23	46.0	
50-55	19	19.0	13	36.0	

Abbreviations: EPLs, endoperiodontal lesions.

At the end of the study, or 12 months after the end of basic therapy, the indicators of the periapical index (PAI), which characterize the effectiveness of the treatment, significantly decreased in Group I, compared to the values observed in the control group (p=0.0190). Table 2 provides the average of the PAI both prior to the start of therapy and at certain intervals after it has ended.

The dynamics of changes in the PAI serve as a marker of treatment efficacy. With the development of endoperiodontal lesions, there was a decrease in the average values of the PAI in both groups (p>0.05). Thus, compared to the results demonstrated in the control group over the same period, the best data and long-lasting favorable dynamics are found after completing complicated treatment and preventative measures using laser therapy.

TABLE 2. The changes in periapical index (PAI) of study patients before and after treatment

	Group I (N=20)	Group II (N=21)	p-value
Before treatment	2.60±0.112	2.86±0.125	0.9153
After 6 months of treatment	2.55±0.135	2.57±0.148	0.1344
After 12 months of treatment	1.90±0.100	2.24±0.095	0.0190

A mild positive trend was detected Against traditional root canal obturation methods in patients with endoperiodontal syndrome. Thus, the average values of the periapical index (PAI) in the control group at six months after treatment compared with the initial index values decreased, but not significantly: from 2.86±0.125 to 2.57±0.148 points (p=0.1477). Similar dynamics were observed in the basic group - from 2,60±0,112 to 2,55±0,135 points (p=0.7777).

At the final stage of clinical studies, the average values of the PAI in both groups began to decrease, but more significantly in Group I after the introduction of the laser, where the index significantly reduced compared to the initial values and reached 1.90 ± 0.100 points (p=0.0005). At the same time, it should be noted that the rate of decrease in the importance of the periapical index at 12 months after treatment in the basic group concerning the control group was not the same, but statistically significant (p=0.0190) and less pronounced decrease in the PAI during these periods was observed in the control group (2.24±0.095 points).

Before the start of treatment, there was no significant difference in the immune parameters between groups (p=0.7238). Six months after basic combination therapy in patients of both groups, there was a positive trend (Tab.3). The level of IgA in the oral fluid in patients of Group I decreased to 4.46±0.111 g/l. At the same time, the indicator in Group II was significantly higher (4.82±0.118 g/l) (p=0.0312).

Twelve months after treatment, intergroup and intragroup differences were also significant. The level of IgA in the oral fluid in patients of Group I continued to decrease and reached 3.43±0.127 g/l. In contrast, the level of salivary IgA was significantly higher in the control group - 4.17±0.142 g/l (p= 0.0004). Thus, a significant decrease in the concentration of IgA in saliva was observed throughout the rehabilitation period in both groups, with more pronounced positive dynamics after introducing a diode laser in patients of Group I.

Table 4 represents the changes in salivary TNF-a levels in study patients before and after treatment. After initiation of laser therapy, salivary TNF-a levels significantly decreased after 6 and 12 months of treatment, compared to the control group.

Georgian Biomedical News
ISSN (Online): 2720-8796 ISSN (Print): 2720-7994

TABLE 3. The changes in salivary IgA levels in study patients before and after treatment

	Group I (N=20)	Group II (N=21)	p-value
Before treatment	5.19±0.089	5.24±0.113	0.7238
After 6 months of treatment	4.46±0.111	4.82±0.118	0.0312
After 12 months of treatment	3.43±0.127	4.17±0.142	0.0004

Abbreviations: IgA, immunoglobulin A.

At the same time, the decrease in the level of TNF-α in the oral fluid in patients of Group I after six months was more pronounced (12.21± 0.629 pg/ml) than in the control group (15.81±0.418 pg/ml). After 12 months, the level of salivary TNF-α was significantly lower in Group I compared to the control group (p=0.0001) (Tab.4).

TABLE 4. The changes in salivary TNF-a level in study patients before and after treatment

	Group I (N=20)	Group II (N=21)	p-value
Before treatment	17.82±0.280	18.09±0.258	0.5034
After 6 months of treatment	12.21±0.629	15.81±0.418	0.0001
After 12 months of treatment	6.50±0.323	10.65±0.665	0.0001

Abbreviations: TNF-a, tumor necrosis factor a.

Table 5 represents the periodontal index (PI) changes in the combined and traditional treatment groups before and after treatment. Based on the study results, a statistically significant change in PI was observed at all stages of the study in both groups of patients (p<0.0001).

TABLE 5. The changes in the periodontal index (PI) in study patients before and after treatment

	Group I (N=20)	Group II (N=21)	p-value
Before treatment	3.91±0.043	3.97±0.031	0.2528
After 6 months of treatment	1.65±0.021	2.74±0.027	0.0001
After 12 months of treatment	1.33±0.013	2.03±0.012	0.0001

According to the intragroup analysis, the decrease in the periodontal index was more pronounced and significant after 6 and 12 months (p<0.0001). PI was significantly reduced in the control group compared to the baseline by the end of clinical trials (p<0.001).

To identify the influence of the level of immune system factors on the severity of inflammatory changes in periodontal tissues and the effectiveness of ongoing therapeutic and preventive measures, we analyzed the correlations between the indicators of the clinical periodontal index, the level of salivary TNF-α cytokine and IgA immunoglobulin.

Table 6 represents the correlation between periodontal index (PI) and IgA and TNF-a salivary concentrations.

TABLE 6. The correlation between the periodontal index (PI) and salivary concentrations of IgA and TNF-a in study patients before and after treatment

	Group I (N=20)					
	Before treatment		After 6 months		After 12 months	
	r	p	r	p	r	p
IgA	-0.26	0.2682	-0.23	0.3214	-0.16	0.4893
TNF-a	0.27	0.2428	0.38	0.0975	0.31	0.1851
	Group II (N=21)					
	r	p	r	p	r	p
IgA	-0.14	0.5444	-0.08	0.7285	-0.22	0.3389
TNF-a	0.29	0.2128	0.32	0.1627	0.30	0.1909

Abbreviations: IgA, immunoglobulin A; TNF-a, tumor necrosis factor a.

The correlation between the level of salivary cytokines and PI before the start of treatment was pronounced and positive in both groups (r=0.29 and r=0.27, respectively, p>0.05). The nature of the correlations between the studied clinical and laboratory parameters in these groups at all post-treatment stages was similar.

Based on the analysis of the correlation between TNF-α and PI, we found the most pronounced positive correlation in both groups of patients (r=0.38, p=0.0975 in Group I, and r=0.32, p=0.1627 in Group II). The correlation between the level of immunoglobulin IgA and the PI in both groups and at all stages of observation was less pronounced and was negative.

DISCUSSION

The anatomical and physiological relationship between pulp and periodontium frequently contributes to their joint complex lesions, which is the object of the growing interest of specialists.[12]

Against the background of various forms of inflammatory and destructive diseases of periodontal tissues, there are certain violations of the local immune status and an increase in the level of immunoglobulins and proinflammatory cytokines in the oral fluid, considered essential factors of specific antimicrobial protection.

The correlation between the level of proinflammatory cytokine and the values of the periodontal index, to some extent, reflects changes in the state of the immunological reactivity of the oral cavity with clinical manifestations of activation or weakening of the combined pathological process affecting periodontal and periapical tissues.[13]

ISSN (Online): 2720-8796 ISSN (Print): 2720-7994

The current study's findings indicate that the treatment modality of endoperiodontal complications is associated with changes in salivary proinflammatory cytokine TNF-a and immunoglobulin IgA 12 months after therapy. A more significant decrease in their concentrations was revealed in the patients of Group I after using a diode laser in a complex therapy.

According to the statistical analysis, the periodontal index (PI) and baseline salivary IgA were negatively correlated. In contrast, the baseline and post-intervention PIs positively correlated with salivary TNF-a levels.

Our findings coincide with the existing evidence about the anti-inflammatory and stimulating properties of the diode laser with a wavelength of 810+/- 910 nm in the case of periodontal tissue lesions.[14]

CONCLUSIONS

Treatment of endo-perio lesions using a diode laser contributes to a more pronounced decrease in the periodontal index and the level of salivary proinflammatory cytokines compared to traditional therapy.

Laser therapy's clinical and laboratory effectiveness can be the basis for its comprehensive implementation in practical dentistry to correct combined endodontic-periodontal lesions.

AUTHOR AFFILIATION

1 Department of Orthopedic Dentistry, Azerbaijan Medical University, Baku, Azerbaijan.

REFERENCES

1. Singh P. Endo-perio dilemma: a brief review. Dent Res J (Isfahan). 2011 Winter;8(1):39-47. PMID: 22132014; PMCID: PMC3177380.
2. Mohan v, Sajid H, Mohana s A Case Report of Successfully Managed Endo-Perio Lesion by Interdisciplinary Approach. Journal of Medical and Dental Science Research. Volume 9~ Issue 5 (2022) pp: 01-06. ISSN(Online): 2394-076X
3. Prashaanthi N, Arvina Rajasekar, Shantha Sundari. K.K Prevalence of Endo Perio Lesion - An Institutional Study. Int J Dentistry Oral Sci. 2021; 8(6):2858-2862. DOI:10.19070/2377-8075-21000580
4. Siew, K. L., Goh, V., Goo, C. L., Leung, E. F. The Periodontal-Endodontic Relationship, What Do We Know? In (Ed.), Periodontology and Dental Implantology. IntechOpen. (2018) https://doi.org/10.5772/intechopen.78664
5. Dana T. Graves, Thomas Oates, Gustavo P. Garlet Review of osteoimmunology and the host response in endodontic and periodontal lesions, Journal of Oral Microbiology, (2011) 3:1, DOI: 10.3402/jom.v3i0.5304
6. Alshawwa H, Wang JF, Liu M, Sun SF. Successful management of a tooth with endodontic-periodontal lesion: A case report. World J Clin Cases. 2020 Oct 26;8(20):5049-5056. doi: 10.12998/wjcc.v8.i20.5049.
7. Dembowska, E.; Jaron, A.; Homik-Rodzinska, A.; Gabrysz-Trybek, E.; Bladowska, J.; Trybek, G. Comparison of the Treatment Efficacy of Endo–Perio Lesions Using a Standard Treatment Protocol and Extended by Using a Diode Laser (940 nm). J. Clin. Med. 2022, 11, 811. https://doi.org/ 10.3390/jcm11030811
8. Keerthika R, Nivedhitha MS, Endodontic Periodontal Lesion Diagnosis and Treatment Decision Analysis, J Res Med Dent Sci, 2021, 9 (2): 140-145. eISSN No. 2347-2367:pISSN No. 2347-2545
9. Safarov AM. Etiopathogenesis of complication caused by removable full dentures. Georgian Med News. 2009 Dec;(177):27-30. PMID: 20090147.
10. Ahmedbeyli RM, Mamedzade RE. Clinical and radiographic rationale for endodontic treatment of permanent teeth with periapical destruction. Stomatologiya. 2020;99(1):33 https://doi.org/10.17116/stomat20209901133
11. Omelchenko V.P., Demidova A.A. Medical informatics. Guide to practical classes: a tutorial. M:GEOTAR-Media. 2017; 324–356
12. Gopal K, Sangram P, Mirna G, Abhilash M, Pradyumna S, Rashmita N. (2020). Possible Pathways of Disease Communication of the Endo-Perio Lesions and their Management. Indian Journal of Forensic Medicine & Toxicology, 14(4), 8415–8419. https://doi.org/10.37506/ijfmt.v14i4.13010
13. Galiyeva, D.T., Atrushkevich V.G., Tsarev V.N. Endodonto-periodontal lesions: topical issues. infectious diseases. 2015. No. 4. S. 85-91.
14. Qadri T, Javed F, Johannsen G, Gustafsson A. Role of diode lasers (800-980 nm) as adjuncts to scaling and root planing in the treatment of chronic periodontitis: a systematic review. Photomed Laser Surg. 2015 Nov;33(11):568-75. doi:10.1089/pho.2015.3914.