ORIJINAL TƏDQIQAT • ORIGINAL RESEARCH

Using Laser Therapy in Endo-Periodontal Lesions

Vusala Mirsahib Bayramova

Doctoral student, Department of Therapeutic Dentistry, Azerbaijan Medical University, Baku, Azerbaijan

The aim of the study was to analyze immune changes associated with the use of a treatment combination in patients with endodontic and periodontal lesions. The study was conducted from 2020 to 2023 at the Department of Therapeutic Dentistry of the Azerbaijan Medical University. Two groups were compared: Group 1 (main, n=20) received diode laser therapy (Picasso Lite, Italy) in addition to standard treatment, and Group 2 (control, n=21) received traditional treatment only. Twelve months after completing basic therapy, statistically significant differences were found in the proinflammatory cytokine TNF-α and immunoglobulin IgA depending on treatment method, with a more pronounced reduction in oral fluid levels in the main group.

Keywords: *endo-periodontal lesions, laser, TNF-α, IgA*

28. Introduction

Endo-perio lesions might be interdependent because of the vascular and anatomic connections between the pulp and the periodontium. Endo-periodontal lesions are complex conditions that involve both the dental pulp (endodontic) and the surrounding periodontal tissues, resulting from infections, trauma, or systemic conditions. Proper diagnosis and a well-coordinated treatment plan addressing both endodontic and periodontal components are essential; early detection and appropriate therapy can significantly improve prognosis, and multidisciplinary care often yields the best results.

The problem of endo-periodontal lesions is highly relevant in modern dentistry [1]. Endodontic and periodontal infections are difficult to distinguish and often share common clinical features, complicating diagnosis [2]. In this regard, laser medicine is considered a promising area. Lasers have become well integrated into clinical dentistry over the past two decades, providing clinical alternatives for the management of both soft and hard tissues [3]. The primary application of lasers in dentistry is periodontal treatment, which reduces inflammation and bleeding and promotes rapid tissue healing [4]. As a non-surgical adjuvant therapy, laser use offers hemostasis, sterilization of periodontal pockets, biostimulation, and reduced morbidity compared with surgical methods [5]. The aim of the study was to analyze immune changes when using a treatment complex in patients with endo-periodontal lesions.

The anatomical and functional commonality of the pulp and periodontium determines a high probability of their joint involvement in the pathological process. Communication routes between the dental pulp and periodontal tissues include dentinal tubules, lateral and additional canals, and the apical foramen [23]. Modern studies have shown that the permeability of intact dentin is insufficient for the exchange of inflammatory mediators between the pulp and periodontal tissues [24]. An important route for infection is the lateral and additional canals, as well as the apical foramen [25,26]: waste products of microorganisms and inflammatory mediators can enter the pulp from a deep periodontal pocket and cause retrograde pulpitis, and vice versa [27].

29. Materials and Methods

The study, conducted from 2020 to 2023 at the Department of Therapeutic Dentistry of the Azerbaijan Medical University, included clinical, instrumental and laboratory stages. Forty-one patients with endo-periodontal lesions, not burdened with somatic pathology, were examined. Radiation diagnostic methods (orthopantomography and intraoral targeted radiographs) were performed in all patients before therapy and 6 and 12 months after completion. The groups were comparable in gender and age composition ($p>0.05$).

Patients were divided into two groups: Group I (main, n=20) received, alongside standard treatment, decontamination of the root canal and laser curettage with a dental diode laser (Picasso Lite); Group II (control, n=21) received standard treatment only. Root canal treatment comprised mechanical expansion with endodontic instruments and antiseptic treatment with 3% sodium hypochlorite and 17% EDTA solution. In the control group, dental deposits were removed with scaling and Gracey

curettes and an ultrasound device (Piezon Master 600, EMS). Statistical analysis used the arithmetic mean (M), the Pearson χ^2 test, and applied statistics programs (Microsoft Excel, Statistica for Windows v. 7.0).

30. Results and Discussion

Before treatment, baseline immune parameters did not differ significantly between groups (p=0.7238). Six months after basic combination therapy, both groups showed positive dynamics, with statistically significant intergroup differences in salivary IgA: the main group decreased to 4.46 ± 0.111 g/L versus 4.82 ± 0.118 g/L in the control group (p=0.0312). At the 12-month final stage, IgA in the main group continued to decrease to 3.43 ± 0.127 g/L, while the control group remained significantly higher at 4.17 ± 0.142 g/L (p=0.0004).

Regarding TNF-α, the reduction was significant at all stages (p=0.0001). At 6 months, control-group values decreased to 15.81 ± 0.418 pg/mL, while the main group reached 12.21 ± 0.629 pg/mL. At 12 months, TNF-α in the study group was also statistically significantly lower than the control group (p=0.0001). A directly proportional relationship was revealed at all stages between the TNF-α and periodontal index (PI), reflecting the intensity of the inflammatory process. The most pronounced positive correlation was found in the study group 6 months after treatment (r=0.38, p=0.0975).

Analyzing the periodontal PMA index, initial values did not differ significantly (p=0.6009). At 12 months, values in the main group were significantly lower than the control group (21.9 ± 0.35 vs 18.6 ± 0.27; p=0.0001). Densitometry indicated a more pronounced favorable condition of the periapical tissues in the main group, with bone density improving from $37.1 \pm 1.77\%$ to $54.2 \pm 1.46\%$ (almost 17%), versus $42.2 \pm 2.48\%$ to $49.1 \pm 2.60\%$ (about 7%) in the control group.

Table 1. Densitometry data before and after treatment in the observation groups.

	Control (n=21)		Main (n=20)	
Parameter	Before, %	After, %	Before, %	After, %
M±m (min–max)	42.2±2.48 (27–69)	49.1±2.60 (33–76)	37.1±1.77 (20–55)	54.2±1.46 (39–64)
p (before vs after)	0.0000		0.0000	
t	8.23		8.24	

The results of the index evaluation showed pronounced anti-inflammatory and bone-tissue-stimulating properties of laser therapy, consistent with earlier clinical studies by Giannelli M. et al., which demonstrated improved periodontal tissue condition and stimulation of reparative processes using a diode laser [29].

31. Conclusion

The method of treatment of endo-periodontal complications with a diode laser significantly reduced the focus of bone tissue destruction in the periapical region and contributed to improved oral hygiene and periodontal tissue condition. The high efficiency of the proposed combined method allows us to recommend it for wide application in practical dentistry. Further studies may assess the effectiveness of a diode laser (Picasso Lite, Italy; wavelength 810 ± 10 nm; average power $\sim$1.2–1.4 W) in the treatment of severe forms of inflammatory-destructive periodontal disease and periapical periodontitis.

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