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Assessing the Effectiveness of Various Periodontitis Treatment Approaches Using the Specific Clinical-Laboratory Markers

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ABSTRACT

Background: Periodontitis is one of the most common dental diseases of the adult population in the world; it is the leading cause of tooth loss, significantly impacting individuals' health and overall quality of life.

Objectives: The present study evaluated the efficacy of diverse periodontitis treatment modalities, such as vector system, diode laser, and a combined approach integrating both the vector system and diode laser.

Methods: In pursuit of our objectives, 35 patients aged 20 to 60, devoid of concurrent chronic ailments, underwent clinical-laboratory investigations and treatment. This cohort comprised 25 women and 10 men diagnosed with varying stages and extents of periodontitis.

Results: Statistical data processing allowed us to establish a reliable relationship between the values obtained before and after treatment. The data obtained after the vector system, combined vector system, and diode laser treatment were found to be reliable for the target parameters, and the effectiveness of the treatment was established ($p<0.05$), which is not confirmed in the case of diode laser treatment.

Conclusions: Objectively evaluating the results of conservative methods and comparing laboratory data and quantitative and qualitative changes in periodontal markers before and after treatment, it can be concluded that the most reliable modality is the integrated treatment of periodontitis.

Keywords: Diode Laser; periodontal disease; periodontal markers; Vector Paro.

BACKGROUND

Periodontitis is one of the most common dental diseases in the world.[1-4] The main reason for the development of inflammatory processes in periodontal tissues is the etiological factor of an infectious nature.[5-10] Diseases of an inflammatory nature of the periodontium can be considered as the result of violating the ratio between bacterial symbiosis and oral tissues.[10-16]

Adopting a comprehensive and highly individualized approach is imperative when addressing periodontal diseases.[17-19] Despite the advancements in treatment, the balance of microorganisms within the periodontal pocket, the reduction of invasiveness, and the extension of remission periods remain pertinent concerns for dental practitioners.[20-25]

This research used a comprehensive clinical and laboratory findings analysis to assess the efficacy of various periodontitis treatment modalities, including the vector system, diode laser therapy, and their combination.[26]

METHODS

In pursuit of the defined objective, a comprehensive clinical-laboratory investigation and treatment were administered to 35 patients aged 20 to 60 without concurrent chronic diseases. This cohort comprised 25 women and 10 men, presenting diverse diagnoses spanning different stages and levels of periodontitis.

At the initial clinical stage of the study, an examination and assessment of the periodontal complex were conducted for all patients, with recording data in the periodontal map, coupled with an orthopantomographic or CT study and a microbiological investigation employing polymerase chain reaction (PCR) and Micro-Ident analysis, targeted to pathogenic organisms in the periodontal pocket, specifically Aggregatibacter actinomycetemcomit, Porphyromonas gingivalis, Prevotella intermedia, Tannerella forsythia, and Treponema denticola.

After determining periodontal markers, the examined patients were categorized into three groups: Group I underwent therapy with the vector system, Group II received diode laser therapy, and Group III underwent combined therapy utilizing both the vector system and diode laser.

For Group I, etiotropic treatment was administered using the vector system following the scrutiny of periodontopathogenic markers. Notably, the vector system's distinct advantages were leveraged, such as adjustable cavitation amplitude, a specialized hydroxyapatite suspension, and a varied selection of working heads. The hydroxyapatite suspension effectively

removed biofilm from the root surface, smoothing the tooth surface. Moreover, the alkaline pH of the hydroxyapatite expedited gum recovery post-procedure, facilitating a painless experience even in patients with heightened sensitivity.

In Group II, etiotropic treatment and post-periodontopathogenic marker analysis were conducted using a diode laser (BioLase; Dr. SmileWiser - wavelength 940 nm). This laser modality's relevance in the holistic treatment of periodontal diseases lies in its ability to activate metabolic processes, enhance tissue trophic and local immunity, and inactivate bacterial endotoxins within the soft tissues of the periodontal pocket.

Group III underwent etiotropic treatment with a combination of the vector system and diode laser following laboratory research of periodontal markers.

RESULTS

All patients exhibited a reliable improvement in the clinical presentation following treatment within the mentioned target group. The diverse microbial spectrum with different growth intensities found before treatment underwent a profound transformation after treatment, with valid quantitative and qualitative changes and/or elimination of periodontal markers.

Statistical data processing facilitated the identification of a reliable relationship between values obtained pre-treatment and post-treatment. A parameter evaluation scale ranging from 0 to 3, with a digit of 1, was employed. Statistical processing utilized Spearman's rank correlation with α=0.05 (significance level α at 95% probability) and degrees of freedom y=13. Credibility was tested through the null hypothesis, with the critical value of Spearman's criterion set at 0.521.

Post-vector system treatment, the following rank correlation coefficient values were observed: Porphyromonas gingivalis: rs=0.665, Prevotella intermedia: rs=0.565, Tannerella forsythia: rs=0.515, Treponema denticola: rs=0.518 (Fig.1). The reliability of the relationship between parameters before and after treatment was established for Porphyromonas gingivalis, Prevotella intermedia, Tannerella forsythia, and Treponema denticola ($p<0.05$), affirming the efficacy of treatment.

For diode laser treatment, the rank correlation coefficient values were: Porphyromonas gingivalis - rs=0.477, Prevotella intermedia - rs=0.53, Tannerella forsythia - rs=0.654, Treponema denticola - rs=0.874. Statistical research revealed that for three parameters, Prevotella intermedia, Tannerella forsythia, Treponema denticola, rs>0.521 ($p<0.05$), signifying statistically reliable relationships before and after treatment. However, this confirmation was not applicable for Porphyromonas gingivalis (Fig.2). Consequently, diode laser treatment in periodontal pockets demonstrated a partial reduction in the quantity and type of bacteria.

FIGURE 1. Results of microbiological examination before and after treatment with Vector System in Group I

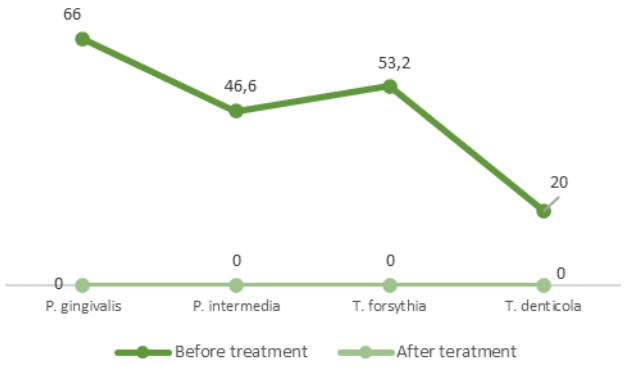


FIGURE 2. Results of microbiological examination before and after treatment with Diode Laser in Group II

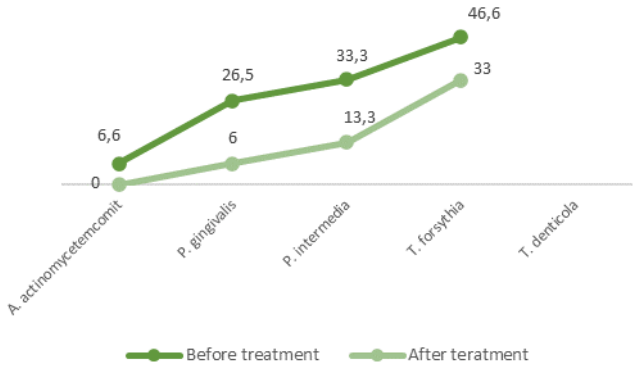
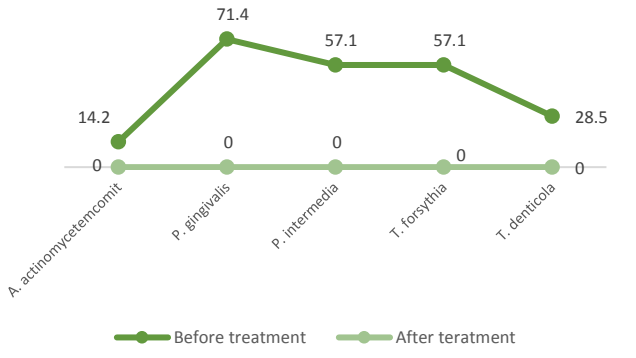


FIGURE 3. Results of microbiological examination before and after treatment with the combination of Vector System and Diode Laser in Group III



In the context of combined treatment with the vector system and diode laser, the rank correlation coefficient values indicated a reliable relationship before and after treatment for periodontopathogenic markers Aggregatibacter actinomycetemcomit, Porphyromonas gingivalis, Prevotella intermedia, and Treponema denticola

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(p<0.05). After treatment, all patients exhibited a significant improvement in the clinical presentation, accompanied by the complete elimination of quantitative and qualitative indicators of periodontal markers (Fig.3).

DISCUSSION

The ongoing study initiated in 2016 aimed to assess the efficacy of non-surgical, conservative approaches to periodontitis treatment, explicitly focusing on the vector system, diode laser, and the combined vector system and diode laser treatment. This evaluation was grounded in a comprehensive analysis incorporating clinical and laboratory examinations, notably Micro-Ident analysis targeting periodontal pocket markers (Aggregatibacter actinomycetemcomit, Porphyromonas gingivalis, Prevotella intermedia, Tannerella forsythia, Treponema denticola).

Research findings indicate that therapy utilizing the Vector system, both independently and in combination with the vector system and diode laser, reliably eliminates periodontal markers, underscoring the method's effectiveness. Conversely, diode laser treatment alone (BioLase; Dr. SmileWiser) did not yield complete quantitative and specific elimination of periodontal markers. This monotherapeutic approach demonstrated efficacy solely within the context of comprehensive treatment.

The study results highlight the heightened diagnostic value and utmost reliability of marker-pathogenic analysis in objectively assessing the outcomes of conservative periodontitis treatment methods. This aligns seamlessly with the "Classification of Periodontal and Peri-implant Diseases and Conditions" provided by the European Federation of Periodontology (EFP) and the American Academy of Periodontology (AAP) in Amsterdam (2018).[2,27-31]

CONCLUSIONS

Objectively evaluating the results of conservative methods and comparing laboratory data and quantitative and qualitative changes in periodontal markers before and after treatment, it can be concluded that the most reliable modality is the integrated treatment of periodontitis.

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