CASE REPORT: New Treatment Protocol for Periodontal Pocket Treatment using a Combination of Er:YAG and Nd:YAG Lasers

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I. INTRODUCTION

Periodontitis is the most common chronic inflammatory disease in European adults. Eight out of ten individuals over 35 suffer from some kind of gum complaint. It is associated with systemic diseases, including type 2 diabetes, cardiovascular disease and stroke. Although common, periodontal diseases are not very well acknowledged [1,2].

To date, mechanical therapy has been the general treatment for plaque-induced periodontal disease, however, many studies have shown that mechanical treatment itself does not lead to a complete healing because it does not eliminate the periopathoges [3].

Laser therapy may constitute an efficient alternative to surgical treatment. Based on the research, data and experience of many practitioners, we can enumerate the potential advantages of laser therapy, such as bactericidal, detoxification and homeostatic effects and biostimulation. Laser treatment facilitates the eradication of bacteria and better wound healing [4,5]. It is also easy to use, provides good access to anatomically difficult areas and offers a comfortable treatment for patients.

High-energy lasers are applied in periodontal procedures as an adjunctive therapy or as an alternative to conventional procedures, and have become the standard treatment of periodontal pockets. Their effectiveness in eliminating periodontal pathogens and decreasing pocket depth is widely documented. The Neodymium:Yttrium–Aluminum–Garnet (Nd:YAG) laser with a wavelength of 1,064 nm can decontaminate periodontal pockets without causing necrosis or carbonization of the underlying connective tissue. [6] Periodontopathogens can persist within cells outside the pocket epithelium after conventional mechanical periodontal debridement, and Gianelli et al. reported that the Nd:YAG is capable of eradicating periodontopathogenic bacteria trapped within gingival epithelial cells [7].

Erbium:YAG (Er:YAG) laser, with a wavelength of 2,940 nm, has been applied for effective elimination of granulation tissue, gingival melanin pigmentation and gingival discoloration. This laser is also used for contouring and cutting of bone with minimal damage and enhanced healing [8]. In addition, irradiation with the Er:YAG laser has a bactericidal effect with a reduction of lipopolysaccharides, it is efficient in calculus removal, with the effect limited to a very thin layer of the surface, and it is effective for implant maintenance.

II. CASE

A 47-year-old female patient was diagnosed with advanced generalized periodontal disease, numerous missing teeth, a lack of prosthetic supplements in the posterior region, periapical lesions, and an incomplete endodontic treatment. The patient required a comprehensive dental treatment. To create a preliminary treatment plan, it was necessary to implement an initial treatment (hygienization) to check the patient's motivation to continue the highly specialized treatment and assess the prognosis of her teeth (Figs. 1, 2).

Fig. 1: a) initial state; b) orthopantomographic image
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Detailed clinical examination included, among others, data on the periodontal pocket depth (PD), bleeding on probing (BOP) and plaque index (PI). In the case of a significantly severe disease, high tooth mobility, numerous missing teeth, it is recommended to carry out a molecular-biological test to assess periopathogens quantitatively and qualitatively.

Before the treatment the patient underwent supragingival hygienic procedures with an ultra-sound scaler (EMS, Piezon). After hygienization, the clinical condition of the patient improved. Additional examination was carried out to determine the stage of the periodontal disease. Then, an Nd:YAG laser was applied for periodontal pocket sterilization and decontamination (Fig. 3) and Er:YAG laser to remove subgingival calculus (Fig. 4). For the final decontamination and stabilization of the fibrin clot, the Nd:YAG laser was applied again (Fig. 5). Figure 6 shows the situation immediately after surgery by Er:YAG and decontamination of the periodontal pocket by Nd:YAG (LightWalker, Fotona).

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Fig. 2: a) Clinical improvement of the gum after hygienisation, reduction of swelling, bleeding and bacterial plaque; b) the result of pocket-depth probing (PD) and clinical attachment level (CAL), Bleeding on Probing (BOP), mean value of PD = 38; RC = 1.19; AT = 3.57; BOP = 33%; c) Plaque Index (PI), PI = 11%; d) baseline values of molecular-biological test (PET Plus test, MIP Pharma, Germany).

Fig. 3: Sterilisation of the periodontal pockets and decontamination

Fig. 4: Removal of subgingival stone

Fig. 5: Final decontamination and stabilization of the fibrin clot

Fig. 6: Situation immediately after the procedure
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III. CONCLUSIONS

Er:YAG and Nd:YAG lasers have become the tool of choice in the treatment of periodontal diseases. They effectively reduce bleeding (BOP) and pocket depth (PD) and are less time-consuming in comparison to conventional methods. Another advantage is the increased access of laser light to anatomically difficult areas compared to conventional hand tools, such as deep narrow pockets or furcations.

Lasers broaden the range of treatments offered in the dental office, increasing precision, enabling minimally-invasive treatments and better wound healing. The introduction of laser methods to the dental practice compels us to seek further learning, improved professional qualifications and specialization in the field. This in turn extends the range of nonsurgical treatments of periodontal diseases.

REFERENCES


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