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Case Report - Combined Application of 1064 nm Diode and Er:YAG Laser in Nonsurgical Periodontal Therapy

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ABSTRACT

Periodontitis is one of the most common diseases worldwide.[1] Mechanical removal of supragingival and subgingival plaque and calculus with scaling and root planing (non-surgical therapy) is the golden standard in the treatment of periodontitis.[2] This treatment is not always sufficient.

To enhance treatment outcomes in periodontal therapy, lasers have been investigated as an adjunctive therapy. In this case, Er:YAG and 1064 nm diode lasers were used (Fotona SkyPulse) for periodontal pockets degranulation, disinfection, calculus removal and fibrin clot stabilization.

The results show that adjunctive therapy with Er:YAG and 1064 nm diode laser can be an alternative to the combination of Er:YAG and Nd:YAG lasers in non-surgical periodontal therapy.

Key words: Periodontitis, Periodontal therapy, Er:YAG laser, 1064 nm diode laser.

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I. INTRODUCTION

Periodontal diseases encompass a wide scope of chronic inflammation of gums, periodontal ligament and alveolar bone. The first stage is called gingivitis. Gingivitis is localized inflammation of the gingiva initiated by the bacteria in dental plaque. If plaque-induced gingivitis is untreated it can progress to chronic periodontitis, which affects the gingiva, bone and periodontal ligament. This creates the deep periodontal pockets that are the hallmark of the disease.[2]

Periodontitis is one of the most common diseases worldwide. The incidence is greatest in the third and fourth decade in life.[1]

Mechanical removal of supragingival and subgingival plaque and calculus with scaling and root planing (non-surgical therapy) is still the golden standard for treating periodontitis.[2] If this treatment alone is not sufficient, surgical procedures need to be performed in order to reduce periodontal probing depths and to achieve regeneration of lost periodontal tissues.[3]

To enhance treatment outcomes in periodontal therapy, lasers have been investigated as an adjunctive therapy. The combined application of Nd:YAG and Er:YAG laser irradiation as an adjunct to conventional non-surgical therapy has a beneficial effect on periodontal treatment results.[4]

In this case Er:YAG and 1064 nm diode lasers were used (Fotona SkyPulse) for periodontal pockets degranulation, disinfection, calculus removal, root conditioning and fibrin clot stabilization. 1064 nm diode laser was used because it emits same laser wavelength as Nd:YAG laser (1064 nm).

II. CASE

A 62-year-old medically fit, non-smoking female presented with generalized gingival bleeding in the upper jaw. Radiographic and clinical assessment with periodontal pockets probing revealed stage III periodontitis. In the upper jaw 23 of 66 probing sites were measured with a depth ≥ 4 mm.

All details about the diagnosis and treatment were discussed with the patient and consent was obtained.

After administration of the local anesthetic agent, the ultrasound scaler (EMS, Piezon) was used for removal of supragingival plaque and calculus. Then a diode laser (Fotona SkyPulse) with 1064 nm wavelength, 2 W power in continuous wave mode, was used for periodontal pockets sterilization and decontamination for 30 seconds per tooth. The R21-C3 handpiece with 320 μm fiber was used and inclined 5-15° to the long axis of the tooth.

The next step was removal of subgingival plaque, granulations and calculus with Er:YAG laser (Fotona SkyPulse) with water cooling in contact mode. The laser settings were micro-short pulse (pulse duration 100 μs), 50 mJ, 30 Hz with a Flat-SWEEPS400 fiber tip. The

laser was used 60 seconds per tooth and the tip was inclined 10-20º to the long axis of the tooth in constant motion scanning the pocket wall.

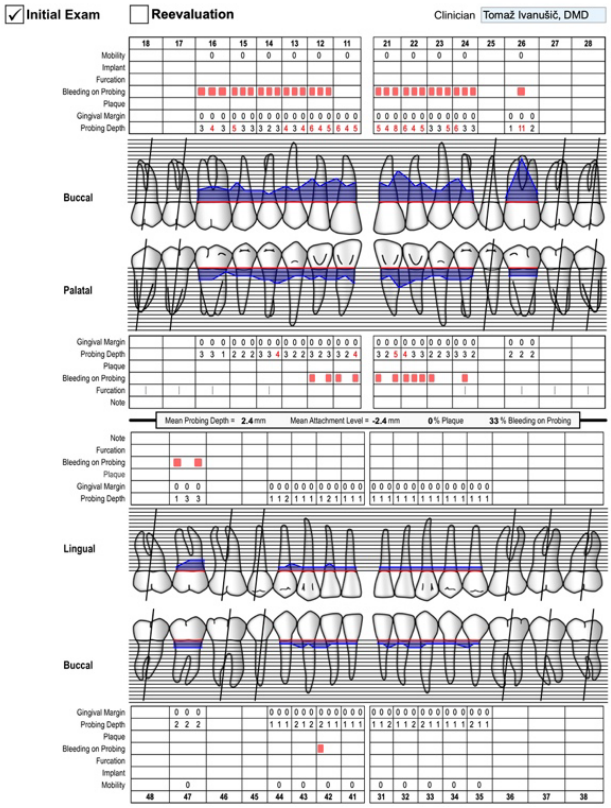

Figure 1: Periodontal chart of initial examination

Figure 2: Initial situation

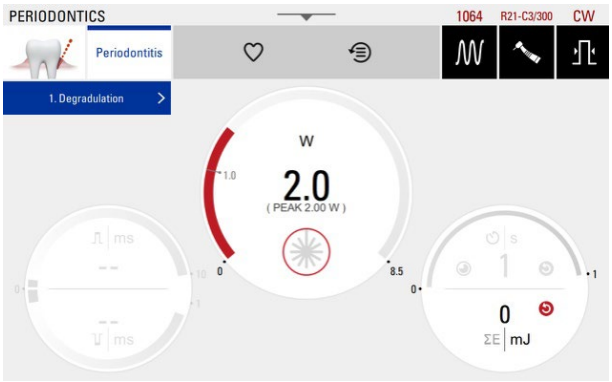

Figure 3: Settings used for periodontal pockets sterilization and decontamination

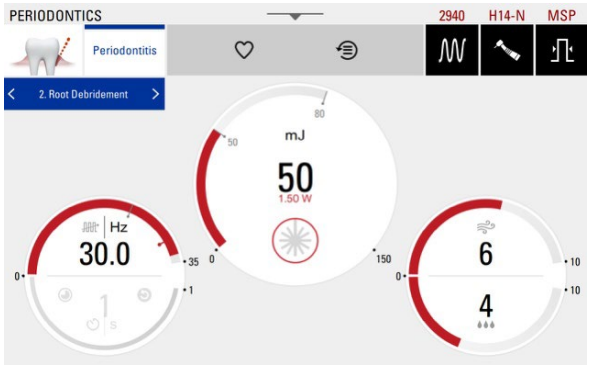

Figure 4: Settings used for subgingival plaque, granulations and calculus removal

For final decontamination and stabilization of the fibrin clot, the diode laser with 1064 nm wavelength, 4 W in continuous wave mode was applied again. The laser fiber tip was introduced into the periodontal pocket at a depth of 1 mm less than the value obtained through the probing procedure. The tip was held parallel to the long axis of the tooth, activated and kept in constant motion scanning the pocket wall until stable fibrin clot was achieved.

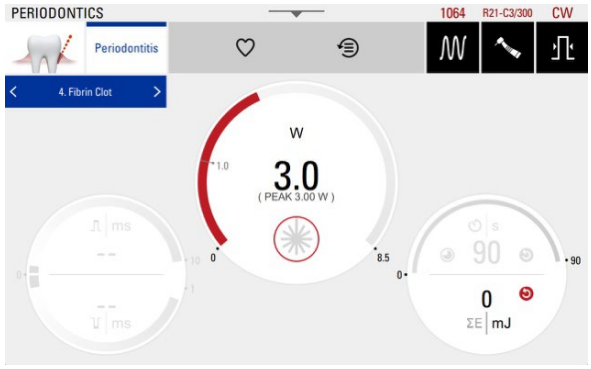

Figure 5: Settings used for final decontamination and stabilisation of the fibrin clot

At the end of the appointment the patient was instructed on how to perform home hygiene.

After 3 months, periodontal probing was performed again.

III. RESULTS

The number of probing sites with depth ≥ 4 mm was reduced from 23 to 3. Bleeding on probing was reduced from 33% to 2%.

No adverse effects related to the laser irradiation were reported. Healing was uneventful and without complications.

After the periodontal treatment, the patient decided to change her old porcelain-fused-metal crowns with monolithic zirconia crowns.

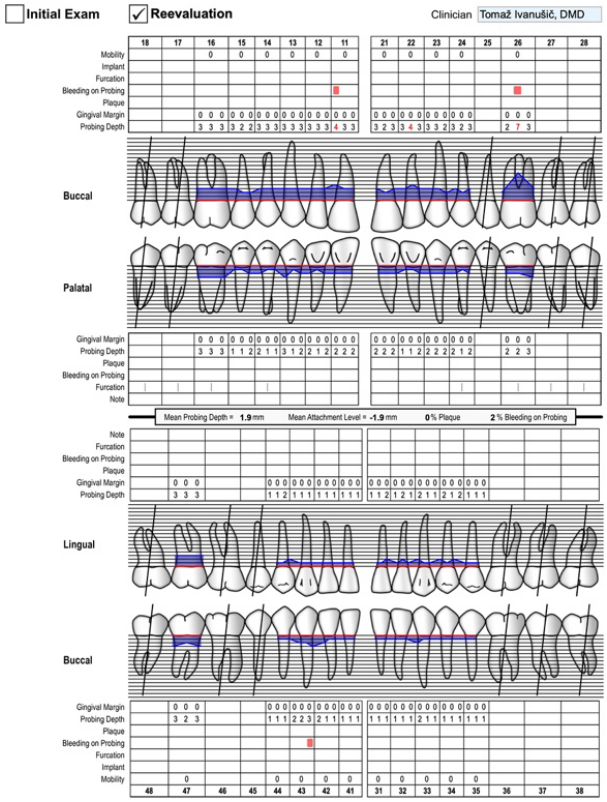

Figure 6: Reevaluation of the periodontal chart

Figure 7: Clinical situation after periodontal treatment and new monolithic zirconia crowns

IV. DISCUSSION

The combination of Nd:YAG and Er:YAG laser treatment as an adjunct to conventional non-surgical periodontal treatment shows a beneficial effect on periodontal treatment results.[4]

In combination with Er:YAG, 1064 nm diode laser was used in this case, because it emits the same laser wavelength as Nd:YAG laser (1064 nm).

1064 nm diode or Nd:YAG laser is used in periodontology for deepithelisation, pocket sterilisation, minimizing bacterial spread into the body, and creating a stable fibrin clot.[5]

Minimally invasive ablation of the epithelial lining of the periodontal pocket can be achieved with Er:YAG laser.[6] Er:YAG laser is used also for calculus removal and root surface conditioning to create an optimal root surface for periodontal regeneration.[4]

To the best of our knowledge, no other case report combining Er:YAG and 1064 nm diode laser in non-surgical periodontal therapy has been published at the time of writing.

V. CONCLUSIONS

Adjunctive therapy with a combination of Er:YAG laser and 1064 nm diode laser can enhance the success of periodontal therapy.

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