Use of a 970 nm laser for adjunctive periodontal therapy of tooth 16

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ABSTRACT
The main objectives of periodontal treatment are deep scaling of the root surface to remove bacterial plaque as completely as possible and preventing resettlement of pathogenic periodontal bacteria. In this context, the supportive use of a diode laser can contribute to the removal of pathogenic bacteria from diseased periodontal structures. Due to limited clinical view during subgingival instrumentation, careful selection of laser parameters and treatment approaches are particularly necessary for non-surgical procedures.
This case report describes the supportive laser treatment in the conventional treatment of periodontitis of tooth 16, which in addition to increased probe depths also exhibited a class II furcation defect. The periodontal structures were completely free of clinical inflammation and infection after additional pathogen reduction using the diode laser. Yet without further treatment or at least admission to a respective periodontal recall program, the prognosis of the tooth must be considered to be critical due to the furcation defect. Another therapeutic intervention, possibly even a surgical intervention at the affected tooth cannot be ruled out.

KEYWORDS
Diode laser, 970 nm, periodontitis, furcation defect, pathogen reduction

Introduction

There are several possible uses of laser systems in periodontal treatment.[1] It must, however, be taken into consideration that to date, no laser system has met all the requirements of complex periodontal therapy. For the detection[2] and removal of calcified deposits[3], other systems are needed than for periodontal surgery or pathogen-reducing measures. Laser energy can have an athermal (e.g. photodynamic)[4] or thermal antimicrobial effect. For laser systems such as the diode, Nd:YAG, or CO_2 lasers, antimicrobial properties are based primarily on thermal effects. Because the tissues absorb laser energy differently during periodontal therapy and particularly due to the limited clinical view under subgingival instrumentation, the laser parameters and approach must be selected carefully. Clinical studies have revealed clinically relevant antibacterial effects. Using the diode laser prior to ultrasonic instrumentation of teeth affected by gingivitis is credited with preventing bacteremia caused by treatment.[5] In patients with chronic periodontitis, using adjunctive therapy with a 980 nm diode laser yielded slightly better clinical parameters than conventional therapy.[6] Overall, on the basis of existing data, it can be established that adjunctive laser treatment improves the healing of diseased periodontal tissue.

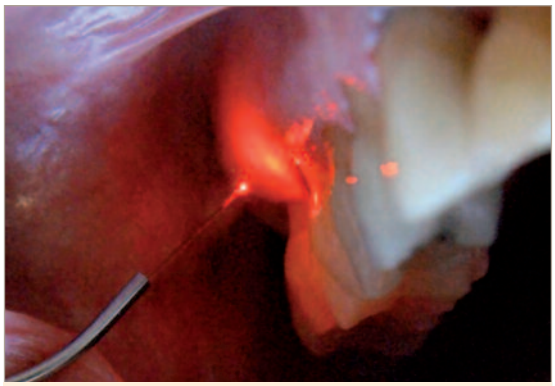

Fig. 1: Laser fiber with a core diameter of 200 µm prior to therapy of tooth 16.

Case report

On June 13, 2013, a 76-year-old patient came to the Department of Operative Dentistry and Endodontology in the Medical Center for Dental, Oral and Maxillofacial Sciences of the University Hospital of Gießen and Marburg in Marburg, Germany. The reason for his visit was his annual check-up and plaque removal. During the examination, the patient's periodontal pockets were also measured withgeneral probing depths of 2–3 mm. Periodontal pockets of up to 4 mm with bleeding on probing could be observed in tooth 16. A buccal class II furcation defect was also detected at tooth 16. When pressure was applied to the surrounding gums, some pus was produced from the buccal gingival pocket. The patient was advised to have periodontitis therapy at this tooth. In addition to conventional cleaning with hand instruments, supportive laser therapy was offered to increase reduction of pathogens in the diseased periodontal tissues.

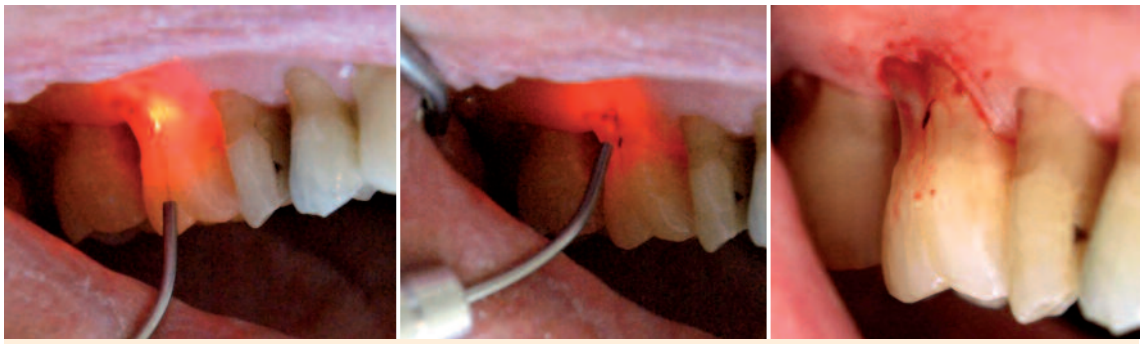

Fig. 2: Axially positioned laser fiber prior to pathogen-reducing irradiation of periodontal lesion of tooth 16. The probe was inserted into the gingival pocket for irradiation. – **Fig. 3:** Laser irradiation of exposed buccal furcation (class II furcation). – **Fig. 4:** Postoperative situation after laser treatment of the periodontal lesion and the affected furcation area.

The SIROLaser Advance (Sirona, Bensheim, Germany), a 970 nm class IV diode laser with software version 2.0.6 was used for treatment. The laser menu includes preset parameters for periodontal treatment: laser root planing, perio pathogen reduction, peri-implantitis. For this patient, the "perio pathogen reduction" program with the preset parameters 1.5 W, 10 Hz, and a pulse duty cycle of 50 % was selected. To reach all areas of the periodontal pocket, a laser fiber with a diameter of 200 µm was used (Fig. 1).

At the time of treatment, the patient was in good condition. No anesthesia was applied in consultation with the patient. During the first session, the dental surface of tooth 16 was conventionally cleaned using hand instruments. Two weeks after conventional therapy, the patient was still not completely free of inflammation and supportive laser therapy was then applied. After both the patient and treatment team had been equipped with protective glasses and a signal lamp at the door cautioning against entering the laser therapy room during treatment was turned on, laser therapy began. The laser fiber was inserted into the periodontal pocket from mesial, distal, palatinal and buccal direction for 60 s each and the laser was activated using a finger switch (Fig. 2). Additionally, the furcation area was irradiated from buccal direction for a duration of 60 s (Fig. 3). To ensure that the area was always sufficiently moistened and to prevent the laser fiber from sticking to the gingiva, the periodontal pocket was flooded with physiological saline solution prior to each cycle. We dispensed with a postoperative wound dressing in the treated area (Fig. 4). The patient was also instructed not to exclude the treated tooth during regular oral hygiene. Postoperative follow-up of the wound showed a periodontal tissue free of inflammation and infection (Fig. 5). We recommended regular follow-ups at two-month intervals.

Fig. 5: Clinical situation at follow-up. No clinical signs of inflammation or infection of the periodontal structures.

Concluding remarks

The clinical picture after periodontal therapy of tooth 16 was consistent with expectations based on the available data on supportive laser treatment. What was particularly interesting in this case was that the patient was clinically free of inflammation and infection only after supportive laser therapy had been performed. However, without further treatment or at least admission to a respective periodontal recall program, the prognosis of a tooth with a class II furcation defect must be considered to be critical. Another therapeutic intervention, possibly even surgical intervention at the affected tooth cannot be ruled out.

Literature

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