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Letter to the editor

# The role of laser irradiation in dental therapy during the SARS-CoV-2 pandemic

The coronavirus pandemic is defined as a pandemic caused by SARS-CoV-2. The structure of the SARS-CoV-2 spike protein has high mutation potential. In this regard, SARS-CoV-2 mutations have posed new challenges for global health management. To prevent the spread of COVID-19 in dentistry and for successful dental treatment, it is essential to provide treatment that has low dental aerosol production with an appropriate treatment plan. The use of lasers in dentistry can improve treatment prognosis.<sup>1,2</sup> This brief letter focuses on using lasers in routine dental procedures.

Light amplification by stimulated emission of radiation (LASER) is generated by intense rays from a coherent monochromatic light source. In terms of wavelengths, the lasers' spectrum can be categorized as: ultraviolet spectrum (100–400 nm), visible spectrum (400–750 nm), near infrared spectrum (750–1300 nm), medium infrared spectrum (1300–3000 nm), and far infrared spectrum (3000 nm to 1 mm). The active laser media, particularly solid state lasers including Nd:YAG, Er:YAG, Er,Cr:YAG, Er,Cr:YSGG, and diode have been widely used in various dental specialties.<sup>2–4</sup>

In a clinical study, Gadzhula et al. investigated the efficacy of a diode (940±15 nm) laser in treating periodontal inflammatory diseases in 62 patients. The participants were divided into two groups: 1) 32 patients with chronic gingivitis and 2) 30 patients with hypertrophic gingivitis. Each group was divided once more into the main and control groups. The control groups (i.e., chronic and hypertrophic gingivitis) were treated using routine dental procedures such as professional oral hygiene. In the main groups, patients were treated with diode laser in addition to the routine dental procedures. The exposure time was 2 min with 3 and 6 procedures daily for chronic and hypertrophic gingivitis, respectively. The results showed that the diode laser significantly reduced the inflammatory process in the main groups compared to the control groups. Also, the laser therapy decreased gum pain, bleeding, and edema in 68.8% after 3 days and 93.8% after 7 days in chronic gingivitis. Besides, the effectiveness of the diode laser after days 3, 7, and 14 in hypertrophic gingivitis was 33.3%, 53.3%, and 80%,

respectively. Therefore, it is necessary to highlight the role of laser in eliminating inflammation in the oral cavity during the pandemic, especially chronic gingivitis.<sup>5</sup>

In a successful root canal therapy, the activation of irrigation solution, i.e., QMix (a mixture of CHX, EDTA, and surface-active agent), with irradiation of Er,Cr:YSGG in the root canals can improve the adhesion of filling material to the root canal dentin. Hence, laser technology can increase the roughness of the dentin surface for stronger bonding to the root filling materials.<sup>2</sup> It is also suggested that the instruments should not produce any reflection during laser irradiation in root canal therapy and other dental procedures. Since the dark rubber dam can highly absorb laser energy during irradiation, it can also have a negative effect on oral tissues. Thus, it is recommended to use light-color rubber dams as well as plastic, sandblasting, and anti-reflection clamps in dental procedures.<sup>1</sup>

In addition, two studies focused on using laser irradiation to eliminate microorganisms from root canals. In the first study, 20 extracted teeth incubated with *Enterococcus (E.) faecalis* were included. In the first group (n = 10), root canals were irrigated with 2.5% NaOCl using the conventional needle irrigation technique. In the second group (n = 10), the canals were filled with 2.5% NaOCl and then irradiated by Er:YAG (2940 nm) for 30 s. The results showed that the laser irradiation annihilated *E. faecalis* completely.<sup>6</sup> The second study used 120 extracted teeth contaminated with *E. faecalis*. The samples were divided into four groups (n = 30), where the root canals of the groups were disinfected as follows: Group 1 (3% NaOCl), Group 2 (ozonated water), Group 3 (distilled water and diode 980 nm), and Group 4 (ozonated water and diode 980 nm). The results showed that ozonated water and diode in group 4 compared to other groups can significantly eliminate *E. faecalis* from the canals.<sup>7</sup> Thus, the use of laser irradiation along with other irrigation solutions should be considered during the pandemic.

Recently, in a review paper based on 34 studies, Labunet et al. evaluated the effect of lasers on etching enamel

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surfaces in dentistry. The results showed that irradiation of hard dental tissues with solid lasers (i.e., Er:YAG and Er,Cr:YAG) contributes to an irregular surface, open dentin tubules, elimination of smear layer, and reducing the risk of cavities formation. Also, it was reported that a combination of laser and acid conditioning increases etch depth. Since debonding brackets, particularly ceramic brackets, can damage the tooth enamel at the end of orthodontic treatment, applying an appropriate wavelength of laser irradiation may be helpful in etching the enamel.<sup>4</sup>

In line with the previous study, the effect of diode laser on soft tissue surgery was investigated in four orthodontics cases. The use of diode laser irradiation in cases of teeth exposure to the oral cavity, frenectomy, and gingivectomy showed satisfactory results. Therefore, the appropriate use of a laser can provide a potential advantage in orthodontic cases. Overall, a small number of participants in the study and the absence of a control group should be highlighted. Finally, more clinical studies are required to reach a comprehensive conclusion in the field of orthodontics.<sup>8</sup>

In a study on peri-implantitis therapy, Strauss et al. assessed the efficacy of Nd:YAG in the treatment of peri-implantitis. The participants of this study included 20 patients with 36 dental implants, probing pocket depths greater than 4 mm and bone loss. The 36 samples were divided into two groups as follows: 1) the test group (treated with Nd:YAG) and 2) the control group (treated with conventional mechanical debridement). The results showed that laser therapy reduced probing pocket depths and the level of bone loss compared to conventional treatment. Thus, laser therapy can be employed as a valuable modality to treat peri-implantitis.<sup>9</sup> In addition, the effect of laser in oral surgery showed satisfactory results in bleeding reduction in the oral cavity. Applying low-level laser therapy before injection also reduced trauma to vessels or nerves from needle sticking and provided effective anesthetic.<sup>3</sup>

Finally, clinicians should be aware of the safety rules in laser therapy, and selecting the correct parameters can decrease the aerosol generation or smoke during therapy. The use of a high vacuum aspiration system, face shield, and medical masks can prevent the spread of the virus during laser therapy.<sup>1</sup> According to the information provided in this letter, the use of laser therapy can successfully increase dental treatments during the pandemic. However, more clinical studies are required to be conducted in this area.

## Declaration of competing interest

There is no conflict of interest.

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