Laser-assisted teeth bleaching

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_It is more than evident that in our every day practice, patients are asking for a whiter and brighter smile. Advertisements, movies, television shows and all kinds of media services, are centralized on the totally white teeth which seem to project ones health, well-being and beauty. As a profession we have learned that we have to deal not only with pain itself but also with the esthetics of our patients. For that reason many materials and techniques have evolved giving us the opportunity to implement it in our offices. Composite veneers, porcelain laminates all-porcelain crowns and teeth bleaching are some of them. Today the dental clinicians have to be capable and willing to offer esthetic interventions to their patients in order to be considered modern and up-to-date.

If we want to give a definition of teeth bleaching we could say that it is the process that a dentist alters the color of the patient's teeth so as to appear whiter. This is made possible with the use of different oxidizing bleaching agents and different techniques in order to eliminate teeth discoloration. The main oxidizing agents that are used today are hydrogen peroxide in concentrations of 30–35 % and carbamide peroxide in concentrations of 10–22 %.

The decomposition of those agents ends up to the production of perhydroxyl free radical (-2) with high bleaching capability. It is known that by heating hydroxyl or carbamide peroxide its decomposition rate is accelerated. By increasing the bleaching agent's temperature by 10 °C, the speed of the decomposition is doubled. At this point more hydroperoxyl free radicals are released and then the free radicals penetrate the porosities in the rod-like crystal structure of enamel and oxidize the interprismatic stain deposits. Many different light sources both coherent and incoherent have been used for tooth bleaching (arc/plasma lamps, halogen lamps, LED's, lasers).

The advantages of the use of laser in teeth bleaching can be concentrated on the speed of the procedure, the comfort of the patient and the minimal to none after treatment discomfort (pain kicks) that are often encountered in light activated teeth bleaching with incoherent light sources (e.g. plasma lamps). In a pulsed mode operated laser these advantages are more apparent due to the fact that packs of energy are offered to the bleaching agent in a very short time period, thus giving enough time for heat dissipation to the tissue.

_Clinical procedure

It is essential that the steps of the procedure are followed carefully in order to achieve the best possible result and maintain it as long as possible. In the following case report a young woman aged 32 came to our office for laser-assisted teeth bleaching.

After obtaining the medical and dental anamnesis of the patient we are making clinical and radiographic examination in order to find and address any therapeutical (caries, endodontic treatments, periodontal) problems. The patient must be informed that composites and ceramic crowns (if present) will not be


Fig. 1


Fig. 2

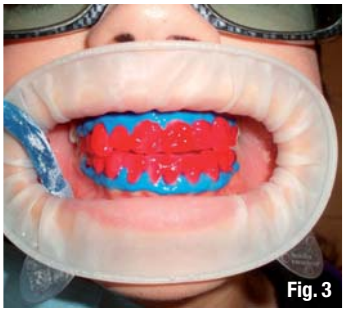

Fig. 3


Fig. 4


Fig. 5

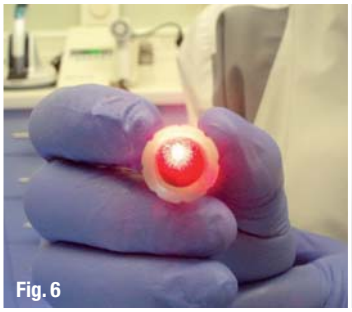

Fig. 6


Fig. 7

bleached and that after bleaching might need replacement. Also patients should know in advance that the result of the procedure is not permanent. It is dependant to the age of the patient and the use of tobacco and extrinsic staining by deposition of tannins found in coffee, red wine, tea and cola beverages. The average duration expectancy is 3–4 years for non-smokers. Discussing and consulting the patient on the desired bleaching results will help you to determine the best treatment plan for each individual situation.

The first session will be a prophylaxis session. Teeth must be carefully cleaned from plaque, calculus and extrinsic staining (Fig. 1). On the following session the laser-assisted bleaching can begin.

At first we have to evaluate the initial color of the teeth. In our case patient's initial color was evaluated as A3 in the VITA Classical Shade Guide (Fig. 2). Safety goggles must be worn by the patient all personnel in the laser working area in advance. We apply a lip protection cream and then we isolate the working area with a cheek and lip retractor. After drying teeth and gums with gentle air stream we apply the gingival barrier carefully.

It is time to apply the bleaching agent in a layer of 1–2 mm on each tooth (Fig. 3). We select the appropriate power settings for our laser and we activate the bleaching agent for three intervals of 10 seconds on each tooth (Fig. 4). After the end of the procedure we leave the activated bleaching gel for 8–10 minutes. Then we use dry suction to remove it. We can repeat the same process two or three times on the same appointment until we achieve the desired results and evaluate the final color. In our patient after three repetitions of the process on the same appointment the color of the teeth moved to B1 according to VITA Classical Shade Guide (Fig. 5).

_Discussion

In our clinic we are using an Nd:YAG laser and a red colored bleaching agent provided by Fotona with a concentration of 35% H_2O_2. The special bleaching handpiece has a spot size of 8 mm and the fiber is a 320 µm one. The power settings that are used: Power 8 W, Pulse duration 120 µm, Repetition rate 60 Hz (Fig. 6).

The advantages of the system are obvious. The wavelength of 1,064 nm has a high absorption coefficient on pigments, and it is absorbed by the colorants of the bleaching gel (usually carotene) and the added small silica particles in the nm or lower µm-scale which are also increasing the absorption of red and infrared light. Its pulsed operation offers packs of high energy on the gel. Consequently the bleaching gel is heated rapidly, increasing rapidly the decomposition rate of hydrogen peroxide to perhydroxyl free radical.

Different wavelengths can be used in laser-assisted teeth bleaching. Apart from Nd:YAG, diodes (940 nm, 980 nm) which are also in the near infrared spectrum can be used and also double-frequenced Nd:YAG lasers (532 nm). Recently there have been proofs that Er:YAG lasers can be used for laser bleaching using non-ablative power settings. The clinician has to select the appropriate bleaching gel that absorbs in the best way the laser energy applied in order not to harm the pulp by transmission of the non-absorbed energy.

_Summary

Lasers can be very useful as an activation medium of the teeth bleaching process. The whole procedure is faster, the results are excellent and the patient feels comfortable throughout the appointment. The future aspects are also encouraging and we can expect better designed handpieces for bleaching and wavelength-special bleaching agents. Taking great caution in the different steps of the procedure, selecting the right wavelength and the proper parameters, is essential for the clinician in order to achieve the best results in profit of his/hers patients (Fig. 7)._

_contact laser

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