A Modern Approach to Endodontic Treatment Using LAI

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Thorough disinfection and complete elimination of microorganisms and their by-products from the root canal system is currently regarded as the most important goal in endodontic treatment. Due to the complex 3D anatomy of the root canal system, this goal is often very hard to achieve. Mechanical instrumentation has been shown to have certain limitations when it comes to preparing and cleaning the entire root canal surface area. To ensure successful disinfection and debridement we have to provide sufficient delivery of irrigant solutions to all parts of the root canal system. Besides conventional needle irrigation, which has shown certain limitations regarding the velocity and the flow of the irrigant it produces, other irrigant agitation techniques, including laser activated irrigation (LAI), have been proposed to increase irrigation effectiveness.

In recent years Fotona has developed several novel methods of LAI employing Er:YAG laser light with a wavelength of 2940 nm with the aim to increase the flow of irrigant solution throughout the root canal system. Since Er:YAG laser light is highly absorptive in water, it causes boiling and the formation of primary and secondary cavitation bubbles in the irrigant solution. Due to the expansion and implosion of air bubbles, the fluid dynamics inside the root canal system are greatly increased. In addition, shockwaves and high shear stresses along the root canal walls are generated, adding to the cleaning effect. The results of recent in vitro studies have shown LAI to be more effective than conventional needle irrigation as well as ultrasonically and sonically activated irrigation in terms of disinfection efficacy, debris and smear layer removal as well as filling material removal in retreatment cases.

Currently Fotona offers different LAI methods for endodontic treatment, differing in the delivery of laser pulses and the primary and secondary cavitation effects. The two methods employing a single pulse are SSP mode (super-short pulse) with a 50 μs duration of the laser pulse (formerly known as PIPS®) and USP mode (ultra-short pulse) with a 25 μs duration of the laser pulse, while the methods employing a synchronized pair of laser pulses are the Auto-SWEEPS mode (dual-pulse "sweeping" mode) and the X-SWEEPS mode (dual-pulse resonant shock wave enhancing mode). With all these methods, sub-ablative energies (20 mJ) are used and the laser fiber tip is held in the endodontic access cavity, thus minimizing the need for over shaping and enlarging the root canals as well as the chance of irrigant extrusion and thermal damage to dentin.

In clinical terms LAI brings many advantages over conventional irrigation methods to endodontic treatments. Since the penetration of the irrigation solution is better into complex and narrow anatomical structures of the root canal system, such as lateral and accessory canals, isthmuses, apical ramifications and the dentinal tubules, the removal of microorganisms and biofilms and thus the disinfection efficacy is greatly increased. LAI also increases the chemical reaction rate of NaOCl, producing a greater bactericidal effect. Therefore, the final file size required for canal shaping can be significantly reduced, leading to less iatrogenic errors. When using LAI, the principles of minimally invasive endodontics can be adopted. The clinical step of irrigation is made simple and safe for the operator, while also reducing endodontic treatment time, which is greatly appreciated by the patient.

Back to Basics with Soft-tissue Surgery and Periodontitis Treatment

Ilay Maden

Erbium laser is a great tool that provides flexibility and versatility in achieving different results for any kind of oral surgery. For soft tissues, from injection-free surgeries with minimal to no pain, to hemostasis, we have the option of changing the application of heat into tissues. The lecture will review laser-tissue interaction and provide tips on mastering the variables of different settings we can use with LightWalker. Balancing what we can get with Er:YAG and discussing where Nd:YAG laser can help, different indications of the solo use of Er:YAG and dual wavelength treatments will be discussed.

The second part of the lecture will focus on periodontitis treatment and suggest a basic protocol for the "average" periodontal patient covering the basics of periodontal disease.