FOCUS ON: Lasers for Disinfection


Q: How important is disinfection to predictably successful endodontic treatment?
A: Like the extraction, the biological goals of predictably successful endo treatment should be directed toward removing all the pulp, bacteria when present, and related irritants from the root canal system. To accomplish these goals, any given canal is shaped to provide an effective reservoir of reagent that, upon activation, can be exchanged into all aspects of the root canal system. Yet, the dimensions of the final preparation have ignited a debate between those who advocate minimally prepared canals and proponents of more fully shaped canals. Endlessly disputing the dimensions of the final preparation is a zero sum game. Scientific and clinical evidence demonstrate that the overwhelming majority of all endo failures result from deficiencies in primary treatment, not from radicular fractures caused by overzealous shaping. The way forward is laser-activated irrigation (LAI). Specifically, the erubium family of lasers represents cutting-edge technology for activating irrigants and achieving endo 3-D disinfecion and—this is most important—in either minimally prepared or fully shaped canals.

Q: How do you feel about advocates who promote intentionally leaving bacteria within a root canal system?
A: Advocating purposely leaving bacteria within the root canal system with the hope these microbes-organisms will routinely become dormant is negligent, definitely not in the patient's best interest, and is quackery. As stated on the website quackwatch.org: "Quackery may be defined as the promotion of unsubstantiated methods that lack a scientific plausible rationale. Promotion usually involves a profit motive. Unsubstantiated means either unproven or disproven. Impossibly understood: namely, that the Er:YAG laser, in a fluid-filled pulp chamber, kills bacteria. The Er:YAG laser has been repeatedly shown to be a superior technology for laser disfection because it produces a wavelength of 2,940 nm on the electromagnetic spectrum of light. This specific wavelength has the highest absorption of water, which is a major component of both hard and soft tissues. This laser, its unique wavelength, and resultant energy produces LAI to eliminate pulp tissue remnants and bacteria and their related irritants from all aspects of the root canal system.

Q: What is a minimally invasive technology that can disinfect minimally or fully shaped canals?
A: The Er:YAG laser has been repeatedly shown to be a superior technology for laser disfection because it produces a wavelength of 2,940 nm on the electromagnetic spectrum of light. This specific wavelength has the highest absorption of water, which is a major component of both hard and soft tissues. This laser, its unique wavelength, and resultant energy produces LAI to eliminate pulp tissue remnants and bacteria and their related irritants from all aspects of the root canal system. A great example of advanced Er:YAG LAI technology is Photon-Induced Photoacoustic Streaming (PIPS). As summarized in Lasers in Endodontics, PIPS is a process by which photons of light are emitted at very low energy levels with a short microsecond pulse duration. Unlike other forms of LAI, PIPS uses a uniquely tapered and stripped tip that it placed within the pulp chamber only. PIPS disperses reagent laterally, generates shockwaves at subablative levels, and actively pumps fluid 3-dimensionally into both minimally or fully prepared canals and their related root canal systems.

Q: What is the mechanism of PIPS LAI?
A: The exposed portion of the PIPS tip is placed in a fluid-filled pulp chamber. Upon activation, a few molecules of reagent at the tip of the fiber are superheated to 100°C, which explosively causes a steam bubble to form and expand. Relative to the vast volume of reagent within the root canal system, the steam bubble immediately cools and is converted back to liquid, causing the bubble to collapse. This resultant burst of energy is short-lived for only 50 µsec and produces enormous shear-wall forces similar to that of a pressure washer used to clean paint from stone, brick, or concrete. The lateral dispersion and propagation of shockwaves in intracanal fluids at subablative levels produces both photoacoustic and photochemical events. For example, the PIPS method dissociates NaOCl into Na+ and OCl- ions. Hypochlorite ions have superior tissue-dissolving capacity, which serves to digest and eliminate organic tissue and micro-organisms from fins, isthmuses, loops, lateral canals, including 1,000 µm deep into the dentinal tubules. Strategically, this photochemical event is synergistic with the photoacoustic shockwaves.

Q: Is there evidence supporting the safety of PIPS?
A: In the past decade, more than 20 scientific, peer-reviewed papers have validated what 1,000-plus international dental users have increas-ingly understood: namely, that the Er:YAG laser, in combination with the PIPS method, is the safest, most effective and efficient laser to perform 3-D endo disinfecion in both minimally and fully shaped ca- nals. The PIPS method promises to fundamentally change clinical endodontics as more dentists embrace this new technological future.

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