An introduction to lasers in dental hygiene

By Jeanne M. Godett, BDAED, RDH, EF

What is a laser? How does it work? How long have lasers been used in dentistry? How do they benefit our patients? How are lasers integrated in dental hygiene? Are there any disadvantages to the use of a dental laser? These and more were the questions I had when I first became interested in using laser technology. In short, this technology has simplified my dental hygiene day. I now have more time in my hygiene treatment regimen to introduce comprehensive restorative dentistry, granting my clients the dentistry they want and deserve along with the ability to preserve their investment.

What is a laser? The word laser is an acronym for “light amplification by stimulated emission of radiation.” We can thank Albert Einstein for theorizing that photoelectric amplification could emit a single frequency, or stimulated emission, which explains how a laser operates. Light is a form of energy that exists as a particle, called a photon, and travels in a wave. A photon wave has three basic properties. Velocity: The speed of light. Amplitude: The vertical measurement of the height of the wave, from the zero axis to the peak, which describes the energy of that wave. For convenience, energy is measured in millijoules, or thou-sandths of a joule. Wavelength: The horizontal distance between any two corresponding points on the wave. In dentistry, we use wavelengths that range between 450 nm and 10,600 nm.

Lasers were introduced to dentistry in 1969 and are capable of providing results comparable to or superior to conventional techniques and instruments. There are more than two dozen indications for laser use ranging from simple gingival troughing for homeostasis to caries detection, carious lesion removal, tooth preparation and curing.

Laser energy can be reflected, absorbed, transmitted or scattered within the target tissue or can pass through without any effect on the tissues. The diode family of lasers range in wavelengths from 808 nm to 1,064 nm. These are soft-tissue lasers and are absorbed in hemoglobin, other blood components and melanin. The Nd:YAG 1064 nm wavelength is also a soft-tissue laser and also absorbed in hemoglobin, blood components and melanin.

Hydroxyapatite does not absorb these wavelengths. The two erbium lasers are the only hard-tissue lasers with wavelengths of 2,780 nm and 2,940 nm. This laser energy is best absorbed in water and tooth structure.

The Nd:YAG laser is also a soft-tissue laser with a wavelength of 10,600 nm. This wavelength is best absorbed, such as the erbium family, in water and tooth structure. However, this laser is only used on the soft tissues. A dentist or hygienist must choose the best laser for the desired treatment.

Erbium lasers use extremely short pulse durations and can easily ablate layers of calcified tissue with minimal thermal effects. Because of the unique absorption properties, all wavelengths have different penetration depths within the tissues. The erbium and CO2 lasers are absorbed on the surface of the target tissue where the diode and Nd:YAG lasers can reach several thousand microns deep into the tissues.

Lasers in daily practice

With the integration of lasers, I finally have the ability to achieve a higher level of health for my patients.

The first laser I use in my clinical appointment is the 655 nm wavelength laser to detect subgingival and supra-gingival calculus with the laser perio tip attached (Note that the DIAGNOdent uses a standard tip for caries detection and a separate tip for perio calculus detection, so two tips in one just by changing the tip.). Calculus has never been easier to detect, making my clinical pulpal time minimal (Fig. 1). My patients leave with less sensitivity, trauma and discomfort.

Secondly, I use my diode laser to reduce the bacteria and pathogens within my client’s sulcus or periodontally infected pocket by simply taking a small optic fiber, almost half the size of a periodontal probe, and shining photonic laser energy into the sulcus.

This is what we in the laser hygiene community call laser decontamination1, or laser bacterial reduction (LBR), which is the reduction of the bacteria and pathogens within the sulcus. I then proceed with the use of ultrasonics and hand instruments for biofilm and calculus removal from the hard tissues, finishing with the use of the diode laser for laser degranulation (curettage), so again entering a diseased periodontal pocket with the same optic fiber.

I am able to selectively remove granulation tissue produced by infections and inflammatory diseases like periodontitis.

Today hygienists have the ability to simply and selectively remove bacteria living in our clients’ mouths.

Research shows, 96 percent of the germs that are found in the periodontal pocket are pigmented and can thus be selectively destroyed by the laser.

By simply shining photonic laser energy into our clients’ sub-sulcular tissue, we can safely and effectively lower the bacteria in our clients’ sulcus for up to 56 days.2 Additionally, the light energy through biostimulation can speed up the process of wound healing and similar regenerative processes.

For a finale, I end my client’s appointment with the same 655 nm wavelengths for laser caries detection, again the KaVo DIAGNOdent. I can give my clinician the necessary information to diagnose decay in our patient’s teeth for a higher gold standard of minimally invasive dentistry. Treating caries at its earliest inception preserves our patients’ natural enamel for their lifetimes.

My newest laser purchase has been the KaVo FTLL900m Premium. This laser has water irrigation. Water irrigation offers less tissue trauma, along with 12 watts of greater energy.

Pulsing allows the tissues to thermally relax and cool before each additional pulse. Each pulse is taking a small optic fiber, almost half the size of a periodontal probe, into my client’s sulcus or periodontal pocket by simply taking a small optic fiber, almost half the size of a periodontal probe, and shining photonic laser energy into the sulcus.

This wavelength is also absorbed more readily in water vs. the other diode wavelengths.

Any disadvantages? A perceived disadvantage of some practices is the initial cost. However, with proper training and laser integration (I consider this to be my specialty), the ROI (return on investment) can be less than three months.

The bottom line

I love working with dental offices throughout the country, assisting them in the integration of laser technology, offering their clients this new gold standard in technology.

The offices I have worked with are seeing improved health for their clients. In conjunction, they are seeing their hygiene departments run at a profit.

I highly recommend that if you are going to use laser technology, you seek out education. The Academy of Laser Dentistry (ALD) is a
Are children receiving prompt cleft lip/palate treatment?


Results: 406 children in North Carolina with OFC were continuously enrolled in Medicaid during the first two years of life. Overall, 78.1 percent of children had surgery within 18 months. About 90 percent of children with cleft lip (CL), 78 percent of children with cleft palate (CP), and 89.6 percent of children with cleft lip and palate (CLP) received timely cleft surgery; the mean age at which surgery occurred was 5 months. Children whose mothers received maternal care coordination, received prenatal care at a local health department, or lived in the southeastern or northeastern region of the state were more likely to receive timely cleft surgery.

The timely repair of orofacial cleft (OFC) can greatly improve a child’s medical and psychosocial well-being. The American Cleft Palate-Craniofacial Association (ACPA) has set forth guidelines for the optimal time by which primary repair surgery should be received, broken down by type of OFC.

A retrospective study, published recently in The Cleft Palate–Craniofacial Journal (Vol. 46, Issue 6, Nov. 2009) was conducted to determine whether children with OFC receive primary repair surgery within the time recommended by these guidelines.

The study, conducted in North Carolina, found that most children in that state are undergoing primary repair surgery by the recommended age.


The many variables analyzed fell into five broad categories: maternal, child and system characteristics, perinatal care region and place of residence, medical and psychosocial well-being.

The findings suggest that most (78.1 percent) North Carolina children with OFC received primary repair surgery by the time recommended by the APCA guidelines.

Percentages varied among cleft lip (about 90 percent), cleft palate (58 percent) and cleft lip and palate (89.6 percent).

According to the authors of the study, “Children whose mothers received maternity care coordination, received prenatal care at a local health department, or lived in the southeastern or northeastern region of the state were more likely to receive timely cleft surgery.”

The populations least likely to receive the surgery in a timely manner were African-American/non-Hispanic and those in the southwestern region of the state.


References


About the author

Jeanne M. Godett has been making a professional difference in people’s lives for more than 25 years. She has consulted with hygienists throughout the United States and Canada providing instruction, guidance and productivity guidelines related to hygiene and the use of lasers.

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