The Renaissance of Science-based Laser Surgery, Dentistry and Safety Education
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The Renaissance of Science-Based Laser Surgery, Dentistry and Safety Education

The “sound scientific basis and proven efficacy in order to ensure public safety” is one of the main eligibility requirements of the ADA CERP Recognition Standards and Procedures (ADA.org/CERP). The scientific foundation for understanding the soft tissue laser ablation and coagulation is based on soft tissue light scattering and absorption spectra. Unfortunately, some of the laser dentistry educational programs and publications include misinterpretations with regard to the soft and hard tissue laser science and safety. Such misrepresentations partially take their origin in the Laser Dentistry Curriculum Guidelines, which dates back to early 1990s, and is missing a whole lot of important laser tissue interaction concepts, such as: Absorption Spectra; Hot Glass Tip; Plasma Plume, Ablation and Coagulation Depths, etc.¹

The long term Vision of the American Laser Study Club (ALSC) and its Journal is to promote Science- Based Laser Surgery, Dentistry and Safety Education. ALSC’s Curriculum based on The Study Guide of The American Board of Laser Surgery, dedicated to the detailed physics of soft tissue ablation and coagulation with laser and hot tip (non-laser) devices, i.e. the physics of laser tissue interaction, such as absorption, scattering, ablation, coagulation and hemostasis, soft and hard tissue ablation, laser safety, etc. ALSC helps Physicians, Dentists, Veterinarians, and Practice Staff Members to excel at efficient and safe application of laser energy in everyday practice. ALSC also provides help for those preparing for the Certification Exam with The American Board of Laser Surgery.

References


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Dr. Vitruk was born and raised in Western Ukraine. He earned his PhD degree in Physics from the Moscow Physics and Technology Institute, Moscow in the late 1980s in the former USSR. In the 1990s he held Research Scientist position with The Academy of Sciences in the former USSR and then a Royal Society Visiting Research Fellow position at Heriot-Watt University in Edinburgh, Scotland, UK. He later worked as Senior Scientist with Synrad Inc. in Seattle, WA, and then as Chief Scientist with Luxar/ESC/Lumenis also in Seattle, WA. In 2002 Dr. Vitruk founded Luxarcare LLC – an exclusive certified Luxar laser service and accessories provider for 12,000+ surgical Luxar laser installations around the globe. In 2005 he founded Aesculight LLC and LightScalpel LLC – the only American based designer and manufacturer of surgical CO₂ lasers for small office out-patient market. Dr. Vitruk has authored 10 patents and over 20 articles on CO₂ lasers, and is a Member of The Institute of Physics, UK and a Diplomate of and a Director with the American Board of Laser Surgery, USA. In 2017 he founded the American Laser Study Club, an educational platform to support clinicians studying for the written Certification Exams with the American Board of Laser Surgery. He is married to his wife of 32 years Natasha and they together have two children, Olga and Alexander.
Identification and Laser Eradication of Oral Cavity Spirochetes. Case Study

About the Author
Ben Sutter DMD, graduated Rutgers School of Dental Medicine in 2005. Prior to dental school, Dr. Sutter had research experience in viral genomics and bioinformatics at UNLV in Dr. McClure’s Lab where he studied the Order Mononegavirales, which includes Ebola, measles, mumps and rabies among others. At Columbia University, College of Physicians and Surgeons, Microbiology Department he examined PhoP-PhoQ, a two-component system which is a well-studied bacterial signaling system that regulates virulence and stress response in Salmonella typhimurium under Dr. Waldburger. Dr Sutter can be reached at BSutterDMD@aol.com.

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Abstract
Microbial infections represent a substantial health risk worldwide. Recently, more emphasis has been placed on the role of spirochetes in the etiology of Alzheimer’s disease. Periodontal treponemas have been implicated in playing a co-infectious role in the disease process. Eliminating the co-infecting pathogens could interrupt or slow down the disease progression. This is a clinical case review, where a patient was confirmed to have an oral spirochetal infection via Phase Contrast Microscopy (PCM), was treated using a 10,600 nm CO2 laser, and followed for a year. At post op intervals subgingival plaque samples were examined with PCM. No return of the infection was observed. The author is also publishing the protocol used in the eradication of the oral infection.

Keywords: Spirochetes, CO2 Laser, Phase Contrast Microscope, Periodontal Infection, Alzheimer’s disease, dementia, periodontal pathogen, Treponema, laser periodontal therapy, Lyme disease.

Introduction
The significance of biofilms in the oral cavity has been well established and accepted. Loss of attachment and alveolar bone are associated with an increase proportionately of gram negative organisms in subgingival plaque. Socransky’s “red complex” is of specific interest because of its association with bleeding on probing and contains B. forsythus, P. gingivalis, and T. denticola.¹ These organisms are known to be particularly pathogenic and virulent. Unfortunately, the mouth is not the only place in the body where biofilms can wreak havoc.

The oral microflora, specifically periodontal pathogens, have been named as cofactors in adverse pregnancy outcomes and in systemic disease states such as cardiovascular disease, diabetes and.²⁻⁴ There is a growing body of evidence that points to microbial involvement in Alzheimer’s Disease (AD).⁵⁻⁸ Specifically, spirochetes working in mature biofilms have been found in amyloid plaques of post mortem brain samples from AD patients. Miklossy’s review of the literature found spirochetes in 91.1% of AD cases (451/495) and the 185 control samples showed the absence of spirochetes.⁶ It is critical to note, that these biofilms exist as co-infections where multiple spirochetes are present and not just a single species. This includes known periodontal pathogen Treponemas such as T. denticola, T. pectinovorum, T. amylovorum, T. lecithinolyticum, T.
Miklossy’s analysis shows a probable causal relationship between neurospirochetosis and AD, following Koch’s and Hill’s postulates. Others have speculated that it is not the actual spirochete infection that causes the amyloid plaques, but rather the body’s immune response to the infection that causes the plaque formation. Regardless of the actual mechanism, if the spirochetes are not present it would stand to reason amyloid plaque formation could be minimized.

AD is a chronic neurodegenerative disease and is the most frequent cause of dementia. It is characterized symptomatically by a slowly progressive decline of thinking, behavior and memory. AD is confirmed histologically by progressive brain atrophy and the accumulation of amyloid plaques and neurofibrillary tangles.

Spirochetes are gram-negative, anaerobic, motile, and coiled bacteria. They are able to avoid destruction by host immune reactions and initiate chronic infections. They have been linked both to AD and periodontal diseases.6,10 As neurotropic microorganisms, spirochetes can enter the brain and generate a dormant, persistent infection.11,12 This infection occurs years or decades before manifestation of dementia. Given that the frequency of periodontal pathogen spirochetes in the amyloid plaques is higher compared to that of *B. burgdorferi*, which is present in less than one third of the AD cases analyzed.6 It would make sense to target the periodontal spirochetes in an attempt to disrupt co-infectivity. It stands to reason that disrupting the formation of a mature biofilm type could delay or decrease the incidence of AD.

The use of phase contrast microscopy (PCM) in dentistry for rapid identification of therapeutic targets is not a new concept. Phase contrast microscopy offers the earliest stage risk assessment possible and spirochetes have a very unique morphology making them easy to identify. Phase contrast microscopy is performed chair side and offers real time evaluation of the

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**Figure 1.** Spectra18,19 of (a) Absorption Coefficient, 1/cm, (b) Thermal Relaxation Time, TRT, msec, (c) short pulse Ablation Threshold Fluence, *E*ₐ, J/cm² and (d) short pulse Photo-Thermal Coagulation Depth, *H*, mm, at histologically relevant concentrations of water, hemoglobin (Hb), oxyhemoglobin (HbO₂), and melanin. Logarithmic scales are in use.
periodontal risk. Other technologies such as DNA sequencing require time for shipping and sample processing. Despite the advantage of specificity that DNA sequencing offers, the known sequenced pathogens are but a small portion of the 500-700 oral pathogens known to infect the oral cavity. For the purposes of this case review, the detection and confirmation of elimination of spirochetes, were fulfilled by PCM.

CO₂ Laser Eradication of Oral Cavity Spirochetes

Photo-thermal laser ablation of spirochete-carrying tissues\textsuperscript{14} and bacterial biofilms\textsuperscript{15} has been proven effective with infrared (IR) 10,600 nm CO₂ laser and is utilized in the Case Study reported here. CO₂ laser advantages over near-IR 800-1,100 nm diode and Nd:YAG lasers and mid-IR 2,780/2,940 nm Erbium lasers are best understood through the Absorption Spectra (see Figure 1) for the strongest chromophores (at their histologically relevant concentrations) in biofilms (water), epithelium (water and melanin), and sub-epithelium (water, hemoglobin, oxyhemoglobin).\textsuperscript{16-19} First, low absorption coefficient in near-IR range of the spectrum renders near-IR lasers inapplicable.\textsuperscript{18} Second, unlike the Erbium lasers, the CO₂ laser minimizes the introduction of Spirochetes into the blood stream during laser ablation, due to CO₂ laser’s coagulation depth being 5-15 times thicker than Erbium lasers’ coagulation depth.\textsuperscript{19} Also the absorption spectra defines the necessary CO₂ laser pulse (SuperPulse specifications under 1.5 msec duration)\textsuperscript{15,18,19} and fluence (over 3 J/cm\textsuperscript{2})\textsuperscript{15,18,19} for safe and efficient ablation inside the sulcus (laser sulcular debridement).

Materials and Methods

Laser treatments were performed with the LightScalpel LS-1005 Surgical/Dental SuperPulse 10,600 nm CO₂ laser (LightScalpel LLC, Bothell, WA). Two different SuperPulse settings were configured at 1,500 and 2,000 mWatts of average power (20 and 26.7 mJ pulse energy at 150 Hz further gated with 50% Duty Cycle at 20 Hz). Laser fluence during each individual SuperPulse is 40-54 J/cm\textsuperscript{2}, which greatly exceeds the required ablation threshold of 3 J/cm\textsuperscript{2} for water-rich soft tissue and bacterial biofilms. LightScalpel dental angled laser hand piece PN LS9010-02 was used together with 0.25 mm small aperture “Perio Tip” PN LS9005-05 with >90% optical transmission and a miniature distal end design suitable for the intra-sulcus procedures. Perio Tip’s distal end OD is approximately 0.5 mm, and its tapered design allows for easy insertion into the deep pockets of up to 9 mm. The CO₂ laser beam out of the perio tip diverges at approximately 14°, which is important for delivering laser energy to the walls of the sulcus. Constant air-flow through the hollow core of the Perio Tip pushes the sulcular debris and fluids (blood, saliva, irrigation) out of the way of the laser beam, and prevents tip clogging.

Case Study

The patient, a 55-year-old female, was seen by a dental hygienist in a general dentistry practice for her regular prophylaxis cleaning. The gum tissue of the patient appeared normal and healthy. Full mouth periodontal probing was completed revealing most pockets were 1 to 3 mm deep, a couple were 4 mm deep, and only one pocket was 5 mm located in the lower right quadrant.

Visit 1: Prophy and Scaling and Root Planing (SRP) with PCM

Medical history was reviewed and the patient reported a history of heart murmur, skin rashes, and obstructive sleep apnea which was being treated with CPAP therapy. The patient reported taking multivitamins and progesterone/estrogen replacement therapy. Samples of subgingival plaque were obtained from the mesio-lingual aspect of teeth #30 and #31 and visualized under phase contrast microscopy at 400x and
1000x magnification using a Nikon Eclipse Ci-S research grade phase-contract microscope (OraTec, Manassas, VA). It was confirmed the patient was infected with spirochetes (shown in Figure 2 along with some rods and cocci) and trichomonads.

The presence of leukocytes indicates the presence of infection (Figure 3). Limited SRP 1-3 was completed on the lower right quadrant and a prophylaxis was completed in the rest of the mouth based on presence of high risk periodontal pathogens. The patient requested a trial of non-surgical treatment, and recommitted to more consistent homecare and observing better oral hygiene.

Figure 2. Spirochetes (red arrows), rods (blue arrows) and cocci (white arrows) are observed the in biofilm during the initial visit (1000x magnification).

Figure 3. A trilobed polymorphonuclear (PMN) leukocyte cell is seen here. Cytoplasmic granules, which help dissolve bacteria they ingest, are seen moving around showing the presence of infection (1000x magnification).
The cleaning was performed using ultrasonic USI 25 MPLC with E\textsuperscript{+} insert at 25 Hz (USI, Houston, TX), and hand instruments. Oral hygiene instructions were given as well as post op instructions. Post cleaning samples were difficult to obtain immediately following her cleaning, but neither spirochetes nor trichomonads were identified. This is due to the fact that an ultrasonic was used in the cleaning and plaque was disturbed, diluted and removed all in the same process. The author suspected the infection was still present although nothing was observed under PCM.

Laser periodontal therapy was advised as part of her treatment, but the patient decided to try to control the infection herself by implementing a more consistent homecare oral hygiene program. In an attempt to improve oral environment, she utilized an Oral B electric tooth brush (Proctor and Gamble, Cincinnati, OH), brushing only with baking soda (Bob’s Red Mill, Milwaukee, OR) and used a water irrigator (Hydro Floss\textsuperscript{®}, Bessemer, AL).

At this first visit, the patient’s husband accompanied her and multiple subgingival plaque samples were obtained from him. Interestingly, no spirochetes or trichomonads were found in any of his samples despite being married for over twenty years.

Visit 2: Follow up with PCM

Patient returned after two weeks to have another plaque sample taken and evaluated under the microscope. In this plaque sample neither spirochetes nor trichomonads were detected; however, white blood cells — tri-lobed polymorphonuclear leukocytes (PMN) — were observed and were too numerous to count. This is an indication that the infection persisted even though no spirochetes could be seen (Figures 4A and 4B).

Due to the lack of observed spirochetes, the patient thought the infection was gone and decided to resume brushing with her regular toothpaste against medical advice. She was advised to return within 24 hours for another plaque sample. Plaque sample #3 (Figure 5A) revealed that the spirochetes had returned in less than 24 hours.

Spirochetes are unique and opportunistic — they can be found in one of two forms, i.e., an active form when movement can be observed, or a cystic/granular form (Figure 5B). They can assume a cystic form and go dormant until the environment changes in their favor. In this example cystic forms were found in epithelium cells (not shown) which traditional dental cleanings do not address.
These observations are consistent with the findings of others.20 When the conditions are right, the spirochete reacti
vates and the infection continues. At this point the patient wanted one last opportunity to rid herself of the infection on her own; patient was asked to keep track of what she was doing at home.

**Visit 3: Follow up with PCM and Home Care Evaluation**

The patient incorporated alternative home treatments into her oral hygiene regimen for one week. She added oil pulling alternating between tea tree and coconut oil. PerioScience rinse (PerioSciences LLC, Dallas, TX) was added twice a day, and baking soda paste used with an electric toothbrush and water irrigator. At the conclusion of that week a subgingival plaque sample (#4) was evaluated and indicated the presence of both the spirochetes and trichomonads (Figures 6A and 6B). The unique thing observed in this plaque sample was the spirochetes had much more activity such as spinning faster and with higher motility. At this point the patient decided to undergo laser-assisted periodontal therapy.

**Figure 5A.** Sample in less than 24 hours after the cessation of baking soda regimen. Spirochetes of varying motility, thicknesses, lengths, and coils return. There are more spirochetes than PMNs to fight the infection (400x magnification).

**Figure 5B.** Same slide as in 5a, but at 1000x magnification. PMN has at least two of the spore forms, that look like clear vacuoles – that is how spirochetes manage to avoid the immune system (1000x magnification).

**Figure 6A.** 2 weeks after home care with oil pulling, using backing soda and irrigator. Spirochetes (red arrows) appear more agitated than in previous slides, attacking cell remnants (white arrow) (1000x magnification).

**Figure 6B.** Trichomonads are present along with spirochetes. Trichomonads (red selection) are clustered together although they are usually found by themselves (1000x magnification).
Laser Periodontal Therapy

Four weeks after scaling and root planing and after exhausting other home care methods, the patient agreed to undergo CO₂ laser assisted periodontal therapy through perio-pocket de-epithelization and closed-flap sulcular debridement. Subgingival plaque samples were obtained pre-treatment and confirmed the presence of spirochetes and trichomonads. Patient's tissues appear healthy (Figure 7A). A consent form was signed and procedures, alternatives, risks, benefits were discussed and all questions were answered.

Anesthesia

Anesthesia for the procedure was achieved by buccal infiltrations on the maxilla with 2 carpules, one carpule (1.7cc) on each side, of 4% Septocaine with 1:100k epinephrine. The mandible was anesthetized with bilateral inferior alveolar nerve blocks of 4% Septocaine with 1:100k epinephrine (one carpule on each side). No palatal or long buccal nerve injections were given.

Laser Procedure

The crest of the sulcus was de-epithelialized with the laser set at 3 Watts SuperPulse gated at 20 Hz with 50% Duty Cycle (average power to the tissue 1,500 mWatt). 2 to 3 mm strip of epithelium around the neck of each tooth was treated to ensure that bacteria embedded into this tissue area were evaporated. Laser energy was applied in small overlapping concentric (circular) movements at the crest of the sulcus in 1 to 2 mm circles from the distal interproximal aspect toward the mesial interproximal aspect and then moving to the next tooth (Figure 7B). As this tissue heals, it brings in fresh new tissue and delays the epithelial down growth into the sulcus. First, laser treatment was completed on all of the buccal surfaces of the arch; then the procedure was performed on lingual surfaces in the same manner.

Sulcular debridement was performed with the laser set to 4 Watts SuperPulse gated at 20Hz with 50% Duty Cycle (average power to the tissue 2,000 mWatt) for the posterior (molars and premolars) and 3 Watts SuperPulse gated at 20 Hz with 50% Duty Cycle (average power to the tissue 1,500 mWatt) for the anterior (canine to

Figure 7A. Patient's tissues appear healthy.

Figure 7B. Crest of the sulcus is de-epithelialized 2-3 mm around the neck of each tooth to ensure that bacteria embedded in tissue are evaporated. De-epithelialization is performed on the buccal, then on the lingual side.

Figure 7C. After crestal de-epithelialization is complete, the distal end of the laser perio tip is inserted into the sulcus and is slowly moved around the tooth circumference, while engaging the laser. Damp gauze is used to clear the tip if tissue clogs it up. The tip moves slowly in order to transfer as much energy as possible into sulcus to evaporate anything biologic in this site.
canine). The laser periodontal tip was inserted into the patient's sulcus at the distal and moved slowly towards the mesial and into the proximal area at a rate of 2 to 3 mm/sec. The tip was kept approximately 1 mm away from the depth of the pocket (Figure 7C). The tip was slowly moved around the entire circumference of the tooth, all of the buccal surfaces were done first then the lingual surfaces were completed. Excess tissue was removed from the tip in order to prevent clogging.

Immediately following the laser therapy, a Cavitron prophy jet (Cavitron, Dentsply Sirona, York, PA) with 65 μm sodium bicarbonate powder (Air Flow, Nyon, Switzerland) was utilized to flush debris out of the sulcus — this was a full mouth procedure, just like with the laser where the application nozzle was walked around the neck of the tooth. It was performed with medium auto cycles, with the medium powder flow rate. Oral hygiene instructions were given as well as post op instructions.

After periodontal therapy was completed, the results were verified with a slide on phase-contrast microscope. No spirochetes or trichomonads were detected (Figure 8). The day of treatment, soft cold food and beverages were advised, i.e., ice cream, smoothies, shakes. The patient was instructed to observe dietary restrictions for 4 to 5 days following the treatment of no caustic or spicy foods/beverages. For the same time period the patient was advised to brush her teeth with nothing on the brush and hydrofloss with the irrigator. Following the initial healing time, the patient was to return to brushing with her electric toothbrush and baking soda after using the hydrofloss irrigator.

2 Week Follow-Up

The patient was seen two weeks postoperatively. A biofilm slide was taken and examined with PCM and the results were very minimalistic (Figures 9A). The oral environment as a whole was changed. Only one slow tumbling spirochete was observed (Figure 9A). At this visit a periodontal maintenance cleaning was completed. The patient’s gingival tissues were healing well. Areas above teeth #9 and #10 were still granulating, but appeared healthy overall (Figure 9B). The patient was instructed that good oral habits are required to maintain the results. Oral hygiene instructions were reviewed and encouraged.
Plaque samples of the mesio-lingual aspect of teeth 30 and 31 were taken and examined with the PCM at both visits. There was no re-colonization of spirochetes or trichomonads noted at the 6 week, 6 month (Figure 10A), and 1 year follow up visits (Figure 10B). This indicates that the treatment was effective at eliminating bacteria, and that the patient was following her homecare instructions. The absence of spirochetes for a one year period was encouraging and suggests a stable oral environment that was not recolonized.

**Discussion**

Dr. Samuel Cohen of Cambridge University cautions “For most of the last 114 years, everyone including scientists, mistakenly confused Alzheimer's with aging.” This is not the case. One only needs to complete an age comparison between healthy brains and those ravaged by AD to see the difference. 40 million people are currently affected by AD; and by 2050 that number is expected to increase to 150 million. Statistically, if one plans on living to the age of 85, one’s probability of contracting AD will be almost one in two. The United States will spend 259 billion dollars in 2017 for Alzheimer's care. Costs are expected to increase 500% by the year 2050 as the baby boomer generation ages. AD is poised to be one the biggest medical challenges of our generation and, like with many diseases, prevention and education are cheaper than treatments and cures.

Proposed laser therapy offers an effective preventative treatment, which, if combined with the adequate homecare, may provide an efficient technique to maintain spirochete-free oral environment. Many factors could contribute to the effectiveness of this therapy in other treated patients. This includes laser settings, medications, oral hygiene, sharing food practices, sexual and kissing partners and behaviors, genetics and host immune response. Even allowing pets licking one's face could reintroduce pathogenic bacteria into a treated mouth. Differences in these factors between the patient in this case study and her husband may explain why she was infected and he was not despite being married over 20 years.

It is worth noting that no bleeding occurred during the laser therapy, minimizing the introduction of spirochetes into the bloodstream. This is especially important if the goal is to minimize the number of bacteria released into the bloodstream and, ultimately, the brain and other organs. Absence of bleeding is attributed to highly efficient hemostatic and coagulative properties of the 10,600 nm CO₂ laser.

Of particular note is that the patient treated in this case study was a Registered Dental Hygienist with 30 years of experience. The infection in this case being due to a lack of suitable homecare seems very remote and illustrates the point that the only way to know if
more pathogenic bacteria are hosted in the mouth of our patients is to seek more data beyond periodontal probing and radiographic imaging. In this case, conventional periodontal cleanings coupled with adjunctive therapies such as a baking soda, oral irrigators, and oil pulling did nothing to definitively remove a spirochetal infection. It was only when the 10,600 nm CO2 laser was used the infection was eliminated.

There are a few limitations about this case that need to be addressed. No DNA sequencing was undertaken, as it is expensive and takes additional time in shipping. Observed eradication of spirochetes in this study does not mean other pathogenic bacteria were not able to re-colonize the mouth. Another limitation of this review is the number of subjects is low, N=1, and it is hard to extrapolate results of a single case to broader populations.

**Summary**

Early intervention for a chronic oral spirochete infection could prove to be a realistic and effective prevention of spirochete infections. Phase-contrast microscopy, uniquely suitable for spirochete imaging, has shown that a 10,600 nm CO2 laser can definitively eliminate spirochetal infections in oral cavity. There was no detectable re-colonization of spirochetes for up to 1 year. More research is needed to verify the consistency of the results across a larger patient population.

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Benefits of Laser Surgery in Veterinary Dermatology. Case Study

About the Author

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Abstract

A combination of the CO₂ laser wavelength, and SuperPulse settings, and a variety of beam geometries, allows for a char-free and bloodless surgery with highly controllable speed and depth of vaporization with dynamic range from micrometers to millimeters. The depth is proportional to laser power and inversely proportional to laser beam width and hand speed. An instant hemostasis during high speed vaporization/ablation/cutting affords the clinician with the improved visibility of the surgical field and allows for more precise and accurate tissue removal. As observed in our surgeries, healing with the CO₂ laser is markedly different from the other surgical modalities, it is uncomplicated and predictable.

Introduction

The carbon dioxide (CO₂) surgical laser has many advantageous uses and is the primary laser in use today in veterinary dermatology. The surgeon can easily control the device for use in three ways: skin incision, lesion excision and ablation. It can be readily controlled for precise microsurgery or used for ablating larger lesions. Because its wavelength is highly absorbed by water (see Figure 1), little to no collateral tissue damage occurs when this laser is used properly. Some of the skin diseases that are easily treated with CO₂ lasers include Bowenoid in-situ carcinoma, apocrine cysts, nodular sebaceous gland tumors, follicular tumors (sometimes erroneously called sebaceous cysts), various nevi and skin tags, squamous cell carcinoma, precancerous actinic lesions on the nose and pinnae, and small tumors on the pinnae, muzzle, eyelids and paws. Many of these are treatable only with the CO₂ laser; others are more easily treated with laser surgery. Below are a few examples that demonstrate why the CO₂ laser is a necessary tool in today’s veterinary dermatology practice.

Laser-tissue interaction

The key to the success of soft tissue surgical lasers is their ability to vaporize and coagulate the soft tissue at the same time, which makes many soft tissue procedures much simpler and far more enjoyable for practitioners1-11. Figure 1 presents the known optical absorption coefficient spectra of the soft tissue’s four main chromophores3-6 – water, melanin, hemoglobin (Hb)
and oxyhemoglobin (HbO₂), which are needed to understand the photo-thermal ablation (or photovaporolysis) and photo-thermal coagulation (or photopyrolysis) efficiencies for the soft tissue lasers on the market today:

- **IR CO₂ lasers circa 10,000 nm are both efficient cutters and efficient coagulators;**
- **Mid-IR Erbium lasers circa 3,000 nm are efficient cutters but poor coagulators;**
- **Near-IR diodes circa 1,000 nm are highly inefficient cutters but good coagulators.**

**Diodes are Hot Glass Tip Cautery devices.** Near-IR light heats up the charred distal end of the fiber glass tip to 500-900°C, which then heats up the soft tissue through heat conduction.

**Thermal Relaxation Time**

Soft tissue ablation and coagulation efficiencies are influenced not only by absorption/attenuation spectra, but also by laser pulse duration and tissue's thermal conductivity. The rate of how fast the irradiated tissue diffuses the heat away is defined through the Thermal Relaxation Time, TRT, which equals approximately 1.5 msec for CO₂ lasers. The most efficient heating of the irradiated tissue takes place when laser pulse energy is high and its duration is much shorter than TRT. The most efficient cooling of the tissue adjacent to the ablated zone takes place if time duration between laser pulses is much greater than TRT.

For instance, short pulse SuperPulse CO₂ lasers allow for the most efficient ablation of the irradiated tissue with minimum coagulation and hemostasis underneath the ablated tissue. The long pulse and continuous wave (CW) CO₂ lasers are less efficient cutters but provide for greater depth of coagulation for excising/incising in highly vascular and inflamed tissues like hemangioma.

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**Figure 1.** Optical absorption coefficient spectra at different (including histologically relevant) concentrations of water, hemoglobin (Hb), oxyhemoglobin (HbO₂), and melanin. Logarithmic scales are in use.
Coagulation occurs as a denaturation of soft tissue proteins that takes place in the 60-100°C temperature range leading to a significant reduction in bleeding (and oozing of lymphatic liquids) on the margins of ablated tissue. Photo-thermal coagulation is also accompanied by hemostasis due to shrinkage of the walls of blood and lymphatic vessels due to collagen shrinkage at increased temperatures. For SuperPulse CO₂ lasers, the sub 100-μm coagulation depths (can be derived from absorption depth spectra from Figure 1) extend just deep enough into a severed blood vessel capillaries to stop the bleeding; coagulation depth can be extended for longer laser pulses and for CW laser operation.

For a CO₂ laser cutting applications, greater laser fluence (i.e., energy density, or power density times the duration it applied to the target) results in greater depth and rate of soft tissue removal. The vaporization/ablation depth equals \( A \frac{(E - E_{th})}{E_{th}} \), where \( A \) is the absorption depth and \( E_{th} \) is the ablation threshold (15 micrometers and 3 J/cm², respectively), and \( E \) is the fluence delivered to the tissue. For laser beam that is moving over the target tissue, the vaporization/ablation depth is:

- proportional to laser average power, and
- inversely proportional to laser beam width, and surgeon's hand speed.

For SuperPulse CO₂ laser with 0.25 mm focal diameter of the beam (the smallest diameter with practically acceptable depth of focus in veterinary laser surgery). A requirement for multi-millimeter deep incisions with hand speed faster than 10 mm/sec is laser power above 35-45 Watts.
Small Beam Size = multi-mm Deep Incision

VetScalpel® Adjustable Handpiece from Aesculight®, displayed in Figure 3, features three spot size diameters 0.25, 0.4 and 0.8 mm. The smallest focal area of 0.05 mm² is used for fast, multi-mm deep, 0.25 mm narrow incisions with char-free margins when SuperPulse mode is utilized for the most efficient cutting (Figure 3A). Adjustable Handpiece allows for instant switch to a larger spot size of 0.8 mm diameter with 0.5 mm² area (10 times larger area than for 0.25 mm spot) for a shallow coagulation when CW mode of operation is utilized (Figure 3B), or for shallow ablation with SuperPulse mode of operation.

Large Beam Size = sub-mm Shallow Vaporization / Ablation

VetScalpel® Wide Ablation Nozzle from Aesculight®, displayed in Figures 4, 5, 7, 8, features approximately 2.5 mm x 0.4 mm large spot area of approximately 1 mm². Such wide ablation nozzle, shown in use in Figures 4 and 5, allows for approximately 2.5 mm wide pass of the laser beam over the target tissue with sub-mm depth of ablation. Wide ablation beam area is 20 times larger than focal area of 0.25 mm diameter beam in Figure 2, which allows for up to 20 times shallower ablations at high power with fast hand speed.

Figure 4. Bowenoid in situ squamous cell carcinoma in a 9 yr old Domestic Long Haired Cat. This is a cancer that remains in the outer layers of the epidermis, it will invade if not removed. Laser ablation removes the cancer and the underlying normal epidermis is left undamaged. A. Pre-op. B, C. Ablation is performed with VetScalpel® Wide Ablation Nozzle at 25 Watt SuperPulse Repeat Mode F1-2 (20 Hz, 10 msec). D. Immediate Post-op.

Figure 5. A viral papilloma on the tongue of a 3 yr old French bulldog; these are caused by a wart virus and are contagious to other dogs and this results in the affected animal’s quarantine from daycare until the wart is gone. Laser ablation on the tongue is bloodless, and is not painful post op. Removal eliminates the virus so these dogs can return to daycare immediately post-surgery. Ablation is performed with VetScalpel® Wide Ablation Nozzle at 12 Watts SuperPulse Repeat Mode F2-5, (29 Hz, 25 msec), and 8 Watts CW Repeat Mode F1-2 (20 Hz, 10 msec).
Materials and Methods

Laser Equipment

VetScalpel® CO2 laser model VS-4530 (Aesculight®, Bothell, WA) was utilized with a straight hand piece and a ceramic Wide Ablation Nozzle delivering laser spot size of 2.5 mm x 0.4 mm (area of approximately 1 mm² - the tip is shown in Figures 7A, 7B, 7C and 8A).

Laser Settings Utilized in Case Study

30 W SuperPulse Repeat F2-5 (21.75 W average power at 72.5% duty cycle). For the ablation of deeper areas, the power and pulse duration were decreased and the settings were changed to the following: 15 W non-SuperPulse Repeat F1-4 (6 W average power at 40% duty cycle).

Anesthesia and Pain Management

The patient was pre-medicated with dexmedetomidine (DexDomitor®) given at 350 μg/1.2 m² and butorphanol (Torbutrol®) at 0.01 mg/kg given intravenously and received an injection of robenacoxib (Onsior®) given at 0.2 mg/kg. General anesthesia was mask induced with isoflurane in oxygen and maintained via an endotracheal tube.

Case Study

Elbow Follicular Cysts in the Dog

Follicular cysts (known as epidermal inclusion cysts, epidermoid cysts and sometimes erroneously referred to as sebaceous cysts) are a cystic dilatation of the upper portion of the outer sheath of the hair follicle lined by a layer of stratified cornifying epithelial cells indistinguishable from the epidermis. These cysts may be solitary or multiple, firm to fluctuant, round and well-circumscribed. Follicular cysts vary in size from 2 mm to >5 cm. They are found in about a third of the non-neoplastic non-inflammatory tumor-like lesions removed in dogs. Predilection in middle-aged to older dogs has been reported. Cysts may rupture releasing yellowish, brownish or greyish material (keratin) into the surrounding dermis and subcutis. Keratin is highly irritating, evoking a strong inflammatory response and secondary bacterial infection. The inflammation, especially with multiple cysts, may irritate the dog, lesions may become painful, pruritic, or both, causing the dog to constantly lick and chew the affected area which exacerbates the problem. The therapy of choice for multiple follicular cysts is surgical ablation.

Patient

Sadie, a female spayed Chesapeake Bay retriever, was brought with follicular cysts on both elbows (Figure 6). The cysts periodically had become inflamed and then ruptured with discharge. Initially the problem improved temporarily with the use of Differin gel (retinol) and Mupirocin prescribed by the local veterinarian. However, by the time of the visit to our dermatology clinic these medications had stopped working, the elbows became extremely pruritic and the dog constantly licked them. The problem with follicular cysts had persisted for 1.5 – 2 years and the symptoms were not seasonal. The dog had allergies and had been treated by her local veterinarian with SLIT allergen solution and hypoallergenic diet. Physical examination revealed moderately raised, erythematous elbow callus areas. The right side had a long extended erythematous raised area with several hemorrhagic draining tracts. The left side callus was smaller but with similar hemorrhagic tracts. There were visible comedones with keratin easily expressed from both of these areas. It was decided to ablate the follicular cysts from both elbow areas with a CO2 laser.

Figure 6. Preoperative aspect of the left and right elbows with multiple follicular cysts.
Surgical Procedure

The surgical area was aseptically prepared, including the clipping of overlying hair. The larger section of the skin with follicular cysts on the right elbow was excised – it was first outlined with a single pass of the laser (Figure 7A). Then the edge of the lesion was grasped with a tissue forceps and retracted, while the lesion was undermined with the laser beam and excised (Figure 7B). In the process, two larger blood vessels were severed and had to be ligated. The remaining section of the elbow skin with multiple follicular cysts was ablated with several laser passes (Figure 7C). After each pass the surgical site was wiped with sterile saline on gauze pads and gentle pressure was applied to express the contents of the remaining deeper follicular cysts until the surgeon ensured that no more cysts were left (Figure 7D).

The affected area on the left elbow was much smaller. The follicular cysts were ablated in multiple laser passes (Figure 8A), with the contents of the cysts expressed and wiped away between each pass (Figure 8B). The laser procedure continued until no content could be expressed. All ablated tissue and debris were removed with a sterile gauze pad prior to wound closure (Figure 8C).

Wound Closure

For each elbow, surgical margins were apposed and sutured (vicryl was used for subcutaneous and nylon for cutaneous closure) (Figure 9). A soft wrap was then
applied to help holding the surgical margins together, as well as to decrease the swelling and to absorb any serum leakage. Then the suture site was treated with mupirocin 2% ointment and covered with a Telfa pad, cast padding and the usual outer bandage material. The patient was used to the DogLeggs™, so this was a good way to help prevent her from bothering the bandage.

**Postoperative Care**

To prevent an infection at the site, the patient was put on a three-week course of oral cephalexin (500 mg capsules, two capsules b.i.d.). This is warranted, because of all of the follicular contents coming out onto the surgical area. For pain management the patient was prescribed tramadol (50 mg tablets, 1.5 tablets once or twice daily, as needed).

**Follow Up**

The patient was seen by a local vet for bandage change at three days after the surgery, and again four days later. After this first post op week of bandage changes the bandages were changed every seven days until healed. At the bandage change, the suture sites were gently cleaned with chlorhexidine scrub and the area was patted dry. Then the suture site was covered with mupirocin 2% ointment, a Telfa pad, cast padding and the usual outer bandage material and protected with the DogLeggs™. During the first week, there is typically some inflammation and serum seepage which subside by the second week. Sutures were removed three weeks postoperatively.
Discussion

In most cases the CO₂ laser proves curative and resolves the problems caused by multiple follicular cysts on canine elbows, such as swelling, inflammation, draining hemorrhagic tracts, pruritus, pain, and secondary infection. This laser procedure combines both excision and vaporization of the affected skin containing follicular cysts. Laser surgery allows ablation of multiple layers of cysts and adjacent hair follicles without excessive thermal damage to the surrounding normal tissues. The procedure was facilitated by the ability of the CO₂ laser to coagulate small blood vessels during the surgery. The recovery was uneventful (Figure 10), with no concerns reported by the dog’s owners.

Summary

A combination of the CO₂ laser wavelength, and Super-Pulse settings, and a variety of beam geometries, allows for a char-free and bloodless surgery with:

- **Highly controllable speed and depth of VAPORIZATION/ABLATION/INCISION** with dynamic range from micrometers to millimeters. The depth is proportional to laser power and inversely proportional to laser beam width and hand speed;¹²⁶
  - **Sub-100 µm coagulation/hemostasis depth, which closely matches the blood capillary diameters.⁵** It allows for an instant hemostasis during high speed ablation/cutting. It affords the clinician with the improved visibility of the surgical field and therefore allows for more precise and accurate tissue removal;⁷ coagulation depth can be increased by utilizing a long pulse or CW laser operation.
  - **Minimal post-operative pain, discomfort, swelling and edema, significantly reduced post-surgery production of myofibroblasts, diminished wound contraction and scarring.¹²¹¹** As observed in our surgeries, healing with the CO₂ laser is markedly different from the other surgical modalities, it is uncomplicated and predictable.

Acknowledgement

Author is grateful to Peter Vitruk, PhD for help in providing Figures 1 and 2, and to Anya Glazkova, PhD for assistance in organizing this material for publication.

References


Figure 10. Healed surgical areas 12 weeks post-op.
Surgical Glue Dressing Usage During Post-Frenectomy Second Intention Wound Healing

About the Author
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Abstract
The use of the cyanoacrylate surgical adhesive as a protective dressing over the unsutured CO₂ laser surgical wound is presented. Such wound dressing is shown to consistently result in smooth uncomplicated healing, without the return of restriction (referred to as “reattachment”). Such dressing allows patients to perform the normally prescribed post-frenectomy myofunctional exercises easier and more comfortably.

Surgical Wound Healing
The two main types of wound healing are by primary intention and by secondary intention. Healing by primary intention is the fastest type of closure. Wounds that heal by primary closure have a small, clean defect that minimizes the risk of infection and requires new blood vessels and keratinocytes to migrate only a small distance. Primary intention healing includes four overlapping stages:
1) Hemostasis – the action of platelets and cytokines forms a hematoma and causes vasoconstriction, limiting blood loss at the affected area. The close proximity of the wound edges allows for ease of clot formation and prevents infection by forming a scab;
2) Inflammation – a cellular inflammatory response acts to remove any cell debris and pathogens;
3) Proliferation – cytokines released by inflammatory cells drive the proliferation of the fibroblasts, and the formation of granulation tissue. Angiogenesis is promoted by the presence of growth mediators with surgical glue, which, in her experience, leads to comparable, or better, clinical outcomes than secondary intention healing alone.
(e.g., PDGF, TGF-β, EGF, VEGF, basic FGF (bFGF), others), allowing for further maturation of the granulation tissue. The production of collagen by fibroblasts allows for closure of the wound after approximately a week; 4) **Remodeling** – devascularization of the region occurs, and the fibroblasts undergo apoptosis.

**Healing by secondary intention** describes the healing of a wound in which the wound edges cannot be approximated. It occurs in the same four overlapping stages as primary intention healing (i.e., hemostasis, inflammation, proliferation and remodeling), but the processes involved in some of the stages are different. During the inflammation phase, there is a larger amount of cell debris present than in a primarily closed wound, and the inflammatory reaction tends to be more intense than in primary intention. During the granulation phase, granulation tissue forms at the bottom of the wound. This is an important step – as the epithelia can only proliferate and regenerate once granulation tissue fills the wound to the level of the original epithelium. Once the granulation tissue reaches this level, the epithelia can completely cover the wound. And because the surface to heal is much larger than that of a primary closed wound, this stage takes longer to complete. During the remodeling phase, the inflammatory response begins to resolve, and wound contraction can occur. The goal of this phase is to increase the tensile strength of the wound. Myofibroblasts are especially important in secondary intention healing. They are a cell phenotype that is differentiated from smooth muscle cells and some other precursor cells and act to contract the wound, decreasing the space between the wound edges. They are also responsible for the secretion of extracellular matrix (ECM). Studies have demonstrated that the increased myofibroblasts' activity results in scarring and suggested that reduced activation/differentiation of myofibroblasts ultimately inhibits scar formation.

**Healing of Intraoral CO2 Laser Second Intention Wounds**

Studies have found delays in healing of CO2 laser wounds, compared to scalpel ones, mainly at the stages of inflammation and proliferation. Wound healing delay is caused by temporary postponement of inflammation, phagocytic resorption, collagen production and re-epithelialization in the early stages of repair. It was also found that CO2 laser excisions during healing contained fewer myofibroblasts than corresponding scalpel excisions, which are known to heal by contraction. This reason is likely why a minimal degree of contraction in CO2 laser excision wounds is observed and there is less potential for excess scarring.

**Why Surgical Glue Dressing?**

Usually after a laser frenectomy procedure, patients are instructed to perform lingual and labial exercises to prevent reattachment. Through clinical observations in the author’s operatories, it has been noted that patients who diligently follow the prescribed oromymofunctional therapy — i.e., they perform the tongue and lip exercises exactly as instructed and do so with the frequency and duration recommended — have very satisfactory outcomes with minimal to no reattachment issues.

However, this author has seen that patients, who are not as proactive in the exercises, can experience reattachment at the frenectomy site. In addition, there is much patient confusion regarding the wound care routine after the laser frenectomy procedures. Many seek unprofessional help online and wonder if they should touch / manipulate the wound to prevent reattachment. The instructions of post-frenectomy exercise routines also vary among clinicians, which may leave patients more confused about how to care for the wounds.

While researching procedures that might prevent reattachment regardless of adherence to myofunctional exercises, the author considered sutures that both close the surgical site and hold the tissue in place to prevent tissue regrowth. However, as many clinicians can attest, sutures, particularly in sites that routinely experience mechanical stress, can cause significant discomfort for patients. A better alternative is the use of cyanoacrylate surgical periodontal glue to dress the
wound, given the ease of application and fast set times. PeriAcryl® 90 solution (GluStitch Inc, Delta, Canada) used in the author's practice, utilizes a mixture of cyanoacrylates that combines the bacteriostatic and hemostatic properties of N-butyl cyanoacrylate with the flexibility and slower degradation of the longer chain 2-octyl cyanoacrylate. PeriAcryl® 90 has been formulated to work in the oral cavity and has become a popular product in oral surgery. Due to their hemostatic and bacteriostatic properties and because they serve as a protective barrier during the initial healing phase, cyanoacrylates have been successfully used in periodontics, for example, as a dressing over the graft donor (or recipient) site, a biopsy site, mucosal ulcerations or over a tooth extraction socket in patients with bleeding disorders.

The author has seen excellent results from using PeriAcryl® 90 solution at the site of frenectomy. It is applied as a dressing to seal the wound, protecting it from debris and infection and preventing the wound edges from excessive gaping during mastication and speech — it gives the wound stability without putting mechanical stress on the edges by creating a flexible scaffold. In addition, cyanoacrylates have been shown to increase the expression of matrix-degrading enzymes, or matrix metalloproteinase (MMPs), in models of wound healing. This may indicate that this barrier is also aiding wound healing and slowing down the creation of scar tissue by allowing for tissue remodeling and breakdown of excess extracellular matrix.

Caution should be taken to apply only minimally necessary amounts of the glue. The adhesive is left at the surgical site for approximately 10 seconds allowing the glue to set. Then the surgeon stretches the lips or tongue in a manner that simulates the therapeutic exercises the patients are instructed to do. The flexibility of the cyanoacrylate material does not appear to prevent the tissue from going through the proper range of motion required for the exercises. Immediately after application, excess glue is removed with a gauze sponge or Q-tip to prevent the creation of any mass that might cause irritation or pain at the wound. If too much of the adhesive solution is applied, it may result in an overly thick layer of hardened glue; this rigid structure might cause discomfort for the patient.

This paper describes case studies of laser frenectomies when cyanoacrylate dressing is applied to the release site immediately upon completion of the procedure. Author postulates that the application of the surgical glue, to an extent, mimics the effect of a surgical wound closed by sutures (i.e., it provides slight tension), while creating a scaffold preventing the wound from closing back on itself (similar to a dressing-assisted, or accelerated, secondary intention healing).

Materials and Methods

The LightScalpel 10,600 nm CO₂ laser was at 2 W of power in the SuperPulse mode with Gated Repeat Pulse setting F1-6 (1.2 W average power delivered to target tissue). The laser was equipped with an autoclaveable straight tipless handpiece with 0.25-mm focal spot size.

Anesthesia: ½ carpule Xylocaine 2% (lidocaine HCL 2% with epinephrine 1:100,000) was administered by local infiltration to each site.

Wound dressing: The wound is sealed with a thin layer of the formulated cyanoacrylate tissue adhesive with approximately 0.2 mL of PeriACryl® 90, carefully applied to the site of release.

Post-op instructions: The patient or the patient's parents are instructed (starting immediately post laser procedure and glue application) to ensure tongue and lip stretching exercises are performed. Such exercises include steps: (1) Tongue to spot (tongue touching the inside of the upper front teeth); (2) Tongue to spot swallowing; (3) Tongue to touch the chin; (4) Push Tongue to touch right; (5) Push Tongue to touch left; (6) Click the Tongue 15 times - make a loud clicking sound with the tongue against the roof of the mouth; (7) Wipe the tongue from upper 2nd molars to 2nd molars, from right to left and back, inside and outside the teeth.

Postoperative Follow-Ups: The patient is typically seen approximately 10 days and then 3 weeks after the procedure (plus/minus couple of days depending on clinic's and patient's schedules). At each visit the importance of tongue and lip exercises is emphasized. At the 10 day follow up, the glue is sometimes already dis-
solved. Occasionally, however, a small amount of the glue may remain the tissue and is carefully removed with tweezers. Upon clinical examination between days 14 and 30 post-surgery, wounds appear completely closed and the tissue appears normal.

**Case Study 1**

**Lingual Frenectomy**

The patient, a 38-year-old male, was presented with a deep bite, severe bruxism, and multiple chipped and worn teeth. It was decided to release patient’s tight lingual frenum (Figure 1A) with the CO₂ laser. Gentle tension was applied to the tongue to facilitate the procedure. Frenectomy started with several short horizontal laser passes in the middle of the frenum (CO₂ laser beam was directed perpendicular to the tissue). The clinician then noted tension above the wound and continued laser ablation in short zigzagging motion apically until the tension began to release. The remaining restriction was then removed horizontally, extending laser incision laterally in both directions (Figure 1B). The wound was thoroughly examined and dressed with a thin layer of the surgical adhesive. Figure 1C shows the surgical site ten days after the procedure, with some adhesive was still present and carefully removed with tweezers; no infection or reattachment was noted. Healing progressed well at seventeen days examination (Figure 1D). At twenty three days after the surgery, the wound appeared completely healed (Figure 1E).
Case Study 2
Lower Labial Frenectomy

The patient, a four-year-old female, presented with a crowded dentition, deep bite and sleep bruxism. Intraoral examination showed a restrictive lingual and lower labial frenum. It was decided to release both frena with a CO₂ laser; only a lower labial frenectomy is presented in this article. The decision to release the lower labial frenum (see Figure 2A) was based on evaluation of function and not the appearance. To release the mandibular labial frenum, incision was started at the place of the frenal insertion into the attached gingiva. Several short back and forth laser passes were made and then the incision was extended laterally both the right and left to ensure that no fibers remained and the lip function was unobstructed. After frenectomy, the wound was dressed with the surgical adhesive, as described above. The patient was seen 11 days postoperatively and the healing progressed well (Figure 2B). Patient’s parents were diligent with her myofunctional exercises. Some adhesive was still present at the surgical site and it was carefully removed, taking precaution to not disrupt the wound. No signs of edema, infection or abnormal scarring were present. The visit at three weeks after the frenectomy (Figure 2C) showed no visible scarring.

Summary

The use of the cyanoacrylate surgical adhesive as a protective dressing over the unsutured CO₂ laser surgical wound has been shown to consistently result in smooth uncomplicated healing, without the return of restriction. Such dressing allows patients to perform the normally prescribed post-frenectomy myofunctional exercises easier and more comfortably. Regardless of patients’ compliance with their exercise routine, wound healing appears improved and reattachment is minimized compared to procedures performed without PeriAcryl® 90 dressing. The author recommends utilizing this technique for use in patients from toddlers to adults as an adjunct to laser frenectomy surgery.

Acknowledgement

Author is grateful to Peter Vitruk, PhD and Anya Glazkova, PhD for assistance in organizing this material for publication.

References


Welcome To The
ALSC Inaugural Symposium
April 6-8, 2018
Orlando, FL, USA
Symposium Schedule

Overview

Friday, April 6th, 2018
7:00am - 8:00am  Registration / Check-In
8:00am - 10:10am Joint Session / Keynote Addresses
10:10am - 10:30am Coffee Break
10:30am - 12:45pm Breakout Sessions
12:45pm - 1:45pm Lunch catered in the Atrium
1:45pm - 3:15pm Breakout Sessions
3:15pm - 3:30pm Coffee Break
3:30pm - 5:00pm Breakout Sessions
5:00pm - 5:10pm Coffee Break
5:10pm - 6:00pm Panel Discussions
6:00pm - 8:00pm Cocktail reception immediately following in Atrium

Saturday, April 7th, 2018
8:00am - 10:10am Joint Session / Keynote Addresses
10:10am - 10:30am Coffee Break
10:30am - 12:45pm Breakout Sessions
12:45pm - 1:45pm Lunch catered in the Atrium
1:45pm - 3:15pm Breakout Sessions
3:15pm - 3:30pm Coffee Break
3:30pm - 5:00pm Breakout Sessions
5:00pm - 5:10pm Coffee Break
5:10pm - 6:00pm Panel Discussions

Sunday, April 8th, 2018
8:00am - 10:00am Joint Session
10:00am - 10:15am Coffee Break
10:15am - 11:45am Joint Session
11:45am - 12:00pm Awards and Closing
### Symposium Schedule Detailed

**Inaugural ALSC Symposium Orlando, Florida, April 6th-8th 2018**

*All sessions are in a lecture format. CE Credit is provided on an hour for hour basis of instructional time. Each lecture is 0.75 CE credit. Each keynote speaker’s lecture is 1 CE credit.*

**TRACKS GUIDE (See Colored Dots After the Presentation Titles)**
- **Frenectomy** - For Pediatricians, Pediatric Dentists, Dentists, Oral Surgeons, ENTs, IBCLCs, OMTs, SLPs, and other specialists
- **Dentistry** - For Dentists, Dental Hygienists, Oral Surgeons, Veterinary Dentists, and Veterinary Surgeons
- **Veterinary Dentistry and Surgery** - For Veterinary Dentists and Veterinary Surgeons, Dentists, and Oral Surgeons
- **Dermatology and Cosmetic Surgery** - For Cosmetic Surgeons, Oral and Maxillofacial Surgeons, Veterinary Dentists, Veterinary Surgeons, and Dentists

#### FRIDAY, APRIL 6TH SCHEDULE

**Combined Joint Session / Keynote Addresses**
8:00am - 10:10am - 2 Presentations

- **Scott Siegel, MD, DDS, FACS, FICS, FAAP**: Laser Frenectomy: 18-year Experience with CO2 Laser from Infants Through Adults
  - **8:10am - 9:10am**
- **C. Kumar N. Patel, PhD, MS**, the Inventor of the CO2 Laser:
  The Discovery and Science of the CO2 Laser
  - **9:10am - 10:10am**

10:10am - 10:30am - Coffee Break

### Laser Dentistry & Laser Surgery Session

**10:30am - 12:45pm - 3 Presentations**

- **Robert Levine, DDS**: The State of the Art of Dental Lasers
  - **10:30am - 11:15am**
- **Richard Winter, DDS, MAGD, DABO/ID, DICOI, FAAID, FADI, FICD, DABLS**: LightSculpel 10,600-nm Laser Use in an Advanced Reconstructive Implant Dental Practice
  - **11:15am - 12:00pm**
- **David D. Duclos, DVM, DACVD**: Excision of follicular tumors, claw carcinoma and eyelid tumors in the dog using CO2 laser excisional technique
  - **12:00pm - 12:45pm**

12:45pm - 1:45pm - Lunch catered in the Atrium

**1:45pm - 3:15pm - 2 Presentations**

  - **1:45pm - 2:30pm**
- **Noel Berger, DVM, MS, DABLS**: Veterinary oral laser surgery: Feline stomatitis, canine tonsillectomy, Laser epulis removal and gingival hyperplasia remodeling
  - **2:30pm - 3:15pm**

3:15pm - 3:30pm - Coffee Break

**3:30pm - 5:00pm - 2 Presentations**

- **Christopher J. Winkler, DVM, VMLSO, DABLS**: CO2 Surgical Laser in Veterinary Procedures: A Case Review
  - **3:30pm - 4:15pm**
- **Lorraine A. Corriveau, DVM, DABVP (canine/feline)**: General Practice use of the CO2 surgical laser in veterinary medicine: Case Presentations
  - **4:15pm - 5:00pm**

5:00pm - 5:10pm - Coffee Break

### Laser Frenectomy Session

**10:30am - 12:45pm - 3 Presentations**

- **Richard Baxter, DMD, MS, DABLS**: Clinical Pearls and How to Start Performing Laser Frenectomies in Your Office
  - **10:30am - 11:15am**
- **Martin Kaplan, DMD, DABLS**: Laser Frenum Surgery is More than Just the Frenum
  - **11:15am - 12:00pm**
- **Cara Riek, DNP, RN, FNP-BC, IBCLC, DABLS**: Unbuckling the Buccals: Case studies discussing laser revision of buccal ties from a breastfeeding standpoint
  - **12:00pm - 12:45pm**

12:45pm - 1:45pm - Lunch catered in the Atrium

**1:45pm - 3:15pm - 2 Presentations**

- **Annette Skowronski, DDS, FAGD, DABLS**: The Ethical Conundrum: Separating Science and Marketing
  - **1:45pm - 2:30pm**
- **Diana Batoon, DMD**: Sleep Disordered Breathing in the Pediatric Population - Lasers and the Airway
  - **2:30pm - 3:15pm**

3:15pm - 3:30pm - Coffee Break

**3:30pm - 5:00pm - 2 Presentations**

- **Matthew Rowe, DDS, MSD**: Laser Frenectomy: Integration of a Tripartite Approach to Collaborative Care
  - **3:30pm - 4:15pm**
- **Martin Kaplan, DMD, DABLS**: Review of Techniques for Biopsy, Mucoceles and Fibromas in Infant and Pediatric Frenectomy Patients
  - **4:15pm - 5:00pm**

5:00pm - 5:10pm - Coffee Break

5:10pm - 6:00pm - Panel Discussions
### Symposium Schedule **Detailed**

#### SATURDAY, APRIL 7TH SCHEDULE

**Combined Joint Session / Keynote Addresses**

8:00am - 10:10am - 2 Presentations

- **Warren B. Seiler III, MD, DABLS**: Review of Laser Wavelengths Utilized in a Modern-Day Cosmetic Laser Surgery Practice ● ● 8:10am - 9:10am
- **Robert Strauss, DDS, MD, FACS**: Ablational and Incisional Cosmetic Facial Surgery ● 9:10am - 10:10am

10:10am - 10:30am - Coffee Break

#### Laser Dentistry & Laser Surgery Session

10:30am - 12:45pm - 3 Presentations

- **Jack T. Krauser, DMD**: The 10,600 nm SuperPulse CO₂ Laser May Alleviate the Late Implant Failure Linked to Tissue Tension ● 10:30am - 11:15am
- **William E. Schultz, DVM**: Veterinary Soft Palate Laser Resection, and Laser Repair of Nares, Lip and Palate Deformity 11:15am - 12:00pm
- **David D. Duclos, DVM, DACVD**: Ablation of various dermatologic lesions in the dog and cat ● ● 12:00pm - 12:45pm

12:45pm - 1:45pm - Lunch catered in the Atrium

1:45pm - 3:15pm - 2 Presentations

- **Praveen A. Arany, BDS, MDS, MMSc, PhD**: Non-surgical applications of Lasers in Dentistry - Photodynamic versus Photobiomodulation Therapy ● ● ● 1:45pm - 2:30pm
- **Robert Convissar, DDS, FAGD**: Ethical and Legal Ramifications of Using Diode Lasers for Closed Periodontal Pocket Therapy 2:30pm - 3:15pm

3:15pm - 3:30pm - Coffee Break

3:30pm - 5:00pm - 2 Presentations

- **Noel Berger, DVM, MS, DABLS**: Veterinary laser surgery of the skin: ears to ears and anything in between ● 3:30pm - 4:15pm
- **Yuliya Cherepinskaya, PhD**: Evaluation of Clinical Efficiency of Er:Cr: YSGG (2,780 nm) Laser for Gingivectomy 4:15pm - 5:00pm

5:00pm - 5:10pm - Coffee Break

5:10pm - 6:00pm - Panel Discussions

#### Laser Frenectomy Session

10:30am - 12:45pm - 3 Presentations

- **Paula Fabbie, RDH, BS, COM**: Success with complex cases: Utilizing CO₂ laser and OMT to achieve optimal function and long term results ● 10:30am - 11:15am
- **Karen Wuerzt, DDS, PA, DABLS**: SuperPulse 10,600 nm CO₂ Laser Revision of Lingual Frenulum Previously Released with a Diode 11:15am - 12:00pm
- **Brooke Pettus, RDH, BSDH**: Having Fun to Achieve Function: A Quick Guide to Motivating Patients and Customizing Pre/Post Frenectomy Care Techniques for All Ages 12:00pm - 12:45pm

12:45pm - 1:45pm - Lunch catered in the Atrium

1:45pm - 3:15pm - 2 Presentations

- **Cara Riek, DNP, RN, FNP-BC, IBCLC, DABLS**: Research to Practice: Putting together a multi-center study to address laser frenectomy release and long-term breastfeeding rates 1:45pm - 2:30pm
- **Leonard Kundel, DMD**: Osteopathically guided release of oral restrictions and return to proper orofacial function 2:30pm - 3:15pm

3:15pm - 3:30pm - Coffee Break

3:30pm - 5:00pm - 2 Presentations

- **Brynn L. Leroux, DDS**: Pediatric Dental Laser Procedures with X-Lase Diode and LightScalpel CO₂ Laser 3:30pm - 4:15pm
- **Peter Vitruk, PhD / Anna “Anyia” Glazkova, PhD**: Literature Review of Wound Healing as it relates to Frenectomy Tools 4:15pm - 5:00pm

5:00pm - 5:10pm - Coffee Break

5:10pm - 6:00pm - Panel Discussions

#### SUNDAY, APRIL 8TH SCHEDULE

**Combined Joint Session**

8:00am - 10:00am - 2 Presentations

- **Warren B. Seiler III, MD, DABLS**: The American Board of Laser Surgery Certification Process ● ● ● 8:00am - 9:00am
- **Peter Vitruk, PhD**: American Board of Laser Surgery Written Certification Examination ● ● ● 9:00am - 10:00am

10:00am - 10:15am - Coffee Break

**Combined Joint Session**

10:15am - 11:45am - 2 Presentations

- **Robert Levine, DDS**: Laser Education Curriculum Challenges at Dental Schools 10:15am - 11:00am
- **Cara Riek, DNP, RN, FNP-BC, IBCLC, DABLS / Peter Vitruk, PhD**: Infant Laser Frenectomy IRB Study Design Parameters 11:00am - 11:45am

11:45 – 12:00pm - Awards and Closing
Scott Siegel, MD, DDS

Laser frenectomy: 18-year experience with CO₂ laser from infants through adults

This presentation is focused on 18 years of private and academic clinical practice in oral and maxillofacial surgery in which the primary focus is the treatment of infants through adults for frenectomies with Tethered Oral Tissues (most commonly known as lip and tongue ties). To date over 17,000 frenectomy procedures using CO₂ laser have been tracked and documented. The history of my practice stemming from introduction to CO₂ lasers in my surgical residency training, utilizing scissors and scalpels to complete transition to lasers will be discussed. The patient population in my practice receiving these minimally invasive surgical treatments are broken down into the subcategories of infants with breastfeeding/feeding problems, infants with aerodigestive problems, babies and toddlers with feeding problems, children and adolescents with speech/articulation disorders, children and adolescents swallowing/feeding disorders, children and adults with craniofacial, oromyofunctional disorders and sleep apnea. Diagnosis, indications, surgical techniques, aftercare and outcomes will be discussed. Historic relevance of laser technology, use of various types of soft tissue lasers in my practice and superiority of CO₂ laser for these procedures will also be discussed.

C. Kumar N. Patel, PhD, MS

The Discovery and Science of the CO₂ Laser

Kumar N. Patel, PhD, MS, invented the carbon dioxide (CO₂) laser in 1964. This presentation describes the invention of the CO₂ laser. The course attendees are introduced to the main physics concepts behind the CO₂ laser technology. The presentation outlines the changes the invention has brought to soft tissue surgery since the laser’s inception over 50 years ago.

Warren B. Seiler III, MD, DABLS

Review of Laser Wavelengths Utilized in Modern Day Cosmetic Surgery Practice

Over the last 10 years there have been many new wavelengths that have been discovered to be usable to treat different medical and cosmetic concerns in a cosmetic laser surgery practice. This presentation will discuss some of those different laser/light wavelengths, what conditions they treat, how they can be utilized in a cosmetic practice, what training and regulations are necessary, and why one would use one wavelength over another depending on the patient skin type, condition, funds available and downtime allowance. This presentation will also show some before and after pictures (with patient permission) and give some clinical guidelines and pearls for application and treatment. The importance of pre- and post-treatment skincare and preparation will also be discussed. Time for questions will be allowed.

Robert Strauss, DDS, MD, FACS

Ablational and Incisional Cosmetic Facial Surgery

Lasers have become an important tool in the field of soft tissue surgery. Using them safely and efficiently in private practice requires understanding of how to choose the correct wavelength, power, time and beam spot size. In his presentation, Dr. Strauss will discuss, demonstrate, and guide participants through the most popular laser wavelengths, physics of laser surgery, means of controlling a laser’s effect on tissue, and the basic techniques of laser use. In addition, the attendees will learn safety principles associated with laser use.
Praveen Arany, BDS, MDS, MMSc, PhD

Non-surgical applications of Lasers in Dentistry – Photodynamic versus Photobiomodulation Therapy

The use of low dose lasers for non-surgical applications includes selective destruction of cells or microbes termed Photodynamic therapy. Advances in dyes and laser devices is enabling wide spread use of this technique in clinical dentistry. A key advantage of this technique is a lack of antimicrobial resistance that allows targeting of difficult to treat microbial strains. Another use of low dose laser treatments involves alleviation of pain and inflammation as well as promotion of tissue healing and regeneration termed Photobiomodulation Therapy. A more thorough understanding of its mechanisms is enabling the use of this innovative treatment for broad spectrum of dental diseases including TMD, accelerated tooth movement, periodontal and peri-implant therapy and regeneration with dental stem cells, among others. This presentation will provide an overview of these laser applications in clinical dentistry.

Diana Batoon, DMD

Sleep Disordered Breathing in the Pediatric Population – Lasers and the Airway

Untreated or misdiagnosed Sleep Disordered Breathing in the pediatric population has a significant impact on the deterioration of health, development, and self-confidence in young lives. Each year a large population of children with symptoms of mouth-breathing, snoring, bruxism, bed-wetting and ADD/ADHD go untreated and misdiagnosed. Unaware that Sleep Disordered Breathing is the root cause of their troubles, parents and children pursue treatments that make their situation worse, both in the present and the long run. It more important than ever for the dental community to empower families to heal this condition instead of just cope with it.

Richard Baxter, DMD, MS, DABLS

Clinical Pearls and How To Start Performing Laser Frenectomies in Your Office

Often hearing about the techniques and success stories of the laser frenectomy procedure for tongue and lip-tie release will inspire a practitioner to want to provide these services in his or her community. The difficult issue is how to practically incorporate these patients into the schedule, and how to actually get started seeing patients. With this “nuts and bolts” lecture, Dr. Baxter will share his insights, successes, and failures in treating patients with restricted frenae. Dr. Baxter will also share clinical pearls regarding best practices and how to evaluate, treat, and ensure proper follow-up for these patients to give the best outcomes. Many cases will be presented from newborn to adolescent and from nursing, speech, and feeding issues. In addition, clinical videos will supplement the discussion to demonstrate techniques so the practitioner can see the release technique for different ages and anatomy.

Noel Berger, DVM, MS, DABLS

Veterinary oral laser surgery: Feline stomatitis, canine tonsillectomy, Laser epulis removal and gingival hyperplasia remodeling

Elongated soft palate correction, Tonsillectomy, Epulectomy / Gingivectomy, Stomatitis treatment in cats, Tongue tumor surgery, Marsupialization of salivary mucocele / ranula, and Oral cancer surgery will be reviewed. The oral cavity has an excellent blood supply and the soft tissues are generally very well hydrated. These features make traditional surgery challenging due to the inherent vigorous bleeding that is expected during surgical procedures. The use of surgical lasers provides an effective method to reduce or prevent excessive bleeding, thus reducing the time spent in surgery, and thereby reducing post-surgical complications.
Noel Berger, DVM, MS, DABLS  
**Veterinary laser surgery of the skin: ears to rears and anything in between**

Single Pass Full Thickness Skin Incisions in Veterinary Patients, Laser Surgery of the Ear Pinna, Laser Surgery of the Ear Canal, Laser Surgery of the Skin, Orthopedic Applications for Laser Surgery, Laser Surgery in Aqueous Environments, Veterinary Laser Surgery of the Perineum will be reviewed. Living tissue has an excellent blood supply and these soft tissues are generally very well hydrated and heavily innervated. These features make traditional surgery challenging due to the inherent bleeding and pain that is expected during surgical procedures. The use of surgical lasers provides an effective method to reduce or prevent excessive bleeding and pain, thus reducing the time spent in surgery, and thereby reducing post-surgical complications. Some procedures are so laser-dependent that it would be considered difficult or impossible for a general practitioner to perform it without the use of a surgical laser.

Yuliya Cherepinskaya, PhD  
**Evaluation of Clinical Efficiency of Er.Cr: YSGG (2,780 nm) Laser for Gingivectomy**

The literature data shows that erbium laser for the treatment of gingival hyperplasia is one of the promising directions in modern periodontics; and it allows achieving good clinical results due to several clinical advantages of laser impact, such as: the laser cut is more accurate and precise than the scalpel one, it allows to achieve hemostasis and coagulation of small blood vessels that create a dry operating area and provide a good visual control, minimal invasive intervention, thus improving healing, and reduced damage to surrounding tissue; the laser also disinfects the wound surface due to heat generation. Formation of coagulant layer and destruction of bacteria is leading to the reduction of the risk of diseases transmitted through the blood and prevention of a secondary infection. Coagulation of small lymphatic vessels and, as a consequence, the reduction in postoperative edema contribute to the reduction in the recovery time, pain reduction, minimal wound contraction with minimal scarring, etc. Laser surgery may be less painful and, therefore, requires less use of anesthesia than conventional scalpel surgery in oral soft tissue procedures, less prescription drugs for pain relief and possibly no prescription anti-inflammatory medications.

Robert Convissar, DDS, FAGD  
**Periodontitis and Periimplantitis – State of the Art Laser – Assisted Tissue Regeneration 2018**

Soft and hard tissue regeneration has always been an ideal, yet elusive goal when treating periodontal and peri-implant disease. This course will provide the attendee with a 12 step program to achieve laser-assisted periodontal tissue regeneration. This technique is also applicable to peri-implantitis treatment. Though lasers have been used in dentistry for over 25 years, and many laser companies have made many claims about regeneration of tissue, these techniques will be proven to work via case reviews and supported by a critical review of the peer-reviewed literature.

Lorraine A. Corriveau, DVM, DABVP  
**General Practice use of the CO2 surgical laser in veterinary medicine: Case Presentations**

Minimizing bleeding and pain in the veterinary patient is a benefit of the CO2 laser in veterinary medicine. The use of the CO2 laser for procedures that would traditionally be done with a scalpel blade allows for better visualization and can shorten the length of a procedure for a veterinarian and patient. Utilizing the CO2 laser allows for some procedures to even be done under a local anesthetic block, +/- sedation, instead of general anesthesia in older patients. The excellent hemostasis the CO2 laser provides makes it an ideal tool for use in small exotic species or in areas that are highly vascular such as the mouth and nose. This session will present several case studies where the CO2 laser was an asset in veterinary medicine such as with exotics, in the mouth for biopsy or nodule removals, and ablation of ceruminous gland hyperplasia affecting the feline ear.
David D. Duclos, DVM, DACVD

Ablation of Various Dermatologic Lesions in the Dog and Cat

This presentation will focus on ablation of veterinary dermatologic lesions using larger spot size and fluence required to ablate the lesions. It will include demonstrations using higher watts and power density needed in the more dense part of these lesions and then when the procedure approaches the normal tissue demonstrations of how easy it is for the surgeon to decrease the power density, and pulse rate using the newer VetScalpel by Aesculight. Dermatologic cases will include Bowenoid in-situ carcinoma and actinic lesions in the cat and follicular cysts and pigmented viral plaques in the dog.

Excision of follicular tumors, claw carcinoma and eyelid tumors in the dog using CO2 laser excisional technique

This presentation will show the precision that is made possible by use of good incisional laser technique in removal of dermatologic tumors in the dog. Follicular tumors arise from mutations in hair follicles and gradually form firm dermal tumors that have cystic centers filled with keratin and hair. The wall of these tumors is not very stable so when they get to a certain size they tend to rupture through the skin and cause severe pain, swelling, infection and drainage of the cystic contents. Removal before they rupture is important. Traditional scalpel excision requires a large incision around these tumors. Excision with the CO2 laser allows the surgeon to make much smaller incisions and remove the cystic tumor through this small incision. This results in less surgical time, less tissue damage and less sutures. Dogs tend to develop squamous cell cancer in the nail bed and treatment needs to have the entire claw removed. Removal of the claw with the CO2 laser is much simpler than with the traditional scalpel method. Finally dogs tend to develop tumors on the edges of the eyelids which cause irritation to the cornea and cause pain and continual eye discharge. Ablation of these tumors with the CO2 laser allows complete removal with little to no disruption of the eyelid margin.

Paula Fabbie, RDH, BS, COM

Success with complex cases: Utilizing CO2 laser and OMT to achieve optimal function and long term results

From infants to older adults TOTs restrict function, growth and sleep quality and breathing. These untreated issues continue throughout adulthood. Dentists for decades have tried to deal with the deleterious adverse growth and development that evidence has contributed to TOTs. A team approach which utilizes oral rest posture therapy, and functional nasal breathing along with habit elimination is key to success in these complex dental/medical cases. Timing of treatment is critical, and uncovering underlying etiology is essential for long term treatment goals and stability of treatment.

Martin A. Kaplan, DMD, DABLS

Laser Frenum Surgery is More than just the Frenum

The review of case studies will demonstrate why the frenum surgery is more than just ablation of soft tissue. This is a health imperative. Ways in which laser surgeries and techniques benefit patients will be discussed.

Review of Techniques for Biopsy, Mucoceles and Fibromas in Infant and Pediatric Frenectomy Patients

Based on a large collection of case studies, the course discusses the best technique for biopsy, mucocele and fibroma excision in infant and pediatric patients with a 10,600-nm CO2 laser.
Jack Krauser, DMD

The 10,600 nm SuperPulse CO₂ Laser May Alleviate the Late Implant Failure Linked to Tissue Tension

Implant therapy is now mainstream and continues to gain popularity. That said, we now have an abundant number of cases that are exhibiting tissue recession and possibly “late loss failure”. This presentation will identify the issue and demonstrate a quick, effective and relatively painless concept to prophylactically address this issue with the adjunctive use of a 10,600 nm CO₂ laser. The depth of incision and the depth of coagulation will be discussed, as well as specific laser handpieces and treatment protocol.

Leonard Kundel, DMD

Osteopathically guided release of oral restrictions and return to proper orofacial function

Surgical goals of tongue tie release are different for infants and adults. The goal of infant lingual frenectomy is to establish proper eating/breastfeeding and nasal breathing. Adult needs are much more diverse. Repetitive, incorrect use of the tongue leads to deformation and potentially damage to orofacial structures; these issues need to be corrected. Therefore, the lingual release is more extensive for adults than for infants; and it also involves the mandatory pre- and post-frenectomy myofunctional therapy. In this presentation the instructor introduces and describes the osteopath-guided tongue tie functional release (OGTTFR). The real-time osteopathic assessment take place during a CO₂ laser frenectomy, guiding the clinician for ideal tongue tie release. The ultimate goal of such a release is to improve the whole body function.

Brynn L. Leroux, DDS

Pediatric Dental Laser Procedures with X-Lase Diode and LightScalpel CO₂ Laser

This presentation shows a clinical comparison of multiple different types of soft tissue laser procedures commonly performed in the pediatric dental setting, including frenectomies and mucocele removals. Clinical cases are shown using both the X-lase diode and LightScalpel CO₂ lasers. Cases include infants, children, adolescents and teenagers and were performed using various levels of sedation specific to what was required to safely and successfully accomplish the procedure in each individual patient. Pre-op and post-op histories are reviewed, including the involvement of therapists where appropriate.

Robert Levine, DDS

Laser Trends in Dentistry 2018

Lasers have a history dating back to 1957. Many innovative changes have occurred in the field of lasers that are supportive to all areas of dentistry. This lecture will review the progress of laser dentistry and discuss where laser dentistry is heading in the future with respect to new technologies that might be available to all practitioners.

Lasers in Academics 2018

Only a few dental schools in the country are providing full laser training to their predoctoral students. We will discuss why this has occurred and why it is critical to the laser industry to support the academic environment. All attendees are encouraged to participate and contribute to the discussion.
Brooke Pettus, RDH, BSDH  
*Having Fun to Achieve Function: A Quick Guide to Motivating Patients and Customizing Pre/Post Frenectomy Care Techniques for All Ages*  
Pre and post frenectomy care is a topic surrounded by much debate, confusion, and varying instruction. As a complex subject that can be perplexing even to top leaders in healthcare, patients can be left with many questions, feeling overwhelmed and unsure about the frenectomy care process. In this talk, Brooke will provide some unconventional guidance and care techniques based on a “Who, What, When, Where, Why, and How” approach for infants, toddlers, children, teens, and adults. She will share examples of how to customize pre and post frenectomy care based on parent/patient motivation, individualized needs, and myofunctional principles. Successful and unsuccessful case studies will be shown and discussed.

Cara Riek, DNP, RN, FNP-BC, IBCLC, DABLS  
*Unbuckling the Buccals: Case studies discussing laser revision of buccal ties from a breastfeeding standpoint*  
Little is known or understood about buccal ties as they relate to breastfeeding or proper oral development. Buccal ties are atypical mucosal tethers that extend from the cheek to the gingiva. This talk addresses the epidemiology of buccal ties within the population patients seen with our practice. This talk further addresses the physiological changes noted with breastfeeding post buccal tie release. Multiple case studies will be presented.

Research to Practice: Putting together a multi-center study to address laser frenotomy release and long-term breastfeeding rates  
Much research has been done to look at the short-term effects of tongue and lip tie release. Little is known about long term breastfeeding rates of patient who have undergone lingual and labial frenotomies. It is well known that both the Centers for Disease Control and Prevention (CDC) and world Health Organization (WHO) recommend exclusive breastfeeding for a period of 6 months, with complimentary breastfeeding extending beyond one year. Healthy People 2020 has a set goal aiming to increase exclusive breastfeeding rates at 3 months and 6 months. This talk aims to present a protocol for looking addressing long term breastfeeding rates in patients who have undergone frenotomies and necessary steps to implement this study for projected publication.

Cara Riek, DNP, RN, FNP-BC, IBCLC, DABLS / Peter Vitruk, PhD, DABLS  
*Infant Laser Frenectomy IRB Study Design Parameters*  
Tongue and Lip ties may interfere with the normal functioning of the mouth during breastfeeding in infants. Releasing ties may dramatically change infant’s ability to breastfeed. Objective, reproducible, and affordable in-office measurements of the difficulty or the ease that the infant is having in feeding before and after the frenectomy is lacking presently. We propose a quantitative study of the intra-oral air pressure during breastfeeding pre- and post-frenectomy utilizing an intra-oral air pressure measurement and recording device. The device consists of a pressure transducer, data acquisition module, and laptop computer. Data is collected and stored on the computer for latter analysis. Soft silicone tubing includes a single use sterile section with a microbial filter that is attached to the breast for one time use; the other piece of silicone tubing connects to the pressure transducer. Requirements for the multi-center IRB controlled study will be presented and discussed. A modified device for diagnosing chewing and swallowing function in older population will be also presented and discussed.

Matthew J. Rowe, DDS, MSD  
*Laser Frenectomy: Integration of a Tripartite Approach to Collaborative Care*  
The topic of infant frenectomy has become a polarizing area of debate and discussion within the pediatric and social media communities. A novel approach to integrating diagnoses, pre-surgical interventions, post-operative wound management and therapy services has been developed and implemented in the private practice clinical setting. Professional networking across collegial borders has been utilized as an attempt to provide optimal outcomes and to develop assessment strategies for improvement of function following frenectomy laser surgical procedures. The overall goal in collaboration with supportive colleagues is to provide a decision tree and toolset to providers, which will aid the proper diagnosis, referral, treatment and rehabilitation of tethered oral tissues. Secondarily, the collaborative approach to networking colleagues has been developed to provide patients the access necessary to increase the likelihood of positive post-surgical outcomes.

ALSC Inaugural Symposium, April 6-8, 2018
William E. Schultz, DVM
Veterinary Soft Palate Laser Resection, and Laser Repair of Nares, Lip and Palate Deformity

Elongated soft palates in bulldogs cause breathing problems. Prior to the use of a surgical laser the palate was clamped with hemostats, trimmed and then over sewn with absorbable suture material. The advent of the CO2 laser changes the dynamics of the surgery making the procedure rapid, fully hemostatic and suture free. Cleft palates, cleft lips and Nasal deformities are rare problems in dogs. When encountered by the general practitioner the usual outcome is euthanasia. Repair of extensive defects using conventional sharp surgical technique is very difficult due to the inability to control bleeding. CO2 laser utilizing different diameter beam and power settings allows the surgeon to complete the surgery with excellent visibility and less tissue damage.

Warren B. Seiler III, MD, DABLS
American Board of Laser Surgery Certification Process

American Board of Laser Surgery was founded in 1984 to promote the safe and efficacious use of lasers in medicine and surgery by establishing standards of acceptable levels of knowledge and competence through a certifying examination for medical professionals. It is currently the only true board for laser medicine and surgery in the world and has national and international diplomats that have taken the time and effort to study the extensive study guide and textbook and pass the written and oral examination. This presentation will discuss the American Board of laser surgery, it's materials and certifying process, and the benefits of being a diplomat of the American Board of laser surgery both in improving a practitioners clinical practice and as a source for greater learning networking and research.

Annette Skowronski, DDS, DABLS
The Ethical Conundrum: Separating Science and Marketing

With the explosive increase in public awareness of out-patient surgery to release naturally occurring muscle attachments purported to relieve a myriad of dysfunction, can health professionals reliably know that today's procedure will achieve a long term positive outcome? What are the potential variables to a successful outcome and are they real or perceived? How much of the long term success is based upon the subjectivity of the procedure performed? Why does the scientific evidence lag? Why are many early invasive procedures considered appropriate to 'prevent' dysfunction that has not been proven to reliably occur? The focus of this lecture is for the health care provider who is currently performing surgical release of muscle attachments; to consider what the purpose and long term goal is of the surgical intervention? Is that goal reliably occurring? Is it procedural or protocol dependent or does the body rule in the end? In addition, the interaction the health professional has with the general public and their presence in online social media platforms regarding this treatment should be ethically considered. This may foster the new laser term of WGOOCHY What Goes On Online Can Hurt You.

Peter Vitruk, PhD, DABLS / Anna “Anya” Glazkova, PhD
Literature Review of Wound Healing as it relates to Frenectomy Tools

The presentation reviews the four stages of conventional scalpel wound healing and compares those with the healing of CO2 laser surgical wounds. The role of myofibroblasts in tissue healing is discussed. This literature review addresses such issues as CO2 laser wounds display prolonged healing, reduced scarring, decreased postoperative pain and discomfort.

Peter Vitruk, PhD, DABLS
American Board of Laser Surgery Written Certification Examination

The presentation is designed to help clinicians preparing to take the written part of the Board certification exam with the American Board of Laser Surgery (ABLS). It reviews key concepts of the ABLS’ Study Guide and guides the audience through mock examination in a fast-paced, exciting format closely simulating the experience of the open book written certification examination. The review covers the most important concepts of laser-tissue interaction science, i.e., absorption, scattering, ablation and coagulation. Laser safety is also reviewed. Finally, the presentation outlines the additional reading materials to supplement the study guide of the ABLS (“The Study Guide for the Fundamental Laser Science / Laser Interaction & Laser Safety Written Examinations”). This presentation familiarizes the attendees with the fundamentals they need to know to better prepare for the certification exam.
Christopher J. Winkler, DVM, VMLSO, DABLS
CO₂ Surgical Laser in Veterinary Procedures: A Case Review

Certain procedures in veterinary surgery are conducted in vascular areas known for profuse bleeding and their sensitivity to pain and post-operative discomfort, making recovery difficult for the client and patient. This presentation will show in an animal model how conducting these procedures with a CO₂ surgical laser can mitigate these effects, assisting the surgeon by providing an unobstructed surgical field while reducing pain, thus reducing anesthetic consumption, which in turn increase intra-operative safety for the patient and improve the pet's post-operative comfort and recovery. Laser surgical case studies of a urinary bladder mass, an interdigital mass, an aural hematoma, an aural mass, and a perianal mass in an animal model will be presented for the education of the symposium audience. The urinary bladder case will also demonstrate the extreme importance of obtaining biopsy results for definitive diagnosis of transitional cell carcinoma.

Richard B. Winter, DDS, MAGD, DABOI/ID, DICOI, FAAID, FADI, FICO, DABLS
LightScalpel 10,600 nm Laser Use in an Advanced Reconstructive Implant Dental Practice

In a general dental practice the procedures we encounter are varied and complex. Having the best armamentarium and tools to efficiently and comprehensively treat our patients is of the utmost importance. This no-nonsense lecture will highlight several cases that this clinician sees in everyday practice and how he incorporates the LightScalpel CO₂ 10,600 nm laser to efficiently treat his patients. Some of the procedures that will be discussed range from MMCL (Modified Minimal Crown Lengthening), frenectomy, abscess removal and decontamination of extraction sites as well as areas being prepared for guided tissue regeneration.

Karen M. Wuertz, DDS, DABLS
Superpulse 10,600 nm CO₂ Laser Revision of Lingual Frenulum Previously Released with a Diode

This study demonstrates the benefits of CO₂ laser revision after patient presented with residual signs and symptoms of Ankyloglossia post Diode frenectomy. Patient had initial improvement after Diode frenectomy; however, admitted to non-compliance during the postoperative period and failure to complete prescribed Oro-Myofunctional therapy. Laser revision provided good visibility of the surgical field and the risk of postoperative edema and scarring was reduced. The importance of postoperative oro-myofunctional therapy (OMT) was demonstrated and was crucial in reestablishing optimum swallowing, chewing, speaking and breathing patterns that developed as a consequence of ankyloglossia.
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* “Sound scientific basis and proven efficacy in order to ensure public safety” is one of the main eligibility requirements of the American Dental Association CERP Recognition Standards and Procedures (ADA.org/CERP).

Curriculum
American Laser Study Club (ALSC) has designed its curriculum based on the peer reviewed physics reviews on the foundations of laser-tissue interaction and laser surgery, and the original work of its founder Dr. Peter Vitruk dedicated to the detailed physics of soft tissue ablation and coagulation with laser and hot tip (non-laser) devices. ALSC’s curriculum overcomes the known limitations of many laser dentistry courses.

Mission
To fill the void in current Laser Dentistry and Laser Surgery education (i.e. the physics of laser tissue interaction, such as absorption, scattering, ablation, coagulation and hemostasis, soft and hard tissue ablation, laser safety, etc.) and help Dentists, Physicians and Veterinarians to excel at efficient and safe application of laser energy in everyday practice.

Membership Dues
Membership is only $100 annually for for doctors, scientists and researchers; $75 annually for auxiliary staff / non-doctors; $50 annually for students; and $200 annually for industry professionals.

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The Journal of the American Laser Study Club | April 2018 Vol.1, No. 1
The Quiz

1. Oral soft tissue scattering coefficient is greatest around this wavelength:
   (a) 1,000 nm (b) 3,000 nm (c) 10,000 nm  
   Hint – see 3rd paragraph on the Laser Surgery Basics Page

2. Oral soft tissue absorption coefficient is lowest around this wavelength:
   (a) 1,000 nm (b) 3,000 nm (c) 10,000 nm  
   Hint – see Figure 1 on the Laser Surgery Basics Page

3. Oral soft tissue absorption coefficient is greatest around this wavelength:
   (a) 1,000 nm (b) 3,000 nm (c) 10,000 nm  
   Hint – see Figure 1 on the Laser Surgery Basics Page

4. Oral soft tissue photo-thermal ablation threshold is highest around this wavelength:
   (a) 1,000 nm (b) 3,000 nm (c) 10,000 nm  
   Hint – see Figure 9 on the Laser Surgery Basics Page

5. Oral soft tissue thermal relaxation time is greatest around this wavelength:
   (a) 1,000 nm (b) 3,000 nm (c) 10,000 nm  
   Hint – see Figure 7 on the Laser Surgery Basics Page

6. Oral soft tissue thermal relaxation time is shortest around this wavelength:
   (a) 1,000 nm (b) 3,000 nm (c) 10,000 nm  
   Hint – see Figure 7 on the Laser Surgery Basics Page

7. Oral soft tissue blood vessel capillary diameters are:
   (a) > 1 mm (b) < 0.01 mm (c) Approx 0.02 - 0.04 mm  
   Hint – see Figure 11 on the Laser Surgery Basics Page

8. Oral soft tissue depth of photo-thermal coagulation / hemostasis is greatest around this wavelength:
   (a) 1,000 nm (b) 3,000 nm (c) 10,000 nm  
   Hint – see Figure 11 on the Laser Surgery Basics Page

9. Oral soft tissue depth of photo-thermal coagulation / hemostasis is shortest around this wavelength:
   (a) 1,000 nm (b) 3,000 nm (c) 10,000 nm  
   Hint – see Figure 11 on the Laser Surgery Basics Page

10. Oral soft tissue absorption coefficient around 1,000 nm is:  
    (a) < 1 cm⁻¹ (b) > 1 cm⁻¹ (c) > 10 cm⁻¹ (d) > 500 cm⁻¹ (e) > 3,000 cm⁻¹  
    Hint – see Figure 1 on the Laser Surgery Basics Page
SAVE THE DATE
March 29th - 31st, 2019
The 2019 2nd Annual ALSCC Symposium
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