Buffalo Niagara Dental Meeting

October 15, 2015

Lasers:

Separating the Facts from the Fiction

Considerations When Incorporating Lasers into to Everyday and Enhanced Dentistry & Hygiene

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Soft Tissue Procedures and Applications Performed with the Assistance of a Laser

Basic Functions of a Soft Tissue Laser

- Vaporize Soft Tissue (Ablation)
  - Ablate (Erase) Soft Tissue
  - Incise Soft Tissue
  - Excise Soft Tissue
- Stimulate (Photobiomodulate) Tissue Responses

A Partial List of Specific Procedures That Can Be Performed with the Assistance of a Soft Tissue Laser

- Gingivectomy
- Gingivoplasty
- Gingival Troughing
- Periodontal Pocket Debridement Laser Therapy (PDLT)
- Biopsies
- Fibroma Removal
- Implant Uncovering
- Flap Surgery
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- Assisting in Bleaching of Dentition
- Prevention & Treatment of Oral Mucositis
- Management of Temporal Mandibular Discomfort

Hard Tissue Procedures and Applications Performed with the Assistance of a Laser

Basic Functions of a Hard Tissue Laser

- Vaporize Hard Tissue (Ablation)
  - Tooth Preparations
  - Osseous Recontouring
  - Cleaning of Endodontic Root Canal Systems

- Stimulate (Photobiomodulate) Tissue Responses

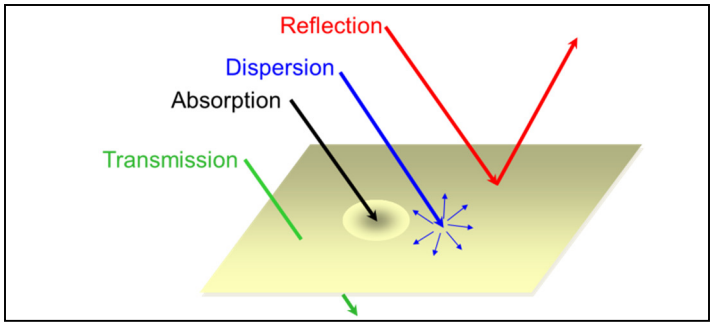
A Partial List of Specific Procedures That Can Be Performed with the Assistance of a Hard Tissue Laser

- Composite Curing
- Tooth Whitening
- Cavity Preparation
- Dentin Roughening
- Enamel Roughening
- Apicoectomy
- Caries Removal
- Aid in Caries Detection
- Removing Restorative Material
- Osseous Recontouring
- Endodontic Access
- Illumination for Endodontic Orifice Location
- Cleaning of Endodontic Root Canal Systems
  - (Photon Induced Photoaucostical Streaming) (PIPS®)

Effects of Light Energy

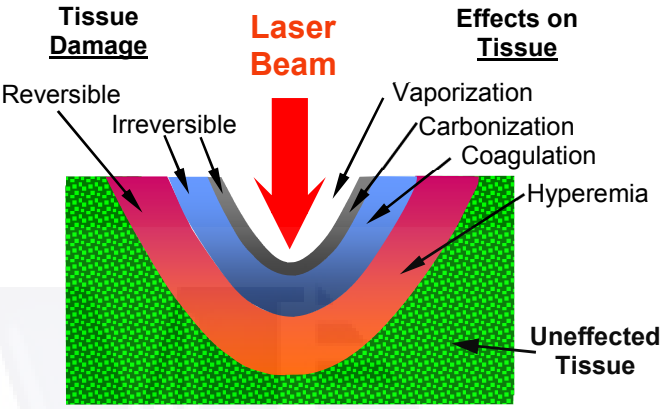
Effects of Light on Target Tissue

- Reflection
- Dispersion / Scattering
- Absorption
- Transmission



Effects of Light Energy on Target Subjects

- Photo-thermal Effects
  - Coagulation
  - Vaporization
- Photo-acoustic Effects
  - Disruption
  - Plasma effect
- Light-Induced Fluorescence
  - Caries detection
  - Mucosal evaluation
- Photo-chemical Effects
  - Stimulate chemical reactions
  - Creates chemical bonds
  - Break chemical bonds
- Photobiomodulation
  - Pain relief
  - Wound healing



Source: *Laser Therapy in the Dental Practice;* Gutknecht, N

Thermal Effect of Laser Energy on Tissue

Tissue Temperature (C°)	Observed Effect
37-50°	Hyperthermia
50-60°	Bacteria Inactivation & Protein Denaturation
> 60°	Coagulation
70-90°	Welding
100-150°	Vaporization
>200°	Carbonization

There is a linear relationship between the energy of the pulse and the size of the ablation crater.

Increasing the power lowers the ablation threshold and accelerates the ablation process, thus decreasing thermal side effects.

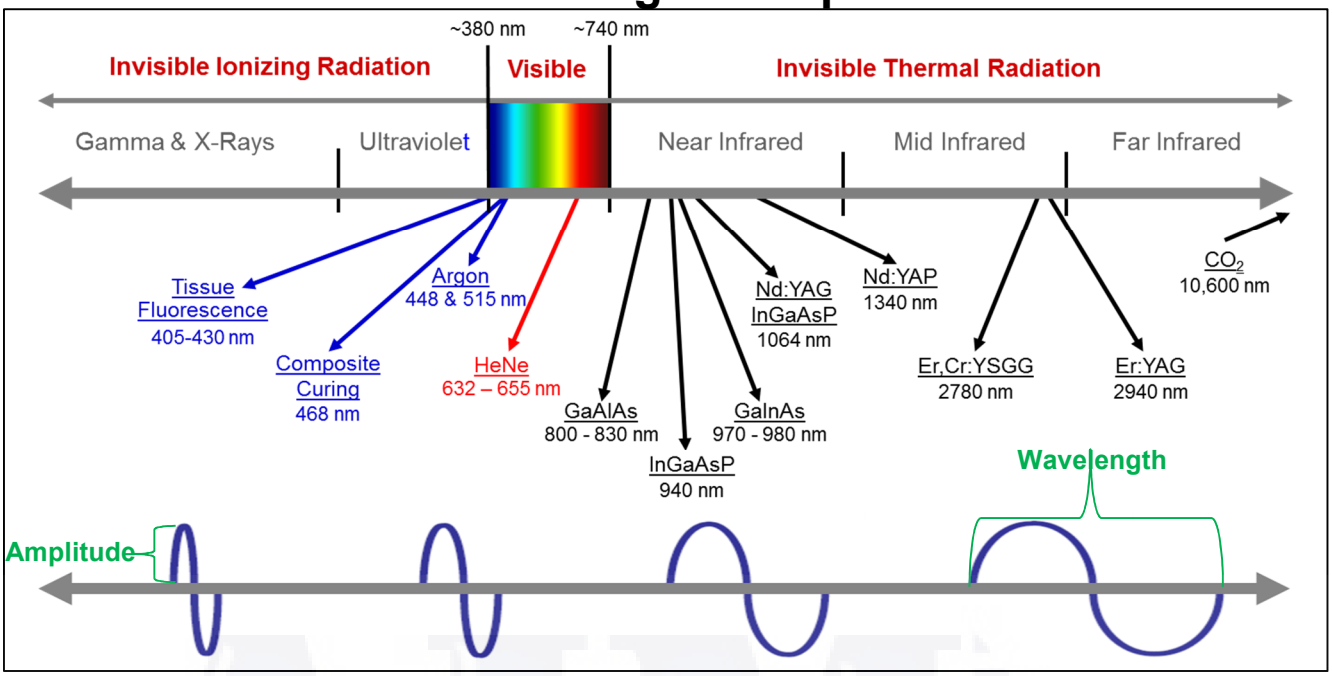
Variables Effecting Laser Tissue Interaction

- Wavelength
- Target Composition
  - Chromophores- Substances that absorbs light energy
  - Fluorophores- - Substances that emits (produces) light, often when stimulated with light energy
- Interaction Time
  - Temporal Mode
  - Hand Speed
  - Total Interaction Time
- Power
- Energy Transfer Mode
  - Contact vs. Non-Contact
- Spot Size
  - Fiber Diameter, Tip Diameter, Diameter of Focal Spot
- Operator's Knowledge and Experience

Maximizing the Tissue Interaction Requires:

Tissue interaction is maximized by matching the proper wavelength with the adequate amount of power with the chromophores present in the tissue.

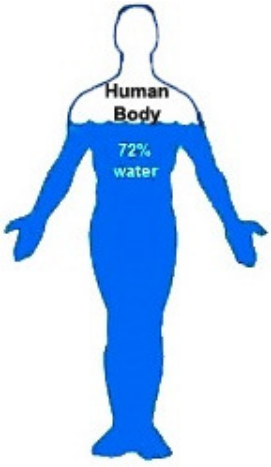
Wavelengths of Light Energy Used in Dentistry on the Electromagnetic Spectrum



Active Mediums & Wavelengths of Surgical Dental Lasers

Active Medium	Wavelengths
▪ Argon	448-515 nm
▪ Diodes	445-1064 nm
• InGaN	445 nm
• HeNe	630-665 nm
• GaAlAs	805-830 nm
• InGaAsP	940 nm
• GaInAs	970-980 nm
• InGaAsP	1064 nm
▪ Nd:YAG	1064 nm
▪ Nd:YAP	1340 nm
▪ Erbium,Cr:YSGG	2780 nm
▪ Erbium:YAG	2940 nm
▪ CO_2	9,250-10,600 nm

Water Content By Percentage (%) in Biological Components



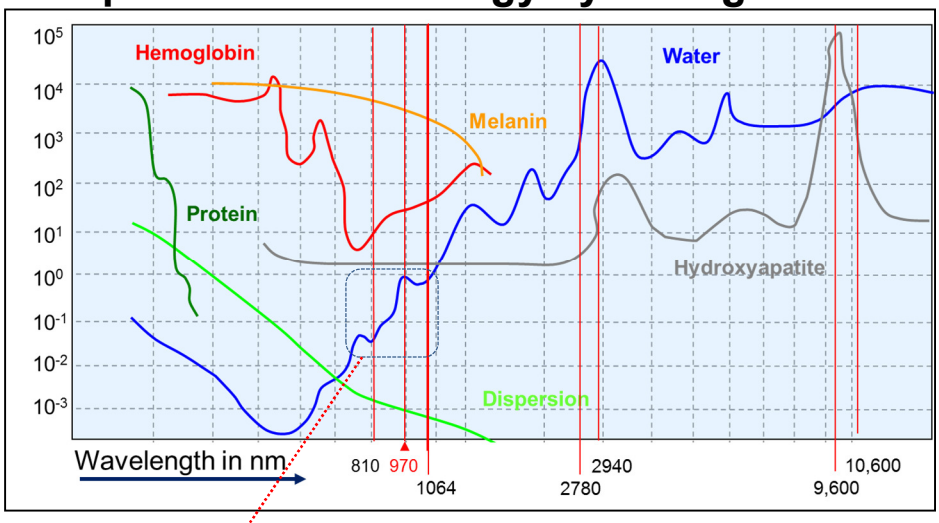
- **Blood ~94%**
- **Mucosa ~75%**
- **Muscle ~75%**
- **Skin ~70%**
- **Bone ~22%**
- **Dentin ~12%**
- **Enamel ~1-3%**

Source: http://www.waterinfo.org/resources/water-facts

- **Bacteria ~92%**

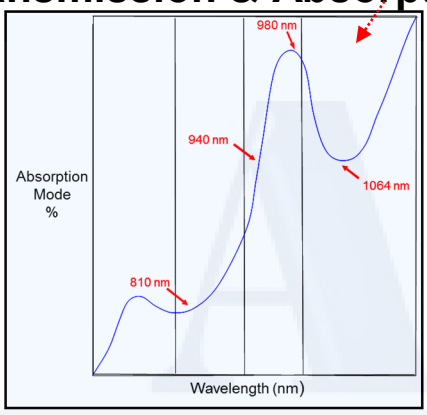
Relationships between the Cell Volume and the Carbon Content of Bacteria
Romanova ND, Sazfin AF
Oceanology 2010, Vol,50 No. 4 pp 522-530

Absorption of Laser Energy by Biological Tissue



Source: Hale GM, Querry MR, "*Optical constants of water in the 200 nm to 200 µm wavelength region*" Appl. Opt.,12, 555-563

Transmission & Absorption of Near Infrared (NIR) Light Energy in Water



The Absorption of Light Energy in Water is:

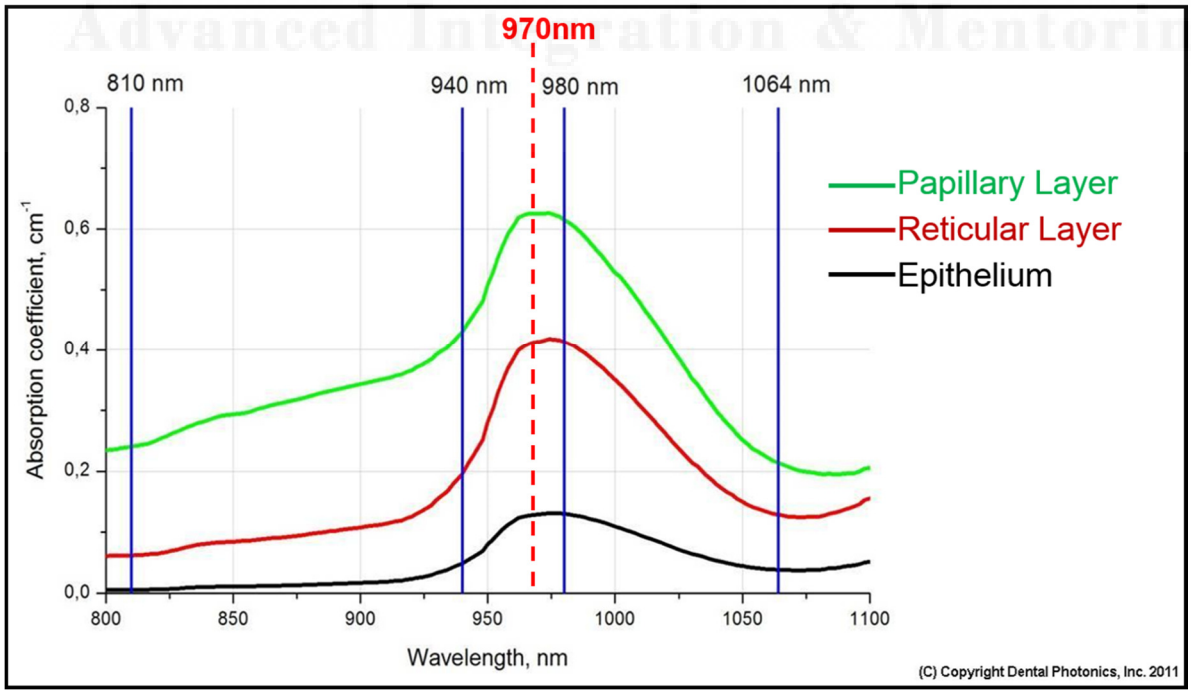
35% at 980 nm
15% at 1064 nm
3% at 810 nm

The Coefficient of Light Transmission in Water is:

97 % at 810 nm
85 % at 1064 nm
65 % at 980 nm

Cecchetti W, Guazzieri C, Tasca A, Dal Bianco M, Zattoni F, Pagano F
980 nm Diode Laser and Fiber Optic Resectoscope in Endourological Surgery
European Biomedical Optics Week, BiOS Europe '96

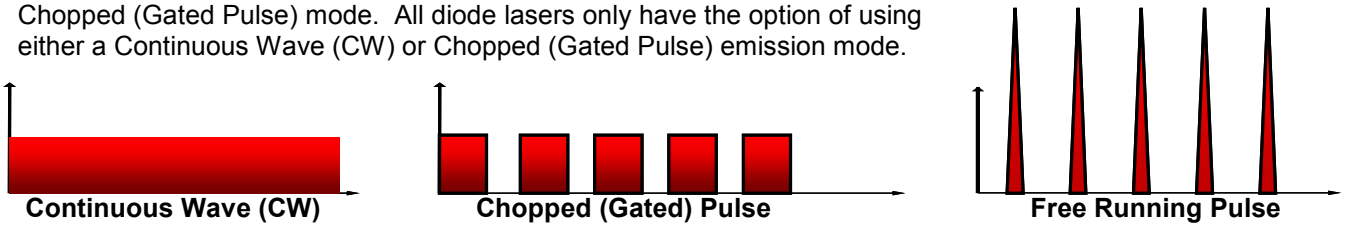
Light Absorption of Mucosa for the Near Infrared (NIR) Laser Range



Source: Feldchtein F; *Soft Tissue Surgery with Diode Laser - Direct Laser Cutting or Hot Tip?*
Presented at the 18th Annual Conference of the Academy of Laser Dentistry; San Diego, CA; March 3, 2011

Temporal Emission Modes

Temporal Emission Mode assists in managing the tissue interaction by controlling the amount of time that laser energy interacts with the tissue, by allowing or not allowing time for the remaining tissue to cool between the pulses of energy emitted by the laser. The 3 basic temporal emission modes used in dentistry are Continuous Wave (CW), Chopped (Gated Pulse), and Free Running Pulse. All the other terms used are variations of the Chopped (Gated Pulse) mode. All diode lasers only have the option of using either a Continuous Wave (CW) or Chopped (Gated Pulse) emission mode.



Thermal Relaxation Time (TRT) -The time when the laser energy is not being emitted (off).

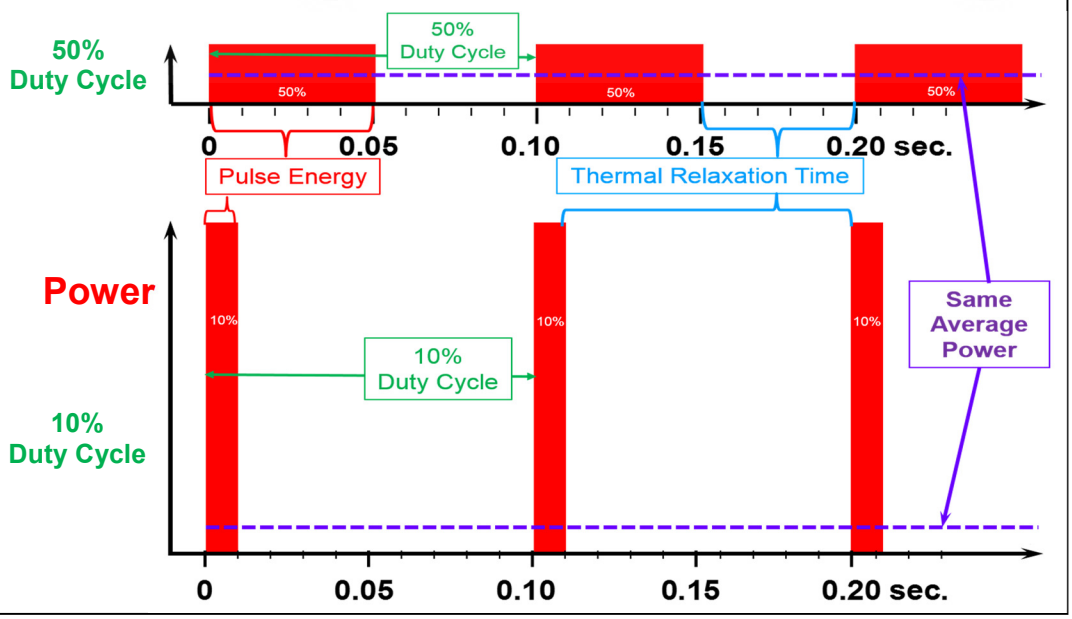
The purpose of the thermal relaxation time (TRT) is to give the surrounding tissue (the non target tissue) time to cool between the pulses of laser energy thus assists in minimizing the thermal transmission into the collateral tissue. This helps to minimize the collateral damage to the remaining tissue and reduces the zones of thermal necrosis and hyperemia (inflammation). Basically, the longer the TRT the more tissue cooling that occurs and the less collateral damage to the remaining tissue.

- **Continuous Wave (CW) Mode -Does NOT allow for any Thermal Relaxation Time (TRT)**
  - CW has the greatest amount of collateral damage and creates the largest zones of thermal necrosis and thermal conduction and therefore has the greatest amount of coagulation.
- **Chopped (Gated Pulse) Mode - Does allow for Thermal Relaxation Time (TRT)**
  - **It creates considerably less thermal damage when compared to Continuous Wave (CW).**
  - When used in a chopped mode it can minimize the zones of thermal necrosis and thermal damage.
- **Free Running Pulse Mode** -Provide a long and excellent Thermal Relaxation Time (TRT), however, a free-running pulse mode is not available on any diode laser.

Duty Cycle (Emission Cycle) –The temporal duty cycle (sometimes referred to as an emission cycle) is the percentage (%) of time that the laser is Emitting Laser Energy vs. the Thermal Relaxation Time (TRT) within a single pulse. Simply put, it is the percentage of time the laser is on vs. off per pulse cycle.

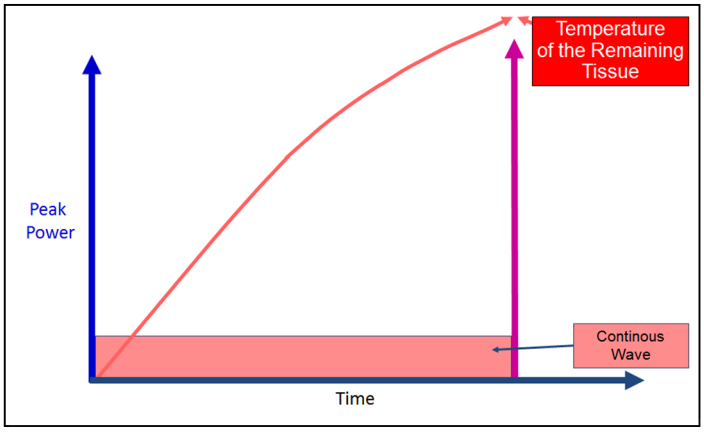
- Allowing the clinician to adjust the duty cycle enables control of the Thermal Relaxation Time (TRT) by extending the TRT as long as desired or even completely eliminating it. This enables the ideal treatment objective to be accomplished and greatly improves outcomes.

A Comparison of the Thermal Relaxation Time (TRT) of a 50% & 10% Duty Cycle Utilizing the Same Average Power in Both Modes

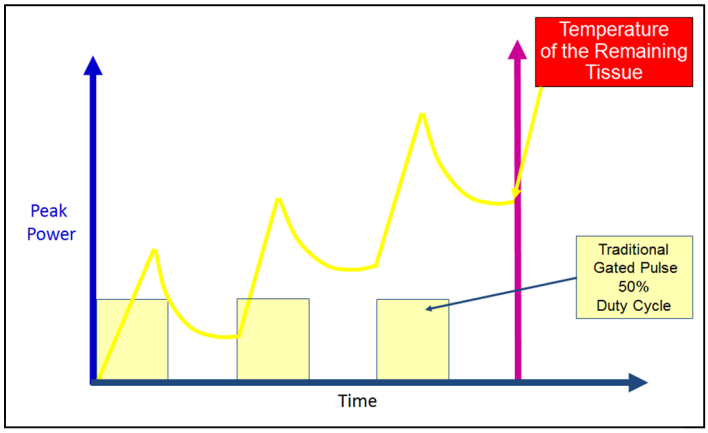


Temporal Emission Modes
(Continued)

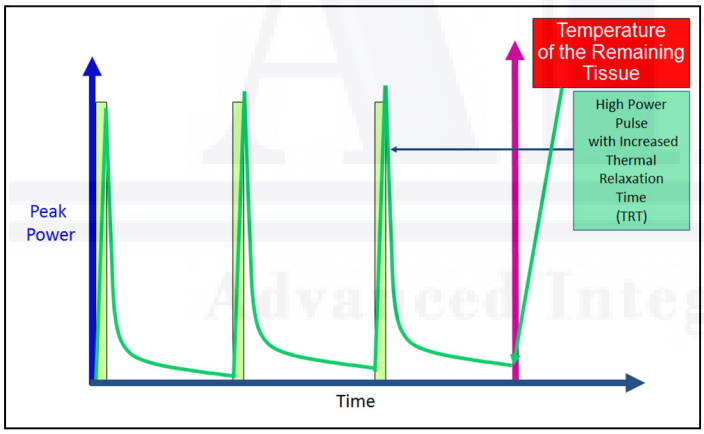
Continues Wave Temporal Mode
Note the Continuous Rise in Remaining Tissue Temperature
(Solid Red Line)



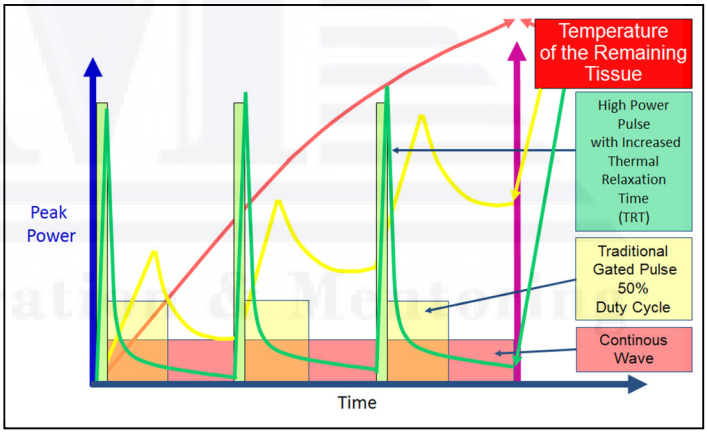
Chopped (Gated Pulsed) Temporal Mode 50% Duty Cycle
Note the Rise & Fall in Remaining Tissue Temperature
(Zig-Zag Yellow Line)



Chopped (Gated Pulsed) Temporal Mode 10% Duty Cycle
Note the Minimal Rise in Remaining Tissue Temperature
(Zig-Zag Green Line)



Comparison of Different Temporal Modes
Note the Differences in Remaining Tissue Temperatures
Between Red – Yellow – Green Lines



Comparison of Different Temporal Pulse Modes and Duty / Emission Cycle Effects on Coagulation

Free Running Pulsed or Chopped (Gated Pulsed) 10% Duty Cycle	Chopped (Gated Pulsed) 25% Duty Cycle	Chopped (Gated Pulsed) 50% Duty Cycle	Chopped (Gated Pulsed) 75% Duty Cycle	Continuous Wave (CW)
Minimal Coagulation				Maximum Coagulation
Least Amount of Collateral Thermal Damage				Most Amount of Collateral Thermal Damage

Continuous Wave (CW) Mode Will Provide
Maximum Coagulation and Cause the Most Thermal Damage

Laser Safety Guidelines & Requirements

Lasers Require Special Safety Procedures to be Followed During Their Use and Maintenance

American National Standards Institute (ANSI):

ANSI has set the general and clinical standards for the safe use of lasers and the Laser Institute of America serves as the secretariat for lasers under ANSI Accredited Standards Committee Z136.

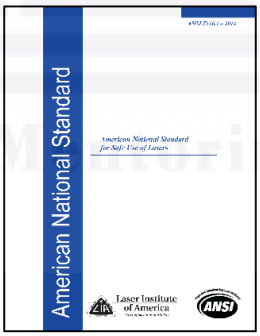
The **ANSI Standard Document: *Z136.1-2014, American National Standard for Safe Use of Lasers*** is the base document that pertains to all lasers used in the USA whether they are used in healthcare, industry, commercial, defense, or entertainment. This document defines terminology, measurements, exposure levels, control measures, and other information on the use of lasers regardless of the environment or application in which the device is being utilized.

The **ANSI Standard Document: Z136.3-2011, *American National Standard for Safe Use of Lasers in Health Care*** further defines the requirements for the safe and effective use of lasers in health care which includes all dental and medical facilities as well lasers for veterinary and home use.

These documents should be part of the facility's *"Laser Policies and Safety Procedures Manual" and c*an purchased from the Laser Institute of America, Inc. on their website at: www.lia.org

ANSI Standard: *Z136.1-2014, American National Standard for Safe Use of Lasers*

- Scope & Requirements for Laser Safety
- Laser Classifications
- Definitions and Laser Terminology
- Measurement Standards
- Hazard Evaluation
- Criteria for Exposures of Eye and Skin
- Personal Protective Equipment
- Education and Training
- Incident Reporting Mechanism
- Engineering Controls
- Labels and Signage
- Laser Safety Officer (LSO)



ANSI Standard: *Z136.3-2011, American National Standard for Safe Use of Lasers in Health Care*

- Biological Hazards
- Eye ware & Personal Protective Equipment
- Healthcare Personnel Laser Training
- Incident Reporting Mechanism
- Health Care Laser Systems Engineering Controls
- Infection Control for Health Care Laser Systems
- Pathogens in Laser Generated Airborne Contaminates
- Health Care Facility Laser Safety Officer(s) (LSO)

ANSI Laser Classifications & Requirements

Class 1 Laser System
Any laser or laser system containing a laser that cannot emit laser radiation at levels that are known to cause eye or skin injury during normal operation.

Class 1M Laser System
Considered incapable of producing hazardous exposure unless viewed with collecting optics.

Class 2 Laser System
Visible lasers considered incapable of emitting laser radiation at levels that are known to cause skin or eye injury within the time period of the human eye aversion response (0.25 seconds).

Class 2M Laser System
Emits in the visible portion of the spectrum, and is potentially hazardous if viewed with collecting optics.

Class 3R Laser Systems
A laser system that is potentially hazardous under some direct and specular reflection viewing condition if the eye is appropriately focused and stable.

Class 3B Laser Systems
Medium-powered lasers (visible or invisible regions) that present a potential eye hazard for intrabeam (direct) or specular (mirror-like) conditions. Class 3B lasers do not present a diffuse (scatter) hazard or significant skin hazard expect for higher powered 3B lasers operating at certain wavelengths.

Class 4 Laser Systems (ALL DENTAL & MEDICAL SURGICAL LASERS)
High-powered lasers (visible or invisible) considered to present potential acute hazard to the eye and skin for both direct (intrabeam) and scatter (diffused) conditions. Also have potential hazard considerations for fire (ignition) and byproduct emissions from target or process materials.

American National Standard Requirements for Lasers by Classification[1]

Class	Controls Measures	Training	Laser Safety Officer (LSO)	Engineering Controls
1	Not Required	Not Required	Not Required	Not Required
1M	Required	Application Dependent	Application Dependent	Application Dependent
2	Not Required	Not Required	Not Required	Not Required
2M	Required	Application Dependent	Application Dependent	Application Dependent
3R	Not Required	Not Required	Not Required	Not Required
3B	Required	Required	Required	Required
4	Required	Required	Required	Required

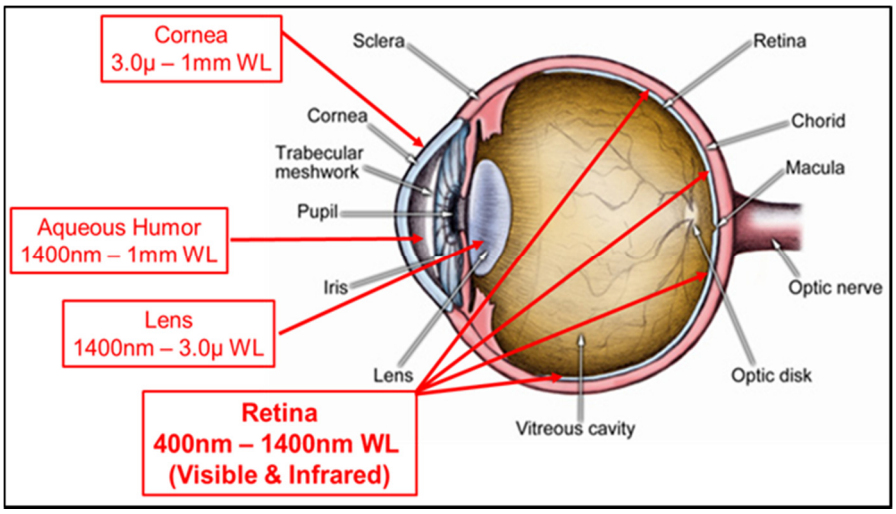
1. *American National Standard (ANSI) for the Safe Use of Lasers Z136.1-2014 Table 1.1*; Laser Institute of America; Publisher

Laser Safety Guidelines & Requirements

Control Measures & Laser Beam Hazards

Potential Ocular (Eye) Damage from Laser Light Energy:

Wavelengths with the Potential of Causing Ocular Damage	Ocular Structure
400nm to 1,400nm (Visible & Near Infrared)	**Retina**
1,400nm to 3,000nm (3.0µ) (Near Infrared)	**Lens**
1,400nm to 1mm (Near, Mid, & Far Infrared)	**Aqueous Humor**
3,000nm (3.0µ) to 1mm (Mid & Far Infrared)	**Cornea**



Laser Protective Eyewear:

- **ALL Class 3B & Class 4 Lasers REQUIRE ALL PERSONS in the NHZ to wear Laser Protective Eyewear** (LPE)
- **The FDA requires that Operators Manual must state the minimum Optical Density (OD) or Laser Filtration (L) required of the Laser Protective Eyewear (LPE) for the Wavelength of the laser in use.**
- The Optical Density (OD) / Laser Filtration (L) for the wavelength (WL) in nanometers (nm) covered is required to be designated on the eyewear to insure they provide the proper filtration & protection for the laser energy.

Laser Protective Eyewear (LPE) *MUST* Be Worn by Everyone in the Nominal Hazard Zone (NHZ) with an Optical Density (OD) / Laser Filtration (L) for the Wavelength (WL) that is Appropriate and Specific for the Laser Being Used!!!

Nominal Ocular Hazard Distance (NOHD):

- The **Nominal Ocular Hazard Distance (NOHD)** is the distance from where a laser is firing that there is the potential for damage to the eye if the emitted laser energy were to strike the eye.
- The NOHD is specifically determined for each model of the laser and must be specified for each device.
  - Example: NOHD for the Sirona SIROLaser Advance & Xtend laser is 5 feet (1.5 meters)
    NOHD for the Biolase Epic laser is 15 feet 7 inches (4.7 meters)
    NOHD for the Biolase ezlase laser is 38 feet 8 inches (11.8 meters)
  - The NOHD is determined by following parameters;
    The laser's Wavelength, the laser's Maximum power, and the laser's beam divergence.
    - Divergence is determined by the laser's delivery mechanism of the emitted laser energy.
    - Different brands / types of fibers will have different beam divergence and therefore have a significant effect on establishing the NOHD for the emitted energy.

Nominal Hazard Zone (NHZ)

- The Nominal Hazard Zone (NHZ) is the area *within* the Nominal Ocular Hazard Distance (NOHD) unless the emitted laser energy is blocked by an obstruction that the emitted laser energy cannot pass through, such as a wall. (Remember that most laser energy is invisible to the human eye and can pass through glass and similar mediums that do not contain the proper filtering or blocking components in it.)
- **NHZ is specific for each laser & is determined by NOHD of the laser being used.**
- **Nominal Hazard Zone (NHZ) is Essentially the Entire Operatory**.
- **The NHZ must be designated with appropriate signage specifying:** Classification, potential danger, wavelength, & power of the laser, OD of the LPE required & the name of the LSO.
- NHZ area should be restricted to the patient and only necessary personnel.
- Reflective surfaces within the NHZ should be reasonably minimized.
- **All persons in the NHZ must wear appropriate eye protection for ALL CLASS 3 and 4 LASERS.**

Clip-in Laser Filter Eyewear & Laser Protective Eyewear

from

Innovative Optics, Inc.

Clip-in Laser Filters will protect your eyes when wearing loupes and operating a Laser. The following information is required when you place an order for a clip-in laser filter. You should contact Innovative Optics by phone to assist in obtaining the correct size for your loupes frame as there are many sizes and shape of loupes. It is often helpful to have a magnifying glass available assist in reading the model number inscribed on the frames.

Laser Manufacturer & Model: _____ Wavelength(s): _____nm

Required Optical Density / Laser Filtration: _____

Manufacturer of Loupes	Size of Loupe Frame	Model of Loupe Frame
Designs for Vision	_____	_____
PeriOptix	_____	_____
Orascoptic	_____	_____
SurgiTel	_____	_____
Zeiss	_____	_____
Other	_____	_____

Credit Card: (Visa / Master Card / Am. Express)

Card #: _____

Exp. Date: _____ Security #: _____

(Last 3 digits on back of Visa & MC, 4 on front of AmX)

Clip-in Laser Filters are available in many different sizes.

MWL 562

The size that best fits your loupes will depend upon the brand, size and model of the loupe frame.

Price is approximately $350.00 plus shipping

MWL 561 G

Also Recommend:

For the Patient

BWL 5X7 (~$150)

Pediatric Laser Eyewear

555 PED M (Medium)

Place your order by calling:

(800) 990–1455 or (763) 425–7789

Visit their website: www.InnovativeOptics.com

Many other styles and sizes of laser eyewear are available!

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Maple Grove, MN 55369
Toll Free (800) 990-1455
Phone (763) 425-7789
Fax (763) 425-6689

CORPORATE MEMBER ALD Academy of Laser Dentistry

Laser Safety Guidelines & Requirements

Control Measures & Laser Beam Hazards

Control Measures

Control measures are devices, protocols and systems that are to be used to help ensure the safe use of laser devices to help mitigate the potential dangers of laser utilization

Labeling for Class 4 Laser Devices:

All Class 4 lasers devices are required to be properly labeled and use warning signage in accordance with the ANSI Standard Document *Z136.1-2014*[1], which is consistent with and based on ANSI Standard Documents: *ANSI Z535.1 American National Standard Specifications for Accident Prevention Signs*, *Z535.2-1998*[2], *American National Standard Criteria for Safety Symbols*[3], and the *ANSI Z535.3-1998, American National Specification for Accident Prevention Signs*[4].

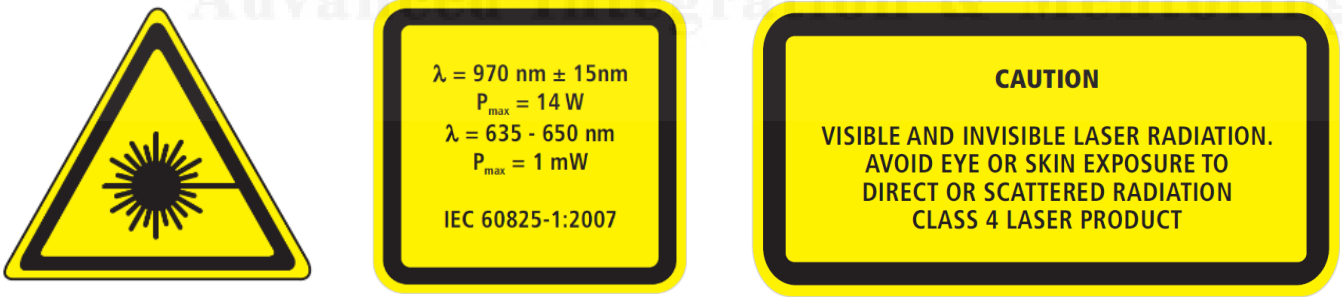
All Class 4 laser devices are required to be labeled in accordance to the above ANSI standards which has been used to establish the FDA's Federal Laser Product Performance Standard (FLPPS). All laser warning labels shall be conspicuously displayed and in a suitable font and symbol size to be easily read and recognized.

The laser device must be regularly inspected to insure that the required labels are present and legible.

Class 4 laser devices shall have equipment labels that includes the following information:

- The laser radiation symbol (a yellow equilateral triangle with a black sunburst in the center)
- Stating the laser device in a Class 4 laser system
- The emitted wavelength
- The maximum output
- A precautionary statement for users stating:
  - Laser Radiation:
    - Avoid Eye Exposure to Direct or Scattered Radiation
    - Avoid Skin Exposure to Direct Radiation

Below are the labels on the SIROLaser Advance Laser (these type of labels are required on all Class 4 lasers):



[1] *American National Standard for Safe Use of Lasers ANSI Z136.1-2014; Section 4;* Laser Institute of America, Publisher
[2] *American National Standard Specifications for Accident Prevention Signs. ANSI Z535.1*
[3] *American National Standard Criteria for Safety Symbols. ANSI Z535.2-1998.*
[4] *American National Specification for Accident Prevention Signs ANSI Z535.3-1998.*

Laser Safety Guidelines & Requirements

Control Measures & Laser Beam Hazards

Laser Controlled Area Warning Signs

"*The purpose of a laser area warning sign is to convey a rapid visual hazard-alerting message that:*

a) Warns of the presence of a laser hazard in the area
b) Indicates specific policy in effect relative to laser controls
c) Indicates the severity of the hazard (e.g., class of laser, NHZ extent)
d) Instructs appropriate action(s) to take to avoid the hazard (eyewear requirements, etc.)"[1]

Location of Laser Controlled Area Warning Signs. "*All signs shall be conspicuously displayed in locations where they best will serve to warn onlookers.*"[1] Laser Area Warning Signs must be placed at every entrance into the Nominal Hazard Zone (NHZ / Operatory) and should only be displayed when the laser is in use.

The appearance of the laser warning sign for a Class 3B or Class 4 laser:

"Laser controlled area warning signs shall be of the three panel format unless additional panels are needed for a second language. The top panel shall contain the ***safety alert symbol*** *as well as the* ***signal word****. The other two panels shall contain the* ***laser radiation hazard safety symbol*** *and the* ***message panel****."* [1]

- **Safety Alert Symbol.** *"This is a symbol which indicates a potential personal safety hazard. It shall be composed of an equilateral triangle surrounding an exclamation mark, conforming with ANSI Z535.3.*
  The symbol shall be located to the left of the signal word." [1]

- **Signal Words.** The signal words have the following meanings:
  - *"**DANGER** indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme conditions."*[1]
    "The signal word "Danger" indicates that death or serious injury will occur if necessary control measures are not implemented and used to mitigate the hazards within the laser controlled area. This signal word shall be restricted to those Class 4 lasers with high (e.g., multi-kilowatt) output power or pulse energies with exposed beams."[1,2]
  - *"**WARNING** indicates an imminently hazardous situation that, if not avoided, could result in death or serious injury."*[1] *"The signal word "Warning" shall be used on laser area warning signs associated with lasers and laser systems whose output exceeds the applicable MPE for irradiance, including all Class 3B, and most Class 4 lasers and laser systems."* [1,2]
  - *"**CAUTION** indicates a hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to "NOTICE."* [1] *"The signal word "Caution" shall be used with all signs and labels associated with Class 2 and Class 2M lasers and laser systems that do not exceed the applicable MPE for irradiance."* [1,2]
  - *"**NOTICE** is the preferred signal word to address practices not related to personal injury. The safety alert symbol shall not be used with this signal word. As an alternative to "NOTICE," the word "CAUTION" without the safety alert symbol may be used to indicate a message not related to personal injury. This signal word shall not be associated directly with a hazard or hazardous situation and shall not be used in place of "DANGER," "WARNING," or "CAUTION."* [1,2]

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[1] *American National Standard for Safe Use of Lasers ANSI Z136.1-2014; Section 4.6*

[2] *American National Standard Specifications for Accident Prevention Signs. ANSI Z535.1; American National Standard Criteria for Safety Symbols. ANSI Z535.2-1998; American National Specification for Accident Prevention Signs ANSI Z535.3*

Laser Safety Guidelines & Requirements

Control Measures & Laser Beam Hazards

Laser Controlled Area Warning Signs: (continued)

Signal Word Panel.

- ***Warning signs*** *should have the signal word "WARNING" in black letters on a rectangular orange background placed at the top of the sign. The safety alert symbol shall precede the signal word. The base of the symbol shall be on the same horizontal line as the base of the letters of the signal word. The height of the safety alert symbol shall be equal to or exceed the signal word letter height.*[1]
- ***Danger signs*** *shall have the signal word "DANGER" in white letters on a rectangular safety red background placed at the top of the sign. The safety alert symbol shall precede the signal word. The base of the symbol shall be on the same horizontal line as the base of the letters of the signal word. The height of the safety alert symbol shall be equal to or exceed the signal word letter height.*[1]

Laser Radiation Hazard Safety Symbol. *"The laser radiation hazard safety symbol shall be composed of an equilateral triangle surrounding a sunburst pattern consisting of two sets of radial spokes of different lengths and one spoke, radiating from a common center."* [1]

Message Panel Information. *The message shall be in black letters on a white background or white letters on a black background.*[1] *Adequate space shall be available within the message panel to allow for the inclusion of pertinent information. Such information may be included during the printing of the sign or may be handwritten in a legible manner, and shall include the following:*

a) The hazard class of the laser controlled area.

b) Special precautionary instructions or protective action that may be applicable. For example:

1) Laser Eye Protection Required

2) Invisible Laser Radiation

3) Knock Before Entering

4) Do Not Enter When Light is Illuminated

5) Restricted Area, Authorized Personnel Only

c) The highest hazard class of the laser or lasers within the laser controlled area. Additional information such as type of laser, pulse duration (as appropriate), and maximum output may be included.

d) The optical density of laser eye protection to be worn within the area.

e) The name and contact information for the LSO.

NOTE—The word "Radiation" on signs and labels may be replaced by the word "Light" for lasers operating in the visible range at wavelengths greater than 400 nm and equal to or less than 700 nm. For lasers operating outside of this visible range the word "Invisible" shall be placed prior to the words "Laser Radiation."[1]

[1] *American National Standard for Safe Use of Lasers ANSI Z136.1-2014; Section 4.6*

Laser Safety Guidelines & Requirements

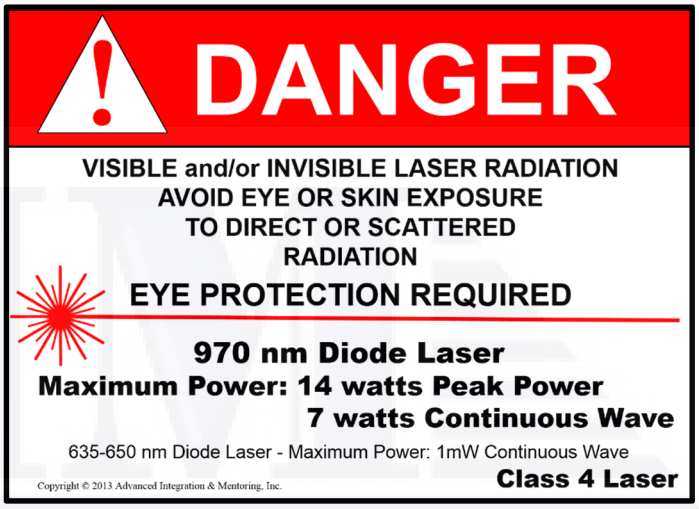
Control Measures & Laser Beam Hazards

Laser Controlled Area Warning Signs: (continued)

Existing Laser Controlled Area Signs. *Laser controlled area signs prepared in accordance with previous revisions of this standard are considered to fulfill the requirement of this standard.*[1]

However, it is strongly recommended that the most current version of the Laser Control Area Sign be used. Local governmental and/or regulatory agency may require that the most current standard be implemented. Laser safety applies both to patients and all health care personnel (HCP), meaning that the American National Standards (ANSI), the Center for Disease Control (CDC), the Food and Drug Administration (FDA), and the Occupational Safety and Health Administration (OSHA) regulations and guidelines must be followed by the practitioner.

ANSI Z136.1-2007 & Z136.3-2011
Compliant Sign for Laser Controlled Areas
for SIROLaser Advance Laser



Sample ANSI Z535.2-1998 / ANSI Z136.1-2014 Compliant Warning Sign for
SIROLaser Advance Class 4 Laser Controlled Areas.[1]

[1] American National Standard for Safe Use of Lasers ANSI Z136.1-2014; Section 4.6

Laser Safety Guidelines & Requirements

Control Measures & Non-Beam Hazards

Engineering Controls & Safety Mechanisms

Non-Beam Hazards:

- **Respiratory Hazards (Laser Generated Airborne Contaminates (LGAC) / Laser Plume):**
  - Laser Generated Airborne Contaminates (LGAC) often referred to as the laser plume are generated when laser energy interacts with matter. The quality, composition, and chemical complexity of the LGAC depends greatly upon the target material and beam irradiance.
  - The LGAC / laser plume is the biological hazard of gas fumes created when tissue is ablated (vaporized). It has been shown that laser plume can contain vital strains of the Human Papilloma Virus (HPV) and other organisms.
  - **High Volume Evacuation (HVE) should always be used when a laser is in use to remove the laser generated airborne contaminants from the energy impact site to reduce the transmission of potentially hazardous particulates (the LGAC / laser plume).**
  - The use of water irrigation with the 970nm will help reduce the laser plume.
  - The LGAC / laser plume created when performing Periodontal Pocket Debridement Laser Therapy (PDLT) is minimal due to the fact that the laser interaction is being performed in a fluid filled environment, however the highest volume evacuation possible should still be used.
  - A well-fitting surgical masks should also be worn.
- **Fire Hazards:**
  - Combustible materials must not be hit by the laser beam.
  - If oxygen is used in the area of laser treatment, extra caution should be taken, and if possible the use of oxygen avoided, if reasonably possible.
  - Nitrous oxide may be used with a laser but appropriate scavenger devices must be in place.
  - If general anesthesia is being performed, combustible gasses should not be used.
    - Endotracheal tubes must be protected.
  - **ALCOHOL WIPES MUST NEVER BE USED** to remove debris or coagulum from the fiber.
    - Use a 2x2 gauze moistened with water to remove any debris or coagulum from the fiber.
  - Do not place hot fiber on flammable material such as paper tray covers and dry 2x2 gauze.
  - The laser system should be placed in standby mode or inactive state when the laser procedure is interrupted or terminated.
- **Electrical Hazards:**
  - Electric cords and cables must be kept in good repair.
  - Electric cords and cables should be kept out of the traffic pattern of personnel and patients.
  - All electrical connections need to be properly grounded.
- **Human Factors:**
  - All healthcare personnel must receive appropriate training for their roles in the laser utilization.
  - Safe and proper ergonomics systems should be utilized
  - Limit access and individuals in the Nominal Hazard Zone (NHZ) to patient and necessary personnel
  - User errors should be minimized if not eliminated completely.

Engineering Controls & Safety Mechanisms:

U.S. Food and Drug Administration
Protecting and Promoting *Your* Health

The FDA has established the Federal Laser Product Performance Standard (FLPPS) which requires that Class 4 lasers have the following engineering controls and safety mechanisms in place to help facilitate their safe utilization.

- Software Self Check (POST)
- Fiber Interlock Switch
- Automatic Sleep Mode
- Visual & Auditory Laser Emission Indicators
- Labeling on the device emitting laser light
- Password or Keyed Locking Mechanism
- Guarded activation Switch
  - Foot Control “Safety” Cover
  - Recessed Finger Switch
- Containment Case Interlock
- Emergency Shut Off Switch

Laser Safety Guidelines & Requirements

Laser Safety Officer

Laser Safety Officer (LSO) Role & Responsibilities:

All facilities where Class 4 lasers are in use are **Required to have a designated Laser Safety Officer (LSO). Some states require that the Laser Safety Officer is formally trained and registered with the state's regulatory agency.** The LSO does **Not** have to be the dentist and is very often a clinical auxiliary**.**

The LSO is the person responsible for the laser safety program for the dental facility. This individual must have the training and experience to establish and administer the laser safety program and education for the other personnel within the facility. The LSO is responsible for monitoring and overseeing the control of laser hazards. The LSO shall oversee the evaluation and control of laser hazards by utilizing, when necessary, the most appropriate clinical and technical support staff and other resources. The LSO either performs the stated tasks or ensures that the tasks are performed by qualified individual(s); and may delegate specific responsibilities.

The Laser Safety Officer's Responsibilities Include:

- Being the office's "expert" on the care, maintenance, and the safe operation of the lasers that are being used.
- To develop and ensure that all the facility's appropriate polices, protocols, SOPs, and manuals have been established and are properly being implemented and followed. The procedures and protocols should include:
  - Compliance with applicable regulations and requirements, including federal, state, local, and professional regulations and standards.
  - Consideration for safety from both beam and non-beam hazards.
  - Facility's laser policy manual, logs and forms.
  - Inspection procedures and schedule for each Health Care Laser System (HCLS).
  - Laser related accident reporting procedures.
  - Maintenance schedule and procedures for HCLS.
  - Training requirements for all personnel.
- Verifying the classifications of the lasers and laser systems (HCLS) used within the facility.
- To evaluate the areas where the laser utilization occurs for potential hazardous conditions or situations, and to mitigate any potential problem discovered.
- Overseeing and ensuring that all personnel are trained on the laser's use and safety to a level appropriate to their role and exposure to the HCLS.
- Ensuring that all of the required labels and signs are appropriate and are in place.
- To ensure that the laser protective eyewear (LPE) and other devices are appropriate and in good condition.
- Controlling the laser's key and / or manage the passwords for activating the laser.
- To periodically audit and inspect the presence and functionality of the laser systems (HCLS), ensuring that the safety features are in place and the HCLS are functioning properly.
- Participate in investigating any laser related accident and to report any significant laser related injury to the laser's manufacturer and appropriate agencies when deemed appropriate.
- Assuring that the necessary records required by applicable government regulations are maintained. (Documenting the inspection and maintenance of the HCLS and required safety programs, such as inspection and maintenance logs, training records, audits, SOP, etc.)
- Overseeing the Deputy Laser Safety Officer (DLSO) and Laser Safety Site Contact (LSSC), if those positions are deemed necessary for the dental facility.

Facility Policies on Laser Safety Procedures and Protocols

The purpose of this document is to define the practice's protocols for the safe and effective use of lasers and light base technologies in the performance of oral healthcare for this facility. As lasers present special dangers to individuals (patents and staff) who are present in the "controlled" area known as the Nominal Hazard Zone (NHZ), specific considerations and protocols must be followed. These precautions greatly reduce the primary risks of fire, electrical injury, biologic, and especially ophthalmic injury.

The use of all Health Care Laser Systems (HCLS) and laser products are to be used in accordance with the American National Standards Institute (ANSI) z136 standards. More specifically the HCLS will be used in accordance with the ANSI standards documents *z136.1, The Safe Use of Lasers,* and *z136.3, The Safe Use of Laser in Healthcare.* All lasers systems and products are to be used as specified by the manufacturer's classification and instructions. All HCLS will have periodic safety audits of laser systems, related equipment, and accessories at least once every 3 months.

The facility has the following Class 3 and 4 laser systems:

Laser System	Wavelength (WL)	Laser Class	NOHD	Eyewear's OD
_____	_____	____	_____	_____
_____	_____	____	_____	_____
_____	_____	____	_____	_____
_____	_____	____	_____	_____

All Health Care Personnel (HCP) in the facility will be properly trained to the level as related to their role and potential exposure to laser radiation. Licensed dental professionals must use lasers within their scope of practice and in a manner where the procedure is safe, effective and consistent with the clinician's education, training and experience. The training programs shall be specific to the HCLS (lasers) to be utilized, and to the procedures to be performed. Program criteria and content shall be in accordance with facility policies and procedures, applicable standards, and government regulations (local, state, and federal). All personnel that are laser users, laser operators, Laser Safety Officers (LSO), Deputy Laser Safety Officers (DLSO), and Laser Safety Site Contact (LSSC) will have appropriate retraining programs at intervals determined by the applicable regulations, but not less frequently than every five years.

Maintenance of Records Related to Laser Systems

The following records will be maintained for seven (7) years:

- Laser education and training records for all related personnel.
- Protective eyewear maintenance logs for the inspection, and removal from service.
- Inspection, calibration, service, and maintenance records.
- Laser related incidence/accident reports and related correspondence.

Laser Safety Officer (LSO)

The following individual, _____ has been designated as the Laser Safety Officer (LSO) has the authority and responsibility to monitor and enforce the control of laser hazards and to effect the knowledgeable evaluation and control of laser hazards.

The LSO shall ensure that appropriate laser safety education and training has been provided to all people associated with lasers such as providers, clinicians, staff, technicians, students, and other health care personnel (HCP). The LSO shall ensure maintenance of records of laser safety education and training of those HCP. The LSO may delegate appropriate procedures and responsibilities to other suitably trained HCPs to help ensure that all HCLS and the environments they are utilized are properly maintained and utilized in a safe and effective manner.

Facility Policies on Laser Safety Procedures and Protocols
(continued)

Laser Safety Officers (LSO) Responsibilities

- Verification of laser classification for Class 3b or Class 4 lasers or laser systems in the facility.
- Hazard evaluation of laser areas, including Nominal Hazard Zones (NHZ).
- Maintaining records of all Class 3b and Class 4 lasers.
- Ensuring that appropriate polices, protocols, and procedures have been established and are properly followed for the control of laser hazards.
- Ensuring that the Laser Protective Eyewear (LPE) is appropriate, in satisfactory condition, properly used, and is routinely inspected.
- Ensuring that all of the required labels and signs are appropriate in place and their routine inspection.
- Conduct periodic safety audits of laser systems, related equipment, and accessories.
- To conduct surveys and inspections of all areas where laser equipment is used. To periodically inspect the functionality of the laser systems, related equipment, accessories, and safety features and ensure corrective action is taken if required.
- Suspend, restrict, or terminate laser or laser system operation, if laser hazard controls are determined inadequate.
- Overseeing and ensuring that all HCP are appropriately trained on the laser's use and safety.
- Controlling and managing the passwords and or keys for activating the laser.
- Participate in accident investigations involving lasers and issuing laser incident/accident notifications and report any significant laser related injury to the laser manufacturer and appropriate agencies.
- Assuring the necessary records required by government regulations are maintained. (Documenting: maintenance programs, training records, audits, SOP, etc.)
- Overseeing and delegating duties to the Deputy Laser Safety Officer and Laser Safety Site Contact.

Laser Incident Reporting Protocol

The Laser Safety Officer (LSO) or an appropriately designated person:

A. Shall notify the manufacturer of the laser system and the applicable agency by telephone within 24 hours of any incident that has caused or may have caused:
   1. Permanent loss of sight in either eye, or
   2. Third-degree burns of the skin involving more than 5 percent of the body surface as estimated by the rule of nines.

B. Shall notify the manufacturer of the laser system and the applicable agency by telephone within five working days of any incident that has or may have caused:
   1. Any second-degree burn of the skin larger than one inch (2.54 centimeter) in greatest diameter, or
   2. Any third-degree burn of the skin, or an eye injury with any potential loss of sight.

C. Shall file a written report with the manufacturer of the laser system and the applicable agency of any known exposure of an individual to laser radiation or collateral radiation within 30 days of its discovery, describing:
   1. Each exposure of the individual to laser or collateral radiation that exceeds the applicable Maximum Permissible Exposure (MPE), and
   2. Any incident that triggered a notice requirement in sections (A) or (B) above.
   3. These written reports shall describe the extent of exposure to each individual including:
      1. An estimate of the individual's exposure,
      2. The level of laser or collateral radiation involved,
      3. The cause of the exposure, and
      4. The corrective steps taken or planned to prevent a recurrence.

Laser Incident / Accident Reporting Form

Advanced Integration & Mentoring
www.DentalAIM.org

Office Name: _____ Phone #: _____

Office Address: _____

Name of the Laser Safety Officer (LSO): _____

Contact Person (if different from LSO): _____

Laser Device: _____ Wavelength(s): _____nm Laser Class: ____

Name of Injured Person: _____

Address: _____

Phone #s: Home: _____ Work: _____ Cell: _____

Date of Incident: _____ Time: _____

Person Operating the Laser Device: _____

Nature of Injury:

- ☐ Permanent loss of sight in either eye
- ☐ Third-degree burns of the skin involving more than 5 percent of the body surface
- ☐ Third-degree burn of the skin involving less than 5 percent of the body surface
- ☐ Second degree burn of the skin larger than one inch (2.54 cm) in greatest diameter
- ☐ Eye injury with any potential loss of sight.
- ☐ Other _____

Extent of Injury: _____

Cause of the Incident / Injury: _____

_____

Corrective steps taken or planned to prevent a recurrence: _____

_____

Estimated Amount of Radiation and Individual's Exposure: _____

Incident Reported by : ☐ Telephone ☐ In Writing ☐ Other: _____

To Organization: _____ Date: _____ Time: _____

Individual's Name: _____Position: _____

Additional Report by: ☐ Telephone ☐ In Writing ☐ Other: _____

To Organization: _____ Date: _____ Time: _____

Individual's Name: _____ Position: _____

Attach Any Additional Documents, Statements, Correspondence, and Amendments, to this Form

Completed By (Print Name): _____ Title: _____

Signature: _____ Date: _____

Laser Inspection & Maintenance Form

Advanced Integration & Mentoring
www.DentalAIM.org

Laser Device: _____ Wavelength: _____ nm Laser Class:___

Required Labels are on the Device and Legible: **Yes / No**

- ☐ Laser Radiation Symbol
- ☐ Wavelengths and Maximum Power
- ☐ Caution Label (Laser Classification and Potential Dangers):

Nominal Ocular Hazard Distance (NOHD) for this Device is: _____

Nominal Hazard Zone(s) (NHZ) for the Use of this Device Have Been Identified: **Yes / No**

Required Laser Safety Signs are Appropriate and in Satisfactory Condition: **Yes / No**

Laser Protective Eyewear:

Minimal Optical Density (OD) / Laser Filtration (L) Required is: _____

Number of Pairs of Eyewear Inspected and in Satisfactory Condition for this Device: _____

Laser System Has Been Inspected and is in Satisfactory Condition: **Yes / No**

- ☐ Condition of Containment Case
- ☐ Password / Key Mechanism
- ☐ Guarded Activation Switch
- ☐ Safety Interlock Mechanism
- ☐ Software Self Check (POST)
- ☐ Automatic Sleep Mode
- ☐ Visual & Auditory Laser Emission Indicators
- ☐ Emergency Shut Off Switch

Evacuation System for the Laser Generated Airborne Contaminants (LGAC) / Laser Plume is Appropriate and Functioning Satisfactorily: **Yes / No**

Date of Last Calibration of the Laser Device: _____

All Employees in the Area Where the Device is in Use Have Been Appropriately Trained on Laser Safety to their Level of Potential Exposure and Use: **Yes / No**
(Training Must be Documented):

Are the Appropriate Forms Available to Record Any Incident that Might Occur for an Exposure? in Excess to the Maximum Permissible Exposure (MPE) of Laser Energy: **Yes / No**

Has There Been Any Reportable Incidents of Anyone Being Exposed in Excess to the Maximum Permissible Exposure (MPE) of Laser Energy with this Device: **Yes / No**
(If Yes, Include a Copy of the Report to This Document)

Regulatory Documents that Have Been Submitted since the Last Report was Completed:

_____

_____

Other Laser Safety Concerns or Information that Need to be Included in this Report:

_____

_____

Name of the Laser Safety Officer (LSO) for this Location: _____

Completed By (Print Name): _____ Title: _____

Signature: _____ Date: _____

Laser Calibration and Inspection Log

Advanced Integration & Mentoring
www.DentalAIM.org

Laser Device: _____ Wavelength(s): _____nm Laser Class: ___

Name of the Laser Safety Officer (LSO) for this Location: _____

Date of Inspection	Inspection Performed By		Date of Calibration	Calibration Performed By

Laser Settings & Parameters Concepts
Overview

"A young man may know the rules, but a wise man knows the exceptions!"

This quote from Supreme Court Chief Justice, Oliver Wendell Holmes, was not about what settings should be used for a laser procedure but could have been, or about dentistry as a whole for that matter. A Class 4 surgical laser should only be utilized by properly licensed practitioners who have completed appropriate training with clinical simulation experience. The following settings are only recommendations and guidelines, and are intended for use with a high powered (over 6 watts) 970nm (or 980nm class) diode laser. A clinician must always use their own prudent judgment when utilizing any laser in clinical practice. The biological effect and tissue interaction attained is dependent on the wavelength, the amount of laser energy (watts) being used, the temporal mode, the clinician's handspeed, and the composition of the patient's target tissue. Varying these parameters will affect the amount of energy that is absorbed by the tissue and the resulting biological effect. Remember, tissue composition varies from patient to patient and also varies from region to region within the same patient and the area being treated. The settings should always be adjusted appropriately to achieve the desired tissue interaction and treatment objective for the specific area receiving laser therapy.

Variables Effecting Laser Energy's Interaction with Tissue

- Wavelength (970nm and can only be altered by changing the laser being used)
- Power / Energy
    - Power (Peak)
    - Average power
- Interaction Time
    - Total Interaction Time (Time)
    - Duty cycle – the % of time emitting energy vs. thermal relaxation time (on vs. off time per pulse)
    - Continuous Wave vs. Pulsing laser light energy (Frequency)
    - Hand Speed of the clinician
- Energy Transfer Mode – Contact vs. Non-Contact Mode
- Fiber (spot) size -320 micron vs. 200 micron fiber and the diffusion properties of fiber when used out of contact
- Composition of target tissue
    - Fibrous, vs. inflammatory, vs. granulation

Pre-set Parameters & User Defined Settings on Lasers

- Most of the factory installed Pre-set parameters have been designed to provide efficient tissue removal with the maximum amount of hemostasis. However, these settings may cause some unwanted collateral tissue damage to establish the hemostatic effect.

High Fluence Mode / High Peak-Power with Short Pulses of Laser Energy

There is a linear relationship between the amount of power (which is expressed in watts) in the pulse and the volume of the tissue that is vaporized and removed (referred to as the ablation creator). Using a higher peak power lowers the ablation threshold and accelerates the ablation process and its efficiency, thus decreasing the thermal side effects of the pulse.[1]

By increasing the laser's peak power in the pulse it also allows for the use of a pulse with a shorter duration with the same average power allowing for a longer thermal relaxation time (TRT) between each pulse. The goal is to increase the thermal relaxation time (TRT) between each pulse allowing the surrounding tissue to cool down after each pulse and remain within a normal temperature range in comfortable state.

The ratio or percentage of the length of time the pulse of laser energy is being emitted and the length of the thermal relaxation time (TRT) is referred to as the duty cycle which sometimes referred to as the emission cycle. The use of a high peak power enables a reduced duty cycle and allows for a greater percentage of time that the remaining tissue surrounding the ablation creator is allowed to cool before the next pulse. The ability to manage the duty cycle and therefore the thermal relaxation time enables the clinician to control and reduce the amount of thermal damage to the remaining tissue.

[1] Hibst, R. *Lasers for Caries Removal and Cavity Preparation: State of the Art and Future Directions,* Journal of Oral Laser Applications, 2002; 2:203-212

Below are Various Examples of Different Duty Cycles and Average Powers

Ablation, Incisional, and Excisional Procedures

The fact that lasers simply function by removing tissue by vaporizing the water in the tissue, means that Ablation Incisional, and Excisional procedures can be accomplished using all the same parameters and principles. However, the Continuous Wave mode can also be used with an Ablation technique especially if coagulation / hemostasis is desired.

Ablation procedures include, but are not limited to: Frenectomy, Soft tissue troughing, Destruction of a lesion, Distal wedge procedures, Gingivoplasty, Operculectomy, Gingivectomy, Vestibuloplasty, Tooth exposures, Implant uncovering, etc. Periodontal Pocket Debridement Laser Therapy (PDLT) is an ablation technique, however it has specialized settings utilizing significantly lower average power, see the specific settings for that procedure in the PDLT section of this handout.

- An ablation technique is removing tissue by moving the laser fiber in a two way back and forth motion, similar to the use of a pencil eraser. It can be accomplished with the fiber in slight contact with the tissue for tactile sensitivity, or with the fiber completely out of contact with the tissue. Almost all soft tissue laser procedures that are performed are finished with the tissue being smoothed or contoured with an ablation technique.

Incisional / Excisional procedures include, but are not limited to: Gingivectomy, Gingival flap incisions, Distal wedge, Biopsies, Tooth exposures, Fibroma removal, etc.

- **Incisional** "Blade type" technique is using the laser fiber like a scalpel blade to make an incision, but with a two way back and forth "sawing" type motion.
- The slower the fiber movement (hands peed) the faster the incision will be made. However, the slower the hand speed, the more heat that will be spread into the surrounding tissue and its resulting effect.
- **Excisional** technique is used when the tissue to be removed is cut off in block section(s) with an incision. The use of tissue pickups or a silk suture can be helpful in controlling the specimen (tissue) to be removed or excised.
- An excisional technique is used for biopsies so there is a tissue specimen that can be evaluated by an oral pathologist.

Continuous Wave (CW) temporal mode can also be used for ablation procedures:

- However, a continuous wave temporal mode setting does not provide for any thermal relaxation time (TRT). It is recommended when using a CW mode to begin with 3 watts of power using water irrigation for cooling and adjust the amount of water being applied or adjusting the power up or down according to the desired laser tissue interaction.
- Due to the collateral spread of heat in the CW mode, the surrounding tissue will have a raise in temperature, which will help facilitate coagulation as the tissue approaches 60º centigrade. This rise in temperature will also cause tissue necrosis, sloughing, and an inflammatory response possibly causing increased pain and post-operative discomfort.

Continuous wave mode should always be used with caution, due to the increased potential for side effects

Hemostasis

Overview

Hemostasis is achieved when adequate zone of the remaining tissue is elevated to a temperature above 60ºC. However, it is important to remember that when the tissue temperature is at 60ºC or above it will be irreversibly damaged causing tissue necrosis and will slough, which may cause recession and / or other undesirable side effects, so a great deal of care needs to be taken to insure that the desired goals and outcomes are achieved. This rise in temperature may also cause an inflammatory response possibly causing increased pain and post-operative discomfort.

A very general and basic concept is that the wider the pulse width (longer the time) the more heat that will spread into the surrounding tissue adjacent to the laser fiber, and the more the heat the better the hemostasis. This means at any given power level a continuous wave (CW) will provide the greatest amount of hemostasis, and potential tissue damage.

Additionally the longer the time between each pulse, known thermal relaxation time (TRT) more the remaining tissue will be allowed to cooled between each pulse. This allows the surrounding tissue to dissipate some of the heat it gained from previous pulse. A general concept is the higher the Duty Cycle (the % of time that time emitting energy vs. the % of time the tissue is allowed to cool between each pulse) the greater the amount of heat that will spread into the surrounding tissue, and therefore have an increased amount of hemostasis and related tissue damage. Conversely, the shorter the duty cycle the less collateral damage will occur in the surrounding tissue and the less hemostatic effect and the less tissue damage each pulse will have on the remaining tissue.

Continuous Wave (CW) temporal mode can also be used for hemostasis:

However, a continuous wave temporal mode setting does not provide for any thermal relaxation time (TRT) and will restrict the clinician's ability to control the tissue interactions. It is recommended when using a CW mode to begin with 3 watts of power using water irrigation for cooling and adjust the power up or down and the amount of water irrigation according to the desired laser tissue interaction and need to achieve the hemostasis.

- Continuous wave (CW) mode with an ablation technique is often used for procedures where the primary objective is coagulation. Due the collateral spread of heat in this mode, the surrounding tissue will have a raise in temperature, which will help facilitate coagulation as the tissue approaches 60º centigrade.

Continuous wave mode should always be used with caution, due to the increased potential for side effects!

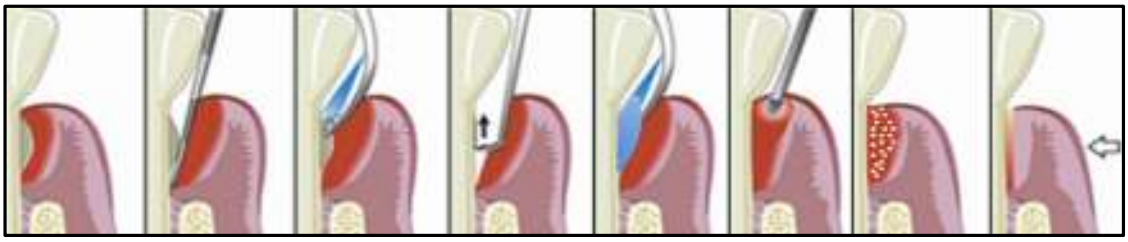
If water irrigation for cooling is not used, lower power settings should be used!

Photobiomodulation (PBM) / Phototherapy / LLLT

- Phototherapy, or more scientifically referred to as Photobiomodulation (PBM), and often called Low Level Laser (or Light) Therapy (LLLT) or Biostimulation is the technique of achieving a therapeutic tissue response without removing any tissue. It is accomplished with the fiber completely out of contact with the tissue and constantly moving the laser fiber, similar to the use of a paint sprayer.
- Phototherapy / PBM procedures that can be performed with soft tissue lasers include, but are not limited to: Treatment of Aphthous ulcers, Herpetic lesions, Desensitization, Pain reduction, Improved healing, etc.
- **Anesthesia is NEVER used with Phototherapy / PBM (neither local nor topical).** The patient's feedback and response is essential in determining tissue interaction and preventing unwanted tissue damage.
- **Use freshly cleaved, non-initiated fiber.** Do not test fire fiber in contact as any debris on the end (tip) of the will block or disperse the laser energy from the target tissue.
- Settings used for Phototherapy / PBM is simply 2 watts in a Continuous Wave (CW) mode for two minutes.
    - Depending on the treatment objective, it is usually recommended that the treatment phase is divided into 30 second increments with equal amount of thermal relaxation time (TRT). (30 sec. on and 30 sec. off).
- The motion of the laser fiber is to constantly move the tip and paint the target area with laser energy, starting at approximately 2 inches away from the target and moving the tip closer until the patient feels some sensation or heat, then backing slightly away and constantly moving the fiber over the target in 30 second increments while trying to get progressively closer to the target. If it is not possible to back the tip far enough back from the target, the power should be lowered to remove any sensation for the patient. The patient should only occasionally feel some sensation or warmth as the laser tip is occasionally moved in closer to the tissue, but…

  It should never be uncomfortable!

Laser Assisted Periodontal Care & Bacterial Decontamination



Overview

When utilizing a laser in periodontal care the historical goals, principles of the causes, treatment, and management of periodontal disease, does not change. The primary goals in the treatment of periodontal disease are to:

- Decontaminate the periodontal pocket and the infected tissue of the periodontal pocket
- Arrest the progressive destruction of periodontal attachment.
- Establish a periodontal architecture that can be properly maintained with adequate home care.
- Create an environment to facilitate the regeneration of the lost periodontium, whenever possible.

The purpose of laser assisted periodontal care is to assist in the initial non-surgical management of periodontal disease. The laser assist in decreasing the bacterial load and can assist in debridement of the diseased sulcular epithelium. When this is accomplished, pocket depths are reduced and able to be maintained with proper routine homecare. Bleeding on probing should be eliminated, and the apical migration of the epithelial attachment halted.

Treatment Considerations

Comprehensive examination and diagnostic procedures need to be performed to establish an accurate diagnosis of the periodontal status. Prudent clinical judgment is required and the practitioner and the patient need to have realistic expectations for the desired outcomes. Informed consent from the patient on the treatment objectives, prognosis and possibility of tooth loss should be established before any treatment is rendered.

The Role of the Laser as an adjunct to Scaling and Root Planing

The soft tissue laser and is an adjunctive device primarily used in closed subgingival instrumentation procedures without the displacement (flapping) of the gingiva. The laser's role is not to replace any of the traditional procedures or instrumentation, but is used in addition to ultrasonic and hand instrumentation to obtain a better outcome. The laser's primary role is to reduce or eliminate the bacteria in the periodontal pocket to assist in creating an enhanced environment to help facilitate the reattachment of the soft tissue to the root structure of the tooth. All clinicians must only perform lasers procedures that are permitted within their scope of practice that is defined by the State's Dental Practice Act. A laser can assist in removal of diseased, inflamed, or inappropriate soft tissue in the periodontal pocket. Laser decontamination is accomplished by the clinician thoroughly applying photonic energy to the entire soft tissue lining of the periodontal pocket. The composition of bacteria is as much as 90% water. This enables laser energy with a wavelength which is highly absorbed in water such as the 970nm WL to inactivate the bacteria in the periodontal pocket very efficiently when compared to other diode lasers with an 810-950nm WL.

Additionally, a laser with a high peak power and very short pulse width plays a significant role in minimizing collateral tissue damage while creating the proper environment for the establishment and organization of a sufficient and stable clot to promote healing. Commencing and maintaining this healing process is imperative in the re-establishment of the periodontal attachment architecture to the root structure of the tooth, thus minimizing pocket depths and to arresting the apical migration of the attachment.

Practitioners need to have a comprehensive understanding of the disease processes, the benefits and limitations of laser bacterial decontamination, as well as, the present periodontal status of the patient and the patient's overall oral and systemic health. The clinician and patient need to understand and remember that reduction of the bacterial load and periodontal pocket decontamination are only part of the comprehensive treatment regime, and care that is required to achieve successful outcomes.

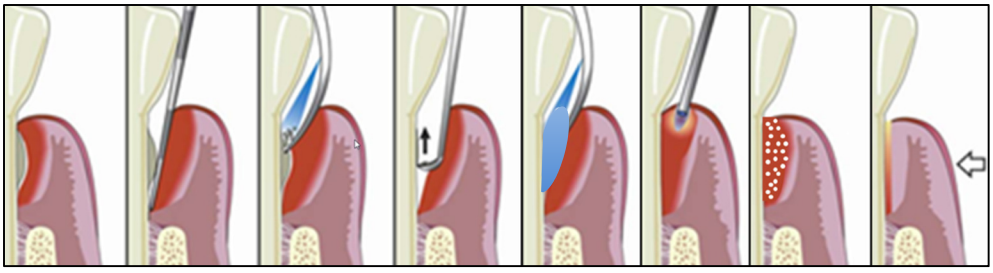
Laser Assisted Periodontal Care
Bacterial Decontamination

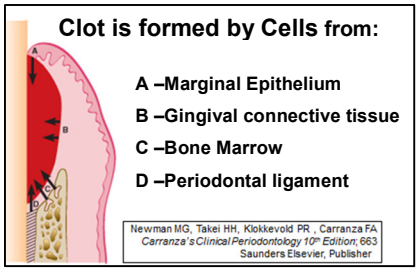
Treatment Sequence for Comprehensive Periodontal Care

1. Review the patient's medical, dental, and social history and assess their present status.
2. Cursory visual and tactile examination.
3. Acquisition and review of appropriate radiographs.
4. Comprehensive oral examination.
5. Enhanced soft tissue and mucosal examination.
6. Full mouth periodontal probing.
7. Oral hygiene assessment and focused detailed instructions.
8. Assessment of the information obtained and the establishment of a treatment plan with the associated treatment time required and related costs.
9. Treatment.
10. Re-evaluation of the patient's oral health status and treatment outcomes.
11. Ongoing maintenance and surveillance.

Steps of a Typical Laser Assisted Periodontal Treatment Appointment

1. Anesthesia should be administered and re-administered as needed.
   - Often liquid topical anesthetic placed in periodontal pocket is adequate.
     -Cetacaine liquid (.4ml max dosage), Hurricaine liquid, Oraqix, TAC-20, etc.
   - The use of a local anesthetic may be required and used when deemed necessary and appropriate.
2. Re-probe the periodontal pocket to confirm the pocket depths and to become familiar with architecture.
3. Ultrasonic scaling with an antimicrobial irrigating agent.(ex: 0.01% buffered NaOCl—Diluted Dakin's Solution)
   - The goal is to remove calculus and other debris from the root surfaces of the tooth and pocket.
   - The role of the antimicrobial agent -To flush out the debris from the pocket & to assist in eradicating and reducing the number of any residual microbes in the pocket.
4. Light hand instrumentation of the tooth surfaces as necessary.
   - To inspect the root surfaces and remove any remaining calculus or deposits.
5. Irrigating the pocket with water (through ultrasonic device) to dilute the concentration of the NaOCl and to flush out the remaining debris. (This also flushes the device at the same time.)
6. Laser bacterial decontamination of the entire diseased epithelial lining of the periodontal pocket. (See laser parameters and settings on next page.)
   - The goal is to disinfect and remove the bacteria and debris from the soft tissue.
   - To create the formation of a clot, to facilitate reattachment of the soft tissue to the root surface.
7. Apply finger pressure to the gingiva to place it in close contact with the tooth structure.
   - To obtain the close adaptation of the soft tissues to the root surface
   - To help control the environment while the clot is being formed and organized
   - **DO NOT PROBE THE POCKET FOR A MINIMUM OF 90 DAYS.**
8. Post-op instructions and specific home care instructions.
9. Schedule 1 month evaluation and to remove staining from the Chlorhexidine at home rinses if necessary.
10. Re-evaluation in 90 days and 3 month on going periodontal maintenance with retreatment as necessary.





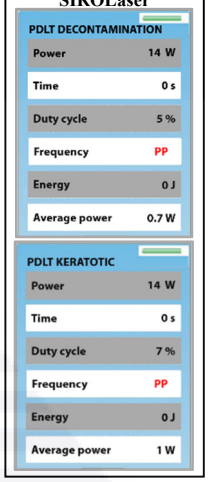
Laser Assisted Periodontal Care
Pocket Decontamination Laser Therapy (PDLT)

Laser Parameters, Motion, & Considerations

Parameters and Settings

- The parameter and settings used for PDLT are determined by the status of the patient's tissue and the specific features and properties the laser used for the procedure.
- The use of a 320µ fiber is ideal.
- The fiber should never be initiated, as blocking the laser energy will cause the fiber to become hot and cauterize the lining of the pocket which inhibits / blocks the reattachment and healing process. Cauterizing the pocket lining produces an undesirable effect and a poor outcome.
- **Temporal mode should always be a pulsed mode** (gated / chopped pulse or a free-running mode).
  - **The shorter the duty cycle (length of the pulse / the time energy is being emitted) the less heat that spreads into the surrounding tissue and cauterization that will occur.**
- **Continuous Wave (CW) should not be used for pocket decontamination.**
  CW will cause cauterization, thermal damage, and /or tissue necrosis of the pocket lining.
- **Average power of 0.7 to 0.8 watts** is a recommended starting point and is adjusted as needed for the type of tissue being treated.
  Fibrous / Hyperkeratotic pocket will require more power.
  Recommend starting with 1.0 Watts of Average power for Hyperkeratotic tissue.
  Average power should not exceed 1.5 Watts
- **Power (Peak)** of the pulse times the **Duty cycle** equals the **Average power**
  Example: 14 W (Peak Power) x 5% (Duty cycle) = 0.7 W (Average power)
  14 W (Peak Power) x 7% (Duty cycle) = 1.0 W (Average power)
  - Hand speed will have a significant relationship to biologic effect.
  - Adjust settings as needed to achieve the desired effect.
    - Heavily keratinized tissue will require more power than inflamed tissue.

Examples of the Proper Settings with the SIROLaser



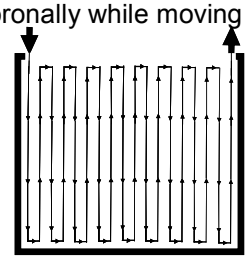
Recommended Treatment Time per Pocket

- Because the pocket size (volume and surface area) varies from pocket to pocket, so should the treatment time that the laser is emitting photonic laser energy while in the pocket.
- Generally the recommended treatment time is 15-30 seconds per pocket.
- When scheduling treatment estimate the time for each tooth to be treated will be approximately 1minute.

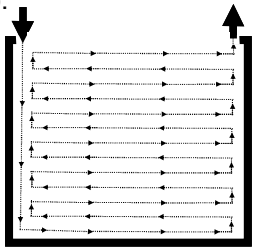
Hand Speed and Motion of the Laser

- The goal is to treat the entire epithelial lining of the pocket with laser energy to decontaminate the pocket, establish a stable clot, and to prevent the apical migration of the pocket and its attachment.
- The fiber tip should be aimed away from the tooth structure at the diseased epithelial lining of the pocket.
- When appropriate the crestal and extra sulcular epithelium may also need to be treated by the dentist.
- The fiber tip should be in constant motion whenever laser energy is being emitted, and this is especially true when it is inside the pocket during periodontal pocket debridement laser therapy (PDLT).
- The fiber has to be adjusted and extended beyond the end of the canula to a length that will enable it to reach the bottom of the pocket. (Often performed by using a periodontal probe as a reference guide).
- Hand speed should be consistent and at moderate speed (dots touching each other on the worksheet).
- Treatment is most often performed by starting in the interproximal area and moving the fiber within the pocket buccal or lingually (circumferentially) around the tooth to the opposite interproximal area.
- It is often best to start by moving the fiber in an up and down / vertical (coronal-apical) direction while moving toward the opposite interproximal area (see Fig. 1 below).
- Then retreating the pocket by inserting the fiber again inside the pocket, and this time moving it in a side to side / horizontal (mesial-distal) direction placing the tip at the bottom (apical portion) of the pocket and moving coronally while moving the tip back and forth (see Fig. 2 below).

(Fig. 1)
Vertical hand movement pattern



(Fig. 2)
Horizontal hand movement pattern



Other Considerations

- Soft tissue lasers are **NOT indicated for calculus removal.**
- Soft tissue lasers are **NOT for use on the root or bone** (should minimize trauma to alveolar bone and tooth).

Laser Assisted Periodontal Care
Pocket Decontamination Laser Therapy (PDLT)

Irrigation, Anesthetic, Antibiotics, & Medication Considerations

Water Cooling / Irrigation and Topical Anesthetic

- One of the main benefits of the high powered 970 nm wavelength (WL) diode and 1064 nm Nd:YAG lasers is the true use of radiant (light/photonic) energy vs. heat energy that used by 800 to 950 nm lasers. This allows the laser to function in the fluid filled periodontal pocket and enables an increased biological effect with radiant photonic laser energy rather than heat.
    - **Studies have shown that *"exposure (30 sec.) of light at 810 nm exhibited minimal and non-selective antimicrobial effects."*[i]**
- The use of radiant energy vs. heat application of a liquid cooling agent can easily be performed by using a disposable irrigation syringe with the appropriate plastic cannula. When decontaminating the pocket with the 970nm laser, water or agent can be flushed directly through the periodontal pocket, before and during the application of laser energy. Applying a liquid cooling agent into the pocket will assist in controlling the collateral thermal damage to the remaining underlying tissue, and also enhance the patient's comfort.
- Water is the best vehicle to enhance the photonic energy transfer into the tissue, bacteria, and biofilm and to facilitate tissue cooling, as well as, minimizing collateral tissue damage.
- The only "anesthetic" effect of water irrigation is by reducing the thermal heat transfer into the tissue and therefore reducing the thermal sensitivity caused by the laser interaction.
- Liquid topical anesthetics (such as Cetacaine Liquid) can be flushed through the pocket to both facilitate convection cooling and have an analgesic effect.
- While, irrigating with liquid topical anesthetics may help in reducing tissue dehydration and analgesia, they will not significantly improve the photonic effects of the 970nm wavelength that is obtained with water irrigation.
- When performing pocket decontamination with a high fluence technique, (meaning a high peak power and a very short duty cycle) a more efficient and effective tissue interaction will be obtained.
- When convection irrigation is used and a high fluence technique is utilized, less collateral damage and cauterization will occur, assisting in the formation of an appropriate and stable clot to promote healing.
- To obtain the maximum absorption of laser energy in the target materials and minimize cauterization, the fiber should not be "initiated". However, all laser fibers will self-initiate when in contact with biological matter.

Arestin® and Locally Administered Antibiotics (LAAs)

- The use of the time released ARESTIN® (minocycline hydrochloride) Microspheres, which is a powder is beneficial in maintaining a reduced bacterial count during the healing phase. Other locally administered antibiotics (LAAs) should not be placed in the pocket with laser assisted hygiene / periodontal care.
- After treating the epithelial lining with laser energy and decontaminating the pocket, Arestin can be placed in the pocket to be incorporated into the clot. The time released minocycline of the Arestin microspheres will help maintain a low bacterial count in the treated area while the periodontal attachment apparatus is being re-established over the next few weeks.
- The last clinical procedure is to apply finger pressure to the gingiva against the tooth with the goal of placing the soft tissue and the root structure (ideally cementum) in close proximity to assist in establishing a stable clot and coagulation in the hopes of gaining the re-attachment of the soft tissue to the tooth structure.

Prescription and Medication Considerations

Systemic antibiotics (Doxycycline, etc.) and antimicrobial rinses might be considered and may be beneficial. The information is provided for possible guidance and consideration and should be used in conjunction with an individual assessment of each patient's case. It may be considered as an adjunct to thorough and comprehensive periodontal care. Prescribing should be based upon the healthcare provider's examination of each patient and considering factors unique to the patient. This information should be used as a guide to help the user reach diagnostic and treatment decisions, bearing in mind that individual circumstances may lead the user to reach other decisions.

- Systemic antibiotic for use during the treatment phase and immediate post treatment:
    - Doxycycline 100 mg Disp: 22 Sig: 2 STAT then 1 QD until gone
- OraSoothe Oral Hydrogel Antimicrobial Rinse 2 Bottles Dispensed from the Office
    - At least Twice a day---Starting 2 days before the treatment phase & continue 1 month post treatment:
- Systemic antibiotic 3 month maintenance program after initial Doxycycline 100 mg regime above:
    - Periostat 20 mg Disp: 180 Sig: 1 BID until gone

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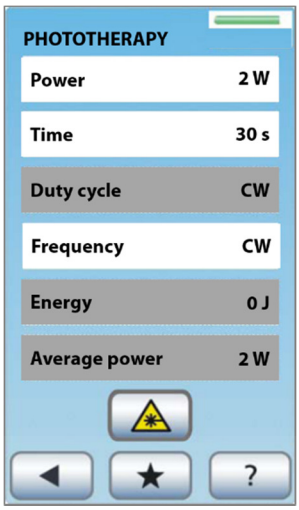
[i] Song X, Yaskell T, Klepac-Ceraj V, Lynch MC, Soukos NS; Applied Molecular Photomedicine Laboratory, Department of Applied Oral Sciences, The Forsyth Institute, Cambridge, MA.; *Antimicrobial Action of Minocycline Microspheres Versus 810 nm Diode Laser on Human Dental Plaque Microcosm Biofilms*; *J Periodontol. 2013 Jun 27*

Laser Documentation Guidelines

Whenever any treatment is performed, a thorough and detailed account of the procedures performed, discussions carried out, and the laser parameters utilized should be documented in the patient's records for both the benefit of the patient and for the protection of the practice. Listed below are a number of recommendations and guidelines for some of the information that should be documented. (See examples and forms on the following pages).



Consent:

Risks, benefits, and alternatives have been explained and accepted by the patient

Treatment Objective:

Procedure and reason / purpose of treatment (treatment and treatment objective)

Laser Parameters:

Laser / Wavelength: SIROLaser 970nm Class 4 laser

Fiber Size: 320 or 200 micron (µ) fiber

Power Levels: Record the highest power setting used, expressed in watts

Time (Interaction Time): Especially important for:

- Periodontal pocket debridement laser therapy (PDLT)
- Phototherapy (photobiomodulation) procedures:
  Aphthous ulcers, Herpetic lesions, Venous lake, etc.

Duty Cycle: Percent of a single pulse the laser is emitting energy (# %)

Frequency: Pulses per seconds (# of Hz), Continuous Wave (CW), or Peak Pulse Mode (PP)

Safety Guides Lines Followed:

Especially eye protection levels for all of the people in the nominal hazard zone (NHZ)

Photo-documentation:

Most soft tissues conditions / lesions (other than periodontal) are not discernable on a radiograph, so it is strongly recommended that these conditions be documented in the patient's record with photographic images. This photo-documentation can also assist in patient education, correspondence with insurance carriers, consulting with specialists, and pathology labs.

Whenever appropriate both a white light and a fluorescence (VELscope) image should be acquired. Whenever possible a measurement reference guide, such as periodontal probe, or sterilizable millimeter ruler, should be included within the image. This will assist in the recording of the status of the condition or anomaly and will aid in monitoring the progression or regression of the condition.

Whenever possible a distinguishable anatomical landmark (such as a tooth, uvula, commissure of lip, parotid duct, etc.) should be contained within the image to help establish the location and orientation of the image.

Recommended Images to Be Recorded:

- Discovery Photograph
- Pre-treatment Photograph
- Immediate Post-treatment Photograph
- Post Healing Photograph
- Any Additional Images to Monitor the Progression, Regression, Healing or Surveillance

Schematic Representation (Oral Cavity Mapping):

Schematics can also be used to document the location(s) and extent of an area of concern. It is beneficial to use the dentition as a reference to define location when the mouth is at rest. (i.e. ventral surface of tongue adjacent to tooth #31) There are some examples of downloadable forms on following pages to assist in this process.

Forms for Textual Description of a Soft Tissue Area(s) of Concern:

To assist in organizing, comparing, and sharing findings between appointments, with specialists, pathology labs and insurance carriers recording detailed information with the clinical findings obtained in text form is extremely valuable. There are some examples of downloadable forms on following pages to assist in this process. Answering all of these questions for every area is usually not necessary but these forms can help as a guide to that information that might need to be recorded.

Patient Acknowledgment & Post Treatment Instructions

Acknowledgment of the Presence of Periodontal Disease

I have been informed that periodontal pockets are indicators of periodontal disease, which is an infection of the gingival (gum) tissue and the permanent loss of bone that support my teeth.

I understand that my periodontal probing and screening has shown that I have periodontal pockets in my mouth which indicate I have periodontitis (a gum infection and a loss of the supporting bone).

I also understand that periodontal disease may be painless at this stage, and in even more advanced stages, and may be progressive, and that failure to treat and control this disease may result in the eventual loss of my teeth and many other illnesses.

I also understand that research has shown a connection and a link between a periodontal infection and periodontal disease as a possible cause of heart disease, diabetes, stroke, several forms of cancer, and other diseases.

I am aware that periodontists are dental specialists who are available and can provide specialized treatment for this disease.

Signature_____ Date_____ _____

Post Treatment Instructions
After Laser Enhanced Periodontal Root Planing & Scaling

- You may have some mild discomfort after the periodontal (gum) treatment.
  - **Applying the *SockIT Gel* as often as desired to the treatment area to will help relieve any discomfort you may be experiencing.**
- Applying the *SockIT Gel* will also help reduce the bacteria in the area and aid in the healing process.
- **Additionally lightly Swish / Rinse with a cap full with the *OraSoothe Hygiene Oral Coating Rinse* at least Twice a day for 1 month.** (This also may be done as frequently as you desire.)
- ***SockIT Gel* and *OraSoothe Hygiene Oral Coating Rinse* are comprised of all natural food ingredients and can be swallowed and they both can be used as often as desired.**
  - You can obtain more of the *SockIT Gel* and/or *OraSoothe Rinse* by contacting our office.
- Gently brush the area with the **extra soft toothbrush** provided for 4 weeks.
- **DO NOT FLOSS for 2 to 3 weeks.**
- **DO NOT TO USE AN ORAL IRRIGATOR / WATER PIK in the treated areas for 1 month.**
- It is recommended to eat soft foods and avoiding hard “crunchy” and spicy foods for a few days.
- Return for your 1 month follow-up appointment as scheduled.
- **Please contact our office if you have any questions, problems, or concerns.**

Post Treatment Instructions
After Soft Tissue Laser Surgical Procedures

- You may have some mild discomfort after the surgical treatment.
  - **Applying the *SockIT Gel* as often as desired to the treatment area will help to relieve any discomfort you may be experiencing.**
- Applying the *SockIT Gel* will also help reduce the bacteria in the area and aid in the healing process.
- **Lightly Swish / Rinse with a cap full with the *OraSoothe Hygiene Oral Coating Rinse* at least Twice a day for 1 month.** (This also may be done as frequently as you desire.)
- ***SockIT Gel* and *OraSoothe Hygiene Oral Coating Rinse* are comprised of all natural food ingredients and can be swallowed and they both can used as often as desired.**
  - You can obtain more of the *SockIT Gel* and/or *OraSoothe Rinse* by contacting our office.
- The treatment will have a whitish yellow appearance while healing this is a normal appearance.
- It is recommended to avoid spicy foods for a few days as they might cause a mild burning sensation.
- Return for your follow-up appointment if scheduled.
- **Please contact our office if you have any questions, problems, or concerns.**

Health Information and History

Patient's Name: _____ **Date of Birth**: _____

If You are Completing This form For Another Person:
Your Name: _____ Phone:_____ Relationship:_____

Emergency Contact: (If Not Listed Above)
Name: _____ Phone: _____ Relationship:_____

Primary Physician: _____ Phone: _____ City & State:_____

Date of Last Physical Examination: _____ Date of Last Blood Test/Workup: _____

Other Physicians & Specialists
Name: _____ Specialty: _____ Phone: _____ City & State: _____

Name: _____ Specialty: _____ Phone: _____ City & State: _____

Within the Last 5 Years Have You Been Hospitalized or Had Surgery? ☐Yes ☐No

If Yes, Please Give Reasons and Dates: _____

Have You Ever Been Instructed to Take ANY Medications or Take ANY Special Precautions Before Any Dental Appointments*? ☐Yes ☐No

If Yes, Please Explain: _____

Have You Ever Taken or Been Treated with a Bisphosphonate Medication? ☐Yes ☐No

Are You Taking ANY Drugs, Medications, or Treatments at This Time? ☐Yes ☐No
(If You Brought a Complete Written List with You, Give that to the Receptionist Instead)

Prescribed_____
_____

Over-the-Counter Medications (Such as Aspirin, Advil, Allergy Medication, Sleeping Aids, Etc.)
_____

Vitamins, Natural or Herbal Preparations and/or Dietary Supplements
_____
_____

x. Are You Having or Ever Had Radiation or Chemotherapy Treatments*? ☐Yes ☐No

If Yes, for How Long?_____ Name of Facility Performing the Therapy:_____

2. Are You Allergic to or Have You Ever Experienced an Unusual Reaction to:

___Latex ___Metals or Jewelry ___Dental Anesthesia (Local)
___Fluoride ___Nitrous Oxide (Laughing Gas) ___General Anesthesia

3. Are You Allergic to or Have You Ever Had Any Reaction to Any of the Following Drugs?

___Penicillin (or Related Drugs) ___Tranquilizers (Valium) ___Tetracycline ___Codeine
___Aspirin / Ibuprofen (Advil, Motrin, Nuprin) ___Keflex (Cephalexin) ___Sulfa Drugs ___Iodine
___NSAID (Celebrex, Vioxx, Anaprox) ___Clindamycin (Cleocin) ___Erythromycin

Have You Had an Allergic Reaction or Unusual Response to ANY Other Medications, Drugs, Pills, or Treatments? ☐Yes ☐No

If Yes, Please List: _____

Continued on Next Page

AIM
Advanced Integration & Mentoring
www.DentalAIM.com

Patient's Name: _____

Do You Have or Have You Ever Had Any of the Following? (Please Check Yes or No for Each Question)

	Yes	No
Congenital Heart Defects*	___	___
Angina or Chest Pains	___	___
Atherosclerosis	___	___
Congestive Heart Failure	___	___
Coronary Artery Disease	___	___
Heart Surgery	___	___
If Yes, Date _____		
Heart Attack	___	___
If Yes, Date _____		
Rheumatic Heart Disease / Rheumatic Fever	___	___
Infective Endocarditis*	___	___
Heart Valve(s) Damage / Mitral Valve Prolapse	___	___
Artificial Heart Valve*	___	___
Pacemaker	___	___
Stroke or CVA	___	___
High Blood Pressure	___	___
Low Blood Pressure	___	___
Anemia	___	___
Hemophilia or Bleeding Disorder	___	___
Excessive Bleeding from Any Cut or Incident	___	___
Diabetes or Blood Sugar Problems	___	___
Any Artificial Joint, Joint Surgery,or Prosthesis*	___	___
If Yes, What Joint or Area: _____		
When was Operation Done: _____		
Hepatitis, Jaundice, or Other Liver Problems	___	___
Any Form of Cancer	___	___
An Organ Transplant*	___	___

	Yes	No
Asthma	___	___
Hay Fever, Skin or Food Allergies or Allergies in General	___	___
Sinus Problems	___	___
Tuberculosis, Emphysema or Lung Disorder	___	___
Skin Problems	___	___
If Yes, Describe: _____		
A Sore or Wound that Bleeds Easily or Does not Heal	___	___
A Thyroid Problem or Disease	___	___
Arthritis	___	___
Glaucoma or Any Eye Diseases	___	___
Epilepsy or Other Seizure Disorder	___	___
Any Kidney Problems	___	___
Ulcers, Acid Reflux, or Stomach Problems	___	___
A Compromised Immune System* (Lupus, HIV, AIDS, Radiation Immune Problem, etc)	___	___
An Active Sexually Transmitted Disease (STD)	___	___
Any Mental Health Issues	___	___
Been Treated for Any Psychiatric Condition	___	___

Women Only:	Yes	No
Are You Pregnant	___	___
If Yes, What is Your Due Date: _____		
Do You Think You Might Be Pregnant	___	___
Are You Presently Nursing	___	___
Are You Using Birth Control Medication	___	___
Are You Taking Hormone Replacement Therapy	___	___

Do You Have Any Other Conditions, Diseases, or Medical Problems, or is there ANY Other Information that You Would Like Us to Know About or that We Should Be Made Aware Of?

If So, Please Explain:_____

_____

_____

_____

_____

CONSENT—To the best of my knowledge, all of the preceding information is correct and if there is ever any change in health, or medications, this practice will be informed of the changes without fail. I also consent to allow this practice to contact any healthcare provider(s) and to have the patient's health information released to aid in care and treatment. I also hereby consent to allow diagnosis, proper health care and treatment to be performed by this practice for the above named individual until further notice. I understand there are no guarantees or warranties in health or dental care.

Signature: _____ Date: _____

(Parent or Guardian, if Patient is a Minor)

Reviewed By: _____

Dental and Oral Health Information

AIM Advanced Integration & Mentoring www.DentalAIM.com

Please Describe Any Specific Dental Problem or Discomfort You Are Having at This Time:

_____ How Long Has It Been Present? _____

If You Have Had Any of the Following Dental Care Please List the Dentists and Approximate Dates:

Periodontal (Gum) Treatment or Surgery: _____

"Braces" or Any Type of Orthodontic Treatment: _____

Dental Implants: _____

Any Other Type of Oral Surgery: _____

Do You Have or Had Any of the Following or Noticed Any of These Signs or Symptoms in Your Head, Neck, or Mouth?

(Please Check Yes or No for Each Question)	Yes	No		Yes	No
Teeth that are Sensitive to:			A Clicking, Snapping or Difficulty When Chewing	___	___
Hot, Cold, Sweets, or Biting Pressure	___	___	Difficulty Opening or Moving the Jaws	___	___
An Unpleasant Taste or Persistent Bad Breath	___	___	Difficulty Speaking or Changes in Your Voice	___	___
Does Food Catch Between Your Teeth	___	___	Difficulty Moving Your Tongue or "Tongue Tied"	___	___
Do Your Gums Bleed When Brushing	___	___	Loose or Separating Teeth	___	___
Red, Swollen, Tender, Bleeding, or Sore Gums	___	___	Changes in the Way Your Teeth Fit Together	___	___
Gums That Have Pulled Away from the Teeth	___	___	A Color Change of the Tissues in Your Mouth	___	___
Pus Between the Teeth and Gums	___	___	Pain, Tenderness, Numbness, or Earaches	___	___
Avoid Any Area When Brushing or Chewing	___	___	Any Lumps Swelling or Swollen Glands	___	___
Do You Clench or Grind Your Teeth	___	___	Sores, Ulcers, or Rough Spots in Your Mouth	___	___

About Your Dental Health:

How Do You Rate Your Overall Dental Health? ☐Good ☐Fair ☐Poor

How Many Times a Day Do You Brush Your Teeth? _____ **How Many Times a Week Do You Floss Your Teeth?** _____

Do You Use Any of the Following? (Please Check Yes or No for Each Question)	Yes	No
Power / Mechanical / Electric Toothbrush	___	___
If Yes, What Type or Brand? ☐Sonicare ☐Oral-B/Braun ☐Disposable ☐Other_____		
Flossing Aids (Floss Holders, Threaders, etc.)	___	___
Oral Irrigating Device (Water Pik)	___	___
Fluoride Treatments or Supplements at Home. If Yes, What: _____	___	___
Mouthwashes or Oral Rinses. If Yes, What Brand? _____	___	___
Do You Have Any Missing Teeth That Have Not Been Replaced?	___	___
Why Have You Not Had Them Replaced?_____		
Do You Wear Any Removable Dental Appliances? If Yes, What Type and For How Long? _____	___	___
Have You Ever Had Your Teeth Whitened or Bleached?	___	___
Would You Like to Have Your Teeth Whitened or Bleached?	___	___
Are You Concerned About the Finances Required to Return Your Mouth to Excellent Health?	___	___
Are You Frustrated Because You Always Need Something Treated or Repaired When You Visit a Dentist?	___	___
Do You Feel You Will Eventually Wear Artificial Dentures?	___	___
Have You Ever Had Any Complications From an Extraction or Dental Treatment?	___	___
If Yes, Please Explain: _____		
Have You Ever Had Any Other Dental Conditions, Major Trauma or Injury to Your Head, Neck, or Mouth?	___	___
If Yes, Please Specify: _____		

How Do You Feel About the Appearance of Your Smile and What Would You Change If You Could?

_____

If You are a New Patient to this Practice:

Date of Last Dental Visit: _____ Dentist's Name: _____ City & State: _____

Signature: _____ **Date**: _____

Oral Health Risk Factors

Patient's Name: _____

1. Do you smoke or have you EVER smoked? ☐Yes ☐No

(If No, proceed to question 2)

The amount that you are presently smoking: (Check ALL that apply)

___None (quit smoking completely) ___Less than 1 pack of cigarettes per day ___An occasional cigar
___An occasional cigarette ___1-2 Packs of cigarettes per day ___Cigars on a daily / regular basis
___A few cigarettes per Day ___2 or more packs of cigarettes per day ___Occasional pipe smoker
___A pipe on a daily / regular Basis

If you have quit smoking, when did you quit?

___Less than 6 months ago ___6 months to a year ago ___1 to 3 years ago ___Over 3 years ago

How many years have you or did you smoke?

___Less than 1 year ___Less than 2 years ___2-5 years ___5-10 years ___10-20 years ___Over 20 years

2. Do you / Have you EVER chewed tobacco or use/used snuff or other similar substance? ☐Yes ☐No

(If No, proceed to question 3)

Are you STILL using smokeless tobacco or snuff? ☐Yes ☐No

If No, WHEN did you quit?

___Less than 6 months ago ___6 months to a year ago ___1 to 3 years Ago ___Over 3 years ago

How many years did you use or have you used smokeless tobacco?

___Less than 1 year ___1-2 years ___2-5 years ___Over 5 years

3. Approximate average amount of alcoholic beverages presently consumed per week:

___None ___Less than 1 per week ___1-5 drinks ___6-11 drinks ___11-20 drinks ___Over 20 drinks

4. Do you have or have you ever had a substance abuse problem? ☐Yes ☐No

Describe_____

5. Do you presently use any recreational drugs? ☐Yes ☐No

List_____

6. Do you have or have you ever had an eating disorder? ☐Yes ☐No

If Yes, Please Specify: _____

7. Do you have or have you ever had any head, neck or mouth piercing(s)? (Other than ears) ☐Yes ☐No

List _____

8. Do you have or have you ever been informed that you have been infected with an oncogenic strain (possible cancer-causing) of the Human Papilloma Virus (HPV)? ☐Yes ☐No

9. Have your parents been able to keep most of their natural teeth? Mother ☐Yes ☐No--Father ☐Yes ☐No

10. Please list your history or any family member's history of cancer:

_____

_____

11. Other concerns and considerations:

_____

_____

Signature_____ Date _____

(Parent or guardian, if patient is a minor)

Reviewed By: _____

10 Steps of an Oral Mucosal Examination

1. **Inform Patients They are Receiving a Thorough Oral Examination and Oral Health Assessment, Including a Comprehensive Oral Mucosal and Soft Tissue Examination**
   - It shows that the practice cares about their well-being.
   - Inform the patient that you are looking for everything from a cheek bite to Cancer
   - Informs the patients that they are receiving the best possible overall oral health care
     It's Not…. "Just a Cleaning!"
2. **Comprehensively Review the Patient's Medical, Pharmacological, and Dental History.**
   - Past history of Cancer, dermatologic, or mucosal abnormities in the patient and their family
   - Present medical conditions and treatments
   - Medications
   - Dental and other oral habits
     - Bruxism, cheek biting, gum chewing, finger habits, etc.
   - Discuss tobacco and alcohol use along with social habits, and history
3. **Visual Examination and Assessment of the Face, Head, & Neck.**
   - Looking for lumps, bumps, patches, color changes, asymmetry, etc
4. **Extraoral Tactile Examination (Palpation) of the Head & Neck.**
   - Looking for abnormal lumps, bumps, nodules, and bilateral symmetry.
5. **Intraoral and Transoral Tactile Examination (Palpation) of Hard and Soft Tissue.**
   - Looking for abnormal lumps, bumps, nodules, and bilateral symmetry
6. **Visual Exam of Intraoral Structures Utilizing Magnification.**
   - Paying particular attention to the high-risk areas:
     - Lower Lip
     - Ventrolateral Tongue
     - Floor of the Mouth
     - Soft Palate Complex
       - Lingual Retromolar Trigone, Anterior Tonsillar Pillar, Soft Palate Proper, Uvula
   - Looking for:
     - **Induration-** Abnormal hardness of a lesion or area on palpation
     - **Ulceration-** Loss of continuity of the mucosal or any soft tissue
     - **Fungation-** Verrucous, cauliflower-like surface
     - **Elevation-** Part of lesion is raised above the normal level of the surrounding tissue
     - **Enlargement-** Areas of increased size especially when compare to contra-lateral side
     - **Fixation-**Attachment of normally mobile tissues to underlying structures with loss of mobility
     - **ANY Changes from Normal Tissue**
       - Especially red areas and red & white patches
       - Changes in surface texture
7. **Visual Intraoral Exam with Fluorescence Visualization.**
   - Repeat above visual examination of intraoral structures using a fluorescence screening device.
8. **Photo-documentation of Any Areas of Concern.**
   - Both with visible light and with fluorescence visualization.
9. **Record and Document of All Findings.**
   - Recording no areas of concern observed (WNL) if appropriate.
   - If an area is discovered the "Oral Mucosal Soft Tissue Evaluation Form" and "Oral Schematics Forms" can be used or referred to for assistance.
10. **Inform the Patient of All Findings and Recommended Course of Action**
    - Stating -no areas of concern observed (WNL) if appropriate
    - If an area of concern is noted
      - Seek a probable cause and treat or manage appropriately:
        - Traumatic / irritational, infectious, developmental, nutritional, caused by systemic disease, or unknown cause
      - If not particularly of concerned,
        - Encourage removal of all potential causes of the lesion and schedule a recall appointment for re-evaluation in two weeks.
        - Consider using adjunctive techniques such as a transepithelial (brush) biopsy.
      - If particularly concerned by the lesion's appearance or growth behavior
        - Perform full-thickness scalpel biopsy or refer patient for a biopsy.
      - Recommended follow-up
      - Patient instructions

Oral Cavity Mucosal Recording Schematic

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Patient Name: _____ **ID #:** _____ **Date of Birth:** _____

Clinician: _____ **ID #:** _____ **Examination / Study Date:** _____

Institution / Clinic Name: _____

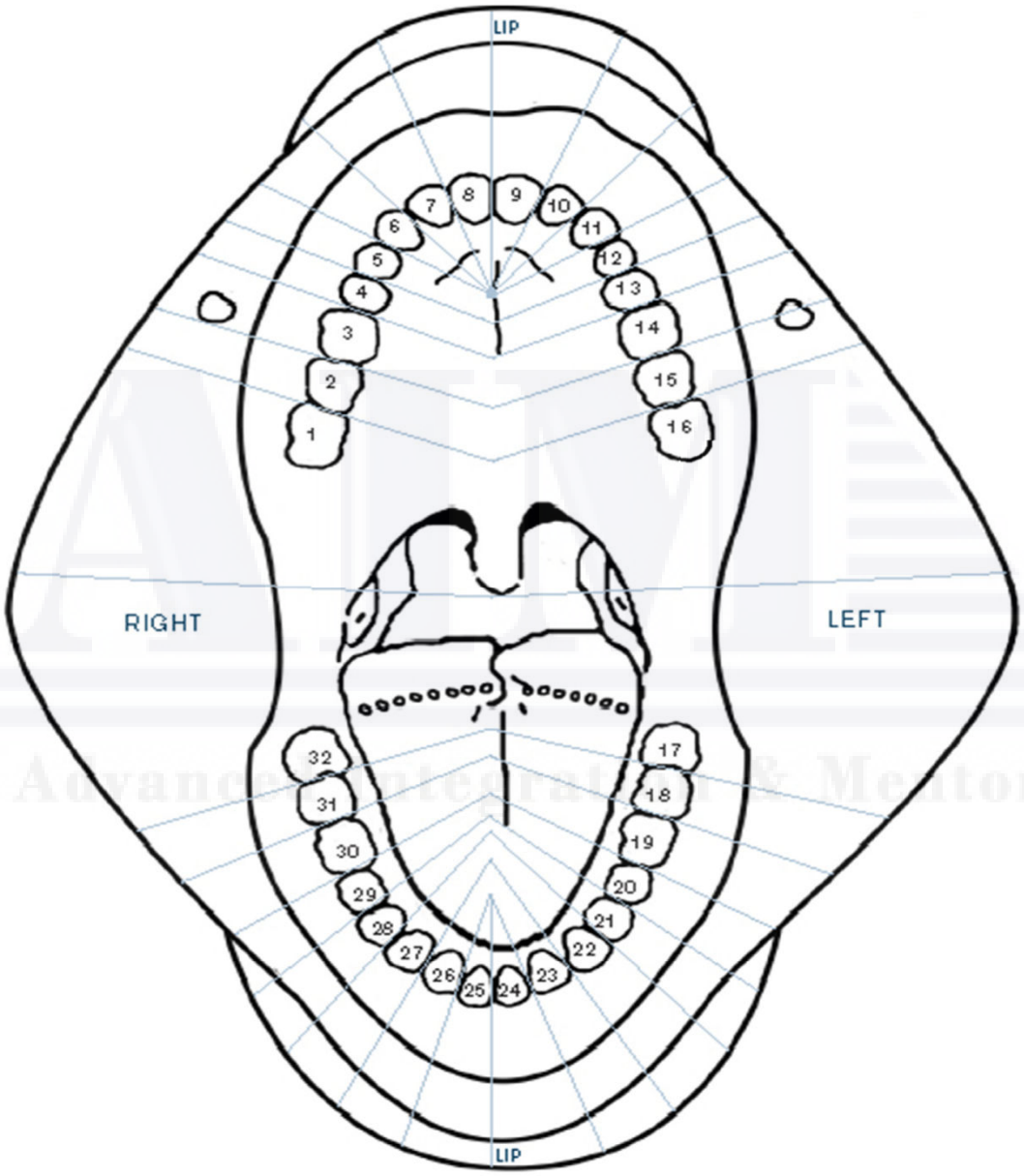


Photo-documentation Additional Images Acquired: _____**White Light Images** _____**Fluorescence Images** _____**Other Images**

Relevant Information & Findings: _____

_____

Clinical Impression / Working Diagnosis: _____

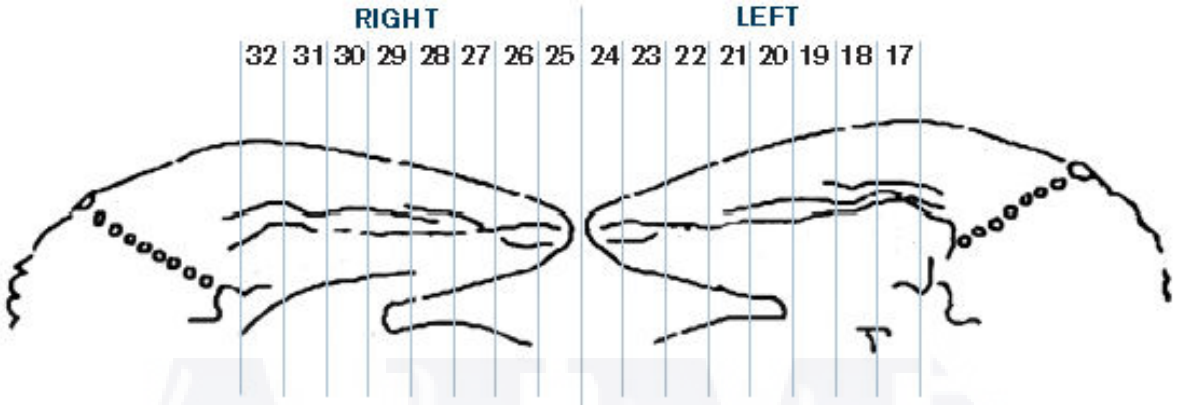
Tongue & Floor of Mouth Recording Schematic

Advanced Integration & Mentoring
www.DentalAIM.com

Patient Name: _____ **ID #:** _____ **Date of Birth:** _____

Clinician: _____ **ID #:** _____ **Examination / Study Date:** _____

Institution / Clinic Name: _____



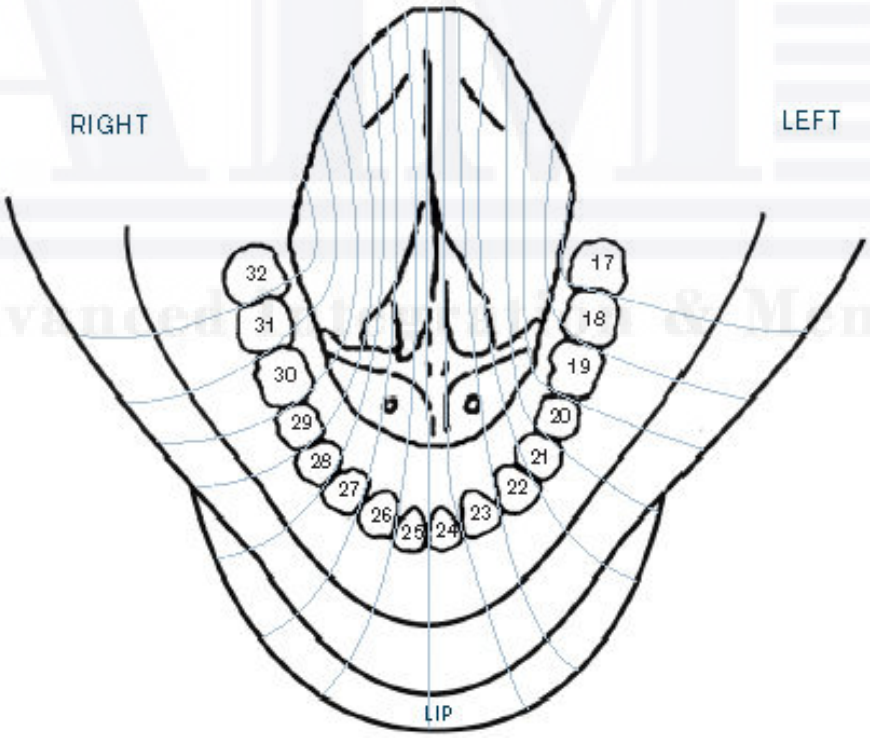


Photo-documentation
Additional Images Acquired: _____**White Light Images** _____**Fluorescence Images** _____**Other Images**

Relevant Information & Findings: _____

_____

Clinical Impression / Working Diagnosis: _____

Submission Policy on Excised Tissue

Policy:

All tissue removed from the oral and maxillofacial region should be submitted to a pathology laboratory for examination. Histopathologic examination of such tissues should be performed by an oral and maxillofacial pathologist. Tissues possibly exempt from the requirement of submission to a laboratory include:

1. extracted teeth lacking attached soft tissue;
2. extirpated dental pulp tissue;
3. clinically normal tissue;
4. excess donor tissue resulting from grafting procedures.

Gross description of all removed tissues should be entered into the patient's dental/medical record by the attending dentist/physician.

The pathology laboratory must prepare and transmit to the attending doctor a written report of the diagnosis. The diagnosis should be discussed with the patient by the attending doctor in a timely manner, and the report should be filed with the patient's dental/medical record.

Rationale:

Submission of removed tissues to a pathology laboratory offers the opportunity to:

1. establish a definitive diagnosis;
2. confirm a provisional clinical diagnosis;
3. provide additional information in instances where there is no clinically evident cause for a lesion, or when there is no resolution after appropriate, conservative treatment;
4. establish the adequacy of surgical margins;
5. provide diagnostic information to the clinician for management of disease.

Knowledge gained through histopathologic examination is useful in estimating clinical behavior and prognosis of disease, and in assessing the need for any additional therapy and follow-up evaluation. Submission of removed tissues to a pathology laboratory for diagnostic examination constitutes a generally accepted standard of patient care. Documentation of tissue examination and diagnosis enhances the validity of patient management decisions, increases the likelihood of positive clinical outcomes, and substantiates the patient record in the medicolegal context.

Source: Website of American Academy of Oral Maxillofacial Pathology; accessed June 21, 2010
http://www.aaomp.org/healthcare-professionals/tissue.php

Dental Insurance Submission Guidelines

The following are general guidelines on how to submit claims to dental insurance companies for reimbursement. Many of the procedures that are performed with a laser can be submitted to both medical and dental insurance plans. These basic principles can be applied with minor variations for most dental procedures. Submitting for medical reimbursement is significantly different than dental submissions. It might be wise, at least initially, to use a medical billings service (such as Cross Over Dental Enterprises, Inc.) to assist in maximizing the patients reimbursement for the procedures that have medical coverage.

Remember that dental benefits are determined by the terms of policy's contract and not the patient's needs. Also remember that presently dental insurance coverage is based on the procedure performed and not the device or technology used to perform the procedure.

It is recommended to file your submissions electronically in order to avoid delays and excess documentation. When submitting for the first time, it is generally not necessary to include a narrative for the code unless the CDT code or policy states that a report / narrative is necessary (a "clean claim"). Remember that some policies may require that specific codes are only reimbursed after a narrative ("by report") has been submitted.

- A "clean claim" will likely be processed "automatically", which will result in the greatest possibly of it being paid automatically as a standard procedure code.

If the claim is rejected or is requesting more information, the insurance carrier must supply a written explanation as to why the procedure is not covered under the patient's policy or why more information is needed.

- It is suggested to attempt a second submission with a narrative.
- If re-submitting in electronic format use a shorter version to stay within the 88 character limit that some clearing houses or third party payers have, and truncate everything over that.

If the claim is rejected again, the insurance carrier must supply a written explanation as to why the procedure is not covered under the patient's policy. If the insurance carrier does not provide this information, it is recommended that you send a written request to the insurance carrier for a written explanation as to why the procedure was not reimbursed. An appropriate narrative might be:

- ***"Please explain in writing a detailed explanation of how the patient lost their legally entitled ERISA benefit for proper dental care. If this cannot be provided immediately in writing please remit the appropriate covered amount within the legal time frame required by the state from the date of the original submittal"***
- It is also suggested to send a copy of the written rejection from the insurance carrier to the patient and their employer's HR department (this is one of the reasons it is important to have it in writing). This is to bring it to the attention of the employer that coverage of a procedure that should be considered vital, is not being paid by the carrier and is not in the best interest of the patient /employee.
- The policy may be written in such a way that the only procedures that are covered, are listed by line item (procedure #) and that all other procedures are not covered regardless of need. This is why the employer needs to be involved in the process so they can request this coverage when the policy is renewed.

If the written response from the insurance carrier is "the procedure has been deemed not medically necessary". Reply with the following response to the insurance company, and carbon copy the patient, the employer's HR department and the state insurance commissioner, and if so desired the state licensing board for dentistry.

- *"Please provide our office and the patient with the name and the state license number of the clinician who determined this procedure as not being medically necessary."*

A reply to a patient who is concerned if their dental insurance covers a procedure might be:

- *"Whether or not your insurance company covers this **needed** procedure, **it does not change your needs** Now let's check to see if this **needed** procedure is covered."*

Abbreviated Glossary of Laser Terminology

Definitions
The definitions of the terms listed below are based on a pragmatic rather than a basic approach. The terms defined in this glossary are in no way intended to constitute a dictionary of terms used in the laser field as a whole.

ABLATION -The removal of material or tissue with action of laser light energy by melting, evaporation, and / or vaporization. Often termed vaporization, although not technically correct.

ABSORPTION -Transformation of radiant energy to a different form of energy by interaction with matter.

ACTIVE MEDIUM -The material within the optical cavity that, when stimulated and amplified into a population inversion, will emit laser energy. This medium may be an ion, molecule, crystal, semi-conductor wafer, or combination of gases.

ADMINISTRATIVE CONTROL MEASURE -Control measures incorporating administrative means, e.g., training, safety approvals, LSO designation, and P/Ps, to mitigate the potential hazards associated with laser use.

AMPLIFICATION -The growth of the radiation field in the laser resonator cavity. A process that occurs within the optical resonator whereby stimulated emission produces a population inversion.

AMPLITUDE -The maximum value of the electromagnetic wave, measured from the mean to the extreme; the height of the wave.

ANSI -The American National Standards Institute (ANSI) Committee ASC-Z136 is the consensus standards organization responsible for the development and maintenance of standards to protect against hazards associated with the use of lasers and optically radiating diodes. ANSI document Z136.1-2007 is the *American Nation Standard for the Safe Use of Lasers*, and ANSI document Z136.3-2011 is specifically the *American National Standard for Safe Use of Lasers in Health Care.* These are the standards, protocols, education, and requirements that all lasers users are required to conform to.

ARTICULATED ARM -A laser delivery system that uses segments of a hollow tube that are coupled with right angle mirrors that allows propagation of the laser beam along its length.

AVERAGE POWER -The total energy imparted during exposure divided by the exposure duration. An expression of the average of the peak power and the laser off time.

BEAM SPOT SIZE -The diameter of the laser beam which can vary with the focal distance and divergence.

CARBON DIOXIDE (CO_2) LASER -A laser whose active medium is composed primarily of helium, with carbon dioxide, nitrogen and small amounts of hydrogen and helium. Wavelengths range of 9300-10600nm, in the far-infrared thermal portion of the electromagnetic spectrum.

CHOPPED PULSE -See GATED PULSE MODE.

CHROMOPHORE -A light-absorbing compound or molecule normally occurring in tissues that is an attractor of specific wavelengths of laser energy.

CLADDING -A thin coating that surrounds the core of glass in a fiber-optic delivery system. The cladding maintains the propagation of the laser beam along the glass. The cladding is surrounded by a thicker jacket to aid in flexibility.

COAGULATION -An observed denaturation of soft tissue proteins that occurs at approximately 60 degrees Celsius.

COHERENT -A beam of light characterized by a fixed phase relationship (spatial coherence) or single wavelength, (temporal coherence). Coherent light or radiation is composed of wave trains vibrating in phase with each other. Simply expressed it is parallel rays of light. Coherency, describes all of the radiant waves travelling in phase both temporally and spatially.

COLLECTING OPTICS -Lenses or optical instruments having magnification and thereby producing an increase in energy or power density. Such devices may include telescopes, binoculars, microscopes, or loupes.

COLLIMATION -The state in which all electromagnetic rays are parallel with virtually no divergence. The process by which divergent rays (white, or natural, light) are converted into parallel rays.

CONDUCTION -The mechanism of transferring heat from an object to object (tissue) by direct contact. Touching a hot object to tissue is direct conduction.

CONTACT MODE -The direct touching of the laser delivery system to the target tissue.

Abbreviated Glossary of Laser Terminology
(continued)

CONTINUOUS WAVE (CW) -The output of a laser which is operated in a continuous rather than a pulsed mode. A laser operating with a continuous output for a period greater than or equal to a 0.25 second is regarded as a Continuous Wave laser. A continuous mode is the manner of applying laser energy in which beam power density remains constant over time. Abbreviated CW.

CONTROLLED AREA (laser) -An area where the occupancy and activity of those within is subject to control and supervision for the purpose of protection from laser radiation hazards.

DELIVERY SYSTEM -The manner in which laser energy is transferred to the target tissue. For dental lasers, there are fiber-optic, hollow waveguide, and articulated arm systems. Some of these systems employ additional tips.

DEPUTY LASER SAFETY OFFICER (DLSO) -The person authorized and responsible for managing the laser safety program, in the absence of the LSO.

DIODE LASER -A laser whose active medium consists of a semi-conductor wafer, pumped with electrical current, whose beams are collected and focused into a beam. The emission wavelengths can range from the visible into the near-infrared thermal portion of the electromagnetic spectrum (Wavelengths range from 400nm- 1064nm).

DIVERGENCE -The angle at which the laser beam spreads in the far field. It is the increase in the diameter of the laser beam with propagation distance from the exit aperture. Sometimes this is also referred to as beam spread. The opposite of collimation.

DUTY CYCLE -The length of time the laser beam is actually cutting, drilling, welding, or heat-treating, as compared to the entire work cycle time. Also referred to as the EMISSION CYCLE.

ELECTROMAGNETIC RADIATION -The flow of energy consisting of oscillating electric and magnetic fields lying transverse to the direction of propagation. Gamma rays, X-ray, ultraviolet, visible, infrared, and radio waves occupy various portions of the electromagnetic spectrum and differ only in frequency, wavelength, and photon energy.

ELECTROMAGNETIC SPECTRUM -A graphic representation of all forms of radiant energy from gamma rays to radio waves and usually depicted with increasing wavelength and/or decreasing frequency.

ELECTROMAGNETIC WAVE -A disturbance which propagates outward from an electric charge which oscillates or is accelerated. Includes radio waves; X-rays; gamma rays; and infrared, ultraviolet, and visible light.

EMISSION CYCLE -The length of time the laser beam is actually cutting, drilling, welding, or heat-treating, as compared to the entire work cycle time. Also referred to as the DUTY CYCLE.

ENERGY -The capacity for doing work. Energy content is commonly used to characterize the output from pulsed lasers, and is generally expressed in joules (J).

ENERGY DENSITY -The measurement of energy per unit area, usually expressed as joules/square centimeter; also known as fluence.

ENGINEERING CONTROL MEASURE -Control measures designed or incorporated into the laser or laser system, e.g., interlocks, shutters, watch-dog timer, etc., or its application.

ERBIUM (Er) -A rare earth element that is used to dope a crystal of Yttrium Aluminum Garnet (YAG) or Yttrium Scandium Gallium Garnet (YSGG). Abbreviated Er.

ERBIUM, CHROMIUM: YSGG LASER (Er,Cr:YSGG) –Erbium, Chromium: Yttrium Scandium Gallium Garnet(Er,Cr:YSGG) laser, a free running laser with an emission wavelength of 2780 nm that is primarily used on hard tissue (enamel, dentin, and bone) but also has soft tissue indications in dental applications.

ERBIUM:YAG LASER (Er:YAG) -Erbium: Yttrium-Aluminum Garnet laser, a free running laser with an emission wavelength of 2940 nm that is primarily used on hard tissue (enamel, dentin, and bone) but also has soft tissue indications in dental applications.

EXPOSURE -A measure of the total radiant energy incident on a surface per unit area; radiant exposure.

FAILSAFE INTERLOCK -An interlock where the failure of a single mechanical or electrical component of the interlock will cause the system to go into, or remain in, a safe mode.

FIBER OPTIC -A delivery system composed of a glass fiber which may be stranded and is used to propagate the laser beam along its length. The glass is surrounded by cladding and a jacket or layers of jackets

Abbreviated Glossary of Laser Terminology
(continued)

FLASHLAMP -Source of powerful light; often in the form of a helical coil and used to excite photon emission in a solid-state laser.

FLUENCE -See ENERGY DENSITY.

FLUORESCENCE -The glow induced in a material when bombarded by light.

FLUX -The radiant, or luminous, power of a light beam; the time rate of the flow of radiant energy across a given surface.

FREE-RUNNING PULSE MODE -A laser operating mode where the emission is truly pulsed and not gated. A flashlamp is used as the external energy source so that very short pulse durations and peak powers of thousands of watts are possible. A laser that operates with Free-running pulse mode cannot be operated in continuous wave.

FREQUENCY -The number of light waves passing a fixed point unit of time, or the number of complete vibrations in that period of time. The number of wave oscillations (cycles) of a wave per second, is measured in hertz (Hz)

GATED PULSE MODE -A laser operating mode where the emission is a repetitive on and off cycle. The laser beam is actually emitted continuously, but a mechanical shutter or electronic controls 'chop' the laser beam into pulses. This term is synonymous with CHOPPED PULSE MODE.

HEALTH CARE LASER SYSTEM (HCLS) -A laser system used in health care applications. The HCLS includes the laser or lasers, a delivery system to direct the output of the laser, a power supply with control and calibration functions, mechanical housing with interlocks, and associated liquids and gases required for the operation of the laser.

HELIUM-NEON LASER (HeNe) -Laser in which the active medium is a mixture of helium and neon, which is in the visible range. Used widely in industry for alignment, recording, printing, and measuring, it is also valuable as a pointer for an invisible laser light.

HERTZ (Hz) -The unit which expresses pulses per second which the frequency of a periodic oscillation in cycles per second.

HOLLOW WAVE GUIDE -A delivery system that uses a flexible hollow tube with a mirrored inner surface to propagate the laser beam along its length.

INFRARED -The region of the electromagnetic spectrum between the long-wavelength extreme of the visible spectrum (about 700 nm to 1 mm) and the shortest microwaves (about 1 mm).

INTENSITY -The magnitude of radiant energy (light) per unit, such as time or reflecting surface. See POWER DENSITY.

IONIZING RADIATION -Electromagnetic radiation having a sufficiently large photon energy to directly ionize atomic or molecular systems with a single quantum event.

IRRADIANCE -Radiant power incident per unit area upon a surface. The SI unit of irradiance is watts per-square-meter (W/m^2), or for convenience, watts-per-square-centimeter (W/cm^2). Symbol: *E*. NOTE -The terms POWER DENSITY and fluence rate are sometimes used as synonyms for irradiance, although these terms have slightly different technical meanings.

IRRADIATION -Exposure to radiant energy, such as heat, X-rays, or light; the product of irradiance and time.

JOULE -A unit of expression of energy and is a measurement frequently given for laser output in pulsed operation. 1 joule = 1 watt per second.

LASER -A device which produces an intense, coherent, directional beam of light by stimulating electronic or molecular transitions to lower energy levels. An acronym for Light Amplification by Stimulated Emission of Radiation. The basic components of the device are the active medium, external energy source or pumping mechanism, optical resonator, and the focusing and delivery systems. A laser is a cavity that has mirrors at the ends and is filled with lasable material such as crystal, glass, liquid, gas, or dye. These materials must have atoms, ions, or molecules capable of being excited to a metastable state by light, electric discharge, or other stimulus. The transition from this metastable state back to the normal ground state is accompanied by the emission of photons which form a coherent beam.

LASER CLASSIFICATION -An indication of the beam hazard level of a laser or laser system during normal operation or the determination thereof. The hazard level of a laser or laser system is represented by a number or a numbered capital letter. The laser classifications are Class 1.Class 1M, Class 2, Class 2M, Class 3R, Class 3B and Class 4. In general, the potential beam hazard level increases in the same order.

Abbreviated Glossary of Laser Terminology
(continued)

LASER GENERATED AIRBORNE CONTAMINANTS (LGAC) -Airborne contaminants generated when a laser beam interacts with target materials. The materials may include, but are not limited to, plastics, metals, ceramics, glasses, wood, and tissue. LGAC may be in the form of gases, vapors, organic or inorganic particulates, or aerosols and often are a complex mixture of substances in all three states. See: PLUME.

LASER PROTECTIVE EYEWEAR (LPE) -Equipment such as eyecups, face shields, goggles, eye shields, spectacles and visors, intended to protect the eyes from overexposure to laser radiation. LPE does not include laser protective windows.

LASER RADIATION -Coherent optical (non-ionizing) radiation emitted by a laser. This should not be confused with ionizing radiation.

LASER SAFETY OFFICER (LSO) -The person authorized and responsible for the laser safety program. This individual has the training and experience to administer a laser safety program and has responsibility for oversight and control of laser hazards. The LSO is authorized by the administration and is responsible for monitoring and overseeing the control of laser hazards.

LASER SAFETY SITE CONTACT (LSSC) -In diverse practice areas, such as large facilities or corporations, a LSSC serves under the supervision of the LSO, and is the person responsible for all aspects of laser safety in each site where lasers are used.

LASER TREATMENT CONTROLLED AREA (LTCA) -The room within which the HCLS is used, and the occupancy and activity of those within this area are subject to supervision for the purpose of protection against all hazards associated with the use of the HCLS. In a large room, a limited LTCA can be designated if clearly marked and controlled.

MAXIMUM PERMISSIBLE EXPOSURE (MPE) -The level of laser radiation to which a person, under normal circumstances, may be exposed without hazardous effects or adverse biological changes in the eye or skin.

METER -A unit of length in the international system of units; currently defined as the length of a path traversed in vacuum by light during a period of 1/299792458 seconds.

Typically. The meter is subdivided into the following units:

centimeter (cm) = 10^{-2} meters
millimeter (mm) = 10^{-3} meters
micrometer (µm) = 10^{-6} meters
nanometer (nm) = 10^{-9} meters

MILLIJOULE -One thousandth of a Joule.

MODE -A particular functioning arrangement for laser operation, such as continuous emission, pulses, or grouped pulses.

MONOCHROMATIC LIGHT -Theoretically, light consisting of consisting of one color or wavelength. Since no light is completely monochromatic, it usually consists of a very narrow band of wavelengths. Lasers provide the narrowest bands.

NANOMETER (nm) -A unit of length in the International System of Units (SI) equal to one billionth of a meter. Once called a millimicron, it is used to represent wavelength.

Nd:YAG LASER -A solid-state laser of Neodymium: Yttrium Aluminum Garnet, is pumped by a flashlamp. The emission wavelength produced is 1064nm, in the near-infrared thermal portion of the electromagnetic spectrum

NEODYMIUM -A rare earth element used to dope a crystal of Yttrium Aluminum Garnet.

NOMINAL HAZARD ZONE (NHZ) -The space within which the level of the direct, reflected or scattered radiation during normal operation exceeds the applicable MPE. Exposure levels beyond the boundary of the NHZ are below the appropriate MPE level. Also referred to as the nominal ocular hazard area (NOHA).

NOMINAL OCULAR HAZARD DISTANCE (NOHD) -The distance along the axis of the unobstructed beam from the laser to the human eye beyond which the irradiance or radiant exposure during normal operation is not expected to exceed the appropriate MPE.

NON-BEAM HAZARD -A class of hazards that result from factors other than direct exposure to a laser beam.

NON-CONTACT MODE -The delivery system is used without touching the target tissue.

Abbreviated Glossary of Laser Terminology
(continued)

OPTICAL DENSITY [*D*(λ), D_λ, or OD] -Protection factor provided by a filter (such as used in eyewear, viewing windows, etc.) at a specific wavelength. Each unit of OD represents a 10x increase in protection A value that defines the attenuation property of a filter and is equal to the logarithm to the base ten of the reciprocal of the transmittance at a particular wavelength,
NOTE-For example, when the attenuation is 1/100, the OD = 2;
when the attenuation is 1/100,000, the OD = 5.

OPTICAL FIBER -Filament of quartz or other optical material capable of transmitting light along its conformation and emitting it at the end.

OPTICAL RESONATOR (OPTICAL CAVITY) -The component of a laser containing the active medium in which the population inversion occurs. At each end of the resonator, there are reflective surfaces or mirrors which produce amplification and coherency. The distal mirror is partially transmissive; when there is sufficient energy, the beam can exit through that mirror.

PEAK POWER -The measurement of power in each pulse.

PERSONAL PROTECTIVE EQUIPMENT (PPE) -Personal safety protective devices used to mitigate hazards associated with laser use, e.g., laser eye protection (LEP), and biologic hazards for infection control, (protective gowns, clothing, masks, & gloves.)

PHOTOACOUSTIC EFFECTS -Arises with the use of very short-duration high-energy laser pulses, at pulse durations typically below 10 microseconds. Significant amounts of energy are absorbed and a rapid expansion occurs in the tissue, generating an acoustic shock wave that causes mechanical disruption to cellular structures.

PHOTOCHEMICAL EFFECT -An effect produced by a chemical action brought about by the absorption of photons by molecules that directly alter the molecule. It is the effects that occur from long exposure durations at incident power levels insufficient to cause damaging photothermal effects. It is an energy dependent process (a function of the total quantity of radiation absorbed rather than its rate of absorption).

PHOTON -A unit or quantum of radiant energy.

PHOTOSENSITIZERS -Substances which increase the sensitivity of a material to exposure by optical radiation.

PHOTOTHERMAL EFFECTS -The damage mechanism for acute laser injury (i.e. for injury immediately following exposure). The radiation incident at the surface is absorbed in the underlying tissue, increasing the temperature of the tissue to the level at which damage can occur, and laser burns result. It is a power dependent process (a function of the RATE at which energy is absorbed rather than the total quantity of energy involved).

PLUME -Gases, vapors and aerosol created by vaporization of tissue or other materials and may contain viable bacteria, viruses, cellular debris, or noxious fumes. Essentially the smoke produced from aerosolization of by-products due to the laser-tissue interaction. It is composed of particulate matter, cellular debris, carbonaceous and inorganic materials, and potentially bio-hazardous products.

POWER -The rate at which energy is emitted, transferred, or received.
The amount of work performed per unit time, expressed in Watts (joules per second).

POWER DENSITY -The amount of radiant energy concentrated on a surface. The measurement of power per unit area, usually expressed as Watts/square centimeter (W/cm^2). Also known as INTENSITY, IRRADIANCE, and RADIANCE.

PULSE DURATION - A measurement of the total amount of time that the pulse is emitted; also known as pulse width.
The duration of a laser pulse; usually measured as the time interval between the half-power points on the leading and trailing edges of the pulse. Symbol: *t* Typical units:
microsecond (μs) = 10^{-6} second
nanosecond (ns) = 10^{-9} second
picosecond (ps) = 10^{-12} second
femtosecond (fs) = 10^{-15} second

PULSE ENERGY -The power of a single, brief emission from a laser programmed for pulsed behavior rather than continuous operation. Pulse energy can be several times greater than CW emission.

PULSE RATE -See HERTZ and PULSE-REPETITION FREQUENCY (PRF).

PULSE-REPETITION FREQUENCY (PRF) -The number of pulses occurring per second, expressed in hertz (Hz). Symbol: *F*.

PULSE WIDTH -See PULSE DURATION.

Abbreviated Glossary of Laser Terminology
(continued)

PULSED LASER -A laser which delivers its energy in the form of a single pulse or a train of pulses. In the ANSI standard, the duration of the pulse must be < 0.25 seconds, be considered a pulsed laser.

PUMPING -The process of applying energy to the active medium from an external energy source.

PUMPING MECHANISM -See EXTERNAL ENERGY SOURCE.

PROCEDURAL CONTROL MEASURE -See: ADMINISTRATIVE CONTROL MEASURE.

RADIANCE -The power output (radiant flux) per unit solid angle per unit area in units of watts per steradian per meter squared. The brightness; the radiant energy per unit solid angle per unit projected area of a radiating surface.

RADIANT ENERGY -Energy transferred by an electromagnetic wave. The energy emitted, transferred, or received in the form of radiation in units of joules (J). Also called RADIATION.

RADIANT EXPOSURE -Surface density of the radiant energy received. The SI unit of radiant exposure is joules-per-meter squared ($J \cdot / m^2$), or for convenience, joules per centimeter squared ($J \cdot cm^2$). Symbol: *H*.
NOTE -The terms *energy density* and *fluence* are sometimes used as synonyms for radiant exposure, although these terms have slightly different technical meanings.

RADIANT FLUX - The rate of emission or transmission of radiant energy, the power emitted, transferred, or received in the form of radiation in units of watts (W). Also called RADIANT POWER.

RADIANT INTENSITY -Radiant power, or flux, expressed as emission per unit solid angle about the direction of the light in a given length of time.

RADIANT POWER -Power emitted, transferred, or received in the form of radiation in units of watts (W). Also called: RADIANT FLUX.

REFLECTANCE -The ratio of total reflected radiant power to total incident power, or the ratio of reflected light to light falling on the object. Also called REFLECTIVITY.

REFRACTION -The bending of a beam of light in transmission through an interface between two dissimilar media or in a media whose refractive index is a continuous function of position (graded index medium). Simply put, the bending of incident rays as they pass from one medium to another, such as air to water. See DIFFRACTION.

REPETITION RATE –See HERTZ

REPETITIVE PULSE LASER -A laser with multiple pulses of radiant energy occurring in a sequence.

RESONATOR -The mirrors (or reflectors) making up the laser cavity containing the laser rod or tube. The mirrors reflect light back and forth to build up amplification under an external stimulus. Emission is through one of them, called a coupler, which is partially transmissive.

RETINAL HAZARD REGION -Optical radiation with wavelengths between 0.4 and 1.4 μm, where the principal hazard is to the retina.

SCANNING LASER -A laser having a time-varying direction origin, or pattern of propagation with respect to a stationary frame of reference.

SCINTILLATION -The rapid changes in irradiance levels in a cross-section of a laser beam

SECURED ENCLOSURE -An enclosure to which casual access is impeded by an appropriate means. e.g., a door secured by a magnetically or electrically operated lock or latch or by fasteners that need a tool to remove.

SELECTIVE PHOTOTHERMOLYSIS -A precise laser tissue interaction in which the radiation is well absorbed and the pulse duration is shorter than the thermal relaxation time which minimizes tissue damage.

SOURCE -A laser or a laser-illuminated reflecting surface.

SPECTRAL RESPONSE -The response of a device or material to monochromatic light as a function of wavelength

SPECULAR REFLECTION -A mirror-like reflection.

Abbreviated Glossary of Laser Terminology
(continued)

SPONTANEOUS EMISSION -The release of energy (a photon) as the previously excited particle level returns to its resting, stable state

STANDARD OPERATING PROCEDURE (SOP) -Formal written description of the safety and administrative procedures to be followed in performing a specific task.

STIMULATED EMISSION -The release of energy (a photon) from an already excited particle by interaction with a particle of identical energy, producing two coherent particles. Theorized by Albert Einstein in 1916 and is the basis for laser operation

SUPERPULSE -A variation of gated pulsed mode in which the pulse durations are very short, producing high peak power; also termed very short pulse

THERMAL EFFECT -An effect brought about by the temperature elevation of a substance due to laser exposure.

THERMAL RELAXATION TIME (TRT) - The amount of time between laser pulses of energy emission.

THERMAL RELAXATION TIME OF TISSUE (TRT) -The amount of time required for temperature of the tissue that was raised by absorbed laser radiation to cool down to one half of that value immediately after the laser pulse.

THRESHOLD -During excitation of the laser medium, this is the point where lasing begins.

TRANSMISSION -Passage of radiation through a medium.
In optics, the passage of electromagnetic radiant energy (light) through a medium.

ULTRAVIOLET (UV) RADIATION -Electromagnetic radiation with wavelengths shorter than those of visible radiation; for the purpose of this standard, 180 to 400 nm.

UNCONTROLLED AREA -An area where the occupancy and activity of those within is not subject to control and supervision for the purpose of protection from radiation hazards.

VAPORIZATION -The physical process of converting a solid or liquid into a gas; for dental procedures, it describes conversion of liquid water into steam.

VISIBLE RADIATION (LIGHT) -Electromagnetic radiation which can be detected by the human eye. This term is commonly used to describe wavelengths which lie in the range 400 to 700 nm.

WATT -An expression of power. The unit of power or radiant flux. (1 watt = 1 joule per second).

WAVELENGTH -The distance measured in meters between two successive points on a periodic wave which have the same phase. A fundamental property of light the length of the light wave, which determines its color.
Common units of measurement (which is usually from crest to crest) are microns and nanometer.

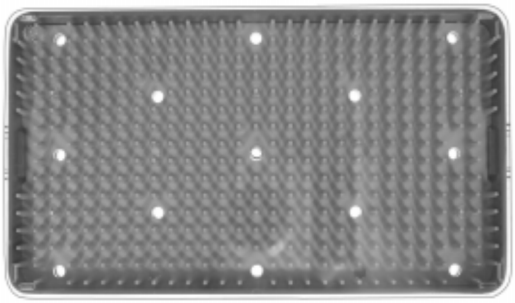
YAG -An acronym describing a solid crystal of Yttrium, Aluminum, and Garnet that can be doped with various rare earth elements and is used as an active medium for some lasers.

YSGG -An acronym describing a sold crystal of Yttrium, Scandium, Gallium and Garnet that can be doped with various rare earth elements and is used as an active medium for some lasers.

Instrument Setup for Biopsy & Soft Tissue Surgical Procedures

Instruments

1 -Sterilization Cassette — Two Piece Plastic Sterilization Cassette/ Tray w/ Silicone Finger Mat



1 - # 23 Explorer

1 -UNC 15 Double Ended UNC 15 Periodontal Probe

1 -Tissue Pickup Forceps — #41 Adson Tissue Forceps (Tissue Pick-ups) Serrated (4.75”/12cm)

1 -Needle Holder — Mathieu Stainless Needle Holder (5.5” /14cm)

1 -Surgical scissors — #18 Iris Curved Scissors, No Serrations (4.5” /11.5cm)

1 -Periosteal Elevator — Periosteal Elevator, Double Ended

1 -Tissue Clamp — Desmarres-Chalazion Tissue & Dressing Forceps (Medium -9cm Long with 26mm Oval)

*1-Laser Cleaving Tool (*additional to kit) — Laser Cleaving Tool
Zoll Item # LCT-1 (3 piece package item # LCT-1-3pk)

Laser Accessory Instruments, Parts, & Devices

Cleaving Tool

Zoll Dental Instruments www.ZollDental.com Telephone: 800-239-2904

Laser Cleaving Tool-Diamond Coated (mfg # LCT-1D) 3 piece package (mfg # LCT-3D)

Laser Cleaving Tool (mfg # LCT-1) 3 piece package (mfg # LCT-3)

Benjamin Biopsy Kit (mfg # Z Kit-BBK)

Tips, Canulas, Fiber Guides

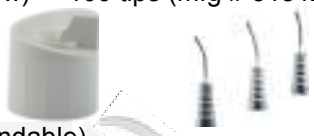
Bendable ¾" Stainless Steel Multipurpose Dispensing Tips (Disposable Fiber Guides for Handpiece)

Use 18 Gauge for 320 micron fiber & 20 Gauge for 200 micron fiber

Patterson Bendable SS Dispensing Tips		Vista-Dental Appli-Vac™ 3/4" Tips	
18 gauge (Pink)	125 tips (part # 089-4428)	18 gauge (Pink)	100 tips (mfg # 315118)
19 gauge (Brown)	125 tips (part # 089-4436)	19 gauge (Brown)	100 tips (mfg # 315119)
20 gauge (Yellow)	125 tips (part # 089-4444)	20 gauge (Yellow)	100 tips (mfg # 315120)

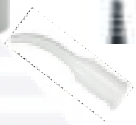
Sirona single-use tips with metal hub with Bending Tool

Package of 100 tips, including bending tool (mfg # 62 56 692)



Plastic Disposable Tips (Disposable Fiber Guides for Handpiece–Non Bendable)

White Mini Laser Tip 20 tips (Ivoclar Item # 579116)



Surgical Punch

Premier Uni-Punch (available in diameters ranging from 1.5mm to 8mm)

Assorted package (5 each of 2mm. 3mm, 4mm, & 5mm) (mfg # 9033525)

Recommend routinely using: 4 mm (mfg # 9033504) or 5 mm (mfg # 9033505)

Crystal HD Mirrors by Zirc (Plastic Back & 40% Brighter)

Soft Grip (mfg # 50Z363) Thin Grip (mfg # 50Z353) Cone Socket (mfg # 50Z392 or 50Z392)

Mr. Thirsty One Step by Zirc (Isolation &Suction Device)

Medium/ Large (mfg # 50Z986LG) Pedo/ Small (mfg # 50Z986SM)

Laser Protective Eyewear (LPE) / Laser Safety Glasses

Laser Filters for Loupes & Microscopes; also Laser Safety Glasses for Clinician, Patient, & Children)

Innovative Optics Inc. www.InnovativeOptics.com Telephone: 800-990-1455

For adult patients the darker green and less expensive model #: **BWL 5X7**

For children patients model #: **555 PED M** (50mm) **Silver**

For the staff I recommend the following:

To wear over the corrective glasses model #: **MWL 562 GG** (Frame color is gunmetal)

For staff not wearing glasses model #: **MWL 561 G** (Frame color is white)

Illumination (Loupe-Light)

Feather Light LED by UltraLight Optics (Smallest & Lightest Loupe-Light Available)

www.ultralightoptics.com Telephone: (323) 316-4514

Laser Safety Signs (available in digital format for printing)

Advanced Integrating & Mentoring www.DentalAIM.org

email: Education@DentalAIM.org

3M Command Decorator Hooks #17026

For Hanging Laser Safety Signs

Laser Related Treatment Medications, Supplies, & Irrigating Agents

Topical Anesthetics

Cetacaine (Benzocaine 14.0%, Butamben 2.0%, Tetracaine Hydrochloride 2.0%) Topical Anesthetic Liquid Kit

Cetacaine Topical Anesthetic Clinical Kit (Liquid)	(mfg # 0212)
Delivery Tips for Cetacaine Liquid Topical Anesthetic	(mfg # 0213)
Delivery Syringes for Cetacaine Liquid Topical Anesthetic	(mfg # 0214)
Cetacaine Topical Anesthetic Liquid (30g)	(mfg # 0211)

Hurricaine (Benzocaine 20.0%) Topical Anesthetic

HurriPak Periodontal Kit Cherry	(mfg # 0283056984)
HurriPak Periodontal Kit Pina Colada	(mfg # 0283188684)

Anti-microbial Irrigating Agent

Dakin's Solution Full Strength (Buffered 0.50% NaOCl)
Di-Dak-Sol (Diluted Dakin's Solution / Buffered 0.0125% NaOCl)
www.Dakins.net Telephone: 866-343-2576

Anti-microbial Rinse

OraSoothe Hygiene -Oral Coating Rinse
www.OraSoothe-Hygiene.com (Available thru Schein & Patterson)

Alcohol-free Chlorhexidine Gluconate 0.12% by Sunstar Butler (GUM) (mfg # 1789P-1)

Locally Administered Antibiotics (LAA)

ARESTIN® (minocycline HCl) microspheres
www.ArestinProfessional.com Telephone: 866-273-7846

Hemostasis Products

HemCon Dental Dressings

10mm x 12mm HemCon Dental Dressing (available in 1/pk & 4/pk)
1 inch x 3 inches HemCon Dental Dressing (available in single packs or boxes of 12 packs)

Post Treatment Products:

SockIt! Oral Hydrogel Wound Dressing
www.sockitgel.com (Available thru Schein & Patterson)

OraSoothe Hygiene-Oral Coating Rinse
www.OraSoothe-Hygiene.com (Available thru Schein & Patterson)

Biotene (GlaxoSmithKlein) Products

Sample packages for professionals to handout to patients can be obtained directly from Biotene (GSK) by registering and logging in on their website at:
www.Biotene.com Telephone: 800-652-5625

Post Treatment Toothbrushes

Patterson PD 34 Tuft Ultrasoft Toothbrush-Box of 72 (Patterson Item # 093-1022)
Gum Post-Surgical Toothbrush-317MB (Butler-Sunstar)

Patient Brochures

WHAT IS THE DIFFERENCE…

Between a "Regular" Cleaning a Root Planing and Periodontal Maintenance?
www.SteppingStonesToSuccess.com Telephone: 800-548-2164

Considerations When Evaluating Diode Lasers

Advanced Integration & Mentoring
www.DentalAIM.com

Advanced Integration & Mentoring, and the Purpose of this Document:

AIM's mission is to provide guidance for the dental profession in the use of advanced technologies, and to assist in the proper selection of diagnostic and treatment modalities through appropriate planning, evaluation, and education.

The role of diode lasers in dentistry is to improve the quality and care that we provide our patients by enhancing the efficiency in which quality care is delivered, by controlling the interaction of laser light energy with soft tissue and managing its response.

The purpose of this document is to provide information and guidance on some of the considerations a clinician needs to evaluate when they are assessing a diode laser for their practice. On the right hand side of the page the bolded words are usually the desired response. Remember, the most important consideration is having the knowledge and understanding of the procedure the clinician wants to perform both now and in the future.

Laser Name and Model: _____

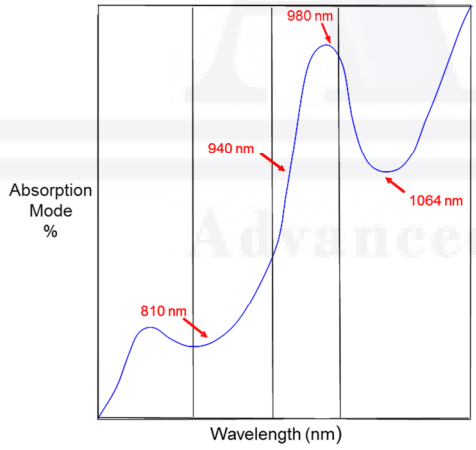
Scientific / Technical Considerations:

Wavelength in nanometers (nm)? 808nm — 810nm — 940nm — **970nm — 980nm** — 1064nm

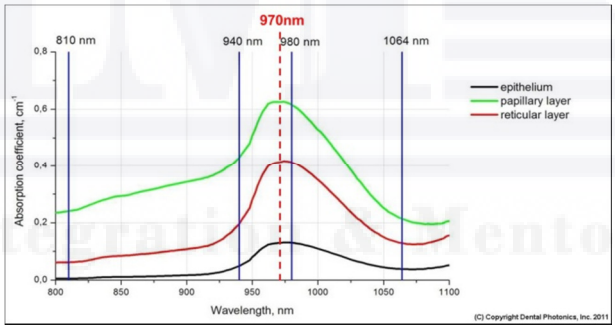
►**Is initiating the tip of the fiber required to remove tissue?** Yes / **NO**
(Blackening the tip, blocking the laser energy with a cork, or articulating paper, etc.)

►**Can water convection cooling be used while ablating (vaporizing) the tissue to control its interaction and effects with the remaining tissue?** **YES** / No
Have it demonstrated if Yes.
(This is important to minimize heat artifacts, prevent recession, and to be effective in the fluid filled perio pocket.)

Absorption of Light Energy in Water by Wavelength*



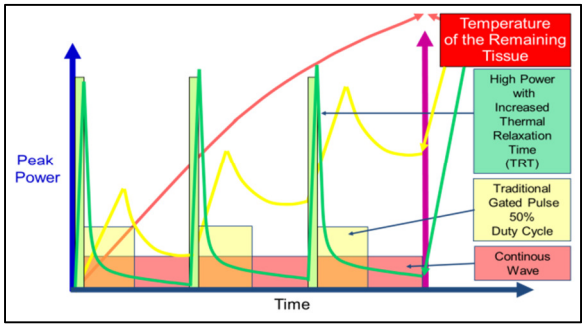
Absorption of Light Energy in Mucosa by Wavelength

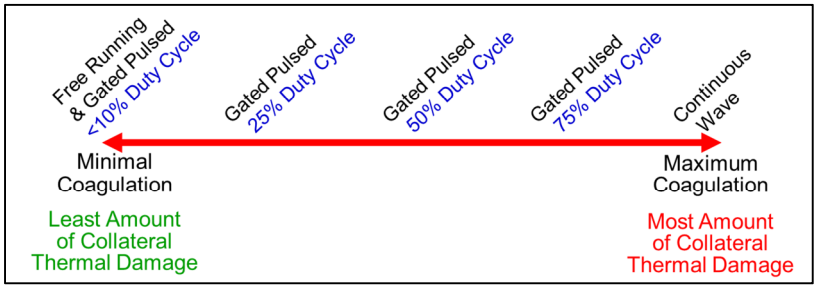


The % of Absorption of Light Energy in Water*:
3% at 810 nm
15% at 1064 nm
35% at 980 nm *Cecchetti et al. European Biomedical Optics 1996

What is the Peak Power of Energy Available (Watts)? _____ **Watts**
►**Can power levels be incrementally controlled or only at pre-set levels?** **YES** / No

Temporal Emission Modes Available?
►**What Pulse Rates (Hertz/ Hz) are Available?** Fixed at 10 Hz or **User Can Adjust as Desired**
►**Can the Duty Cycle be Adjusted by the Clinician?** Fixed at 50% or **User Can Adjust as Desired**
(The % of time emitting energy (on) vs. the Thermal Relaxation Time (off) to allow control over enabling the clinician to have control of the remain tissue to attain the desired effect.)





Ergonomic Considerations:

►Is it battery operated? **YES** / No
If so, how long can the laser operate before it has to be recharged? _____ Hours
►Are the screens and settings easily viewed and manipulated? **YES** / No
►Can each user set up their own passwords and settings? **YES** / No
►Does it have basic preset procedure settings? **YES** / No
►Can you name, define the settings and save procedures for each individual user? **YES** / No
►Are proper infection control procedures obtainable, adequate, and easily accomplished? **YES** / No
►Will it fit (and be plugged in, if not battery operated) where you want to use it? **YES** / No
►Does it require a foot pedal or can it operated by a finger switch, are both available? **YES** / No
►Does the laser have a way to time the length of a procedure? **YES** / No

Quality and Appearance of the Laser:

►Where is it manufactured? _____ and where is it predominately assembled? _____
►Does it look well made? **YES** / No
►Does it look stable? (Will not move or tip over easily) **YES** / No

Safety Considerations: (Does it meet all required governmental standards?)*

Look yourself as several lasers do not, and it is the user's responsibility to insure all components are in place.
►Fiber Interlock mechanisms? **YES** / No
►Guarded Activation Switch:
If a foot pedal, is there a cover guard / bar over it, as required? **YES** / No or NA
If a finger switch, is it recessed to prevent accidental firing when handled or on a counter? **YES** / No or NA
►Are the proper LASER Safety Glasses included with the purchase and how many pairs? **Yes _____#** / No
►Can the fiber and handpiece be autoclaved? **YES** / No
►What is the Nominal Hazard Distance? _____ **Feet**
(How far away do you need to be, to not wear lasers safety glasses etc.)
►Can the user test the calibration of the laser on a regular basis? **YES** / No
►Does the laser record the procedures and settings for each patient? **YES** / No

Company & Dealer Support and Stability:

►How is it sold? **Thru Major Dealers** or Mfg Direct
Is there local dealer support? **YES** / No
►Is the manufacturer a stable company? **YES** / No
►How long has the manufacturer been in the dental industry? _____ **Years**
How committed are the manufacturers and /or dealer to dentistry? _____
►Other non-laser products made by the manufacturer? _____
►How are consumables and accessories available? **Thru Major Dealers** or Only from Mfg Direct Sales
Are the consumable industry standard, or proprietary to the manufacturer? **Industry Standard** or Proprietary

Training:

►Is the ANSI and regulatory required device specific hands-on in person training available? **YES** / No
(Like a driver's license, the manufacturer is NOT required to provide it!)
►Is the ANSI and regulatory required hands-on in person training included in the price? **YES** / No
►Is additional training available? **YES** / No
►Who provides the training? **Practicing Dentist**, Non-practicing Dentist, Hygienist, Sales Rep
►Does the trainer actually use this laser in their practice? **YES** / No

Cost of Ownership:

►Cost per patient / procedure for the consumables? $_____
►Cost of training? $_____
►Is there a maintenance contract? If so, what is the cost? $_____
►What is the purchase price of the laser? $_____
►Other expenses?? $_____