# We just got a Laser, now what do we do with it?

ANGIE WALLACE, RDH LASER EDUCATOR





- 1. Understand how a laser works and how to choose what laser will be best for your practice
- 2. Learn techniques and protocols using the Diode laser on the periodontal patient for more predictable outcomes
- 3. Develop strategies to incorporate lasers into a productive hygiene appointment

# WHY USE A LASER ?

MORE PREDICTABLE OUTCOMES

OPFFERING THE OPTIMUM TREATMENT TO THE PATIENT



TREATMENT OF THE GINGIVAL DISEASE IN ADDITION TO TRADITIONAL SCALING AND ROOT PLANNING

BACTERIAL REDUCTION

DECREASED DISCOMFORT

IMPROVED HEALING

LASER APPLICATIONS IN DENTAL HYGIENE LASER BACTERIAL REDUCTION (LBR) LASER ASSISTED PERIODONTAL THERAPY (LAPT) APHTHOUS ULCER/HERPETIC LESION TREATMENT DESENSITIZATION **PHOTOBIOMODULATION (PBM)** PAIN THERAPY WHITENING TREATMENT

# Let's talk a little about Physics

# Laser Light...

# Typically,<br/>one colorHighly<br/>FocusedDirectionalOrganizedEfficient



**Collimated** - refers to the parallel nature of the laser beam.

<u>Monochromatic</u> - refers to the single (wavelength of a laser beam.) <u>**Coherent**</u> refers to the synchronized phase of the light waves.

# **Electromagnetic Spectrum**

Regions (and Boundaries) Relative to Laser Emission

Ultra-violet (1- 349 nm) <u>Visible (350 - 750 nm)</u> Infra-red (750 + nm)

# **Electromagnetic Spectrum**



#### Dental Laser Wavelengths on the Electromagnetic Spectrum



## Short & Long Wavelengths

The short wavelength lasers are absorbed primarily in hemoglobin and melanin.

The long wavelength lasers are absorbed by water or carbonated hydroxyapatite.

# Laser Emission Modes

Continuous Wave- always on

Chopped, Gated or Pulsed - mechanically closed

Super Pulsed...should be Super Chopped

**Free-running pulsed**- short bursts of energy, <u>dependent on</u> the excitation source in the dental laser.

# Laser Tissue Interaction

Power Density + Duration of exposure + Amount of Cooling + Wavelength + Emission Mode + Tissue Characteristics = BIOLOGICAL EFFECT

# Modes of Use

# Contact Mode-

#### narrow deep incision

### Non-contact Modeshallow broad ablation

# Laser-Tissue Interaction

#### Laser Light on Target Tissue

- Reflected
- Scattered
- Transmitted
- Absorbed



Thermal Effect of Laser on Tissue

#### <u>Tissue Temperature(°C)</u> <u>Observed Effect</u>

Advantages of Lasers for Soft Tissue Therapy

- The Laser is very precise
- Bacterial reduction in the sulcus is excellent
- Coagulation of the treatment site is superior
- The laser can be used on every segment of the population regardless of age
- There are no allergic reactions to the laser

# Laser Applications for Dental Hygiene

- Aphthous Ulcers/Herpetic Lesions
- Photobiomodulation-external (PBM)
- Tooth Desensitization
- Laser Whitening
- Laser Bacterial Reduction (LBR)
- Laser Assisted Periodontal Therapy (LAPT)
- Photobiomodulation-perio (PBM)

Please check your State's Practice Act for scope of practice

# **TYPES OF LASERS**

# DIODE LASERS











# Diode Lasers - 810nm, 940nm, 980nm, 1064nm

#### **Active Medium is either:**

#### AlGaAs (Aluminium, Gallium, Arsenate)

#### InGaAs (Indium, Gallium, Arsenate)

#### Soft tissue surgery

**Optic fiber delivery** 

- CW, Gated Modes
- Pulsing available on some instruments
- Lightweight and compact
- Can be used for tooth whitening



#### Diode, AMD/CAO Picasso, Clario and Picasso Lite 810nm

# We focus the Light!

#### Beamer STL 980 nm wavelength

Ultradent's Gemini & Evo Dual Wavelength 810nm & 980nm









Biolase Epic 940nm





Biolase Epic Hygiene 980nm

#### **Biolase Laser Tips for Surgical Handpiece**



#### PERIO

NON-ABLATIVE: Laser bacterial reduction

E3 - 7mm, 9mm

ABLATIVE: Curettage/removal of necrotic tissue

Pi 3 – 7mm, 9mm Pi Pro Tips, 3 – 4mm (Epic Pro)

Pi 3 - 7mm

E3 - 7mm

**Epic** 

\* State laws may vary on RDH applications. Check with your respective state hygiene board for more information.

#### SOFT TISSUE

NON-SURGICAL: Aphthous Ulcer/Canker Sore Treatment

E4 - 4mm



Epic.

SURGICAL:

Frenectomy, biopsy, gingivectomy, gingivoplasty, troughing, and hemostasis

Pi 4 – 4mm Pi Pro 4 – 4mm (Epic Pro)



#### <u>Photobiomodulation</u> (PBM)

**B**iostimulation

Low Level Laser Therapy (LLLT) Light augments the metabolic rate of cells with compromised metabolism, but normal cells are not affected

- Stimulates blood flow, macrophages, fibroblasts, etc.
- Reduces pain receptors
- Used post surgery, hypersensitivity, TMD

# Low Level Lasers, 630nm-900nm







# Laser Set Up

Quartz Optic Fiber

Jacket (Silicone Rubber) Cladding **Core** (Quartz Fiber)

# **Optical Fiber** used for short wavelength lasers (diode, Nd:YAG)





#### Keep in mind that some lasers have more than one jacket.

# How to cleave a fiber

- If the laser that you are using has a rubber jacket, you must first remove or strip the fiber with a special tool.
- Keep in mind that some lasers have more than one jacket.
- You then must cleave or cut the fiber using special scissors or stone to achieve the desired cleave.
- Some fibers have tips that are preset and are disposable.



You must cleave or cut the fiber using special scissors or stone to achieve the desired cleave.
Red tip and red line of score on fiber

Some fibers have tips that are preset and are disposable.

#### A scored fiber that is ready to be cleaved

#### A properly Cleaved Fiber

#### Aiming beam of a well-cleaved fiber

#### **A Poorly Cleaved Fiber**

#### Aiming beam of a poorly cleaved fiber

# Conditioning of the Tip

- Conditioning the tip of a <u>diode</u> laser focus the energy efficiency and effectively and allows the laser to treat the tissue at a much lower power. No need to condition a Nd:YAG tip
- Keep in mind, once a diode comes in-contact with soft tissue for a certain amount of time- it becomes "conditioned" and can cut tissue or ablate cells
- Conditioning can be done with articulating paper or a marker.

#### Laser fiber conditioning with dark articulating paper



## Laser Procedures

## Laser Bacterial Reduction (LBR)

#### LBR is administering low power laser energy within the sulcus throughout the entire dentition

## Reasons to provide LBR

Reduce bacteremia

Reduce cross contamination

 Reduce bacterial load to help prevent attachment loss Laser Bacterial Reduction (LBR)

- Non-initiated fiber, contact mode
- Suggested setting:
- ▶ 0.3 0.4 CW
- High volume evac and personal protective equip
- Place fiber into sulcus and circle around tooth
- 10-15 seconds per tooth, administered through entire mouth

## LASER BACTERIAL REDUCTION (LBR)

- REDUCES GRAM NEGATIVE BACTERIA
- REDUCES RISK OF BACTEREMIA
- USES LOW ENERGY
- UNINITATED TIP
- LOWERS MICRO COUNT IN AEROSOLS
- STIMULATES NEW CELL GROWTH AND HEALING OF THE TISSUE
- 0.5-1 MM INTO THE SULCUS
- 10-15 SECONDS PER TOOTH



## LASER BACTERIAL REDUCTION



## Laser Assisted Periodontal Therapy (LAPT)

# Laser Assisted Periodontal Therapy (LAPT)

LAPT is administering laser energy within the periodontal pocket for profound decontamination. It will result in tissue interaction.

## Reasons to provide LAPT

- Removing the inflammatory factors
- Profound bacterial reduction within the pocket
- Promoting growth factors for healing

#### Ultimate goal of tissue rehabilitation

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#### REASONS FOR APPLYING LASER ASSISTED PERIODONTAL THERAPY



## Fiber Technique

- Do not use fiber to full pocket depth
- Angle fiber away from the tooth
- Place fiber into sulcus before firing
- Keep fiber moving
- On re-visits calibrate fiber 2mm less than the initial depth of the pocket

## LASER ASSISTED PERIO THERAPY (LAPT)



## LASER ASSISTED PERIO THERAPY-LAPT

#### PRE-OP



#### IMMEDIATE POST LAPT



## Periodontal Therapy







#18 Mandibular Left Second Molar Mesial Facial 4mm



#### 6 Months Post Op-3mm



## Periodontal Therapy





#32 Mandibular Right Third Molar Mesial Lingual 5 mm





#### At 6 Months 3mm



## Periodontal Therapy





#15 Maxillary Left First MolarMesial Facial5 mm







#### At 6 Months 3mm





## Laser Debris

## "Bone Repair"

#### ...is it possible ??

Not bone regeneration, that would require bone grafting as a surgical procedure





# Other Laser Procedures for Hygienists



# HERPETIC LESION

EXPECTED OUTCOMES IN TREATMENT OF APHTHOUS ULCERS AND HERPETIC LESIONS

- REDUCED INFLAMMATION
- REDUCE THE VIRUSES AND BACTERIA RELATED TO APHTHOUS ULCERS AND HERPETIC LESIONS
- REDUCE THE SEVERITY AND FREQUENCY OF THE RE-OCCURENCE OF THE HERPETIC LESION
- INCREASE OVERALL HEALTH
- PAIN MANAGEMENT AND DESENSITIZATION
- INCREASED PATIENT COMPLIANCE

# Apthous & Herpetic Lesions

Non-Contact, non-initiated tip **CW** Continuous wave HVE mandatory Start at low setting, .3W (300mW) and increase by .2W every 45-60 seconds, depending on size of lesion, up to 5 settings Place laser 2mm away from lesion

## Treating Aphthous/Herpetic Lesions



## HERPETIC LESION LASER TREATMENT


## Herpetic Lesion

3.

1.



2.

4.





## Herpetic Lesion



2.

4.



3.



weeks 3

## Herpetic Lesion Oct 2012





## PHOTOBIOMODULATION(PBM)/ PAIN THERAPY



## **PHOTOBIOMODULATION (PBM)**



## Laser Safety

## Laser Classification

## Class III

#### Requires special training, eye protection Dental Argon Curing Lasers, Soft Lasers

### Class IV



Potentially hazardous, specific safety measures Dental and Medical Surgical Laser Systems

## Class IV Lasers

- High powered Dental Lasers
- Hazard to eyes, skin, can catch things on fire
- Generates air contaminants
- LSO required
- Maximum Permissible Exposure (MPE) values for eye & skin
- Nominal Occular Hazard Distance (NOHD)
- Nominal Hazard Zone (NHZ)

## **Class 3B and Class 4 Lasers**

## 



#### **Class 4 Laser Controlled Area**

VISIBLE and/or INVISIBLE LASER RADIATION Avoid Eye or Skin Exposure to Direct or Scattered Radiation.

Laser Eye Protection Required: OD≥ 5 @ 970nm

970nm Wavelength Diode Laser 14 Watts Peak Power - 7 Watts Average Power

635-650 nm Diode Laser Maximum Power 1mW Continuous Wave Laser Safety Officer: Dr. Scott Benjamin

## Common Laser Signs and Labels













#### NHZ- Nominal Hazard Zone

This is the space within which the MPE is being exceeded. Anyone standing inside the NHZ must be wearing laser protection

#### NOHD- Nominal Occular Hazard Distance

The distance from the emission port of the laser, within which the MPE is being exceeded. Anyone inside the NOHD must be wearing their laser specific protective eyewear.



**Standards Organizations** and National Regulatory Requirements CDRH, ANSI, OSHA **Other National Bodies** Laser Safety Officer Laser Protection Advisor Laser Safety Mechanisms Adverse Effects Reporting Training Eye and Tissue Protection Environment **Proper Warning Signs Controlled** Area **Limited Access Reflective Surfaces Minimized High Volume Evacuation** Laser Use Documentation



## Laser Safety Combustible Gases Nitrous Oxide and Laser Usage

2005 ANSI standard, Z-136.3, states that Nitrous Oxide/Oxygen <u>can</u> be used with proper scavenger and suction techniques.

However,...

And,...Ether, alcohol-based topical anesthetics, and alcohol moistened gauze should be used with caution in close proximity to the laser beam. Patients with oxygen- tanks should be left outside NHZ.

## Laser Safety Officer

- Keeper of the Key or Passcodes
- Sets up standard operating procedures
- Understands the operational characteristics of the laser
- Knows output limitations of the device
  - Supervises staff education and training
  - Ensures laser maintenance and beam alignment, and calibration
  - Posts warning signs
  - Oversees personal protective wear
  - Supervises medical surveillance and incident reporting
- Is familiar with the biological and other potential hazards of the laser
- Knows of all regulations such as OSHA and ANSI
- Determines the potential hazard zone and nonhazard zone

## LASER SAFETY

- WAVELENGTH SPECIFIC GLASSES
- MASK 0.1 MICRON FILTRATION (CLASS 3)
- HIGH SPEED EVACUATION (HVE)
- LASER SIGN
- LASER SAFETY MECHANISMS
- LASER SAFETY OFFICER (LSO)
- STAY WITHIN THE CLINICIAN AND TREATMENT PARAMETERS

## **Eye Protection**

## **ALWAYS!**

Use the appropriate glasses specified for the wavelength being used!

![](_page_87_Picture_3.jpeg)

#### 190-315 D LB7 + IR LB4 >315-400 DIR 190-315 D LB4 + IR LB5 >950-1070 D LB 840-950 D LB4 + IR LB5 >950-1070 D LB 840-950 D LB4 + IR LB4 2780-2940 DI LB2 NO

## Multiple Wavelengths

## **Corneal Damage**

#### Laser Wavelength

& Er,Cr:YSGG

Er:YAGCO<sub>2</sub>

![](_page_89_Picture_4.jpeg)

## Lens Damage

## Laser Wavelength

Diode

**Nd:YAG** 

&Er,Cr:YSGG

\*Er:YAG

![](_page_90_Picture_6.jpeg)

## Aqueous Damage

#### Laser Wavelength

# Er,Cr:YSGGEr:YAG

![](_page_91_Picture_3.jpeg)

## **Retinal Damage**

#### Laser Wavelength

Argon

- HeNe
- Diode

![](_page_92_Picture_5.jpeg)

![](_page_92_Picture_6.jpeg)

## Irreversible Retinal Damage

![](_page_93_Picture_1.jpeg)

A cultural change among experimentalists is required to make laser eye accidents, such as this retinal burn from an Nd:YAG, a thing of the past.

## Signs of Eye Exposure

![](_page_94_Picture_1.jpeg)

## High Volume Evacuation

To help cool site
To remove Plume
carbonized tissue and blood
contains: Toluene, Acrolein, Formaldahyde,
can contain viruses and bacteria

## HIGH EVACUATION (HVE)

## Laser Infection Control

o Identification of Biologic Hazards

o Plume Hazards

• Sterilization of Instruments

• Decontamination of field

Disposal of used-up supplies

## Laser Safety Manual

![](_page_98_Picture_1.jpeg)

Do-It-Yourself Laser Safety Manual

> Academy of Laser Dentistry PO BOX 8667 Coral Springs, FL 33075 Phone 954.346.3776

www.laserdentistry.org email laserexec@laserdentistry.org

## Laser Use Documentation Chart notes should include:

fiber size/spot size

tip shape and size

emission mode--continuous/pulsed

energy/power setting(s)

time of exposure

eye protection worn

## Laser Communication Skills

## COMMUNICATION IS THE KEY

- ENTIRE TEAM IS TRAINED AND EDUCATED IN THE CORRECT VERBIAGE
- USE KEY PHRASES
- EDUCATE THE PATIENT
- HAVE OPEN COMMUNICATION
- REITERATE INFORMATION (DOCTOR EXAM, FRONT OFFICE HAND OFF)
- PROVIDE HANDOUTS AND
   INFORMATION FOR THE PATIENT
- POST OPERATIVE CALLS

## KEY PHRASES AND VERBIAGE

Laser Assisted Perio Therapy	
Laser Bacterial Reduction	
Infection	
Oral systemic link	
Pathogenic bacteria	
Bleeding	
Healing	
Significant	
Disease/diseased state	
Permanent	
Maintain periodontal health	
Sequence of therapy	
Successful results	
Optimum treatment options	
Laser treatment helps the body heal itself	

![](_page_103_Picture_0.jpeg)

Laser Bacterial Reduction (LBR) = \$50 for full mouth

Laser Assisted Perio Therapy (LAPT) = \$100 per quadrant or per session

5 days of Hygiene per week with 8 patients per day

#### 50% of patients

2 LBR x\$50 = \$100 2 LAPT x\$100= \$200 Average Increase → \$300/day 5 days x\$300 =\$1,500/week 4 weeks x\$1,500 =\$6,000/month 12 months x\$6,000 =\$72,000/year

#### 80% of patients

2 LBR x \$50 = \$200 2 LAPT x \$100 = \$200 Average Increase =\$400/day 5 days x\$400 = \$2,000/week 4 weeks x\$2,000 =\$8,000/weeh 12 months x \$8,000\$\$96,000/year Laser Bacterial Reduction (LBR) = \$50 for full mouth

Laser Assisted Perio Therapy (LAPT) = \$150 per quadrant or per session

5 days of Hygiene per week with 8 patients per day

#### 50% of patients

2 LBR x \$50 = \$100 2 LAPT x \$150= \$300 Average Increase → \$400/day 5 days x \$400 = \$2,000/week 4 weeks x \$2,000 = \$8,000/month 12 months x \$8,000 = \$96,000/year 80% of patients
4 LBR x \$50 = \$200
2 LAPT x \$150 = \$300
 Average Increase = \$500/day
5 days x \$500 = \$2,500/week
4 weeks x \$2,500 = \$10,000/month
12 months x \$10,000 = \$120,000/year

Laser Bacterial Reduction (LBR) = \$85 for full mouth

Laser Assisted Perio Therapy (LAPT) = 200 per quadrant or per session

5 days of Hygiene per week with 8 patients per day

50% of patients	80% of patients
$2 \text{ LBR} \times \$85 = \$170$	$4 \text{ LBR} \times \$85 = \$340$
2 LAPT x \$200= \$400	2 LAPT x \$200 = \$400
Average Increase → \$570/day	Average Increase = <b>\$740/day</b>
5 days x \$570 = <b>\$2,850/week</b>	5 days x \$740 = <b>\$3,700/week</b>
4 weeks x \$2,850 = <b>\$11,400/month</b>	4 weeks x \$3,700 = <b>\$14,800/month</b>
12 months x \$11,400 = <b>\$136,800/year</b>	12months x\$14,800 = <b>\$177,600/year</b>

Can I use my Laser in my State?
# Scope of Practice and The Dental Practice Act

The practitioner must deliver competent dental care in according to his or her education, training, clinical experience and scope of practice

# Additional Resources

### Resources for Lasers

BOOK BY ANGIE MOTT SOFT-TISSUE LASERS IN DENTAL HYGIENE Written by: Jessica Blayden & Angie Mott Published by: Wiley-Blackwell ISBN 978-0-4709-5854-4 Can order through Amazon.com



#### **Additional Resources for LASERS**

#### The Academy of Laser Dentistry www.laserdentistry.org

At this time, we are the only unbiased international organization of clinicians, researchers and academicians for laser dentistry

# Let's use our Lasers!

## Thank You

#### Questions ??

Feel free to reach out to me at: <u>Angie@Laserrdh.com</u>

Contact me if you are interested in, in-office Laser courses