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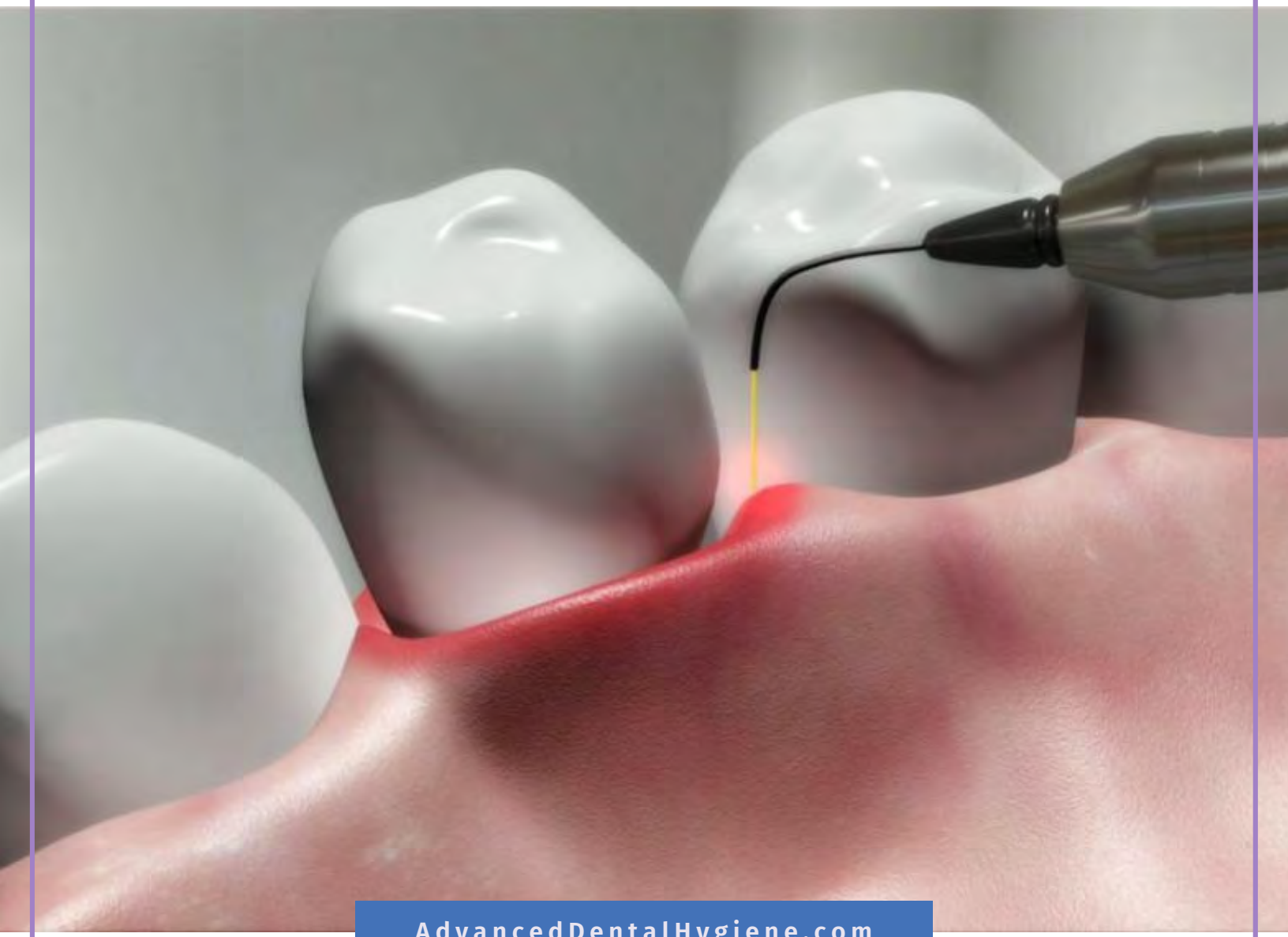
APPLICATIONS of the DIODE LASER



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Joy Raskie, RDH

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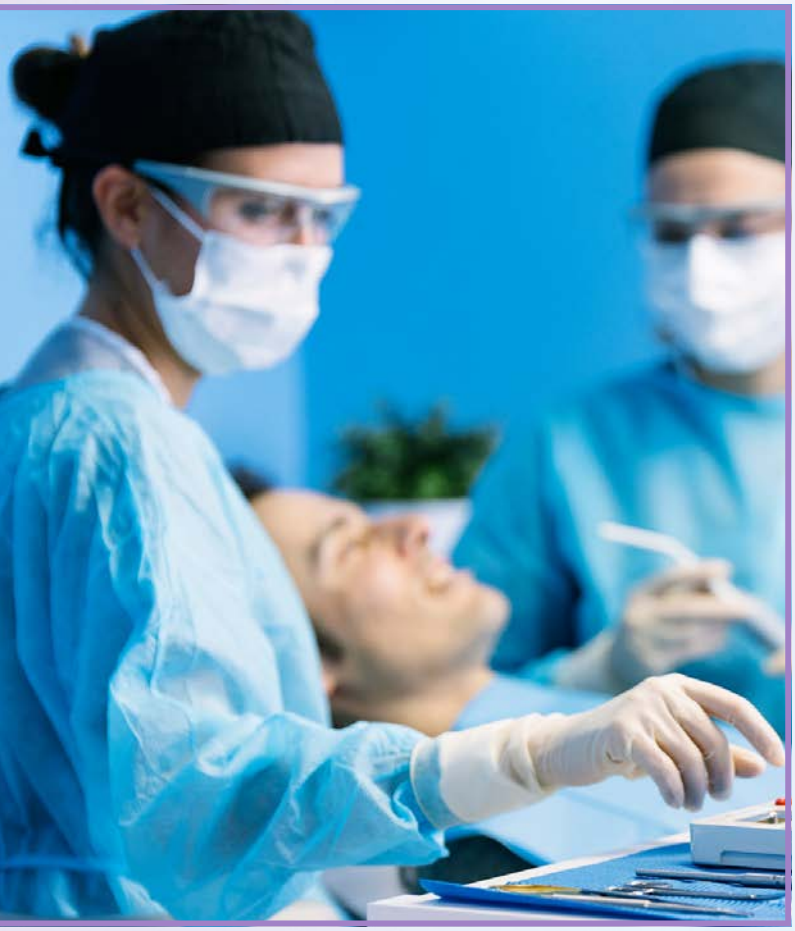
- Registered Dental Hygienist in Littleton, Colorado, since 2003
- CEO, Director of Education at Advanced Dental Hygiene
  - AdvancedDentalHygiene.com
  - Specialize and teach dental laser training courses worldwide
- Associate Fellowship and Fellowship from the World Clinical Laser Institute (WCLI) and Advanced Laser Training. Working towards my Mastership
- Advanced Proficiency from the Academy of Laser Dentistry (ALD)
  - Presented 5 laser case studies with a high degree of difficulty
  - One of 20 RDH's who hold this certification worldwide

Course Objectives



- Gain an understanding of NEW trends with lasers
- Acquire the knowledge on how doctors are utilizing super-pulsing and dual-wavelength technology for superior cutting power for many common everyday dental procedures
- Discover how dental hygienists are integrating lasers into the hygiene workflow as well as increasing profitability with lasers in the hygiene department
- Master tips to effectively implement laser into daily hygiene practice
- Discover new procedures that allow assistants, doctors, and hygienists to biostimulate tissue, reduce pain, reduce inflammation and accelerate healing with lasers

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GAIN AN UNDERSTANDING OF NEW TRENDS WITH LASERS

Older Laser Devices






New Trends With Lasers

- Procedures pre-set for multiple clinicians
  - *Doctors, hygienists, specialists*
- Look of the laser
  - *Futuristic, light-weight, portable*
- Tips
  - *Uninitiated, Pre-initiated, Stronger tips, PBM*
- Multiple wavelengths in ONE LASER!
  - *810nm, 980nm*
- Using two wavelengths at ONCE
  - *Dual-wavelength*
- Super-Pulsing Technology
- Procedures are all set-up
- For all clinicians
- No Guessing
- Plug and Play | Turn-key
- Everyone loves EASY
- Futuristic
- Light-weight | Portable


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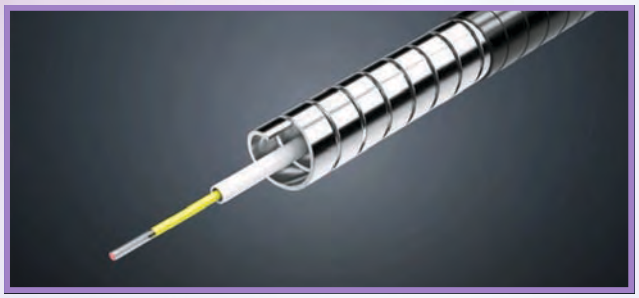
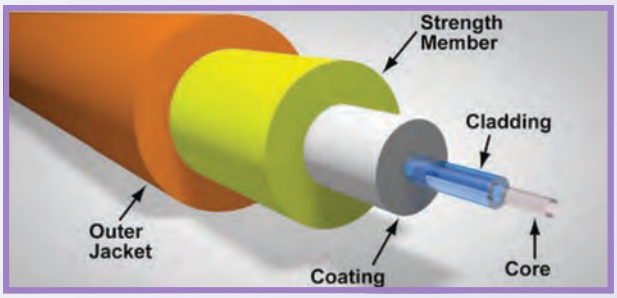
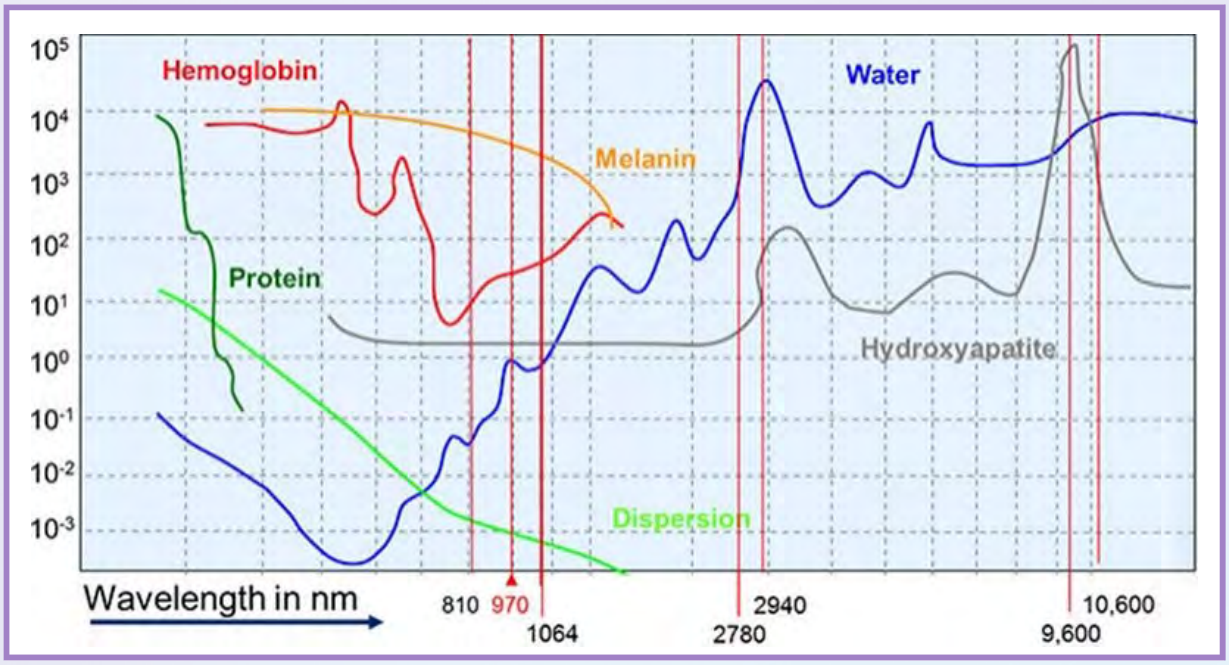
Laser Fibers / Laser Tips

Initiated vs Uninitiated





Laser Wavelengths & Various Tissue Components



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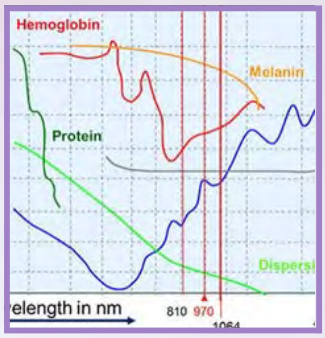
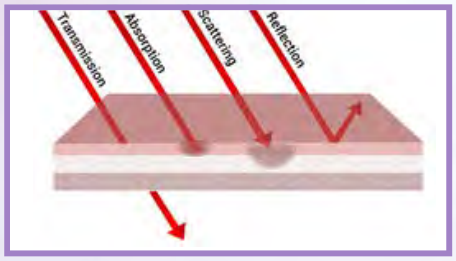
Multiple Wavelengths - Dual Wavelength

Two Wavelengths

- 810nm
  - More attracted to the melanin in tissue (*pigment-tissue color*)
  - *Superior coagulation*
- 980nm
  - More attracted to water
  - Better for tissue ablation (cutting)
- When used together it cuts AMAZING!!



Power of Lasers



- Lasers cut by absorption in the tissue
  - Can produce a slow cutting effect

- Electrosurgery is very powerful/fast
  - Necrosis zone is 3-5x wider than that of a diode laser
  - Patients experience more pain post-op, longer healing time
  - Can't use around metal dental restorations or titanium implants

- Diode Lasers
  - Main complaint with diode lasers- SLOW cutting due to limits on power (watts) to minimize collateral thermal damage
  - Continuous wave was introduced to provide constant energy to cut faster1
    - Can produce collateral damage to soft tissues1.
    - Often causes carbonization leading to tissue necrosis and delayed wound healing2
    - Not good for esthetic cases (smile line contouring)

1. *R. Borchers, Comparison of diode lasers in soft-tissue surgery using CW-and superpulsed mode: an in vivo study, RWTH Aachen University: Master thesis for Master of Science in Laser in Dentistry, 2008*
2. *A. A. Al-Khatib and A. S. Al-Azzawi, "Comparative study of diode laser 940 nm in performing frenectomy in both: continuous and pulsed modes: an in vivo study," Journal of Dental Lasers, vol. 9, no. 2, p. 50, 2015*

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Before | During Procedure | Directly After

R. Borchers, Comparison of diode lasers in soft-tissue surgery using CW-and superpulsed mode: an in vivo study, RWTH Aachen University: Master thesis for Master of Science in Laser in Dentistry, 2008.

1 Day After | 2 Days After | 1 Week After

2 Weeks After

R. Borchers, Comparison of diode lasers in soft-tissue surgery using CW-and superpulsed mode: an in vivo study, RWTH Aachen University: Master thesis for Master of Science in Laser in Dentistry, 2008.

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DENTIST PROCEDURES

- Crown-lengthening
- Exposing crown margins
- Gingivectomy – ortho/braces
- De-bulking gingival grafts
- Venous Lake
- Smile line correction - Gingivectomy
- Frenectomy
- Laser periodontal therapy – Flap
- Operculectomy
- Lesion (tumor) removal
- Biostimulation, TMJ Therapy
- Exposure of Implants
- Mucositis / Periimplantitis
- Extractions
- Biopsy
- Pulpotomy
- De-pigmentation
- Canal disinfection / Apicoectomy
- Pain Therapy – TMJ, Migranes

Why Lasers Over Conventional Methods?

Overall:

- Enhanced hemostasis reducing need for sutures
- Less post-op pain
- Better post-op healing
- Control moisture content of the field (heme and crevicular fluid)
- Bacterial decontamination of the field leading to gingival health at margins
- “Laser treatment causes no recession or repositioning of the gingival margin.”*

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TROUGHING PROCEDURE

Gingival Troughing

The “trough” is the narrow space between the free margin of the gingival epithelium and the adjacent enamel of the tooth

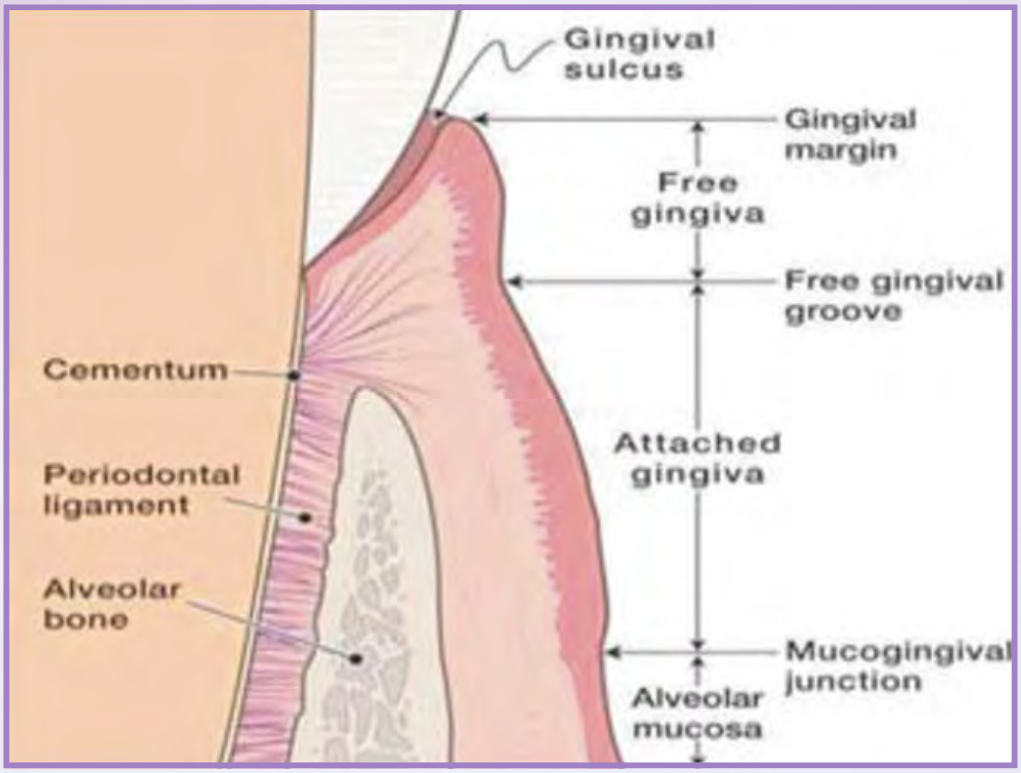

Photo from Alaa Eddin Omar Al Ostwani (April 4th 2019). Introductory Chapter: The Importance of Gingival Treatment and Prevention [Online First], IntechOpen, DOI: 10.5772/intechopen.85653. Available from: https://www.intechopen.com/online-first/introductory-chapter-the-importance-of-gingival-treatment-and-prevention

Most Popular Technique for Doctors with the Diode Laser

- Provides access and visualization of operative site and margins, especially when subgingival
  - Great impressions
- Controls moisture content of field (Heme and crevicular fluid)
- Bacterial decontamination of field, leading to gingival health at margins and while in temporary

Dentalcompare.com

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Packing a Cord vs Not Packing a Cord

- With Laser used to trough
  - Only takes 15-30 seconds
  - Patients notice LESS post-op pain
  - Less material needed
  - Healing time much quicker with laser
  - No hemodent needed, don't need assistant
  - Patient notice a lot less pain!
- Could get sub-optimal results afterward with the cord (especially in anterior areas) if you end up pushing that tissue too much, which will be causing a recession. The cord can hurt periodontal ligaments

GINGIVECTOMY \ GINGIVOPLASTY PROCEDURE

Gingivectomy | Gingivoplasty | Crown Lengthening Procedures

- *These procedures are very similar in technique and goal. We want a pocket-depth reduction, remove excess gingival tissue and improve the gingival contour*
- Gingivoplasty will almost always be done in conjunction with LAPT/LD

Dual-Wave 810nm & 980nm & Super-Pulsed

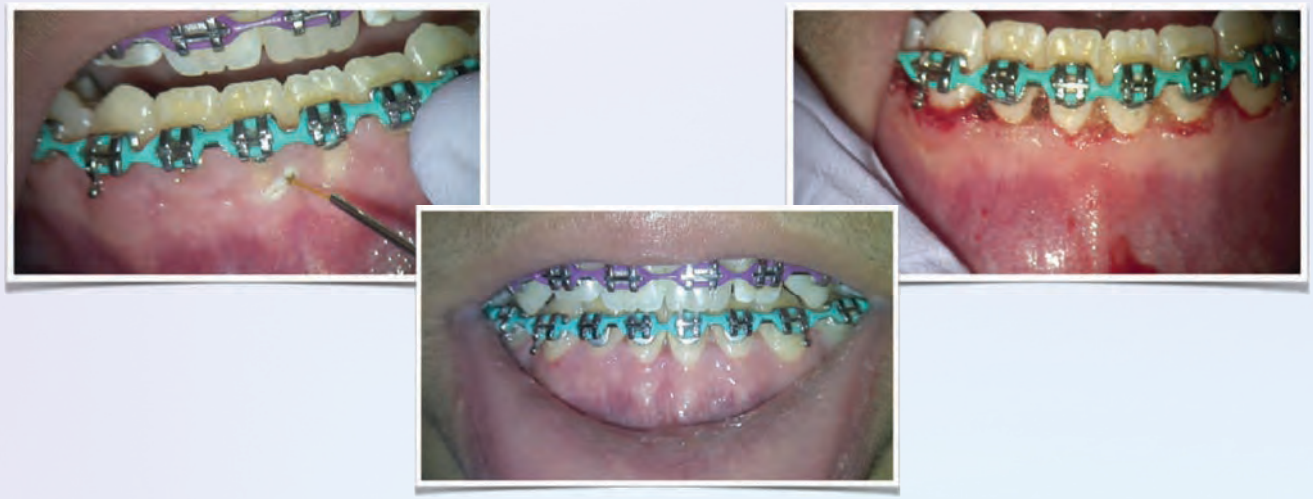
Nur Hafizah Kamar Affendi, Rohana Ahmad, Farhad Vahidi, Mohd Zulkifli Hassan, Siti Nadia Rahimi, "The Integration of a Dual-Wavelength Super Pulsed Diode Laser for Consistent Tissue Ablation in the Esthetic Zone: A Case Series", Case Reports in Dentistry, vol. 2020, Article ID 8883156, 6 pages, 2020. https://doi.org/10.1155/2020/8883156

Class III & IV Composite Restorations

- Gingival tissues often come into play - ***more bleeding*** with procedure
- Adhesive resins and composite materials are hydrophobic (don't like moisture -saliva and/or blood)
- Controlling moisture is crucial for bonding successfully in these areas requires
- Diode laser can substantially increase successful adhesion in these areas by making the margins supragingival and stopping bleeding prior to matrix and restorative material placement

Lowe, Robert A, "Tissue Management in Restorative Dentistry: The "Super Pulsed" Diode Laser, "Oral Health", July 2018.

Gingivectomy/Gingivoplasty



8 days Post Surgery

Lawrence Kotlow DDS 2012

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BIOPSY PROCEDURE

Lawrence Kotlow DDS 2012

FRENECTOMY PROCEDURE

This procedure is done for several reasons.

1. In Babies, for latching (breast feeding). Bonding Mom/Baby
2. In young children, it may not have receded as it should have and can prevent the permanent teeth from coming together creating a diastema.
3. In adults with or without gingival recession present could create a mucogingival defect creating the possible need for a graft
4. Possible breathing problems with age (night-time issues)

Before/After Frenectomy

Before **Immediate After** **After Healing**

970nm laser

OPERCULECTOMY PROCEDURE

Operculectomy

Indications for an Operculectomy

- Pericoronitis but when the extraction of the tooth is not indicated
  - Pericoronitis-inflammation of the soft tissues surrounding the crown of a partially erupted tooth, including the gingiva and the dental follicle, may cause patient discomfort

VENOUS LAKE PROCEDURE

Venous Lake on Lip

- Venous lake, or venous pool, lesion presents as a soft, bluish/purple, discrete, painless nodule beneath the epithelium
- Usually seen after age 40
- Often appears as the result of an injury to the lip
- Persists throughout life, usually uncomplicated

How does the laser work?

- The laser beam generates heat when absorbed by **hemoglobin** and thus **coagulates** tissue (down to a depth of approximately 7–10 mm) in a process characterized as **photocoagulation**

Azevedo LH, Galletta VC, Eduardo Cde P, Migliari DA. Venous lake of the lips treated using photocoagulation with high-intensity diode laser. Photomed Laser Surg. 2010;28(2):263–265.

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EXPOSING AN IMPLANT PROCEDURE

Exposing an Implant

Ultradent Gemini Dual Wave

Lowe, Robert A, "Tissue Management in Restorative Dentistry: The "Super Pulsed" Diode Laser, "Oral Health", July 2018.

LASERS IN HYGIENE

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Explanation of the Inflammatory Process

Manor A, Lebendiger M, Shiffer A, Tovel H: Bacterial invasion of periodontal tissues in advanced periodontitis in humans, J Periodontol 55(10) 567-573, 1984.

Biofilm – The "bad guys"

- *First component of gingivitis/periodontal disease*
- Complex community of microorganisms protected by a secreted extracellular polymeric substance. As it becomes more mature, the microbes use molecular communication to create a highly organized and adaptable infrastructure and become living organisms. *(Fux CA, Costerton JW, Stewart PS, Stoodley P: Survival strategies of infection biofilms, Trends Microbiol 13:34-40, 2005)*
- Develops resistance to UV light, bacteriophages, biocides, antibiotics, immune system responses, and environmental stresses. *(Donlan RM, Costerton JW: Biofilms: survival mechanisms of clinically relevant microorganisms, Clin Microbiol Rev 15: 167-193, 2002.)*
- Biofilm is what you are targeting with the laser!!

Convissar, Robert. A. Principles and Practice of Laser Dentistry. New York: Mosby 3:27, 2015.

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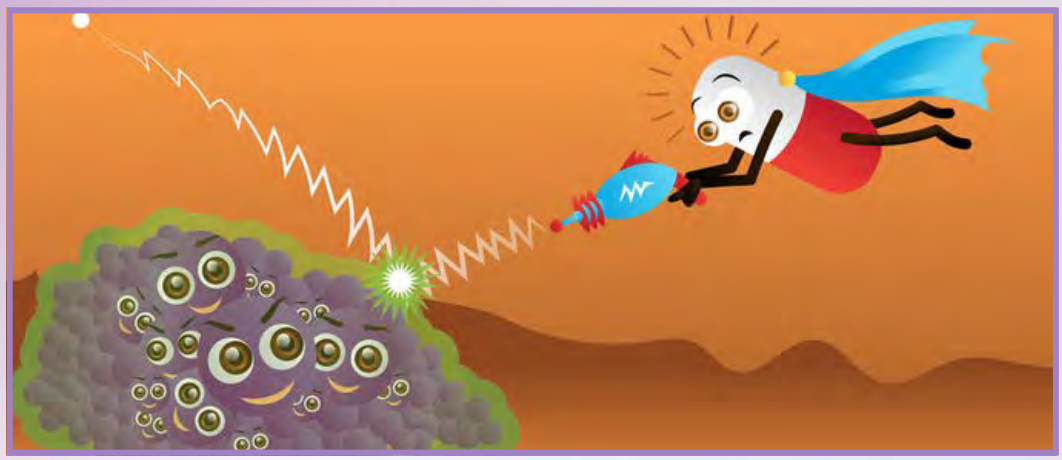
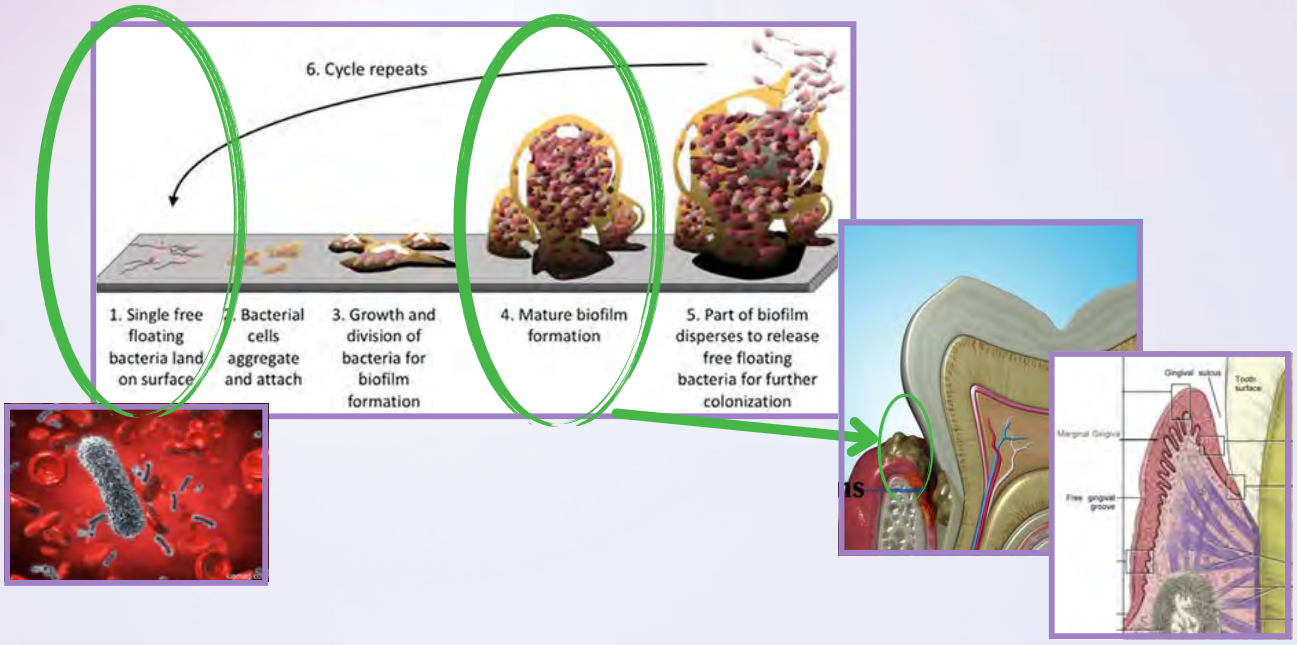
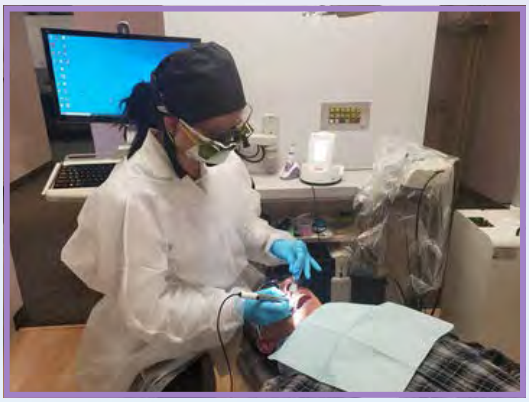
Lasers Role in the Infection Process





How do dental hygienists integrate lasers into the hygiene workflow



How can we increase profitability in the hygiene department

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Breaking it Down into Easy Steps

01	02	03	04
What are we doing	When do we perform this treatment	Ideal patients for this treatment	Results and Increasing Profits

LASER BACTERIAL REDUCTION PROCEDURE

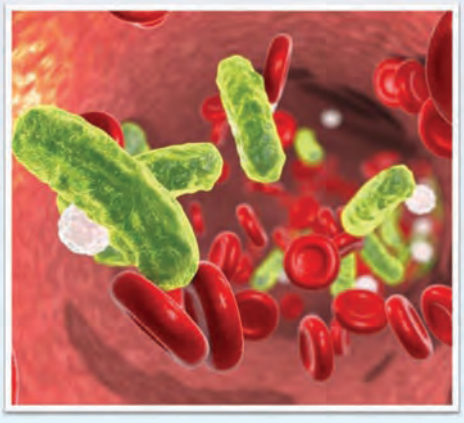
Laser Bacterial Reduction

This is like a pre-procedural rinse but reduces bacteria UNDER the gums

Lasers and Bacteria Research

Lasers are bactericidal

- The diode laser group showed **100% reduction of long-term bacteria** (Periodontal specific), whereas 58.4% of the controls showed an improvement.
- The diode laser group **reduced their bleeding on probing (BOP) by 96.9% compared** to 66.7% in the control group.



Moritz A, Schoop U, Goharkhay K, et al: Treatment of periodontal pockets with a diode laser. Department of Conservative Dentistry, Dental School of the University of Vienna, Austria, Lasers Sug Med 22 (5):302-311, 1998.

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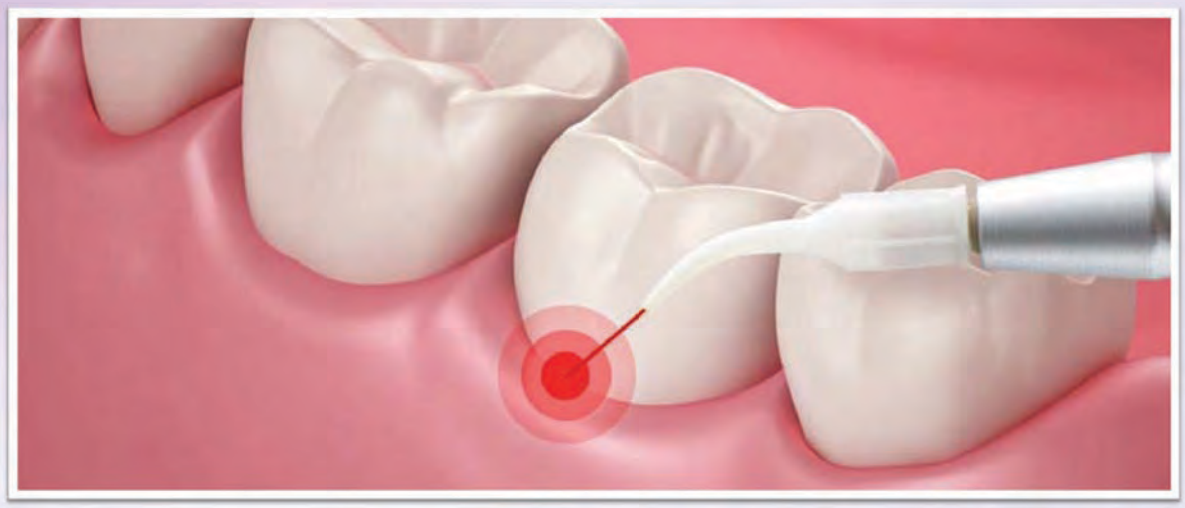
LASER DECONTAMINATION PROCEDURE

Laser-Assisted Periodontal Therapy (LAPT)
Laser Decontamination (LD)



Laser Decontamination – (LD)

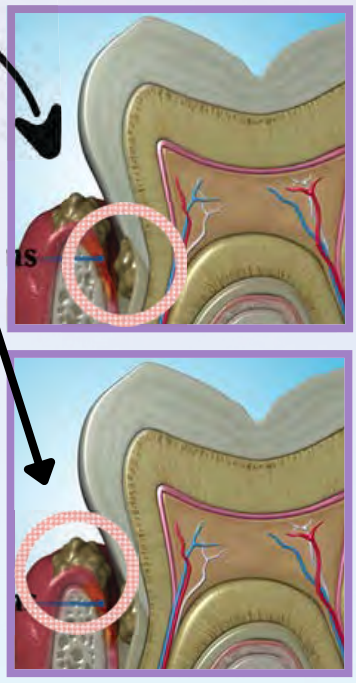
(Why I call it LD and why it is ok to initiate your tip in somestates)

Just as conventional *root debridement* **removes biofilm** and accretions from the hard tooth surface, *laser decontamination* **removes biofilm** within the **necrotic tissue of the pocket wall**. The laser energy interacts strongly with inflamed tissue components (diseased tissue, red-orange complex bacteria) and less strongly with healthy tissue.

Convissar, RA: Principles and Practice of laser Dentistry, New York: Mosby, (3) 31. 2011. Print.

This *nonsurgical therapy* uses very low settings and decontaminates rather than cuts the tissue.

Coluzzi DJ, Convissar RA: Atlas of laser applications in dentistry, Chicago, 2007. Quintessence.



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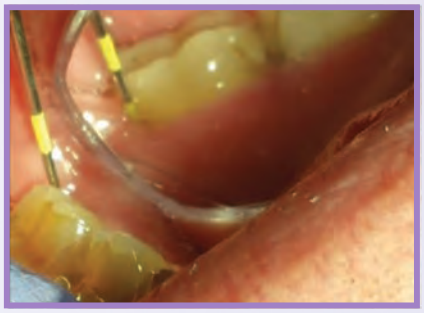
Medically Compromised Patients

LD on a single tooth

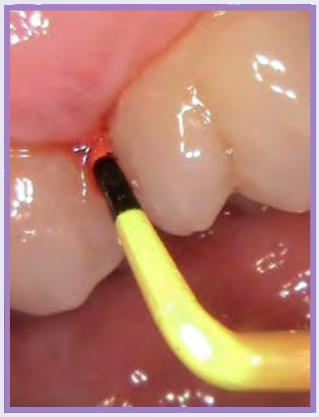
#31 DL 10mm



#31 DL 4.5mm 3-week post op

#31 DL post laser

LD on 8mm pocket



8mm initial therapy

Immediate post op with coagulation

4mm at 4mo periomaint

Results We See | Typical Fees

- Pocket reduction
- Gums heal quickly
- Bone regeneration
- Patients respond great
- $50-500
    - Quadrant fee $75-225

Research SRP + Laser | SRP Alone

In ALL articles ~ SRP + Laser = more bacterial reduction than SRP alone

- Significantly higher reduction in **periodontal pathogens after 2 months** compared to SRP alone [1]
- Considerable **bacterial elimination**, especially of **Actinobacillus actinomycetemcomitans**, from periodontal pockets [2]

1. *Fenol A, Boban NC, Jayachandran P, Shereef M, Balakrishnan B, Lakshmi P. A Qualitative Analysis of Periodontal Pathogens in Chronic Periodontitis Patients after Nonsurgical Periodontal Therapy with and without Diode Laser Disinfection Using Benzoyl-DL Arginine-2-Naphthylamide Test: A Randomized Clinical Trial. Contemp Clin Dent. 2018 Jul-Sep;9(3):382-387.*
2. *Moritz A, Gutknecht N, Doertbudak O, et al. Bacterial reduction in periodontal pockets through irradiation with a diode laser: a pilot study. J Clin Laser Med Surg. 1997;15(1):33–37.*
3. *Crispino A, Figliuzzi MM, Iovane C, Del Giudice T, Lomanno S, Pacifico D, et al. Effectiveness of a diode laser in addition to non-surgical periodontal therapy: Study of intervention. Ann Stomatol (Roma) 2015;6:15-20.*
4. *Elavarasu S, Suthanthiran T, Thangavelu A, Mohandas L, Selvaraj S, Saravanan J. LASER curettage as adjunct to SRP, compared to SRP alone, in patients with periodontitis and controlled type 2 diabetes mellitus: A comparative clinical study. J Pharm Bioallied Sci. 2015;7(Suppl 2): S636–S642.*
5. *Gupta, Sunil Kumar et al. "An evaluation of diode laser as an adjunct to scaling and root planning in the nonsurgical treatment of chronic periodontitis: A clinico-microbiological study." Dentistry & Medical Research. 2016; 4(2): 44-49.*

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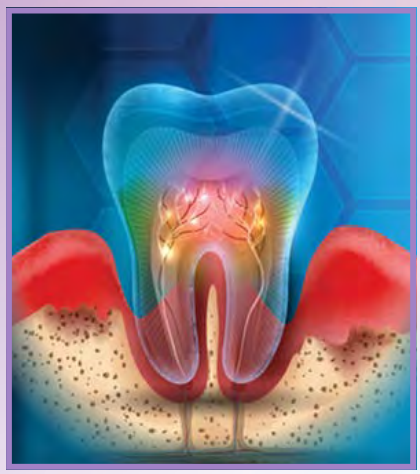
What About Bone Regeneration?



Bone Regeneration – 6 months

Janessa Bock RDH, Houston, TX

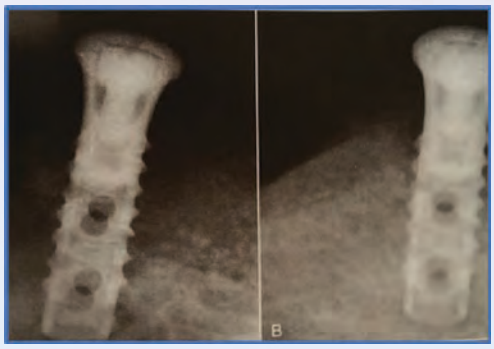
Research Articles on Regeneration

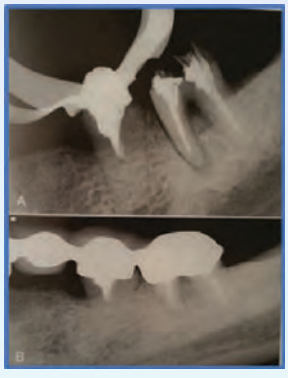
- Findings showed a positive effect on the proliferation of both gingival fibroblasts and periodontal ligament fibroblasts, as well as their responses to inflammation

Ren, C., McGrath, C., Jin, L. et al. Effect of diode low-level lasers on fibroblasts derived from human periodontal tissue: a systematic review of in vitro studies. Lasers Med Sci 31, 1493–1510 (2016)

- Diode lasers have a biostimulatory effect on bone tissue as well as enhanced osteoblastic (bone-forming cells) proliferation

Amid R, Kadkhodazadeh M, Ahsaie MG, Hakakzadeh A. Effect of low level laser therapy on proliferation and differentiation of the cells contributing in bone regeneration. J Lasers Med Sci. 2014;5(4):163–170.





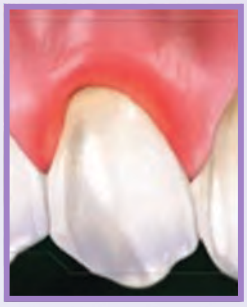
Pires Oliveria DA, de Oliveria RF, et al: Evaluation of low-level laser therapy of osteoblastic cells, Photomed laser surg 26(4):401-404, 2008

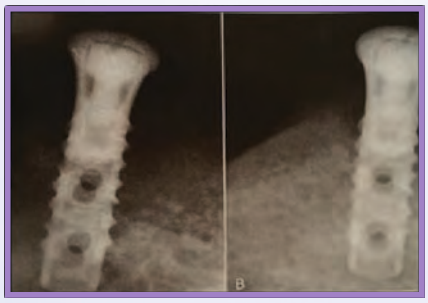
Dortbudak O, Haas R, Mallath-Pokorny G: Biostimulation of bone marrow cells with a diode soft laser, Clin Oral Implants Res 11(6):540-545, 2000

What About Treating Implants with a Laser?

Peri-Implant Mucositis

- Gum infection/infection in the tissue
- Disinfect gum pocket
- Clean deeper than we can get with our instruments[1]
- Stimulate healing[2]





1.Malmqvist, Sebastian et al. "Using 445 nm and 970 nm Lasers on Dental Implants-An In Vitro Study on Change in Temperature and Surface Alterations." Materials (Basel, Switzerland) vol. 12,23 3934. 27 Nov. 2019
2.Pires Oliveria DA, de Oliveria RF, et al: Evaluation of low-level laser therapy of osteoblastic cells, Photomed laser surg 26(4):401-404, 2008

Technique Is Very Important!

Angulation of laser tip & time in pocket

Malmqvist S, Liljeborg A, Qadri T, Johannsen G, Johannsen A. Using 445 nm and 970 nm Lasers on Dental Implants-An In Vitro Study on Change in Temperature and Surface Alterations. Materials (Basel). 2019;12(23):3934. Published 2019 Nov 27. doi:10.3390/ma12233934

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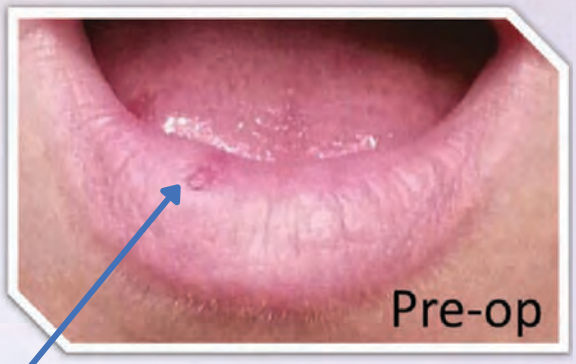
LESION TREATMENT PROCEDURE

Canker Sores
OR
Cold Sores



Step 1: What We Are Doing?

- Killing viral particles
- Inactivating lesion
- Begin the healing and dormant process
- Cauterizes nerve endings
- Biostimulating the area

Step 2: When Do We Perform This Treatment

Herpes Labialis (Cold Sores)

- Ideally performed ASAP
- Right when the patient feels it coming on
- First day of lesion
- Can perform at any stage of virus – promotes healing

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Training

- Seek out a perio course
  - All team members attend (RDH/DDS)
- Proper hands-on laser training
  - Makes everyone feel comfortable and confident delivering laser therapy

- Verbalization training
  - Practice working on your “script” or verbiage
  - Team meetings to discuss what is working/not working
  - Get ALL staff on board/same messaging from front to back
- Practice on co-workers or loved ones

Tips to On-Board Patients

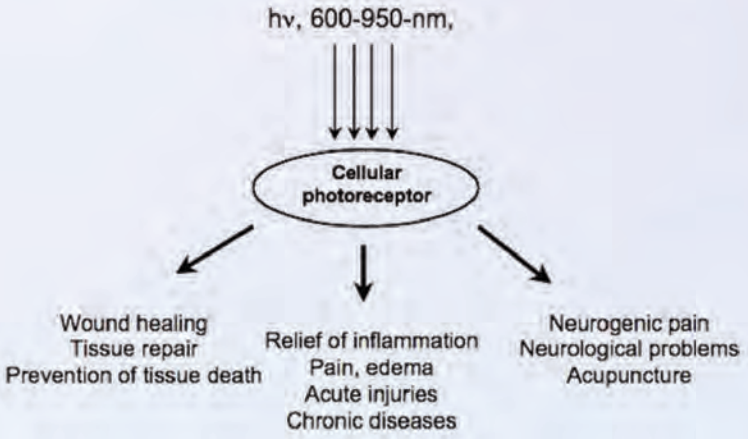
- Get ***excited***, the more you stay positive the better your patients will feel about accepting treatment
- Be ***confident***, you know what you are talking about and your patients trust you
- Think about your ***delivery***
  - ***Direct Eye Contact*** is important
- Making it a **part of their out of pocket investment** will help them understand this is the standard of care in your office
- During the hygiene & restorative appts, talk about the laser
  - Create the Hype, be excited

Discover new procedures that allow assistants, doctors and hygienists to biostimulate tissue, reduce pain, reduce inflammation and accelerate healing

PHOTOBIOMODULATION PROCEDURES

What is Photobiomodulation

- Photo (light), bio (life & cells), modulation (modify or influence change)
- Also known as:
  - Low-level laser therapy
  - Cold Laser therapy



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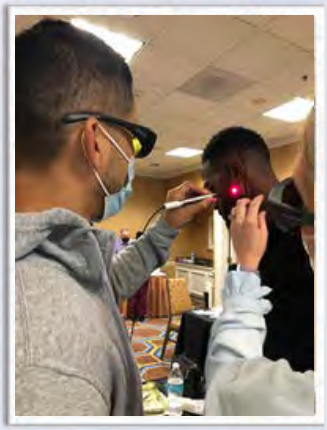
Advanced Dental Hygiene

PBM Uses In Dentistry

- Post extraction
- Dry Socket
- Endodontics – root canal/post-op pain
- Implants
- Restorative Procedures, Fillings, Cementing Crowns
- Analgesic & Acupuncture affects
- Dental Infections
- Nausea & Gagging
- Mucositis
- Nerve Regeneration
- Facial Pain Relief After Long Dental Appointments
- TMJ/TMD
- Sinusitis
- Orthodontics (movement of teeth-stimulation)
- Dry Mouth- Stimulation mode
- Paresthesia
- Gingival Grafts

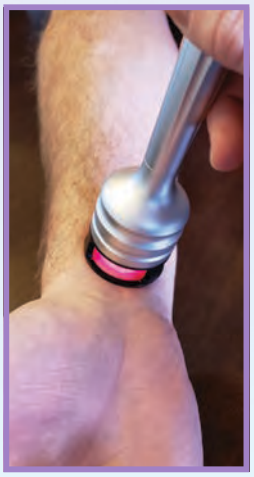
TMJ & Treatment of Facial Pain

- Find out where they are experiencing pain and/or soreness
- Treat that area
- Clinical forms for patient to complete evaluating pain areas
- Clinical Interview (Let the patients tell you their story)
  - A good clinical interview is key to a good diagnosis



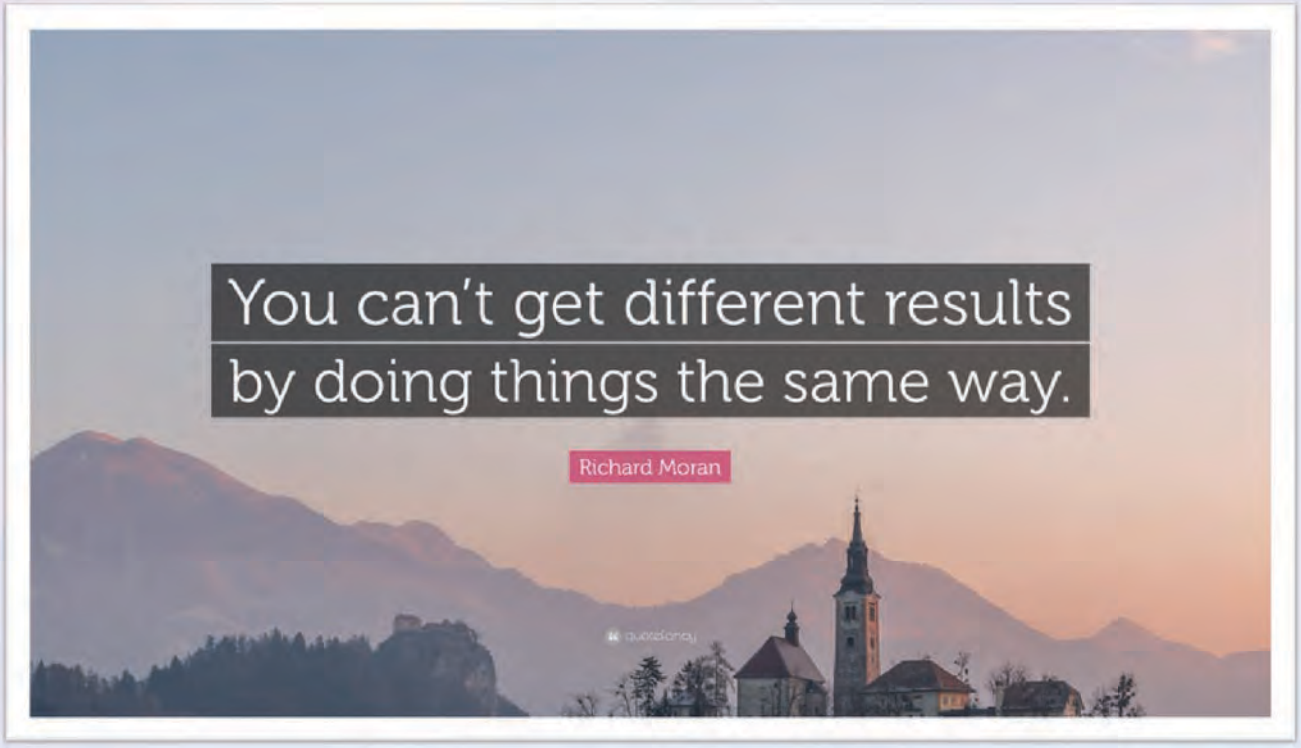
Nausea & Gagging

- Apply laser to P6 acupuncture point
- Reduces nausea & gagging
- Bioinhibition
- High anxiety or very strong gagger- apply laser to all 3 points



Lasers Can Help With

- Reduce post-op pain
- Happier patient
- Stimulate Healing
- Faster healing
- Happier patient
- This is what sets your office apart



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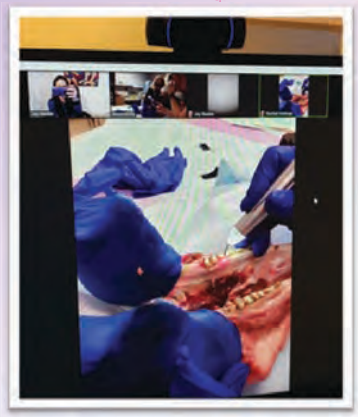

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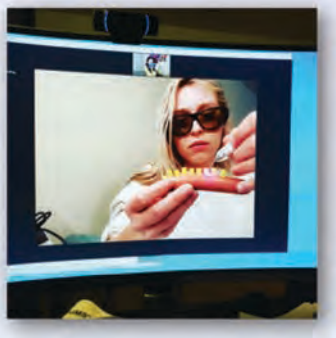
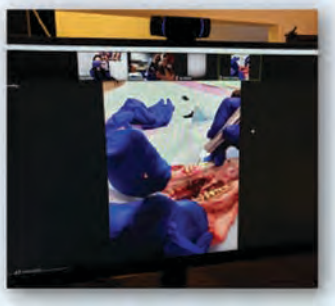
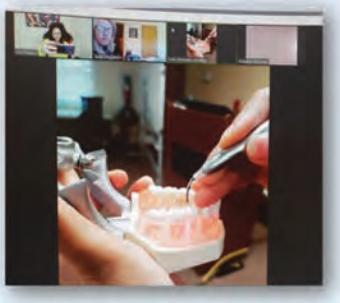

CONFIDENCE

ADH Advanced Dental Hygiene

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