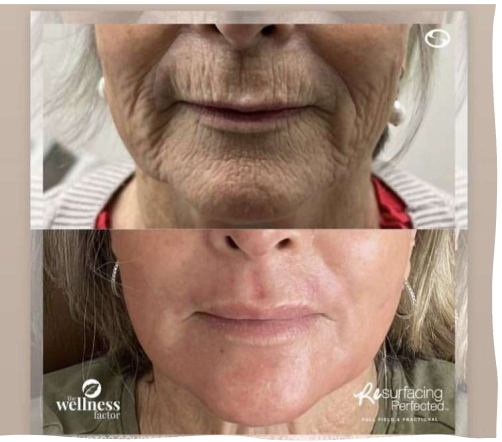
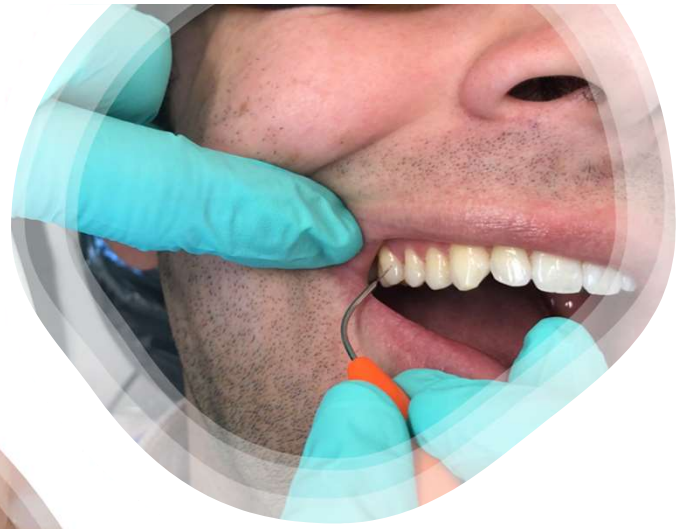
Photo Therapy

With your diode laser



Common Medical Laser Procedures

- Dermatology
- Pain Therapy
- Chiropractic
- Lasix
- Tattoo Removal
- Wound Healing
- Hair Removal
- Etc...



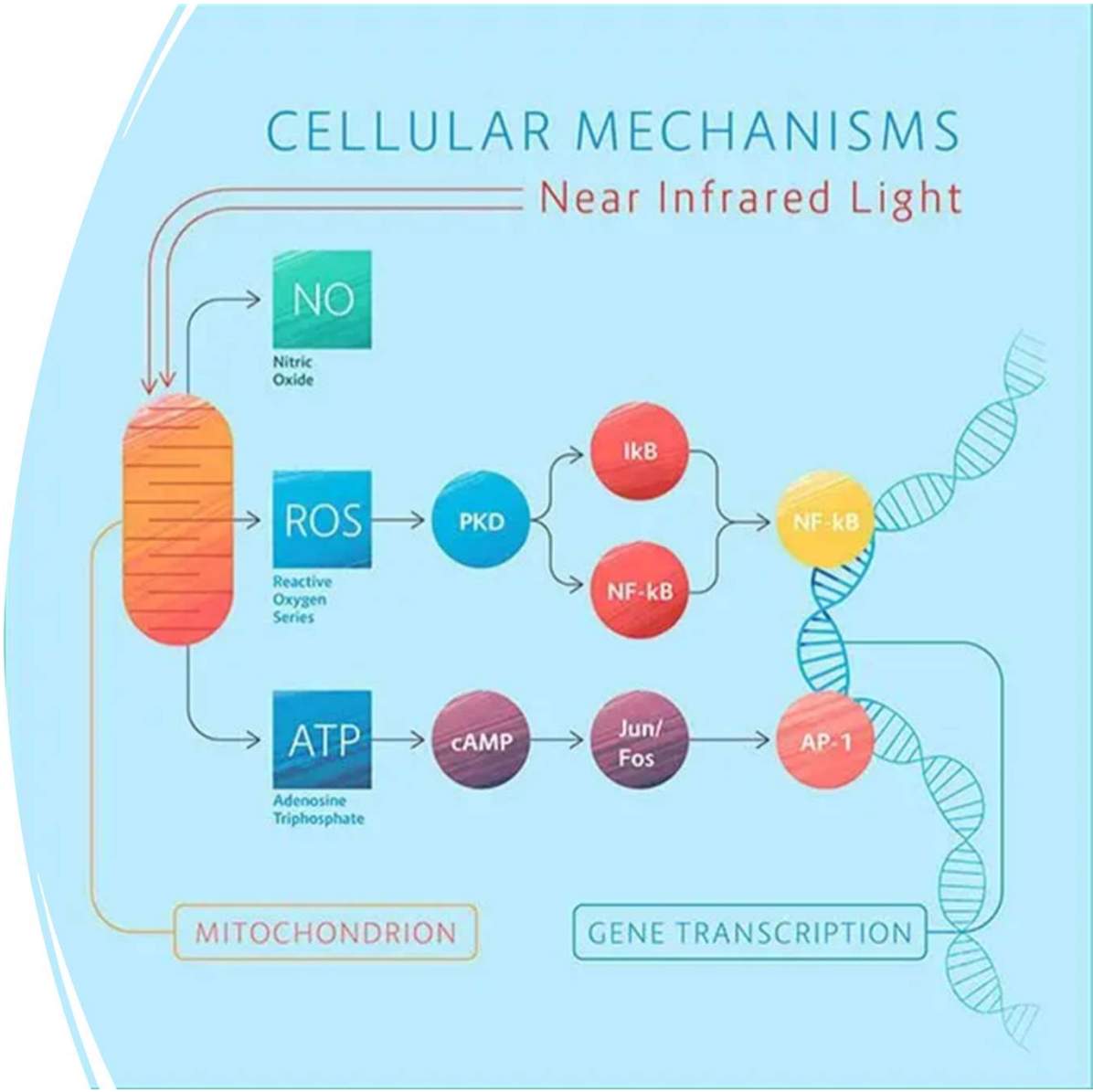
Hygiene – Periodontal - Surgical

Your Diode Can Be So Much More!

Photo Biomodulation
“PBM”
Low-Dose Non-Thermal Radiation

https://pro.vielight.com/the-science/

- Cold Laser
- Cool Laser
- Light Therapy
- Red Light Therapy
- LLLT

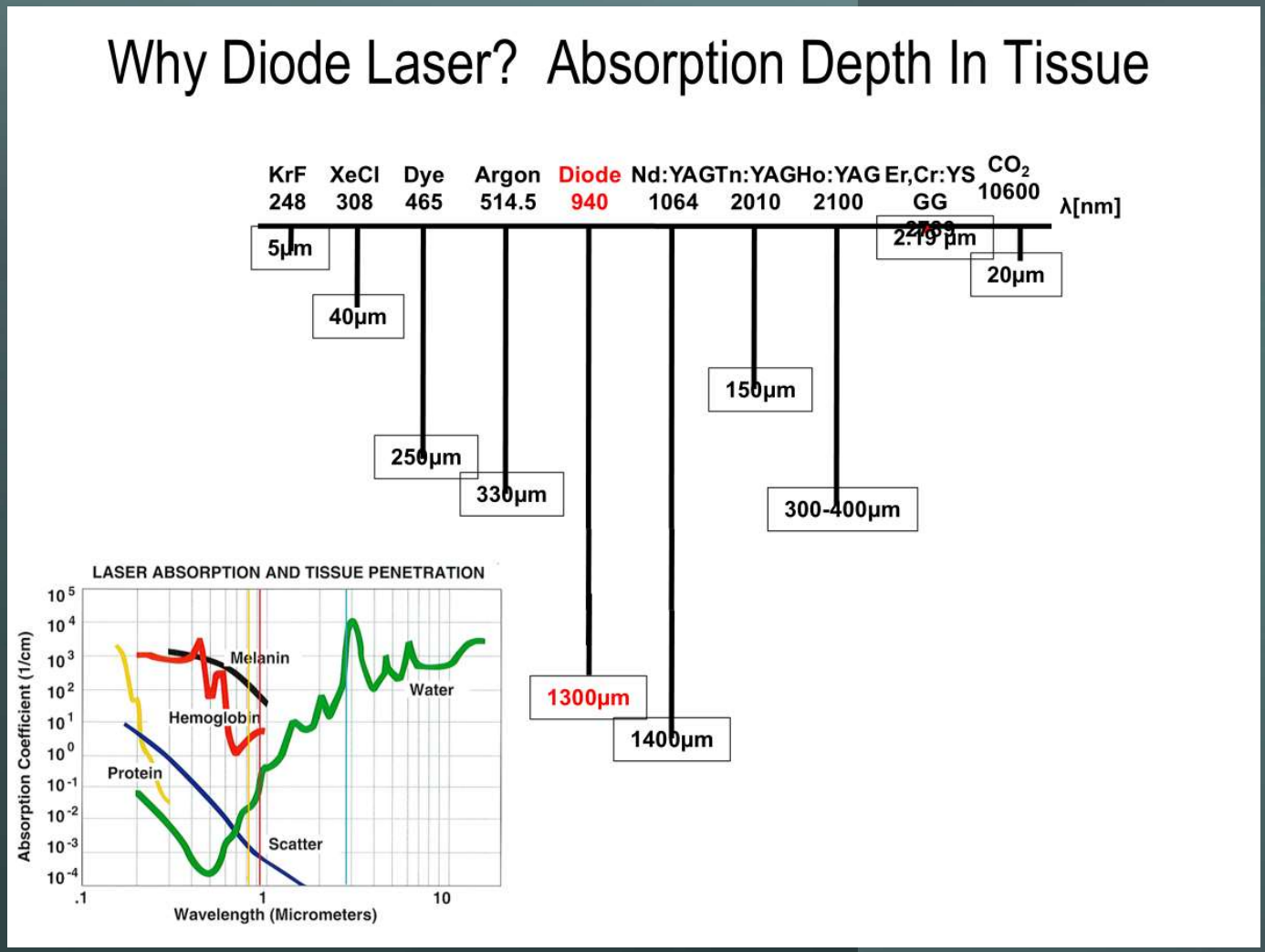


Class 3B Lasers versus Class 4 Lasers

≤ .5 Watts ≥ .5 Watts

450-800nm 800-1064nm

Class III lasers (output power of less than 0.5 Watts) versus Class IV lasers (output powers greater than 0.5 Watts An important differentiator between high and low-power lasers. Quick pain relief requires higher irradiance to illicit temporary neuroplastic changes at the neuron. These changes slow the conduction velocity and reduce the amplitude of compound action potentials of both C and A-delta sensory nerves for approximately 24 hours.[9,10] These higher irradiances are extremely difficult to achieve in vivo with lower power devices.



Treating Pain with Low vs High-Power Lasers: What is the Difference?
https://rehabpub.com/pain-management/technology/treating-pain-low-vs-high-power-lasers-difference/

PBM
How will this light affect the biological tissue?

- Reduce Pain
- Regenerate tissue
- Disinfect
- Wound healing

DIODE LASER
Thermal Effects at Various Temperatures

Tissue Temerature (Celcius)	Observered Effect
40-50	Photobiomodulation
60	Coagulation, Protien Denaturazation
70-90	Tissue Welding
100-150	Vaporization
200	Carbonization

Chart Courtesy of Dr Ron Kaminer

Average Output

1 Watt, Continuous Mode = 1 Watt Average Output

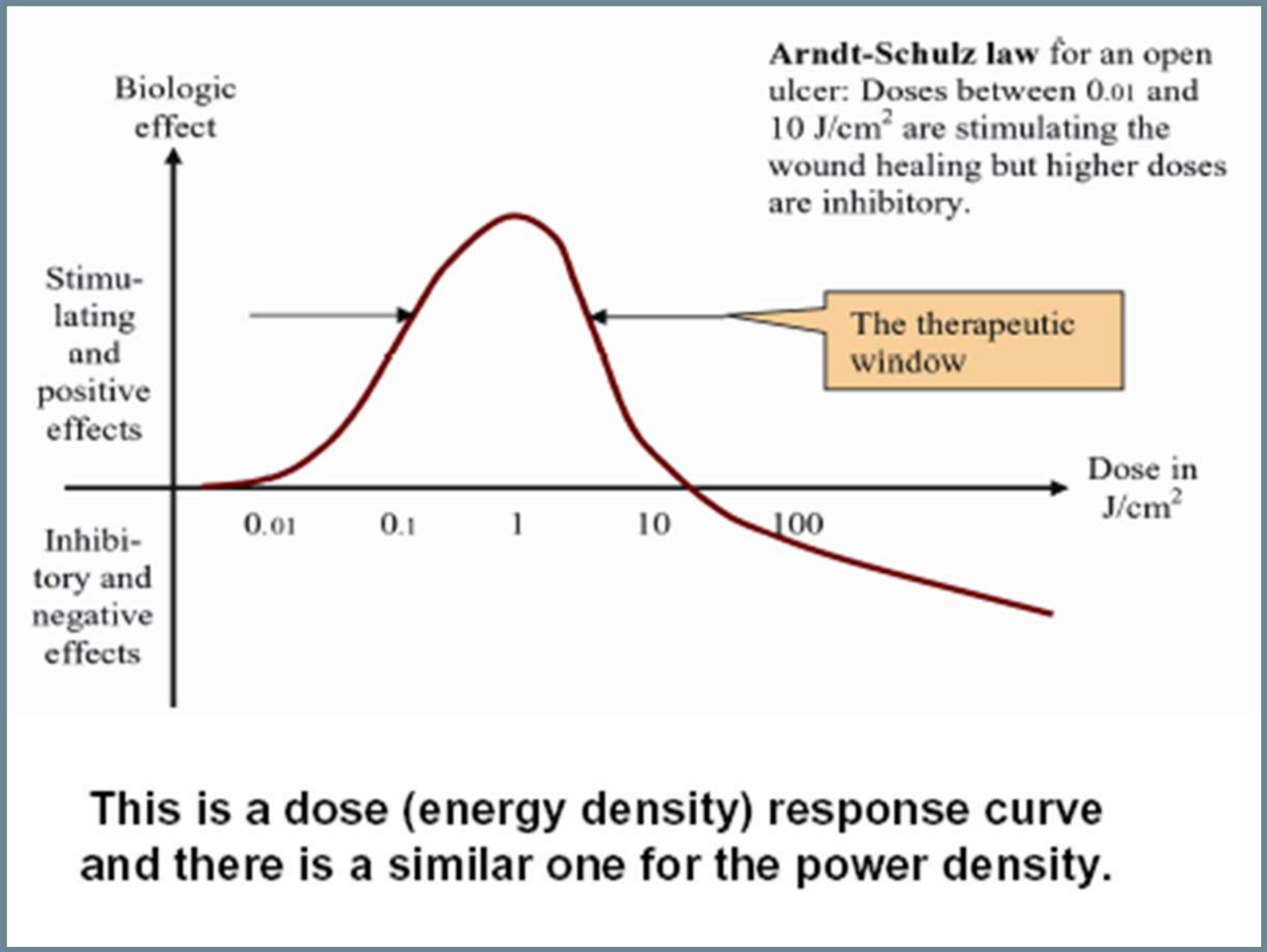
2 Watts, 50% Pulsed Mode = 1 Watt Average Output

10 Watts, 10% Pulsed Mode = 1 Watt Average Output

Dosage

Wattage X time = Jcm^2

(Average Output) (How long you deliver) (Dose)

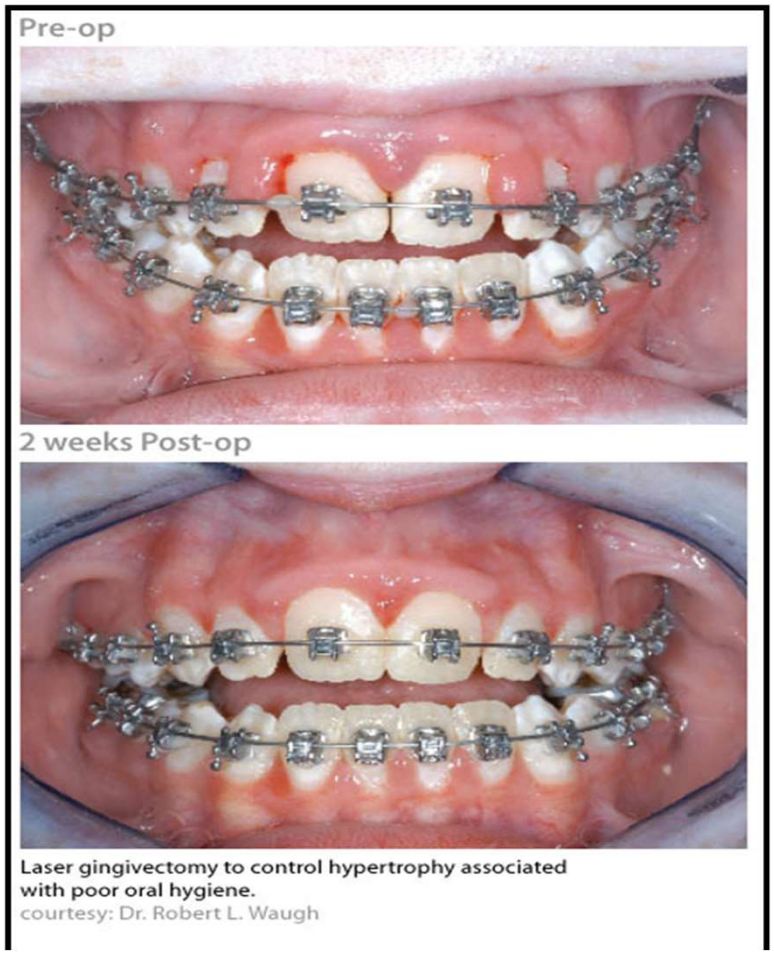


This is a dose (energy density) response curve and there is a similar one for the power density.

Orthodontics

With your diode laser

Diode Laser Surgical Orthodontic Procedures



Laser gingivectomy to control hypertrophy associated with poor oral hygiene.
courtesy: Dr. Robert L. Waugh

Can we enhance movement?

Clinical Research:

low-level laser therapy in accelerating Orthodontic Tooth Movement

Zheng J, Yang K. Clinical research: low-level laser therapy in accelerating orthodontic tooth movement. BMC Oral Health. 2021 Jun 28;21(1):324. doi: 10.1186/s12903-021-01684-z. PMID: 34182967; PMCID: PMC8237464.

Materials and Methods

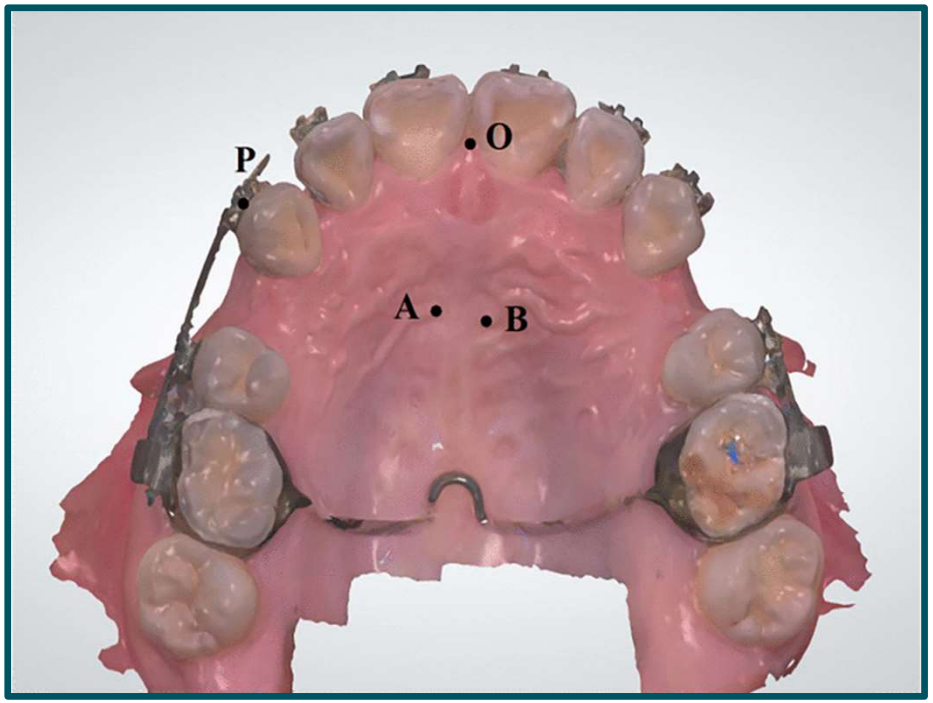
This split-mouth design study included 12 patients scheduled for the extraction of both upper first premolars. Patients were randomly selected for experimental group that received left- or right-side radiation with a diode laser (810 nm wavelength, 100 mW power output, 6.29 J/cm2 energy density). Laser treatment was applied on days 0, 7, 14, and 21, after loading the canine retraction forces. GCF concentrations of IL-1β, RANKL, and OPG were analyzed. The upper arch of each patient was scanned with an intraoral scanner to assess tooth movement.

- 810 nm diode laser
- .1 W *average output* power setting
- 60 seconds per square centimeter
- Delivers 6 J/cm2
- Day 0, 7, 14, 21

Gingival crevicular fluid concentrations of IL-1β, RANKL, and OPG

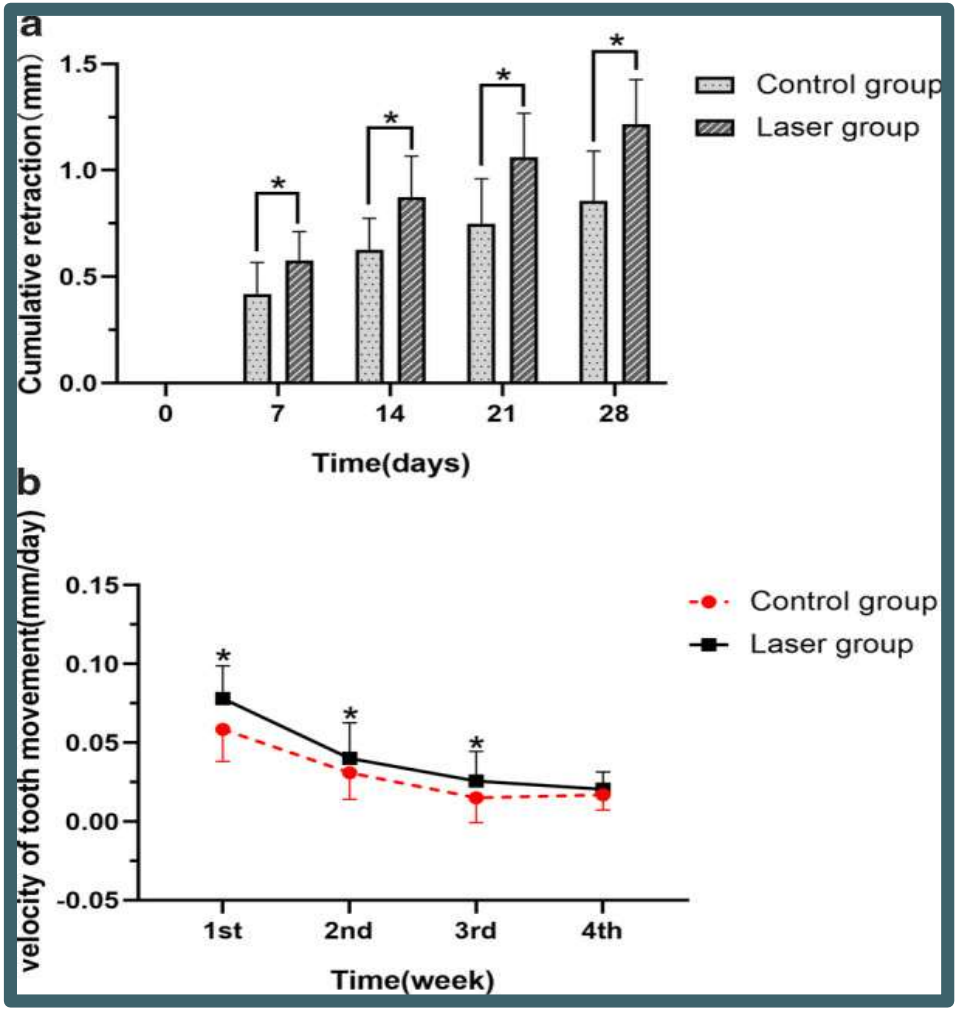
Interleukin-1 beta, Receptor Activator of Nuclear Factor-κB Ligand, Osteoprotegerin

KEY PLAYERS IN THE REGULATION OF BONE REMODELING



Cumulative tooth movement

Figure 2a displays the Cumulative distance achieved in both groups during the experimental period. At the end of 4 weeks of retraction, the canines were retracted 1.15 ± 0.29 mm on the laser side and 0.85 ± 0.23 mm on the control side. At all time points. the laser group showed significantly larger distalization than the control group. The mean retraction velocity was significantly greater in the laser group than in the control group (Fig. 2b), until the 4th week



Findings

In the conditions of this present randomized controlled trial, we concluded that LLLT could have clinical utility in accelerating OTM, due to its biostimulatory effects, which elicited an enhanced biological response in the periodontium adjacent to the tooth. More studies are needed to investigate different irradiation parameters, longer experimental periods, and more frequent time points to explain the mechanisms underlying the biostimulation effects, to find optimal laser settings, and to reveal possible side effects.

Meta-Analysis

Clinical research #2:

Effectiveness of photobiomodulation with low-level lasers on the acceleration of orthodontic tooth movement: a systematic review and meta-analysis of split-mouth randomized clinical trials

Grajales M, Ríos-Osorio N, Jimenez-Peña O, Mendez-Sanchez J, Sanchez-Fajardo K, García-Perdomo HA. Effectiveness of photobiomodulation with low-level lasers on the acceleration of orthodontic tooth movement: a systematic review and meta-analysis of split-mouth randomized clinical trials. Lasers Med Sci. 2023 Sep 4;38(1):200. doi: 10.1007/s10103-023-03870-7. PMID: 37667064.

Findings

Findings of this systematic review and meta-analysis point to a tendency for faster orthodontic dental movement in the groups receiving LLLT treatment during the first (OR of 0.28 95% CI (0.07 to 0.48)), second (OR of 0.52 95% CI (0.31 to 0.73)), and third (OR of 0.41 95% CI (0.03 to 0.79)) month follow-up.

Can We Reduce Orthodontic Pain and Inflammation?

Clinical Research:

Low-level laser-aided orthodontic treatment of periodontally compromised patients: a randomised controlled trial

Ren C, McGrath C, Gu M, Jin L, Zhang C, Sum FHKMH, Wong KWF, Chau ACM, Yang Y. Low-level laser-aided orthodontic treatment of periodontally compromised patients: a randomised controlled trial. Lasers Med Sci. 2020 Apr;35(3):729-739. doi: 10.1007/s10103-019-02923-0. Epub 2019 Dec 12. PMID: 31833004.

Materials and Methods

The aim of this article is to investigate the analgesic and inflammation-modulatory effects of low-level laser irradiation among orthodontic patients with compromised periodontium.

- Split mouth design
- 940 nm diode laser
- 2.8 cm^2 spot size
- .1 W *average output* power setting
- 60 seconds per half mouth
- Delivers 8.6 J/cm^2
- Every week first six weeks
- 1 x month thereafter

Findings

A smaller increase was observed in the plaque index scores on the laser side at 1-month (mean difference = 0.19, 95% CI: 0.13-0.24, $P < 0.05$) and in the gingival index scores at the 3-month follow-up visit (mean difference = 0.18, 95% CI: 0.14-0.21, $P < 0.05$). Laser irradiation inhibited the elevation of interleukin-1β, prostaglandin E_2 and substance P levels during the first month ($P < 0.05$). However, no intergroup difference was detected in the bacteria levels. Low-level laser irradiation exhibits benefits in pain relief and inflammation control during the early stage of adjunctive orthodontic treatment in periodontally compromised individuals.

Oral Surgery

With your diode laser

Can We Lessen Extraction Pain?

Clinical Research:

The Effects of Transcutaneous and Intraoral Low-Level Laser Therapy After Extraction of Lower Third Molars:
A Randomized Single Blind, Placebo Controlled Dual-Center Study

Kahraman SA, Cetiner S, Strauss RA. The Effects of Transcutaneous and Intraoral Low-Level Laser Therapy After Extraction of Lower Third Molars: A Randomized Single Blind, Placebo Controlled Dual-Center Study. Photomed Laser Surg. 2017 Aug;35(8):401-407. doi: 10.1089/pho.2016.4252. Epub 2017 Mar 14. PMID: 28294694.k

Purpose

This randomized, placebo controlled, single-blind, split-mouth design study was conducted on 60 patients with full bony impacted similar position mandibular third molars bilaterally. The patients were divided into two groups of 30 each: transcutaneous LLLT and intraoral LLLT and the other side of each group treated with nonactive laser (60 teeth)
The laser treatment consisted of administering laser energy immediately before and after the extraction procedure with gallium aluminum arsenide (GaAlAs) 830 nm diode lasers. Postoperative pain and healing of the sockets were compared in transcutaneous and intraoral group with placebo for 1 week following the extraction. Descriptive and bivariate statistics was computed, and the p-value was set at 0.05.

Materials & Methods

- 810-830 nm diode laser
- 400 micron fiber
- Immediately before and after extraction
- .5 W *average output* power setting
- 15 seconds per square centimeter
- Delivers 7.5 J/cm2
- Immediately before and after extraction

Findings

Compared 1 week post op

Results: Intraoral LLLT application resulted in a statistically significant reduction of postoperative pain in comparison with transcutaneous laser group and placebo. The unhealed socket numbers were compared in two groups at seventh day and no differences were observed.

Conclusions: The results of this study suggest that single-session intraoral LLLT is more effective than extraoral application for reducing postoperative pain. It was postulated that the differences between skin and mucosa could have effect on the results. Although intraoral use would allow closer application to the surgical site, the size of some laser devices precludes their use intraorally.

Can We Lessen Extraction Pain?

Clinical Research #2:

Is Low-Level Laser Therapy Effective for Pain Control After the Surgical Removal of Unerupted Third Molars? A Randomized Trial

Santos PL, Marotto AP, Zatta da Silva T, Bottura MP, Valencise M, Marques DO, Queiroz TP. Is Low-Level Laser Therapy Effective for Pain Control After the Surgical Removal of Unerupted Third Molars? A Randomized Trial. J Oral Maxillofac Surg. 2020 Feb;78(2):184-189. doi: 10.1016/j.joms.2019.08.029. Epub 2019 Sep 14. PMID: 31604060.

Purpose

One of the main challenges after extraction of unerupted third molars is pain control, and one of the treatments for pain control is low-level laser therapy (LLLT). Thus, this study aimed to assess the effectiveness of LLLT for pain control after extraction of lower third molars.

Materials & Methods

This randomized, double-blind, split-mouth study included patients who required bilateral extraction of unerupted lower third molars. Patients received LLLT on 1 side (laser group) but not on the opposite side (control group). On the experimental side, each patient received a laser application at 5 intraoral points for 30 seconds per point. This procedure was simulated on the control side. The pain control response was assessed with a modified pain visual analog scale at the following times: immediately after surgery (T0), after laser application (T1), 24 hours after surgery (T2), 48 hours after surgery (T3), and 72 hours after surgery (T4)

- .2 W *average output* power setting
- 5 INTRAORAL points per extraction
- 30 seconds per square centimeter
- Delivers 6 J/cm2
- Immediately after extraction
- 24 hours Post Op
- 48 hours Post Op
- 72 hours Post Op

Findings

Results: Thirty-two patients, 56.25% of whom were women, underwent extraction; the average age was 22.2 years. At the times analyzed, the laser group presented better results than the control group.

Conclusion: LLLT was effective in reducing pain after surgical removal of unerupted third molars.

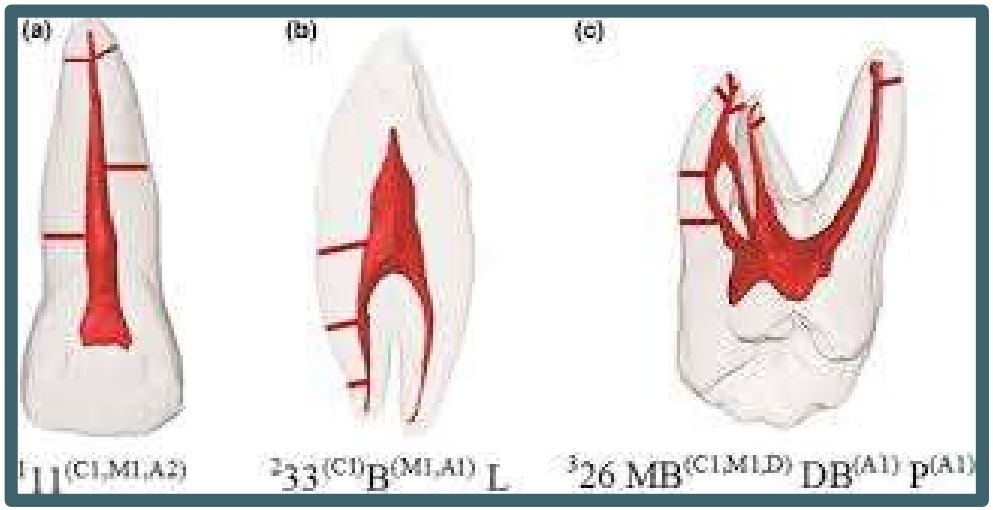
Endodontics

With your diode laser

Can We Improve Endodontic Outcomes?

Clinical Research:

An In Vitro Study Comparing the Antimicrobial Efficacy of 0.2% Chitosan, 3% Sodium Hypochlorite, 2% Chlorhexidine against Enterococcus faecalis, Alone and in Conjunction with Diode Laser



Goel P, Galhotra V, Makkar S, Mohan J, Bala N, Kaur T. An In Vitro Study Comparing the Antimicrobial Efficacy of 0.2% Chitosan, 3% Sodium Hypochlorite, 2% Chlorhexidine against Enterococcus faecalis, Alone and in Conjunction with Diode Laser. Int J Clin Pediatr Dent. 2022 Jan-Feb;15(1):109-114. doi: 10.5005/jp-journals-10005-2351. PMID: 35528502; PMCID: PMC9016914.

Purpose

the purpose of this study was to evaluate the antimicrobial efficacy of three different irrigating solutions alone and in concert with diode laser, which has the potential to be used as a supplement to mechanical debridement. Since E. faecalis is one of the intracanal bacteria which are most resistant to the actions of irrigating solutions, it was chosen.

NaOCl 3% Chlorhexidine 2% Chitosan 2%

Technically PDT
“Photo Dynamic Therapy”

Findings

RESULTS

The results of this study show that the samples disinfected with a diode laser after root canal irrigation with chemical solutions showed a smaller number of Colony Forming Units CFU/mL as compared to the samples irrigated with root canal solutions alone or diode laser alone.

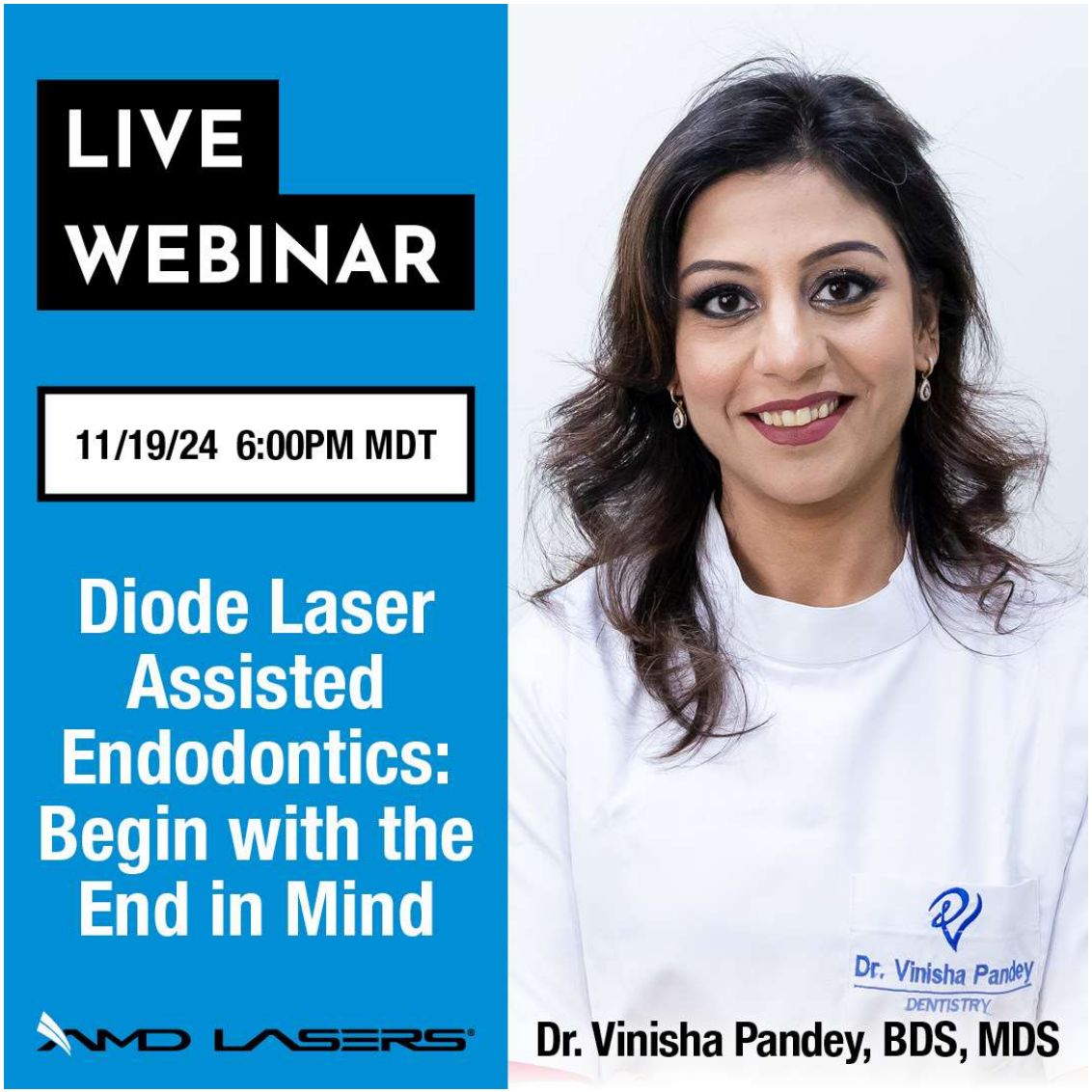
CONCLUSIONS

From the results of this study, we can infer the following among the irrigants tested: 2% chlorhexidine and 0.2% chitosan have best results with least number of bacterial colonies of E. faecalis and should be the preferred irrigants. Diode laser increases the effectiveness of these irrigates against E. faecalis. It should be used in conjunction with the irrigate so as to obtain maximum antibacterial effect against E. faecalis.

Can We Improve Endodontic Outcomes?

FREE On Demand:

https://amdlasers.podia.com/diode-laser-assisted-endodontics-begin-with-the-end-in-mind

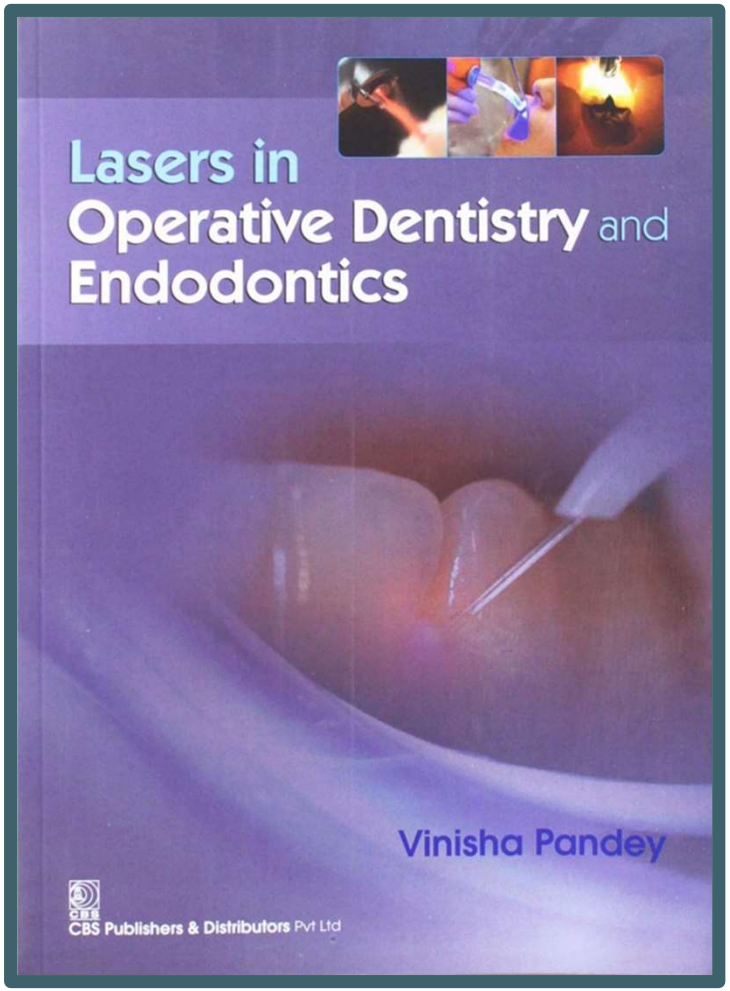


Can We Improve Endodontic Outcomes?

Clinical Research:

Lasers in Operative Dentistry and Endodontics

5.0 out of 5 stars



Materials & Methods Post Instrumentation

The reason for using the laser in the wet canal was to warm the irrigating solution to enhance its disinfecting effect, further laser induces cavitation, which enhance the elimination of the smear layer.

1. Irrigate first 4% NaOCl
2. 810 nm diode laser
3. 1 to 2.5 W *average output* power setting
4. 200–300-micron fiber measured to canal length
5. Moving 2 mm per second
6. Irrigate with distilled water
7. Repeat from step 2, 4 times raising .5 W each pass

Findings

- E. faecalis (Gram+ anerobic) can survive after irrigation
- E. faecalis in 33% of failures
- Instrumentation leaves 35% of canal surface unchanged
- Over-instrumentation weakens and can promote fractures
- Chemotherapeutics are the only way to access “dead zones”
- Laser irradiation increases effectiveness of irrigates
- Laser irradiation increases access to “dead zones”

Pain Therapy

With your diode laser

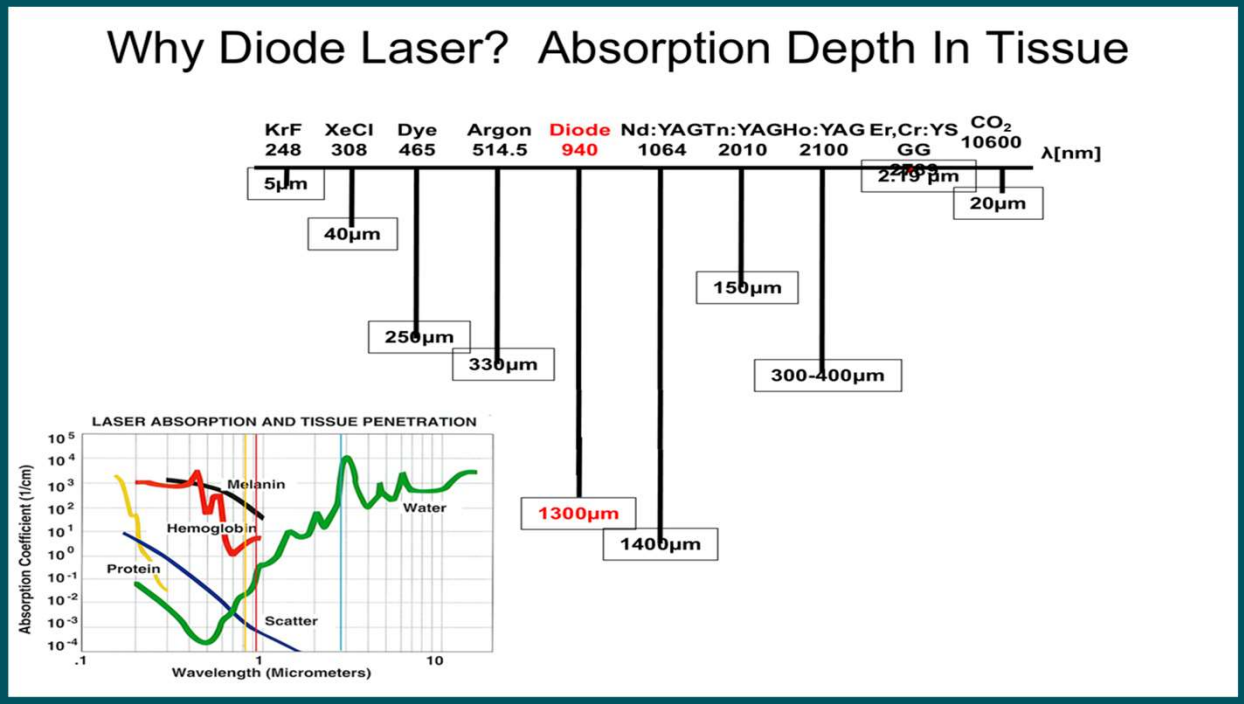
Can We Treat Dental Pain?

- Dentinal Hypersensitivity?
- Painful Lesions?
- Denture Sores?
- Cheek bites
- TMJ Dysfunction?

Remember

Class III lasers (output power of less than 0.5 Watts) versus Class IV lasers (output powers greater than 0.5 Watts

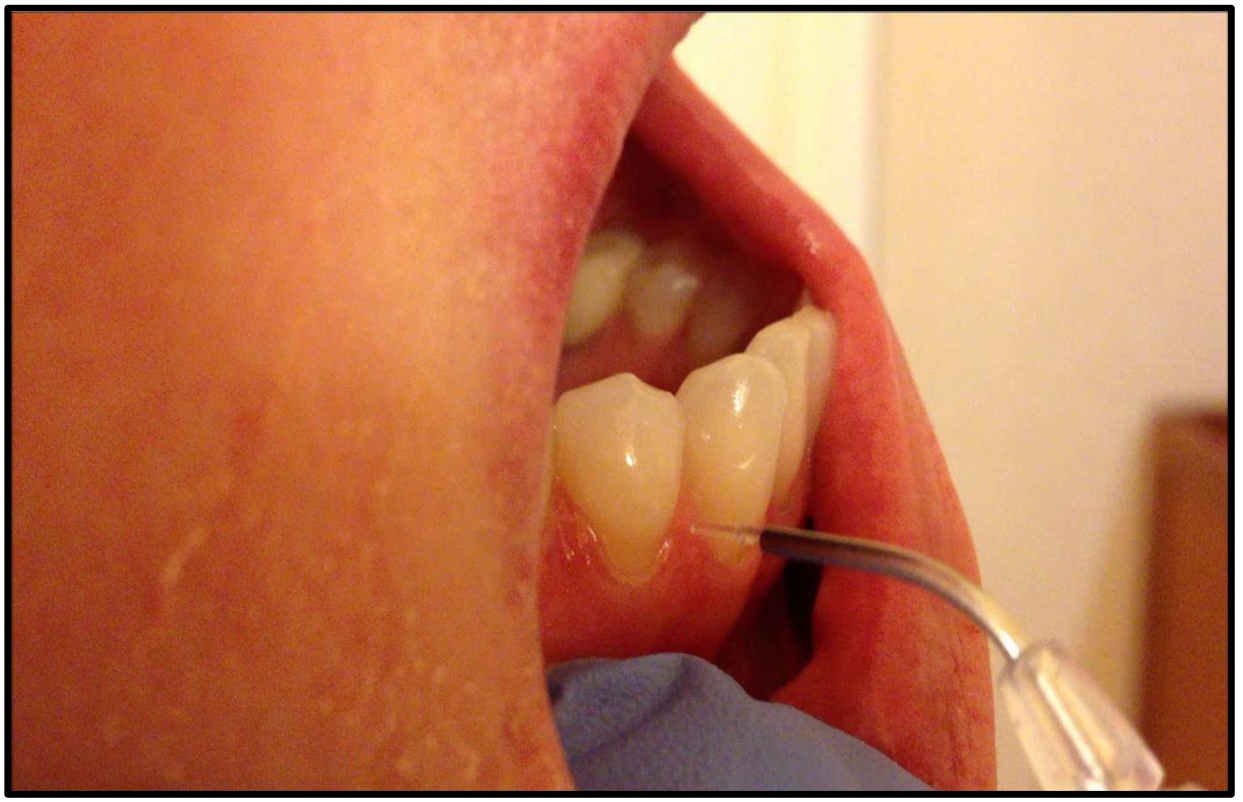
An important differentiator between high and low-power lasers. Quick pain relief requires higher irradiance to illicit temporary neuroplastic changes at the neuron. These changes slow the conduction velocity and reduce the amplitude of compound action potentials of both C and A-delta sensory nerves for approximately 24 hours.[9,10] These higher irradiances are extremely difficult to achieve in vivo with lower power devices.



Can We Treat Dentinal Hypersensitivity?

Clinical Research:

Evaluation of diode laser and stannous fluoride in the treatment of root sensitivity after access flap surgery: Randomized controlled clinical trial



Raut CP, Sethi KS, Kohale B, Mamajiwala A, Warang A. Evaluation of diode laser and stannous fluoride in the treatment of root sensitivity after access flap surgery: Randomized controlled clinical trial. J Indian Soc Periodontol. 2018 Mar-Apr;22(2):158-163. doi: 10.4103/jisp.jisp_2_18. PMID: 29769771; PMCID: PMC5939024.

Materials & Methods

Thirty patients participated in this study and 99 teeth were included. Root sensitivity was assessed for all groups with a Verbal Rating Scale (VRS). For each patient, the teeth were randomized into three groups. In the test Group I, sensitive teeth were treated with SnF2 and diode laser. In the test Group II, sensitive teeth were irradiated with laser only. In the control group, no treatment was performed.

- Power Setting - 1 Watt AVERAGE OUTPUT
- Non Touch Procedure
- 2-5mm from the root surface, moving the fiber in a consistent overlapping pattern, covering the entire effected area
- Repeat for another 20-30 seconds
- Check in with patient for comfort and results
- Raise Wattage .2 W each pass if needed
- Repeat for another 30 seconds if necessary

Findings

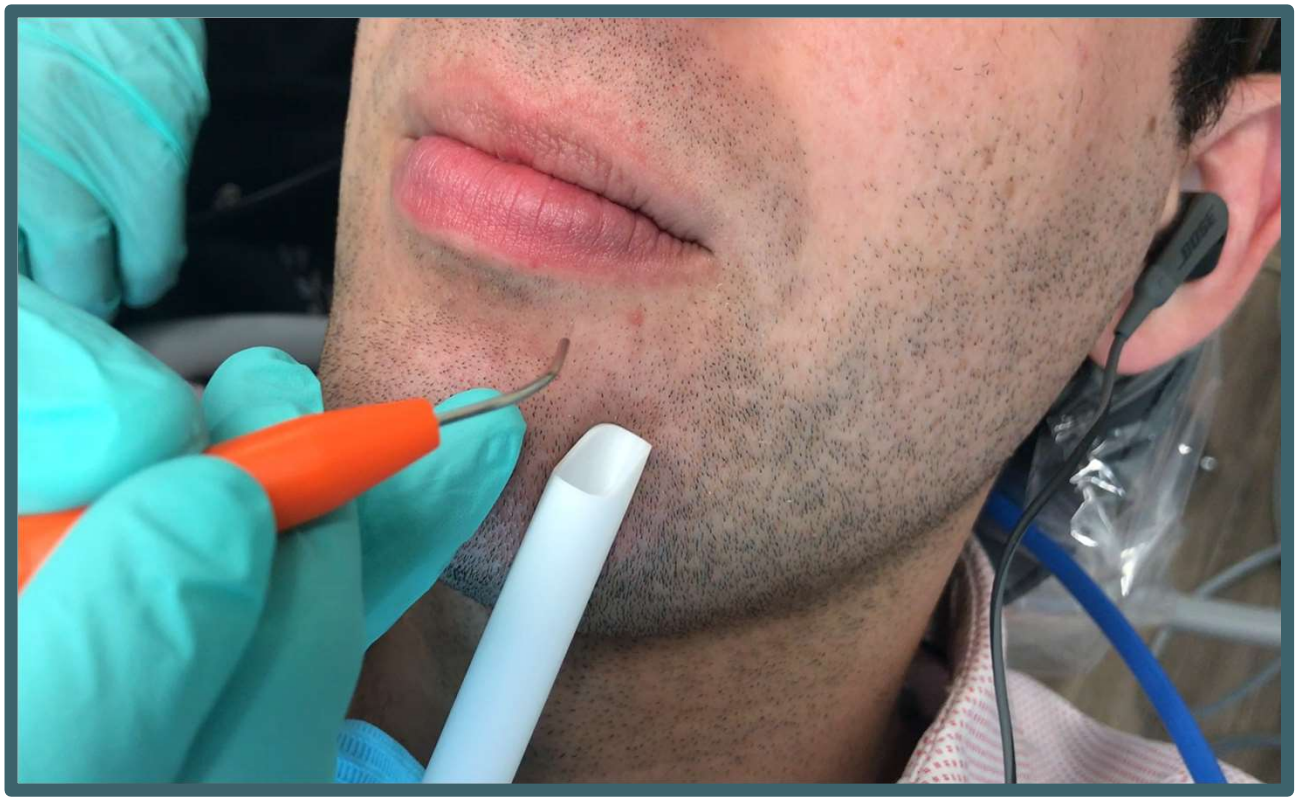
Results: The mean ± standard deviation (SD) score for VRS and Visual Analog Scale at baseline was not statistically significant ($P > 0.05$) between the three groups. After 15 min, statistical significant difference was seen in test Group I and test Group II, although no difference was found in the control group. At 15th day and 30th day, the mean ± SD scores were statistically significant ($P < 0.05$).

Conclusion: Within the limitations of the study, it can be concluded that diode lasers alone and in combination with 0.4% SnF2 was effective in the treatment of root sensitivity after access flap surgery.

Can We Treat Painful Lesions?

Clinical Research:

Treatment of recurrent minor aphthous stomatitis using diode laser (940 nm)



Ghali HGH, Abdulhamed BS. Treatment of recurrent minor aphthous stomatitis using diode laser (940 nm). J Popul Ther Clin Pharmacol. 2022 Jan 21;28(2):e99-e112. doi: 10.47750/jptcp.2022.864. PMID: 35213109.

Materials & Methods

Thirty patients participated in this study and 99 teeth were included. Root sensitivity was assessed for all groups with a Verbal Rating Scale (VRS). For each patient, the teeth were randomized into three groups. In the test Group I, sensitive teeth were treated with SnF2 and diode laser. In the test Group II, sensitive teeth were irradiated with laser only. In the control group, no treatment was performed.

- Power Setting - 1 Watt AVERAGE OUTPUT
- Non Touch Procedure
- 2-5mm from the root surface, moving the fiber in a consistent overlapping pattern, covering the entire effected area
- Repeat for another 20-30 seconds
- Check in with patient for comfort and results
- Raise Wattage .2 W each pass if needed
- Repeat for another 30 seconds if necessary

Findings

Results: In this randomized, controlled, clinical study, LLLT using Diode LASER causes reduction in pain intensity due to RAUs, thereby reducing morbidity. There is also reduction in the diameter and healing time of the ulcer as compared to Anginovag spray medication and the control group.

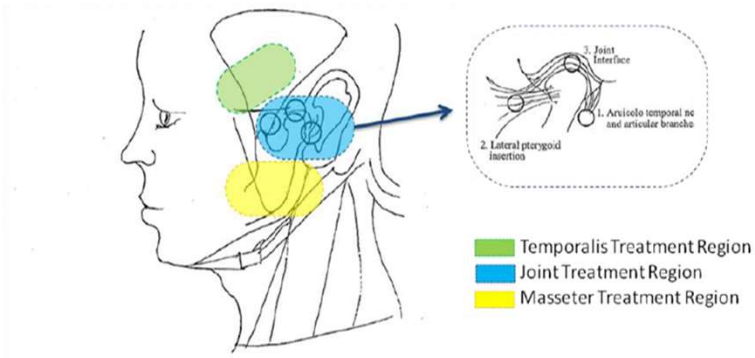
Conclusion: Although various treatment modalities have been used and LLLT is not commonly used to treat aphthous ulcers, this study suggests that using LLLT would be a safe and effective treatment modality for RAUs patients.

Can We Treat TMD Pain?

Clinical Research:

The Effect of Photobiomodulation on Temporomandibular Pain and Functions in Patients With Temporomandibular Disorders: An Updated Systematic Review of the Current Randomized Controlled Trials

Procedure:



- **Treatment of Painful Region**s: For the treatment of TMJ dysfunction, there are 3 regions where treatment has to be conducted:
  - Temporalis Region
  - Joint Region
  - Masseter Region

Farshidfar N, Farzinnia G, Samiraninezhad N, Assar S, Firoozi P, Rezazadeh F, Hakimiha N. The Effect of Photobiomodulation on Temporomandibular Pain and Functions in Patients With Temporomandibular Disorders: An Updated Systematic Review of the Current Randomized Controlled Trials. J Lasers Med Sci. 2023 Aug 5;14:e24. doi: 10.34172/jlms.2023.24. PMID: 37744015; PMCID: PMC10517581.

Materials & Methods

- A systematic literature search was conducted in Web of Science, PubMed/Medline, and Scopus databases using appropriate keywords and specific strategies from January 2000 to September 2022.

- 40 studies were evaluated

- 27 studies showed a reduction in pain intensity in PBMT groups
- 7 showed a greater MMO in PBMT groups than in placebo groups
- Passive maximum mouth opening (PMMO) and active maximum mouth opening (AMMO) in all the studies were higher in PBMT groups.
- 8 out of 10 studies, lateral movement (LM) was greater in PBMT groups.
- 3 out of 4, protrusive movement (PM) was greater in the PBMT group.
- Reduced TMJ sounds in the PBMT group in two out of five studies.

General Materials & Methods

Treatment Schedule:

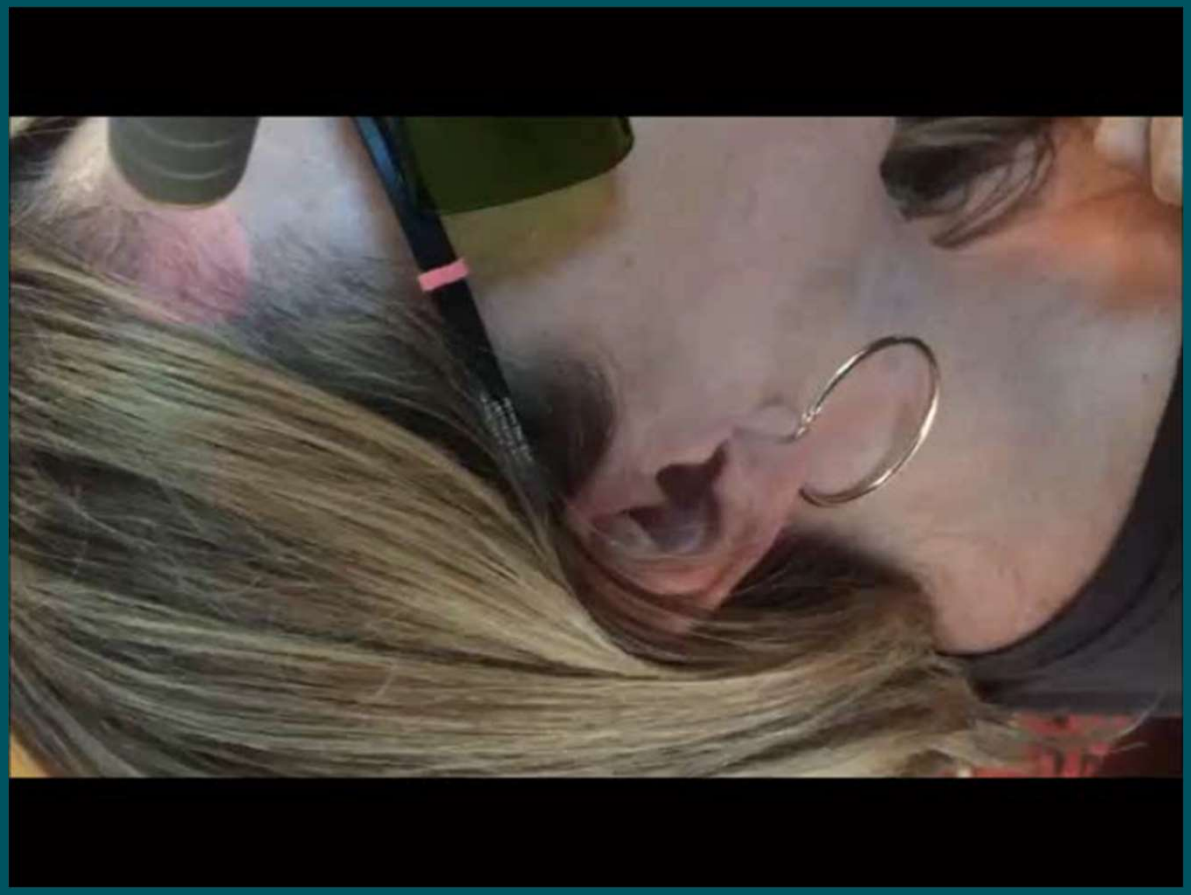
	SUN	MON	TUES	WED	THU	FRI	SAT
WEEK 1		Treatment 1			Treatment 2		
WEEK 2		Treatment 3			Treatment 4		
WEEK 3		Treatment 5			Treatment 6		

- 5 – 6 treatments every 2-4 days. In cases where the pain is resolved within the first 2-3 treatment sessions additional treatments are not necessary

Higher Wattage = Deeper Penetration

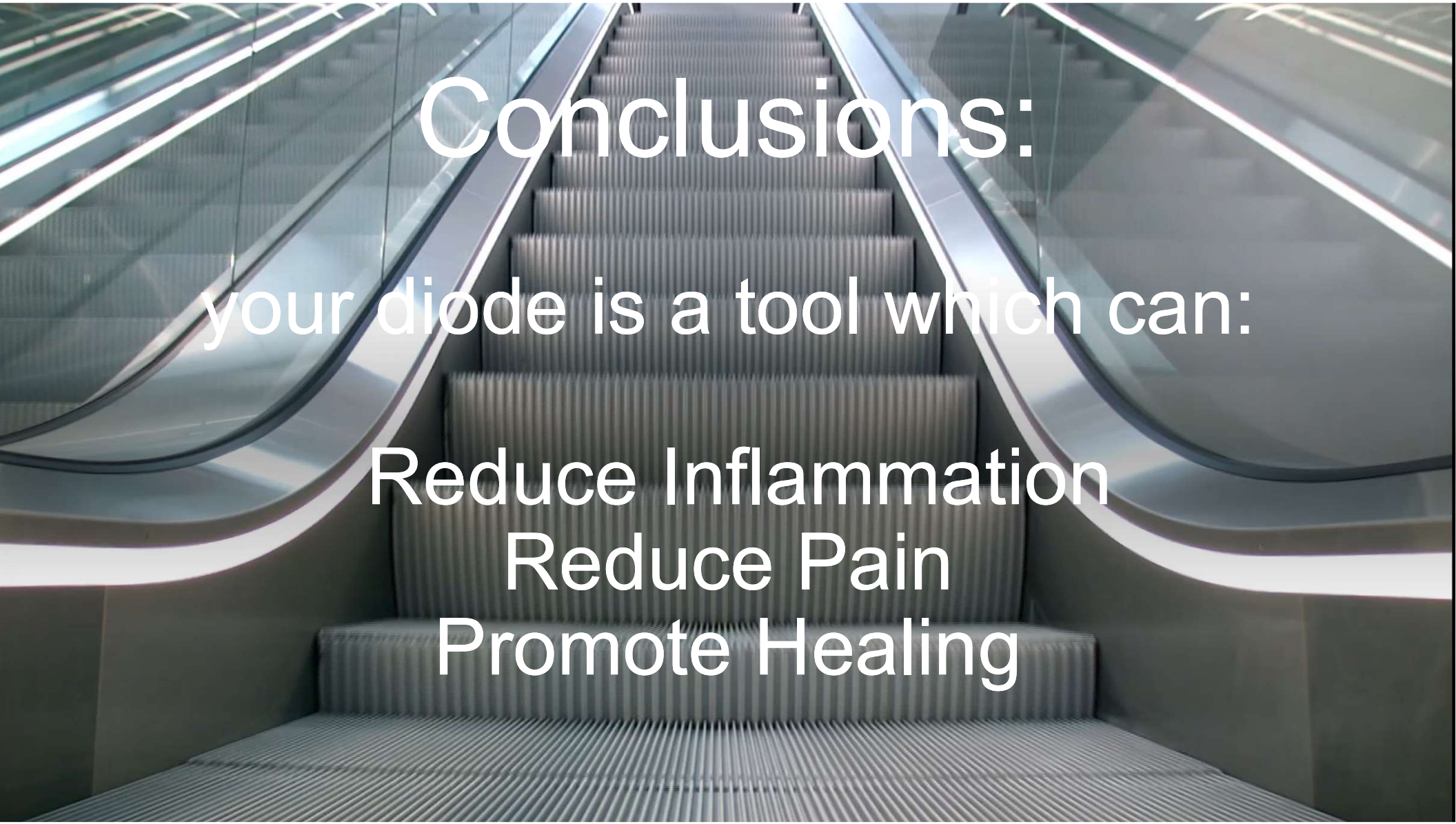

10 Watts Minimum &
Larger spot size needed

General Materials & Methods



Findings

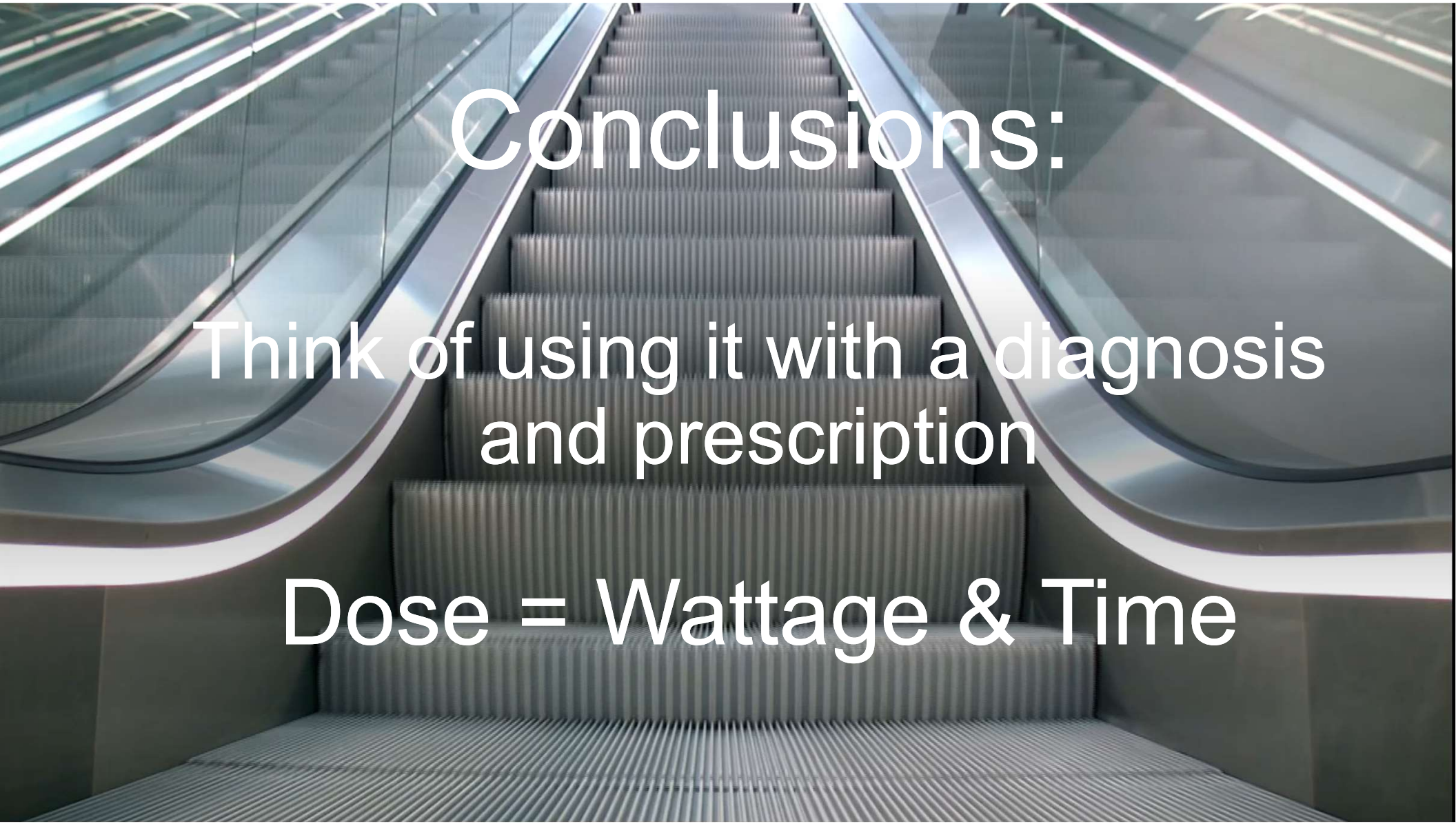
This updated systematic review showed the promising effects of PBMT on the alleviation of pain and improvement in MMO. Using diode laser with a wavelength ranging between 780-980 nm, an energy density of<100 J/ cm^2, and an output power of≤500 mW for at least six sessions of treatment seems to be a promising option for treating mentioned TMDs signs and symptoms based on the previously reported findings..



Conclusions:

your diode is a tool which can:

Reduce Inflammation
Reduce Pain
Promote Healing


Conclusions:
Think of using it with a diagnosis and prescription
Dose = Wattage & Time

Heidi@dentalteamce.com

Scientific Resources

The Science: What is Photobiomodulation? https://pro.vielight.com/the-science/

Clinical research: low-level laser therapy in accelerating orthodontic tooth movement. BMC Oral Health. 2021 Jun https://pubmed.ncbi.nlm.nih.gov/34182967/

Treating Pain with Low vs High-Power Lasers: What is the Difference? https://rehabpub.com/pain-management/technology/treating-pain-low-vs-high-power-lasers-difference/

OTM Systemic. Effectiveness of Photobiomodulation with low-level lasers on the acceleration of orthodontic tooth movement: https://pubmed.ncbi.nlm.nih.gov/37667064/

An In Vitro Study Comparing the Antimicrobial Efficacy / Alone and in Conjunction with Diode Laser https://pmc.ncbi.nlm.nih.gov/articles/PMC9016914/

The Effects of Transcutaneous and Intraoral Low-Level Laser Therapy After Extraction of Lower Third Molars: https://pubmed.ncbi.nlm.nih.gov/28294694/

Is Low-Level Laser Therapy Effective for Pain Control After the Surgical Removal of Unerupted Third Molars? A Randomized Trial https://pubmed.ncbi.nlm.nih.gov/31604060/

Low-level laser-aided orthodontic treatment of periodontally compromised patients: a randomized controlled trial https://pubmed.ncbi.nlm.nih.gov/31833004/

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