The Lumoral method in scientific journals, thesis programs, and other test programs

This research summary is updated on average every two weeks. The information in this document can change significantly in a short time.

MK / updated 05 Aug 2025

Published Lumoral-related studies and their main findings				
Study title	**Link to the study article**	**Type of study**	**Main results (In clinical studies Lumoral group results compared to the Control group results)**	**Symbols**
Dual-light photodynamic therapy administered daily provides a sustained antibacterial effect on biofilm and prevents Streptococcus mutans adaptation	Nikinmaa et al. 2020	In vitro	↓↓↓ Streptococcus Mutans ↓ Bacterial adaptation	↓↓↓ significant decrease ↓↓ moderate decrease ↓ decrease → no effect ↑↑↑ significant improvement ↑↑ moderate improvement ↑ improvement
Dual-Light Photodynamic Therapy Effectively Eliminates Streptococcus Oralis Biofilms	Hentilä, J. et al. 2021	In vitro	↓↓↓ Streptococcus Oralis	
Daily Administered Dual-Light Photodynamic Therapy Provides a Sustained Antibacterial Effect on Staphylococcus aureus	Nikinmaa et al. 2021	In vitro	↓↓↓ Stafylococcus Aureus	
Indocyanine Green-Assisted and LED-Light-Activated Antibacterial Photodynamic Therapy Reduces Dental Plaque	Nikinmaa et al. 2021	Randomized, split-mouth, clinical study (n=15)	↓↓↓ Amount of early dental plaque formation ↓↓↓ MMP8 concentration → (no effect) Bacterial diversity ↓↓↓ Streptococcal species ↓↓↓ Actinomyces species ↓ Capnocytophaga species ↓↓↓ Rothia species	
Repeated Home-Applied Dual-Light Antibacterial Photodynamic Therapy Can Reduce Plaque Burden, Inflammation, and aMMP-8 in Peri-Implant Disease—A Pilot Study	Lähteenmäki et al. 2022	First in-human (n=7)	↑ Oral hygiene ↓↓ Bleeding on probing (BOP) ↓↓ Amount of dental plaque (VPI) ↓↓ aMMP8 levels ↓ Periodontal pocket depth (PPD)	
Repeated Daily Use of Dual-Light Antibacterial Photodynamic Therapy in Periodontal Disease—A Case Report	Trujillo et al. 2022	Case study	↓↓↓ Amount of dental plaque (VPI) ↓↓↓ Bleeding on probing (BOP) ↓ Number of infected deep periodontal pockets	
Home-Applied Dual-Light Photodynamic Therapy in the Treatment of Stable Chronic Periodontitis (HOPE-CP)—Three-Month Interim Results	Pakarinen et al. 2022 (3-month interim results)	Randomized, controlled clinical study (n=59)	↑↑↑ Oral hygiene ↓ Amount of dental plaque (VPI) ↓↓↓ Number of deep periodontal pockets ↓↓↓ Inflamed deep periodontal pockets	
Peri-Implant Diseases: Enhanced Antibacterial Photodynamic Therapy	Lähteenmäki et al. 2025	Randomized, controlled clinical study (n=40)	↓↓↓ Bleeding on probing (BOP) ↓↓↓ aMMP-8 levels ↓ Amount of dental plaque (VPI) in both groups	
A Multicenter, Controlled, Randomized Trial of Home-Applied Dual-Light Photodynamic Therapy in Chronic Periodontitis	Tegelberg et al. 2025 (preprint available)	Randomized, controlled, multi-centre clinical study (n=41)	↓↓ Amount of dental plaque (VPI) ↓↓ Bleeding on probing (BOP) ↓↓↓ Number of deep periodontal pockets ↓↓ Amount of infected deep periodontal pockets	
Effects of Regular Antibacterial Photodynamic Therapy (aPDT) on Oral Hygiene in Assisted Living Residents	(In peer review, no URL available yet)	Randomized, controlled clinical study (n=31)	↓↓ Amount of dental plaque (VPI) ↓↓↓ Periodontal health measurement (CPI) ↓ Objectively and subjectively assessed symptoms of dry mouth	

Published Lumoral-related thesis and their main findings			
Title of Thesis	**Link to the article**	**Type of study**	**Main results (in clinical studies: Lumoral group results compared to the Control group results)**
Lumoral and mouth rinse with chlorhexidine in treatment against periodontitis - A comparison study of the evidence on these preventive products for home use	Latif & Safar 2023	Literature review	Home-use of adjunct antibacterial photodynamic treatment can provide clinical improvements in BOP (bleeding on probing) and PPD (periodontal pocket depth) compared to the traditional antibacterial products, such as chlorhexidine
Comfort of using the Lumoral device and feeling of oral cleanliness in healthy adults	Niva & Kulmala & Vakkuri 2024 (In Finnish with English abstract)	Qualitative research/device test (n=10)	- Lumoral was easy and simple to use - Study participants experienced a fresher and cleaner mouth during the testing
The benefits of the Lumoral Treatment device for oral self-care habits	Haukka & Kinnunen 2024 (In Finnish with English abstract)	Questionnaire (N=25)	- Improved oral hygiene, - Reduced symptoms of periodontal disease, - Reduced caries, - Reduced plaque and tartar
The effect of home-use antibacterial photodynamic treatment on clinical oral parameters of patients with grade II or higher periodontitis – Evaluating an innovative medical device	Sundberg 2024	Randomized clinical study (n=40)	- Decreased number of participants with more than 20 % BOP (bleeding on probing) - Improved pocket healing in the non-smoking population of the study group
Regular Home-Use of Dual-Light Photodynamic Therapy in Oral Plaque Control in Healthy Adults - A Randomized Cross-Over Study	Gusseva & Lill 2025	A crossover study (n=30) with healthy adults	Daily Lumoral use improves oral hygiene in healthy individuals when used as an adjunct to oral self-care.

List of in vitro and clinical studies and their main findings (click on any study to read more)

In vitro, split-mouth and first-in-human studies
In vitro 1: "Dual-light aPDT improves the bactericidal effect on Staphylococcus aureus biofilm"
In vitro 2: "A single wavelength-based aBL or aPDT leads to a significant biofilm adaptation and increased S. mutans viability"
In vitro 3: "Dual-light can be used as an effective disinfectant against Streptococcus oralis biofilm"
aPDT Split-mouth study: "aPDT reduced Streptococcus, Acinetobacteria, Capnocytophaga, and Rothia bacteria species in plaque"
Lumoral First in human: "Frequently repeated dual-light aPDT can be a promising approach to diminishing the microbial burden and to lowering the tissue destructive proteolytic and inflammatory load around dental implants"
Clinical studies
1: "The regular use of antibacterial dual-light Lumoral device improves the health status of the adjacent tissues of inflamed dental implants"
2: "Adjunct Lumoral® treatment significantly improves the results of non-surgical periodontal treatment in stable chronic periodontitis"
3: A Multicenter, Controlled, Randomized Trial of Home-Applied Dual-Light Photodynamic Therapy in Chronic Periodontitis
4: "dual light aPDT can improve oral health in selected 24-hour care residents as an adjunct to routine oral hygiene"
5: (/Thesis 1) "Lumoral significantly improves oral hygiene in healthy adults when used regularly twice a week."
Ongoing and planned clinical studies

List of thesis studies and their main findings (click on any study to read more)

Thesis
2: “Lumoral Clinic device has a potential opportunity to be part of the treatment at the clinics if it is targeted correctly”
3: “Lumoral for home use as aPDT adjunct provides clinical improvements in BOP and PPD compared to the traditional antibacterial products such as chlorhexidine”
4: “The study found Lumoral to be easy and simple to use, the mouth felt fresher and cleaner during the testing run, and Lumoral may have effects already after the first use”
5: “The data revealed improved oral hygiene, a reduction on symptoms of periodontal diseases and caries, and a decrease in plaque and tartar buildup”
6: “The result of this development work was a video guide which contained a user manual, basic information about the Lumoral® Treatment device, research results, answers to frequently asked questions, and customer feedback”
7: “The effect of home-use antibacterial photodynamic treatment on clinical oral parameters of patients with grade II or higher periodontitis – Evaluating an innovative medical device”
8: “Regular Home-Use of Dual-Light Photodynamic Therapy in Oral Plaque Control in Healthy Adults-A Randomized Cross-Over Study”
Ongoing or planned thesis programs

List of other scientific articles (click on article to read more)

Articles
1: “The article supports the feasibility and effectiveness of daily home-use dual-light PDT as an adjunct for managing severe periodontitis, especially in patients with limited manual dexterity. It emphasizes the potential for such devices to improve oral health in elderly or disabled populations”
2: “Based on the clinical testing, using the Lumoral method, better oral hygiene in patients was observed”
3: “The article highlights the role of Lumoral® as an adjunct treatment that may contribute to improved gum health and comfort before professional cleaning. It also supports continuous home care as a means to reduce periodontal symptoms”
4: “The significant reductions in PESA, PISA, Bleeding on Probing (BOP), and Plaque Index (API) observed in this study strongly suggest that the Lumoral treatment can be an effective adjunctive therapy in periodontal care”

In vitro / published (1): Nikinmaa, S.; Podonyi, A.; Raivio, P.; Meurman, J.; Sorsa, T.; Rantala, J.; Kankuri, E.; Tauriainen, T.; Pätilä, T. **Daily Administered Dual-Light Photodynamic Therapy Provides a Sustained Antibacterial Effect on Staphylococcus aureus.**
Antibiotics 2021, 10, 1240. https://doi.org/10.3390/antibiotics10101240

ABSTRACT

New means to reduce excessive antibiotic use are urgently needed. This study tested dual-light aPDT against *Staphylococcus aureus* biofilm with different relative ratios of light energy with indocyanine green.

We applied single-light aPDT (810 nm aPDT, 405 aBL) or dual-light aPDT (simultaneous 810 nm aPDT and 405 nm aBL), in both cases, together with the ICG photosensitizer with constant energy of 100 or 200 J/cm^2.

Single-dose light exposures were given after one-day, three-day, or six-day biofilm incubations. A repeated daily dose of identical light energy was applied during biofilm incubations for the three- and six-day biofilms.

Using 100 J/cm^2 light energy against the one-day biofilm, the dual-light aPDT consisting of more than half of aBL was the most effective. On a three-day maturated biofilm, single-dose exposure to aPDT or dual-light aPDT was more effective than aBL alone. With total light energy of 200 J/cm^2, all dual-light treatments were effective.

Dual-light aPDT improves the bactericidal effect on *Staphylococcus aureus* biofilm compared to aPDT or aBL and provides a sustained effect. An increase in the relative ratio of aBL strengthens the antibacterial effect, mainly when the treatment is repeatedly applied. Thus, the light components' energy ratio is essential with dual-light.

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In vitro / published (2): Nikinmaa S, Alapulli H, Auvinen P, Vaara M, Rantala J, Kankuri E, et al. (2020):
Dual-light photodynamic therapy administered daily provides a sustained antibacterial effect on biofilm and prevents Streptococcus mutans adaptation.
PLoS ONE 15(5): e0232775. https://doi.org/10.1371/journal.pone.0232775

ABSTRACT

Antibacterial photodynamic therapy (aPDT) and antibacterial blue light (aBL) are emerging treatment methods auxiliary to mechanical debridement for periodontitis. APDT provided with near-infrared (NIR) light in conjunction with an indocyanine green (ICG) photosensitizer has shown efficacy in several dental in-office-treatment protocols. In this study, we tested *Streptococcus mutans* biofilm sensitivity to either aPDT, aBL or their combination dual-light aPDT (simultaneous aPDT and aBL) exposure.

Biofilm was cultured by pipetting diluted *Streptococcus mutans* suspension with growth medium on the bottom of well plates. Either aPDT (810 nm) or aBL (405 nm) or a dual-light aPDT (simultaneous 810 nm aPDT and 405 nm aBL) was applied with an ICG photosensitizer in cases of aPDT or dual-light, while keeping the total given radiant exposure constant at 100 J/cm^2. Single-dose light exposures were given after one-day or four-day biofilm incubations. Also, a model of daily treatment was provided by repeating the same light dose daily on four-day and fourteen-day biofilm incubations. Finally, the antibacterial action of the dual-light aPDT with different energy ratios of 810 nm and 405 nm of light were examined on the single-day and four-day biofilm protocols. At the end of each experiment, the bacterial viability was assessed by colony-forming unit method. Separate samples were prepared for confocal 3D biofilm imaging.

On a one-day biofilm, the dual-light aPDT was significantly more efficient than aBL or aPDT, although all modalities were bactericidal. On a four-day biofilm, a single exposure of aPDT or dual-light aPDT was more efficient than aBL, resulting in a four logarithmic scale reduction in bacterial counts. Surprisingly, when the same amount of aPDT was repeated daily on a four-day or a fourteen-day biofilm, bacterial viability improved significantly. A similar improvement in bacterial viability was observed after repetitive aBL application. This viability improvement was eliminated when dual-light aPDT was applied. By changing the 405 nm to 810 nm radiant exposure ratio in dual-light aPDT, the increase in aBL improved the antibacterial action when the biofilm was older.

In conclusion, when aPDT is administered repeatedly to *S. mutans* biofilm, a single wavelength-based aBL or aPDT leads to a significant biofilm adaptation and increased *S. mutans* viability. The combined use of aBL light in synchrony with aPDT arrests the adaptation and provides significantly improved and sustained antibacterial efficacy.

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In vitro / published (3): Hentilä, J., Laakamaa, N., Sorsa, T., Meurman, J., Välimaa, H., Nikinmaa, S., Kankuri, E., Tauriainen, T., Pätilä, T. (2021): **Dual-Light Photodynamic Therapy Effectively Eliminates Streptococcus Oralis Biofilms.**
Journal of Pharmacy & Pharmaceutical Sciences, 24, 484–487. https://doi.org/10.18433/jpps32084

ABSTRACT

Purpose: During cancer treatment, oral mucositis due to radiotherapy or chemotherapy often leads to disruption of the oral mucosa, enabling microbes to invade bloodstream. Viridans streptococcal species are part of the healthy oral microbiota but can be frequently isolated from the blood of neutropenic patients. We have previously shown the antibacterial efficacy of dual-light, the combination of antibacterial blue light (aBL) and indocyanine green photodynamic therapy (aPDT).

Methods: Here, we investigated the dual-light antibacterial action against four-day *Streptococcus oralis* biofilm. In addition, while keeping the total radiant exposure constant at 100J/cm2, we investigated the effect of changing the different relative light energies of aBL and aPDT to the antibacterial potential.

Results: The dual-light had a significant antibacterial effect in all the tested combinations.

Conclusion: Dual-light can be used as an effective disinfectant against *S. oralis* biofilm.

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aPDT split-mouth study / published: Nikinmaa S, Moilanen N, Sorsa T, Rantala J, Alapulli H, Kotiranta A, Auvinen P, Kankuri E, Meurman JH, Pätilä T.: **Indocyanine Green-Assisted and LED-Light-Activated Antibacterial Photodynamic Therapy Reduces Dental Plaque.**
Dent J (Basel). 2021 May 3;9(5):52. doi: 10.3390/dj9050052. PMID: 34063662; PMCID: PMC8147628.

ABSTRACT

Aim: This study aimed to determine the feasibility and first efficacy of indocyanine green (ICG)-assisted antimicrobial photodynamic therapy (aPDT) as activated using LED light to the dental plaque.

Methods: Fifteen healthy adults were assigned to this four-day randomized study. After rinsing with ICG, 100 J/cm2 of 810 nm LED light was applied to the aPDT-treatment area. Plaque area and gingival crevicular fluid (GCF) matrix metalloproteinase-8 (MMP-8) were measured, and plaque bacteriomes before and after the study were analyzed using 16S rRNA sequencing.

Results: aPDT administration was performed successfully and plaque-specifically with the combination of ICG and the applicator. Total plaque area and endpoint MMP-8 levels were reduced on the aPDT-treatment side. aPDT reduced Streptococcus, Acinetobacteria, Capnocytophaga, and Rothia bacteria species in plaques.

Conclusion: ICG-assisted aPDT reduces plaque forming bacteria and exerts anti-inflammatory and anti-proteolytic effects.

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Lumoral first in human / published: Lähteenmäki H, Pätilä T, Räisänen IT, Kankuri E, Tervahartiala T, Sorsa T. (2022): **Repeated Home-Applied Dual-Light Antibacterial Photodynamic Therapy Can Reduce Plaque Burden, Inflammation, and aMMP-8 in Peri-Implant Disease—A Pilot Study**
https://pmc.ncbi.nlm.nih.gov/articles/PMC8947626/

ABSTRACT

Until now, in clinical dentistry, antibacterial photodynamic therapy (aPDT) has been restricted to in-office treatments, which hampers repeated applications. This pilot study tested the benefit of a commercially available Lumoral® device designed for regular periodontal dual-light aPDT treatment at home.

Seven patients with peri-implant disease applied dual-light aPDT daily in addition to their normal dental hygiene for four weeks. A single Lumoral® treatment includes an indocyanine green mouth rinse followed by 40 J/cm2 radiant exposure to a combination of 810 nm and 405 nm light. A point-of-care analysis of active-matrix metalloproteinase (aMMP-8), visible plaque index (VPI), bleeding on probing (BOP), and peri-implant pocket depth (PPD) measurements was performed on day 0, day 15, and day 30.

Reductions in aMMP-8 ($p = 0.047$), VPI ($p = 0.03$), and BOP ($p = 0.03$) were observed, and PPD was measured as being 1 mm lower in the implant (p = ns).

These results suggest a benefit of regular application of dual-light aPDT in peri-implantitis. Frequently repeated application can be a promising approach to diminishing the microbial burden and to lowering the tissue destructive proteolytic and inflammatory load around dental implants. Further studies in larger populations are warranted to show the long-term benefits

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Clinical study (1)

Published:

Peri-Implant Diseases: Enhanced Antibacterial Photodynamic Therapy

Hanna Lähteenmäki, Tommi Pätilä, Ismo T. Räisänen, Rauni Kalliala, Timo Sorsa

https://doi.org/10.1002/cre2.70146

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Regularly applied adjunct dual-light photodynamic therapy reduces inflammation in peri-implant disease

Hanna Lähteenmäki[1,4], Tommi Pätilä[2], Ismo T. Räisänen[1], Rauni Kalliala[4], Taina Tervahartiala[1], Timo Sorsa[1,3]

[1]Department of Oral and Maxillofacial Diseases, University of Helsinki and Helsinki University Hospital, 00280 Helsinki, Finland; [2]Department of Pediatric Heart Surgery and Organ Transplantation, New Children's Hospital, Helsinki University, 00100 Helsinki, Finland; [3]Division of Periodontology, Department of Dental Medicine, Karolinska Institutet, 141 52 Huddinge, Sweden; [4]The Unit of Specialized Dental Implant and Oral Care Clinic, Hammasklinikka Kruunu, 33200 Tampere Finland

Background:

- The number of dental implants is constantly increasing, and inflammation of their surrounding tissues is an increasing problem. Effective early identification and treatment of inflammation is essential, because advanced inflammation is difficult and expensive to treat.
- Antibacterial photodynamic therapy (aPDT) performed regularly at home has been shown to enhance the treatment results of chronic periodontitis as an addition to conventional treatment[1].
- In the study, the effect of regular aPDT in the home treatment of observed peri-implant disease was investigated.

[1] Pakarinen S et al., Home-Applied Dual-Light Photodynamic Therapy in the Treatment of Stable Chronic Periodontitis (HOPE-CP)-Three-Month Interim Results. Dent J (Basel). 2022 Nov 2;10(11):206. doi: 10.3390/dj10110206

Methods:

- 40 peri-implantitis patients - diagnoses based on clinical and radiological bone level deficiency (RBL)
- All subjects received enhanced self-care instructions
- The treatment group (n=20) was randomized to use Lumoral treatment (dual light 405 nm and 810 nm, photosensitizer indocyanine green - ICG)
- Treatment: once a day for 2 weeks, then twice a day for 2 weeks
- The control group (n=20) continued enhanced self-care during the study period
- Measurements at baseline, 2 weeks and 4 weeks: visible plaque index (VPI) around the implant, gingival bleeding index (BOP), implant pocket aMMP-8 concentration, implant pocket depth (PPD)

Condition/ variable	Control group (n=20)	Lumoral group (n=20)	*p*-Value
Gender, n, %			
Female	11 (55%)	15 (75%)	*p*=1.000
Male	9 (45%)	5 (25%)	
Age, mean ± SD	66.75 ± 11.29	65.65 ± 8.2	*p*=1.000
Diabetes, n, %	2 (10%)	3 (15%)	*p*=1.000
Diagnosis, n, %			
Peri-implant mucositis	18 (80%)	16 (70%)	*p*=0.742
Peri-implantitis	0 (0%)	4 (20%)	

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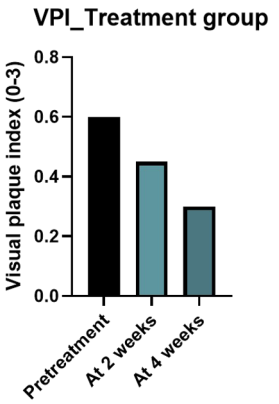
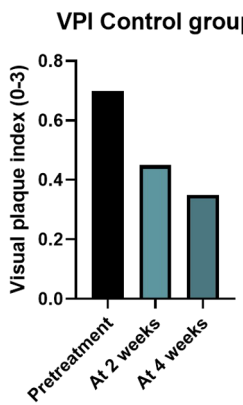
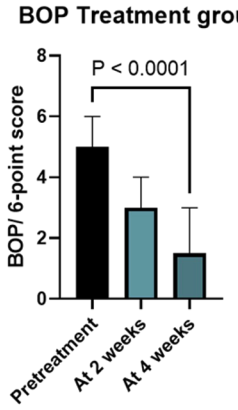
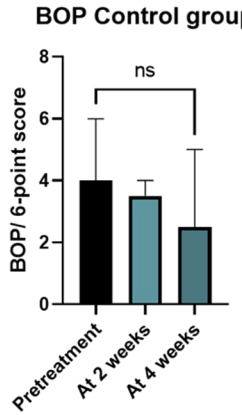
Results:



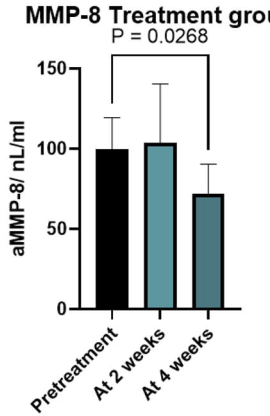


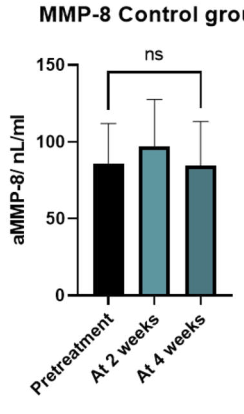
During the 4-week study period, VPI decreased in both groups





BOP decreased significantly in the treatment group, 4.7±1.3 - 1.8±1.6 (KA±SD), p<0.0001, but no statistical difference in the control group 3.5±2.3 - 3.0±2.3, p=0.39





Implant pocket aMMP-8 decreased in the treatment group 100±41 to 72±38 (KA±SD), p=0.027, but not in the control group, 86±54 to 86±, p= 0.38

- **In the implant pocket measurements, pocket depth correction was measured in 3 subjects in the treatment group and 1 subject in the control group**

Conclusions:

Regularly applied dual-light aPDT reduces inflammation in the dental implant adjacent tissues. Dual-light aPDT approach holds promise as an effective home care tool for implant patients.

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Clinical study (2)

A Randomized Trial of Home-Applied Dual-Light Photodynamic Therapy in Stable Chronic Periodontitis (HOPE-CP) – Interim Analysis of Half Cohort Results / Unpublished 6-month half-cohort results

Saila Pakarinen, Riitta Saarela, Hanna-Mari Välimaa, Anna-Mari Heikkinen, Esko Kankuri, Marja Noponen, Heikki Alapulli, Taina Tervahartiala, Ismo Räisänen, Timo Sorsa, Tommi Pätilä

(Published 3-month interim analysis of 59 first participants can be found at: https://pmc.ncbi.nlm.nih.gov/articles/PMC9689653/).
The full report is being prepared.

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A Randomized Trial of Home-Applied Dual-Light Photodynamic Therapy in Stable Chronic Periodontitis –Interim Analysis of Half Cohort Results

Saila Pakarinen[1], Riitta Saarela[2], Hanna-Mari Välimaa[3], Anna-Mari Heikkinen[4], Esko Kankuri[5], Marja Noponen[2,3], Heikki Alapulli[3,6], Taina Tervahartiala[3], Ismo Räisänen[3], Timo Sorsa[3,7], Tommi Pätilä[8]

[1]Metropolia University of Applied Sciences, Helsinki, Finland; [2]Department of Oral Health, Health and Social Services, Helsinki City, Finland; [3]Department of Oral and Maxillofacial Diseases, Faculty of Medicine, University of Helsinki, [4]Faculty of Medicine and Health Technology, University of Tampere, City of Tampere Finland; [5]Department of Pharmacology, Helsinki University; [6]Department of Pediatric Dentistry, New Children's Hospital, University of Helsinki; [7]Department of Oral Diseases, Karolinska Institute, Sweden; [8]Department of Congenital Heart Surgery and Organ Transplantation, New Children's Hospital, University of Helsinki, 00290 Helsinki, Finland; mailto: tommi.patila@hus.fi

Background:

• Periodontitis is a chronic inflammatory condition of the attachment and supporting tissues of the teeth. The subgingival microbiota and the host's immune system are the most critical factors in its generation mechanism, leading to the irreversible destruction of soft and hard tissue in the periodontium

• Antibacterial photodynamic therapy (aPDT) performed regularly at home has arised as a novel adjuvant therapy to improve the treatment results of chronic periodontitis[1].

• This study aims to investigate the benefit of dual-light antibacterial PDT in the treatment of chronic stable periodontal disease.

Methods:

• Chronic periodontitis patients sent for hygienist care by dentist at the Metropolitan Area of Helsinki

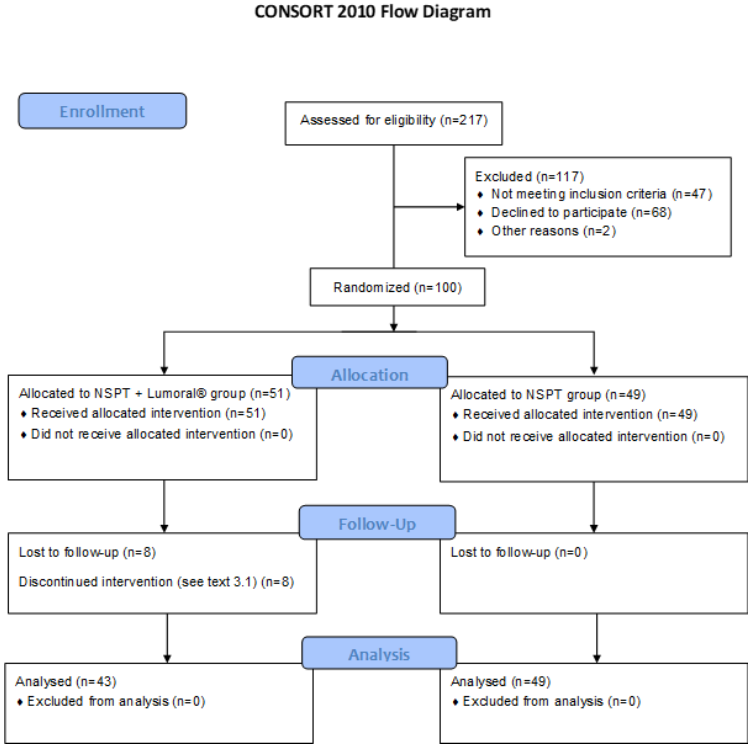
• The first 100 consecutive randomized cases are analyzed

• All participants received oral hygiene instructions and a new electric toothbrush

• Treatment group (n=51) received SRP at the beginning and adjuvant Lumoral treatment daily at home (includes dual-light aPDT with 405 nm aBL and 810 nm aPDT combined with indocyanine green photosensitizer)

• The control group (n=49) received SRP at the beginning

• Measurements at baseline, at 3 months, and at 6 months: visible plaque index (VPI) around, gingival bleeding index (BOP), Mouthrinse aMMP-8 concentration, pocket depths (PPD). Compliance was measured by diary and ICG mouthrinse consumption



[1] Pakarinen S et al., Home-Applied Dual-Light Photodynamic Therapy in the Treatment of Stable Chronic Periodontitis (HOPE-CP)-Three-Month Interim Results. Dent J (Basel). 2022 Nov 2;10(11):206. doi: 10.3390/dj10110206

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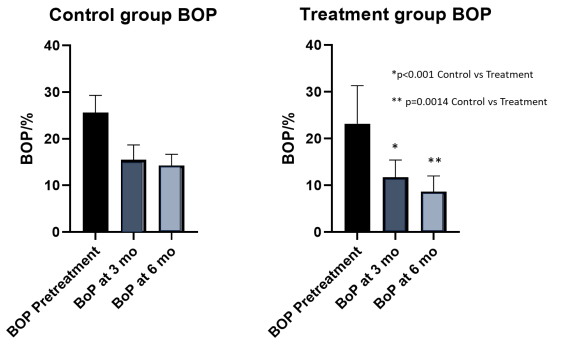
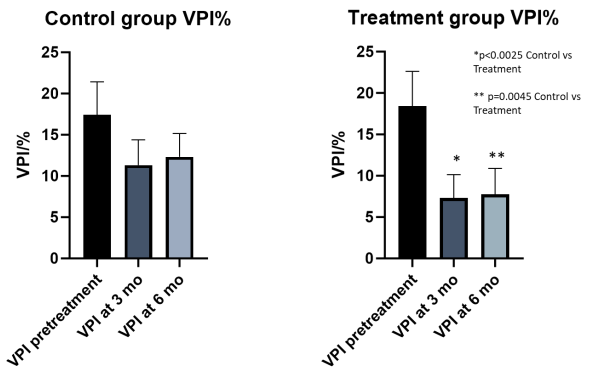
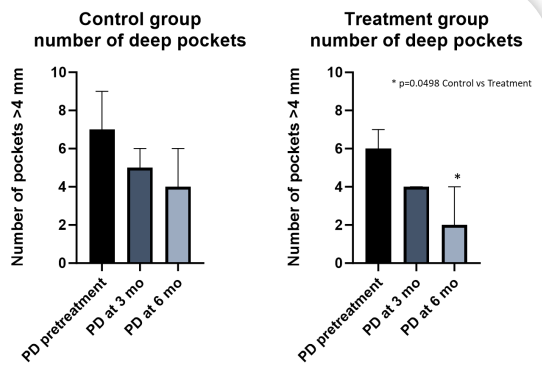
Results



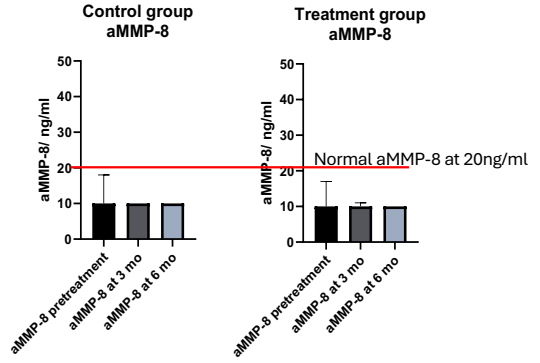
During the six months BOP reduced significantly in the Treatment group



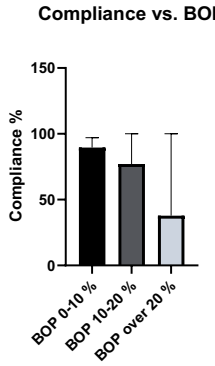
There was a significant improvement in the VPI% in the treatment group



The reduction in the number of deep pockets was greater in the treatment group



Most of the patients had normal aMMP-8 levels, indicating a patient cohort with a slow progression of the periodontal disease



Compliance with adjunct treatment showed a trend toward improving BOP

Conclusions:

Adjunct Lumoral® treatment significantly improves the results of non-surgical periodontal treatment in chronic periodontitis.

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Clinical study (3)

A Multicenter, Controlled, Randomized Trial of Home-Applied Dual-Light Photodynamic Therapy in Chronic Periodontitis

Paula Tegelberg, Meeri Ojala, Merja Ylipalosaari, Jori Lindroth, Anna-Maria Heikkinen, Hanna Lähteenmäki, Saila Pakarinen, Ismo T. Räisänen, Timo Sorsa, Tommi Pätilä

Unpublished, in peer review (preprint available):
https://www.medrxiv.org/content/10.1101/2025.03.25.25324596v1
ClinicalTrials.gov ID: NCT05425784 (https://clinicaltrials.gov/study/NCT05425784)

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A Multicenter, Controlled, Randomized Trial of Home-Applied Dual-Light Photodynamic Therapy in Chronic Periodontitis

Paula Tegelberg[1], Meeri Ojala[1], Merja Ylipalosaari[1], Jori Lindroth[2], Anna-Maria Heikkinen[3], Hanna Lähteenmäki[4], Saila Pakarinen[5], Ismo T. Räisänen[4] Timo Sorsa[4], Tommi Pätilä[5]
[1]Research Unit of Population Health, Faculty of Medicine, University of Oulu, Oulu, Finland; [2]Institute of Dentistry, University of Eastern Finland, Kuopio, Finland; [3]Faculty of Medicine and Health Technology, University of Tampere, City of Tampere Finland; [4]Department of Oral and Maxillofacial Diseases, Faculty of Medicine, University of Helsinki, and Helsinki; [5]Metropolia University of Applied Sciences, Helsinki, Finland; [6]Department of Congenital Heart Surgery and Organ Transplantation, New Children's Hospital, University of Helsinki, 00290 Helsinki, Finland. Correspondence: tommi.patila@hus.fi

Aim:

This multicenter, randomized controlled trial evaluated the efficacy of the Lumoral® dual-light antibacterial photodynamic (aPDT) home care device as an adjunct tool to non-surgical periodontal treatment (NSPT) in chronic periodontitis patients.

Materials and Methods:

Forty-one Stage I-III periodontitis patients were randomized to receive NSPT, including standardized hygiene instructions and scaling and root planing, or NSPT with adjunctive Lumoral® treatment, applied daily at home. Clinical examinations were conducted at baseline, three months, and six months.

Results:

- Both groups showed significant reductions in Visual Plaque Index (VPI) and Bleeding on Probing (BOP) at three and six months. However, the NSPT + Lumoral® group exhibited significantly greater BOP and VPI reductions at six months (p=0.03, p=0.04) compared to the NSPT group.
- Incidence of Probing Pocket Depth (PPD) ≥ 4 mm reduced significantly in the NSPT + Lumoral® group at both follow-ups (p=0.0019, p=0.0043) but not in the NSPT group.
- Periodontal epithelial surface area (PESA) and periodontal inflamed surface area (PISA) significantly decreased in the NSPT + Lumoral® group (p<0.01), while no significant changes were observed in the control group.

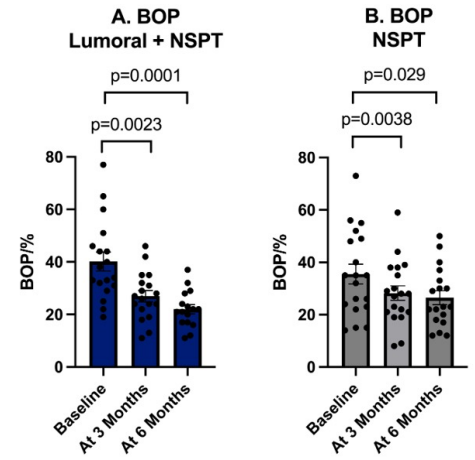

Figure 2. Bleeding on probing (%) improved significantly in both groups.

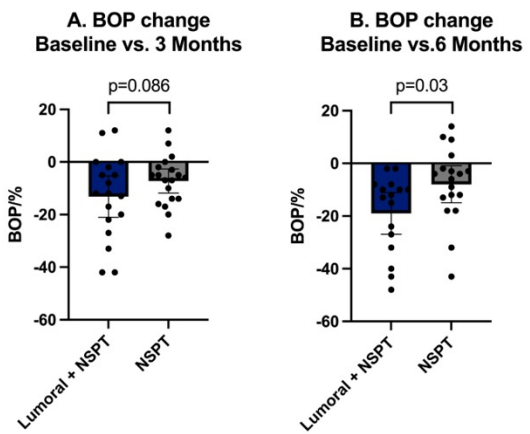

Figure 3. Reduction in the bleeding on probing (%) was greater in the NSPT + Lumoral® group than in the NSPT group.

At the baseline, the mean±SEM BOP was 40.2±3,4% in the NSPT + Lumoral® group and 35.5±3.7% in the NSPT group, with no statistical difference between the groups. Both groups showed a reduction in BOP both at the three-month and six-month visits when compared to the baseline, the BOP being 27.0±2.0% and 22.0±1.6%, respectively in the NSPT + Lumoral® group, and 28.2±2.7% and 26.5±2.4%, respectively, in the NSPT group. The BOP reduction was significantly greater in the NSPT + Lumoral® group compared to the NSPT group between the baseline and the final six-month visit (p=0.03). See Figures 2 and 3.

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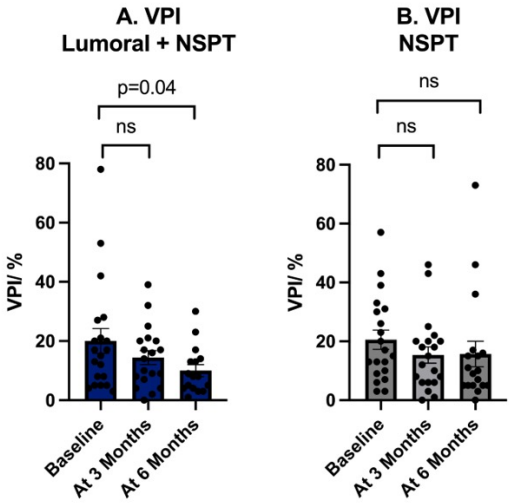

Figure 4. Visual plaque index (%) reduced significantly in the NSPT + Lumoral® group, when no statistical change was observed in the NSPT group.

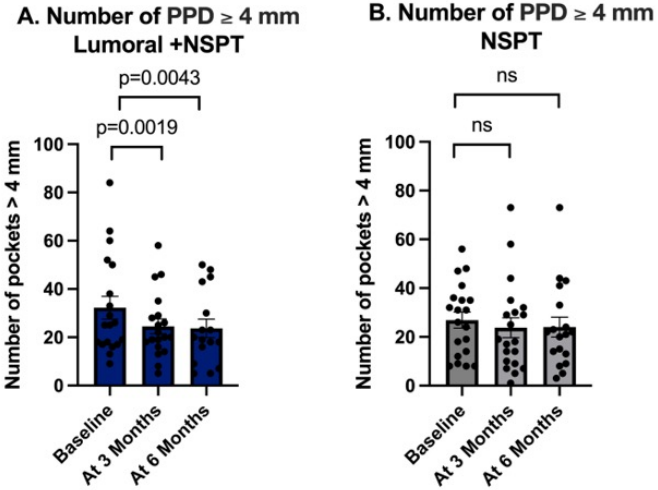

Figure 5. The number of sites with probing pocket depth (PPD) ≥ 4 mm reduced significantly in the NSPT + Lumoral®, while in the NSPT group, no statistical change was observed.

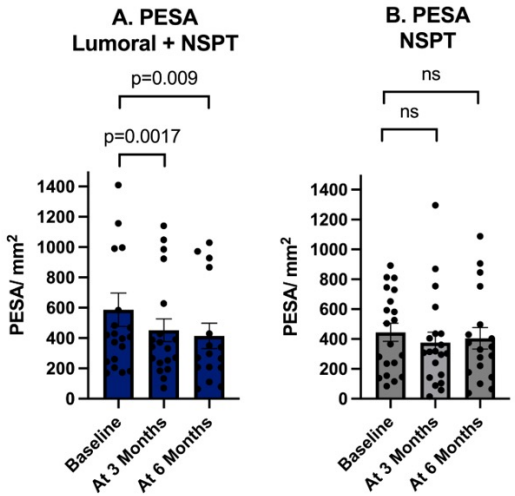

Figure 6. Periodontal epithelial surface area reduced significantly in the NSPT + Lumoral® group during the treatment period, while in the NSPT group, no statistical change was observed.

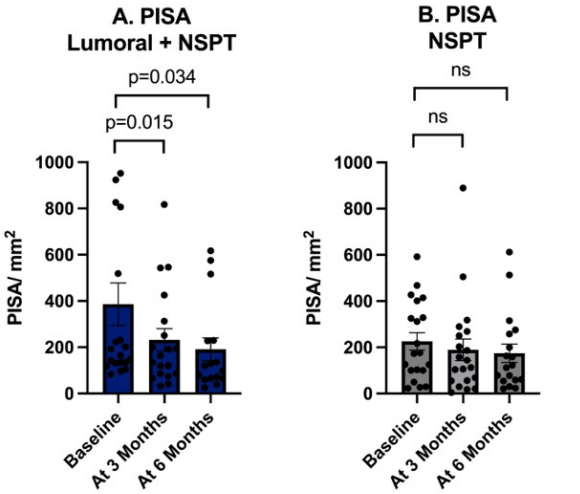

Figure 7. Periodontal inflamed surface area reduced significantly in the NSPT + Lumoral® group, while in the NSPT group no statistical change was observed.

- *At the baseline, the mean±SEM **VPI** was 20.9±4.3% in the NSPT + Lumoral® group and 19.6±3.2% in the NSPT group, with no statistical difference between the groups. At the three-month and six-month visits, the VPI was 14.3±2.4% and 10.6±1.8%, respectively, in the NSPT + Lumoral® group, and 15.0±2.7% and 15.7±4.3%, respectively, in the NSPT group. The NSPT + Lumoral® group had significantly less plaque in the six-month visit compared to the baseline (p=0.04). There was no statistical reduction in the VPI in the NSPT group. See Figure 4.*
- *At the baseline, the **number of sites PPD ≥ 4 mm**, expressed as mean±sem, was 32.3±4.5. in the NSPT + Lumoral® group and 26.9±3.8 in the NSPT group, with no statistical difference between the groups. In the NSPT + Lumoral® group, at the three-month visit, the number of PPD ≥ 4 mm had significantly reduced down to 24.5±3.7 (p=0.019), and at the six-month visit to 23.7±3.9 (p=0.0043, compared to the baseline). The number of PPD ≥ 4 mm in the NSPT group was 23.8±4.3 and 24.0±4.2 at three-month and six-month visits, respectively. There was no statistically significant reduction in the number of PPD ≥ 4 mm in the NSPT group. See Figure 5.*
- *At the baseline, the **PISA**, expressed as mean±sem, was 385±20 mm2 in the NSPT + Lumoral® group and 226±13 mm2 in the NSPT group, with no statistical difference between the groups. In the NSPT + Lumoral® group, at the three-month visit, the total periodontal inflamed surface area had significantly reduced to 231±15 mm2 (p=0.015), and at the six-month visit to 191±14 mm2 (p=0.034, compared to the baseline). The total periodontal inflamed surface area in the NSPT group was 189±14 mm2 and 174±13 mm2 at three-month and six-month visits, respectively. There was no statistically significant reduction in the number of periodontal pockets in the NSPT group. See Figure 7.*

Conclusion:

Regular adjunctive use of Lumoral® after NSPT improved clinical periodontitis treatment outcomes.

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Clinical study (4)

Effects of regular antibacterial photodynamic therapy on oral hygiene in elderly 24-hour care residents (RSAA2021)

Riitta Saarela, Jaana Helenius-Hietala, Tommi Pätilä, Saila Pakarinen, Sanna Korte, Wilma Romppanen, Taina Tervahartiala, Anna Maria Heikkinen, Timo Sorsa

Unpublished, the full study article for peer-review is under preparation (no URL available)

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Effects of regular antibacterial photodynamic therapy on oral hygiene in elderly 24-hour care residents / RSAA2021 (report on peer-review)

In collaboration with the City of Helsinki and the University of Helsinki

Authors: Riitta Saarela*; Jaana Helenius-Hietala***; Tommi Pätilä***; Saila Pakarinen****; Sanna Korte*; Wilma Romppanen*; Taina Tervahartiala**; Anna Maria Heikkinen*****; Timo Sorsa**

Background

- The proportion of people in 24-hour care who are completely edentulous will decrease, further increasing the need for dental care. Between 2003 and 2017, the proportion of people without teeth fell from 59% to 31%[1,2].
- Several studies have suggested significant deficiencies in oral hygiene maintenance among people in 24-hour care. In addition, tooth decay and diseases of the attachment tissues are common. Poor oral health further exposes people to other diseases and reduces their quality of life[3,4].
- Preventive treatment is the most effective method of oral health care also for this patient group[1,2].
- Regular use of dual-light antibacterial photodynamic therapy (aPDT) improves oral hygiene and reduces inflammation in the surrounding dental tissue[5,6].
- The aim of this study was to investigate the impact of dual light aPDT on oral health in 24-hour care residents compared to a traditional oral hygiene intervention.

Methodology

- Residents of 24-hour senior care homes in Laajasalo and in Roihuvuori (Helsinki) were randomized to receive either a standard intervention to improve oral hygiene or a standard intervention with the adjuvant regular use of the double light aPDT method. The aPDT was applied with the Lumoral® Treatment device. Appointments and measurements were made on-site using a mobile dental unit.
- N = 31 in total (4 discontinued). Follow-up period 2 Months. Randomized:
  - Treatment Group N=10; standard of care + Lumoral® adjuvant
  - Control Group N=17; standard of care
- The following clinical measeurements were performed: aMMP-8 chairside test; VPI (visible plaque index, modified Sillness&Loe); CPITN (The Community Periodontal Index of Treatment Needs); clinical assessment of oral mucosal moisture/dryness

Literature: 1) Saarela R., et al. 2020; 2) Saarela R., et al. 2021; 3) Hiltunen K., et al. 2020; 4) Nishizava T. Et al. 2019; 5) Pakarinen S. Et al 2022; 6) Nikinmaa S., et al. 2021

*) City of Helsinki; **) University of Helsinki; ***) Helsinki University Hospital; ****) Metropolia UAS; *****) Tampere University and the Wellbeing Services of County Pirkanmaa.

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Results

- In both groups, a significant reduction in plaque was observed in the VPI measurement. The groups benefited from being included in the study (see Figure 1)
- A significant improvement in teeth measured according to CPITN was observed in patients in the treatment group (p=0.0006). No change was observed in the control group (see Figure 2).
- The proportion of positive aMMP-8 oral rinse test decreased from 53% to 29% in the control group and from 44% to 33% in the treatment group (p=ns.)
- Subjectively assessed dry mouth remained 18%-18% in the control group, while it decreased from 30% to 12% in the treatment group (p=ns.). Objective dry mouth decreased from 53% to 35% in the control group and from 89% to 33% in the treatment group (p=ns.)
- Half of those who were using Lumoral (n=5) found it very easy to use, and half were neutral. None of the respondents rated it as difficult to use. There were no adverse events.

Comments

- Regular use of Lumoral® improved the oral health of the subjects according to periodontal measurements. The results are in line with previous publications.
- A sample of residents with variance in their capabilities took part in the Study. In this selected cohort, the usability of Lumoral® was rated as at least moderate.
- The sample size was small, but a result in line with previously published results confirms the hypothesis of the benefits of Lumoral® method.

Figure 1

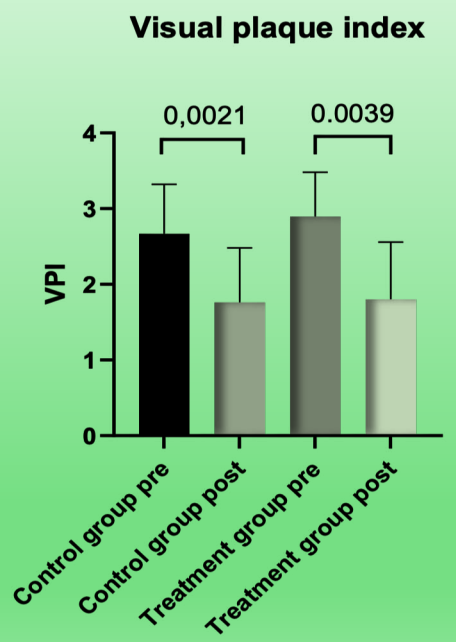
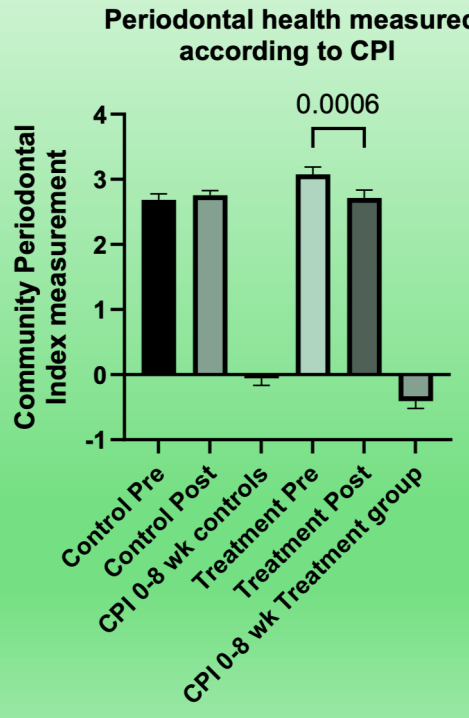


Figure 2



Conclusions: dual light aPDT can improve oral health in selected 24-hour care residents as an adjunct to routine oral hygiene.

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Clinical study (5) **This is also a published thesis (1)**
Plaque study - Metropolia University of Applied Sciences
Carolina Cavalcante-Bitu, Panu Halen, Susanna Lehti / Supervisor: Saila Pakarinen:
The full study article for peer-review is under preparation. Link to thesis: https://www.theseus.fi/handle/10024/799188 (in Finnish with English abstract)

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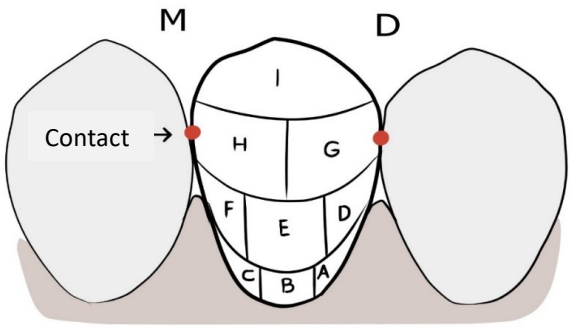
Randomized Protocol

- Healthy adults, n = 13
- Plaque staining Curaprox Plaque Finder (Picture)
- Rustog index (Figure) and diconomic plaque-index
- Instructions to improve self hygiene at home
- Randomization by envelopes:
  - Improved oral hygiene (Control group) or
  - Improved oral hygiene + adjuvant Lumoral twice a week (Treatment group)



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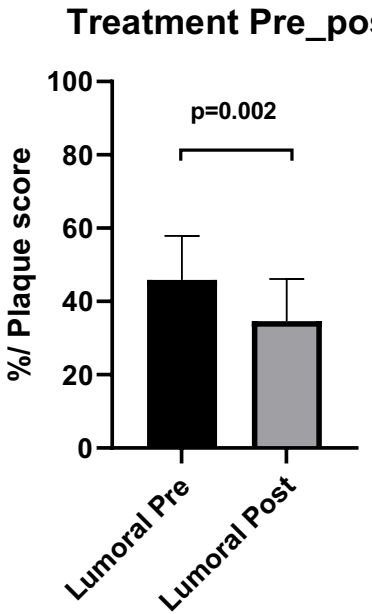
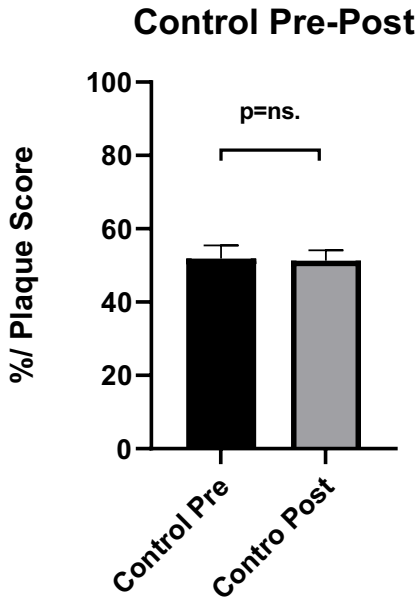
Results





Conclusion: Lumoral significantly improves oral hygiene in healthy adults when used regularly twice a week.

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On-going and planned clinical studies with Lumoral method

Sponsored or academic studies?			
	Planned	On-going	Finished recruitment
Sponsored by Koite Health:	0	3	3
With academic funding:	1	8	5

Number of patients in studies	
Already enrolled:	727
Targeted total:	1348

Countries:
Finland
Sweden
Estonia
Lithuania
Germany
Italy
Greece

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Lumoral method in Clinical Studies

Active, recruiting | Active, no more recruiting | Report writing | *Published recently* | Planning phase

Periodontitis / Oral hygiene

- **Plaque control in healthy adults**
  - Gusseva & Lill
- **THSS1**
  - Sakellari, Vakaki, Sorsa et al.
- **LumoNorth2022**
  - Tegelberg, Ojala, Ylipalosaari, Sorsa et al.
- **KHE2021 Metro / HOPE-CP**
  - Pakarinen, Sorsa, et al.
- **LumoKaunas2023**
  - Pacauskiene, Renata, Sorsa, et al.
- **Periodontitis, elderly patients**
  - Flyborg, Renvert

Peri-implant disease

- ***Prevention of peri-implant diseases***
  - *Lähteenmäki et al.*
- **IS-2022**
  - Ruokonen, Nylund, Avellan et al.
- **Severe peri-implantitis**
  - Rathnayake, Sorsa et al.
- **Peri-implant mucositis**
  - De Biase, d'Abusco, Lollobrigida et al.

Oral health vs. general health

- **APDT-T2D**
  - Heikkinen, Ehnrooth, Saikkonen et al.
- **Sports and oral health**
  - Marjosola, Elomaa-Krapu, Pätilä, et al.

Oral mucositis

- **Oral Mucositis**
  - Arduino, Iorio, Gambino

Immunologically mediated mucocutaneous diseases

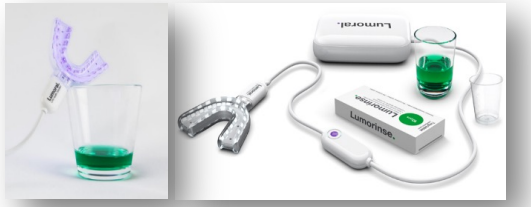
- **OLP-01TRE**
  - Heikkinen, Ylä-Tuuhonen, et al.

Orthodontic and implant hygiene

- **CLEAN-BRACKET**
  - Jansåker, Elses, et al.
- **Orthodontics**
  - Faber, Birglechner et al.

Other

- **RSAA2021, elderly**
  - Sorsa, Helenius-Hietala, Pakarinen, Korte, Romppainen
- **Cleft palate operations**
  - Ronkainen, Sorsa, et al.
- **LumoPrevent, adolescents**
  - Heikkinen, Sarja et al.
- **LumoKoti2024, oral hygiene elderly**
  - Sorsa, Kallio, Niskanen et al.



LumoralPro

Updated 05 Aug 2025 / MK

Lumoral Clinical Studies, patient update

For more details, please visit: https://lumoralpro.com/pages/scientific-papers

	Name or title of study with the target group:	Koite sponsored	Academic	No. of consented participants by April 2025	Study status	Targeted no. of participants
Ongoing studies	**HEALTHIER, Peri-implantitis, surgical and non-surgical treatment** (Stockholm, Sweden)		X	12	**Active**, recruiting	80
	OLP-01TRE, oral lichen planus (Tampere, Finland)	X		13	**Active**, recruiting	60
	LumoPrevent, prevention and oral hygiene, adolescents (Tampere, Finland)		X	97	**Active**, recruiting	120
	LumoKoti2024, oral hygiene for elderly (Vantaa, Sipoo and Loviisa, Finland)		X	10	**Active**, recruiting	100
	Oral mucositis in relation to radiotherapy (Turin, Italy)		X	2	**Active**, recruiting	60
	Peri-implant mucositis (Rome, Italy)	X		7	**Active**, recruiting	30
	Oral health with orthodontics, aged 15-18 (Hamburg, Germany)		X	0	**Active**, recruiting	52
	Management of periodontitis on type 2 diabetes patients / APDT-T2D (Tampere, Finland)		X	40	**Active**, recruiting	150
	AthleteOralHealth (cross-over study / Helsinki, Finland)		X	19	**Active**, recruiting	36
	LumoKaunas2023, periodontitis stage III-IV (Kaunas, Lithuania)	X		56	**Active**, follow-up	
	IS-HUS, peri-implantitis (Helsinki, Finland)		X	46	**Active**, follow-up	
	CLEAN-BRACKET, orthodontics with fixed braces (Lund, Sweden)	X		40	Data review	40
	HUS Cleft bone transplantation study (no more recruiting) (Helsinki, Finland)		X	14	Data review	20
	Thss-1, smoking and periodontitis study (no more recruiting) (Thessaloniki, Greece)		X	60	Data review	60
	KHE2021Metro/HOPE-CP, periodontitis stage I-III (Helsinki, Finland)	X		200	Report writing	200
	LumoNorth2022, multicentre, periodontitis stage I-III (Oulu, Kemi and Rovaniemi, Finland)	X		41	Report writing	90
	Oral plaque control in healthy adults (follow-up finished) (crossover study) (Tartu, Estonia)		X	30	Report writing	30
	RSAA2021, oral hygiene elderly (follow-up finished) (Helsinki, Finland)		X	31	Report in peer review	40
	IS-Tre, peri-implantitis *(follow-up finished) (Tampere, Finland)*		*X*	*40*	*Published*	*40*
	Total	**19 studies**		**758**		**1348**
	Planned studies:	**Koite sponsored**	**Academic**	**Planned start**	**Study status**	**Planned number of participants**
	Elderly patients with periodontitis (Blekinge, Sweden)		X	Q3/2025	Protocol planning	60

Thesis (2) published: Use of Lumoral Clinic device in dental hygienist office as part of an anti-infective treatment. Anna-Riina Karvonen & Milla Koivuluoma / Supervisor(s): Anna-Leena Keinänen & Jaana Holappa-Girginkaya, Oulu University of Applied Sciences.
https://www.theseus.fi/handle/10024/810794 (in Finnish with English abstract)

ABSTRACT

The purpose of this thesis is to describe the experiences of the **Lumoral Clinic device** at the oral health care office as part of an anti-infectious treatment. The thesis has been carried out in cooperation with Koite Health Oy, which enabled the Lumoral clinic devices involved in this thesis.
The aim of the study is to provide evidence-based information to oral health care professionals about the use of the Lumoral Clinic device as part of anti-infectious treatment.

The thesis has been carried out as **qualitative research**. The data for the study was collected based on **semi-structured interviews**, from which the results were analyzed using content analysis. The interviews were based on a one-month trial period during which Lumoral clinic equipment was in use at the clinics. The interview material consisted of **nine dental hygienist user experiences**. Evidence-based research has been used as the central material for the thesis. The knowledge base has been compiled from related literature as well as from websites.

Based on the results, the use of the Lumoral Clinic device at the clinic was satisfying. The device was easy and simple to implement at the clinics. The responses also highlighted shortcomings in equipment maintenance and time management and hoped for improved solutions in that area to make the device more suitable for use in the care environment. Based on the research, it can be said that the Lumoral Clinic device has a potential opportunity to be part of the treatment at the clinics if it is targeted correctly.

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Thesis (3) published: Lumoral and mouth rinse with chlorhexidine in treatment against periodontitis - A comparison study of the evidence on these preventive products for home use Sia Latif & Catrin Safar / Supervisors: Sebastian Malmqvist & Annsofi Johannsen Karolinska Institutet, Tandhygienistprogrammet, https://cdn.shopify.com/s/files/1/0264/6291/2621/files/Catrin_Sia_EN.pdf?v=1748262626

ABSTRACT

Introduction: Lumoral and chlorhexidine mouthwash (CHX) are antibacterial home products to improve oral health by reducing plaque, bleeding on probing and deepened gingival pockets and resuming clinical attachment loss. The products contribute to the prevention and treatment of gingivitis and periodontitis through its antibacterial effect after scaling and root planing (MIB).

Purpose: The purpose of this literature study is to compare the adjunctive effect of Lumoral and chlorhexidine mouthwash in the treatment of periodontitis scaling and root planing.

Material & Method: This comparison is a **systematic literature study** that compiles current evidence on Lumoral and chlorhexidine mouthwash in both table form and in text. The compilation includes scientific articles published in PubMed. The study design and results of the articles were compared with each other based on the examined periodontal parameters and the length of treatment.

Results: Use of Lumoral and rinsing with chlorhexidine as a supplement after MIB is effective for reducing periodontal parameters (PI, BOP, GI, PPD and CAL). **Lumoral demonstrates a better effect on reducing PPD and BOP. The percentage of patients who reduced the number of PPD in MIB + Lumoral was 92% compared to 63% with MIB alone**. CHX demonstrates the best effect on reducing PI compared to Lumoral. CAL was seen to improve in four CHX studies and no Lumoral study reports CAL value.

Conclusion: Lumoral for home use as aPDT adjunct **provides clinical improvements in BOP and PPD compared to the traditional antibacterial products** such as CHX. However, the evidence and scientific basis for this product is currently very limited and more research is needed.

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Thesis (4) published: Comfort of using the Lumoral device and feeling of oral cleanliness in healthy adults Emma Niva & Heidi Kulmala & Sofia Vakkuri / Supervisor(s): Anna-Leena Keinänen & Anne Korteniemi, Oulu University of Applied Sciences.
Theseus link: https://www.theseus.fi/handle/10024/870703 (in Finnish with English abstract)

ABSTRACT

The purpose of the study was to describe the experiences of healthy adults using Lumoral. **The aim of the study** was to obtain information on the comfort of use of the device and its impact on the feeling of oral cleanliness. The thesis has been carried out in cooperation with Koite Health Oy.

The thesis has been carried out in a **qualitative research method**. Data collection was carried out during a four-week trial period, in which **a group of ten test users used Lumoral twice a week**. The sample consisted of dental hygienist students. After the trial period interviews were conducted using a **semi-structured** method. Content analysis was used as the method of analysis of the data. The knowledge base of the study is based on evidence-based research and literature.

The results of the study found Lumoral to be easy and simple to use. The instructions for use were found to be informative. The results showed that **the mouth felt fresher and cleaner during the testing run**. **The research suggests that Lumoral may have effects already after the first use.** Warming of the mouthpiece, the size of the mouthpiece and the seemingly long operating time were perceived as a hindrance to use. Poor water solubility of Lumorinse tablets and increased salivary secretion were perceived as complicating factors of the use of Lumoral.

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Thesis (5) published: The benefits of the Lumoral Treatment -device for oral self-care habits. Henrika Haukka & Saana Kinnunen / Supervisor: Saila Pakarinen, Metropolia University of Applied Sciences. Theseus link: https://urn.fi/URN:NBN:fi:amk-2024112630435 (in Finnish with English abstract)

ABSTRACT

This thesis explores the experiences of users of the Lumoral Treatment device. **The purpose of the thesis** was to examine the effect of the Lumoral Treatment device on personal oral care habits. **The goal** was to determine whether the Lumoral Treatment device influences users' oral care practices and if they experience improvements in their oral hygiene.

The thesis was conducted as a **qualitative study**, commissioned by Koite Health Oy. The data was collected through a survey using Metropolia's E-form. The survey was open for **two weeks** in a private Facebook group called "Lumoral käyttäjät" and participants responded in their own words in open comment fields. Participants remained anonymous, as no identifying information was collected. **A total of 25 responses** were received for the survey.

The main categories formed in the qualitative analysis were: the impact of the Lumoral Treatment device on personal oral care habits, and the effect of the Lumoral Treatment device on perceived oral hygiene. **Based on the collected data, time spent on personal oral care increased, new tools were incorporated into oral care routines, and changes were observed in cleaning routines. The data also revealed improved oral hygiene, a reduction on symptoms of periodontal diseases and caries, and a decrease in plaque and tartar buildup**. Additionally, the data showed that a few participants experienced a decrease in their oral care routines, and one participant reported negative changes in oral hygiene.

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Thesis (6) published: Lumoral video guide for home use Veera Hyttinen & Oona Lahtinen / Supervisor: Minna Kaarakainen, Savonia University of Applied Sciences, Theseus link: https://www.theseus.fi/handle/10024/870455 (in Finnish only)
ABSTRACT
The method used in the thesis was **development work**, in which Koite Health Ltd was a partner.
The purpose of the thesis was to produce a video guide on the home use of the Lumoral® Treatment device.
The aim was to make the video guide as clear and easy to understand as possible so that users of the Lumoral® Treatment device can get all the necessary information about the device and its use.
The result of this development work was a video guide which, as planned, contained a user manual, basic information about the Lumoral® Treatment device, research results, answers to frequently asked questions, and customer feedback.
The partner was satisfied with the final video guide and can further modify it according to their needs.

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Thesis (7) published: The effect of home-use antibacterial photodynamic treatment on clinical oral parameters of patients with grade II or higher periodontitis – Evaluating an innovative medical device

Enikö Sundberg / Supervisor Mia Sivén, University of Helsinki, Faculty of Pharmacy, Division of Pharmaceutical Chemistry and Technology.

HELDA link: https://helda.helsinki.fi/items/e9f93e98-1387-4c33-ba12-54f73526b6ae

ABSTRACT

Objective: To determine the efficacy and safety of the regularly used Lumoral® dual-light antibacterial device on plaque control and gingival health in a community health care setting.

Methods: A single-site, randomized clinical trial was designed and performed. 40 subjects representing both genders aged between 37 and 77, diagnosed with periodontitis stage II or higher, who brush their teeth at least daily and use dental floss or an interdental brush, were randomized in a 1:1 ratio to control and study groups. Clinical parameters, such as PPD, BOP, and VPI, were evaluated at both baseline and the study end visit. Participants in both groups performed daily oral health routines for approximately 5 weeks, and the study group's routines were supplemented with a daily aPDT intervention. aPDT was performed using CE-marked Lumorinse® mouthwash in conjunction with a CE-marked Lumoral® light applicator.

Results: Study results imply that use of Lumoral® aPDT treatment decreases bleeding on probing helping to treat inflammatory oral diseases which are associated to increased gingival bleeding, such as periodontitis, peri-implantitis and gingivitis. A greater benefit is shown for non-smoking subjects. Study results suggest that non-smoking subjects diagnosed with periodontitis stage II or III might benefit from use of Lumoral® aPDT when evaluating deep gingival pockets. The study indicates that subjects with stage II or greater periodontitis who already possess moderately good home dental care routines are motivated to give the additional effort to improve their treatment.

Conclusion: Study results imply that use of Lumoral® aPDT treatment decreases bleeding on probing, thus helping to treat inflammatory oral diseases. Studies of the efficacy of Lumoral® treatment in a larger group of subjects with different periodontitis stages and grades are needed.

ClinicalTrials.gov registration ID: NCT05361590

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Thesis (8) non-published: Regular Home-Use of Dual-Light Photodynamic Therapy in Oral Plaque Control in Healthy Adults-A Randomized Cross-Over Study

Laura Gusseva & Liisa Lill / Supervisor: Riina Runnel, University of Tartu, Dentistry Student Program

https://cdn.shopify.com/s/files/1/0264/6291/2621/files/Tarto_hygiene_study_thesis_En_22May2025.pdf?v=1748262952

ABSTRACT

The **objective** of this study was to evaluate the efficacy of the antibacterial, light-activated Lumoral® treatment in reducing oral biofilm as part of daily dental care in healthy volunteers.

Methods: After the first baseline plaque measurements, a total of 30 young adults with proven good oral hygiene were randomly assigned to two groups. Group 1 (n=15) commenced two weeks of adjunctive, daily home use of Lumoral®, while Group 2 (n=15) continued with their usual daily oral health care routines. At two weeks, plaque measurements were repeated, following a two-week crossover period during which participants resumed their usual oral healthcare routines. Then, second baseline plaque measurements were performed, and Group 2 commenced two weeks of adjunctive, daily home use of Lumoral®, while Group 1 continued with their regular oral health care routines. Finally, at six weeks, the plaque measurements were repeated after the second two-week treatment period.

Results: There was no difference between the groups in the first baseline plaque measurements. After the first two weeks, both groups improved their oral hygiene significantly. After the crossover period, Group 1, which had started with Lumoral use, had significantly less plaque (p=0.02) than the conventionally treated Group 2, suggesting a sustained effect of Lumoral® treatment. After the second treatment period, Group 2, which changed to using Lumoral, improved their oral hygiene significantly compared to the conventionally treated Group 1 (p=0.01). When the results of participants in both group's Lumoral®-using periods were compared to the corresponding baseline, Lumoral® use resulted in improved oral hygiene (p=0.0001), while conventional treatment had no effect (p=ns.).

Conclusion: Daily Lumoral® use improves oral hygiene in healthy individuals when used as an adjunct to oral self-care.

ISRCTN registration ID: ISRCTN83029100 (https://doi.org/10.1186/ISRCTN83029100).

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On-going and planned thesis programs

On-going	Thesis 8: “Photodynamic treatment in the management of residual plaque – a crossover study” Melina Liimatta / supervisor Saila Pakarinen, Metropolia University of Applied Sciences Master’s programme. ClinicalTrials.gov ID: NCT06860321
	Thesis 9: “Mechanisms of action of Lumoral® Treatment and its significance in oral self-care – a literature review” Laura Lakkakorpi & Sylvia Jokelainen / supervisor Anna-Leena Keinänen, Oulu University of Applied Sciences
	Thesis 10: “Development of instruction card and video guide for oral hygienist students on the use of Lumoral Treatment device” (non-verified name of thesis) Katriina Niemi-Nikkola & Jenni Villanen & Iida Silander & Linnea Åberg / supervisor Päivi Pietikäinen, Turku University of Applied Sciences
	Thesis 11: “Lumoral® Treatment as part of Oral Healthcare on Persons with Sjögren’s Syndrome” Milla Kiviniemi & Sini Laaksonen / supervisor Saila Pakarinen, Metropolia University of Applied Sciences, in collaboration with Finnish Sjögren’s Federation. ClinicalTrials.gov ID: NCT06877546
Planning phase	Thesis 12: “Lumoral® Treatment usability with persons suffering from Oral Lichen Planus“ (non-verified name of Thesis) Saara Stavén / supervisor Tiina Holopainen, Savonia University of Applied Sciences, in collaboration with The Finnish Allergy, Skin and Asthma Federation. ClinicalTrials.gov registration pending.
	Thesis 13: “Development of Lumoral® instructions for the oral health teaching clinic” (non-verified name of Thesis) student TBA, supervisor Anna-Leena Keinänen, Oulu University of Applied Sciences.

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Article 1:

Name: Repeated Daily Use of Dual-Light Antibacterial Photodynamic Therapy in Periodontal Disease – A Case Report

Authors: Trujillo, Katherina et al. (Stockholm, Sweden)

Article: https://pmc.ncbi.nlm.nih.gov/articles/PMC9497669/

Methods:

- Patient case: A 78-year-old male with severe Stage IV periodontal disease and multiple health issues (vascular dementia, hypertension, epilepsy). The patient struggled with oral hygiene due to limited dexterity and relied on his wife's assistance.
- Treatment Protocol: Daily home-use of Lumoral® dual-light photodynamic therapy (PDT) device for five months, alongside standard mechanical cleaning.
- Clinical Monitoring: The patient had four clinical visits, including baseline measurements and assessments after one, five, and thirteen months.

Key findings:

- Patient-reported outcome: The Lumoral® device was easy to use, even with limited motor skills, improving the patient's confidence in managing oral hygiene.
- Professional outcome: Significant reduction in periodontal pocket depths, with deep pockets (≥7 mm) reduced to zero and moderately deep pockets (4–6 mm) reduced to one. Overall clinical attachment improved.UP) and oral hygiene compared to those who did not use Lumoral as an adjunct to oral hygiene.

Conclusions:

- The article supports the feasibility and effectiveness of daily home-use dual-light PDT as an adjunct for managing severe periodontitis, especially in patients with limited manual dexterity. It emphasizes the potential for such devices to improve oral health in elderly or disabled populations

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Article 2:

Name: A Lumoral test for 6 months at the Baltic Dental Clinic
Author: Ljutkina, Viktoria (Tallinn, Estonia)
Article: https://medshop24.ee/parodontiit-suitsetav-lumoral-ravi/

Methods:

- At the Baltic Dental Clinic, Lumoral photodynamic therapy was administered two to three times a week for 6 months in addition to non-surgical periodontal treatment for patients with periodontal disease (recommended after periodontal treatment daily 2 times a day for 4 weeks). The remaining patients received only standard periodontal non-surgical treatment.

Key findings:

- Patients who used Lumoral as an adjunct to oral care had better periodontal outcomes (gingival pockets, tooth mobility, BOP, VIP, SUP) and oral hygiene compared to those who did not use Lumoral as an adjunct to oral hygiene.

Conclusions:

- Based on the clinical testing, using the Lumoral method, better oral hygiene in patients was observed.

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Article 3:

Name: Home Photodynamic Therapy as a Means of Prevention for Biofilm Control – A Case Study

Author: Panzironi, Gianfranco (Rome, Italy)

Artricle: https://www.revistaahb.com/download/la-terapia-fotodinamica-domiciliaria-como-medio-de-prevencion-para-el-control-del-biofilm/

Methodologies Used:

- Patient case: suffering from post-COVID-19 symptoms, periodontitis, and significant pain in the gums. Chromogenic (black) stains were also observed on the surfaces of the posterior teeth.
- Treatment protocol: the home use of Lumoral® adjunct treatment was started, and after 7 days it was possible to perform professional cleaning.
- Measurements: Periodontal health was assessed through indicators like bleeding on probing (BOP) and inflammation reduction.

Key Findings/

- Patient-reported outcome: The dual-light photodynamic therapy demonstrated efficacy in reducing gum discomfort and enabling both professional dental cleaning and adequate self-care practices for oral health.
- Professional outcome at three months: Treatment effectively managed biofilm, enhanced healing in gums, reduced bleeding on probing, and improved overall periodontal health.

Conclusion:

- The article highlights the role of Lumoral® as an adjunct treatment that may contribute to improved gum health and comfort before professional cleaning. It also supports continuous home care as a means to reduce periodontal symptoms.

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Article 4 (under prepapration):

Name: German case studies – a prospective analysis of retrospective patient data

Authors: Vanessa Faber & Werner Birglechner (Hamburg, Germany)

Introduction:

- In this study, we aimed to analyze the effect of Lumoral dual-light therapy in dental hygiene patients.

Methods:

- A total of 174 consecutive individuals treated at different clinics around the Heidelberg and Hamburg area in Germany, and organized by Medical School 11 Heidelberg, Germany were included in a Lumoral test program. The patients were treated by dental hygienists or dental prophylaxis assistants, and oral hygiene, including average dental plaque index (API), bleeding on probing (BOP), and deep periodontal pockets (PD) were assessed in the beginning and after eight weeks. To be included in the analysis, patient case records had to meet specific criteria to ensure comprehensive and accurate reporting of periodontal status.
- After thorough assessment, and since the original participant instructions for data collection were not standardized, 46 patient cases were excluded from the final analysis of BOP, 48 cases from the analysis of API, and 119 patient cases from the analysis on PD were excluded due to the non-inclusion of relevant data. As a conclusion of the eligibility assessment of the patient cases, 126 cases were analyzed for the plaque index, 128 cases were analyzed for bleeding on probing, 55 for calculations for possible changes in the periodontal pockets, and 48 cases included all the data required for thorough periodontal index analysis.
- Although the data was gathered according to a controlled and standardized protocol, similar to a prospective study design, the decision to analyze the data retrospectively was made post hoc. This approach allows for the evaluation of the effectiveness of Lumoral treatment in a real-world setting, while still benefiting from the rigor associated with controlled data collection methods

Results:

- The significant reductions in total periodontal epithelial surface area (PESA), total periodontal inflamed surface area (PISA), Bleeding on Probing (BOP), and Plaque Index (API), and positive changes in periodontal pockets observed in this study strongly suggest that the Lumoral treatment can be an effective adjunctive therapy in periodontal care

Conclusion:

- The analysis concentrated on alterations in periodontal health indices, particularly in the quantity of deep periodontal pockets and bleeding on probing. The results demonstrated a consistent trend across the majority of analyzed patient cases, with a notable reduction in the clinical measures during the eight-week period of daily Lumoral use.

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More articles under preparation:

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