

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

Hanna Lähteenmäki<sup>1,4</sup>, Tommi Pätilä<sup>2</sup>, Ismo T. Räisänen<sup>1</sup>, Rauni Kalliala<sup>4</sup>, Taina Tervahartiala<sup>1</sup>, Timo Sorsa<sup>1,3</sup>

<sup>1</sup>Department of Oral and Maxillofacial Diseases, University of Helsinki and Helsinki University Hospital, 00280 Helsinki, Finland; <sup>2</sup>Department of Pediatric Heart Surgery and Organ Transplantation, New Children's Hospital, Helsinki University, 00100 Helsinki, Finland; <sup>3</sup>Division of Periodontology, Department of Dental Medicine, Karolinska Institutet, 141 52 Huddinge, Sweden; <sup>4</sup>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<sup>1</sup>.
- In the study, we investigated the effect of regular aPDT in the home treatment of observed peri-implant disease.

<sup>1</sup> 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

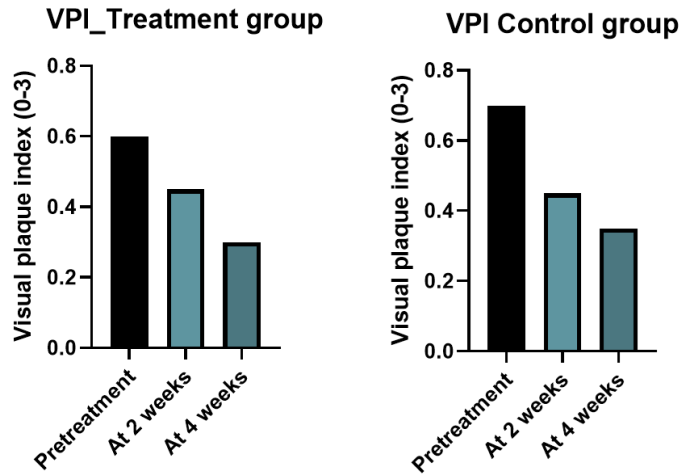
## Methods:

- 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: 1x a day for 2 weeks, then 2x 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)

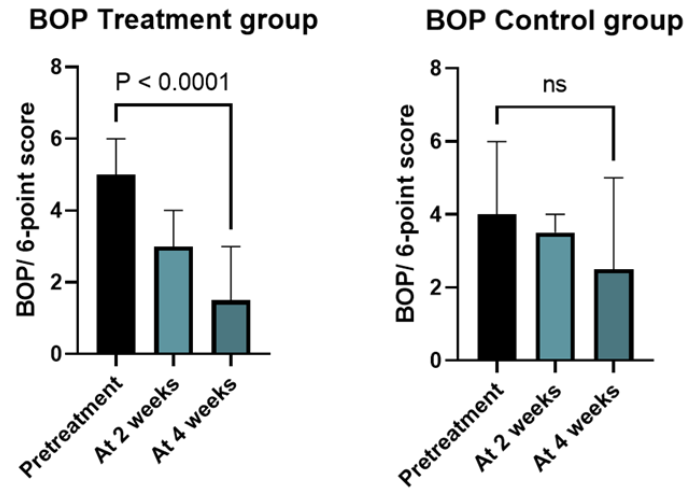


Condition/variable	Control group (n=20)	Lumoral group (n=20)	p-Value
<b>Gender, n, %</b>			
Female	11 (55%)	15 (75%)	<i>p</i> =1.000
Male	9 (45%)	5 (25%)	
<b>Age, mean ± SD</b>	66.75 ± 11.29	65.65 ± 8.2	<i>p</i> =1.000
<b>Diabetes, n, %</b>	2 (10%)	3 (15%)	<i>p</i> =1.000
<b>Diagnosis, n, %</b>			
Peri-implant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

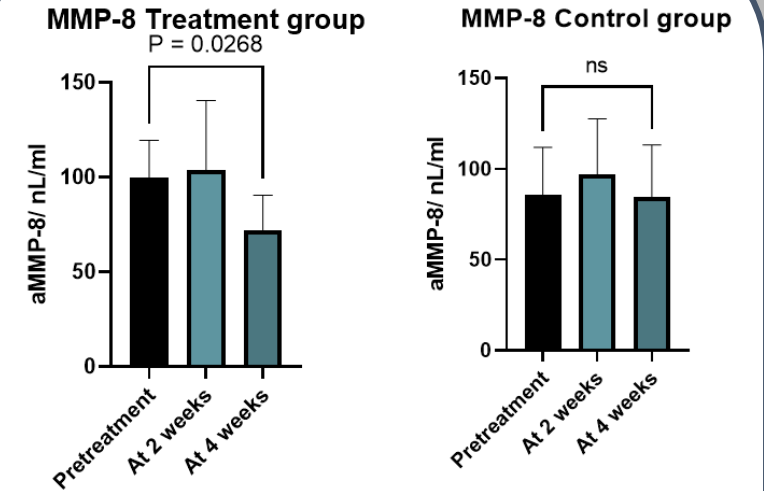
## Results:



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



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



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

- 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:

The use of regular double light based antibacterial double light with the Lumoral device improves the health status of the adjacent tissues of inflamed dental implants.

# La terapia fotodinamica a doppia luce aggiuntiva applicata regolarmente riduce l'infiammazione nelle malattie perimplantarie

Hanna Lähteenmäki<sup>1,4</sup>, Tommi Pätilä<sup>2</sup>, Ismo T. Räisänen<sup>1</sup>, Rauni Kalliala<sup>4</sup>, Taina Tervahartiala<sup>1</sup>, Timo Sorsa<sup>1,3</sup>

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

## Background:

- Il numero di impianti dentali è in costante aumento e l'infiammazione dei tessuti circostanti è un problema crescente. Un'efficace identificazione precoce e il trattamento dell'infiammazione sono essenziali, perché l'infiammazione avanzata è difficile e costosa da trattare.
- La terapia fotodinamica antibatterica (aPDT) eseguita regolarmente a casa ha dimostrato di migliorare i risultati del trattamento della parodontite cronica come aggiunta al trattamento convenzionale<sup>1</sup>
- Nello studio, abbiamo studiato l'effetto dell'aPDT applicata regolarmente nel trattamento domiciliare della malattia perimplantare osservata.

<sup>1</sup> 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

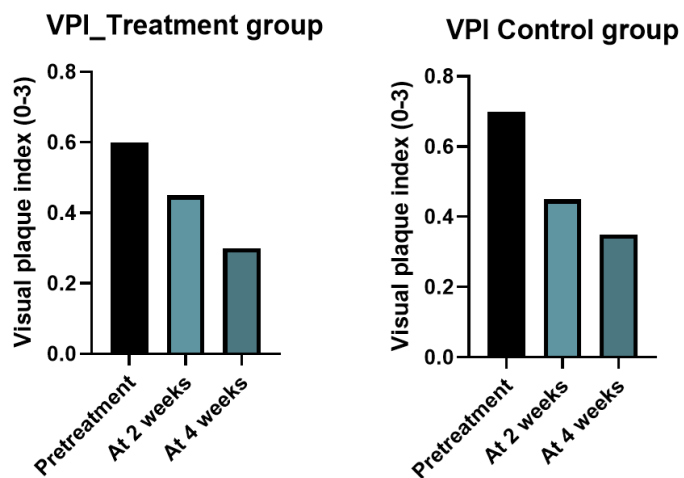
## Methods:

- 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: 1x a day for 2 weeks, then 2x 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)

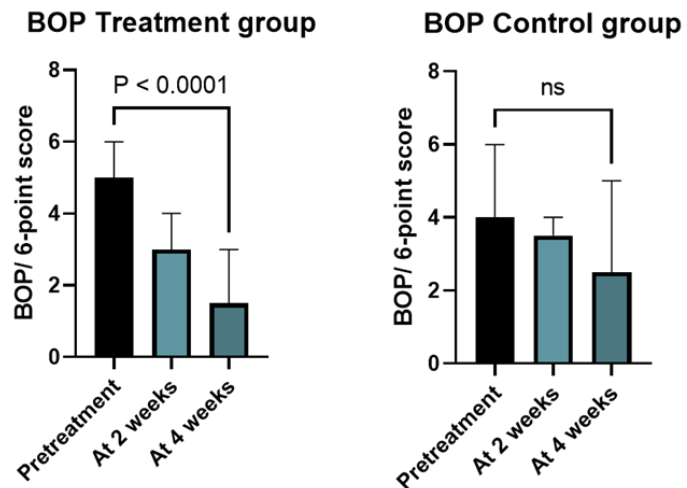


Condition/variable	Control group (n=20)	Lumoral group (n=20)	p-Value
<b>Gender, n, %</b>			
Female	11 (55%)	15 (75%)	$p=1.000$
Male	9 (45%)	5 (25%)	
<b>Age, mean <math>\pm</math> SD</b>	66.75 $\pm$ 11.29	65.65 $\pm$ 8.2	$p=1.000$
<b>Diabetes, n, %</b>	2 (10%)	3 (15%)	$p=1.000$
<b>Diagnosis, n, %</b>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

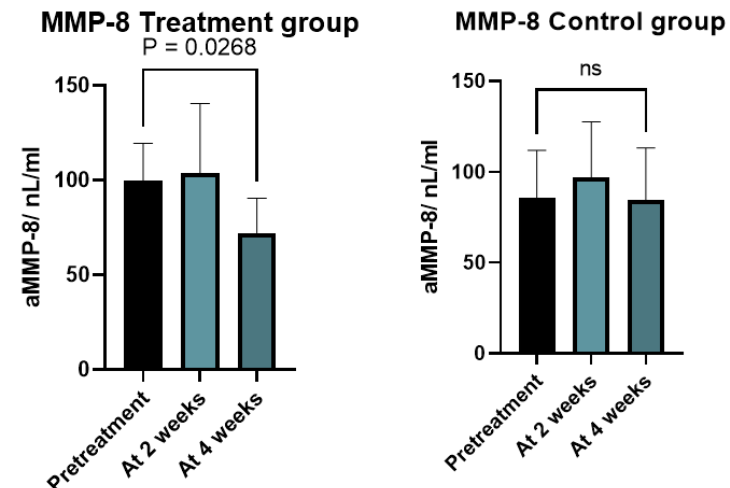
## Results:



Durante il periodo di studio di 4 settimane, VPI diminuito in entrambi i gruppi



Il BOP è diminuito significativamente nel gruppo di trattamento,  $4,7 \pm 1,3 - 1,8 \pm 1,6$  (KA $\pm$ SD),  $p < 0,0001$ , ma nessuna differenza statistica nel gruppo di controllo  $3,5 \pm 2,3 - 3,0 \pm 2,3$ ,  $p = 0,39$



L'aMMP-8 della tasca dell'impianto è diminuito nel gruppo di trattamento da  $100 \pm 41$  a  $72 \pm 38$  (KA $\pm$ SD),  $p = 0,027$ , ma non nel gruppo di controllo, da  $86 \pm 54$  a  $86 \pm$ ,  $p = 0,38$

## Conclusions:

- Nelle misurazioni della tasca dell'impianto, la correzione della profondità della tasca è stata misurata in 3 soggetti nel gruppo di trattamento e in 1 soggetto nel gruppo di controllo

L'uso della doppia luce antibatterica a base regolare di doppia luce con il dispositivo Lumoral migliora lo stato di salute dei tessuti adiacenti agli impianti dentali infiammati.