



## PHOTODYNAMIC THERAPY AS AN EFFICIENT ADJUNCT TO NON SURGICAL TREATMENT OF PERIODONTITIS: A CASE SERIES

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### ABSTRACT

The aim of this case series was to assess the efficacy of antimicrobial photodynamic therapy in the treatment of chronic periodontitis. This case series included two subjects with Presence of pocket depth 6 mm or more with clinical attachment loss (CAL) and bleeding on probing (BOP) in minimum of 1 tooth in atleast two quadrants. After full mouth mechanical debridement (SRP), first site received no further treatment, whereas, second site was subjected to photodynamic therapy. SRP+PDT group showed significant improvement in (CAL) and reduction in probing depth as compared to SRP group. Therefore, it can be concluded that Photodynamic therapy has its own advantage as an adjunct to SRP in the non surgical treatment of chronic periodontitis, further research for which may be advocated.

**KEYWORDS :** Photodynamic therapy, scaling and root planing, chronic periodontitis, non surgical treatment

### INTRODUCTION

Periodontitis is a chronic inflammatory disease caused by a complex polymicrobial infection that, if untreated, may result in breakdown of the periodontal tissues in susceptible individuals.<sup>1</sup> Scaling and root planning is the gold standard for treatment of chronic periodontitis but it alone may fail to eliminate the subgingival periodontopathogenic bacteria located in areas which are inaccessible to periodontal instruments such as multirooted teeth furcation sites, concavities and deep pockets. Therefore, photodynamic therapy (PDT) may provide a potential benefit in the treatment of periodontal disease by reducing and eradicating periodontopathogenic species in inaccessible sites.<sup>2</sup>

PDT is a technique combining diode laser energy with a photosensitizer to produce free radicals to destroy targeted cells. PDT is based on the principle that a dye, such as a photosensitizer or photoactivatable agent, binds to the target cells and is activated by light of an appropriate wavelength. By changing the energy status of the molecules in the photosensitizer, free radicals of singlet oxygen are formed, which are toxic to the cell by destroying the membrane.<sup>3</sup> Hence, the aim of this case series is to depict the beneficial effect of PDT on treatment outcomes of chronic periodontitis patients.

### CASE PRESENTATION

#### CASE 1

A 45 year old male patient reported to the OPD of Department of Periodontics, Maulana Azad Institute of Dental Sciences with chief complaint of bleeding gums. Gingival inflammation was observed. The patient was in good general health, had never smoked and did not take any medications. The initial examination revealed deep periodontal pocket, clinical attachment loss and bleeding on probing with respect to tooth no. 46 (left mandibular 1<sup>st</sup> molar) and 24 (right maxillary 1<sup>st</sup> premolar). Thorough supragingival and subgingival scaling was performed using ultrasonic and hand scalers and above mentioned clinical parameters recorded using UNC-15 probe (Figure 1&3). Tooth no. 46 received no further treatment. Tooth no. 24 received Photodynamic Therapy which was done as per the following steps.

The photosensitizer dye was injected into the bottom of the pocket using a blunt cannula until it appeared flowing over the free margin of the pocket (Figure 4). Dye was left in the pocket for duration of 3 minutes. Pocket was irrigated by normal saline, to remove excess dye, as it can act as an optical shield during laser irradiation. Laser application was performed circumferentially at six sites per tooth for 1 minute

(10 seconds each for mesio-buccal, buccal, disto-buccal, mesio-oral, oral and disto-oral surfaces of tooth), at wavelength of 660 nm, and power density of 100mW/cm<sup>2</sup>. Fiber-optic tip (HELBO<sup>®</sup> 3D pocket probe) of 0.6 mm diameter was inserted to the depth of pocket, followed by illumination for 10 seconds. (Figure 5) It was then moved to the next site, till all 6 sites around a tooth got illuminated. New 3D pocket probe was used for every patient. Clinical parameters were again recorded at three month interval. (Figure 2&6)

#### CASE 2

A 53 year old female, systemically healthy, non-smoker patient reported with the chief complaint of halitosis and swollen gums. The patient did not receive any periodontal treatment previously. The oral examination revealed deep periodontal pocket, clinical attachment loss and bleeding on probing with respect to tooth no. 36 (right mandibular 1<sup>st</sup> molar) and 26 (right maxillary 1<sup>st</sup> molar). Full mouth scaling and root planning was done and clinical parameters were recorded using UNC-15 probe (Figure 7&9). Tooth no. 36 received no further treatment. Tooth no. 26 received Photodynamic Therapy using the same steps as described previously (Figure 10&11). Clinical parameters were again recorded at three month interval (Figure 8&12).

### RESULT

The results/measurements derived from the two subjects have shown that both treatment protocols were efficacious in the treatment of patients with Chronic periodontitis but adjunctive Photodynamic therapy was more beneficial and resulted in significant improvements in the clinical outcome measurement. These values have been depicted in tables 1,2,3. Probing depths of both the subjects decreased considerably while using PDT as compared to SRP resulting in more gain of clinical tissue attachment.

### DISCUSSION

The aim of this case series was to evaluate the clinical effects of adjunctive Photodynamic therapy as compared to conventional mechanical debridement in chronic periodontitis patients. Photodynamic therapy (PDT) has been used to treat localized microbial infections because the free radicals generated during the therapy specifically destroys the pathogenic bacteria, sparing the host cells. PDT also decreases the amount of inflammation and accelerates wound healing by changing the expression of genes responsible for the production of inflammatory cytokines.<sup>4</sup> In the current study, plaque index (PI) decreased significantly from baseline to 1 month and 3 months post treatment in both the groups. These findings may be correlated with strict oral hygiene maintenance and supra-gingival scaling at every follow-up visit.

SRP+PDT group reported significant more reduction in probing depth group when compared to SRP and is consistent with the studies of Anderson et al (2007)<sup>5</sup>, Braun et al (2009)<sup>6</sup> and Lulic M (2009)<sup>7</sup>. This higher reduction in probing depth may have resulted from additional shrinkage in inflamed pocket wall after reduction in microbial load as achieved by photodynamic therapy, thus making it a very efficient treatment method employed in order to treat periodontal patients non surgically.

**FIGURES AND LEGENDS**



Figure 1: Probing of SRP site at Baseline



Figure 2: Probing of SRP site at 3 months



Figure 3: Probing of PDT site at Baseline



Figure 4: Photosensitizer dye injected into periodontal pocket

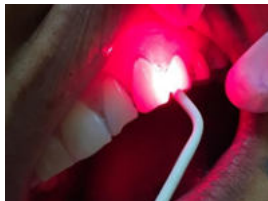


Figure 5: Illumination of photosensitizer by fiberoptic light



Figure 6: Probing of PDT site at 3 month



Figure 7: Probing of SRP site at Baseline



Figure 8: Probing of SRP site at 3 months



Figure 9: Probing of PDT site at Baseline



Figure 10: Photosensitizer dye injected into periodontal pocket



Figure 11: Illumination of photosensitizer by fiberoptic light



Figure 12: Probing of PDT site at 3 month

**TABLES**

**Table 1: Plaque index**

S. No.	Scaling and root planning(SRP)		Photodynamic therapy(PDT)	
	Baseline	3 month	Baseline	3 month
1.	1	0.75	1	0.25
2.	1.25	0.5	1.5	0.5

**Table 2: Probing Depth**

S. No.	Scaling and root planing (in mm)		Photodynamic therapy(in mm)	
	Baseline	3 month	Baseline	3 month
1.	7	4	7	2
2.	8	6	7	3

**Table 3: Clinical Attachment Level**

S. No.	Scaling and root planning(in mm)		Photodynamic therapy(in mm)	
	Baseline	3 month	Baseline	3 month
1.	7	4	7	2
2.	9	7	8	4

**CONCLUSION**

Within its limits, the present cases showed that Scaling and root planing is the mainstay of treatment in chronic periodontitis, however, its outcome can be enhanced by photodynamic therapy. Photodynamic therapy seems to be more beneficial in CAL gain and probing depth reduction when compared to SRP, which is an indicator of improvement in periodontal health. Therefore, Photodynamic therapy can be considered as useful adjunct to SRP in the non surgical treatment of chronic periodontitis.

**REFERENCES**

1. Sanz M, van Winkelhoff AJ; Working Group 1 of Seventh European Workshop on Periodontology. Periodontal infections: Understanding the complexity — Consensus of the Seventh European Workshop on Periodontology. *J Clin Periodontol* 2011;38(Suppl. 11):3-6.
2. Ishikawa I, Aoki A, Takasaki AA, Mizutani K, Sasaki KM, Izumi Y. Application of lasers in periodontics: True innovation or myth? *Periodontol* 2000 2009;50:90-126.
3. Soukos NS, Goodson JM. Photodynamic therapy in the control of oral biofilms. *Periodontol* 2000 2011;55:143-166.
4. Tuner J, Hode L. Some basic laser physics. In: *The Laser Therapy Handbook*. Grangesberg, Sweden: Prima Books; 2007. p. 317-38.
5. Andersen R, Loebel N, Hammond D, Wilson M. Treatment of periodontal disease by photodisinfection compared to scaling and root planing. *J Clin Dent*. 2007;18:34-8
6. Braun A, Dehn C, Krause F, Jepsen S. Short-term clinical effects of adjunctive antimicrobial photodynamic therapy in periodontal treatment: a randomized clinical trial. *J Clin Periodontol*. 2008;35:877-84
7. Lulic M, Leigegener GI, Salvi GE, Ramseier CA, Mattheos N, Lang NP. One-year outcomes of repeated adjunctive photodynamic therapy during periodontal maintenance: a proof-of-principle randomized-controlled clinical trial. *J Clin Periodontol*. 2009;36:661-6