doi: 10.13241/j.cnki.pmb.2019.23.045

光动力疗法辅助治疗轻中度牙周炎的疗效观察 *

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摘要 目的：探讨光动力疗法（PDT）辅助治疗轻中度牙周炎患者的临床疗效。**方法：**选取我院 2016 年 1 月 -2017 年 8 月收治的轻中度牙周炎患者 46 例为研究对象，共选取患牙 276 颗，随机分为观察组与对照组，每组 138 颗患牙，对照组予以龈下刮治术和根面平整术（SRP）治疗，观察组在对照组的基础上联合 PDT 治疗，比较治疗前、治疗后 1 个月、2 个月、3 个月观察两组患者的牙周袋探诊深度（PD）、探诊出血（BOP）阳性率、出血指数（BI）。**结果：**治疗后 1 个月、2 个月、3 个月，两组 PD 均随着时间的推移逐渐变浅（P<0.05），且观察组治疗后各时间点均浅于对照组（P<0.05）；两组 BOP 阳性率均较治疗前降低，且观察组治疗后各时间均低于对照组（P<0.05）；两组 BI 随着时间的推移呈逐渐下降趋势（P<0.05），且观察组治疗后各时间点 BI 均低于对照组（P<0.05）。**结论：**PDT 辅助治疗轻中度牙周炎患者的临床疗效较好，其能减小 PD，降低 BI 和 BOP 阳性率。

关键词：牙周炎；光动力疗法；龈下刮治术；根面平整术；探诊深度；探诊出血；出血指数

中图分类号：Q63；R781.4 **文献标识码：**A **文章编号：**1673-6273（2019）23-4593-04

Observation of the Therapeutic Effect of Photodynamic Therapy on Mild and Moderate Periodontitis*

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ABSTRACT Objective: To explore the clinical efficacy of photodynamic therapy (PDT) in the treatment of patients with mild and moderate periodontitis. **Methods:** 46 patients with mild and moderate periodontitis who were treated in our hospital from January 2016 to August 2017 were selected as the research subjects, a total of 276 teeth were selected, which were randomly divided into the observation group and the control group, with 138 teeth in each group. The control group was treated with scaling and root planing (SRP), and the observation group was treated with PDT on the basis of the control group. The probing depth (PD), the positive rate of bleeding on probing (BOP) and bleeding index (BI) in two groups before treatment, 1 months, 2 months and 3 months after treatment were compared. **Results:** After 1 month, 2 months and 3 months of treatment, PD in the two groups gradually became shallower with time (P<0.05), and the PD in the observation group at each time point after treatment were shallower than that in the control group (P<0.05); The positive rate of BOP in two groups was lower than before treatment, and the positive rate of BOP in the observation groupat each time point after treatment were lower than that in the control group (P<0.05); The BI in the two groups became lower with time, and the BI in observation group at each time point after treatment were lower than that in the control group (P<0.05). **Conclusion:** PDT assisted treatment of mild and moderate periodontitis has a good clinical effect, which can reduce PD, and BI, improve the positive rate of BOP.

Key words: Periodontitis; Photodynamic therapy; Subgingival curettage; Root planing; Probing depth; Bleeding on probing; Bleeding index

Chinese Library Classification(CLC): Q63; R781.4 Document code: A

Article ID: 1673-6273(2019)23-4593-04

前言

牙周炎是一种慢性感染性疾患，是指在支持牙齿的组织周围形成炎症并对牙齿组织造成破坏，病情严重时则导致牙齿松动、脱落，该病多发于 35 岁以上人群，是成人牙齿丧失的主要原因[1-3]。经有关研究表明，该病的始动因子为龈下菌斑微生物，但其发病机制仍不完全清楚[4,5]。龈下刮治术和根面平整术（scaling and root planing，SRP）是治疗牙周炎的常用方法，此方法能将附着在牙面和根面的菌斑及结石有效的清除，但随着病情的持续发展，牙周袋及其内部结构将发生变化，单用 SRP 方法不能完全清除菌斑、结石以及炎性组织等[6-8]。光动力疗法（Photodynamic therapy，PDT）是一种治疗牙周炎的新型微创抗菌技术，其原理是运用光敏物质与光化学相结合从而达到灭菌的目的[9,10]。本研究选取轻中度慢性牙周炎患者，在 SRP 治疗基础上再予以 PDT 对残留在牙周袋内的细菌进行消除，并观察疗效，旨在为轻中度牙周炎治疗方法的选取提供参考，现报道

* 基金项目：青海省科技厅应用基础研究计划项目（2013-Z-733）

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（收稿日期：2019-04-23 接受日期：2019-05-19）

如下。

1 资料与方法

1.1 一般资料

选择 2016 年 1 月 -2017 年 8 月我院收治的 46 例轻中度牙周炎患者，纳入标准：(1)符合轻中度牙周炎相关标准[11]；(2)患者全部牙齿中的牙周探诊深度(probing depth，PD)至少有 1 个位点≥ 7 mm，且探诊出血(bleeding on probing，BOP)阳性在口腔的分布区域≥ 2 个象限；(3)X 线牙槽骨吸收≥ 根长的一半；(4) 所有患者治疗前均签署知情同意书；(5) 口腔尚存牙数≥ 20 颗。排除标准：(1)一年内接受过牙周炎相关治疗且在近 3 个月服用过抗生素者；(2)处于妊娠期患者；(3)精神疾病不能配合治疗者；(4) 对光及甲亚甲基蓝有过敏反应者；(5)合并严重的全身慢性疾病者。其中男性 26 例，女性 20 例，年龄 29-69 岁，平均年龄(48.23± 5.61)岁。所有患者均在对侧同名牙中选择病损相近的患牙进行观察，共纳入 276 颗患牙，以随机分组方式分为观察组与对照组，每组 138 颗患牙。

1.2 方法

根据患者症状体征、相关检查进行常规对症治疗，嘱患者加强口腔卫生并予以相应指导及示范，口腔卫生应始终贯穿整个治疗过程。两组患者在治疗观察期间均不服用任何抗生素，对照组采用 Gracey 标准龈下刮治器械套装（商品名：Hu Friedy，生产地：USA）实施龈上洁治术，并使用法国赛特力 P5X5 超声波牙周治疗仪(上海三崴医疗设备有效公司)行龈下刮治术以及 SRP 治疗，观察组在对照组的基础上予以 PDT 治疗，选取 PD≥ 7 mm 的位点进行激光治疗，PDT 具体方法：在牙周袋底缓慢注射亚甲基蓝溶液(商品名：Yes Blue，Yes Bio，Inc，生产地：美国)，直至自行溢出后停止，溶液保留在牙周袋内 3 分钟，每个位点采用连续发光二极管(商品名：Yes Bio，Inc，生产地：美国)激光仪进行照射 1 分钟左右(激光治疗：输出红光波长 660 nm，功率 150 mW)，以上所有治疗操作均由同一医师完成。

1.3 观察指标

所有患者通过复查的方式随访 3 个月，分别于治疗前、治疗后 1 个月、2 个月、3 个月采用标准手用牙周探针(生产商：上海康桥齿科医械厂，WHO 探针)检测 PD，在进行 PD 检查时观察有无出血情况，若在探诊 10 秒后发生出血情况则记录为阳性，否则为阴性，记录 BOP 阳性率，观察两组患者的出血指数(Bleeding index，BI)，总分为 5 分，分值越高代表出血症状越严重。

1.4 统计学方法

运用 SPSS23. 0 软件进行统计分析，计量资料 PD 和 BI 采用($\bar{x}\pm s$)表示，实施 t 检验，计数资料 BOP 阳性率以(%)表示，实施 x^2 检验，检验水准设置为 α=0.05。

2 结果

2.1 两组治疗前后 PD 比较

治疗后 1 个月、2 个月、3 个月两组 PD 均浅于治疗前，随着时间的推移呈逐渐下降趋势(P<0.05)，且治疗后各时间点观察组 PD 均浅于对照组(P<0.05)。见表 1。

表 1 两组治疗前后 PD 比较($\bar{x}\pm s$，mm)

Table 1 Comparison of PD in two group before and after treatment($\bar{x}\pm s$, mm)

Groups	n	Before treatment	1 months after treatment	2 months after treatment	3 months after treatment
Observation group	138	7.82± 1.12	4.89± 0.73*	4.21± 0.84*#	3.52± 0.78*#@
Control group	138	7.91± 1.03	5.62± 0.81*	4.75± 0.72*#	3.79± 0.76*#@
t	-	0.695	7.865	5.734	2.912
P	-	0.488	0.000	0.000	0.004

Note: Compared with before treatment, *P<0.05; compared with 1 months after treatment, #P<0.05; compared with 2 months after treatment, @P<0.05.

2.2 两组治疗前后 BOP 阳性率比较

治疗后 1 个月、2 个月、3 个月两组 BOP 阳性率均低于治疗前，且观察组低于对照组，差异有统计学意义(P<0.05)。见表 2。

表 2 两组治疗前后 BOP 阳性率比较[n(%)]

Table 2 Comparison of the positive rate of BOP in two groups before and after treatment [n (%)]

Groups	n	Before treatment	1 months after treatment	2 months after treatment	3 months after treatment
Observation group	138	128(92.75)	57(41.30)*	48(34.78)*	37(26.81)*
Control group	138	129(93.48)	88(63.77)*	74(53.62)*	63(45.65)*
t	-	0.057	13.963	9.931	10.601
P	-	0.812	0.000	0.002	0.001

Note: Compared with before treatment, *P<0.05.

2.3 两组治疗前后 BI 比较

治疗后 1 个月、2 个月、3 个月两组 BI 均低于治疗前，随着时间的推移呈逐渐下降趋势(P<0.05)，且治疗后各时间点观察组 BI 均低于对照组(P<0.05)。见表 3。

表 3 两组治疗前后 BI 比较($\bar{x}\pm s$,分)

Table 3 Comparison of BI in two group before and after treatment($\bar{x}\pm s$, score)

Groups	n	Before treatment	1 months after treatment	2 months after treatment	3 months after treatment
Observation group	138	3.12± 0.45	1.85± 0.27*	1.17± 0.31*#	1.01± 0.24*#@
Control group	138	3.08± 0.41	2.17± 0.25*	1.51± 0.48*#	1.31± 0.31*#@
t	-	0.772	10.216	6.990	8.989
P	-	0.441	0.000	0.000	0.000

Note: Compared with before treatment, *P<0.05; compared with 1 months after treatment, #P<0.05; compared with 2 months after treatment, @P<0.05.

3 讨论

牙周炎是由菌斑微生物引起的宿主免疫反应和炎症反应，从而破坏牙周支持组织，导致牙周袋进行性附着丧失和牙槽骨吸收，其具体的发病机制尚不清楚，但有报道显示，微生物在发病机制起着重要作用，其中革兰氏阴性菌是致病的重要因素[12-14]。由于在治疗牙周炎时针对微生物治疗而广泛使用抗生素，导致产生大量耐药的细菌微生物，因此寻求一种更好的抗菌治疗方法显得尤为重要[15,16]。PDT 作为一种控制感染的新方法在牙周炎疾病中广泛应用，其灭菌的基本原理是通过光敏剂、激光和组织中的分子氧共同协同作用，具体过程为应用光敏剂标识组织与细胞，在激光照射后发生氧化作用使得细胞结构发生氧化损伤，最终导致细胞死亡[17-19]。该治疗方法操作时间短且患者无明显疼痛，易被患者所接受。通过 PDT 治疗不会产生耐药性，而且其在有效灭菌的同时，不会对人体造成热损伤[20]。亚甲基蓝是 PDT 治疗的光敏剂，其对红光尤为敏感，在波长为 660nm 时为最大吸收峰位，且对革兰氏阴性菌可进行明显染色，故通过此方法可有效地消灭致病菌，达到治疗牙周炎的目的[21]。此外，亚甲基蓝作为第三代光敏剂，在第二代的基础上应用某些特殊的化学物质作为其载药体系，使得 PDT 在治疗过程中的效果增强，有研究发现第三代光敏剂可与壳聚糖、赖氨酸等形成聚合体，形成的聚合体水溶性明显增强细菌的结合能力[22,23]，故可应用 PDT 当作牙周炎的辅助疗法。

有研究发现[24]，PDT 可作为机械清创后的辅助疗法，且证实有效。本研究发现，治疗后 1 个月、2 个月、3 个月两组 PD、BI 均低于治疗前，随着时间的推移呈逐渐下降趋势，且治疗后各时间点观察组 PD、BI 均低于对照组(P<0.05)，说明不管是单独采用 SRP 进行治疗还是应用 SRP 联合 PDT 进行治疗，对轻中度牙周炎患者的 PD、BI 均有所改善，但单独采用 SRP 治疗疗效较差，而联合应用 PDT 可有效杀灭细菌微生物，对牙周炎有较好的治疗效果。PDT 作为辅助疗法已被应用在牙周炎的初始治疗和维护治疗阶段，其操作时间只需 1 分钟左右，细菌抵抗可能小，并且治疗过程无需麻醉，舒适度较高，治疗精准，减少损伤临近组织的可能性[25,26]。有研究显示[27]，在 PD>6 mm 时，单用 SRP 治疗后仅有福赛坦氏菌明显减少，而其他致病菌如牙龈卟啉单胞菌、齿垢密螺旋体等与治疗前相比无差异性，此研究表明对于 PD>6 mm 的位点单用 SRP 治疗对牙周炎致病菌作用较差。而大量研究报道[28,29]，PDT 可对上述致病菌进行有效的清除，抑制炎症因子的升高。本研究结果还显示，治疗后 1 个月、2 个月、3 个月两组 BOP 阳性率均低于治疗前，且观察组低于对照组(P<0.05)，说明 SRP 联合 PDT 治疗牙周炎可加速牙周组织的愈合，减少出血症状，可能的原因是 PDT 治疗的光敏剂对微生物有高选择性，而对宿主细胞损伤较小，无副作用，并且不会产生耐药菌株，此外，联合 PDT 治疗可消除一下游离在根凹面、内陷区、牙周结缔组织中的细菌，改善了牙周组织愈合的微环境，促进牙周组织的修复[30]。

综上所述，对于轻中度牙周炎患者，SRP 联合 PDT 治疗可改善 PD、BI 水平，降低 BOP 阳性率，疗效优于单独采用 SRP 治疗，可在临床上进一步推广运用。

参 考 文 献(References)

[1] Wei X, Zhao HQ, Ma C, et al. The association between chronic periodontitis and oral Helicobacter pylori: A meta-analysis[J]. PLoS One, 2019, 14(12): e0225247

[2] Leite FRM, Nascimento GG, Scheutz F, et al. Effect of Smoking on Periodontitis: A Systematic Review and Meta-regression [J]. Am J Prev Med, 2018, 54(6): 831-841

[3] Mertens B, Orti V, Vialaret J, et al. Assessing a multiplex-targeted proteomics approach for the clinical diagnosis of periodontitis using saliva samples[J]. Bioanalysis, 2018, 10(1): 35-45

[4] Rashmi N, Galhotra V, Goel P, et al. Assessment of C-reactive Proteins, Cytokines, and Plasma Protein Levels in Hypertensive Patients with Apical Periodontitis [J]. J Contemp Dent Pract, 2017, 18(6): 516-521

[5] Martínez-Martínez RE, Moreno-Castillo DF, Loyola-Rodríguez JP, et al. Association between periodontitis, periodontopathogens and preterm birth: is it real?[J]. Arch Gynecol Obstet, 2016, 294(1): 47-54

[6] Ashouri Moghaddam A, Radafshar G, Jahandideh Y, et al. Clinical Evaluation of Effects of Local Application of Aloe vera Gel as an Adjunct to Scaling and Root Planning in Patients with Chronic Periodontitis[J]. J Dent (Shiraz), 2017, 18(3): 165-172

[7] Raghava KV, Sistla KP, Narayan SJ, et al. Efficacy of Curcumin as an Adjunct to Scaling and Root Planing in Chronic Periodontitis Patients: A Randomized Controlled Clinical Trial [J]. J Contemp Dent Pract, 2019, 20(7): 842-846

[8] Gandhi KK, Pavaskar R, Cappetta EG, et al.Effectiveness of Adjunctive Use of Low-Level Laser Therapy and Photodynamic Therapy After Scaling and Root Planing in Patients with Chronic Periodontitis[J]. Int J Periodontics Restorative Dent, 2019, 39(6): 837-843

[9] Joseph B, Janam P, Narayanan S, et al. Is Antimicrobial Photodynamic Therapy Effective as an Adjunct to Scaling and Root Planing in Patients with Chronic Periodontitis? A Systematic Review [J]. Biomolecules, 2017, 7(4): E79

[10] Mistry A, Pereira R, Kini V, et al. Effect of Combined Therapy Using Diode Laser and Photodynamic Therapy on Levels of IL-17 in Gingival Crevicular Fluid in Patients with Chronic Periodontitis[J]. J Lasers Med Sci, 2016, 7(4): 250-255

[11] 裴喜燕, 欧阳翔英, 和璐. 关于牙周炎定义标准[J].牙体牙髓牙周病学杂志, 2015, 7(1): 45-51

[12] Belstrøm D, Sembler-Møller ML, Grande MA, et al. Microbial profile comparisons of saliva, pooled and site-specific subgingival samples in periodontitis patients[J]. PLoS One, 2017, 12(8): e0182992

[13] 王珺, 欧龙, 谢潇, 等. 慢性牙周炎患者洁刮治术后牙周微生物变化及意义[J].现代生物医学进展, 2015, 15(17): 3228-3231

[14] Dolińska E, Skurska A, Dymicka-Piekarska V, et al. The Effect of Nonsurgical Periodontal Therapy on the Level of Human Neutrophil Peptides 1-3 in Patients with Aggressive Periodontitis[J]. Oral Health Prev Dent, 2017, 15(6): 557-561

[15] Devji T. Mechanical and antibiotic periodontal therapies may be no different in terms of tooth loss in patients with chronic periodontitis [J]. J Am Dent Assoc, 2017, 148(9): e124

[16] Borges I, Faveri M, Figueiredo LC, et al. Different antibiotic protocols in the treatment of severe chronic periodontitis: A 1-year randomized trial[J]. J Clin Periodontol, 2017, 44(8): 822-832

[17] Chambrone L, Wang HL, Romanos GE. Antimicrobial photodynamic therapy for the treatment of periodontitis and peri-implantitis: An American Academy of Periodontology best evidence review [J]. J Periodontol, 2018, 89(7): 783-803

[18] Zorita-García M, Alonso-Ezpeleta LÓ Cobo M, et al. Photodynamic therapy in endodontic root canal treatment significantly increases bacterial clearance, preventing apical periodontitis [J]. Quintessence Int, 2019, 50(10): 782-789

[19] Pulikkotil SJ, Toh CG, Mohandas K, et al. Effect of photodynamic therapy adjunct to scaling and root planing in periodontitis patients: A randomized clinical trial[J]. Aust Dent J, 2016, 61(4): 440-445

[20] Corrêa MG, Oliveira DH, Saraceni CH, et al. Short-term microbiological effects of photodynamic therapy in non-surgical periodontal treatment of residual pockets: A split-mouth RCT [J]. Lasers Surg Med, 2016, 48(10): 944-950

[21] Filipini SMR, Campagnolo CB, Dutra DAM, et al. Adjunctive antimicrobial photodynamic therapy using methylene blue/ethanol formulation in experimental periodontitis in diabetic rats: short-term results[J]. Lasers Med Sci, 2019, 34(6): 1253-1260

[22] Agut-Busquet E, Romaní J, Gilaberte Y, et al. Photodynamic therapy with intralesional methylene blue and a 635 nm light-emitting diode lamp in hidradenitis suppurativa: a retrospective follow-up study in 7 patients and a review of the literature [J]. Photochem Photobiol Sci, 2016, 15(8): 1020-1028

[23] Malgikar S, Reddy SH, Sagar SV, et al. Clinical effects of photodynamic and low-level laser therapies as an adjunct to scaling and root planing of chronic periodontitis: A split-mouth randomized controlled clinical trial[J]. Indian J Dent Res, 2016, 27(2): 121-126

[24] Chatzopoulos GS, Doufexi AE. Photodynamic therapy in the treatment of aggressive periodontitis: A systematic review [J]. Med Oral Patol Oral Cir Bucal, 2016, 21(2): e192-e200

[25] Segarra-Vidal M, Guerra-Ojeda S, Vallés LS, et al. Effects of photodynamic therapy in periodontal treatment: A randomized, controlled clinical trial[J]. J Clin Periodontol, 2017, 44(9): 915-925

[26] Petelin M, Perkič K, Seme K, et al. Effect of repeated adjunctive antimicrobial photodynamic therapy on subgingival periodontal pathogens in the treatment of chronic periodontitis [J]. Lasers Med Sci, 2015, 30(6): 1647-1656

[27] Uraz A, Karaduman B, Isler SÇ, et al. Ozone application as adjunctive therapy in chronic periodontitis: Clinical, microbiological and biochemical aspects[J]. J Dent Sci, 2019, 14(1): 27-37

[28] Theodoro LH, Longo M, Novaes VCN, et al. Low-level laser and antimicrobial photodynamic therapy on experimental periodontitis in rats submitted to chemotherapy by 5-fluorouracil [J]. Support Care Cancer, 2017, 25(10): 3261-3271

[29] da Cruz Andrade PV, Euzebio Alves VT, de Carvalho VF, et al. Photodynamic therapy decrease immune-inflammatory mediators levels during periodontal maintenance[J]. Lasers Med Sci, 2017, 32(1): 9-17

[30] Chambrone L, Wang HL, Romanos GE. Antimicrobial photodynamic therapy for the treatment of periodontitis and peri-implantitis: An American Academy of Periodontology best evidence review [J]. J Periodontol, 2018, 89(7): 783-803

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[29] Coccia E, Marziali G, Fiorucci G, et al. Transcriptional induction of H2 (class I) antigens and beta 2 microglobulin by interferon-gamma in interferon-sensitive and interferon-resistant Friend leukemia cells. [J]. Journal of Biological Regulators & Homeostatic Agents, 2016, 6 (6): 21-25

[30] Nasseh H, Abdi S, Roshani A, et al. Urinary Beta-2Microglobulin: An Indicator of Renal Tubular Damage after Extracorporeal Shock Wave Lithotripsy[J]. Urology Journal, 2016, 13(6): 2911