MEDWIN PUBLISHERS
Committed to Create Value for Researchers

Open Access Journal of Mycology & Mycological Sciences
ISSN: 2689-7822

Antimicrobial Photodynamic Therapy for treating Oral Candidiasis: Mini Review

Trigo-Gutierrez JK*
Health Science School, Franz Tamayo University, Bolivia

***Corresponding author:** Jeffersson Krishan Trigo-Gutierrez, Health Science School, Franz Tamayo University, La Paz, Bolivia; Email: doc.jefferssonkrishan.trigo.gu@unifranz.edu.bo

Mini Review
Volume 5 Issue 1
Received Date: May 13, 2022
Published Date: May 31, 2022
DOI: 10.23880/oajmms-16000163

Abstract

The antimicrobial Photodynamic Therapy (aPDT) has been suggested to treat microbial infections, even those caused by resistance microorganisms. In oral cavity, the aPDT has been used to treat infections on gum, root channel, or soft tissues. This mini-review shows an overview of aPDT used for treat oral candidiasis in the palate.

Keywords: Oral candidiasis; Photosensitizer; antimicrobial Photodynamic Therapy (aPDT); Denture Stomatitis

Introduction

Oral candidiasis (OC) is a fungal infection disease mainly caused by fungi of the Candida genus. However, other Candida species such as *Candida glabrata*, *Candida tropicalis*, and *Candida krusei* have been associated with the disease [1]. Clinically OC can show as white or red lesions affecting gun, tongue, cheilitis, or palate [1,2]. The treatment of the OC is mainly using antifungals such as fluconazole, miconazole, amphotericin B, or nystatin [2,3]. Nevertheless, the non-*albicans* fungal species can develop resistance to conventional antifungals [4,5]. Furthermore, disinfectant solutions and antiseptic mouthwashes have been associated with tissue irritation [6].

Therefore, antimicrobial Photodynamic Therapy (aPDT) has been suggested as an alternative to solve these problems. In aPDT interact with a chemical compound called Photosensitizer (PS), a light source in an adequate wavelength for the PS, and oxygen [7,8]. Briefly, the PS -in presence of oxygen- is stimulated by the light, following the generation of free radicals that promote microbial death [7,8]. In a standard procedure of aPDT, the microbial and the PS are incubated in the dark for some time (Pre-Irradiation Time), then, a light source is used at a different time to promote the reaction for microbial death [8,9].

Clinical Reports

Clinical reports of aPDT include the treatment of Denture Stomatitis (DS), which is a type of fungal oral infection that affect up to 70% of denture wearers [10]. The risk factors for developing the DS include denture wear, poor hygiene of dentures, patients who sleep wearing the denture, external factors as radiotherapy, chemotherapy, and immune-compromised patients [5,10]. Patients with a diagnosis of DS have been reported burning, painful sensations, changes in taste, and swallowing difficulty [10]. Clinically DS is classified by the extension of the lesions by the Newton criteria, which includes three types of DS: Type I is simple and localized inflammation (pin-point hyperemia). Type II –most common- diffuse erythema and edema of palatal mucosa. Type III granular inflammatory papillary hyperplasia [5,10].

Patients with diagnosis of DS were submitted to aPDT mediated by Photogem as photosensitizer at 500 mg/L [5,6]. In a study with 5 patients with the diagnosis of DS, the individuals and their dentures in contact with the PS were kept in the dark for 30 minutes. Then, the dentures and palates were irradiated with blue light at 455 nm by 37.5

J/cm^2 and 122 J/cm^2, respectively, for 15 days thrice per week. The authors observed that in 4 of 5 patients the DS was resolved [5]. In another study [6], aPDT was evaluated in smokers and non-smokers patients with DS diagnosis using Photogem at 500 mg/L as PS associated with 12 J/cm^2 of light dose [6]. The aPDT promotes a significant decrease in colony count in both groups evaluated, additionally, the non-smokers showed a lower amount of fungi compared to smokers [6].

The effect of aPDT mediated by Photodathazine® (another type of PS) at 200 mg/L associated with PIT 20 minutes and irradiation with 50 J/cm^2 (660 nm light) on palate and denture was compared to Nystatin oral suspension (100,000 IU/mL) applied 4 times per day by 15 days. Both treatments were effective in promoting wound healing of the palate. Nevertheless, the aPDT was more effective than nystatin in promoting microbial death, since a significant difference was observed at baseline and final treatment in patients treated with aPDT, by the contrary, there was not a significant difference in baseline and final the treatment in patients treated with the antifungal [10].

Besides DS the aPDT has been evaluated in immunosuppressed patients with a diagnosis of oral candidiasis [11-13]. A patient submitted to immune suppression because of hematopoietic cell transplantation developed oral candidiasis resistance to micafungin in a patient with grade-III mucositis with ulcerative lesions on the palate -pseudomembranous candidiasis- [11]. The patient was submitted to aPDT mediated by methylene blue at 0.01% that was sprayed on the palate followed PIT for 3 minutes and irradiated with 178 J/cm^2 of light dose (wavelength at 660 nm). After 3 days the mucosa health was improved [11].

A pediatric patient submitted to head and neck radiotherapy by Undifferentiated Mesenchymal Neoplasm in the right masticatory space showed white lesions on the palate. The palate of the patient was incubated with 0.05% of methylene blue and following irradiated with red light (35 J/cm^2). The painful symptoms disappear after 12 days, also, was observed complete wound of palatal mucosa [12].

In a study Du M, et al. [13], patients with oral candidiasis associated with AIDS were submitted to aPDT mediated by methylene blue at 400 μM or 600 μM using light at 633 nm (37.29 J/cm^2) in two sessions. Both concentrations of PS promoted wound healing of oral mucosa [13].

Conclusion

As observed in this brief review the aPDT has the potential to treat oral fungal infections. However, the protocols should be carefully reviewed before to establish the aPDT as a viable clinical alternative to treat oral infections.

References

1. Hellstein JW, Marek CL (2019) Candidiasis: Red and White Manifestations in the Oral Cavity. Head Neck Pathol 13(1): 25-32.

2. Millsop JW, Fazel N (2016) Oral candidiasis. Clin Derm 34(4): 487-494.

3. Lyu X, Zhao C, Yan ZM, Hua H (2016) Efficacy of nystatin for the treatment of oral candidiasis: a systematic review and meta-analysis. Drug Des Devel Ther 10: 1161-1171.

4. Campos L, Rezende SB, Palma LF, Hotsumi AM, Tateno RY, et al. (2021) Antimicrobial photodynamic therapy to oral candidiasis not responsive to micafungin in a patient undergoing hematopoietic cell transplantation. Photodiagnosis Photodyn Ther 34: 102296.

5. Mima EG, Pavarina AC, Silva MM, Ribeiro DG, Vergani CE, et al. (2011) Denture stomatitis treated with photodynamic therapy: five cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 112(5): 602-608.

6. Abduljabbar T, Al Askar M, Baig MK, AlSowygh ZH, Kellesarian SV, et al. (2017) Efficacy of photodynamic therapy in the inactivation of oral fungal colonization among cigarette smokers and non-smokers with denture stomatitis. Photodiagnosis Photodyn Ther 18: 50-53.

7. Abrahamse H, Hamblin MR (2016) New photosensitizers for photodynamic therapy. Biochem J 473(4): 347-364.

8. Cieplik F, Deng D, Crielaard W, Buchalla W, Hellwig E, et al. (2018) Antimicrobial photodynamic therapy what we know and what we don't. Crit Rev Microbiol 44(5): 571-589.

9. Warrier A, Mazumder N, Prabhu S, Satyamoorthy K, Murali TS (2021) Photodynamic therapy to control microbial biofilms. Photodiagnosis and Photodynamic Therapy 33: 102090.

10. Alves F, Carmello JC, Alonso GC, De Oliveira Mima EG, Bagnato VS, et al. (2020) A Randomized clinical trial evaluating Photodithazine-mediated Antimicrobial Photodynamic Therapy as a treatment for denture stomatitis. Photodiagnosis Photodyn Ther 32: 102041.

11. Campos L, Rezende SB, Palma LF, Hotsumi AM, Tateno RY, et al. (2021) Antimicrobial photodynamic therapy to oral candidiasis not responsive to micafungin in a patient undergoing hematopoietic cell transplantation.

Photodiagnosis Photodyn Ther 34: 102296.

12. Rojz JCC, Cotomacio CC, Caran EM, Chen MJ, Figueiredo MLS (2022) Photodynamic therapy to control oral candidiasis in a pediatric patient undergoing head and neck radiotherapy. Photodiagnosis Photodyn Ther 37: 102627.

13. Du M, Xuan W, Zhen X, He L, Lan L, et al. (2021) Antimicrobial photodynamic therapy for oral Candida infection in adult AIDS patients: A pilot clinical trial. Photodiagnosis Photodyn Ther 34: 102310.