Long-Term Follow-Up Study of Orthodontic Patients Undergoing Oral Decontamination by Photodynamic Therapy

Kate Cristina Blanco*, Vitor Hugo Panhca, Natalia Mayumi Inada, Vanderlei Salvador Bagnato
São Carlos Institute of Physics, University of São Paulo – Box 369, 13566-970, São Carlos, SP, Brazil

Abstract

**Background:** Photodynamic Therapy (PDT) is available for oral decontamination, including curcumin and blue LED (450nm).

**Aim:** the aim of this study was to evaluate safety factors five years after treatment.

**Methods:** the follow up of patients who underwent PDT for oral decontamination in 2013 were studied. In first study, a total of 24 volunteers were distributed into four groups: blue light irradiation; curcumin in surfactant; surfactant and irradiation with blue light; curcumin in surfactant and irradiated with blue light. The late evaluation of toxicity by PDT on human oral mucosa was performed.

**Results:** symptoms and signs of side effects in oral mucosa were evaluated five years post treatment. The results indicated that PDT using curcumin associated to blue light no known side effects during five years. The results indicated that the PDT using curcumin and blue light (450 nm) no known side effects during and after five years from treatment. Discussion: these results suggest that the late evaluation performed was accurate and efficient for screening of side effects for five years after PDT.

**Conclusions:** Patient’s “quality of life after oral PDT was observed. We are now able to report more the monitoring the unwanted effects over the past five years.

**Keywords:** PDT; Curcumin; Long-term; Side effects; Quality of life; Late evaluation

Introduction

The bacterial bio-film formed on the dental tissues are sources of pathogenic microorganisms related to upper respiratory tract infection [1]. Immune system is often not able to coordinate action against the pathogens. Which may increase the risk of systemic disease [2].

Group A streptococcus is a common causes of pharyngitis in humans [3]. Rheumatic fever is a secondary infection in oropharyngeal patients [4]. Standard treatment is the administration of antibiotics (Andersson 2003). The indiscriminate use of these drugs may aid in the increase of bacterial strains resistant to available substances. Multi-drug resistant bacteria cause emerging diseases of international public health importance

PDT is a treatment at low cost and can achieve rapid results oral infections [5]. To perform the PDT is used a photosensitizer activated by a light source of adequate wavelength that, in the presence of oxygen, to produce reactive toxic species that inactivate the target cells as microorganisms.

Clinical follow up monitories the patient’s health over time after treatment. Therefore, the reliability of a clinical method depends of observation period of patients long enough [6]. We analyze the adverse effects on the oral mucosa by PDT, thereby assisting the possibility of therapy for oropharyngeal diseases as infectious pharyngotonsillitis. The aim of this study was to analyze the follow up in patients who have undergoing antimicrobial PDT by comparing findings immediately after, and in long post oral treatment follow-up.

Methods

This study was approved by the Human Research Ethics Committee of the Federal University of
São Carlos with protocol N° 258.461 [7]. Terms of Free and Informed Consent were presented and signed by patients when treatment was indicated. The therapy was indicated for patients with the utilization of dental brackets or metallic bands that difficult the patient’s ability to perform oral hygiene. For this study the inclusion criteria were: orthodontic treatment without administration of systemic antibiotics and absence of periodontal disease. A total of 24 orthodontic patients were distributed into four groups: 1) blue light irradiation; 2) curcumin plus surfactant; 3) surfactant and irradiated with blue light; 4) curcumin plus surfactant and irradiated with blue light.

Follow up

Since September 2013, 24 orthodontics patients (age 18 to 50) treated with oral PDT were retrospectively studied. The late evaluation protocol recorded the following characteristics: clinical history; physical examination; complaints of pain; burning; dryness; alteration of palate; fever; bleeding and ulcerations. In addition, appearance of the oral mucosa, oropharynx and tonsils were evaluated. The hard and soft palate, oral mucosa, tongue and gingiva were examined for inflammation, ulceration and signs as irritation.

Results and Discussion

Since September 2013, 24 orthodontics patients (age 18 to 50) treated with oral PDT were retrospectively studied. The late evaluation protocol recorded the following characteristics: clinical history; physical examination; complaints of pain; burning; dryness; alteration of palate; fever; bleeding and ulcerations. In addition, appearance of the oral mucosa, oropharynx and tonsils were evaluated. The hard and soft palate, oral mucosa, tongue and gingiva were examined for inflammation, ulceration and signs as irritation.

The effects distributed into four groups containing the isolated and associated therapy variables: blue light, curcumin and surfactant and PDT were analyzed separately, however, no complications were presented in Table 1.

Adverse events have not been reported in clinical trials using PDT in oral decontamination of patients. The full clinical history, with particular attention to relevant data such as pain, fever, burning, bleeding, dryness, ulceration and taste disturbance were not reported by patients submitted to PDT immediately after and during 5 years after treatment. In the clinical evaluation performed in December 2017, no alterations were observed in the appearance of the oral mucosa of volunteers. The investigation performed was hypertrophy of the tonsils, oral exanthema, vesicles, oropharynx hyperemia and ulcerations. In the follow-up of clinical studies of oral mucosa has been monitored the potential intra-oral as mucositis, tooth, taste and hypersensitivity as well as systemic adverse events [8-9]. PDT is proven to be efficient in microbial control. There are several studies that show the benefits of PDT on oral decontamination. Therefore, it is necessary studies that show the outcome of the safety of therapy over a longer time. In Figure 1 is showed the oral mucosa of a patient submitted to PDT in Setember 2013 and with follow up of 2017.

There was no complaint or alteration of the normal appearance of the oral mucosa. The oral mucosa, tonsils and oropharynx of the 24 patients submitted to PDT in September 2013 were examined between September and December 2017. No alterations were observed on Figure 1 as hyperemia and hypertrophy of tonsils and oropharynx. In addition, no side-effects as ulcerations and vesicles were observed.

It is possible to observe the healthy aspect of the oral mucosa and oropharynx with absence of tonsil and oropharynx hyperemia. The pharynx is connected to digestive and respiratory tract brings and

<table>
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<tbody>
<tr>
<td>Clinical history</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Pain</td>
<td>0 (0%)</td>
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<tr>
<td>Burning</td>
<td>0 (0%)</td>
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<td>Dryness</td>
<td>0 (0%)</td>
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<tr>
<td>Alteration of palate</td>
<td>0 (0%)</td>
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<tr>
<td>Fever</td>
<td>0 (0%)</td>
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<tr>
<td>Bleeding</td>
<td>0 (0%)</td>
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<td>Ulcerations</td>
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<tr>
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<tr>
<td>Vesicles</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Oropharynx hyperemia</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Tonsil hyperemia</td>
<td>0 (0%)</td>
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<tr>
<td>Ulcerations</td>
<td>0 (0%)</td>
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</tbody>
</table>

Table 1: Clinical history and evaluation of oral decontamination by PDT.

Figure 1: Oral mucosa of patient submitted to PDT four years after the end of the treatment [B] with absence of tonsil [A] and oropharynx [C] hyperemia.
external environment and it susceptible to microorganisms and carcinogenic substances. The follow-up of treatment of patients submitted to oral decontamination was evaluated and it indicated that antimicrobial PDT (curcumin and light, 450 nm) in oral mucosa is safe, and is, thus, it can be used to treat bacterial pharyngotonsillitis.

**Conclusion**

Long-Term Follow of all patients undergoing PDT were clinically evaluated after four years. It was considered the absence of adverse effects, such as hypersensitivity reactions and side effects. The study of the primary reported that PDT was effective in oral control with a microbial reduce of 3.34 Log10 UFC/mL in 2013.

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**References**


